

# MAX96717F

# CSI-2 to GMSL2 Serializer

## General Description

The MAX96717F GMSL™ serializer receives video on a MIPI CSI-2 interface and outputs it on a GMSL2 serial link transceiver. Simultaneously, it sends and receives bidirectional control channel data across the same GMSL2 link. GMSL2 data can be transported over Coaxial or Shielded-Twisted Pair (STP) cables. It operates at a fixed rate of 3Gbps in the forward direction and 187.5Mbps in the reverse direction. The device is programmed through a local I<sup>2</sup>C/UART interface or across the link from a matching deserializer. The MAX96717F includes two I<sup>2</sup>C/UART pass-through channels, flexible GPIO, SPI tunnel, a built-in ADC, temperature sensor, and an extensive set of diagnostics for functional safety. Operation is specified over the automotive temperature range of -40°C to +105°C. The device is AEC-Q100 Grade 2 qualified.

Data can be transmitted over low-cost 50Ω Coax or 100Ω STP cables that meet the GMSL2 channel specification. Table 1 provides guidance to typical maximum lengths of commonly used automotive cables. Contact the factory for the GMSL2 channel specification.

Table 1. Typical Maximum Cable Length vs. Attenuation

|  | 3.2mm Ø<br>50Ω<br>Coax,<br>Foam<br>Dielectric     | 2.7mm Ø<br>50Ω<br>Coax,<br>Solid<br>Dielectric | 100Ω<br>Shielded<br>Twisted<br>Pair,<br>AWG26 |
|--|---|--|---|
| <b>Attenuation at 3GHz<br/>(Typ, Room Temp)</b>    | 0.9dB/m   | 1.6dB/m  | 1.8dB/m                                       |
| <b>Attenuation at 3GHz<br/>(Max, Aged, +105°C)</b> | 1.1dB/m   | 2.0dB/m  | 2.2dB/m                                       |
| <b>GMSL Fwd/Rev Data<br/>Rate</b>                  | <b>Typical Maximum Cable Length at<br/>+105°C</b> |  |   |
| 3Gbps/187.5Mbps                                    | 20m   | 10m  | 11m   |

## Applications

- Advanced Driver Assistance Systems (ADAS)
  - LiDAR Systems
  - RADAR Systems
- 4Mp 40fps Forward-Vision Camera (FVC) Systems
- Surround View Systems (SVS)
- Driver Monitor Systems (DMS)
- Rear-View Camera (RVC)
- Systems with Multiple Synchronized Cameras

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[Ordering Information](#) appears at end of data sheet.

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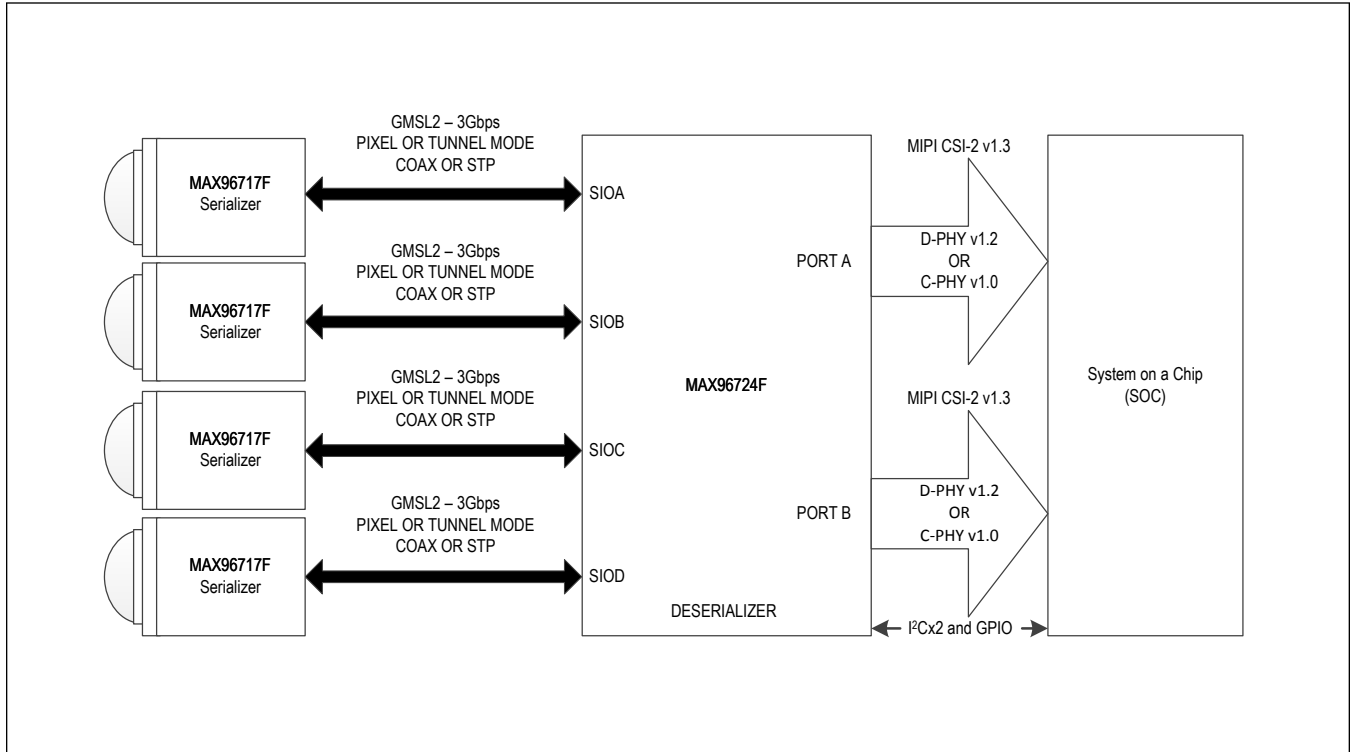
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## Benefits and Features

- Four-Lane D-PHY MIPI CSI-2 v1.3 Input Port
  - 16 Virtual Channels
  - Supports any CSI-2 Data Type in Tunneling Mode
- Advanced MIPI D-PHY v1.2 Receivers Rated at 2.5Gbps
  - Polarity Flip and Data Lane Reassignment
- Full-Duplex Capability Over a Single Wire
  - 3Gbps Forward-Link Rate
  - 187.5Mbps Reverse-Link Rate
- CSI-2 ECC, Checksum Local, Remote Error Detection, and Flagging
- ASIL-B Compliant
  - End-to-End Data Integrity through CRC in Tunneling Mode
  - R-S FEC for Protection of Forward Video and Control-Channel Data
  - CRC Protection of Side-Channel and Video Data
- Continuous Link-Margin Monitoring and Optimization
  - Reverse-Channel Adaptive Equalization
  - Reverse-Channel Eye-Opening Monitor for Continuous Link Margin Diagnosis
- Concurrent Side Channel for Device Configuration and Communication with Peripherals
  - I<sup>2</sup>C/UART, Pass-Through I<sup>2</sup>C/UART, SPI, GPIO, and Register-Programmable GPIO
- Reference Over Reverse (RoR) Clocking Supports Crystal-Free Operation
- Generates Reference Clock for Image Sensor
- Die Temperature Monitor, Internal and External Supply Voltage Monitor
- Compact 5mm x 5mm TQFN Side-Wettable Package with 0.5mm Pitch

Simplified Applications Diagram



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### Absolute Maximum Ratings

|  |                           |   |                                     |
|--|---------------------------|---|-------------------------------------|
| (All voltages with respect to ground) .....  |                           | XRES, X2.....   | -0.3V to (V <sub>DD18</sub> + 0.3V) |
| V <sub>DDIO</sub> .....                      | -0.3V to +3.9V            | All Other Pins ( <i>Note B</i> ).....   | -0.3V to (V <sub>DDIO</sub> + 0.3V) |
| V <sub>DD18</sub> .....                      | -0.3V to +2.0V            | Continuous Power Dissipation (T <sub>A</sub> = +70°C) TQFN and TQFN-SW, Multilayer board, derate 34.5mW/°C above +70°C .... | mW to 1896mW                        |
| V <sub>DD</sub> .....                        | -0.3V to +2.0V            | Storage Temperature Range .....   | -40°C to +150°C                     |
| CAP_VDD .....                                | 0.3V to +1.2V             | Soldering Temperature (Reflow).....   | +260°C                              |
| SIO_ (Active State) ( <i>Note A</i> ) .....  | -0.3V to (CAP_VDD + 0.3V) |   |                                     |
| SIO_ (Inactive State) ( <i>Note A</i> )..... | -0.3V to (CAP_VDD + 0.3V) |   |                                     |
| D_P/N, CKP/N .....                           | -0.3V to +1.35V           |   |                                     |

**Note A:** Active state means the device is powered-up and not in sleep or power-down modes. Inactive means the device is not powered-up, or powered-up in sleep or power-down mode.

**Note B:** V<sub>DDIO</sub> = specified maximum voltage or 3.9V, whichever is lower.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### Package Information

#### 32-Pin TQFN-SW (Side-Wettable)

|  |                           |
|--|---------------------------|
| Package Code                                 | T3255Y+8                  |
| Outline Number                               | <a href="#">21-100156</a> |
| Land Pattern Number                          | <a href="#">90-100067</a> |
| <b>Thermal Resistance, Four-Layer Board:</b> |                           |
| Junction to Ambient (θ <sub>JA</sub> )       | 29°C/W                    |
| Junction to Case (θ <sub>JC</sub> )          | 1.7°C/W                   |

For the latest package outline information and land patterns (footprints), go to [www.maximintegrated.com/packages](http://www.maximintegrated.com/packages). Note that a "+", "#", or "-" in the package code indicates RoHS status only. Package drawings may show a different suffix character, but the drawing pertains to the package regardless of RoHS status.

Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to [www.maximintegrated.com/thermal-tutorial](http://www.maximintegrated.com/thermal-tutorial).

### Electrical Characteristics

(V<sub>DD18</sub> = 1.7V to 1.9V, V<sub>DD</sub> = 0.95V to 1.26V, V<sub>DDIO</sub> = 1.7V to 3.6V, T<sub>A</sub> = -40°C to +105°C, EP connected to PCB ground, typical values are at V<sub>DD18</sub> = V<sub>DDIO</sub> = 1.8V, V<sub>DD</sub> = 1.0V, T<sub>A</sub> = +25°C, unless otherwise noted (*Note 1*.)

| PARAMETER  | SYMBOL           | CONDITIONS   | MIN | TYP | MAX  | UNITS |
|--|------------------|--|-----|-----|------|-------|
| <b>DC ELECTRICAL CHARACTERISTICS / GMSL2 FORWARD-CHANNEL SERIAL INPUTS/OUTPUTS (SIOP, SION)—SEE Figure 1</b> |                  |  |     |     |      |       |
| Output-Voltage Swing (Single-Ended)  | V <sub>O</sub>   | R <sub>L</sub> = 100Ω ±1%, (V <sub>OH</sub> - V <sub>OL</sub> ) for both outputs | 300 | 400 | 500  | mV    |
| Output-Voltage Swing (Differential)  | V <sub>ODT</sub> | R <sub>L</sub> = 100Ω ±1%, peak-to-peak differential voltage                     | 600 | 800 | 1000 | mV    |
| Change in V <sub>OD</sub> Between Complementary Output States  | ΔV <sub>OD</sub> | R <sub>L</sub> = 100Ω ±1%,  V <sub>OD(H)</sub> - V <sub>OD(L)</sub>              |     |     | 25   | mV    |
| Differential Output Offset Voltage   | V <sub>OS</sub>  | R <sub>L</sub> = 100Ω ±1%, offset voltage in each output state                   | 0.4 | 0.5 | 0.6  | V     |
| Change in V <sub>OS</sub> Between Complementary Output States  | ΔV <sub>OS</sub> | R <sub>L</sub> = 100Ω ±1%,  (V <sub>OS(H)</sub> - V <sub>OS(L)</sub> )           |     |     | 25   | mV    |

**Electrical Characteristics (continued)**

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^{\circ}C$  to  $+105^{\circ}C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^{\circ}C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER   | SYMBOL         | CONDITIONS   | MIN                   | TYP | MAX                   | UNITS      |
|---|----------------|--|-----------------------|-----|-----------------------|------------|
| Termination Resistance (Internal)   | $R_O$          | Any pin to $V_{DD18}$  | 45                    | 50  | 55                    | $\Omega$   |
| <b>DC ELECTRICAL CHARACTERISTICS / D-PHY HS RECEIVER</b>                              |                |  |                       |     |                       |            |
| Common-Mode Voltage HS Receive Mode   | $V_{CMRX(DC)}$ |  | 70                    |     | 330                   | mV         |
| Differential Input High Threshold   | $V_{IDTH}$     |  |                       |     | 40                    | mV         |
| Differential Input Low Threshold  | $V_{IDTL}$     |  | -40                   |     |                       | mV         |
| Single-Ended Input High Voltage   | $V_{IHHS}$     |  |                       |     | 460                   | mV         |
| Single-Ended Input Low Voltage  | $V_{ILHS}$     |  | -40                   |     |                       | mV         |
| Single-Ended Threshold For HS Termination Enable                                      | $V_{TERM-EN}$  |  |                       |     | 450                   | mV         |
| Differential Input Impedance  | $Z_{ID}$       |  | 80                    | 100 | 125                   | $\Omega$   |
| <b>DC ELECTRICAL CHARACTERISTICS / D-PHY LP RECEIVER—SEE <a href="#">Figure 6</a></b> |                |  |                       |     |                       |            |
| Logic 1 Input Voltage   | $V_{IH}$       |  | 740                   |     |                       | mV         |
| Logic 0 Input Voltage, Not in ULP State   | $V_{IL}$       |  |                       |     | 550                   | mV         |
| Input Hysteresis  | $V_{HYST}$     |  | 25                    |     |                       | mV         |
| Pin Leakage Current   | $I_{LEAK}$     | -0.05V to 1.35V  | -10                   |     | 10                    | $\mu A$    |
| <b>DC ELECTRICAL CHARACTERISTICS / I/O PINS (GPIO)</b>                                |                |  |                       |     |                       |            |
| High-Level Input Voltage  | $V_{IH}$       |  | $0.7 \times V_{DDIO}$ |     |                       | V          |
| Low-Level Input Voltage   | $V_{IL}$       |  |                       |     | $0.3 \times V_{DDIO}$ | V          |
| High-Level Output Voltage   | $V_{OH}$       | $I_{OH} = -4mA$  | $V_{DDIO} - 0.4$      |     |                       | V          |
| Low-Level Output Voltage  | $V_{OL}$       | $I_{OL} = 4mA$   |                       |     | 0.4                   | V          |
| Input Current   | $I_{IN}$       | $V_{IN} = 0$ to $V_{DDIO}$ . All pullup/pulldown devices disabled. |                       |     | 1                     | $\mu A$    |
| Input Capacitance   | $C_{IN}$       | Each pin   |                       | 5   |                       | pF         |
| Input Pullup/Pulldown Resistance  | $R_{IN}$       | 40k $\Omega$ enabled   |                       | 40  |                       | k $\Omega$ |
|   |                | 1M $\Omega$ enabled  |                       | 1   |                       | M $\Omega$ |
| <b>DC ELECTRICAL CHARACTERISTICS / OPEN-DRAIN PINS</b>                                |                |  |                       |     |                       |            |
| High-Level Input Voltage  | $V_{IH}$       |  | $0.7 \times V_{DDIO}$ |     |                       | V          |
| Low-Level Input Voltage   | $V_{IL}$       |  |                       |     | $0.3 \times V_{DDIO}$ | V          |

**Electrical Characteristics (continued)**

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^{\circ}C$  to  $+105^{\circ}C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^{\circ}C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER   | SYMBOL       | CONDITIONS   | MIN                   | TYP  | MAX                   | UNITS      |
|---|--------------|--|-----------------------|------|-----------------------|------------|
| Low-Level Open-Drain Output Voltage   | $V_{OL}$     | $I_{OL} = 4mA$   |                       |      | 0.4                   | V          |
| Input Current   | $I_{IN}$     | $V_{IN} = 0$ to $V_{DDIO}$ . All pullup/pulldown devices disabled. |                       |      | 1                     | $\mu A$    |
| Input Capacitance   | $C_{IN}$     | Each pin   |                       | 3    |                       | pF         |
| Internal Pullup Resistor  | $R_{PU}$     | 40k $\Omega$ enabled   |                       | 40   |                       | k $\Omega$ |
|   |              | 1M $\Omega$ enabled  |                       | 1    |                       | M $\Omega$ |
| <b>DC ELECTRICAL CHARACTERISTICS / PWDNB INPUT</b>  |              |  |                       |      |                       |            |
| High-Level Input Voltage  | $V_{IH}$     |  | $0.7 \times V_{DDIO}$ |      |                       | V          |
| Low-Level Input Voltage   | $V_{IL}$     |  |                       |      | $0.3 \times V_{DDIO}$ | V          |
| Input Current   | $I_{IN}$     | $V_{IN} = 0$ to $V_{DDIO}$   |                       |      | 6                     | $\mu A$    |
| Input Capacitance   | $C_{IN}$     |  |                       | 3    |                       | pF         |
| Internal Pulldown Resistor  | $R_{PD}$     |  |                       | 1    |                       | M $\Omega$ |
| <b>DC ELECTRICAL CHARACTERISTICS / PUSH-PULL OUTPUTS (GPIO)</b>   |              |  |                       |      |                       |            |
| High-Level Output Voltage   | $V_{OH}$     | $I_{OH} = -4mA$  | $V_{DDIO} - 0.4$      |      |                       | V          |
| Low-Level Output Voltage  | $V_{OL}$     | $I_{OL} = 4mA$   |                       |      | 0.4                   | V          |
| <b>DC ELECTRICAL CHARACTERISTICS / LINE FAULT DETECTION INPUT (LMN0, LMN1)</b>                              |              |  |                       |      |                       |            |
| Open-Pin Voltage  | $V_{O0}$     | LMN0   |                       | 1.25 |                       | V          |
|   | $V_{O1}$     | LMN1   |                       | 0.75 |                       |            |
| <b>DC ELECTRICAL CHARACTERISTICS / REFERENCE CLOCK INPUT (CRYSTAL) (X1/OSC, X2)</b>                         |              |  |                       |      |                       |            |
| X1/OSC Input Capacitance  | $C_{IN\_X1}$ |  |                       | 3    |                       | pF         |
| X2 Input Capacitance  | $C_{IN\_X2}$ |  |                       | 1    |                       | pF         |
| Internal X2 Limit Resistor  | $R_{LIM}$    |  |                       | 1.2  |                       | k $\Omega$ |
| Internal Feedback Resistor  | $R_{FB}$     |  |                       | 10   |                       | k $\Omega$ |
| Transconductance  | $g_m$        |  |                       | 28   |                       | mA/V       |
| <b>DC ELECTRICAL CHARACTERISTICS / REFERENCE CLOCK REQUIREMENTS (EXTERNAL INPUT ON X1/OSC, X2 FLOATING)</b> |              |  |                       |      |                       |            |
| High-Level Input Voltage  | $V_{IH}$     |  | 0.9                   |      |                       | V          |
| Low-Level Input Voltage   | $V_{IL}$     |  |                       |      | 0.4                   | V          |
| Input Resistance  | $R_{IN}$     |  |                       | 10   |                       | k $\Omega$ |
| X1 Input Capacitance  | $C_{IN\_X1}$ |  |                       | 3    |                       | pF         |
| <b>DC ELECTRICAL CHARACTERISTICS / MONITOR ADC</b>  |              |  |                       |      |                       |            |
| Resolution  |              |  |                       | 10   |                       | bits       |

**Electrical Characteristics (continued)**

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^{\circ}C$  to  $+105^{\circ}C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^{\circ}C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER   | SYMBOL         | CONDITIONS  |                                     | MIN  | TYP     | MAX        | UNITS       |
|---|----------------|---|-------------------------------------|--|---------|------------|-------------|
| Input-Voltage Range   | $V_{IN}$       | Using internal reference, no divider, no internal buffer.                         |                                     | 0.0 to $V_{REF}$                               |         | V          |             |
|   |                | Using internal reference, 2:1 divider, no internal buffer, ADC0, ADC1, ADC2 pins. |                                     | 0.0 to lower of (2 x $V_{REF}$ ) or $V_{DDIO}$ |         |            |             |
|   |                | Using internal reference, 3:1 divider, no internal buffer, ADC0, ADC1, ADC2 pins. |                                     | 0.0 to lower of (3 x $V_{REF}$ ) or $V_{DDIO}$ |         |            |             |
|   |                | Using internal reference, 4:1 divider, no internal buffer, ADC0, ADC1, ADC2 pins. |                                     | 0.0 to $V_{DDIO}$                              |         |            |             |
|   |                | No divider, buffered input  |                                     | 0.1 to $V_{REF}$                               |         |            |             |
| Input Resistance  | $R_{IN}$       | Input configured for 2:1 voltage division   |                                     | 60   |         | k $\Omega$ |             |
|   |                | Input configured for 3:1 voltage division   |                                     | 45   |         |            |             |
|   |                | Input configured for 4:1 voltage division   |                                     | 40   |         |            |             |
|   |                | No divider, buffered input  |                                     | > 5  |         | M $\Omega$ |             |
| Total Unadjusted Error  | TUE            | External $V_{REF} = 1.25V$ , no divider, buffered input                           | External ADC (0-2) voltage = 0.1V   | -10  |         | +10        | mV          |
|   |                |   | External ADC (0-2) voltage = 0.625V | -12  |         | +12        |             |
|   |                |   | External ADC (0-2) voltage = 1.2V   | -15  |         | +15        |             |
| Reference-Voltage Tolerance for 1% ADC Accuracy                                     | $V_{REF\_TOL}$ | External $V_{REF} = 1.25V$ , no divider, buffered input                           |                                     |  | $\pm 1$ |            | mV          |
| <b>DC ELECTRICAL CHARACTERISTICS / TEMPERATURE MONITOR (<a href="#">Note 2</a>)</b> |                |   |                                     |  |         |            |             |
| Measurable Range  | T1             |   |                                     | -40  |         | +105       | $^{\circ}C$ |
| Accuracy  | $ERROR_{T1}$   | -40 $^{\circ}C$ to +105 $^{\circ}C$   |                                     |  | $\pm 3$ |            | $^{\circ}C$ |
| Measurable Range  | T2             |   |                                     | +105   |         | 125        | $^{\circ}C$ |
| Accuracy  | $ERROR_{T2}$   | +105 $^{\circ}C$ to +125 $^{\circ}C$  |                                     | -2.5   |         | +2.5       | $^{\circ}C$ |
| <b>DC ELECTRICAL CHARACTERISTICS / POWER SUPPLY CURRENTS</b>                        |                |   |                                     |  |         |            |             |
| Supply Current ( <a href="#">Note 3</a> )   | $I_{DD}$       | RGB888, 3Gbps, 4-Lane CSI-2 input, 600Mbps per lane                               | $V_{DD18} = 1.9V$                   |  | 46      | 53         | mA          |
|   |                |   | $V_{DD} = 1.05V$                    |  | 74      | 228        |             |
|   |                |   | $V_{DD} = 1.26V$                    |  | 74      | 238        |             |
| Maximum $V_{DDIO}$ Supply Current ( <a href="#">Note 4</a> )                        | $I_{DDIO}$     | Per toggling GPIO, $C_L = 20pF$   | $V_{DDIO} = 1.9V$                   |  | 44      |            | $\mu A/MHz$ |
|   |                |   | $V_{DDIO} = 3.6V$                   |  | 81      |            |             |

**Electrical Characteristics (continued)**

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^{\circ}C$  to  $+105^{\circ}C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^{\circ}C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER  | SYMBOL                | CONDITIONS  | MIN                   | TYP  | MAX | UNITS    |
|--|-----------------------|---|-----------------------|------|-----|----------|
| <b>DC ELECTRICAL CHARACTERISTICS / POWER-DOWN CURRENT</b>                        |                       |   |                       |      |     |          |
| Maximum Power-Down Current   | $I_{DD}$              | $V_{DDIO}$ at 3.6V  | $T_A = +25^{\circ}C$  | 6.4  |     | $\mu A$  |
|  |                       |   | $T_A = +105^{\circ}C$ | 6.1  |     |          |
|  |                       | $V_{DD18}$ at 1.9V  | $T_A = +25^{\circ}C$  | 0.5  |     |          |
|  |                       |   | $T_A = +105^{\circ}C$ | 1.9  |     |          |
|  |                       | $V_{DD}$ at 1.26V   | $T_A = +25^{\circ}C$  | 3    |     |          |
|  |                       |   | $T_A = +105^{\circ}C$ | 48   |     |          |
| <b>DC ELECTRICAL CHARACTERISTICS / SLEEP CURRENT</b>                             |                       |   |                       |      |     |          |
| Maximum Sleep Current  | $I_{DD}$              | $V_{DDIO}$ at 3.6V  | $T_A = +25^{\circ}C$  | 7.7  |     | $\mu A$  |
|  |                       |   | $T_A = +105^{\circ}C$ | 7.4  |     |          |
|  |                       | $V_{DD18}$ at 1.9V  | $T_A = +25^{\circ}C$  | 0.5  |     |          |
|  |                       |   | $T_A = +105^{\circ}C$ | 5    |     |          |
|  |                       | $V_{DD}$ at 1.26V   | $T_A = +25^{\circ}C$  | 6.2  |     |          |
|  |                       |   | $T_A = +105^{\circ}C$ | 49   |     |          |
| <b>AC ELECTRICAL CHARACTERISTICS / FORWARD CHANNEL SWITCHING CHARACTERISTICS</b> |                       |   |                       |      |     |          |
| Serial-Output Rise Time  | $t_R$                 | 20% to 80%, $V_{OD} = 800mV$ differential, $R_L = 100\Omega$ , 500mV single-ended $R_L = 50\Omega$  |                       | 50   |     | ps       |
| Serial-Output Fall Time  | $t_F$                 | 80% to 20%, $V_{OD} = 800mV$ differential, $R_L = 100\Omega$ , 400mV single-ended $R_L = 50\Omega$  |                       | 50   |     | ps       |
| Total Serial-Output Jitter   | $t_{TSOJ}$            | PRBS7, single-ended or differential   |                       | 0.15 |     | UI (p-p) |
| Deterministic Serial-Output Jitter   | $t_{DSOJ}$            | PRBS7, single-ended or differential   |                       | 0.10 |     | UI (p-p) |
| Lock Time  | $t_{LOCK}$            | Time from deassertion of PWDNB until LOCK = '1'. See <a href="#">Figure 2</a>   |                       | 35   |     | ms       |
| PWDNB Hold Time  | $t_{HOLD\_PWNB}$      | The minimum duration PWDNB must be held LOW to reset the device.  |                       | 1    |     | ms       |
| Data Initialization Time   | $t_{PU}$              | Time from initial data being applied to CSI-2 until it appears at SIOF, SION. Assumes link is already established. See <a href="#">Figure 3</a> |                       | 2    |     | ms       |
| GPI-to-GPO Delay   | $t_{GPD1}$            | Delay compensated mode.   |                       | 10   |     | $\mu s$  |
|  | $t_{GPD2}$            | Non-delay compensated mode.   |                       | 3    |     |          |
| GPI-GPO Skew Reverse Path  | $t_{SKEW}$            | Delay compensated mode.   |                       | 7    |     | ns       |
| <b>AC ELECTRICAL CHARACTERISTICS / D-PHY HS RECEIVER</b>                         |                       |   |                       |      |     |          |
| Common-Mode Interference Beyond 450MHz   | $\Delta V_{CMRX(HF)}$ | <a href="#">Note 2</a> , <a href="#">Note 5</a> , <a href="#">Note 8</a>  | Data rate > 1.5Gbps   |      | 50  | mV       |
| Common-Mode Interference 50MHz–450MHz  | $\Delta V_{CMRX(LF)}$ | <a href="#">Note 2</a> , <a href="#">Note 5</a> , <a href="#">Note 6</a>  | Data rate > 1.5Gbps   | -25  | 25  | mV       |

### Electrical Characteristics (continued)

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^{\circ}C$  to  $+105^{\circ}C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^{\circ}C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER   | SYMBOL                                    | CONDITIONS   | MIN  | TYP   | MAX                 | UNITS       |
|---|---|--|------|-------|---------------------|-------------|
| Common-Mode Reflection Coefficient  | $S_{CCRX}$                                | $450MHz < f < 1.875GHz$  |      | -5    |                     | dB          |
| Differential-Mode Reflection Coefficient  | $S_{ddRX}$                                | $f < 20MHz$  |      | -22.5 |                     | dB          |
|   |   | $f = 1.25GHz$  |      | -12   |                     |             |
|   |   | $f = 1.875GHz$   |      | -9.7  |                     |             |
| <b>AC ELECTRICAL CHARACTERISTICS / D-PHY LP RECEIVER—SEE <a href="#">Figure 6 (Note 2)</a></b>                                  |   |  |      |       |                     |             |
| Input Pulse Rejection   | $e_{SPIKE}$                               | See <a href="#">Figure 6</a>   |      |       | 300                 | V·ps        |
| Minimum Pulse Width Response  | $T_{MIN-RX}$                              | See <a href="#">Figure 6</a>   | 20   |       |                     | ns          |
| Peak Interference Amplitude   | $V_{INT}$                                 |  |      |       | 200                 | mV          |
| Interference Frequency  | $f_{INT}$                                 |  | 450  |       |                     | MHz         |
| <b>AC ELECTRICAL CHARACTERISTICS / D-PHY DATA CLOCK TIMING—SEE <a href="#">Figure 7 (Note 2)</a></b>                            |   |  |      |       |                     |             |
| UI Instantaneous  | $UI_{INST}$                               |  | 0.4  |       | 12.5                | ns          |
| UI Variation  | $\Delta UI$                               | $UI \geq 1ns$ , within a single burst  | -10% |       | +10%                | UI          |
|   |   | $0.667ns < UI < 1ns$ , within a single burst   | -5%  |       | 5%                  |             |
| Data to Clock Setup Time  | $T_{SETUP[RX]}$                           | $< 1.0Gbps$  | 0.15 |       |                     | $UI_{INST}$ |
|   |   | $> 1.0Gbps$  | 0.2  |       |                     |             |
| Data to Clock Hold Time   | $T_{HOLD[RX]}$                            | $< 1.0Gbps$  | 0.15 |       |                     | $UI_{INST}$ |
|   |   | $> 1.0Gbps$  | 0.2  |       |                     |             |
| Static Data to Clock Skew   | $T_{SKEW[RX]}$<br>static                  | $> 1.5Gbps$  | -0.2 |       | 0.2                 | $UI_{INST}$ |
| Dynamic Data to Clock Skew Window Rx Tolerance  | $T_{SETUP[RX]} + T_{HOLD[RX]}$<br>Dynamic | $> 1.5Gbps$  | 0.50 |       |                     | $UI_{INST}$ |
| <b>AC ELECTRICAL CHARACTERISTICS / D-PHY GLOBAL OPERATION TIMING (<a href="#">Note 2</a>)</b>                                   |   |  |      |       |                     |             |
| Time Interval When the HS Receiver Ignores Any Clock Lane HS Transitions, Starting from the Beginning of $T_{CLK-PREPARE}$ .    | $T_{CLK-SETTLE}$                          | See <a href="#">Switching the Clock Lane Between Clock Transmission and Low-Power Mode</a> . | 95   |       | 300                 | ns          |
| Time for the Clock Lane Receiver to Enable the HS Line Termination, Starting from the Time Point When Dn Crosses $V_{IL,MAX}$ . | $T_{CLK-TERM-EN}$                         | See <a href="#">Switching the Clock Lane between Clock Transmission and Low-Power Mode</a> . |      |       | 38                  | ns          |
| Time for the Data Lane Receiver to Enable the HS Line Termination, Starting from the Time Point When Dn Crosses $V_{IL,MAX}$ .  | $T_{D-TERM-EN}$                           | See <a href="#">Figure 8</a> and <a href="#">Figure 9</a>                                    |      |       | $35ns + 4 \cdot UI$ | ns          |

### Electrical Characteristics (continued)

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^{\circ}C$  to  $+105^{\circ}C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^{\circ}C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER  | SYMBOL          | CONDITIONS   | MIN                          | TYP | MAX            | UNITS   |
|--|-----------------|--|------------------------------|-----|----------------|---------|
| Time Interval When the HS Receiver Ignores Any Data Lane HS Transitions, Starting from the Beginning of $T_{HS-PREPARE}$ . | $T_{HS-SETTLE}$ | See <a href="#">Figure 8</a> and <a href="#">Figure 9</a>  | 85 +<br>6*UI                 |     | 145 +<br>10*UI | ns      |
| <b>AC ELECTRICAL CHARACTERISTICS / I<sup>2</sup>C/UART PORT TIMING—SEE <a href="#">Figure 4</a></b>                        |                 |  |                              |     |                |         |
| Output Fall Time   | $t_F$           | 70% to 30%, $C_L = 20pF$ to $100pF$ , $1k\Omega$ pullup to $V_{DDIO}$ . ( <a href="#">Note 2</a> )   | 20 x<br>$V_{DDIO}/5$ .<br>5V |     | 150            | ns      |
| I <sup>2</sup> C/UART Wake Time  |                 | From power-up or rising edge of PWDNB to local register access. For remote register access, I <sup>2</sup> C/UART wake time is the same as lock time ( $t_{LOCK}$ ). |                              | 1.1 |                | ms      |
| <b>AC ELECTRICAL CHARACTERISTICS / I<sup>2</sup>C TIMING—SEE <a href="#">Figure 4</a></b>                                  |                 |  |                              |     |                |         |
| SCL Clock Frequency  | $f_{SCL}$       | Low $f_{SCL}$ range : (I2CMSTBT = 010, I2CSLVSH = 10)  | 9.6                          |     | 100            | kHz     |
|  |                 | Mid $f_{SCL}$ range : (I2CMSTBT = 101, I2CSLVSH = 01)  | 100                          |     | 400            |         |
|  |                 | High $f_{SCL}$ range : (I2CMSTBT = 111, I2CSLVSH = 00)   | 400                          |     | 1000           |         |
| Start Condition Hold Time  | $t_{HD:STA}$    | $f_{SCL}$ range, Low   | 4                            |     |                | $\mu s$ |
|  |                 | $f_{SCL}$ range, Mid   | 0.6                          |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 0.26                         |     |                |         |
| Low Period of SCL Clock  | $t_{LOW}$       | $f_{SCL}$ range, Low   | 4.7                          |     |                | $\mu s$ |
|  |                 | $f_{SCL}$ range, Mid   | 1.3                          |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 0.5                          |     |                |         |
| High Period of SCL Clock   | $t_{HIGH}$      | $f_{SCL}$ range, Low   | 4                            |     |                | $\mu s$ |
|  |                 | $f_{SCL}$ range, Mid   | 0.6                          |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 0.26                         |     |                |         |
| Repeated Start Condition Setup Time  | $t_{SU:STA}$    | $f_{SCL}$ range, Low   | 4.7                          |     |                | $\mu s$ |
|  |                 | $f_{SCL}$ range, Mid   | 0.6                          |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 0.26                         |     |                |         |
| Data Hold Time   | $t_{HD:DAT}$    | $f_{SCL}$ range, Low   | 0                            |     |                | ns      |
|  |                 | $f_{SCL}$ range, Mid   | 0                            |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 0                            |     |                |         |
| Data Setup Time  | $t_{SU:DAT}$    | $f_{SCL}$ range, Low   | 250                          |     |                | ns      |
|  |                 | $f_{SCL}$ range, Mid   | 100                          |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 50                           |     |                |         |
| Setup Time for Stop Condition  | $t_{SU:STO}$    | $f_{SCL}$ range, Low   | 4                            |     |                | $\mu s$ |
|  |                 | $f_{SCL}$ range, Mid   | 0.6                          |     |                |         |
|  |                 | $f_{SCL}$ range, High  | 0.26                         |     |                |         |



**Electrical Characteristics (continued)**

( $V_{DD18} = 1.7V$  to  $1.9V$ ,  $V_{DD} = 0.95V$  to  $1.26V$ ,  $V_{DDIO} = 1.7V$  to  $3.6V$ ,  $T_A = -40^\circ C$  to  $+105^\circ C$ , EP connected to PCB ground, typical values are at  $V_{DD18} = V_{DDIO} = 1.8V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^\circ C$ , unless otherwise noted ([Note 1](#).)

| PARAMETER  | SYMBOL             | CONDITIONS   | MIN                             | TYP         | MAX  | UNITS   |
|--|--------------------|--|---------------------------------|-------------|------|---------|
| Bus Free Time  | $t_{BUF}$          | $f_{SCL}$ range, Low   | 4.7                             |             |      | $\mu s$ |
|  |                    | $f_{SCL}$ range, Mid   | 1.3                             |             |      |         |
|  |                    | $f_{SCL}$ range, High  | 0.5                             |             |      |         |
| Data Valid Time  | $t_{VD:DAT}$       | $f_{SCL}$ range, Low   |                                 |             | 3.45 | $\mu s$ |
|  |                    | $f_{SCL}$ range, Mid   |                                 |             | 0.9  |         |
|  |                    | $f_{SCL}$ range, High  |                                 |             | 0.45 |         |
| Data Valid Acknowledge Time  | $t_{VD:ACK}$       | $f_{SCL}$ range, Low   |                                 |             | 3.45 | $\mu s$ |
|  |                    | $f_{SCL}$ range, Mid   |                                 |             | 0.9  |         |
|  |                    | $f_{SCL}$ range, High  |                                 |             | 0.45 |         |
| Pulse Width of Spikes Suppressed   | $t_{SP}$           | $f_{SCL}$ range, Low   |                                 |             | 50   | ns      |
|  |                    | $f_{SCL}$ range, Mid   |                                 |             | 50   |         |
|  |                    | $f_{SCL}$ range, High  |                                 |             | 50   |         |
| Capacitive Load On Each Bus Line   | $C_B$              |  |                                 |             | 100  | pF      |
| <b>AC ELECTRICAL CHARACTERISTICS / SPI MASTER—SEE <a href="#">Figure 12 (Note 7)</a></b>                             |                    |  |                                 |             |      |         |
| Programmable Operating Frequency Range   | $f_{MCK}$          | ( <a href="#">Note 2</a> )   | 0.588                           |             | 25   | MHz     |
| SCLK Period  | $t_{MCK}$          |  |                                 | $1/f_{MCK}$ |      | ns      |
| SCLK Output Pulse-Width High/Low   | $t_{MCH}, t_{MCL}$ | $C_L = 5pF$ ( <a href="#">Note 2</a> )                                       | $t_{MCK}/2 - \frac{t_{MCK}}{3}$ | $t_{MCK}/2$ |      | ns      |
| MOSI Data Output Delay   | $t_{MOD}$          | After SCLK falling edge ( <a href="#">Note 2</a> )                           | -6                              |             | 3    | ns      |
| MISO Input Setup Time  | $t_{MIS}$          | Before programmed sampling edge ( <a href="#">Note 2</a> )                   | 13.5                            |             |      | ns      |
| MISO Input Hold Time   | $t_{MIH}$          | After programmed sampling edge ( <a href="#">Note 2</a> )                    | -2                              |             |      | ns      |
| <b>AC ELECTRICAL CHARACTERISTICS / SPI SLAVE—SEE <a href="#">Figure 13 (Note 7)</a></b>                              |                    |  |                                 |             |      |         |
| Operating Frequency  | $f_{SCK}$          | ( <a href="#">Note 2</a> )   |                                 |             | 50   | MHz     |
| SCLK Period  | $t_{SCK}$          |  |                                 | $1/f_{SCK}$ |      | ns      |
| MISO Data Output Delay   | $t_{SOD}$          | After SCLK falling edge ( <a href="#">Note 2</a> )                           | 2                               |             | 11.3 | ns      |
| MOSI Input Setup Time  | $t_{SIS}$          | Before SCLK rising edge ( <a href="#">Note 2</a> )                           | 5                               |             |      | ns      |
| MOSI Input Hold Time   | $t_{SIH}$          | After SCLK rising edge ( <a href="#">Note 2</a> )                            | 3                               |             |      | ns      |
| <b>AC ELECTRICAL CHARACTERISTICS / MONITOR ADC</b>   |                    |  |                                 |             |      |         |
| Conversion Time  |                    |  |                                 | 430         |      | $\mu s$ |
| ADC Setup Time   | $T_{ADC\_SETUP}$   | ADC ready after power-up enable. Excluding external $V_{REF}$ power-up time. |                                 | 30          |      | $\mu s$ |
| ADC Clock  | $f_{ADCCLK}$       |  |                                 | 2.5         |      | MHz     |
| <b>AC ELECTRICAL CHARACTERISTICS / REFERENCE CLOCK INPUT REQUIREMENTS (CRYSTAL) (X1,X2) (<a href="#">Note 2</a>)</b> |                    |  |                                 |             |      |         |
| Frequency  |                    | Fundamental mode only  |                                 | 25          |      | MHz     |

### Electrical Characteristics (continued)

( $V_{DD18}$  = 1.7V to 1.9V,  $V_{DD}$  = 0.95V to 1.26V,  $V_{DDIO}$  = 1.7V to 3.6V,  $T_A$  = -40°C to +105°C, EP connected to PCB ground, typical values are at  $V_{DD18}$  =  $V_{DDIO}$  = 1.8V,  $V_{DD}$  = 1.0V,  $T_A$  = +25°C, unless otherwise noted ([Note 1](#).)

| PARAMETER  | SYMBOL     | CONDITIONS   | MIN | TYP | MAX  | UNITS    |
|--|------------|--|-----|-----|------|----------|
| Frequency Stability + Frequency Tolerance  | $f_{TN}$   |  |     |     | ±200 | ppm      |
| <b>AC ELECTRICAL CHARACTERISTICS / REFERENCE CLOCK REQUIREMENTS (EXTERNAL CLOCK INPUT ON X1, X2 FLOATING) (<a href="#">Note 2</a>)</b> |            |  |     |     |      |          |
| Frequency  | $f_{REF}$  |  |     | 25  |      | MHz      |
| Frequency Stability + Frequency Tolerance  | $f_{TN}$   |  |     |     | ±200 | ppm      |
| Input Jitter   | $t_{JIN}$  | 3Gbps/187.5Mbps, sinusoidal jitter < 1MHz (rising edge), downstream deserializer using crystal reference |     |     | 600  | ps (p-p) |
| Duty Cycle   | $T_{DUTY}$ |  | 40  |     | 60   | %        |
| Maximum Rise Time  | $t_R$      | 10% to 90%   |     | 5   |      | ns       |
| Maximum Fall Time  | $t_F$      | 80% to 20%   |     | 4   |      | ns       |
| <b>AC ELECTRICAL CHARACTERISTICS / REFERENCE CLOCK OUTPUT (RCLKOUT)</b>  |            |  |     |     |      |          |
| Frequency  | $f_{REF}$  | Crystal or reference clock input.  |     | 25  |      | MHz      |
| Rise Time  | $t_R$      | 20% to 80%, $C_L$ = 10pF, 12.5MHz (25MHz divided by 2), ( <a href="#">Note 4</a> )                       |     | 2   |      | ns       |
| Fall Time  | $t_F$      | 80% to 20%, $C_L$ = 10pF, 12.5MHz (25MHz divided by 2), ( <a href="#">Note 4</a> )                       |     | 2   |      | ns       |
| Jitter   | $t_J$      | $C_L$ = 10pF, Rising or falling edge, 12.5MHz (25MHz divided by 2)                                       |     | 100 |      | ps (p-p) |
| <b>AC ELECTRICAL CHARACTERISTICS / DIGITAL PLL OUTPUT (DPLL_OUT)</b>   |            |  |     |     |      |          |
| Frequency  | $f_{DPLL}$ | Maximum  |     |     | 75   | MHz      |
|  |            | Minimum  |     | 1   |      |          |
| Rise Time  | $t_R$      | 20% to 80%, $C_L$ = 10pF ( <a href="#">Note 4</a> )  |     | 2   |      | ns       |
| Fall Time  | $t_F$      | 80% to 20%, $C_L$ = 10pF ( <a href="#">Note 4</a> )  |     | 2   |      | ns       |
| Jitter   | $t_J$      | Rising or falling edge, deterministic jitter + 14 x random jitter, 27MHz. ( <a href="#">Note 4</a> )     |     | 360 |      | ps (p-p) |
| <b>ESD PROTECTION</b>  |            |  |     |     |      |          |
| SIO__  | $V_{ESD}$  | Human Body Model (HBM), $R_D$ = 1.5k $\Omega$ , $C_S$ = 100pF  |     | ±8  |      | kV       |
|  |            | ISO10605, $R_D$ = 330 $\Omega$ , $C_S$ = 150pF, Contact Discharge  |     | ±6  |      |          |
|  |            | ISO10605, $R_D$ = 330 $\Omega$ , $C_S$ = 150pF, Air Discharge  |     | ±8  |      |          |
|  |            | AEC-Q100-011 Rev-C1, Charged-Device Model (CDM)  |     | 750 |      | V        |
| All Other Pins   | $V_{ESD}$  | Human Body Model (HBM), $R_D$ = 1.5k $\Omega$ , $C_S$ = 100pF  |     | ±4  |      | kV       |
|  |            | AEC-Q100-011 Rev-C1, Charged-Device Model (CDM)  |     | 750 |      | V        |

**Note 1:** Limits are 100% tested at  $T_A$  = +105°C. Limits over the operating temperature range and relevant supply voltage range are guaranteed by design and characterization.

**Note 2:** Not production tested. Guaranteed by design.

**Note 3:** Color bar pattern. Maximum supply currents are measured at indicated supply voltages. Typical supply currents are measured at the typical supply voltages.

**Note 4:** MFP pin speed programmed to fastest setting. See the [Multifunction Pin Assignments](#) section.

**Note 5:** Excluding static ground shift of 50mV.

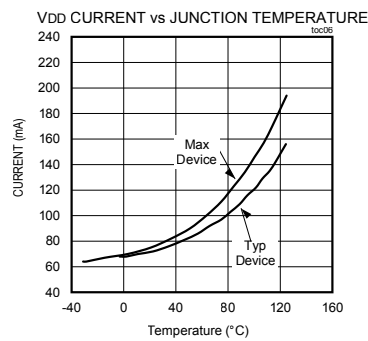
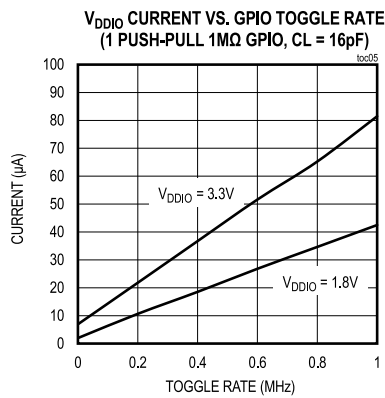
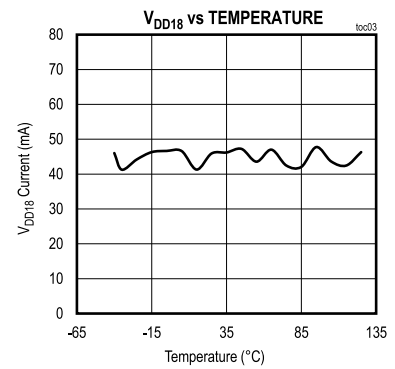
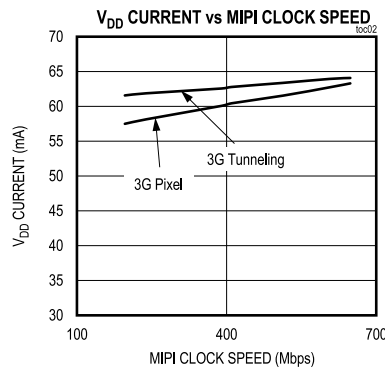
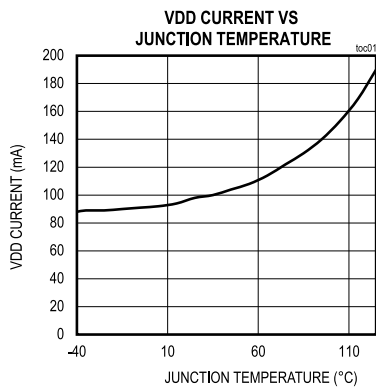
**Note 6:** Voltage difference compared to the DC average common-point potential.

**Note 7:** Measured at 50MHz, for  $V_{DDIO} = 1.7V$  to  $2.24V$ , Slew speed (PIOxxx\_SLEW[1:0] = 00) for MOSI, MISO, SCLK, RO, and BNE pins, and set to (PIOxxx\_SLEW[1:0] = 01) for  $V_{DDIO} = 2.2$  to  $3.6V$ .

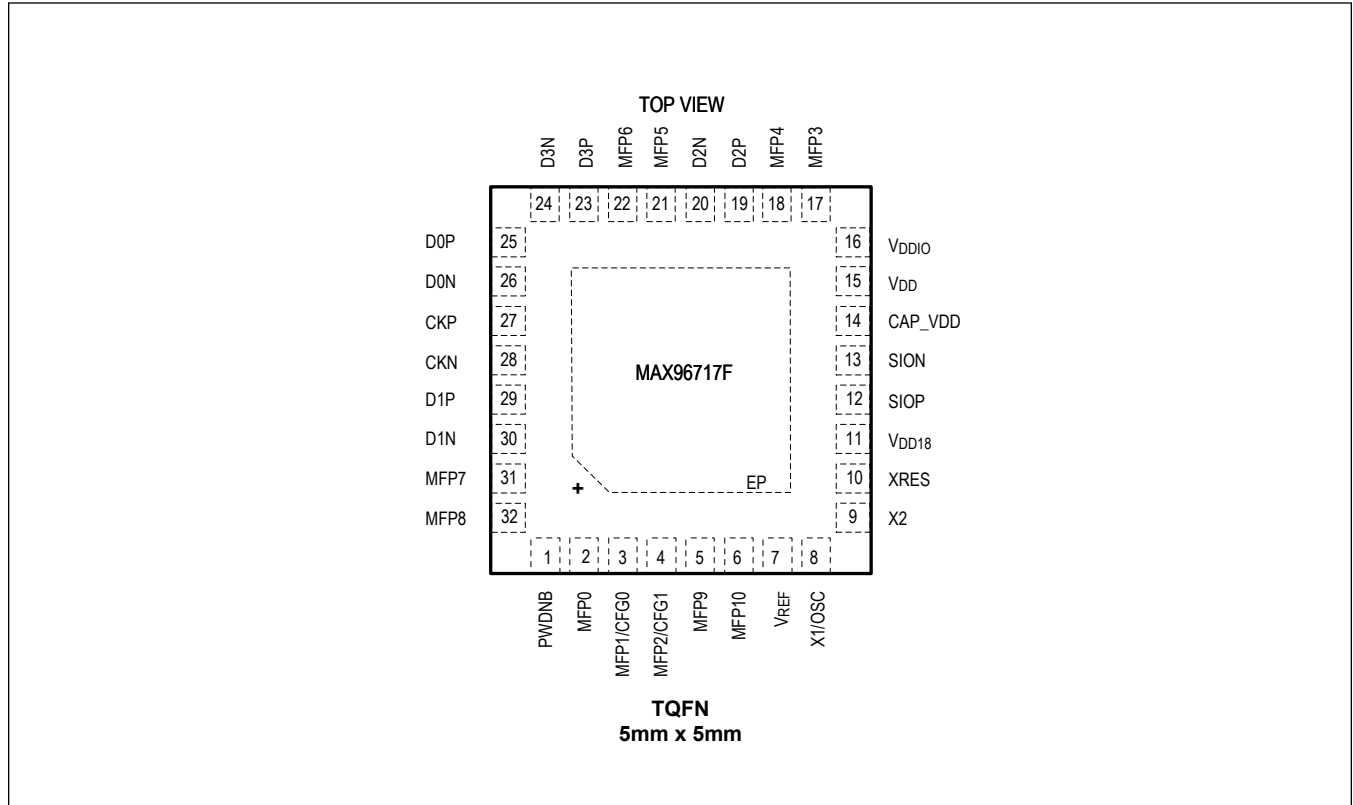
**Note 8:**  $\Delta V_{CMRX(HF)}$  is the peak amplitude of a sine-wave superimposed on the receiver inputs.

### Typical Operating Characteristics

( $V_{DD18} = 1.8V$ ,  $V_{DDIO} = 3.3V$ ,  $V_{DD} = 1.0V$ ,  $T_A = +25^\circ C$  unless otherwise noted. 3Gbps forward rate, 187.5Mbps reverse rate, PRBS24 data, 600Mbps per lane on 4 lanes DPHY.)



Pin Configuration



Pin Descriptions

| PIN                      | NAME | FUNCTION MODE | FUNCTION  |
|--------------------------|------|---------------|---|
|                          |      | GMSL2         |   |
| <b>GMSL2 SERIAL LINK</b> |      |               |   |
| 12                       | SIOP | SIOP          | Noninverted Coax/Twisted-Pair Serial-Data Input/Output.   |
| 13                       | SION | SION          | Inverted Twisted-Pair Serial-Data Input/Output. Terminate with 50Ω in series with 100nF to ground in Coax mode. |
| <b>CSI-2 INTERFACE</b>   |      |               |   |
| 19                       | D2P  | D2P           | CSI-2 Data Lane 2 Noninverted Input. Leave open if unused.  |
| 20                       | D2N  | D2N           | CSI-2 Data Lane 2 Inverted Input. Leave open if unused.   |
| 23                       | D3P  | D3P           | CSI-2 Data Lane 3 Noninverted Input. Leave open if unused.  |
| 24                       | D3N  | D3N           | CSI-2 Data Lane 3 Inverted Input. Leave open if unused.   |
| 25                       | D0P  | D0P           | CSI-2 Data Lane 0 Noninverted Input. Leave open if unused.  |
| 26                       | D0N  | D0N           | CSI-2 Data Lane 0 Inverted Input. Leave open if unused.   |
| 27                       | CKP  | CKP           | CSI-2 Clock Lane Noninverted Input.   |
| 28                       | CKN  | CKN           | CSI-2 Clock Lane Inverted Input.  |
| 29                       | D1P  | D1P           | CSI-2 Data Lane 1 Noninverted Input. Leave open if unused.  |
| 30                       | D1N  | D1N           | CSI-2 Data Lane 1 Inverted Input. Leave open if unused.   |

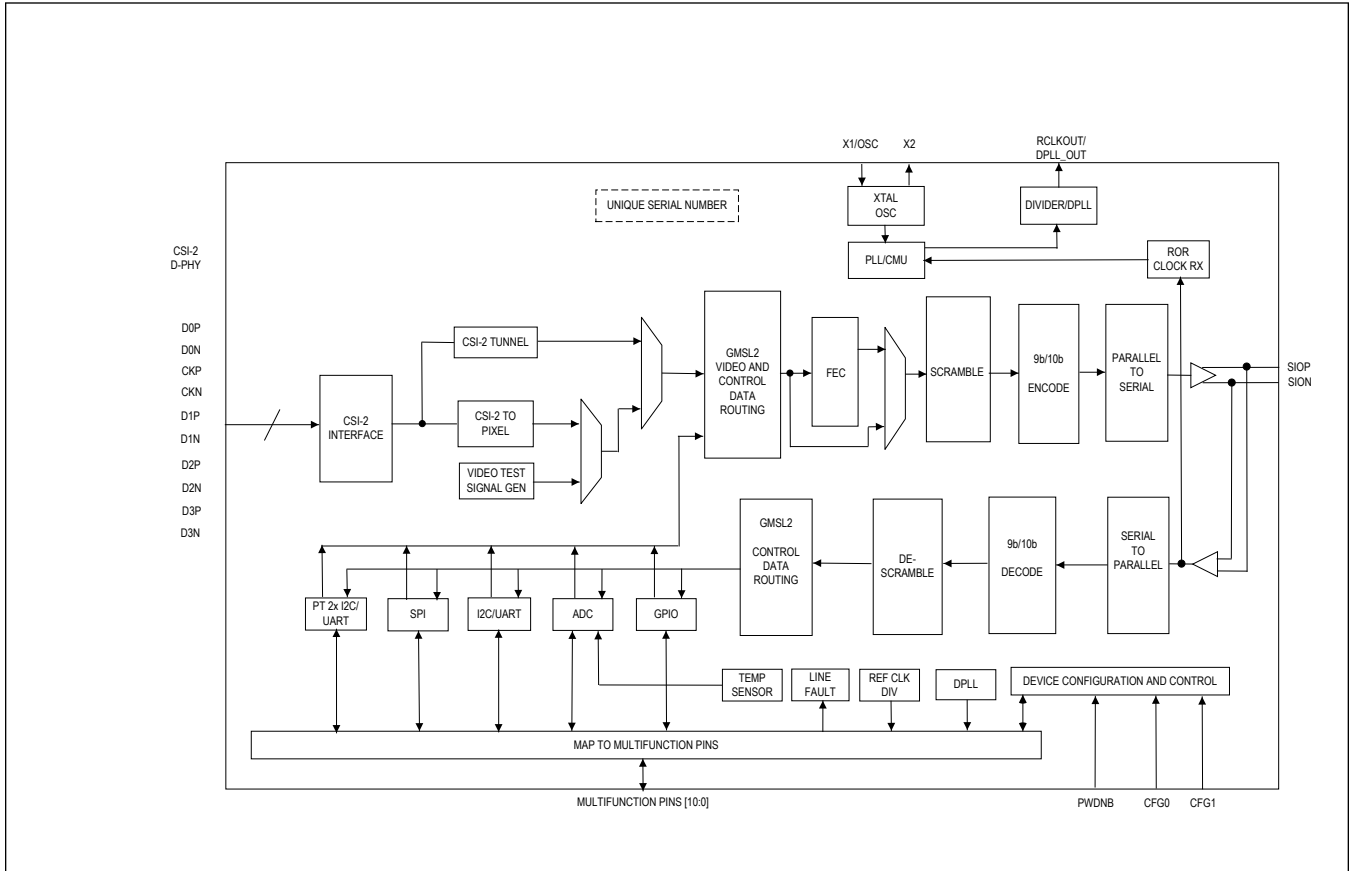
| PIN   | NAME      | FUNCTION MODE  | FUNCTION   |
|---|-----------|--|--|
|   |           | GMSL2  |  |
| <b>MULTIFUNCTION PINS (*) INDICATES DEFAULT STATE AFTER POWER-UP (LEAVE OPEN IF NOT USED)</b> |           |  |  |
| 2   | MFP0      | GPIO0*<br>SCLK<br>VTG0                                 | GPIO0: Configurable General-Purpose Input or Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor.<br>SCLK: SPI Clock. When configured as SPI master, push-pull clock output. When configured as slave, clock input with 1M $\Omega$ pulldown to ground.<br>VTG0: Selectable Video-Timing Generator Output for VS, HS, or PCLK  |
| 3   | MFP1/CFG0 | CFG0<br>GPO1*<br>SS1<br>BNE<br>VTG1                    | CFG0: Configuration Pin. Voltage at pin sets device modes, which are latched at power-up. Connect to a resistor divider between V <sub>DDIO</sub> and ground. See <a href="#">Table 10</a> .<br>GPO1: General-Purpose Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor.<br>SS1: When Configured as SPI Master, SS1 is a Slave Select Output.<br>BNE: When Configured as SPI Slave, BNE Output Indicates SPI Data is Available.<br>VTG1: Selectable Video-Timing Generator Output for VS, HS, or PCLK            |
| 4   | MFP2/CFG1 | CFG1<br>GPO2*<br>RCLKOUT(Alt)<br>DPLL_OUT(Alt)<br>VTG2 | CFG1: Configuration Pin. Voltage at pin sets device modes, which are latched at power-up. Connect to a resistor divider between V <sub>DDIO</sub> and ground. See <a href="#">Table 11</a> .<br>GPO2: General-Purpose Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor.<br>RCLKOUT (Alternate): 25MHz Frequency Reference Output. Divide by 2 or 4 available.<br>DPLL_OUT (Alternate): Digital PLL Output. Programmable from 1 to 75 MHz.<br>VTG2: Selectable Video-Timing Generator Output for VS, HS, or PCLK |
| 17  | MFP3      | GPIO3*<br>ADC0<br>LOCK<br>ERRB<br>VTG3                 | GPIO3: Configurable General-Purpose Input or Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor and GPIO disabled.<br>ADC0: Voltage Monitor Analog Input.<br>LOCK: High Indicates GMSL Link is Locked with Correct Serial Word Boundary Alignment.<br>ERRB: Line Fault or Error Output. Goes low when a line fault on LMN0 or LMN1, a CSI-2 ECC/CRC or other error (as configured) is detected.<br>VTG3: Selectable Video-Timing Generator Output for VS, HS, or PCLK   |

| PIN | NAME | FUNCTION MODE   | FUNCTION  |
|-----|------|---|---|
|     |      | GMSL2   |   |
| 18  | MFP4 | GPIO4*<br>RCLKOUT<br>DPLL_OUT<br>SS2<br>RO<br>VTG4          | GPIO4: Configurable General-Purpose Input or Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor and GPIO disabled.<br>RCLKOUT: 25MHz Frequency Reference Output. Divide by 2 or 4 available.<br>DPLL_OUT: Digital PLL Output. Programmable from 1 MHz to 75 MHz.<br>SS2: When Configured as SPI Master, SS2 is a Slave Select Output.<br>RO: When Configured as SPI Slave, the SPI Master can Read from the Local SPI Slave when Initiating an Exchange with the Remote Slave. RO is an input.<br>VTG4: Selectable Video-Timing Generator Output for VS, HS, or PCLK   |
| 21  | MFP5 | ODO5_GPI5*<br>ADC1<br>LMN0                                  | ODO5_GPI5: Configurable General-Purpose Input or Open-Drain Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor and GPIO disabled.<br>ADC1: Voltage Monitor Analog Input.<br>LMN0: Line-Fault Monitor Input.  |
| 22  | MFP6 | ODO6_GPI6*<br>ADC2<br>LMN1                                  | ODO6_GPI6: Configurable General-Purpose Input or Open-Drain Output. Power-up default is high impedance with a 1M $\Omega$ pulldown resistor and GPIO disabled.<br>ADC2: Voltage Monitor Analog Input.<br>LMN1: Line-Fault Monitor Input.  |
| 31  | MFP7 | GPI7*<br>GPIO7<br>MOSI<br>SDA1<br>RX1<br>LOCK (Alt)<br>VTG7 | GPI7: Configurable General-Purpose Input. Power-up default is GPI with a 1M $\Omega$ pulldown resistor.<br>GPIO7: Configurable General-Purpose Input or Output.<br>MOSI: SPI Master Output, Drives Data to an External SPI Slave. When configured as the master, push-pull output that drives data to external slave. When configured as a slave, input with an internal 1M $\Omega$ pulldown to ground that receives data from an external master.<br>SDA1: Pass-Through I <sup>2</sup> C Data Input/Output.<br>RX1: Pass-Through UART Input.<br>LOCK (Alternate): High Indicates PLLs Locked with Correct Serial Word Boundary Alignment.<br>VTG7: Selectable Video-Timing Generator Output for VS, HS, or PCLK   |
| 32  | MFP8 | GPIO8*<br>MS<br>MISO<br>SCL1<br>TX1<br>ERRB (Alt)<br>VTG8   | GPIO8: Configurable General-Purpose Input or Output with an Internal 40k $\Omega$ Pullup to V <sub>DDIO</sub> . Power-up default is GPIO output with logic high.<br>MS: Mode Select Input. Selects Base Mode or Bypass Mode for UART Control Channel.<br>MISO: Input, Receives Data from an External SPI Slave.<br>SCL1: Pass-Through I <sup>2</sup> C Clock Input/Open-Drain Output with an Internal 40k $\Omega$ Pullup to V <sub>DDIO</sub> .<br>TX1: Pass-Through UART Output with an Internal 40k $\Omega$ Pullup to V <sub>DDIO</sub> .<br>ERRB (Alternate): Error Output. Goes low when a line-fault on LMN0 or LMN1, or a CSI-2 ECC, CRC, or other (as configured) error is detected.<br>VTG8: Selectable Video-Timing Generator Output for VS, HS, or PCLK |

| PIN  | NAME              | FUNCTION MODE                      | FUNCTION  |
|--|-------------------|------------------------------------|---|
|  |                   | GMSL2                              |   |
| 5  | MFP9              | SDA_RX*<br>ODO9_GPI9<br>SDA2_RX2   | SDA_RX: I <sup>2</sup> C Serial-Data Input/Output or UART Receive. Internal 40k $\Omega$ pullup to V <sub>DDIO</sub> . (SDA or RX selected by CFG0 at power-up)<br>SDA: I <sup>2</sup> C Serial-Data Input/Open-Drain Output. RX: UART Input.<br>ODO9_GPI9: General-Purpose Input and/or Open-Drain Output.<br>SDA2_RX2: Pass-Through I <sup>2</sup> C Serial-Data Input/Output or UART2 Receive. Internal 40k $\Omega$ pullup. SDA2: Pass-Through I <sup>2</sup> C Data Input/Open-Drain Output. RX2: Pass-Through UART Input.   |
| 6  | MFP10             | SCL_TX*<br>ODO10_GPI10<br>SCL2_TX2 | SCL_TX: I <sup>2</sup> C Serial-Clock Input/Output or UART Transmit. Internal 40k $\Omega$ pullup to V <sub>DDIO</sub> . SCL: I <sup>2</sup> C Clock Input/Open-Drain Output. TX: UART Open-Drain Output. (SCL or TX selected by CFG0 at start-up)<br>ODO10_GPI10: Open-Drain Output or General-Purpose Input.<br>SCL2_TX2: Pass-Through I <sup>2</sup> C Serial-Clock Input/Output or UART2 Transmit. Internal 40k $\Omega$ pullup to V <sub>DDIO</sub> . SCL2: Pass-Through I <sup>2</sup> C Clock Input/Open-Drain Output. TX2: UART Pass-Through Open-Drain Output. |
| <b>POWER SUPPLIES—SEE <a href="#">Table 3</a> FOR DECOUPLING CAPACITOR RECOMMENDATIONS</b> |                   |                                    |   |
| 11   | V <sub>DD18</sub> | V <sub>DD18</sub>                  | 1.8V Analog Supply.   |
| 14   | CAP_VDD           | CAP_VDD                            | Decoupling Capacitor Pin for 1V Core Supply.  |
| 15   | V <sub>DD</sub>   | V <sub>DD</sub>                    | Digital Core Supply. Connect a 1.0V to 1.2V supply.   |
| 16   | V <sub>DDIO</sub> | V <sub>DDIO</sub>                  | 1.8V to 3.3V I/O Supply.  |
| EP   | EP                | EP                                 | Exposed Pad. EP is the ground connection to the device. EP MUST be connected to the PCB ground plane through an array of vias for proper thermal and electrical performance.  |
| <b>MISCELLANEOUS—SEE <a href="#">Table 3</a> FOR EXTERNAL COMPONENTS</b>                   |                   |                                    |   |
| 1  | PWDNB             | PWDNB                              | PWDNB: Active-Low Power-Down Input with a 1M $\Omega$ Pulldown to Ground. Set PWDNB low to enter power-down mode.   |
| 7  | V <sub>REF</sub>  | V <sub>REF</sub>                   | Optional External Reference Voltage for ADC. Voltage reference should be V <sub>REF</sub> = 1.25V.<br>Leave open if not used.   |
| 8  | X1/OSC            | X1/OSC                             | Crystal/Oscillator Input. If a crystal is used, connect to one terminal of a 25MHz $\pm$ 200ppm crystal and connect a load capacitor from X1/OSC to EP (load capacitor value depends on the crystal used). If an oscillator is used, supply a 25MHz $\pm$ 200ppm signal. Leave open if using Reference Over Reverse mode.   |
| 9  | X2                | X2                                 | Crystal Input. Connect to one terminal of a 25MHz $\pm$ 200ppm crystal and connect a load capacitor from X2 to EP (Load capacitor value depends on crystal used). Leave open if using Reference Over Reverse mode or using an oscillator.   |
| 10   | XRES              | XRES                               | Used to Calibrate SIO Output Driver Swings. Connect a 402 $\Omega$ $\pm$ 1% resistor between XRES and Ground (EP).  |



Functional Diagrams



## Detailed Description

### Additional Documentation

In addition to the provided information, use the following information to correctly design systems using the MAX96717F.

- GMSL2 Channel Specification
- GMSL2 Hardware Design Guide
- GMSL2 User Guide
- Device Errata

The Channel Specification contains physical layer requirements for the PCB traces, cables, and connectors that constitute the GMSL link. The Hardware Design Guide contains recommendations for PCB design, applications circuits, selection of external components, and guidelines for use of GMSL signal integrity tools. The User Guide contains detailed programming guidelines for GMSL device features. Errata sheets contain deviations from published device specifications, and are specific to part number and revision ID. Contact the factory for these documents.

### Recommended Operating Conditions

**Table 2. Recommended Operating Conditions**

| PARAMETER                                      | PIN               | NOMINAL VOLTAGE | MIN  | TYP  | MAX  | UNIT              |
|--|-------------------|-----------------|------|------|------|-------------------|
| Supply Range                                   | V <sub>DD18</sub> |                 | 1.7  | 1.8  | 1.9  | V                 |
|  | V <sub>DD</sub>   |                 | 0.95 |      | 1.26 |                   |
|  | V <sub>DDIO</sub> |                 | 1.7  |      | 3.6  |                   |
| Maximum Supply Noise                           | V <sub>DD18</sub> |                 |      | 25   |      | mV <sub>p-p</sub> |
|  | V <sub>DD</sub>   | 1.0V            |      | 25   |      |                   |
|  |                   | 1.1V            |      | 37.5 |      |                   |
|  |                   | 1.2V            |      | 50   |      |                   |
|  | V <sub>DDIO</sub> | 1.8V            |      | 50   |      |                   |
| 3.3V   |                   |                 | 100  |      |      |                   |
| Operating Junction Temperature, T <sub>J</sub> |                   |                 | -40  |      | +125 | °C                |

**Note:** Supply noise < 1MHz. Supply voltage ripple is assumed to be symmetric around the measured DC supply voltage. For example, 50mV<sub>p-p</sub> means ±25mV peak voltage.

### External Component Requirements

See [Figure 21](#), [Figure 22](#), and the Typical Application Circuits section for typical application circuits. [Table 3](#) details critical components that must be connected to the specified pins for correct functionality.

**Table 3. External Component Requirements**

| COMPONENT                    | SYMBOL            | CONDITION   | VALUE                              | UNIT |
|------------------------------|-------------------|---|------------------------------------|------|
| XRES                         | R <sub>XRES</sub> | Connect R <sub>XRES</sub> resistor between XRES pin and ground. Total variation not to exceed ±3% including tolerance, temperature, and lifetime drift (e.g. ±100ppm/°C temperature coefficient and ±1% lifetime drift).                                | 402 ±1%.<br>Use a single resistor. | Ω    |
| Line-Fault Pulldown Resistor | R <sub>PD</sub>   | Connect to ground at far end of Coax/STP cable; only required if line-fault detection is used. Total variation not to exceed ±3% including tolerance, temperature, and lifetime drift (e.g. ±100ppm/°C temperature coefficient and ±1% lifetime drift). | 49.9 ±1%                           | kΩ   |

**Table 3. External Component Requirements (continued)**

| COMPONENT   | SYMBOL            | CONDITION   | VALUE   | UNIT           |            |
|---|-------------------|---|---|----------------|------------|
| Line-Fault Resistor                               | R <sub>EXT</sub>  | Connect to LMN input of serializer at near end of Coax/STP cable; only required if line-fault detection is used. Total variation not to exceed $\pm 3\%$ including tolerance, temperature and lifetime drift (e.g. $\pm 100\text{ppm}/^\circ\text{C}$ temperature coefficient and $\pm 1\%$ lifetime drift). Line-fault detection cannot be used in conjunction with PoC. | LMN0 STP mode   | $42.2 \pm 1\%$ | k $\Omega$ |
|   |                   |   | LMN0 Coax mode  | $48.7 \pm 1\%$ |            |
|   |                   |   | LMN1  | $48.7 \pm 1\%$ |            |
| Link-Isolation Capacitors                         | C <sub>LINK</sub> | Place in series and in close proximity to the SIO pins (pins 12 and 13).  | 0.1   | $\mu\text{F}$  |            |
| Termination Resistors for SIO_N pins in Coax mode | R <sub>TERM</sub> | Connect in series with C <sub>LINK</sub> capacitor between SION and ground when GMSL link is configured in Coax mode. Place near associated SION pin.   | $49.9 \pm 1\%$  | $\Omega$       |            |
| Crystal   |                   | Place as close as possible to pins X1/OSC (pin 8) and X2 (pin 9), and connect between these two pins.   | 25MHz $\pm 200\text{ppm}$   |                |            |
| Crystal Load Capacitors                           |                   | Use crystal-loading capacitor guidance from the crystal manufacturer. Select values that compensate for the X1 and X2 input, and PCB node capacitances. Place the capacitors as close as possible to pins X1/OSC (pin 8) and X2 (pin 9).  | Crystal dependent   | $\mu\text{F}$  |            |
| V <sub>DDIO</sub> Decoupling Capacitors*          |                   | Place 0.01 $\mu\text{F}$ , 0.1 $\mu\text{F}$ capacitors as close as possible to pin V <sub>DDIO</sub> (pin 16). Include a minimum of 10 $\mu\text{F}$ bulk decoupling on the PCB.   | $0.01 + 0.1 + 10$   | $\mu\text{F}$  |            |
| V <sub>DD18</sub> Decoupling Capacitors*          |                   | Place 0.01 $\mu\text{F}$ , 0.1 $\mu\text{F}$ capacitors as close as possible to pin V <sub>DD18</sub> (pin 11). Include a minimum of 10 $\mu\text{F}$ bulk decoupling on the PCB.   | $0.01 + 0.1 + 10$   | $\mu\text{F}$  |            |
| V <sub>DD</sub> Decoupling Capacitors*            |                   | Place a 0.01 $\mu\text{F}$ , 0.1 $\mu\text{F}$ capacitors as close as possible to pin V <sub>DD</sub> (pin 15). Include a minimum of 10 $\mu\text{F}$ bulk decoupling on the PCB. See configuration information in the <a href="#">Power Supplies</a> section.  | $0.01 + 0.1 + 10$   | $\mu\text{F}$  |            |
| CAP_VDD Decoupling Capacitor                      |                   | Place a 0.1 $\mu\text{F}$ capacitor as close as possible to pin 14. Include a minimum of 10 $\mu\text{F}$ bulk decoupling near the pin.   | $0.1 + 10$  | $\mu\text{F}$  |            |
| Open-Drain Pullup Resistors                       |                   | Application-specific. Quantity and values depend on multifunction GPIO pin configurations.  |   |                |            |
| Resistors for Configuration Pin Resistor Divider  | R1, R2            | Place resistor-divider close to pin 3 (MFP1/CFG0).  | Use $\pm 1\%$ Tolerance Resistors. See <a href="#">Table 10</a> . | $\Omega$       |            |
|   | R1, R2            | Place resistor-divider close to pin 4 (MFP2/CFG1).  | Use $\pm 1\%$ Tolerance Resistors. See <a href="#">Table 11</a> . | $\Omega$       |            |

\* With exception of CAP\_VDD, power supply decoupling capacitor values are recommendations only. It is the responsibility of the board designer to determine what decoupling is necessary for the specific application.

## Figures

**GMSL2 Serial Output Parameters**

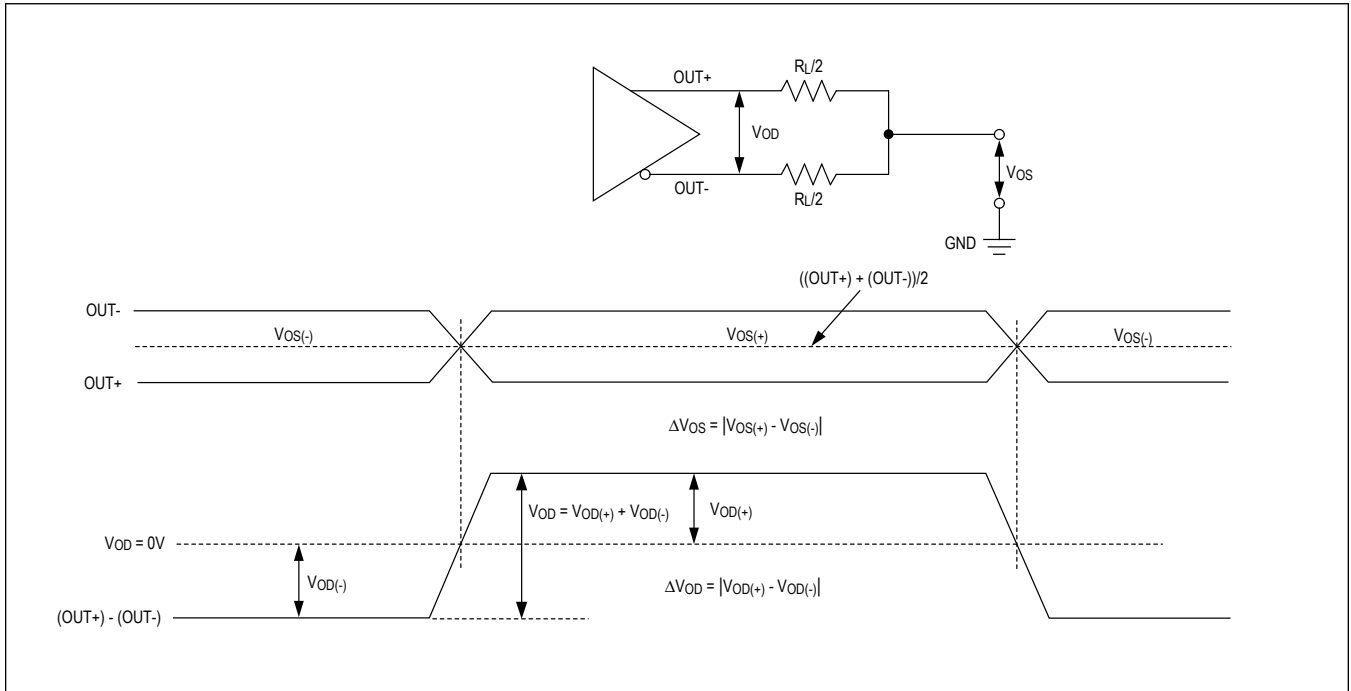
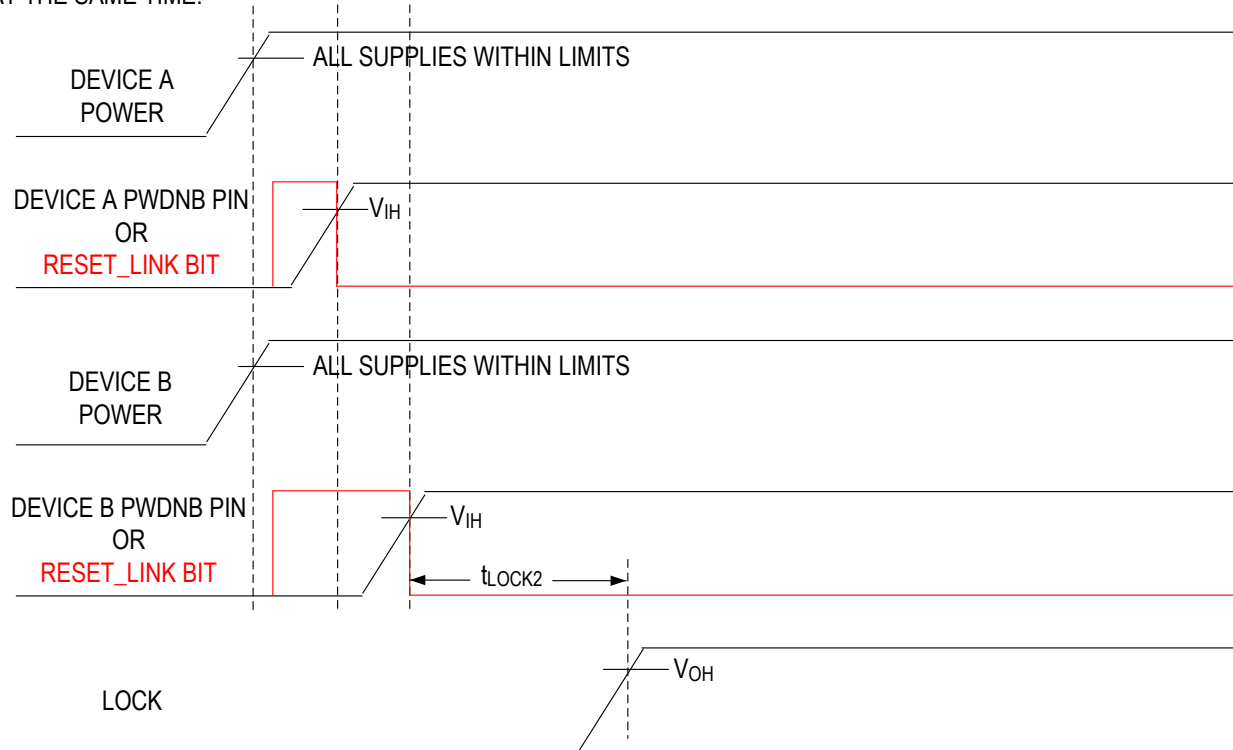


Figure 1. Serial Output Parameters

**GMSL2 Lock Time**

THE LOCK SEQUENCE IS INITIATED BY THE RELEASE OF THE PWDNB PIN OR THE RESET\_LINK BIT IN EITHER SERIALIZER OR DESERIALIZER. SPECIFIED PERFORMANCE CAN BE ACHIEVED REGARDLESS OF WHETHER THE LOCKING PROCESS IS INITIATED IN SERIALIZER OR DESERIALIZER (PWDNB/RESET\_LINK CAN BE RELEASED LATER ON EITHER DEVICE OR SIMULTANEOUSLY). THE REQUIRED LOCK TIME IS MEASURED UPON RELEASE OF PWDNB OR RESET\_LINK ON EITHER SERIALIZER OR DESERIALIZER TO LOCK ASSERTION. THE PWDNB/RESET\_LINK STATE ON THE TWO SIDES OF THE LINK MUST HAVE OVERLAP WHEN BOTH DEVICES ARE IN PWDNB/RESET\_LINK MODE PRIOR TO THE LOCK PROCESS STARTING. THE DEVICES DO NOT NEED TO ENTER OR EXIT THE PWDNB/RESET\_LINK STATE AT THE SAME TIME.



**NOTE:**

1. IF RESET\_LINK IS USED TO INITIATE LOCK, PWDNB IS ASSUMED TO BE HIGH AFTER POWER-UP (NORMAL OPERATION).
2. IF PWDNB IS USED TO INITIATE LOCK, RESET\_LINK IS ASSUMED TO BE LOW AFTER POWER-UP (NORMAL OPERATION).
3. DEVICE A IS THE FIRST DEVICE (SERIALIZER OR DESERIALIZER) TO BE POWERED UP. DEVICE B IS THE DEVICE (SERIALIZER OR DESERIALIZER) AT THE OTHER END OF THE GMSL LINK.

Figure 2. GMSL2 Lock Time

**GMSL2 Data Initialization Time**

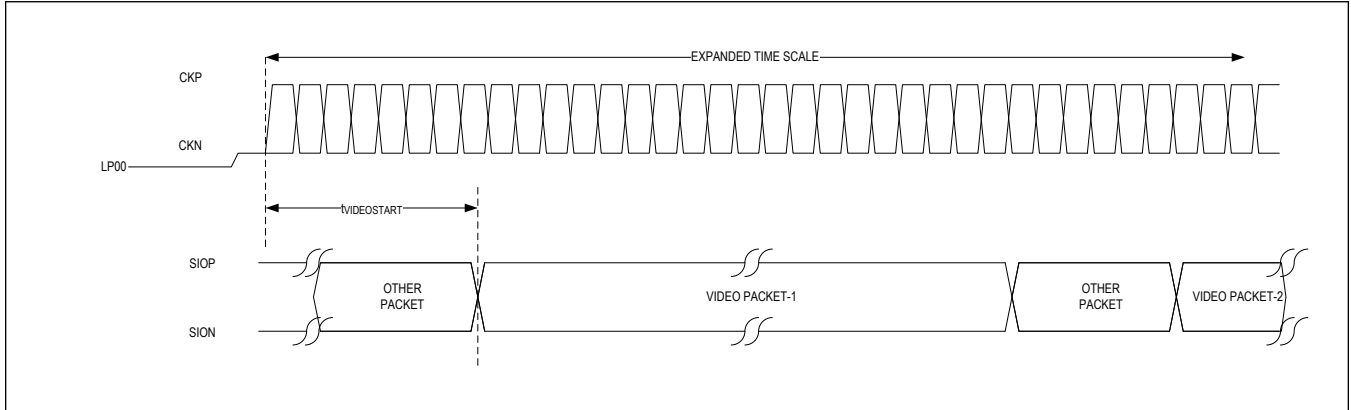


Figure 3. GMSL2 Data Initialization Time

**I<sup>2</sup>C Timing Parameters**

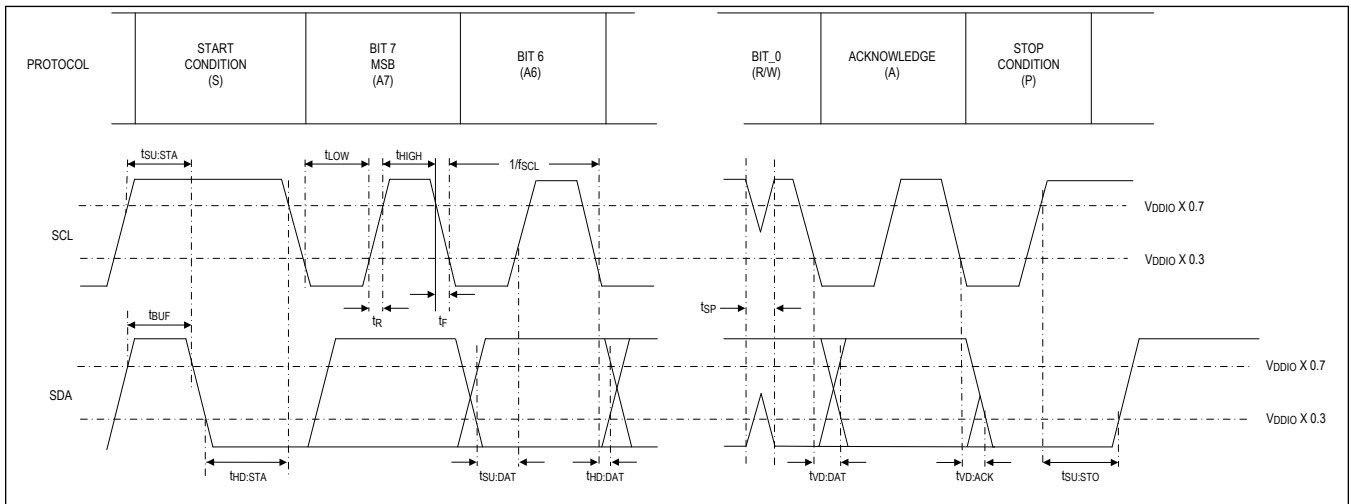


Figure 4. I<sup>2</sup>C Timing Parameters

**GMSL2 Data Latency**

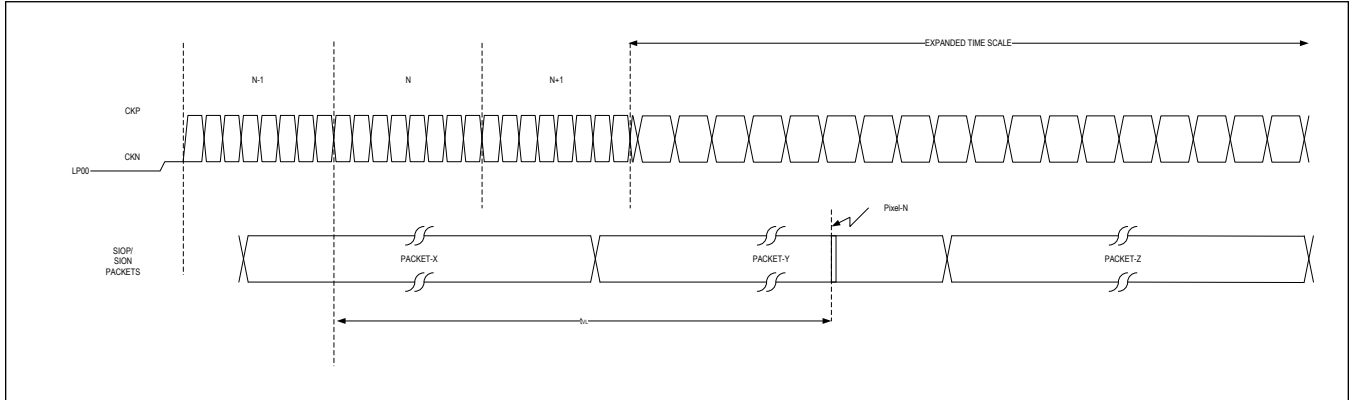


Figure 5. GMSL2 Data Latency

**D-PHY LP Receiver Pulse**

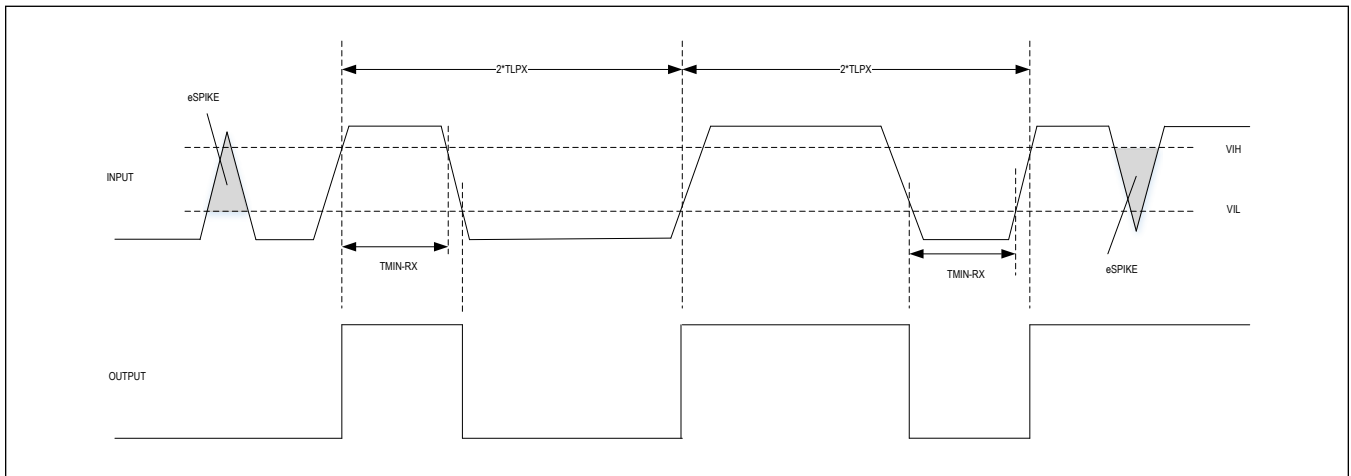


Figure 6. D-PHY LP Receiver Pulse

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**D-PHY Data Clock Timing**

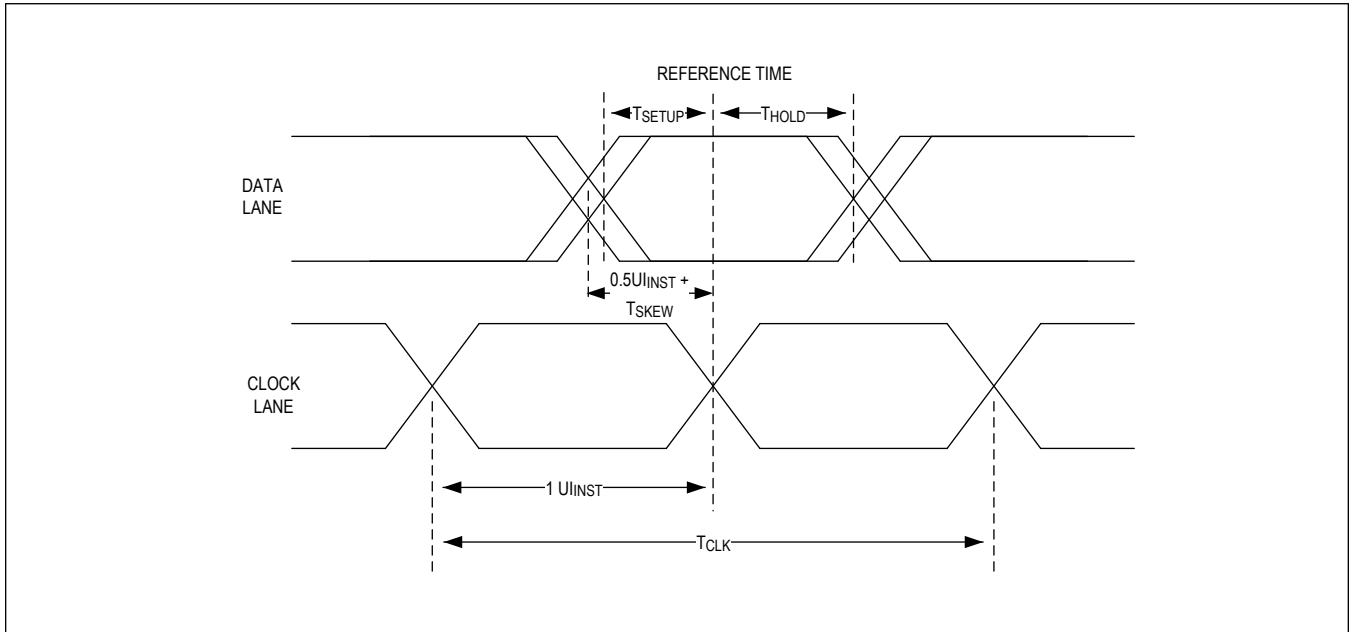


Figure 7. D-PHY Data Clock Timing

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**High-Speed Data Transmission in Bursts**

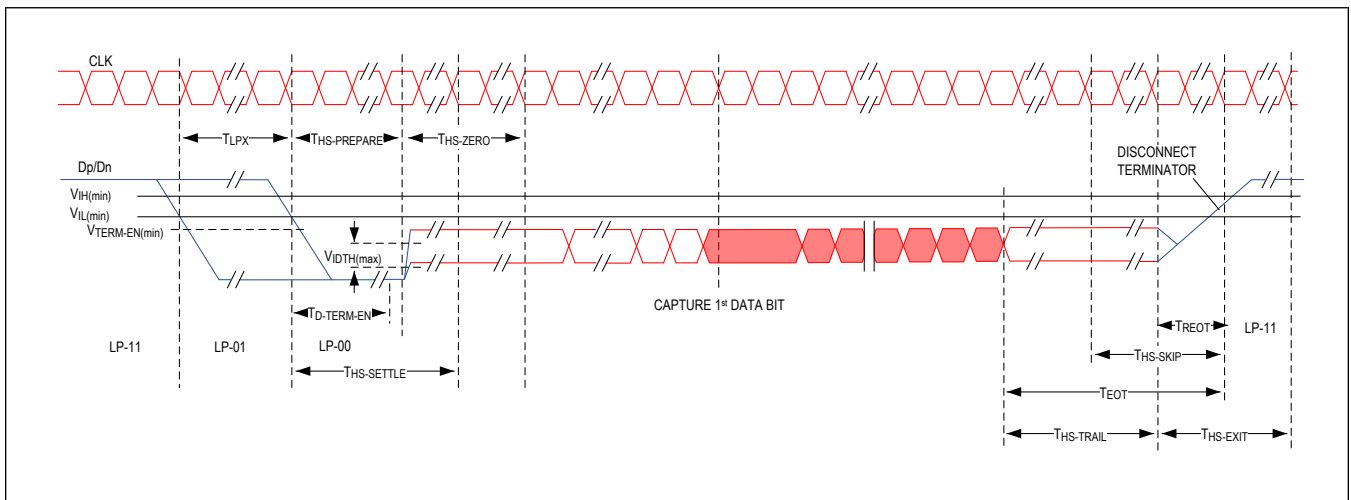


Figure 8. High-Speed Data Transmission in Bursts

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**D-PHY High-Speed Skew Calibration**

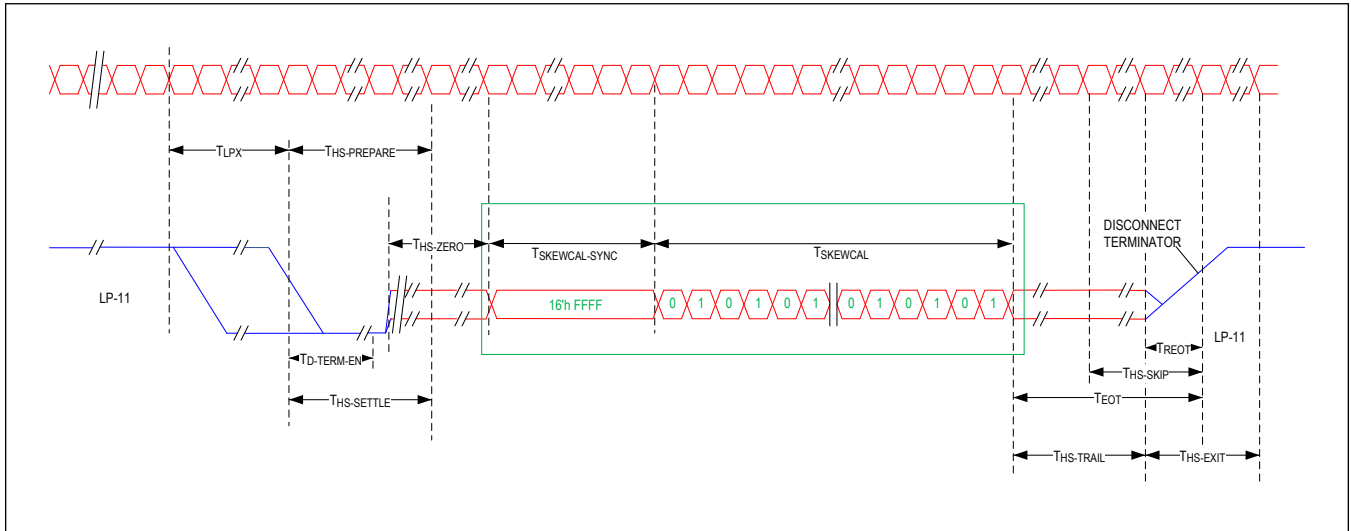


Figure 9. D-PHY High-Speed Skew Calibration

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**Switching the Clock Lane Between Clock Transmission and Low-Power Mode**

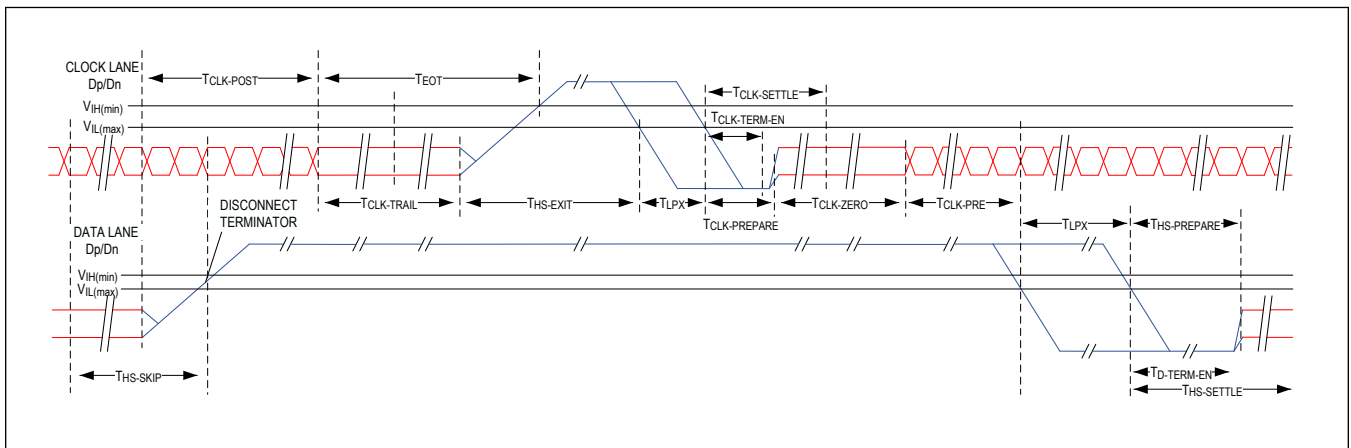


Figure 10. Switching the Clock Lane Between Clock Transmission and Low-Power Mode

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Signaling and Contention Voltage Levels

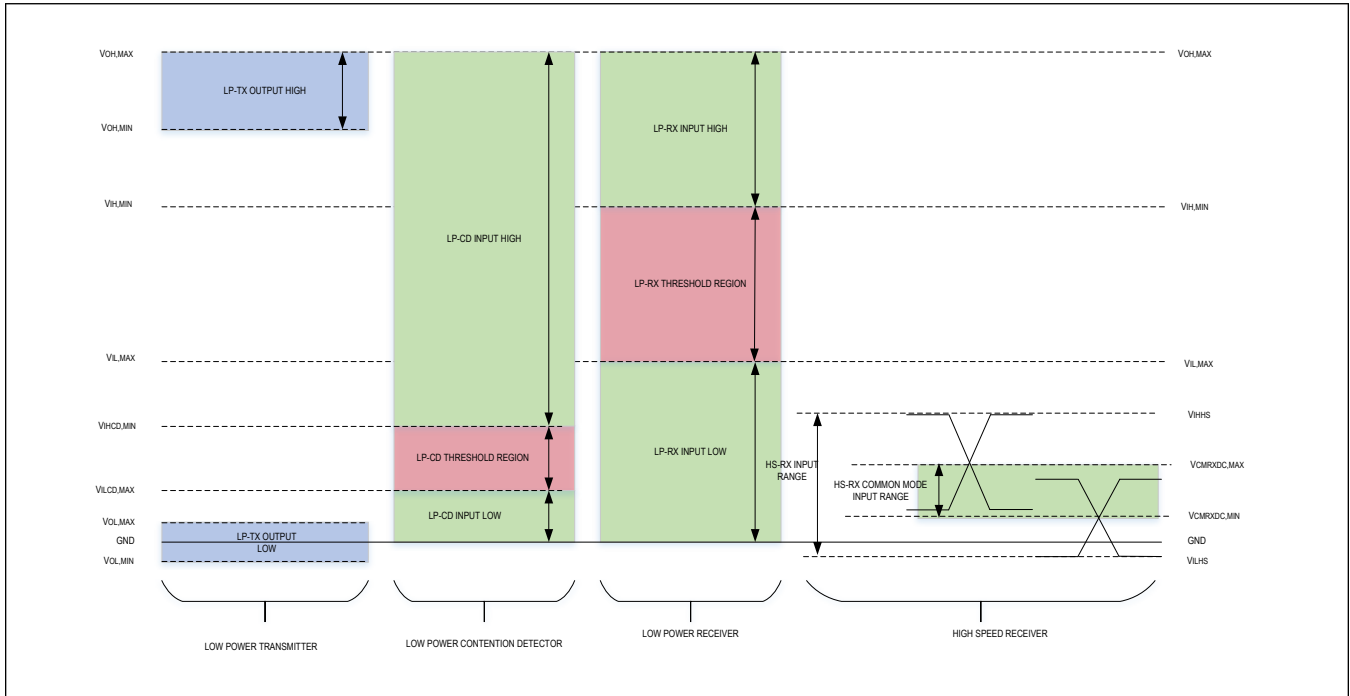


Figure 11. Signaling and Contention Voltage Levels

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SPI Master-Mode Timing Parameters

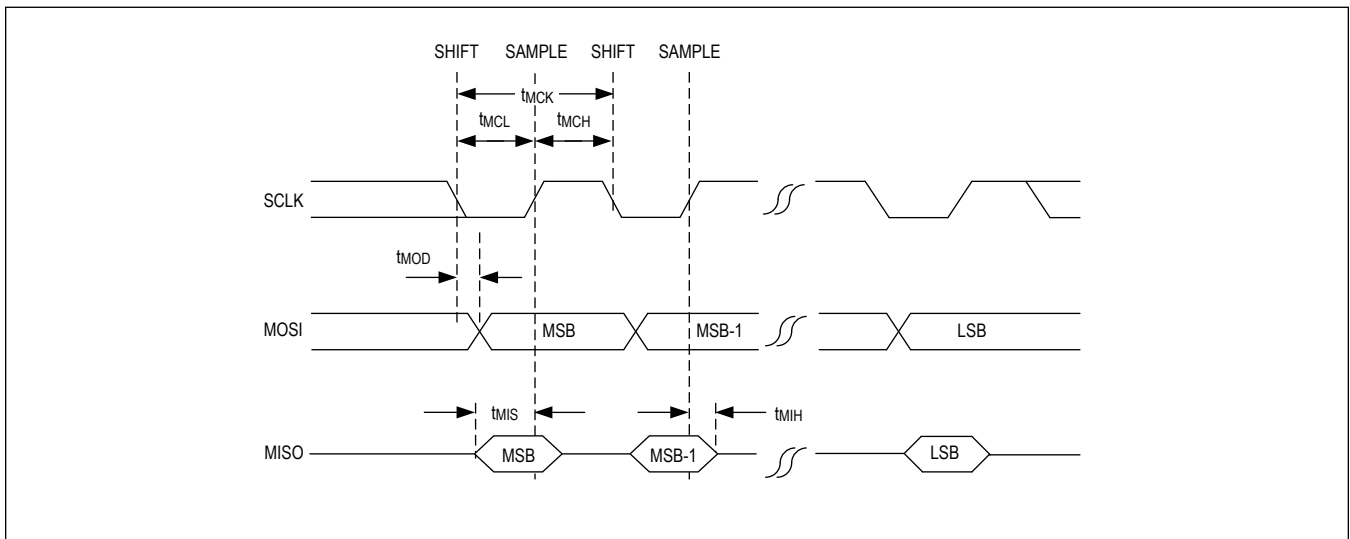


Figure 12. SPI Master-Mode Timing Parameters

**SPI Slave-Mode Timing Parameters**

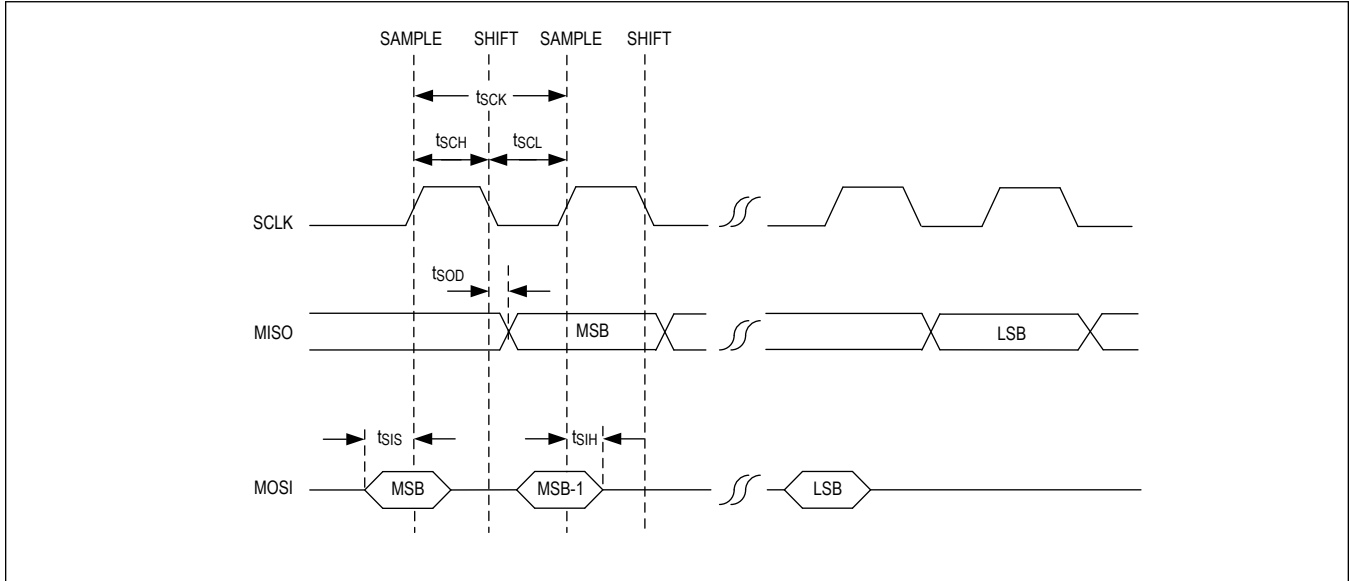


Figure 13. SPI Slave-Mode Timing Parameters

**Introduction**

Analog Devices' tunneling GMSL2 serializers and deserializers provide end-to-end data integrity of both sensor data and side-channel data, while also providing sophisticated link management for high-speed, low bit-error-rate, and serial data transport. They support a comprehensive suite of sensor and communication interfaces over a single wire. The serializer provides 3Gbps forward and 187.5Mbps reverse packetized data transmission over each fixed-speed link.

The following sections provide a brief overview of the device functions and features. Contact the factory for additional information, and details on configuration of each function and feature.

**Product Overview**

The MAX96717F serializer converts MIPI CSI-2 to single-link GMSL2. See [Figure 14](#). It also sends and receives side-channel data, enabling full-duplex transmission of forward-path sensor data and bidirectional data over low-cost 50Ω Coax or 100Ω STP cables meeting the GMSL2 channel specification.

The MAX96717F has a four-lane D-PHY v1.2 that supports a data rate of 108Mbps to 2.5Gbps per lane. The number of active D-PHY v1.2 data lanes is programmable as one, two, three, or four lanes. Up to 16 virtual channels are also supported.

The MAX96717F is intended for use with a GMSL2 deserializer such as the dual-port MAX96716A/B/F, a quad-port MAX96712 or MAX96722, or a GMSL3 deserializer operating in GMSL2 mode. For example, when used with the MAX96716F, several modes are supported. A single sensor can be connected to an SoC in GMSL2 modes at a data rate of 3Gbps, as shown in [Figure 14](#). Two MAX96717F serializers can be used with one MAX96716F deserializer to connect two sensors to two SoC devices. See [Figure 15](#). The cable types, sensor timing, and data rates do not have to be the same. Data from Link A and Link B are output on separate, dedicated CSI-2 ports for capture by the SoCs.

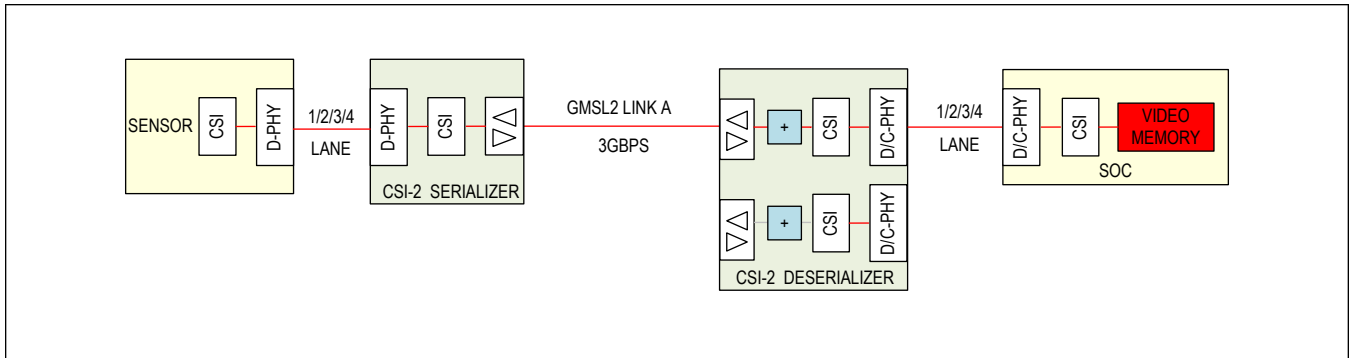


Figure 14. Single Link

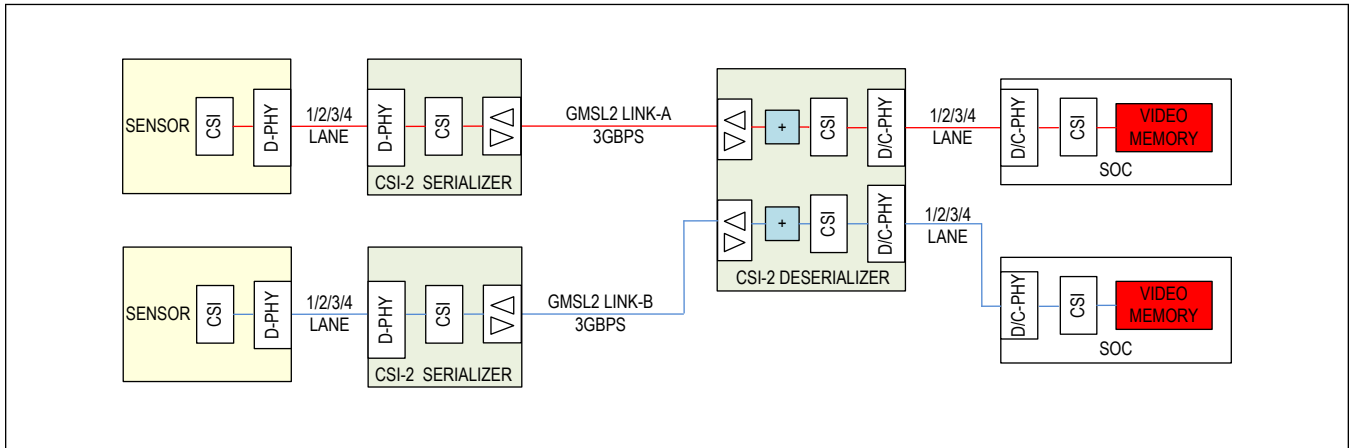


Figure 15. Dual Link, Separate Data Type

The MAX96717F supports data aggregation as detailed in [Figure 16](#). The sources can have different video timing and resolution. The SoC identifies the video source by reading the packet's virtual channel. If both sources use the same virtual channel, the MAX96717F can assign a different virtual channel (16 are available) in pixel mode. Reassignment of up to 16 data types is also possible in pixel mode. The aggregated data can be replicated to both MIPI ports, allowing multiple SoCs to process the same data, as shown in [Figure 17](#).

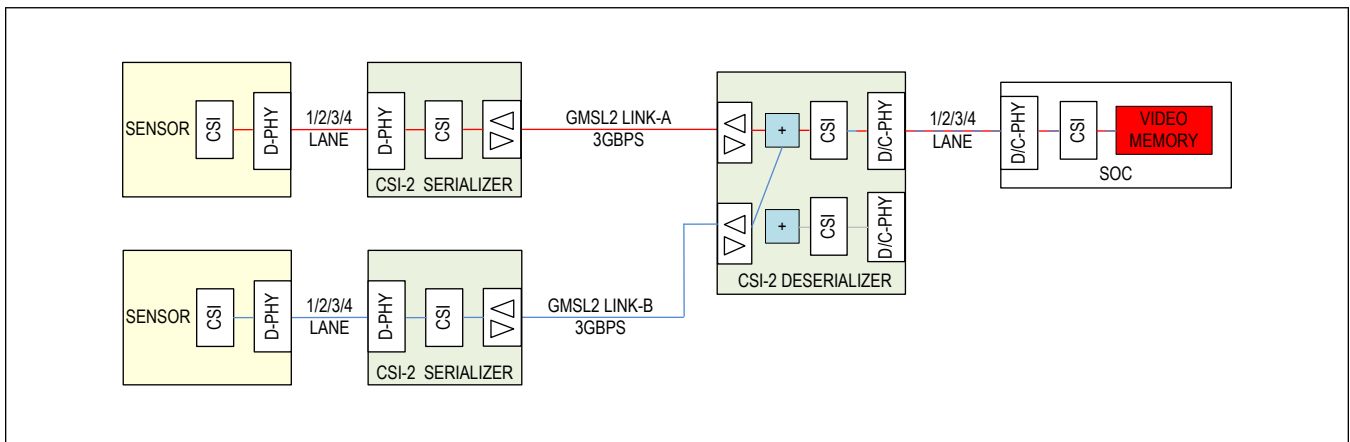


Figure 16. Dual Link, Data Aggregation

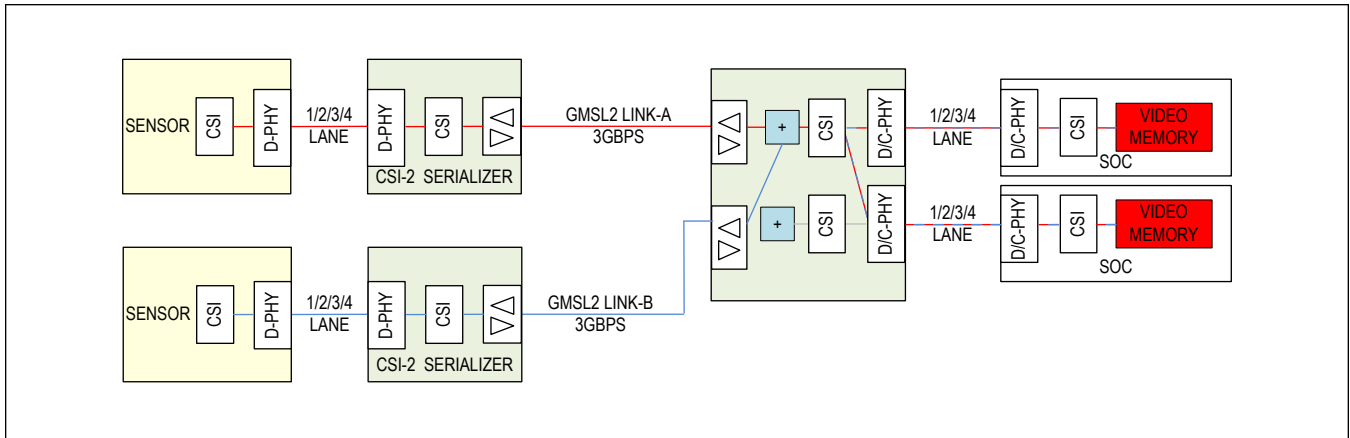


Figure 17. Dual Link, Data Aggregation and Replication

The MAX96717F is an ideal sensor serializer to use (it has a CSI-2 interface, and single or multiple data types) when various cameras and/or sensors need to be supported. Radio Detection and Ranging (RADAR) and Light Detection and Ranging (LiDAR) sensors can also be supported where a high-speed Serial Peripheral Interface (SPI) is generally required.

**Tunneling and Pixel Modes**

The MAX96717F is specifically designed for Advanced Driver Assistance Systems (ADAS), where data integrity is a key safety requirement. Prior GMSL2 solutions supported only the pixel mode for transporting MIPI CSI-2 data over the GMSL link. In the pixel mode, the CSI-2 headers and footers are removed in the serializer, and the video data is sent to one or more video pipes. The CSI-2 header includes the Data Type (DT) and Virtual Channel (VC) sent separately as an info-frame. The header also includes an Error Correction Code (ECC), which is also removed. The packet footer contains the CSI-2 Cyclic Redundancy Check (CRC). The serializer combines video-line data from the video pipe(s) with control channel data and adds CRC to the GMSL2 packet. Removing the headers and footers provides flexibility in how different data types are packetized, the number of video pipes used, and optimizes the bandwidth of the GMSL link when in the pixel mode. The deserializer receives the data and verifies the GMSL2 packet CRC. The sensor data is then used to recreate the header and footer, ECC, and CRC, respectively, in the deserializer to duplicate the CSI-2 data received by the serializer. See [Figure 18](#).

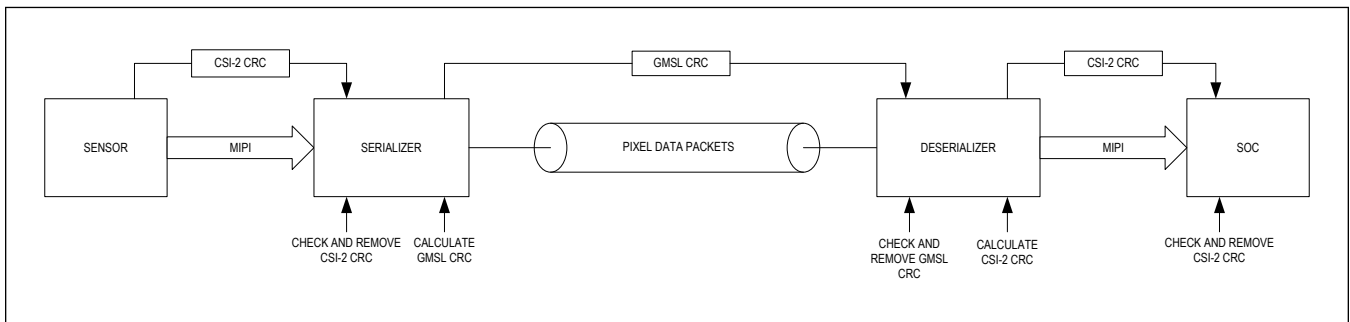


Figure 18. Pixel Mode

In the tunneling mode, the CSI-2 ECC byte and CRC bytes, as well as routing and pixel data, are encapsulated and forwarded over the GMSL2 link. Data integrity across the GMSL2 link is guaranteed with a separately calculated line CRC that covers the entire CSI-2 packet content, including header and footer data. Because this mode forwards CSI-2 ECC and CRC from the video source, it is the recommended transmission mode for safety-critical applications where end-to-end data integrity is important. A serializer in the tunneling mode can interface only to the GMSL2 CSI-2 deserializers that support the tunneling mode. The serializer combines sensor and control data, and adds CRC to the GMSL2 packets.

See [Figure 19](#). The deserializer receives the transmitted GMSL2 packets, checks the CRC, separates video data from control data, and reconstructs each CSI-2 packet from multiple GMSL2 packets, outputting them on the standard MIPI interface exactly as they were received at the serializer. The tunneling mode ensures end-to-end data integrity and is more bandwidth efficient if multiple data types are being sent, but does not allow the processing of the video data (e.g., watermarking or lossy data compression).

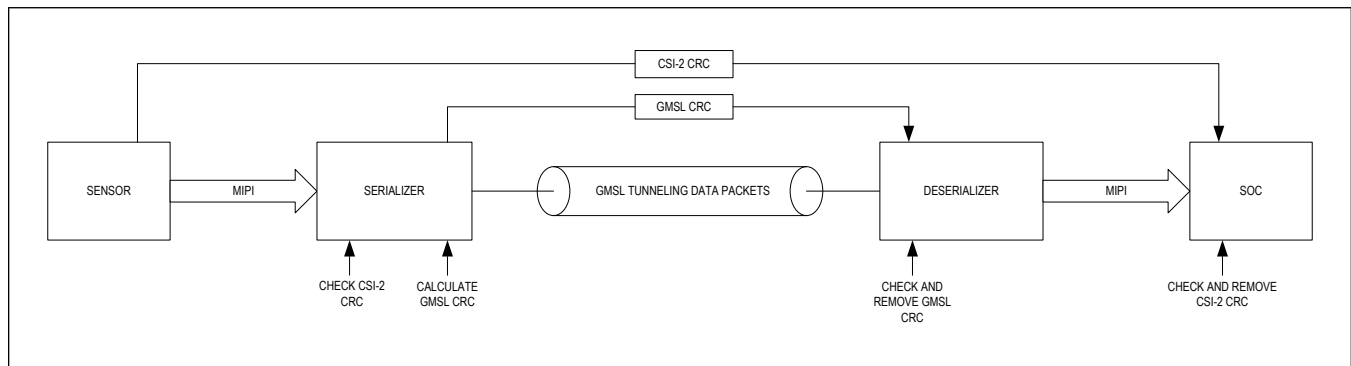


Figure 19. Tunneling Mode

## Video Pipeline

The video channel is designed to transmit video data received from the CSI-2 interface to the deserializer side of the link. The following data types are supported: RGB888, RGB666, RGB565, YUV422-8, YUV422-10 RAW8, RAW10, RAW12, RAW14, RAW16, RAW20, User-Defined, Embedded, and Null. By default, the bits per pixel (bpp) of the video stream is automatically detected by inspecting the data type of the CSI-2 packets. If a video stream with a different bpp is sent through the same video pipe in the pixel mode, disable the auto-detect through register write. Video input data consists of color, HS, and VS synchronous to the Pixel Clock (PCLK). Reception of video is detected using the PCLKDET function. Video flows through the design as described in the following sections.

### Video Pipes in Pixel Mode

Video data transport in GMSL2 pixel mode is based on the concept of video pipes. Carrying data in pipes allows GMSL2 to bridge different digital video interfaces, and perform watermark generation and detection.

**Note:** Watermark generation is not supported by this device.

A pipe carries video stream(s) and video synchronization data, and operates in one of the following modes:

- Mode 1: Streams with constant bits per pixel (bpp) of up to 24bpp. The bpp of the streams must be the same.
- Mode 2: Streams with 16, 14, 12, 10, or 8bpp. Streams less than 16bpp are padded with zeros.
- Mode 3: Streams with two different bpp rates. The bpp of one stream must be twice the bpp of the other stream. The highest bpp stream is 24bpp.

In all modes, a pipe can carry multiple concurrent video streams, with each stream having different virtual channels and data types.

Modes 1 and 3 carry data at full bandwidth, but put more restrictions on bpp than Mode 2. Mode 2 allows streams with different bpp rates, but streams of less than 16bpp are carried using more bandwidth than necessary on the GMSL2 link because of zero-padding. Modes 1 or 3 are sufficient for most applications. Mode 2 requires less programming and is more convenient if the application does not require maximum link bandwidth.

The MAX96717F has a single input port and one video pipe. The pipe in the MAX96717F has a dedicated MIPI receiver buffer. The retiming buffer has the capacity to buffer 96 24-bit pixels. This allows sufficient memory for transmission of a line to start, and not overflow or underflow. The number of pipes used by a deserializer is equal to the number of pipes used by all connected serializers.

After data exits a retiming buffer, it goes through a crosspoint switch, and a Data Type (DT) and Virtual Channel (VC) reassignment stage. If the video source has a CSI-2 output, packet, DT and VC can each be left as-is, or reassigned by register programming. Up to 16 DT/VC incoming pairs can be mapped to 16 DT/VC outgoing pairs.

### Video-Timing Generator

The MAX96717F includes a programmable Video-Timing Generator (VTG) to generate or retime input video sync signals. The timing generator can modify the source (i.e., sensor or Image Signal Processor (ISP)) input timing), filter out glitches in the sync signals, or reduce the number of input sync signals. Each sync signal can be individually retimed or left unmodified. Several registers determine the length of the timing parameters in pixel clock cycles. Timing parameters include high/low period length, line count, and delay from the input VS signal. The parameters of the VTG are set in the REF\_VTG registers.

The timing generator uses three different trigger modes: tracking, single-trigger, and auto-run.

- Tracking locks once three consecutive identical VS signals are received. The tracker then outputs the same VS signal, filtering any glitches on the input VS. It attempts to relock if three consecutive VS input waveforms do not match the locked signal.
- Single-trigger generates one frame for each VS.
- Auto-run generates a new frame at the rate determined by the VS high/low period. If a new VS signal appears before a frame is complete in either single-trigger or auto-run modes, a new frame immediately starts, cutting the previous frame short.

VS, HS, and PCLK signals can be output on MFP pins 0, 1, 2, 3, 4, 7, or 8, as defined in registers REF\_VTG1, REF\_VTG2, and REF\_VTG3.

### RGB888 Video-Pattern Generator

The RGB888 Video-Pattern Generator (VPG) is an auxiliary block used for a variety of purposes, such as replacing video from the peripheral with the video pattern generated by the VPG. Various patterns can be generated when configured using the configuration registers. The VPG creates a checker board pattern and gradient using the RGB888 data.

**Note:** The VPG is only for use in the pixel mode.

### Tx Crossbar

Data from the video input is captured and optionally multiplexed with the generated patterns from the VPG. Final data goes into a crossbar multiplexer that allows any input bit to be mapped to any output bit using the configuration registers. The crossbar should only be used in the pixel mode.

## GMSL2 Packet Protocol

### Packet Protocol

GMSL2 is a fixed rate, packet-based transmission protocol designed to efficiently and dynamically carry multiple types of communication channels concurrently. Link bandwidth is only used by a channel when data is being sent. The link bit rate is based on a constant frequency link clock generated from the 25MHz crystal oscillator, external reference frequency, or Reference over Reverse feature (RoR). The link clock does not have any relation to the video-pixel clock.

GMSL2 uses a packet-based protocol to seamlessly share the link bandwidth between communication channels in a flexible way. Bandwidth allocation is dynamic, so that if a certain channel is not active, it does not consume any link bandwidth, and all the remaining active channels can share the full link bandwidth. Maximum packet size is limited to prevent a single channel from utilizing the link bandwidth for an extended time. In most cases, available link bandwidth exceeds the bandwidth requirement. Idle packets are used to fill in the unused link bandwidth.

The same data protocol is used on forward and reverse channels, and for both video and control-channel data.

### 9b10b Link Encoding

9b10b is a link encoding scheme that maps 9-bit symbols (512 unique data symbols) and eight additional special characters (K) to 10-bit symbols. This is an efficient encoding scheme that requires significantly less encoding overhead than other similarly robust coding schemes. To illustrate, this method requires 11% overhead, whereas 8b10b encoding requires 25% overhead – effectively apportioning more bandwidth for communications and data transfer. The link is DC-balanced: the running disparity (i.e., the number of 1s and 0s in a given window) is bounded to  $\pm 9$  with a maximum run length (i.e., consecutive number of 1s or 0s) limited to seven.

Eight available special K characters are used for link synchronization, as packet delimiters and for other control purposes.

The Hamming distance (number of bit differences) in this scheme is at least 3 between any two special symbols. Therefore, a special symbol cannot transform into another special symbol with one or two bit errors. A cascading sequence of special symbols creates a unique bit pattern that does not exist in any other data symbol combination; this sequence is deployed for symbol and word boundary locking purposes to delimit data packets.

Each packet starts with two words consisting of two special symbols in each word. This packet indicator is repeated for error-correction purposes and allows one bit-error correction in the receiver for errors that hit packet start words.

**Note:** *Reduction of packet start words to one word (two special symbols) to increase bandwidth efficiency is a programmable option. This option should only be employed if the physical link is sufficiently reliable and the additional usable bandwidth is needed. In this scenario, a bit error hitting one of the special symbols in the packet start word does not transform the affected packet into another packet; rather, the packet is dropped entirely. Dropped control packets can be automatically recovered by the Automatic Repeat Mechanism (ARQ) (see the following). Packets can be protected by an optional 16-bit packet Cyclic Redundancy Check (CRC) (see the following).*

### Tunneling Mode

Tunneling mode transmits all MIPI CSI-2 content, without modification, over the serial link. Unlike the pixel mode, the received CSI-2 payload is not decoded. Unchanged CSI-2 bytes are split into smaller GMSL packets encapsulated and protected with GMSL CRCs, and are transported across the link. This means the CSI-2 headers and footers generated by the video source, including ECC and CRC, are preserved through the GMSL link, and can be decoded by the host connected to the deserializer. This provides end-to-end data integrity critical for ADAS vehicles.

The pixel mode checks the ECC and CRC packets for errors at the serializer, and then removes them prior to converting the payload to pixels and transmitting over the GMSL2 link. In the pixel mode, the deserializer recalculates and inserts the CSI-2 ECC and CRC packets. Both the tunneling and pixel modes have CRC protection of the serial-link payload. So, any GMSL link errors are detected. However, an error in recalculating the ECC/CRC packets in the deserializer is not detected by the SerDes, but is detected by the MIPI video sink device.

### CRC Generation and Checking

Every packet (excluding Idle and Acknowledge packets) can be protected by a 16-bit packet CRC. Each packet type can be individually configured to enable or disable the packet CRC. By default, all low-bandwidth channels have packet CRC. Note that as Acknowledge packets contain no data and the header is repeated, CRC is unnecessary. Although the video channel disables the packet CRC in default settings to maximize usable bandwidth, video-line CRC (a 32-bit code at the end of each DE or HS pulse) is enabled by default to provide data protection.

The 16-bit packet CRC generator polynomial is:  $x^{16} + x^{15} + x^2 + 1$ .

### Control-Channel Retransmission on Error

#### Automatic Repeat Request/Automatic Retransmission (ARQ)

Communications channels with control data (I<sup>2</sup>C/UART, GPIO, SPI) are relatively low bandwidth, but require the highest data integrity protection. An optional automatic packet retransmission method, Automatic Repeat Request (ARQ), is employed here. ARQ works in conjunction with 16-bit packet CRC to detect if packets are received with or without error.

Packets are appended with a 2-bit sequence number on the transmit side, and an acknowledge is sent from the receiver side upon successful receipt of each data packet. These packets are stored on the transmit side until acknowledged. If the acknowledge does not arrive in a predetermined interval or the sequence number of the acknowledge does not match the expected value, the packet waiting at the top of the queue is automatically retransmitted.

The acknowledge packet uses the same header field as low bandwidth packets, but begins with a different special symbol to distinguish it from regular data packets. This simplified format keeps retransmission exchanges independent from the communication channel. Note that this smaller packet format contains no data, obviating the need for full 16-bit CRC. Instead, the header symbol is sent twice in the packet and checked against each other to ensure a match. The acknowledge packets also include a 2-bit sequence number that is the same sequence number of the correctly received data packet. The data packet transmitter keeps track of which packets are acknowledged.

### Forward-Error Correction

The MAX96717F includes an optional Forward-Error Correction (FEC) for GMSL2. The Reed Solomon encoding adds



a 6-bit correction word to every 121 bits of data for an effective throughput of 93.3% in return for a bit-error rate (BER) reduction from  $1e^{-15}$  to  $1e^{-55}$ . Note that use of FEC in the MAX96717F serializer requires pairing it with a deserializer that also supports FEC.

### Scheduler/Arbiter

A scheduler transmits packets with high priority values before lower priority values. Each communication transmit adapter sets a priority for the packet request before transmitting data to the remote side. The priority value is 2 bits, allowing for four different settings: 0 = Low, 1 = Normal, 2 = High, and 3 = Urgent. The scheduler, provided there is sufficient link bandwidth, chooses to transmit the packet with the highest priority among the pending active requests. Priority levels become more important as link bandwidth becomes scarce. Prioritization should be assigned accordingly.

In most cases, each transmitter adapter should use the normal priority setting (priority = 1) to allow the scheduler to choose the transmission schedule based on recent bandwidth usage. Packet priority can be increased if packets require low latency or have waited for a length of time. For example, packets with maximum latency requirements can have increased priority if the packet request is not serviced until half of the maximum latency requirement has elapsed. This can also be used for communications channels with continuous data flow (e.g., video). Priority is increased when the transmit adapter data buffer approaches overflow. Conversely, register configuration allows overriding the priority settings of each channel. This option is useful if the host  $\mu$ C wants to prioritize one channel over the others.

**Note:** Communications channels with very relaxed latency requirements can use the low priority setting (priority = 0). These low priority packets are not serviced by the scheduler if there are any pending requests of a higher priority setting. In this arrangement, link bandwidth assignment can reach the theoretical maximum for video. Low priority packets can then be transmitted during video horizontal blanking time, during which the video channel bandwidth usage drops considerably.

### Bandwidth Sharing

The GMSL2 link bandwidth is flexible to share between different communication channels, including video/data, I<sup>2</sup>C/UART control channel, pass-through I<sup>2</sup>C/UARTs, SPI, and GPIOs, as well as various protocol-specific data exchanges, such as information frames, sync, and acknowledgments. Each channel must request the link for packet transmissions. This flexibility comes from packet-based transmission format and dynamic bandwidth allocation. If a certain channel is not active, it does not consume any link bandwidth, leaving the full link bandwidth available for all active communication channels to share. The packet-based protocol allows the sharing requirement to be fulfilled. The maximum packet size is limited to 64 20-bit words to prevent one single channel from monopolizing the link bandwidth and to ensure other channels are served. The total-link bandwidth used by all communication channels cannot exceed the fixed available link bandwidth or errors occur.

The data and control-channel packets can be assigned a priority level. There are four priority levels: low, normal, high, and urgent. The scheduler transmits the packet with the highest priority among the pending requests. Packets with maximum latency requirements can be assigned an increased priority.

A bandwidth sharing scheme is employed in cases of multiple pending requests of the same priority setting to avoid creating buffer overflows. Without bandwidth sharing, a burst data request from a channel could cause buffer overflow in other communications channels on the link. Bandwidth sharing, however, considers predefined bandwidth share ratios and recent bandwidth usage averages of each type of communication channel to avoid buffer overflows, and ensure all channels are served.

The arbiter continuously measures the bandwidth usage of each channel and filters the data according to the analysis of the moving averages. This data is then compared to assigned bandwidth share ratios. To ensure link bandwidth parity, the arbiter takes this recent bandwidth usage information to decide which channel is allocated to use the link for each new packet transmission request. Consider a link allocated for either video or SPI communications, where video is assigned 90% link share and SPI is given 5%. A burst SPI transmission request on this link could result in video overflow buffering if the SPI bandwidth share exceeds 10% of the total. To avoid video buffering, SPI is allotted no more than 10% of the link to preserve the remaining 90% for video transmission.

## GMSL2 Physical Interface

### Link Speeds (Forward and Reverse)

Analog Devices' GMSL2 family of serial links have transmitter and receiver capability enabled simultaneously, enabling full-duplex operation on a single wire. A single cable between the serializer and deserializer delivers data being transmitted from each end of the link. Forward transmission is data being sent from the serializer to the deserializer at a link rate of 3Gbps for the MAX96717F. Reverse transmission is data being sent from the deserializer to the serializer at a link rate of 187.5Mbps. The GMSL2 link rates are fixed and independent of the video clock.

### Cabling Options

GMSL2 supports either 50Ω Coax or 100Ω Shielded-Twisted Pair (STP) cabling. Cable attenuation and return loss characteristics must stay within the requirements of the GMSL2 channel specification to achieve robust full-duplex link performance. These requirements vary with selected link rate. The available link rates and GMSL2 adaptive equalization enable support of a wide range of cabling options.

Coax or STP mode, and data rates are configured upon start-up by the level of CFG1 at power-up, and determine which cabling option applies. See [Table 11](#). In the Coax mode, use only the non-inverted SIO pin. AC-couple and terminate the inverting SIO pin using the series connection of a 100nF capacitor and a 49.9Ω resistor. In the STP configuration, both the non-inverted and inverted SIO pins are enabled by default.

Maximum cable length is limited by the frequency-dependent attenuation of the cable. Connectors degrade the return loss characteristic of the cable assembly. The GMSL2 channel specification allows two inline connectors, and provides detailed requirements for cable attenuation and return loss, as well as insertion loss and return loss requirements for PCB traces. In general, any physical channel implementation compliant with the GMSL2 channel specification can be used with reliable results. Contact the factory for the GMSL2 channel specification document.

### Adaptive Equalization (AEQ)

The GMSL2 devices automatically adapt the receiver's characteristics to compensate for the insertion and return loss characteristics of the channel that consist of the cables, connectors, and PCBs. This approach optimizes performance on any channel that meets the GMSL2 channel specification. The equalizer architecture makes GMSL2 links robust against noise, crosstalk, and reflections. Initial adaptation is performed during link lock, and is then invoked at a rate of approximately 1Hz to track temperature and voltage variations. The adaptation process optimizes the equalizer coefficients to minimize the intersymbol interference observed at the output of the equalizer.

### Echo Cancellation

The GMSL2 link includes an echo cancellation circuit in both the serializer and deserializer to enable simultaneous transmission of high-speed video data and bidirectional control data.

### Spread-Spectrum

Spread-spectrum is used to reduce Electromagnetic Interference (EMI). Optional Spread-Spectrum Clocking (SSC) is available to mitigate electromagnetic interference emitted from the device and interconnections, and provides additional margin. SSC reduces peaks in the frequency spectrum by spreading the energy over a wider bandwidth. The forward-channel spread-spectrum frequency is programmable in the range of 10kHz to 40kHz, and the frequency deviation is programmable in the range 0% to ±0.125%. If no forward channel spread-spectrum is programmed, up to 0.5% frequency deviation can be tolerated.

### Line Fault

GMSL serializers include a novel line-fault detection circuit. It detects and reports open-circuit, short-to-battery, short-to-ground, and line-to-line short. The line fault monitor requires external resistors  $R_{EXT1}$  and  $R_{PD}$  in the Coax mode, and  $R_{EXT1}$ ,  $R_{EXT2}$ , and  $R_{PD}$  in the STP mode connected to the LMN\_ pins, as detailed in the following sections.

The line-fault monitor is disabled by default, and configuration options are available through registers, and status can be read by the register. If unmasked, a line-fault condition asserts ERRB. Line fault detection cannot be used in conjunction with Power-over-Coax (POC) or AC-coupled ground applications.

The line-fault monitor pins offer flexible connection and programming in either Coax or STP applications.

Figure 20 illustrates the two configuration options to locate line-fault detection. The Local-Side Serializer Configuration is typically used for display links and Local-Side Deserializer Configuration for camera links. However, either configuration can be used on any device serial link system. Additionally, either applies to the Coax or STP modes.

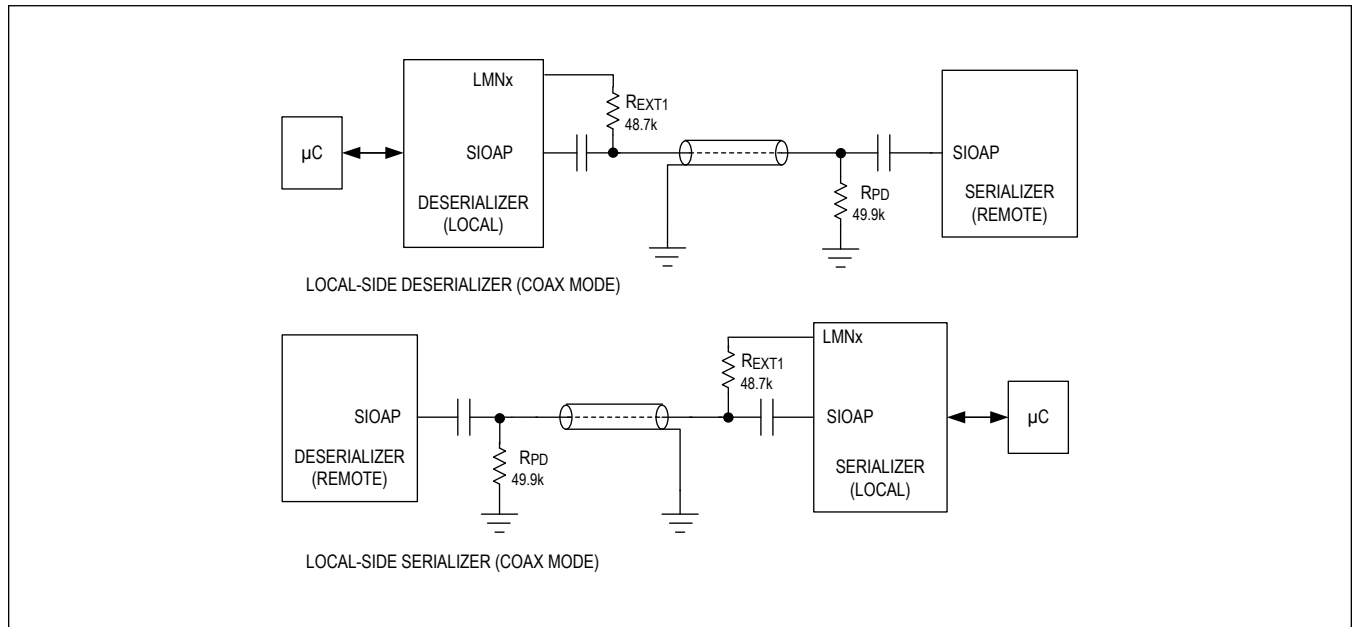


Figure 20. Line Fault Detection Location Options

The LMNx pins (LMN0 to LMN3) are typically mapped to different multifunctional pins on each unique part and package options. Some parts may have up to four line-fault detectors depending on the package options and pin availability.

**Coax Mode**

In Coax applications, any LMNx pin may be used. The local side sources the line-fault. The local-side device requires a single 48.7kΩ resistor (REXT1) connected directly from any of the LMNx pins to the serial link. REXT2 is not used in Coax applications. The remote side of the serial link requires a 49.9kΩ resistor (RPD) connected from the serial link to GND. Any of the line-monitor pins may be used in Coax applications.

**Table 4. Coax Mode Line Fault Configuration Options**

| SIGNAL         | SIOAP              | SIOBP              |
|----------------|--------------------|--------------------|
| Line Fault Pin | LMNx (Any LMN pin) | LMNx (Any LMN pin) |
| REXT1          | 48.7kΩ             | 48.7kΩ             |

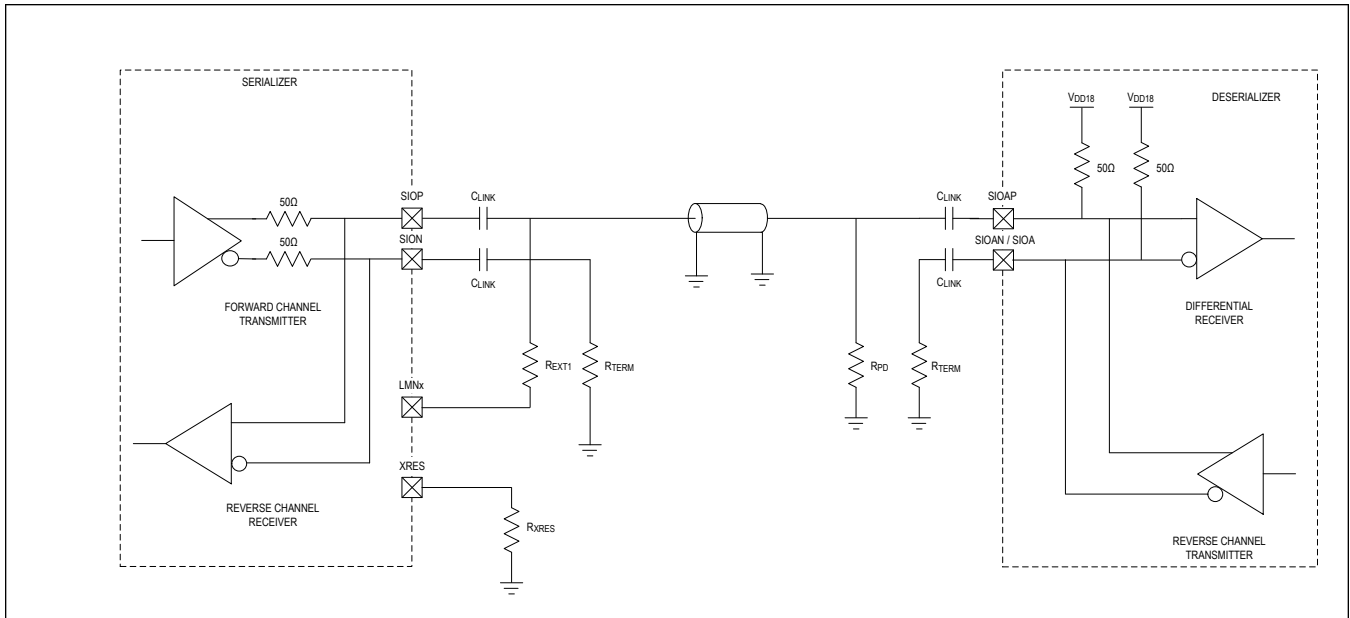


Figure 21. Typical GMSL Link Application Circuit for Coax Cable

**STP Mode**

If the serial link is operating in the twisted-pair mode, connect one line to an even-numbered pin (LMN0/2) and the other line to an odd-numbered pin (LMN1/3) on the local side. For reliable line-fault detection, the even-numbered pins (i.e., LMN0 and LMN2) must be connected to the line using a 42.2kΩ resistor (R<sub>EXT2</sub>); the odd-numbered pins (i.e., LMN1 and LMN3) must use a 48.7kΩ resistor (R<sub>EXT1</sub>) to connect to the line (as with the single-ended mode). On the remote side, both lines require a 49.9kΩ resistor (R<sub>PD</sub>) connected to GND.

For full operation of line-fault detection in twisted-pair applications, ensure that LMN0/1 pairs are used. This pairing is required for proper operation of the line-to-line short detection. However, this pairing is not necessary for the detection of other fault conditions.

Line Fault Pair #1 (LMN0/LMN1) Resistor Values and Connection Choices in STP Mode:

**Table 5. STP Mode Line Fault Configuration Options for LMN0/LMN1**

| LINE FAULT PAIR #1: LMN0 AND LMN1 | SIOAP   | SIOAN   |
|-----------------------------------|---|---|
| Option #1                         | LMN0: R <sub>EXT2</sub> = 42.2kΩ to serial link | LMN1: R <sub>EXT1</sub> = 48.7kΩ to serial link |
| Option #2                         | LMN1: R <sub>EXT1</sub> = 48.7kΩ to serial link | LMN0: R <sub>EXT2</sub> = 42.2kΩ to serial link |

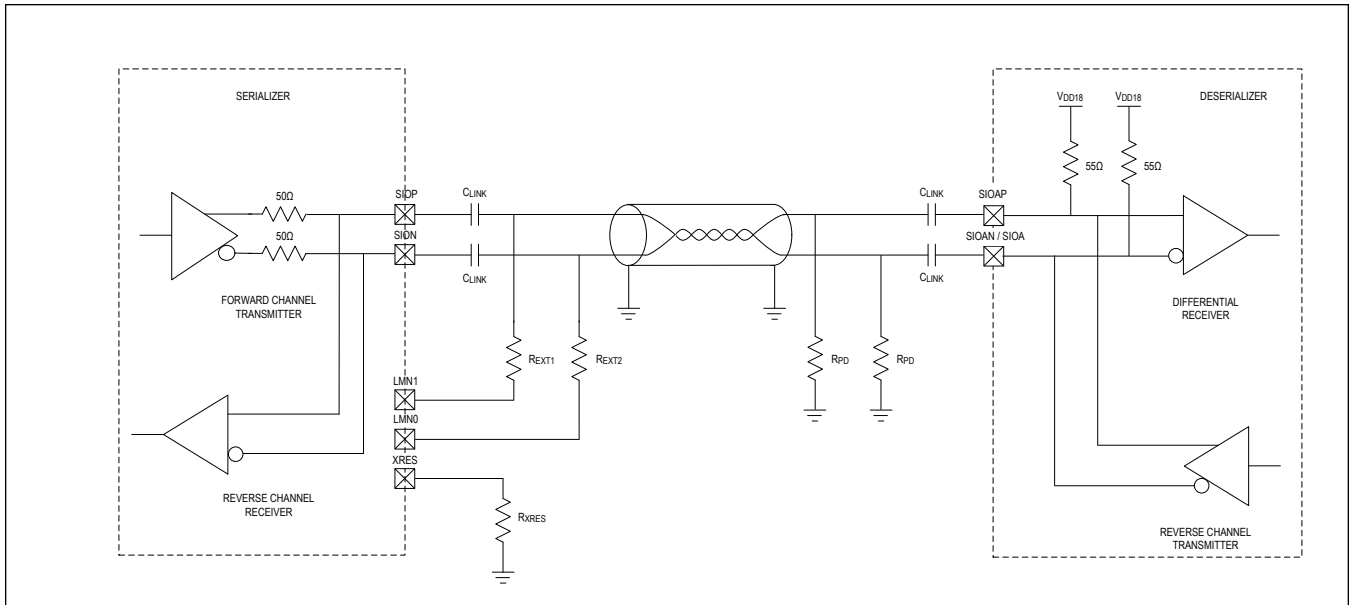


Figure 22. Typical GMSL Link Application Circuit for Twisted Pair (Line Fault Pair #1: LMN0 and LMN1, Option #2)

**Link Lock**

Link lock happens automatically on power-up, and is an indication the cable is plugged in, and the system is up and running. Lock is obtained with no interaction or commands from the  $\mu$ C to the GMSL parts. Both serializers and deserializers have an open-drain LOCK output pin, and a related status register.

Link lock indicates the Phase-Locked Loops (PLL) for the GMSL2 link are locked to each other and the data-receive paths are locked (i.e., forward channel in deserializer, reverse channel in serializer). Video and control-channel functions (I<sup>2</sup>C/UART, SPI, and GPIO) can be used immediately after link lock is asserted.

The GMSL2 link uses the crystal or external-reference input as the reference clock for the GMSL2 link. So, a valid video input (pixel clock) is not needed for the GMSL2 link to lock.

**GMSL2 Bandwidth Calculations**

The GMSL2 forward link has a fixed link rate of 3Gbps for the MAX96717F. The reverse-link rate is also fixed at 187.5Mbps. The GMSL2 protocol and channel coding overhead is roughly 16%. This leaves approximately 2.6Gbps of data throughput in the forward direction and 162Mbps in the reverse direction.

Ensure the worst cases do not exceed the available throughput of the forward and reverse links. Analog Devices' evaluation kit (EV kit) GUI includes a bandwidth (BW) calculator for initial bandwidth requirement estimates. Analog Devices also has other tools to calculate link-bandwidth utilization. Consult the factory for high-bandwidth use cases to ensure error-free performance.

Table 6 provides rough estimates of the bandwidth utilization for each communication channel.

**Table 6. Forward- and Reverse-Link Bandwidth Utilization**

| DATA                      | APPROXIMATE BANDWIDTH UTILIZATION   |
|---------------------------|---|
| Video (Forward Path Only) | $H \times V \times fps \times bpp \times (1 + (\% \text{ horizontal blanking})/100 + (\% \text{ vertical blanking})/100) \times 1.16$<br>Maximum bandwidth is limited by pixel clock rate PCLK.<br>Pixel mode: PCLK = MIPI data rate/bpp<br>Pixel mode (double pixel mode): PCLK = MIPI data rate/(2 x bpp)<br>Tunneling mode: PCLK = MIPI data rate/24<br>Maximum PCLK: 300MHz for 3Gbps link rate |

**Table 6. Forward- and Reverse-Link Bandwidth Utilization (continued)**

| DATA             | APPROXIMATE BANDWIDTH UTILIZATION   |
|------------------|---|
| I <sup>2</sup> C | 18 to 60 x I <sup>2</sup> C clock rate, depending on available link bandwidth                                     |
| UART             | 6 x UART bit rate, 5.5 x when parity bit enabled  |
| SPI              | 2.5 x SPI rate  |
| GPIO             | 60 x GPIO transition rate without delay compensation<br>80 x GPIO transition rate with delay compensation enabled |

**Note:** Bandwidth utilization for all video and control-channel communication in the forward direction increases by 6.7% when Forward-Error Correction (FEC) is enabled.

Definitions:

H = Horizontal resolution (active pixels)

V = Vertical resolution (active video lines)

fps = frames per second

bpp = bits per pixel

MIPI data rate = Aggregate data rate of all lanes in the Mobile Industry Processor Interface (MIPI).

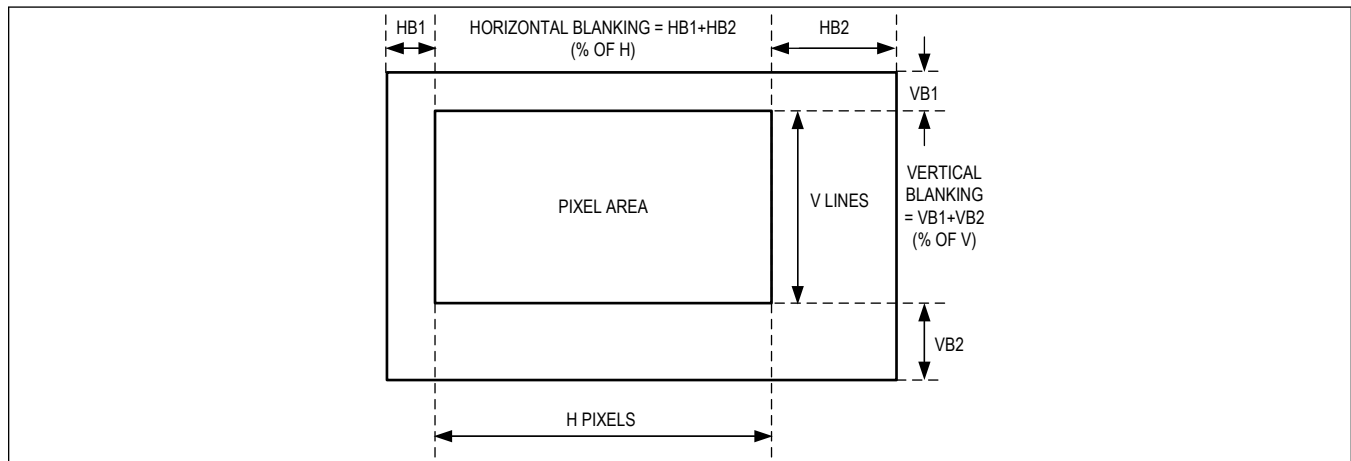


Figure 23. Video Frame Format for Bandwidth Calculation

### Control Channel and Side Channels

A  $\mu$ C or other controller can send and receive control and side-channel data over the GMSL2 serial link simultaneously with high-speed video data. Most GMSL2 devices support the following interfaces:

- Main I<sup>2</sup>C/UART (internal access)
- Pass-through I<sup>2</sup>C/UART
- SPI
- GPIO

All of the above interfaces can pass data through the GMSL2 link, but the GMSL2 device registers can be accessed and configured only through the main I<sup>2</sup>C/UART interface, unless the pass-through I<sup>2</sup>C/UART ports are enabled through register control.

The side channel, with its various interfaces, is accessed using multifunction pins. Multifunction pins have a default function and can be programmed to an alternate function after power-up. Due to a practical limit in the number of pins available on a given device, not all interfaces can be simultaneously supported. See [Pin Descriptions](#) and [Table 12](#) for default and alternate multifunction pin functions, as well as available combinations of interfaces.

### Main I<sup>2</sup>C/UART

The main I<sup>2</sup>C/UART is located on the SDA\_RX and SCL\_TX pins of each GMSL2 device. The I<sup>2</sup>C (SDA, SCL) or UART (Tx, Rx) interface is selected by the CFG0 pin voltage at power-up (see [Table 10](#)). The selected interface provides master access to both GMSL2 registers and device registers from either end of the link.

The master microcontroller (μC) can reside on either end of the link (usually the serializer side for display applications and deserializer side for camera applications). The MAX96717F supports dual-master microcontrollers, provided that software arbitration, such as token passing, is used to prevent packet collisions. The control channel allows only one master μC to communicate at a time.

To configure peripheral devices over the link, the GMSL2 serializer and deserializer must use the same control-channel interface (both I<sup>2</sup>C or both UART). Unlike legacy GMSL1 devices, there is no I<sup>2</sup>C-to-UART conversion capability. I<sup>2</sup>C /UART outputs are open-drain and require appropriately-sized external pullup resistors for proper operation.

For detailed main channel programming information, see the [Control-Channel Programming](#) section under [Applications Information](#).

### I<sup>2</sup>C/UART CRC and Message Counter

The MAX96717F provides additional functional safety by adding an optional CRC to I<sup>2</sup>C/UART read/write transactions, and a separate message counter for read and write packets. These features are either enabled by default at power-up or enabled by register settings. The CRC and message counter can be used together or individually. The CRC and message counter features only apply to device register read/write transactions, and are not supported for pass-through traffic. The CRC and/or message counter can be enabled in the serializer, deserializer, or both.

The first CRC byte covers the data for the first 6 bytes: Device Address, Register Address MSB, Register Address LSB, Message Counter MSB, Message Counter LSB, and the first data byte. If there are multiple data bytes after the first byte, then a CRC byte is appended after each subsequent data byte. The CRC engine is reset to 0 after each CRC calculation is complete, meaning a new CRC calculation is done for each additional byte. The CRC polynomial for I<sup>2</sup>C/UART is  $P(x) = x^8 + x^6 + x^3 + x^2 + 1$ .

### I<sup>2</sup>C/UART CRC and Message Counter Options

At power-up, the I<sup>2</sup>C/UART CRC and Message Counter features are disabled by default in the MAX96717F. Both features can be enabled or disabled through register control.

### Pass-Through I<sup>2</sup>C/UART

The MAX96717F has two pass-through I<sup>2</sup>C/UART channels. These channels do not have access to registers in either the GMSL2 serializer or deserializer; they simply tunnel the I<sup>2</sup>C or UART signal across the GMSL2 link. This allows I<sup>2</sup>C channels to be separated so that no multimaster conflicts occur. I<sup>2</sup>C/UART outputs are open-drain and require appropriately-sized external pullup resistors for proper operation.

### Serial Peripheral Interface (SPI)

The MAX96717F enables a host SPI master on one side of the GMSL2 link to control a peripheral SPI slave on the opposite side. Communication may be in either direction across the GMSL2 link.

The SPI clock range is 600kHz to 25MHz. Care must be taken to meet setup and hold-time requirements when using at speeds higher than 20MHz. The speed rating for each MFP needs to be set correctly for reliable operation. [Table 7](#) specifies the recommended drive strength and latching edge for the SPI as a function of Serial Clock (SCLK) speed.

**Table 7. SPI Latching Edge and Speed**

| FREQUENCY        | V <sub>DDIO</sub> | LATCHING EDGE       | PIOX_SLEW[1:0] |
|------------------|-------------------|---------------------|----------------|
| <12.5MHz         | 1.7V to 2.24V     | Opposite from Shift | 01             |
|                  | 2.25V to 3.6V     |                     | 10             |
| 12.5MHz to 25MHz | 1.7V to 2.24V     | Opposite from Shift | 00             |
|                  | 2.25V to 3.6V     |                     | 01             |

### General Purpose Input and Output (GPIO)

The MAX96717F provides up to 13 GPIO/GPO/GPI, dependent on device feature utilization. GPIOs are typically used to tunnel low-speed (< 100Kbps) signals over the GMSL2 link, although rates in excess of 1MHz can also be supported. A GPIO tunnel can be set up in the forward or reverse direction. MFP pins can be programmed as GPI, GPO (push-pull output), or ODO (open-drain output).

Each GPIO pin can be configured as an input, output, or input/output by programming the GPIO\_TX\_EN and GPIO\_RX\_EN register bits of each GPIO pin. Note that unwanted loop behavior is avoided for pins configured as input/output; when the pin is driven by a transition received from the remote side, the driven GPIO transition is not transmitted back. GPIO pins may alternately be controlled and read solely from registers.

Most GPIO pins can be programmed for 1M $\Omega$  or 40k $\Omega$  pullup or pulldown (or none).

When a GPIO is programmed as GPO, the GPO can generally be programmed for open-drain or push-pull output.

A GPIO packet has 32 possible GPIO channel IDs. Each GPI is mapped to a channel ID according to the GPIO\_TX\_ID register. On the receiving end, each GPO outputs the received data with a programmed GPIO channel ID corresponding to the GPIO\_RX\_ID register for that pin. This provides flexibility in determining which GPIO input drives which GPIO output.

GPIO transmissions are transition-based; a GPIO packet is created and transmitted on the GMSL2 link when a rising or falling edge transition is detected at a GPIO pin. Several GPIO transitions at different GPIO pins can be grouped into a single packet. These pin transitions can be transmitted in two different modes: regular and delay-compensated.

The GPIO channel is not bandwidth-efficient and should be used for low-speed signals only. Each GPIO transition uses 40 bits to 80 bits on the GMSL2 link for transmit and 40 bits to 60 bits on the reverse (due to received ACK packets). Bandwidth usage values vary based on channel configuration: ARQ enable, CRC enable, and double-header enable, all impact channel bandwidth usage.

The state of each GPIO can be read or written by register, either locally or remotely, over the GMSL2 link by a  $\mu$ C using the control-channel I<sup>2</sup>C/UART interface. In non-delay-compensated mode, channel latency is not fixed. The GPI transition is sent as soon as possible, based on priority and available link bandwidth. This variable delay is a result of multiple communication channels sharing the link. Non-compensated mode should be used with signals tolerant to delay variation (i.e.,  $\mu$ C interrupts). Priority can be set for GPI pins using registers. If no priority is set, GPI transitions are transmitted in the order they occur. However, when priority is set, transitions on GPI with higher priority are transmitted earlier.

Typical GMSL2 device delays for forward-link and reverse-link rates are shown in [Table 8](#).

**Table 8. Typical GPIO Delays for Forward-Link and Reverse-Link Transmission**

| DIRECTION                                       | DELAY COMPENSATION | DELAY       |
|---|--------------------|-------------|
| GPIO forwarding from serializer to deserializer | 0                  | 1 $\mu$ s   |
|   | 1                  | 3.5 $\mu$ s |
| GPIO forwarding from deserializer to serializer | 0                  | 6 $\mu$ s   |
|   | 1                  | 15 $\mu$ s  |

#### Delay in Non-Compensated Mode

In non-compensated mode, the value of the transition is transmitted along with the GPIO channel ID. Note that GPIO channel latency is not fixed; the GMSL2 link has variable delay as a result of multiple communication channels sharing the link. A maximum latency limit is established by the GMSL2 bandwidth-sharing scheme, but significant fluctuation remains. Non-compensated GPIO mode should be used with signals invariant to the delay variations (e.g.,  $\mu$ C interrupts).

#### Delay-Compensated Mode

In delay-compensated mode, a timestamp value is transmitted in addition to the value of the transition and GPIO channel ID. This timestamp is a high-resolution value sampled by an internal 600MHz clock that records when the GPIO transition is detected at the input. The remote-side chip uses the timestamp value to wait and output the GPIO transition after a total fixed delay from the GPIO input transition. This method mitigates possible variable latency issues by making the total GPIO input-to-output delay a precise, fixed value. Delay-compensated GPIO mode should be used for signals of



which the relative timing of rising and falling edges are important (e.g., Pulse-Width Modulation (PWM), camera frame sync, radar ramp trigger, and low-speed UART signals).

### Frame Sync

In surround-view camera applications, a frame-sync signal is usually required by the sensors to synchronize the output of a frame with the other cameras in the system. Most GPIOs can be configured as GPI and linked to a frame-sync signal generated by a surround-view camera Electronic Control Unit (ECU).

### Functional Safety Features

The MAX96717F integrates a number of safety features, including Power-On-Self-Test (POST) that includes logic Built-In Self Test (LBIST) and Memory Built-In Self Test (MBIST), and a power manager that reports undervoltage/overvoltage conditions. The host interface (I<sup>2</sup>C/UART) has an optional CRC capability and optional message counter for I<sup>2</sup>C/UART traffic.

At power-up, LBIST verifies that key logic blocks are correctly functioning and free of latent faults. MBIST checks the memories for defects on power-up. The POST produces a pass/fail result that can be read through a register for each test. A POST failure on start-up does not prevent the device from operation, but is reflected in registers POST\_LBIST\_PASSED and POST\_MBIST\_PASSED.

A register CRC (REGCRC) detects unintended changes in the configuration registers. A CRC value for the configuration registers is computed and stored on demand at start-up. During operation, the REGCRC block periodically calculates the CRC of the configuration registers and compares the calculated value to the stored value. A mismatch can be reported through ERRB. Refer to the product specific safety manual for a complete list of safety features.

### Analog-to-Digital Converter (ADC)

The MAX96717F features a 10-bit, integrating Analog-to-Digital Converter (ADC) with a multiplexed, single-ended input to monitor DC-voltages. The multiplexed input allows the monitoring of external input lines (ADC0, ADC1, and ADC2), and internal power supplies. The input range of the ADC extends from ground to a full-scale voltage, dependent upon the selected reference voltage. The default is a built-in 1.25V voltage reference. Alternatively, an external 1.25V precision reference or the V<sub>DD18</sub> supply voltage divided by 2 (V<sub>DD18</sub>/2) can be used. With the 1.25V reference, the maximum ADC input voltage is 1.2V. When using V<sub>DD18</sub>/2 as the reference, the maximum input voltage is limited to V<sub>DD18</sub>/2. Higher input voltages are supported using built-in programmable voltage dividers at the ADC input pins.

The ADC is controlled through the MAX96717F register map with feedback through interrupt flags. Controls include ADC power-up control, input channel selection, overrange/underrange thresholds, and conversion start. Feedback includes ADC conversion done, ADC ready, ADC overflow, and conversion overrange and underrange. Input and voltage monitoring, and threshold levels are set up through the register map.

The overvoltage/undervoltage thresholds can be programmed for up to eight individual ADC input channels. These thresholds can be enabled to assert an error flag if the converted ADC value is out of range. This feature allows voltage monitoring without the need to read out the converted value after each A/D conversion. This allows to issue a conversion, review the error flag status for overrange/underrange, and proceed to the next channel, when ready.

The ADC also contains a round-robin state machine that continuously cycles through up to eight input channels for continuous voltage monitoring. When an overrange/underrange or overflow occurs, an error flag asserts.

The state machine also contains an ADC shutdown mode that powers off the ADC for up to 65,535 ADC conversion cycles.

The ADC contains a low-offset input buffer to be used when sampling signals with output impedances greater than 20kΩ. If the input buffer is used, the ADC shows some nonlinearity affecting its accuracy below 100mV (the minimum input voltage for buffered input). The conversion time is approximately 430μs.

### ADC Features

- Input buffer, ADC, and voltage reference.
- Programmable input multiplexer with three channels each to monitor external and internal supply voltages.
- Integrated voltage dividers (/1, /2, /3, and /4) at the MFP pins to measure voltages as high as V<sub>DDIO</sub>.
- Input for optional external precision voltage reference.

- Overvoltage and undervoltage interrupt generation.
- ADC conversion start and done interrupt generation.
- Power control with interrupt generation when ADC and charge pump power-up are complete.
- Continuous round-robin monitoring of all channels.
- Programmable input and reference gains to scale the input and reference.

**ADC Architecture**

The ADC on the MAX96717F is an integrating type analog-to-digital converter with a single-ended input multiplexer, high-impedance input buffer, and integrated reference generator. See [Figure 24](#). The optional input buffer is high-input impedance and can be used to minimize the loading of high-impedance external inputs.

The ADC reference voltage can be based on the built-in 1.25V reference, the  $V_{DD18}$  supply level divided by 2, or an external pin ( $V_{REF}$ ).

Optimum accuracy is achieved by connecting an external reference to the  $V_{REF}$  pin while powering down the internal-reference buffer.

The ADC supports an input gain of 1x (unity) or 2x. For signals less than half the voltage reference, the 2x gain can provide additional resolution.

The ADC input features a 16-channel input multiplexer. However, only six physical channels are used (0, 1, 2, 8, 9, and A). These physical channels can be mapped to any of the ADC logical channels.

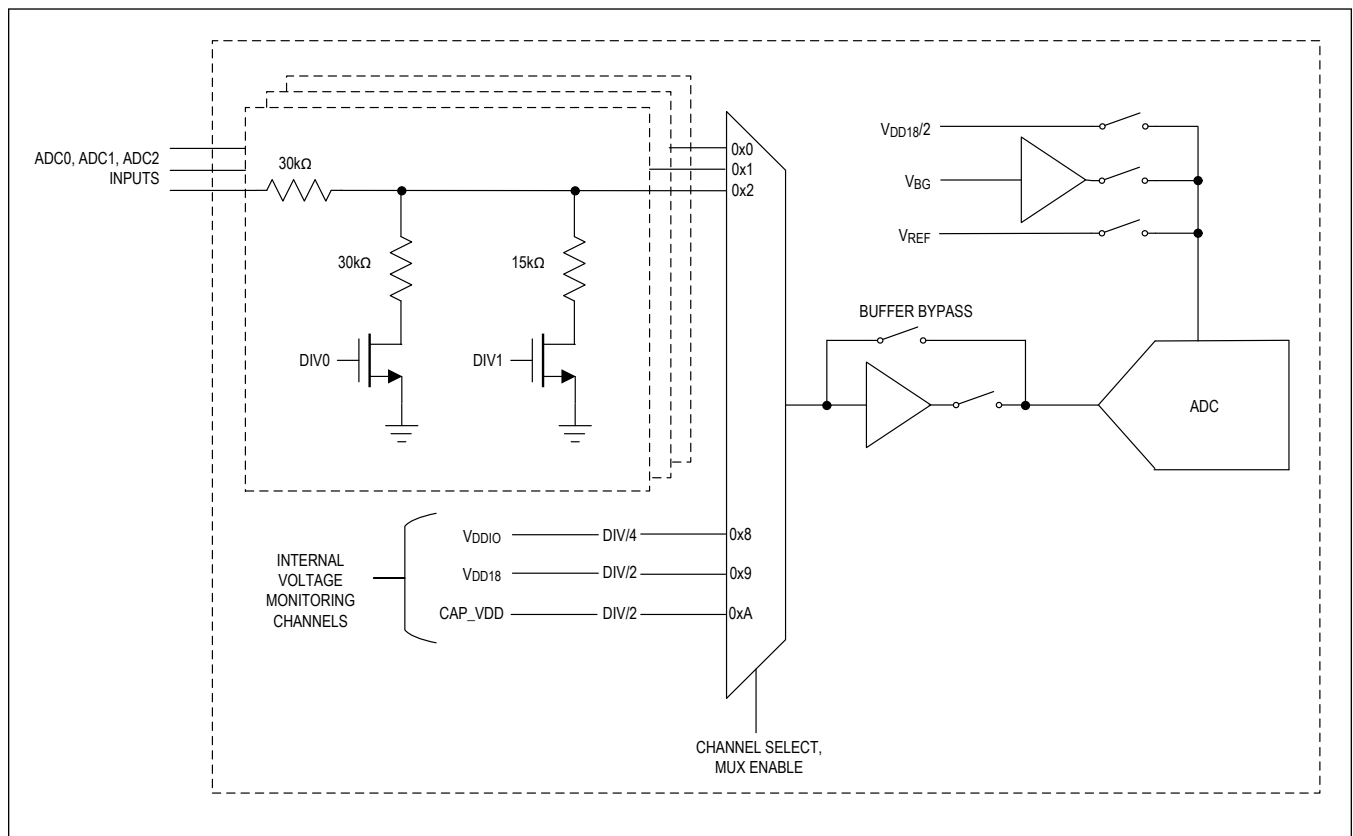


Figure 24. ADC Block Diagram

## ADC Operation

### ADC Control Interface

The control registers for the ADC are used to set up the ADC, start A/D conversions, and retrieve the results of ADC conversion operations. The ADC control interface enables:

- Configuration of the input multiplexer, reference, input buffer, and ADC.
- Power control and generation of interrupt when the charge pump power-up delay is complete.
- A/D conversion start and done interrupt generation.
- ADC threshold limits and interrupt generation.

After an A/D conversion is complete, the data is available to be read from the ADC\_DATA register. The ADC output value is a function of the input voltage, reference voltage, and optional data scaling. The voltage reference for the conversion can be the internal 1.25V reference, an external reference, or  $V_{DD18}$  voltage supply. The ADC input buffer should be enabled and ADC control buffer bypass disabled if the output impedance of the measured source is  $> 20k\Omega$ .

Interrupt flags are used to provide status and error conditions. Individual interrupt flags are set to indicate ADC Ready (power-up complete), ADC Done (conversion done), ADC Lo Range violation, ADC Hi Range violation, and ADC Overflow. Associated with each channel is a channel Lo and Hi range violation interrupt flag.

Each interrupt flag has an enable bit to indicate it should be monitored. When a flag is set by the ADC, it remains set until it is cleared, by reading the interrupt register associated with the asserted flag.

The ADC can also operate in a round-robin fashion to continuously monitor up to eight channels of the input MUX. Each channel contains individual controls for monitoring. Upper and lower limits can be set individually for each channel, and each channel can be individually configured as an interrupt source.

During the round-robin, the ADC Done and ADC Ready interrupt flags are masked.

### ADC Power-Up and Power-Down Sequences

The MAX96717F must have  $V_{DD}$ ,  $V_{DD18}$ , and  $V_{DDIO}$  supplies available, and the link between the serializer and deserializer must be established before the ADC can be used.

After the power supplies are validated, the ADC clock must be enabled and power-up controls applied. Note that the ADC's charge pump requires a  $10\mu s$  delay from initial power-up before it is in steady-state and available for use. The interface detects when the ADC circuits are enabled and sets the ADC ready interrupt flag. Once the delay is passed, the ADC is ready for use. See ADC\_CTRL and ADC\_INTR register documentation for further details. Refer to the GMSL2 User Guide for details of the sequence of steps to power-up, use, and power-down the ADC.

### ADC Overvoltage and Undervoltage Thresholds

To simplify power supply monitoring, the ADC supports programmable data limits and interrupt enables for all channels. At the end of conversion, the ADC output is compared to a limit when a selected channel is sampled. If the detector and overlimit interrupt are enabled, an interrupt is generated. This same capability is provided for the underrange limit detector. Refer to the GMSL2 User Guide for details on programming.

### ADC Round-Robin Sampling

The MAX96717F can continuously monitor the enabled channels by cycling through them. The ADC can also be programmed to automatically enter sleep mode to shut down for up to 65,535 ADC conversion cycles.

### ADC Application Diagrams for External Voltage Measurements

Using the ADC to measure external voltages requires planning to understand how the input network of the ADC0, ADC1, and ADC2 pins are implemented.

For voltages less than  $V_{DDIO}$  (maximum voltage of the ADC input), the internal dividers can be used to bring the voltage to within the valid input range of the ADC. For voltages greater than  $V_{DDIO}$ , an external resistor divider can be used to create a voltage within the input range of the ADC. When external dividers are used, the ADC input resistor-divider should be programmed for /1 mode and the internal buffer enabled.

External resistors in series with the internal dividers should not be used because large variations in voltages are

experienced due to on-chip resistor variations.

**Measuring External Voltages Lower than  $V_{DDIO}$**

When measuring voltages below 3.6V, as shown in [Figure 25](#), the internal dividers can be used to adjust the voltage into the ADC to be ~1V (or  $V_{REF}$ ). [Table 9](#) shows the recommended divider setting for  $V_{IN}$  ranges (Note: In [Table 9](#), <ch> refers to the ADC logical channel). Note that the maximum input voltage to the ADC should not exceed  $V_{DDIO}$ . If a higher voltage needs to be monitored, it should be divided down using an external resistor divider.

**Table 9. ADC Voltage Divider Settings**

| $V_{IN}$<br>VOLTAGE RANGE | DIVIDER PROGRAM | ADC_CTRL_3.adc_div or ADC_LIMIT<ch>_3.<br>div_sel<ch> |
|---------------------------|-----------------|---|
| < $V_{REF}$               | /1              | 2'b00   |
| $V_{REF}$ to 1.8V         | /2              | 2'b01   |
| 1.8V to 3V                | /3              | 2'b10   |
| 3V to 3.6V                | /4              | 2'b11   |

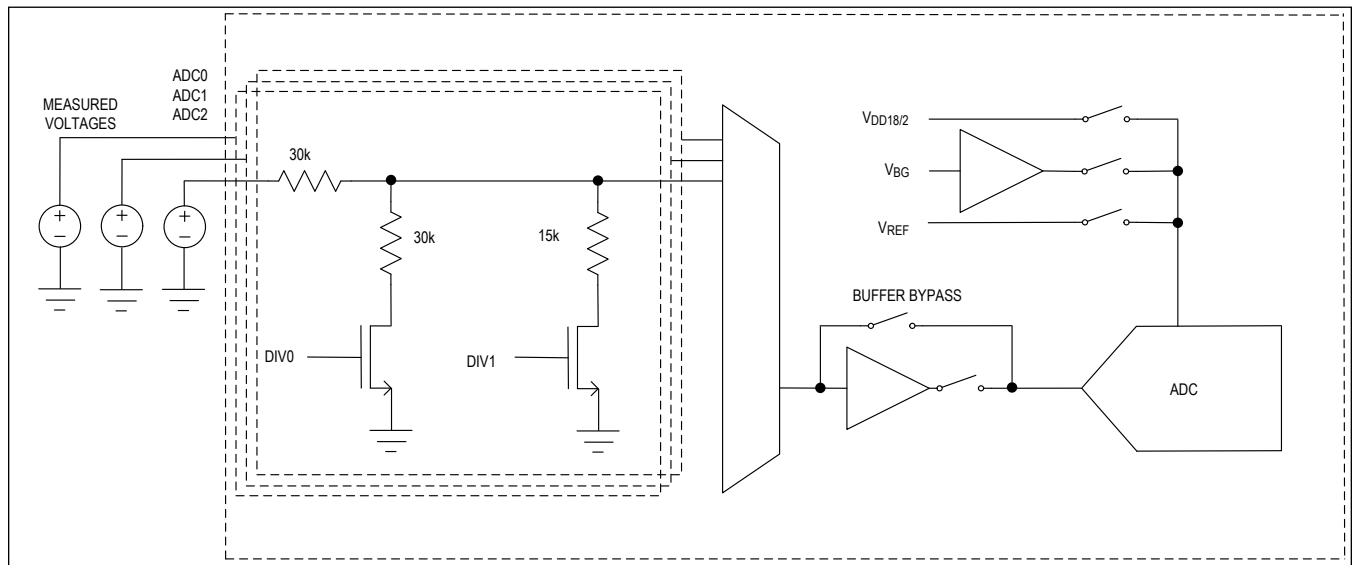


Figure 25. Measuring External ADC Voltages < 3.6V

**Measuring Voltages Higher than  $V_{DDIO}$**

To make measurements of these voltages higher than 3.6V, an external resistor-divider should be used to bring the voltage within the range of the ADC (<  $V_{REF}$ ). See [Figure 26](#). In this application, program the internal divider setting to /1 mode (2'b00).

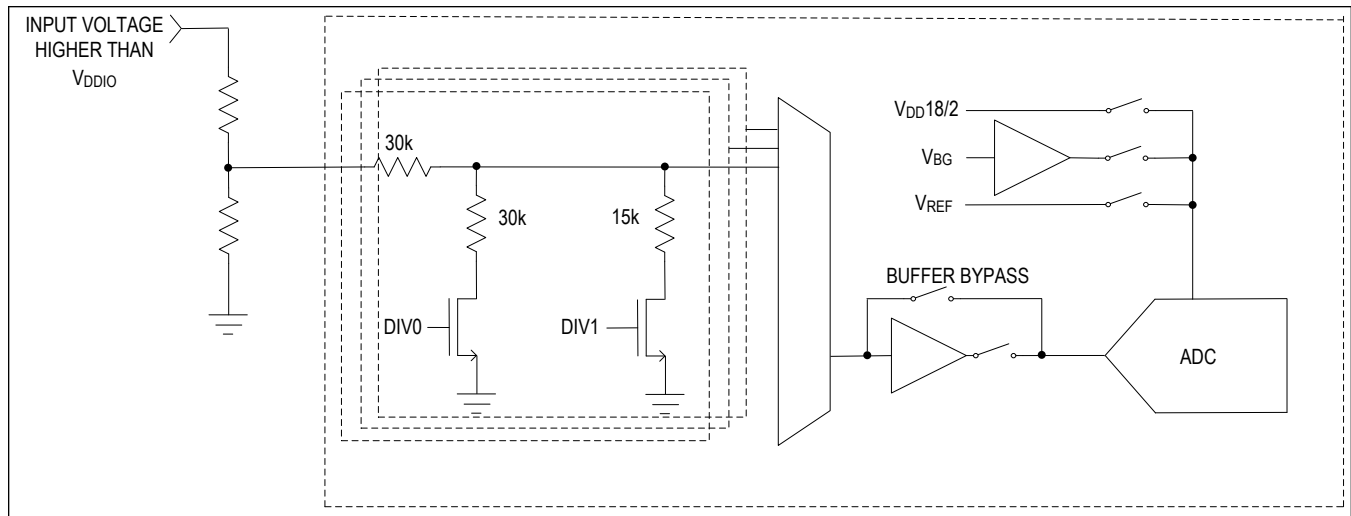


Figure 26. Measuring External ADC Voltages Greater Than  $V_{DDIO}$

### Junction Temperature Monitoring and Overtemperature Alarm

The MAX96717F includes redundant temperature sensors to measure the die temperature. The junction temperature of the MAX96717F can be monitored by initiating a junction temperature measurement and reading the junction temperature out through registers (REGADCBIST0/13/14/15). The junction temperature is reported in degrees Kelvin with 0.5° resolution. Overtemperature threshold needs to be set equal to +125°C (or lower, if preferred), and monitored by System-on-Chip (SoC).

### Eye-Opening Monitor

The Eye-Opening Monitor (EOM) enables GMSL2 parts to monitor the link margin on an active link and generate an interrupt if it falls below an acceptable level. For example, if a cable is damaged, the link can run error-free, but have less link margin than desired. This allows proactive reaction to deteriorating cable performance before any link errors occur. GMSL2 parts can measure the horizontal or vertical eye-opening of the equalizer's output. The measurement is activated automatically at a rate of approximately 1Hz once a link is active. The EOM block compares the data sampled at the center of the eye with a sample offset in phase (for the horizontal EOM) or offset in voltage (for the vertical EOM). An eye-opening figure of merit is then reported. The EOM can trigger an interrupt or a reset if the opening falls below user-defined thresholds.

### Sleep Mode

The sleep state preserves critical register settings and configurations. Retained registers are detailed in the register table. The device can be put into the sleep state through an I<sup>2</sup>C/UART command. Resume is invoked by an I<sup>2</sup>C command or a low-frequency clock beacon transmitted from the master device over the GMSL2 link. See the Register Map to determine if any register writes are needed to fully restore the device to the presleep condition. Note that GPIO levels set by received values from the other side of the link are not retained when entering sleep mode. Disable GPIO receive and set GPIO values to known levels before entering the sleep mode.

### Other Functions

GMSL2 serializers and deserializers have a main I<sup>2</sup>C/UART control-channel interface that a  $\mu$ C uses to access serializer and deserializer registers, as well as peripheral devices, from either end of the link. Each device also has two pass-through I<sup>2</sup>C/UART channels available for local or remote peripheral control. The pass-through I<sup>2</sup>C/UART channels do not have access to serializer and deserializer registers.

The MAX96717F also includes an SPI master/slave with two slave-select pins for peripheral control. The SPI enables a host SPI master on one side of the GMSL2 link to control a peripheral SPI slave on the opposite side. The host can be located at either end of the link or can swap ends by reprogramming the GMSL2 devices, as a GMSL2 device can be

configured as an SPI master or slave.

The MAX96717F provides up to 10 GPIOs dependent on device feature utilization. GPIOs are typically used to tunnel low-speed (< 100Kbps) signals over the GMSL2 link, although rates in excess of 1MHz can also be supported. A GPIO tunnel can be set up in the forward or reverse direction.

The devices include a video crossbar. The crossbar can be used to reorder the color and sync signals. It can also be used for D-PHY lane remapping and phase inversion, if desired.

GMSL2 devices incorporate numerous link-margin optimization and monitoring functions to ensure a high link margin. Adaptive equalization periodically (~1Hz) optimizes the link margin to adapt to environmental changes and cable aging. An eye-opening monitor function for continuous link-margin diagnosis with various threshold alarm levels is available for runtime alerts of link degradation. A Pseudorandom Bit Sequence (PRBS) checking function is available to verify the correct link and video-channel operation.

### Video PRBS

The video channel of the serializer includes a PRBS pattern generator that operates with bit-error verification in the deserializer to test channel operation. The PRBS generator works with the clock received from the source.

To run the video PRBS test, first enable the PRBS generator on the transmitter side, then enable the checker on the receiver side. The PRBS checker automatically synchronizes itself to the incoming PRBS pattern. If it is unable to synchronize within a few cycles, it asserts the PRBS\_FAIL register. To stop the PRBS test, first turn the checker off on the receiver side, then turn the generator off on the transmitter side.

PRBS errors can be read from the VPRBS\_ERR register on the deserializer side. Any PRBS error causes the ERRB pin to go low in the deserializer by default (see VPRBS\_ERR\_OEN and VPRBS\_ERR\_FLAG register bits).

**Note:** The video channel shares link bandwidth; it is possible to have a bit error on the link, which does not cause a video PRBS error.

## MIPI CSI-2 Input Interface

### Lane Configurations and Data Rates

Image data is received on a unidirectional MIPI CSI-2 v1.3 input port. The port should be configured to use D-PHY v1.2. The interface offers a high degree of flexibility. When configured as D-PHY, the interface supports either one, two, three, or four differential lanes. To ease the PCB layout, lane swapping is supported independently of how many lanes are used. For example, when the device is configured to enable a single lane, that lane can be any one of the four lanes available within that port. If two lanes are enabled, those two lanes can be any two lanes within the port. Lane polarity swapping within a lane is also supported. [Figure 27](#) shows the options and default mapping. D-PHY mode supports data rates up to 2.5Gbps per lane.

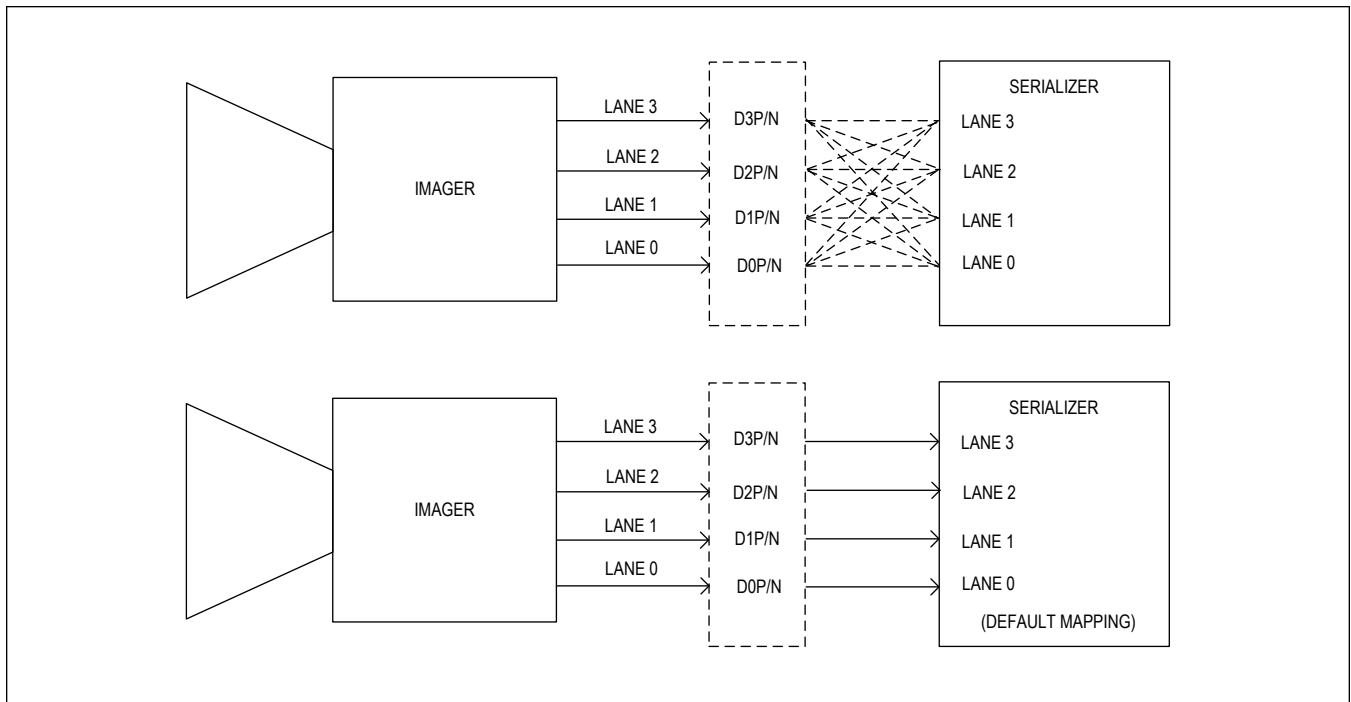


Figure 27. MIPI CSI-2 Lane Mapping Options and Default Settings

### Clocking

The device CSI-2 interface supports both continuous and burst-mode clocking in the D-PHY mode.

### CSI-2 Virtual Channel and Data Type Interleaving

The device supports virtual channels, including Virtual Channel Extension (VCX) introduced in CSI-2 v2.0, enabling up to 16 virtual channels.

If operating in the pixel mode, the virtual channel and/or data type received from the CSI-2 source can be reassigned (pixel mode only) or passed through (pixel and tunneling modes).

### Lane Deskew

The CSI-2 D-PHY interface can be configured to use interlane deskew using deskew patterns from the transmitter when the bit transmission rate is 1.5Gbps/lane and above. Deskew is optional for data rates lower than 1.5Gbps/lane. Deskew is initiated by the transmitter under CSI-PPI control.

### Minimum Blanking

The minimum horizontal blanking period needed by the CSI-2 serializers and deserializers is the maximum of either 40 pixels or  $300\text{ns} + 370\text{UI}$  (where UI is defined as the period of CSI-2 lane rate). For most cases, 40 pixels is the larger number. Minimum vertical blanking period is one video line. Minimum vertical front porch is one video line. Recommended vertical back porch is one video line.

Minimum vertical back porch in pixel mode is the maximum of:

- 40 pixels
- $300\text{ns} + 370\text{UI}$

Minimum vertical back porch in tunneling mode is the maximum of:

- 40 pixels
- $200 \text{ PCLK periods} + 233\text{ns}$ , where  $\text{PCLK} = \text{total MIPI data rate}/24$
- $300\text{ns} + 370\text{UI}$

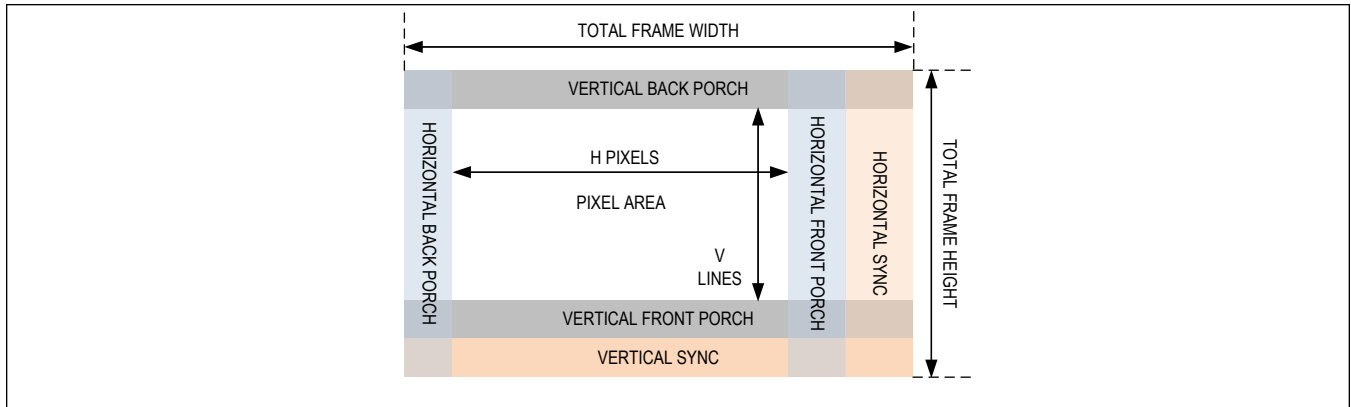


Figure 28. Video Timing

**MIPI End-to-End Packet Spacing**

When in tunneling mode, timing requirements must be met to avoid a false line-CRC error flag. As shown in [Figure 29](#), the end-to-end packet spacing (L1, L2, ... LN, LE, LS) must be a minimum of 200 x PCLK cycles + 233ns, where PCLK is the total MIPI data rate/24. This limit is typically a concern for the line-end short packets that follow the last-long data packet of a frame. An alternate solution is to disable the line-CRC check and rely on the MIPI CSI-2 packet CRC, which is a valid verification of error-free data reception.

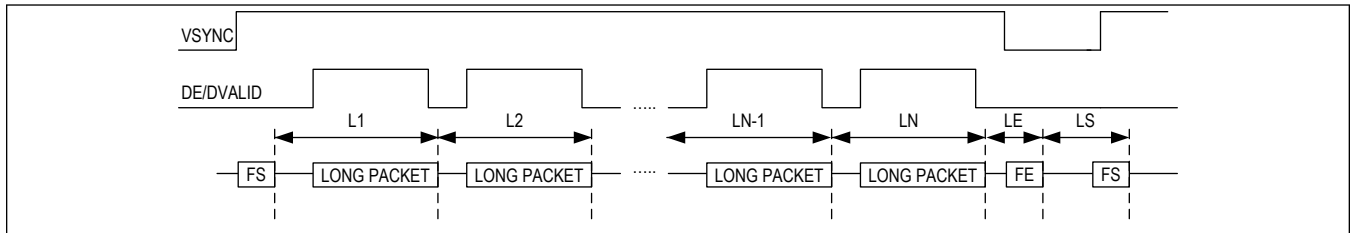


Figure 29. End-to-End Packet Spacing

**CFG Latch at Power-Up Pins**

Voltage levels at the CFG0 and CFG1 pins are latched at power-up, or upon a low-to-high transition of PWDNB. These levels set initial register values and functional modes that may not be easily programmed through I<sup>2</sup>C or UART after the IC powers up. The CFG pins select device address, I<sup>2</sup>C or UART main control channel, and coax or STP cable. See [Table 10](#) and [Table 11](#).

The voltage level for each pin is set by an external precision resistor-divider connected between V<sub>DDIO</sub> and ground, or for some configurations, by a single resistor connected to V<sub>DDIO</sub> or ground. [Table 10](#) and [Table 11](#) show the recommended resistor values to select each configuration. The voltage level at the CFG pins is latched approximately 1ms after all MAX96717F supplies reach the minimum levels required by the POR (power-on-reset) circuit.

If the requirements described in [Table 10](#) and [Table 11](#) are met, the CFG pins can be used as general-purpose outputs or MFP function outputs, after the input voltage levels are latched. CFG pins cannot be used as general-purpose inputs.

**Table 10. CFG0 Input Map**

| CFG0 INPUT VOLTAGE SPECIFICATION (% OF V <sub>DDIO</sub> )<br>(NOTES a, b) |     |     | SUGGESTED RESISTOR VALUES<br>(1% TOLERANCE)<br>(NOTE c) |        | MAPPED CONFIGURATION<br>(NOTE c) |              |                |
|--|-----|-----|---|--------|----------------------------------|--------------|----------------|
| MIN  | TYP | MAX | R1 (Ω)  | R2 (Ω) | I2CSEL                           | RoR/<br>Xtal | DEVICE ADDRESS |



**Table 10. CFG0 Input Map (continued)**

| CFG0 INPUT VOLTAGE SPECIFICATION (% OF V <sub>DDIO</sub> )<br>(NOTES a, b) |       |       | SUGGESTED RESISTOR<br>VALUES<br>(1% TOLERANCE)<br>(NOTE c) |       | MAPPED CONFIGURATION<br>(NOTE c) |      |      |
|--|-------|-------|--|-------|----------------------------------|------|------|
| 0.0%   | 0.0%  | 11.7% | OPEN   | 10k   | I <sup>2</sup> C                 | RoR  | 0x80 |
| 16.9%  | 20.2% | 23.6% | 80.6k  | 20.5k |                                  |      | 0x84 |
| 28.8%  | 32.1% | 35.5% | 68.1k  | 32.4k |                                  | Xtal | 0x80 |
| 40.7%  | 44.0% | 47.4% | 56.2k  | 44.2k |                                  |      | 0x84 |
| 52.6%  | 56.0% | 59.3% | 44.2k  | 56.2k | UART                             | RoR  | 0x84 |
| 64.5%  | 67.9% | 71.2% | 32.4k  | 68.1k |                                  |      | 0x80 |
| 76.4%  | 79.8% | 83.1% | 20.5k  | 80.6k |                                  | Xtal | 0x84 |
| 88.3%  | 100%  | 100%  | 10k  | OPEN  |                                  |      | 0x80 |

**Note a:** Resistor-divider tolerance, V<sub>DDIO</sub> supply ripple, and external loading must not cause the CFG0 input voltage to exceed the maximum or minimum limits.

**Note b:** Other than the CFG0 input resistor-divider, any load on CFG0 must be  $\geq 25 \times (R1 + R2)$ .

**Note c:** Each resistor in the voltage-divider must be  $\leq 100\text{k}\Omega$ .

**Note d:** I2CSEL: I<sup>2</sup>C or UART interface for SDA\_RX and SCL\_TX.

**Table 11. CFG1 Input Map**

| SPECIFICATION (% of V <sub>DDIO</sub> ) (NOTES<br>a, b) |       |       | SUGGESTED RESISTOR<br>VALUES<br>(1% TOLERANCE) |                 | MAPPED CONFIGURATION<br>(NOTE c) |                        |                          |        |
|---|-------|-------|--|-----------------|----------------------------------|------------------------|--------------------------|--------|
| MIN   | TYP   | MAX   | R1 ( $\Omega$ )                                | R2 ( $\Omega$ ) | COAX OR TWISTED<br>PAIR          | DATA<br>RATE<br>(Gbps) | TUNNEL/<br>PIXEL<br>MODE |        |
| 0%  | 0.0%  | 11.7% | OPEN   | 10k             | STP                              | 3                      | Tunnel                   |        |
| 16.9%   | 20.2% | 23.6% | 80.6k  | 20.5k           |                                  |                        | Pixel                    |        |
| 28.8%   | 32.1% | 35.5% | 68.1k  | 32.4k           |                                  | COAX                   | 3                        | Tunnel |
| 40.7%   | 44.0% | 47.4% | 56.2k  | 44.2k           |                                  |                        |                          | Pixel  |
| 52.6%   | 56.0% | 59.3% | 44.2k  | 56.2k           | COAX                             | 3                      | Tunnel                   |        |
| 64.5%   | 67.9% | 71.2% | 32.4k  | 68.1k           |                                  |                        | Pixel                    |        |
| 76.4%   | 79.8% | 83.1% | 20.5k  | 80.6k           |                                  | COAX                   | 3                        | Tunnel |
| 88.3%   | 100%  | 100%  | 10k  | OPEN            |                                  |                        |                          | Pixel  |

**Note a:** Resistor-divider tolerance, V<sub>DDIO</sub> supply ripple, and external loading must not cause the CFG1 input voltage to exceed the maximum or minimum limit.

**Note b:** Other than the CFG1 input resistor-divider, any load on CFG1 must be  $\geq 25 \times (R1 + R2)$ . Each resistor in the voltage-divider must be  $\leq 100\text{k}\Omega$ .

**Note c:** GMSL2: GMSL2 operating mode.

### Multifunction Pin Assignments

Side-channel functions, such as SPI and pass-through I<sup>2</sup>C/UART, are enabled by programming multifunction pins. Each MFP has several possible functions, but only one can be used at a time.

Some functions require only a single MFP, but most are implemented across a group of MFPs. For example, LOCK is a single MFP, but SPI takes several MFPs. MFP functions are selected to suit each use-case by programming the appropriate registers.

The [Pin Description](#) table shows default and alternate functions for each MFP, listed in order of priority (highest first). [Table 12](#) also shows priority, left to right, with highest priority on the left. A higher-priority function must be disabled when a lower-priority function is to be enabled, both by register writes.

VTG0 to VTG8 functions on pins MFP0, MFP1, MFP2, MFP3, MFP4, MFP7, or MFP8 represent video-timing generator VS, HS, and PCLK output on these pins. This can be defined flexibly in registers REF\_VTG1, REF\_VTG2 and REF\_VTG3.

Each MFP defaults to one of four slew rates, with each setting having a default output transition-time setting. The transition-time default suits the MFP's normal application requirements. Except for I<sup>2</sup>C/UART and GPI\_/ODO functions, whose slew rates are fixed, the transition time of each setting can be changed from the default value through register programming. When the slew rate is changed, the transition time of the MFP is changed. The main channel and pass-through I<sup>2</sup>C/UART channel's transition times are not affected by the transition-time settings.

Transition times depend on the transition-time setting and V<sub>DDIO</sub> supply voltage. See [Table 13](#) for typical transition times.

**Table 12. MFP Pin Function Map**

| PIN   | LATCH ON POWER-UP | I <sup>2</sup> C/UART | SPI      | OTHER FUNCTIONS                    | GPIO         | POWER_UP DEFAULT                       | PIN SLEW DEFAULT (BINARY) |
|-------|-------------------|-----------------------|----------|------------------------------------|--------------|--|---------------------------|
| MFP0  |                   |                       | SCLK     | VTG0                               | GPIO0        | DISABLED (1MΩ to GND)                  | 10                        |
| MFP1  | CFG0              |                       | BNE, SS1 | VTG1                               | GPO1         | DISABLED (Hi-Z)                        | 11                        |
| MFP2  | CFG1              |                       |          | RCLKOUT(Alt), DPLL_OUT (Alt), VTG2 | GPO2         | DISABLED (Hi-Z)                        | 11                        |
| MFP3  |                   |                       |          | ERRB, LOCK, ADC0, VTG3             | GPIO3        | DISABLED (1MΩ to GND)                  | 11                        |
| MFP4  |                   |                       | RO, SS2  | RCLKOUT, DPLL_OUT, VTG4            | GPIO4        | DISABLED (1MΩ to GND)                  | 11                        |
| MFP5  |                   |                       |          | LMN0, ADC1                         | ODO5_GPI5    | DISABLED (1MΩ to GND)                  | NA                        |
| MFP6  |                   |                       |          | LMN1, ADC2                         | ODO6_GPI6    | DISABLED (1MΩ to GND)                  | NA                        |
| MFP7  |                   | SDA1_RX1              | MOSI     | LOCK(Alt), VTG7                    | GPIO07       | GPI7 (1MΩ to GND)                      | 11                        |
| MFP8  |                   | SCL1_TX1              | MISO     | ERRB(Alt), MS, VTG8                | GPIO08       | GPIO8 (BiDir)                          | 11                        |
| MFP9  |                   | SDA_RX                |          | SDA2_RX2                           | ODO9_GPIO9   | SDA or RX (I2C or UART, 40kΩ to VDDIO) | NA                        |
| MFP10 |                   | SCL_TX                |          | SCL2_TX2                           | ODO10_GPIO10 | SCL or TX (I2C or UART, 40kΩ to VDDIO) | NA                        |

All MFP pins are Hi-Z in power-down state.

All MFP IOs are latched in sleep mode.

Hi-Z – 1MΩ pullup/pulldown is disabled and input/output is disabled.

Latched – Value of input before sleep mode entered remains latched in sleep mode and after return to power-up mode.

ODO = Open-Drain Output.

**Table 13. Control- and Side-Channel Typical Rise and Fall Times**

| PIN SLEW         | RISE TIME (ns)<br>(20% to 80%), C <sub>L</sub> = 10pF |                          | FALL TIME (ns)<br>(80% to 20%), C <sub>L</sub> = 10pF |                          |
|------------------|---|--------------------------|---|--------------------------|
|                  | V <sub>DDIO</sub> = 1.8V                              | V <sub>DDIO</sub> = 3.3V | V <sub>DDIO</sub> = 1.8V                              | V <sub>DDIO</sub> = 3.3V |
| 00               | 1.0   | 0.6                      | 0.8   | 0.5                      |
| 01               | 2.1   | 1.1                      | 2.0   | 1.1                      |
| 10               | 4.0   | 2.3                      | 4.3   | 2.3                      |
| 11               | 9.0   | 5.0                      | 10.0  | 5.0                      |
| I <sup>2</sup> C | N/A   | N/A                      | 40  | 30                       |

### Control-Channel Link and Power-Up

GMSL2 ICs are in power-down mode when the PWDNB pin is low or when any of the power supplies are down. Register and configurations are set to default reset conditions.

The serializer and deserializer may power up in any order. After all power supplies are up and PWDNB is released, each device starts its power-up sequence and performs these actions in sequence:

1. Latch at power-up pins register set. Set internal registers according to the selected configuration on CFG0 and CFG1 pins. See [Table 10](#) and [Table 11](#).
2. Control channel (I<sup>2</sup>C or UART) is functional on the local side. Device registers are writable and readable.
3. The enabled PHY performs link calibration, equalizer adaptation, and data-channel locking. Once the link is locked, the device sets the LOCK pin high.
4. Control channel is available from the remote side.

This entire link-up process, from the time that the last part's PWDNB input is brought high, takes approximately 35ms nominally for any channels that meet the GMSL2 channel specification.

After the device is linked, it can be configured. This can be done either locally or over the control channel by a  $\mu$ C on either the serializer or deserializer side.

### Device Reset

There are three general reset options available through register writes:

- RESET\_ALL resets all blocks, including all registers, digital, and analog blocks. This is similar to driving the PWDNB pin low and then high. Note: If sleep mode is being used, do not use RESET\_ALL as it returns the device to sleep mode.
- Setting RESET\_LINK resets all GMSL2 PHY-related digital logic and all data pipelines. After this bit is set, all control registers are still accessible through the local control channel. The link remains in RESET until RESET\_LINK is cleared.
- RESET\_ONESHOT resets all GMSL2 PHY-related digital logic and all data pipelines, and then automatically clears itself. This is similar to setting and clearing RESET\_LINK.

Registers that affect GMSL2 link operation (i.e., TX\_RATE, RX\_RATE, CXTP\_A) should be programmed first, followed by RESET\_ONESHOT. Alternatively, set these registers when RESET\_LINK = 1, and then set RESET\_LINK = 0. Always disable the UART pass-through channel before resetting the link.

### Clocking

#### GMSL Reference Clock

The MAX96717F requires a reference clock source to generate the 3GHz line-rate clock and associated internal clocks. Both the serializer and deserializer can be clocked with an external 25MHz crystal or an external clock source with a frequency accuracy of  $\pm 200$ ppm. The MAX96717F can generate a reference clock using the return-path data-stream with an integrated digital phase-locked loop. The latter alternative is called Reference over Reverse (RoR) and allows for elimination of crystals from sensor modules. This also phase and frequency locks sensor modules to a common frequency reference, which is connected to the deserializer. See [Reference Over Reverse Channel \(RoR\)](#).

### Reference Clock Input Jitter

If the reference clock is supplied from an external clock source rather than from a crystal, reference clock jitter must be considered. Jitter tolerance is highest for slow variations in clock period, as these can be absorbed by the clock recovery circuit on the GMSL2 serial link.

### Remote Clocking (RoR Channel)

#### Reference Over Reverse Channel (RoR)

The MAX96717F supports the generation of the reference clock for the device using the reverse-channel data stream. This eliminates the need for a local 25MHz crystal in each sensor. A phase-locked loop is used to synchronize the serializer's reference clock to the reference clock in the deserializer. This eliminates the need for a local crystal and synchronizes the timing for all devices using the serializer's reference clock output.

#### RoR Power-Up

At power-up and when the MAX96717F is configured to operate in RoR using the configuration pins, a free-running oscillator within the serializer is initially used as a clock reference until the RoR signal being sent from the deserializer to the serializer's return-path receiver is detected. Once the return-path signal's embedded reference locks the serializer's PLL, a locked state signal is sent from the serializer to the deserializer on the serializer's forward path as part of the power-up sequence. After the deserializer receives the lock signal from the serializer, control-channel data is enabled over the reverse channel, and the serializer's forward channel is enabled. The serializer is then ready for register programming and normal operation. Note that the deserializer must support the RoR mode.

#### Reference Clock/DPLL Generation

The MAX96717F can share a crystal or reference by providing a reference clock output. RCLKOUT can be used as a reference clock by a sensor or other IC in close proximity, eliminating the need for an additional external crystal or oscillator in a camera module.

The MAX96717F can also generate a unique reference frequency by utilizing an integrated digital PLL, which can be configured to generate a multitude of output frequencies through DPLL\_OUT. The reference clock is output on the MFP4 pin.

Using the built-in reference clock divider, the part can supply 25MHz, 12.5MHz, or 6.25MHz. Using the digital PLL allows frequency generation over a frequency range of 1MHz to 75MHz with fractional step sizes. Predefined frequencies include 13.5MHz, 19.2MHz, 24MHz, 27.0MHz, 37.125MHz, and 74.25MHz. By configuring the dividers in the DPLL,  $f_{DPLL\_OUT} = (N.M)/K \times f_{REF}$ , where N, M, and K are 7-bit, 11-bit, and 9-bit integers generated, respectively. Refer to the GMSL2 User Guide for further details on programming the digital DPLL.

#### Spread-Spectrum Clocking (SSC)

Analog Devices' GMSL2 links provide exceptional EMI performance. Optional Spread-Spectrum Clocking (SSC) is available to further mitigate EMI caused by the emissions. SSC reduces peaks in the frequency spectrum by spreading the signal over a wider bandwidth. The spread has a 25KHz sawtooth modulation profile, programmable to deviate up to  $\pm 1250$ ppm from the center frequency.

#### Error and Fault-Condition Monitoring

Both the serializer and deserializer have an open-drain, multipurpose error reporting and interrupt status output. The active-low ERRB pin is driven by the logical OR of a wide variety of error and event status indicators. The ability of each error condition to drive ERRB is maskable by register settings. Each error and event that can drive ERRB has a status flag within a sub-block of registers. So, the reason for assertion of ERRB can be determined by reading the register status.

#### Power Supplies

The supply voltages for the MAX96717F can be brought up in any order. An on-chip power manager ensures that all supply rails are within limits before enabling device start-up.

The serializer core runs on a regulated 1.0V supply (CAP\_VDD). It is supplied from a built-in LDO that regulates the

voltage received on the  $V_{DD}$  pin down to 1.0V.  $CAP\_VDD$  also powers the output driver for the GMSL forward channel. The  $V_{DDIO}$  supply for the GPIO pins can be between 1.8V and 3.3V for flexibility in interfacing with the part. The allowable supply voltage range is 1.7V to 3.6V.

$V_{DD18}$  is the analog supply. Connect to 1.8V.

Proper bypassing of all power supplies is essential for high-frequency circuit performance. See [Table 3](#) and [Table 2](#) for power-supply tolerances and noise requirements. Contact the factory for guidance on sharing supplies and optimizing supply decoupling.

### Supply Sequencing

The power supplies to the MAX96717F can be brought up in any sequence. An on-chip power management block manages the power domains during power-up.

However, when a PMIC has the ability to sequence, the following sequence is recommended:

1.  $V_{DD18}$  ramp-up
2.  $V_{DDIO}$  ramp-up
3.  $V_{DD}$  ramp-up

Power supply ramp-time recommendation:  $20\mu\text{s} < \text{ramp time} < 2\text{ms}$ . Power supply ramps should be monotonic. Once the supply voltage reaches the minimum supply voltage limit, it should not be allowed to drop below the specification.

### Overvoltage/Undervoltage

The MAX96717F includes Overvoltage (OV) and Undervoltage (UV) comparators, and detection logic for the supply rails.

For an OV condition on  $V_{DD18}$ ,  $CAP\_VDD$  (internal 1V), or  $V_{DD}$ , the ERRB pin is asserted, but no further action is taken. The device continues to operate and may suffer damage. Note that OV detection is active only when the Pixel Clock Detector (PCLKDET) detects a valid pixel clock. To clear the OV flags, read bits  $VREG\_OV\_FLAG$ ,  $VDD\_OV\_FLAG$ , and  $VDD18\_OV\_FLAG$ .

In a UV condition, the ERRB pin is asserted when:

1.  $V_{DD18}$  drops below an internal threshold. The part continues to function until  $V_{DD18}$  drops further to the reset level, and the device resets.
2.  $V_{DDIO}$  drops below an internal threshold. The part continues to function until  $V_{DDIO}$  drops further to the reset level, and the device resets. There are no OV flags for the  $V_{DDIO}$  rail.
3.  $CAP\_VDD$  (core 1V supply) drops below an internal threshold. The device resets.

Once the device resets and the power supply recovers, the device returns to the default power-up state with default register settings. Reinitiate device start-up and reprogram the device.

To clear the UV flags: read the respective error status registers PWR0 and PWR1, and the respective flags ( $VDDBAD\_INT\_FLAG$ ,  $PORZ\_INT\_FLAG$ , and  $VDDCMP\_INT\_FLAG$ ) for each supply domain. If  $VDDCMP\_INT\_FLAG$  and  $PORZ\_INT\_FLAG$  are both set, read PWR0 before PWR1 to properly clear the ERRB pin.

When an undervoltage event occurs, I<sup>2</sup>C communication may be lost. When power is restored, UV status registers can be read to determine which power supply experienced the undervoltage event.

### PCB Layout Guidelines for GMSL

Proper circuit board design techniques are required for optimal GMSL link performance. This includes having at least a four-layer board to provide a proper ground plane reference, low thermal impedance, DC supply pin bypassing, Power-over-Coax design, and high-speed GMSL trace impedance matching.

### Ground Plane

A consistent ground plane, generally the second layer, is recommended to provide isolation from the high-speed GMSL traces, and other traces and components that can couple noise onto the GMSL signals. This also simplifies the design of impedance-matched transmission lines. The ground plane is also key to provide a low thermal impedance to the device's exposed paddle.

### High-Speed GMSL Traces

Proper transmission-line design techniques are needed to achieve optimal GMSL link performance. The characteristic impedance must be closely matched to the desired impedance (50Ω single-ended or 100Ω differential). Any mismatch increases insertion loss and causes reflections (degrade return loss). Suggested layout practices are:

- Use only 100Ω differential or 50Ω single-ended traces.
- Minimize length of high-speed traces.
- Minimize pad stubs by placing component pads directly on the signal trace.
- Use ground cutouts under pads as required (1.3 x area of pad).
- Follow vendor layout recommendations for components, including connectors.
- Avoid sharp bends on high-speed traces.
- Place AC-coupling capacitors within 500mils of the SIOx pins.
- Place the GMSL device as close to the serial-link connector as possible to minimize insertion loss.
- Stitch ground layers together with vias near high-speed traces.

### Power-Over-Coax Layout

When used, the Power-over-Coax (PoC) circuit needs to provide a low DC series resistance to the power supply while minimizing the loading of the GMSL forward and reverse signals. The PoC circuit behaves as a bias-tee and requires proper layout techniques for optimal GMSL link performance, including:

- Placing the smallest valued inductor (highest self resonant frequency) on the GMSL signal trace.
- Placing the next smallest valued inductor after the smallest.
- Using ground cutouts as needed under the first two inductors and resistors. See [Figure 30](#).
- Placing the PoC within 1/2 UI of the device, particularly for the deserializer.

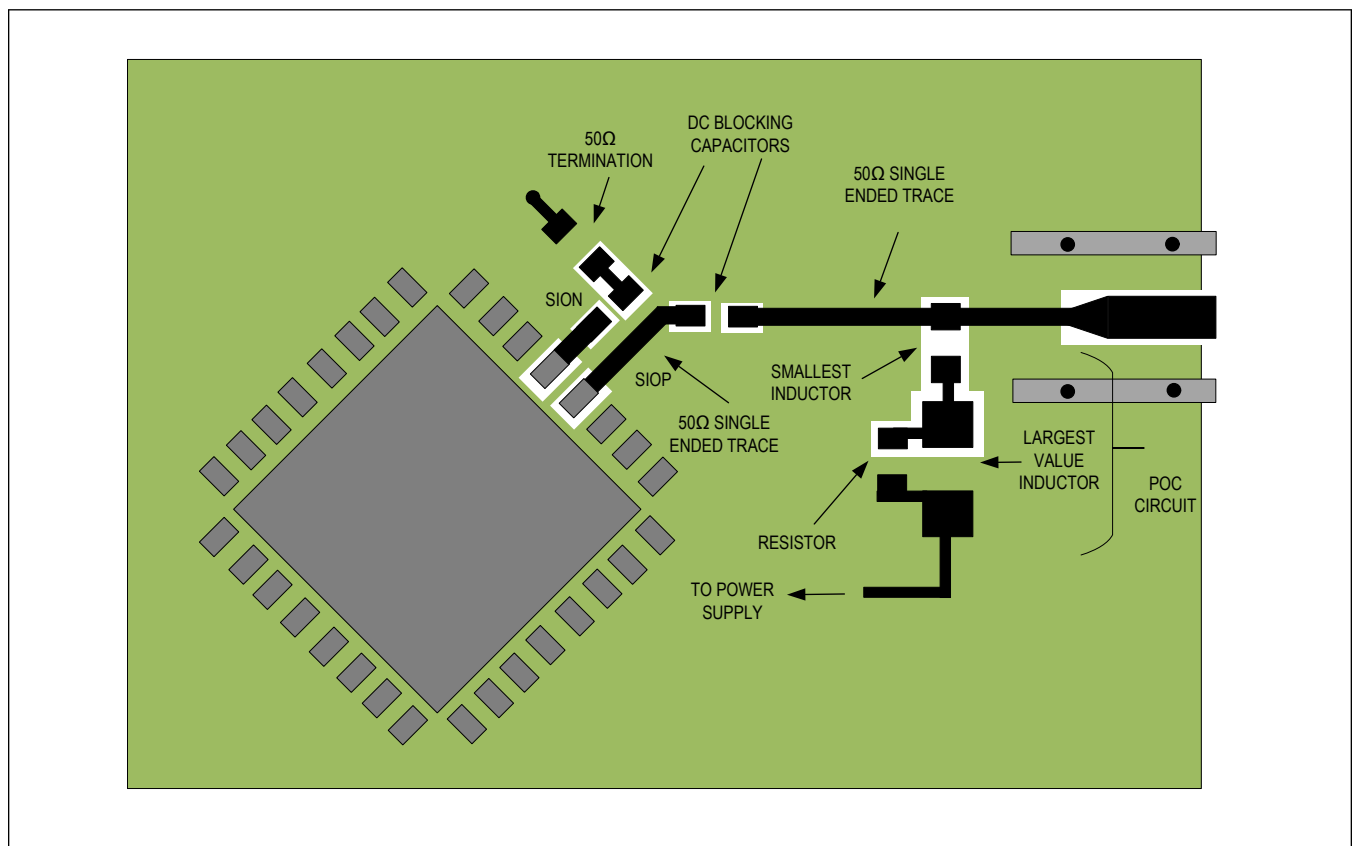


Figure 30. Coax PoC Layout Example

### Shielded-Twisted Pair Layout

Shielded-Twisted Pair (STP) designs require the differential traces to closely maintain a differential impedance of 100Ω. Use ground cutouts under AC-coupling capacitors and line-fault resistors. See [Figure 31](#).

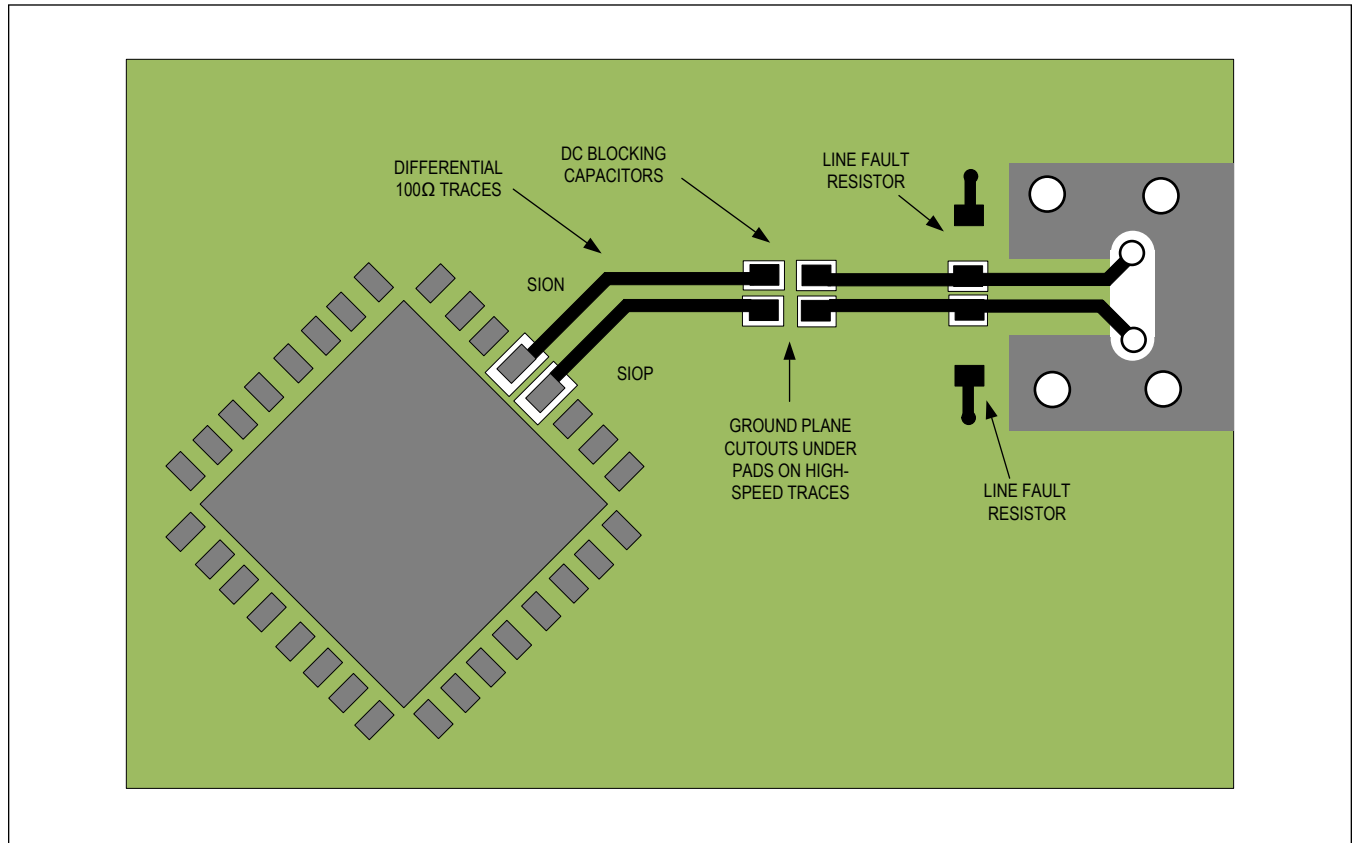


Figure 31. STP Layout Example

### Thermal Management

Power consumption of GMSL2 devices varies based on use-case. Take care to provide sufficient heat dissipation with proper board and cooling design techniques. The package exposed pad must be connected to the PCB ground plane by an array of vias. This approach simultaneously provides the lowest electrical and thermal impedances.

System thermal management must keep the operating junction temperature below +125°C to avoid impacting device reliability.

Refer to Tutorial 4083 ([www.maximintegrated.com/thermal-tutorial](http://www.maximintegrated.com/thermal-tutorial)) for further guidance.

## Applications Information

### Software Programming Model

Analog Devices' automotive serializers and deserializers are designed to follow a general software programming model. Except for features that require in-operation control channel accesses, such as the ASIL safety measures and interrupt handling, follow this programming model:

1. Set the impacted functional blocks to disabled or reset mode. Place the part in IDLE state to stop all side-channel and video traffic, followed by a register write (RESET\_LINK=1) to stop the GMSL link.
2. Fully configure the settings for each feature before it is enabled.
3. Establish the link by setting RESET\_LINK = 0. Wait for the link to lock.
4. Start video and side-channel traffic.

If changing the configuration of a feature during the operation of other features, disable the reconfigured feature, change its settings, and re-enable it.

### Programming Notes

#### MANDATORY REGISTER PROGRAMMING

**Make the following register writes to ensure proper operation of the MAX96717F. Without these writes, the operation of the device specified in the data sheet cannot be guaranteed.**

**Set bits [6:4] = 3'b001 in register 0x302**

### Control-Channel Programming

At power-up, GMSL2 device registers are accessed and configured only through the main I<sup>2</sup>C/UART interface. The pass-through I<sup>2</sup>C/UART interfaces can be enabled access to the device registers through register control.

### Conventional I<sup>2</sup>C/UART Control-Channel Programming

#### Host-to-Peripheral Main I<sup>2</sup>C and Pass-Through I<sup>2</sup>C Communication

When communicating between a host and peripheral, main and pass-through I<sup>2</sup>C operations are the same. A pass-through I<sup>2</sup>C across the GMSL2 link connects the host's I<sup>2</sup>C master to the peripheral's I<sup>2</sup>C slave. This logically connects separated I<sup>2</sup>C buses, enabling I<sup>2</sup>C transactions across the serial link to occur (with some delay) as if performed on the same physical I<sup>2</sup>C bus. The GMSL2 serializer and deserializer are intermediary devices; the host I<sup>2</sup>C master connects to a GMSL2 device I<sup>2</sup>C slave, and the peripheral I<sup>2</sup>C slave connects to a GMSL2 device I<sup>2</sup>C master.

For example, when the host I<sup>2</sup>C master transacts on one side of the link (local side), data is forwarded to the other side (remote side) by the I<sup>2</sup>C slave of the local side GMSL2 device. Data is then received by the I<sup>2</sup>C master of the remote side GMSL2 device, which generates the same I<sup>2</sup>C transaction with the peripheral slave I<sup>2</sup>C. The remote side GMSL2 device sends back any I<sup>2</sup>C data expected by the local side.

**Note:** This device does not support pass-through I<sup>2</sup>C/UART channels to access the main I<sup>2</sup>C/UART control channel on the remote side.

The I<sup>2</sup>C interface uses clock stretching (holding SCL low) to account for timing differences between the master and slave, and to allow time for data to be forwarded and received across the serial link. All local side I<sup>2</sup>C devices must support clock stretching by the GMSL2 device. Remote side I<sup>2</sup>C devices are not required to support clock stretching.

SDA and SCL lines operate as both input and open-drain output. Pullup resistors are required on SDA and SCL.

Each transmission consists of a START condition sent by a master, followed by the device's 7-bit slave address plus a R/W bit, register address bytes, one or more data bytes, and finally a STOP condition.

Register addresses are 16 bits wide. Single or multiple data bytes can be written or read by address auto-increments.



**I<sup>2</sup>C Write Packet Format**

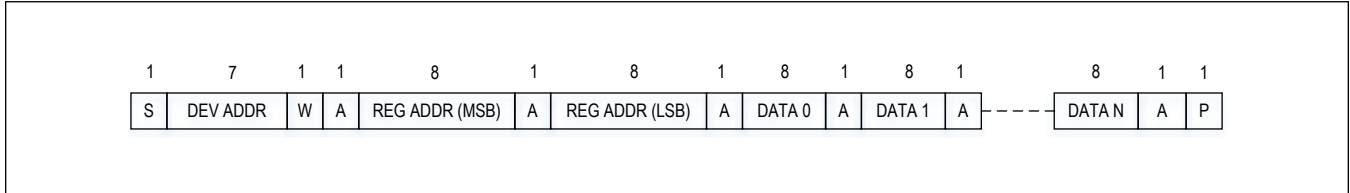


Figure 32. I<sup>2</sup>C Write Packet Format

**I<sup>2</sup>C Read Packet Format**

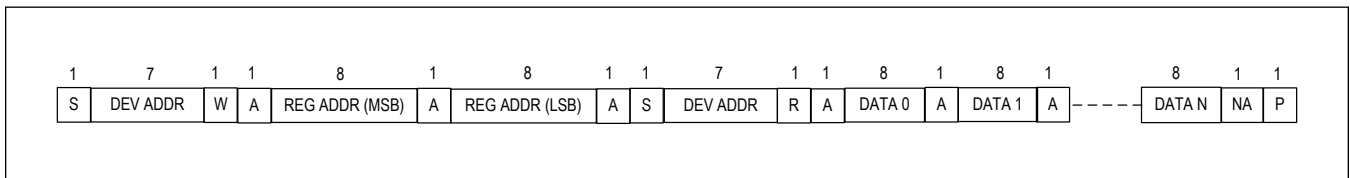


Figure 33. I<sup>2</sup>C Read Packet Format

**Main I<sup>2</sup>C Host-to-GMSL2 Device Communication**

The host I<sup>2</sup>C master has access to GMSL2 serializer and deserializer registers. The host can program GMSL2 device registers to change the pass-through I<sup>2</sup>C/UART interface as I<sup>2</sup>C or UART.

**Main UART**

When the main I<sup>2</sup>C/UART is configured as a UART, there are two operating modes: Base and Bypass modes.

**UART Base Mode**

Base mode is the means by which the microcontroller communicates with the serializer and deserializer, where registers in these and peripheral devices can be accessed. Base mode is typically enabled by default at power-up. In the base mode, the  $\mu$ C is the host and can access the registers of both the serializer and deserializer from either side of the link using the GMSL2 UART packet protocol. The  $\mu$ C can also program the peripherals on the remote side by sending the UART packets to the serializer or deserializer. The  $\mu$ C communicates with a UART peripheral in base mode (through INTTYPE register settings). The device addresses of the serializer and deserializer in this mode are programmable. In the base mode, the serializer, deserializer, and peripheral registers can be written and read using the half-duplex GMSL2 UART protocol. Base mode is enabled by default at power-up.

[Figure 34](#) shows the UART protocol for writing and reading in the base mode.

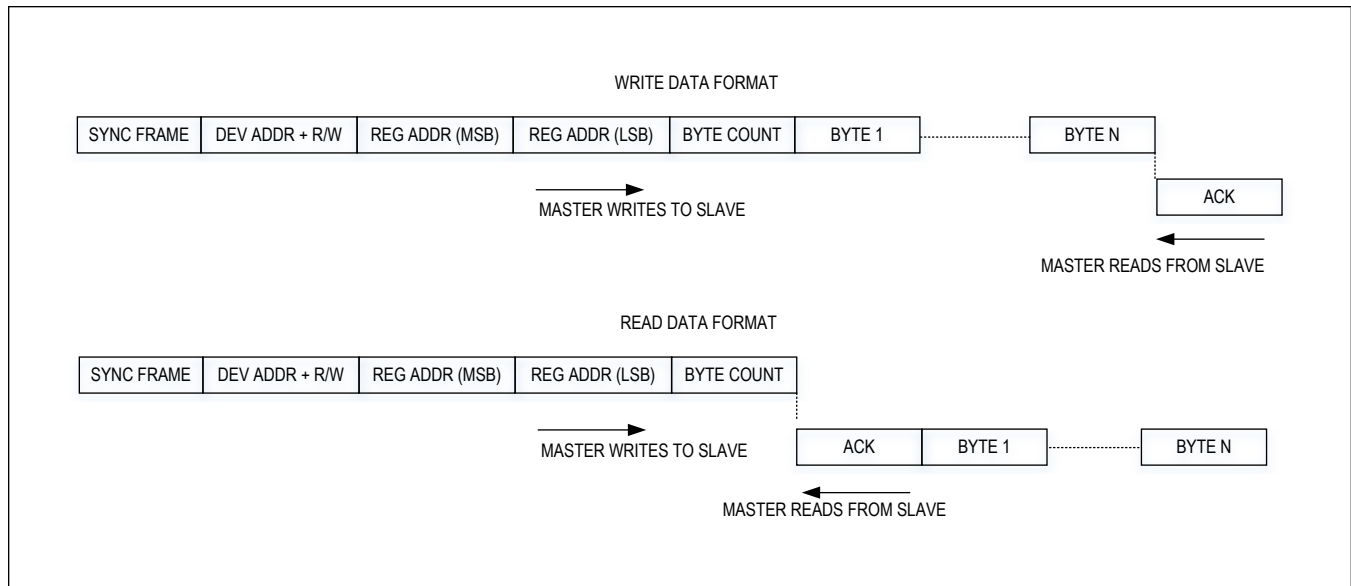


Figure 34. UART Protocol for Base Mode

### UART Bypass Mode

In the bypass mode, the serializer/deserializer ignore UART commands from the  $\mu\text{C}$ , and the  $\mu\text{C}$  communicates only with the peripherals using its own defined UART protocol. The  $\mu\text{C}$  cannot access the serializer/deserializer's registers in this mode. The UART transitions are simply sent over the GMSL2 link. Ignoring UART transactions prevents inadvertent misprogramming of serializer and deserializer registers. The device addresses of the serializer and deserializer in this mode are not programmable.

### Switching Between UART Base and Bypass Modes

There are two ways to switch between the base and bypass modes: programming the `BYPASS_TO` register and using the device MS pin.

When setting the bypass mode through the register, `BYPASS_TO` is programmed for a timeout (2ms, 8ms, or 32ms). Bypass mode is active only as long as there is UART activity. When there is no UART activity for the selected timeout, both devices exit the bypass mode, and the bit is automatically cleared.

When in the UART bypass mode, random data may be output if link lock is lost. This issue can be avoided by not enabling the UART bypass mode until all initial device programming is complete.

When set by the MS pin, a high-level puts the device into the bypass mode, and a low-level puts the device into the base mode. MS is set on the fly and is not latched on power-up.

### UART Frame Format

Regular UART frames with an even parity bit are used to carry 1 byte of data each. A frame consists of a low start bit followed by 8 data bits, a parity bit, and a high stop bit. The parity bit is high if the number of 1s in 8-bit data is odd; otherwise, it is low. There must be at least 1 high stop bit. If the next frame is in the same packet, there can be no more than 4 high bits from the end of the stop bit to the beginning of the next start bit. Note that for a parity-bit error, the packet, starting from the frame with the error, is discarded. The start of each frame is always a high-to-low transition (i.e., the stop bit is high and start bit is low). The phase of the internal UART bit clock is adjusted using the start bit of each frame. The framer calibrates the length of 1 UART bit in terms of the internal oscillator clock using the synchronization frame (i.e., the first frame of a UART packet transmission). In the bypass mode, the parity bit is enabled by default, but the frames are not checked for parity errors. Either even or odd parity can be used. The parity bit is passed along with UART data transmissions; the recipient of the data must perform error checking. The parity bit can optionally be disabled before entering the bypass mode. Note that the bit rate in the bypass mode must be the same bit rate last used in the base mode. See [Figure 35](#).

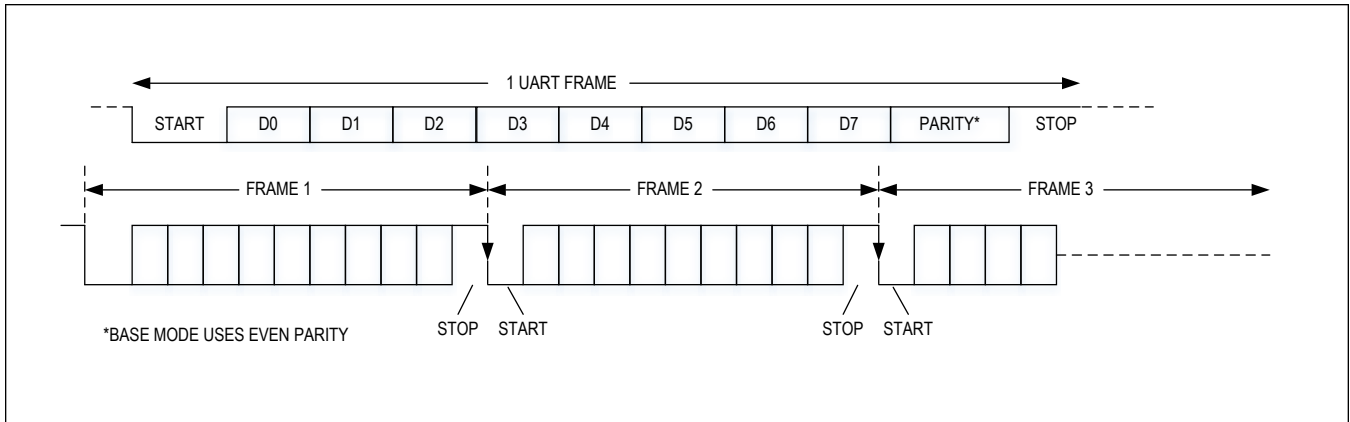


Figure 35. UART Data Format for Base Mode

**Synchronization Frame**

The serializer/deserializer must calibrate internal bit length counters with the UART bit rate for the proper recovery of UART frames. The  $\mu$ C sends a synchronization frame (i.e., a regular UART frame with the value 0x79) as the first frame of each data packet. The synchronization frame allows the addressed device to calibrate the bit length in terms of the device’s internal 150 MHz clock. A synchronization frame must be properly detected before the subsequent frames of the packet can be correctly received. When the line stays high for at least 32 bits, the packet boundary is reset, and the framer begins waiting for the next synchronization frame. See [Figure 36](#).

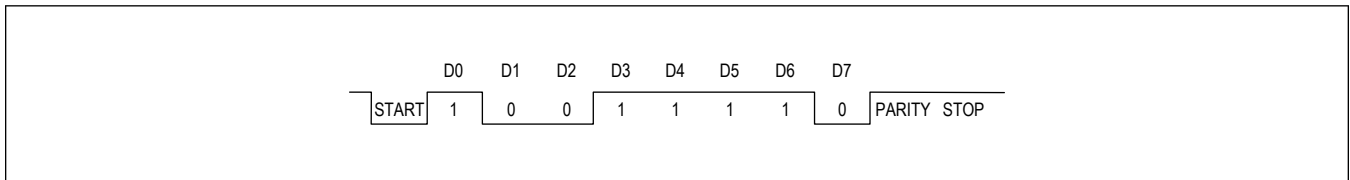


Figure 36. UART Synchronization Frame

**Acknowledge Frame**

When a packet is successfully received, the addressed device responds with an acknowledge frame to inform the  $\mu$ C that no errors are detected in the transmitted packet. The acknowledge frame is sent after the last bit of a valid packet is received. The acknowledge frame is a regular UART frame (value 0xC3). Data written to the serializer/deserializer registers do not take effect until after the acknowledge byte is sent. See [Figure 37](#).

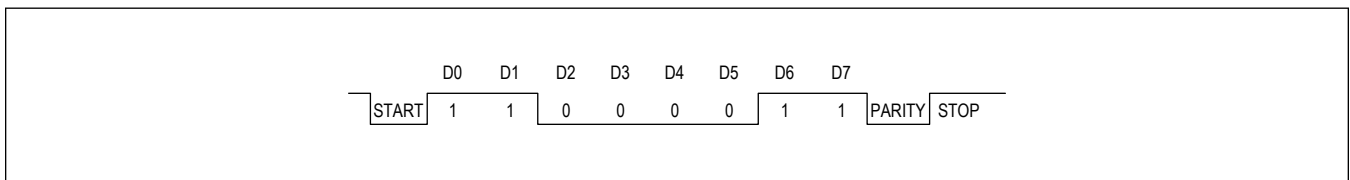


Figure 37. UART Acknowledge Frame

**Write Packet**

Write packets consist of a 5-byte packet header followed by 1 or more data bytes. A packet is recognized as a write packet when the LSB of the device address frame is 0. The addressed device responds with an acknowledge frame if no errors are detected while receiving a valid write packet. Byte Count indicates the number of data bytes to be written; this number cannot be 0. See [Figure 38](#).

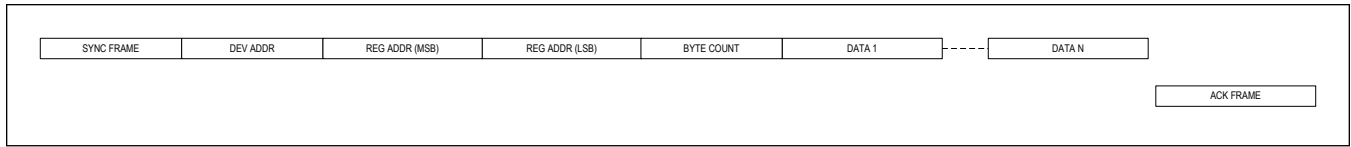


Figure 38. UART Write Packet Format

**Read Packet**

Read packets consist of 5 bytes. The LSB of the device address frame is 1 for read packets. If no errors are detected while receiving a valid read packet, the addressed device responds with an acknowledge frame followed by 1 or more data bytes. Byte Count indicates the number of data bytes to be read; this number cannot be 0. See [Figure 39](#).

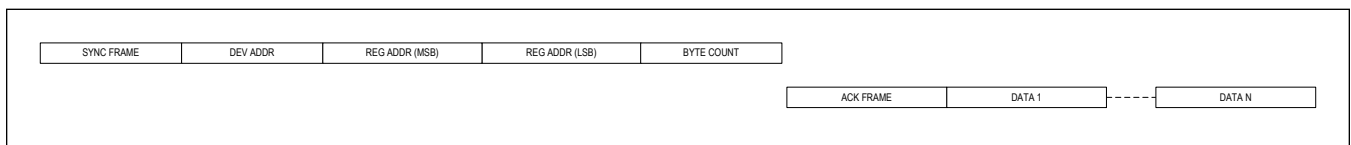


Figure 39. UART Read Packet Format

**I<sup>2</sup>C/UART Control-Channel Programming with Optional CRC and Message Counter**

The MAX96717F provides additional functional safety by adding an optional CRC to I<sup>2</sup>C/UART read/write transactions, and a separate message counter for read and write packets. These features are disabled by default at power-up, but can be enabled by register settings. The CRC and message counter can be used together or individually. The CRC and message counter features only apply to device register read/write transactions, and are not supported for pass-through traffic. The CRC and/or message counter can be enabled in the serializer, deserializer, or both.

**I<sup>2</sup>C/UART CRC and Message Counter Options**

At power-up, the I<sup>2</sup>C/UART CRC and Message Counter features are disabled by default in the MAX96717F. Both features can be enabled or disabled through register control.

**I<sup>2</sup>C Writes with CRC**

To provide additional functional safety for ADAS applications, the MAX96717F supports the addition of a Cyclic Redundancy Check (CRC) to I<sup>2</sup>C transactions. When enabled, the master μC must compute and send a CRC byte after each data byte. See [Figure 40](#). For each single-byte or multibyte write, the serializer first clears the CRC engine. The first CRC includes the device address byte, register address bytes, message counter bytes, and first data byte. For all following data bytes, the CRC engine is reset, and the CRC byte covers the additional data byte. See [Figure 41](#) and [Figure 42](#). The serializer receives the data byte and calculates the CRC using an identical CRC engine. It verifies a match before accepting the data byte. If the CRCs do not match, a write is not accepted, a NACK is transmitted, and the error counter is triggered.

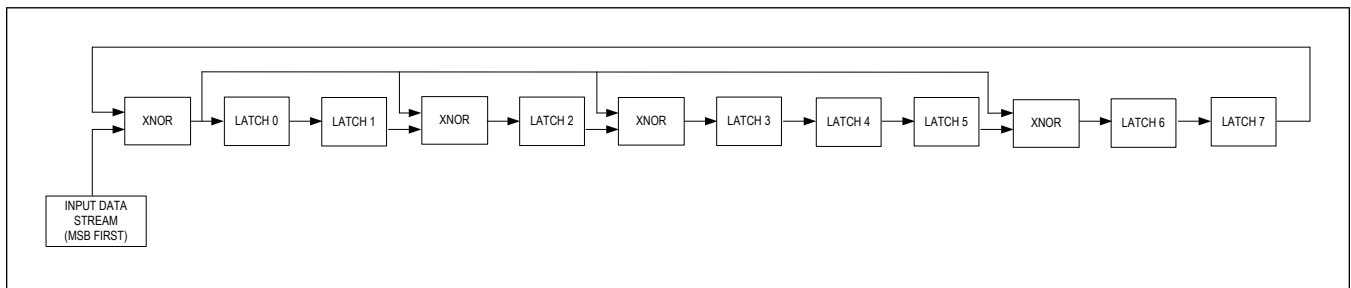


Figure 40. I<sup>2</sup>C CRC Engine

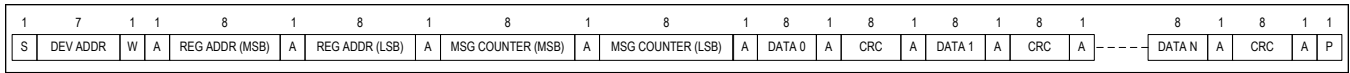


Figure 41. I<sup>2</sup>C Multiple-Byte Write with CRC

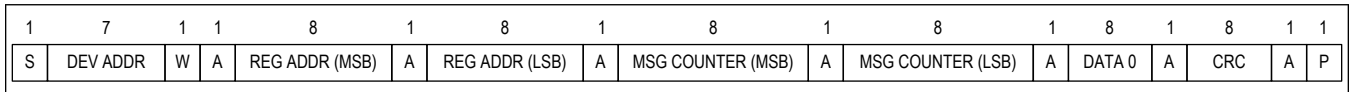


Figure 42. I<sup>2</sup>C Single-Byte Write with CRC

**I<sup>2</sup>C Reads with CRC**

For I<sup>2</sup>C reads of the MAX96717F's registers, the device's CRC engine clears, then uses the outgoing device address byte, register address bytes, message counter bytes, and first data byte to calculate the CRC byte. This is added to the data stream directly after the corresponding data byte. The CRC engine is subsequently cleared again for all other data bytes. See Figure 43 and Figure 44. When the μC receives the I<sup>2</sup>C read data, either through the MAX96717F or directly from the device on the other side of the link, the μC's CRC engine should calculate a CRC byte for each data byte and compare with the transmitted CRC byte.

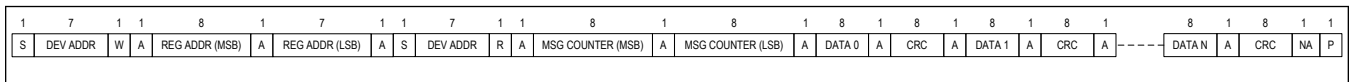


Figure 43. I<sup>2</sup>C Multiple-Byte Read with CRC

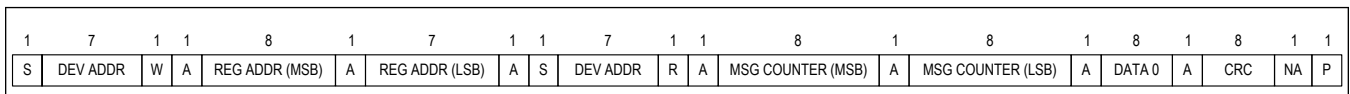


Figure 44. I<sup>2</sup>C Single-Byte Read with CRC

**Message Counter Writes**

An additional functional safety feature of the MAX96717F is a message counter, which can be used with the I<sup>2</sup>C/UART CRC feature. If enabled, the device expects a 2-byte message count from the μC, indicating the number of writes being sent. The MAX96717F counts the number of write transactions and compares that with the count sent by the μC. If the two counts match, the write is accepted. If the two counts do not match, the write is rejected, a NACK is sent in return, and the error counter is incremented. A programmable threshold for the error counter asserts ERRB, when reached.

**Message Counter Reads**

For read transactions, the MAX96717F sends the message counter value to the μC along with the requested data. The μC should compare the sent message count against its stored value and accept the data if the counts match. Note that a read transaction has a repeated start condition with the device address byte sent twice. This results in each read transaction incrementing the message counter twice, once for each device address byte. If the two message counter values do not agree, the data should be rejected.

If a read is requested from the last used registers address, resulting in only one device address byte, the message counter is incremented once.

If the message counter values for the MAX96717F and μC do not agree, the device's message counter can be reset using a register write; the μC's counter should also be reset. If the μC or its message counter is reset for any reason, the device's counter must be reset using a register write as well.

**UART Writes with CRC**

To provide additional functional safety for ADAS applications, the MAX96717F supports the addition of a CRC to UART transactions. When enabled, the master μC must compute and send a CRC byte after each data byte. See Figure 45. For each single-byte or multibyte write, first clear the CRC engine. The first CRC includes the synchronization frame, device address byte, register address bytes, message counter bytes, and the first data byte. All bytes are sent Least-Significant Byte (LSB) first. For all following data bytes, the CRC engine is reset, and the CRC byte covers the additional

data byte. See [Figure 46](#) and [Figure 47](#). The MAX96717F receives the data byte, calculates the CRC using an identical CRC engine, and verifies a match before accepting the data byte. If the CRCs do not match, a write is not accepted, a NACK is transmitted, and the error counter is triggered.

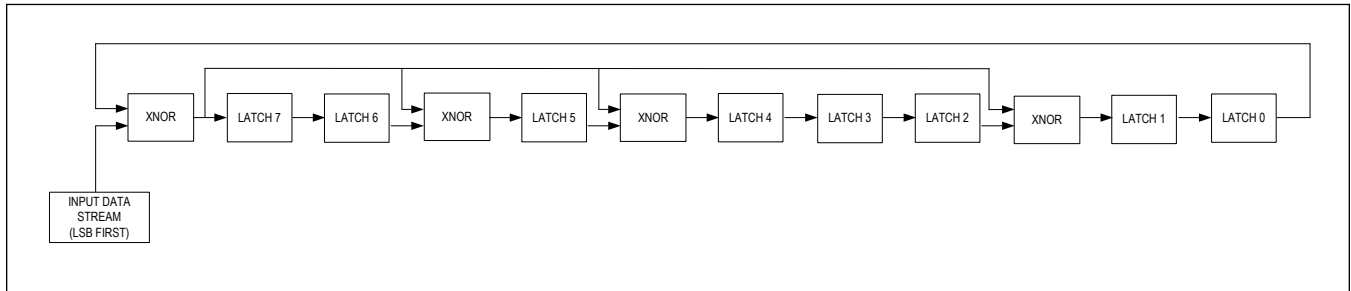


Figure 45. UART CRC Engine

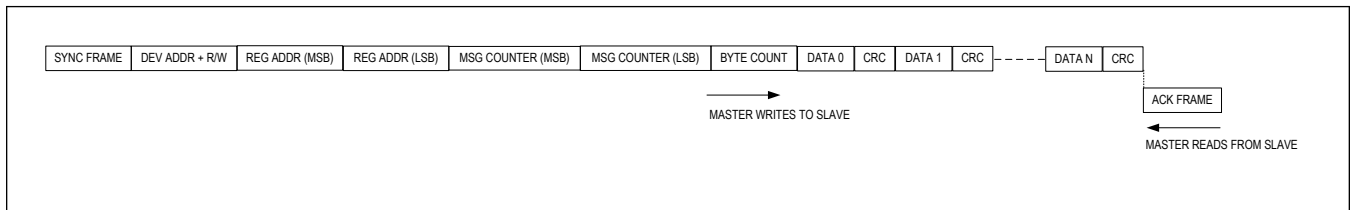


Figure 46. UART Multiple-Byte Write Transactions with CRC

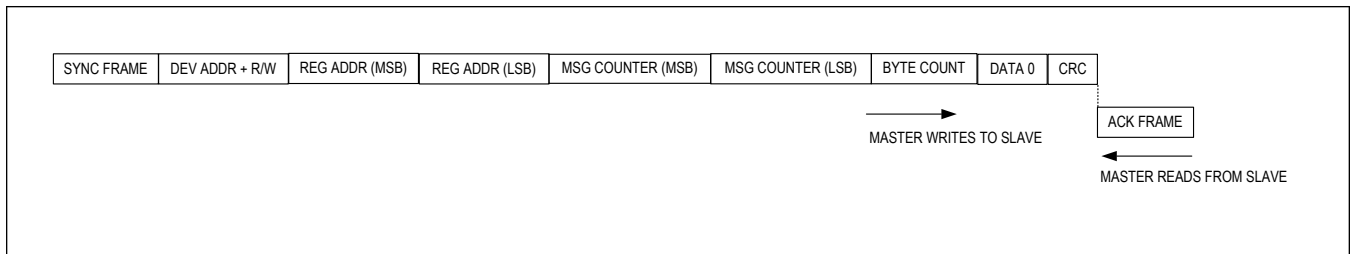


Figure 47. UART Single-Byte Write Transaction with CRC

**UART Reads with CRC**

For UART reads of MAX96717F's registers, the device's CRC engine clears, then uses the outgoing sync frame, device address byte, register address bytes, message counter bytes, and the first data byte to calculate the CRC byte. This is added to the data stream directly after the corresponding data byte. All bytes are sent LSB first. The CRC engine is subsequently cleared again for all other data bytes. See [Figure 48](#) and [Figure 49](#). When the  $\mu$ C receives the UART read data, either through the serializer on the other side of the link or directly from the MAX96717F, the  $\mu$ C's CRC engine can calculate a CRC byte for each data byte and compare with the transmitted CRC byte. The ACK frame is not included in the CRC calculation, because the  $\mu$ C is looking for the ACK value of 0xC3. If there is an error, the  $\mu$ C treats the frame as a NACK and rejects the data. Note that the read command from the  $\mu$ C does not include CRC.

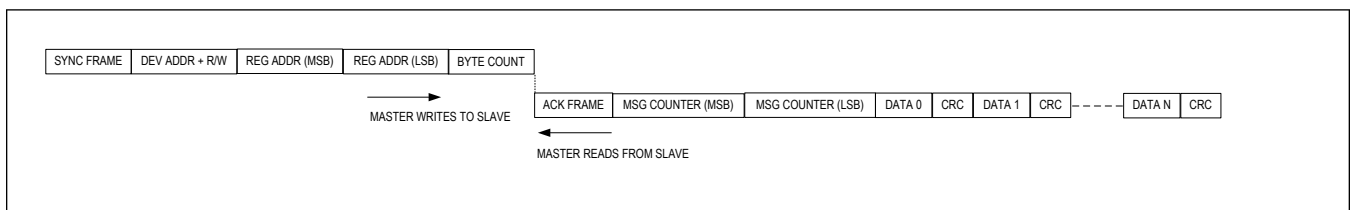


Figure 48. UART Multiple-Byte Read Transaction with CRC

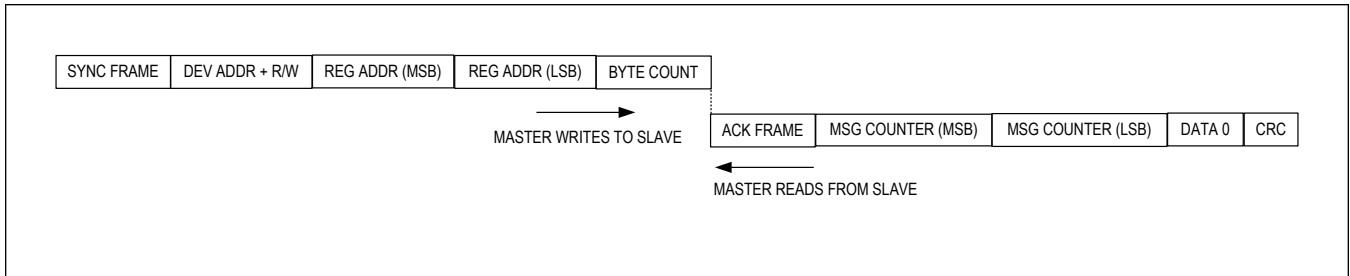


Figure 49. UART Single-Byte Read Transaction with CRC

### Typical Application Circuits

#### Application Diagram

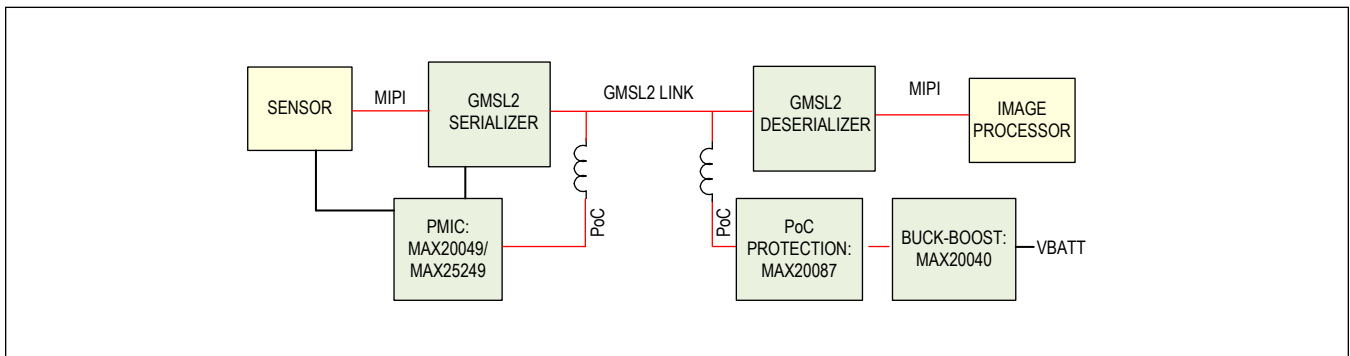
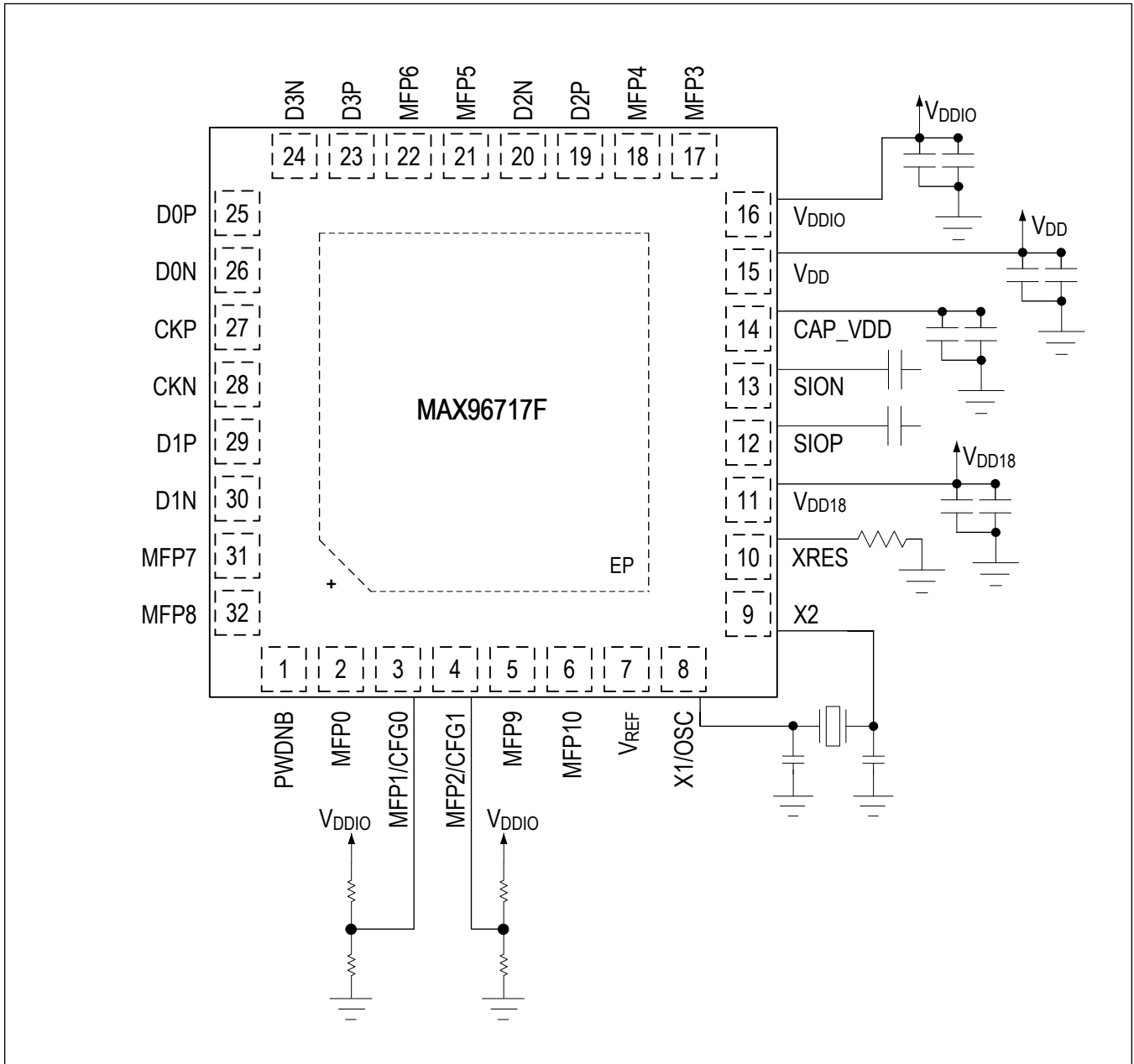


Figure 50. Typical Application Diagram - Power over Coax

#### Application Note

Maxim’s GMSL specifications have been tested using the MAX20049 and MAX25249 power management ICs for camera module designs to ensure optimal system design and performance. Maxim’s GMSL EMI has been tested using MAX20049 and MAX25249 to meet CISPR25 Class 5 requirements. The MAX25249/MAX25249B are high-efficiency, four-output PMICs, which integrate three DC-DC converters and a high Power-Supply Rejection Ratio (PSRR) LDO with OV/UV monitoring on all outputs. The MAX20049 is a dual step-down converter IC with two Low-Dropout Regulators (LDOs), providing a single-chip solution for automotive cameras.

Typical Application Circuits (continued)





## Ordering Information

| PART NUMBER       | TEMP RANGE      | PIN-PACKAGE   | TOP MARKING |
|-------------------|-----------------|---------------|-------------|
| MAX96717FGTJ/VY+  | -40°C to +105°C | 32 TQFN-SW-EP | MAXIM       |
| MAX96717FGTJ/VY+T | -40°C to +105°C | 32 TQFN-SW-EP | MAXIM       |
| MAX96717FGTJ/V+   | -40°C to +105°C | 32 TQFN-EP    | MAXIM       |
| MAX96717FGTJ/V+T  | -40°C to +105°C | 32 TQFN-EP    | MAXIM       |

+ Denotes a lead(Pb)-free/RoHS-compliant package.

T Denotes tape-and-reel.

/V Denotes automotive qualified.

Y Denotes wettable flank.

EP = Exposed pad.

## Register Map

### MAX96717F

Not all register bits in the register space are shown in the register table. Any bit not explicitly defined in the register table should be treated as reserved and not modified. When a write is required to a register with both defined and undefined register bits, first read the register's contents, then create a new register value by only changing the defined bits. Finally, write the new byte to the register (Read/Replace/Write).

Default values are provided for read-only register bits. Read-only bit states are changed at power-up according to the actual state of the device. To avoid overwriting these bits, treat read-only bits as undefined.

**Note:** See the Programming Notes section for mandatory register writes on start-up.

\*Register is stored in a retention memory when entering sleep mode and is restored upon exit.

| ADDRESS      | RESET | NAME                        | MSB                |                        |                       |                   |                         |                               |                | LSB         |  |
|--------------|-------|-----------------------------|--------------------|------------------------|-----------------------|-------------------|-------------------------|-------------------------------|----------------|-------------|--|
| <b>DEV</b>   |       |                             |                    |                        |                       |                   |                         |                               |                |             |  |
| 0x00         | 0x80  | <a href="#">REG0[7:0]*</a>  | DEV_ADDR[6:0]      |                        |                       |                   |                         |                               |                | CFG_BLOCK   |  |
| 0x01         | 0x08  | <a href="#">REG1[7:0]*</a>  | IIC_2_EN           | IIC_1_EN               | DIS_LO<br>CAL_CC      | DIS_RE<br>M_CC    | TX_RATE[1:0]            |                               | RX_RATE[1:0]   |             |  |
| 0x02         | 0x43  | <a href="#">REG2[7:0]*</a>  | -                  | VID_TX_EN_Z            | -                     | -                 | -                       | -                             | RSVD           | RSVD        |  |
| 0x03         | 0x00  | <a href="#">REG3[7:0]*</a>  | -                  | -                      | UART_2_EN             | UART_1_EN         | -                       | RCLK_ALT                      | RCLKSEL[1:0]   |             |  |
| 0x04         | 0x18  | <a href="#">REG4[7:0]*</a>  | -                  | -                      | -                     | CC_MS<br>GCNTR_EN | CC_CRC<br>_EN           | CC_CRC<br>MSGC<br>NTR_OV<br>R | RSVD           | XTAL_P<br>U |  |
| 0x05         | 0x00  | <a href="#">REG5[7:0]*</a>  | LOCK_EN            | ERRB_EN                | ALT_LO<br>CK_EN       | ALT_ER<br>RB_EN   | RSVD                    | RSVD                          | PU_LF1         | PU_LF0      |  |
| 0x06         | 0x80  | <a href="#">REG6[7:0]*</a>  | RSVD               | -                      | RCLKEN                | I2CSEL            | -                       | -                             | -              | RSVD        |  |
| 0x0D         | 0xB7  | <a href="#">REG13[7:0]</a>  | DEV_ID[7:0]        |                        |                       |                   |                         |                               |                |             |  |
| 0x0E         | 0x04  | <a href="#">REG14[7:0]</a>  | RSVD[3:0]          |                        |                       |                   | DEV_REV[3:0]            |                               |                |             |  |
| 0x26         | 0x22  | <a href="#">REG26[7:0]</a>  | -                  | LF_1[2:0]              |                       |                   | -                       | LF_0[2:0]                     |                |             |  |
| OVERLAP      |       |                             |                    |                        |                       |                   |                         |                               |                |             |  |
| <b>TCTRL</b> |       |                             |                    |                        |                       |                   |                         |                               |                |             |  |
| 0x08         | 0x00  | <a href="#">PWR0[7:0]</a>   | VDDBAD_STATUS[2:0] |                        |                       |                   | CMP_STATUS[4:0]         |                               |                |             |  |
| 0x0C         | 0x15  | <a href="#">PWR4[7:0]*</a>  | RSVD               | DIS_LO<br>CAL_WA<br>KE | -                     | WAKE_E<br>N_A     | RSVD[3:0]               |                               |                |             |  |
| 0x10         | 0x11  | <a href="#">CTRL0[7:0]*</a> | RESET_<br>ALL      | RESET_<br>LINK         | RESET_<br>ONESH<br>OT | RSVD              | SLEEP                   | -                             | RSVD[1:0]      |             |  |
| 0x11         | 0x02  | <a href="#">CTRL1[7:0]*</a> | RSVD               | RSVD                   | RSVD                  | -                 | -                       | -                             | RSVD           | CXTP_A      |  |
| 0x12         | 0x04  | <a href="#">CTRL2[7:0]</a>  | RSVD               | RSVD                   | -                     | LDO_BY<br>PASS    | RSVD[1:0]               |                               | RSVD[1:0]      |             |  |
| 0x13         | 0x10  | <a href="#">CTRL3[7:0]</a>  | RSVD               | RSVD                   | RSVD[1:0]             |                   | LOCKED                  | ERROR                         | CMU_LO<br>CKED | -           |  |
| 0x18         | 0xA0  | <a href="#">INTR0[7:0]*</a> | RSVD               | RSVD                   | RSVD                  | -                 | AUTO_E<br>RR_RST<br>_EN | DEC_ERR_THR[2:0]              |                |             |  |

| ADDRESS     | RESET | NAME                        | MSB                             |                        |                         |                          |                          |                   |                  | LSB                    |   |
|-------------|-------|-----------------------------|---------------------------------|------------------------|-------------------------|--------------------------|--------------------------|-------------------|------------------|------------------------|---|
| 0x19        | 0x00  | <a href="#">INTR1[7:0]*</a> | PKT_CNT_EXP[3:0]                |                        |                         |                          | AUTO_C<br>NT_RST<br>_EN  | RSVD[2:0]         |                  |                        |   |
| 0x1A        | 0x09  | <a href="#">INTR2[7:0]*</a> | REFGEN<br>_UNLOC<br>KED_OE<br>N | RSVD                   | REM_ER<br>R_OEN         | -                        | LFLT_IN<br>T_OEN         | IDLE_ER<br>R_OEN  | -                | DEC_ER<br>R_OEN_<br>A  |   |
| 0x1B        | 0x00  | <a href="#">INTR3[7:0]</a>  | REFGEN<br>_UNLOC<br>KED         | RSVD                   | REM_ER<br>R_FLAG        | -                        | LFLT_IN<br>T             | IDLE_ER<br>R_FLAG | -                | DEC_ER<br>R_FLAG<br>_A |   |
| 0x1C        | 0x08  | <a href="#">INTR4[7:0]*</a> | VREG_O<br>V_OEN                 | EOM_E<br>RR_OEN<br>_A  | VDD_OV<br>_OEN          | VDD18<br>OV_OEN          | MAX_RT<br>_OEN           | RT_CNT<br>_OEN    | PKT_CN<br>T_OEN  | -                      |   |
| 0x1D        | 0x00  | <a href="#">INTR5[7:0]</a>  | VREG_O<br>V_FLAG                | EOM_E<br>RR_FLAG<br>_A | VDD_OV<br>_FLAG         | VDD18<br>OV_FLAG         | MAX_RT<br>_FLAG          | RT_CNT<br>_FLAG   | PKT_CN<br>T_FLAG | -                      |   |
| 0x1E        | 0xFB  | <a href="#">INTR6[7:0]*</a> | VDDCM<br>P_INT_O<br>EN          | PORZ_I<br>NT_OEN       | VDDBAD<br>_INT_OE<br>N  | EFUSE<br>CRC_ER<br>R_OEN | RTTN_C<br>RC_ERR<br>_OEN | ADC_IN<br>T_OEN   | RSVD             | MIPI_ER<br>R_OEN       |   |
| 0x1F        | 0x00  | <a href="#">INTR7[7:0]</a>  | VDDCM<br>P_INT_F<br>LAG         | PORZ_I<br>NT_FLAG      | VDDBAD<br>_INT_FL<br>AG | EFUSE<br>CRC_ER<br>R     | RTTN_C<br>RC_INT         | ADC_IN<br>T_FLAG  | RSVD             | MIPI_ER<br>R_FLAG      |   |
| 0x20        | 0x9F  | <a href="#">INTR8[7:0]*</a> | ERR_TX<br>_EN                   | -                      | -                       | ERR_TX_ID[4:0]           |                          |                   |                  |                        |   |
| 0x21        | 0xDF  | <a href="#">INTR9[7:0]*</a> | ERR_RX<br>_EN                   | RSVD                   | -                       | ERR_RX_ID[4:0]           |                          |                   |                  |                        |   |
| 0x22        | 0x00  | <a href="#">CNT0[7:0]</a>   | DEC_ERR_A[7:0]                  |                        |                         |                          |                          |                   |                  |                        |   |
| 0x24        | 0x00  | <a href="#">CNT2[7:0]</a>   | IDLE_ERR[7:0]                   |                        |                         |                          |                          |                   |                  |                        |   |
| 0x25        | 0x00  | <a href="#">CNT3[7:0]</a>   | PKT_CNT[7:0]                    |                        |                         |                          |                          |                   |                  |                        |   |
| <b>GMSL</b> |       |                             |                                 |                        |                         |                          |                          |                   |                  |                        |   |
| 0x28        | 0x60  | <a href="#">TX0[7:0]*</a>   | RSVD[1:0]                       |                        | RSVD                    | RSVD                     | -                        | -                 | TX_FEC<br>_EN    | -                      |   |
| 0x29        | 0x08  | <a href="#">TX1[7:0]*</a>   | LINK_PR<br>BS_GEN               | RSVD                   | -                       | ERRG_E<br>N_A            | TX_FEC<br>_CRC_E<br>N    | -                 | DIS_SC<br>R      | DIS_EN<br>C            |   |
| 0x2A        | 0x20  | <a href="#">TX2[7:0]*</a>   | ERRG_CNT[1:0]                   |                        | ERRG_RATE[1:0]          |                          | ERRG_BURST[2:0]          |                   |                  | ERRG_P<br>ER           |   |
| 0x2B        | 0x44  | <a href="#">TX3[7:0]*</a>   | RSVD[1:0]                       |                        | TX_FEC<br>_ACTIVE       | -                        | -                        | RSVD[2:0]         |                  |                        |   |
| 0x2C        | 0x00  | <a href="#">RX0[7:0]*</a>   | PKT_CNT_LBW[1:0]                |                        | -                       | RSVD                     | PKT_CNT_SEL[3:0]         |                   |                  |                        |   |
| 0x2D        | 0x28  | <a href="#">RX1[7:0]*</a>   | LINK_PR<br>BS_CHK               | -                      | RSVD[1:0]               |                          | RSVD[1:0]                |                   | RSVD             | RSVD                   |   |
| 0x30        | 0x41  | <a href="#">GPIOA[7:0]*</a> | RSVD                            | RSVD                   | GPIO_FWD_CDLY[5:0]      |                          |                          |                   |                  |                        |   |
| 0x31        | 0x88  | <a href="#">GPIOB[7:0]*</a> | RSVD[1:0]                       |                        | GPIO_REV_CDLY[5:0]      |                          |                          |                   |                  |                        |   |
| <b>CC</b>   |       |                             |                                 |                        |                         |                          |                          |                   |                  |                        |   |
| 0x40        | 0x26  | <a href="#">I2C_0[7:0]*</a> | -                               | -                      | SLV_SH[1:0]             |                          | -                        | SLV_TO[2:0]       |                  |                        |   |
| 0x41        | 0x56  | <a href="#">I2C_1[7:0]*</a> | RSVD                            | MST_BT[2:0]            |                         |                          | -                        | MST_TO[2:0]       |                  |                        |   |
| 0x42        | 0x00  | <a href="#">I2C_2[7:0]*</a> | SRC_A[6:0]                      |                        |                         |                          |                          |                   |                  |                        | - |
| 0x43        | 0x00  | <a href="#">I2C_3[7:0]*</a> | DST_A[6:0]                      |                        |                         |                          |                          |                   |                  |                        | - |

| ADDRESS             | RESET | NAME                               | MSB                     |                |                |                        |                         |                          |                        | LSB            |   |
|---------------------|-------|------------------------------------|-------------------------|----------------|----------------|------------------------|-------------------------|--------------------------|------------------------|----------------|---|
| 0x44                | 0x00  | <a href="#">I2C_4[7:0]*</a>        | SRC_B[6:0]              |                |                |                        |                         |                          |                        |                | - |
| 0x45                | 0x00  | <a href="#">I2C_5[7:0]*</a>        | DST_B[6:0]              |                |                |                        |                         |                          |                        |                | - |
| 0x48                | 0x42  | <a href="#">UART_0[7:0]*</a>       | RSVD[1:0]               | REM_M<br>S_EN  | LOC_MS<br>_EN  | BYPASS<br>_DIS_PA<br>R | BYPASS_TO[1:0]          | BYPASS<br>_EN            |                        |                |   |
| 0x4C                | 0x26  | <a href="#">I2C_PT_0[7:0]</a><br>↓ | -                       | -              | SLV_SH_PT[1:0] | -                      | SLV_TO_PT[2:0]          |                          |                        |                |   |
| 0x4D                | 0x56  | <a href="#">I2C_PT_1[7:0]</a><br>↓ | RSVD                    | MST_BT_PT[2:0] |                |                        | -                       | MST_TO_PT[2:0]           |                        |                |   |
| 0x4F                | 0x00  | <a href="#">UART_PT_0[7:0]</a>     | BITLEN<br>MAN_CF<br>G_2 | DIS_PA<br>R_2  | RSVD           | RSVD                   | BITLEN<br>MAN_CF<br>G_1 | DIS_PA<br>R_1            | RSVD                   | RSVD           |   |
| <b>CFGV VIDEO_Z</b> |       |                                    |                         |                |                |                        |                         |                          |                        |                |   |
| 0x58                | 0x30  | <a href="#">TX0[7:0]*</a>          | TX_CRC<br>_EN           | -              | RSVD[1:0]      |                        | RSVD[1:0]               |                          | RSVD[1:0]              |                |   |
| 0x5B                | 0x02  | <a href="#">TX3[7:0]*</a>          | -                       | -              | -              | -                      | -                       | -                        | TX_STR_SEL[1:0]        |                |   |
| <b>CFGF INFOFR</b>  |       |                                    |                         |                |                |                        |                         |                          |                        |                |   |
| 0x78                | 0xF0  | <a href="#">TR0[7:0]*</a>          | TX_CRC<br>_EN           | RX_CRC<br>_EN  | RSVD[1:0]      |                        | RSVD[1:0]               |                          | RSVD[1:0]              |                |   |
| 0x7B                | 0x00  | <a href="#">TR3[7:0]*</a>          | -                       | -              | -              | -                      | -                       | TX_SRC_ID[2:0]           |                        |                |   |
| 0x7C                | 0xFF  | <a href="#">TR4[7:0]*</a>          | RX_SRC_SEL[7:0]         |                |                |                        |                         |                          |                        |                |   |
| <b>CFGL SPI</b>     |       |                                    |                         |                |                |                        |                         |                          |                        |                |   |
| 0x80                | 0xF0  | <a href="#">TR0[7:0]*</a>          | TX_CRC<br>_EN           | RX_CRC<br>_EN  | RSVD[1:0]      |                        | RSVD[1:0]               |                          | RSVD[1:0]              |                |   |
| 0x83                | 0x00  | <a href="#">TR3[7:0]*</a>          | -                       | -              | -              | -                      | -                       | TX_SRC_ID[2:0]           |                        |                |   |
| 0x84                | 0xFF  | <a href="#">TR4[7:0]*</a>          | RX_SRC_SEL[7:0]         |                |                |                        |                         |                          |                        |                |   |
| 0x85                | 0x98  | <a href="#">ARQ0[7:0]*</a>         | RSVD                    | RSVD           | RSVD           | RSVD                   | ARQ0_E<br>N             | DIS_DBL<br>_ACK_R<br>ETX | -                      | -              |   |
| 0x86                | 0x72  | <a href="#">ARQ1[7:0]*</a>         | -                       | RSVD[2:0]      |                |                        | -                       | -                        | MAX_RT<br>_ERR_O<br>EN | RT_CNT<br>_OEN |   |
| 0x87                | 0x00  | <a href="#">ARQ2[7:0]</a>          | MAX_RT<br>_ERR          | RT_CNT[6:0]    |                |                        |                         |                          |                        |                |   |
| <b>CFGL GPIO</b>    |       |                                    |                         |                |                |                        |                         |                          |                        |                |   |
| 0x90                | 0xF0  | <a href="#">TR0[7:0]*</a>          | TX_CRC<br>_EN           | RX_CRC<br>_EN  | RSVD[1:0]      |                        | RSVD[1:0]               |                          | RSVD[1:0]              |                |   |
| 0x93                | 0x00  | <a href="#">TR3[7:0]*</a>          | -                       | -              | -              | -                      | -                       | TX_SRC_ID[2:0]           |                        |                |   |
| 0x94                | 0xFF  | <a href="#">TR4[7:0]*</a>          | RX_SRC_SEL[7:0]         |                |                |                        |                         |                          |                        |                |   |
| 0x95                | 0x98  | <a href="#">ARQ0[7:0]*</a>         | RSVD                    | RSVD           | RSVD           | RSVD                   | ARQ0_E<br>N             | DIS_DBL<br>_ACK_R<br>ETX | -                      | -              |   |
| 0x96                | 0x72  | <a href="#">ARQ1[7:0]*</a>         | -                       | RSVD[2:0]      |                |                        | -                       | -                        | MAX_RT<br>_ERR_O<br>EN | RT_CNT<br>_OEN |   |
| 0x97                | 0x00  | <a href="#">ARQ2[7:0]</a>          | MAX_RT<br>_ERR          | RT_CNT[6:0]    |                |                        |                         |                          |                        |                |   |

| ADDRESS           | RESET | NAME                            | MSB                   |               |                    |                    |             |                  |                    | LSB           |
|-------------------|-------|---------------------------------|-----------------------|---------------|--------------------|--------------------|-------------|------------------|--------------------|---------------|
| <b>CFGL IIC_X</b> |       |                                 |                       |               |                    |                    |             |                  |                    |               |
| 0xA0              | 0xF0  | <a href="#">TR0[7:0]*</a>       | TX_CRC_EN             | RX_CRC_EN     | RSVD[1:0]          |                    | RSVD[1:0]   |                  | RSVD[1:0]          |               |
| 0xA3              | 0x00  | <a href="#">TR3[7:0]*</a>       | -                     | -             | -                  | -                  | -           | TX_SRC_ID[2:0]   |                    |               |
| 0xA4              | 0xFF  | <a href="#">TR4[7:0]*</a>       | RX_SRC_SEL[7:0]       |               |                    |                    |             |                  |                    |               |
| 0xA5              | 0x98  | <a href="#">ARQ0[7:0]*</a>      | RSVD                  | RSVD          | RSVD               | RSVD               | ARQ0_EN     | DIS_DBL_ACK_RETX | -                  | -             |
| 0xA6              | 0x72  | <a href="#">ARQ1[7:0]*</a>      | -                     | RSVD[2:0]     |                    | -                  | -           | MAX_RT_ERR_EN    | RT_CNT_OEN         |               |
| 0xA7              | 0x00  | <a href="#">ARQ2[7:0]</a>       | MAX_RT_ERR            | RT_CNT[6:0]   |                    |                    |             |                  |                    |               |
| <b>CFGL IIC_Y</b> |       |                                 |                       |               |                    |                    |             |                  |                    |               |
| 0xA8              | 0xF0  | <a href="#">TR0[7:0]*</a>       | TX_CRC_EN             | RX_CRC_EN     | RSVD[1:0]          |                    | RSVD[1:0]   |                  | RSVD[1:0]          |               |
| 0xAB              | 0x00  | <a href="#">TR3[7:0]*</a>       | -                     | -             | -                  | -                  | -           | TX_SRC_ID[2:0]   |                    |               |
| 0xAC              | 0xFF  | <a href="#">TR4[7:0]*</a>       | RX_SRC_SEL[7:0]       |               |                    |                    |             |                  |                    |               |
| 0xAD              | 0x98  | <a href="#">ARQ0[7:0]*</a>      | RSVD                  | RSVD          | RSVD               | RSVD               | ARQ0_EN     | DIS_DBL_ACK_RETX | -                  | -             |
| 0xAE              | 0x72  | <a href="#">ARQ1[7:0]*</a>      | -                     | RSVD[2:0]     |                    | -                  | -           | MAX_RT_ERR_EN    | RT_CNT_OEN         |               |
| 0xAF              | 0x00  | <a href="#">ARQ2[7:0]</a>       | MAX_RT_ERR            | RT_CNT[6:0]   |                    |                    |             |                  |                    |               |
| <b>VID_TX Z</b>   |       |                                 |                       |               |                    |                    |             |                  |                    |               |
| 0x110             | 0x68  | <a href="#">VIDEO_TX0[7:0]*</a> | LINE_CRC_SEL          | LINE_CRC_EN   | ENC_MODE[1:0]      |                    | AUTO_BPP    | CLKDET_BY        | RSVD[1:0]          |               |
| 0x111             | 0x58  | <a href="#">VIDEO_TX1[7:0]*</a> | RSVD[1:0]             |               | BPP[5:0]           |                    |             |                  |                    |               |
| 0x112             | 0x0A  | <a href="#">VIDEO_TX2[7:0]*</a> | PCLKDET               | DRIFT_ERR     | OVERFLOW           | FIFO_WARN          | RSVD        | LIM_HEART        | RSVD               | RSVD          |
| <b>SPI</b>        |       |                                 |                       |               |                    |                    |             |                  |                    |               |
| 0x170             | 0x08  | <a href="#">SPI_0[7:0]*</a>     | SPI_LOC_ID[1:0]       |               | SPI_CC_TRG_ID[1:0] | SPI_IGN_R_ID       | SPI_CC_EN   | MST_SLVN         | SPI_EN             |               |
| 0x171             | 0x1D  | <a href="#">SPI_1[7:0]*</a>     | SPI_LOC_N[5:0]        |               |                    |                    |             |                  | SPI_BASE_PRIO[1:0] |               |
| 0x172             | 0x03  | <a href="#">SPI_2[7:0]*</a>     | REQ_HOLD_OFF[2:0]     |               |                    | FULL_SCK_SETUP     | SPI_M0_D3_F | SPI_M0_D3        | SPIM_S2_ACT_H      | SPIM_S1_ACT_H |
| 0x173             | 0x00  | <a href="#">SPI_3[7:0]*</a>     | SPIM_SS_DLY_CLKS[7:0] |               |                    |                    |             |                  |                    |               |
| 0x174             | 0x00  | <a href="#">SPI_4[7:0]*</a>     | SPIM_SCK_LO_CLKS[7:0] |               |                    |                    |             |                  |                    |               |
| 0x175             | 0x00  | <a href="#">SPI_5[7:0]*</a>     | SPIM_SCK_HI_CLKS[7:0] |               |                    |                    |             |                  |                    |               |
| 0x176             | 0x00  | <a href="#">SPI_6[7:0]*</a>     | -                     | -             | BNE                | SPIS_RWN           | SS_IO_EN_2  | SS_IO_EN_1       | BNE_IO_EN          | RWN_IO_EN     |
| 0x177             | 0x00  | <a href="#">SPI_7[7:0]</a>      | SPI_RX_OVRFLW         | SPI_TX_OVRFLW | -                  | SPIS_BYTE_CNT[4:0] |             |                  |                    |               |

| ADDRESS      | RESET | NAME                                | MSB |               |               |  |  | LSB                  |
|--------------|-------|-------------------------------------|-----|---------------|---------------|--|--|----------------------|
| 0x178        | 0x00  | <a href="#">SPI_8[7:0]</a> *        |     |               |               |  |  | REQ_HOLD_OFF_TO[7:0] |
| <b>VTX Z</b> |       |                                     |     |               |               |  |  |                      |
| 0x236        | 0x00  | <a href="#">CROSS_0[7:0]</a><br>I*  | -   | CROSS0<br>_I  | CROSS0<br>_F  |  |  | CROSS0[4:0]          |
| 0x237        | 0x01  | <a href="#">CROSS_1[7:0]</a><br>I*  | -   | CROSS1<br>_I  | CROSS1<br>_F  |  |  | CROSS1[4:0]          |
| 0x238        | 0x02  | <a href="#">CROSS_2[7:0]</a><br>I*  | -   | CROSS2<br>_I  | CROSS2<br>_F  |  |  | CROSS2[4:0]          |
| 0x239        | 0x03  | <a href="#">CROSS_3[7:0]</a><br>I*  | -   | CROSS3<br>_I  | CROSS3<br>_F  |  |  | CROSS3[4:0]          |
| 0x23A        | 0x04  | <a href="#">CROSS_4[7:0]</a><br>I*  | -   | CROSS4<br>_I  | CROSS4<br>_F  |  |  | CROSS4[4:0]          |
| 0x23B        | 0x05  | <a href="#">CROSS_5[7:0]</a><br>I*  | -   | CROSS5<br>_I  | CROSS5<br>_F  |  |  | CROSS5[4:0]          |
| 0x23C        | 0x06  | <a href="#">CROSS_6[7:0]</a><br>I*  | -   | CROSS6<br>_I  | CROSS6<br>_F  |  |  | CROSS6[4:0]          |
| 0x23D        | 0x07  | <a href="#">CROSS_7[7:0]</a><br>I*  | -   | CROSS7<br>_I  | CROSS7<br>_F  |  |  | CROSS7[4:0]          |
| 0x23E        | 0x08  | <a href="#">CROSS_8[7:0]</a><br>I*  | -   | CROSS8<br>_I  | CROSS8<br>_F  |  |  | CROSS8[4:0]          |
| 0x23F        | 0x09  | <a href="#">CROSS_9[7:0]</a><br>I*  | -   | CROSS9<br>_I  | CROSS9<br>_F  |  |  | CROSS9[4:0]          |
| 0x240        | 0x0A  | <a href="#">CROSS_10[7:0]</a><br>I* | -   | CROSS1<br>0_I | CROSS1<br>0_F |  |  | CROSS10[4:0]         |
| 0x241        | 0x0B  | <a href="#">CROSS_11[7:0]</a><br>I* | -   | CROSS1<br>1_I | CROSS1<br>1_F |  |  | CROSS11[4:0]         |
| 0x242        | 0x0C  | <a href="#">CROSS_12[7:0]</a><br>I* | -   | CROSS1<br>2_I | CROSS1<br>2_F |  |  | CROSS12[4:0]         |
| 0x243        | 0x0D  | <a href="#">CROSS_13[7:0]</a><br>I* | -   | CROSS1<br>3_I | CROSS1<br>3_F |  |  | CROSS13[4:0]         |
| 0x244        | 0x0E  | <a href="#">CROSS_14[7:0]</a><br>I* | -   | CROSS1<br>4_I | CROSS1<br>4_F |  |  | CROSS14[4:0]         |
| 0x245        | 0x0F  | <a href="#">CROSS_15[7:0]</a><br>I* | -   | CROSS1<br>5_I | CROSS1<br>5_F |  |  | CROSS15[4:0]         |
| 0x246        | 0x10  | <a href="#">CROSS_16[7:0]</a><br>I* | -   | CROSS1<br>6_I | CROSS1<br>6_F |  |  | CROSS16[4:0]         |
| 0x247        | 0x11  | <a href="#">CROSS_17[7:0]</a><br>I* | -   | CROSS1<br>7_I | CROSS1<br>7_F |  |  | CROSS17[4:0]         |
| 0x248        | 0x12  | <a href="#">CROSS_18[7:0]</a><br>I* | -   | CROSS1<br>8_I | CROSS1<br>8_F |  |  | CROSS18[4:0]         |
| 0x249        | 0x13  | <a href="#">CROSS_19[7:0]</a><br>I* | -   | CROSS1<br>9_I | CROSS1<br>9_F |  |  | CROSS19[4:0]         |
| 0x24A        | 0x14  | <a href="#">CROSS_20[7:0]</a><br>I* | -   | CROSS2<br>0_I | CROSS2<br>0_F |  |  | CROSS20[4:0]         |
| 0x24B        | 0x15  | <a href="#">CROSS_21[7:0]</a><br>I* | -   | CROSS2<br>1_I | CROSS2<br>1_F |  |  | CROSS21[4:0]         |
| 0x24C        | 0x16  | <a href="#">CROSS_22[7:0]</a><br>I* | -   | CROSS2<br>2_I | CROSS2<br>2_F |  |  | CROSS22[4:0]         |

| ADDRESS | RESET | NAME                            | MSB         |            |              |              |                     |           |                  | LSB |  |
|---------|-------|---------------------------------|-------------|------------|--------------|--------------|---------------------|-----------|------------------|-----|--|
| 0x24D   | 0x17  | <a href="#">CROSS_23[7:0]</a> * | -           | CROSS2_3_I | CROSS2_3_F   | CROSS23[4:0] |                     |           |                  |     |  |
| 0x24E   | 0x03  | <a href="#">VTX0[7:0]</a> *     | GEN_VS      | GEN_HS     | GEN_DE       | VS_INV       | HS_INV              | DE_INV    | VTG_MODE[1:0]    |     |  |
| 0x24F   | 0x01  | <a href="#">VTX1[7:0]</a> *     | -           | -          | PCLKDE_T_VTX | -            | PATGEN_CLK_SRC[2:0] |           | VS_TRIG          |     |  |
| 0x250   | 0x00  | <a href="#">VTX2[7:0]</a> *     |             |            |              |              | VS_DLY_2[7:0]       |           |                  |     |  |
| 0x251   | 0x00  | <a href="#">VTX3[7:0]</a> *     |             |            |              |              | VS_DLY_1[7:0]       |           |                  |     |  |
| 0x252   | 0x00  | <a href="#">VTX4[7:0]</a> *     |             |            |              |              | VS_DLY_0[7:0]       |           |                  |     |  |
| 0x253   | 0x00  | <a href="#">VTX5[7:0]</a> *     |             |            |              |              | VS_HIGH_2[7:0]      |           |                  |     |  |
| 0x254   | 0x00  | <a href="#">VTX6[7:0]</a> *     |             |            |              |              | VS_HIGH_1[7:0]      |           |                  |     |  |
| 0x255   | 0x00  | <a href="#">VTX7[7:0]</a> *     |             |            |              |              | VS_HIGH_0[7:0]      |           |                  |     |  |
| 0x256   | 0x00  | <a href="#">VTX8[7:0]</a> *     |             |            |              |              | VS_LOW_2[7:0]       |           |                  |     |  |
| 0x257   | 0x00  | <a href="#">VTX9[7:0]</a> *     |             |            |              |              | VS_LOW_1[7:0]       |           |                  |     |  |
| 0x258   | 0x00  | <a href="#">VTX10[7:0]</a> *    |             |            |              |              | VS_LOW_0[7:0]       |           |                  |     |  |
| 0x259   | 0x00  | <a href="#">VTX11[7:0]</a> *    |             |            |              |              | V2H_2[7:0]          |           |                  |     |  |
| 0x25A   | 0x00  | <a href="#">VTX12[7:0]</a> *    |             |            |              |              | V2H_1[7:0]          |           |                  |     |  |
| 0x25B   | 0x00  | <a href="#">VTX13[7:0]</a> *    |             |            |              |              | V2H_0[7:0]          |           |                  |     |  |
| 0x25C   | 0x00  | <a href="#">VTX14[7:0]</a> *    |             |            |              |              | HS_HIGH_1[7:0]      |           |                  |     |  |
| 0x25D   | 0x00  | <a href="#">VTX15[7:0]</a> *    |             |            |              |              | HS_HIGH_0[7:0]      |           |                  |     |  |
| 0x25E   | 0x00  | <a href="#">VTX16[7:0]</a> *    |             |            |              |              | HS_LOW_1[7:0]       |           |                  |     |  |
| 0x25F   | 0x00  | <a href="#">VTX17[7:0]</a> *    |             |            |              |              | HS_LOW_0[7:0]       |           |                  |     |  |
| 0x260   | 0x00  | <a href="#">VTX18[7:0]</a> *    |             |            |              |              | HS_CNT_1[7:0]       |           |                  |     |  |
| 0x261   | 0x00  | <a href="#">VTX19[7:0]</a> *    |             |            |              |              | HS_CNT_0[7:0]       |           |                  |     |  |
| 0x262   | 0x00  | <a href="#">VTX20[7:0]</a> *    |             |            |              |              | V2D_2[7:0]          |           |                  |     |  |
| 0x263   | 0x00  | <a href="#">VTX21[7:0]</a> *    |             |            |              |              | V2D_1[7:0]          |           |                  |     |  |
| 0x264   | 0x00  | <a href="#">VTX22[7:0]</a> *    |             |            |              |              | V2D_0[7:0]          |           |                  |     |  |
| 0x265   | 0x00  | <a href="#">VTX23[7:0]</a> *    |             |            |              |              | DE_HIGH_1[7:0]      |           |                  |     |  |
| 0x266   | 0x00  | <a href="#">VTX24[7:0]</a> *    |             |            |              |              | DE_HIGH_0[7:0]      |           |                  |     |  |
| 0x267   | 0x00  | <a href="#">VTX25[7:0]</a> *    |             |            |              |              | DE_LOW_1[7:0]       |           |                  |     |  |
| 0x268   | 0x00  | <a href="#">VTX26[7:0]</a> *    |             |            |              |              | DE_LOW_0[7:0]       |           |                  |     |  |
| 0x269   | 0x00  | <a href="#">VTX27[7:0]</a> *    |             |            |              |              | DE_CNT_1[7:0]       |           |                  |     |  |
| 0x26A   | 0x00  | <a href="#">VTX28[7:0]</a> *    |             |            |              |              | DE_CNT_0[7:0]       |           |                  |     |  |
| 0x26B   | 0x00  | <a href="#">VTX29[7:0]</a>      | VID_PRBS_EN | RSVD       | VPRBS_FAIL   | -            | -                   | GRAD_MODE | PATGEN_MODE[1:0] |     |  |
| 0x26C   | 0x04  | <a href="#">VTX30[7:0]</a>      |             |            |              |              | GRAD_INC[7:0]       |           |                  |     |  |
| 0x26D   | 0x00  | <a href="#">VTX31[7:0]</a>      |             |            |              |              | CHKR_A_L[7:0]       |           |                  |     |  |
| 0x26E   | 0x00  | <a href="#">VTX32[7:0]</a>      |             |            |              |              | CHKR_A_M[7:0]       |           |                  |     |  |
| 0x26F   | 0x00  | <a href="#">VTX33[7:0]</a>      |             |            |              |              | CHKR_A_H[7:0]       |           |                  |     |  |
| 0x270   | 0x00  | <a href="#">VTX34[7:0]</a>      |             |            |              |              | CHKR_B_L[7:0]       |           |                  |     |  |
| 0x271   | 0x00  | <a href="#">VTX35[7:0]</a>      |             |            |              |              | CHKR_B_M[7:0]       |           |                  |     |  |
| 0x272   | 0x00  | <a href="#">VTX36[7:0]</a>      |             |            |              |              | CHKR_B_H[7:0]       |           |                  |     |  |
| 0x273   | 0x00  | <a href="#">VTX37[7:0]</a>      |             |            |              |              | CHKR_RPT_A[7:0]     |           |                  |     |  |
| 0x274   | 0x00  | <a href="#">VTX38[7:0]</a>      |             |            |              |              | CHKR_RPT_B[7:0]     |           |                  |     |  |

| ADDRESS        | RESET | NAME                         | MSB                    |               |                |                 |         |                |                | LSB              |
|----------------|-------|------------------------------|------------------------|---------------|----------------|-----------------|---------|----------------|----------------|------------------|
| 0x275          | 0x00  | <a href="#">VTX39[7:0]</a>   | CHKR_ALT[7:0]          |               |                |                 |         |                |                |                  |
| 0x276          | 0x18  | <a href="#">VTX40[7:0]</a>   | RSVD                   | CROSS<br>HS_I | CROSS<br>HS_F  | CROSSHS[4:0]    |         |                |                |                  |
| 0x277          | 0x19  | <a href="#">VTX41[7:0]</a>   | -                      | CROSS<br>VS_I | CROSS<br>VS_F  | CROSSVS[4:0]    |         |                |                |                  |
| 0x278          | 0x1A  | <a href="#">VTX42[7:0]</a>   | -                      | CROSS<br>DE_I | CROSS<br>DE_F  | CROSSDE[4:0]    |         |                |                |                  |
| <b>GPIO0 0</b> |       |                              |                        |               |                |                 |         |                |                |                  |
| 0x2BE          | 0x99  | <a href="#">GPIO_A[7:0]*</a> | RES_CF<br>G            | RSVD          | TX_COM<br>P_EN | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2BF          | 0xA0  | <a href="#">GPIO_B[7:0]*</a> | PULL_UPDN_SEL[1<br>:0] |               | OUT_TY<br>PE   | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2C0          | 0x40  | <a href="#">GPIO_C[7:0]*</a> | OVR_RE<br>S_CFG        | RSVD          | -              | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO1 1</b> |       |                              |                        |               |                |                 |         |                |                |                  |
| 0x2C1          | 0x81  | <a href="#">GPIO_A[7:0]*</a> | RES_CF<br>G            | RSVD          | TX_COM<br>P_EN | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2C2          | 0x21  | <a href="#">GPIO_B[7:0]*</a> | PULL_UPDN_SEL[1<br>:0] |               | OUT_TY<br>PE   | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2C3          | 0x41  | <a href="#">GPIO_C[7:0]*</a> | OVR_RE<br>S_CFG        | RSVD          | -              | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO2 2</b> |       |                              |                        |               |                |                 |         |                |                |                  |
| 0x2C4          | 0x99  | <a href="#">GPIO_A[7:0]*</a> | RES_CF<br>G            | RSVD          | TX_COM<br>P_EN | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2C5          | 0x22  | <a href="#">GPIO_B[7:0]*</a> | PULL_UPDN_SEL[1<br>:0] |               | OUT_TY<br>PE   | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2C6          | 0x42  | <a href="#">GPIO_C[7:0]*</a> | OVR_RE<br>S_CFG        | RSVD          | -              | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO3 3</b> |       |                              |                        |               |                |                 |         |                |                |                  |
| 0x2C7          | 0x81  | <a href="#">GPIO_A[7:0]*</a> | RES_CF<br>G            | RSVD          | TX_COM<br>P_EN | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2C8          | 0xA3  | <a href="#">GPIO_B[7:0]*</a> | PULL_UPDN_SEL[1<br>:0] |               | OUT_TY<br>PE   | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2C9          | 0x43  | <a href="#">GPIO_C[7:0]*</a> | OVR_RE<br>S_CFG        | RSVD          | -              | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO4 4</b> |       |                              |                        |               |                |                 |         |                |                |                  |
| 0x2CA          | 0x99  | <a href="#">GPIO_A[7:0]*</a> | RES_CF<br>G            | RSVD          | TX_COM<br>P_EN | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2CB          | 0xA4  | <a href="#">GPIO_B[7:0]*</a> | PULL_UPDN_SEL[1<br>:0] |               | OUT_TY<br>PE   | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2CC          | 0x44  | <a href="#">GPIO_C[7:0]*</a> | OVR_RE<br>S_CFG        | RSVD          | -              | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO5 5</b> |       |                              |                        |               |                |                 |         |                |                |                  |
| 0x2CD          | 0x81  | <a href="#">GPIO_A[7:0]*</a> | RES_CF<br>G            | RSVD          | TX_COM<br>P_EN | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2CE          | 0xA5  | <a href="#">GPIO_B[7:0]*</a> | PULL_UPDN_SEL[1<br>:0] |               | OUT_TY<br>PE   | GPIO_TX_ID[4:0] |         |                |                |                  |



| ADDRESS          | RESET | NAME                                 | MSB                    |                      |                 |                 |         |                |                | LSB              |
|------------------|-------|--------------------------------------|------------------------|----------------------|-----------------|-----------------|---------|----------------|----------------|------------------|
| 0x2CF            | 0x45  | <a href="#">GPIO_C[7:0]*</a>         | OVR_RE<br>S_CFG        | RSVD                 | -               | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO6 6</b>   |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x2D0            | 0x99  | <a href="#">GPIO_A[7:0]*</a>         | RES_CF<br>G            | RSVD                 | TX_COM<br>P_EN  | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2D1            | 0xA6  | <a href="#">GPIO_B[7:0]*</a>         | PULL_UPDN_SEL[1<br>:0] |                      | OUT_TY<br>PE    | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2D2            | 0x46  | <a href="#">GPIO_C[7:0]*</a>         | OVR_RE<br>S_CFG        | RSVD                 | -               | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO7 7</b>   |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x2D3            | 0x83  | <a href="#">GPIO_A[7:0]*</a>         | RES_CF<br>G            | RSVD                 | TX_COM<br>P_EN  | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2D4            | 0xA7  | <a href="#">GPIO_B[7:0]*</a>         | PULL_UPDN_SEL[1<br>:0] |                      | OUT_TY<br>PE    | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2D5            | 0x47  | <a href="#">GPIO_C[7:0]*</a>         | OVR_RE<br>S_CFG        | RSVD                 | -               | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO8 8</b>   |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x2D6            | 0x9C  | <a href="#">GPIO_A[7:0]*</a>         | RES_CF<br>G            | RSVD                 | TX_COM<br>P_EN  | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2D7            | 0x28  | <a href="#">GPIO_B[7:0]*</a>         | PULL_UPDN_SEL[1<br>:0] |                      | OUT_TY<br>PE    | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2D8            | 0x48  | <a href="#">GPIO_C[7:0]*</a>         | OVR_RE<br>S_CFG        | RSVD                 | -               | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO9 9</b>   |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x2D9            | 0x81  | <a href="#">GPIO_A[7:0]*</a>         | RES_CF<br>G            | RSVD                 | TX_COM<br>P_EN  | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2DA            | 0xA9  | <a href="#">GPIO_B[7:0]*</a>         | PULL_UPDN_SEL[1<br>:0] |                      | OUT_TY<br>PE    | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2DB            | 0x49  | <a href="#">GPIO_C[7:0]*</a>         | OVR_RE<br>S_CFG        | RSVD                 | -               | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>GPIO10 10</b> |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x2DC            | 0x99  | <a href="#">GPIO_A[7:0]*</a>         | RES_CF<br>G            | RSVD                 | TX_COM<br>P_EN  | GPIO_O<br>UT    | GPIO_IN | GPIO_R<br>X_EN | GPIO_T<br>X_EN | GPIO_O<br>UT_DIS |
| 0x2DD            | 0x2A  | <a href="#">GPIO_B[7:0]*</a>         | PULL_UPDN_SEL[1<br>:0] |                      | OUT_TY<br>PE    | GPIO_TX_ID[4:0] |         |                |                |                  |
| 0x2DE            | 0x4A  | <a href="#">GPIO_C[7:0]*</a>         | OVR_RE<br>S_CFG        | RSVD                 | -               | GPIO_RX_ID[4:0] |         |                |                |                  |
| <b>CMU</b>       |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x302            | 0x00  | <a href="#">CMU2[7:0]</a>            | RSVD                   | PFDDIV_RSHORT[2:0]   |                 |                 | RSVD    | RSVD[1:0]      |                | RSVD             |
| <b>FRONTTOP</b>  |       |                                      |                        |                      |                 |                 |         |                |                |                  |
| 0x308            | 0x64  | <a href="#">FRONTTOP<br/>0[7:0]*</a> | RSVD                   | enable_li<br>ne_info | START_<br>PORTB | -               | -       | RSVD           | -              | -                |
| 0x30D            | 0xFF  | <a href="#">FRONTTOP<br/>5[7:0]*</a> | VC_SELZ_L[7:0]         |                      |                 |                 |         |                |                |                  |
| 0x30E            | 0xFF  | <a href="#">FRONTTOP<br/>6[7:0]*</a> | VC_SELZ_H[7:0]         |                      |                 |                 |         |                |                |                  |
| 0x311            | 0x40  | <a href="#">FRONTTOP<br/>9[7:0]*</a> | -                      | START_<br>PORTBZ     | -               | -               | -       | -              | -              | -                |

| ADDRESS        | RESET | NAME  | MSB                       |                    |                      |                  |                    |                      |                   | LSB |
|----------------|-------|---|---------------------------|--------------------|----------------------|------------------|--------------------|----------------------|-------------------|-----|
| 0x312          | 0x00  | <a href="#">FRONTTOP_10[7:0]</a> <sup>2</sup> | -                         | RSVD               | -                    | -                | -                  | bpp8dblz             | -                 | -   |
| 0x313          | 0x00  | <a href="#">FRONTTOP_11[7:0]</a> <sup>2</sup> | -                         | bpp12dblz          | -                    | -                | -                  | bpp10dblz            | -                 | -   |
| 0x318          | 0x00  | <a href="#">FRONTTOP_16[7:0]</a>              | -                         | mem_dt1_selz[6:0]  |                      |                  |                    |                      |                   |     |
| 0x319          | 0x00  | <a href="#">FRONTTOP_17[7:0]</a>              | -                         | mem_dt2_selz[6:0]  |                      |                  |                    |                      |                   |     |
| 0x31E          | 0x18  | <a href="#">FRONTTOP_22[7:0]</a>              | soft_dtz_en               | soft_vcz_en        | soft_bppz_en         | soft_bppz[4:0]   |                    |                      |                   |     |
| 0x320          | 0x00  | <a href="#">FRONTTOP_24[7:0]</a>              | -                         | -                  | soft_vcz[1:0]        |                  | -                  | -                    | -                 | -   |
| 0x323          | 0x30  | <a href="#">FRONTTOP_27[7:0]</a>              | -                         | -                  | soft_dtz[5:0]        |                  |                    |                      |                   |     |
| 0x325          | 0x00  | <a href="#">FRONTTOP_29[7:0]</a>              | FORCE_START_MIPI_FRONTTOP | -                  | -                    | -                | -                  | -                    | -                 | -   |
| <b>MIPI_RX</b> |       |   |                           |                    |                      |                  |                    |                      |                   |     |
| 0x330          | 0x00  | <a href="#">MIPI_RX0[7:0]</a> <sup>1</sup>    | -                         | mipi_noncontclk_en | ctrl1_vc_map_en      | -                | mipi_rx_reset      | RSVD[2:0]            |                   |     |
| 0x331          | 0x30  | <a href="#">MIPI_RX1[7:0]</a> <sup>1</sup>    | ctrl1_vcx_en              | ctrl1_deskewen     | ctrl1_num_lanes[1:0] |                  | -                  | -                    | -                 | -   |
| 0x332          | 0xE0  | <a href="#">MIPI_RX2[7:0]</a> <sup>1</sup>    | phy1_lane_map[3:0]        |                    |                      |                  | -                  | -                    | -                 | -   |
| 0x333          | 0x04  | <a href="#">MIPI_RX3[7:0]</a> <sup>1</sup>    | -                         | -                  | -                    | -                | phy2_lane_map[3:0] |                      |                   |     |
| 0x334          | 0x00  | <a href="#">MIPI_RX4[7:0]</a> <sup>1</sup>    | -                         | phy1_pol_map[2:0]  |                      |                  | -                  | -                    | -                 | -   |
| 0x335          | 0x00  | <a href="#">MIPI_RX5[7:0]</a> <sup>1</sup>    | -                         | -                  | -                    | -                | -                  | phy2_pol_map[2:0]    |                   |     |
| 0x337          | 0x00  | <a href="#">MIPI_RX7[7:0]</a> <sup>1</sup>    | -                         | -                  | RSVD                 | RSVD[4:0]        |                    |                      |                   |     |
| 0x338          | 0x55  | <a href="#">MIPI_RX8[7:0]</a> <sup>1</sup>    | RSVD[1:0]                 |                    | t_hs_settle[1:0]     |                  | RSVD[1:0]          |                      | t_clk_settle[1:0] |     |
| 0x33B          | 0x00  | <a href="#">MIPI_RX11[7:0]</a>                | -                         | -                  | -                    | phy1_lp_err[4:0] |                    |                      |                   |     |
| 0x33C          | 0x00  | <a href="#">MIPI_RX12[7:0]</a>                | phy1_hs_err[7:0]          |                    |                      |                  |                    |                      |                   |     |
| 0x33D          | 0x00  | <a href="#">MIPI_RX13[7:0]</a>                | -                         | -                  | -                    | phy2_lp_err[4:0] |                    |                      |                   |     |
| 0x33E          | 0x00  | <a href="#">MIPI_RX14[7:0]</a>                | phy2_hs_err[7:0]          |                    |                      |                  |                    |                      |                   |     |
| 0x343          | 0x00  | <a href="#">MIPI_RX19[7:0]</a>                | ctrl1_csi_err_l[7:0]      |                    |                      |                  |                    |                      |                   |     |
| 0x344          | 0x00  | <a href="#">MIPI_RX20[7:0]</a>                | -                         | -                  | -                    | -                | -                  | ctrl1_csi_err_h[2:0] |                   |     |
| 0x345          | 0x00  | <a href="#">MIPI_RX21[7:0]</a> <sup>2</sup>   | ctrl1_vc_map0[3:0]        |                    |                      |                  | -                  | -                    | -                 | -   |

| ADDRESS             | RESET | NAME                                | MSB      |      |           |                     |                 |                 |                 | LSB             |                   |
|---------------------|-------|-------------------------------------|----------|------|-----------|---------------------|-----------------|-----------------|-----------------|-----------------|-------------------|
| 0x346               | 0x00  | <a href="#">MIPI_RX22[7:0]</a> *    |          |      |           | ctrl1_vc_map1[3:0]  |                 | -               | -               | -               | -                 |
| 0x347               | 0x00  | <a href="#">MIPI_RX23[7:0]</a>      |          |      |           | ctrl1_vc_map2[3:0]  |                 | -               | -               | -               | -                 |
| 0x36C               | 0x00  | <a href="#">MIPI_RX60[7:0]</a>      |          |      |           | ctrl1_vc_map3[3:0]  |                 | -               | -               | -               | -                 |
| 0x36D               | 0x00  | <a href="#">MIPI_RX61[7:0]</a>      |          |      |           | ctrl1_vc_map4[3:0]  |                 | -               | -               | -               | -                 |
| 0x36E               | 0x00  | <a href="#">MIPI_RX62[7:0]</a>      |          |      |           | ctrl1_vc_map5[3:0]  |                 | -               | -               | -               | -                 |
| 0x36F               | 0x00  | <a href="#">MIPI_RX63[7:0]</a>      |          |      |           | ctrl1_vc_map6[3:0]  |                 | -               | -               | -               | -                 |
| <b>MIPI_RX_EXT</b>  |       |                                     |          |      |           |                     |                 |                 |                 |                 |                   |
| 0x377               | 0x00  | <a href="#">EXT00[7:0]</a>          |          |      |           | ctrl1_vc_map7[3:0]  |                 | -               | -               | -               | -                 |
| 0x378               | 0x00  | <a href="#">EXT0[7:0]</a>           |          |      |           | ctrl1_vc_map8[3:0]  |                 | -               | -               | -               | -                 |
| 0x379               | 0x00  | <a href="#">EXT1[7:0]</a>           |          |      |           | ctrl1_vc_map9[3:0]  |                 | -               | -               | -               | -                 |
| 0x37A               | 0x00  | <a href="#">EXT2[7:0]</a>           |          |      |           | ctrl1_vc_map10[3:0] |                 | -               | -               | -               | -                 |
| 0x37B               | 0x00  | <a href="#">EXT3[7:0]</a>           |          |      |           | ctrl1_vc_map11[3:0] |                 | -               | -               | -               | -                 |
| 0x37C               | 0x00  | <a href="#">EXT4[7:0]</a>           |          |      |           | ctrl1_vc_map12[3:0] |                 | -               | -               | -               | -                 |
| 0x37D               | 0x00  | <a href="#">EXT5[7:0]</a>           |          |      |           | ctrl1_vc_map13[3:0] |                 | -               | -               | -               | -                 |
| 0x37E               | 0x00  | <a href="#">EXT6[7:0]</a>           |          |      |           | ctrl1_vc_map14[3:0] |                 | -               | -               | -               | -                 |
| 0x37F               | 0x00  | <a href="#">EXT7[7:0]</a>           |          |      |           | ctrl1_vc_map15[3:0] |                 | -               | -               | -               | -                 |
| 0x380               | 0x00  | <a href="#">EXT8[7:0]</a>           | RSVD     |      | RSVD[1:0] |                     | RSVD[1:0]       | RSVD            | RSVD            | RSVD            | tun_fifo_overflow |
| 0x381               | 0x00  | <a href="#">EXT9[7:0]</a>           |          |      |           |                     |                 | RSVD[7:0]       |                 |                 |                   |
| 0x383               | 0x80  | <a href="#">EXT11[7:0]</a>          | Tun_Mode | RSVD | -         | -                   | RSVD            | RSVD            | RSVD[1:0]       |                 |                   |
| 0x38D               | 0x00  | <a href="#">EXT21[7:0]</a>          |          |      |           | phy1_pkt_cnt[7:0]   |                 |                 |                 |                 |                   |
| 0x38E               | 0x00  | <a href="#">EXT22[7:0]</a>          |          |      |           | csi1_pkt_cnt[7:0]   |                 |                 |                 |                 |                   |
| 0x38F               | 0x00  | <a href="#">EXT23[7:0]</a>          |          |      |           | tun_pkt_cnt[7:0]    |                 |                 |                 |                 |                   |
| 0x390               | 0x00  | <a href="#">EXT24[7:0]</a>          |          |      |           | phy_clk_cnt[7:0]    |                 |                 |                 |                 |                   |
| <b>FRONTTOP_EXT</b> |       |                                     |          |      |           |                     |                 |                 |                 |                 |                   |
| 0x3C8               | 0x00  | <a href="#">FRONTTOP_EXT8[7:0]</a>  |          |      |           | mem_dt3_selz[7:0]   |                 |                 |                 |                 |                   |
| 0x3C9               | 0x00  | <a href="#">FRONTTOP_EXT9[7:0]</a>  |          |      |           | mem_dt4_selz[7:0]   |                 |                 |                 |                 |                   |
| 0x3CA               | 0x00  | <a href="#">FRONTTOP_EXT10[7:0]</a> |          |      |           | mem_dt5_selz[7:0]   |                 |                 |                 |                 |                   |
| 0x3CB               | 0x00  | <a href="#">FRONTTOP_EXT11[7:0]</a> |          |      |           | mem_dt6_selz[7:0]   |                 |                 |                 |                 |                   |
| 0x3D1               | 0x00  | <a href="#">FRONTTOP_EXT17[7:0]</a> | -        | -    | -         | -                   | mem_dt6_selz_en | mem_dt5_selz_en | mem_dt4_selz_en | mem_dt3_selz_en |                   |
| <b>MIPI_RX_EXT2</b> |       |                                     |          |      |           |                     |                 |                 |                 |                 |                   |
| 0x3DC               | 0x00  | <a href="#">EXTA[7:0]</a>           | -        |      |           | mem_dt7_selz[6:0]   |                 |                 |                 |                 |                   |
| 0x3DD               | 0x00  | <a href="#">EXTB[7:0]</a>           | -        |      |           | mem_dt8_selz[6:0]   |                 |                 |                 |                 |                   |

| ADDRESS        | RESET | NAME                            | MSB                    |                  |                         |                        |                        |            |           | LSB           |  |
|----------------|-------|---------------------------------|------------------------|------------------|-------------------------|------------------------|------------------------|------------|-----------|---------------|--|
| <b>REF_VTG</b> |       |                                 |                        |                  |                         |                        |                        |            |           |               |  |
| 0x3E0          | 0x70  | <a href="#">VTX0[7:0]</a>       | -                      | VS_TRIG          | REF_VTG_MODE[1:0]       | HS_INV                 | GEN_HS                 | VS_INV     | GEN_VS    |               |  |
| 0x3E1          | 0x00  | <a href="#">VTX1[7:0]</a>       | VS_HIGH_2[7:0]         |                  |                         |                        |                        |            |           |               |  |
| 0x3E2          | 0x00  | <a href="#">VTX2[7:0]</a>       | VS_HIGH_1[7:0]         |                  |                         |                        |                        |            |           |               |  |
| 0x3E3          | 0x00  | <a href="#">VTX3[7:0]</a>       | VS_HIGH_0[7:0]         |                  |                         |                        |                        |            |           |               |  |
| 0x3E4          | 0x00  | <a href="#">VTX4[7:0]</a>       | VS_LOW_2[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3E5          | 0x00  | <a href="#">VTX5[7:0]</a>       | VS_LOW_1[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3E6          | 0x00  | <a href="#">VTX6[7:0]</a>       | VS_LOW_0[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3E7          | 0x00  | <a href="#">VTX7[7:0]</a>       | V2H_2[7:0]             |                  |                         |                        |                        |            |           |               |  |
| 0x3E8          | 0x00  | <a href="#">VTX8[7:0]</a>       | V2H_1[7:0]             |                  |                         |                        |                        |            |           |               |  |
| 0x3E9          | 0x00  | <a href="#">VTX9[7:0]</a>       | V2H_0[7:0]             |                  |                         |                        |                        |            |           |               |  |
| 0x3EA          | 0x00  | <a href="#">VTX10[7:0]</a>      | HS_HIGH_1[7:0]         |                  |                         |                        |                        |            |           |               |  |
| 0x3EB          | 0x00  | <a href="#">VTX11[7:0]</a>      | HS_HIGH_0[7:0]         |                  |                         |                        |                        |            |           |               |  |
| 0x3EC          | 0x00  | <a href="#">VTX12[7:0]</a>      | HS_LOW_1[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3ED          | 0x00  | <a href="#">VTX13[7:0]</a>      | HS_LOW_0[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3EE          | 0x00  | <a href="#">VTX14[7:0]</a>      | HS_CNT_1[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3EF          | 0x00  | <a href="#">VTX15[7:0]</a>      | HS_CNT_0[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3F0          | 0x50  | <a href="#">REF_VTG0[7:0]</a>   | REFGEN_LOCKED          | REFGEN_PREDEF_EN | REFGEN_PREDEF_FREQ[1:0] | REFGEN_PREDEF_FREQ_ALT | -                      | REFGEN_RST | REFGEN_EN |               |  |
| 0x3F1          | 0x00  | <a href="#">REF_VTG1[7:0]</a> * | RCLKEN_Y               | -                | PCLK_GPIO[4:0]          |                        |                        |            |           | PCLKEN        |  |
| 0x3F2          | 0x00  | <a href="#">REF_VTG2[7:0]</a> * | -                      | -                | HS_GPIO[4:0]            |                        |                        |            |           | HSEN          |  |
| 0x3F3          | 0x00  | <a href="#">REF_VTG3[7:0]</a> * | -                      | -                | VS_GPIO[4:0]            |                        |                        |            |           | VSEN          |  |
| 0x3F4          | 0x00  | <a href="#">REF_VTG4[7:0]</a>   | REFGEN_FB_FRACT_L[7:0] |                  |                         |                        |                        |            |           |               |  |
| 0x3F5          | 0x00  | <a href="#">REF_VTG5[7:0]</a>   | -                      | -                | -                       | -                      | REFGEN_FB_FRACT_H[3:0] |            |           |               |  |
| 0x3F6          | 0x00  | <a href="#">REF_VTG6[7:0]</a>   | VS_DLY_2[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3F7          | 0x00  | <a href="#">REF_VTG7[7:0]</a>   | VS_DLY_1[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3F8          | 0x00  | <a href="#">REF_VTG8[7:0]</a>   | VS_DLY_0[7:0]          |                  |                         |                        |                        |            |           |               |  |
| 0x3F9          | 0x1E  | <a href="#">REF_VTG9[7:0]</a>   | REF_VTG_TRIG_EN        | -                | -                       | REF_VTG_TRIG_ID[4:0]   |                        |            |           |               |  |
| <b>AFE</b>     |       |                                 |                        |                  |                         |                        |                        |            |           |               |  |
| 0x500          | 0x00  | <a href="#">ADC_CTRL_0[7:0]</a> | buf_bypass             | RSVD             | RSVD                    | adc_chg_pump_pu        | adc_refbuf_pu          | buf_pu     | adc_pu    | cpu_adc_start |  |
| 0x501          | 0x00  | <a href="#">ADC_CTRL_1[7:0]</a> | adc_chsel[3:0]         |                  |                         |                        | adc_clk_en             | adc_refsel | adc_scale | RSVD          |  |

| ADDRESS | RESET | NAME                             | MSB                 |                          |                             |                     |                     |                     |                      | LSB                 |  |
|---------|-------|----------------------------------|---------------------|--------------------------|-----------------------------|---------------------|---------------------|---------------------|----------------------|---------------------|--|
| 0x502   | 0x00  | <a href="#">ADC_CTRL_2[7:0]</a>  | RSVD                | –                        | RSVD                        | RSVD                | adc_div[1:0]        | adc_xref            | Inmux_e<br>n         |                     |  |
| 0x508   | 0x00  | <a href="#">ADC_DATA0[7:0]</a>   | adc_data_l[7:0]     |                          |                             |                     |                     |                     |                      |                     |  |
| 0x509   | 0x00  | <a href="#">ADC_DATA1[7:0]</a>   | RSVD                | –                        | –                           | –                   | –                   | –                   | adc_data_h[1:0]      |                     |  |
| 0x50C   | 0x00  | <a href="#">ADC_INTRIE0[7:0]</a> | adc_calD<br>one_ie  | adc_over<br>Range_i<br>e | adc_tmo<br>n_cal_oo<br>d_ie | RSVD                | adc_lo_li<br>mit_ie | adc_hi_li<br>mit_ie | adc_ref_<br>ready_ie | adc_don<br>e_ie     |  |
| 0x50D   | 0x00  | <a href="#">ADC_INTRIE1[7:0]</a> | ch7_hi_li<br>mit_ie | ch6_hi_li<br>mit_ie      | ch5_hi_li<br>mit_ie         | ch4_hi_li<br>mit_ie | ch3_hi_li<br>mit_ie | ch2_hi_li<br>mit_ie | ch1_hi_li<br>mit_ie  | ch0_hi_li<br>mit_ie |  |
| 0x50E   | 0x00  | <a href="#">ADC_INTRIE2[7:0]</a> | ch7_lo_li<br>mit_ie | ch6_lo_li<br>mit_ie      | ch5_lo_li<br>mit_ie         | ch4_lo_li<br>mit_ie | ch3_lo_li<br>mit_ie | ch2_lo_li<br>mit_ie | ch1_lo_li<br>mit_ie  | ch0_lo_li<br>mit_ie |  |
| 0x50F   | 0x00  | <a href="#">ADC_INTRIE3[7:0]</a> | –                   | reflim_ie                | reflimscl<br>1_ie           | reflimscl<br>2_ie   | reflimscl<br>3_ie   | RSVD                | tmon_err<br>_ie      | RSVD                |  |
| 0x510   | 0x00  | <a href="#">ADC_INTR0[7:0]</a>   | adc_calD<br>one_if  | adc_over<br>Range_if     | adc_tmo<br>n_cal_oo<br>d_if | RSVD                | adc_lo_li<br>mit_if | adc_hi_li<br>mit_if | adc_ref_<br>ready_if | adc_don<br>e_if     |  |
| 0x511   | 0x00  | <a href="#">ADC_INTR1[7:0]</a>   | ch7_hi_li<br>mit_if | ch6_hi_li<br>mit_if      | ch5_hi_li<br>mit_if         | ch4_hi_li<br>mit_if | ch3_hi_li<br>mit_if | ch2_hi_li<br>mit_if | ch1_hi_li<br>mit_if  | ch0_hi_li<br>mit_if |  |
| 0x512   | 0x00  | <a href="#">ADC_INTR2[7:0]</a>   | ch7_lo_li<br>mit_if | ch6_lo_li<br>mit_if      | ch5_lo_li<br>mit_if         | ch4_lo_li<br>mit_if | ch3_lo_li<br>mit_if | ch2_lo_li<br>mit_if | ch1_lo_li<br>mit_if  | ch0_lo_li<br>mit_if |  |
| 0x513   | 0x00  | <a href="#">ADC_INTR3[7:0]</a>   | –                   | reflim_if                | reflimscl<br>1_if           | reflimscl<br>2_if   | reflimscl<br>3_if   | RSVD                | tmon_err<br>_if      | RSVD                |  |
| 0x514   | 0x00  | <a href="#">ADC_LIMIT0[7:0]</a>  | chLoLimit_l0[7:0]   |                          |                             |                     |                     |                     |                      |                     |  |
| 0x515   | 0xF0  | <a href="#">ADC_LIMIT0[7:0]</a>  | chHiLimit_l0[3:0]   |                          |                             |                     | –                   | –                   | chLoLimit_h0[1:0]    |                     |  |
| 0x516   | 0x3F  | <a href="#">ADC_LIMIT0[7:0]</a>  | –                   | –                        | chHiLimit_h0[5:0]           |                     |                     |                     |                      |                     |  |
| 0x517   | 0x03  | <a href="#">ADC_LIMIT0[7:0]</a>  | –                   | –                        | div_sel0[1:0]               | ch_sel0[3:0]        |                     |                     |                      |                     |  |
| 0x518   | 0x00  | <a href="#">ADC_LIMIT1[7:0]</a>  | chLoLimit_l1[7:0]   |                          |                             |                     |                     |                     |                      |                     |  |
| 0x519   | 0xF0  | <a href="#">ADC_LIMIT1[7:0]</a>  | chHiLimit_l1[3:0]   |                          |                             |                     | –                   | –                   | chLoLimit_h1[1:0]    |                     |  |
| 0x51A   | 0x3F  | <a href="#">ADC_LIMIT1[7:0]</a>  | –                   | –                        | chHiLimit_h1[5:0]           |                     |                     |                     |                      |                     |  |
| 0x51B   | 0x03  | <a href="#">ADC_LIMIT1[7:0]</a>  | –                   | –                        | div_sel1[1:0]               | ch_sel1[3:0]        |                     |                     |                      |                     |  |
| 0x51C   | 0x00  | <a href="#">ADC_LIMIT2[7:0]</a>  | chLoLimit_l2[7:0]   |                          |                             |                     |                     |                     |                      |                     |  |
| 0x51D   | 0xF0  | <a href="#">ADC_LIMIT2[7:0]</a>  | chHiLimit_l2[3:0]   |                          |                             |                     | –                   | –                   | chLoLimit_h2[1:0]    |                     |  |
| 0x51E   | 0x3F  | <a href="#">ADC_LIMIT2[7:0]</a>  | –                   | –                        | chHiLimit_h2[5:0]           |                     |                     |                     |                      |                     |  |
| 0x51F   | 0x03  | <a href="#">ADC_LIMIT2[7:0]</a>  | –                   | –                        | div_sel2[1:0]               | ch_sel2[3:0]        |                     |                     |                      |                     |  |
| 0x520   | 0x00  | <a href="#">ADC_LIMIT3[7:0]</a>  | chLoLimit_l3[7:0]   |                          |                             |                     |                     |                     |                      |                     |  |

| ADDRESS     | RESET | NAME  | MSB                |                   |                    |              |                 |   | LSB               |  |
|-------------|-------|---|--------------------|-------------------|--------------------|--------------|-----------------|---|-------------------|--|
| 0x521       | 0xF0  | <a href="#">ADC_LIMIT3_1[7:0]</a>           |                    | chHiLimit_l3[3:0] |                    |              | -               | - | chLoLimit_h3[1:0] |  |
| 0x522       | 0x3F  | <a href="#">ADC_LIMIT3_2[7:0]</a>           | -                  | -                 | chHiLimit_h3[5:0]  |              |                 |   |                   |  |
| 0x523       | 0x03  | <a href="#">ADC_LIMIT3_3[7:0]</a>           | -                  | -                 | div_sel3[1:0]      | ch_sel3[3:0] |                 |   |                   |  |
| 0x524       | 0x00  | <a href="#">ADC_LIMIT4_0[7:0]</a>           | chLoLimit_l4[7:0]  |                   |                    |              |                 |   |                   |  |
| 0x525       | 0xF0  | <a href="#">ADC_LIMIT4_1[7:0]</a>           |                    | chHiLimit_l4[3:0] |                    |              | -               | - | chLoLimit_h4[1:0] |  |
| 0x526       | 0x3F  | <a href="#">ADC_LIMIT4_2[7:0]</a>           | -                  | -                 | chHiLimit_h4[5:0]  |              |                 |   |                   |  |
| 0x527       | 0x03  | <a href="#">ADC_LIMIT4_3[7:0]</a>           | -                  | -                 | div_sel4[1:0]      | ch_sel4[3:0] |                 |   |                   |  |
| 0x528       | 0x00  | <a href="#">ADC_LIMIT5_0[7:0]</a>           | chLoLimit_l5[7:0]  |                   |                    |              |                 |   |                   |  |
| 0x529       | 0xF0  | <a href="#">ADC_LIMIT5_1[7:0]</a>           |                    | chHiLimit_l5[3:0] |                    |              | -               | - | chLoLimit_h5[1:0] |  |
| 0x52A       | 0x3F  | <a href="#">ADC_LIMIT5_2[7:0]</a>           | -                  | -                 | chHiLimit_h5[5:0]  |              |                 |   |                   |  |
| 0x52B       | 0x03  | <a href="#">ADC_LIMIT5_3[7:0]</a>           | -                  | -                 | div_sel5[1:0]      | ch_sel5[3:0] |                 |   |                   |  |
| 0x52C       | 0x00  | <a href="#">ADC_LIMIT6_0[7:0]</a>           | chLoLimit_l6[7:0]  |                   |                    |              |                 |   |                   |  |
| 0x52D       | 0xF0  | <a href="#">ADC_LIMIT6_1[7:0]</a>           |                    | chHiLimit_l6[3:0] |                    |              | -               | - | chLoLimit_h6[1:0] |  |
| 0x52E       | 0x3F  | <a href="#">ADC_LIMIT6_2[7:0]</a>           | -                  | -                 | chHiLimit_h6[5:0]  |              |                 |   |                   |  |
| 0x52F       | 0x03  | <a href="#">ADC_LIMIT6_3[7:0]</a>           | -                  | -                 | div_sel6[1:0]      | ch_sel6[3:0] |                 |   |                   |  |
| 0x530       | 0x00  | <a href="#">ADC_LIMIT7_0[7:0]</a>           | chLoLimit_l7[7:0]  |                   |                    |              |                 |   |                   |  |
| 0x531       | 0xF0  | <a href="#">ADC_LIMIT7_1[7:0]</a>           |                    | chHiLimit_l7[3:0] |                    |              | -               | - | chLoLimit_h7[1:0] |  |
| 0x532       | 0x3F  | <a href="#">ADC_LIMIT7_2[7:0]</a>           | -                  | -                 | chHiLimit_h7[5:0]  |              |                 |   |                   |  |
| 0x533       | 0x03  | <a href="#">ADC_LIMIT7_3[7:0]</a>           | -                  | -                 | div_sel7[1:0]      | ch_sel7[3:0] |                 |   |                   |  |
| 0x534       | 0x00  | <a href="#">ADC_RR_CT_RL0[7:0]</a>          | -                  | -                 | -                  | -            | -               | - | adc_rr_r<br>un    |  |
| 0x53E       | 0x00  | <a href="#">ADC_CTRL_4[7:0]</a>             | RSVD               | RSVD[3:0]         |                    |              | adc_pin_en[2:0] |   |                   |  |
| <b>MISC</b> |       |   |                    |                   |                    |              |                 |   |                   |  |
| 0x548       | 0xDC  | <a href="#">UART_PT_0[7:0]</a> <sup>2</sup> | BITLEN_PT_1_L[7:0] |                   |                    |              |                 |   |                   |  |
| 0x549       | 0x05  | <a href="#">UART_PT_1[7:0]</a> <sup>2</sup> | -                  | -                 | BITLEN_PT_1_H[5:0] |              |                 |   |                   |  |
| 0x54A       | 0xDC  | <a href="#">UART_PT_2[7:0]</a> <sup>2</sup> | BITLEN_PT_2_L[7:0] |                   |                    |              |                 |   |                   |  |

| ADDRESS             | RESET | NAME                                | MSB                 |                  |                    |                     |                      |        |          | LSB      |  |
|---------------------|-------|-------------------------------------|---------------------|------------------|--------------------|---------------------|----------------------|--------|----------|----------|--|
| 0x54B               | 0x05  | <a href="#">UART_PT_3[7:0]*</a>     | -                   | -                | BITLEN_PT_2_H[5:0] |                     |                      |        |          |          |  |
| 0x550               | 0x00  | <a href="#">I2C_PT_4[7:0]</a><br>↓  |                     |                  |                    | SRC_A_1[6:0]        |                      |        |          | -        |  |
| 0x551               | 0x00  | <a href="#">I2C_PT_5[7:0]</a><br>↓  |                     |                  |                    | DST_A_1[6:0]        |                      |        |          | -        |  |
| 0x552               | 0x00  | <a href="#">I2C_PT_6[7:0]</a><br>↓  |                     |                  |                    | SRC_B_1[6:0]        |                      |        |          | -        |  |
| 0x553               | 0x00  | <a href="#">I2C_PT_7[7:0]</a><br>↓  |                     |                  |                    | DST_B_1[6:0]        |                      |        |          | -        |  |
| 0x554               | 0x00  | <a href="#">I2C_PT_8[7:0]</a><br>↓  |                     |                  |                    | SRC_A_2[6:0]        |                      |        |          | -        |  |
| 0x555               | 0x00  | <a href="#">I2C_PT_9[7:0]</a><br>↓  |                     |                  |                    | DST_A_2[6:0]        |                      |        |          | -        |  |
| 0x556               | 0x00  | <a href="#">I2C_PT_10[7:0]</a><br>↓ |                     |                  |                    | SRC_B_2[6:0]        |                      |        |          | -        |  |
| 0x557               | 0x00  | <a href="#">I2C_PT_11[7:0]</a><br>↓ |                     |                  |                    | DST_B_2[6:0]        |                      |        |          | -        |  |
| 0x55F               | 0x00  | <a href="#">HS_VS_Z[7:0]</a>        | -                   | DE_DET_Z         | VS_DET_Z           | HS_DET_Z            | -                    | -      | VS_POL_Z | HS_POL_Z |  |
| 0x56E               | 0xBB  | <a href="#">UNLOCK_KEY[7:0]*</a>    | UNLOCK_KEY[7:0]     |                  |                    |                     |                      |        |          |          |  |
| 0x56F               | 0x3E  | <a href="#">PIO_SLEW_0[7:0]*</a>    | -                   | -                | PIO02_SLEW[1:0]    | PIO01_SLEW[1:0]     | PIO00_SLEW[1:0]      |        |          |          |  |
| 0x570               | 0x3C  | <a href="#">PIO_SLEW_1[7:0]*</a>    | -                   | -                | PIO06_SLEW[1:0]    | PIO05_SLEW[1:0]     | -                    | -      |          |          |  |
| 0x571               | 0xFC  | <a href="#">PIO_SLEW_2[7:0]*</a>    | PIO011_SLEW[1:0]    |                  | PIO010_SLEW[1:0]   | RSVD[1:0]           | -                    | -      |          |          |  |
| <b>MIPI_RX_EXT3</b> |       |                                     |                     |                  |                    |                     |                      |        |          |          |  |
| 0x584               | 0x00  | <a href="#">EXT4[7:0]</a>           |                     |                  |                    | ctrl1_fs_cnt_l[7:0] |                      |        |          |          |  |
| 0x585               | 0x00  | <a href="#">EXT5[7:0]</a>           |                     |                  |                    | ctrl1_fs_cnt_h[7:0] |                      |        |          |          |  |
| 0x586               | 0x00  | <a href="#">EXT6[7:0]</a>           |                     |                  |                    | ctrl1_fe_cnt_l[7:0] |                      |        |          |          |  |
| 0x587               | 0x00  | <a href="#">EXT7[7:0]</a>           |                     |                  |                    | ctrl1_fe_cnt_h[7:0] |                      |        |          |          |  |
| 0x588               | 0x00  | <a href="#">EXT8[7:0]</a>           | -                   | -                | -                  | -                   | ctrl1_fs_vc_sel[3:0] |        |          |          |  |
| <b>SPI_CC_WR</b>    |       |                                     |                     |                  |                    |                     |                      |        |          |          |  |
| 0x1300              | 0x00  | <a href="#">SPI_CC_WR[7:0]</a>      | -                   | -                | -                  | -                   | -                    | -      | -        | -        |  |
| <b>SPI_CC_RD</b>    |       |                                     |                     |                  |                    |                     |                      |        |          |          |  |
| 0x1380              | 0x00  | <a href="#">SPI_CC_RD[7:0]</a>      | -                   | -                | -                  | -                   | -                    | -      | -        | -        |  |
| <b>RLMS A</b>       |       |                                     |                     |                  |                    |                     |                      |        |          |          |  |
| 0x1404              | 0x4B  | <a href="#">RLMS4[7:0]*</a>         | EOM_CHK_AMOUNT[3:0] |                  |                    | EOM_CHK_THR[1:0]    | EOM_PERR_MOD_E       | EOM_EN |          |          |  |
| 0x1405              | 0x10  | <a href="#">RLMS5[7:0]*</a>         | EOM_MAN_TRG_REQ     | EOM_MIN_THR[6:0] |                    |                     |                      |        |          |          |  |

| ADDRESS         | RESET | NAME                         | MSB  |                         |                    |  |                       |                              |                  | LSB                   |             |
|-----------------|-------|------------------------------|--|-------------------------|--------------------|--|-----------------------|------------------------------|------------------|-----------------------|-------------|
| 0x1406          | 0x80  | <a href="#">RLMS6[7:0]*</a>  | EOM_PV_MODE                                  | RSVD[6:0]               |                    |  |                       |                              |                  |                       |             |
| 0x1407          | 0x00  | <a href="#">RLMS7[7:0]</a>   | EOM_D ONE                                    | EOM[6:0]                |                    |  |                       |                              |                  |                       |             |
| 0x1417          | 0x00  | <a href="#">RLMS17[7:0]</a>  | DFE5En                                       | DFE4En                  | DFE3En             | DFE2En   | DFE1En                | BSTEnO<br>v                  | BSTEn            | AGCEn                 |             |
| 0x141C          | 0x00  | <a href="#">RLMS1C[7:0]</a>  | AGCMuL[7:0]                                  |                         |                    |  |                       |                              |                  |                       |             |
| 0x141D          | 0x02  | <a href="#">RLMS1D[7:0]</a>  | -  | -                       | AGCMuH[5:0]        |  |                       |                              |                  |                       |             |
| 0x141F          | 0x00  | <a href="#">RLMS1F[7:0]</a>  | AGCInit[7:0]                                 |                         |                    |  |                       |                              |                  |                       |             |
| 0x1432          | 0x7F  | <a href="#">RLMS32[7:0]</a>  | OSNMode                                      | RSVD                    | RSVD[5:0]          |  |                       |                              |                  |                       |             |
| 0x143A          | 0x00  | <a href="#">RLMS3A[7:0]</a>  | EyeMonValCntL[7:0]                           |                         |                    |  |                       |                              |                  |                       |             |
| 0x143B          | 0x00  | <a href="#">RLMS3B[7:0]</a>  | EyeMonValCntH[7:0]                           |                         |                    |  |                       |                              |                  |                       |             |
| 0x1464          | 0x90  | <a href="#">RLMS64[7:0]*</a> | RSVD[3:0]                                    |                         |                    |  | -                     | RSVD                         | TxSSCMode[1:0]   |                       |             |
| 0x1470          | 0x01  | <a href="#">RLMS70[7:0]*</a> | -  | TxSSCFrqCtrl[6:0]       |                    |  |                       |                              |                  |                       |             |
| 0x1471          | 0x02  | <a href="#">RLMS71[7:0]*</a> | -  | TxSSCCenSprSt[5:0]      |                    |  |                       |                              |                  |                       | TxSSCE<br>n |
| 0x1472          | 0xCF  | <a href="#">RLMS72[7:0]*</a> | TxSSCPreScL[7:0]                             |                         |                    |  |                       |                              |                  |                       |             |
| 0x1473          | 0x00  | <a href="#">RLMS73[7:0]*</a> | -  | -                       | -                  | -  | -                     | TxSSCPreScH[2:0]             |                  |                       |             |
| 0x1474          | 0x00  | <a href="#">RLMS74[7:0]*</a> | TxSSCPhL[7:0]                                |                         |                    |  |                       |                              |                  |                       |             |
| 0x1475          | 0x00  | <a href="#">RLMS75[7:0]*</a> | -  | TxSSCPhH[6:0]           |                    |  |                       |                              |                  |                       |             |
| 0x1476          | 0x00  | <a href="#">RLMS76[7:0]*</a> | -  | -                       | -                  | -  | -                     | -                            | TxSSCPhQuad[1:0] |                       |             |
| 0x14A8          | 0x00  | <a href="#">RLMSA8[7:0]</a>  | FW_PHY_CTRL                                  | FW_PHY_PU_TX            | FW_PHY_RSTB        | RSVD   | RSVD                  | RSVD                         | RSVD             | RSVD                  |             |
| 0x14A9          | 0x00  | <a href="#">RLMSA9[7:0]</a>  | FW_REPCAL_RS<br>TB                           | RSVD                    | FW_TXD_SQUEL<br>CH | FW_TXD_EN                                      | FW_RXD_EN             | RSVD                         | RSVD             | RSVD                  |             |
| 0x14AA          | 0x90  | <a href="#">RLMSAA[7:0]</a>  | RSVD   | RSVD                    | ROR_CLK_DET        | RSVD   | RSVD                  | RSVD                         | RSVD             | RSVD                  |             |
| 0x14CE          | 0x01  | <a href="#">RLMSCE[7:0]</a>  | RSVD   | RSVD                    | RSVD               | enminus_reg                                    | enminus_man           | RSVD                         | RSVD             | enffe                 |             |
| <b>DPLL REF</b> |       |                              |  |                         |                    |  |                       |                              |                  |                       |             |
| 0x1A00          | 0xF5  | <a href="#">DPLL_0[7:0]*</a> | RSVD   | RSVD                    | RSVD               | RSVD   | RSVD                  | RSVD                         | RSVD             | config_s<br>oft_rst_n |             |
| 0x1A03          | 0x82  | <a href="#">DPLL_3[7:0]*</a> | config_s<br>el_clock<br>out_use_<br>external | RSVD                    | RSVD               | config_u<br>se_intern<br>al_divide<br>r_values | RSVD                  | config_spread_bit_ratio[2:0] |                  |                       |             |
| 0x1A07          | 0x04  | <a href="#">DPLL_7[7:0]</a>  | config_di<br>v_fb_L                          | config_div_in[4:0]      |                    |  |                       |                              | RSVD[1:0]        |                       |             |
| 0x1A08          | 0x14  | <a href="#">DPLL_8[7:0]</a>  | config_div_fb_H[7:0]                         |                         |                    |  |                       |                              |                  |                       |             |
| 0x1A09          | 0x40  | <a href="#">DPLL_9[7:0]</a>  | config_div_out_L[4:0]                        |                         |                    |  |                       | config_div_fb_exp[2:0]       |                  |                       |             |
| 0x1A0A          | 0x81  | <a href="#">DPLL_10[7:0]</a> | config_al<br>low_coar<br>se_chan<br>ge       | config_div_out_exp[2:0] |                    |  | config_div_out_H[3:0] |                              |                  |                       |             |
| <b>EFUSE</b>    |       |                              |  |                         |                    |  |                       |                              |                  |                       |             |
| 0x1C50          | 0x00  | <a href="#">EFUSE80[7:0]</a> | SERIAL_NUMBER_0[7:0]                         |                         |                    |  |                       |                              |                  |                       |             |



| ADDRESS          | RESET | NAME                                     | MSB |   |           |                         |                        |                          |                                   | LSB                       |
|------------------|-------|--|-----|---|-----------|-------------------------|------------------------|--------------------------|-----------------------------------|---------------------------|
| 0x1C51           | 0x00  | <a href="#">EFUSE81[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_1[7:0]      |
| 0x1C52           | 0x00  | <a href="#">EFUSE82[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_2[7:0]      |
| 0x1C53           | 0x00  | <a href="#">EFUSE83[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_3[7:0]      |
| 0x1C54           | 0x00  | <a href="#">EFUSE84[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_4[7:0]      |
| 0x1C55           | 0x00  | <a href="#">EFUSE85[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_5[7:0]      |
| 0x1C56           | 0x00  | <a href="#">EFUSE86[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_6[7:0]      |
| 0x1C57           | 0x00  | <a href="#">EFUSE87[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_7[7:0]      |
| 0x1C58           | 0x00  | <a href="#">EFUSE88[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_8[7:0]      |
| 0x1C59           | 0x00  | <a href="#">EFUSE89[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_9[7:0]      |
| 0x1C5A           | 0x00  | <a href="#">EFUSE90[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_10[7:0]     |
| 0x1C5B           | 0x00  | <a href="#">EFUSE91[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_11[7:0]     |
| 0x1C5C           | 0x00  | <a href="#">EFUSE92[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_12[7:0]     |
| 0x1C5D           | 0x00  | <a href="#">EFUSE93[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_13[7:0]     |
| 0x1C5E           | 0x00  | <a href="#">EFUSE94[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_14[7:0]     |
| 0x1C5F           | 0x00  | <a href="#">EFUSE95[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_15[7:0]     |
| 0x1C60           | 0x00  | <a href="#">EFUSE96[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_16[7:0]     |
| 0x1C61           | 0x00  | <a href="#">EFUSE97[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_17[7:0]     |
| 0x1C62           | 0x00  | <a href="#">EFUSE98[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_18[7:0]     |
| 0x1C63           | 0x00  | <a href="#">EFUSE99[7:0]</a>             |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_19[7:0]     |
| 0x1C64           | 0x00  | <a href="#">EFUSE100[7:0]</a>            |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_20[7:0]     |
| 0x1C65           | 0x00  | <a href="#">EFUSE101[7:0]</a>            |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_21[7:0]     |
| 0x1C66           | 0x00  | <a href="#">EFUSE102[7:0]</a>            |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_22[7:0]     |
| 0x1C67           | 0x00  | <a href="#">EFUSE103[7:0]</a>            |     |   |           |                         |                        |                          |                                   | SERIAL_NUMBER_23[7:0]     |
| <b>FUNC_SAFE</b> |       |  |     |   |           |                         |                        |                          |                                   |                           |
| 0x1D00           | 0x00  | <a href="#">REGCRC0[7:0]*</a>            | -   | - | RSVD      | GEN_R<br>OLLING<br>_CRC | I2C_WR<br>_COMP<br>UTE | PERIODI<br>C_COM<br>PUTE | CHECK_<br>CRC                     | RESET_<br>CRC             |
| 0x1D01           | 0x00  | <a href="#">REGCRC1[7:0]*</a>            |     |   |           |                         |                        |                          |                                   | CRC_PERIOD[7:0]           |
| 0x1D02           | 0x00  | <a href="#">REGCRC2[7:0]</a>             |     |   |           |                         |                        |                          |                                   | REGCRC_LSB[7:0]           |
| 0x1D03           | 0x00  | <a href="#">REGCRC3[7:0]</a>             |     |   |           |                         |                        |                          |                                   | REGCRC_MSB[7:0]           |
| 0x1D08           | 0x00  | <a href="#">I2C_UART_C<br/>RC0[7:0]*</a> | -   | - | -         | -                       | -                      | -                        | -                                 | RESET_<br>MSGCN<br>TR     |
| 0x1D09           | 0x00  | <a href="#">I2C_UART_C<br/>RC1[7:0]*</a> |     |   | RSVD[2:0] |                         | RSVD[2:0]              |                          | RESET_<br>MSGCN<br>TR_ERR<br>_CNT | RESET_<br>CRC_ER<br>R_CNT |
| 0x1D0A           | 0x00  | <a href="#">I2C_UART_C<br/>RC2[7:0]</a>  |     |   |           |                         |                        |                          |                                   | CRC_VAL[7:0]              |

| ADDRESS | RESET | NAME                                    | MSB                       |                      |                    |                  |   |                     |                        | LSB                    |
|---------|-------|---|---------------------------|----------------------|--------------------|------------------|---|---------------------|------------------------|------------------------|
| 0x1D0B  | 0x00  | <a href="#">I2C_UART_CRC3[7:0]</a>      | MSGCNTR_LSB[7:0]          |                      |                    |                  |   |                     |                        |                        |
| 0x1D0C  | 0x00  | <a href="#">I2C_UART_CRC4[7:0]</a>      | MSGCNTR_MSB[7:0]          |                      |                    |                  |   |                     |                        |                        |
| 0x1D12  | 0xE0  | <a href="#">FS_INTR0[7:0]</a><br>1*     | I2C_UART_MSG_CNTR_ERR_OEN | I2C_UART_CRC_ERR_OEN | MEM_ECC_ERR2_OEN   | MEM_ECC_ERR1_OEN | - | -                   | -                      | REG_CRC_ERR_OEN        |
| 0x1D13  | 0x00  | <a href="#">FS_INTR1[7:0]</a><br>1      | I2C_UART_MSG_CNTR_ERR_INT | I2C_UART_CRC_ERR_INT | MEM_ECC_ERR2_INT   | MEM_ECC_ERR1_INT | - | -                   | -                      | REG_CRC_ERR_FLAG       |
| 0x1D14  | 0x00  | <a href="#">MEM_ECC0[7:0]</a><br>0*     | RSVD[2:0]                 |                      |                    | RSVD[2:0]        |   |                     | RESET_MEM_ECC_ERR2_CNT | RESET_MEM_ECC_ERR1_CNT |
| 0x1D20  | 0x00  | <a href="#">REG_POST0[7:0]</a><br>0*    | POST_DONE                 | POST_M_BIST_PASSED   | POST_L_BIST_PASSED | -                | - | RSVD                | RSVD                   | RSVD                   |
| 0x1D28  | 0x00  | <a href="#">REG_ADCBIT0[7:0]</a><br>0*  | RR_ACCURACY               | RSVD                 | -                  | MUXVER_EN        | - | RUN_ACCURACY        | RSVD                   | RUN_TMON_CAL           |
| 0x1D31  | 0x0F  | <a href="#">REG_ADCBIT3[7:0]</a><br>0*  | REFLIM[7:0]               |                      |                    |                  |   |                     |                        |                        |
| 0x1D32  | 0x0F  | <a href="#">REG_ADCBIT4[7:0]</a><br>0*  | REFLIMSCL1[7:0]           |                      |                    |                  |   |                     |                        |                        |
| 0x1D33  | 0x07  | <a href="#">REG_ADCBIT5[7:0]</a><br>0*  | REFLIMSCL2[7:0]           |                      |                    |                  |   |                     |                        |                        |
| 0x1D34  | 0x07  | <a href="#">REG_ADCBIT6[7:0]</a><br>0*  | REFLIMSCL3[7:0]           |                      |                    |                  |   |                     |                        |                        |
| 0x1D35  | 0x03  | <a href="#">REG_ADCBIT7[7:0]</a><br>0*  | TLIMIT[7:0]               |                      |                    |                  |   |                     |                        |                        |
| 0x1D37  | 0x00  | <a href="#">REG_ADCBIT9[7:0]</a><br>0*  | MUXV_CTRL[7:0]            |                      |                    |                  |   |                     |                        |                        |
| 0x1D3A  | 0xFF  | <a href="#">REG_ADCBIT12[7:0]</a><br>0* | TMONCAL_OOD_WAIT_B2[7:0]  |                      |                    |                  |   |                     |                        |                        |
| 0x1D3B  | 0xFF  | <a href="#">REG_ADCBIT13[7:0]</a><br>0* | T_EST_OUT_B0[7:0]         |                      |                    |                  |   |                     |                        |                        |
| 0x1D3C  | 0xC3  | <a href="#">REG_ADCBIT14[7:0]</a><br>0* | T_EST_OUT_B1[1:0]         | -                    | -                  | -                | - | -                   | ALT_T_EST_OUT_B1[1:0]  |                        |
| 0x1D3D  | 0xFF  | <a href="#">REG_ADCBIT15[7:0]</a><br>0* | ALT_T_EST_OUT_B0[7:0]     |                      |                    |                  |   |                     |                        |                        |
| 0x1D5F  | 0x00  | <a href="#">CC_RTTN_ERR[7:0]</a><br>0*  | -                         | -                    | -                  | -                | - | RESET_EFUSE_CRC_ERR | INJECT_EFUSE_CRC_ERR   | INJECT_RTTN_CRC_ERR    |

## Register Details

[REG0 \(0x0\)\\*](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0           |
|-------------|---------------|---|---|---|---|---|---|-------------|
| Field       | DEV_ADDR[6:0] |   |   |   |   |   |   | CFG_BLOCK   |
| Reset       | 0b1000000     |   |   |   |   |   |   | 0b0         |
| Access Type | Write, Read   |   |   |   |   |   |   | Write, Read |

| BITFIELD  | BITS           | DESCRIPTION  | DECODE                           |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
|-----------|----------------|--|----------------------------------|----------------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|-----|-----------|---|
| DEV_ADDR  | 7:1            | Device Address<br><br>Default value is set by the CFG0 pin as follows:<br><table border="1"> <thead> <tr> <th>CFG0</th> <th>Device Address</th> </tr> </thead> <tbody> <tr><td>000</td><td>0b1000000</td></tr> <tr><td>001</td><td>0b1000010</td></tr> <tr><td>010</td><td>0b1000000</td></tr> <tr><td>011</td><td>0b1000010</td></tr> <tr><td>100</td><td>0b1000010</td></tr> <tr><td>101</td><td>0b1000000</td></tr> <tr><td>110</td><td>0b1000010</td></tr> <tr><td>111</td><td>0b1000000</td></tr> </tbody> </table> | CFG0                             | Device Address | 000 | 0b1000000 | 001 | 0b1000010 | 010 | 0b1000000 | 011 | 0b1000010 | 100 | 0b1000010 | 101 | 0b1000000 | 110 | 0b1000010 | 111 | 0b1000000 | 0b0000000: I <sup>2</sup> C write/read address is 0x00/0x01<br>0b0000001: I <sup>2</sup> C write/read address is 0x02/0x03<br>...<br>0b1000000: I <sup>2</sup> C write/read address is 0x80/0x81<br>0b1000010: I <sup>2</sup> C write/read address is 0x84/0x85<br>0b1000100: I <sup>2</sup> C write/read address is 0x88/0x89<br>0b1100000: I <sup>2</sup> C write/read address is 0xC0/0xC1<br>0b1100010: I <sup>2</sup> C write/read address is 0xC4/0xC5<br>0b1100100: I <sup>2</sup> C write/read address is 0xC8/0xC9<br>0b0100000: I <sup>2</sup> C write/read address is 0x40/0x41<br>0b0100010: I <sup>2</sup> C write/read address is 0x44/0x45<br>...<br>0b1111111: I <sup>2</sup> C write/read address is 0xFE/0xFF |
| CFG0      | Device Address |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 000       | 0b1000000      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 001       | 0b1000010      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 010       | 0b1000000      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 011       | 0b1000010      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 100       | 0b1000010      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 101       | 0b1000000      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 110       | 0b1000010      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| 111       | 0b1000000      |  |                                  |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |
| CFG_BLOCK | 0              | Configuration Block<br><br>When set, all registers become non-writable (read-only). This bit can be used to freeze the chip configuration. The only way to clear this register and regain write access is with a power cycle or toggling the PWDNB pin.  | 0b0: Not Blocked<br>0b1: Blocked |                |     |           |     |           |     |           |     |           |     |           |     |           |     |           |     |           |   |

[REG1 \(0x1\)\\*](#)

| BIT         | 7           | 6           | 5            | 4           | 3            | 2 | 1            | 0 |
|-------------|-------------|-------------|--------------|-------------|--------------|---|--------------|---|
| Field       | IIC_2_EN    | IIC_1_EN    | DIS_LOCAL_CC | DIS_REM_CC  | TX_RATE[1:0] |   | RX_RATE[1:0] |   |
| Reset       | 0b0         | 0b0         | 0b0          | 0b0         | 0b10         |   | 0b00         |   |
| Access Type | Write, Read | Write, Read | Write, Read  | Write, Read | Write, Read  |   | Write, Read  |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| IIC_2_EN     | 7    | Enable pass-through I <sup>2</sup> C Channel 2 (SDA2/RX2, SCL2/TX2)  | 0b0: I <sup>2</sup> C pass-through Channel 2 disabled<br>0b1: I <sup>2</sup> C pass-through Channel 2 enabled   |
| IIC_1_EN     | 6    | Enable pass-through I <sup>2</sup> C Channel 1 (SDA1/RX1, SCL1/TX1)  | 0b0: I <sup>2</sup> C pass-through Channel 1 disabled<br>0b1: I <sup>2</sup> C pass-through Channel 1 enabled   |
| DIS_LOCAL_CC | 5    | Disable control-channel connection to RX/SDA and TX/SCL pins         | 0b0: RX/SDA and TX/XCL connected to control channel<br>0b1: RX/SDA and TX/SCL disconnected from control channel |
| DIS_REM_CC   | 4    | Disable access to remote device control-channel over GMSL connection | 0b0: Remote control channel enabled<br>0b1: Remote control channel disabled                                     |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| TX_RATE  | 3:2  | Transmitter (forward channel) bit rate (when changed, becomes active after next link reset).<br><br>Default value is set by the configuration pins at power-up. | 0b00: Reserved<br>0b01: 3Gbps<br>0b10: 6Gbps<br>0b11: 12Gbps          |
| RX_RATE  | 1:0  | Receiver (reverse channel) bit rate (when changed, becomes active after next link reset)  | 0b00: 187.5Mbps<br>0b01: Reserved<br>0b10: Reserved<br>0b11: Reserved |

**REG2 (0x2)\***

| BIT         | 7 | 6           | 5 | 4 | 3 | 2 | 1    | 0    |
|-------------|---|-------------|---|---|---|---|------|------|
| Field       | – | VID_TX_EN_Z | – | – | – | – | RSVD | RSVD |
| Reset       | – | 0b1         | – | – | – | – | 0b1  | 0b1  |
| Access Type | – | Write, Read | – | – | – | – |      |      |

| BITFIELD    | BITS | DESCRIPTION                            | DECODE  |
|-------------|------|--|---|
| VID_TX_EN_Z | 6    | Video Transmit Enable for Video Pipe Z | 0b0: Video transmit Pipe Z disabled<br>0b1: Video transmit Pipe Z enabled |

**REG3 (0x3)\***

| BIT         | 7 | 6 | 5           | 4           | 3 | 2           | 1            | 0 |
|-------------|---|---|-------------|-------------|---|-------------|--------------|---|
| Field       | – | – | UART_2_EN_N | UART_1_EN_N | – | RCLK_ALT    | RCLKSEL[1:0] |   |
| Reset       | – | – | 0b0         | 0b0         | – | 0b0         | 0b00         |   |
| Access Type | – | – | Write, Read | Write, Read | – | Write, Read | Write, Read  |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| UART_2_EN | 5    | Enable pass-through UART Channel 2 (SDA2/RX2, SCL2/TX2) | 0b0: Pass-through UART Channel 2 disabled<br>0b1: Pass-through UART Channel 2 enabled                  |
| UART_1_EN | 4    | Enable pass-through UART Channel 1 (SDA1/RX1, SCL1/TX1) | 0b0: Pass-through UART Channel 1 disabled<br>0b1: Pass-through UART Channel 1 enabled                  |
| RCLK_ALT  | 2    | Selects MFP pin to route RCLK to.                       | 0b0: Route RCLK to MFP4<br>0b1: Route RCLK to MFP2 (alternate RCLK output pin)                         |
| RCLKSEL   | 1:0  | RCLKOUT clock selection                                 | 0b00: XTAL/1 = 25MHz<br>0b01: XTAL/2 = 12.5MHz<br>0b10: XTAL/4 = 6.25MHz<br>0b11: Reference PLL output |

**REG4 (0x4)\***

| BIT            | 7 | 6 | 5 | 4                 | 3             | 2                          | 1    | 0           |
|----------------|---|---|---|-------------------|---------------|----------------------------|------|-------------|
| Field          | – | – | – | CC_MSGC<br>NTR_EN | CC_CRC_E<br>N | CC_CRC_<br>MSGCNTR<br>_OVR | RSVD | XTAL_PU     |
| Reset          | – | – | – | 0b1               | 0b1           | 0b0                        | 0b0  | 0b0         |
| Access<br>Type | – | – | – | Write, Read       | Write, Read   | Write, Read                |      | Write, Read |

| BITFIELD                   | BITS | DESCRIPTION   | DECODE  |
|----------------------------|------|---|---|
| CC_MSGCN<br>TR_EN          | 4    | Enable I <sup>2</sup> C/UART message counter override when set to 1.<br>Only active when<br>CC_CRC_MSGCNTR_OVR = 1  | 0x0: I2C / UART Message Counter not enabled<br>0x1: I2C / UART Message Counter enabled  |
| CC_CRC_E<br>N              | 3    | Enable I <sup>2</sup> C/UART CRC override when set to 1.<br>Only active when<br>CC_CRC_MSGCNTR_OVR = 1  | 0b0: I2C / UART CRC not enabled<br>0b1: I2C / UART CRC enabled  |
| CC_CRC_M<br>SGCNTR_O<br>VR | 2    | Enable manual override of I <sup>2</sup> C/UART CRC or message counter configuration when set to 1.<br>When 0, use default CRC and message counter configuration. | 0b0: Default CRC and Message Counter configuration<br>0b1: Manual override of CRC and Message Counter configuration. CC_CRC_EN and CC_MSGCNTR_EN register bits control I2C / UART CRC and Message Counter options respectively. |
| XTAL_PU                    | 0    | Enable XTAL as reference clock.<br>The initial value of this register is set by the CFG pin selection.<br>Writing to this register bit overrides CFG pin.         | 0b0: Reverse Channel Reference (ROR) used as reference clock<br>0b1: XTAL used as reference clock   |

**REG5 (0x5)\***

| BIT            | 7           | 6           | 5               | 4               | 3    | 2    | 1           | 0           |
|----------------|-------------|-------------|-----------------|-----------------|------|------|-------------|-------------|
| Field          | LOCK_EN     | ERRB_EN     | ALT_LOCK<br>_EN | ALT_ERRB<br>_EN | RSVD | RSVD | PU_LF1      | PU_LF0      |
| Reset          | 0b0         | 0b0         | 0b0             | 0b0             | 0b0  | 0b0  | 0b0         | 0b0         |
| Access<br>Type | Write, Read | Write, Read | Write, Read     | Write, Read     |      |      | Write, Read | Write, Read |

| BITFIELD        | BITS | DESCRIPTION                            | DECODE  |
|-----------------|------|--|---|
| LOCK_EN         | 7    | Enable LOCK Output                     | 0b0: LOCK output disabled<br>0b1: LOCK output enabled                   |
| ERRB_EN         | 6    | Enable ERRB Output                     | 0b0: ERRB output disabled<br>0b1: ERRB output enabled                   |
| ALT_LOCK_<br>EN | 5    | Enable LOCK output on alternate output | 0b0: LOCK output disabled<br>0b1: LOCK output enabled                   |
| ALT_ERRB_<br>EN | 4    | Enable ERRB output on alternate output | 0b0: ERRB output disabled<br>0b1: ERRB output enabled                   |
| PU_LF1          | 1    | Power Up Line-Fault Monitor 1          | 0b0: Line-fault monitor 1 disabled<br>0b1: Line-fault monitor 1 enabled |
| PU_LF0          | 0    | Power Up Line-Fault Monitor 0          | 0b0: Line-fault monitor 0 disabled<br>0b1: Line-fault monitor 0 enabled |

**REG6 (0x6)\***

| BIT         | 7    | 6 | 5           | 4           | 3 | 2 | 1 | 0    |
|-------------|------|---|-------------|-------------|---|---|---|------|
| Field       | RSVD | – | RCLKEN      | I2CSEL      | – | – | – | RSVD |
| Reset       | 0b1  | – | 0b0         | 0b0         | – | – | – | 0b0  |
| Access Type |      | – | Write, Read | Write, Read | – | – | – |      |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| RCLKEN   | 5    | Enable/disable RCLK Output.  | 0b0: RCLK output is disabled<br>0b1: RCLK output is enabled |
| I2CSEL   | 4    | I <sup>2</sup> C/UART selection<br>Bit is set according to the CFG0 pin value at power-up.<br>Changing this value through a register write is not recommended. Instead, change the CFG0 value and power up the device again. | 0b0: UART<br>0b1: I2C                                       |

**REG13 (0xD)**

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | DEV_ID[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xB7        |   |   |   |   |   |   |   |
| Access Type | Read Only   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION       | DECODE          |
|----------|------|-------------------|-----------------|
| DEV_ID   | 7:0  | Device Identifier | 0xC8: MAX96717F |

**REG14 (0xE)**

| BIT         | 7         | 6 | 5 | 4 | 3            | 2 | 1 | 0 |
|-------------|-----------|---|---|---|--------------|---|---|---|
| Field       | RSVD[3:0] |   |   |   | DEV_REV[3:0] |   |   |   |
| Reset       | 0x0       |   |   |   | 0x4          |   |   |   |
| Access Type |           |   |   |   | Read Only    |   |   |   |

| BITFIELD | BITS | DESCRIPTION     | DECODE                              |
|----------|------|-----------------|-------------------------------------|
| DEV_REV  | 3:0  | Device Revision | 0xX: Device revision number (RevID) |

**REG26 (0x26)**

| BIT         | 7 | 6         | 5 | 4 | 3 | 2         | 1 | 0 |
|-------------|---|-----------|---|---|---|-----------|---|---|
| Field       | – | LF_1[2:0] |   |   | – | LF_0[2:0] |   |   |
| Reset       | – | 0b010     |   |   | – | 0b010     |   |   |
| Access Type | – | Read Only |   |   | – | Read Only |   |   |

| BITFIELD | BITS | DESCRIPTION                                     | DECODE   |
|----------|------|---|--|
| LF_1     | 6:4  | Line-fault status of wire connected to LMN1 pin | 0b000: Short to battery<br>0b001: Short to GND<br>0b010: Normal Operation<br>0b011: Line Open<br>0b1XX: Line-to-line short |
| LF_0     | 2:0  | Line-fault status of wire connected to LMN0 pin | 0b000: Short to battery<br>0b001: Short to GND<br>0b010: Normal Operation<br>0b011: Line Open<br>0b1XX: Line-to-line short |

**PWR0 (0x8)**

| BIT         | 7                  | 6 | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|-----------------|---|---|---|---|
| Field       | VDDBAD_STATUS[2:0] |   |   | CMP_STATUS[4:0] |   |   |   |   |
| Reset       | 0b000              |   |   | 0b00000         |   |   |   |   |
| Access Type | Read Only          |   |   | Read Only       |   |   |   |   |

| BITFIELD       | BITS | DESCRIPTION   | DECODE  |
|----------------|------|---|---|
| VDDBAD_ST ATUS | 7:5  | Switched 1V supply comparator status bits<br>Note that when CAP_VDD < 0.82V, the device is operating outside of the specified conditions and usually powers down. | 0bXX1: Latched high when CAP_VDD < 0.82V<br>0bX1X: Latched high when CAP_VDD < 0.82V<br>0b1XX: Reserved   |
| CMP_STATU S    | 4:0  | VDD18, VDDIO, and CAP_VDD supply voltage comparator status bits   | 0bXXXX0: Latched low when VDD18 < 1.617V<br>0bXXX0X: Latched low when switched VDDIO supply < 1.617V<br>0bXX0XX: Latched low when CAP_VDD < 0.82V<br>0bX0XXX: Reserved<br>0b0XXXX: Reserved<br>0bXX111: All supplies are at expected levels |

**PWR4 (0xC)\***

| BIT         | 7    | 6              | 5 | 4           | 3         | 2 | 1 | 0 |
|-------------|------|----------------|---|-------------|-----------|---|---|---|
| Field       | RSVD | DIS_LOCAL_WAKE | – | WAKE_EN_A   | RSVD[3:0] |   |   |   |
| Reset       | 0b0  | 0b0            | – | 0b1         | 0x5       |   |   |   |
| Access Type |      | Write, Read    | – | Write, Read |           |   |   |   |

| BITFIELD       | BITS | DESCRIPTION  | DECODE  |
|----------------|------|--|---|
| DIS_LOCAL_WAKE | 6    | Disable wake-up by local $\mu$ C from SDA_RX pin     | 0b0: Local wake-up enabled<br>0b1: Local wake-up disabled                       |
| WAKE_EN_A      | 4    | Enable wake-up by remote chip connected to GMSL Link | 0b0: GMSL Link remote wake-up disabled<br>0b1: GMSL Link remote wake-up enabled |

**CTRL0 (0x10)\***

| BIT            | 7             | 6              | 5                         | 4    | 3           | 2 | 1         | 0 |
|----------------|---------------|----------------|---------------------------|------|-------------|---|-----------|---|
| Field          | RESET_AL<br>L | RESET_LIN<br>K | RESET_ON<br>ESHOT         | RSVD | SLEEP       | – | RSVD[1:0] |   |
| Reset          | 0b0           | 0b0            | 0b0                       | 0b1  | 0b0         | – | 0b01      |   |
| Access<br>Type | Write, Read   | Write, Read    | Write Clears<br>All, Read |      | Write, Read | – |           |   |

| BITFIELD          | BITS | DESCRIPTION  | DECODE  |
|-------------------|------|--|---|
| RESET_ALL         | 7    | Writing 1 to this bit resets the device, including all blocks. Registers are reset to defaults. This is equivalent to toggling the PWDNB pin. The bit is cleared when written. | 0b0: No action<br>0b1: Activate chip reset          |
| RESET_LIN<br>K    | 6    | Reset data path (keep register settings). Write 1 to activate reset. Write 0 to release reset.   | 0b0: Release link reset<br>0b1: Activate link reset |
| RESET_ONE<br>SHOT | 5    | Reset data path (keep register settings). Write 1 to activate reset, bit self clears and automatically releases reset.   | 0b0: No action<br>0b1: Reset data path              |
| SLEEP             | 3    | Activate Sleep Mode  | 0b0: Sleep mode disabled<br>0b1: Sleep mode enabled |

**CTRL1 (0x11)\***

| BIT            | 7    | 6    | 5    | 4 | 3 | 2 | 1    | 0           |
|----------------|------|------|------|---|---|---|------|-------------|
| Field          | RSVD | RSVD | RSVD | – | – | – | RSVD | CXTP_A      |
| Reset          | 0b0  | 0b0  | 0b0  | – | – | – | 0b1  | 0b0         |
| Access<br>Type |      |      |      | – | – | – |      | Write, Read |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CXTP_A   | 0    | Coax/Twisted-pair cable select for GMSL Link<br>Bit is set according to the latched CFG1 pin value at power-up | 0b0: Shielded twisted-pair drive<br>0b1: Coax drive |

**CTRL2 (0x12)**

| BIT            | 7    | 6    | 5 | 4              | 3         | 2 | 1         | 0 |
|----------------|------|------|---|----------------|-----------|---|-----------|---|
| Field          | RSVD | RSVD | – | LDO_BYPA<br>SS | RSVD[1:0] |   | RSVD[1:0] |   |
| Reset          | 0b0  | 0b0  | – | 0b0            | 0b01      |   | 0b00      |   |
| Access<br>Type |      |      | – | Write, Read    |           |   |           |   |

| BITFIELD   | BITS | DESCRIPTION       |
|------------|------|-------------------|
| LDO_BYPASS | 4    | Enable LDO bypass |



**CTRL3 (0x13)**

| BIT         | 7    | 6    | 5         | 4 | 3         | 2         | 1          | 0 |
|-------------|------|------|-----------|---|-----------|-----------|------------|---|
| Field       | RSVD | RSVD | RSVD[1:0] |   | LOCKED    | ERROR     | CMU_LOCKED | – |
| Reset       | 0b0  | 0b0  | 0b01      |   | 0b0       | 0b0       | 0b0        | – |
| Access Type |      |      |           |   | Read Only | Read Only | Read Only  | – |

| BITFIELD   | BITS | DESCRIPTION                        | DECODE   |
|------------|------|------------------------------------|--|
| LOCKED     | 3    | GMSL Link Locked (bidirectional)   | 0b0: GMSL link not locked<br>0b1: GMSL link locked                         |
| ERROR      | 2    | Reflects global error status       | 0b0: ERRB not asserted (ERRB pin = 1)<br>0b1: ERRB asserted (ERRB pin = 0) |
| CMU_LOCKED | 1    | Clock Multiplier Unit (CMU) Locked | 0b0: CMU not locked<br>0b1: CMU locked                                     |

**INTR0 (0x18)\***

| BIT         | 7    | 6    | 5    | 4 | 3               | 2                | 1 | 0 |
|-------------|------|------|------|---|-----------------|------------------|---|---|
| Field       | RSVD | RSVD | RSVD | – | AUTO_ERR_RST_EN | DEC_ERR_THR[2:0] |   |   |
| Reset       | 0b1  | 0b0  | 0b1  | – | 0b0             | 0b000            |   |   |
| Access Type |      |      |      | – | Write, Read     | Write, Read      |   |   |

| BITFIELD        | BITS | DESCRIPTION  | DECODE  |
|-----------------|------|--|---|
| AUTO_ERR_RST_EN | 3    | Automatically resets DEC_ERR_A (0x22) and IDLE_ERR (0x24) bitfields after ERRB pin is asserted for 1 $\mu$ s.  | 0b0: Auto reset disabled<br>0b1: Auto reset enabled   |
| DEC_ERR_THR     | 2:0  | Decoding and idle-error reporting threshold. Threshold controls the number of errors that can happen before the error flags assert. DEC_ERR_FLAG_A is asserted when DEC_ERR_A $\geq$ DEC_ERR_THR<br>IDLE_ERR_FLAG is asserted when IDLE_ERR $\geq$ DEC_ERR_THR | 0b000: 1<br>0b001: 2<br>0b010: 4<br>0b011: 8<br>0b100: 16<br>0b101: 32<br>0b110: 64<br>0b111: 128 |

**INTR1 (0x19)\***

| BIT         | 7                | 6 | 5 | 4 | 3               | 2         | 1 | 0 |
|-------------|------------------|---|---|---|-----------------|-----------|---|---|
| Field       | PKT_CNT_EXP[3:0] |   |   |   | AUTO_CNT_RST_EN | RSVD[2:0] |   |   |
| Reset       | 0x0              |   |   |   | 0b0             | 0b000     |   |   |
| Access Type | Write, Read      |   |   |   | Write, Read     |           |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE                  |
|-------------|------|---|-------------------------|
| PKT_CNT_EXP | 7:4  | Packet Count Multiplier Exponent<br>See the description of PKT_CNT (0x25) bitfield. | 0bXXX: PKT_CNT exponent |

| BITFIELD        | BITS | DESCRIPTION   | DECODE  |
|-----------------|------|---|---|
| AUTO_CNT_RST_EN | 3    | Automatically reset PKT_CNT (0x25) bitfield after ERRB pin is asserted for 1μs. | 0b0: Auto reset disabled<br>0b1: Auto reset enabled |

**INTR2 (0x1A)\***

| BIT         | 7                   | 6    | 5           | 4 | 3            | 2            | 1 | 0             |
|-------------|---------------------|------|-------------|---|--------------|--------------|---|---------------|
| Field       | REFGEN_UNLOCKED_OEN | RSVD | REM_ERR_OEN | – | LFLT_INT_OEN | IDLE_ERR_OEN | – | DEC_ERR_OEN_A |
| Reset       | 0b0                 | 0b0  | 0b0         | – | 0b1          | 0b0          | – | 0b1           |
| Access Type | Write, Read         |      | Write, Read | – | Write, Read  | Write, Read  | – | Write, Read   |

| BITFIELD            | BITS | DESCRIPTION   | DECODE  |
|---------------------|------|---|---|
| REFGEN_UNLOCKED_OEN | 7    | Enable reporting of reference clock DPLL not locked                     | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| REM_ERR_OEN         | 5    | Enable reporting of remote error status (REM_ERR - 0x1B) at ERRB pin    | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| LFLT_INT_OEN        | 3    | Enable reporting of line-fault interrupt (LFLT_INT - 0x1B) at ERRB pin  | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| IDLE_ERR_OEN        | 2    | Enable reporting of idle-word errors (IDLE_ERR_FLAG - 0x1B) at ERRB pin | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| DEC_ERR_OEN_A       | 0    | Enable reporting of decoding errors (DEC_ERR_FLAG_A - 0x1B) at ERRB pin | 0b0: Reporting disabled<br>0b1: Reporting enabled |

**INTR3 (0x1B)**

| BIT         | 7               | 6    | 5            | 4 | 3         | 2             | 1 | 0              |
|-------------|-----------------|------|--------------|---|-----------|---------------|---|----------------|
| Field       | REFGEN_UNLOCKED | RSVD | REM_ERR_FLAG | – | LFLT_INT  | IDLE_ERR_FLAG | – | DEC_ERR_FLAG_A |
| Reset       | 0b0             | 0b0  | 0b0          | – | 0b0       | 0b0           | – | 0b0            |
| Access Type | Read Only       |      | Read Only    | – | Read Only | Read Only     | – | Read Only      |

| BITFIELD        | BITS | DESCRIPTION  | DECODE  |
|-----------------|------|--|---|
| REFGEN_UNLOCKED | 7    | Reference DPLL generating RCLKOUT is not locked.<br>This bit is only valid when the reference DPLL is enabled and should be ignored when it is not.<br><br>See register 0x3F0. | 0b0: REFGEN DPLL is locked<br>0b1: REFGEN DPLL not locked |
| REM_ERR_FLAG    | 5    | Received remote side error status (inverse of remote side ERRB pin level)  | 0b0: No remote side error<br>0b1: Remote side error       |
| LFLT_INT        | 3    | Line-Fault Interrupt<br><br>Asserted when either one of line-fault monitors indicates a fault status.<br><br>See LF_0 (0x26) and LF_1 (0x26) bitfields for more information.   | 0b0: No line fault<br>0b1: Line fault                     |

| BITFIELD       | BITS | DESCRIPTION   | DECODE   |
|----------------|------|---|--|
| IDLE_ERR_FLAG  | 2    | Idle-Word Error Flag<br>Asserted when IDLE_ERR (0x24) ≥ DEC_ERR_THR (0x18).                             | 0b0: Flag not asserted<br>0b1: Flag asserted             |
| DEC_ERR_FLAG_A | 0    | GMSL Packet Decoding Error Flag<br>Asserted when DEC_ERR_A (at addr 0x22) ≥ DEC_ERR_THR (at addr 0x18). | 0b0: Error flag not asserted<br>0b1: Error flag asserted |

**INTR4 (0x1C)\***

| BIT         | 7           | 6             | 5           | 4            | 3           | 2           | 1           | 0 |
|-------------|-------------|---------------|-------------|--------------|-------------|-------------|-------------|---|
| Field       | VREG_OV_OEN | EOM_ERR_OEN_A | VDD_OV_OEN  | VDD18_OV_OEN | MAX_RT_OEN  | RT_CNT_OEN  | PKT_CNT_OEN | – |
| Reset       | 0b0         | 0b0           | 0b0         | 0b0          | 0b1         | 0b0         | 0b0         | – |
| Access Type | Write, Read | Write, Read   | Write, Read | Write, Read  | Write, Read | Write, Read | Write, Read | – |

| BITFIELD      | BITS | DESCRIPTION   | DECODE  |
|---------------|------|---|---|
| VREG_OV_OEN   | 7    | Enable CAP_VDD overvoltage status on ERRB   | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| EOM_ERR_OEN_A | 6    | Enable reporting of eye-opening monitor error (EOM_ERR_FLAG_A - 0x1D) for GMSL Link at ERRB pin           | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| VDD_OV_OEN    | 5    | Enable V <sub>DD</sub> overvoltage status on ERRB   | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| VDD18_OV_OEN  | 4    | Enable V <sub>DD18</sub> overvoltage status on ERRB   | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| MAX_RT_OEN    | 3    | Enable reporting of combined ARQ maximum retransmission limit error flag (MAX_RT_FLAG - 0x1D) at ERRB pin | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| RT_CNT_OEN    | 2    | Enable reporting of combined ARQ retransmission event flag (RT_CNT_FLAG_0x1C) at ERRB pin                 | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| PKT_CNT_OEN   | 1    | Enable reporting of packet count flag (PKT_CNT_FLAG - 0x1E) at ERRB pin                                   | 0b0: Reporting disabled<br>0b1: Reporting enabled |

**INTR5 (0x1D)**

| BIT         | 7                  | 6              | 5                  | 4                  | 3           | 2           | 1            | 0 |
|-------------|--------------------|----------------|--------------------|--------------------|-------------|-------------|--------------|---|
| Field       | VREG_OV_FLAG       | EOM_ERR_FLAG_A | VDD_OV_FLAG        | VDD18_OV_FLAG      | MAX_RT_FLAG | RT_CNT_FLAG | PKT_CNT_FLAG | – |
| Reset       | 0b0                | 0b0            | 0b0                | 0b0                | 0b0         | 0b0         | 0b0          | – |
| Access Type | Read<br>Clears All | Read Only      | Read<br>Clears All | Read<br>Clears All | Read Only   | Read Only   | Read Only    | – |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                                       |
|--------------|------|--|--|
| VREG_OV_FLAG | 7    | CAP_VDD Overvoltage Indication<br><br>This bit is sticky. It is set when CAP_VDD is over the overvoltage threshold. It is cleared when read. | 0b0: Flag not asserted<br>0b1: Flag asserted |

| BITFIELD       | BITS | DESCRIPTION  | DECODE                                       |
|----------------|------|--|--|
| EOM_ERR_FLAG_A | 6    | Eye-opening is below the configured threshold set by EOM_MIN_THR[6:0]. This bit is sticky. It is cleared when read.  | 0b0: Flag not asserted<br>0b1: Flag asserted |
| VDD_OV_FLAG    | 5    | V <sub>DD</sub> Overvoltage Indication<br>This bit is sticky. It is set when V <sub>DD</sub> is over the overvoltage threshold. It is cleared when read.   | 0b0: Flag not asserted<br>0b1: Flag asserted |
| VDD18_OV_FLAG  | 4    | V <sub>DD18</sub> Overvoltage Flag<br>This bit is sticky. It is set when V <sub>DD18</sub> is over the overvoltage threshold. It is cleared when read.   | 0b0: Flag not asserted<br>0b1: Flag asserted |
| MAX_RT_FLAG    | 3    | Combined ARQ maximum retransmission limit error flag<br>Asserted when any of the selected channel's ARQ retransmission limit is reached. Selection is done by each channel's MAX_RT_ERR_OEN (0x1C) bitfield. | 0b0: Flag not asserted<br>0b1: Flag asserted |
| RT_CNT_FLAG    | 2    | Combined ARQ retransmission event flag<br>Asserted when any of the selected channels have done at least one ARQ retransmission. Selection is done by each channel's RT_CNT_OEN (0x1C) bitfield.              | 0b0: Flag not asserted<br>0b1: Flag asserted |
| PKT_CNT_FLAG   | 1    | Packet Count Flag<br>Asserted when PKT_CNT (0x25) ≥ PKT_CNT_THR (0x19)   | 0b0: Flag not asserted<br>0b1: Flag asserted |

**INTR6 (0x1E)\***

| BIT         | 7              | 6            | 5              | 4                 | 3                | 2           | 1    | 0            |
|-------------|----------------|--------------|----------------|-------------------|------------------|-------------|------|--------------|
| Field       | VDDCMP_INT_OEN | PORZ_INT_OEN | VDDBAD_INT_OEN | EFUSE_CRC_ERR_OEN | RTTN_CRC_ERR_OEN | ADC_INT_OEN | RSVD | MIPI_ERR_OEN |
| Reset       | 0b1            | 0b1          | 0b1            | 0b1               | 0b1              | 0b0         | 0b1  | 0b1          |
| Access Type | Write, Read    | Write, Read  | Write, Read    | Write, Read       | Write, Read      | Write, Read |      | Write, Read  |

| BITFIELD          | BITS | DESCRIPTION   | DECODE  |
|-------------------|------|---|---|
| VDDCMP_INT_OEN    | 7    | Enable reporting of combined undervoltage comparator output (VDDCMP_INT_FLAG) at ERRB pin   | 0x0: Disable reporting<br>0x1: Enable reporting |
| PORZ_INT_OEN      | 6    | Enable reporting of PORZ interrupt (PORZ_INT_FLAG - 0x1F) at ERRB pin. PORZ is monitoring of undervoltage levels of V <sub>DD18</sub> and V <sub>DDIO</sub> . | 0x0: Disable reporting<br>0x1: Enable reporting |
| VDDBAD_INT_OEN    | 5    | Enable reporting of V <sub>DDBAD</sub> interrupt (VDDBAD_INT_FLAG) at ERRB pin  | 0x0: Disable reporting<br>0x1: Enable reporting |
| EFUSE_CRC_ERR_OEN | 4    | Enable reporting efuse CRC at ERRB pin  | 0x0: Disable reporting<br>0x1: Enable reporting |

| BITFIELD         | BITS | DESCRIPTION   | DECODE  |
|------------------|------|---|---|
| RTTN_CRC_ERR_OEN | 3    | Enable reporting of CRC errors (RTTN_CRC_ERR) incurred during readout of retention memory during exit of sleep mode at ERRB pin                     | 0x0: Disable reporting<br>0x1: Enable reporting   |
| ADC_INT_OEN      | 2    | Enable reporting of ADC interrupts (ADC_INT_FLAG) at ERRB pin. Individual interrupts also have individual enable bits. See registers ADC_INTRIE0-3. | 0x0: Disable reporting<br>0x1: Enable reporting   |
| MIPI_ERR_OEN     | 0    | Enable reporting of MIPI RX errors (MIPI_ERR_FLAG) at ERRB pin  | 0b0: Reporting disabled<br>0b1: Reporting enabled |

**INTR7 (0x1F)**

| BIT         | 7                  | 6                  | 5                  | 4             | 3            | 2            | 1    | 0             |
|-------------|--------------------|--------------------|--------------------|---------------|--------------|--------------|------|---------------|
| Field       | VDDCMP_INT_FLAG    | PORZ_INT_FLAG      | VDDBAD_INT_FLAG    | EFUSE_CRC_ERR | RTTN_CRC_INT | ADC_INT_FLAG | RSVD | MIPI_ERR_FLAG |
| Reset       | 0b0                | 0b0                | 0b0                | 0b0           | 0b0          | 0b0          | 0b0  | 0b0           |
| Access Type | Read<br>Clears All | Read<br>Clears All | Read<br>Clears All | Read Only     | Read Only    | Read Only    |      | Read Only     |

| BITFIELD        | BITS | DESCRIPTION  | DECODE   |
|-----------------|------|--|--|
| VDDCMP_INT_FLAG | 7    | Combined undervoltage comparator output<br>Asserts when a bit in the CMP_STATUS register is asserted.  | 0b0: Flag not asserted<br>0b1: Flag asserted   |
| PORZ_INT_FLAG   | 6    | PORZ interrupt flag. PORZ is monitoring of undervoltage levels of VDD18 and VDDIO. Asserts when VDD18 < 1.516V or VDDIO < 1.055V.  | 0b0: Flag not asserted<br>0b1: Flag asserted   |
| VDDBAD_INT_FLAG | 5    | Combined VDD bad indicator. Asserts when either VDDBAD_STATUS[1] or [0] bits is a 1, indicating that CAP_VDD (switched digital core VDD) has fallen below 0.82V.   | 0x0: CAP_VDD has not fallen below 0.82V<br>0x1: CAP_VDD has fallen below 0.82V at least once since this bit is last read |
| EFUSE_CRC_ERR   | 4    | efuse CRC error indicator  | 0b0: Flag not asserted<br>0b1: Flag asserted   |
| RTTN_CRC_INT    | 3    | Retention memory restore CRC error interrupt. When the device wakes up, contents of retention memory is loaded back to main registers. The restored data is covered by CRC. If CRC fails, this bit is set. | 0b0: Flag not asserted<br>0b1: Flag asserted   |
| ADC_INT_FLAG    | 2    | ADC Interrupt. Individual interrupts also have individual status flags. See registers ADC_INTR0-3.   | 0b0: Flag not asserted<br>0b1: Flag asserted   |
| MIPI_ERR_FLAG   | 0    | MIPI RX error flag, asserted when any of these is asserted:<br>phy1_hs_err [0],[1],[4],[5] phy2_hs_err [0],[1],[4],[5] ctrl1_csi_err_l [0],[1],[7] ctrl1_csi_err_h [0]                                     | 0b0: Flag not asserted<br>0b1: Flag asserted   |

**INTR8 (0x20)\***

| BIT         | 7           | 6 | 5 | 4              | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|----------------|---|---|---|---|
| Field       | ERR_TX_EN   | – | – | ERR_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b1         | – | – | 0b11111        |   |   |   |   |
| Access Type | Write, Read | – | – | Write, Read    |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| ERR_TX_EN | 7    | Transmit local error status (inverse of ERRB pin level) to remote side through GPIO channel  | 0b0: Transmit error status disabled<br>0b1: Transmit error status enabled |
| ERR_TX_ID | 4:0  | GPIO ID used for transmitting ERR_TX. Error status is transmitted to remote side using the GPIO interface, using this value as a special GPIO index. It is not recommended to change this value. | 0bXXXXX: Value of GPIO ID for transmitting ERR_TX                         |

**INTR9 (0x21)\***

| BIT         | 7           | 6    | 5 | 4              | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|----------------|---|---|---|---|
| Field       | ERR_RX_EN   | RSVD | – | ERR_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b1         | 0b1  | – | 0b11111        |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read    |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| ERR_RX_EN | 7    | Enable reception of remote error status (inverse of ERRB pin level) through GPIO channel   | 0b0: Receive error status disabled<br>0b1: Receive error status enabled |
| ERR_RX_ID | 4:0  | GPIO ID used for receiving ERR_RX. Error status is received from remote side using the GPIO interface, using this value as a special GPIO index. It is not recommended to change this value. | 0bXXXXX: Value of GPIO ID for receiving ERR_TX                          |

**CNT0 (0x22)**

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | DEC_ERR_A[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Read Clears All |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| DEC_ERR_A | 7:0  | Number of decoding (disparity) errors detected in packets received over GMSL link. Cleared on read or upon link transitioning from unlock to lock state. | 0xXX: Number of detected GMSL link disparity errors |

**CNT2 (0x24)**

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | IDLE_ERR[7:0]   |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Read Clears All |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                                    |
|----------|------|--|---|
| IDLE_ERR | 7:0  | Number of idle-word errors detected.<br>Reset after reading or with the rising edge of LOCK. | 0xXX: Number of idle-word errors detected |

**CNT3 (0x25)**

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | PKT_CNT[7:0]    |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Read Clears All |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                                  |
|----------|------|--|---|
| PKT_CNT  | 7:0  | Number of received packets of a selected type.<br><br>Packet type is selected with PKT_CNT_SEL (0x2C register).<br>Reported packet count is a scaled value, such that actual packet count is $\geq \text{PKT\_CNT} \times (2^{\text{PKT\_CNT\_EXP}})$ and $< (\text{PKT\_CNT} + 1) \times (2^{\text{PKT\_CNT\_EXP}})$ .<br><br>When maximum value is reported, packet count is greater or equal to the reported value. | 0xXX: Scaled number of received packets |

**TX0 (0x28)\***

| BIT         | 7         | 6 | 5    | 4    | 3 | 2 | 1           | 0 |
|-------------|-----------|---|------|------|---|---|-------------|---|
| Field       | RSVD[1:0] |   | RSVD | RSVD | – | – | TX_FEC_EN   | – |
| Reset       | 0b01      |   | 0b1  | 0b0  | – | – | 0x0         | – |
| Access Type |           |   |      |      | – | – | Write, Read | – |

| BITFIELD  | BITS | DESCRIPTION  | DECODE                      |
|-----------|------|--|-----------------------------|
| TX_FEC_EN | 1    | Enable Forward-Error Correction (FEC) in forward direction.<br>When the part is started up in GMSL2 mode, FEC is default off, and this bit is 0.<br>For GMSL3 parts, if a part is started up in GMSL3 mode, FEC is on by default, and this bit is 1. | 0x0: FEC off<br>0x1: FEC on |

**TX1 (0x29)\***

| BIT         | 7             | 6    | 5 | 4           | 3             | 2 | 1           | 0           |
|-------------|---------------|------|---|-------------|---------------|---|-------------|-------------|
| Field       | LINK_PRBS_GEN | RSVD | – | ERRG_EN_A   | TX_FEC_CRC_EN | – | DIS_SCR     | DIS_ENC     |
| Reset       | 0b0           | 0x0  | – | 0b0         | 0x1           | – | 0b0         | 0b0         |
| Access Type | Write, Read   |      | – | Write, Read | Write, Read   | – | Write, Read | Write, Read |

| BITFIELD      | BITS | DESCRIPTION  | DECODE  |
|---------------|------|--|---|
| LINK_PRBS_GEN | 7    | Enable link PRBS-7 generator   | 0x0: Disabled<br>0x1: Enabled   |
| ERRG_EN_A     | 4    | Error Generator Enable for GMSL Link. Error injection applies to all data going across the link.             | 0b0: GMSL Link error generator disabled<br>0b1: GMSL Link error generator enabled |
| TX_FEC_CRC_EN | 3    | Enable CRC at each FEC block<br>Setting must match deserializer. It is not recommended to change this value. | 0x0: Off<br>0x1: On   |
| DIS_SCR       | 1    | Disable scrambler  |   |
| DIS_ENC       | 0    | Disable 9b10b encoding   |   |

**TX2 (0x2A)\***

| BIT         | 7             | 6 | 5              | 4 | 3               | 2 | 1 | 0           |
|-------------|---------------|---|----------------|---|-----------------|---|---|-------------|
| Field       | ERRG_CNT[1:0] |   | ERRG_RATE[1:0] |   | ERRG_BURST[2:0] |   |   | ERRG_PER    |
| Reset       | 0b00          |   | 0b10           |   | 0b000           |   |   | 0b0         |
| Access Type | Write, Read   |   | Write, Read    |   | Write, Read     |   |   | Write, Read |

| BITFIELD   | BITS | DESCRIPTION                                  | DECODE   |
|------------|------|--|--|
| ERRG_CNT   | 7:6  | Number of errors to be generated             | 0b00: Continuous<br>0b01: 16<br>0b10: 128<br>0b11: 1024  |
| ERRG_RATE  | 5:4  | Error generator average bit error rate       | 0b00: 1 in 5120 bits<br>0b01: 1 in 81920 bits<br>0b10: 1 in 1310720 bits<br>0b11: 1 in 20971520 bits |
| ERRG_BURST | 3:1  | Error generator burst error length in bits   | 0b000: 1<br>0b001: 2<br>0b010: 3<br>0b011: 4<br>0b100: 8<br>0b101: 12<br>0b110: 16<br>0b111: 20      |
| ERRG_PER   | 0    | Error generator error distribution selection | 0b0: Pseudorandom<br>0b1: Periodic   |



**TX3 (0x2B)\***

| BIT         | 7         | 6 | 5             | 4 | 3 | 2         | 1 | 0 |
|-------------|-----------|---|---------------|---|---|-----------|---|---|
| Field       | RSVD[1:0] |   | TX_FEC_ACTIVE | - | - | RSVD[2:0] |   |   |
| Reset       | 0b01      |   |               | - | - | 0b100     |   |   |
| Access Type |           |   | Read Only     | - | - |           |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE   |
|---------------|------|--|--|
| TX_FEC_ACTIVE | 5    | Indicates FEC is active<br><br>Communication with deserializer must have been established for this bit to get set by hardware. | 0x0: Not active<br>0x1: Actively generating error checking bits. |

**RX0 (0x2C)\***

| BIT         | 7                | 6 | 5 | 4    | 3                | 2 | 1 | 0 |
|-------------|------------------|---|---|------|------------------|---|---|---|
| Field       | PKT_CNT_LBW[1:0] |   | - | RSVD | PKT_CNT_SEL[3:0] |   |   |   |
| Reset       | 0b00             |   | - | 0b0  | 0x0              |   |   |   |
| Access Type | Write, Read      |   | - |      | Write, Read      |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| PKT_CNT_LBW | 7:6  | Select the subtype of low-bandwidth packets to count at PKT_CNT (0x25) bitfield | 0b00: Count low-bandwidth data packets only<br>0b01: Count low-bandwidth acknowledge packets only<br>0b10: Count low-bandwidth data and acknowledge packets<br>0b11: Reserved   |
| PKT_CNT_SEL | 3:0  | Select the type of received packets to count at PKT_CNT (0x25) bitfield         | 0x0: None<br>0x1: VIDEO<br>0x2: Reserved<br>0x3: INFO Frame<br>0x4: SPI<br>0x5: I <sup>2</sup> C<br>0x6: UART<br>0x7: GPIO<br>0x8: Reserved<br>0x9: Reserved<br>0xA: Reserved<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: All<br>0xF: Unknown and packets with error |

**RX1 (0x2D)\***

| BIT           | 7             | 6                          | 5         | 4 | 3         | 2                             | 1    | 0    |
|---------------|---------------|----------------------------|-----------|---|-----------|-------------------------------|------|------|
| Field         | LINK_PRBS_CHK | –                          | RSVD[1:0] |   | RSVD[1:0] |                               | RSVD | RSVD |
| Reset         | 0b0           | –                          | 0b10      |   | 0b10      |                               | 0b0  | 0b0  |
| Access Type   | Write, Read   | –                          |           |   |           |                               |      |      |
| BITFIELD      | BITS          | DESCRIPTION                |           |   |           | DECODE                        |      |      |
| LINK_PRBS_CHK | 7             | Enable link PRBS-7 checker |           |   |           | 0x0: Disabled<br>0x1: Enabled |      |      |

**GPIOA (0x30)\***

| BIT           | 7    | 6  | 5                  | 4 | 3 | 2   | 1 | 0 |
|---------------|------|--|--------------------|---|---|---|---|---|
| Field         | RSVD | RSVD   | GPIO_FWD_CDLY[5:0] |   |   |   |   |   |
| Reset         | 0b0  | 0b1  | 0b000001           |   |   |   |   |   |
| Access Type   |      |  | Write, Read        |   |   |   |   |   |
| BITFIELD      | BITS | DESCRIPTION  |                    |   |   | DECODE  |   |   |
| GPIO_FWD_CDLY | 5:0  | Compensation delay multiplier for the forward direction.<br><br>This must be the same value as GPIO_FWD_CDLY of the chip on the other side of the link.<br><br>Total delay is the (value + 1) multiplied by 1.7µs. Default delay is 3.4µs.<br><br>See GMSL user guide for further information. |                    |   |   | 0bXXXXXX: Forward compensation delay multiplier value |   |   |

**GPIOB (0x31)\***

| BIT           | 7         | 6   | 5                  | 4 | 3 | 2   | 1 | 0 |
|---------------|-----------|---|--------------------|---|---|---|---|---|
| Field         | RSVD[1:0] |   | GPIO_REV_CDLY[5:0] |   |   |   |   |   |
| Reset         | 0b10      |   | 0b001000           |   |   |   |   |   |
| Access Type   |           |   | Write, Read        |   |   |   |   |   |
| BITFIELD      | BITS      | DESCRIPTION   |                    |   |   | DECODE  |   |   |
| GPIO_REV_CDLY | 5:0       | Compensation delay multiplier for the reverse direction.<br><br>This must be the same value as GPIO_REV_CDLY of the chip on the other side of the link.<br><br>Total delay is the (value + 1) multiplied by 1.7µs. Default delay is 15.3µs.<br><br>See GMSL user guide for further information. |                    |   |   | 0bXXXXXX: Reverse compensation delay multiplier value |   |   |

[I2C\\_0 \(0x40\)\\*](#)

| BIT         | 7 | 6 | 5           | 4 | 3 | 2           | 1 | 0 |
|-------------|---|---|-------------|---|---|-------------|---|---|
| Field       | – | – | SLV_SH[1:0] |   | – | SLV_TO[2:0] |   |   |
| Reset       | – | – | 0b10        |   | – | 0b110       |   |   |
| Access Type | – | – | Write, Read |   | – | Write, Read |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| SLV_SH   | 5:4  | I <sup>2</sup> C-to-I <sup>2</sup> C slave-setup and hold-time setting.<br>Configures the interval between SDA and SCL transitions when driven by the internal I <sup>2</sup> C slave.  | 0b00: Set for I <sup>2</sup> C Fast-mode Plus speed (1Mbps)<br>0b01: Set for I <sup>2</sup> C Fast-mode speed (400Kbps)<br>0b10: Set for I <sup>2</sup> C Standard-mode speed (100Kbps)<br>0b11: Reserved |
| SLV_TO   | 2:0  | I <sup>2</sup> C-to-I <sup>2</sup> C slave timeout setting.<br>Internal GMSL2 I <sup>2</sup> C slave times out after the configured duration if it does not receive any response while waiting for a packet from remote device. | 0b000: 16µs<br>0b001: 1ms<br>0b010: 2ms<br>0b011: 4ms<br>0b100: 8ms<br>0b101: 16ms<br>0b110: 32ms<br>0b111: Disabled  |

[I2C\\_1 \(0x41\)\\*](#)

| BIT         | 7    | 6           | 5 | 4 | 3 | 2           | 1 | 0 |
|-------------|------|-------------|---|---|---|-------------|---|---|
| Field       | RSVD | MST_BT[2:0] |   |   | – | MST_TO[2:0] |   |   |
| Reset       | 0b0  | 0b101       |   |   | – | 0b110       |   |   |
| Access Type |      | Write, Read |   |   | – | Write, Read |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE   |
|----------|------|---|--|
| MST_BT   | 6:4  | I <sup>2</sup> C-to-I <sup>2</sup> C master bit rate setting<br>Configures the I <sup>2</sup> C bit rate used by the internal I <sup>2</sup> C master (in the device on the remote side from the external I <sup>2</sup> C master) Set this according to the I <sup>2</sup> C speed mode. | 0b000: 9.92Kbps - Set for I <sup>2</sup> C Standard mode speed<br>0b001: 33.2Kbps - Set for I <sup>2</sup> C Standard mode speed<br>0b010: 99.2Kbps - Set for I <sup>2</sup> C Standard or Fast-mode speed<br>0b011: 123Kbps - Set for I <sup>2</sup> C Fast-mode speed<br>0b100: 203Kbps - Set for I <sup>2</sup> C Fast-mode speed<br>0b101: 397Kbps - Set for I <sup>2</sup> C Fast or Fast-mode Plus speed<br>0b110: 625Kbps - Set for I <sup>2</sup> C Fast-mode Plus speed<br>0b111: 980Kbps - Set for I <sup>2</sup> C Fast-mode Plus speed |
| MST_TO   | 2:0  | I <sup>2</sup> C-to-I <sup>2</sup> C master timeout setting<br>Internal GMSL2 I <sup>2</sup> C master times out after the configured duration if it does not receive any response while waiting for a packet from remote device.  | 0b000: 16µs<br>0b001: 1ms<br>0b010: 2ms<br>0b011: 4ms<br>0b100: 8ms<br>0b101: 16ms<br>0b110: 32ms<br>0b111: Disabled   |

[I2C\\_2 \(0x42\)\\*](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | SRC_A[6:0]  |   |   |   |   |   |   | – |
| Reset       | 0b0000000   |   |   |   |   |   |   | – |
| Access Type | Write, Read |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION  | DECODE                                      |
|----------|------|--|---|
| SRC_A    | 7:1  | I <sup>2</sup> C address translator source A for main control channel.<br><br>When an I <sup>2</sup> C transaction across the GMSL link has a device address matching I <sup>2</sup> C SRC_A, the device address as seen on the remote side is replaced by the device address in I <sup>2</sup> C DST_A. | 0bXXXXXXXX: Value of I <sup>2</sup> C SRC_A |

[I2C\\_3 \(0x43\)\\*](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | DST_A[6:0]  |   |   |   |   |   |   | – |
| Reset       | 0b0000000   |   |   |   |   |   |   | – |
| Access Type | Write, Read |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION   | DECODE                                      |
|----------|------|---|---|
| DST_A    | 7:1  | I <sup>2</sup> C address translator destination A for main control channel.<br><br>See the description of I <sup>2</sup> C SRC_A. | 0bXXXXXXXX: Value of I <sup>2</sup> C DST_A |

[I2C\\_4 \(0x44\)\\*](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | SRC_B[6:0]  |   |   |   |   |   |   | – |
| Reset       | 0b0000000   |   |   |   |   |   |   | – |
| Access Type | Write, Read |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION  | DECODE                                      |
|----------|------|--|---|
| SRC_B    | 7:1  | I <sup>2</sup> C address translator source B for main control channel.<br><br>When an I <sup>2</sup> C transaction across the GMSL link has a device address matching I <sup>2</sup> C SRC_B, the device address as seen on the remote side is replaced by the device address in I <sup>2</sup> C DST_B. | 0bXXXXXXXX: Value of I <sup>2</sup> C SRC_B |

[I2C\\_5 \(0x45\)\\*](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | DST_B[6:0]  |   |   |   |   |   |   | – |
| Reset       | 0b0000000   |   |   |   |   |   |   | – |
| Access Type | Write, Read |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION   | DECODE                                      |
|----------|------|---|---|
| DST_B    | 7:1  | I <sup>2</sup> C address translator destination B for main control channel.<br>See the description of I <sup>2</sup> C SRC_B. | 0bXXXXXXXX: Value of I <sup>2</sup> C DST_B |

[UART\\_0 \(0x48\)\\*](#)

| BIT         | 7         | 6 | 5           | 4           | 3              | 2              | 1 | 0           |
|-------------|-----------|---|-------------|-------------|----------------|----------------|---|-------------|
| Field       | RSVD[1:0] |   | REM_MS_EN   | LOC_MS_EN   | BYPASS_DIS_PAR | BYPASS_TO[1:0] |   | BYPASS_EN   |
| Reset       | 0b01      |   | 0b0         | 0b0         | 0b0            | 0b01           |   | 0b0         |
| Access Type |           |   | Write, Read | Write, Read | Write, Read    | Write, Read    |   | Write, Read |

| BITFIELD       | BITS | DESCRIPTION   | DECODE   |
|----------------|------|---|--|
| REM_MS_EN      | 5    | Enables UART Bypass Mode Control by Remote GPIO Pin<br><br>When set, remote chip's GPIO is used as MS pin (UART mode select).<br><br>When MS is high, chip is in bypass mode, otherwise, chip is in base mode.<br><br>In bypass mode, the UART interface can only access an external UART interface through the MFP pins, and cannot access the control channel. In base mode, the control channel access is enabled. | 0b0: UART bypass mode not controlled by remote MS pin<br>0b1: UART bypass mode controlled by remote MS pin |
| LOC_MS_EN      | 4    | Enables UART bypass mode control by local GPIO pin<br><br>Set to use GPIO2 pin as MS pin (UART mode select).<br><br>When MS is high, chip is in bypass mode, otherwise, chip is in base mode.<br><br>In bypass mode, the UART interface can only access an external UART interface through the MFP pins, and cannot access the control channel. In base mode, the control channel access is enabled.                  | 0b0: UART bypass mode not controlled by local MS pin<br>0b1: UART bypass mode controlled by local MS pin   |
| BYPASS_DIS_PAR | 3    | Selects whether or not to receive and send parity bit in bypass mode  | 0b0: Receive and send parity bit in bypass mode<br>0b1: Do not receive and send parity bit in bypass mode  |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| BYPASS_TO | 2:1  | UART soft-bypass timeout duration   | 0b00: 2ms<br>0b01: 8ms<br>0b10: 32ms<br>0b11: Disabled (bypass mode active until next power cycle/PWDNB) |
| BYPASS_EN | 0    | Enable UART soft-bypass mode.<br><br>Bypass mode remains active as long as there is UART activity. When there is no UART activity for selected duration (configured by BYPASS_TO bitfield), device exits bypass mode, and the bit is automatically cleared. | soft-bypass<br>0b0: UART soft-bypass mode disabled<br>0b1: UART soft-bypass mode enabled                 |

**I2C\_PT\_0 (0x4C)**

| BIT         | 7 | 6 | 5              | 4 | 3 | 2              | 1 | 0 |
|-------------|---|---|----------------|---|---|----------------|---|---|
| Field       | – | – | SLV_SH_PT[1:0] |   | – | SLV_TO_PT[2:0] |   |   |
| Reset       | – | – | 0b10           |   | – | 0b110          |   |   |
| Access Type | – | – | Write, Read    |   | – | Write, Read    |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| SLV_SH_PT | 5:4  | Pass-through 1 and 2 I <sup>2</sup> C-to-I <sup>2</sup> C slave setup and hold-time setting (setup, hold).<br><br>Configures the interval between SDA and SCL transitions when driven by the internal I <sup>2</sup> C slave. Set this according to the I <sup>2</sup> C speed mode. | 0b00: Set for I <sup>2</sup> C Fast-mode Plus speed (1Mb/s)<br>0b01: Set for I <sup>2</sup> C Fast-mode speed (400kb/s)<br>0b10: Set for I <sup>2</sup> C Standard-mode speed (100kb/s)<br>0b11: Reserved |
| SLV_TO_PT | 2:0  | Pass-through 1 and 2 I <sup>2</sup> C-to-I <sup>2</sup> C slave timeout setting<br><br>Internal GMSL2 I <sup>2</sup> C slave times out after the configured duration if it does not receive any response while waiting for a packet from remote device.                              | 0b000: 16µs<br>0b001: 1ms<br>0b010: 2ms<br>0b011: 4ms<br>0b100: 8ms<br>0b101: 16ms<br>0b110: 32ms<br>0b111: Disabled  |

**I2C\_PT\_1 (0x4D)**

| BIT         | 7    | 6              | 5 | 4 | 3 | 2              | 1 | 0 |
|-------------|------|----------------|---|---|---|----------------|---|---|
| Field       | RSVD | MST_BT_PT[2:0] |   |   | – | MST_TO_PT[2:0] |   |   |
| Reset       | 0b0  | 0b101          |   |   | – | 0b110          |   |   |
| Access Type |      | Write, Read    |   |   | – | Write, Read    |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| MST_BT_PT | 6:4  | <p>Pass-through 1 and 2 I<sup>2</sup>C-to-I<sup>2</sup>C master bit rate setting</p> <p>Configures the I<sup>2</sup>C bit rate (SCL clock frequency) used by the internal I<sup>2</sup>C master (in the device on the remote side from the external I<sup>2</sup>C master).</p> <p>Set this according to the I<sup>2</sup>C speed mode.</p> | <p>0b000: 9.92Kbps - Set for I2C Standard mode speed</p> <p>0b001: 33.2Kbps - Set for I2C Standard mode speed</p> <p>0b010: 99.2Kbps - Set for I2C standard or Fast-mode speed</p> <p>0b011: 123Kbps - Set for I2C Fast-mode speed</p> <p>0b100: 203Kbps - Set for I2C Fast-mode speed</p> <p>0b101: 397Kbps - Set for I2C Fast or Fast-mode Plus speed</p> <p>0b110: 625Kbps - Set for I2C Fast-mode Plus speed</p> <p>0b111: 980Kbps - Set for I2C Fast-mode Plus speed</p> |
| MST_TO_PT | 2:0  | <p>Pass-through 1 and 2 I<sup>2</sup>C-to-I<sup>2</sup>C master timeout setting</p> <p>Internal GMSL2 I<sup>2</sup>C master times out after the configured duration if it does not receive any response while waiting for a packet from the remote device.</p>  | <p>0b000: 16μs</p> <p>0b001: 1ms</p> <p>0b010: 2ms</p> <p>0b011: 4ms</p> <p>0b100: 8ms</p> <p>0b101: 16ms</p> <p>0b110: 32ms</p> <p>0b111: Disabled</p>   |

**UART\_PT\_0 (0x4F)**

| BIT         | 7                | 6           | 5    | 4    | 3                | 2           | 1    | 0    |
|-------------|------------------|-------------|------|------|------------------|-------------|------|------|
| Field       | BITLEN_MAN_CFG_2 | DIS_PAR_2   | RSVD | RSVD | BITLEN_MAN_CFG_1 | DIS_PAR_1   | RSVD | RSVD |
| Reset       | 0b0              | 0b0         | 0b0  | 0b0  | 0b0              | 0b0         | 0b0  | 0b0  |
| Access Type | Write, Read      | Write, Read |      |      | Write, Read      | Write, Read |      |      |

| BITFIELD         | BITS | DESCRIPTION   | DECODE  |
|------------------|------|---|---|
| BITLEN_MAN_CFG_2 | 7    | Use the custom UART bit rate (selected by the BITLEN_PT_2_L - 0x54A and BITLEN_PT_2_H - 0x54B bitfields) in pass-through UART Channel 1 | <p>0b0: Use standard bit rate</p> <p>0b1: Use custom bit rate</p> |
| DIS_PAR_2        | 6    | Disable parity bit in pass-through UART Channel 2   | <p>0b0: Parity bit enabled</p> <p>0b1: Parity bit disabled</p>    |
| BITLEN_MAN_CFG_1 | 3    | Use the custom UART bit rate (selected by the BITLEN_PT_1_L - 0x548 and BITLEN_PT_1_H - 0x549 bitfields) in pass-through UART Channel 1 | <p>0b0: Use standard bit rate</p> <p>0b1: Use custom bit rate</p> |
| DIS_PAR_1        | 2    | Disable parity bit in pass-through UART Channel 1   | <p>0b0: Parity bit enabled</p> <p>0b1: Parity bit disabled</p>    |

**TX0 (0x58)\***

| BIT         | 7           | 6 | 5         | 4 | 3         | 2 | 1         | 0 |
|-------------|-------------|---|-----------|---|-----------|---|-----------|---|
| Field       | TX_CRC_EN   | – | RSVD[1:0] |   | RSVD[1:0] |   | RSVD[1:0] |   |
| Reset       | 0b0         | – | 0b11      |   | 0b00      |   | 0b00      |   |
| Access Type | Write, Read | – |           |   |           |   |           |   |

| BITFIELD  | BITS | DESCRIPTION         | DECODE  |
|-----------|------|---------------------|---|
| TX_CRC_EN | 7    | Transmit CRC Enable | 0b0: Transmit CRC disabled<br>0b1: Transmit CRC enabled |

**TX3 (0x5B)\***

| BIT         | 7 | 6 | 5 | 4 | 3 | 2 | 1               | 0 |
|-------------|---|---|---|---|---|---|-----------------|---|
| Field       | – | – | – | – | – | – | TX_STR_SEL[1:0] |   |
| Reset       | – | – | – | – | – | – | 0b10            |   |
| Access Type | – | – | – | – | – | – | Write, Read     |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| TX_STR_SEL | 1:0  | Stream ID used in packets transmitted from this channel | 0bXX: Stream ID for packets from this channel |

**TR0 (0x78)\***

| BIT         | 7           | 6           | 5         | 4 | 3         | 2 | 1         | 0 |
|-------------|-------------|-------------|-----------|---|-----------|---|-----------|---|
| Field       | TX_CRC_EN   | RX_CRC_EN   | RSVD[1:0] |   | RSVD[1:0] |   | RSVD[1:0] |   |
| Reset       | 0b1         | 0b1         | 0b11      |   | 0b00      |   | 0b00      |   |
| Access Type | Write, Read | Write, Read |           |   |           |   |           |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| TX_CRC_EN | 7    | When set, calculate and append CRC to each packet transmitted from this port.  | 0b0: Transmit CRC disabled<br>0b1: Transmit CRC enabled |
| RX_CRC_EN | 6    | When set, indicates that packets received at this port have appended CRC. CRC checking should be performed at each packet. | 0b0: Receive CRC disabled<br>0b1: Receive CRC enabled   |

**TR3 (0x7B)\***

| BIT         | 7 | 6 | 5 | 4 | 3 | 2              | 1 | 0 |
|-------------|---|---|---|---|---|----------------|---|---|
| Field       | – | – | – | – | – | TX_SRC_ID[2:0] |   |   |
| Reset       | – | – | – | – | – | 0b000          |   |   |
| Access Type | – | – | – | – | – | Write, Read    |   |   |



| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| TX_SRC_ID | 2:0  | Source identifier used in packets transmitted from this channel.<br><br>Default value is based on the device address set by the CFG0 pin. | 0bXXX: Source ID for packets from this channel |

**TR4 (0x7C)\***

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | RX_SRC_SEL[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xFF            |   |   |   |   |   |   |   |
| Access Type | Write, Read     |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| RX_SRC_SEL | 7:0  | Receive packets from selected sources.<br>Each bit indicates whether packets with that source ID should be received or not. This is a one-hot encoding.<br><br>For example, when SRC_SEL = 00001001, then packets with source ID equal to 0 and 3 are received. | 0x00: No packets received<br>0x01: Packets from source ID 0 received<br>0x02: Packets from source ID 1 received<br>0x03: Packets from source ID 0 and 1 received<br>0x04: Packets from source ID 2 received<br>...<br>...<br>0xFF: Packets from all source IDs received |

**TR0 (0x80, 0x90, 0xA0, 0xA8)\***

| BIT         | 7           | 6           | 5         | 4 | 3         | 2 | 1         | 0 |
|-------------|-------------|-------------|-----------|---|-----------|---|-----------|---|
| Field       | TX_CRC_EN   | RX_CRC_EN   | RSVD[1:0] |   | RSVD[1:0] |   | RSVD[1:0] |   |
| Reset       | 0b1         | 0b1         | 0b11      |   | 0b00      |   | 0b00      |   |
| Access Type | Write, Read | Write, Read |           |   |           |   |           |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| TX_CRC_EN | 7    | When set, calculate and append CRC to each packet transmitted from this port.   | 0b0: Transmit CRC disabled<br>0b1: Transmit CRC enabled |
| RX_CRC_EN | 6    | When set, indicates that packets received at this port have appended CRC and CRC checking should be performed at each packet. | 0b0: Receive CRC disabled<br>0b1: Receive CRC enabled   |

**TR3 (0x83, 0x93, 0xA3, 0xAB)\***

| BIT         | 7 | 6 | 5 | 4 | 3 | 2              | 1 | 0 |
|-------------|---|---|---|---|---|----------------|---|---|
| Field       | - | - | - | - | - | TX_SRC_ID[2:0] |   |   |
| Reset       | - | - | - | - | - | 0b000          |   |   |
| Access Type | - | - | - | - | - | Write, Read    |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| TX_SRC_ID | 2:0  | Source identifier used in packets transmitted from this channel.<br><br>Default value is based on the device address set by the CFG0 pin. | 0bXXX: Source ID for packets from this channel |

**TR4 (0x84, 0x94, 0xA4, 0xAC)\***

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | RX_SRC_SEL[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xFF            |   |   |   |   |   |   |   |
| Access Type | Write, Read     |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| RX_SRC_SEL | 7:0  | Receive packets from selected sources.<br>Each bit indicates whether packets with that source ID should be received or not. This is a one-hot encoding.<br><br>For example, when SRC_SEL = 00001001, then packets with source ID equal to 0 and 3 are received. | 0x00: No packets received<br>0x01: Packets from source ID 0 received<br>0x02: Packets from source ID 1 received<br>0x03: Packets from source ID 0 and 1 received<br>0x04: Packets from source ID 2 received<br>...<br>...<br>0xFF: Packets from all source IDs received |

**ARQ0 (0x85, 0x95, 0xA5, 0xAD)\***

| BIT         | 7    | 6    | 5    | 4    | 3           | 2                    | 1 | 0 |
|-------------|------|------|------|------|-------------|----------------------|---|---|
| Field       | RSVD | RSVD | RSVD | RSVD | ARQ0_EN     | DIS_DBL_A<br>CK_RETX | – | – |
| Reset       | 0b1  | 0b0  | 0b0  | 0b1  | 0b1         | 0b0                  | – | – |
| Access Type |      |      |      |      | Write, Read | Write, Read          | – | – |

| BITFIELD             | BITS | DESCRIPTION  | DECODE                                |
|----------------------|------|--|---------------------------------------|
| ARQ0_EN              | 3    | Enable ARQ. It is not recommended to change this value.        | 0b0: ARQ disabled<br>0b1: ARQ enabled |
| DIS_DBL_A<br>CK_RETX | 2    | Disable retransmission due to receiving same acknowledge twice | 0b0: Enabled<br>0b1: Disabled         |

**ARQ1 (0x86, 0x96, 0xA6, 0xAE)\***

| BIT         | 7 | 6         | 5 | 4 | 3 | 2 | 1                  | 0              |
|-------------|---|-----------|---|---|---|---|--------------------|----------------|
| Field       | – | RSVD[2:0] |   |   | – | – | MAX_RT_E<br>RR_OEN | RT_CNT_O<br>EN |
| Reset       | – | 0b111     |   |   | – | – | 0b1                | 0b0            |
| Access Type | – |           |   |   | – | – | Write, Read        | Write, Read    |

| BITFIELD       | BITS | DESCRIPTION   | DECODE  |
|----------------|------|---|---|
| MAX_RT_ERR_OEN | 1    | Enable reporting of ARQ maximum retransmission limit errors (MAX_RT_ERR) for this channel at ERRB pin.  | 0b0: ARQ maximum retransmission limit errors reporting at ERRB pin disabled<br>0b1: ARQ maximum retransmission limit errors reporting at ERRB pin enabled |
| RT_CNT_OEN     | 0    | Enable reporting of ARQ retransmission event for this channel at ERRB pin.<br><br>When enabled, ERRB is asserted when RT_CNT of this channel is greater than 0. | 0b0: ARQ retransmission count reporting at ERRB pin disabled<br>0b1: ARQ retransmission count reporting at ERRB pin enabled                               |

**ARQ2 (0x87, 0x97, 0xA7, 0xAF)**

| BIT         | 7                  | 6               | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|-----------------|---|---|---|---|---|---|
| Field       | MAX_RT_ERR         | RT_CNT[6:0]     |   |   |   |   |   |   |
| Reset       | 0b0                | 0b0000000       |   |   |   |   |   |   |
| Access Type | Read<br>Clears All | Read Clears All |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION  | DECODE   |
|------------|------|--|--|
| MAX_RT_ERR | 7    | Reached maximum retransmission limit (MAX_RT) for one packet in this channel | 0b0: Maximum retransmission limit not reached<br>0b1: Maximum retransmission limit reached |
| RT_CNT     | 6:0  | Total retransmission count in this channel                                   | 0xXX: Count of retransmissions for this channel  |

**VIDEO\_TX0 (0x110)\***

| BIT         | 7            | 6           | 5             | 4 | 3           | 2           | 1         | 0 |
|-------------|--------------|-------------|---------------|---|-------------|-------------|-----------|---|
| Field       | LINE_CRC_SEL | LINE_CRC_EN | ENC_MODE[1:0] |   | AUTO_BPP    | CLKDET_BYP  | RSVD[1:0] |   |
| Reset       | 0b0          | 0b1         | 0b10          |   | 0b1         | 0b0         | 0b00      |   |
| Access Type | Write, Read  | Write, Read | Write, Read   |   | Write, Read | Write, Read |           |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| LINE_CRC_SEL | 7    | Line CRC checksum generation with DE or HS  | 0b0: Use DE for Line CRC<br>0b1: Use HS for Line CRC  |
| LINE_CRC_EN  | 6    | Line CRC Enable<br><br>Generates a CRC code for the video line and sends it to the receiver side for comparison.  | 0b0: Line CRC disabled<br>0b1: Line CRC enabled   |
| ENC_MODE     | 5:4  | HS, VS, and DE Encoding mode. This Encoding mode is intended to minimize video bandwidth usage on the GMSL link. When the encoding is on, the HS, VS, DE signals are included in video packets across the GMSL link only when they toggle. Additionally, color pixel data may not be transmitted during horizontal or vertical blanking periods. When the encoding is off, the HS, VS, DE signals are included in all video packets, along with the color pixel data, and are sent every 36 pixels. | 0b00: HS, VS, DE encoding off<br>0b01: HS, VS, DE encoding on, color bits always sent<br>0b10: HS, VS, DE encoding on, color bits sent only when DE is high<br>0b11: HS, VS, DE encoding on, color bits sent only when HS is high |

| BITFIELD    | BITS | DESCRIPTION  | DECODE  |
|-------------|------|--|---|
| AUTO_BPP    | 3    | Select bits per pixel (BPP) source. Set to 0 if override of BPP is required. | 0b0: Use BPP from BPP register<br>0b1: Use BPP from MIPI receiver |
| CLKDET_BY P | 2    | Bypass PCLK detector   |   |

**VIDEO\_TX1 (0x111)\***

| BIT         | 7           | 6 | 5 | 4        | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|----------|---|---|---|---|
| Field       | RSVD[1:0]   |   |   | BPP[5:0] |   |   |   |   |
| Reset       | 0b01        |   |   | 0b011000 |   |   |   |   |
| Access Type | Write, Read |   |   |          |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION                        | DECODE                             |
|----------|------|------------------------------------|------------------------------------|
| BPP      | 5:0  | Color bits per pixel (RGB888 = 24) | 0bXXXXXX: Number of bits per pixel |

**VIDEO\_TX2 (0x112)\***

| BIT         | 7         | 6               | 5               | 4               | 3    | 2           | 1    | 0    |
|-------------|-----------|-----------------|-----------------|-----------------|------|-------------|------|------|
| Field       | PCLKDET   | DRIFT_ER R      | OVERFLO W       | FIFO_WAR N      | RSVD | LIM_HEAR T  | RSVD | RSVD |
| Reset       | 0b0       | 0b0             | 0b0             | 0b0             | 0b1  | 0b0         | 0b1  | 0b0  |
| Access Type | Read Only | Read Clears All | Read Clears All | Read Clears All |      | Write, Read |      |      |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| PCLKDET   | 7    | PCLK detected. This bit is asserted when a pixel clock can be extracted from the video interface receiver and the extracted frequency is measured to be greater than 4MHz.<br><br>Valid in all video modes.<br><br>Can also read the following registers to determine if MIPI data is received:<br>phy1_pkt_cnt, csi1_pkt_cnt.<br>In tunneling mode, can also read tun_pkt_cnt. | 0b0: Video received PCLK not detected<br>0b1: Video received PCLK detected                                     |
| DRIFT_ERR | 6    | VID_TX PCLK drift error detected.<br><br>After the video pipeline starts, PCLK cannot drift more than a certain amount (+/-1.25%) without restarting the subsystem.   | 0b0: Video transmit PCLK drift error not detected<br>0b1: Video transmit PCLK drift error detected             |
| OVERFLOW  | 5    | VID_TX FIFO has overflowed, video input throughput may be too high, bandwidth allocation on GMSL link for video may not be enough.  | 0b0: Video transmit FIFO has not overflowed<br>0b1: Video transmit FIFO has overflowed                         |
| FIFO_WARN | 4    | VID_TX FIFO is more than half full, video data coming from the video interface receiver is read by the scheduler  | 0b0: Video transmit FIFO is less than or equal to half full<br>0b1: Video transmit FIFO is more than half full |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| LIM_HEART | 2    | Disable heartbeat during blanking<br><br>Use together with SEQ_MISS_EN and DIS_PKT_DET bitfields in deserializer. | 0b0: Heartbeat enabled during blanking<br>0b1: Heartbeat disabled during blanking |

**SPI\_0 (0x170)\***

| BIT         | 7               | 6 | 5                  | 4 | 3           | 2           | 1           | 0           |
|-------------|-----------------|---|--------------------|---|-------------|-------------|-------------|-------------|
| Field       | SPI_LOC_ID[1:0] |   | SPI_CC_TRG_ID[1:0] |   | SPI_IGNR_ID | SPI_CC_EN   | MST_SLVN    | SPI_EN      |
| Reset       | 0b00            |   | 0b00               |   | 0b1         | 0b0         | 0b0         | 0b0         |
| Access Type | Write, Read     |   | Write, Read        |   | Write, Read | Write, Read | Write, Read | Write, Read |

| BITFIELD      | BITS | DESCRIPTION  | DECODE   |
|---------------|------|--|--|
| SPI_LOC_ID    | 7:6  | Program to local ID if filtering packets based on header ID.                 | 0b00: ID = 0<br>0b01: ID = 1<br>0b10: ID = 2<br>0b11: ID = 3                     |
| SPI_CC_TRG_ID | 5:4  | ID for GMSL header in SPI control-channel bridge mode                        | 0b00: ID = 0<br>0b01: ID = 1<br>0b10: ID = 2<br>0b11: ID = 3                     |
| SPI_IGNR_ID   | 3    | Selects if SPI should use or ignore header ID to decide on packet acceptance | 0b0: Accept only packets with proper ID<br>0b1: Ignore ID and accept all packets |
| SPI_CC_EN     | 2    | Enable control channel SPI bridge function                                   | 0b0: SPI bridge disabled<br>0b1: SPI bridge enabled                              |
| MST_SLVN      | 1    | Selects if SPI is master or slave  | 0b0: SPI slave<br>0b1: SPI master  |
| SPI_EN        | 0    | Enable SPI channel   | 0b0: SPI channel disabled<br>0b1: SPI channel enabled                            |

**SPI\_1 (0x171)\***

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1                  | 0 |
|-------------|----------------|---|---|---|---|---|--------------------|---|
| Field       | SPI_LOC_N[5:0] |   |   |   |   |   | SPI_BASE_PRIO[1:0] |   |
| Reset       | 0b000111       |   |   |   |   |   | 0b01               |   |
| Access Type | Write, Read    |   |   |   |   |   | Write, Read        |   |

| BITFIELD      | BITS | DESCRIPTION   | DECODE   |
|---------------|------|---|--|
| SPI_LOC_N     | 7:2  | Sets the packet size ((2N + 1) bytes) for GMSL2 SPI packets<br><br>If this is programmed to a value more than 7, ARQ of the SPI channel must be disabled. | 0b000000: Packet size is 1 byte<br>0b000001: Packet size is 3 bytes<br>...<br>0b111111: Packet size is 127 bytes |
| SPI_BASE_PRIO | 1:0  | Starting GMSL Request Priority, advances by 1 (if room) if Tx Buffer is over half full.   |  |

**SPI\_2 (0x172)\***

| BIT         | 7                 | 6 | 5 | 4              | 3           | 2           | 1              | 0              |
|-------------|-------------------|---|---|----------------|-------------|-------------|----------------|----------------|
| Field       | REQ_HOLD_OFF[2:0] |   |   | FULL_SCK_SETUP | SPI_MOD3_F  | SPI_MOD3    | SPIM_SS2_ACT_H | SPIM_SS1_ACT_H |
| Reset       | 0b000             |   |   | 0b0            | 0b0         | 0b0         | 0b1            | 0b1            |
| Access Type | Write, Read       |   |   | Write, Read    | Write, Read | Write, Read | Write, Read    | Write, Read    |

| BITFIELD       | BITS | DESCRIPTION   | DECODE  |
|----------------|------|---|---|
| REQ_HOLD_OFF   | 7:5  | The SPI port transmits data across the GMSL link as soon as it is received. This register can be used to hold off transmitting data across GMSL link until this number of extra bytes are received on the SPI port. No extra bytes means the data is transmitted as soon as it is received. | 0b00: No extra bytes<br>0b01: 1 extra byte<br>0b10: 2 extra bytes<br>0b11: 3 extra bytes  |
| FULL_SCK_SETUP | 4    | Sample MISO after half or full SCLK period.   | 0b0: MISO sampled after half SCLK period<br>0b1: MISO sampled after full SCLK period  |
| SPI_MOD3_F     | 3    | Allows the suppression of an extra SCLK prior to SS deassertion when SPI mode 3 is selected.  | 0b0: Extra SCLK present prior to SS deassertion when in SPI mode 3<br>0b1: Extra SCLK suppressed prior to SS deassertion when in SPI mode 3   |
| SPI_MOD3       | 2    | Selects SPI mode 0 or 3<br><br>In both modes, data is sampled on the rising clock edge and shifted out on the falling edge.   | 0b0: SPI mode 0. Clock polarity and phase are 0. Slave select asserts when clock is low.<br>0b1: SPI mode 3. Clock polarity and phase are 1. Slave select asserts when clock is high. |
| SPIM_SS2_ACT_H | 1    | Sets the polarity for SS2 when the SPI is a master.   | 0b0: Slave select 2 is active low<br>0b1: Slave select 2 is active high   |
| SPIM_SS1_ACT_H | 0    | Sets the polarity for SS1 when the SPI is a master.   | 0b0: Slave select 1 is active low<br>0b1: Slave select 1 is active high   |

**SPI\_3 (0x173)\***

| BIT         | 7                     | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------------|---|---|---|---|---|---|---|
| Field       | SPIM_SS_DLY_CLKS[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                  |   |   |   |   |   |   |   |
| Access Type | Write, Read           |   |   |   |   |   |   |   |

| BITFIELD         | BITS | DESCRIPTION   | DECODE                       |
|------------------|------|---|------------------------------|
| SPIM_SS_DLY_CLKS | 7:0  | Number of 300MHz clock cycles to delay between:<br>- Assertion of SS and start of SCLK pulses<br>- End of SCLK pulses and deassertion of SS<br>- Deassertion of SS and reassertion of SS (if necessary) | 0xXX: Number of clock cycles |

**SPI\_4 (0x174)\***

| BIT              | 7                     | 6  | 5 | 4 | 3  | 2 | 1 | 0 |
|------------------|-----------------------|--|---|---|--|---|---|---|
| Field            | SPIM_SCK_LO_CLKS[7:0] |  |   |   |  |   |   |   |
| Reset            | 0x00                  |  |   |   |  |   |   |   |
| Access Type      | Write, Read           |  |   |   |  |   |   |   |
| BITFIELD         | BITS                  | DESCRIPTION                                    |   |   | DECODE   |   |   |   |
| SPIM_SCK_LO_CLKS | 7:0                   | Number of 300MHz clock cycles for SCK low time |   |   | 0xXX: Number of clock cycles for SCLK low time |   |   |   |

**SPI\_5 (0x175)\***

| BIT              | 7                     | 6  | 5 | 4 | 3   | 2 | 1 | 0 |
|------------------|-----------------------|--|---|---|---|---|---|---|
| Field            | SPIM_SCK_HI_CLKS[7:0] |  |   |   |   |   |   |   |
| Reset            | 0x00                  |  |   |   |   |   |   |   |
| Access Type      | Write, Read           |  |   |   |   |   |   |   |
| BITFIELD         | BITS                  | DESCRIPTION                                      |   |   | DECODE  |   |   |   |
| SPIM_SCK_HI_CLKS | 7:0                   | Number of 300MHz clock cycles for SCLK high time |   |   | 0xXX: Number of clock cycles for SCLK high time |   |   |   |

**SPI\_6 (0x176)\***

| BIT         | 7    | 6   | 5         | 4           | 3  | 2           | 1           | 0           |
|-------------|------|---|-----------|-------------|--|-------------|-------------|-------------|
| Field       | –    | –   | BNE       | SPIS_RWN    | SS_IO_EN_2   | SS_IO_EN_1  | BNE_IO_EN   | RWN_IO_EN   |
| Reset       | –    | –   | 0b0       | 0b0         | 0b0  | 0b0         | 0b0         | 0b0         |
| Access Type | –    | –   | Read Only | Write, Read | Write, Read  | Write, Read | Write, Read | Write, Read |
| BITFIELD    | BITS | DESCRIPTION   |           |             | DECODE   |             |             |             |
| BNE         | 5    | Alternate status register to use for BNE status if MFP is not available               |           |             | 0b0: Buffer empty<br>0b1: Buffer not empty                                   |             |             |             |
| SPIS_RWN    | 4    | Alternate GPU control register to use for Read/Write control if MFP is not available. |           |             | 0b0: Write<br>0b1: Read  |             |             |             |
| SS_IO_EN_2  | 3    | Enable MFP for use as Slave Select 2 output.  |           |             | 0b0: MFP not used for SPI SS2 function<br>0b1: MFP used for SPI SS2 function |             |             |             |
| SS_IO_EN_1  | 2    | Enable MFP for use as Slave Select 1 output.  |           |             | 0b0: MFP not used for SPI SS1 function<br>0b1: MFP used for SPI SS1 function |             |             |             |
| BNE_IO_EN   | 1    | Enable MFP for use as BNE output for SPI data available status.                       |           |             | 0b0: MFP not used for SPI BNE function<br>0b1: MFP used for SPI BNE function |             |             |             |
| RWN_IO_EN   | 0    | Enable MFP for use as RO input for control of SPI data movement.                      |           |             | 0b0: MFP not used for SPI RO function<br>0b1: MFP used for SPI RO function   |             |             |             |

[SPI\\_7 \(0x177\)](#)

| BIT         | 7                  | 6                  | 5 | 4                  | 3 | 2 | 1 | 0 |
|-------------|--------------------|--------------------|---|--------------------|---|---|---|---|
| Field       | SPI_RX_OVRFLW      | SPI_TX_OVRFLW      | – | SPIS_BYTE_CNT[4:0] |   |   |   |   |
| Reset       | 0b0                | 0b0                | – | 0b00000            |   |   |   |   |
| Access Type | Read<br>Clears All | Read<br>Clears All | – | Read Only          |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE  |
|---------------|------|--|---|
| SPI_RX_OVRFLW | 7    | SPI Rx Buffer Overflow Flag                                    | 0b0: No SPI Rx buffer overflow<br>0b1: SPI Rx buffer overflow |
| SPI_TX_OVRFLW | 6    | SPI Tx Buffer Overflow flag                                    | 0b0: No SPI Tx buffer overflow<br>0b1: SPI Tx buffer overflow |
| SPIS_BYTE_CNT | 4:0  | Number of SPI data bytes available for reading from Rx buffer. | 0bXXXXX: Number of bytes available                            |

[SPI\\_8 \(0x178\)\\*](#)

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | REQ_HOLD_OFF_TO[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Write, Read          |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION  | DECODE   |
|-----------------|------|--|--|
| REQ_HOLD_OFF_TO | 7:0  | Timeout delay (in 100nS increments) for GMSL request hold off transmitting data across the GMSL link until extra bytes are received (0 is disable). See REQ_HOLD_OFF for more details. | 0xXX: Number of 100nS delay increments for GMSL request hold off |

[CROSS\\_0 \(0x236\)\\*](#)

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS0_I    | CROSS0_F    | CROSS0[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00000     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS0_I | 6    | Invert outgoing bit 0  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS0_F | 5    | Force outgoing bit 0 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS0   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 0  | 0bXXXXX: Incoming bit position                          |



**CROSS\_1 (0x237)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS1_I    | CROSS1_F    | CROSS1[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00001     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS1_I | 6    | Invert outgoing bit 1  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS1_F | 5    | Force outgoing bit 1 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS1   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 1  | 0bXXXXX: Incoming bit position                          |

**CROSS\_2 (0x238)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS2_I    | CROSS2_F    | CROSS2[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00010     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS2_I | 6    | Invert outgoing bit 2  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS2_F | 5    | Force outgoing bit 2 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS2   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 2  | 0bXXXXX: Incoming bit position                          |

**CROSS\_3 (0x239)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS3_I    | CROSS3_F    | CROSS3[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00011     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS3_I | 6    | Invert outgoing bit 3  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS3_F | 5    | Force outgoing bit 3 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS3   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 3  | 0bXXXXX: Incoming bit position                          |

**CROSS\_4 (0x23A)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS4_I    | CROSS4_F    | CROSS4[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00100     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS4_I | 6    | Invert outgoing bit 4  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS4_F | 5    | Force outgoing bit 4 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS4   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 4  | 0bXXXXX: Incoming bit position                          |

**CROSS\_5 (0x23B)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS5_I    | CROSS5_F    | CROSS5[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00101     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS5_I | 6    | Invert outgoing bit 5  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS5_F | 5    | Force outgoing bit 5 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS5   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 5  | 0bXXXXX: Incoming bit position                          |

**CROSS\_6 (0x23C)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS6_I    | CROSS6_F    | CROSS6[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00110     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS6_I | 6    | Invert outgoing bit 6  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS6_F | 5    | Force outgoing bit 6 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS6   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 6  | 0bXXXXX: Incoming bit position                          |

**CROSS\_7 (0x23D)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS7_I    | CROSS7_F    | CROSS7[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b00111     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS7_I | 6    | Invert outgoing bit 7  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS7_F | 5    | Force outgoing bit 7 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS7   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 7  | 0bXXXXX: Incoming bit position                          |

**CROSS\_8 (0x23E)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS8_I    | CROSS8_F    | CROSS8[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01000     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS8_I | 6    | Invert outgoing bit 8  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS8_F | 5    | Force outgoing bit 8 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS8   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 8  | 0bXXXXX: Incoming bit position                          |

**CROSS\_9 (0x23F)\***

| BIT         | 7 | 6           | 5           | 4           | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|-------------|---|---|---|---|
| Field       | – | CROSS9_I    | CROSS9_F    | CROSS9[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01001     |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| CROSS9_I | 6    | Invert outgoing bit 9  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS9_F | 5    | Force outgoing bit 9 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS9   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 9  | 0bXXXXX: Incoming bit position                          |

**CROSS\_10 (0x240)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS10_I   | CROSS10_F   | CROSS10[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01010      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS10_I | 6    | Invert outgoing bit 10  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS10_F | 5    | Force outgoing bit 10 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS10   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 10  | 0bXXXXX: Incoming bit position                          |

**CROSS\_11 (0x241)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS11_I   | CROSS11_F   | CROSS11[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01011      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS11_I | 6    | Invert outgoing bit 11  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS11_F | 5    | Force outgoing bit 11 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS11   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 11  | 0bXXXXX: Incoming bit position                          |

**CROSS\_12 (0x242)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS12_I   | CROSS12_F   | CROSS12[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01100      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS12_I | 6    | Invert outgoing bit 12  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS12_F | 5    | Force outgoing bit 12 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |

| BITFIELD | BITS | DESCRIPTION  | DECODE                         |
|----------|------|--|--------------------------------|
| CROSS12  | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 12 | 0bXXXXX: Incoming bit position |

**CROSS 13 (0x243)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS13_I   | CROSS13_F   | CROSS13[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01101      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS13_I | 6    | Invert outgoing bit 13  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS13_F | 5    | Force outgoing bit 13 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS13   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 13  | 0bXXXXX: Incoming bit position                          |

**CROSS 14 (0x244)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS14_I   | CROSS14_F   | CROSS14[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01110      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS14_I | 6    | Invert outgoing bit 14  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS14_F | 5    | Force outgoing bit 14 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS14   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 14  | 0bXXXXX: Incoming bit position                          |

**CROSS 15 (0x245)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS15_I   | CROSS15_F   | CROSS15[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b01111      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION            | DECODE                                    |
|-----------|------|------------------------|---|
| CROSS15_I | 6    | Invert outgoing bit 15 | 0b0: Do not invert bit<br>0b1: Invert bit |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS15_F | 5    | Force outgoing bit 15 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS15   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 15  | 0bXXXXX: Incoming bit position                          |

**CROSS 16 (0x246)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS16_I   | CROSS16_F   | CROSS16[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10000      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS16_I | 6    | Invert outgoing bit 16  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS16_F | 5    | Force outgoing bit 16 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS16   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 16  | 0bXXXXX: Incoming bit position                          |

**CROSS 17 (0x247)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS17_I   | CROSS17_F   | CROSS17[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10001      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS17_I | 6    | Invert outgoing bit 17  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS17_F | 5    | Force outgoing bit 17 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS17   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 17  | 0bXXXXX: Incoming bit position                          |

**CROSS 18 (0x248)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS18_I   | CROSS18_F   | CROSS18[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10010      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS18_I | 6    | Invert outgoing bit 18  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS18_F | 5    | Force outgoing bit 18 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS18   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 18  | 0bXXXXX: Incoming bit position                          |

**CROSS 19 (0x249)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS19_I   | CROSS19_F   | CROSS19[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10011      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS19_I | 6    | Invert outgoing bit 19  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS19_F | 5    | Force outgoing bit 19 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS19   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 19  | 0bXXXXX: Incoming bit position                          |

**CROSS 20 (0x24A)\***

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS20_I   | CROSS20_F   | CROSS20[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10100      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS20_I | 6    | Invert outgoing bit 20  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS20_F | 5    | Force outgoing bit 20 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS20   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 20  | 0bXXXXX: Incoming bit position                          |

[CROSS\\_21 \(0x24B\)\\*](#)

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS21_I   | CROSS21_F   | CROSS21[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10101      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS21_I | 6    | Invert outgoing bit 21  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS21_F | 5    | Force outgoing bit 21 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS21   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 21  | 0bXXXXX: Incoming bit position                          |

[CROSS\\_22 \(0x24C\)\\*](#)

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS22_I   | CROSS22_F   | CROSS22[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10110      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS22_I | 6    | Invert outgoing bit 22  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS22_F | 5    | Force outgoing bit 22 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSS22   | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 22  | 0bXXXXX: Incoming bit position                          |

[CROSS\\_23 \(0x24D\)\\*](#)

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSS23_I   | CROSS23_F   | CROSS23[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b10111      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| CROSS23_I | 6    | Invert outgoing bit 23  | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSS23_F | 5    | Force outgoing bit 23 to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |



| BITFIELD | BITS | DESCRIPTION  | DECODE                         |
|----------|------|--|--------------------------------|
| CROSS23  | 4:0  | Maps incoming bit position set by this field to the outgoing bit position 23 | 0bXXXXX: Incoming bit position |

### VTX0 (0x24E)\*

Used to generate sync signals for image sensor. Uses reference clock output (derived from XTAL clock) as reference to generate sync signals for image sensor.

REF\_VTG works the same as regular VTG, with the exception of how they are connected internally. VTG uses the input pixel clock as the clock source, and HS, VS, DE signals generated can replace the HS, VS, DE signals received in the input video.

REF\_VTG uses the REFGEN\_PLL output as the clock source. REFGEN\_PLL is a DPLL that uses XTAL clock as the clock source. It can be programmed to generate any PCLK frequency. PCLK generated by REFGEN\_PLL (RCLK in pin description) and HS, VS, DE generated by REF\_VTG are synchronous to RCLK and output from MFP pins, when enabled. These are then used by the image sensor, which drives the CSI-2 input of the serializer.

| BIT                | 7           | 6           | 5           | 4           | 3           | 2           | 1             | 0 |
|--------------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|---|
| <b>Field</b>       | GEN_VS      | GEN_HS      | GEN_DE      | VS_INV      | HS_INV      | DE_INV      | VTG_MODE[1:0] |   |
| <b>Reset</b>       | 0b0         | 0b0         | 0b0         | 0b0         | 0b0         | 0b0         | 0b11          |   |
| <b>Access Type</b> | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE                                      |
|----------|------|---|---|
| GEN_VS   | 7    | Enable to generate VS output according to the timing definition | 0b0: Do not generate VS<br>0b1: Generate VS |
| GEN_HS   | 6    | Enable to generate HS output according to the timing definition | 0b0: Do not generate HS<br>0b1: Generate HS |
| GEN_DE   | 5    | Enable to generate DE output according to the timing definition | 0b0: Do not generate DE<br>0b1: Generate DE |
| VS_INV   | 4    | Invert V <sub>SYNC</sub> output of video-timing generator       | 0b0: Do not invert VS<br>0b1: Invert VS     |
| HS_INV   | 3    | Invert H <sub>SYNC</sub> output of video-timing generator       | 0b0: Do not invert HS<br>0b1: Invert HS     |
| DE_INV   | 2    | Invert DE output of video-timing generator                      | 0b0: Do not invert DE<br>0b1: Invert DE     |

| BITFIELD | BITS | DESCRIPTION   | DECODE   |
|----------|------|---|--|
| VTG_MODE | 1:0  | <p>Video interface timing-generation mode. Used when VTG GEN_VS, GEN_HS, or GEN_DE are enabled.</p> <p>00 = VS tracking mode. VS input's period (VS_HIGH + VS_LOW) is tracked. After VS tracking is locked, any VS input edge (glitches) not in the expected PCLK cycle is ignored. VS tracking is locked with three consecutive matches and unlocked by three consecutive mismatches. When unlocked or powered up, the next VS input edge is assumed to be the right VS edge.</p> <p>01 = VS one-trigger mode (default)<br/>One VS input edge triggers the generation of one frame of VS/HS/DE output. If the next VS input edge comes earlier or later than expected by VS period, the newly generated frame is correct. The current VS/HS/DE output is cut or extended at the time point of the rising edge of the newly-generated VS/HS/DE output.</p> <p>10 = Auto-repeat mode<br/>VS input edge triggers the generation of continuous frames of VS/HS/DE output even if no more VS input edges are seen. If the next VS input edge comes earlier or later than expected by VS period, the newly-generated frame is correct. The current VS/HS/DE output is cut or extended at the time point of the rising edge of the newly-generated VS/HS/DE output.</p> | <p>0b00: VS tracking mode<br/>0b01: VS one trigger mode<br/>0b10: Auto-repeat mode<br/>0b11: Free running mode</p> |

**VTX1 (0x24F)\***

| BIT         | 7 | 6 | 5           | 4 | 3                   | 2 | 1 | 0           |
|-------------|---|---|-------------|---|---------------------|---|---|-------------|
| Field       | – | – | PCLKDET_VTX | – | PATGEN_CLK_SRC[2:0] |   |   | VS_TRIG     |
| Reset       | – | – | 0b0         | – | 0b000               |   |   | 0b1         |
| Access Type | – | – | Read Only   | – | Write, Read         |   |   | Write, Read |

| BITFIELD    | BITS | DESCRIPTION   | DECODE   |
|-------------|------|---|--|
| PCLKDET_VTX | 5    | <p>PCLK detected. This bit is asserted when a pixel clock can be extracted from the video interface receiver, and the extracted frequency is measured to be greater than 4MHz.</p> <p>Valid in all video modes.</p> <p>Also read the following registers to determine if MIPI data is received: phy1_pkt_cnt, csi1_pkt_cnt.<br/>In tunneling mode, tun_pkt_cnt can be read.</p> | <p>0b0: PCLK not detected<br/>0b1: PCLK detected</p> |

| BITFIELD       | BITS | DESCRIPTION   | DECODE   |
|----------------|------|---|--|
| PATGEN_CLK_SRC | 3:1  | Pattern generator clock source for video PRBS, checkerboard, and gradient patterns. | 3'b0XX: Use external clock<br>3'b100: Use 25MHz internal clock<br>3'b101: Use 75MHz internal clock<br>3'b110: Use 150MHz internal clock<br>3'b111: Use 375MHz internal clock |
| VS_TRIG        | 0    | Select VS trigger edge (positive vs. negative polarity of VS)                       | 0b0: Falling edge<br>0b1: Rising edge  |

**VTX2 (0x250)\***

| BIT         | 7             | 6   | 5                                     | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---------------------------------------|---|---|---|---|---|
| Field       | VS_DLY_2[7:0] |   |                                       |   |   |   |   |   |
| Reset       | 0x00          |   |                                       |   |   |   |   |   |
| Access Type | Write, Read   |   |                                       |   |   |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION   | DECODE                                |   |   |   |   |   |
| VS_DLY_2    | 7:0           | VS delay in terms of PCLK cycles<br>The output VS is delayed by VS_DLY cycles from the input VS. (bits [23:16]) | 0xXX: Most significant byte of VS_DLY |   |   |   |   |   |

**VTX3 (0x251)\***

| BIT         | 7             | 6  | 5                                       | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|--|---|---|---|---|---|---|
| Field       | VS_DLY_1[7:0] |  |   |   |   |   |   |   |
| Reset       | 0x00          |  |   |   |   |   |   |   |
| Access Type | Write, Read   |  |   |   |   |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION  | DECODE                                  |   |   |   |   |   |
| VS_DLY_1    | 7:0           | VS delay in terms of PCLK cycles<br>The output VS is delayed by VS_DLY cycles from the input VS. (bits [15:8]) | 0xXX: Middle significant byte of VS_DLY |   |   |   |   |   |

**VTX4 (0x252)\***

| BIT         | 7             | 6   | 5                                      | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|--|---|---|---|---|---|
| Field       | VS_DLY_0[7:0] |   |  |   |   |   |   |   |
| Reset       | 0x00          |   |  |   |   |   |   |   |
| Access Type | Write, Read   |   |  |   |   |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION   | DECODE                                 |   |   |   |   |   |
| VS_DLY_0    | 7:0           | VS delay in terms of PCLK cycles<br>The output VS is delayed by VS_DLY cycles from the input VS. (bits [7:0]) | 0xXX: Least significant byte of VS_DLY |   |   |   |   |   |

**VTX5 (0x253)\***

|                    |                |          |          |          |          |          |          |          |
|--------------------|----------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>       | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | VS_HIGH_2[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00           |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read    |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>                                    | <b>DECODE</b>                                 |
|-----------------|-------------|---|---|
| VS_HIGH_2       | 7:0         | VS high period in terms of PCLK cycles (bits [23:16]) | 0xXX: Most significant byte of VS high period |

**VTX6 (0x254)\***

|                    |                |          |          |          |          |          |          |          |
|--------------------|----------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>       | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | VS_HIGH_1[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00           |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read    |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>                                   | <b>DECODE</b>                                   |
|-----------------|-------------|--|---|
| VS_HIGH_1       | 7:0         | VS high period in terms of PCLK cycles (bits [15:8]) | 0xXX: Middle significant byte of VS high period |

**VTX7 (0x255)\***

|                    |                |          |          |          |          |          |          |          |
|--------------------|----------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>       | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | VS_HIGH_0[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00           |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read    |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>                                  | <b>DECODE</b>                                  |
|-----------------|-------------|---|--|
| VS_HIGH_0       | 7:0         | VS high period in terms of PCLK cycles (bits [7:0]) | 0xXX: Least significant byte of VS high period |

**VTX8 (0x256)\***

|                    |               |          |          |          |          |          |          |          |
|--------------------|---------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>      | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | VS_LOW_2[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00          |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read   |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>                                   | <b>DECODE</b>                                |
|-----------------|-------------|--|--|
| VS_LOW_2        | 7:0         | VS low period in terms of PCLK cycles (bits [23:16]) | 0xXX: Most significant byte of VS low period |

**VTX9 (0x257)\***

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | VS_LOW_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE   |
|----------|------|---|--|
| VS_LOW_1 | 7:0  | VS low period in terms of PCLK cycles (bits [15:8]) | 0xXX: Middle significant byte of VS low period |

**VTX10 (0x258)\***

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | VS_LOW_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| VS_LOW_0 | 7:0  | VS low period in terms of PCLK cycles (bits [7:0]) | 0xXX: Least significant byte of VS low period |

**VTX11 (0x259)\***

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | V2H_2[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE   |
|----------|------|---|--|
| V2H_2    | 7:0  | VS edge to the rising edge of the first HS in terms of PCLK cycles (bits [23:16]) | 0xXX: Most significant byte of VS edge to first HS rising edge |

**VTX12 (0x25A)\***

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | V2H_1[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE   |
|----------|------|--|--|
| V2H_1    | 7:0  | VS edge to the rising edge of the first HS in terms of PCLK cycles (bits [15:8]) | 0xXX: Middle significant byte of VS edge to first HS rising edge |

[VTX13 \(0x25B\)\\*](#)

| BIT         | 7           | 6   | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | V2H_0[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |
| BITFIELD    | BITS        | DESCRIPTION   |   |   | DECODE  |   |   |   |
| V2H_0       | 7:0         | VS edge to the rising edge of the first HS in terms of PCLK cycles (bits [7:0]) |   |   | 0xXX: Least significant byte of VS edge to first HS rising edge |   |   |   |

[VTX14 \(0x25C\)\\*](#)

| BIT         | 7              | 6  | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|----------------|--|---|---|---|---|---|---|
| Field       | HS_HIGH_1[7:0] |  |   |   |   |   |   |   |
| Reset       | 0x00           |  |   |   |   |   |   |   |
| Access Type | Write, Read    |  |   |   |   |   |   |   |
| BITFIELD    | BITS           | DESCRIPTION  |   |   | DECODE  |   |   |   |
| HS_HIGH_1   | 7:0            | HS high period in terms of PCLK cycles (bits [15:8]) |   |   | 0xXX: Most significant byte of HS high period |   |   |   |

[VTX15 \(0x25D\)\\*](#)

| BIT         | 7              | 6   | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|----------------|---|---|---|--|---|---|---|
| Field       | HS_HIGH_0[7:0] |   |   |   |  |   |   |   |
| Reset       | 0x00           |   |   |   |  |   |   |   |
| Access Type | Write, Read    |   |   |   |  |   |   |   |
| BITFIELD    | BITS           | DESCRIPTION   |   |   | DECODE   |   |   |   |
| HS_HIGH_0   | 7:0            | HS high period in terms of PCLK cycles (bits [7:0]) |   |   | 0xXX: Least significant byte of HS high period |   |   |   |

[VTX16 \(0x25E\)\\*](#)

| BIT         | 7             | 6   | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|---|---|---|--|---|---|---|
| Field       | HS_LOW_1[7:0] |   |   |   |  |   |   |   |
| Reset       | 0x00          |   |   |   |  |   |   |   |
| Access Type | Write, Read   |   |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION   |   |   | DECODE                                       |   |   |   |
| HS_LOW_1    | 7:0           | HS low period in terms of PCLK cycles (bits [15:8]) |   |   | 0xXX: Most significant byte of HS low period |   |   |   |

**VTX17 (0x25F)\***

| BIT         | 7             | 6  | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|---------------|--|---|---|---|---|---|---|
| Field       | HS_LOW_0[7:0] |  |   |   |   |   |   |   |
| Reset       | 0x00          |  |   |   |   |   |   |   |
| Access Type | Write, Read   |  |   |   |   |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION  |   |   | DECODE  |   |   |   |
| HS_LOW_0    | 7:0           | HS low period in terms of PCLK cycles (bits [7:0]) |   |   | 0xXX: Least significant byte of HS low period |   |   |   |

**VTX18 (0x260)\***

| BIT         | 7             | 6                                 | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|-----------------------------------|---|---|--|---|---|---|
| Field       | HS_CNT_1[7:0] |                                   |   |   |  |   |   |   |
| Reset       | 0x00          |                                   |   |   |  |   |   |   |
| Access Type | Write, Read   |                                   |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                       |   |   | DECODE   |   |   |   |
| HS_CNT_1    | 7:0           | HS pulses per frame (bits [15:8]) |   |   | 0xXX: Most significant byte of HS pulses per frame |   |   |   |

**VTX19 (0x261)\***

| BIT         | 7             | 6                                | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|---------------|----------------------------------|---|---|---|---|---|---|
| Field       | HS_CNT_0[7:0] |                                  |   |   |   |   |   |   |
| Reset       | 0x00          |                                  |   |   |   |   |   |   |
| Access Type | Write, Read   |                                  |   |   |   |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                      |   |   | DECODE  |   |   |   |
| HS_CNT_0    | 7:0           | HS pulses per frame (bits [7:0]) |   |   | 0xXX: Least significant byte of HS pulses per frame |   |   |   |

**VTX20 (0x262)\***

| BIT         | 7           | 6   | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|-------------|---|---|---|--|---|---|---|
| Field       | V2D_2[7:0]  |   |   |   |  |   |   |   |
| Reset       | 0x00        |   |   |   |  |   |   |   |
| Access Type | Write, Read |   |   |   |  |   |   |   |
| BITFIELD    | BITS        | DESCRIPTION   |   |   | DECODE   |   |   |   |
| V2D_2       | 7:0         | VS edge to the rising edge of the first DE in terms of PCLK cycles (bits [23:16]) |   |   | 0xXX: Most significant byte of VS edge to first DE |   |   |   |

[VTX21 \(0x263\)\\*](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | V2D_1[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE   |
|----------|------|--|--|
| V2D_1    | 7:0  | VS edge to the rising edge of the first DE in terms of PCLK cycles (bits [15:8]) | 0xXX: Middle significant byte of VS edge to first DE |

[VTX22 \(0x264\)\\*](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | V2D_0[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| V2D_0    | 7:0  | VS edge to the rising edge of the first DE in terms of PCLK cycles (bits [7:0]) | 0xXX: Least significant byte of VS edge to first DE |

[VTX23 \(0x265\)\\*](#)

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | DE_HIGH_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| DE_HIGH_1 | 7:0  | DE high period in terms of PCLK cycles (bits [15:8]) | 0xXX: Most significant byte of DE high period |

[VTX24 \(0x266\)\\*](#)

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | DE_HIGH_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| DE_HIGH_0 | 7:0  | DE high period in terms of PCLK cycles (bits [7:0]) | 0xXX: Least significant byte of DE high period |



[VTX25 \(0x267\)\\*](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | DE_LOW_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE                                       |
|----------|------|---|--|
| DE_LOW_1 | 7:0  | DE low period in terms of PCLK cycles (bits [15:8]) | 0xXX: Most significant byte of DE low period |

[VTX26 \(0x268\)\\*](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | DE_LOW_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| DE_LOW_0 | 7:0  | DE low period in terms of PCLK cycles (bits [7:0]) | 0xXX: Least significant byte of DE low period |

[VTX27 \(0x269\)\\*](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | DE_CNT_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                      | DECODE   |
|----------|------|--|--|
| DE_CNT_1 | 7:0  | Active lines per frame (DE pulses) (bits [15:8]) | 0xXX: Most significant byte of DE pulses per frame |

[VTX28 \(0x26A\)\\*](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | DE_CNT_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                     | DECODE  |
|----------|------|---|---|
| DE_CNT_0 | 7:0  | Active lines per frame (DE pulses) (bits [7:0]) | 0xXX: Least significant byte of DE pulses per frame |

[VTX29 \(0x26B\)](#)

| BIT         | 7           | 6    | 5          | 4 | 3 | 2           | 1                | 0 |
|-------------|-------------|------|------------|---|---|-------------|------------------|---|
| Field       | VID_PRBS_EN | RSVD | VPRBS_FAIL | – | – | GRAD_MODE   | PATGEN_MODE[1:0] |   |
| Reset       | 0b0         | 0b0  | 0b0        | – | – | 0b0         | 0b00             |   |
| Access Type | Write, Read |      | Read Only  | – | – | Write, Read | Write, Read      |   |

| BITFIELD    | BITS | DESCRIPTION                     | DECODE   |
|-------------|------|---------------------------------|--|
| VID_PRBS_EN | 7    | Enable video PRBS generator     | 0b0: Video PRBS generator disabled<br>0b1: Video PRBS generator enabled  |
| VPRBS_FAIL  | 5    | Video PRBS check pass/fail      | 0b0: Video PRBS check passed<br>0b1: Video PRBS check failed   |
| GRAD_MODE   | 2    | Gradient pattern-generator mode | 0b0: Gradient mode increasing. Each gradient color starts from a value of 0x00 and increases to 0xFF<br>0b1: Gradient mode decreasing. Each gradient color starts from a value of 0xFF and decreases to 0x00 |
| PATGEN_MODE | 1:0  | Pattern-generator mode          | 0b00: Pattern generator disabled - use video from the serializer input<br>0b01: Generate checkerboard pattern<br>0b10: Generate gradient pattern<br>0b11: Reserved   |

[VTX30 \(0x26C\)](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | GRAD_INC[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x04          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                        |
|----------|------|--|-------------------------------|
| GRAD_INC | 7:0  | Gradient mode increment amount (increment amount is the register value divided by 4) | 0xXX: Gradient increment base |

[VTX31 \(0x26D\)](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | CHKR_A_L[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION                        | DECODE  |
|----------|------|------------------------------------|---|
| CHKR_A_L | 7:0  | Checkerboard Mode Color A Low Byte | 0xXX: Least significant byte of checkerboard mode color A |

[VTX32 \(0x26E\)](#)

| BIT         | 7             | 6                                     | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|---------------------------------------|---|---|--|---|---|---|
| Field       | CHKR_A_M[7:0] |                                       |   |   |  |   |   |   |
| Reset       | 0x00          |                                       |   |   |  |   |   |   |
| Access Type | Write, Read   |                                       |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                           |   |   | DECODE   |   |   |   |
| CHKR_A_M    | 7:0           | Checkerboard Mode Color A Middle Byte |   |   | 0xXX: Middle significant byte of checkerboard mode color A |   |   |   |

[VTX33 \(0x26F\)](#)

| BIT         | 7             | 6                                   | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|-------------------------------------|---|---|--|---|---|---|
| Field       | CHKR_A_H[7:0] |                                     |   |   |  |   |   |   |
| Reset       | 0x00          |                                     |   |   |  |   |   |   |
| Access Type | Write, Read   |                                     |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                         |   |   | DECODE   |   |   |   |
| CHKR_A_H    | 7:0           | Checkerboard Mode Color A High Byte |   |   | 0xXX: Most significant byte of checkerboard mode color A |   |   |   |

[VTX34 \(0x270\)](#)

| BIT         | 7             | 6                                  | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|---------------|------------------------------------|---|---|---|---|---|---|
| Field       | CHKR_B_L[7:0] |                                    |   |   |   |   |   |   |
| Reset       | 0x00          |                                    |   |   |   |   |   |   |
| Access Type | Write, Read   |                                    |   |   |   |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                        |   |   | DECODE  |   |   |   |
| CHKR_B_L    | 7:0           | Checkerboard Mode Color B Low Byte |   |   | 0xXX: Least significant byte of checkerboard mode color B |   |   |   |

[VTX35 \(0x271\)](#)

| BIT         | 7             | 6                                     | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|---------------------------------------|---|---|--|---|---|---|
| Field       | CHKR_B_M[7:0] |                                       |   |   |  |   |   |   |
| Reset       | 0x00          |                                       |   |   |  |   |   |   |
| Access Type | Write, Read   |                                       |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                           |   |   | DECODE   |   |   |   |
| CHKR_B_M    | 7:0           | Checkerboard Mode Color B Middle Byte |   |   | 0xXX: Middle significant byte of checkerboard mode color B |   |   |   |

[VTX36 \(0x272\)](#)

| BIT         | 7             | 6                                   | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|-------------------------------------|---|---|--|---|---|---|
| Field       | CHKR_B_H[7:0] |                                     |   |   |  |   |   |   |
| Reset       | 0x00          |                                     |   |   |  |   |   |   |
| Access Type | Write, Read   |                                     |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                         |   |   | DECODE   |   |   |   |
| CHKR_B_H    | 7:0           | Checkerboard Mode Color B High Byte |   |   | 0xXX: Most significant byte of checkerboard mode color B |   |   |   |

[VTX37 \(0x273\)](#)

| BIT         | 7               | 6   | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | CHKR_RPT_A[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Write, Read     |   |   |   |   |   |   |   |
| BITFIELD    | BITS            | DESCRIPTION   |   |   | DECODE  |   |   |   |
| CHKR_RPT_A  | 7:0             | Checkerboard Mode Color A: Dimension of each square in number of pixels |   |   | 0xXX: Repeat count of checkerboard mode color A |   |   |   |

[VTX38 \(0x274\)](#)

| BIT         | 7               | 6  | 5 | 4 | 3   | 2 | 1 | 0 |
|-------------|-----------------|--|---|---|---|---|---|---|
| Field       | CHKR_RPT_B[7:0] |  |   |   |   |   |   |   |
| Reset       | 0x00            |  |   |   |   |   |   |   |
| Access Type | Write, Read     |  |   |   |   |   |   |   |
| BITFIELD    | BITS            | DESCRIPTION  |   |   | DECODE  |   |   |   |
| CHKR_RPT_B  | 7:0             | Checkerboard Mode Color B: Dimension of each square in number of pixels<br>Set equal to CHKR_RPT_A for square checkerboard pattern |   |   | 0xXX: Repeat count of checkerboard mode color B |   |   |   |

[VTX39 \(0x275\)](#)

| BIT         | 7             | 6  | 5 | 4 | 3  | 2 | 1 | 0 |
|-------------|---------------|--|---|---|--|---|---|---|
| Field       | CHKR_ALT[7:0] |  |   |   |  |   |   |   |
| Reset       | 0x00          |  |   |   |  |   |   |   |
| Access Type | Write, Read   |  |   |   |  |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION  |   |   | DECODE                                       |   |   |   |
| CHKR_ALT    | 7:0           | Checkerboard Mode Alternate Line Count: Dimension of each square in number of video lines<br>Set equal to CHKR_RPT_A for square checkerboard pattern |   |   | 0xXX: Checkerboard mode alternate line count |   |   |   |

[VTX40 \(0x276\)](#)

| BIT         | 7    | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|------|-------------|-------------|--------------|---|---|---|---|
| Field       | RSVD | CROSSHS_I   | CROSSHS_F   | CROSSHS[4:0] |   |   |   |   |
| Reset       | 0b0  | 0b0         | 0b0         | 0b11000      |   |   |   |   |
| Access Type |      | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE                                    |
|-----------|------|--|---|
| CROSSHS_I | 6    | Invert outgoing HS   | 0b0: Do not invert bit<br>0b1: Invert bit |
| CROSSHS_F | 5    | Force HS to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. |   |
| CROSSHS   | 4:0  | Map selected internal signal to HS   | 0bXXXXX: Incoming bit position            |

[VTX41 \(0x277\)](#)

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSSVS_I   | CROSSVS_F   | CROSSVS[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b11001      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| CROSSVS_I | 6    | Invert outgoing VS   | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSSVS_F | 5    | Force VS to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSSVS   | 4:0  | Map selected internal signal to VS   | 0bXXXXX: Incoming bit position                          |

[VTX42 \(0x278\)](#)

| BIT         | 7 | 6           | 5           | 4            | 3 | 2 | 1 | 0 |
|-------------|---|-------------|-------------|--------------|---|---|---|---|
| Field       | – | CROSSDE_I   | CROSSDE_F   | CROSSDE[4:0] |   |   |   |   |
| Reset       | – | 0b0         | 0b0         | 0b11010      |   |   |   |   |
| Access Type | – | Write, Read | Write, Read | Write, Read  |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE  |
|-----------|------|--|---|
| CROSSDE_I | 6    | Invert outgoing DE   | 0b0: Do not invert bit<br>0b1: Invert bit               |
| CROSSDE_F | 5    | Force DE to 0. Applied before inversion so that if inversion is also set, the outgoing bit is forced to 1. | 0b0: Do not force bit to zero<br>0b1: Force bit to zero |
| CROSSDE   | 4:0  | Map selected internal signal to DE   | 0bXXXXX: Incoming bit position                          |

**GPIO\_A (0x2BE)\***

## GPIO 0

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b1         | 0b1       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| RES_CFG      | 7    | Resistor pullup/pulldown strength  | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable  | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.  | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level   | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control. Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO Tx source control   | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver   | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO\_B (0x2BF)\***

## GPIO 0

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b00000         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                          | DECODE   |
|---------------|------|--------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pullup/pulldown configuration | 0b00: None<br>0b01: Pullup<br>0b10: Pulldown<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection                | 0b0: Open-drain<br>0b1: Push-pull                              |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting   | 0bXXXXX: This GPIO transmit ID                                 |

**GPIO\_C (0x2C0)\***

## GPIO 0

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00000         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

### GPIO A (0x2C1)\*

#### GPIO 1

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b0         | 0b0       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| RES_CFG      | 7    | Resistor Pullup/Pulldown Strength   | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.   | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO Tx source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

### GPIO B (0x2C2)\*

#### GPIO 1

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b00               |   | 0b1         | 0b00001         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                          | DECODE   |
|---------------|------|--------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pullup/pulldown configuration | 0b00: None<br>0b01: Pullup<br>0b10: Pulldown<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection                | 0b0: Open-drain<br>0b1: Push-pull                              |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting   | 0bXXXXX: This GPIO transmit ID                                 |

**GPIO\_C (0x2C3)\***

## GPIO 1

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00001         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO\_A (0x2C4)\***

## GPIO 2

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b1         | 0b1       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD   | BITS | DESCRIPTION   | DECODE   |
|------------|------|---|--|
| RES_CFG    | 7    | Resistor pullup/pulldown strength   | 0b0: 40kΩ<br>0b1: 1MΩ  |
| TX_COMP_EN | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                |
| GPIO_OUT   | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP. | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1 |



| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO Tx source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO B (0x2C5)\***

## GPIO 2

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b00               |   | 0b1         | 0b00010         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                          | DECODE   |
|---------------|------|--------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pullup/pulldown configuration | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection                | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting   | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO C (0x2C6)\***

## GPIO 2

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00010         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO\_A (0x2C7)\***

GPIO 3

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b0         | 0b0       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| RES_CFG      | 7    | Resistor pullup/pulldown strength  | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable  | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.  | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level   | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control. Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO Tx source control   | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver   | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO\_B (0x2C8)\***

GPIO 3

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b00011         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                          | DECODE   |
|---------------|------|--------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pullup/pulldown configuration | 0b00: None<br>0b01: Pullup<br>0b10: Pulldown<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection                | 0b0: Open-drain<br>0b1: Push-pull                              |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting   | 0bXXXXX: This GPIO transmit ID                                 |

**GPIO\_C (0x2C9)\***

GPIO 3

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00011         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO A (0x2CA)\***

## GPIO 4

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b1         | 0b1       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| RES_CFG      | 7    | Resistor pullup/pulldown strength   | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.   | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO Tx source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO B (0x2CB)\***

## GPIO 4

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b00100         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO\_C (0x2CC)\***

## GPIO 4

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00100         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   |   |

**GPIO\_A (0x2CD)\***

## GPIO 5

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b0         | 0b0       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD   | BITS | DESCRIPTION   | DECODE   |
|------------|------|---|--|
| RES_CFG    | 7    | Resistor pull-up/pull-down strength   | 0b0: 40kΩ<br>0b1: 1MΩ  |
| TX_COMP_EN | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                |
| GPIO_OUT   | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP. | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1 |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO TX source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO B (0x2CE)\***

GPIO 5

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b00101         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO C (0x2CF)\***

GPIO 5

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00101         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO\_A (0x2D0)\***

GPIO 6

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b1         | 0b1       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| RES_CFG      | 7    | Resistor pull-up/pull-down strength  | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable  | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.  | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level   | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control. Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO TX source control   | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver   | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO\_B (0x2D1)\***

GPIO 6

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b00110         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO\_C (0x2D2)\***

GPIO 6

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00110         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

### [GPIO A \(0x2D3\)\\*](#)

#### GPIO 7

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b0         | 0b0       | 0b0         | 0b1         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| RES_CFG      | 7    | Resistor pull-up/pull-down strength   | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.   | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO TX source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

### [GPIO B \(0x2D4\)\\*](#)

#### GPIO 7

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b00111         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO\_C (0x2D5)\***

## GPIO 7

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b00111         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO\_A (0x2D6)\***

## GPIO 8

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b1         | 0b1       | 0b1         | 0b0         | 0b0          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD   | BITS | DESCRIPTION   | DECODE   |
|------------|------|---|--|
| RES_CFG    | 7    | Resistor pull-up/pull-down strength   | 0b0: 40kΩ<br>0b1: 1MΩ  |
| TX_COMP_EN | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                |
| GPIO_OUT   | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP. | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1 |



| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO TX source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO B (0x2D7)\***

GPIO 8

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b00               |   | 0b1         | 0b01000         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO C (0x2D8)\***

GPIO 8

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b01000         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO\_A (0x2D9)\***

## GPIO 9

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b0         | 0b0       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| RES_CFG      | 7    | Resistor pull-up/pull-down strength  | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable  | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.  | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level   | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control. Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO TX source control   | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver   | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO\_B (0x2DA)\***

## GPIO 9

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b10               |   | 0b1         | 0b01001         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO\_C (0x2DB)\***

## GPIO 9

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b01001         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**GPIO A (0x2DC)\***

GPIO 10

| BIT         | 7           | 6    | 5           | 4           | 3         | 2           | 1           | 0            |
|-------------|-------------|------|-------------|-------------|-----------|-------------|-------------|--------------|
| Field       | RES_CFG     | RSVD | TX_COMP_EN  | GPIO_OUT    | GPIO_IN   | GPIO_RX_EN  | GPIO_TX_EN  | GPIO_OUT_DIS |
| Reset       | 0b1         | 0b0  | 0b0         | 0b1         | 0b1       | 0b0         | 0b0         | 0b1          |
| Access Type | Write, Read |      | Write, Read | Write, Read | Read Only | Write, Read | Write, Read | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| RES_CFG      | 7    | Resistor pull-up/pull-down strength   | 0b0: 40kΩ<br>0b1: 1MΩ   |
| TX_COMP_EN   | 5    | Jitter minimization compensation enable   | 0b0: Jitter compensation disabled<br>0b1: Jitter compensation enabled                                       |
| GPIO_OUT     | 4    | GPIO pin output drive value when GPIO_RX_EN = 0. This can be used to drive a value out on an MFP.   | 0b0: This GPIO pin output is driven to 0<br>0b1: This GPIO pin output is driven to 1                        |
| GPIO_IN      | 3    | GPIO pin local MFP input level  | 0b0: This GPIO pin value is 0<br>0b1: This GPIO pin value is 1  |
| GPIO_RX_EN   | 2    | GPIO out source control.<br>Set to 1 to receive GPIO value from GMSL link. Set GPIO_OUT_DIS to 0 to output the received value on the local MFP. | 0b0: This GPIO source disabled for GMSL reception<br>0b1: This GPIO source enabled for GMSL reception       |
| GPIO_TX_EN   | 1    | GPIO TX source control  | 0b0: This GPIO source disabled for GMSL transmission<br>0b1: This GPIO source enabled for GMSL transmission |
| GPIO_OUT_DIS | 0    | Disable GPIO output driver  | 0b0: Output driver enabled<br>0b1: Output driver disabled   |

**GPIO B (0x2DD)\***

GPIO 10

| BIT         | 7                  | 6 | 5           | 4               | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|-------------|-----------------|---|---|---|---|
| Field       | PULL_UPDN_SEL[1:0] |   | OUT_TYPE    | GPIO_TX_ID[4:0] |   |   |   |   |
| Reset       | 0b00               |   | 0b1         | 0b01010         |   |   |   |   |
| Access Type | Write, Read        |   | Write, Read | Write, Read     |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                        | DECODE   |
|---------------|------|------------------------------------|--|
| PULL_UPDN_SEL | 7:6  | Buffer pull up/down configuration  | 0b00: None<br>0b01: Pull-up<br>0b10: Pull-down<br>0b11: Reserved |
| OUT_TYPE      | 5    | Driver type selection              | 0b0: Open-drain<br>0b1: Push-pull                                |
| GPIO_TX_ID    | 4:0  | GPIO ID for pin while transmitting | 0bXXXXX: This GPIO transmit ID                                   |

**GPIO\_C (0x2DE)\***

## GPIO 10

| BIT         | 7           | 6    | 5 | 4               | 3 | 2 | 1 | 0 |
|-------------|-------------|------|---|-----------------|---|---|---|---|
| Field       | OVR_RES_CFG | RSVD | – | GPIO_RX_ID[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b1  | – | 0b01010         |   |   |   |   |
| Access Type | Write, Read |      | – | Write, Read     |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION   | DECODE  |
|-------------|------|---|---|
| OVR_RES_CFG | 7    | Override non-GPIO port function IO setting.<br><br>When set, RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS are effective when pin is configured as non-GPIO. When cleared, non-GPIO pin function determines IO type. | 0b0: Non-GPIO function determines IO type when alternate function is selected<br>0b1: RES_CFG, PULL_UPDN_SEL, OUT_TYPE, and GPIO_OUT_DIS determine IO type for non-GPIO configuration |
| GPIO_RX_ID  | 4:0  | GPIO ID for pin while receiving   | 0bXXXXX: This GPIO receive ID   |

**CMU2 (0x302)**

| BIT         | 7    | 6                  | 5 | 4 | 3    | 2         | 1 | 0    |
|-------------|------|--------------------|---|---|------|-----------|---|------|
| Field       | RSVD | PFDDIV_RSHORT[2:0] |   |   | RSVD | RSVD[1:0] |   | RSVD |
| Reset       | 0b0  | 0b000              |   |   | 0b0  | 0b00      |   | 0b0  |
| Access Type |      | Write, Read        |   |   |      |           |   |      |

| BITFIELD      | BITS | DESCRIPTION                       | DECODE   |
|---------------|------|-----------------------------------|--|
| PFDDIV_RSHORT | 6:4  | PFDDIV regulator voltage control. | 0: VREG_PFDDIV = 1.0V<br>1: VREG_PFDDIV = 1.1V<br>2: VREG_PFDDIV = 0.875V<br>3: VREG_PFDDIV = 0.94V<br>4: VREG_PFDDIV = 1.0V<br>5: VREG_PFDDIV = 1.1V<br>6: VREG_PFDDIV = 0.875V<br>7: VREG_PFDDIV = 0.94V |

**FRONTTOP\_0 (0x308)\***

| BIT         | 7    | 6                | 5            | 4 | 3 | 2    | 1 | 0 |
|-------------|------|------------------|--------------|---|---|------|---|---|
| Field       | RSVD | enable_line_info | START_PO RTB | – | – | RSVD | – | – |
| Reset       | 0b0  | 0b1              | 0b1          | – | – | 0b1  | – | – |
| Access Type |      | Write, Read      | Write, Read  | – | – |      | – | – |

| BITFIELD         | BITS | DESCRIPTION                           | DECODE  |
|------------------|------|---------------------------------------|---|
| enable_line_info | 6    | Enable sending line start info-frames | 0b0: Line start info frames disabled<br>0x1: Line start info frames enabled |
| START_POR TB     | 5    | Enable CSI Port                       | 0b0: CSI disabled<br>0x1: CSI enabled                                       |

**FRONTTOP\_5 (0x30D)\***

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | VC_SELZ_L[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xFF           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   |
|-----------|------|---|
| VC_SELZ_L | 7:0  | Virtual channel filter bits [7:0]. Each bit represents whether a virtual channel's packets are processed or discarded (bit 0 is virtual channel 0, bit 1 is virtual channel 1, etc.). If the bit is set to 1, the virtual channel packets are processed. If the bit is set to 0, the virtual channel packets are discarded. |

**FRONTTOP\_6 (0x30E)\***

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | VC_SELZ_H[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xFF           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   |
|-----------|------|---|
| VC_SELZ_H | 7:0  | Virtual channel filter bits [15:8]. Each bit represents whether a virtual channel's packets are processed or discarded (bit 0 is virtual channel 0, bit 1 is virtual channel 1 etc.). If the bit is set to 1, the virtual channel packets are processed. If the bit is set to 0, the virtual channel packets are discarded. |

**FRONTTOP\_9 (0x311)\***

| BIT         | 7 | 6             | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---------------|---|---|---|---|---|---|
| Field       | – | START_PO RTBZ | – | – | – | – | – | – |
| Reset       | – | 0b1           | – | – | – | – | – | – |
| Access Type | – | Write, Read   | – | – | – | – | – | – |

| BITFIELD         | BITS | DESCRIPTION                      | DECODE                                     |
|------------------|------|----------------------------------|--|
| START_POR<br>TBZ | 6    | Start video pipe Z from CSI port | 0b0: Video not started<br>0b1: Start video |

**FRONTTOP 10 (0x312)\***

| BIT         | 7 | 6    | 5 | 4 | 3 | 2           | 1 | 0 |
|-------------|---|------|---|---|---|-------------|---|---|
| Field       | – | RSVD | – | – | – | bpp8dblz    | – | – |
| Reset       | – | 0b0  | – | – | – | 0b0         | – | – |
| Access Type | – |      | – | – | – | Write, Read | – | – |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| bpp8dblz | 2    | Send 8-bit pixels as 16-bit on video pipe Z (double pixel mode). Maximizes GMSL link bandwidth capacity for 8-bit pixels. | 0b0: Send as 8-bit pixels<br>0b1: Send 8-bit pixels as 16-bit |

**FRONTTOP 11 (0x313)\***

| BIT         | 7 | 6           | 5 | 4 | 3 | 2           | 1 | 0 |
|-------------|---|-------------|---|---|---|-------------|---|---|
| Field       | – | bpp12dblz   | – | – | – | bpp10dblz   | – | – |
| Reset       | – | 0b0         | – | – | – | 0b0         | – | – |
| Access Type | – | Write, Read | – | – | – | Write, Read | – | – |

| BITFIELD  | BITS | DESCRIPTION   | DECODE  |
|-----------|------|---|---|
| bpp12dblz | 6    | Send 12-bit pixels as 24-bit on video pipe Z (double pixel mode). Maximizes GMSL link bandwidth capacity for 12-bit pixels. | 0b0: Send as 12-bit pixels<br>0b1: Send 12-bit pixels as 24-bit |
| bpp10dblz | 2    | Send 10-bit pixels as 20-bit on video pipe Z (double pixel mode). Maximizes GMSL link bandwidth capacity for 10-bit pixels. | 0b0: Send as 10-bit pixels<br>0b1: Send 10-bit pixels as 20-bit |

**FRONTTOP 16 (0x318)**

| BIT         | 7 | 6                 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|-------------------|---|---|---|---|---|---|
| Field       | – | mem_dt1_selz[6:0] |   |   |   |   |   |   |
| Reset       | – | 0b0000000         |   |   |   |   |   |   |
| Access Type | – | Write, Read       |   |   |   |   |   |   |

| BITFIELD         | BITS | DESCRIPTION  | DECODE   |
|------------------|------|--|--|
| mem_dt1_sel<br>z | 6:0  | Select designated datatype to route to video pipeline Z. Bit 6 is the enable. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt1_selz[6], mem_dt2_selz[6], mem_dt7_selz[6], and mem_dt8_selz[6] are all 0. | 0b0XXXXXX: Datatype selection disabled<br>0b1XXXXXX: Datatype enabled for datatype selected to route to video pipeline |

**FRONTTOP\_17 (0x319)**

| BIT         | 7 | 6                 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|-------------------|---|---|---|---|---|---|
| Field       | – | mem_dt2_selz[6:0] |   |   |   |   |   |   |
| Reset       | – | 0b0000000         |   |   |   |   |   |   |
| Access Type | – | Write, Read       |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE   |
|--------------|------|--|--|
| mem_dt2_selz | 6:0  | Select designated datatype to route to video pipeline Z. Bit 6 is the enable. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt1_selz[6], mem_dt2_selz[6], mem_dt7_selz[6], and mem_dt8_selz[6] are all 0. | 0b0XXXXXX: Datatype selection disabled<br>0b1XXXXXX: Datatype enabled for datatype selected to route to video pipeline |

**FRONTTOP\_22 (0x31E)**

| BIT         | 7           | 6           | 5            | 4              | 3 | 2 | 1 | 0 |
|-------------|-------------|-------------|--------------|----------------|---|---|---|---|
| Field       | soft_dtz_en | soft_vcz_en | soft_bppz_en | soft_bppz[4:0] |   |   |   |   |
| Reset       | 0b0         | 0b0         | 0b0          | 0b11000        |   |   |   |   |
| Access Type | Write, Read | Write, Read | Write, Read  | Write, Read    |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| soft_dtz_en  | 7    | Datatype software override enable for video pipeline Z        | 0b0: Software override disabled<br>0b1: Software override enabled |
| soft_vcz_en  | 6    | Virtual channel software override enable for video pipeline Z | 0b0: Software override disabled<br>0b1: Software override enabled |
| soft_bppz_en | 5    | BPP software override enable for video pipeline Z             | 0b0: Software override disabled<br>0b1: Software override enabled |
| soft_bppz    | 4:0  | Software override of BPP on video pipeline Z                  | 0bXXXXX: Software override value                                  |

**FRONTTOP\_24 (0x320)**

| BIT         | 7 | 6 | 5             | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|---------------|---|---|---|---|---|
| Field       | – | – | soft_vcz[1:0] |   | – | – | – | – |
| Reset       | – | – | 0b00          |   | – | – | – | – |
| Access Type | – | – | Write, Read   |   | – | – | – | – |

| BITFIELD | BITS | DESCRIPTION  | DECODE                        |
|----------|------|--|-------------------------------|
| soft_vcz | 5:4  | Virtual channel software override for video pipeline Z | 0bXX: Software override value |

**FRONTTOP\_27 (0x323)**

| BIT         | 7    | 6  | 5             | 4 | 3 | 2                                 | 1 | 0 |
|-------------|------|--|---------------|---|---|-----------------------------------|---|---|
| Field       | –    | –  | soft_dtz[5:0] |   |   |                                   |   |   |
| Reset       | –    | –  | 0b110000      |   |   |                                   |   |   |
| Access Type | –    | –  | Write, Read   |   |   |                                   |   |   |
| BITFIELD    | BITS | DESCRIPTION                                    |               |   |   | DECODE                            |   |   |
| soft_dtz    | 5:0  | Datatype software override for video channel Z |               |   |   | 0bXXXXXX: Software override value |   |   |

**FRONTTOP\_29 (0x325)**

| BIT                       | 7                         | 6   | 5 | 4 | 3 | 2   | 1 | 0 |
|---------------------------|---------------------------|---|---|---|---|---|---|---|
| Field                     | FORCE_START_MIPI_FRONTTOP | –   | – | – | – | –   | – | – |
| Reset                     | 0b0                       | –   | – | – | – | –   | – | – |
| Access Type               | Write, Read               | –   | – | – | – | –   | – | – |
| BITFIELD                  | BITS                      | DESCRIPTION   |   |   |   | DECODE  |   |   |
| FORCE_START_MIPI_FRONTTOP | 7                         | Force the MIPI receiver start without waiting for the GMSL link lock. |   |   |   | 0b0: Do not force MIPI receiver to start without waiting for GMSL link lock<br>0b1: Force MIPI receiver to start without waiting for GMSL link lock |   |   |

**MIPI\_RX0 (0x330)\***

| BIT                | 7    | 6  | 5               | 4 | 3             | 2   | 1 | 0 |
|--------------------|------|--|-----------------|---|---------------|---|---|---|
| Field              | –    | mipi_noncontclk_en   | ctrl1_vc_map_en | – | mipi_rx_reset | RSVD[2:0]   |   |   |
| Reset              | –    | 0b0  | 0b0             | – | 0b0           | 0b000   |   |   |
| Access Type        | –    | Write, Read  | Write, Read     | – | Write, Read   |   |   |   |
| BITFIELD           | BITS | DESCRIPTION  |                 |   |               | DECODE  |   |   |
| mipi_noncontclk_en | 6    | MIPI non-continuous clock enable   |                 |   |               | 0x0: enable MIPI continuous clock<br>0x1: enable MIPI non-continuous clock  |   |   |
| ctrl1_vc_map_en    | 5    | Virtual channel mapping enable. When enabled, the incoming virtual channel numbers are remapped according to the values in the ctrl1_vc_map0 through ctrl1_vc_map15 register bits. |                 |   |               | 0x0: Disable virtual channel mapping<br>0x1: Enable virtual channel mapping |   |   |
| mipi_rx_reset      | 3    | Reset MIPI RX receiver (MIPI PHY). This bit is not self-clearing.  |                 |   |               | 0b0: Do not reset MIPI RX<br>0b1: Reset MIPI RX                             |   |   |



**MIPI\_RX1 (0x331)\***

| BIT         | 7            | 6              | 5                    | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|----------------|----------------------|---|---|---|---|---|
| Field       | ctrl1_vcx_en | ctrl1_deskewen | ctrl1_num_lanes[1:0] |   | – | – | – | – |
| Reset       | 0b0          | 0b0            | 0b11                 |   | – | – | – | – |
| Access Type | Write, Read  | Write, Read    | Write, Read          |   | – | – | – | – |

| BITFIELD        | BITS | DESCRIPTION   | DECODE   |
|-----------------|------|---|--|
| ctrl1_vcx_en    | 7    | Enable the extended Virtual Channels feature        | 0b0: Extended VC disabled<br>0b1: Extended VC enabled  |
| ctrl1_deskewen  | 6    | Enable the deskew calibration for 1.5Gbps and above | 0x0: Deskew calibration disabled<br>0x1: Deskew calibration enabled                            |
| ctrl1_num_lanes | 5:4  | Select number of data lanes                         | 0b00: one data lane<br>0b01: two data lanes<br>0b10: three data lanes<br>0b11: four data lanes |

**MIPI\_RX2 (0x332)\***

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | phy1_lane_map[3:0] |   |   |   | – | – | – | – |
| Reset       | 0xE                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD      | BITS | DESCRIPTION   | DECODE   |
|---------------|------|---|--|
| phy1_lane_map | 7:4  | Serializer lane mapping for MIPI data lane 2 and 3. Bit[5:4] controls data lane 2. Bit[7:6] controls data lane 3. Works with phy2_lane_map register. Lane maps must be exclusive. | 0bXX00: Map Sensor Lane 0 to Serializer Lane 2<br>0bXX01: Map Sensor Lane 1 to Serializer Lane 2<br>0bXX10: Map Sensor Lane 2 to Serializer Lane 2<br>0bXX11: Map Sensor Lane 3 to Serializer Lane 2<br>0b00XX: Map Sensor Lane 0 to Serializer Lane 3<br>0b01XX: Map Sensor Lane 1 to Serializer Lane 3<br>0b10XX: Map Sensor Lane 2 to Serializer Lane 3<br>0b11XX: Map Sensor Lane 3 to Serializer Lane 3 |

**MIPI\_RX3 (0x333)\***

| BIT         | 7 | 6 | 5 | 4 | 3                  | 2 | 1 | 0 |
|-------------|---|---|---|---|--------------------|---|---|---|
| Field       | – | – | – | – | phy2_lane_map[3:0] |   |   |   |
| Reset       | – | – | – | – | 0x4                |   |   |   |
| Access Type | – | – | – | – | Write, Read        |   |   |   |

| BITFIELD      | BITS | DESCRIPTION   | DECODE   |
|---------------|------|---|--|
| phy2_lane_map | 3:0  | Serializer lane mapping for MIPI data lane 0 and 1. Bit[1:0] controls data lane 0, Bit[3:2] controls data lane 1. Works with phy1_lane_map register. Lane maps must be exclusive. | 0bXX00: Map Sensor Lane 0 to Serializer Lane 0<br>0bXX01: Map Sensor Lane 1 to Serializer Lane 0<br>0bXX10: Map Sensor Lane 2 to Serializer Lane 0<br>0bXX11: Map Sensor Lane 3 to Serializer Lane 0<br>0b00XX: Map Sensor Lane 0 to Serializer Lane 1<br>0b01XX: Map Sensor Lane 1 to Serializer Lane 1<br>0b10XX: Map Sensor Lane 2 to Serializer Lane 1<br>0b11XX: Map Sensor Lane 3 to Serializer Lane 1 |

**MIPI\_RX4 (0x334)\***

| BIT         | 7 | 6                 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|-------------------|---|---|---|---|---|---|
| Field       | – | phy1_pol_map[2:0] |   |   | – | – | – | – |
| Reset       | – | 0b000             |   |   | – | – | – | – |
| Access Type | – | Write, Read       |   |   | – | – | – | – |

| BITFIELD     | BITS | DESCRIPTION   | DECODE   |
|--------------|------|---|--|
| phy1_pol_map | 6:4  | Serializer lane polarity setting for MIPI data lane 2 and 3 | 0bXX0: Normal Polarity for data lane 2<br>0bXX1: Inverse Polarity for data lane 2<br>0bX0X: Normal Polarity for data lane 3<br>0bX1X: Inverse Polarity for data lane 3<br>0b0XX: Reserved<br>0b1XX: Reserved |

**MIPI\_RX5 (0x335)\***

| BIT         | 7 | 6 | 5 | 4 | 3 | 2                 | 1 | 0 |
|-------------|---|---|---|---|---|-------------------|---|---|
| Field       | – | – | – | – | – | phy2_pol_map[2:0] |   |   |
| Reset       | – | – | – | – | – | 0b000             |   |   |
| Access Type | – | – | – | – | – | Write, Read       |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| phy2_pol_map | 2:0  | Serializer lane polarity setting for MIPI data lane 0, 1 and clock lane | 0bXX0: Normal Polarity for data lane 0<br>0bXX1: Inverse Polarity for data lane 0<br>0bX0X: Normal Polarity for data lane 1<br>0bX1X: Inverse Polarity for data lane 1<br>0b0XX: Normal Polarity for clock lane<br>0b1XX: Inverse Polarity for clock lane |

**MIPI\_RX7 (0x337)**

| BIT         | 7 | 6 | 5    | 4         | 3 | 2 | 1 | 0 |
|-------------|---|---|------|-----------|---|---|---|---|
| Field       | – | – | RSVD | RSVD[4:0] |   |   |   |   |
| Reset       | – | – | 0b0  | 0b00000   |   |   |   |   |
| Access Type | – | – |      |           |   |   |   |   |

[MIPI\\_RX8 \(0x338\)](#)

| BIT         | 7         | 6 | 5                | 4 | 3         | 2 | 1                 | 0 |
|-------------|-----------|---|------------------|---|-----------|---|-------------------|---|
| Field       | RSVD[1:0] |   | t_hs_settle[1:0] |   | RSVD[1:0] |   | t_clk_settle[1:0] |   |
| Reset       | 0b01      |   | 0b01             |   | 0b01      |   | 0b01              |   |
| Access Type |           |   | Write, Read      |   |           |   | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE   |             |            |
|--------------|------|--|--|-------------|------------|
|              |      |  | Value  | Enumeration | Decode     |
| t_hs_settle  | 5:4  | DPHY Mode:<br>Set typical DPHY hs_settle timing in ns (at 2.5Gbps) | 0b00   |             | 132 (DPHY) |
|              |      |  | 0b01   |             | 139 (DPHY) |
|              |      |  | 0b10   |             | 153 (DPHY) |
|              |      |  | 0b11   |             | 166 (DPHY) |
| t_clk_settle | 1:0  | Set typical DPHY Tclk_settle timing in ns                          | 0b00: 160<br>0b01: 220<br>0b10: 286<br>0b11: 352 |             |            |

[MIPI\\_RX11 \(0x33B\)](#)

| BIT         | 7 | 6 | 5 | 4                | 3 | 2 | 1 | 0 |
|-------------|---|---|---|------------------|---|---|---|---|
| Field       | – | – | – | phy1_lp_err[4:0] |   |   |   |   |
| Reset       | – | – | – | 0b00000          |   |   |   |   |
| Access Type | – | – | – | Read Clears All  |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                | DECODE  |
|-------------|------|----------------------------|---|
| phy1_lp_err | 4:0  | Phy1 LP status (DPHY only) | 0bXXXX1: Unrecognized Escape command received from data lane D0<br>0bXXX1X: Unrecognized Escape command received from CLK lane<br>0bXX1XX: Invalid line sequence detected from data lane D0<br>0bX1XXX: Invalid line sequence detected from data lane D1<br>0b1XXXX: Invalid line sequence detected from CLK lane |

[MIPI\\_RX12 \(0x33C\)](#)

| BIT         | 7                | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|------------------|---|---|---|---|---|---|---|
| Field       | phy1_hs_err[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00             |   |   |   |   |   |   |   |
| Access Type | Read Clears All  |   |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                        | DECODE   |
|-------------|------|------------------------------------|--|
| phy1_hs_err | 7:0  | PHY1 high-speed status (DPHY only) | 0bXXXXXXXX1: HS sync pattern with one bit error detected on data lane D0<br>0bXXXXXXXX1X: HS sync pattern with one bit error detected on data lane D1<br>0bXXXXXXXX1XX: HS sync pattern with two or more bit errors detected on data lane D0<br>0bXXXXXXXX1XXX: HS sync pattern with two or more bit errors detected on data lane D1<br>0bXXX1XXXX: High speed receiver skew calibration failed on data lane D1<br>0bXX1XXXXX: High speed receiver skew calibration failed on data lane D0<br>0bX1XXXXXX: High speed receiver skew calibration run on data lane D1<br>0b1XXXXXXX: High speed receiver skew calibration run on data lane D0 |

**MIPI\_RX13 (0x33D)**

| BIT         | 7 | 6 | 5 | 4                | 3 | 2 | 1 | 0 |
|-------------|---|---|---|------------------|---|---|---|---|
| Field       | – | – | – | phy2_lp_err[4:0] |   |   |   |   |
| Reset       | – | – | – | 0b00000          |   |   |   |   |
| Access Type | – | – | – | Read Clears All  |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                | DECODE  |
|-------------|------|----------------------------|---|
| phy2_lp_err | 4:0  | Phy2 LP status (DPHY only) | 0bXXXX1: Unrecognized Escape command received from data lane D0<br>0bXXX1X: Unrecognized Escape command received from CLK lane<br>0bXX1XX: Invalid line sequence detected from data lane D0<br>0bX1XXX: Invalid line sequence detected from data lane D1<br>0b1XXXX: Invalid line sequence detected from CLK lane |

**MIPI\_RX14 (0x33E)**

| BIT         | 7                | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|------------------|---|---|---|---|---|---|---|
| Field       | phy2_hs_err[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00             |   |   |   |   |   |   |   |
| Access Type | Read Clears All  |   |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                        | DECODE  |
|-------------|------|------------------------------------|---|
| phy2_hs_err | 7:0  | PHY2 high-speed status (DPHY only) | 0bXXXXXXXX1: HS sync pattern with 2 or more bit errors detected on data lane D0<br>0bXXXXXXXX1X: HS sync pattern with 2 or more bit errors detected on data lane D1<br>0bXXXXX1XX: HS sync pattern with 1 bit error detected on data lane D0<br>0bXXXX1XXX: HS sync pattern with 1 bit error detected on data lane D1<br>0bXXX1XXXX: High speed receiver skew calibration failed on data lane D1<br>0bXX1XXXXX: High speed receiver skew calibration failed on data lane D0<br>0bX1XXXXXX: High speed receiver skew calibration run on data lane D1<br>0b1XXXXXXX: High speed receiver skew calibration run on data lane D0 |

**MIPI\_RX19 (0x343)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_csi_err_l[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Clears All      |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION                       | DECODE   |
|-----------------|------|-----------------------------------|--|
| ctrl1_csi_err_l | 7:0  | CSI-2 Controller Status, low byte | 0bXXXXXXXX1: 1-bit ECC error detected<br>0bXXXXXXXX1X: 2-bit ECC error detected<br>0bYYYYYYXX: YYYYYY = bit position of the 1-bit error<br>0b1XXXXXXXX: CRC error detected |

**MIPI\_RX20 (0x344)**

| BIT         | 7 | 6 | 5 | 4 | 3 | 2                    | 1 | 0 |
|-------------|---|---|---|---|---|----------------------|---|---|
| Field       | – | – | – | – | – | ctrl1_csi_err_h[2:0] |   |   |
| Reset       | – | – | – | – | – | 0b000                |   |   |
| Access Type | – | – | – | – | – | Read Clears All      |   |   |

| BITFIELD        | BITS | DESCRIPTION                        | DECODE   |
|-----------------|------|------------------------------------|--|
| ctrl1_csi_err_h | 2:0  | CSI-2 Controller Status, high bits | 0bX1: Packets terminated early<br>0b1X: Frame count error detected |

**MIPI\_RX21 (0x345)\***

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map0[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>0 | 7:4  | New virtual channel for VC=0. If ctrl_vc_map_en is set to 1, any time VC=0 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**MIPI\_RX22 (0x346)\***

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map1[3:0] |   |   |   | - | - | - | - |
| Reset       | 0x0                |   |   |   | - | - | - | - |
| Access Type | Write, Read        |   |   |   | - | - | - | - |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>1 | 7:4  | New virtual channel for VC=1. If ctrl_vc_map_en is set to 1, any time VC=1 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**MIPI\_RX23 (0x347)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map2[3:0] |   |   |   | - | - | - | - |
| Reset       | 0x0                |   |   |   | - | - | - | - |
| Access Type | Write, Read        |   |   |   | - | - | - | - |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>2 | 7:4  | New virtual channel for VC=2. If ctrl_vc_map_en is set to 1, any time VC=2 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**MIPI\_RX60 (0x36C)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map3[3:0] |   |   |   | - | - | - | - |
| Reset       | 0x0                |   |   |   | - | - | - | - |
| Access Type | Write, Read        |   |   |   | - | - | - | - |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>3 | 7:4  | New virtual channel for VC=3. If ctrl_vc_map_en is set to 1, any time VC=3 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**MIPI\_RX61 (0x36D)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map4[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>4 | 7:4  | New virtual channel for VC=4. If ctrl_vc_map_en is set to 1, any time VC=4 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**MIPI\_RX62 (0x36E)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map5[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>5 | 7:4  | New virtual channel for VC=5. If ctrl_vc_map_en is set to 1, any time VC=5 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**MIPI\_RX63 (0x36F)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map6[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>6 | 7:4  | New virtual channel for VC=6. If ctrl_vc_map_en is set to 1, any time VC=6 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT00 (0x377)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map7[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>7 | 7:4  | New virtual channel for VC=7. If ctrl_vc_map_en is set to 1, any time VC=7 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT0 (0x378)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map8[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>8 | 7:4  | New virtual channel for VC=8. If ctrl_vc_map_en is set to 1, any time VC=8 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT1 (0x379)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map9[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                |   |   |   | – | – | – | – |
| Access Type | Write, Read        |   |   |   | – | – | – | – |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                   |
|-------------------|------|---|--------------------------|
| ctrl1_vc_map<br>9 | 7:4  | New virtual channel for VC=9. If ctrl_vc_map_en is set to 1, any time VC=9 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT2 (0x37A)**

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map10[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                 |   |   |   | – | – | – | – |
| Access Type | Write, Read         |   |   |   | – | – | – | – |

| BITFIELD           | BITS | DESCRIPTION   | DECODE                   |
|--------------------|------|---|--------------------------|
| ctrl1_vc_map<br>10 | 7:4  | New virtual channel for VC=10. If ctrl_vc_map_en is set to 1, any time VC=10 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |



**EXT3 (0x37B)**

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map11[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                 |   |   |   | – | – | – | – |
| Access Type | Write, Read         |   |   |   | – | – | – | – |

| BITFIELD        | BITS | DESCRIPTION   | DECODE                   |
|-----------------|------|---|--------------------------|
| ctrl1_vc_map 11 | 7:4  | New virtual channel for VC=11. If ctrl_vc_map_en is set to 1, any time VC=11 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT4 (0x37C)**

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map12[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                 |   |   |   | – | – | – | – |
| Access Type | Write, Read         |   |   |   | – | – | – | – |

| BITFIELD        | BITS | DESCRIPTION   | DECODE                   |
|-----------------|------|---|--------------------------|
| ctrl1_vc_map 12 | 7:4  | New virtual channel for VC=12. If ctrl_vc_map_en is set to 1, any time VC=12 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT5 (0x37D)**

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map13[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                 |   |   |   | – | – | – | – |
| Access Type | Write, Read         |   |   |   | – | – | – | – |

| BITFIELD        | BITS | DESCRIPTION   | DECODE                   |
|-----------------|------|---|--------------------------|
| ctrl1_vc_map 13 | 7:4  | New virtual channel for VC=13. If ctrl_vc_map_en is set to 1, any time VC=13 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT6 (0x37E)**

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map14[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                 |   |   |   | – | – | – | – |
| Access Type | Write, Read         |   |   |   | – | – | – | – |

| BITFIELD           | BITS | DESCRIPTION   | DECODE                   |
|--------------------|------|---|--------------------------|
| ctrl1_vc_map<br>14 | 7:4  | New virtual channel for VC=14. If ctrl_vc_map_en is set to 1, any time VC=14 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT7 (0x37F)**

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_vc_map15[3:0] |   |   |   | – | – | – | – |
| Reset       | 0x0                 |   |   |   | – | – | – | – |
| Access Type | Write, Read         |   |   |   | – | – | – | – |

| BITFIELD           | BITS | DESCRIPTION   | DECODE                   |
|--------------------|------|---|--------------------------|
| ctrl1_vc_map<br>15 | 7:4  | New virtual channel for VC=15. If ctrl_vc_map_en is set to 1, any time VC=15 is seen, the virtual channel number is replaced with the value in this register. | 0xX: New virtual channel |

**EXT8 (0x380)**

| BIT         | 7    | 6         | 5 | 4         | 3 | 2    | 1    | 0                     |
|-------------|------|-----------|---|-----------|---|------|------|-----------------------|
| Field       | RSVD | RSVD[1:0] |   | RSVD[1:0] |   | RSVD | RSVD | tun_fifo_ove<br>rflow |
| Reset       | 0b0  | 0b0       |   | 0b0       |   | 0b0  | 0b0  | 0b0                   |
| Access Type |      |           |   |           |   |      |      | Read Only             |

| BITFIELD              | BITS | DESCRIPTION          | DECODE  |
|-----------------------|------|----------------------|---|
| tun_fifo_ove<br>rflow | 0    | Tunnel FIFO overflow | 0x0: No overflow<br>0x1: Overflow error triggered |

**EXT9 (0x381)**

| BIT         | 7         | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------|---|---|---|---|---|---|---|
| Field       | RSVD[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x0       |   |   |   |   |   |   |   |
| Access Type |           |   |   |   |   |   |   |   |

**EXT11 (0x383)**

| BIT         | 7           | 6    | 5 | 4 | 3    | 2    | 1         | 0 |
|-------------|-------------|------|---|---|------|------|-----------|---|
| Field       | Tun_Mode    | RSVD | – | – | RSVD | RSVD | RSVD[1:0] |   |
| Reset       | 0x1         | 0x0  | – | – | 0x0  | 0x0  | 0x0       |   |
| Access Type | Write, Read |      | – | – |      |      |           |   |

| BITFIELD | BITS | DESCRIPTION        | DECODE  |
|----------|------|--------------------|---|
| Tun_Mode | 7    | Select Tunnel mode | 0x0: Select Pixel mode<br>0x1: Select Tunnel mode |

[EXT21 \(0x38D\)](#)

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | phy1_pkt_cnt[7:0] |   |   |   |   |   |   |   |
| Reset       | 0b0               |   |   |   |   |   |   |   |
| Access Type | Read Only         |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION                | DECODE                 |
|--------------|------|----------------------------|------------------------|
| phy1_pkt_cnt | 7:0  | MIPI PHY1 Packets Received | 0xXX: Packets Received |

[EXT22 \(0x38E\)](#)

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | csi1_pkt_cnt[7:0] |   |   |   |   |   |   |   |
| Reset       | 0b0               |   |   |   |   |   |   |   |
| Access Type | Read Only         |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION                         | DECODE                  |
|--------------|------|-------------------------------------|-------------------------|
| csi1_pkt_cnt | 7:0  | MIPI Controller 1 Packets Processed | 0xXX: Packets Processed |

[EXT23 \(0x38F\)](#)

| BIT         | 7                | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|------------------|---|---|---|---|---|---|---|
| Field       | tun_pkt_cnt[7:0] |   |   |   |   |   |   |   |
| Reset       | 0b0              |   |   |   |   |   |   |   |
| Access Type | Read Only        |   |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                   | DECODE                  |
|-------------|------|-------------------------------|-------------------------|
| tun_pkt_cnt | 7:0  | MIPI Tunnel Packets Processed | 0xXX: Packets Processed |

[EXT24 \(0x390\)](#)

| BIT         | 7                | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|------------------|---|---|---|---|---|---|---|
| Field       | phy_clk_cnt[7:0] |   |   |   |   |   |   |   |
| Reset       | 0b0              |   |   |   |   |   |   |   |
| Access Type | Read Only        |   |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION  | DECODE                    |
|-------------|------|--|---------------------------|
| phy_clk_cnt | 7:0  | MIPI RX Clock Received. The changing value indicates MIPI Clock lane is running. | 0xXX: MIPI RX Clock Count |

**FRONTTOP\_EXT8 (0x3C8)**

|                    |                   |          |          |          |          |          |          |          |
|--------------------|-------------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>          | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | mem_dt3_selz[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00              |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read       |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>  | <b>DECODE</b>  |
|-----------------|-------------|---|--|
| mem_dt3_selz    | 7:0         | Select a designated datatype to route to video pipeline Z for VS. Bits 7:6 are for selecting the two LSBs of the virtual channel. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt3_selz_en and mem_dt4_selz_en are 0. | 0b00XXXXXX: VC0,4,8,12, Designated datatype<br>0b01XXXXXX: VC1,5,9,13, Designated datatype<br>0b10XXXXXX: VC2,6,10,14, Designated datatype<br>0b11XXXXXX: VC3,7,11,15, Designated datatype |

**FRONTTOP\_EXT9 (0x3C9)**

|                    |                   |          |          |          |          |          |          |          |
|--------------------|-------------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>          | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | mem_dt4_selz[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00              |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read       |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>  | <b>DECODE</b>  |
|-----------------|-------------|---|--|
| mem_dt4_selz    | 7:0         | Select a designated datatype to route to video pipeline Z for VS. Bits 7:6 are for selecting the two LSBs of the virtual channel. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt3_selz_en and mem_dt4_selz_en are 0. | 0b00XXXXXX: VC0,4,8,12, Designated datatype<br>0b01XXXXXX: VC1,5,9,13, Designated datatype<br>0b10XXXXXX: VC2,6,10,14, Designated datatype<br>0b11XXXXXX: VC3,7,11,15, Designated datatype |

**FRONTTOP\_EXT10 (0x3CA)**

|                    |                   |          |          |          |          |          |          |          |
|--------------------|-------------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>          | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | mem_dt5_selz[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00              |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read       |          |          |          |          |          |          |          |

| BITFIELD      | BITS | DESCRIPTION  | DECODE   |
|---------------|------|--|--|
| mem_dt5_sel_z | 7:0  | Select a designated datatype to route to video pipeline Z for HS/DE. Bits 7:6 are for selecting the two LSBs of the virtual channel. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt5_selz_en and mem_dt6_selz_en are 0. | 0b00XXXXXX: VC0,4,8,12, Designated datatype<br>0b01XXXXXX: VC1,5,9,13, Designated datatype<br>0b10XXXXXX: VC2,6,10,14, Designated datatype<br>0b11XXXXXX: VC3,7,11,15, Designated datatype |

**FRONTTOP\_EXT11 (0x3CB)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | mem_dt6_selz[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE   |
|---------------|------|--|--|
| mem_dt6_sel_z | 7:0  | Select a designated datatype to route to video pipeline Z for HS/DE. Bits 7:6 are for selecting the two LSBs of the virtual channel. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt5_selz_en and mem_dt6_selz_en are 0. | 0b00XXXXXX: VC0,4,8,12, Designated datatype<br>0b01XXXXXX: VC1,5,9,13, Designated datatype<br>0b10XXXXXX: VC2,6,10,14, Designated datatype<br>0b11XXXXXX: VC3,7,11,15, Designated datatype |

**FRONTTOP\_EXT17 (0x3D1)**

| BIT         | 7 | 6 | 5 | 4 | 3               | 2               | 1               | 0               |
|-------------|---|---|---|---|-----------------|-----------------|-----------------|-----------------|
| Field       | – | – | – | – | mem_dt6_selz_en | mem_dt5_selz_en | mem_dt4_selz_en | mem_dt3_selz_en |
| Reset       | – | – | – | – | 0b0             | 0b0             | 0b0             | 0b0             |
| Access Type | – | – | – | – | Write, Read     | Write, Read     | Write, Read     | Write, Read     |

| BITFIELD        | BITS | DESCRIPTION   | DECODE                      |
|-----------------|------|---|-----------------------------|
| mem_dt6_selz_en | 3    | Enable datatype designated in mem_dt6_selz to route to video pipeline Z. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt5_selz_en and mem_dt6_selz_en are 0. | 0b0: Disable<br>0b1: Enable |
| mem_dt5_selz_en | 2    | Enable datatype designated in mem_dt5_selz to route to video pipeline Z. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt5_selz_en and mem_dt6_selz_en are 0. | 0b0: Disable<br>0b1: Enable |

| BITFIELD         | BITS | DESCRIPTION  | DECODE                      |
|------------------|------|--|-----------------------------|
| mem_dt4_sel_z_en | 1    | Enable datatype designated in mem_dt4_sel to route to video pipeline Z. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt3_sel_en and mem_dt4_sel_en are 0. | 0b0: Disable<br>0b1: Enable |
| mem_dt3_sel_z_en | 0    | Enable datatype designated in mem_dt3_sel to route to video pipeline Z. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt3_sel_en and mem_dt4_sel_en are 0. | 0b0: Disable<br>0b1: Enable |

**EXTA (0x3DC)**

| BIT         | 7 | 6                 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|-------------------|---|---|---|---|---|---|
| Field       | – | mem_dt7_selz[6:0] |   |   |   |   |   |   |
| Reset       | – | 0b0000000         |   |   |   |   |   |   |
| Access Type | – | Write, Read       |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE   |
|---------------|------|--|--|
| mem_dt7_sel_z | 6:0  | Select designated datatype to route to video pipeline Z. Bit 6 is the enable. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt1_selz[6], mem_dt2_selz[6], mem_dt7_selz[6], and mem_dt8_selz[6] are all 0. | 0b0XXXXXX: Datatype selection disabled<br>0b1XXXXXX: Datatype enabled for datatype selected to route to video pipeline |

**EXTB (0x3DD)**

| BIT         | 7 | 6                 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|-------------------|---|---|---|---|---|---|
| Field       | – | mem_dt8_selz[6:0] |   |   |   |   |   |   |
| Reset       | – | 0b0000000         |   |   |   |   |   |   |
| Access Type | – | Write, Read       |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE   |
|---------------|------|--|--|
| mem_dt8_sel_z | 6:0  | Select designated datatype to route to video pipeline Z. Bit 6 is the enable. Bits 5:0 are for the datatype. Used for filtering which datatypes are routed to video pipeline Z. If no filtering is enabled, then all datatypes are routed. This happens when mem_dt1_selz[6], mem_dt2_selz[6], mem_dt7_selz[6], and mem_dt8_selz[6] are all 0. | 0b0XXXXXX: Datatype selection disabled<br>0b1XXXXXX: Datatype enabled for datatype selected to route to video pipeline |

**VTX0 (0x3E0)**

| BIT         | 7 | 6           | 5                 | 4 | 3           | 2           | 1           | 0           |
|-------------|---|-------------|-------------------|---|-------------|-------------|-------------|-------------|
| Field       | – | VS_TRIG     | REF_VTG_MODE[1:0] |   | HS_INV      | GEN_HS      | VS_INV      | GEN_VS      |
| Reset       | – | 0b1         | 0b11              |   | 0b0         | 0b0         | 0b0         | 0b0         |
| Access Type | – | Write, Read | Write, Read       |   | Write, Read | Write, Read | Write, Read | Write, Read |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| VS_TRIG      | 6    | Select VS trigger edge (positive vs. negative polarity of VS)  | 0b0: Falling edge is VS trigger<br>0b1: Rising edge is VS trigger                                       |
| REF_VTG_MODE | 5:4  | <p>Selects one of the following modes for video interface timing generation. Used when REF_VTG_GEN_HS or GEN_VS are enabled.</p> <p>VS tracking mode. VS input's period (VS_HIGH + VS_LOW) is tracked. After VS tracking is locked, any VS input edge (glitches) not in the expected PCLK cycle is ignored. VS tracking is locked with three consecutive matches and unlocked by three consecutive mismatches. When unlocked or power-up, the next VS input edge is assumed to be the right VS edge.</p> <p>VS one-trigger mode. One VS input edge triggers the generation of one frame of VSO/HSO/DEO. If the next VS input edge comes earlier or later than expected by VS period, the newly-generated frame is correct. The current VSO/HSO/DEO is cut or extended at the point of the rising edge of the newly-generated VSO/HSO/DEO.</p> <p>Auto-repeat mode. VS input edge triggers the generation of continuous frames of VSO/HSO/DEO even if there are no more VS input edges. If next VS input edge comes earlier or later than expected by VS period, the newly-generated frame is correct. The current VSO/HSO/DEO is cut or extended at the point of the rising edge of the newly-generated VSO/HSO/DEO.</p> | 0b00: VS tracking mode<br>0b01: VS one trigger mode<br>0b10: Auto repeat mode<br>0b11: VS tracking mode |
| HS_INV       | 3    | Invert HS output of video timing generator   | 0b0: Do not invert HS<br>0b1: Invert HS   |
| GEN_HS       | 2    | Enable generation of HS output   | 0b0: Disable generation of HS<br>0b1: Enable generation of HS   |
| VS_INV       | 1    | Invert VS output of video-timing generator   | 0b0: Do not invert VS<br>0b1: Invert VS   |
| GEN_VS       | 0    | Enable generation of VS output   | 0b0: Disable generation of VS<br>0b1: Enable generation of VS   |

**VTX1 (0x3E1)**

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | VS_HIGH_2[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE                         |
|-----------|------|---|--------------------------------|
| VS_HIGH_2 | 7:0  | VS High Period in terms of PCLK cycles (Bits [23:16]) | 0xXX: VS high period high byte |

**VTX2 (0x3E2)**

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | VS_HIGH_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE                           |
|-----------|------|--|----------------------------------|
| VS_HIGH_1 | 7:0  | VS High Period in terms of PCLK cycles (Bits [15:8]) | 0xXX: VS high period middle byte |

**VTX3 (0x3E3)**

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | VS_HIGH_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE                        |
|-----------|------|---|-------------------------------|
| VS_HIGH_0 | 7:0  | VS High Period in terms of PCLK cycles (Bits [7:0]) | 0xXX: VS high period low byte |

**VTX4 (0x3E4)**

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | VS_LOW_2[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                        |
|----------|------|--|-------------------------------|
| VS_LOW_2 | 7:0  | VS Low Period in terms of PCLK cycles (Bits [23:16]) | 0xXX: VS low period high byte |



**VTX5 (0x3E5)**

|                    |               |          |          |          |          |          |          |          |
|--------------------|---------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>      | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | VS_LOW_1[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00          |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read   |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>                                  | <b>DECODE</b>                   |
|-----------------|-------------|---|---------------------------------|
| VS_LOW_1        | 7:0         | VS Low Period in terms of PCLK cycles (Bits [15:8]) | 0xXX: VS low period middle byte |

**VTX6 (0x3E6)**

|                    |               |          |          |          |          |          |          |          |
|--------------------|---------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>      | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | VS_LOW_0[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00          |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read   |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>                                 | <b>DECODE</b>                |
|-----------------|-------------|--|------------------------------|
| VS_LOW_0        | 7:0         | VS Low Period in terms of PCLK cycles (Bits [7:0]) | 0xXX: VS low period low byte |

**VTX7 (0x3E7)**

|                    |             |          |          |          |          |          |          |          |
|--------------------|-------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>    | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | V2H_2[7:0]  |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00        |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>   | <b>DECODE</b>            |
|-----------------|-------------|--|--------------------------|
| V2H_2           | 7:0         | Horizontal sync delay. VS edge to the rising edge of the first HS in terms of PCLK cycles (Bits [23:16]) | 0xXX: HS delay high byte |

**VTX8 (0x3E8)**

|                    |             |          |          |          |          |          |          |          |
|--------------------|-------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>    | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | V2H_1[7:0]  |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00        |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>  | <b>DECODE</b>              |
|-----------------|-------------|---|----------------------------|
| V2H_1           | 7:0         | Horizontal sync delay. VS edge to the rising edge of the first HS in terms of PCLK cycles (Bits [15:8]) | 0xXX: HS delay middle byte |

[VTX9 \(0x3E9\)](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | V2H_0[7:0]  |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                  |
|----------|------|--|-------------------------|
| V2H_0    | 7:0  | Horizontal sync delay. VS edge to the rising edge of the first HS in terms of PCLK cycles (Bits [7:0]) | 0xXX: HS delay low byte |

[VTX10 \(0x3EA\)](#)

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | HS_HIGH_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION  | DECODE                         |
|-----------|------|--|--------------------------------|
| HS_HIGH_1 | 7:0  | HS High Period in terms of PCLK cycles (Bits [15:8]) | 0xXX: HS high period high byte |

[VTX11 \(0x3EB\)](#)

| BIT         | 7              | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------|---|---|---|---|---|---|---|
| Field       | HS_HIGH_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00           |   |   |   |   |   |   |   |
| Access Type | Write, Read    |   |   |   |   |   |   |   |

| BITFIELD  | BITS | DESCRIPTION   | DECODE                        |
|-----------|------|---|-------------------------------|
| HS_HIGH_0 | 7:0  | HS High Period in terms of PCLK cycles (Bits [7:0]) | 0xXX: HS high period low byte |

[VTX12 \(0x3EC\)](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | HS_LOW_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE                        |
|----------|------|---|-------------------------------|
| HS_LOW_1 | 7:0  | HS Low Period in terms of PCLK cycles (Bits [15:8]) | 0xXX: HS low period high byte |

**VTX13 (0x3ED)**

| BIT         | 7             | 6  | 5 | 4 | 3                            | 2 | 1 | 0 |
|-------------|---------------|--|---|---|------------------------------|---|---|---|
| Field       | HS_LOW_0[7:0] |  |   |   |                              |   |   |   |
| Reset       | 0x00          |  |   |   |                              |   |   |   |
| Access Type | Write, Read   |  |   |   |                              |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION  |   |   | DECODE                       |   |   |   |
| HS_LOW_0    | 7:0           | HS Low Period in terms of PCLK cycles (Bits [7:0]) |   |   | 0xXX: HS low period low byte |   |   |   |

**VTX14 (0x3EE)**

| BIT         | 7             | 6   | 5 | 4 | 3                                   | 2 | 1 | 0 |
|-------------|---------------|---|---|---|-------------------------------------|---|---|---|
| Field       | HS_CNT_1[7:0] |   |   |   |                                     |   |   |   |
| Reset       | 0x00          |   |   |   |                                     |   |   |   |
| Access Type | Write, Read   |   |   |   |                                     |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                                 |   |   | DECODE                              |   |   |   |
| HS_CNT_1    | 7:0           | Number of HS pulses per frame (Bits [15:8]) |   |   | 0xXX: HS pulses per frame high byte |   |   |   |

**VTX15 (0x3EF)**

| BIT         | 7             | 6  | 5 | 4 | 3                                  | 2 | 1 | 0 |
|-------------|---------------|--|---|---|------------------------------------|---|---|---|
| Field       | HS_CNT_0[7:0] |  |   |   |                                    |   |   |   |
| Reset       | 0x00          |  |   |   |                                    |   |   |   |
| Access Type | Write, Read   |  |   |   |                                    |   |   |   |
| BITFIELD    | BITS          | DESCRIPTION                                |   |   | DECODE                             |   |   |   |
| HS_CNT_0    | 7:0           | Number of HS pulses per frame (Bits [7:0]) |   |   | 0xXX: HS pulses per frame low byte |   |   |   |

**REF\_VTG0 (0x3F0)**

| BIT              | 7             | 6   | 5                       | 4 | 3   | 2 | 1           | 0           |
|------------------|---------------|---|-------------------------|---|---|---|-------------|-------------|
| Field            | REFGEN_LOCKED | REFGEN_PREDEF_EN  | REFGEN_PREDEF_FREQ[1:0] |   | REFGEN_PREDEF_FR_EQ_ALT   | – | REFGEN_RST  | REFGEN_EN   |
| Reset            | 0b0           | 0b1   | 0b01                    |   | 0b0   | – | 0b0         | 0b0         |
| Access Type      | Read Only     | Write, Read   | Write, Read             |   | Write, Read   | – | Write, Read | Write, Read |
| BITFIELD         | BITS          | DESCRIPTION   |                         |   | DECODE  |   |             |             |
| REFGEN_LOCKED    | 7             | Reference generation PLL is locked (for DPLL_OUT)             |                         |   | 0b0: Reference generation PLL not locked<br>0b1: Reference generation PLL locked  |   |             |             |
| REFGEN_PREDEF_EN | 6             | Enable predefined clock settings for reference generation PLL |                         |   | 0b0: Disable pre-defined clock settings for reference generation PLL<br>0b1: Enable pre-defined clock settings for reference generation PLL |   |             |             |

| BITFIELD                       | BITS | DESCRIPTION  | DECODE  |
|--------------------------------|------|--|---|
| REFGEN_P<br>REDEF_FRE<br>Q     | 5:4  | Predefined reference generation PLL frequency setting<br>Set REFGEN_PREDEF_FREQ_ALT=1 to select alternative frequency selections | 0x0: 19.2 MHz / 13.5MHz (ALT)<br>0x1: 27.0 MHz / 24MHz (ALT)<br>0x2: 37.125 MHz / Reserved (ALT)<br>0x3: 74.25 MHz / Reserved (ALT) |
| REFGEN_P<br>REDEF_FRE<br>Q_ALT | 3    | Enable alternative predefined reference generation PLL frequency setting   | 0x0: Original table<br>0x1: Alternative table   |
| REFGEN_R<br>ST                 | 1    | Reset reference generation PLL   | 0b0: Do not reset reference generation PLL<br>0b1: Reset reference generation PLL   |
| REFGEN_E<br>N                  | 0    | Enable reference generation PLL  | 0b0: Disable reference generation PLL<br>0b1: Enable reference generation PLL   |

**REF\_VTG1 (0x3F1)\***

| BIT         | 7           | 6 | 5              | 4 | 3 | 2 | 1 | 0           |
|-------------|-------------|---|----------------|---|---|---|---|-------------|
| Field       | RCLKEN_Y    | – | PCLK_GPIO[4:0] |   |   |   |   | PCLKEN      |
| Reset       | 0b0         | – | 0b00000        |   |   |   |   | 0b0         |
| Access Type | Write, Read | – | Write, Read    |   |   |   |   | Write, Read |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| RCLKEN_Y  | 7    | Select between REFGEN_PLL output and RCLK to be the PCLK output specified in the PCLK_GPIO register                             | 0b0: Select REFGEN_PLL output for PCLK output on MFP<br>0b1: Select RCLK output for PCLK output on MFP |
| PCLK_GPIO | 5:1  | Select which local MFP PCLK is outputted on. Possible MFPs are 0, 1, 2, 3, 4, 7, 8. Must have PCLKEN set to 1 to enable output. | 0bXXXXX: MFP pin selected for PCLK output  |
| PCLKEN    | 0    | Enable output of PCLK on local MFP selected by PCLK_GPIO  | 0b0: Disable PCLK output on MFP<br>0b1: Enable PCLK output on MFP selected by PCLK_GPIO                |

**REF\_VTG2 (0x3F2)\***

| BIT         | 7 | 6 | 5            | 4 | 3 | 2 | 1 | 0           |
|-------------|---|---|--------------|---|---|---|---|-------------|
| Field       | – | – | HS_GPIO[4:0] |   |   |   |   | HSEN        |
| Reset       | – | – | 0b00000      |   |   |   |   | 0b0         |
| Access Type | – | – | Write, Read  |   |   |   |   | Write, Read |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| HS_GPIO  | 5:1  | Select which local MFP HS is outputted on. Possible MFPs are 0,1, 2, 3, 4, 7, 8. Must have HSEN set to 1 to enable output. | 0bXXXXX: MFP pin selected for HS output   |
| HSEN     | 0    | Enable output of HS on local MFP selected by HS_GPIO   | 0b0: Disable HS output on MFP<br>0b1: Enable HS output on MFP selected by HS_GPIO |

[REF\\_VTG3 \(0x3F3\)\\*](#)

| BIT         | 7 | 6 | 5            | 4 | 3 | 2 | 1 | 0           |
|-------------|---|---|--------------|---|---|---|---|-------------|
| Field       | – | – | VS_GPIO[4:0] |   |   |   |   | VSEN        |
| Reset       | – | – | 0b00000      |   |   |   |   | 0b0         |
| Access Type | – | – | Write, Read  |   |   |   |   | Write, Read |

| BITFIELD | BITS | DESCRIPTION  | DECODE  |
|----------|------|--|---|
| VS_GPIO  | 5:1  | Select which local MFP VS is outputted on. Possible MFPs are 0,1, 2, 3, 4, 7, 8. Must have VSEN set to 1 to enable output. | 0bXXXXX: MFP pin selected for VS output   |
| VSEN     | 0    | Enable output of VS on local MFP selected by VS_GPIO   | 0b0: Disable VS output on MFP<br>0b1: Enable VS output on MFP selected by VS_GPIO |

[REF\\_VTG4 \(0x3F4\)](#)

| BIT         | 7                      | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|------------------------|---|---|---|---|---|---|---|
| Field       | REFGEN_FB_FRACT_L[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                   |   |   |   |   |   |   |   |
| Access Type | Write, Read            |   |   |   |   |   |   |   |

| BITFIELD          | BITS | DESCRIPTION   | DECODE  |
|-------------------|------|---|---|
| REFGEN_FB_FRACT_L | 7:0  | Reference generator PLL feedback divider fraction value when predefined mode is disabled (REFGEN_PREDEF_EN=0) | 0xXX: Low byte of reference generator PLL feedback divider fraction value |

[REF\\_VTG5 \(0x3F5\)](#)

| BIT         | 7 | 6 | 5 | 4 | 3                      | 2 | 1 | 0 |
|-------------|---|---|---|---|------------------------|---|---|---|
| Field       | – | – | – | – | REFGEN_FB_FRACT_H[3:0] |   |   |   |
| Reset       | – | – | – | – | 0x0                    |   |   |   |
| Access Type | – | – | – | – | Write, Read            |   |   |   |

| BITFIELD          | BITS | DESCRIPTION   | DECODE  |
|-------------------|------|---|---|
| REFGEN_FB_FRACT_H | 3:0  | Reference generator PLL feedback divider fraction value when predefined mode is disabled (REFGEN_PREDEF_EN=0) | 0xX: High nibble of reference generator PLL feedback divider fraction value |

[REF\\_VTG6 \(0x3F6\)](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | VS_DLY_2[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                   |
|----------|------|--|--------------------------|
| VS_DLY_2 | 7:0  | VS Delay in terms of pixel clock cycles. The output VS is delayed by VS_DELAY cycles from the input VS. (Bits [23:16]) | 0xXX: VS delay high byte |

**REF\_VTG7 (0x3F7)**

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | VS_DLY_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE                     |
|----------|------|---|----------------------------|
| VS_DLY_1 | 7:0  | VS Delay in terms of pixel clock cycles. The output VS is delayed by VS_DELAY cycles from the input VS. (Bits [15:8]) | 0xXX: VS delay middle byte |

**REF\_VTG8 (0x3F8)**

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | VS_DLY_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                  |
|----------|------|--|-------------------------|
| VS_DLY_0 | 7:0  | VS Delay in terms of pixel clock cycles. The output VS is delayed by VS_DELAY cycles from the input VS. (Bits [7:0]) | 0xXX: VS delay low byte |

**REF\_VTG9 (0x3F9)**

| BIT         | 7               | 6 | 5 | 4                    | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|----------------------|---|---|---|---|
| Field       | REF_VTG_TRIG_EN | – | – | REF_VTG_TRIG_ID[4:0] |   |   |   |   |
| Reset       | 0b0             | – | – | 0b11110              |   |   |   |   |
| Access Type | Write, Read     | – | – | Write, Read          |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION                             | DECODE  |
|-----------------|------|---|---|
| REF_VTG_TRIG_EN | 7    | Enable receiving REF VTG trigger signal | 0b0: Disable reception of REF VTG input signal<br>0b1: Enable reception of REF VTG input signal |
| REF_VTG_TRIG_ID | 4:0  | GPIO ID used for receiving REF_VTG_TRIG | 0bXXXXX: GPIO ID selected for receiving REF_VTG_TRIG  |

**ADC\_CTRL\_0 (0x500)**

| BIT         | 7           | 6    | 5    | 4              | 3             | 2           | 1           | 0             |
|-------------|-------------|------|------|----------------|---------------|-------------|-------------|---------------|
| Field       | buf_bypass  | RSVD | RSVD | adc_chgpump_pu | adc_refbuf_pu | buf_pu      | adc_pu      | cpu_adc_start |
| Reset       | 0b0         | 0b0  | 0b0  | 0b0            | 0b0           | 0b0         | 0b0         | 0b0           |
| Access Type | Write, Read |      |      | Write, Read    | Write, Read   | Write, Read | Write, Read | Write, Read   |

| BITFIELD       | BITS | DESCRIPTION  | DECODE  |
|----------------|------|--|---|
| buf_bypass     | 7    | Bypass input buffer  | 0b0: Use input buffer<br>0b1: Bypass input buffer stage                       |
| adc_chgpump_pu | 4    | ADC charge pump power up   | 0b0: ADC charge pump powered off<br>0b1: ADC charge pump powered on           |
| adc_refbuf_pu  | 3    | ADC reference buffer power up  | 0b0: ADC reference buffer powered off<br>0b1: ADC reference buffer powered on |
| buf_pu         | 2    | ADC input buffer power up  | 0b0: ADC input buffer powered off<br>0b1: ADC input buffer powered on         |
| adc_pu         | 1    | ADC power up   | 0b0: ADC powered off<br>0b1: ADC powered on                                   |
| cpu_adc_start  | 0    | Start ADC conversion. Bit is automatically cleared to zero after completion of the conversion. | 0b0: Conversion complete<br>0b1: Set to 1 to start ADC conversion             |

**ADC\_CTRL\_1 (0x501)**

| BIT         | 7              | 6 | 5 | 4 | 3           | 2           | 1           | 0    |
|-------------|----------------|---|---|---|-------------|-------------|-------------|------|
| Field       | adc_chsel[3:0] |   |   |   | adc_clk_en  | adc_refsel  | adc_scale   | RSVD |
| Reset       | 0x0            |   |   |   | 0b0         | 0b0         | 0b0         | 0b0  |
| Access Type | Write, Read    |   |   |   | Write, Read | Write, Read | Write, Read |      |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| adc_chsel  | 7:4  | ADC channel select. Selects ADC input to be converted (see inmux_en bit). | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |
| adc_clk_en | 3    | ADC clock enable. Must be enabled to activate ADC.                        | 0b0: ADC clock disable<br>0b1: ADC clock enable   |

| BITFIELD   | BITS | DESCRIPTION                  | DECODE   |
|------------|------|------------------------------|--|
| adc_refsel | 2    | ADC reference voltage select | 0b0: Select internal bandgap voltage (or external V <sub>REF</sub> pin) as ADC reference voltage (see adc_xref bit)<br>0b1: Select V <sub>DD18</sub> /2 as ADC reference voltage |
| adc_scale  | 1    | ADC scale                    | 0b0: Normal operation<br>0b1: Scale ADC input down by 1/2  |

**ADC\_CTRL\_2 (0x502)**

| BIT         | 7    | 6 | 5    | 4    | 3            | 2 | 1           | 0           |
|-------------|------|---|------|------|--------------|---|-------------|-------------|
| Field       | RSVD | – | RSVD | RSVD | adc_div[1:0] |   | adc_xref    | Inmux_en    |
| Reset       | 0b0  | – | 0b0  | 0b0  | 0b00         |   | 0b0         | 0b0         |
| Access Type |      | – |      |      | Write, Read  |   | Write, Read | Write, Read |

| BITFIELD | BITS | DESCRIPTION  | DECODE   |
|----------|------|--|--|
| adc_div  | 3:2  | ADC[2:0] internal divider setting  | 0b00: Divide ADC input voltage by 1<br>0b01: Divide ADC input voltage by 2<br>0b10: Divide ADC input voltage by 3<br>0b11: Divide ADC input voltage by 4 |
| adc_xref | 1    | Enable use of ADC external reference   | 0b0: Use internal 1.25V voltage reference for ADC<br>0b1: Use external voltage reference connected to V <sub>REF</sub> pin for ADC                       |
| Inmux_en | 0    | Enable the input mux to the ADC to allow for a break before make connection sequence | 0b0: Input mux is disconnected<br>0b1: Input mux is connected per adc_chsel field  |

**ADC\_DATA0 (0x508)**

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | adc_data_l[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Read Only       |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| adc_data_l | 7:0  | Lower byte of 10-bit ADC converted sample data output | 0xX: Lower byte of 10-bit ADC converted value |

**ADC\_DATA1 (0x509)**

| BIT         | 7    | 6 | 5 | 4 | 3 | 2 | 1               | 0 |
|-------------|------|---|---|---|---|---|-----------------|---|
| Field       | RSVD | – | – | – | – | – | adc_data_h[1:0] |   |
| Reset       | 0b0  | – | – | – | – | – | 0b00            |   |
| Access Type |      | – | – | – | – | – | Read Only       |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| adc_data_h | 1:0  | Upper 2-bits of 10-bit ADC converted sample data output | 0xX: Upper 2-bits of 10-bit ADC converted value |



**ADC\_INTRIE0 (0x50C)**

| BIT         | 7              | 6                | 5                   | 4    | 3               | 2               | 1                | 0           |
|-------------|----------------|------------------|---------------------|------|-----------------|-----------------|------------------|-------------|
| Field       | adc_calDone_ie | adc_overRange_ie | adc_tmon_cal_ood_ie | RSVD | adc_lo_limit_ie | adc_hi_limit_ie | adc_ref_ready_ie | adc_done_ie |
| Reset       | 0b0            | 0b0              | 0b0                 | 0b0  | 0b0             | 0b0             | 0b0              | 0b0         |
| Access Type | Write, Read    | Write, Read      | Write, Read         |      | Write, Read     | Write, Read     | Write, Read      | Write, Read |

| BITFIELD            | BITS | DESCRIPTION  | DECODE  |
|---------------------|------|--|---|
| adc_calDone_ie      | 7    | Signal that ADC accuracy/temperature sensor calibration is complete, enable. Need to also set ADC_INT_OEN. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| adc_overRange_ie    | 6    | ADC Digital Correction Overage enabled. Need to also set ADC_INT_OEN.                                      | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| adc_tmon_cal_ood_ie | 5    | Enable temperature sensor out-of-date interrupt. Need to also set ADC_INT_OEN.                             | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| adc_lo_limit_ie     | 3    | Enable ADC low limit monitor interrupt. Need to also set ADC_INT_OEN.                                      | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| adc_hi_limit_ie     | 2    | Enable ADC high limit monitor interrupt. Need to also set ADC_INT_OEN.                                     | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| adc_ref_ready_ie    | 1    | Enable ADC ready interrupt. Need to also set ADC_INT_OEN.  | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| adc_done_ie         | 0    | Enable ADC Conversion Done Interrupt. Need to also set ADC_INT_OEN.  | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |

**ADC\_INTRIE1 (0x50D)**

| BIT         | 7               | 6               | 5               | 4               | 3               | 2               | 1               | 0               |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Field       | ch7_hi_limit_ie | ch6_hi_limit_ie | ch5_hi_limit_ie | ch4_hi_limit_ie | ch3_hi_limit_ie | ch2_hi_limit_ie | ch1_hi_limit_ie | ch0_hi_limit_ie |
| Reset       | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             |
| Access Type | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     |

| BITFIELD        | BITS | DESCRIPTION  | DECODE  |
|-----------------|------|--|---|
| ch7_hi_limit_ie | 7    | Enable Channel 7 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch6_hi_limit_ie | 6    | Enable Channel 6 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch5_hi_limit_ie | 5    | Enable Channel 5 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch4_hi_limit_ie | 4    | Enable Channel 4 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch3_hi_limit_ie | 3    | Enable Channel 3 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |

| BITFIELD        | BITS | DESCRIPTION  | DECODE  |
|-----------------|------|--|---|
| ch2_hi_limit_ie | 2    | Enable Channel 2 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch1_hi_limit_ie | 1    | Enable Channel 1 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch0_hi_limit_ie | 0    | Enable Channel 0 high limit monitor interrupt. Need to also set ADC_INT_OEN and adc_hi_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |

**ADC\_INTRIE2 (0x50E)**

| BIT         | 7               | 6               | 5               | 4               | 3               | 2               | 1               | 0               |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Field       | ch7_lo_limit_ie | ch6_lo_limit_ie | ch5_lo_limit_ie | ch4_lo_limit_ie | ch3_lo_limit_ie | ch2_lo_limit_ie | ch1_lo_limit_ie | ch0_lo_limit_ie |
| Reset       | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             |
| Access Type | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     | Write, Read     |

| BITFIELD        | BITS | DESCRIPTION   | DECODE  |
|-----------------|------|---|---|
| ch7_lo_limit_ie | 7    | Enable Channel 7 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch6_lo_limit_ie | 6    | Enable Channel 6 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch5_lo_limit_ie | 5    | Enable Channel 5 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch4_lo_limit_ie | 4    | Enable Channel 4 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch3_lo_limit_ie | 3    | Enable Channel 3 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch2_lo_limit_ie | 2    | Enable Channel 2 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch1_lo_limit_ie | 1    | Enable Channel 1 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| ch0_lo_limit_ie | 0    | Enable Channel 0 low limit monitor interrupt. Need to also set ADC_INT_OEN and adc_lo_limit_ie. | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |

**ADC\_INTRIE3 (0x50F)**

| BIT         | 7 | 6           | 5             | 4             | 3             | 2    | 1           | 0    |
|-------------|---|-------------|---------------|---------------|---------------|------|-------------|------|
| Field       | – | reflim_ie   | reflimscl1_ie | reflimscl2_ie | reflimscl3_ie | RSVD | tmon_err_ie | RSVD |
| Reset       | – | 0b0         | 0b0           | 0b0           | 0b0           | 0b0  | 0b0         | 0b0  |
| Access Type | – | Write, Read | Write, Read   | Write, Read   | Write, Read   |      | Write, Read |      |

| BITFIELD      | BITS | DESCRIPTION                                    | DECODE  |
|---------------|------|--|---|
| reflim_ie     | 6    | Enable the REFLIM interrupt (for ADC BIST)     | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| reflimscl1_ie | 5    | Enable the REFLIMSCL1 interrupt (for ADC BIST) | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| reflimscl2_ie | 4    | Enable the REFLIMSCL2 interrupt (for ADC BIST) | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| reflimscl3_ie | 3    | Enable the REFLIMSCL3 interrupt (for ADC BIST) | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |
| tmon_err_ie   | 1    | Enable the temperature sensor error interrupt  | 0b0: ADC interrupt source disabled<br>0b1: ADC interrupt source enabled |

**ADC\_INTR0 (0x510)**

| BIT         | 7              | 6                | 5                   | 4    | 3               | 2               | 1                | 0           |
|-------------|----------------|------------------|---------------------|------|-----------------|-----------------|------------------|-------------|
| Field       | adc_calDone_if | adc_overRange_if | adc_tmon_cal_ood_if | RSVD | adc_lo_limit_if | adc_hi_limit_if | adc_ref_ready_if | adc_done_if |
| Reset       | 0b0            | 0b0              | 0b0                 | 0b0  | 0b0             | 0b0             | 0b0              | 0b0         |
| Access Type | Read Only      | Read Only        | Read Only           |      | Read Only       | Read Only       | Read Only        | Read Only   |

| BITFIELD            | BITS | DESCRIPTION   | DECODE                             |
|---------------------|------|---|------------------------------------|
| adc_calDone_if      | 7    | ADC accuracy/temperature sensor done flag. Cleared when read.   | 0b0: Flag cleared<br>0b1: Flag set |
| adc_overRange_if    | 6    | Detected that ADC input voltage exceeds ADC valid input range flag. Cleared when read.                        | 0b0: Flag cleared<br>0b1: Flag set |
| adc_tmon_cal_ood_if | 5    | Temperature sensor calibration has expired and should be rerun flag (see run_tmoncal bit). Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| adc_lo_limit_if     | 3    | ADC low limit monitor interrupt flag. Cleared when read.  | 0b0: Flag cleared<br>0b1: Flag set |
| adc_hi_limit_if     | 2    | ADC high limit monitor interrupt flag. Cleared when read.   | 0b0: Flag cleared<br>0b1: Flag set |
| adc_ref_ready_if    | 1    | After powerup the ADC is ready to be used flag. Cleared when read.  | 0b0: Flag cleared<br>0b1: Flag set |
| adc_done_if         | 0    | ADC conversion done interrupt flag. Cleared when read.  | 0b0: Flag cleared<br>0b1: Flag set |

**ADC\_INTR1 (0x511)**

| BIT         | 7               | 6               | 5               | 4               | 3               | 2               | 1               | 0               |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Field       | ch7_hi_limit_if | ch6_hi_limit_if | ch5_hi_limit_if | ch4_hi_limit_if | ch3_hi_limit_if | ch2_hi_limit_if | ch1_hi_limit_if | ch0_hi_limit_if |
| Reset       | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             |
| Access Type | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       |

| BITFIELD        | BITS | DESCRIPTION   | DECODE                             |
|-----------------|------|---|------------------------------------|
| ch7_hi_limit_if | 7    | Channel 7 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch6_hi_limit_if | 6    | Channel 6 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch5_hi_limit_if | 5    | Channel 5 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch4_hi_limit_if | 4    | Channel 4 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch3_hi_limit_if | 3    | Channel 3 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch2_hi_limit_if | 2    | Channel 2 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch1_hi_limit_if | 1    | Channel 1 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch0_hi_limit_if | 0    | Channel 0 high limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |

**ADC\_INTR2 (0x512)**

| BIT         | 7               | 6               | 5               | 4               | 3               | 2               | 1               | 0               |
|-------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Field       | ch7_lo_limit_if | ch6_lo_limit_if | ch5_lo_limit_if | ch4_lo_limit_if | ch3_lo_limit_if | ch2_lo_limit_if | ch1_lo_limit_if | ch0_lo_limit_if |
| Reset       | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             | 0b0             |
| Access Type | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       | Read Only       |

| BITFIELD        | BITS | DESCRIPTION  | DECODE                             |
|-----------------|------|--|------------------------------------|
| ch7_lo_limit_if | 7    | Channel 7 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch6_lo_limit_if | 6    | Channel 6 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch5_lo_limit_if | 5    | Channel 5 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch4_lo_limit_if | 4    | Channel 4 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch3_lo_limit_if | 3    | Channel 3 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch2_lo_limit_if | 2    | Channel 2 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| ch1_lo_limit_if | 1    | Channel 1 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |

| BITFIELD        | BITS | DESCRIPTION  | DECODE                             |
|-----------------|------|--|------------------------------------|
| ch0_lo_limit_if | 0    | Channel 0 low limit monitor interrupt flag. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |

**ADC\_INTR3 (0x513)**

| BIT         | 7 | 6         | 5             | 4             | 3             | 2    | 1           | 0    |
|-------------|---|-----------|---------------|---------------|---------------|------|-------------|------|
| Field       | – | reflim_if | reflimscl1_if | reflimscl2_if | reflimscl3_if | RSVD | tmon_err_if | RSVD |
| Reset       | – | 0b0       | 0b0           | 0b0           | 0b0           | 0b0  | 0b0         | 0b0  |
| Access Type | – | Read Only | Read Only     | Read Only     | Read Only     |      | Read Only   |      |

| BITFIELD      | BITS | DESCRIPTION   | DECODE                             |
|---------------|------|---|------------------------------------|
| reflim_if     | 6    | Returned value from ADC BIST test (divided by 1 input mode) exceeds test limit set by REFLIM register. Cleared when read.     | 0b0: Flag cleared<br>0b1: Flag set |
| reflimscl1_if | 5    | Returned value from ADC BIST test (divided by 2 input mode) exceeds test limit set by REFLIMSCL1 register. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| reflimscl2_if | 4    | Returned value from ADC BIST test (divided by 4 input mode) exceeds test limit set by REFLIMSCL2 register. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| reflimscl3_if | 3    | Returned value from ADC BIST test (divided by 8 input mode) exceeds test limit set by REFLIMSCL3 register. Cleared when read. | 0b0: Flag cleared<br>0b1: Flag set |
| tmon_err_if   | 1    | Discrepancy between temperature sensor and redundant temperature sensor exceeds test limit set by TLIMIT register.            | 0b0: Flag cleared<br>0b1: Flag set |

**ADC\_LIMIT0\_0 (0x514)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_I0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_I0 | 7:0  | ADC Output Register set 0 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT0\_1 (0x515)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_I0[3:0] |   |   |   | – | – | chLoLimit_h0[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_I0 | 7:4  | ADC Output Register set 0 - high limit threshold value, low bits | 0bX: High limit low nibble |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                    |
|--------------|------|--|---------------------------|
| chLoLimit_h0 | 1:0  | ADC Output Register set 0 - low limit threshold value, high bits | 0bXX: Low limit high bits |

**ADC\_LIMIT0\_2 (0x516)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h0[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h0 | 5:0  | ADC Output Register set 0 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT0\_3 (0x517)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel0[1:0] |   | ch_sel0[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| div_sel0 | 5:4  | ADC channel 0 divider setting                  | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4  |
| ch_sel0  | 3:0  | ADC Input Select for ADC Output Register set 0 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC\_LIMIT1\_0 (0x518)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_l1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_I1 | 7:0  | ADC Output Register set 1 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT1\_1 (0x519)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_I1[3:0] |   |   |   | – | – | chLoLimit_h1[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_I1 | 7:4  | ADC Output Register set 1 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h1 | 1:0  | ADC Output Register set 1 - low limit threshold value, high bits | 0bXX: Low limit high bits  |

**ADC\_LIMIT1\_2 (0x51A)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h1[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h1 | 5:0  | ADC Output Register set 1 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT1\_3 (0x51B)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel1[1:0] |   | ch_sel1[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                   | DECODE   |
|----------|------|-------------------------------|--|
| div_sel1 | 5:4  | ADC channel 1 divider setting | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4 |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| ch_sel1  | 3:0  | ADC Input Select for ADC Output Register set 1 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC\_LIMIT2\_0 (0x51C)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_I2[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_I2 | 7:0  | ADC Output Register set 2 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT2\_1 (0x51D)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_I2[3:0] |   |   |   | – | – | chLoLimit_h2[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_I2 | 7:4  | ADC Output Register set 2 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h2 | 1:0  | ADC Output Register set 2 - low limit threshold value, high bits | 0bXX: Low limit high bits  |

**ADC\_LIMIT2\_2 (0x51E)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h2[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |



| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h2 | 5:0  | ADC Output Register set 2 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT2\_3 (0x51F)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel2[1:0] |   | ch_sel2[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| div_sel2 | 5:4  | ADC channel 2 divider setting                  | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4  |
| ch_sel2  | 3:0  | ADC Input Select for ADC Output Register set 2 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC\_LIMIT3\_0 (0x520)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_l3[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_l3 | 7:0  | ADC Output Register set 3 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT3\_1 (0x521)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_l3[3:0] |   |   |   | – | – | chLoLimit_h3[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_l3 | 7:4  | ADC Output Register set 3 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h3 | 1:0  | ADC Output Register set 3 - low limit threshold value, high bits | 0bXX: Low limit high bits  |

**ADC\_LIMIT3\_2 (0x522)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h3[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h3 | 5:0  | ADC Output Register set 3 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT3\_3 (0x523)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel3[1:0] |   | ch_sel3[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| div_sel3 | 5:4  | ADC channel 3 divider setting                  | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4  |
| ch_sel3  | 3:0  | ADC Input Select for ADC Output Register set 3 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

[ADC\\_LIMIT4\\_0 \(0x524\)](#)

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_I4[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_I4 | 7:0  | ADC Output Register set 4 - low limit threshold value, low bits | 0xXX: Low limit low byte |

[ADC\\_LIMIT4\\_1 \(0x525\)](#)

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_I4[3:0] |   |   |   | – | – | chLoLimit_h4[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_I4 | 7:4  | ADC Output Register set 4 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h4 | 1:0  | ADC Output Register set 4 - low limit threshold value, high bits | 0bXX: Low limit high bits  |

[ADC\\_LIMIT4\\_2 \(0x526\)](#)

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h4[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h4 | 5:0  | ADC Output Register set 4 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

[ADC\\_LIMIT4\\_3 \(0x527\)](#)

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel4[1:0] |   | ch_sel4[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                   | DECODE   |
|----------|------|-------------------------------|--|
| div_sel4 | 5:4  | ADC channel 4 divider setting | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4 |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| ch_sel4  | 3:0  | ADC Input Select for ADC Output Register set 4 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC\_LIMIT5\_0 (0x528)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_I5[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_I5 | 7:0  | ADC Output Register set 5 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT5\_1 (0x529)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_I5[3:0] |   |   |   | – | – | chLoLimit_h5[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_I5 | 7:4  | ADC Output Register set 5 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h5 | 1:0  | ADC Output Register set 5 - low limit threshold value, high bits | 0bXX: Low limit high bits  |

**ADC\_LIMIT5\_2 (0x52A)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h5[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h5 | 5:0  | ADC Output Register set 5 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT5\_3 (0x52B)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel5[1:0] |   | ch_sel5[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| div_sel5 | 5:4  | ADC channel 5 divider setting                  | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4  |
| ch_sel5  | 3:0  | ADC Input Select for ADC Output Register set 5 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC\_LIMIT6\_0 (0x52C)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_l6[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_l6 | 7:0  | ADC Output Register set 6 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT6\_1 (0x52D)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_l6[3:0] |   |   |   | – | – | chLoLimit_h6[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_l6 | 7:4  | ADC Output Register set 6 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h6 | 1:0  | ADC Output Register set 6 - low limit threshold value, high bits | 0bXX: Low limit high bits  |

**ADC\_LIMIT6\_2 (0x52E)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h6[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h6 | 5:0  | ADC Output Register set 5 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT6\_3 (0x52F)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel6[1:0] |   | ch_sel6[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| div_sel6 | 5:4  | ADC channel 6 divider setting                  | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4  |
| ch_sel6  | 3:0  | ADC Input Select for ADC Output Register set 6 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC\_LIMIT7\_0 (0x530)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | chLoLimit_I7[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                   |
|--------------|------|---|--------------------------|
| chLoLimit_I7 | 7:0  | ADC Output Register set 7 - low limit threshold value, low bits | 0xXX: Low limit low byte |

**ADC\_LIMIT7\_1 (0x531)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                 | 0 |
|-------------|-------------------|---|---|---|---|---|-------------------|---|
| Field       | chHiLimit_I7[3:0] |   |   |   | – | – | chLoLimit_h7[1:0] |   |
| Reset       | 0xF               |   |   |   | – | – | 0b00              |   |
| Access Type | Write, Read       |   |   |   | – | – | Write, Read       |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE                     |
|--------------|------|--|----------------------------|
| chHiLimit_I7 | 7:4  | ADC Output Register set 7 - high limit threshold value, low bits | 0bX: High limit low nibble |
| chLoLimit_h7 | 1:0  | ADC Output Register set 7- low limit threshold value, high bits  | 0bXX: Low limit high bits  |

**ADC\_LIMIT7\_2 (0x532)**

| BIT         | 7 | 6 | 5                 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------------|---|---|---|---|---|
| Field       | – | – | chHiLimit_h7[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b111111          |   |   |   |   |   |
| Access Type | – | – | Write, Read       |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                         |
|--------------|------|---|--------------------------------|
| chHiLimit_h7 | 5:0  | ADC Output Register set 7 - high limit threshold value, high bits | 0bXXXXXX: High limit high bits |

**ADC\_LIMIT7\_3 (0x533)**

| BIT         | 7 | 6 | 5             | 4 | 3            | 2 | 1 | 0 |
|-------------|---|---|---------------|---|--------------|---|---|---|
| Field       | – | – | div_sel7[1:0] |   | ch_sel7[3:0] |   |   |   |
| Reset       | – | – | 0b00          |   | 0x3          |   |   |   |
| Access Type | – | – | Write, Read   |   | Write, Read  |   |   |   |

| BITFIELD | BITS | DESCRIPTION                   | DECODE   |
|----------|------|-------------------------------|--|
| div_sel7 | 5:4  | ADC channel 7 divider setting | 0b00: Divide by 1<br>0b01: Divide by 2<br>0b10: Divide by 3<br>0b11: Divide by 4 |

| BITFIELD | BITS | DESCRIPTION                                    | DECODE  |
|----------|------|--|---|
| ch_sel7  | 3:0  | ADC Input Select for ADC Output Register set 7 | 0x0: ADC0 (See adc_pin_en[0] bit)<br>0x1: ADC1 (See adc_pin_en[1] bit)<br>0x2: ADC2 (See adc_pin_en[2] bit)<br>0x3: Reserved<br>0x4: Reserved<br>0x5: Reserved<br>0x6: Reserved<br>0x7: Reserved<br>0x8: VDDIO/4<br>0x9: VDD18/2<br>0xA: CAP_VDD/2<br>0xB: Reserved<br>0xC: Reserved<br>0xD: Reserved<br>0xE: Reserved<br>0xF: Reserved |

**ADC RR CTRL0 (0x534)**

| BIT         | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0           |
|-------------|---|---|---|---|---|---|---|-------------|
| Field       | – | – | – | – | – | – | – | adc_rr_run  |
| Reset       | – | – | – | – | – | – | – | 0b0         |
| Access Type | – | – | – | – | – | – | – | Write, Read |

| BITFIELD   | BITS | DESCRIPTION                      | DECODE  |
|------------|------|----------------------------------|---|
| adc_rr_run | 0    | Enable ADC round robin operation | 0b0: A/D conversions must be manually triggered using register bit cpu_adc_start<br>0b1: ADC runs in round robin mode, periodically sampling all enabled inputs |

**ADC CTRL 4 (0x53E)**

| BIT         | 7    | 6         | 5 | 4 | 3               | 2 | 1 | 0 |
|-------------|------|-----------|---|---|-----------------|---|---|---|
| Field       | RSVD | RSVD[3:0] |   |   | adc_pin_en[2:0] |   |   |   |
| Reset       | 0b0  | 0x0       |   |   | 0b000           |   |   |   |
| Access Type |      |           |   |   | Write, Read     |   |   |   |

| BITFIELD   | BITS | DESCRIPTION                                | DECODE  |
|------------|------|--|---|
| adc_pin_en | 2:0  | Connect selected MFP pins to ADC input mux | 0bXX0: Disable connection of MFP3 pin to ADC input mux<br>0bXX1: Enable connection of MFP3 pin to ADC input mux<br>0bX0X: Disable connection of MFP5 pin to ADC input mux<br>0bX1X: Enable connection of MFP5 pin to ADC input mux<br>0b0XX: Disable connection of MFP6 pin to ADC input mux<br>0b1XX: Enable connection of MFP6 pin to ADC input mux |



UART\_PT\_0 (0x548)\*

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | BITLEN_PT_1_L[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xDC               |   |   |   |   |   |   |   |
| Access Type | Write, Read        |   |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE  |
|---------------|------|--|---|
| BITLEN_PT_1_L | 7:0  | Low byte of custom (manually configured) UART bit length for pass-thru UART channel #1. Set this register to the UART bit length divided by 6.666ns (LSB 8 bits). Set BITLEN_MAN_CFG_1 to 1 to use this value. | 0xXX: Low byte of custom UART bit length for pass-through UART channel #1 |

UART\_PT\_1 (0x549)\*

| BIT         | 7 | 6 | 5                  | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|--------------------|---|---|---|---|---|
| Field       | – | – | BITLEN_PT_1_H[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b000101           |   |   |   |   |   |
| Access Type | – | – | Write, Read        |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION   | DECODE   |
|---------------|------|---|--|
| BITLEN_PT_1_H | 5:0  | High byte of custom (manually configured) UART bit length for pass-thru UART channel #1. Set this register to the UART bit length divided by 6.666ns (LSB 8 bits). Set BITLEN_MAN_CFG_1 to 1 to use this value. | 0xXX: High byte of custom UART bit length for pass-through UART channel #1 |

UART\_PT\_2 (0x54A)\*

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | BITLEN_PT_2_L[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xDC               |   |   |   |   |   |   |   |
| Access Type | Write, Read        |   |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION  | DECODE  |
|---------------|------|--|---|
| BITLEN_PT_2_L | 7:0  | Low byte of custom (manually configured) UART bit length for pass-thru UART channel #2. Set this register to the UART bit length divided by 6.666ns (LSB 8 bits). Set BITLEN_MAN_CFG_2 to 1 to use this value. | 0xXX: Low byte of custom UART bit length for pass-through UART channel #2 |

[UART\\_PT\\_3 \(0x54B\)\\*](#)

| BIT         | 7 | 6 | 5                  | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|--------------------|---|---|---|---|---|
| Field       | – | – | BITLEN_PT_2_H[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b000101           |   |   |   |   |   |
| Access Type | – | – | Write, Read        |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION   | DECODE   |
|---------------|------|---|--|
| BITLEN_PT_2_H | 5:0  | High byte of custom (manually configured) UART bit length for pass-thru UART channel #2. Set this register to the UART bit length divided by 6.666ns (LSB 8 bits). Set BITLEN_MAN_CFG_2 to 1 to use this value. | 0xXX: High byte of custom UART bit length for pass-through UART channel #2 |

[I2C\\_PT\\_4 \(0x550\)](#)

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | SRC_A_1[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION   |
|----------|------|---|
| SRC_A_1  | 7:1  | I <sup>2</sup> C address translator source A for pass-through channel #1.<br>When an I <sup>2</sup> C transaction across the GMSL link has a device address matching I <sup>2</sup> C SRC_A_1, the device address as seen on the remote side is replaced by the device address in I <sup>2</sup> C DST_A_1. |

[I2C\\_PT\\_5 \(0x551\)](#)

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | DST_A_1[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION  |
|----------|------|--|
| DST_A_1  | 7:1  | I <sup>2</sup> C address translator destination A for pass-through channel #1.<br>See the description of I <sup>2</sup> C SRC_A_1. |

[I2C\\_PT\\_6 \(0x552\)](#)

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | SRC_B_1[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION   |
|----------|------|---|
| SRC_B_1  | 7:1  | I <sup>2</sup> C address translator source B for pass-through channel #1.<br>When an I <sup>2</sup> C transaction across the GMSL link has a device address matching I <sup>2</sup> C SRC_B_1, the device address as seen on the remote side is replaced by the device address in I <sup>2</sup> C DST_B_1. |

**I<sup>2</sup>C\_PT\_7 (0x553)**

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | DST_B_1[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION  |
|----------|------|--|
| DST_B_1  | 7:1  | I <sup>2</sup> C address translator destination B for pass-through channel #1.<br>See the description of I <sup>2</sup> C SRC_B_1. |

**I<sup>2</sup>C\_PT\_8 (0x554)**

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | SRC_A_2[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION   |
|----------|------|---|
| SRC_A_2  | 7:1  | I <sup>2</sup> C address translator source A for pass-through channel #2.<br>When an I <sup>2</sup> C transaction across the GMSL link has a device address matching I <sup>2</sup> C SRC_A_2, the device address as seen on the remote side is replaced by the device address in I <sup>2</sup> C DST_A_2. |

**I<sup>2</sup>C\_PT\_9 (0x555)**

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | DST_A_2[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION  |
|----------|------|--|
| DST_A_2  | 7:1  | I <sup>2</sup> C address translator destination A for pass-through channel #2.<br>See the description of I <sup>2</sup> C SRC_A_2. |

[I2C\\_PT\\_10 \(0x556\)](#)

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | SRC_B_2[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION   |
|----------|------|---|
| SRC_B_2  | 7:1  | I <sup>2</sup> C address translator source B for pass-through channel #2.<br>When an I <sup>2</sup> C transaction across the GMSL link has a device address matching I <sup>2</sup> C SRC_B_2, the device address as seen on the remote side is replaced by the device address in I <sup>2</sup> C DST_B_2. |

[I2C\\_PT\\_11 \(0x557\)](#)

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | DST_B_2[6:0] |   |   |   |   |   |   | – |
| Reset       | 0x00         |   |   |   |   |   |   | – |
| Access Type | Write, Read  |   |   |   |   |   |   | – |

| BITFIELD | BITS | DESCRIPTION  |
|----------|------|--|
| DST_B_2  | 7:1  | I <sup>2</sup> C address translator destination B for pass-through channel #2.<br>See the description of I <sup>2</sup> C SRC_B_2. |

[HS\\_VS\\_Z \(0x55F\)](#)

| BIT         | 7 | 6         | 5         | 4         | 3 | 2 | 1         | 0         |
|-------------|---|-----------|-----------|-----------|---|---|-----------|-----------|
| Field       | – | DE_DET_Z  | VS_DET_Z  | HS_DET_Z  | – | – | VS_POL_Z  | HS_POL_Z  |
| Reset       | – | 0b0       | 0b0       | 0b0       | – | – | 0b0       | 0b0       |
| Access Type | – | Read Only | Read Only | Read Only | – | – | Read Only | Read Only |

| BITFIELD | BITS | DESCRIPTION                                 | DECODE   |
|----------|------|---|--|
| DE_DET_Z | 6    | DE activity is detected on video pipeline Z | 0x0: DE is not detected<br>0x1: DE is detected |
| VS_DET_Z | 5    | VS activity is detected on video pipeline Z | 0x0: VS is not detected<br>0x1: VS is detected |
| HS_DET_Z | 4    | HS activity is detected on video pipeline Z | 0x0: HS is not detected<br>0x1: HS is detected |
| VS_POL_Z | 1    | Detected VS polarity on video pipeline Z    | 0x0: Active low<br>0x1: Active high            |
| HS_POL_Z | 0    | Detected HS polarity on video pipeline Z    | 0x0: Active low<br>0x1: Active high            |

**UNLOCK\_KEY (0x56E)\***

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | UNLOCK_KEY[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xBB            |   |   |   |   |   |   |   |
| Access Type | Write, Read     |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE   |
|------------|------|---|--|
| UNLOCK_KEY | 7:0  | Register must be at unlock value to enable write access to port control bit fields. DIS_LOCAL_CC, IIC_1_EN, IIC_2_EN, UART_1_EN, UART_2_EN. Defaults to unlocked. | 0xBB: Unlock write access<br>Others: Lock write access |

**PIO\_SLEW\_0 (0x56F)\***

| BIT         | 7 | 6 | 5               | 4 | 3               | 2 | 1               | 0 |
|-------------|---|---|-----------------|---|-----------------|---|-----------------|---|
| Field       | – | – | PIO02_SLEW[1:0] |   | PIO01_SLEW[1:0] |   | PIO00_SLEW[1:0] |   |
| Reset       | – | – | 0b11            |   | 0b11            |   | 0b10            |   |
| Access Type | – | – | Write, Read     |   | Write, Read     |   | Write, Read     |   |

| BITFIELD   | BITS | DESCRIPTION  |
|------------|------|--|
| PIO02_SLEW | 5:4  | Slew rate setting for MFP2 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |
| PIO01_SLEW | 3:2  | Slew rate setting for MFP1 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |
| PIO00_SLEW | 1:0  | Slew rate setting for MFP0 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |

**PIO\_SLEW\_1 (0x570)\***

| BIT         | 7 | 6 | 5               | 4 | 3               | 2 | 1 | 0 |
|-------------|---|---|-----------------|---|-----------------|---|---|---|
| Field       | – | – | PIO06_SLEW[1:0] |   | PIO05_SLEW[1:0] |   | – | – |
| Reset       | – | – | 0b11            |   | 0b11            |   | – | – |
| Access Type | – | – | Write, Read     |   | Write, Read     |   | – | – |

| BITFIELD   | BITS | DESCRIPTION  |
|------------|------|--|
| PIO06_SLEW | 5:4  | Slew rate setting for MFP4 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |
| PIO05_SLEW | 3:2  | Slew rate setting for MFP3 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |

[PIO\\_SLEW\\_2 \(0x571\)\\*](#)

| BIT         | 7                | 6 | 5                | 4 | 3         | 2 | 1 | 0 |   |
|-------------|------------------|---|------------------|---|-----------|---|---|---|---|
| Field       | PIO011_SLEW[1:0] |   | PIO010_SLEW[1:0] |   | RSVD[1:0] |   |   | – | – |
| Reset       | 0b11             |   | 0b11             |   | 0b11      |   |   | – | – |
| Access Type | Write, Read      |   | Write, Read      |   |           |   |   | – | – |

| BITFIELD    | BITS | DESCRIPTION  |
|-------------|------|--|
| PIO011_SLEW | 7:6  | Slew rate setting for MFP8 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |
| PIO010_SLEW | 5:4  | Slew rate setting for MFP7 pin. 00 value is the fastest rise and fall time, and 11 value is the slowest. |

[EXT4 \(0x584\)](#)

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_fs_cnt_l[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                |   |   |   |   |   |   |   |
| Access Type | Read Only           |   |   |   |   |   |   |   |

| BITFIELD       | BITS | DESCRIPTION   |
|----------------|------|---|
| ctrl1_fs_cnt_l | 7:0  | Frame start counter value of the virtual channel selected by FS_VC_SEL (low byte) |

[EXT5 \(0x585\)](#)

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_fs_cnt_h[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                |   |   |   |   |   |   |   |
| Access Type | Read Only           |   |   |   |   |   |   |   |

| BITFIELD       | BITS | DESCRIPTION  |
|----------------|------|--|
| ctrl1_fs_cnt_h | 7:0  | Frame start counter value of the virtual channel selected by FS_VC_SEL (high byte) |

[EXT6 \(0x586\)](#)

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_fe_cnt_l[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                |   |   |   |   |   |   |   |
| Access Type | Read Only           |   |   |   |   |   |   |   |

| BITFIELD       | BITS | DESCRIPTION   |
|----------------|------|---|
| ctrl1_fe_cnt_l | 7:0  | Frame end counter value of the virtual channel selected by FS_VC_SEL (low byte) |

[EXT7 \(0x587\)](#)

| BIT         | 7                   | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------------|---|---|---|---|---|---|---|
| Field       | ctrl1_fe_cnt_h[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                |   |   |   |   |   |   |   |
| Access Type | Read Only           |   |   |   |   |   |   |   |

| BITFIELD       | BITS | DESCRIPTION  |
|----------------|------|--|
| ctrl1_fe_cnt_h | 7:0  | Frame end counter value of the virtual channel selected by FS_VC_SEL (high byte) |

[EXT8 \(0x588\)](#)

| BIT         | 7 | 6 | 5 | 4 | 3                    | 2 | 1 | 0 |
|-------------|---|---|---|---|----------------------|---|---|---|
| Field       | – | – | – | – | ctrl1_fs_vc_sel[3:0] |   |   |   |
| Reset       | – | – | – | – | 0x0                  |   |   |   |
| Access Type | – | – | – | – | Write, Read          |   |   |   |

| BITFIELD        | BITS | DESCRIPTION   |
|-----------------|------|---|
| ctrl1_fs_vc_sel | 3:0  | Selected virtual channel for frame start/end count monitoring |

[SPI\\_CC\\_WR \(0x1300\)](#)

SPI data to write over the GMSL link. Use this address space to send write data across the GMSL link.

[SPI\\_CC\\_RD \(0x1380\)](#)

SPI data received over the GMSL link. Use this address space to read data sent across the GMSL link.

[RLMS4 \(0x1404\)\\*](#)

| BIT         | 7                   | 6 | 5 | 4 | 3                | 2 | 1            | 0           |
|-------------|---------------------|---|---|---|------------------|---|--------------|-------------|
| Field       | EOM_CHK_AMOUNT[3:0] |   |   |   | EOM_CHK_THR[1:0] |   | EOM_PER_MODE | EOM_EN      |
| Reset       | 0x4                 |   |   |   | 0b10             |   | 0b1          | 0b1         |
| Access Type | Write, Read         |   |   |   | Write, Read      |   | Write, Read  | Write, Read |

| BITFIELD       | BITS | DESCRIPTION  | DECODE  |
|----------------|------|--|---|
| EOM_CHK_AMOUNT | 7:4  | A factor (N) used to select the order of number of observations in each eye-opening monitor window. N is used in the equation: Observations = $6.29 \times 10^N (N + 2)$ | 0xX: N factor   |
| EOM_CHK_THR    | 3:2  | Eye opening monitor number of error bits to allow in a measurement window  | 0b00: Allow no errors<br>0b01: Allow 1 error<br>0b10: Allow 2 errors<br>0b11: Allow 3 errors      |
| EOM_PER_MODE   | 1    | Eye opening monitor periodic mode enable   | 0b0: Eye opening monitor periodic mode disabled<br>0b1: Eye opening monitor periodic mode enabled |

| BITFIELD | BITS | DESCRIPTION                | DECODE  |
|----------|------|----------------------------|---|
| EOM_EN   | 0    | Eye opening monitor enable | 0b0: Eye opening monitor disabled<br>0b1: Eye opening monitor enabled |

**RLMS5 (0x1405)\***

| BIT         | 7               | 6                | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|------------------|---|---|---|---|---|---|
| Field       | EOM_MAN_TRG_REQ | EOM_MIN_THR[6:0] |   |   |   |   |   |   |
| Reset       | 0b0             | 0b0010000        |   |   |   |   |   |   |
| Access Type | Write Only      | Write, Read      |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION   | DECODE  |
|-----------------|------|---|---|
| EOM_MAN_TRG_REQ | 7    | Eye opening monitor manual trigger. For use when periodic mode is disabled.   | 0b0: No action<br>0b1: EOM manual trigger request |
| EOM_MIN_THR     | 6:0  | The EOM minimum threshold as defined by the equation: % eye-opening = EOM_MIN_THR/64. If measured, eye-opening falls below this threshold, ERRB is triggered if enabled by EOM_ERR_FLAG_*. If the value is zero, the EOM is disabled. | 0bXXXXXXXX: EOM minimum threshold factor          |

**RLMS6 (0x1406)\***

| BIT         | 7           | 6         | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|-----------|---|---|---|---|---|---|
| Field       | EOM_PV_MODE | RSVD[6:0] |   |   |   |   |   |   |
| Reset       | 0b1         | 0b0000000 |   |   |   |   |   |   |
| Access Type | Write, Read |           |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION  | DECODE   |
|-------------|------|--|--|
| EOM_PV_MODE | 7    | Eye opening is measured vertically or horizontally | 0b0: Vertical opening mode<br>0b1: Horizontal opening mode |

**RLMS7 (0x1407)**

| BIT         | 7         | 6         | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------|-----------|---|---|---|---|---|---|
| Field       | EOM_DONE  | EOM[6:0]  |   |   |   |   |   |   |
| Reset       | 0b0       | 0b0000000 |   |   |   |   |   |   |
| Access Type | Read Only | Read Only |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION  | DECODE                                     |
|----------|------|--|--|
| EOM_DONE | 7    | Eye opening monitor measurement done   | 0b0: EOM not complete<br>0b1: EOM complete |
| EOM      | 6:0  | Last completed EOM observation<br>For horizontal eye opening measurement, eye opening is 2*EOM/127 UI<br>For vertical eye opening measurement, eye opening is EOM/127 UI | 0bXXXXXXXX: EOM measurement result         |



[RLMS17 \(0x1417\)](#)

| BIT         | 7           | 6           | 5           | 4           | 3           | 2           | 1           | 0           |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Field       | DFE5En      | DFE4En      | DFE3En      | DFE2En      | DFE1En      | BSTEnOv     | BSTEn       | AGCEn       |
| Reset       | 0b0         | 0b0         | 0b0         | 0b0         | 0b0         | 0b0         | 0b0         | 0b0         |
| Access Type | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read | Write, Read |

| BITFIELD | BITS | DESCRIPTION  |
|----------|------|--|
| DFE5En   | 7    | DFE5 coefficient adapt enable  |
| DFE4En   | 6    | DFE4 coefficient adapt enable  |
| DFE3En   | 5    | DFE3 coefficient adapt enable  |
| DFE2En   | 4    | DFE2 coefficient adapt enable  |
| DFE1En   | 3    | DFE1 coefficient adapt enable  |
| BSTEnOv  | 2    | When 1, BSTEn from is set from registers                             |
| BSTEn    | 1    | Frequency boost adapt enable (Disabled by default for Slow receiver) |
| AGCEn    | 0    | AGC adapt enable   |

[RLMS1C \(0x141C\)](#)

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | AGCMuL[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION        |
|----------|------|--------------------|
| AGCMuL   | 7:0  | AGC adapt gain LSB |

[RLMS1D \(0x141D\)](#)

| BIT         | 7 | 6 | 5           | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---|-------------|---|---|---|---|---|
| Field       | – | – | AGCMuH[5:0] |   |   |   |   |   |
| Reset       | – | – | 0b000010    |   |   |   |   |   |
| Access Type | – | – | Write, Read |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION        |
|----------|------|--------------------|
| AGCMuH   | 5:0  | AGC adapt gain MSB |

[RLMS1F \(0x141F\)](#)

| BIT         | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------|---|---|---|---|---|---|---|
| Field       | AGCInit[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00         |   |   |   |   |   |   |   |
| Access Type | Write, Read  |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION       |
|----------|------|-------------------|
| AGCInit  | 7:0  | AGC initial value |

**RLMS32 (0x1432)**

| BIT         | 7           | 6    | 5         | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|------|-----------|---|---|---|---|---|
| Field       | OSNMode     | RSVD | RSVD[5:0] |   |   |   |   |   |
| Reset       | 0b0         | 0b1  | 0b111111  |   |   |   |   |   |
| Access Type | Write, Read |      |           |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION    | DECODE                         |
|----------|------|----------------|--------------------------------|
| OSNMode  | 7    | GMSL2 OSN mode | 0: duty cycle<br>1: average Ek |

**RLMS3A (0x143A)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | EyeMonValCntL[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00               |   |   |   |   |   |   |   |
| Access Type | Read Only          |   |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                               |
|---------------|------|---|
| EyeMonValCntL | 7:0  | Eye monitor valid (hit) count (read-only) |

**RLMS3B (0x143B)**

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|--------------------|---|---|---|---|---|---|---|
| Field       | EyeMonValCntH[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00               |   |   |   |   |   |   |   |
| Access Type | Read Only          |   |   |   |   |   |   |   |

| BITFIELD      | BITS | DESCRIPTION                               |
|---------------|------|---|
| EyeMonValCntH | 7:0  | Eye monitor valid (hit) count (read-only) |

**RLMS64 (0x1464)\***

| BIT         | 7         | 6 | 5 | 4 | 3 | 2    | 1              | 0 |
|-------------|-----------|---|---|---|---|------|----------------|---|
| Field       | RSVD[3:0] |   |   |   | – | RSVD | TxSSCMode[1:0] |   |
| Reset       | 0x9       |   |   |   | – | 0b0  | 0b00           |   |
| Access Type |           |   |   |   | – |      | Write, Read    |   |

| BITFIELD  | BITS | DESCRIPTION             | DECODE  |
|-----------|------|-------------------------|---|
| TxSSCMode | 1:0  | Tx spread spectrum mode | 00: Manual phase mode (SSC disabled)<br>01: Reserved<br>10: Reserved<br>11: SSC enabled |

[RLMS70 \(0x1470\)\\*](#)

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | TxSSCFrqCtrl[6:0] |   |   |   |   |   |   |   |
| Reset       | 0b0000001         |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION  | DECODE  |
|--------------|------|--|---|
| TxSSCFrqCtrl | 6:0  | Tx SSC modulation frequency deviation control (pp) | 0x07: SSC 268 PPM<br>0x06: SSC 580 PPM<br>0x03: SSC 970 PPM<br>0x01: SSC 1750 PPM<br>0x01: SSC 2530 PPM<br>others: Reserved |

[RLMS71 \(0x1471\)\\*](#)

| BIT         | 7                  | 6 | 5 | 4 | 3 | 2 | 1 | 0           |
|-------------|--------------------|---|---|---|---|---|---|-------------|
| Field       | TxSSCCenSprSt[5:0] |   |   |   |   |   |   | TxSSCEn     |
| Reset       | 0b000001           |   |   |   |   |   |   | 0b0         |
| Access Type | Write, Read        |   |   |   |   |   |   | Write, Read |

| BITFIELD      | BITS | DESCRIPTION                         | DECODE  |
|---------------|------|-------------------------------------|---|
| TxSSCCenSprSt | 6:1  | Tx SSC center spread starting phase | 0x02: SSC 268 PPM<br>0x02: SSC 580 PPM<br>0x02: SSC 970 PPM<br>0x02: SSC 1750 PPM<br>0x02: SSC 2530 PPM<br>others: Reserved |
| TxSSCEn       | 0    | Tx spread spectrum enable           | 0b0: Tx spread spectrum disabled<br>0b1: Tx spread spectrum enabled   |

[RLMS72 \(0x1472\)\\*](#)

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------------|---|---|---|---|---|---|---|
| Field       | TxSSCPreScIL[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xCF              |   |   |   |   |   |   |   |
| Access Type | Write, Read       |   |   |   |   |   |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| TxSSCPreScIL | 7:0  | Tx SSC frequency prescaler bits 7:0. Decode values are for bits 7:0, concatenate with TXSSCPreScIH for final value. | 0xC9: SSC 268 PPM<br>0xAB: SSC 580 PPM<br>0xAB: SSC 970 PPM<br>0xF9: SSC 1750 PPM<br>0xAB: SSC 2530 PPM<br>others: Reserved |

[RLMS73 \(0x1473\)\\*](#)

| BIT         | 7 | 6 | 5 | 4 | 3 | 2                 | 1 | 0 |
|-------------|---|---|---|---|---|-------------------|---|---|
| Field       | – | – | – | – | – | TxSSCPreScIH[2:0] |   |   |
| Reset       | – | – | – | – | – | 0b000             |   |   |
| Access Type | – | – | – | – | – | Write, Read       |   |   |

| BITFIELD     | BITS | DESCRIPTION   | DECODE  |
|--------------|------|---|---|
| TxSSCPreScIH | 2:0  | Tx SSC frequency prescaler bits 10:8. Decode values are for bits 10:8, concatenate with TXSSCPreScIL for final value. | 0x02: SSC 268 PPM<br>0x00: SSC 580 PPM<br>0x00: SSC 970 PPM<br>0x00: SSC 1750 PPM<br>0x00: SSC 2530 PPM<br>others: Reserved |

[RLMS74 \(0x1474\)\\*](#)

| BIT         | 7             | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---------------|---|---|---|---|---|---|---|
| Field       | TxSSCPhL[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00          |   |   |   |   |   |   |   |
| Access Type | Write, Read   |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| TxSSCPhL | 7:0  | Tx SSC phase accumulator increment bits 7:0. Decode values are for bits 7:0, concatenate with TXSSCPhH for final value. | 0xF9: SSC 268 PPM<br>0x63: SSC 580 PPM<br>0x63: SSC 970 PPM<br>0x2C: SSC 1750 PPM<br>0x63: SSC 2530 PPM<br>others: Reserved |

[RLMS75 \(0x1475\)\\*](#)

| BIT         | 7 | 6             | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|---|---------------|---|---|---|---|---|---|
| Field       | – | TxSSCPhH[6:0] |   |   |   |   |   |   |
| Reset       | – | 0b0000000     |   |   |   |   |   |   |
| Access Type | – | Write, Read   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| TxSSCPhH | 6:0  | Tx SSC phase accumulator increment bits 14:8. Decode values are for bits 14:8, concatenate with TXSSCPhL for final value. | 0x01: SSC 268 PPM<br>0x07: SSC 580 PPM<br>0x07: SSC 970 PPM<br>0x05: SSC 1750 PPM<br>0x07: SSC 2530 PPM<br>others: Reserved |

[RLMS76 \(0x1476\)\\*](#)

| BIT         | 7 | 6 | 5 | 4 | 3 | 2 | 1                | 0 |
|-------------|---|---|---|---|---|---|------------------|---|
| Field       | – | – | – | – | – | – | TxSSCPHQuad[1:0] |   |
| Reset       | – | – | – | – | – | – | 0b00             |   |
| Access Type | – | – | – | – | – | – | Write, Read      |   |

| BITFIELD    | BITS | DESCRIPTION                          | DECODE  |
|-------------|------|--------------------------------------|---|
| TxSSCPHQuad | 1:0  | Tx SSC phase starting phase quadrant | 0x00: SSC 268 PPM<br>0x00: SSC 580 PPM<br>0x00: SSC 970 PPM<br>0x00: SSC 1750 PPM<br>0x00: SSC 2530 PPM<br>others: Reserved |

[RLMSA8 \(0x14A8\)](#)

| BIT         | 7           | 6            | 5           | 4    | 3    | 2    | 1    | 0    |
|-------------|-------------|--------------|-------------|------|------|------|------|------|
| Field       | FW_PHY_CTRL | FW_PHY_PU_TX | FW_PHY_RSTB | RSVD | RSVD | RSVD | RSVD | RSVD |
| Reset       | 0b0         | 0b0          | 0b0         | 0b0  | 0b0  | 0b0  | 0b0  | 0b0  |
| Access Type | Write, Read | Write, Read  | Write, Read |      |      |      |      |      |

| BITFIELD     | BITS | DESCRIPTION  | DECODE   |
|--------------|------|--|--|
| FW_PHY_CTRL  | 7    | PHY controller firmware mode enable. Other FW_* bits only take effect when this is set to 1. | 0b0: Disabled<br>0b1: Enabled                  |
| FW_PHY_PU_TX | 6    | Override PHY controller output   | 0b0: Disabled<br>0b1: Enabled                  |
| FW_PHY_RSTB  | 5    | Override PHY controller output   | 0b0: Reset asserted<br>0b1: Reset not asserted |

[RLMSA9 \(0x14A9\)](#)

| BIT         | 7              | 6    | 5              | 4           | 3           | 2    | 1    | 0    |
|-------------|----------------|------|----------------|-------------|-------------|------|------|------|
| Field       | FW_REPCAL_RSTB | RSVD | FW_TXD_SQUELCH | FW_TXD_EN   | FW_RXD_EN   | RSVD | RSVD | RSVD |
| Reset       | 0b0            | 0b0  | 0b0            | 0b0         | 0b0         | 0b0  | 0b0  | 0b0  |
| Access Type | Write, Read    |      | Write, Read    | Write, Read | Write, Read |      |      |      |

| BITFIELD       | BITS | DESCRIPTION                    | DECODE   |
|----------------|------|--------------------------------|--|
| FW_REPCAL_RSTB | 7    | Override PHY controller output | 0b0: Reset asserted<br>0b1: Reset not asserted |
| FW_TXD_SQUELCH | 5    | Override PHY controller output | 0b0: Disabled<br>0b1: Enabled                  |
| FW_TXD_EN      | 4    | Override PHY controller output | 0b0: Disabled<br>0b1: Enabled                  |
| FW_RXD_EN      | 3    | Override PHY controller output | 0b0: Disabled<br>0b1: Enabled                  |

[RLMSAA \(0x14AA\)](#)

| BIT         | 7    | 6  | 5           | 4    | 3   | 2    | 1    | 0    |
|-------------|------|--|-------------|------|---|------|------|------|
| Field       | RSVD | RSVD                                     | ROR_CLK_DET | RSVD | RSVD  | RSVD | RSVD | RSVD |
| Reset       | 0b1  | 0b0                                      | 0b0         | 0b1  | 0b0   | 0b0  | 0b0  | 0b0  |
| Access Type |      |  | Read Only   |      |   |      |      |      |
| BITFIELD    | BITS | DESCRIPTION                              |             |      | DECODE  |      |      |      |
| ROR_CLK_DET | 5    | In SER, indicates ROR clock is detected. |             |      | 0x0: ROR clock has not been detected (or ROR mode is not enabled)<br>0x1: ROR clock has been detected |      |      |      |

[RLMSCE \(0x14CE\)](#)

| BIT         | 7    | 6  | 5    | 4           | 3  | 2    | 1    | 0           |
|-------------|------|--|------|-------------|--|------|------|-------------|
| Field       | RSVD | RSVD   | RSVD | enminus_reg | enminus_man                                    | RSVD | RSVD | enffe       |
| Reset       | 0b0  | 0b0  | 0b0  | 0b0         | 0b0  | 0b0  | 0b0  | 0b1         |
| Access Type |      |  |      | Write, Read | Write, Read                                    |      |      | Write, Read |
| BITFIELD    | BITS | DESCRIPTION  |      |             | DECODE   |      |      |             |
| enminus_reg | 4    | value to use if manual control enabled with enminus_man register bit |      |             |  |      |      |             |
| enminus_man | 3    | enminus manual control   |      |             | 0x0: Automatic<br>0x1: Manual register control |      |      |             |
| enffe       | 0    | ffe enable   |      |             | 0x0: Disabled<br>0x1: Enabled                  |      |      |             |

[DPLL\\_0 \(0x1A00\)\\*](#)

| BIT               | 7    | 6  | 5    | 4    | 3    | 2    | 1    | 0                 |
|-------------------|------|--|------|------|------|------|------|-------------------|
| Field             | RSVD | RSVD   | RSVD | RSVD | RSVD | RSVD | RSVD | config_soft_rst_n |
| Reset             | 0b1  | 0b1  | 0b1  | 0b1  | 0b0  | 0b1  | 0b0  | 0b1               |
| Access Type       |      |  |      |      |      |      |      | Write, Read       |
| BITFIELD          | BITS | DESCRIPTION  |      |      |      |      |      |                   |
| config_soft_rst_n | 0    | Setting this to 1 resets the PLL functional registers. PLL configuration registers are not reset. This bit must be set back to 0 for the PLL to be functional. |      |      |      |      |      |                   |

**DPLL\_3 (0x1A03)\***

| BIT                | 7                                 | 6    | 5    | 4                                  | 3    | 2                            | 1 | 0 |
|--------------------|-----------------------------------|------|------|------------------------------------|------|------------------------------|---|---|
| <b>Field</b>       | config_sel_clock_out_use_external | RSVD | RSVD | config_use_internal_divider_values | RSVD | config_spread_bit_ratio[2:0] |   |   |
| <b>Reset</b>       | 0b1                               | 0b0  | 0b0  | 0b0                                | 0b0  | 0b010                        |   |   |
| <b>Access Type</b> | Write, Read                       |      |      | Write, Read                        |      | Write, Read                  |   |   |

| BITFIELD                           | BITS | DESCRIPTION  | DECODE  |
|------------------------------------|------|--|---|
| config_sel_clock_out_use_external  | 7    | When 1, config_sel_clock_out is used to select output clock. Otherwise, internal registers are used.   |   |
| config_use_internal_divider_values | 4    | Enable all DPLL divider values to come from internal controls  | 0x0: Do not use internal controls for divider values<br>0x1: Use internal controls for divider values |
| config_spread_bit_ratio            | 2:0  | Controls the magnitude of the triangle wave input to the divider dsm as a percentage of the nominal divider value. If config registers are reset, the spread_bit_ratio value does not propagate to the triangle wave without rewriting to it. Likewise, if triangle wave module is reset, rewrite to spread_bit_ratio to set it back to desired value. |   |

**DPLL\_7 (0x1A07)**

| BIT                | 7               | 6                  | 5 | 4 | 3 | 2 | 1         | 0 |  |
|--------------------|-----------------|--------------------|---|---|---|---|-----------|---|--|
| <b>Field</b>       | config_div_fb_L | config_div_in[4:0] |   |   |   |   | RSVD[1:0] |   |  |
| <b>Reset</b>       | 0b0             | 0b00001            |   |   |   |   | 0b00      |   |  |
| <b>Access Type</b> | Write, Read     | Write, Read        |   |   |   |   |           |   |  |

| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| config_div_fb_L | 7    | Sets the DPLL feedback divider value (bit 0) when config_use_internal_divider_values = 1   |
| config_div_in   | 6:2  | Sets the divide value of the input divider connected to i_clk_in, the main PLL clock input |

**DPLL\_8 (0x1A08)**

| BIT                | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------------|----------------------|---|---|---|---|---|---|---|
| <b>Field</b>       | config_div_fb_H[7:0] |   |   |   |   |   |   |   |
| <b>Reset</b>       | 0x14                 |   |   |   |   |   |   |   |
| <b>Access Type</b> | Write, Read          |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION   |
|-----------------|------|---|
| config_div_fb_H | 7:0  | Sets the DPLL feedback divider value (bits 8:1) when config_use_internal_divider_values = 1 |

**DPLL\_9 (0x1A09)**

| BIT         | 7                     | 6 | 5 | 4 | 3 | 2                      | 1 | 0 |
|-------------|-----------------------|---|---|---|---|------------------------|---|---|
| Field       | config_div_out_L[4:0] |   |   |   |   | config_div_fb_exp[2:0] |   |   |
| Reset       | 0b01000               |   |   |   |   | 0b000                  |   |   |
| Access Type | Write, Read           |   |   |   |   | Write, Read            |   |   |

| BITFIELD          | BITS | DESCRIPTION   |
|-------------------|------|---|
| config_div_out_L  | 7:3  | Sets the DPLL output divider value (bits 4:0) when config_use_internal_divider_values = 1 |
| config_div_fb_exp | 2:0  | Sets the feedback exponential divider value when config_use_internal_divider_values = 1   |

**DPLL\_10 (0x1A0A)**

| BIT         | 7                          | 6                       | 5 | 4 | 3                     | 2 | 1 | 0 |
|-------------|----------------------------|-------------------------|---|---|-----------------------|---|---|---|
| Field       | config_allow_coarse_change | config_div_out_exp[2:0] |   |   | config_div_out_H[3:0] |   |   |   |
| Reset       | 0b1                        | 0b000                   |   |   | 0x1                   |   |   |   |
| Access Type | Write, Read                | Write, Read             |   |   | Write, Read           |   |   |   |

| BITFIELD                   | BITS | DESCRIPTION  |
|----------------------------|------|--|
| config_allow_coarse_change | 7    | When set to 1, the coarse tuning DAC is allowed to move to correct for large changes in the integral path. When set to 0, it does not. |
| config_div_out_exp         | 6:4  | Sets the output exponential divider value when config_use_internal_divider_values = 1.   |
| config_div_out_H           | 3:0  | Sets the DPLL output divider value (bits 8:5) when config_use_internal_divider_values = 1.   |

**EFUSE80 (0x1C50)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Only            |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| SERIAL_NUMBER_0 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE81 (0x1C51)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Only            |   |   |   |   |   |   |   |



| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| SERIAL_NUMBER_1 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE82 (0x1C52)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_2[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Only            |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| SERIAL_NUMBER_2 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE83 (0x1C53)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_3[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Only            |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| SERIAL_NUMBER_3 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE84 (0x1C54)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_4[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Only            |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| SERIAL_NUMBER_4 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE85 (0x1C55)**

| BIT         | 7                    | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_5[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                 |   |   |   |   |   |   |   |
| Access Type | Read Only            |   |   |   |   |   |   |   |

| BITFIELD        | BITS | DESCRIPTION  |
|-----------------|------|--|
| SERIAL_NUMBER_5 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE86 (0x1C56)**

| BIT             | 7                    | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|-----------------|----------------------|---|--|---|---|---|---|---|
| Field           | SERIAL_NUMBER_6[7:0] |   |  |   |   |   |   |   |
| Reset           | 0x00                 |   |  |   |   |   |   |   |
| Access Type     | Read Only            |   |  |   |   |   |   |   |
| BITFIELD        | BITS                 |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_6 | 7:0                  |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE87 (0x1C57)**

| BIT             | 7                    | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|-----------------|----------------------|---|--|---|---|---|---|---|
| Field           | SERIAL_NUMBER_7[7:0] |   |  |   |   |   |   |   |
| Reset           | 0x00                 |   |  |   |   |   |   |   |
| Access Type     | Read Only            |   |  |   |   |   |   |   |
| BITFIELD        | BITS                 |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_7 | 7:0                  |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE88 (0x1C58)**

| BIT             | 7                    | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|-----------------|----------------------|---|--|---|---|---|---|---|
| Field           | SERIAL_NUMBER_8[7:0] |   |  |   |   |   |   |   |
| Reset           | 0x00                 |   |  |   |   |   |   |   |
| Access Type     | Read Only            |   |  |   |   |   |   |   |
| BITFIELD        | BITS                 |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_8 | 7:0                  |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE89 (0x1C59)**

| BIT             | 7                    | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|-----------------|----------------------|---|--|---|---|---|---|---|
| Field           | SERIAL_NUMBER_9[7:0] |   |  |   |   |   |   |   |
| Reset           | 0x00                 |   |  |   |   |   |   |   |
| Access Type     | Read Only            |   |  |   |   |   |   |   |
| BITFIELD        | BITS                 |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_9 | 7:0                  |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE90 (0x1C5A)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_10[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_10 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE91 (0x1C5B)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_11[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_11 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE92 (0x1C5C)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_12[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_12 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE93 (0x1C5D)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_13[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_13 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE94 (0x1C5E)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_14[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_14 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE95 (0x1C5F)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_15[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_15 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE96 (0x1C60)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_16[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_16 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE97 (0x1C61)**

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_17[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_17 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

[EFUSE98 \(0x1C62\)](#)

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_18[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_18 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

[EFUSE99 \(0x1C63\)](#)

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_19[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_19 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

[EFUSE100 \(0x1C64\)](#)

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_20[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_20 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

[EFUSE101 \(0x1C65\)](#)

| BIT              | 7                     | 6 | 5  | 4 | 3 | 2 | 1 | 0 |
|------------------|-----------------------|---|--|---|---|---|---|---|
| Field            | SERIAL_NUMBER_21[7:0] |   |  |   |   |   |   |   |
| Reset            | 0x00                  |   |  |   |   |   |   |   |
| Access Type      | Read Only             |   |  |   |   |   |   |   |
| BITFIELD         | BITS                  |   | DESCRIPTION  |   |   |   |   |   |
| SERIAL_NUMBER_21 | 7:0                   |   | Serial Number. Can only be read through the deserializer across the GMSL link. |   |   |   |   |   |

**EFUSE102 (0x1C66)**

| BIT         | 7                     | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_22[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                  |   |   |   |   |   |   |   |
| Access Type | Read Only             |   |   |   |   |   |   |   |

| BITFIELD         | BITS | DESCRIPTION  |
|------------------|------|--|
| SERIAL_NUMBER_22 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**EFUSE103 (0x1C67)**

| BIT         | 7                     | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------------|---|---|---|---|---|---|---|
| Field       | SERIAL_NUMBER_23[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00                  |   |   |   |   |   |   |   |
| Access Type | Read Only             |   |   |   |   |   |   |   |

| BITFIELD         | BITS | DESCRIPTION  |
|------------------|------|--|
| SERIAL_NUMBER_23 | 7:0  | Serial Number. Can only be read through the deserializer across the GMSL link. |

**REGCRC0 (0x1D00)\***

| BIT         | 7 | 6 | 5    | 4               | 3              | 2                | 1           | 0                      |
|-------------|---|---|------|-----------------|----------------|------------------|-------------|------------------------|
| Field       | – | – | RSVD | GEN_ROLLING_CRC | I2C_WR_COMPUTE | PERIODIC_COMPUTE | CHECK_CRC   | RESET_CRC              |
| Reset       | – | – | 0b0  | 0b0             | 0b0            | 0b0              | 0b0         | 0b0                    |
| Access Type | – | – |      | Write, Read     | Write, Read    | Write, Read      | Write, Read | Write Clears All, Read |

| BITFIELD         | BITS | DESCRIPTION   | DECODE  |
|------------------|------|---|---|
| GEN_ROLLING_CRC  | 4    | Calculate register CRC using additional 2-bit counter, so CRC value cycles every four invocations.                            | 0b0: Do not use additional counter<br>0b1: Use additional counter                         |
| I2C_WR_COMPUTE   | 3    | Compute register CRC after every i <sup>2</sup> c register write.   | 0b0: Do not compute after every register write<br>0b1: Compute after every register write |
| PERIODIC_COMPUTE | 2    | Check register CRC on periodic basis, based on CRC_PERIOD value.  | 0b0: Do not check periodically<br>0b1: Check periodically                                 |
| CHECK_CRC        | 1    | Upon calculation of register CRC, compare with previous calculation, except on first time through. On miscompare, issue ERRB. | 0b0: Do not compare after calculation<br>0b1: Compare after calculation                   |
| RESET_CRC        | 0    | Reset CRC value to 16'FFFF.   |   |

[REGCRC1 \(0x1D01\)\\*](#)

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | CRC_PERIOD[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Write, Read     |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION  |
|------------|------|--|
| CRC_PERIOD | 7:0  | Period for register CRC recomputation.<br>This allows for varying the CRC computation time.<br>Period = (value + 1) * 2ms<br><br>0000_0000 - 2ms<br>0000_0001 - 4ms<br>... |

[REGCRC2 \(0x1D02\)](#)

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | REGCRC_LSB[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Read Only       |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION                         |
|------------|------|-------------------------------------|
| REGCRC_LSB | 7:0  | Calculated register CRC value (LSB) |

[REGCRC3 \(0x1D03\)](#)

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | REGCRC_MSB[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00            |   |   |   |   |   |   |   |
| Access Type | Read Only       |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION                         |
|------------|------|-------------------------------------|
| REGCRC_MSB | 7:0  | Calculated register CRC value (MSB) |

[I2C\\_UART\\_CRC0 \(0x1D08\)\\*](#)

| BIT         | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0                      |
|-------------|---|---|---|---|---|---|---|------------------------|
| Field       | - | - | - | - | - | - | - | RESET_MS GCNTR         |
| Reset       | - | - | - | - | - | - | - | 0b0                    |
| Access Type | - | - | - | - | - | - | - | Write Clears All, Read |

| BITFIELD          | BITS | DESCRIPTION   | DECODE                          |
|-------------------|------|---|---------------------------------|
| RESET_MS<br>GCNTR | 0    | Reset Message Counter Value to 0. Self-clearing.<br>Note that the message counter value is not checked when writing to this register. See user guide for details. | 0b0: Do not reset<br>0b1: Reset |

**I2C UART CRC1 (0x1D09)\***

| BIT            | 7         | 6 | 5 | 4         | 3 | 2 | 1                             | 0                         |
|----------------|-----------|---|---|-----------|---|---|-------------------------------|---------------------------|
| Field          | RSVD[2:0] |   |   | RSVD[2:0] |   |   | RESET_MS<br>GCNTR_ER<br>R_CNT | RESET_CR<br>C_ERR_CN<br>T |
| Reset          | 0b000     |   |   | 0b000     |   |   | 0b0                           | 0b0                       |
| Access<br>Type |           |   |   |           |   |   | Write Clears<br>All, Read     | Write Clears<br>All, Read |

| BITFIELD                      | BITS | DESCRIPTION  | DECODE                          |
|-------------------------------|------|--|---------------------------------|
| RESET_MS<br>GCNTR_ER<br>R_CNT | 1    | Reset message counter error count to 0. Self-clearing. | 0b0: Do not reset<br>0b1: Reset |
| RESET_CRC<br>_ERR_CNT         | 0    | Reset CRC Error Count to 0. Self-clearing.             | 0b0: Do not reset<br>0b1: Reset |

**I2C UART CRC2 (0x1D0A)**

| BIT            | 7            | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------|--------------|---|---|---|---|---|---|---|
| Field          | CRC_VAL[7:0] |   |   |   |   |   |   |   |
| Reset          | 0x00         |   |   |   |   |   |   |   |
| Access<br>Type | Read Only    |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   |
|----------|------|---|
| CRC_VAL  | 7:0  | Calculated CRC value for the last write transaction |

**I2C UART CRC3 (0x1D0B)**

| BIT            | 7                | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|----------------|------------------|---|---|---|---|---|---|---|
| Field          | MSGCNTR_LSB[7:0] |   |   |   |   |   |   |   |
| Reset          | 0x00             |   |   |   |   |   |   |   |
| Access<br>Type | Read Only        |   |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                               |
|-------------|------|---|
| MSGCNTR_LSB | 7:0  | Bits 7:0 of current message counter value |



**I2C\_UART\_CRC4 (0x1D0C)**

| BIT         | 7                | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|------------------|---|---|---|---|---|---|---|
| Field       | MSGCNTR_MSB[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x00             |   |   |   |   |   |   |   |
| Access Type | Read Only        |   |   |   |   |   |   |   |

| BITFIELD    | BITS | DESCRIPTION                                |
|-------------|------|--|
| MSGCNTR_MSB | 7:0  | Bits 15:8 of current message counter value |

**FS\_INTR0 (0x1D12)\***

| BIT         | 7                        | 6                    | 5                | 4                | 3 | 2 | 1 | 0               |
|-------------|--------------------------|----------------------|------------------|------------------|---|---|---|-----------------|
| Field       | I2C_UART_MSGCNTR_ERR_OEN | I2C_UART_CRC_ERR_OEN | MEM_ECC_ERR2_OEN | MEM_ECC_ERR1_OEN | – | – | – | REG_CRC_ERR_OEN |
| Reset       | 0b1                      | 0b1                  | 0x1              | 0x0              | – | – | – | 0b0             |
| Access Type | Write, Read              | Write, Read          | Write, Read      | Write, Read      | – | – | – | Write, Read     |

| BITFIELD                 | BITS | DESCRIPTION   | DECODE  |
|--------------------------|------|---|---|
| I2C_UART_MSGCNTR_ERR_OEN | 7    | Enable reporting of I <sup>2</sup> C/UART message counter errors (I2C_UART_MSGCNTR_ERR) at ERRB pin | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| I2C_UART_CRC_ERR_OEN     | 6    | Enable reporting of I <sup>2</sup> C/UART CRC errors (I2C_UART_CRC_ERR) at ERRB pin                 | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| MEM_ECC_ERR2_OEN         | 5    | Enable reporting of memory ECC 2-bit uncorrectable errors at ERRB pin                               | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| MEM_ECC_ERR1_OEN         | 4    | Enable reporting of memory ECC 1-bit correctable errors at ERRB pin                                 | 0b0: Reporting disabled<br>0b1: Reporting enabled |
| REG_CRC_ERR_OEN          | 0    | Enable reporting register CRC at ERRB pin.  | 0b0: Reporting disabled<br>0b1: Reporting enabled |

**FS\_INTR1 (0x1D13)**

| BIT         | 7                        | 6                    | 5                | 4                | 3 | 2 | 1 | 0                |
|-------------|--------------------------|----------------------|------------------|------------------|---|---|---|------------------|
| Field       | I2C_UART_MSGCNTR_ERR_INT | I2C_UART_CRC_ERR_INT | MEM_ECC_ERR2_INT | MEM_ECC_ERR1_INT | – | – | – | REG_CRC_ERR_FLAG |
| Reset       | 0b0                      | 0b0                  | 0x0              | 0x0              | – | – | – | 0b0              |
| Access Type | Read Only                | Read Only            | Read Only        | Read Only        | – | – | – | Read Only        |

| BITFIELD                 | BITS | DESCRIPTION   | DECODE                                       |
|--------------------------|------|---|--|
| I2C_UART_MSGCNTR_ERR_INT | 7    | I <sup>2</sup> C/UART message counter error flag. Asserted when two message counter bytes sent do not match expected count value. See user guide for details. | 0b0: Flag not asserted<br>0b1: Flag asserted |

| BITFIELD             | BITS | DESCRIPTION  | DECODE                                       |
|----------------------|------|--|--|
| I2C_UART_CRC_ERR_INT | 6    | I <sup>2</sup> C/UART CRC error flag. Asserted when CRC byte sent does not match calculated value. See user guide for details. | 0b0: Flag not asserted<br>0b1: Flag asserted |
| MEM_ECC_ERR2_INT     | 5    | Error flag for 2-bit uncorrectable memory ECC errors seen in any memories  | 0b0: Flag not asserted<br>0b1: Flag asserted |
| MEM_ECC_ERR1_INT     | 4    | Error flag for 1-bit correctable memory ECC errors seen in any memories  | 0b0: Flag not asserted<br>0b1: Flag asserted |
| REG_CRC_ERR_FLAG     | 0    | An error occurred on the register CRC calculation.   | 0b0: Flag not asserted<br>0b1: Flag asserted |

**MEM\_ECC0 (0x1D14)\***

| BIT         | 7         | 6 | 5 | 4         | 3 | 2 | 1                      | 0                      |
|-------------|-----------|---|---|-----------|---|---|------------------------|------------------------|
| Field       | RSVD[2:0] |   |   | RSVD[2:0] |   |   | RESET_MEM_ECC_ERR2_CNT | RESET_MEM_ECC_ERR1_CNT |
| Reset       | 0x0       |   |   | 0x0       |   |   | 0b0                    | 0b0                    |
| Access Type |           |   |   |           |   |   | Write Clears All, Read | Write Clears All, Read |

| BITFIELD               | BITS | DESCRIPTION   | DECODE                          |
|------------------------|------|---|---------------------------------|
| RESET_MEM_ECC_ERR2_CNT | 1    | Reset memory ECC 2-bit error count to 0. Self-clearing. | 0b0: Do not reset<br>0b1: Reset |
| RESET_MEM_ECC_ERR1_CNT | 0    | Reset memory ECC 1-bit error count to 0. Self-clearing. | 0b0: Do not reset<br>0b1: Reset |

**REG\_POST0 (0x1D20)\***

| BIT         | 7         | 6                  | 5                 | 4 | 3 | 2    | 1    | 0    |
|-------------|-----------|--------------------|-------------------|---|---|------|------|------|
| Field       | POST_DONE | POST_MBI_ST_PASSED | POST_LBIST_PASSED | – | – | RSVD | RSVD | RSVD |
| Reset       | 0b0       | 0b0                | 0b0               | – | – | 0b0  | 0b0  | 0b0  |
| Access Type | Read Only | Read Only          | Read Only         | – | – |      |      |      |

| BITFIELD          | BITS | DESCRIPTION  | DECODE   |
|-------------------|------|--|--|
| POST_DONE         | 7    | POST (power-on self test LBIST and/or MBIST) is run.                             | 0b0: POST has not run<br>0b1: POST has run   |
| POST_MBIST_PASSED | 6    | MBIST passed during POST (power-on self test). Valid when POST_DONE is asserted. | 0b0: MBIST has failed during POST run (or has not been enabled)<br>0b1: MBIST has passed during POST run |
| POST_LBIST_PASSED | 5    | LBIST passed during POST (power-on self test). Valid when POST_DONE is asserted. | 0b0: LBIST has failed during POST run (or has not been enabled)<br>0b1: LBIST has passed during POST run |

**REGADCBIST0 (0x1D28)\***

| BIT         | 7           | 6    | 5 | 4           | 3 | 2            | 1    | 0            |
|-------------|-------------|------|---|-------------|---|--------------|------|--------------|
| Field       | RR_ACCURACY | RSVD | – | MUXVER_EN   | – | RUN_ACCURACY | RSVD | RUN_TMON_CAL |
| Reset       | 0b0         | 0b0  | – | 0b0         | – | 0b0          | 0b0  | 0b0          |
| Access Type | Write, Read |      | – | Write, Read | – | Write, Read  |      | Write, Read  |

| BITFIELD     | BITS | DESCRIPTION   | DECODE                      |
|--------------|------|---|-----------------------------|
| RR_ACCURACY  | 7    | Run ADC accuracy in round robin state fashion           | 0b0: Do not run<br>0b1: Run |
| MUXVER_EN    | 4    | Enable MUX manual GPIO test                             | 0b0: Disable<br>0b1: Enable |
| RUN_ACCURACY | 2    | Run ADC accuracy testing. Self-clearing.                | 0b0: Do not run<br>0b1: Run |
| RUN_TMON_CAL | 0    | Initiate temperature sensor measurement. Self-clearing. | 0b0: Do not run<br>0b1: Run |

**REGADCBIST3 (0x1D31)\***

| BIT         | 7           | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-------------|---|---|---|---|---|---|---|
| Field       | REFLIM[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x0F        |   |   |   |   |   |   |   |
| Access Type | Write, Read |   |   |   |   |   |   |   |

| BITFIELD | BITS | DESCRIPTION   | DECODE  |
|----------|------|---|---|
| REFLIM   | 7:0  | ADC reference limit for testing code. Sets maximum error from expected ADC conversion code in LSBs before asserting interrupt flag. | 0x00: Converted value has zero deviation<br>0x01: Converted value has up to 1 LSB of error<br>0x02: Converted value has up to 2 LSBs of error<br>...<br>0xFF: Converted value has up to 255 LSBs of error |

**REGADCBIST4 (0x1D32)\***

| BIT         | 7               | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------|---|---|---|---|---|---|---|
| Field       | REFLIMSCL1[7:0] |   |   |   |   |   |   |   |
| Reset       | 0x0F            |   |   |   |   |   |   |   |
| Access Type | Write, Read     |   |   |   |   |   |   |   |

| BITFIELD   | BITS | DESCRIPTION   | DECODE  |
|------------|------|---|---|
| REFLIMSCL1 | 7:0  | Control the accuracy for 1/2 scale measurement. Sets maximum error from expected ADC conversion code in LSBs before asserting interrupt flag. | 0x00: Converted value has zero deviation<br>0x01: Converted value has up to 1 LSB of error<br>0x02: Converted value has up to 2 LSBs of error<br>...<br>0xFF: Converted value has up to 255 LSBs of error |

**REGADCBIST5 (0x1D33)\***

|                    |                 |          |          |          |          |          |          |          |
|--------------------|-----------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>        | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | REFLIMSCL2[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x07            |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read     |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>  | <b>DECODE</b>   |
|-----------------|-------------|---|---|
| REFLIMSCL<br>2  | 7:0         | Control the accuracy for 1/4 scale measurement. Sets maximum error from expected ADC conversion code in LSBs before asserting interrupt flag. | 0x00: Converted value has zero deviation<br>0x01: Converted value has up to 1 LSB of error<br>0x02: Converted value has up to 2 LSBs of error<br>...<br>0xFF: Converted value has up to 255 LSBs of error |

**REGADCBIST6 (0x1D34)\***

|                    |                 |          |          |          |          |          |          |          |
|--------------------|-----------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>        | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | REFLIMSCL3[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x07            |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read     |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>  | <b>DECODE</b>   |
|-----------------|-------------|---|---|
| REFLIMSCL<br>3  | 7:0         | Control the accuracy for 1/8 scale measurement. Sets maximum error from expected ADC conversion code in LSBs before asserting interrupt flag. | 0x00: Converted value has zero deviation<br>0x01: Converted value has up to 1 LSB of error<br>0x02: Converted value has up to 2 LSBs of error<br>...<br>0xFF: Converted value has up to 255 LSBs of error |

**REGADCBIST7 (0x1D35)\***

|                    |             |          |          |          |          |          |          |          |
|--------------------|-------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>    | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | TLIMIT[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x03        |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read |          |          |          |          |          |          |          |

| <b>BITFIELD</b> | <b>BITS</b> | <b>DESCRIPTION</b>   |
|-----------------|-------------|--|
| TLIMIT          | 7:0         | Control accuracy for alternate temperature sensor measurement. Sets maximum deviation between primary and alternate temperature sensors before asserting interrupt flag. |

**REGADCBIST9 (0x1D37)\***

|                    |                |          |          |          |          |          |          |          |
|--------------------|----------------|----------|----------|----------|----------|----------|----------|----------|
| <b>BIT</b>         | <b>7</b>       | <b>6</b> | <b>5</b> | <b>4</b> | <b>3</b> | <b>2</b> | <b>1</b> | <b>0</b> |
| <b>Field</b>       | MUXV_CTRL[7:0] |          |          |          |          |          |          |          |
| <b>Reset</b>       | 0x00           |          |          |          |          |          |          |          |
| <b>Access Type</b> | Write, Read    |          |          |          |          |          |          |          |

| BITFIELD  | BITS | DESCRIPTION   | DECODE   |
|-----------|------|---|--|
| MUXV_CTRL | 7:0  | Value to drive GPIO during MUX testing. This is driven by BIST engine, but is provided as a hook to drive during debug. | 0b11111110: Drive ADC0 MUX input to Low (GND) and all others to High (ADC Voltage Reference)<br>0b00000001: Drive ADC0 MUX input to High (ADC Voltage Reference) and all others to Low (GND)<br>0b11111101: Drive ADC1 MUX input to Low (GND) and all others to High (ADC Voltage Reference)<br>0b00000010: Drive ADC1 MUX input to High (ADC Voltage Reference) and all others to Low (GND)<br>0b11111011: Drive ADC2 MUX input to Low (GND) and all others to High (ADC Voltage Reference)<br>0b00000100: Drive ADC2 MUX input to High (ADC Voltage Reference) and all others to Low (GND) |

**REGADCBIST12 (0x1D3A)\***

| BIT                 | 7                        | 6  | 5   | 4 | 3 | 2 | 1 | 0 |
|---------------------|--------------------------|--|---|---|---|---|---|---|
| Field               | TMONCAL_OOD_WAIT_B2[7:0] |  |   |   |   |   |   |   |
| Reset               | 0xFF                     |  |   |   |   |   |   |   |
| Access Type         | Write, Read              |  |   |   |   |   |   |   |
| BITFIELD            | BITS                     | DESCRIPTION  | DECODE  |   |   |   |   |   |
| TMONCAL_OOD_WAIT_B2 | 7:0                      | Count value to set time before temperature sensor Calibration goes out-of-date. 1 LSB is 26.2ms. | 0x00: 26.2ms<br>0x0F: 418.7ms<br>0xFE: 6.7s<br>0xFF: disabled |   |   |   |   |   |

**REGADCBIST13 (0x1D3B)**

| BIT          | 7                 | 6   | 5 | 4 | 3 | 2 | 1 | 0 |
|--------------|-------------------|---|---|---|---|---|---|---|
| Field        | T_EST_OUT_B0[7:0] |   |   |   |   |   |   |   |
| Reset        | 0xFF              |   |   |   |   |   |   |   |
| Access Type  | Read Only         |   |   |   |   |   |   |   |
| BITFIELD     | BITS              | DESCRIPTION   |   |   |   |   |   |   |
| T_EST_OUT_B0 | 7:0               | Bits 7:0 of temperature sensor measurement. Reconstruct temperature using this register with T_EST_OUT_B1. Bits 9:0 divided by 2 is the die junction temperature in Kelvin. |   |   |   |   |   |   |

**REGADCBIST14 (0x1D3C)**

| BIT         | 7                 | 6 | 5 | 4 | 3 | 2 | 1                     | 0 |
|-------------|-------------------|---|---|---|---|---|-----------------------|---|
| Field       | T_EST_OUT_B1[1:0] |   | – | – | – | – | ALT_T_EST_OUT_B1[1:0] |   |
| Reset       | 0x3               |   | – | – | – | – | 0x3                   |   |
| Access Type | Read Only         |   | – | – | – | – | Read Only             |   |

| BITFIELD         | BITS | DESCRIPTION   |
|------------------|------|---|
| T_EST_OUT_B1     | 7:6  | Bits 9:8 of temperature sensor measurement. Reconstruct temperature using this register with T_EST_OUT_B0. Bits 9:0 divided by 2 is the die junction temperature in Kelvin.     |
| ALT_T_EST_OUT_B1 | 1:0  | Bits 9:8 of temperature sensor measurement. Reconstruct temperature using this register with ALT_T_EST_OUT_B0. Bits 9:0 divided by 2 is the die junction temperature in Kelvin. |

**REGADCBIST15 (0x1D3D)**

| BIT         | 7                     | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-------------|-----------------------|---|---|---|---|---|---|---|
| Field       | ALT_T_EST_OUT_B0[7:0] |   |   |   |   |   |   |   |
| Reset       | 0xFF                  |   |   |   |   |   |   |   |
| Access Type | Read Only             |   |   |   |   |   |   |   |

| BITFIELD         | BITS | DESCRIPTION   |
|------------------|------|---|
| ALT_T_EST_OUT_B0 | 7:0  | Bits 7:0 of alternate temperature sensor measurement. Reconstruct temperature using this register with ALT_T_EST_OUT_B1. Bits 9:0 divided by 2 is the die junction temperature in Kelvin. |

**CC\_RTTN\_ERR (0x1D5F)\***

| BIT         | 7 | 6 | 5 | 4 | 3 | 2                           | 1                            | 0                           |
|-------------|---|---|---|---|---|-----------------------------|------------------------------|-----------------------------|
| Field       | - | - | - | - | - | RESET_EF<br>USE_CRC_<br>ERR | INJECT_EF<br>USE_CRC_<br>ERR | INJECT_RT<br>TN_CRC_<br>ERR |
| Reset       | - | - | - | - | - | 0b0                         | 0b0                          | 0b0                         |
| Access Type | - | - | - | - | - | Write Clears<br>All, Read   | Write, Read                  | Write, Read                 |

| BITFIELD             | BITS | DESCRIPTION   | DECODE  |
|----------------------|------|---|---|
| RESET_EFUSE_CRC_ERR  | 2    | Reset efuse CRC error status to 0. Self-clearing. Use for ASIL evaluation purposes.   | 0b0: Do not reset<br>0b1: Reset   |
| INJECT_EFUSE_CRC_ERR | 1    | Set this bit before reading efuse values to inject error to efuse CRC value (EFUSE_CRC_ERR bit). Use for ASIL evaluation purposes.            | 0b0: Do not inject efuse CRC errors<br>0b1: Inject efuse CRC errors                       |
| INJECT_RTTN_CRC_ERR  | 0    | Set this bit before going into sleep mode to inject error to retention memory CRC value (RTTN_CRC_INT bit). Use for ASIL evaluation purposes. | 0b0: Do not inject retention memory CRC errors<br>0b1: Inject retention memory CRC errors |

**Revision History**

| <b>REVISION NUMBER</b> | <b>REVISION DATE</b> | <b>DESCRIPTION</b> | <b>PAGES CHANGED</b> |
|------------------------|----------------------|--------------------|----------------------|
| 0                      | 1/21                 | Initial Release    | —                    |

| REVISION NUMBER | REVISION DATE | DESCRIPTION   | PAGES CHANGED |
|-----------------|---------------|---|---------------|
| 1               | 12/21         | <p>Data Sheet Updates:</p> <p>Specification changes:<br/>Added non-side-wettable parts under Ordering Information</p> <p>Documentation changes:</p> <p>Absolute Maximum Ratings: Corrected CAP_VDD value</p> <p>Electrical Characteristics Table:<br/>Added typical minimum PWDNB hold time<br/>Open-Drain Pins: Corrected symbols column for <math>V_{IH}</math> and <math>V_{IL}</math><br/>Monitor ADC: Updated conditions columns with additional pin information, added Input impedance information for 3:1 voltage division configuration, updated test condition for Total Unadjusted Error input voltage = 1.2V, deleted Active Load Current (ADC current consumption), as it is an insignificant portion of total supply current, corrected ADC input voltage range when using /3 and /4 dividers<br/>Reference Clock Requirements: Added Typical Maximum Rise and Fall Time Rows.</p> <p>Pin Descriptions:<br/>Added to pin descriptions for improved accuracy and consistency of terminology throughout document.<br/>Added documentation for video timing generator (VTG) I/O to MFP0, MFP1/GCFG0, MFP2/CFG1, MFP3, MFP4, MFP7, MFP8.<br/>Updated Functions column for SIOP, SION.<br/>Updated function names for MPF5, MFP6, MFP9, MFP10.</p> <p>Typical Operating Characteristics:<br/>Replaced plot for for VDDIO current vs. GPIO toggle rate plot with corrected data<br/>Deleted <math>V_{DDIO}</math> Current vs. MIPI clock Speed</p> <p>Recommended Operating Conditions table (Table 2): Added note to clarify definition of supply noise</p> <p>External Components table (Table 3):<br/>Added <math>R_{TERM}</math>. Was previously missing<br/>Added missing information to Value and Unit columns.</p> <p>Updated GMSL2 Lock Time figure</p> <p>Added table to show typical maximum cable lengths and wording to reference GMSL2 Channel Specification<br/>Added Additional Documentation section<br/>Provided more detail on tunneling mode for clarity<br/>Corrected frequency deviations in Spread Spectrum section. These were inconsistent with the (correct) register map<br/>Added detail in Video Timing Generator section<br/>Clarified that video crossbar is only available in pixel mode<br/>Corrected details, added definitions in GMSL2 Bandwidth Calculations Section, Table 6 and added figure 23 for clarity<br/>Table 7: Removed row for unsupported 25-50MHz operation<br/>Deleted Table 8. Typical Control Channel Latencies, renumbering tables following.<br/>Table 8: Updated delay value for GPIO forwarding from serializer to deserializer row.<br/>Documented typical GPIO delay for GPIO forwarding from serializer to deserializer in non-compensated mode<br/>Table 12: Updated SPI, Other Functions and GPIO columns, deleted Default Pin Setting column, and added Power Up Default column.<br/>Added detail on functional safety features</p> | 1-74          |



| REVISION NUMBER | REVISION DATE | DESCRIPTION   | PAGES CHANGED |
|-----------------|---------------|---|---------------|
|                 |               | <p>Corrected errors, added power-up defaults and video timing generator functions to MFP Pin Function Map</p> <p>Thermal Management section rewritten for accuracy</p> <p>Removed reference to TMON in Junction Temperature Monitoring and Overtemperature Alarm section. User should use built-in precision temperature sensor for accurate die temperature measurements</p> <p>Revised recommendation for power supply ramp time</p> <p>Removed requirement for clock stretching on remote side</p> <p>Added Software Programming Model section and Programming Notes</p> <p>Added Typical Application Circuit</p> <p>Moved I<sup>2</sup>C/UART programming related information into Applications section</p> <p>Global: Changed wording, fixed typos, rearranged figures, note references and sections for improved accuracy, clarity and logical grouping. Removed irrelevant references to 6Gbps operation.</p>  |               |
|                 |               | <p>Register Map updates:</p> <p>Global: Added Reset column, added RSVD for hidden bits, added Note and asterisks to show which registers are retained in sleep mode, and changed register descriptions and decodes for clarity.</p> <p>Unhid registers CTRL2 (0x12), EXT21 (0x38D), EXT22 (0x38E), EXT23 (0x38F), REF_VTG (0x3F1), RLMS3A (0x143A), RLMSA8 (0x14A8), RLMSA9 (0x14A9), DPLL_0 (0x1A00), DPLL_7 (0x1A07), REGADCBIST3-REGADCBIST7 (0x1D32-0x1D35).</p> <p>Hid registers PWR1 (0x9), TX1 (0x59), TR1 (0x79, 0x81, 0x89, 0x91, 0xA1, 0xA9), TR0 (0x88), EXT9 (0x381), EXT10 (0x383), PM_OV_STAT2 (0x572), PM_OV_STAT3 (0x573), RLMS30 (0x1430), RLMS31 (0x1431), RLMS32 (0x1460), RLMSA6 (0x14A6), RLMSD8 (0x14D8), RLMSE1 (0x14E1), DPLL_11 (0x1A0B), I2C_UART_CRC5 (0x1D0D), I2C_UART_CRC6 (0x1D0E), MEM_ECC1 (0x1D15), MEM_ECC2 (0x1D16), REGADCBIST10 (0x1D38), REGADCBIST11 (0x1D39).</p> <p>Unhid bitfields VREF_CAP_EN (0x11), config_sel_clock_out_use_external (0x1A03), config_spread_bit_ratio (0x1A03), config_div_fb_exp (0x1A09), config_allow_coarse_change (0x1A0A), config_div_out_exp (0x1A0A).</p> <p>Hid bitfields VPRBS_ERR_OEN (0x1E), VPRBS_ERR_FLAG (0x1F), TIMEOUT (0x2B), ARB_TO_LEN (0x48), PRIO_VAL (0x58, 0x78, 0x88, 0x90, 0xA0, 0xA8), PRIO_CFG (0x58, 0x78, 0x88, 0x90, 0xA0, 0xA8), VID_PRBS_CHK_EN (0x26B), DIS_COLOR_CROSSBAR (0x276), phy_config (0x330), t_hs_dec_en (0x338), cphy_hdr_err; cphy_hdr1_err; cphy_hdr2_err; InvCode_In1; InvCode_In0 (0x380), CPhy_Mode; phy1_CPhyCdrTp bt; phy1_CPhyCdrSwap_en; phy1_CPhyCdrMask (0x383), adc_refs cl (0x501), bypass_volttemp_corr (0x509), adc_over_flow_ie (0x50C), gpio_err_ie (0x50F), adc_over_flow_if (0x510), gpio_err_if (0x513), invalid_ch_sel_if (0x513), EOM_RST_THR (0x1406), MAN_CALIB (0x14A7), MEM_ECC_ERR2_THR (0x1D14), MEM_ECC_ERR1_THR (0x1D14), POST_RUN_MBIST (0x1D20), POST_RUN_LBIST (0x1D20).</p> | 75-240        |
| 2               | 8/22          | Added part numbers for standard TQFN. General upgrades for accuracy and completeness to data sheet text and register descriptions   |               |
| 3               | 10/22         | General Description and Simplified Block Diagram updated.   | 1-2           |

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