# MAX96707/MAX96709 Evaluation Kit

# Evaluates: MAX96707/MAX96709 with Coax or STP Cable

## General Description

The MAX96707/MAX96709 coax evaluation kit (EV kit) provides a proven design to evaluate the MAX96707 and MAX96709 high-bandwidth gigabit multimedia serial link (GMSL) serializers with spread spectrum and full-duplex control channel, through the use of a standard FAKRA coax or STP cable. The EV kit also includes Windows Vista®- and Windows® 7-compatible software that provides a simple graphical user interface (GUI) for exercising features of the device. The EV kit comes with either a MAX96707GTG+ or MAX96709GTG+ IC installed.

For complete GMSL evaluation using a standard FAKRA coax cable, order the MAX96707 or MAX96709 EV kit and a companion deserializer board (the MAX96706 EV kit is referenced in this document). For testing with STP cable, also order the MAXCOAX2STP-HSD adapter kit and refer to its data sheet. Only one adapter kit is required per link (connecting the serializer and deserializer boards).

**Note:** In the following sections, MAX96707/709 and the term "serializer" refer to the MAX96707 or MAX96709 ICs and MAX96706/708 and the term "deserializer" refer to the MAX96706 or MAX96708 ICs.

**Note:** This document applies to both coax and STP EV kits. This document covers coax cable links, but the information provided applies equally to STP cable links.

*Ordering Information* ***appears at end of data sheet.***

## Features

- Accepts 14-Bit Parallel Input Data and Outputs GMSL Serial Data through FAKRA Connectors
- Power-over-Coax Capable
- Windows Vista- and Windows 7-Compatible Software
- USB-Controlled Interface (Cable Included)
- USB Powered
- Proven PCB Layout
- Fully Assembled and Tested

## Items Included in the EV Kit Package

| DECRIPTION | QTY |
|---|---|
| MAX96707 or MAX96709 coax EV kit board | 1 |
| USB cable | 1 |

## MAX96707/MAX96709 EV Kit Files

| FILE | DECRIPTION |
|---|---|
| MAXSerDesEV-N_Vxxxx_Install.EXE | Installs the EV kit files on your computer |
| MAXSerDesEV-N.EXE | Graphical user interface (GUI) program |
| CDM20600.EXE | Installs the USB device driver |
| USB_Driver_Help_200.PDF | USB driver installation help file |

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*19-4482; Rev 0; 4/16*

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## Quick Start

### Required Equipment

- MAX96707 or MAX96709 serializer EV kit
- MAX96706 or MAX96708 deserializer EV kit
- 2m FAKRA cable assembly (included with the deserializer EV kit)
- > 20MHz function generator
- PC with Windows Vista or Windows 7 and a spare USB port (direct 500mA connection required; do not use a bus-powered hub)
- 5V DC, 500mA power supply

**Note:** In the following sections, software-related items are identified by bolding. Text in **bold** refers to items from the EV kit software. Text in **bold and underlined** refers to items from the Windows operating system.

### Procedure

The EV kit is fully assembled and tested. Follow the steps below to verify board operation:

1) Visit **www.maximintegrated.com\EVKitsoftware** to download and install the latest version of the EV kit software:
   - Double-click on **GMSL SerDes Evaluation Kit Software-Nuvoton**.
   - Download the MAXSerDesEV-N_Vx_x_x_x_Install.ZIP file (8MB).
   - Extract and install the MAXSerDesEV-N_Vx_x_x_Install.EXE file. The installation application installs the USB driver. If the USB driver installation is not successful, install the appropriate USB driver for your computer by visiting **www.ftdichip.com/Drivers/VCP.htm**.
2) Verify that jumpers on the serializer board are in their default positions, as shown in Figure 15.
3) Verify that jumpers on the deserializer board are in their default positions, as shown in Figure 16.
4) Set up the system, as shown in Figure 1.
5) Connect the FAKRA cable from the OUT+ terminal on the serializer board to the IN0+ terminal on the deserializer board.
6) Connect the USB cable between the PC and USB port on the Nuvoton microcontroller daughter board on the serializer board.
7) Verify that LED_PWR on the deserializer board lights up, indicating that the deserializer board has power.
8) Verify that LED_PWR on the serializer board lights up, indicating that the serializer board has power. Both serializer and deserializer have a power-over-coax (POC) circuit that is active by default.
9) Verify that LOCK_LED on the deserializer board lights up, indicating that the link has been successfully established. If the LOCK_LED is off, or ERR_LED is on, go to the *Troubleshooting* section and fix the problem before continuing. **Note:** If you are working with an earlier version of the deserializer IC, you must write value of 0xA6 to register address 0x9b at slave address 0x90 to enable the control channel. In the current revision of the IC, this step is no longer needed.
10) Start the EV kit software by selecting **Start | Programs | Maxim Integrated | MAXSerDesEV-N | MAXSerDesEV-N**.
11) The **Configuration Settings** window opens (see Figure 2) and the GUI automatically searches for any active listener in both $I^2C$ and UART mode and identifies a valid GMSL product. Once a valid device is identified, the corresponding configuration jumpers are displayed to help users configure the serializer and deserializer.
12) In case an operating evaluation board with a Nuvoton microcontroller is not found, a window appears (Figure 3) warning as such. Press **OK** to continue and start the GUI anyway, or press **Cancel** to terminate the application. See the *Troubleshooting* section at the end of this document and fix the problem before continuing.
13) When an operating Nuvoton microcontroller is found, the GUI checks the firmware version in the microcontroller and prompts the user to update (Figure 4).
14) While the **Configuration Settings** window is open, press the **Identify Devices** button to search for the devices connected.
15) Only **Link Type** and **Device Address** selections on the **Configuration Settings** window affects the EV kit operation. Other items are for user reference only.
16) Press the **Connect** button to open the **Evaluation Kit** window and the devices under test (DUT) register maps (Figure 5). The GUI reads all internal registers of the serializer and deserializer and update the corresponding tabs.

17) Press the **Read All MAX96707** button in the **Serializer** group box to read all the serializer registers.
18) Press the **MAX96707 Des** tab (Figure 6) and then press the **Read All MAX96706** button in the **Deserializer** group box to read all the deserializer registers.
19) Select any of the other tabs to evaluate other serializer/deserializer (SerDes) functions.

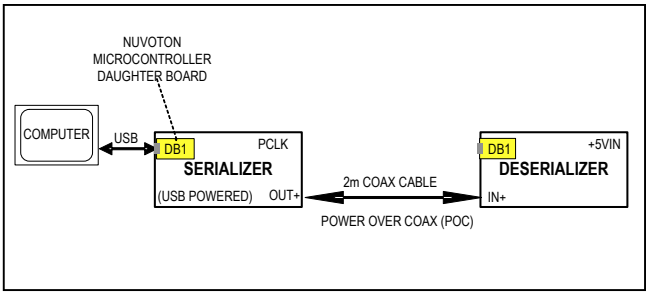


*Figure 1. Serializer Test Setup Block Diagram*

## Table 1. Jumper Description*

| JUMPER | SIGNAL | SHUNT POSITION | FUNCTION |
|---|---|---|---|
| J1 | +12V | — | +12V AC adapter input |
| J2 | +5VIN | — | +5V power-supply input positive terminal |
| J3 | GND | — | +5V power-supply input negative terminal |
| J4 | OUT+ | — | GMSL OUT+ FAKRA connector |
| J5 | OUT- | — | GMSL OUT- FAKRA connector |
| J6 | EXT_UC | — | 4-pin header to apply user microcontroller |
| J7 | VIDT | INT** | U4 powered from on board LDO |
| | | EXT | U4 powered from external source applied on J20 |
| J8 | BRDVDD | INT** | Peripheral circuit powered from internal source |
| | | EXT | Peripheral circuit powered through EXT-DVDD terminal, J19 |
| J11 | U15 ch3 | Open** | VLC3 = U15 level shifter, channel 3 low side<br>VLC4 = U15 level shifter, channel 4 low side |
| J13 | U15 ch4 | Open** | VHC3 = U15 level shifter, channel 3 high side<br>VHC4 = U15 level shifter, channel 4 high side |
| J21 | SCLPU | Short** | on board SCL pulled up resistor in circuit |
| | | Open | on board SCL pulled up resistor NOT in circuit |
| J22 | SDAPU | Short** | on board SDA pulled up resistor in circuit |
| | | Open | on board SDA pulled up resistor NOT in circuit |
| | | Open | External µC SCL signal must be pulled up externally |
| J25 | U4_SCL | Short** | µC connected to U4 oscillator |
| | | Open | µC not connected to U4 oscillator |
| J26 | IDT_OE | L | U4 oscillator output not enabled |
| | | H** | U4 oscillator output enabled |
| | | Open | U4 oscillator OE pin not connected |

**Jumper selections in the **Serializer/Deserializer** group boxes on the **Configurations Settings** window are for reference only and do not affect software operation.*
***Default position.*

## Table 1. Jumper Description* (continued)

| JUMPER | SIGNAL | SHUNT POSITION | FUNCTION |
|---|---|---|---|
| J27 | FSEL0 | L** | U4 oscillator FSEL0 pin pulled low |
| | | H | U4 oscillator FSEL0 pin pulled high |
| | | Open | U4 oscillator FSEL0 pin not connected (internal low) |
| J28 | FSEL1 | L** | U4 oscillator FSEL1 pin pulled low |
| | | H | U4 oscillator FSEL1 pin pulled high |
| | | Open | U4 oscillator FSEL1 pin not connected (internal low) |
| J29 | U1_SDA | Short** | U1 SDA connected to µC |
| | | Open | U1 SDA is open |
| J30 | GPIO1 | Short | Shorted to IOVDD |
| | | Open** | Shorted to GND |
| J32 | GPIO2 | Short | Shorted to IOVDD |
| | | Open** | Shorted to GND |
| J33 | GPO_Low | L | Connected to GND |
| | | H | Connected to IOVDD |
| | | Open** | Not connected |
| J35 | U4_SDA | Short** | U4 oscillator SDA connected to µC |
| | | Open | U4 oscillator SDA open |
| J38 | PCLK_IN | IDT** | U1 PCLKIN connected to U4 output |
| | | SMA | U1 PCLKIN connected to PCLK_SMA connector |
| | | GND | GND terminal for externally applied PCLK to J38.1 |
| | | Open | U1 PCLKIN pin not connected |
| J39 | U1_SCL | TX | U1 TX/SCL pin connected to µC RX pin |
| | | Short** | U1 SCL connected to µC |
| | | Open | U1 SCL open |
| J44 | HIM_HI | Short | HIM pin pulled up to IOVDD |
| | | Open** | HIM internally pulled down |
| J45 | GPO_LOW | Short | U1 GPO pin connected to IOVDD |
| | | Open** | U1 GPO open |

**Jumper selections in the **Serializer/Deserializer** group boxes on the **Configurations Settings** window are for reference only and do not affect software operation.*
***Default position.*

## Table 1. Jumper Description* (continued)

| JUMPER | SIGNAL | SHUNT POSITION | FUNCTION |
|---|---|---|---|
| J51 | POC+ | POC5VOUT | 5V POC is sourced by the serializer |
| | | POC5VIN** | 5V POC is expected from the deserializer |
| | | POC12V | 12V POC can be applied by either the serializer or deserializer |
| | | Open | POC circuit disconnected |
| J52 | POC- | POC5VOUT | 5V POC is sourced by the serializer |
| | | POC5VIN** | 5V POC is expected from the deserializer |
| | | POC12V | 12V POC can be applied by either the serializer or deserializer |
| | | Open | POC circuit disconnected |
| J53 | VDD_REF | +3.3V** | Reference voltage for external µC signals set to +3.3V |
| | | +5V | Reference voltage for external µC signals set to +5V |
| | | Open | Reference voltage for external µC signals applied to J6.VDD_REF |
| J54 | EXSDAPU | Short** | On-board pullup applied on external µC SDA signal |
| | | Open | External µC SDA signal must be pulled up externally |
| J55 | EXSCLPU | Short** | On-board pullup applied on external µC SCL signal |
| | | Open | External µC SCL signal must be pulled up externally |
| JU1 | Power | USB+5V | Board powered from USB port |
| | | +5VIN | Board powered from 5V external power supply |
| | | POC5V | Board power from deserializer through Coax link |
| | | REG+5V | Board powered from +12V supply, stepped down to 5V |
| JU3 | DVDD | INT** | U1 DVDD supplied from internal source |
| | | EXT | U1 DVDD supplied through EXT-DVDD terminal (J19) |
| JU4 | AVDD | INT** | U1 AVDD supplied from internal source |
| | | EXT | U1 AVDD supplied through EXT-AVDD terminal (J18) |

**Jumper selections in the **Serializer/Deserializer** group boxes on the **Configurations Settings** window are for reference only and do not affect software operation.*
***Default position.*

## Detailed Description of Software

To start the serializer evaluation kit GUI, select **Start | All Programs | Maxim Integrated | MAXSerDesEV-N | MAXSerDesEV-N**.

### Configuration Settings Window

The **Configuration Settings** window is the first window that opens after successful program launch. It allows the user to specify serializer and deserializer board setup and mode of operation (Figure 2).

### Controller Group Box

In the **Controller** group box, select **Coax** or **STP** from the **Link Type** drop-down list, **I2C** or **UART** from the **Bus** drop-down list, and whether the **Serializer** or **Deserializer** should be connected to the USB controller. Upon changing any of these parameters, conflicting jumper settings are highlighted, guiding the user to check and make the corresponding changes to the evaluation boards. Only the **Link Type** and **Device Address** selections on the **Configuration Settings** window affect EV kit operation. Other items, including jumper selection, are for user reference only.

### Serializer and Deserializer Jumper Selection Blocks

The **Serializer** and **Deserializer Jumper Selection** blocks list jumpers on the evaluation boards of the selected Device ID and displays the correct shunt positions based on the conditions selected in the **Controller** block.

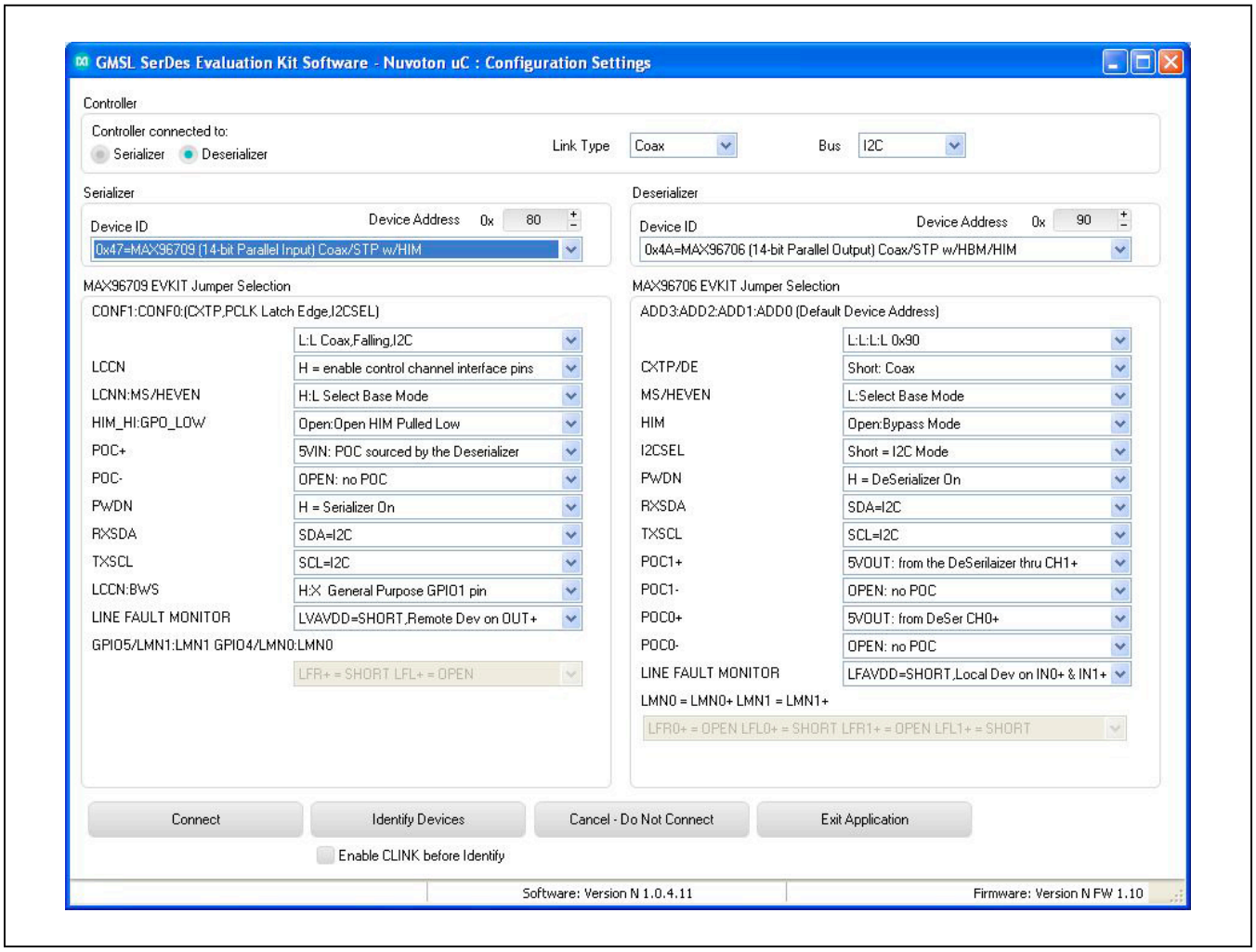


*Figure 2. MAXSerDesEV-N EV Kit Software: Configuration Settings Window (Shown with MAX96709 and MAX96706 EV Kits Connected)*

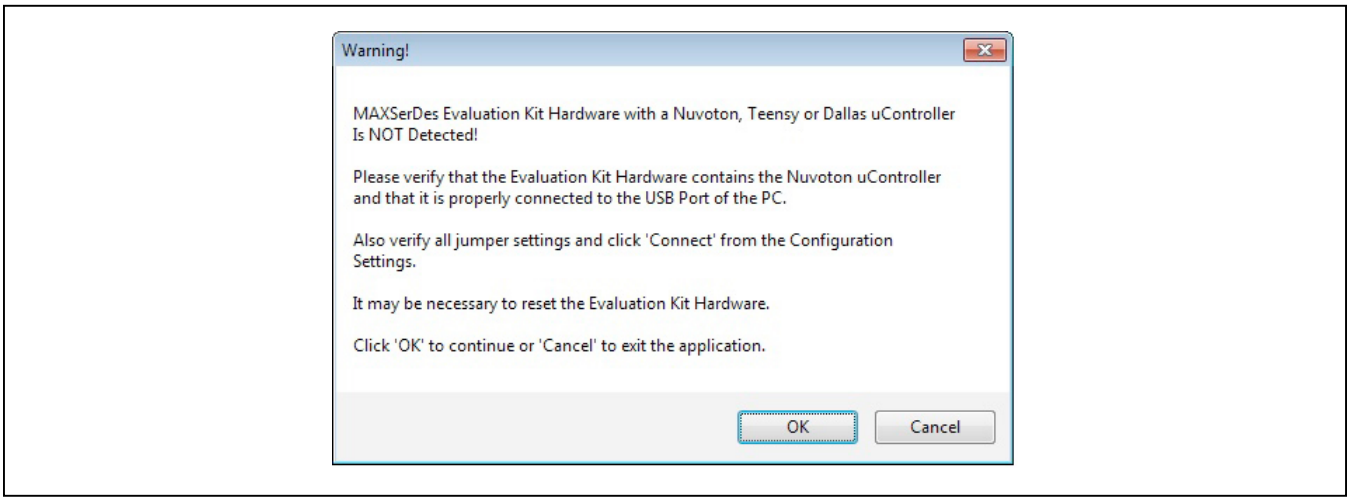


*Figure 3. MAXSerDesEV-N EV Kit Software: Warning! (Nuvoton µController is NOT Detected!)*

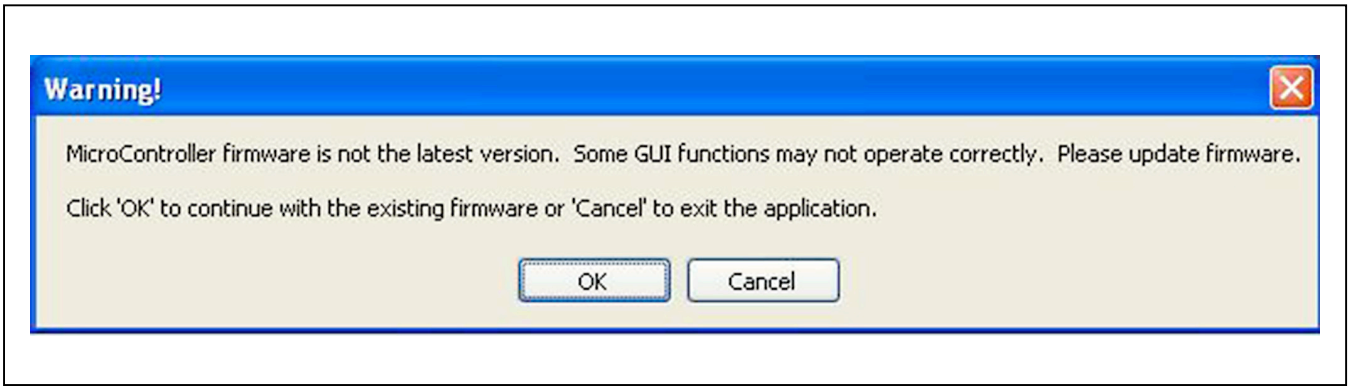


*Figure 4. MAXSerDesEV-N EV Kit Software: Warning! (Microcontroller Firmware is Not the Latest Version)*

### Identify Devices Button

The **Identify Devices** button causes the GUI to scan the system and hunt for slave addresses on the bus. Upon successful communication, it reads the **Device ID** register from the DUTs and displays the corresponding jumper lists on the **Serializer** and **Deserializer Jumper Selection** blocks. It is also possible to select a device from the **Device ID** drop-down list and manually change the slave address in the **Device Address** edit box. It is a good practice to utilize the **Identify Devices** button and verify communication with the DUTs before attempting to **Connect**.

Figure 15 and Figure 16 show jumper settings on the SerDes PCBs for coax cable and I2C communication with a USB cable connected to the serializer board. Refer to the respective SerDes IC data sheets for detailed configuration information. See Table 1 for the serializer jumper descriptions.

### Connect Button

The **Connect** button opens the **Evaluation Kit** window. The GUI reads the SerDes registers and updates the register maps for both. Successful register map updates are indicated by green LED indicators. In case of a communication problem, the LED indicators turn red.

### Cancel - Do not Connect Button

The **Cancel - Do Not Connect** button opens the **Evaluation Kit** main window without attempting to connect to the microcontroller. Although there is no communication with the microcontroller, all functions and tabs corresponding to the selected **Device ID**s on the **Evaluation Kit** window become active once there.

## Evaluation Kit Window

The **Evaluation Kit** window shown in Figure 5 provides access to all internal registers and functions of the DUTs by means of reading and writing registers through different tabs; thus, enabling the user to evaluate various functions of the serializer and deserializer.

The **Read All** button updates the SerDes register maps by reading the DUT's internal registers.

The **Serializer** group box provides pushbuttons to update the serializer's register map from the DUT using the **Read All MAX96707** button. The **Load** button reads and updates from a previously saved file and the **Save** button saves the existing register values into a new file.

The **Deserializer** group box provides pushbuttons to update the deserializer's register map from the DUT using the **Read All MAX96706** button. The **Load** button reads and updates from a previously saved file and the **Save** button saves the existing register values into a new file.

The **Wake Up** button applies the register write sequence described in the IC data sheets to wake the DUTs from sleep mode.

The **Open Configuration** button returns to the **Configuration Settings** window.

### MAX96707 Ser Tab

The **MAX96707 Ser** tab (Figure 5) lists the serializer's register bitmaps. The **Read** and **Write** buttons in each register group box allows access to each bit or group of bits that specify a function or condition, as defined in the respective serializer IC data sheet. The color of the small LED indicator next to the **Read/Write** buttons indicates the communication status. Green indicates successful communication and red indicates failed communication.

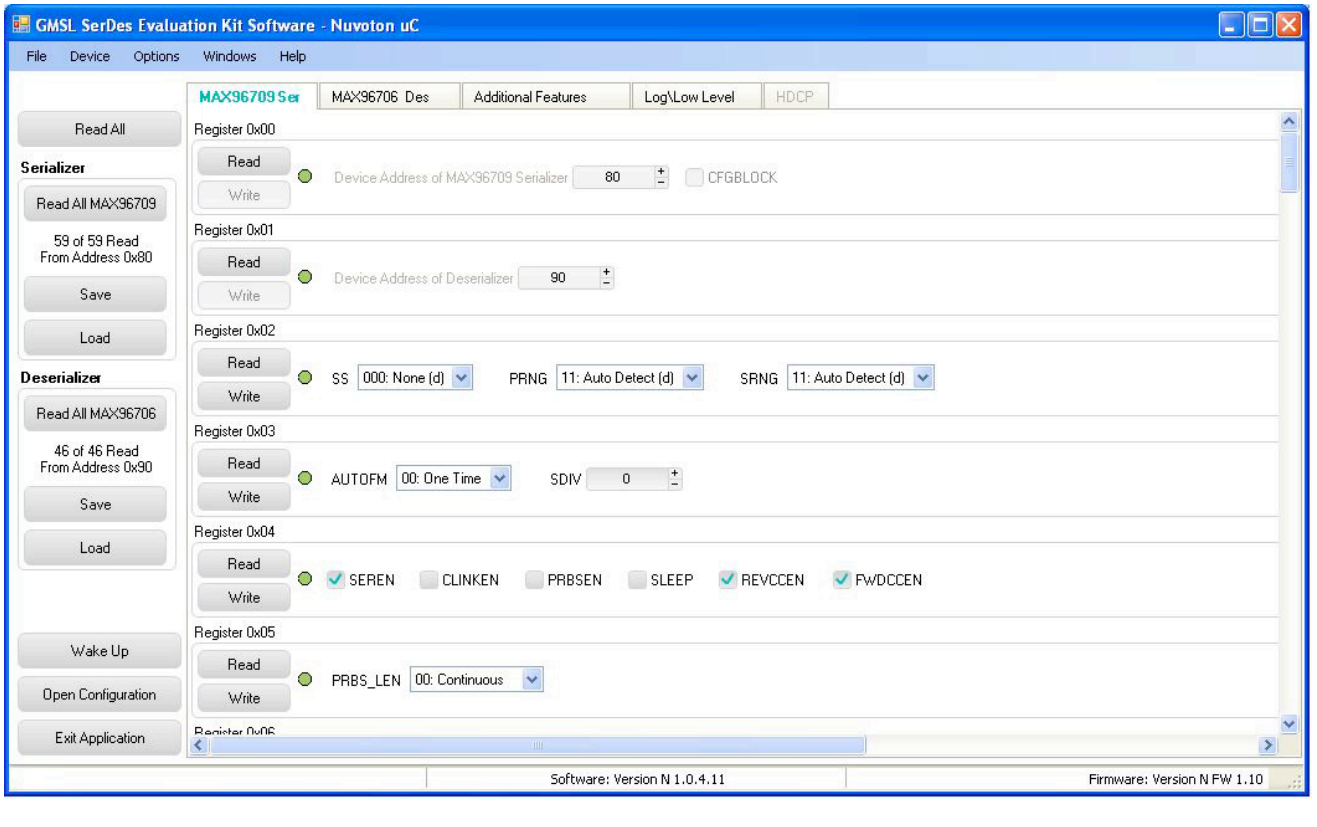


*Figure 5. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (MAX96709 Ser Tab (Serializer))*

### MAX96706 Des Tab

The **MAX92706 Des tab** (Figure 6) lists the deserializer's register bitmaps. The **Read** and **Write** buttons in each register group box allows access to each bit or group of bits that specify a function or condition, as defined in the respective dserializer data sheet. The color of the small LED indicator next to the **Read**/**Write** buttons indicates the communication status. Green indicates successful communication and red indicates failed communication.

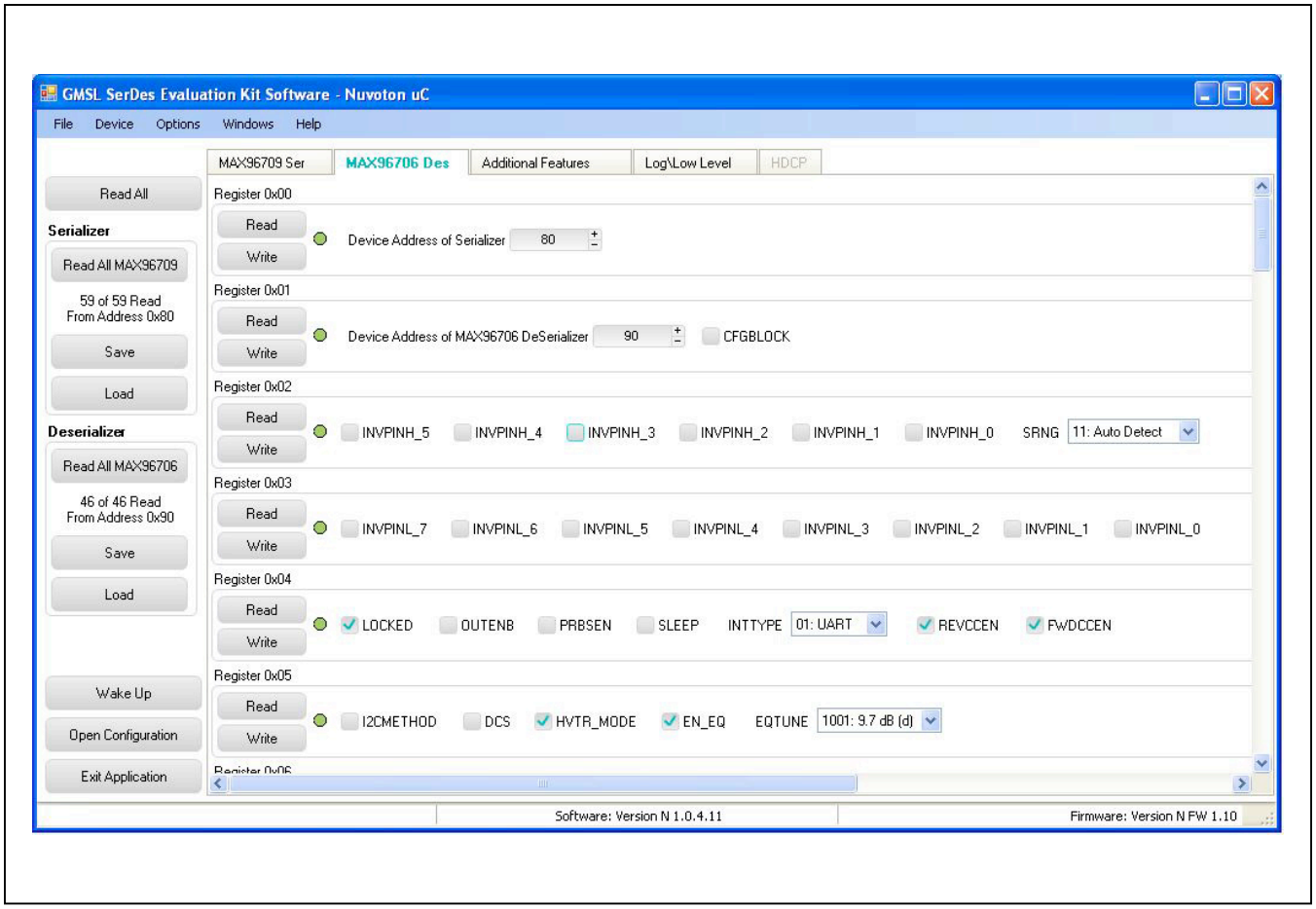


*Figure 6. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (MAX96706 Des Tab (Deserializer))*

### Additional Features Tab

The **Additional Features** tab (Figure 7) provides pushbuttons for specific functions that connected devices can perform. By pressing a button, a new window pops up, launching the specific function selected. Function buttons not supported by the selected device are grayed out.

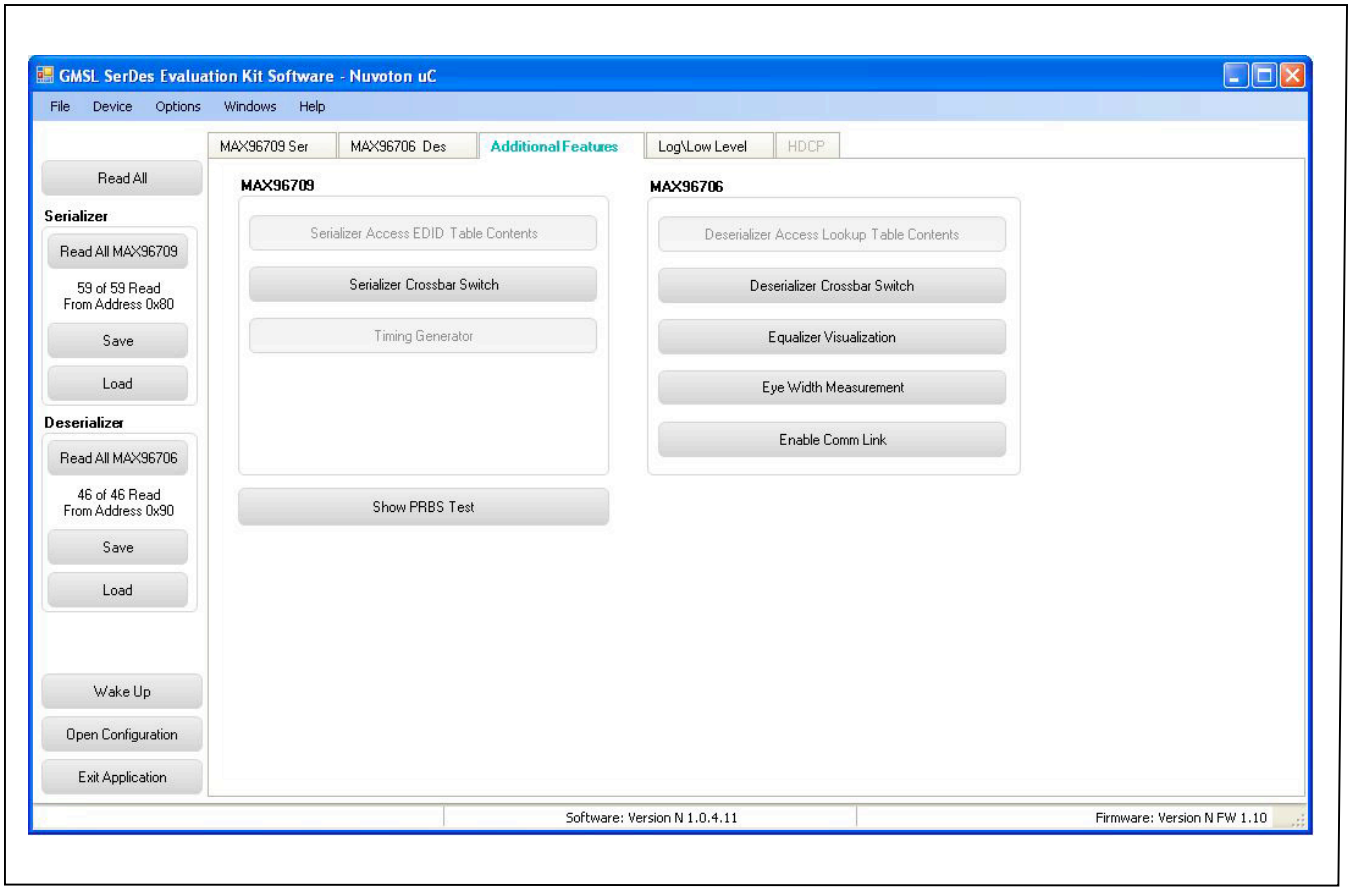


*Figure 7. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Additional Features Tab)*

On the **Additional Features** tab, press the **Serializer Crossbar Switch** button to launch the **Serializer Crossbar Switch Configuration** function (Figure 8). This capability allows the rerouting of data between the parallel input/output by the serializer. Refer to the respective IC data sheet for a detailed description and operation on the embedded crossbar switches.

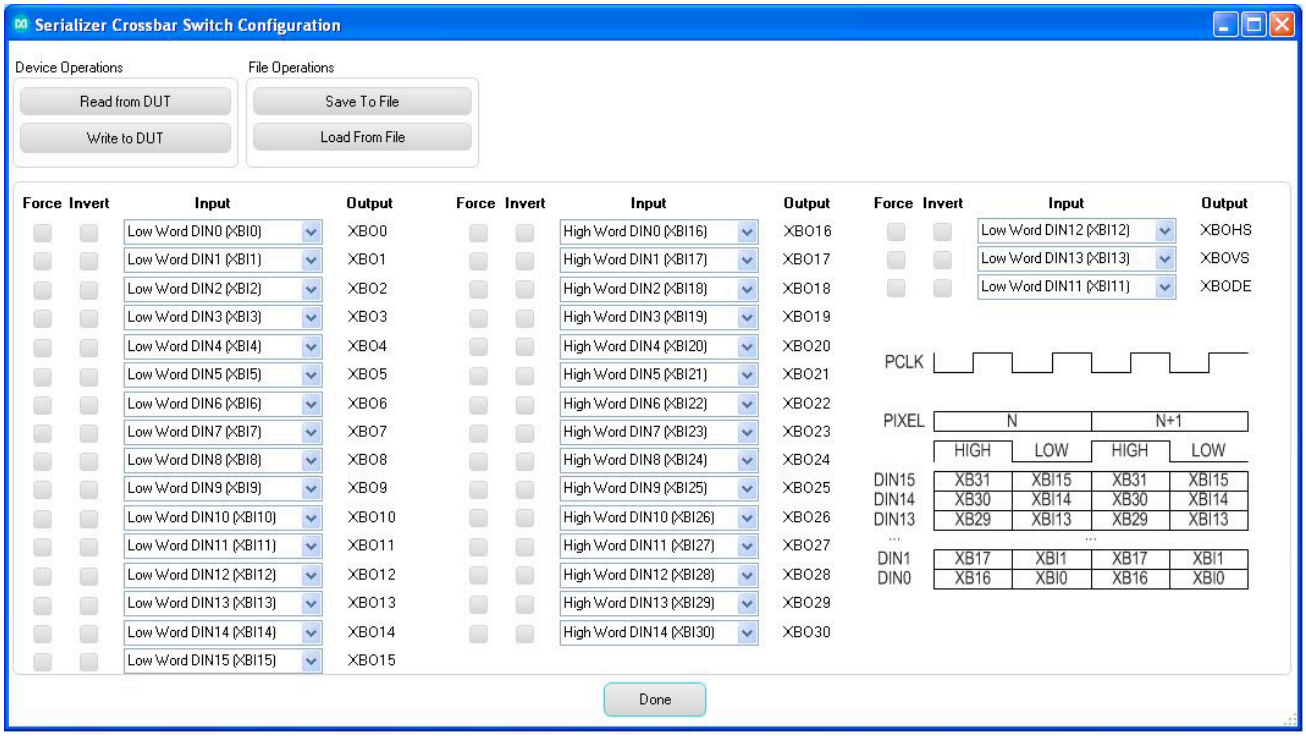


*Figure 8. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Serializer Crossbar Switch Configuration Window)*

On the **Additional Features** tab, press the **Deserializer Crossbar Switch** button to launch the **Deserializer Crossbar Switch Configuration** function for the deserializer (Figure 9). This capability enables rerouting data between the parallel input/output by the deserializer. Refer to the respective IC data sheet for a detailed description and operation on the embedded crossbar switches.

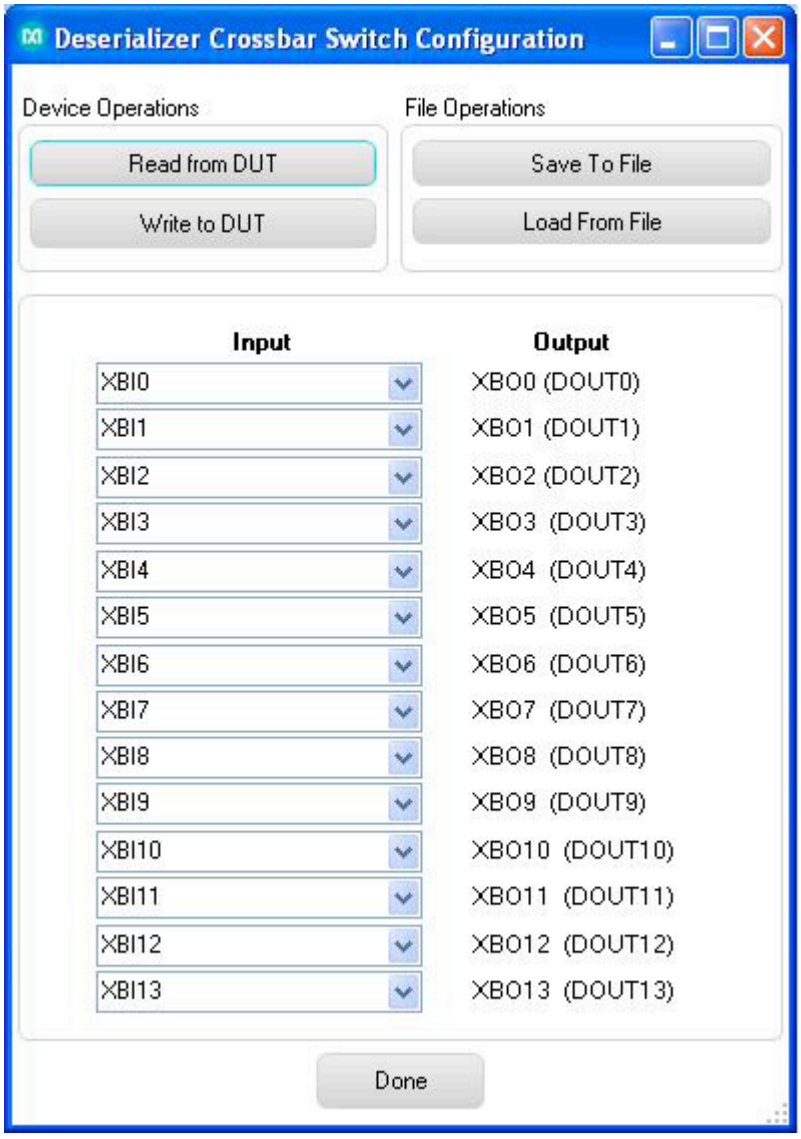


*Figure 9. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Deserializer Crossbar Switch Configuration Window)*

On the **Additional Features** tab, press the **Timing Generator** button to launch this function (Figure 10), which allows the user to utilize the programmable video timing generator to generate/retime the input sync signals. Refer to the respective IC data sheet for a detailed description.

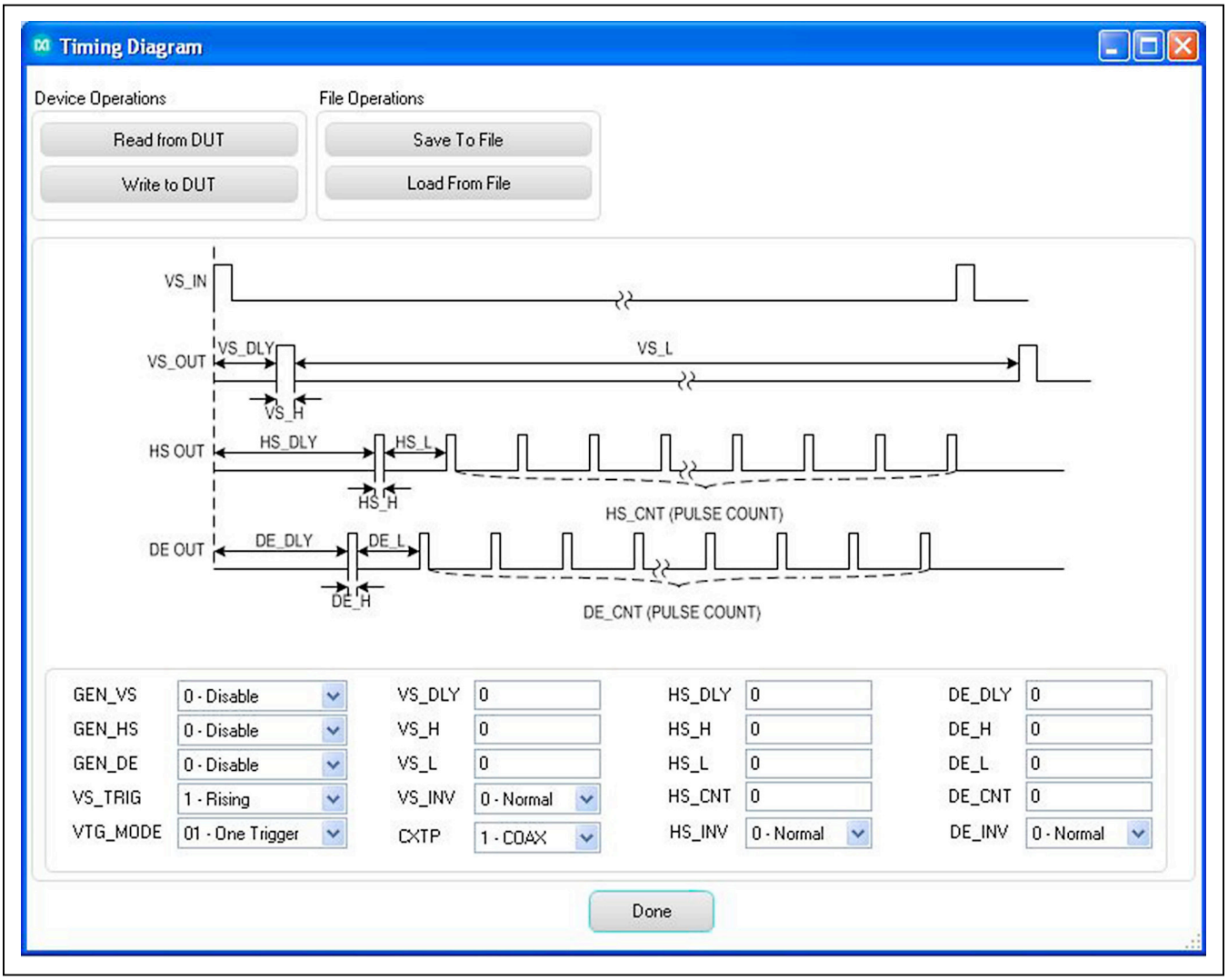


*Figure 10. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Timing Generator Window)*

On the **Additional Features** tab, press the **Equalizer Visualization** button to launch this function (Figure 11), which allows compensating for higher cable attenuation and higher frequencies. Refer to the respective IC data sheet for a detailed description.

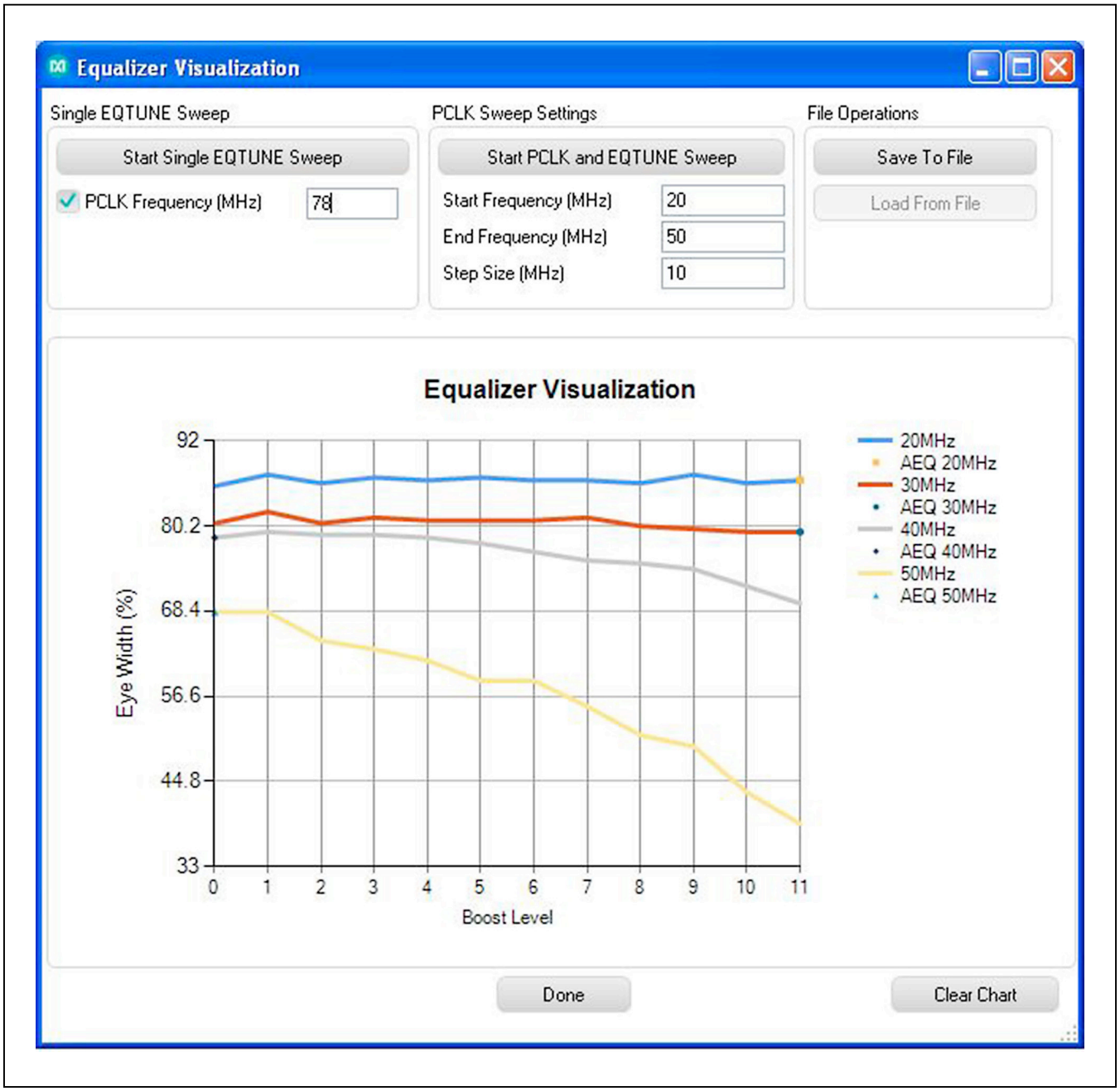


*Figure 11. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Equalizer Visualization Window)*

On the **Additional Features** tab, press the **Eye Width Measurement** button to launch this function (Figure 12) which graphically displays Eye Width/opening of the high-speed data over the link. Refer to the IC data sheet for detailed description. Note that this function is not supported by the MAX96708 deserializer.

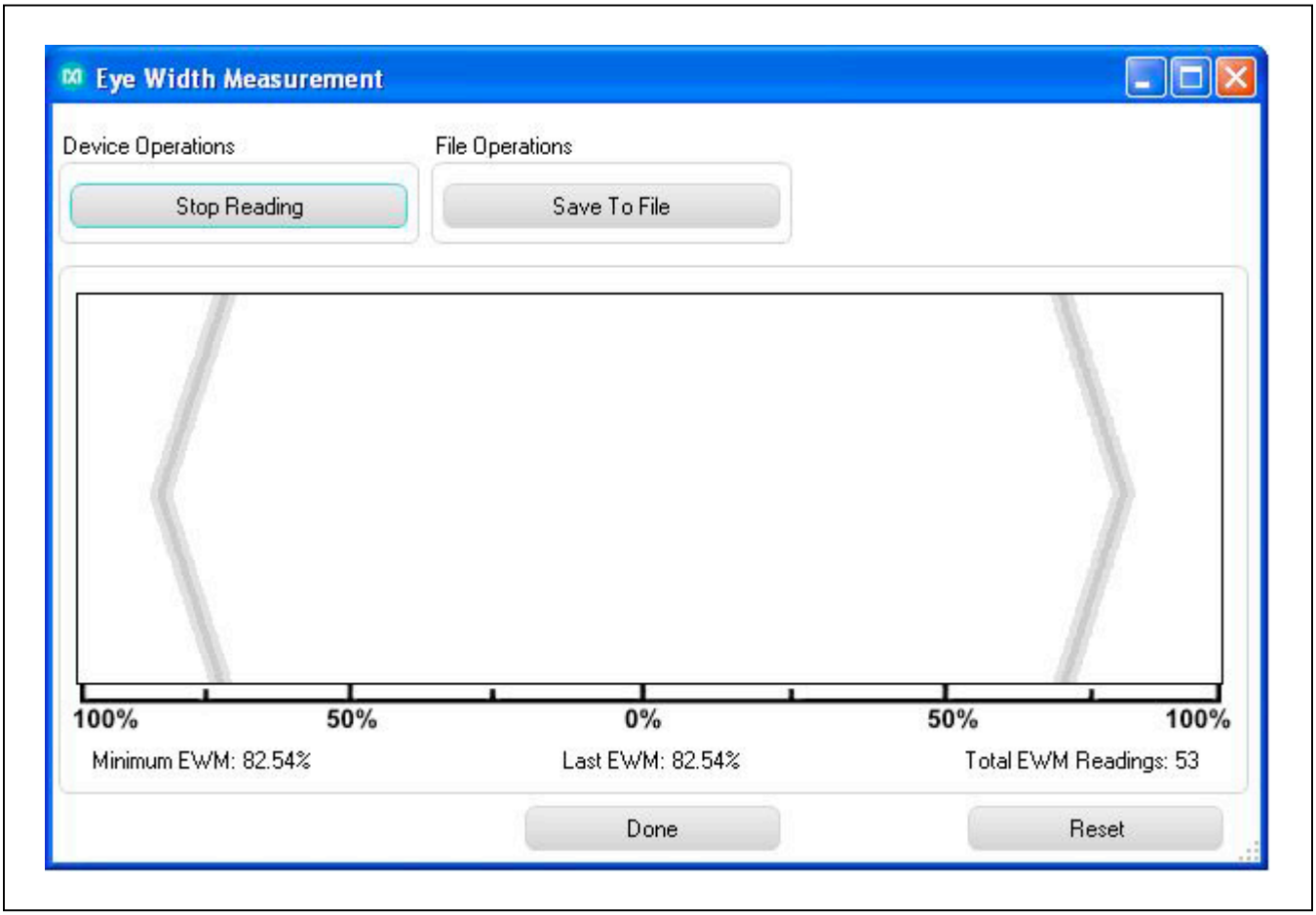


*Figure 12. MAXSerDesEV-N EV KIT Software: Evaluation Kit Window (Eye Width Measurement Window)*

On the **Additional Features** tab, press the **Show PRBS Test** button to perform a PRBS test (Figure 13). Enter test duration (maximum 32,767s = 9.1hrs) in the **Duration** edit box and press **Start** to start the test. At test completion, the number of bit errors are read from the PRBSERR register, and displayed in the **PRBS Error Counter** box.

### Log\Low Level Tab

The **Log\Low Level** tab (Figure 14) logs all activities between the GUI and DUTs.

The **Register Access** group box allows reads or writes of the specified slave and register addresses. Use the **Send String to EVKIT** button to communicate with non-register-based devices (such as the MAX7324). The **SerDes Baud Rate** drop-down list sets the communications baud rate. Note that the baud rate should be changed in small increments/decrements (one step change is forced by the GUI).

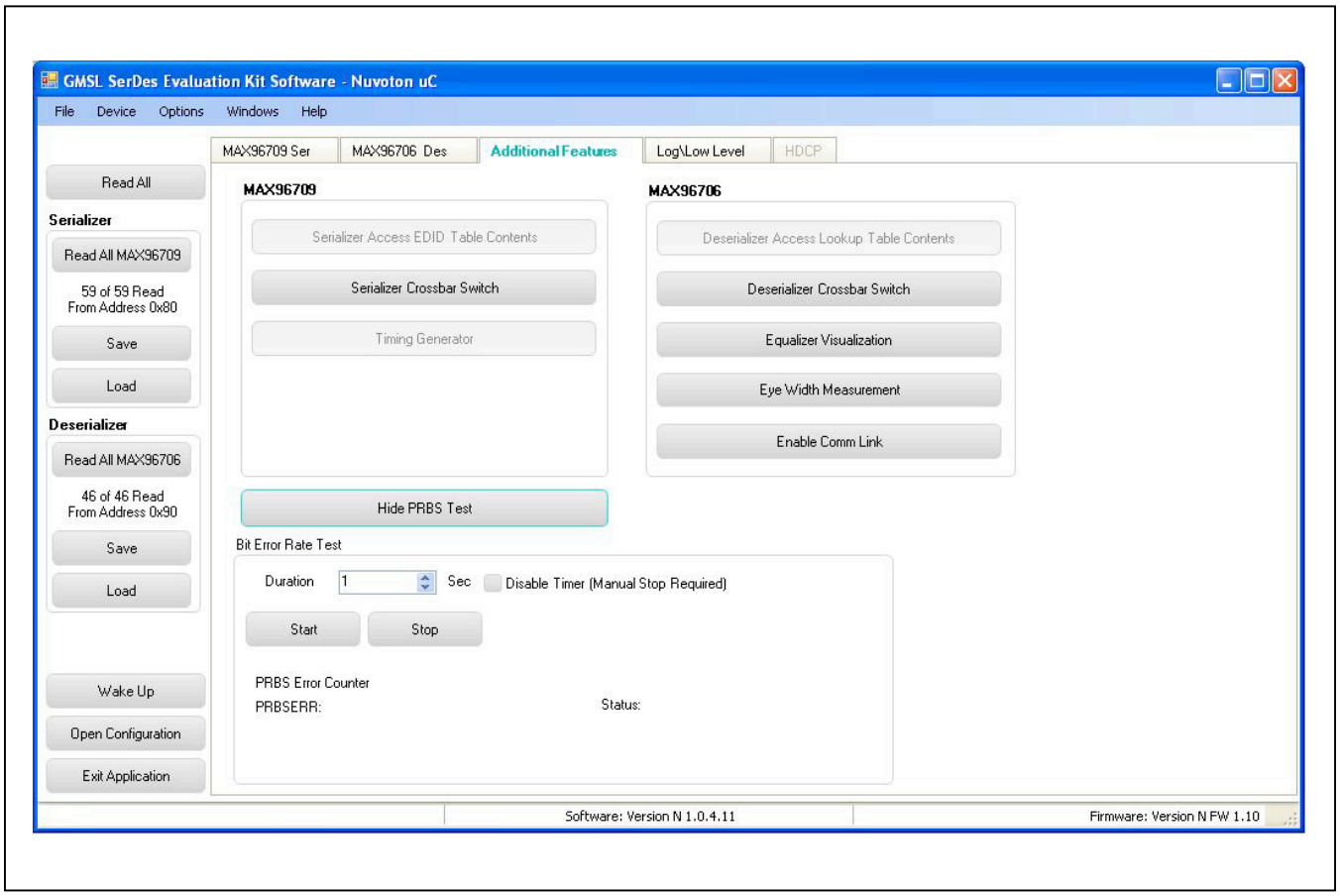


*Figure 13. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Show PRBS Test Window, Expanded)*

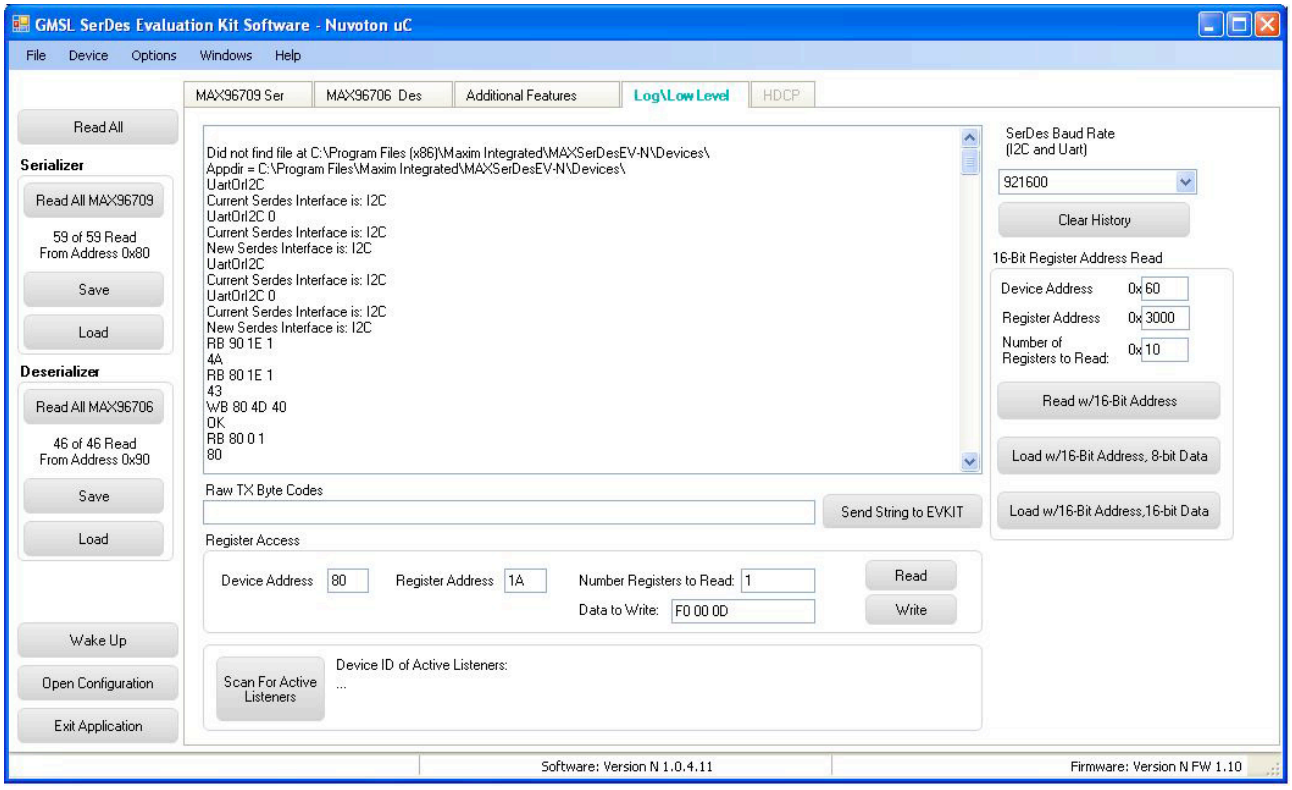


*Figure 14. MAXSerDesEV-N EV Kit Software: Evaluation Kit Window (Log\Low Level Tab)*

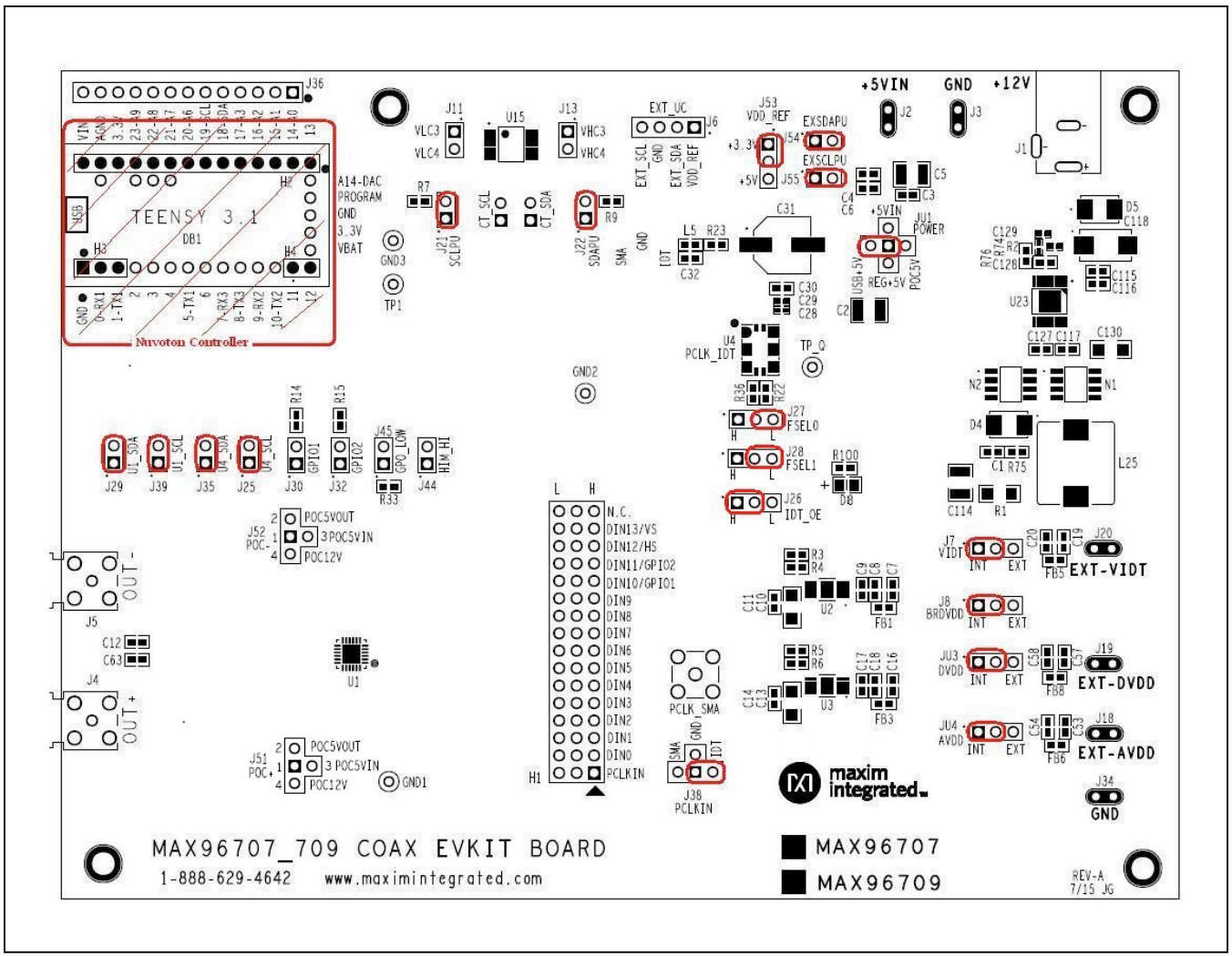


*Figure 15. MAX96707/709 Coax EV KIT jumper setting*

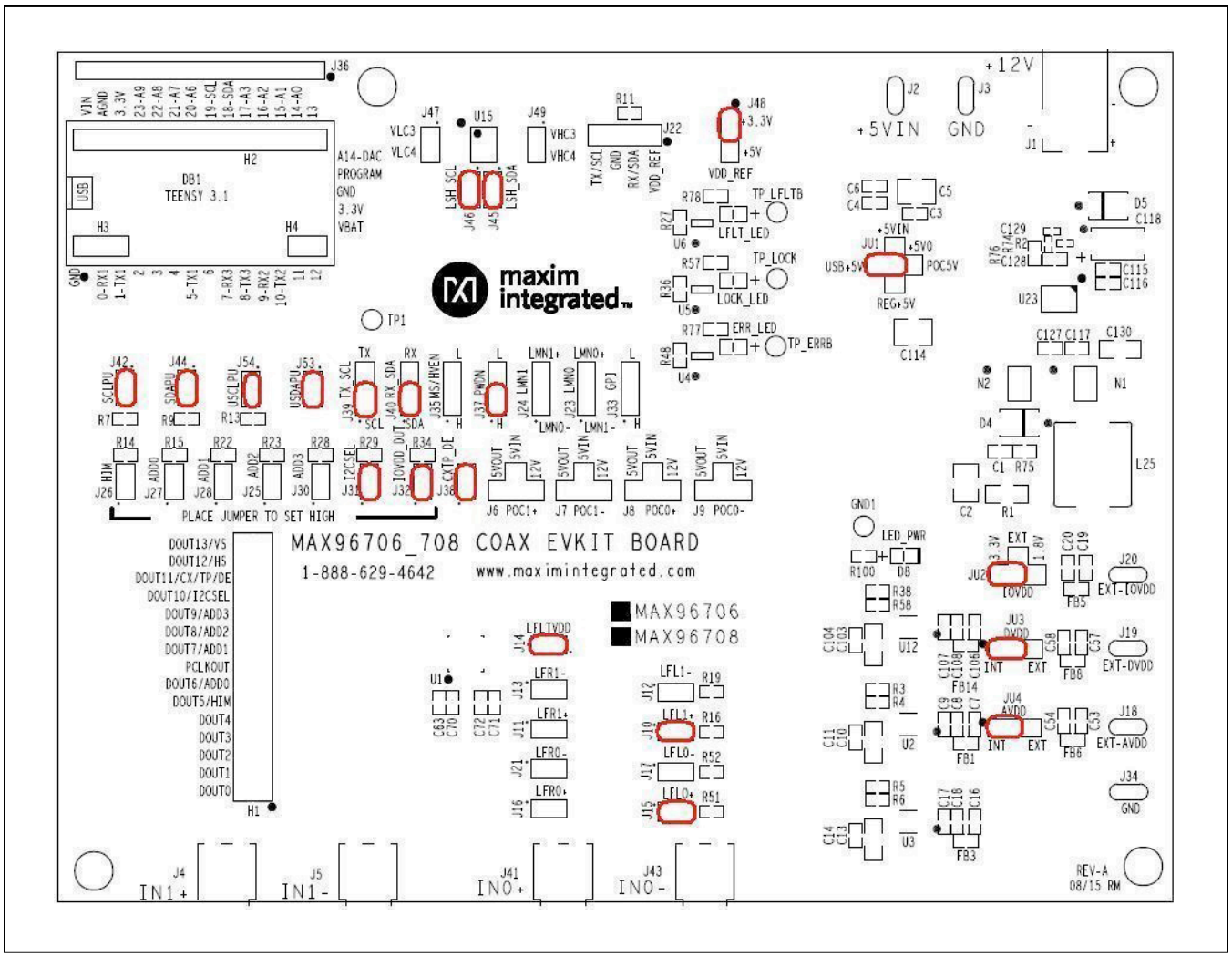


*Figure 16. MAX96706/MAX96708 Coax EV Kit Jumper Settings for Coax Link and I²C Communication*

## Detailed Description of Firmware

The Nuvoton microcontroller on the daughter board runs a custom firmware that ensures reliable communication between the PC and DUTs. The firmware records 9-bit even-parity data received from the USB interface while RTS is set, and plays back the 9-bit data with 1.5 stop bits timing when RTS is cleared. Data received from the DUTs is immediately relayed to the USB port.

### How to Update Firmware

To update the Nuvotron microcontroller firmware, follow the instructions in this folder:

"...\Program Files\Maxim Integrated\MAXSerDesEV-N\Firmware Update\Updating MAXSerDesEV-N firmware.pdf".

## Detailed Description of Hardware

The MAX96707/MAX96709 coax EV kit provides a proven, easy to use, and flexible design for evaluation of MAX96707 and MAX96709 GMSL serializers with parallel input and FAKRA coaxial cable output. On-board level translators and easy-to-use USB-PC connections are also included on the EV kit.

The MAX96707/MAX96709 coax EV kit board consists of four principal functional blocks:

- Microcontroller daughter board
- MAX96707/MAX96709 application circuit block
- Power-supply block
- Oscillator (PCLK) circuit block

### Microcontroller Daughter Board

The Nuvoton-based microcontroller daughter board provides UART and $I^2C$ interfaces that communicate with both serializer and deserializer boards when they are powered on and properly configured. The Nuvoton microcontroller is programmed with the latest firmware at the time of manufacturing.

To use the EV kit with an externally applied controller, remove the Nuvoton microcontroller board from the EV kit board (DB1 position) and apply the RX/SDA, TX/SCL, VDD, and GND signals from the user microcontroller to the corresponding signals on J6 of the serializer board. Use one of the logic levels from the VDD_REF, J53 header, or apply externally.

### Application Circuit

The application circuit block includes the serializer and all other components and circuits suggested in the respective IC data sheet, and test points and provisions to provide access to internal functions of the serializer for evaluation of the product.

### Power Supplies

On-board LDO regulators U2, U3, and U12 generate various voltage levels required to operate the EV kit board. There are four options to power the board:

- USB port (default)
- 12V AC adapter
- 5V power supply applied power over coax cable
- Power jumper (JU1 selects from the four power sources)

To operate the EV kits with voltage levels different from what are generated by on-board regulators, move desired IOVDD (JU2), DVDD (JU3), and AVDD (JU4) shunt from INT to EXT positions and apply the external voltage to the corresponding wire-loop terminal.

### Oscillator (PCLK) Circuit Block

An on-board custom oscillator (U4) to supply PCLK is provided to facilitate the serializer/deserializer evaluation. This is an $I^2C$-programmable oscillator with four custom preprogrammed and jumper-selectable frequencies. FSEL0 and FSEL1 jumpers positions select one of the preprogrammed frequencies per list below:

| FSEL1 | FSEL0 | PCLK (MHz) |
|---|---|---|
| L | L | 25.0 |
| L | H | 37.0 |
| H | L | 78.0 |
| H | H | 104.0 |

Place jumper IDT_EN (J26) in the "L" position to disable the oscillator output. To operate the the oscillator at a frequency other than the four preprogrammed frequencies, refer to the oscillator data sheet available at **www.idt.com/products/clocks-timing/quartz-crystal-oscillator-ics-xo-crystal-clock-oscillators-and-low-power-oscillator-circuits/8n0q001-quad-frequency-programmable-xo-0**, or contact the manufacturer.

## Troubleshooting

Possible causes of board test failure:

- Coax cable not properly connected between the serializer OUT+ to the deserializer IN+.
- PCLKIN not applied (e.g., FG output is disabled): Verify signal at the pins on the board.
- PCLKIN and function generator output are not correct: Verify signal at the pins on the board.
- Incorrect jumper setting on the deserializer board: Reverify.
- Incorrect jumper setting on the serializer board: Reverify.
- Bus selection on the GUI is not consistent with jumpers' position on the boards: Check and verify that USB cable is properly connected.
- USB port has locked: Exit application GUI, remove USB cable from the board, reinsert and relaunch the GUI.
- Nuvoton µC is not communicating: Exit application GUI, remove USB cable from the board, reinsert and relaunch the GUI.
- Deserializer board is faulty: Try a different board (if available).
- Serializer board is faulty: Try a different board (if available).

## Component Suppliers

| SUPPLIER | PHONE | WEBSITE |
|---|---|---|
| Amphenol RF | 800-627-7100 | www.amphenolrf.com |
| Hong Kong X'tals Ltd. | 852-35112388 | www.hongkongcrystal.com |
| Integrated Device Technology (IDT) | 908-766-4941 | www.idt.com |
| Murata Americas | 770-436-1300 | www.murataamericas.com |
| ON Semiconductor | 602-244-6600 | www.onsemi.com |
| Rosenberger Hochfrequenztechnik GmbH | 011-49-86 84-18-0 | www.rosenberger.de |
| TDK Corp. | 847-803-6100 | www.component.tdk.com |

***Note:*** *Indicate that you are using the MAX96707 or MAX96709 when contacting these component suppliers.*

## Component List

Click on the links below for component information, schematics, and PCB layout diagrams:

- **MAX96707/MAX96709 EV Kit BOM**
- **MAX96707/MAX96709 EV Kit Schematics**
- **MAX96707/MAX96709 EV Kit PCB Layout Diagrams**

## Ordering Information

| PART | TYPE |
|---|---|
| MAX96707COAXEVKIT# | EV Kit |
| MAX96709COAXEVKIT# | EV Kit |
| MAXCOAX2STP-HSD# | Adapter Kit |

*#Denotes RoHs compliant.*

***Note:*** *The MAX96707 and MAX96709 coax EV kits are normally ordered with a companion board:*

- MAX96706 coax EV kit (MAX96706COAXEVKIT#)
- MAX96708 coax EV kit (MAX96708COAXEVKIT#)*

## Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|---|---|---|---|
| 0 | 4/16 | Initial release | — |

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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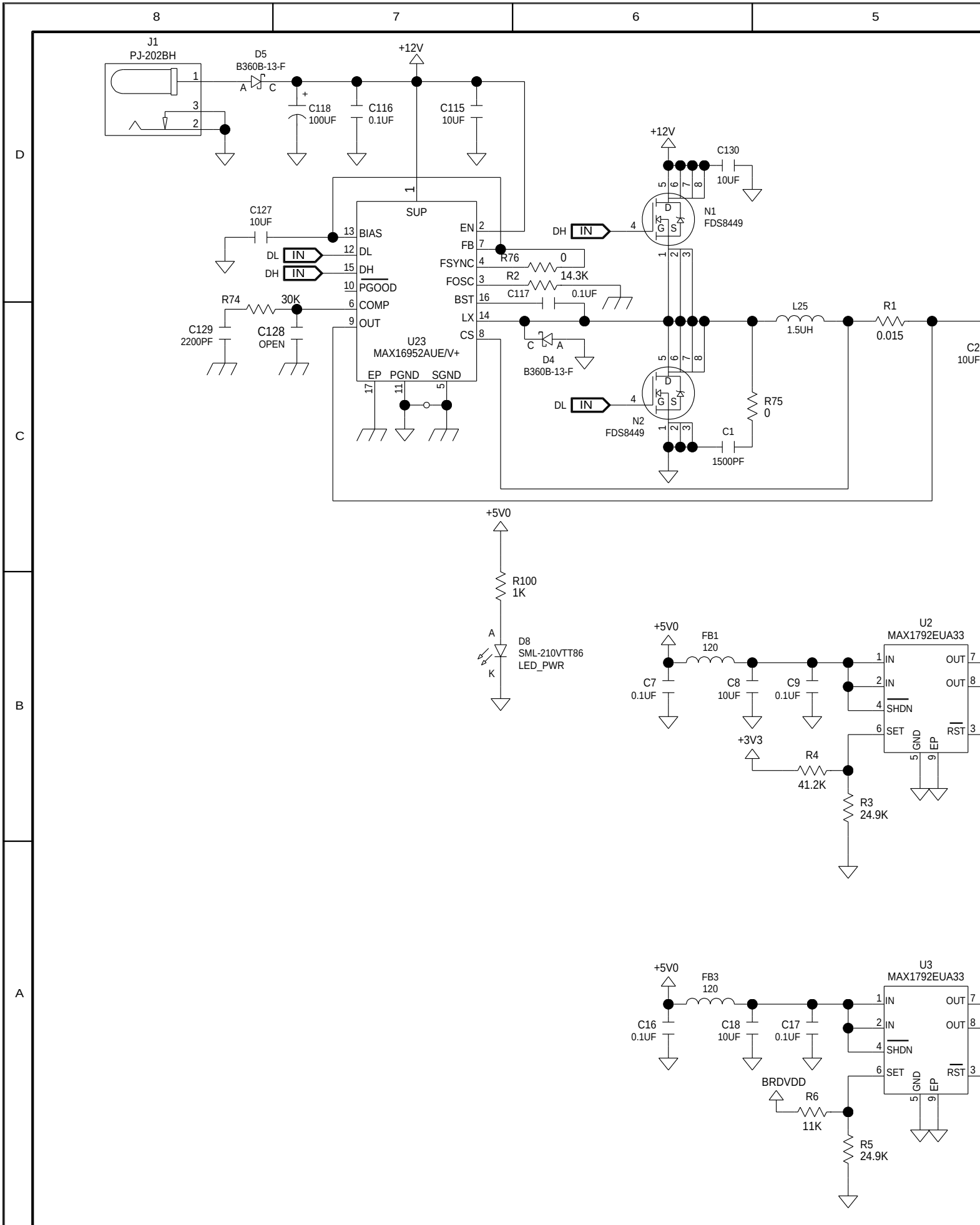
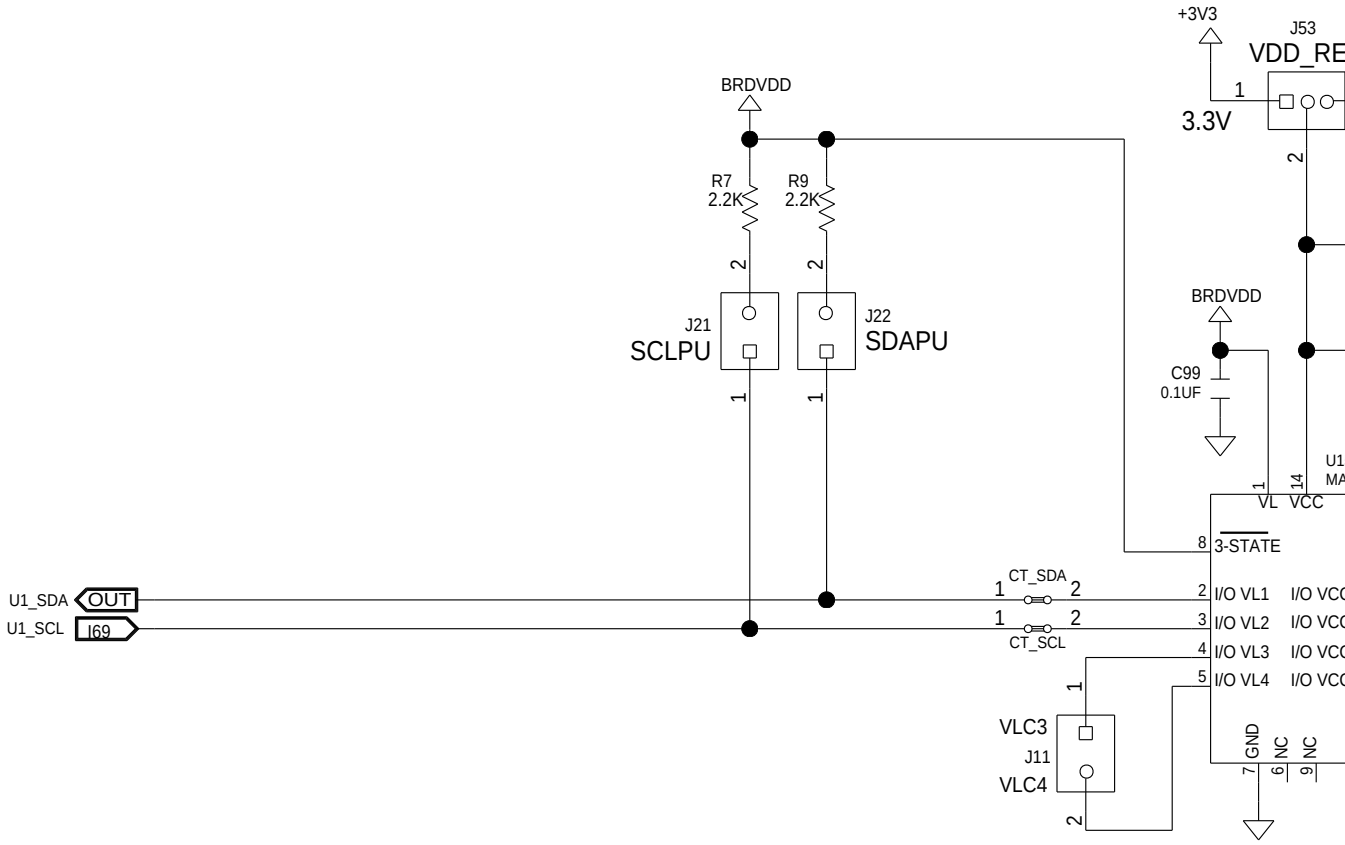
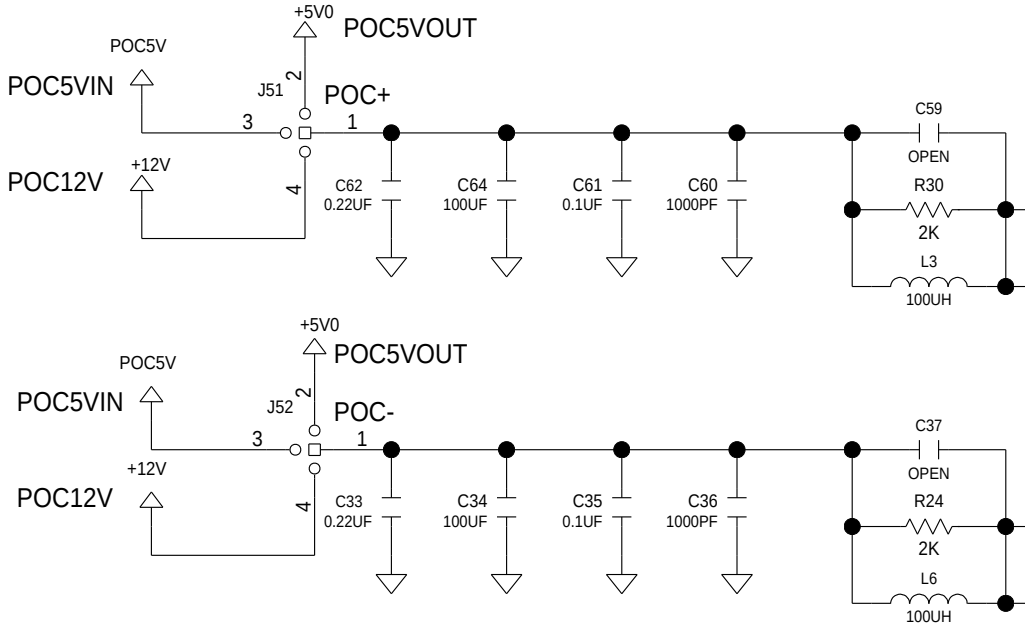
TITLE: Bill of Materials
MAX96707_709; Rev 0; 4/16

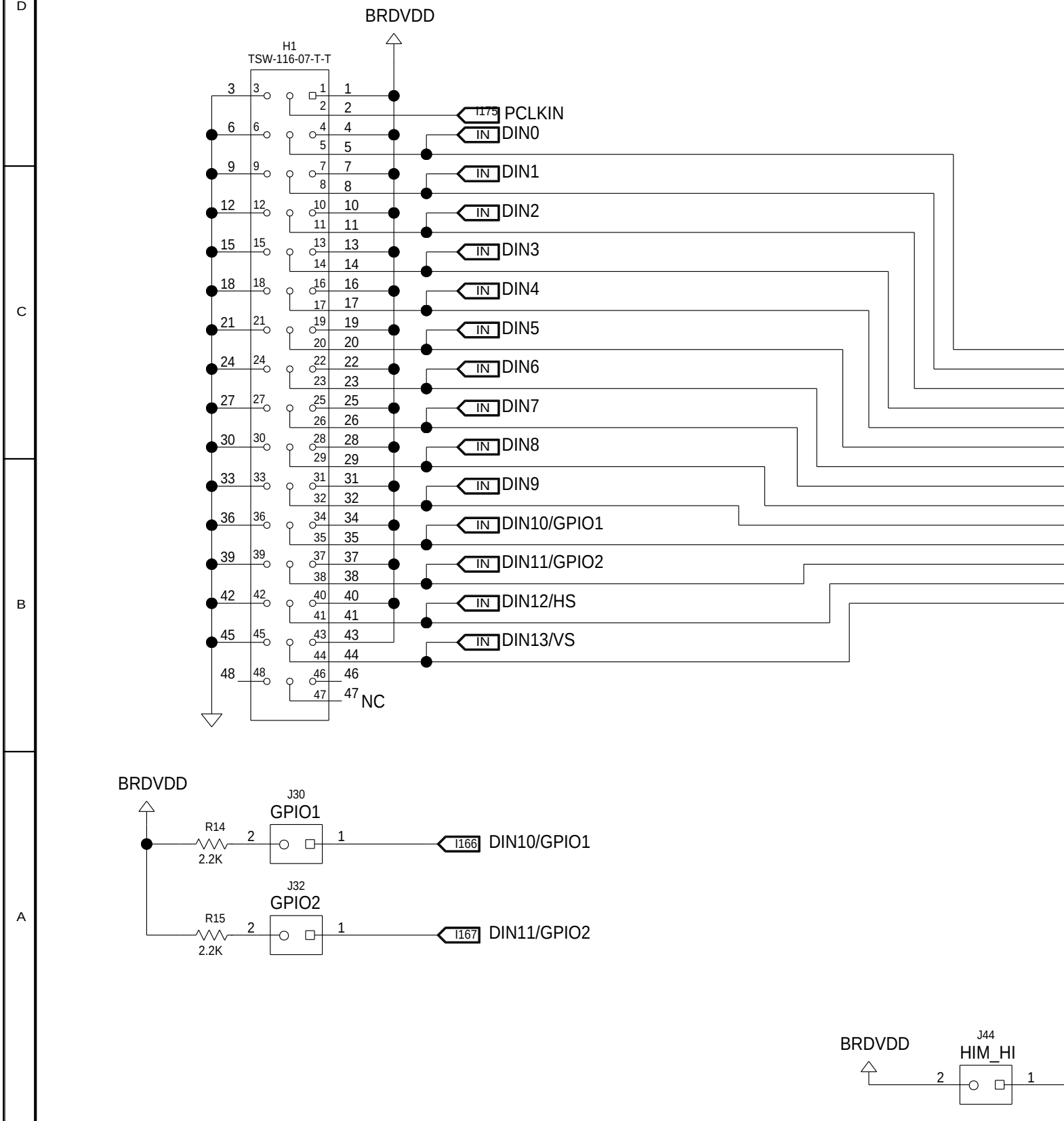
| ITEM | REF_DES | DNI/DNP | QTY | MFG PART # | | MANUFACTURER | VALUE | DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| 1 | C1 | - | 1 | C1608X8R1H152K080 | | TDK | 1500PF | CAPACITOR; SMT (0603); CERAMIC CHIP; 1500PF; 50V; TOL=10%; MODEL=C SERIES; HIGH TEMPERATURE; TG=-55 DEGC TO +150 DEGC; TC=X8R | |
| 2 | C2 | - | 1 | C1210C106M4RAC; C3225X7R1C106M200AB | | KEMET/TDK | 10UF | CAPACITOR; SMT (1210); CERAMIC CHIP; 10UF; 16V; TOL=20%; MODEL=; TG=-55 DEGC TO +125 DEGC; TC=X7R | |
| 3 | C3, C8, C18, C30, C32, C115, C127 | - | 7 | C1608JB1C106M080AB | | TDK | 10UF | CAPACITOR; SMT (0603); CERAMIC CHIP; 10UF; 16V; TOL=20%; TG=-25 DEGC TO +85 DEGC; TC=JB | |
| 4 | C4, C6, C7, C9, C16, C17, C116, C117 | - | 8 | C1608X7R1E104K080AA | | TDK | 0.1UF | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1UF; 25V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R | |
| 5 | C5, C34, C64, C114 | - | 4 | CL32A107MPVNNN | | SAMSUNG ELECTRONICS | 100UF | CAPACITOR; SMT (1210); CERAMIC CHIP; 100UF; 10V; TOL=20%; MODEL=CL SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R | |
| 6 | C10, C13, C130 | - | 3 | C3216X5R1A106M160 | | TDK | 10UF | CAPACITOR; SMT (1206); CERAMIC CHIP; 10UF; 10V; TOL=20%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R | |
| 7 | C11, C14, C19, C20, C53, C54, C57, C58 | - | 8 | C1608X5R0J475M080AB; GRM188R60J475ME19; JMK107BJ475MA-T | | TDK/MURATA/TAIYO YUDEN | 4.7UF | CAPACITOR; SMT (0603); CERAMIC; 4.7UF; 6.3V; TOL=20%; MODEL=C SERIES; TG=-55 DEGC TO +85 DEGC; TC=X5R | |
| 8 | C12, C33, C62, C63 | - | 4 | C1608X7R1H224K080 | | TDK | 0.22UF | CAPACITOR; SMT (0603); CERAMIC CHIP; 0.22UF; 50V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R | |
| 9 | C15, C21, C28, C35, C61 | - | 5 | C0402X7R160-104KNE; CL05B104KO5NNNC; GRM155R71C104KA88; C1005X7R1C104K; CC0402KRX7R7BB104; EMK105B7104KV | | VENKEL LTD./SAMSUNG ELECTRONICS/MURATA/TDK/YAGEO PHICOMP/TAIYO YUDEN | 0.1UF | CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 16V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R; | |
| 10 | C23, C24, C36, C60, C97 | - | 5 | C1005X7R1H102K050BA | | TDK | 1000PF | CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 50V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R | |
| 11 | C29, C85, C96, C99, C100 | - | 5 | GRM155R61C104KA88 | | MURATA | 0.1UF | CAPACITOR; SMT (0402); CERAMIC; 0.1UF; 16V; TOL=10%; MODEL=GRM SERIES; TG=-55 DEGC to +85 DEGC; TC=X5R | |
| 12 | C31 | - | 1 | PCR1C471MCL6 | | NICHICON | 470UF | CAPACITOR; SMT (CASE_F); ALUMINUM-ELECTROLYTIC; 470UF; 16V; TOL=20%; MODEL=CR SERIES; TG=-55 DEGC TO +105 DEGC | |
| 13 | C118 | - | 1 | 16TQC100MYF | | PANASONIC | 100UF | CAPACITOR; SMT (7343); TANTALUM CHIP; 100UF; 16V; TOL=20%; MODEL=TQC SERIES | |
| 14 | C129 | - | 1 | C1005X7R1H222K050BA | | TDK | 2200PF | CAPACITOR; SMT (0402); CERAMIC CHIP; 2200PF; 50V; TOL=10%; MODEL=C SERIES; TG=-55 DEGC TO +125 DEGC; TC=X7R | |
| 15 | D4, D5 | - | 2 | B360B-13-F | | DIODES INCORPORATED | B360B-13-F | DIODE; SCH; SCHOTTKY BARRIER DIODE; SMB; PIV=60V; Io=3A; -55 DEGC TO +125 DEGC | |
| 16 | D8 | - | 1 | SML-210VTT86 | | ROHM | SML-210VTT86 | DIODE; LED; SML-21 SERIES; RED; SMT (0805); PIV=2V; IF=0.02A | |
| 17 | DB1 | - | 1 | TEENSY 3.1 | | PJRC | TEENSY 3.1 | EVKIT PART; MODULE; CTRL; TEENSY USB DEVELOPMENT BOARD; TH-37; CUSTOM PART ONLY | |
| 18 | L4, L5, FB1, FB3, FB5, FB6, FB8 | - | 7 | BLM18SG121TN1 | | MURATA | 120 | INDUCTOR; SMT (0603); FERRITE-BEAD; 120; TOL=+/-25%; 3A | |
| 19 | TP1, GND1-GND3 | - | 4 | | 5000 | KEYSTONE | N/A | TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; | |
| 20 | H1 | - | 1 | TSW-116-07-T-T | | SAMTEC | TSW-116-07-T-T | CONNECTOR; MALE; THROUGH HOLE; 0.025IN SQ POST HEADER; STRAIGHT; 48PINS | |
| 21 | H2 | - | 1 | PBC14SAAN | | SULLINS ELECTRONICS CORP. | PBC14SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 14PINS; -65 DEGC TO +125 DEGC | |
| 22 | H3, J7, J26-J28, J53 H4, J11, J13, J21, J22, J25, J29, J30, J32, J35, J39, J44, J45, J54, | - | 6 | PCC03SAAN | | SULLINS | PCC03SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC | |
| 23 | J55 | - | 15 | PCC02SAAN | | SULLINS | PCC02SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC | |
| 24 | J1 | - | 1 | PJ-202BH | | CUI INC. | PJ-202BH | CONNECTOR; MALE; THROUGH HOLE; PJ-202BH; DC POWER JACK; RIGHT ANGLE; RIGHT ANGLE; 3PINS | |
| 25 | J2, J3, J18-J20, J34 | - | 6 | 9020 BUSS | | WEICO WIRE | MAXIMPAD | EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG | |
| 26 | J4, J5 | - | 2 | 59S2AX-400A5-Z | | ROSENBERGER | 59S2AX-400A5-Z | CONNECTOR; MALE; THROUGH HOLE; RIGHT ANGLE PLUG FOR PCB; RIGHT ANGLE; 5PINS | |
| 27 | J6 | - | 1 | PEC04SAAN | | SULLINS ELECTRONICS CORP. | PEC04SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 4PINS | |
| 28 | J8, JU3, JU4 | - | 3 | PEC03SAAN | | SULLINS | PEC03SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS | |
| 29 | J36 | - | 1 | PBC13SAAN | | SULLINS ELECTRONICS CORP. | PBC13SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 13PINS; -65 DEGC TO +125 DEGC | |
| 30 | J38, J51, J52 | - | 3 | PEC04SAAN | | SULLINS ELECTRONICS CORP. | PEC04SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 4PINS | |
| 31 | JU1 | - | 1 | PBC05SAAN | | SULLINS ELECTRONICS CORP. | PBC05SAAN | CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 5PINS; -65 DEGC TO +125 DEGC | |
| 32 | L1, L8 | - | 2 | LQW18CNR33J00 | | MURATA | 330NH | INDUCTOR; SMT (0603); FERRITE CORE; 330NH; TOL=+/-5%; 0.63A | |
| 33 | L2, L7 | - | 2 | LBC3225T6R8MR | | TAIYO YUDEN | 6.8UH | INDUCTOR; SMT (1210); WIREWOUND CHIP; 6.8UH; TOL=20%; 0.62A | |
| 34 | L3, L6 | - | 2 | LQH6PPN101M43L | | MURATA | 100UH | INDUCTOR; SMT (2424); WIREWOUND CHIP; 100UH; TOL=20%; 0.92A | |
| 35 | L25 | - | 1 | | 7443330150 | WURTH ELECTRONICS INC. | 1.5UH | INDUCTOR; SMT; FERRITE-BEAD; 1.5UH; TOL=+/-20%; 27A | |
| 36 | MISC2 | - | 1 | MAXEVCNTR-NUV# | | MAXIM | MAXEVCNTR-NUV# | EVKIT PART-NUVOTON MICRO CONTROLLER | |
| 37 | N1, N2 | - | 2 | FDS8449 | | FAIRCHILD SEMICONDUCTOR | FDS8449 | TRAN; N-CHANNEL POWER TRENCH MOSFET; NCH; NSOIC8 ; PD-(2.5W); I-(7.6A); V-(40V) | |
| 38 | PCLK_SMA | - | 1 | 5-1814832-1 | | TYCO | 5-1814832-1 | CONNECTOR; FEMALE; THROUGH HOLE; CONN SOCKET SMA STR DIE CAST PCB; STRAIGHT; 5PINS | |
| 39 | R1 | - | 1 | ERJ-8BWJR015V | | PANASONIC | 0.015 | RESISTOR; 1206; 0.015 OHM; 5%; 200PPM; 1W; THICK FILM | |
| 40 | R2 | - | 1 | CRCW040214K3FK | | VISHAY DALE | 14.3K | RESISTOR, 0402, 14.3K OHM, 1%, 100PPM, 0.0625W, THICK FILM | |
| 41 | R3, R5 | - | 2 | CRCW060324K9FK | | VISHAY DALE | 24.9K | RESISTOR; 0603; 24.9K OHM; 1%; 100PPM; 0.10W; THICK FILM | |
| 42 | R4 | - | 1 | CRCW060341K2FK | | VISHAY DALE | 41.2K | RESISTOR; 0603; 41.2K OHM; 1%; 100PPM; 0.10W; METAL FILM | |
| 43 | R6 | - | 1 | CR0603-FX-1102ELF | | BOURNS | 11K | RESISTOR; 0603; 11K OHM; 1%; 100PPM; 0.10W; THICK FILM | |
| 44 | R7, R9, R11, R13-R15 | - | 6 | CRCW06032K20FK | | VISHAY DALE | 2.2K | RESISTOR, 0603, 2.2K OHM, 1%, 100PPM, 0.10W, THICK FILM | |
| 45 | R12, R27 | - | 2 | CRCW04020000ZS | | VISHAY DALE | 0 | RESISTOR; 0402; 0 OHM; 1%; 100PPM; 0.0625W; THICK FILM | |
| 46 | R22, R36 | - | 2 | CRCW06031001FK; ERJ-3EKF1001V | | VISHAY DALE; PANASONIC | 1K | RESISTOR; 0603; 1K; 1%; 100PPM; 0.10W; THICK FILM | |
| 47 | R23 | - | 1 | CRCW06032R00FN | | VISHAY DALE | 2 | RESISTOR, 0603, 2 OHM, 1%, 100PPM, 0.10W, THICK FILM | |
| 48 | R24, R25, R30, R31 | - | 4 | CRCW06032K0FK; ERJ-3EKF2001V | | VISHAY DALE/PANASONIC | 2K | RESISTOR, 0603, 2K OHM, 1%, 100PPM, 0.10W, THICK FILM | |
| 49 | R26, R32 | - | 2 | ERJ-1GEF2001C | | PANASONIC | 2K | RESISTOR; 0201; 2K OHM; 1%; 200PPM; 0.05W; THICK FILM | |
| 50 | R33 | - | 1 | CRCW060330K0FK | | VISHAY DALE | 30K | RESISTOR; 0603; 30K OHM; 1%; 100PPM; 0.10W; THICK FILM | |
| 51 | R74 | - | 1 | RC0402FR-0730KL | | YAGEO PHICOMP | 30K | RESISTOR; 0402; 30K OHM; 1%; 100PPM; 0.063W; THICK FILM | |
| 52 | R75, R76 | - | 2 | RC1608J000CS; CR0603-J/-000ELF;RC0603JR-070RL | | SAMSUNG ELECTRONICS/BOURNS/YAGEO PH | 0 | RESISTOR; 0603; 0 OHM; 5%; JUMPER; 0.10W; THICK FILM | |
| 53 | R100 | - | 1 | CR0603-FX-1001ELF | | BOURNS | 1K | RESISTOR; 0603; 1K OHM; 1%; 100PPM; 0.10W; THICK FILM | |
| 54 | SU1-SU25 | - | 25 | STC02SYAN | | SULLINS ELECTRONICS CORP. | STC02SYAN | TEST POINT; JUMPER; STR; TOTAL LENGTH=0.256IN; BLACK; INSULATION=PBT CONTACT=PHOSPHOR BRONZE; COPPER PLATED TIN OVERALL | |
| 55 | TP_Q | - | 1 | | 5001 | KEYSTONE | N/A | TEST POINT; PIN DIA=0.1IN; TOTAL LENGTH=0.3IN; BOARD HOLE=0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH; | |
| 56 | U1 | -* | 1 | MAX96707GTG+ | | MAXIM | MAX96707GTG+ | EVKIT PART-IC; HS81 PRELIMINARY; PACKAGE OUTLINE 24 TQFN; 0.50MM PITCH; 21-0139/T2444-4 | |
| 57 | U2,U3 | - | 2 | MAX1792EUA33 | | MAXIM | MAX1792EUA33 | IC; VREG; LOW-DROPOUT LINEAR REGULATOR; UMAX8 | |
| 58 | U4 | - | 1 | N0Q001BH-2202CDI | | N/A | N0Q001BH-2202CDI | EVKIT PART; IC; N0Q001BH-2202CDI; CD10 PACKAGE OUTLINE 7X5 BODY; 2.54MM PITCH; CUSTOM PART ONLY | CUSTOM PART# N0Q001BH-2202CDI |
| 59 | U15 | - | 1 | MAX3378EEUD+ | | MAXIM | MAX3378EEUD+ | IC; TRANS; +/-15KV ESD-PROTECTED, 1UA, 16MBPS, QUAD LOW-VOLTAGE LEVEL TRANSLATOR; TSSOP14 | |
| 60 | U23 | - | 1 | MAX16952AUE/V+ | | MAXIM | MAX16952AUE/V+ | IC; CTRL; STEP-DOWN CONTROLLER WITH LOW OPERATING CURRENT; TSSOP16-EP | |
| 61 | MISC1 | DNI | 1 | AK67421-1-R | | ASSMANN | AK67421-1-R | CONNECTOR; MALE; USB; USB2.0 MICRO CONNECTION CABLE; USB B MICRO MALE TO USB A MALE; STRAIGHT; 5PINS-4PINS | |
| 62 | C37, C59, C128 | DNP | 3 | N/A | | N/A | OPEN | PACKAGE OUTLINE 0603 NON-POLAR CAPACITOR | |
| TOTAL | | | 185 | | | | | | |

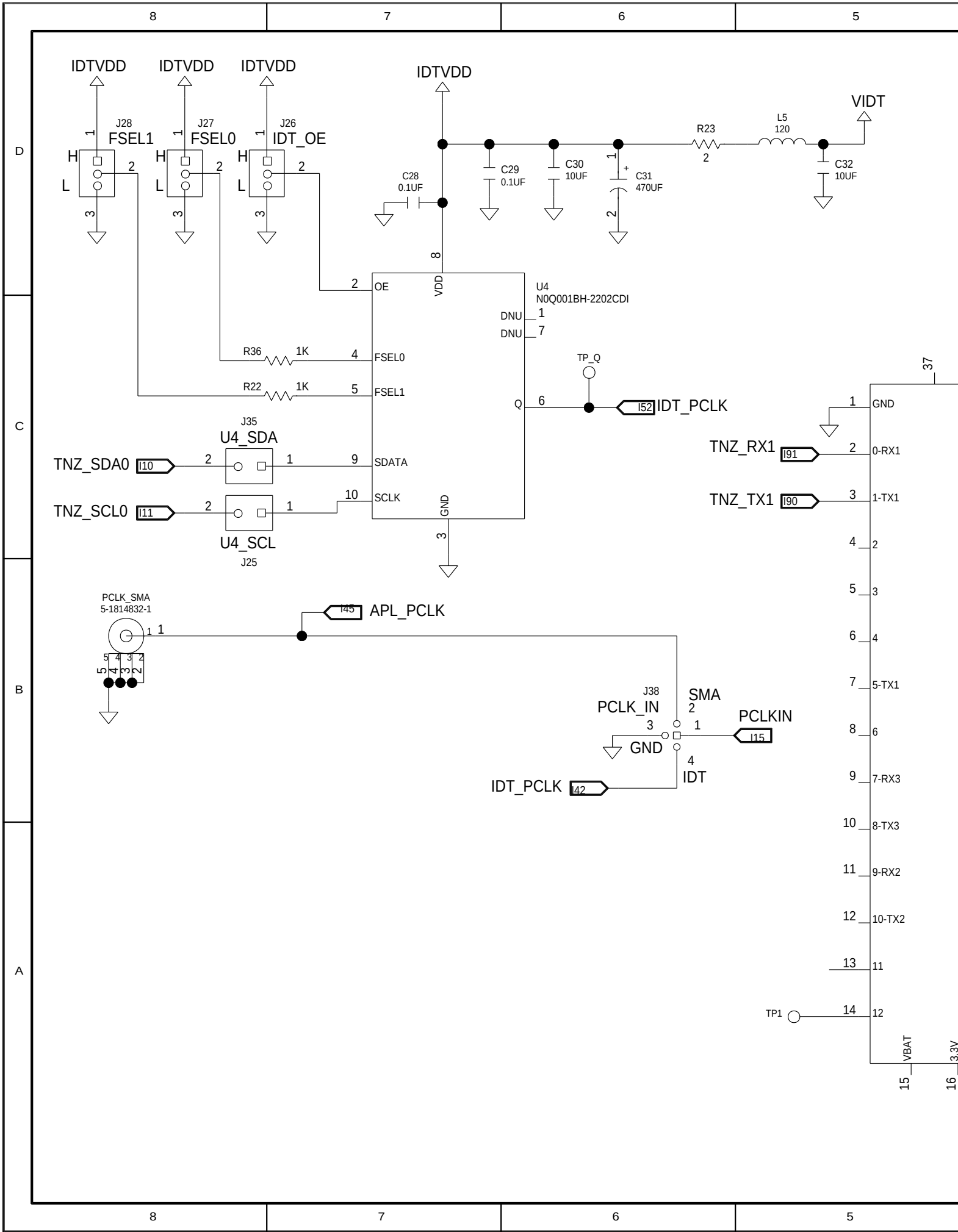

J1
PJ-202BH
D5
B360B-13-F
+12V
C118
100UF
C116
0.1UF
C115
10UF
C130
10UF
N1
FDS8449
C127
10UF
SUP
BIAS
DL
DH
PGOOD
COMP
OUT
EN
FB
FSYNC
FOSC
BST
LX
CS
EP
PGND
SGND
U23
MAX16952AUE/V+
R76
0
R2
14.3K
C117
0.1UF
R74
30K
C129
2200PF
C128
OPEN
D4
B360B-13-F
L25
1.5UH
R1
0.015
C2
10UF
N2
FDS8449
R75
0
C1
1500PF
R100
1K
D8
SML-210VTT86
LED_PWR
+5V0
FB1
120
C7
0.1UF
C8
10UF
C9
0.1UF
U2
MAX1792EUA33
IN
OUT
SHDN
SET
RST
GND
EP
+3V3
R4
41.2K
R3
24.9K
FB3
120
C16
0.1UF
C18
10UF
C17
0.1UF
U3
MAX1792EUA33
BRDVDD
R6
11K
R5
24.9K


+3V3
J53
VDD_RE
1
3.3V
2
BRDVDD
R7
2.2K
R9
2.2K
2
2
J21
SCLPU
J22
SDAPU
1
1
BRDVDD
C99
0.1UF
1
VL
14
VCC
8
3-STATE
U1_SDA
OUT
U1_SCL
I69
CT_SDA
CT_SCL
2
I/O VL1
3
I/O VL2
4
I/O VL3
5
I/O VL4
I/O VCC
I/O VCC
I/O VCC
VLC3
J11
VLC4
7
GND
6
NC
9
NC

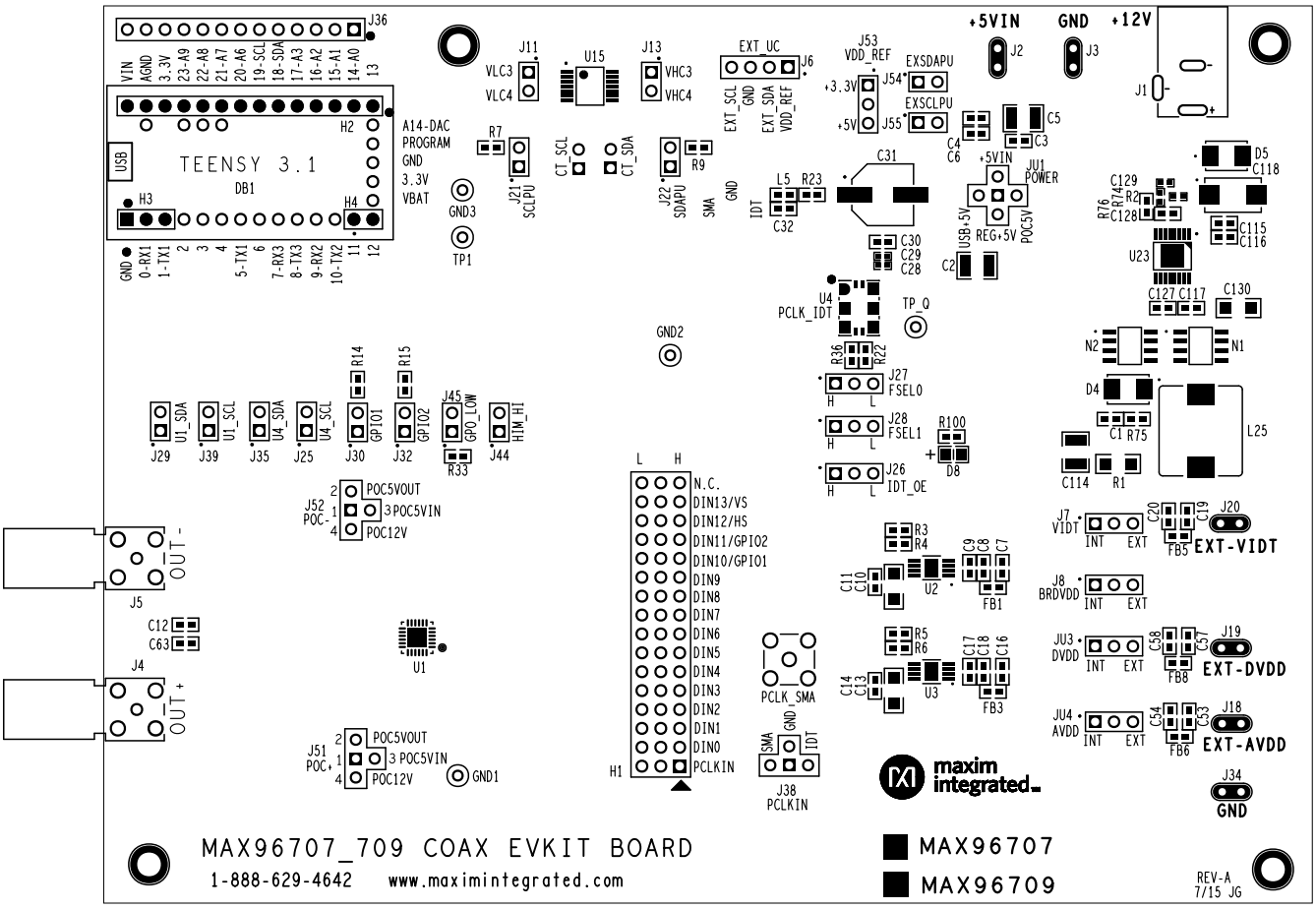

+5V0
POC5VOUT
POC5V
POC5VIN
J51
2
POC+
3
1
POC12V
+12V
4
C62
0.22UF
C64
100UF
C61
0.1UF
C60
1000PF
C59
OPEN
R30
2K
L3
100UH


+5V0
POC5VOUT
POC5V
POC5VIN
J52
2
POC-
3
1
+12V
POC12V
4
C33
0.22UF
C34
100UF
C35
0.1UF
C36
1000PF
C37
OPEN
R24
2K
L6
100UH


BRDVDD
H1
TSW-116-07-T-T
I175 PCLKIN
IN DIN0
IN DIN1
IN DIN2
IN DIN3
IN DIN4
IN DIN5
IN DIN6
IN DIN7
IN DIN8
IN DIN9
IN DIN10/GPIO1
IN DIN11/GPIO2
IN DIN12/HS
IN DIN13/VS
NC
BRDVDD
J30
GPIO1
R14
2.2K
I166 DIN10/GPIO1
J32
GPIO2
R15
2.2K
I167 DIN11/GPIO2
BRDVDD
J44
HIM_HI


IDTVDD
IDTVDD
IDTVDD
IDTVDD
VIDT
J28
FSEL1
J27
FSEL0
J26
IDT_OE
H
L
C28
0.1UF
C29
0.1UF
C30
10UF
C31
470UF
R23
L5
120
C32
10UF
U4
N0Q001BH-2202CDI
OE
VDD
DNU
DNU
R36
1K
FSEL0
R22
1K
FSEL1
TP_Q
Q
I52
IDT_PCLK
J35
U4_SDA
TNZ_SDA0
I10
SDATA
TNZ_SCL0
I11
SCLK
GND
U4_SCL
J25
TNZ_RX1
I91
0-RX1
TNZ_TX1
I90
1-TX1
GND
PCLK_SMA
5-1814832-1
I45
APL_PCLK
J38
PCLK_IN
SMA
PCLKIN
I15
GND
IDT
IDT_PCLK
I42
37
2-
3-
4-
5-TX1
6-
7-RX3
8-TX3
9-RX2
10-TX2
11-
12-
TP1
VBAT
3.3V

**SILK_TOP**


TEENSY 3.1
DB1
A14-DAC
PROGRAM
GND
3.3V
VBAT
USB
+5VIN
GND
+12V
EXT-VIDT
EXT-DVDD
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OUT+
MAX96707_709 COAX EVKIT BOARD
1-888-629-4642
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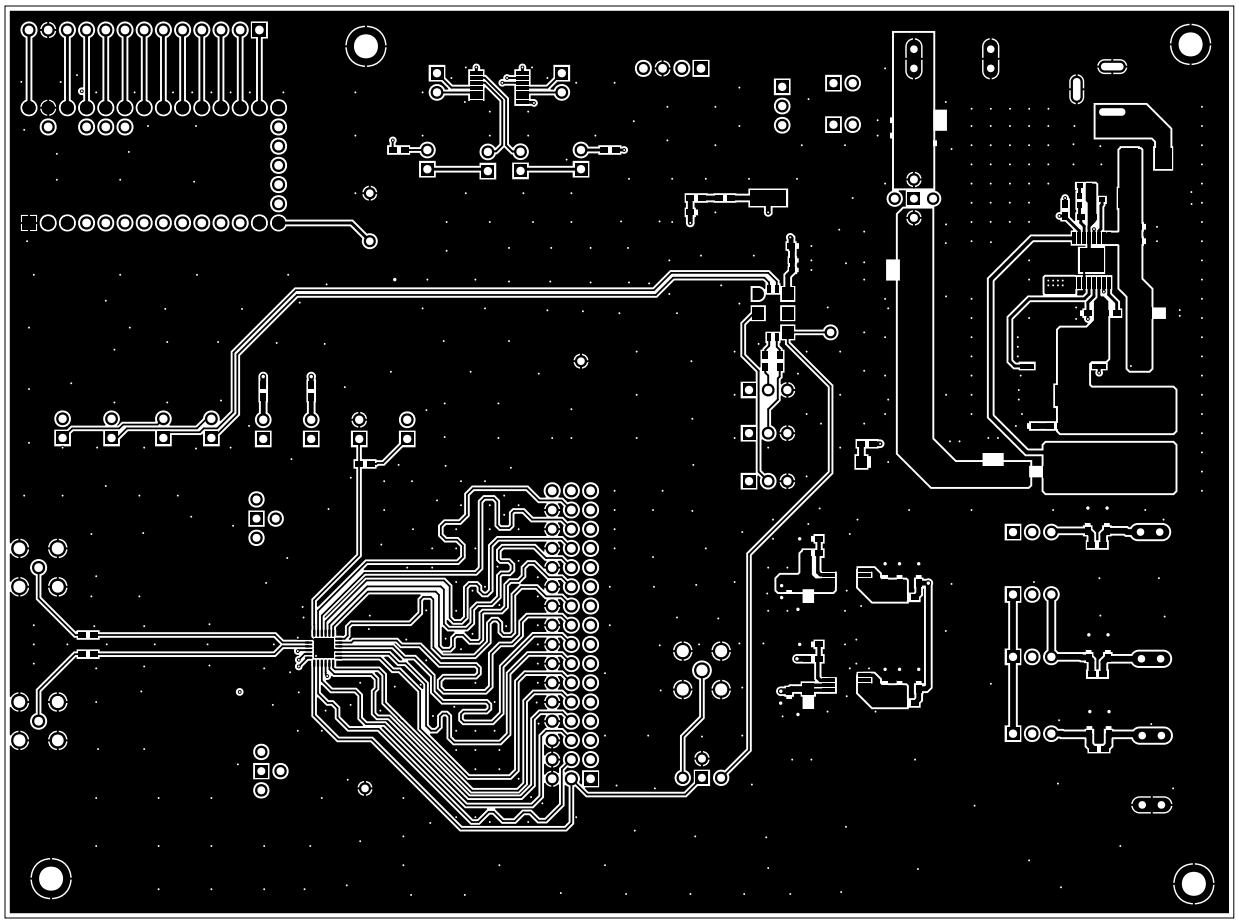
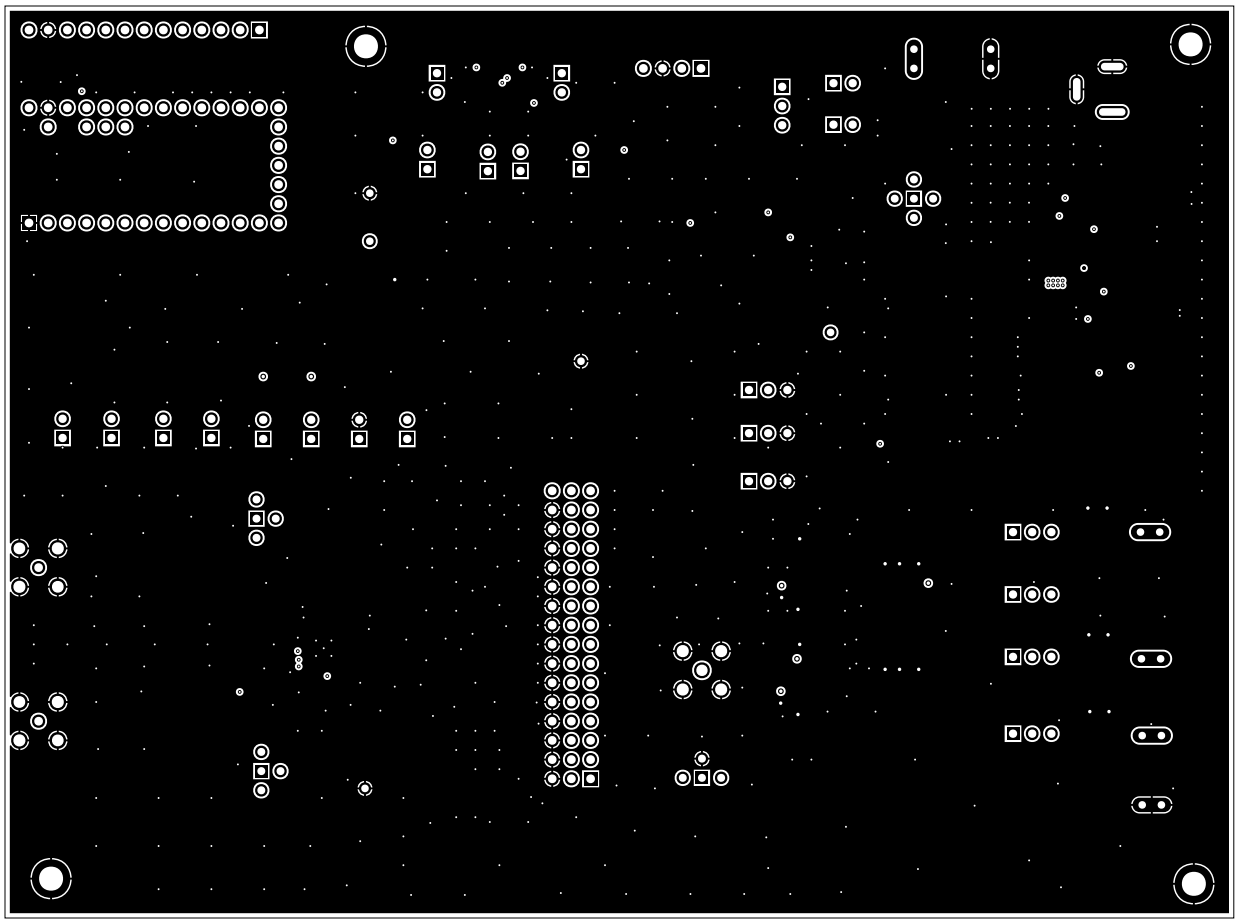
MAX96707
MAX96709
REV-A
7/15 JG

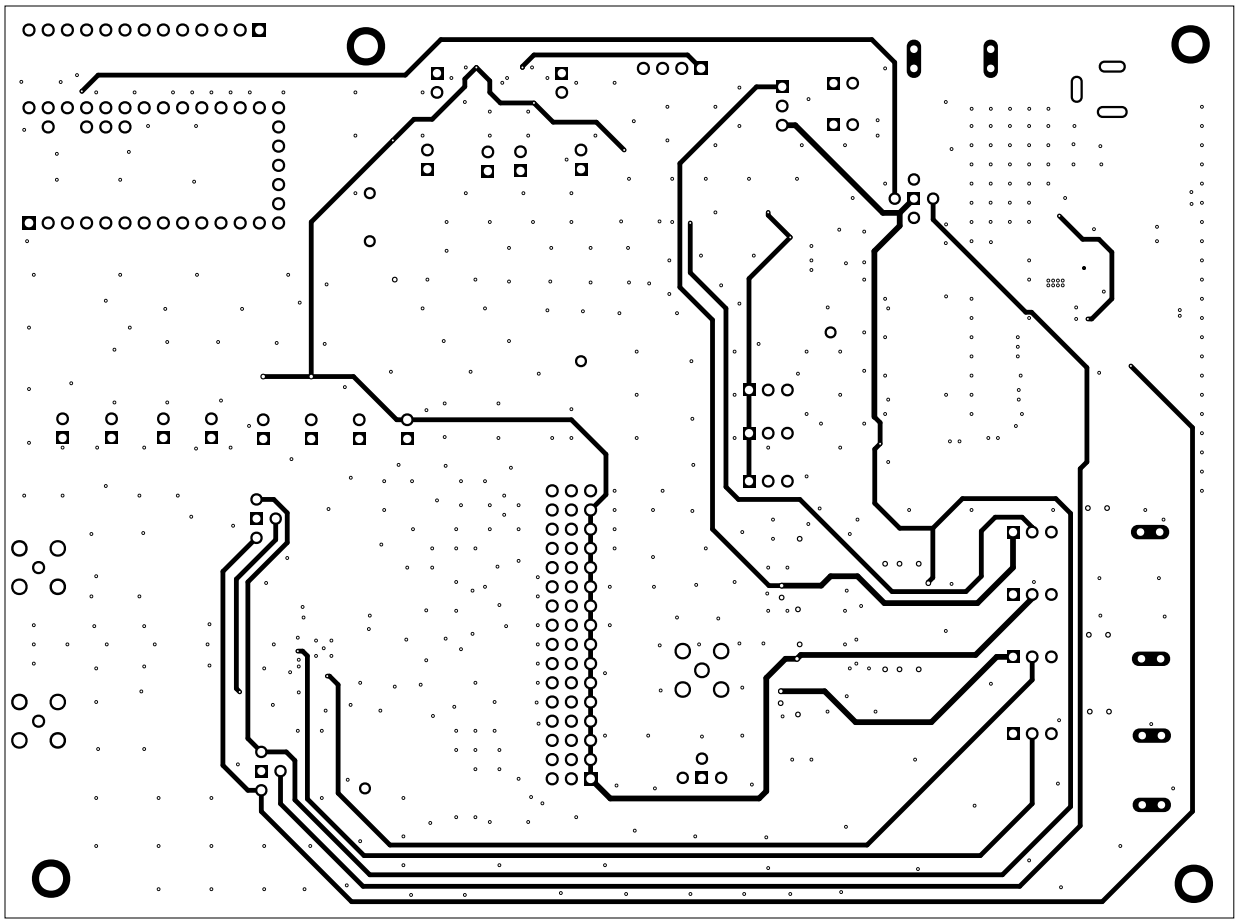
**TOP**



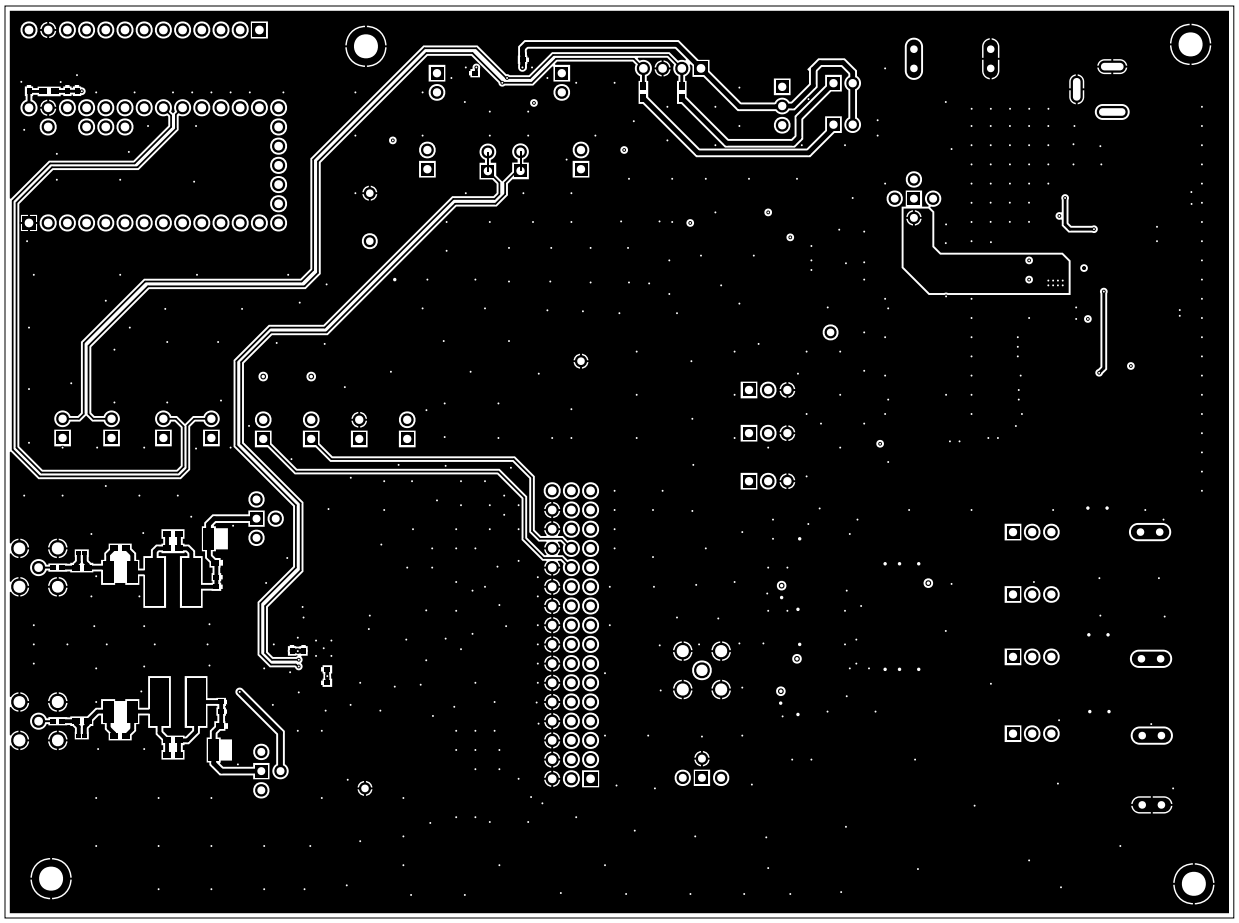
**INNER_LAYER2**



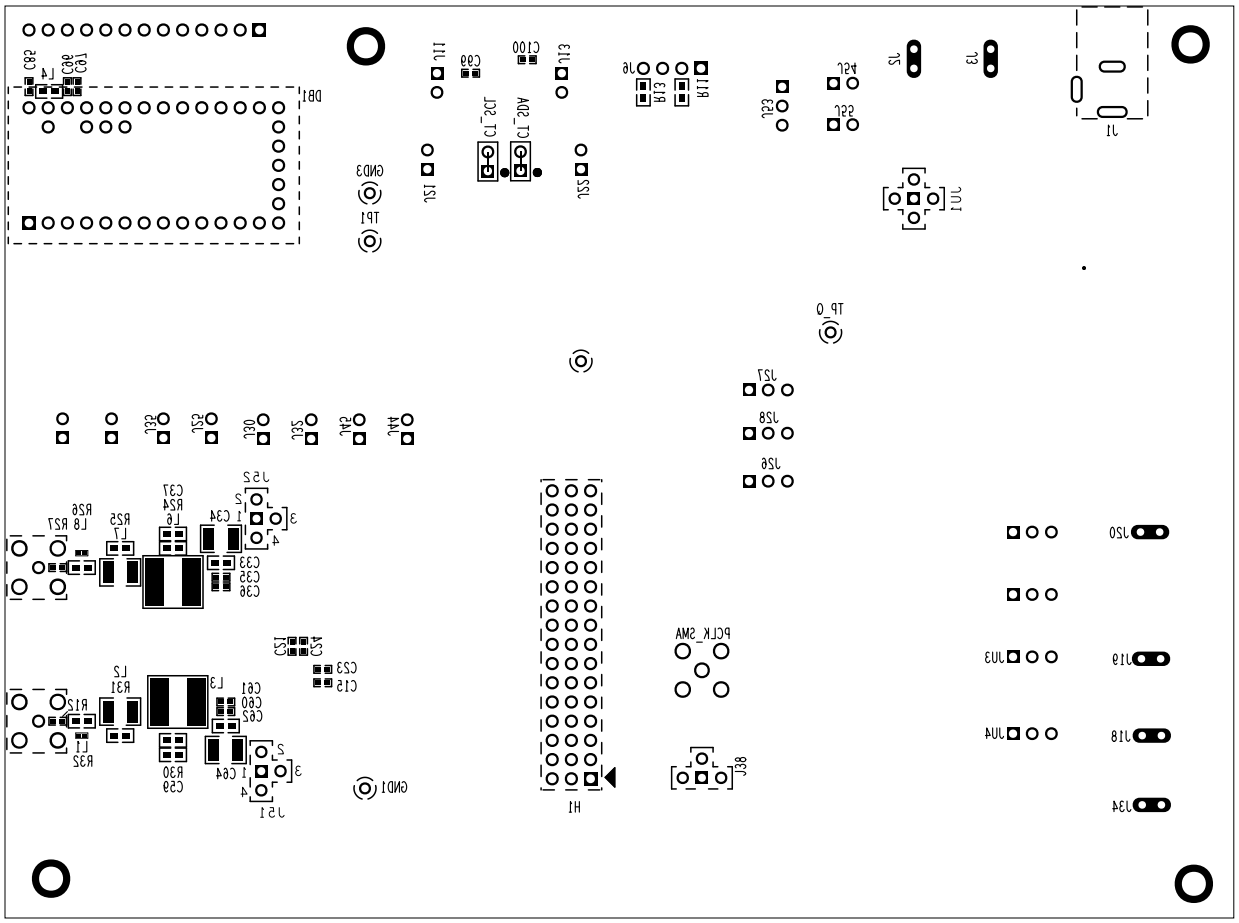
**INNER_LAYER3**



**BOTTOM**



**SILK_BOTTOM**



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