



RVT3.5A320240CFWN36

LCD TFT Datasheet

Rev.1.2
2015-08-05

| ITEM | CONTENTS | UNIT |
|--------------------------------|---------------------------------|-------------------|
| LCD Type | TFT/Transmissive/Normally white | / |
| Size | 3.5 | Inch |
| Viewing Direction | 12:00 (without image inversion) | O' Clock |
| Gray Scale Inversion Direction | 6:00 | O' Clock |
| LCM (W × H × D) | 77.70 x 64.70 x 7.15 | mm ³ |
| Active Area (W × H) | 70.08 × 52.56 | mm ² |
| Dot Pitch (W × H) | 0.73 × 0.219 | mm ² |
| Number Of Dots | 320 (RGB) × 240 | / |
| Controller IC | SSD1963 | / |
| Backlight Type | 6 LEDs | / |
| Surface Luminance | 540 | cd/m ² |
| Interface Type | Parallel 8/16b (i80 by default) | / |
| Color Depth | 262k | / |
| Pixel Arrangement | RGB Vertical Stripe | / |
| Input Voltage | 3.3 | V |
| With/Without TSP | Without touch panel | / |
| Weight | 59 | g |

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

| REVNO. | REVDATE | CONTENTS | REMARKS |
|--------|------------|---|---------|
| 1.0 | 2014-05-16 | Initial Release | |
| 1.1 | 2015-01-30 | Update surface luminance, update LED livetime, update response time | |
| 1.2 | 2015-08-05 | Add pin numbering in the mechanical drawing | |

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1. MODULE CLASSIFICATION INFORMATION

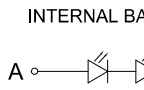
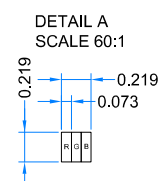
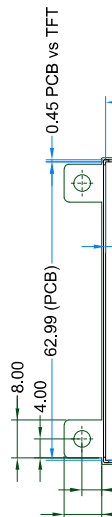
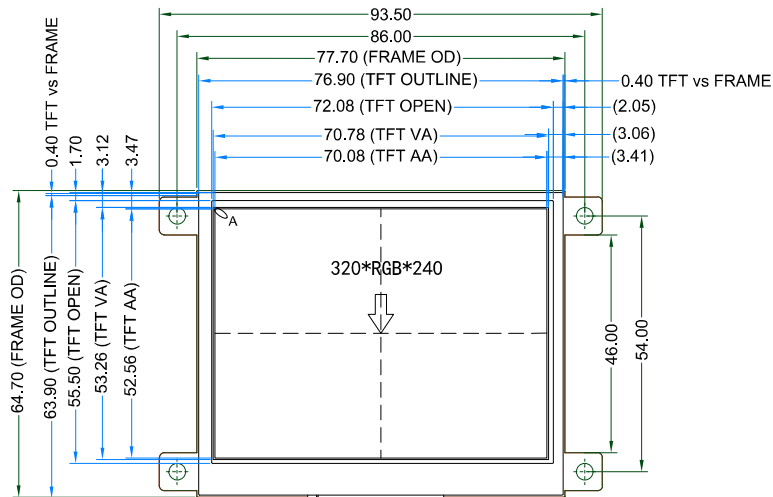
| | | | | | | | | | |
|-----------|----------|------------|----------|---------------|----------|----------|----------|----------|-----------|
| RV | T | 3.5 | A | 320240 | C | F | W | N | 36 |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |

| | | |
|-----|-------------------------|--|
| 1. | BRAND | RV – Riverdi |
| 2. | PRODUCT TYPE | T – TFT Standard F – TFT Custom |
| 3. | DISPLAY SIZE | 3.5 – 3.5” 4.3 – 4.3” 5.7 – 5.7” 7.0 – 7.0” |
| 4. | MODEL SERIAL NO. | A (A-Z) |
| 5. | RESOLUTION | 320240 – 320x240 px 480272 – 480x272 px 800480 – 800x480 px |
| 6. | INTERFACE | T – TFT LCD, RGB L – TFT LCD, LVDS C – TFT + Controller |
| 7. | FRAME | N – No Frame F – Mounting Frame |
| 8. | BACKLIGHT TYPE | W – LED White |
| 9. | TOUCH PANEL | N – No Touch Panel R – Resistive Touch Panel C – Capacitive Touch Panel |
| 10. | VERSION | 36 (00-99) |

LCD TFT Datasheet Rev.1.2

RVT3.5A320240CFWN36

| | |
|-----|---------|
| PIN | 20 |
| 1 | GND |
| 2 | VDD |
| 3 | BL_E |
| 4 | D/C |
| 5 | WR |
| 6 | RD |
| 7 | D0 |
| 8 | D1 |
| 9 | D2 |
| 10 | D3 |
| 11 | D4 |
| 12 | D5 |
| 13 | D6 |
| 14 | D7 |
| 15 | D8 |
| 16 | D9 |
| 17 | D10 |
| 18 | D11 |
| 19 | D12 |
| 20 | D13 |
| 21 | D14 |
| 22 | D15 |
| 23 | NC |
| 24 | NC |
| 25 | CS |
| 26 | RESET |
| 27 | DISP_ON |
| 28 | NC |
| 29 | NC |
| 30 | NC |
| 31 | NC |
| 32 | NC |
| 33 | BLGND |
| 34 | BLGND |
| 35 | BLVDD |
| 36 | BLVDD |



- NOTES:**
- 1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
 - 2. OPERATION VOLTAGE: VDD=3.3V
 - 3. VIEWING DIRECTION: 12 O'CLOCK
 - 4. IC CONTROLLER: SSD1963
 - 5. OPERATING TEMP.: -20°C ~ 70°C
 - 6. STORAGE TEMP.: -30°C ~ 80°C
 - 7. LED BACKLIGHT: 6-LED WHITE, BUILT-IN INVERTER
 - 8. SURFACE LUMINANCE: 540 cd/m²
 - 9. GENERAL TOLERANCE: ±0.2
 - 10. RoHS COMPLIANT

| 1.1 | Adding Pin information | 2015.08.05 |
|------|------------------------|------------|
| 1.0 | Initial case | 2015.05.30 |
| Rev. | DESCRIPTION | DATE |

| |
|---------------|
| CUSTOMER APVL |
| DRAWN |
| DFTG CHK |
| ENGR CHK |
| APPROVAL |



3. ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | MIN | MAX | UNIT |
|--------------------------------|-----------------|------|----------------|------|
| Supply Voltage For Logic | VDD | -0.3 | 4.6 | V |
| Input Voltage For Logic | VIN | -0.3 | VDD | V |
| Input Voltage For LED Inverter | BLVDD | -0.3 | 7.0 | V |
| Operating Temperature | T _{OP} | -20 | 70 | °C |
| Storage Temperature | T _{ST} | -30 | 80 | °C |
| Humidity | RH | - | 90% (Max 60°C) | RH |

4. ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT | NOTES |
|--|--------------------------|--------|-------|--------|------|------------|
| Supply Voltage For Module | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input Voltage for LED Inverter | BLVDD | 2.8 | 3.3 | 5.5 | V | |
| Input Voltage 'H' level for BL_E pin | BL_EH | 1.5 | - | 5.5 | V | |
| Input Voltage 'L' level for BL_E pin | BL_EL | 0 | - | 0.7 | | |
| Input Current (Exclude LED Backlight) | IDD | - | 25 | 32 | mA | VDD = 3.3V |
| LED Backlight Current | IDD _{backlight} | | 150 | 187 | mA | BLVDD=3.3V |
| LED Backlight Current | IDD _{backlight} | | 95 | 119 | mA | BLVDD=5V |
| Total Input Current (Include LED Backlight 100%) | IDD _{total} | - | 175 | 219 | mA | BLVDD=3.3V |
| Input Voltage 'H' level | V _{IH} | 0.7VDD | - | VDD | V | |
| Input Voltage 'L' level | V _{IL} | 0 | - | 0.2VDD | V | |
| LED Life Time | - | 40000 | 50000 | - | Hrs | Note 1 |

Note 1: The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C.

5. ELECTRO-OPTICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT | REMARK | NOTE |
|----------------------------|---------|-------------------------|-------|-------|-------|-------------------|----------|------|
| Response Time | Tr+Tf | θ=0° φ=0° Ta=25°C | - | 25 | 30 | ms | Figure 1 | 4 |
| Contrast Ratio | Cr | | - | 350 | - | --- | Figure 2 | 1 |
| Luminance Uniformity | δ WHITE | | 75 | 80 | - | % | Figure 2 | 3 |
| Surface Luminance | Lv | | - | 540 | - | cd/m ² | Figure 2 | 2 |
| Viewing Angle Range | θ | φ = 90° | 30 | 40 | - | deg | Figure 3 | 6 |
| | | φ = 270° | 50 | 60 | - | deg | Figure 3 | |
| | | φ = 0° | 50 | 60 | - | deg | Figure 3 | |
| | | φ = 180° | 50 | 60 | - | deg | Figure 3 | |
| CIE (x, y) Chromaticity | Red | x | 0.574 | 0.624 | 0.674 | Figure 2 | 5 | |
| | | y | 0.318 | 0.368 | 0.418 | | | |
| | Green | x | 0.300 | 0.350 | 0.400 | | | |
| | | y | 0.500 | 0.550 | 0.600 | | | |
| | Blue | x | 0.093 | 0.143 | 0.193 | | | |
| | | y | 0.069 | 0.119 | 0.169 | | | |
| | White | x | 0.260 | 0.310 | 0.360 | | | |
| | | y | 0.283 | 0.333 | 0.383 | | | |
| NTSC | - | - | - | 50 | - | % | - | |

Note 1. Contrast Ratio(CR) is defined mathematically as below, for more information see Figure 1.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see Figure 2.

L_v = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3. The uniformity in surface luminance δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from white to black (Rise Time, T_r) and from black to white (Decay Time, T_f). For additional information see Figure 1. The test equipment is Autronic-Melchers's ConoScope series.

Note 5. CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Figure 3.

Note 7. For viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCON's BM-5 photo detector.

Note 8. For TFT module, gray scale reverse occurs in the direction of panel viewing angle.

Figure 1. The definition of response time

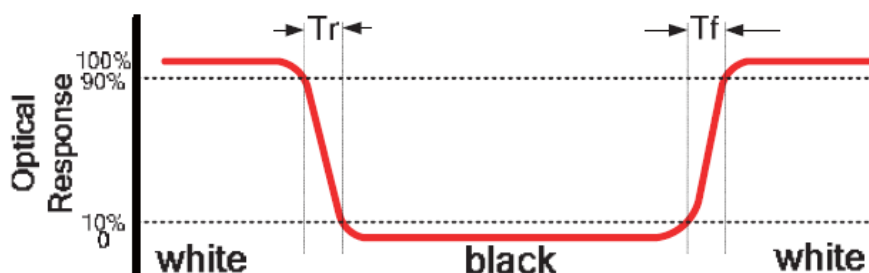


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H, V : Active Area
Light spot size $\varnothing=5\text{mm}$, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

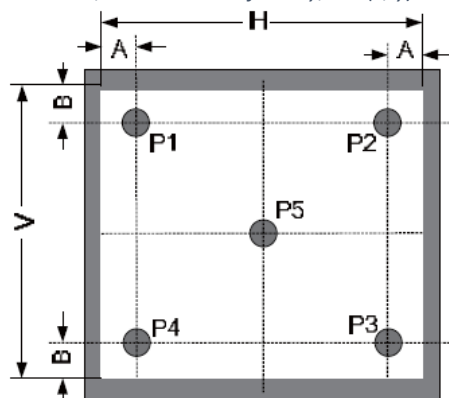
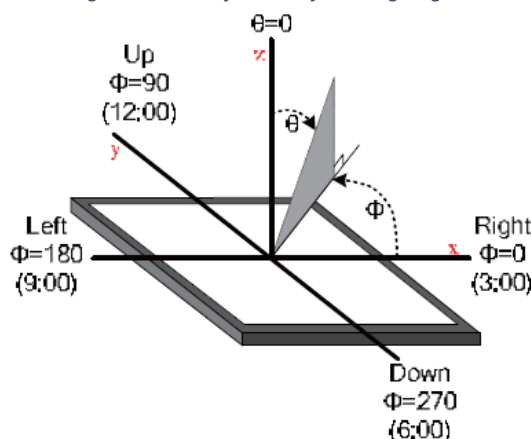


Figure 3. The definition of viewing angle



6. INTERFACE DESCRIPTION

| PIN NO. | SYMBOL | I/O | DESCRIPTION |
|---------|---------|-----|--|
| 1 | GND | P | Power Ground |
| 2 | VDD | P | Power Supply: +3.3V |
| 3 | BL_E | I | Backlight Control Signal, H: On/L: Off (internally pulled-up to BLVDD) |
| 4 | D/C | I | Data/Command Select |
| 5 | WR | I | Write Strobe Signal |
| 6 | RD | I | Read Strobe Signal |
| 7-22 | D0-D15 | I | Data Bus. Pins not used should be floating. |
| 23 | NC | - | No Connection |
| 24 | NC | - | No Connection |
| 25 | CS | I | Chip Select |
| 26 | RESET | I | Hardware reset |
| 27 | DISP ON | I | Display Control H: On/L: Off (internally pulled-up) |
| 28 | NC | - | No Connection |
| 29 | NC | - | No Connection |
| 30 | NC | - | No Connection |
| 31 | NC | - | No Connection |
| 32 | NC | - | No Connection |
| 33 | BLGND | - | Backlight ground, can be connected to GND |
| 34 | BLGND | - | Backlight ground, can be connected to GND |
| 35 | BLVDD | - | Backlight power supply, can be connected to VDD |
| 36 | BLVDD | - | Backlight power supply, can be connected to VDD |

7. INTERFACE TIMING CHARACTERISTICS

7.1. 8080 Mode

The 8080 mode MCU interface consist of CS#, D/C#, RD#, WR#, D[15:0]. This interface use WR# to define a write cycle and RD# for read cycle. If the WR# goes low when the CS# signal is low, the data or command will be latched into the system at the rising edge of WR#. Similarly, the read cycle will start when RD# goes low and end at the rising edge of RD#.

7.2. Pixel Data Format

| Interface | Cycle | D[17] | D[16] | D[15] | D[14] | D[13] | D[12] | D[11] | D[10] | D[9] | D[8] | D[7] | D[6] | D[5] | D[4] | D[3] | D[2] | D[1] | D[0] |
|----------------------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|
| 16 bits (565 format) | 1 st | | | R5 | R4 | R3 | R2 | R1 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 |
| 16 bits | 1 st | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 |
| | 2 nd | | | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| | 3 rd | | | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| 12 bits | 1 st | | | | | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 |
| | 2 nd | | | | | | | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| 9 bits | 1 st | | | | | | | | | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 |
| | 2 nd | | | | | | | | | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 | |
| 8 bits | 1 st | | | | | | | | | | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 |
| | 2 nd | | | | | | | | | | | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 |
| | 3 rd | | | | | | | | | | | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |

7.3. Parallel8080-series Interface Timing

Figure 4. Parallel 8080-series Interface Timing Diagram (Write Cycle)

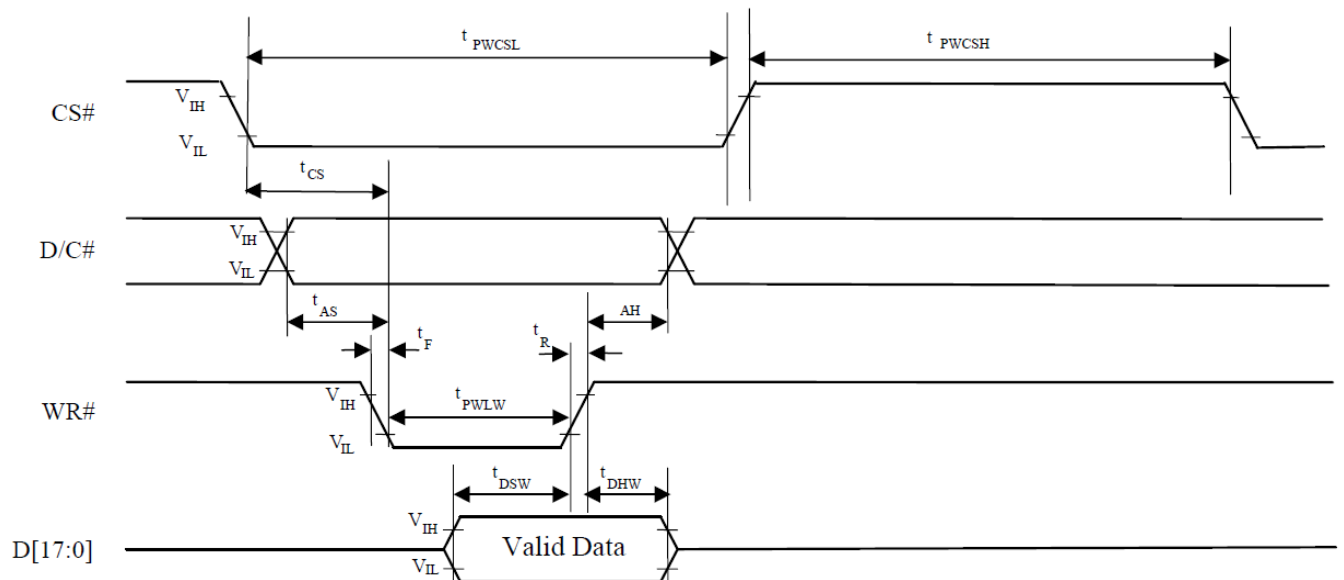
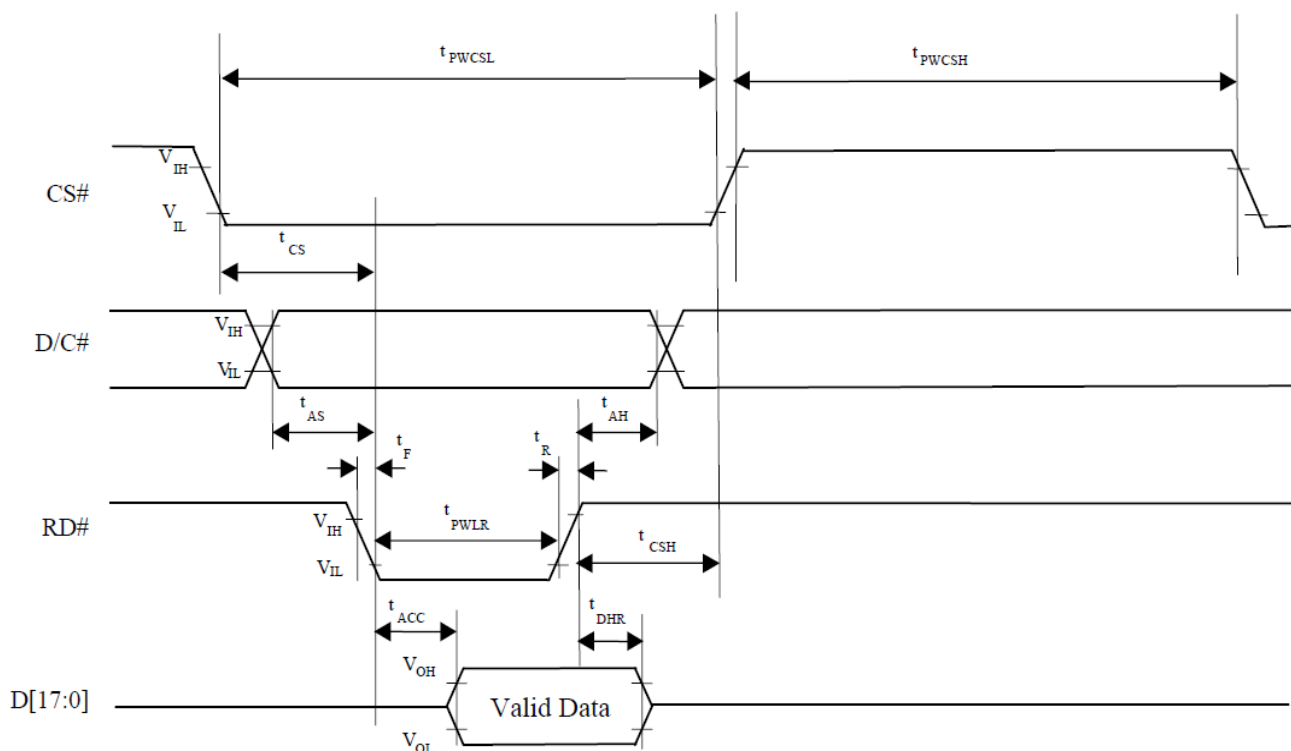


Figure 5.Parallel 8080-series Interface Timing Diagram (Read Cycle)



8. LCD TIMING CHARACTERISTICS

8.1. Timing Chart

Timing parameter (VDD=3.3V, GND=0V, Ta=25°C)

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT | CONDITION |
|-------------------|-----------|-------------------------|-------|-------------------------|------|----------------|
| CLK Clock Time | T_{clk} | $1/\text{Max}(F_{CLK})$ | - | $1/\text{Min}(F_{CLK})$ | ns | - |
| CLK Pulse Duty | T_{chw} | 40 | 50 | 60 | % | T_{CLK} |
| HSYNC to CLK | T_{hc} | - | - | 1 | CLK | - |
| HSYNC Width | T_{hwh} | 1 | - | - | CLK | - |
| VSYNC Width | T_{vwh} | 1 | - | - | ns | - |
| HSYNC Period Time | T_h | 60 | 63.56 | 67 | ns | - |
| VSYNC Set-up Time | T_{vst} | 12 | - | - | ns | - |
| VSYNC Hold Time | T_{vhd} | 12 | - | - | ns | - |
| HSYNC Setup Time | T_{hst} | 12 | - | - | ns | - |
| HSYNC Hold Time | T_{hhd} | 12 | - | - | ns | - |
| Data Set-up Time | T_{dsu} | 12 | - | - | ns | D00~D23 to CLK |
| Data Hold Time | T_{dhd} | 12 | - | - | ns | D00~D23 to CLK |
| DEN Set-up Time | T_{esu} | 12 | - | - | ns | DEN to CLK |

Figure 6. DE mode timing diagram

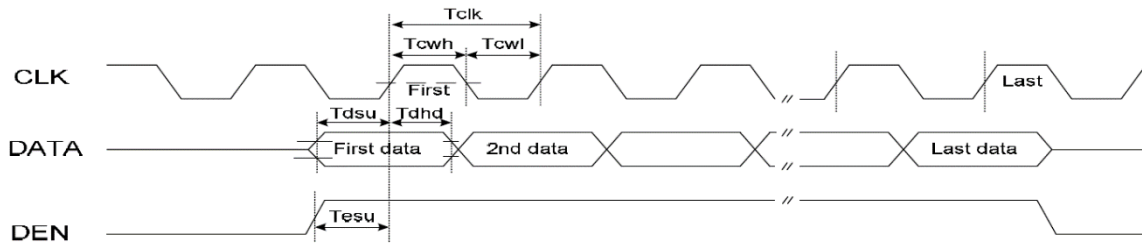


Figure 7. SYNC mode timing diagram

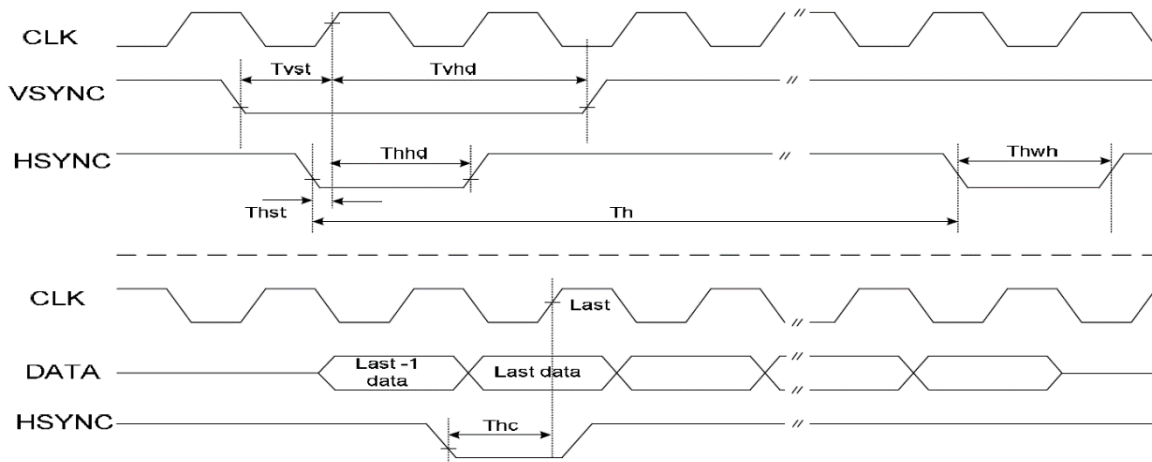
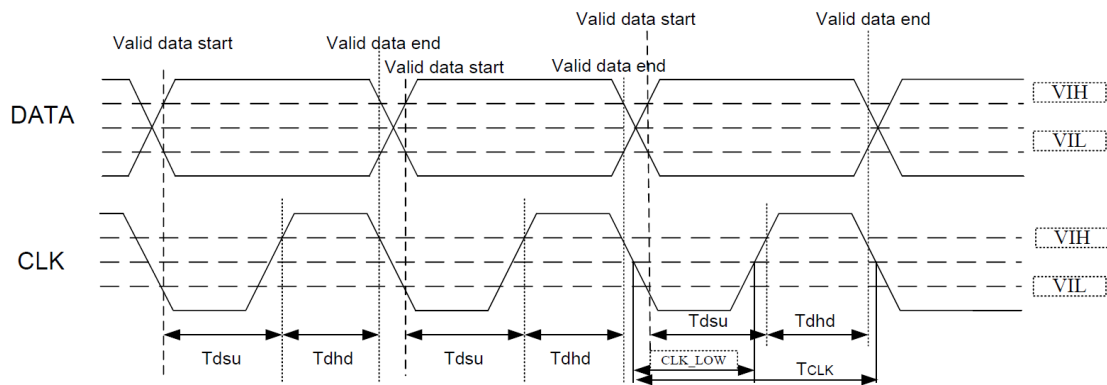


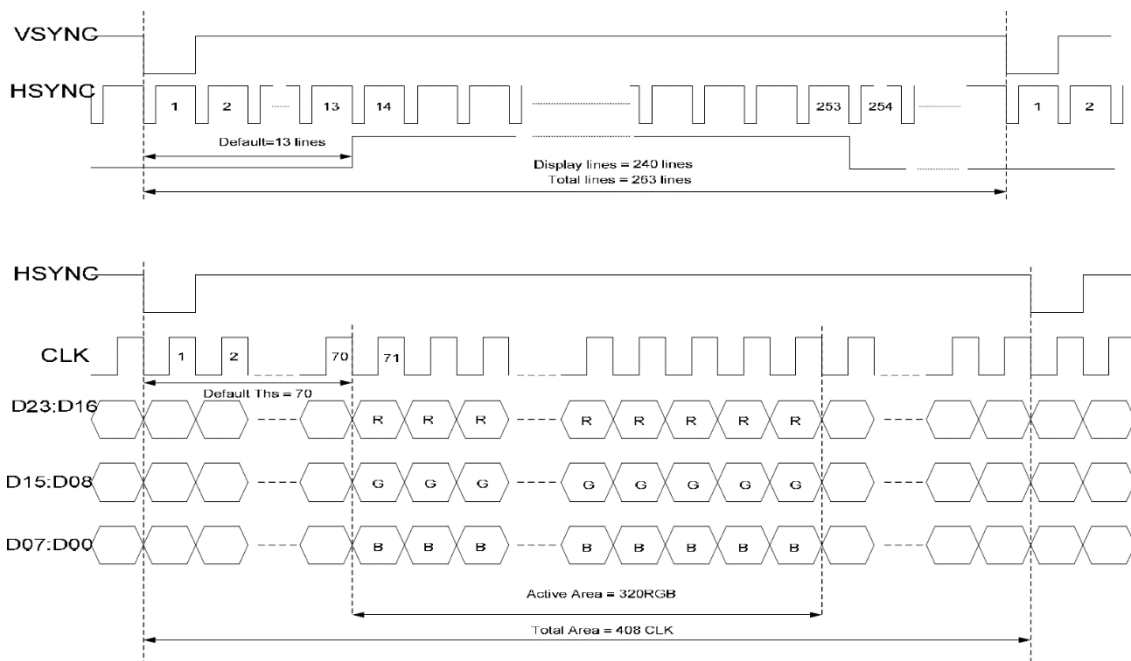
Figure 8. Timing diagram



8.2. 24 Bit RGB Mode for 320 x RGB x 240

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT | CONDITION |
|--|------------------|-----|-----|-----|------|----------------------------|
| CLK Frequency | F _{clk} | 7.0 | 8.0 | 9.0 | MHz | VDD=3.0V~3.6V |
| CLK Cycle Time | T _{clk} | 143 | 125 | 111 | ns | - |
| CLK Pulse Duty | T _{cwh} | 40 | 50 | 60 | % | - |
| Time that HSYNC to 1st Data Input (NTSC) | T _{hs} | 40 | 70 | 255 | CLK | DDLY=70 Offset=0(fixed) |

Figure 9. 24 bit RGB SYNC mode timing



9. RELIABILITY TEST

| NO. | TEST ITEM | TEST CONDITION | INSPECTION AFTER TEST |
|-----|-----------------------------|--|---|
| 1 | High Temperature Storage | 80±2°C/240 hours | Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack 6. Current I _{dd} is twice higher than initial value 7. The surface shall be free from damage 8. Linearity must be no more than 1.5% by the linearity tester 9. The Electric characteristics requirements shall be satisfied |
| 2 | Low Temperature Storage | -30±2°C/240 hours | |
| 3 | High Temperature Operating | 70±2°C/240 hours | |
| 4 | Low Temperature Operating | -20±2°C/240 hours | |
| 5 | Temperature Cycle | -30±2°C~25~70±2°C × 30 cycles | |
| 6 | Damp Proof Test | 60°C ±5°C × 90%RH/160 hours | |
| 7 | Vibration Test | Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours For each direction of X, Y, Z (6 hours for total) | |
| 8 | Mechanical Shock | 60G 6ms, ± X, ± Y, ± Z 3 times for each direction | |
| 9 | Packing Drop Test | Height: 80 cm 1 corner, 3 edges, 6 surfaces | |
| 10 | Package Vibration Test | Random vibration: 0.015G ² /Hz from 5-200Hz -6dB/Octave from 200-500Hz 2 hours for each direction of X, Y, Z (6 hours for total) | |
| 11 | Electrostatic Discharge | Air: ±8KV 150pF/330Ω 5 times Contact: ±4KV 150pF/330Ω 5 times | |
| 12 | Hitting Test | 1,000,000 times in the same point Hitting pad: tip R3.75mm, Silicone rubber, Hardness: 40deg. Load: 2.45N Hitting speed: Twice/sec Electric load: none Test area should be at 1.8mm inside of insulation. | |
| 13 | Pen Sliding Durability Test | 100,000 times minimum Hitting pad: tip R0.8mm plastic pen Load: 1.47N Sliding speed: 60 mm/sec Electric load: none Test area should be at 1.8mm inside of insulation. | |

Remark:

- The test samples should be applied to only one test item.
- Sample size for each test item is 5~10pcs.
- For Damp Proof Test, Pure water(Resistance 10MΩ) should be used.
- In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
- EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
- Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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