



RVT4.3A480272CFWR36

LCD TFT Datasheet

Rev.2.10
2017-11-21

| ITEM | CONTENTS | UNIT |
|--------------------------------|---------------------------------|-------------------|
| LCD Type | TFT/Transmissive/Normally white | / |
| Size | 4.3 | Inch |
| Viewing Direction | 12:00 (without image inversion) | O' Clock |
| Gray Scale Inversion Direction | 6:00 | O' Clock |
| LCM (W × H × D) | 106.30 × 68.00 × 8.20 | mm ³ |
| Active Area (W × H) | 95.04 × 53.86 | mm ² |
| Dot Pitch (W × H) | 0.066 × 0.198 | mm ² |
| Number of Dots | 480 (RGB) × 272 | / |
| Driver IC | SSD1963 | / |
| Backlight Type | 10 LEDs | / |
| Surface Luminance | 440 | cd/m ² |
| Interface Type | Parallel 8/16b (i80 by default) | / |
| Color Depth | 16.7M | / |
| Pixel Arrangement | RGB Vertical Stripe | / |
| Surface Treatment | Anti-glare | |
| Input Voltage | 3.3 | V |
| With/Without TSP | Resistive Touch Panel | / |
| Weight | 91 | g |

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

| REVNO. | REVDATE | CONTENTS | REMARKS |
|--------|------------|--|---------|
| 1.0 | 2014-11-12 | Initial Release | |
| 1.1 | 2014-11-26 | Update mechanical drawing | |
| 1.2 | 2014-12-19 | Update interface description table | |
| 1.3 | 2015-01-19 | Update LED lifetime | |
| 1.4 | 2015-02-24 | Update thickness information | |
| 1.5 | 2015-08-27 | Adding PIN numbering in the mechanical drawing | |
| 1.6 | 2016-08-12 | Added Inspection Standards | |
| 2.0.0 | 2017-05-30 | Glass change, new TFT open dimension, FFC shape, new TFT IC controller | |
| 2.1.0 | 2017-11-21 | Updated Electrical Characteristics | |

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MODULE CLASSIFICATION INFORMATION

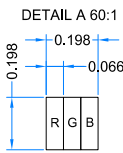
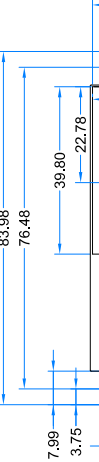
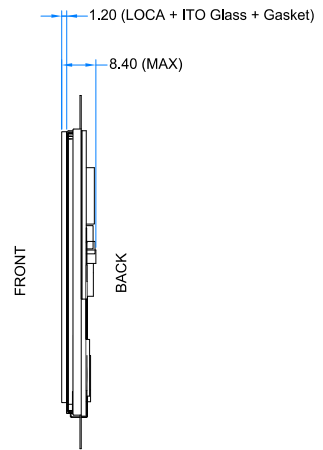
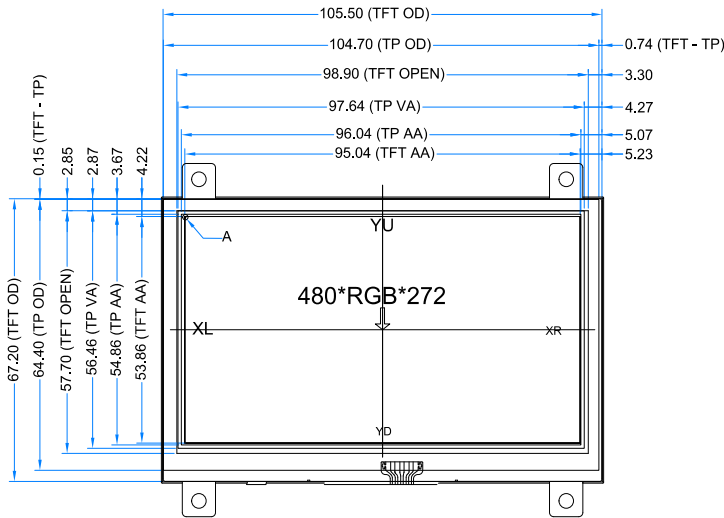
| | | | | | | | | | |
|-----------|----------|------------|----------|---------------|----------|----------|----------|----------|-----------|
| RV | T | 4.3 | A | 480272 | C | F | W | R | 36 |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |

| | | |
|-----|-------------------------|--|
| 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) |

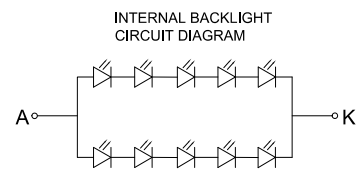
LCD TFT Datasheet Rev.2.1.0

RVT4.3A480272CFWR36

| PIN | DESC |
|-----|---------|
| 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 | VLED- |
| 34 | VLED- |
| 35 | VLED+ |
| 36 | VLED+ |



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
 2. OPERATION VOLTAGE: VDD=3.3V
 3. VIEWING DIRECTION: 12 O'CLOCK
 4. IC CONTROLLER: SSD1963QL9
 5. OPERATING TEMP.: -20°C ~ 70°C
 6. STORAGE TEMP.: -30°C ~ 80°C
 7. LED BACKLIGHT: 10-LED WHITE
 8. SURFACE LUMINANCE: 440 cd/m²
 9. GENERAL TOLERANCE: ±0.2
 10. RoHS COMPLIANT



| | | |
|-------|--|------------|
| 2.0.0 | Glass change, New TFT open dimension, FFC shape. New IC controller and updated pinout. | 2017.05.30 |
| Ver. | DESCRIPTION | DATE |

| |
|----------------------|
| CUSTOMER APVL |
| DRAWN |
| DFTG CHK |
| ENGR CHK |
| APPROVAL |
| RIVERDI SP. Z |

2 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 |

3 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 | V | |
| Input Current (Exclude LED Backlight) | IDD | - | 25 | 32 | mA | VDD = 3.3V |
| LED Backlight Current | IDD _{backlight} | | 265 | 332 | mA | BLVDD=3.3V |
| LED Backlight Current | IDD _{backlight} | | 156 | 195 | mA | BLVDD=5V |
| Total Input Current (Include LED Backlight 100%) | IDD _{total} | - | 290 | 363 | 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 | - | 30000 | 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.

4 ELECTRO-OPTICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT | REMARK | NOTE |
|-------------------------|----------------|---|-------|-------|-------|-------------------|----------|------|
| Response Time | Tr+Tf | $\theta=0^\circ$ $\phi=0^\circ$ Ta=25 | - | 20 | 30 | ms | Figure 1 | 4 |
| Contrast Ratio | Cr | | 320 | 400 | - | --- | Figure 2 | 1 |
| Luminance Uniformity | δ WHITE | | 80 | - | - | % | Figure 2 | 3 |
| Surface Luminance | Lv | | 440 | 550 | - | cd/m ² | Figure 2 | 2 |
| Viewing Angle Range | θ | $\phi = 90^\circ$ | 35 | 50 | - | deg | Figure 3 | 6 |
| | | $\phi = 270^\circ$ | 55 | 70 | - | deg | Figure 3 | |
| | | $\phi = 0^\circ$ | 55 | 70 | - | Deg | Figure 3 | |
| | | $\phi = 180^\circ$ | 55 | 70 | - | Deg | Figure 3 | |
| CIE (x, y) Chromaticity | Red | x | 0.570 | 0.620 | 0.670 | Figure 2 | 5 | |
| | | y | 0.294 | 0.344 | 0.394 | | | |
| | Green | x | 0.256 | 0.306 | 0.356 | | | |
| | | y | 0.513 | 0.563 | 0.613 | | | |
| | Blue | x | 0.083 | 0.133 | 0.183 | | | |
| | | y | 0.099 | 0.149 | 0.199 | | | |
| | White | x | 0.250 | 0.300 | 0.350 | | | |
| | | y | 0.280 | 0.330 | 0.380 | | | |

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 FIG 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.

Figure 1. The definition of response time

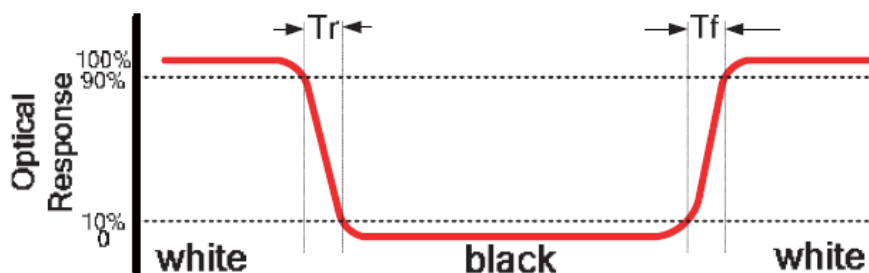


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x,y) chromaticity

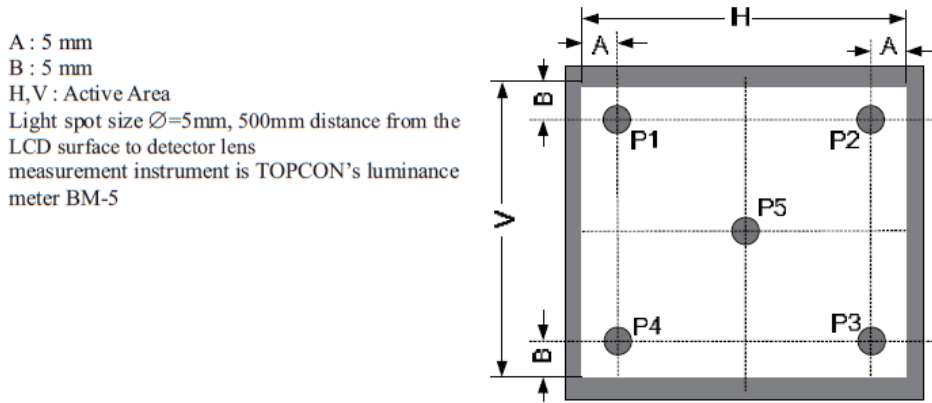
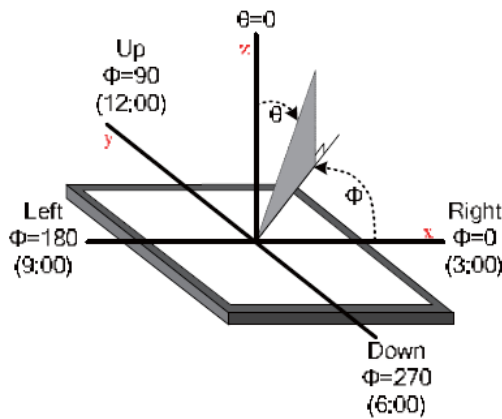


Figure 3. The definition of viewing angle



5 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 | XL | - | Touch left electrode |
| 30 | YU | - | Touch up electrode |
| 31 | XR | - | Touch right electrode |
| 32 | YD | - | Touch down electrode |
| 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 |



6 INTERFACE TIMING CHARACTERISTICS

6.1 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#.

6.2 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 |

6.3 Parallel 8080-series Interface Timing

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

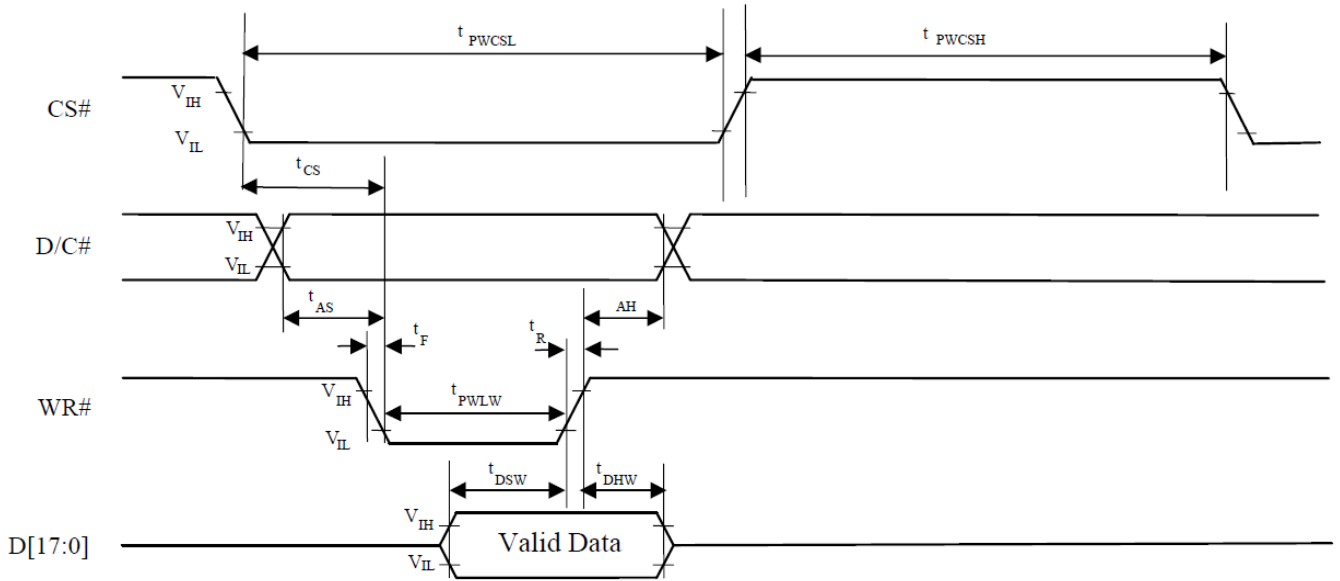
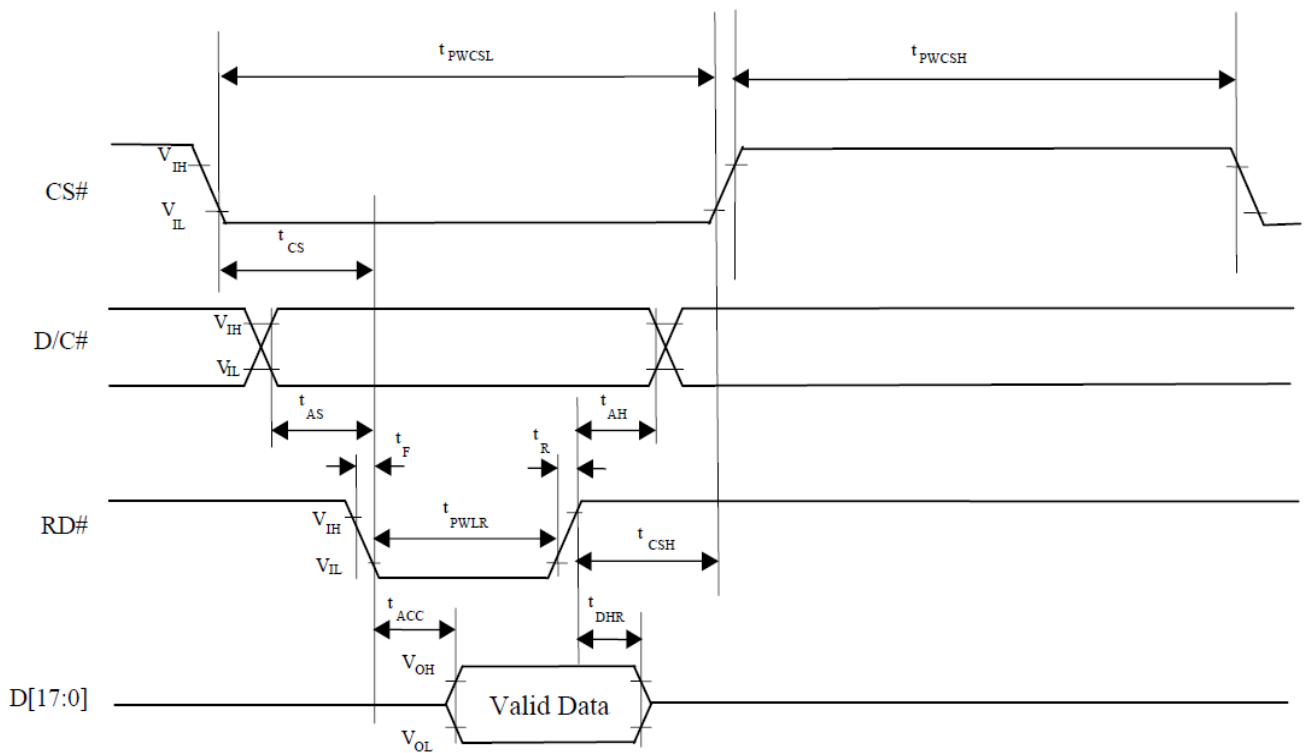


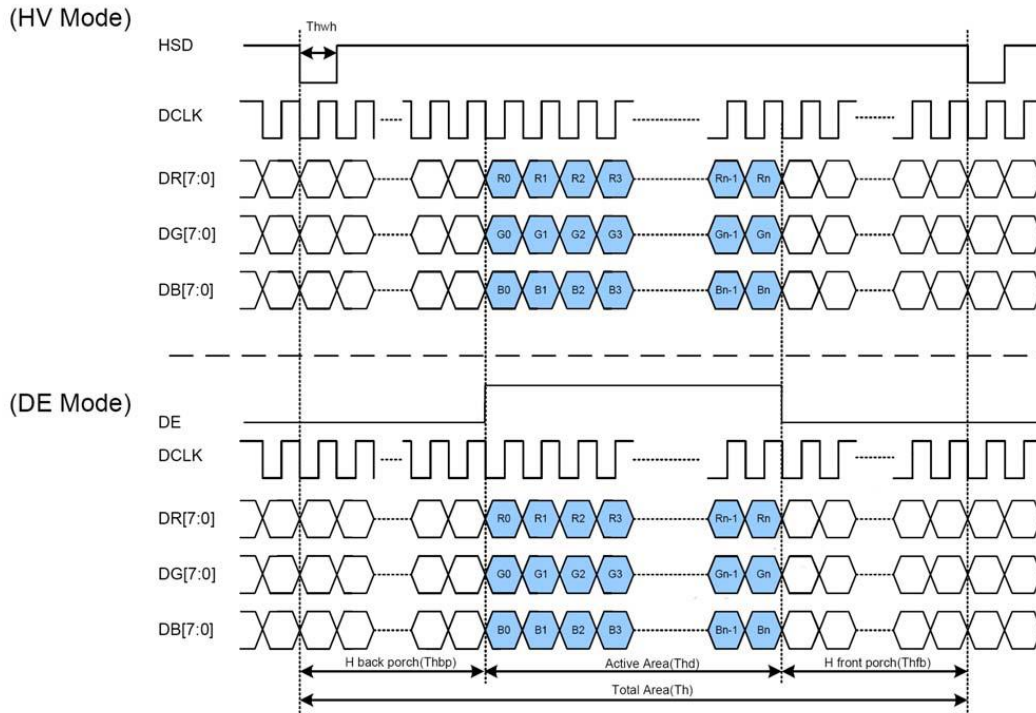
Figure 5. Parallel 8080-series Interface Timing Diagram (Read Cycle)



7 LCD TIMING CHARACTERISTICS

7.1 Clock and data input time diagram

Figure 6. Clock and data input time diagram



7.2 Parallel RGB input timing table

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|------------------|-----------|-----|-----|-----|------|
| DCLK Frequency | Fclk | 5 | 9 | 12 | MHz |
| VSD Period Time | T_v | 277 | 288 | 400 | H |
| VSD Display Area | T_{vd} | | 272 | | H |
| VSD Back Porch | T_{vb} | 3 | 8 | 31 | H |
| VSD Front Porch | T_{vfp} | 2 | 8 | 97 | H |
| HSD Period Time | T_h | 520 | 525 | 800 | DCLK |
| HSD Display Area | T_{hd} | | 480 | | DCLK |
| HSD Back Porch | T_{hbp} | 36 | 40 | 255 | DCLK |
| HSD Front Porch | T_{hfp} | 4 | 5 | 65 | DCLK |

8 TOUCH SCREEN PANEL SPECIFICATIONS

8.1 Electrical characteristics

| ITEM | VALUE | | | UNIT | REMARK |
|-----------------------|-------|------|------|------------|---------------------------|
| | Min. | Typ. | Max. | | |
| Linearity | -3.0 | - | 3.0 | % | Analog X and Y directions |
| Terminal Resistance | 400 | - | 1050 | Ω | X |
| | 100 | - | 450 | Ω | Y |
| Insulation Resistance | - | - | - | M Ω | DC 25V |
| Voltage | - | - | 10 | V | DC |
| Chattering | - | - | 10 | ms | 100k Ω pull-up |
| Transparency | 80 | - | - | % | JIS K7105 |

Note: Avoid operating with hard or sharp material such as a ball point pen or a mechanical pencil except a polyacetal pen (tip R0.8mm or less) or a finger.

8.2 Mechanical & Reliability characteristics

| ITEM | VALUE | | | UNIT | REMARK |
|---------------------------------|---------------|------|------|------------|-----------|
| | Min. | Typ. | Max. | | |
| Activation Force | 80 | - | - | gf | Note 1 |
| Durability - Surface Scratching | Write 100,000 | - | - | characters | Note 2 |
| Durability-Surface Pitting | 1,000,000 | - | - | touches | Note 3 |
| Surface Hardness | 3 | - | - | H | JIS K5400 |

9 INSPECTION

Standard acceptance/rejection criteria for TFT module.

9.1 Inspection condition

Ambient conditions:

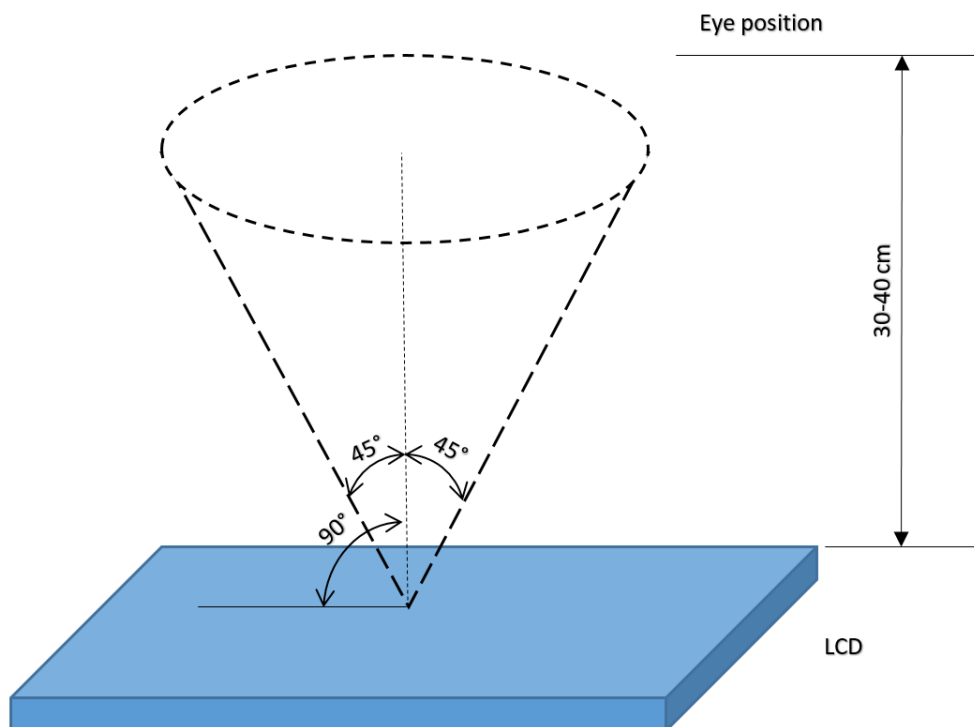
- Temperature: $25\pm^{\circ}\text{C}$
- Humidity: $(60\pm 10)\%RH$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

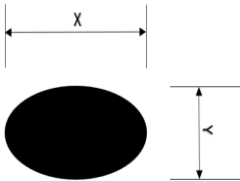
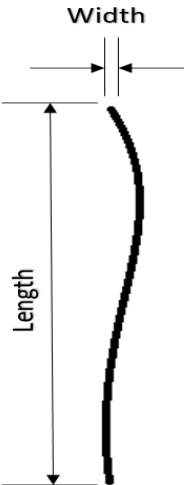
$35\pm 5\text{cm}$ between inspector bare eye and LCD.

Viewing Angle:

U/D: $45^{\circ}/45^{\circ}$, L/R $45^{\circ}/45^{\circ}$



9.2 Inspection standard

| Item | Criterion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--|---------------|--|------------------|---------------|------------|---------------|---------------------|----------|---------------------|---------|-----------------|---|---------|-----------------|---|----------|---|------------|--|--|--------|-------|---------------|---|----------|---------|---------|-----------------|---|---------|-----------------|---|----------|---|
| <p>Black spots, white spots, light leakage, Foreign Particle (round Type)</p> | <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">Size < 5"</th> </tr> <tr> <th>Average Diameter</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>D < 0.2 mm</td> <td>Ignored</td> </tr> <tr> <td>0.2 mm < D < 0.3 mm</td> <td>3</td> </tr> <tr> <td>0.3 mm < D < 0.5 mm</td> <td>2</td> </tr> <tr> <td>0.5 mm < D</td> <td>0</td> </tr> </tbody> </table> </div> <div style="text-align: center; margin: 10px 0;"> $D = \frac{(x + y)}{2}$ </div> <p>*Spots density: 10 mm²</p> | Size < 5" | | Average Diameter | Qualified Qty | D < 0.2 mm | Ignored | 0.2 mm < D < 0.3 mm | 3 | 0.3 mm < D < 0.5 mm | 2 | 0.5 mm < D | 0 | | | | | | | | | | | | | | | | | | | | | | |
| Size < 5" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Average Diameter | Qualified Qty | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D < 0.2 mm | Ignored | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.2 mm < D < 0.3 mm | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.3 mm < D < 0.5 mm | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.5 mm < D | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>LCD black spots, white spots, light leakage (line Type)</p> | <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="3">Size < 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W < 0.02</td> <td>Ignored</td> </tr> <tr> <td>L < 3.0</td> <td>0.02 < W < 0.05</td> <td rowspan="2">2</td> </tr> <tr> <td>L < 2.5</td> <td>0.05 < W < 0.08</td> </tr> <tr> <td>-</td> <td>0.08 < W</td> <td>0</td> </tr> </tbody> </table> </div> <div style="text-align: center; margin: 10px 0;"> <table border="1"> <thead> <tr> <th colspan="3">Size >= 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W < 0.02</td> <td>Ignored</td> </tr> <tr> <td>L < 3.0</td> <td>0.02 < W < 0.05</td> <td rowspan="2">4</td> </tr> <tr> <td>L < 2.5</td> <td>0.05 < W < 0.08</td> </tr> <tr> <td>-</td> <td>0.08 < W</td> <td>0</td> </tr> </tbody> </table> </div> <p>*Spots density: 10 mm²</p> | Size < 5" | | | Length | Width | Qualified Qty | - | W < 0.02 | Ignored | L < 3.0 | 0.02 < W < 0.05 | 2 | L < 2.5 | 0.05 < W < 0.08 | - | 0.08 < W | 0 | Size >= 5" | | | Length | Width | Qualified Qty | - | W < 0.02 | Ignored | L < 3.0 | 0.02 < W < 0.05 | 4 | L < 2.5 | 0.05 < W < 0.08 | - | 0.08 < W | 0 |
| Size < 5" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length | Width | Qualified Qty | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - | W < 0.02 | Ignored | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L < 3.0 | 0.02 < W < 0.05 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L < 2.5 | 0.05 < W < 0.08 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - | 0.08 < W | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size >= 5" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Length | Width | Qualified Qty | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - | W < 0.02 | Ignored | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L < 3.0 | 0.02 < W < 0.05 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| L < 2.5 | 0.05 < W < 0.08 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| - | 0.08 < W | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Item | Criterion | |
|-----------------------------------|----------------------------------|---------------|
| Clear spots | Size < 5" | |
| | Average Diameter | Qualified Qty |
| | D < 0.2 mm | Ignored |
| | 0.2 mm < D < 0.3 mm | 3 |
| | 0.3 mm < D < 0.5 mm | 2 |
| | 0.5 mm < D | 0 |
| | Size >= 5" | |
| | Average Diameter | Qualified Qty |
| | D<0.2 mm | Ignored |
| | 0.2 mm < D < 0.3 mm | 4 |
| | 0.3 mm < D < 0.5 mm | 2 |
| | 0.5 mm < D | 0 |
| | *Spots density: 10 mm | |
| | Polarizer bubbles | Size < 5" |
| Average Diameter | | Qualified Qty |
| D < 0.2 mm | | Ignored |
| 0.2 mm < D < 0.5 mm | | 3 |
| 0.5 mm < D < 1 mm | | 2 |
| 1 mm < D | | 0 |
| Total Q'ty | | 3 |
| Size >= 5" | | |
| Average Diameter | | Qualified Qty |
| D<0.25 mm | | Ignored |
| 0.25 mm < D < 0.5 mm | | 3 |
| 0.5 mm < D | | 0 |
| Electrical Dot Defect | | Size < 5" |
| | | item |
| | Black do defect | 4 |
| | Bright dot defect | 2 |
| | Total Dot | 5 |
| | Size >= 5" | |
| | item | Qualified Qty |
| | Black do defect | 5 |
| | Bright dot defect | 2 |
| | Total Dot | 5 |

| Item | Criterion | | |
|--------------------------------|-----------------------------------|----------------|---------------|
| Touch panel spot | Size < 5" | | |
| | Average Diameter | Qualified Qty | |
| | D < 0.2 mm | Ignored | |
| | 0.2 mm < D < 0.4 mm | 5 | |
| | 0.4 mm < D < 0.5 mm | 2 | |
| | 0.5 mm < D | 0 | |
| | Size >= 5" | | |
| | Average Diameter | Qualified Qty | |
| | D<0.25 mm | Ignored | |
| | 0.25 mm < D < 0.5 mm | 4 | |
| 0.5 mm < D | 0 | | |
| Touch panel White line Scratch | Size < 5" | | |
| | Length | Width | Qualified Qty |
| | - | W< 0.02 | Ignored |
| | L < 3.0 | 0.02 < W <0.05 | 2 |
| | L < 2.5 | 0.05 < W <0.08 | |
| | - | 0.08 < W | 0 |
| | Size >= 5" | | |
| | Length | Width | Qualified Qty |
| | - | W< 0.03 | Ignored |
| | L < 5.0 | 0.03 < W <0.05 | 2 |
| - | 0.05 < W | 0 | |

10 RELIABILITY TEST

| NO. | TEST ITEM | TEST CONDITION |
|-----|----------------------------|---|
| 1 | High Temperature Storage | 80±2°C/240hours |
| 2 | Low Temperature Storage | -30±2°C/240hours |
| 3 | High Temperature Operating | 70±2°C/240hours |
| 4 | Low Temperature Operating | -20±2°C/240hours |
| 5 | Temperature Cycle | -30±2°C~25~80±2°C × 20 cycles (30min.) (5min.) (30min.) |
| 6 | Damp Proof Test | 60°C ±5°C × 90%RH/240hours |
| 7 | Vibration Test | Frequency 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep: 10Hz~55Hz~10Hz X, Y, Z 2 hours for each direction. |
| 8 | Package Drop Test | Height:60 cm 1 corner,3 edges,6 surfaces |
| 9 | ESD Test | Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 time |

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