



## RVT10AQSFWC36

### LCD TFT Datasheet

Rev.2.0  
2016-10-13

| ITEM                           | CONTENTS                         | UNIT              |
|--------------------------------|----------------------------------|-------------------|
| LCD Type                       | TFT/Transmissive/Normally white  | /                 |
| Size                           | 7.0                              | Inch              |
| Viewing Direction              | 12:00 (without image inversion)  | O' Clock          |
| Gray Scale Inversion Direction | 6:00                             | O' Clock          |
| LCM (W × H × D)                | 165.60 × 100.60 × 12.00          | mm <sup>3</sup>   |
| Active Area (W × H)            | 154.08 × 85.92                   | mm <sup>2</sup>   |
| Dot Pitch (W × H)              | 0.1926 × 0.179                   | mm <sup>2</sup>   |
| Number of Dots                 | 800 (RGB) × 480                  | /                 |
| Driver IC                      | SSD1963                          | /                 |
| Backlight Type                 | 21 LEDs                          | /                 |
| Surface Luminance              | 350                              | cd/m <sup>2</sup> |
| Interface Type                 | Parallel 8/16b (i80 by default)  | /                 |
| Color Depth                    | 262k                             | /                 |
| Pixel Arrangement              | RGB Vertical Stripe              | /                 |
| Surface Treatment              | Clear                            |                   |
| Input Voltage                  | 3.3                              | V                 |
| With/Without TSP               | Projected Capacitive Touch Panel | /                 |
| Weight                         | 257                              | g                 |

**Note 1:** RoHS compliant

**Note 2:** LCM weight tolerance: ± 5%.

## REVISION RECORD

| REVNO. | REVDATE    | CONTENTS  | REMARKS |
|--------|------------|---|---------|
| 1.0    | 2015-03-03 | Initial Release                                       |         |
| 1.1    | 2015-04-23 | Changing Part Number                                  |         |
| 1.2    | 2015-04-24 | Updating Interface Description and Mechanical drawing |         |
| 1.3    | 2015-10-12 | Update Interface                                      |         |
| 1.4    | 2016-01-12 | Update Input Voltage for LED Inverter                 |         |
| 1.5    | 2016-10-13 | Added Inspection Standards                            |         |
| 2.0    | 2016-10-13 | New PCT Controller                                    |         |

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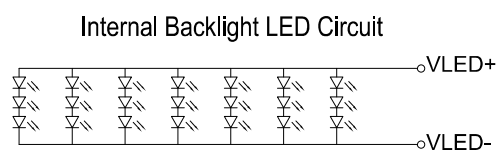
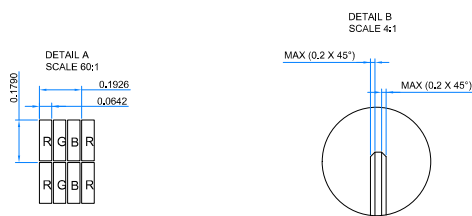
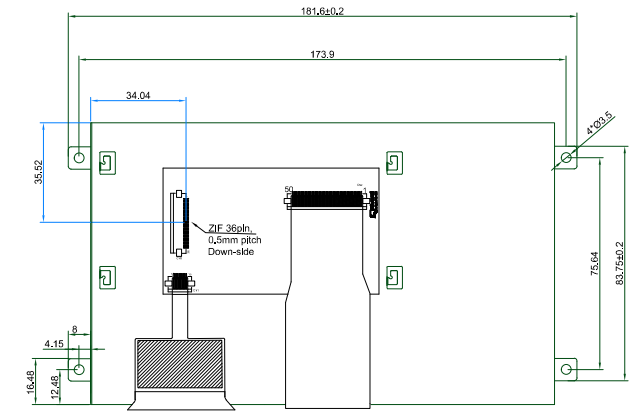
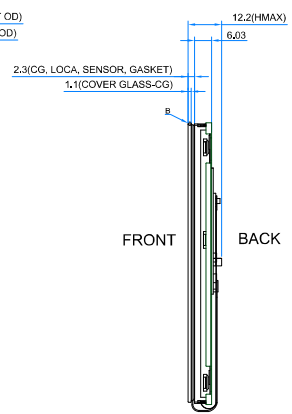
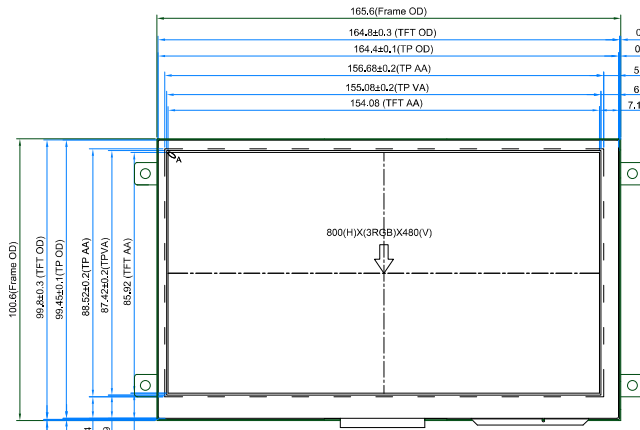
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## 1 MODULE CLASSIFICATION INFORMATION

|           |          |           |          |          |          |          |          |          |           |
|-----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------|
| <b>RV</b> | <b>T</b> | <b>70</b> | <b>A</b> | <b>Q</b> | <b>S</b> | <b>F</b> | <b>W</b> | <b>C</b> | <b>36</b> |
| 1.        | 2.       | 3.        | 4.       | 5.       | 6.       | 7.       | 8.       | 9.       | 10.       |

|     |                         |   |
|-----|-------------------------|---|
| 1.  | <b>BRAND</b>            | <b>RV – Riverdi</b>   |
| 2.  | <b>PRODUCT TYPE</b>     | <b>T – TFT Standard</b><br>F – TFT Custom   |
| 3.  | <b>DISPLAY SIZE</b>     | <b>35 – 3.5”</b><br><b>43 – 4.3”</b><br><b>57 – 5.7”</b><br><b>70 – 7.0”</b>  |
| 4.  | <b>MODEL SERIAL NO.</b> | <b>A (A-Z)</b>  |
| 5.  | <b>RESOLUTION</b>       | <b>Q – 800x480 px</b>   |
| 6.  | <b>INTERFACE</b>        | <b>T – TFT LCD, RGB</b><br><b>L – TFT LCD, LVDS</b><br><b>S – TFT + Controller SSD1963</b><br><b>F – TFT + Controller FT801</b> |
| 7.  | <b>FRAME</b>            | <b>N – No Frame</b><br><b>F – Mounting Frame</b>  |
| 8.  | <b>BACKLIGHT TYPE</b>   | <b>W – LED White</b>  |
| 9.  | <b>TOUCH PANEL</b>      | <b>N – No Touch Panel</b><br><b>R – Resistive Touch Panel</b><br><b>C – Capacitive Touch Panel</b>                              |
| 10. | <b>VERSION</b>          | <b>36 (00-99)</b>   |

| 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  | TP_INT  |
| 25  | CS      |
| 26  | RESET   |
| 27  | L/R     |
| 28  | U/D     |
| 29  | TP_SCL  |
| 30  | TP_SDA  |
| 31  | TP_RST  |
| 32  | TP_WAKE |
| 33  | BLGND   |
| 34  | BLGND   |
| 35  | BLVDD   |
| 36  | BLVDD   |



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
  2. 7.0 INCH PROJECTIVE CAPACITIVE TOUCH PANEL.
  3. OPERATION VOLTAGE: VDD=3.3V
  4. VIEWING DIRECTION: 12 O'CLOCK
  5. LED BACKLIGHT: 21-LED WHITE, BUILT-IN INVERTER
  6. IC CONTROLLER: SSD1963
  7. CTP IC DRIVER: FT5406
  8. CTP MULTI FINGER: UP TO 5
  9. OPERATING TEMP.: -20°C ~ 70°C
  10. STORAGE TEMP.: -30°C ~ 80°C
  11. SURFACE LUMINANCE: 350 cd/m<sup>2</sup>
  12. GENERAL TOLERANCE: ±0.2
  13. RoHS COMPLIANT

| PIN NO. | SYMBOL |
|---------|--------|
| 1       | VSS    |
| 2       | VDD    |
| 3       | SCL    |
| 4       | NC     |
| 5       | SDA    |
| 6       | NC     |
| 7       | /RST   |
| 8       | /WAKE  |
| 9       | /INT   |
| 10      | VSS    |

| Ver. | DESCRIPTION               | DATE       |
|------|---------------------------|------------|
| 1.2  | Update PIN description    | 2015.10.12 |
| 1.1  | Added CTP PIN description | 2015.04.24 |
| 1.0  | Initial case              | 2015.03.01 |

| CUSTOMER |  | DATE       |      |
|----------|--|------------|------|
|          |  | 2015.10.12 |      |
| DRAWN    |  | SCALE      | 1:1  |
| DFTG CHK |  | UNIT       | mm   |
| ENGR CHK |  |            |      |
| APPROVAL |  |            |      |
|          |  | DWG NO     | PAGE |
|          |  | Rev.1.2    | 1/1  |

### 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    |
| LED reverse voltage (each LED) | VR     | -    | 1.2            | V    |
| LED forward voltage (each LED) | IF     | -    | 30             | mA   |
| Operating Temperature          | TOP    | -20  | 70             | °C   |
| Storage Temperature            | TST    | -30  | 80             | °C   |
| Humidity                       | RH     | -    | 90% (Max 60°C) | RH   |

### 4 ELECTRICAL CHARACTERISTICS

| PARAMETER                             | SYMBOL                          | MIN    | TYP   | MAX    | UNIT |
|---------------------------------------|---------------------------------|--------|-------|--------|------|
| Supply Voltage For Module             | VDD                             | 3.0    | 3.3   | 3.6    | V    |
| Input Voltage for LED Inverter        | BLVDD                           | 2.8    | 5     | 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                             | -      | 95    | 115    | mA   |
| LED Backlight Current                 | IDD <sub>backlight</sub> (@ 5V) | -      | 450   | 540    | mA   |
| Input Voltage 'H' level               | V <sub>IH</sub>                 | 0.7VDD | -     | VDD    | V    |
| Input Voltage 'L' level               | V <sub>IL</sub>                 | 0      | -     | 0.2VDD | V    |
| LED Life Time                         | -                               | 30000  | 50000 | -      | Hrs  |

**Note:** 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             | $\theta=0^\circ$<br>$\phi=0^\circ$<br>Ta=25 | -   | 20  | 35    | ms                | FIG 1. | 4    |
| Contrast Ratio          | Cr                |   | 400 | 500 | -     | ---               | FIG 2. | 1    |
| Luminance Uniformity    | $\delta$<br>WHITE |   | 70  | 75  | -     | %                 | FIG 2. | 3    |
| Surface Luminance       | Lv                |   | -   | 350 | -     | cd/m <sup>2</sup> | FIG 2. | 2    |
| Viewing Angle Range     | $\theta$          | $\phi = 90^\circ$                           | 40  | 50  | -     | deg               | FIG 3. | 6    |
|                         |                   | $\phi = 270^\circ$                          | 60  | 70  | -     | deg               | FIG 3. |      |
|                         |                   | $\phi = 0^\circ$                            | 60  | 70  | -     | deg               | FIG 3. |      |
|                         |                   | $\phi = 180^\circ$                          | 60  | 70  | -     | deg               | FIG 3. |      |
| CIE (x, y) Chromaticity | Red               | $\theta=0^\circ$<br>$\phi=0^\circ$<br>Ta=25 | x   | -   | -     | -                 | FIG 2. | 5    |
|                         |                   |   | y   | -   | -     | -                 |        |      |
|                         | Green             |   | x   | -   | -     | -                 |        |      |
|                         |                   |   | y   | -   | -     | -                 |        |      |
|                         | Blue              |   | x   | -   | -     | -                 |        |      |
|                         |                   |   | y   | -   | -     | -                 |        |      |
|                         | White             |   | x   | -   | 0.280 | -                 |        |      |
|                         |                   |   | y   | -   | 0.310 | -                 |        |      |

**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  $\delta$  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.

Figure 1. The definition of response time

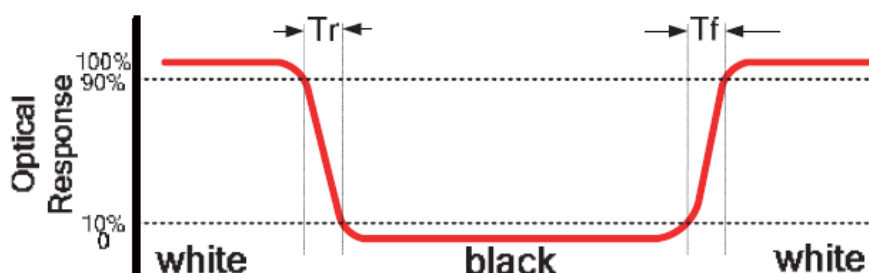


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

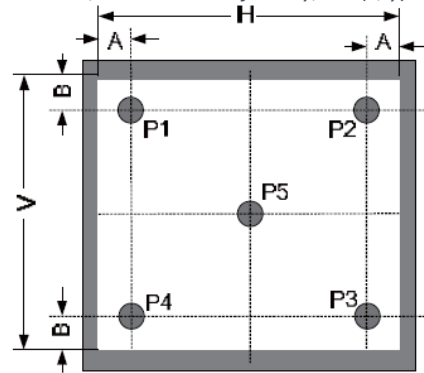
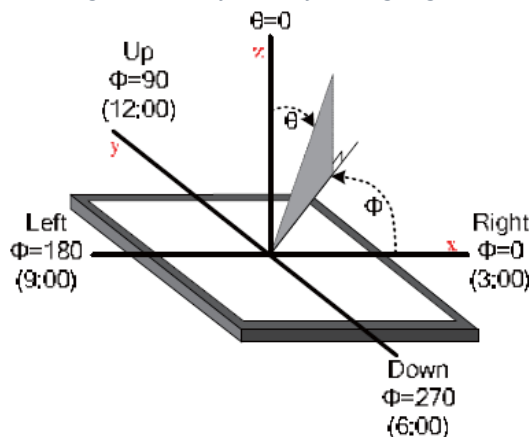


Figure 3. The definition of viewing angle



## 6 INTERFACE DESCRIPTION

| PIN NO. | SYMBOL  | I/O | DESCRIPTION   | REMARK     |
|---------|---------|-----|---|------------|
| 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) |            |
| 4       | D/C     | I   | Data/Command Select   |            |
| 5       | WR      | I   | Write Strobe Signal   |            |
| 6       | RD      | I   | Read Strobe Signal  |            |
| 7-22    | DO-D15  | I   | Data Bus. Pins not used should be floating.                   |            |
| 23      | NC      | -   | No Connection   |            |
| 24      | TP_INT  | O   | Touch Panel INT Signal  |            |
| 25      | CS      | I   | Chip Select   |            |
| 26      | RESET   | I   | Hardware reset  |            |
| 27      | L/R     | I   | Left / Right selection  | 1, 2, 3, 4 |
| 28      | U/D     | I   | Up/Down selection   | 1, 2, 3, 4 |
| 29      | TP_SCL  | I   | Touch Panel I2C SCL Signal                                    |            |
| 30      | TP_SDA  | IO  | Touch Panel I2C SDA Signal                                    |            |
| 31      | TP_RST  | I   | Touch Panel RST Signal, Active Low                            |            |
| 32      | TP_WAKE | I   | Touch Panel Wake Signal, Active Low                           |            |
| 33      | BLGND   | -   | Power ground for B/L LED Inverter (can be connected to GND)   |            |
| 34      | BLGND   | -   | Power ground for B/L LED Inverter (can be connected to GND)   |            |
| 35      | BLVDD   | -   | Power supply for B/L LED Inverter (+5V)                       |            |
| 36      | BLVDD   | -   | Power supply for B/L LED Inverter (+5V)                       |            |

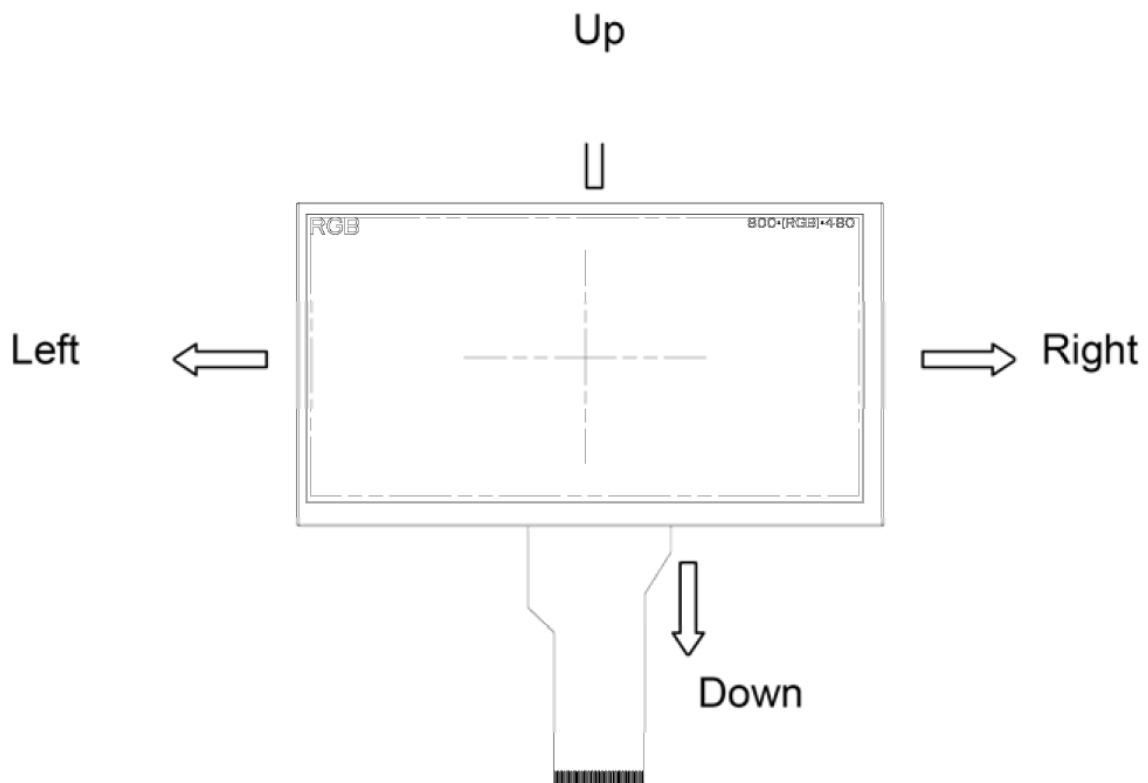


**Note 1:** Selection of scanning mode.

| SET OF SCAN CONTROL INPUT |     | SCANNING DIRECTION        |
|---------------------------|-----|---------------------------|
| UD                        | LR  |                           |
| GND                       | VDD | Up To Down, Left To Right |
| VDD                       | GND | Down To Up, Right To Left |
| GND                       | GND | Up To Down, Right To Left |
| VDD                       | VDD | Down To Up, Left To Right |

**Note 2:** Definition of scanning direction.  
Refer to the figure Figure 4.

Figure 4. Definition of scanning direction



**Note 3:** Normally (internally) pull high.

**Note 4:** Normally (internally) pull low.

## 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 <sup>st</sup> |       |       | R5    | R4    | R3    | R2    | R1    | G5    | G4   | G3   | G2   | G1   | G0   | B5   | B4   | B3   | B2   | B1   |
| 16 bits              | 1 <sup>st</sup> |       |       | R7    | R6    | R5    | R4    | R3    | R2    | R1   | R0   | G7   | G6   | G5   | G4   | G3   | G2   | G1   | G0   |
|                      | 2 <sup>nd</sup> |       |       | B7    | B6    | B5    | B4    | B3    | B2    | B1   | B0   | R7   | R6   | R5   | R4   | R3   | R2   | R1   | R0   |
|                      | 3 <sup>rd</sup> |       |       | G7    | G6    | G5    | G4    | G3    | G2    | G1   | G0   | B7   | B6   | B5   | B4   | B3   | B2   | B1   | B0   |
| 12 bits              | 1 <sup>st</sup> |       |       |       |       |       |       | R7    | R6    | R5   | R4   | R3   | R2   | R1   | R0   | G7   | G6   | G5   | G4   |
|                      | 2 <sup>nd</sup> |       |       |       |       |       |       | G3    | G2    | G1   | G0   | B7   | B6   | B5   | B4   | B3   | B2   | B1   | B0   |
| 9 bits               | 1 <sup>st</sup> |       |       |       |       |       |       |       |       |      | R5   | R4   | R3   | R2   | R1   | R0   | G5   | G4   | G3   |
|                      | 2 <sup>nd</sup> |       |       |       |       |       |       |       |       |      | G2   | G1   | G0   | B5   | B4   | B3   | B2   | B1   | B0   |
| 8 bits               | 1 <sup>st</sup> |       |       |       |       |       |       |       |       |      |      | R7   | R6   | R5   | R4   | R3   | R2   | R1   | R0   |
|                      | 2 <sup>nd</sup> |       |       |       |       |       |       |       |       |      |      | G7   | G6   | G5   | G4   | G3   | G2   | G1   | G0   |
|                      | 3 <sup>rd</sup> |       |       |       |       |       |       |       |       |      |      | B7   | B6   | B5   | B4   | B3   | B2   | B1   | B0   |

### 7.3 Parallel 8080-series Interface Timing

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

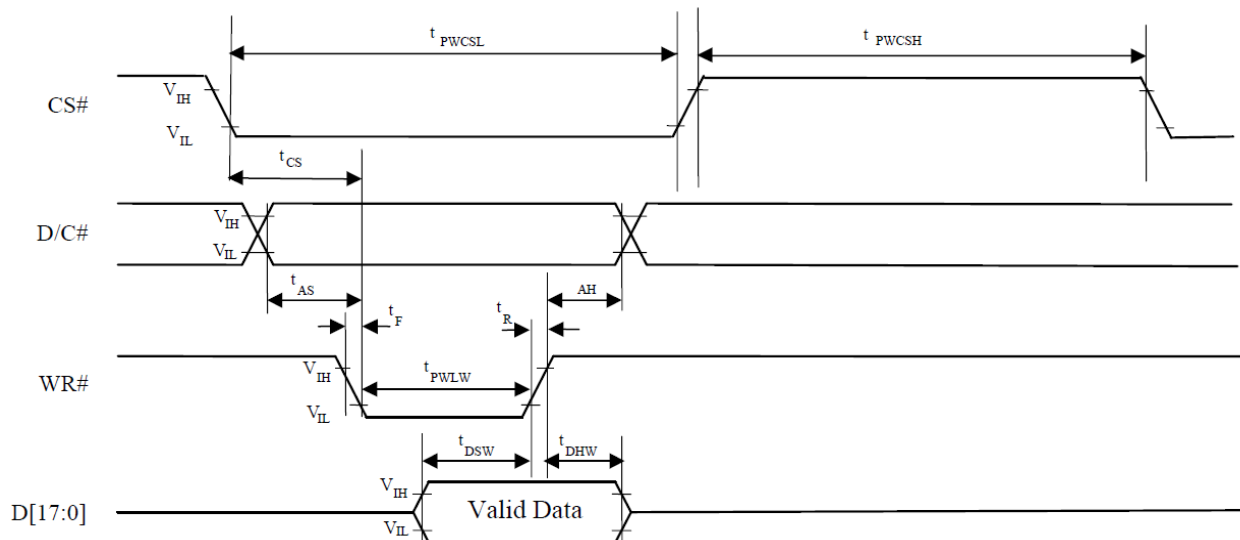
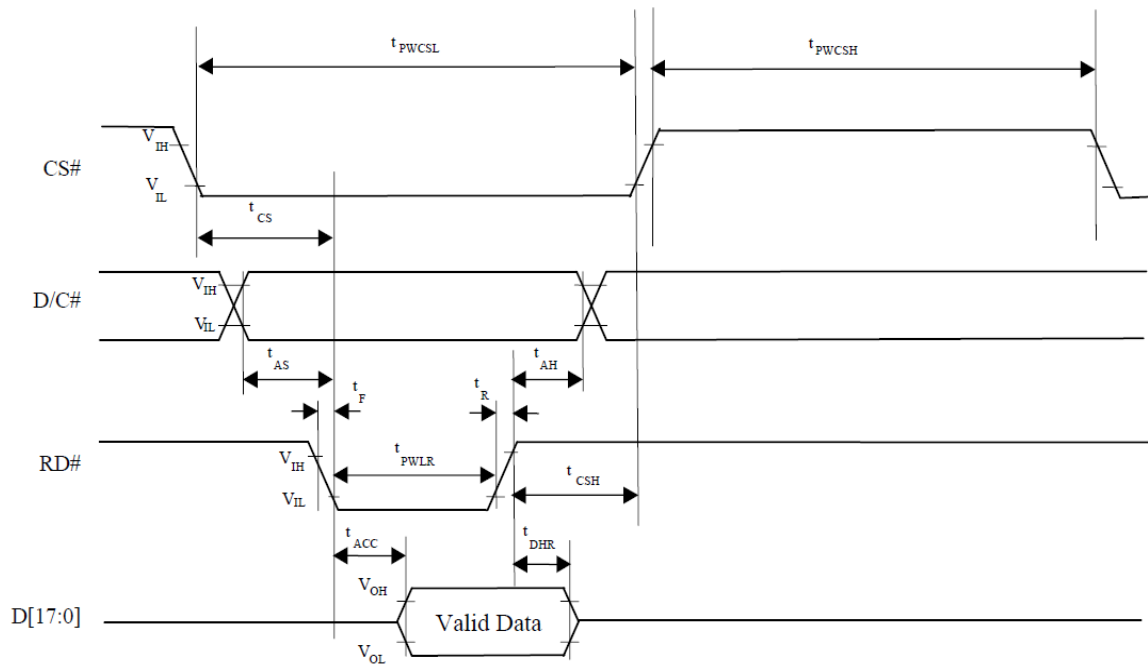


Figure 6. Parallel 8080-series Interface Timing Diagram (Read Cycle)



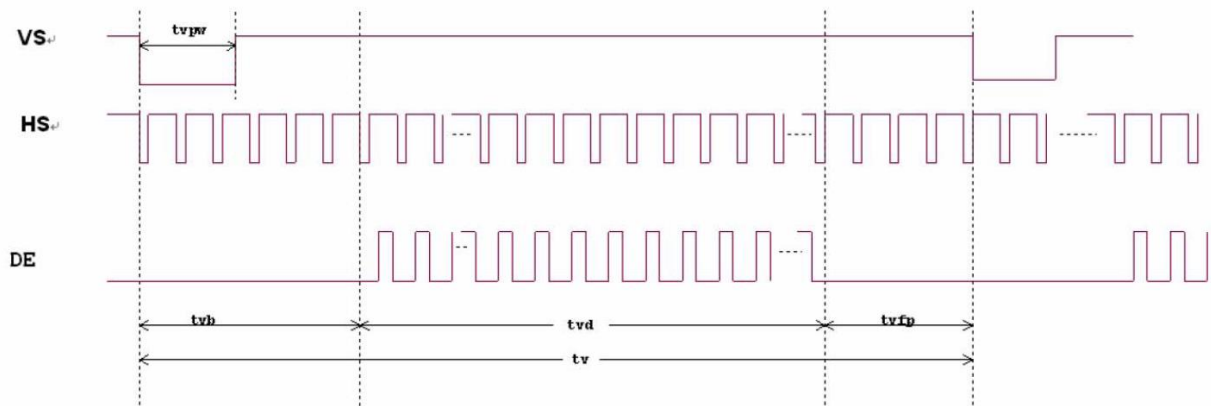
## 8 LCD TIMING CHARACTERISTICS

### 8.1 Clock and data input time diagram

Figure 7. Horizontal input timing diagram



Figure 8. Vertical input timing diagram



## 8.2 Parallel RGB input timing table

| PARAMETER        | SYMBOL | MIN  | TYP  | MAX  | UNIT |
|------------------|--------|------|------|------|------|
| DCLK Frequency   | Fclk   | 26.4 | 33.3 | 46.8 | MHz  |
| VSD Period Time  | Tv     | 510  | 525  | 650  | TH   |
| VSD Display Area | Tvd    |      | 480  |      | TH   |
| VSD Blanking     | Tvb    |      | 23   |      | TH   |
| VSD Front Porch  | Tvfp   | 7    | 22   | 147  | TH   |
| VSD Pulse Width  | Tvpw   | 1    | -    | 20   | TH   |
| HSD Pulse Width  | Thpw   | 1    | -    | 40   | DCLK |
| HSD Period Time  | Th     | 862  | 1056 | 1200 | DCLK |
| HSD Display Area | Thd    |      | 800  |      | DCLK |
| HSD Blanking     | Thb    |      | 46   |      | DCLK |
| HSD Front Porch  | Thfp   | 16   | 210  | 354  | DCLK |

## 9 CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

### 9.1 Mechanical characteristics

| DESCRIPTION            | INL SPECIFICATION  | REMARK             |
|------------------------|--------------------|--------------------|
| Touch Panel Size       | 7 inch             |                    |
| Outline Dimension (OD) | 164.4mm x 99.45mm  | Cover Lens Outline |
| Product Thickness      | 2.3mm              |                    |
| Glass Thickness        | 1.1mm              |                    |
| Ink View Area          | 155.08mm x 87.42mm |                    |
| Sensor Active Area     | 156.68mm x 88.52mm |                    |
| Input Method           | 5 Finger           |                    |
| Activation Force       | Touch              |                    |
| Surface Hardness       | ≥7H                |                    |

## 9.2 Electrical characteristics

| DESCRIPTION             |             | SPECIFICATION        |
|-------------------------|-------------|----------------------|
| Operating Voltage       |             | DC 2.8~3.3V          |
| Power Consumption (IDD) | Active Mode | 10~18mA              |
|                         | Sleep Mode  | 30~50μA              |
| Interface               |             | I <sup>2</sup> C     |
| Linearity               |             | <1.5%                |
| Controller              |             | FT5426               |
| I2C address             |             | 0x38 (7 bit address) |
| Resolution              |             | 1792*1024            |

## 9.3 Interface timing characteristics

| PARAMETER  | MIN | MAX | UNIT |
|--|-----|-----|------|
| SCL Frequency                                    | 0   | 400 | kHz  |
| Bus Free Time Between a STOP and START Condition | 4.7 | /   | μs   |
| Hold Time (repeated) START Condition             | 4.0 | /   | μs   |
| Data Setup Time                                  | 250 | /   | ns   |
| Setup Time for Repeated START Condition          | 4.7 | /   | μs   |
| Setup Time for STOP Condition                    | 4.0 | /   | μs   |

## 9.4 I2C Read/Write Interface Description

Figure 9. Write N bytes to I2C slave

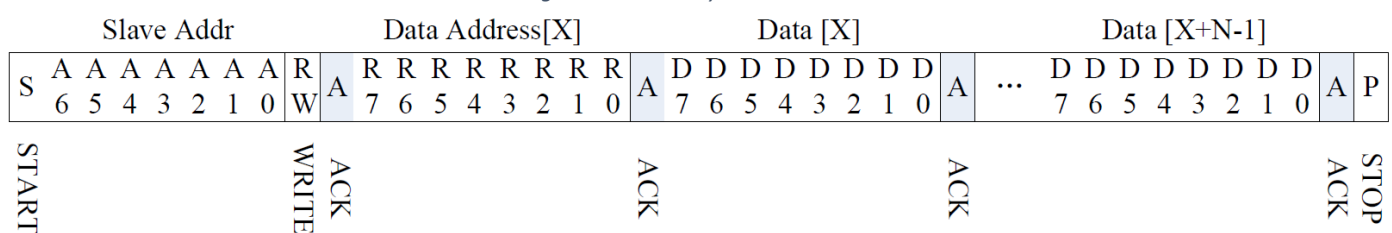


Figure 10. Set Data Address

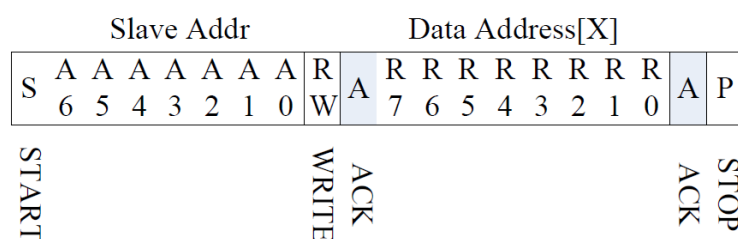
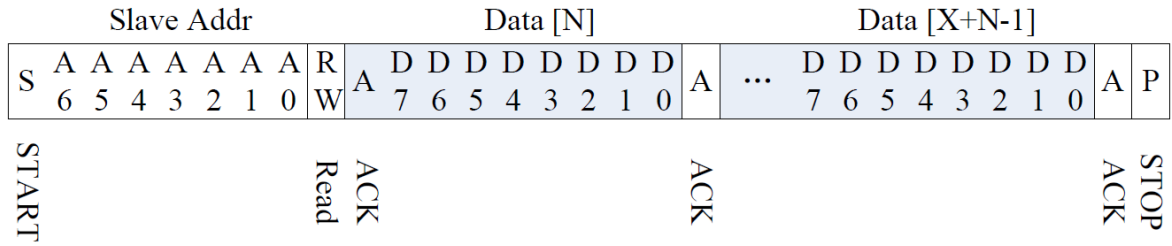
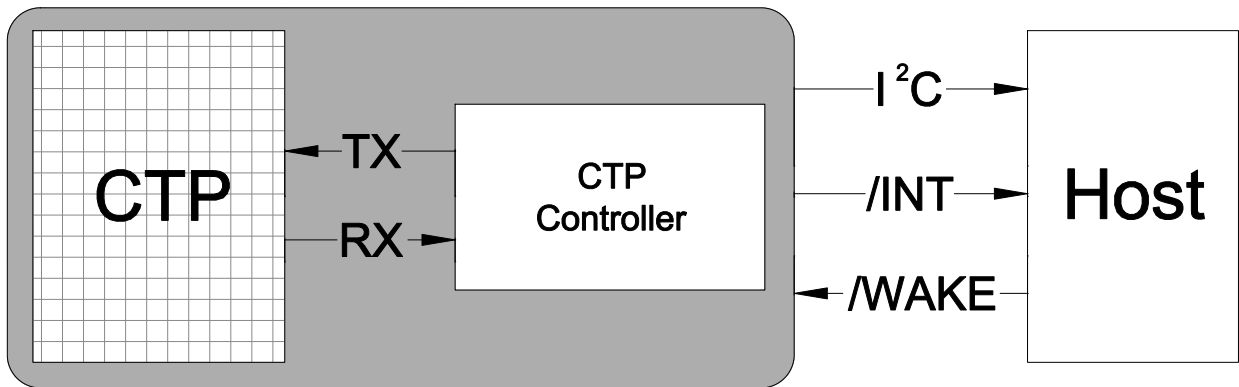


Figure 11. Read X bytes from I2C Slave



### 9.5 Communication of the I<sup>2</sup>C interface with Host

Figure 12. Communication of the I2C interface with Host



### 9.6 Touch data read protocol

| ADDRESS | NAME        | BIT                                   | BIT | BIT | BIT                                    | BIT                                    | BIT | BIT | BIT | HOST ACCESS |    |
|---------|-------------|---------------------------------------|-----|-----|--|--|-----|-----|-----|-------------|----|
|         |             | 7                                     | 6   | 5   | 4                                      | 3                                      | 2   | 1   | 0   |             |    |
| 00h     | DEVIDE_MODE | Device Mode[2:0]                      |     |     |  |  |     |     |     |             | RW |
| 01h     | GEST_ID     | Gesture ID[7:0]                       |     |     |  |  |     |     |     |             | R  |
| 02h     | TD_STATUS   |                                       |     |     |  | Number of touch points[3:0]            |     |     |     |             | R  |
| 03h     | TOUCH1_XH   | 1 <sup>st</sup> Event Flag            |     |     | 1 <sup>st</sup> Touch X Position[11:8] |  |     |     |     | R           |    |
| 04h     | TOUCH1_XL   | 1 <sup>st</sup> Touch X Position[7:0] |     |     |  |  |     |     |     |             | R  |
| 05h     | TOUCH1_YH   | 1 <sup>st</sup> Touch ID [3:0]        |     |     |  | 1 <sup>st</sup> Touch X Position[11:8] |     |     |     |             | R  |
| 06h     | TOUCH1_YL   | 1 <sup>st</sup> Touch Y Position[7:0] |     |     |  |  |     |     |     |             | R  |
| 07h     |             |                                       |     |     |  |  |     |     |     |             | R  |
| 08h     |             |                                       |     |     |  |  |     |     |     |             | R  |
| 09h     | TOUCH2_XH   | 2 <sup>nd</sup> Event Flag            |     |     | 2 <sup>nd</sup> Touch X Position[11:8] |  |     |     |     | R           |    |
| 0Ah     | TOUCH2_XL   | 2 <sup>nd</sup> Touch X Position[7:0] |     |     |  |  |     |     |     |             | R  |
| 0Bh     | TOUCH2_YH   | 2 <sup>nd</sup> Touch ID[3:0]         |     |     |  | 2 <sup>nd</sup> Touch X Position[11:8] |     |     |     |             | R  |
| 0Ch     | TOUCH2_YL   | 2 <sup>nd</sup> Touch Y Position[7:0] |     |     |  |  |     |     |     |             | R  |
| 0Dh     |             |                                       |     |     |  |  |     |     |     |             | R  |
| 0Eh     |             |                                       |     |     |  |  |     |     |     |             | R  |
| 0Fh     | TOUCH3_XH   | 3 <sup>rd</sup> Event Flag            |     |     | 3 <sup>rd</sup> Touch X Position[11:8] |  |     |     |     | R           |    |
| 10h     | TOUCH3_XL   | 3 <sup>rd</sup> Touch X Position[7:0] |     |     |  |  |     |     |     |             | R  |
| 11h     | TOUCH3_YH   | 3 <sup>rd</sup> Touch ID[3:0]         |     |     |  | 3 <sup>rd</sup> Touch X Position[11:8] |     |     |     |             | R  |
| 12h     | TOUCH3_YL   | 3 <sup>rd</sup> Touch Y Position[7:0] |     |     |  |  |     |     |     |             | R  |
| 13h     |             |                                       |     |     |  |  |     |     |     |             | R  |

|     |           |                                       |  |  |  |  |  |  |   |
|-----|-----------|---------------------------------------|--|--|--|--|--|--|---|
| 14h |           |                                       |  |  |  |  |  |  | R |
| 15h | TOUCH4_XH | 4 <sup>th</sup> Event Flag            |  |  | 4 <sup>th</sup> Touch X Position[11:8] |  |  |  | R |
| 16h | TOUCH4_XL | 4 <sup>th</sup> Touch X Position[7:0] |  |  |  |  |  |  | R |
| 17h | TOUCH4_YH | 4 <sup>th</sup> Touch ID[3:0]         |  |  | 4 <sup>th</sup> Touch X Position[11:8] |  |  |  | R |
| 18h | TOUCH4_YL | 4 <sup>th</sup> Touch Y Position[7:0] |  |  |  |  |  |  | R |
| 19h |           |                                       |  |  |  |  |  |  | R |
| 1Ah |           |                                       |  |  |  |  |  |  | R |
| 1Bh | TOUCH5_XH | 5 <sup>th</sup> Event Flag            |  |  | 5 <sup>th</sup> Touch X Position[11:8] |  |  |  | R |
| 1Ch | TOUCH5_XL | 5 <sup>th</sup> Touch X Position[7:0] |  |  |  |  |  |  | R |
| 1Dh | TOUCH5_YH | 5 <sup>th</sup> Touch ID[3:0]         |  |  | 5 <sup>th</sup> Touch X Position[11:8] |  |  |  | R |
| 1Eh | TOUCH5_YL | 5 <sup>th</sup> Touch Y Position[7:0] |  |  |  |  |  |  | R |

## 9.7 Data description.

### DEVICE\_MODE

This register is the device mode register, configure it to determine the current mode of the chip.

| ADDRESS | BIT ADDRESS | REGISTER NAME     | DESCRIPTION   |
|---------|-------------|-------------------|---|
| 00h     | 6:4         | Device Mode [2:0] | 000b Work Mode<br>100b Factory Mode – Read Raw Data |

### GEST\_ID

This register describes the gesture of a valid touch.

| ADDRESS | BIT ADDRESS | REGISTER NAME    | DESCRIPTION   |
|---------|-------------|------------------|---|
| 01h     | 7:0         | Gesture ID [7:0] | Gesture ID<br>0x10 Move Up<br>0x14 Move Down<br>0x18 Move Right<br>0x48 Zoom In<br>0x49 Zoom Out<br>0x00 No Gesture |

### TD\_STATUS

This register is the Touch Data status register.

| ADDRESS | BIT ADDRESS | REGISTER NAME                | DESCRIPTION                              |
|---------|-------------|------------------------------|--|
| 02h     | 3:0         | Number of Touch Points [2:0] | How Many Points Detected<br>1-5 is Valid |
|         | 7:4         |                              |  |

### TOUCHn\_XH(n:1-10)

This register describes MSB of the X coordinate of the nth touch point and the corresponding event flag.

| ADDRESS         | BIT ADDRESS | REGISTER NAME           | DESCRIPTION   |
|-----------------|-------------|-------------------------|---|
| 03h<br>~<br>39h | 7:6         | Event Flag              | 00b: Put Down<br>01b: Put Up<br>10b: Contact<br>11b: Reserved |
|                 | 5:4         |                         | Reserved  |
|                 | 3:0         | Touch X Position [11:8] | MSB of Touch X Position in Pixels                             |

#### TOUCHn\_XL(n:1-10)

This register describes LSB of the X coordinate of the nth touch point.

| ADDRESS         | BIT ADDRESS | REGISTER NAME          | DESCRIPTION                           |
|-----------------|-------------|------------------------|---------------------------------------|
| 04h<br>~<br>3Ah | 7:0         | Touch X Position [7:0] | LSB of the Touch X Position in Pixels |

#### TOUCHn\_YH(n:1-10)

This register describes MSB of the Y coordinate of the nth touch point and corresponding touch ID.

| ADDRESS         | BIT ADDRESS | REGISTER NAME           | DESCRIPTION                       |
|-----------------|-------------|-------------------------|-----------------------------------|
| 05h<br>~<br>3Bh | 7:4         | Touch ID[3:0]           | Touch ID of Touch Point           |
|                 | 3:0         | Touch X Position [11:8] | MSB of Touch Y Position in Pixels |

#### TOUCHn\_YL(n:1-10)

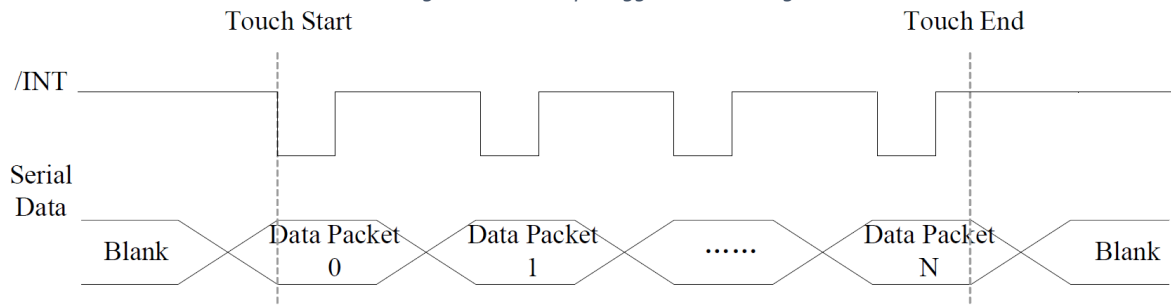
This register describes LSB of the Y coordinate of the nth touch point.

| ADDRESS         | BIT ADDRESS | REGISTER NAME          | DESCRIPTION                           |
|-----------------|-------------|------------------------|---------------------------------------|
| 05h<br>~<br>3Bh | 7:0         | Touch X Position [7:0] | LSB of the Touch Y Position in Pixels |



## 9.8 Interrupt Trigger Mode

Figure 13. Interrupt trigger mode timing



## 10 INSPECTION

Standard acceptance/rejection criteria for TFT module.

### 10.1 Inspection condition

*Ambient conditions:*

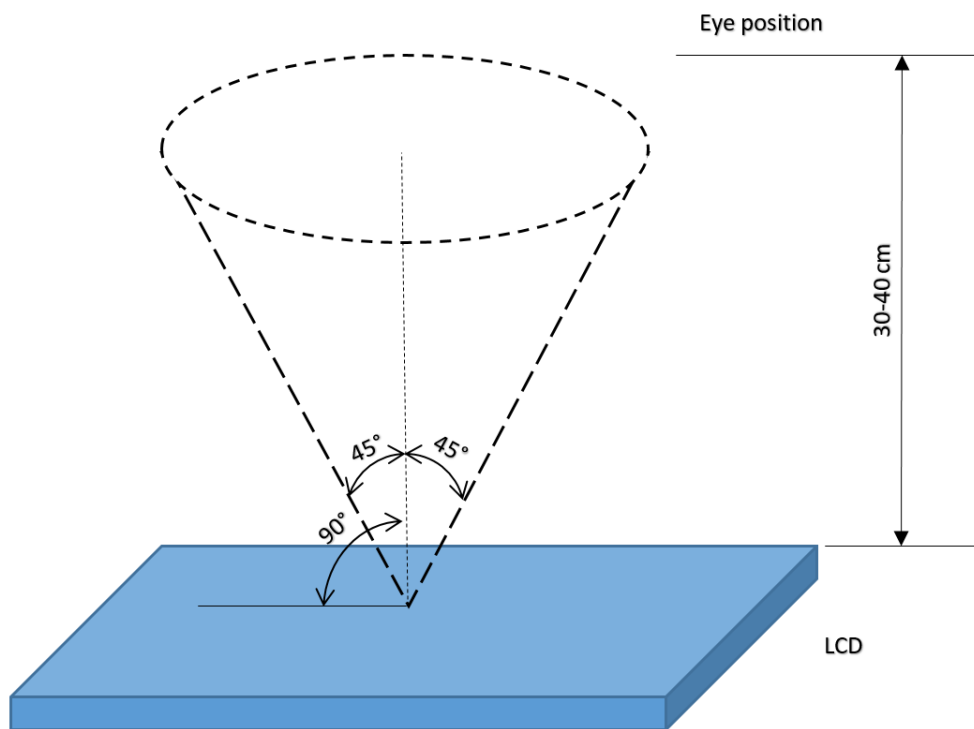
- Temperature:  $25\pm^{\circ}\text{C}$
- Humidity:  $(60\pm 10)\% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

*Viewing distance:*

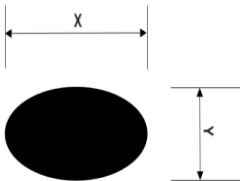
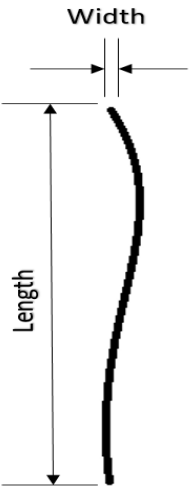
$35\pm 5\text{cm}$  between inspector bare eye and LCD.

*Viewing Angle:*

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



### 10.2 Inspection standard

| Item   | Criterion  |               |  |                  |               |            |               |                     |          |                     |         |                 |   |         |                 |   |          |   |            |  |  |        |       |               |   |          |         |         |                 |   |         |                 |   |          |   |
|--|--|---------------|--|------------------|---------------|------------|---------------|---------------------|----------|---------------------|---------|-----------------|---|---------|-----------------|---|----------|---|------------|--|--|--------|-------|---------------|---|----------|---------|---------|-----------------|---|---------|-----------------|---|----------|---|
| <p><b>Black spots, white spots, light leakage, Foreign Particle (round Type)</b></p> | <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">Size &lt; 5"</th> </tr> <tr> <th>Average Diameter</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>D &lt; 0.2 mm</td> <td>Ignored</td> </tr> <tr> <td>0.2 mm &lt; D &lt; 0.3 mm</td> <td>3</td> </tr> <tr> <td>0.3 mm &lt; D &lt; 0.5 mm</td> <td>2</td> </tr> <tr> <td>0.5 mm &lt; D</td> <td>0</td> </tr> </tbody> </table> </div> <div style="text-align: center; margin: 10px 0;"> <math display="block">D = \frac{(x + y)}{2}</math> </div> <p>*Spots density: 10 mm</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><b>LCD black spots, white spots, light leakage (line Type)</b></p>                | <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="3">Size &lt; 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W &lt; 0.02</td> <td>Ignored</td> </tr> <tr> <td>L &lt; 3.0</td> <td>0.02 &lt; W &lt; 0.05</td> <td rowspan="2">2</td> </tr> <tr> <td>L &lt; 2.5</td> <td>0.05 &lt; W &lt; 0.08</td> </tr> <tr> <td>-</td> <td>0.08 &lt; 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 &gt;= 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W &lt; 0.02</td> <td>Ignored</td> </tr> <tr> <td>L &lt; 3.0</td> <td>0.02 &lt; W &lt; 0.05</td> <td rowspan="2">4</td> </tr> <tr> <td>L &lt; 2.5</td> <td>0.05 &lt; W &lt; 0.08</td> </tr> <tr> <td>-</td> <td>0.08 &lt; W</td> <td>0</td> </tr> </tbody> </table> </div> <p>*Spots density: 10 mm</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"                        |               |
|                                   | <b>Average Diameter</b>          | Qualified Qty |
|                                   | <b>D &lt; 0.2 mm</b>             | Ignored       |
|                                   | <b>0.2 mm &lt; D &lt; 0.3 mm</b> | 3             |
|                                   | <b>0.3 mm &lt; D &lt; 0.5 mm</b> | 2             |
|                                   | <b>0.5 mm &lt; D</b>             | 0             |
|                                   | Size >= 5"                       |               |
|                                   | <b>Average Diameter</b>          | Qualified Qty |
|                                   | <b>D&lt;0.2 mm</b>               | Ignored       |
|                                   | <b>0.2 mm &lt; D &lt; 0.3 mm</b> | 4             |
|                                   | <b>0.3 mm &lt; D &lt; 0.5 mm</b> | 2             |
|                                   | <b>0.5 mm &lt; D</b>             | 0             |
|                                   | *Spots density: 10 mm            |               |
|                                   | Polarizer bubbles                | Size < 5"     |
| <b>Average Diameter</b>           |                                  | Qualified Qty |
| <b>D &lt; 0.2 mm</b>              |                                  | Ignored       |
| <b>0.2 mm &lt; D &lt; 0.5 mm</b>  |                                  | 3             |
| <b>0.5 mm &lt; D &lt; 1 mm</b>    |                                  | 2             |
| <b>1 mm &lt; D</b>                |                                  | 0             |
| <b>Total Q'ty</b>                 |                                  | 3             |
| Size >= 5"                        |                                  |               |
| <b>Average Diameter</b>           |                                  | Qualified Qty |
| <b>D&lt;0.25 mm</b>               |                                  | Ignored       |
| <b>0.25 mm &lt; D &lt; 0.5 mm</b> |                                  | 3             |
| <b>0.5 mm &lt; D</b>              |                                  | 0             |
| Electrical Dot Defect             |                                  | Size < 5"     |
|                                   |                                  | <b>item</b>   |
|                                   | <b>Black do defect</b>           | 4             |
|                                   | <b>Bright dot defect</b>         | 2             |
|                                   | <b>Total Dot</b>                 | 5             |
|                                   | Size >= 5"                       |               |
|                                   | <b>item</b>                      | Qualified Qty |
|                                   | <b>Black do defect</b>           | 5             |
|                                   | <b>Bright dot defect</b>         | 2             |
|                                   | <b>Total Dot</b>                 | 5             |

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

## 11 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<br>(30min.) (5min.) (30min.)  |
| 6   | Damp Proof Test            | 60°C ±5°C × 90%RH/240hours  |
| 7   | Vibration Test             | Frequency 10Hz~55Hz<br>Amplitude of vibration: 1.5mm<br>Sweep: 10Hz~55Hz~10Hz<br>X, Y, Z 2 hours for each direction.          |
| 8   | Package Vibration Test     | Random vibration :0.15G*/HZ from<br>5-200HZ, -6dB/Octave from 200-500HZ<br>of each direction of X.Y. Z<br>(6 hours for total) |
| 9   | Package Drop Test          | Height:60 cm<br>1 corner,3 edges,6 surfaces   |
| 10  | ESD Test                   | ± 2KV, Human body mode,100pF/1500Ω  |
| 11  | Mechanical Shock           | 100G 6ms, X, Y, Z 3 times for each<br>direction   |

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