



## RVT70AQSFWN36

### LCD TFT Datasheet

Rev.1.5  
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 × 9.68	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	400	cd/m <sup>2</sup>
Interface Type	Parallel 8/16b (i80 by default)	/
Color Depth	262k	/
Pixel Arrangement	RGB Vertical Stripe	/
Surface Treatment	Anti-glare	
Input Voltage	3.3	V
With/Without TSP	Without Touch Panel	/
Weight	209.5	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	2015-04-27	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	

## CONTENTS

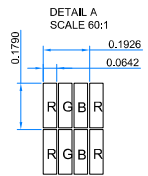
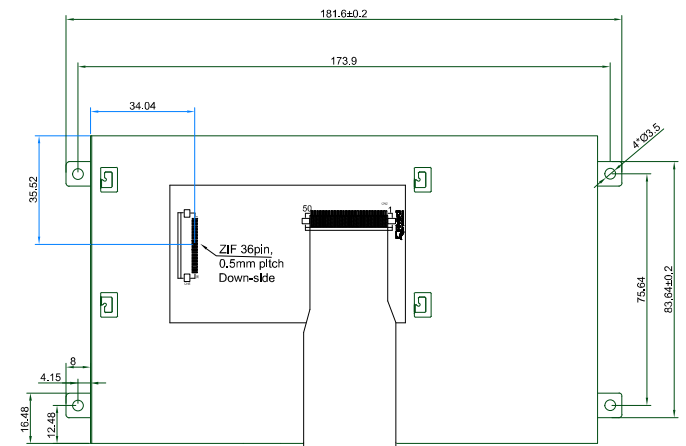
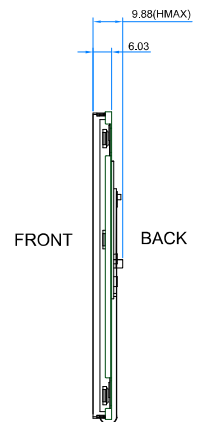
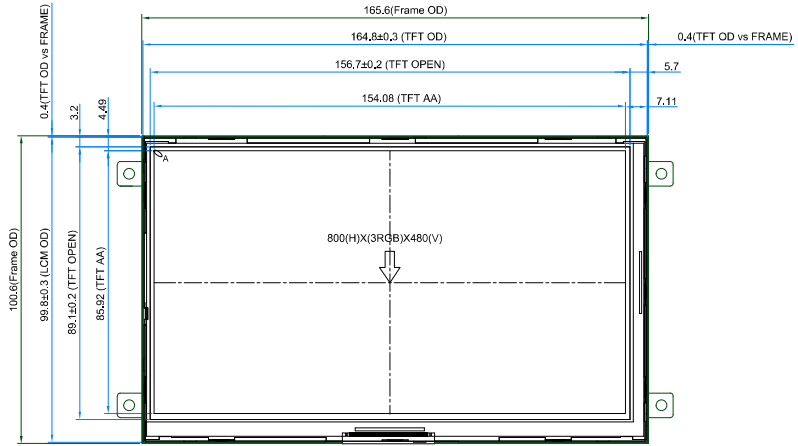
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## 1 MODULE CLASSIFICATION INFORMATION

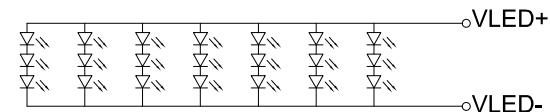
<b>RV</b>	<b>T</b>	<b>70</b>	<b>A</b>	<b>Q</b>	<b>S</b>	<b>F</b>	<b>W</b>	<b>N</b>	<b>36</b>
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

1.	<b>BRAND</b>	<b>RV – Riverdi</b>
2.	<b>PRODUCT TYPE</b>	<b>T – TFT Standard</b> F – TFT Custom
3.	<b>DISPLAY SIZE</b>	<b>35 – 3.5”</b> <b>43 – 4.3”</b> <b>57 – 5.7”</b> <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> <b>L – TFT LCD, LVDS</b> <b>S – TFT + Controller SSD1963</b> <b>F – TFT + Controller FT801</b>
7.	<b>FRAME</b>	<b>N – No Frame</b> <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> <b>R – Resistive Touch Panel</b> <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	NC
25	CS
26	RESET
27	L/R
28	U/D
29	NC
30	NC
31	NC
32	NC
33	BLGND
34	BLGND
35	BLVDD
36	BLVDD



Internal Backlight LED Circuit



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, POSITIVE
  2. OPERATING VOLTAGE: VDD=3.3V
  3. VIEWING DIRECTION: 12 O'CLOCK.
  4. IC DRIVER: SSD1963
  5. OPERATING TEMP: -20°C ~ 70°C.
  6. STORAGE TEMP: -30°C ~ 80°C.
  7. LED BACKLIGHT: 21-CHIP WHITE LED, BUILT-IN INVERTER.
  8. LCM SURFACE LUMINANCE: 400cd/m<sup>2</sup>.
  9. GENERAL TOLERANCE: ±0.2.
  10. RoHS COMPLIANT.

1.1	Update PIN description	2015.10.12
1.1	Update Notes	2015.04.24
1.0	Initial case	2015.03.01
Ver.	DESCRIPTION	DATE

CUSTOMER		DATE	
DRAWN		SCALE	1:1
DFTG CHK		UNIT	mm
ENGR CHK		MODEL	
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
LED reverse voltage (each LED)	VR	-	1.2	V
Input Voltage For LED Inverter	BLVDD	-0.3	7.0	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	$\theta=0^\circ$	-	20	35	ms	FIG 1.	4
Contrast Ratio	Cr	$\phi=0^\circ$	400	500	-	---	FIG 2.	1
Luminance Uniformity	$\delta$ WHITE	Ta=25	70	75	-	%	FIG 2.	3
Surface Luminance	Lv		-	400	-	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	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

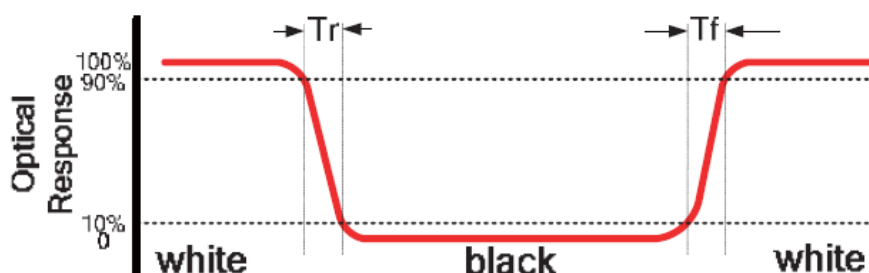


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

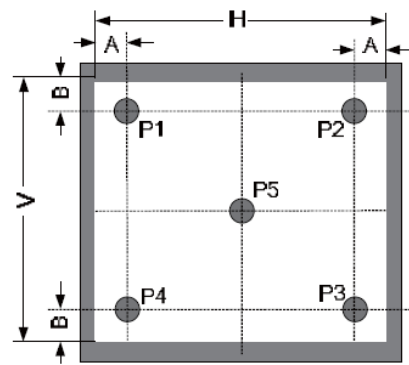
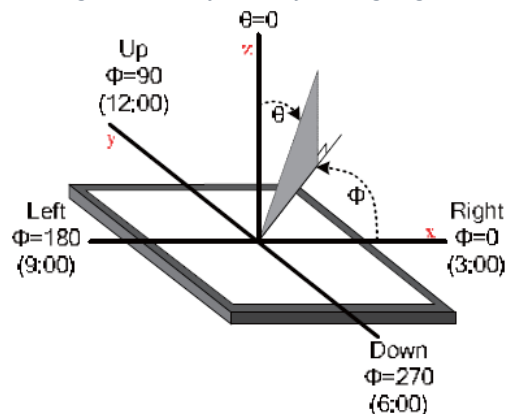


Figure 3. The definition of viewing angle



## 6 INTERFACE DESCRIPTION

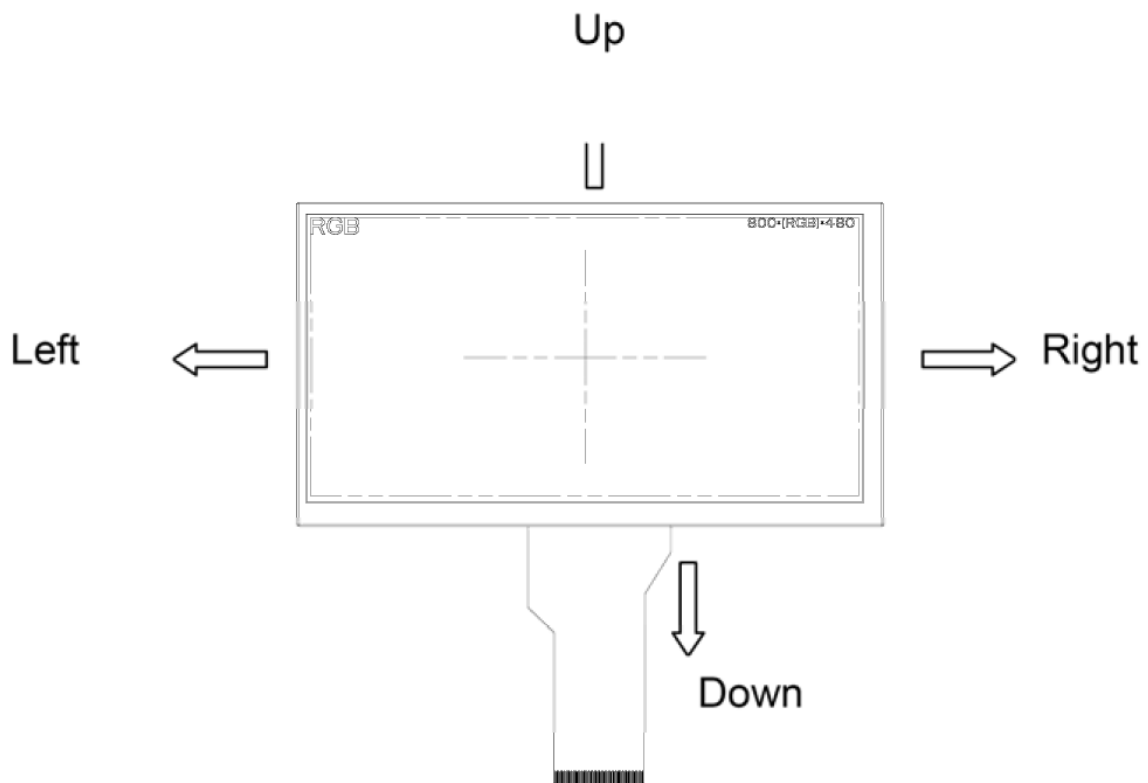
PIN NO.	SYMBOL	I/O	DESCRIPTION	REMARK
1	GND	P	Power Ground	
2	VDD	P	Power Supply: +3.3V	
3	BL_E	I	Backlight Control Signal, H: On/L: Off (internally pulled-up)	
4	D/C	I	Data/Command Select	
5	WR	I	Write Strobe Signal	
6	RD	I	Read Strobe Signal	
7-22	D0-D15	I	Data Bus. Pins not used should be floating.	
23	NC	-	No Connection	
24	NC	-	No Connection	
25	CS	I	Chip Select	
26	RESET	I	Hardware reset	
27	L/R	I	Left / Right Selection	1, 2, 3, 4
28	U/D	I	Up / Down Selection	1, 2, 3, 4
29	NC	-	No Connection	
30	NC	-	No Connection	
31	NC	-	No Connection	
32	NC	-	No Connection	
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 (can be connected to VDD)	
36	BLVDD	-	Power supply for B/L LED Inverter (can be connected to VDD)	

**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)

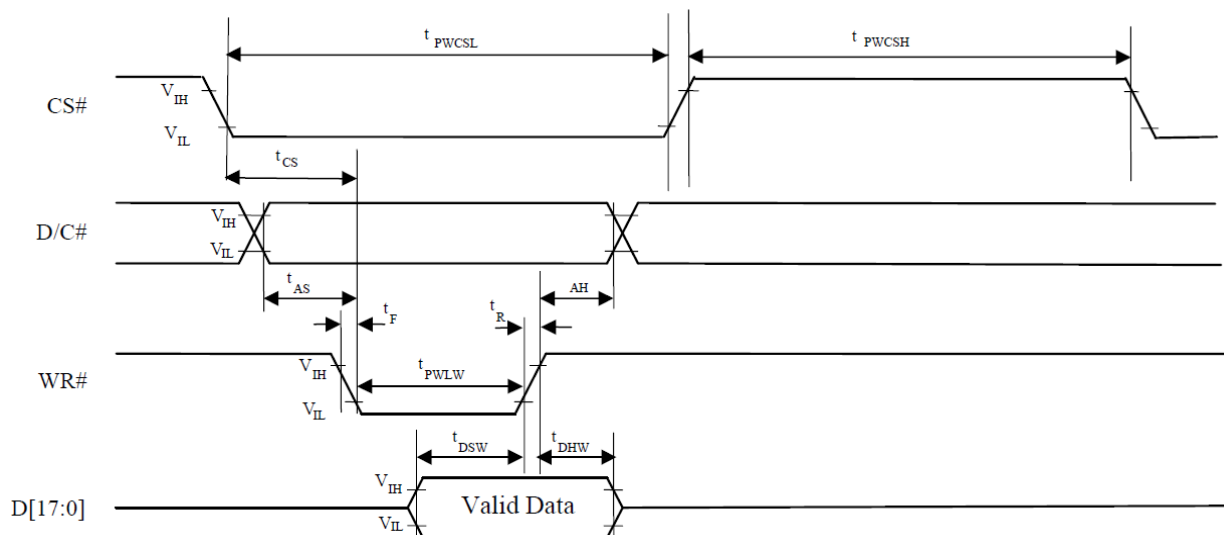
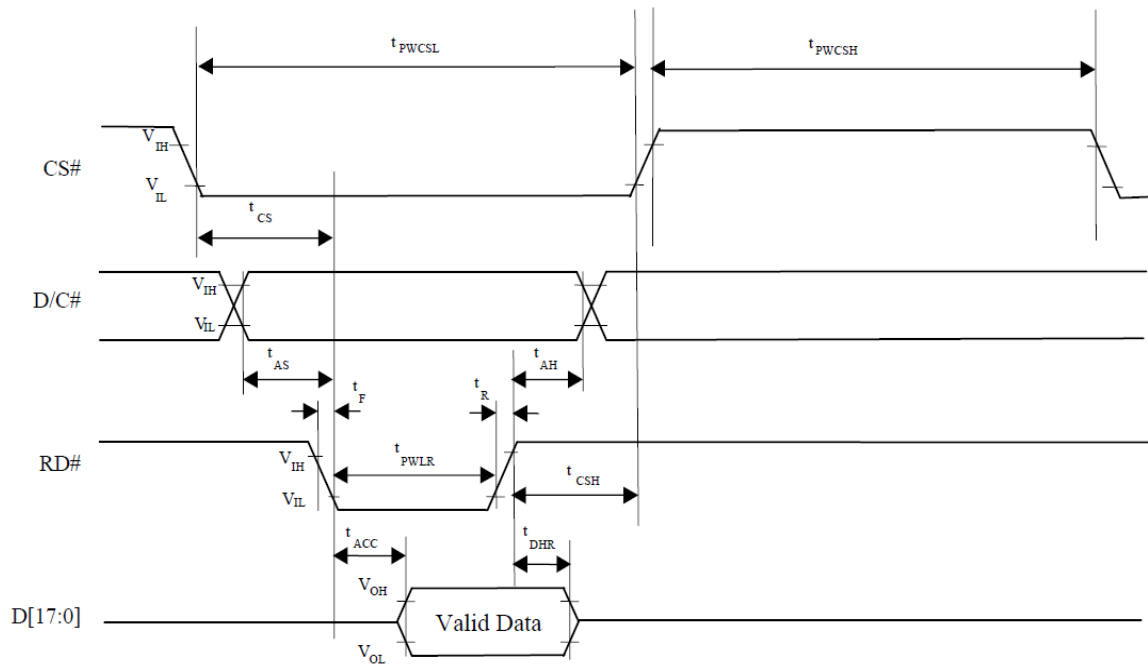


Figure 6. Parallel 8080-series Interface Timing Diagram (Read Cycle)



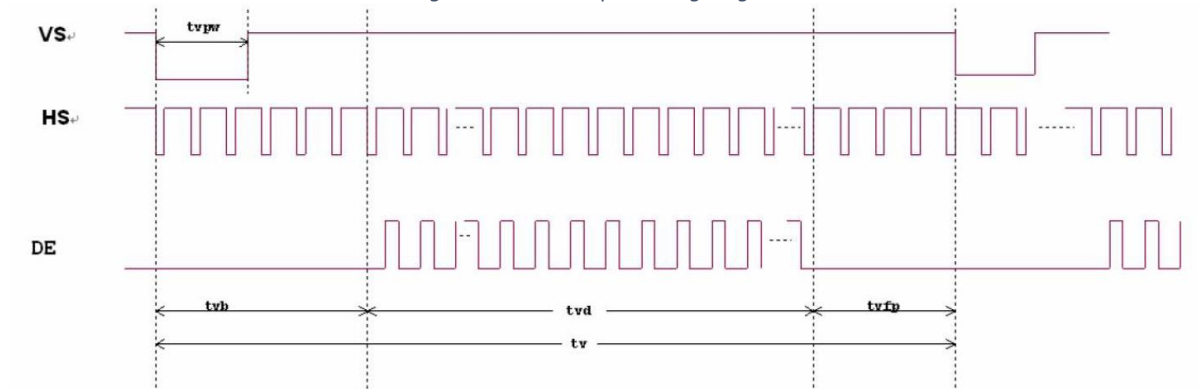
## 8 LCD TIMING CHARACTERISTICS

### 8.1 Clock and data input time diagram

Figure 7. Horizontal input timing diagram



Figure 8. Vertical input timing diagram



### 7.1. 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 INSPECTION

Standard acceptance/rejection criteria for TFT module.

### 9.1 Inspection condition

*Ambient conditions:*

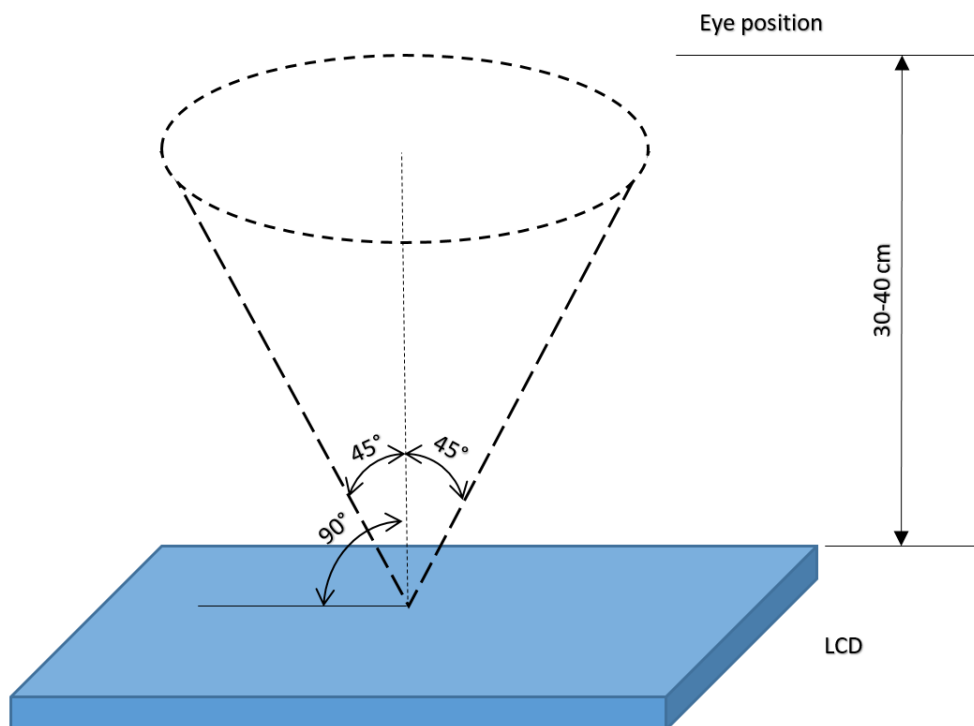
- Temperature:  $25\pm^{\circ}\text{C}$
- Humidity:  $(60\pm 10)\ \%RH$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

*Viewing distance:*

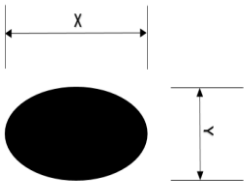
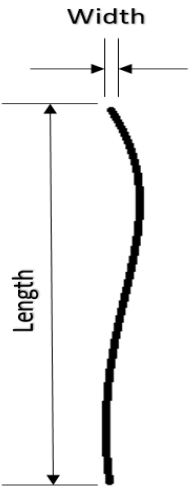
$35\pm 5\text{cm}$  between inspector bare eye and LCD.

*Viewing Angle:*

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



9.2 Inspection standard

Item	Criterion																																		
<p><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" style="background-color: #cccccc;">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" style="background-color: #cccccc;">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="margin-top: 20px;"> <table border="1"> <thead> <tr> <th colspan="3" style="background-color: #cccccc;">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 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	

## 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 Vibration Test	Random vibration :0.15G*G/HZ from 5-200HZ, -6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total)
9	Package Drop Test	Height:60 cm 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 direction

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