



## RVT4.3A480272TNWC00

### LCD TFT Datasheet

Rev.2.0.0

2017-05-26

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 )	105.50 x 67.20 x 4.70	mm <sup>3</sup>
Active Area (W × H)	95.04 × 53.86	mm <sup>2</sup>
Dot Pitch (W × H)	0.066 × 0.198	mm <sup>2</sup>
Number Of Dots	480 (RGB) × 272	/
Driver IC	HX8257A + FT5306	/
Backlight Type	10 LEDs	/
Surface Luminance	500	cd/m <sup>2</sup>
Interface Type	24bit RGB	/
Color Depth	16.7M	/
Pixel Arrangement	RGB Vertical Stripe	/
Surface Treatment	Anti-glare	
Input Voltage	3.3	V
With/Without TSP	Projected Capacitive Touch Panel	/
Weight	59	g

**Note 1:** RoHS compliant

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

## REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.1	2014-11-21	Initial Release.	
1.2	2014-12-04	Add HVDSL pin information, add touch panel detailed information	
1.3	2015-01-19	Update product thickness, update LED lifetime, add CTP interface description	
1.4	2015-02-06	Update dimensions information on mechanical drawing	
1.5	2015-02-24	Update Color Depth	
1.6	2015-04-16	Update Interface Description	
1.7	2015-05-21	Update Mechanical drawing	
1.8	2015-06-12	Update Surface Treatment	
1.9	2016-02-02	Update Touch Panel dimensions and total thickness	
1.10	2016-08-12	Added Inspection Standards	
2.0.0	2017-05-25	Glass change, new TFT open dimension, FFC shape, new TFT IC controller	

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## 1 MODULE CLASSIFICATION INFORMATION

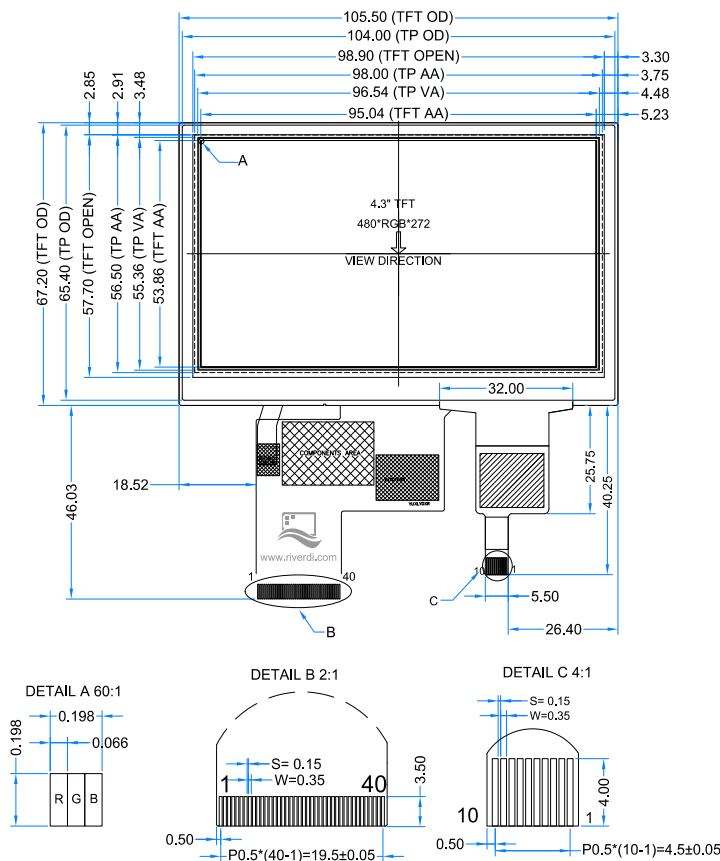
<b>RV</b>	<b>T</b>	<b>4.3</b>	<b>A</b>	<b>480272</b>	<b>T</b>	<b>N</b>	<b>W</b>	<b>C</b>	<b>00</b>
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

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

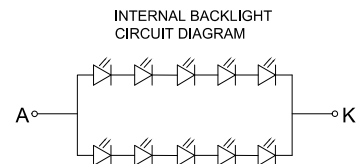
# LCD TFT Datasheet Rev.2.0.0

## RVT4.3A480272TNWC00

TFT PINOUT	
PIN	DESC
1	VLED-
2	VLED+
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
  2. RESOLUTION: 480x272
  3. VIEWING DIRECTION: 12 O'CLOCK
  4. TFT IC CONTROLLER: HX8257A
  5. TP IC CONTROLLER: FT5306
  6. OPERATING TEMP.: -20°C ~ 70°C
  7. STORAGE TEMP.: -30°C ~ 80°C
  8. LED BACKLIGHT: 10-LED WHITE
  9. SURFACE LUMINANCE: 500 cd/m<sup>2</sup>
  10. OPERATING VOLTAGE: 3.3V
  11. GENERAL TOLERANCE: ±0.2
  12. RoHS COMPLIANT



2.0.0	Glass change, new TFT open dimension, FFC shape. New IC controller and updated pinout.	2017.05.26
Ver.	DESCRIPTION	DATE

CUSTOMER APVL
DRAWN
DFTG CHK
ENGR CHK
APPROVAL
<b>RIVERDI SP. Z</b>

### 3 ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage For LCD Logic	VDD	-0.3	4.5	V
Supply Voltage For CTP Logic	VDD-VSS	-0.3	3.6	V
Input Voltage For Logic	VIN	VSS-0.5	VDD	V
LED forward current (each LED)	IF	-	25	mA
Operating Temperature	T <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

### 4 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage For Module	VDD	3.0	3.3	3.6	V	
Input Current	IDD	-	19.5	TBD	mA	VDD = 3.3V
Input Voltage 'H' level	V <sub>IH</sub>	0.7VDD	-	VDD	V	
Input Voltage 'L' level	V <sub>IL</sub>	VSS	-	0.3VDD	V	

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

### 5 BACKLIGHT CHARACTERISTICS

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V <sub>I</sub>	15.0	16.0	17.0	V
Current for LED backlight	I <sub>I</sub>	-	40	60	mA
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.

### 6 ELECTRO-OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time	Tr+Tf	θ=0° φ=0° 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 <sup>2</sup>	Figure 2	2
Viewing Angle Range	θ	φ = 90°	35	50	-	deg	Figure 3	6
		φ = 270°	55	70	-	deg	Figure 3	
		φ = 0°	55	70	-	Deg	Figure 3	
		φ = 180°	55	70	-	Deg	Figure 3	
CIE (x, y) Chromaticity	Red	θ=0° φ=0° Ta=25	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  $\delta$  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 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.

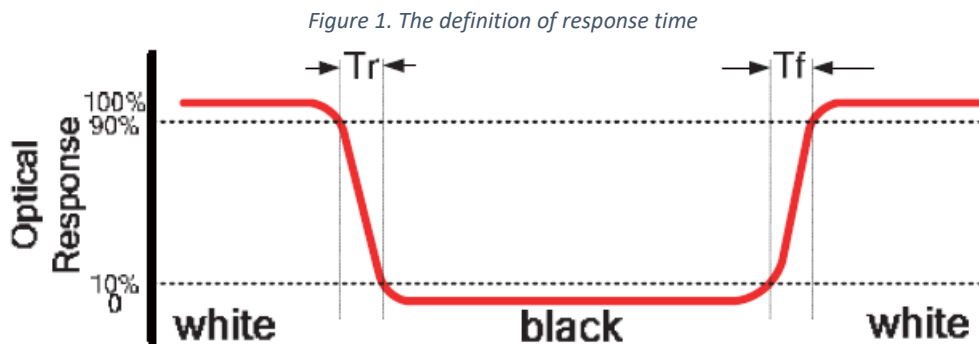


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

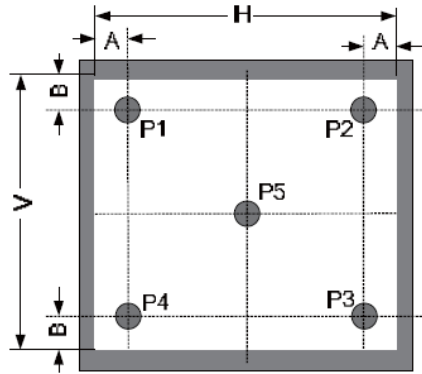
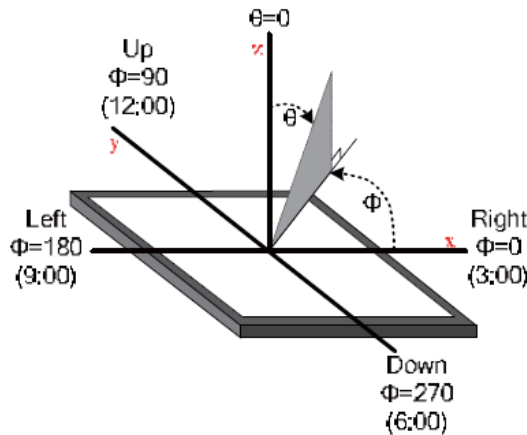


Figure 3. The definition of viewing angle



## 7 INTERFACE DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	VLED-	Cathode Of LED Backlight	
2	VLED+	Anode Of LED Backlight	
3	GND	Power Ground	
4	VDD	Power Voltage	
5-12	R0-R7	Red Data (R0-LSB, R7-MSB)	
13-20	G0-G7	Green Data (G0-LSB, G7-MSB)	
21-28	B0-B7	Blue Data (B0-LSB, B7-MSB)	
29	GND	Power Ground	
30	DCLK	Pixel Clock	
31	DISP	Display On/Off	
32	HSYNC	Horizontal Sync Signal	
33	VSNC	Vertical Sync Signal	
34	DE	Data Enable	
35	NC	No Connect	
36	GND	Power Ground	
37	NC	No Connect	
38	NC	No Connect	
39	NC	No Connect	
40	NC	No Connect	

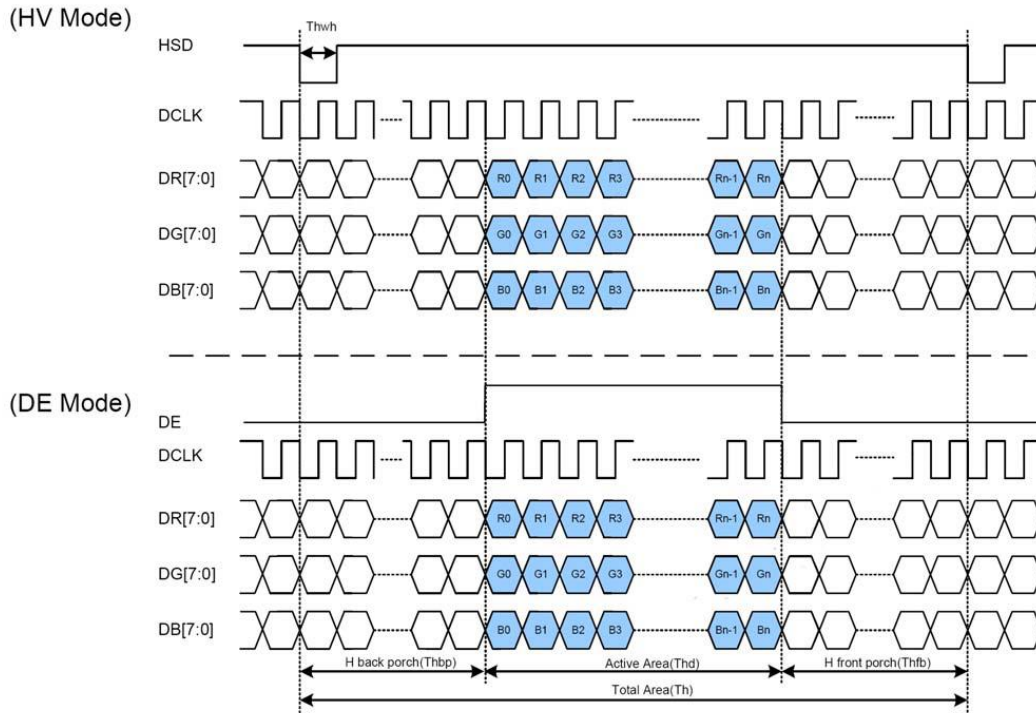
**Note 1:** Displays marked with „rev.2.0” printing, have the ability to select the operating mode: HV mode or DE mode. HVDSL=“H”: Set under HV mode, VSD and HSD signal have to provide by system. HVDSL=“L”: Set under DE mode, DE signal have to provide by system. By default: Internal pulled weak low.



## 8 LCD TIMING CHARACTERISTICS

### 8.1 Clock and data input time diagram

Figure 4. Clock and data input time diagram



### 8.2 Parallel RGB input timing table

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
DCLK Frequency	Fclk	5	9	12	MHz
VSD Period Time	Tv	277	288	400	H
VSD Display Area	Tvd		272		H
VSD Back Porch	Tvb	3	8	31	H
VSD Front Porch	Tvfp	2	8	97	H
HSD Period Time	Th	520	525	800	DCLK
HSD Display Area	Thd		480		DCLK
HSD Back Porch	Thbp	36	40	255	DCLK
HSD Front Porch	Thfp	4	5	65	DCLK

## 9 CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

### 9.1 Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	4.3 inch	
Outline Dimension (OD)	104.0mm x 65.4mm	Cover Lens Outline
Product Thickness	1.7mm	
Glass Thickness	0.7mm	
Ink View Area	96.54mm x 55.36mm	
Sensor Active Area	98.0mm x 56.5mm	
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
	Sleep Mode
Interface	I <sup>2</sup> C
Linearity	<1.5%
Controller	FT5306
I2C address	0x38 (7 bit address)
Resolution	1280*768

### 9.3 Interface description

PIN NO.	SYMBOL	DESCRIPTION	REMARK
1	VSS	Power Ground	
2	VDD	Power For CTP	
3	SCL	I2C SCL	
4	NC	-	
5	SDA	I2C SDA	
6	NC	-	
7	/RST	Reset pin	
8	/WAKE	Wake signal from host	
9	/INT	Interrupt signal from CTP	
10	VSS	Power Ground	

9.4 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

9.5 I2C Read/Write Interface Description

Figure 5. Write N bytes to I2C slave

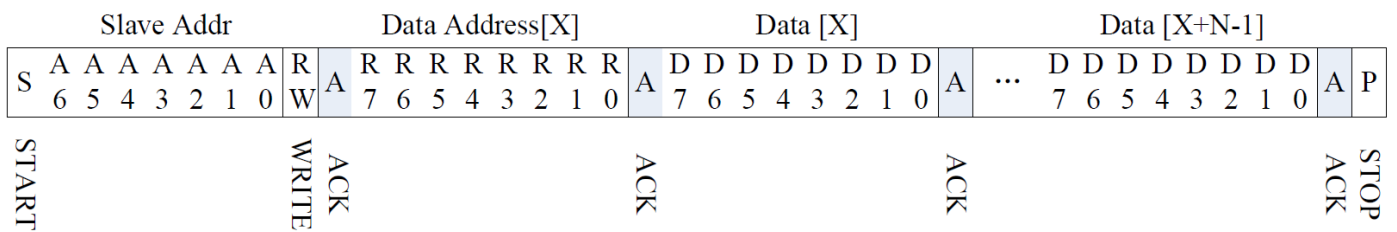


Figure 6. Set Data Address

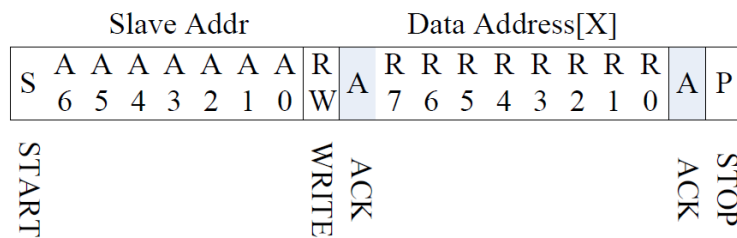
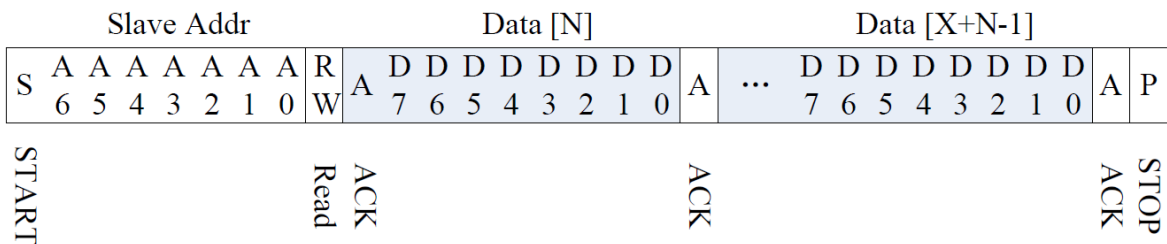
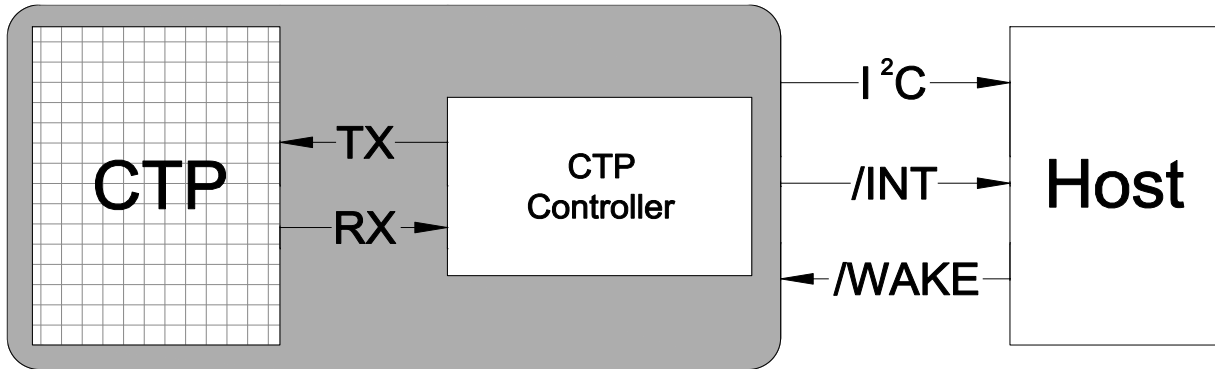


Figure 7. Read X bytes from I2C Slave



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

Figure 8. Communication of the I<sup>2</sup>C interface with Host



9.7 Touch data read protocol

ADDRESS	NAME	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	HOST ACCESS
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

9.8 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 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 0x10 Move Up 0x14 Move Down 0x18 Move Right 0x48 Zoom In 0x49 Zoom Out 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 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 ~ 39h	7:6	Event Flag	00b: Put Down 01b: Put Up 10b: Contact 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 ~ 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 ~ 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

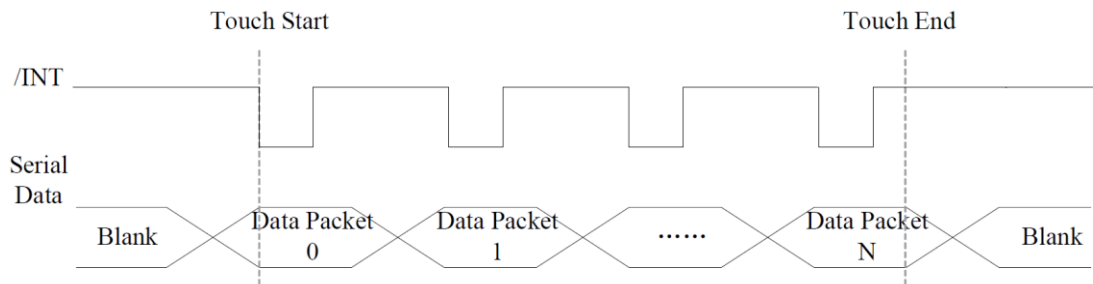
**TOUCHn\_YL(n:1-10)**

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

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

9.9 Interrupt Trigger Mode

Figure 9. Interrupt trigger mode timing



## 10 INSPECTION

Standard acceptance/rejection criteria for TFT module.

### 10.1 Inspection condition

*Ambient conditions:*

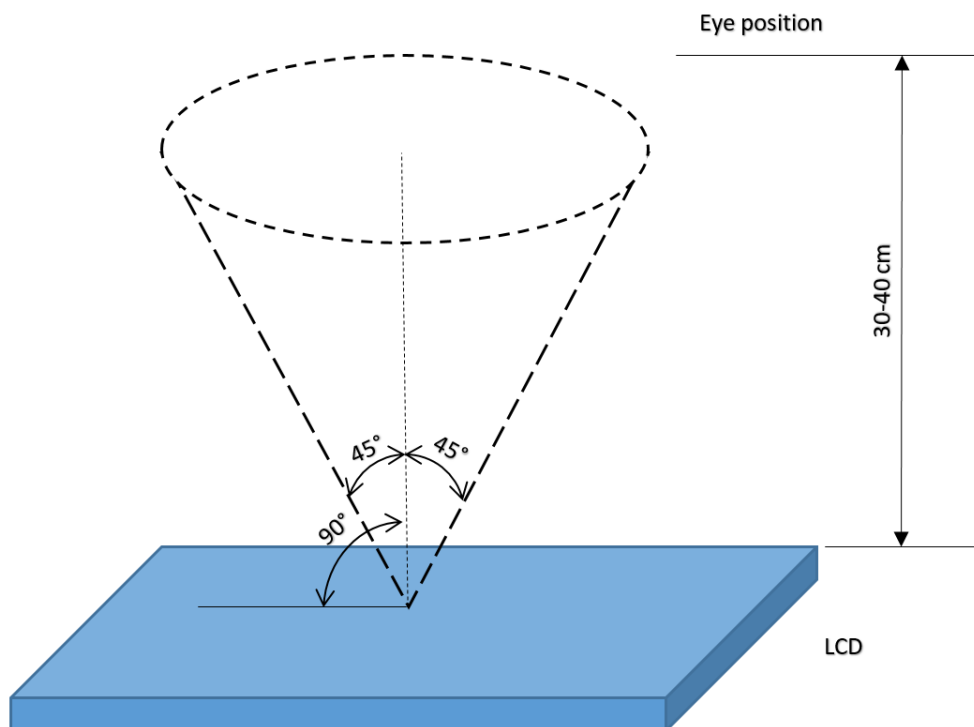
- Temperature:  $25\pm^{\circ}\text{C}$
- Humidity:  $(60\pm 10)\%RH$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

*Viewing distance:*

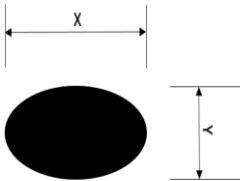
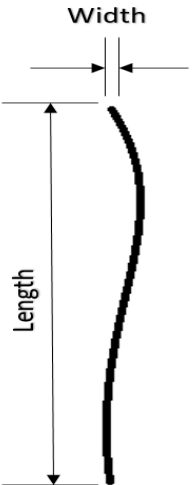
$35\pm 5\text{cm}$  between inspector bare eye and LCD.

*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<sup>2</sup></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<sup>2</sup></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
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-	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	

## 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 (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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