

 <b>深圳市福瑞达显示技术有限公司</b> <b>SHENZHEN FRIDA LCD CO.,LTD</b>	Doc.No.: FRD101B31002-A	
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# PRODUCT SPECIFICATION

## TFT-LCD MODULE

### Model No: FRD101B31002-A

<b>For Customer's Acceptance</b>	
<b>Approved by</b>	<b>Comment</b>

	<b>Signature</b>	<b>Date</b>
<b>Prepared by</b>		<b>2021.06.30</b>
<b>Checked by</b>		<b>2021.06.30</b>
<b>Approved by</b>		<b>2021.06.30</b>

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### 1. Document Revision History :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY
A	2021-06-30	First Release.	

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## 2. General Description

No	Item	Specification	Remark
1	Screen Size	10.1 inch	
2	Display Mode	Normally Black	IPS
3	Resolution	800× RGB ×1280	
4	Active Area	135.36*216.58	mm
5	Outline Dimension	143*228.6*2.58	mm
6	Viewing Direction	ALL	
7	Driver IC	ILI9881C-0HT00GA	
8	Interface	MIPI	
9	Back Light	White Led*27	
10	Touch Panel	-	



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#### 4. Interface Specification

Pin No	Symbol	Description	Note
1-3	LEDA	Power supply for LED backlight anode input.	
4	VPP	Input power for OTP programming. MTP_PWR=8.5V. When not under programming,let MTP_PWR float or connect to GND.	
5-8	LEDK	Power supply for LED backlight cathode input.	
9-10	GND	Ground.	
11	MIPI_D2+	Positive polarity of low voltage differential data 2 signal.	
12	MIPI_D2-	Negative polarity of low voltage differential data 2 signal.	
13	GND	Ground.	
14	MIPI_D1+	Positive polarity of low voltage differential data 1 signal.	
15	MIPI_D1-	Negative polarity of low voltage differential data 1 signal.	
16	GND	Ground.	
17	MIPI_CLK+	Positive polarity of low voltage differential clock signal.	
18	MIPI_CLK-	Negative polarity of low voltage differential clock signal.	
19	GND	Ground.	
20	MIPI_D0+	Positive polarity of low voltage differential data 0 signal.	
21	MIPI_D0-	Negative polarity of low voltage differential data 0 signal.	
22	GND	Ground.	
23	MIPI_D3+	Positive polarity of low voltage differential data 3 signal.	
24	MIPI_D3-	Negative polarity of low voltage differential data 3 signal.	
25	GND	Ground.	
26	VDDIO/1.8V	Power supply for I/O block.	
27	RESET	Reset signal input Pin.Please make sure its same as the logical voltage when its "High".	
28	NC	Non connection.	
29	VDDIO/1.8V	Power supply for I/O block.	
30-31	VDD/3.3V	Power Supply For LCD.	

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## 5. Absolute Maximum Ratings

### Electrical Maximum Ratings – for IC Only

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VDD)	VDD	-0.3	+7.0	V	1&2
Power supply voltage (VDDIO)	VDDIO	-0.3	+3.8	V	1&2

Note:

- 1.VDDIO,VDD, GND must be maintained.
- 2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

## 6. Electrical Specifications

At Ta = 25 °C, VDD = 2.5V to 3.6V, VDDIO = 1.65V to 3.6V ,GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (analog)	VDD-GND		2.5	2.8	3.6	V
Supply voltage (logic)	VDDIO-GND		1.65	2.8	3.6	V
Supply voltage of white LED backlight	VLED	Forward current =180mA Number of LED = 27	8.1	9	9.9	V

## 7. Timing Characteristics

### High Speed Mode – Clock Channel Timing

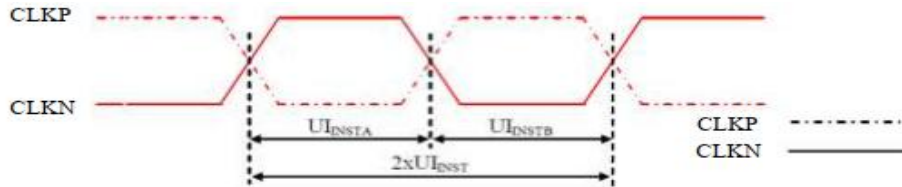


Figure 116: DSI Clock Channel Timing

Table 38: DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
CLKP/N	$2xUI_{INST}$	Double UI instantaneous	Note 2	25	ns
CLKP/N	$UI_{INSTA}, UI_{INSTB}$ (Note 1)	UI instantaneous Half	Note 2	12.5	ns

**Notes:**

1.  $UI = UI_{INSTA} = UI_{INSTB}$
2. Define the minimum value, see Table 39.

Table 39: Limited Clock Channel Speed

Data type	Two Lanes speed	Three Lanes speed	Four Lanes speed
Data Type = 00 1110 (0Eh), RGB 565, 16 UI per Pixel	566 Mbps	466 Mbps	366 Mbps
Data Type = 01 1110 (1Eh), RGB 666, 18 UI per Pixel	637 Mbps	525 Mbps	412 Mbps
Data Type = 10 1110 (2Eh), RGB 666 Loosely, 24 UI per Pixel	850 Mbps	700 Mbps	550 Mbps
Data Type = 11 1110 (3Eh), RGB 888, 24 UI per Pixel	850 Mbps	700 Mbps	550 Mbps

### High Speed Mode – Data Clock Channel Timing

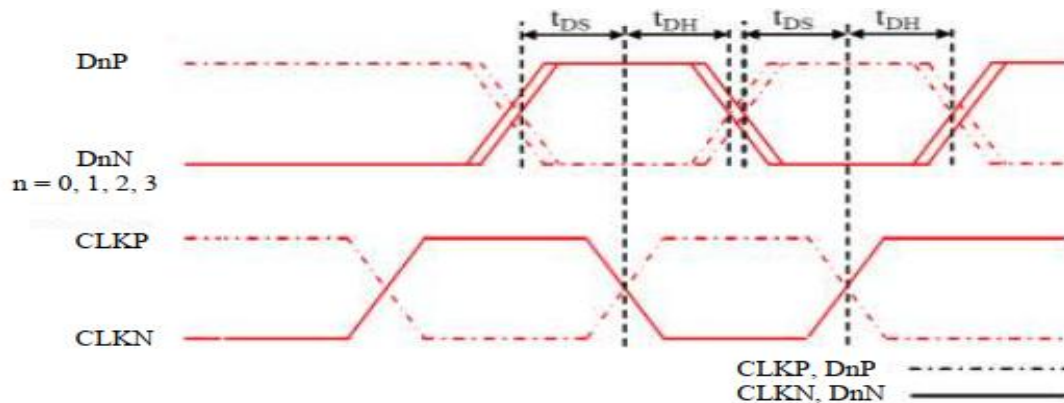


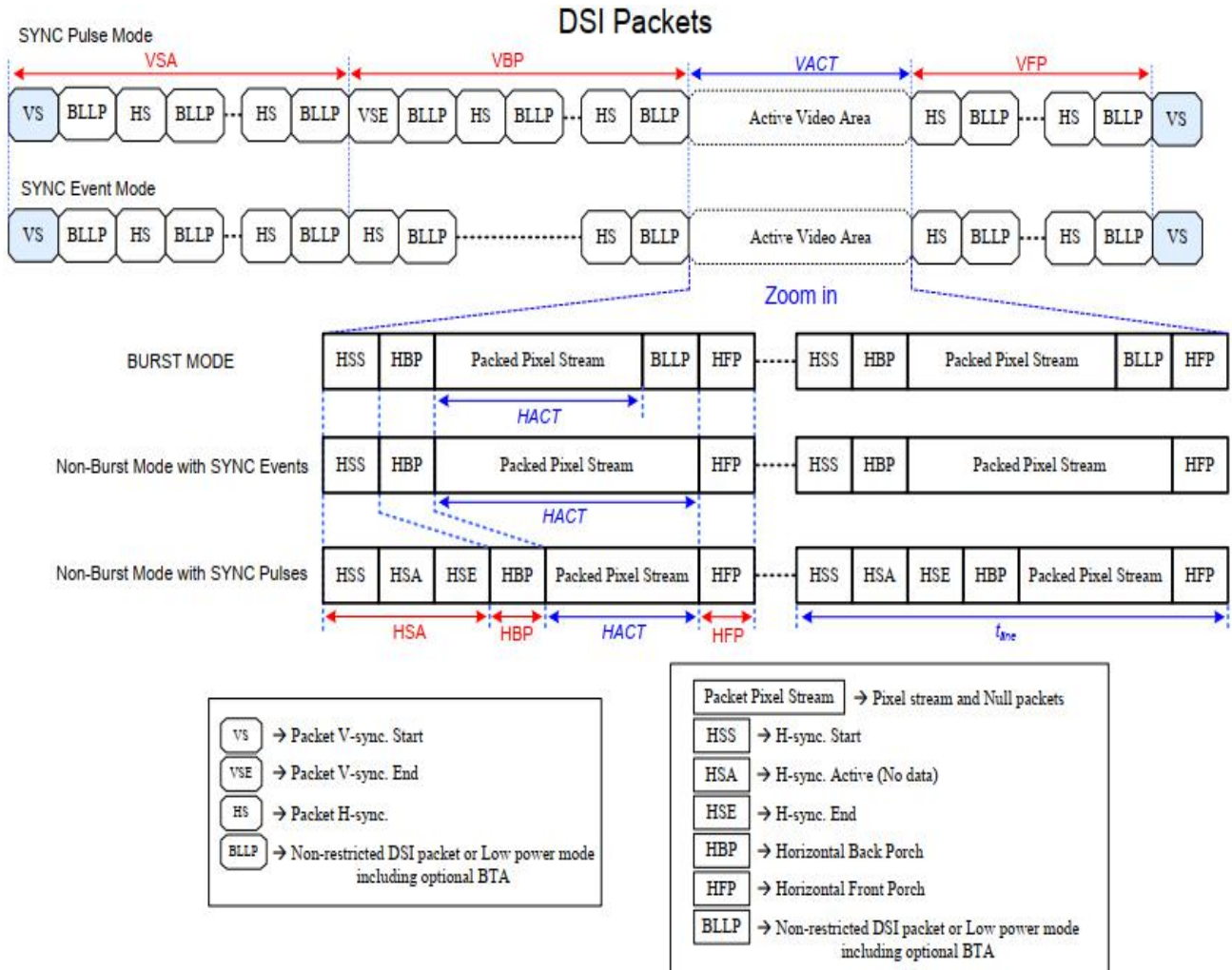
Figure 117: DSI Data to Clock Channel Timings

Table 40: DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DnP/N, n=0,1,2,3	$t_{DS}$	Data to Clock Setup time	$0.15xUI$	-
	$t_{DH}$	Clock to Data Hold Time	$0.15xUI$	-



### Timing for DSI video mode

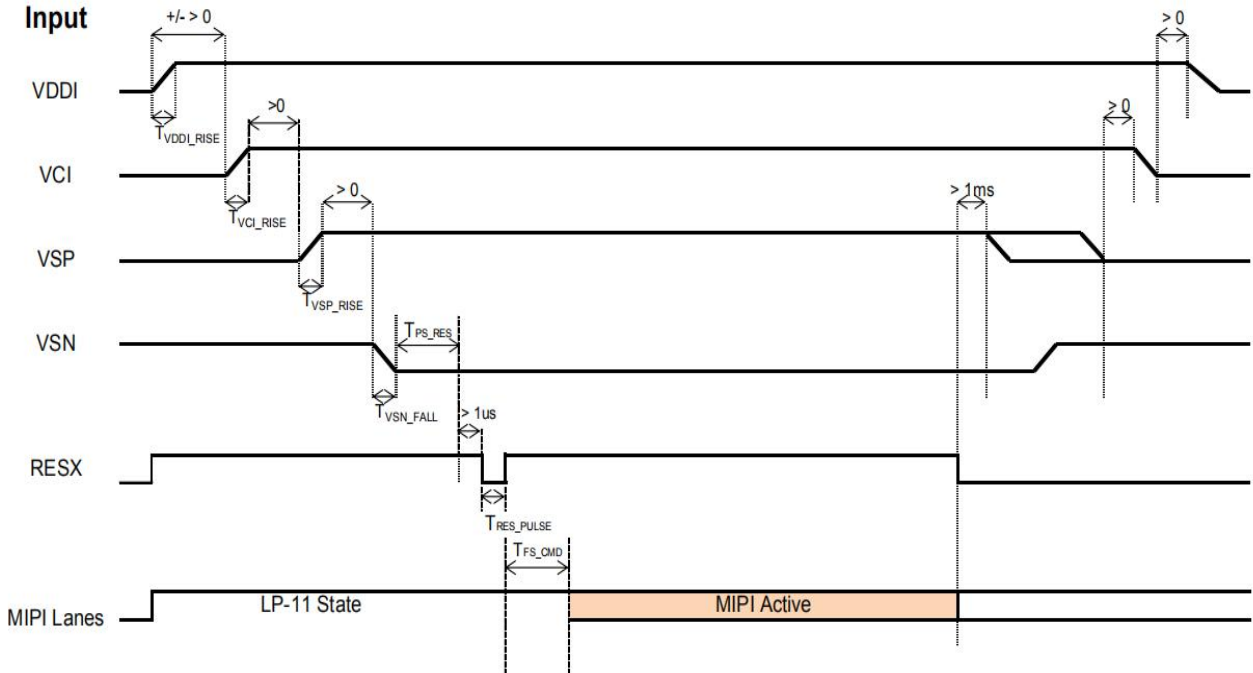


Parameters	Symbols	Min.	Typ.	Max.	Units
Vertical sync. active	VSA	2 (Note 6)	-	-	Line
Vertical Back Porch	VBP	14 (Note 6)	-	-	Line
Vertical Front Porch	VFP	8 (Note 6)	-	-	Line
Active lines per frame	VACT	-	1280	-	Line
Horizontal sync. active	HSA	2	-	-	Pixel
Horizontal Porch period	HSA + HBP + HFP	1.6	-	-	us
Active pixels per line	HACT	-	720	-	Pixel
Bit rate	BR <sub>ops</sub>	385		Note 5	Mbps/lane

## 8. Power Supply Configuration

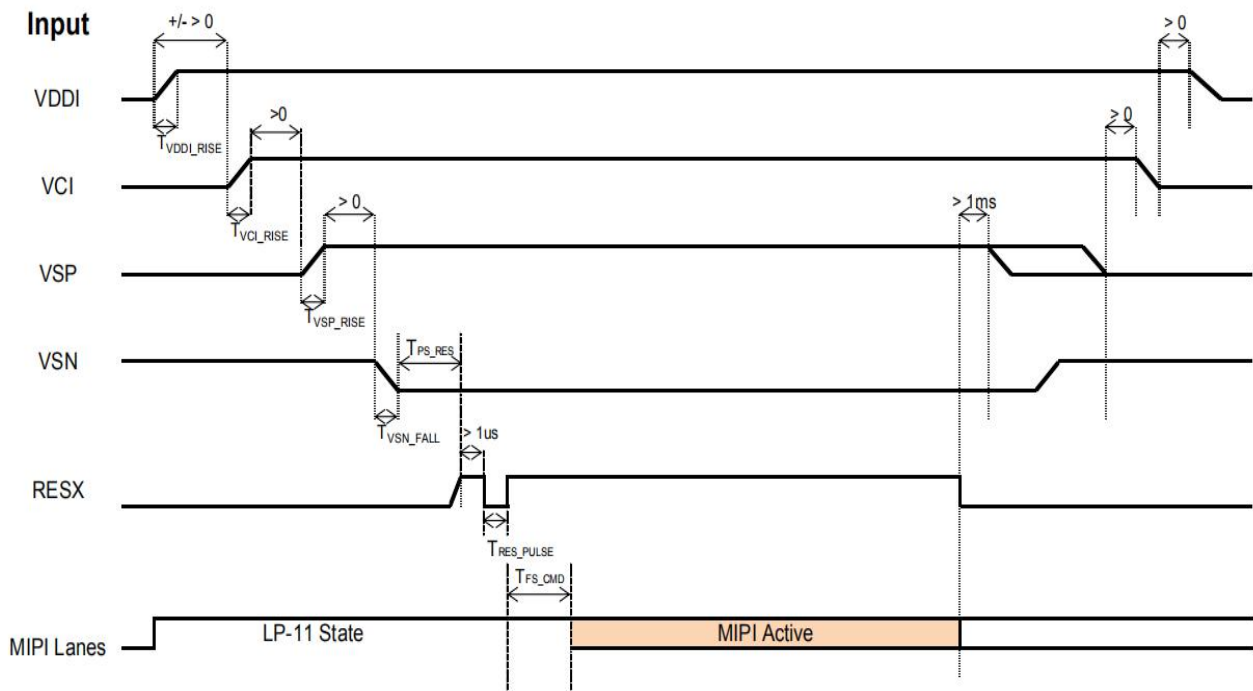
### Case A

#### Input



### Case B

#### Input





Symbol	Characteristics	Min.	Typ.	Max.	Units
T <sub>VDDI_RISE</sub>	VDDI Rise time	20	-	-	us
T <sub>VCI_RISE</sub>	Case A: VCI Rise time	200	-	-	us
	Case B: VCI Rise time	40			
T <sub>VSP_RISE</sub>	VSP Rise time	200	-	-	us
T <sub>VSN_FALL</sub>	VSN Fall time	200	-	-	us
T <sub>PS_RES</sub>	VDDI/VCI on to Reset high	5	-	-	ms
T <sub>RES_PULSE</sub>	Reset low pulse time	10	-	-	us
T <sub>FS_CMD</sub>	Reset to first command	10	-	-	ms

## Uncontrolled Power Off

The uncontrolled power off means a situation when a battery is removed without the controlled power off sequence. There will not be any damages for the display module, or the display module will not cause any damages for the host or lines of the interface. At an uncontrolled power off event, the ILI9881C will force the display to become blank and will not have any abnormal visible effects within 1 second on the display and remains blank until the Power On Sequence powers it up.

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## 9.Optical Specification

Item 项目	Symbol 符号	Condition 条件	Min 最小值	Typ 典型值	Max 最大值	Unit 单位	Note 备注
Response time 响应时间	Tr+Tf	$\Theta_x=0^\circ$ $\Theta_y=0^\circ$ $T_a=25^\circ\text{C}$	-	30	-	ms	1
Contrast ratio 对比度	Cr		800	1000	-	-	2
Color gamut 饱和度	S(%)		55	60	-	%	-
Luminance uniformity 均匀度	$\delta$ WHITE		70	-	-	%	3
Viewing angle range 视角范围	$\Theta_{x+}$	$CR \geq 10$ $T_a=25^\circ\text{C}$	-	80	-	deg	4
	$\Theta_{x-}$		-	80	-	deg	
	$\Theta_{y+}$		-	80	-	deg	
	$\Theta_{y-}$		-	80	-	deg	
LCM Luminance LCM 亮度	Lv	$\Theta_x=0^\circ$ $\Theta_y=0^\circ$ $T_a=25^\circ\text{C}$	-	TBD	-	Cd/m <sup>2</sup>	5

Note1. Response time is the time required for the display to transition from White to black(Rise Time,Tr)and from black to white(Decay Time,Tf).For additional information see FIG1...

Note2.contrast Ratio(CR) is defined mathematically by the following formula ,For more information see FIG2.

Contrast Ratio(CR)=Average Surface Luminance with all white pixels/ Average Surface Luminance with all black pixels

Note3.The uniformity in surface luminance(WHITE) is determined by measuring luminance at each test position,and then dividing the maximum luminance of all white pixels by minimum luminance of all white pixels,For more information seeFIG2.

WHITE=Minimum Surface Luminance with all white pixels(P1,P2,.....)/Maximum Surface Luminance with all white pixels(P1,P2,.....)

Note4.Viewing angle is the angel at which contrast ratio is greater than a specific value.For TET module,the specific value of contrast ratio is 10.For monochrome and color stn module,the specific

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value of contrast ratio is 2. 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 FIG3 Note5. Surface luminance is the LCD surface luminance with all white pixels, For more information see FIG2.

LV=Average Surface Luminance with all white pixels(P1,P2,.....)

FIG1. The definition of Response time

响应时间定义

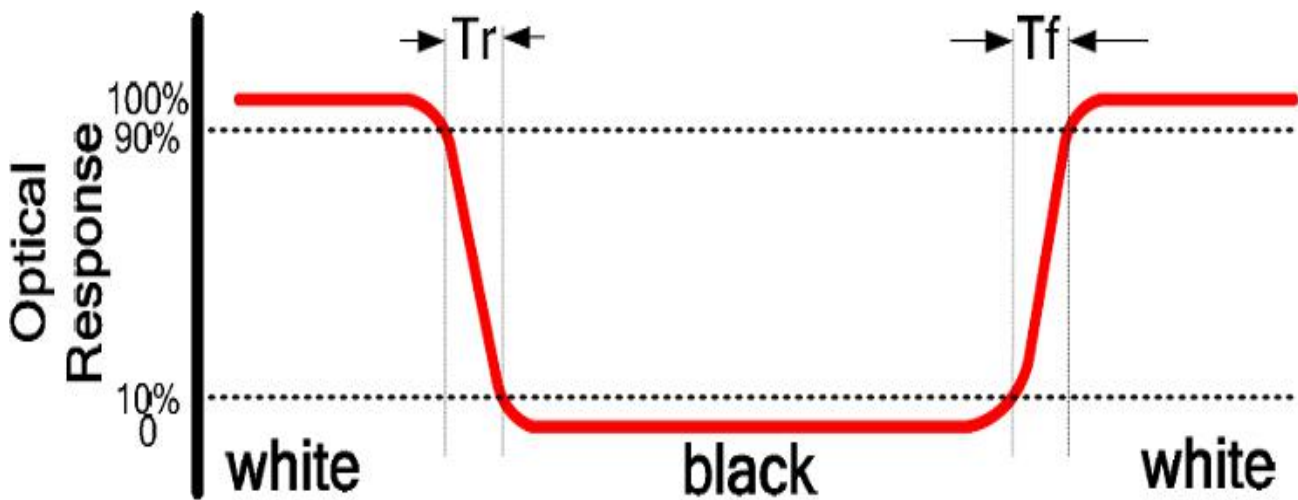


FIG2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE(X,Y) chromaticity.

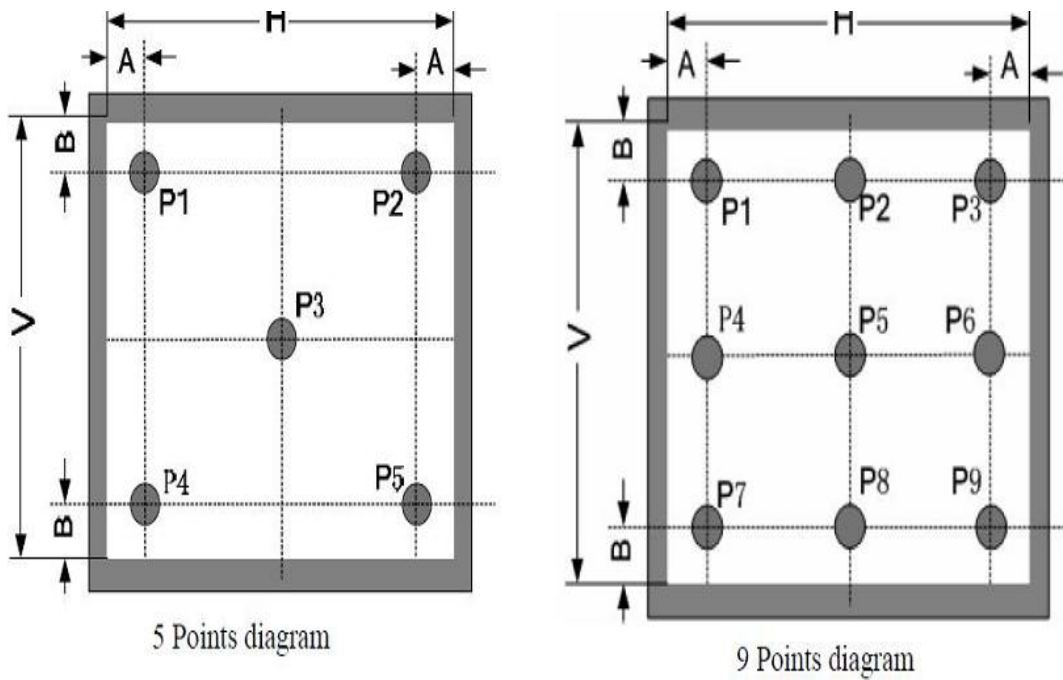
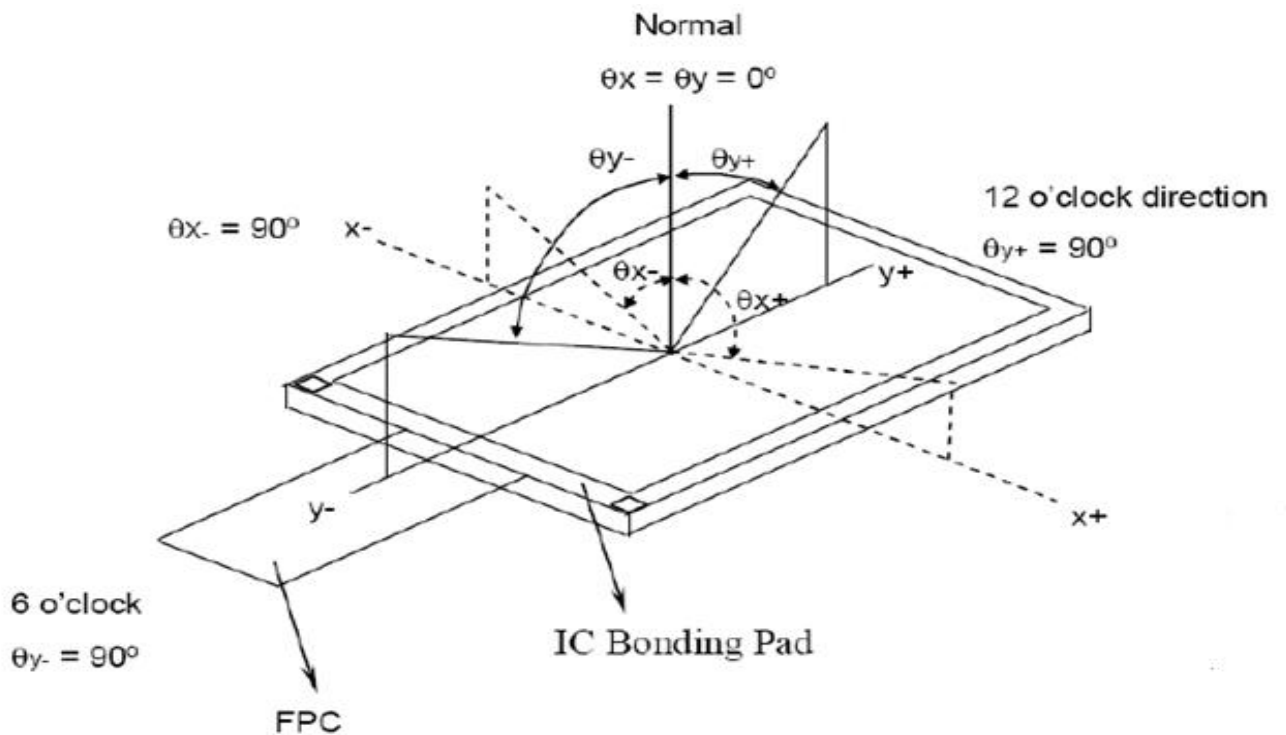


FIG3 The definition of viewing angle 视角定义



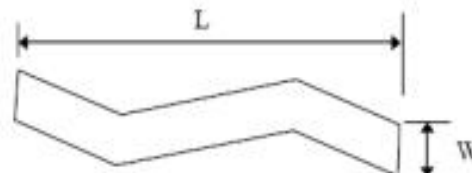
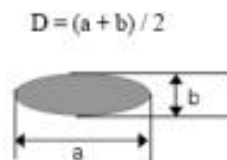
## 10. Inspection items and standards

### 10.1 Appearance inspection

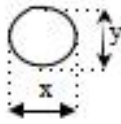
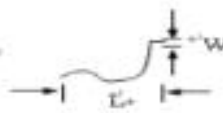
Item	Acceptable standards for defects	Defect level
Broken	Not allowed	critical defects
Cracks	Not allowed	critical defects
Insufficient UV glue entering	Not allowed	critical defects
Liquid crystal seal leakage	Not allowed	critical defects
Liquid crystal bubbles	Not allowed	critical defects
Surface scratch(mm)	$W \leq 0.02$ , ignored	minor defects
	$0.02 < W \leq 0.04$ $L \leq 4$ , $N \leq 2$	
	$0.03 < W \leq 0.05$ $L \leq 3$ , $N \leq 1$	
	$0.05 < W$ Not allowed	
Black/white spot(mm)	$D \leq 0.15$ , ignored; $0.15 < D \leq 0.25$ , $N \leq 4$	minor defects
	$0.25 < D \leq 0.30$ , $N \leq 2$ ; $0.3 < D$ , Not allowed	
The seal pollution	Not allowed	minor defects
Liquid crystal residues	Not allowed	minor defects
Surface stains	Stains that cannot be cleaned or erased are not allowed	minor defects
size	Refer to the product specification corresponding to each product, overall size(including length,Width, thickness) or partial size exceeding the drawing size is not allowed	major defects

Remarks: 1) Surface scratches within 1.5mm of the glass edge are ignored;

2) D = diameter, L = length, W = width, N = qty;



10.2 Functional test criteria

Item	Judgment	Level																		
Display status	No Display、Incomplete image、line defect、wrong viewing angle、flickering、abnormal image、are not allowed.	major defects																		
	Display color, judged by approved samples, Or by limited samples	minor defects																		
	MURA or the phenomenon that is unable to describe in words, judged by ND 5% or limited samples	minor defects																		
Spot(bright/dark) defect	Definition of spot defect: $\phi = (x+y) / 2$ 	minor defects																		
	<table border="1"> <thead> <tr> <th rowspan="2">Size(mm)</th> <th colspan="2">acceptable qty</th> </tr> <tr> <th>Active area</th> <th>View area</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.15</math></td> <td>ignored</td> <td rowspan="4">ignored</td> </tr> <tr> <td><math>0.15 &lt; \phi \leq 0.25</math></td> <td><math>N \leq 2</math> (gap <math>\geq 5</math>)</td> </tr> <tr> <td><math>0.25 &lt; \phi \leq 0.30</math></td> <td>1</td> </tr> <tr> <td><math>0.30 &lt; \phi</math></td> <td>Not allowed</td> </tr> </tbody> </table>		Size(mm)	acceptable qty		Active area	View area	$\phi \leq 0.15$	ignored	ignored	$0.15 < \phi \leq 0.25$	$N \leq 2$ (gap $\geq 5$ )	$0.25 < \phi \leq 0.30$	1	$0.30 < \phi$	Not allowed				
	Size(mm)			acceptable qty																
			Active area	View area																
	$\phi \leq 0.15$		ignored	ignored																
	$0.15 < \phi \leq 0.25$		$N \leq 2$ (gap $\geq 5$ )																	
$0.25 < \phi \leq 0.30$	1																			
$0.30 < \phi$	Not allowed																			
Black/white line	Definition of line defect: L: length, W: width 	minor defects																		
	<table border="1"> <thead> <tr> <th colspan="2">Size(mm)</th> <th colspan="2">Acceptable qty</th> </tr> <tr> <th>W(width)</th> <th>L(length)</th> <th>Active area</th> <th>View area</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.03</math></td> <td>ignored</td> <td>ignored</td> <td rowspan="3">ignored</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.05</math></td> <td><math>L \leq 3.0</math></td> <td>2</td> </tr> <tr> <td><math>W &gt; 0.05</math></td> <td>-</td> <td>Not allowed</td> </tr> </tbody> </table>		Size(mm)		Acceptable qty		W(width)	L(length)	Active area	View area	$W \leq 0.03$	ignored	ignored	ignored	$0.03 < W \leq 0.05$	$L \leq 3.0$	2	$W > 0.05$	-	Not allowed
	Size(mm)		Acceptable qty																	
	W(width)		L(length)	Active area	View area															
	$W \leq 0.03$		ignored	ignored	ignored															
$0.03 < W \leq 0.05$	$L \leq 3.0$	2																		
$W > 0.05$	-	Not allowed																		



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## 11. Reliability Test Items

Item	Test Condition	Criterion
High Temperature Storage	60 °C, 48 hrs	Note1,Note2
Low Temperature Storage	-20 °C, 48 hrs	
High Temp. & High Humidity Storage	40 °C, 80% RH, 48hrs	
Thermal Shock (Static)	-20°C, 30 min /60°C, 30 min, 20 cycles	
High Temperature Operation	50 °C, 48 hrs	
Low temperature Operation	-10 °C, 48 hrs	

Note1: Evaluation should be tested after storage at room temperature for two hours.

Note2:

Pass: Normal display image no line defect.

Fail: No display image, or line defects.

Partial transformation of the module parts should be ignored.

## 12. Precautions

Please pay attentions to the followings as using the LCD module.

### Handling

- Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

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- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.
- (j) Do not lift the FPC of Touch Panel.

### **Storage**

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.
- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

### **Operation**

- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.
- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.
- (h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the

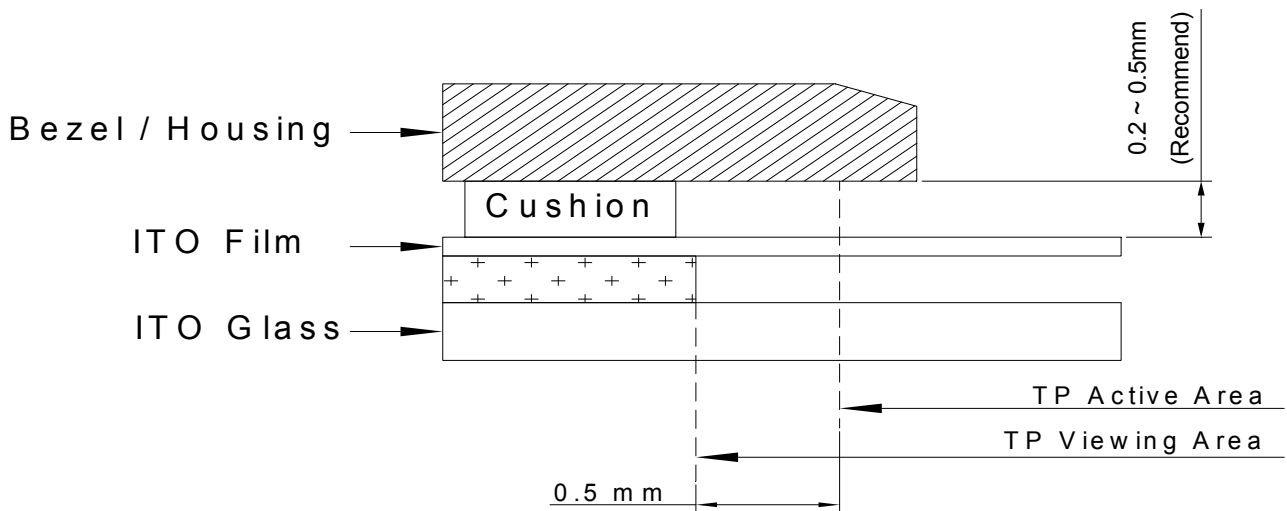
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liquid is accumulated near the air vent.

- (i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

**Touch Panel Mounting Notes**

- (a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb the expansion and contraction to avoid the distortion of film.
- (b) The cushion must be placed out of the Viewing Area.
- (c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Key Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist between Bezel/Housing and ITO film.
- (d) Mounting example:



The corner part has conductivity. Do not touch any metal part after mounting.

**Others**

- a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.