

**SPECIFICATION
FOR
LCM Module**

MODULE No:	KD070WXFID027
CUSTOMER:	

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Revision History

Date	Rev. No.	Page	Summary
2019.06.27	V1.0	ALL	FIRST ISSUE
2019.07.09	V1.1	6	Modify the drawing
2019.07.22	V1.2	8/11	Updated Color Filter Chromacicity and LCM Luminance

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	常备库存 Stock For Sale	长期供货 Long Time supply	支持小量 NO MOQ	品种齐全 In Full Range

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 7.0 " TFT-LCD contains 800x1280 pixels, and can display up to 16.7M colors.

* Features

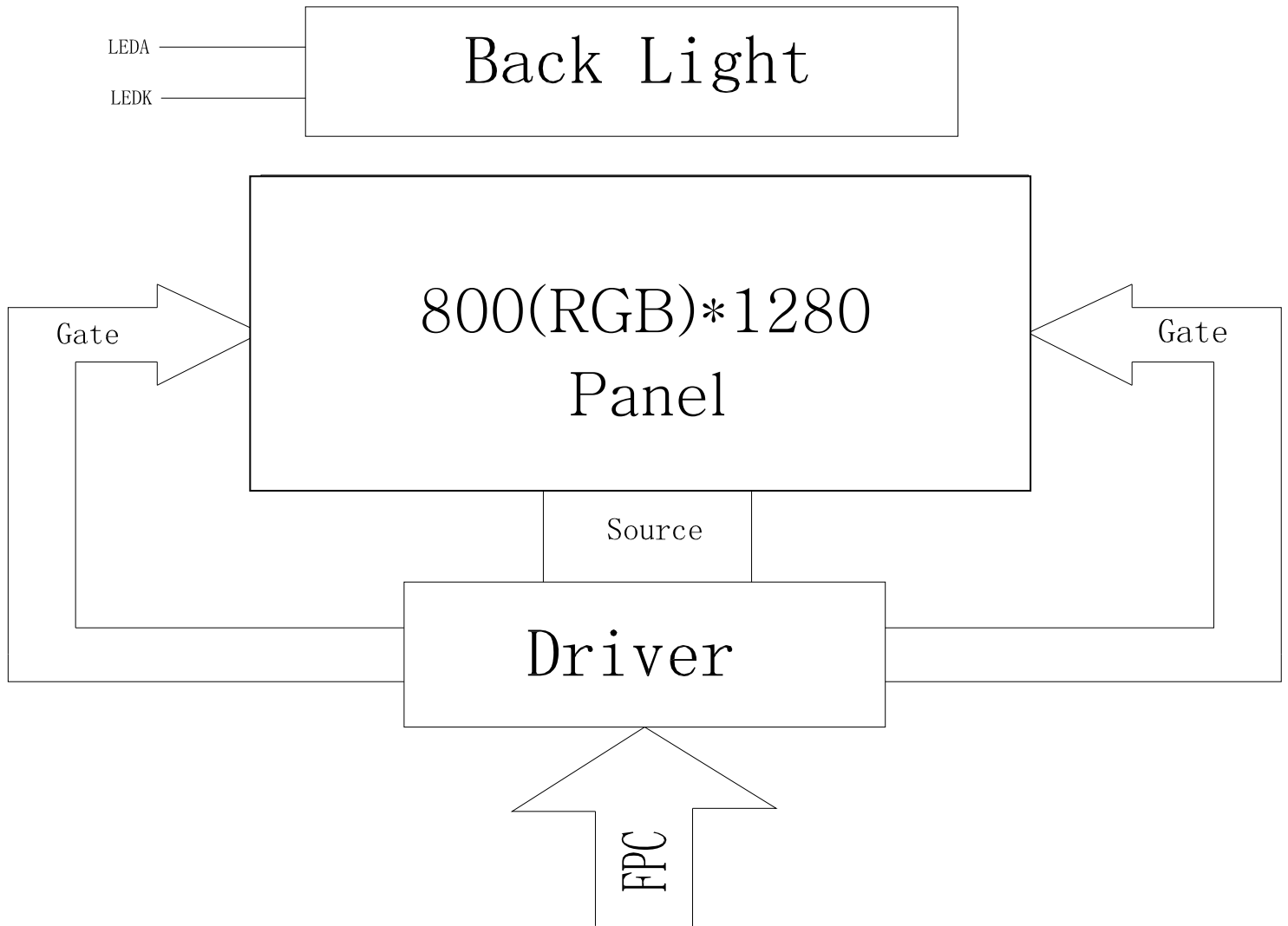
General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	94.2(H)*150.72(V) (7.0inch)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	800(RGB)*1280	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.11775(H)*0.11775(V)	mm	
Viewing angle	Free	o'clock	
Controller IC	JD9366	-	
LCM Interface	4-Lane MIPI	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-20~+70	°C	
Storage temperature	-30~+80	°C	

* Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	103.56	-	mm	
	Vertical(V)	-	162.38	-	mm	
	Depth(D)	-	2.7	-	mm	
Weight		-	90	-	g	

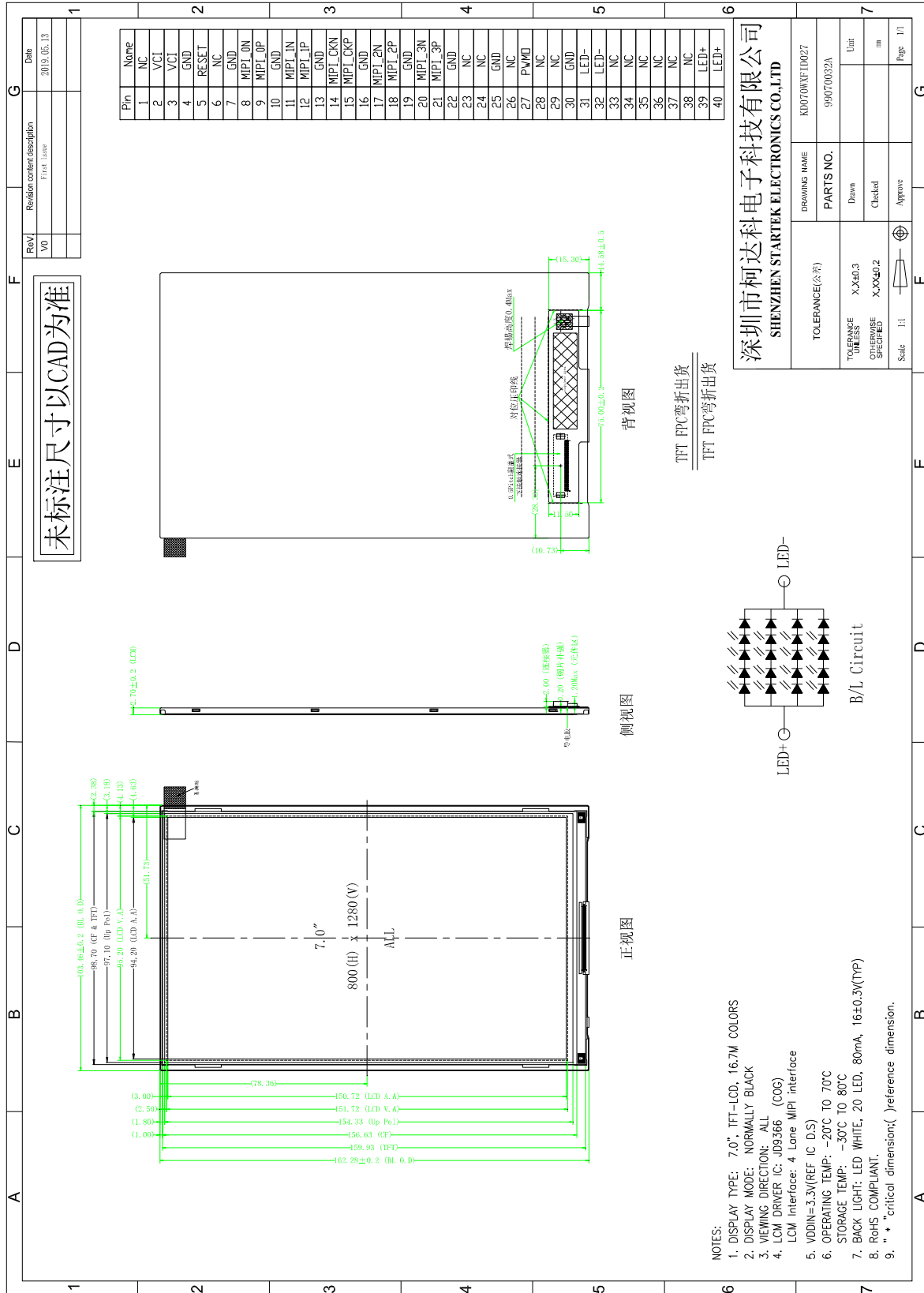
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1. Block Diagram



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2. Outline dimension



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3. Input terminal Pin Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	No connected	
2	IOVCC	A power supply for the I/O circuit. IOVCC=1.65 to 3.6V	P
3	VCI	A power supply for DC/DC circuit. VCI=2.5V to 4.8V	P
4	GND	Ground	P
5	RESET	Device reset signal.	I
6	NC	No connected	--
7	GND	Ground	P
8	MIPI_0N	MIPI Negative data signal (-)	I/O
9	MIPI_0P	MIPI Positive data signal (+)	I/O
10	GND	Ground	P
11	MIPI_1N	MIPI Negative data signal (-)	I/O
12	MIPI_1P	MIPI Positive data signal (+)	I/O
13	GND	Ground	P
14	MIPI_CKN	MIPI Negative clock signal (-)	I/O
15	MIPI_CKP	MIPI Positive clock signal (+)	I/O
16	GND	Ground	P
17	MIPI_2N	MIPI Negative data signal (-)	I/O
18	MIPI_2P	MIPI Positive data signal (+)	I/O
19	GND	Ground	P
20	MIPI_3N	MIPI Negative data signal (-)	I/O
21	MIPI_3P	MIPI Positive data signal (+)	I/O
22	GND	Ground	P
23	NC	No connected	
24	NC	No connected	
25	GND	Ground	P
26	NC	No connected	
27	NC	No connected	
28	NC	No connected	
29	NC	No connected	
30	GND	Ground	P
31	LED-	LED Cathode	P
32	LED-	LED Cathode	P

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33	NC	No connected	
34	NC	No connected	
35	NC	No connected	
36	NC	No connected	
37	NC	No connected	
38	NC	No connected	
39	LED+	LED anode	P
40	LED+	LED anode	P

4. LCD Optical Characteristics

4.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio	CR	$\Theta=0$	700	850	--		(2)
Response time	Rising	Normal viewing angle	--	30	40	msec	(3)
	Falling		--				
Color Gamut	S(%)		45	50	55	%	
Color Filter Chromacicity	White	W_x	0.25388	0.29388	0.33388	CF glass	(4)
		W_y	0.29506	0.33506	0.37506		
	Red	R_x	0.57322	0.59322	0.61322		
		R_y	0.3375	0.3575	0.3775		
	Green	G_x	0.2987	0.3187	0.3387		
		G_y	0.53652	0.55652	0.37652		
	Blue	B_x	0.1413	0.1613	0.1813		
		B_y	0.11836	0.13836	0.15836		
Viewing angle	Hor.	Θ_L	--	89	--	(1)	
		Θ_R	--	89	--		
	Ver.	Θ_U	--	89	--		
		Θ_D	--	89	--		
Option View Direction	Free						

4.2 Measuring Condition

- Measuring surrounding: dark room
- Ambient temperature: $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

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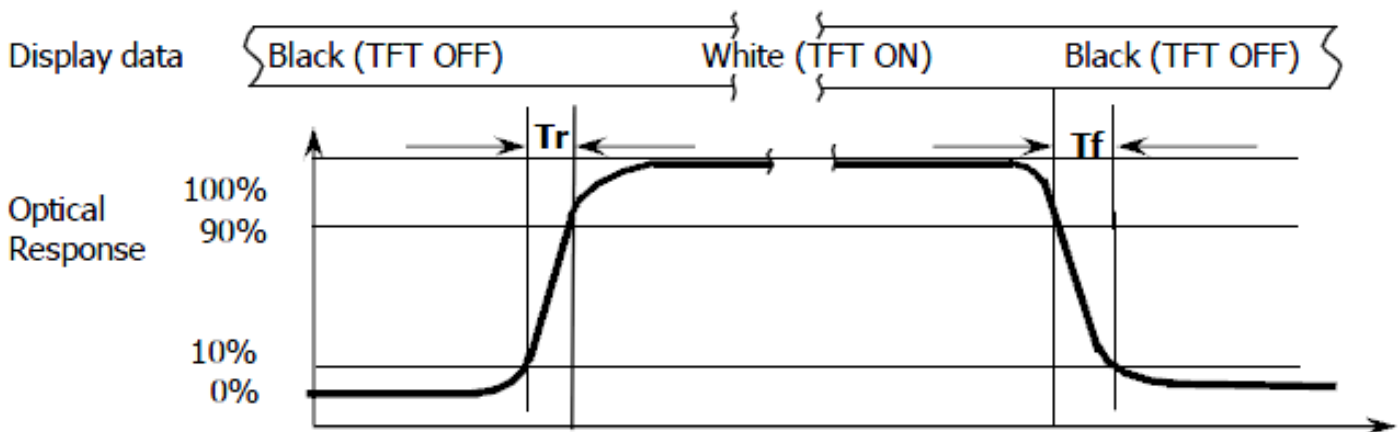
4.3 Measuring Equipment

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1)
 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note3



Note4

The color chromaticity coordinates specified shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

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5. Electrical Characteristics

5.1 Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	V _{CI}	-0.3	3.6	V	Note1
Interface Supply Voltage	IOVCC	-0.3	6.6	V	
Operating temperature	T _{OP}	-20	+70	°C	
Storage temperature	T _{ST}	-30	+80	°C	

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	V _{CI}	2.5	3.3	4.8	V	
Interface Supply Voltage	IOVCC	1.65	1.8	3.6	V	
Normal mode Current	I _{DD}	--	160	--	mA	
Level input voltage	V _{IH}	0.7V _{CI}		V _{CI}	V	
	V _{IL}	GND		0.3 V _{CI}	V	
Level output voltage	V _{OH}	V _{CI} -0.4		--	V	
	V _{OL}	GND		GND+0.4	V	

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5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 20 chips LED

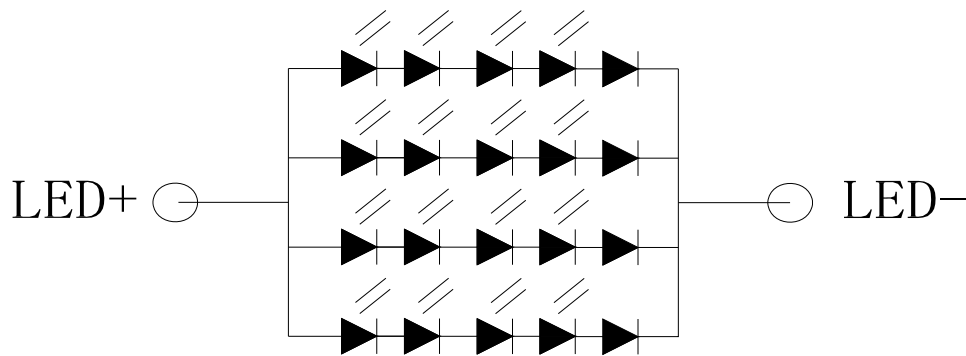
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F		80	--	mA	
Forward Voltage	V_F	--	16	--	V	
LCM Luminance	LV	400	450	--	cd/m ²	Note3
LED life time	Hr	--	50000	--	Hour	Note1,2
Uniformity	Avg	80	--	--	%	Note3

Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

$T_a=25\pm 3\text{ }^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at

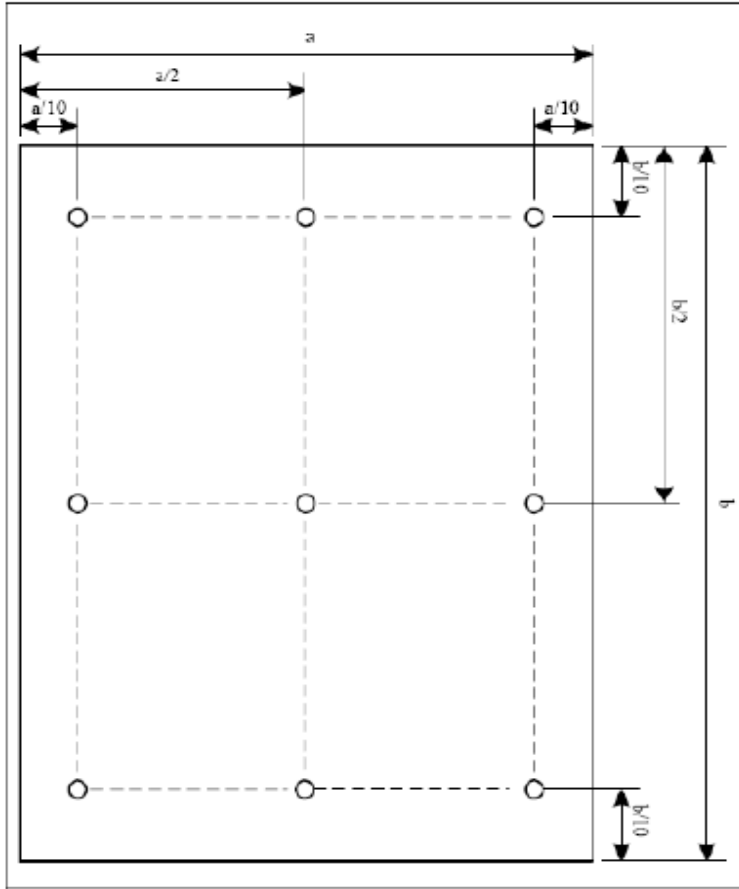
$T_a=25\text{ }^\circ\text{C}$ and $I_L=80\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 80mA. The constant current driving method is suggested.



B/L Circuit

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Note (3) Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

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6. AC Characteristics

6.1 Timings for DSI Video mode

Vertical Timings

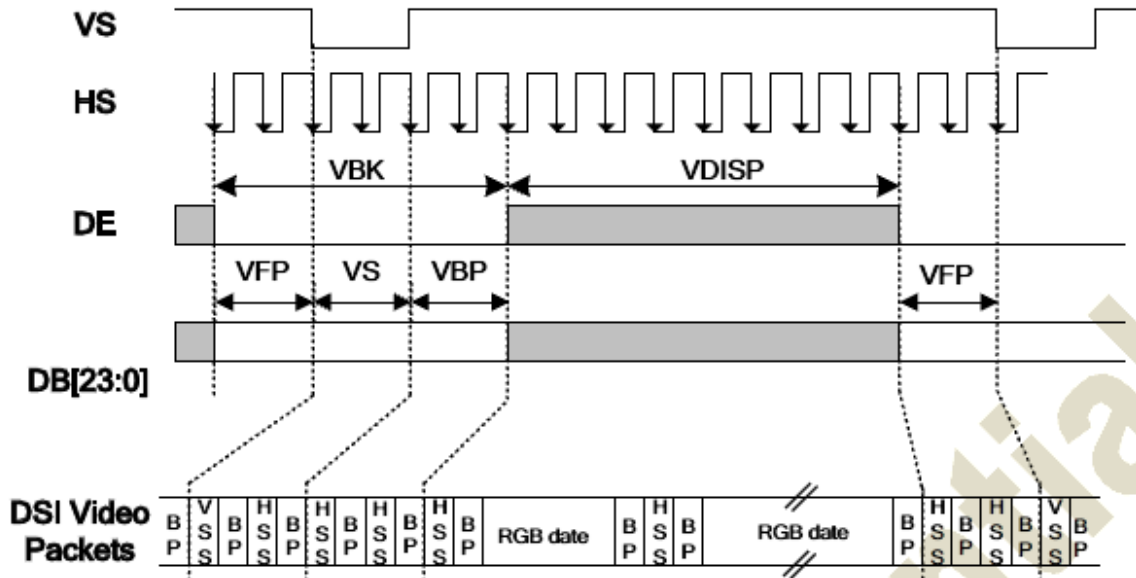


Figure 11.9: Vertical Timings for DPI I/F

Resolution=800x1280($T_A=25^{\circ}\text{C}$, $\text{IOVCC}=1.8\text{V}$, $\text{VCIP}=2.8\text{V}$, $\text{VCI}=2.8\text{V}$)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical low pulse width	VS	-	2	4	200 Note(1)	Line
Vertical front porch	VFP	-	4	20	200	Line
Vertical back porch	VBP	-	2	10	200 Note(1)	Line
Vertical blanking period	VBK	VS+VBP+VFP	8	34	250	Line
Vertical active area	-	VDISP	-	1280	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GIP start pulse and GIP clock pulse timing. The GIP start pulse and GIP clock pulse must be set at corresponding position for LCD normal display.

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Horizontal Timings

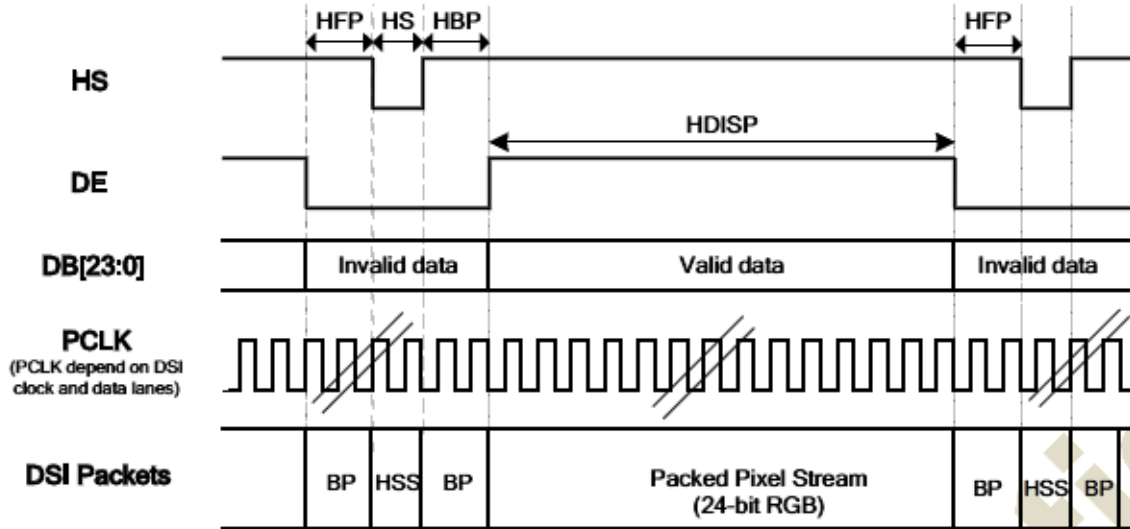


Figure 11.10: Horizontal Timing for DSI Video mode I/F

Resolution=800x1280 (T_A=25°C, IOVCC=1.8V, VCIP=VCI=VCCH=2.8V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS low pulse width	HS	-	6	18	78	DCK
Horizontal back porch	HBP	-	5	18	78	DCK
Horizontal front porch	HFP	-	5	18	78	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	16	54 (Note1)	88	DCK
Horizontal active area	HDISP	-	-	800	-	DCK
Pixel Clock	PCLK	-	63.06 (Note2)	67.33 (Note2)	81.51 (Note2)	MHz

Note 1: HS+HBP > 0.5us.

Note 2: Pixel Clock = (HBLK+HDISP) * (VBK+VDISP) * Frame rate, Frame rate=60Hz.

6.2 Reset timing

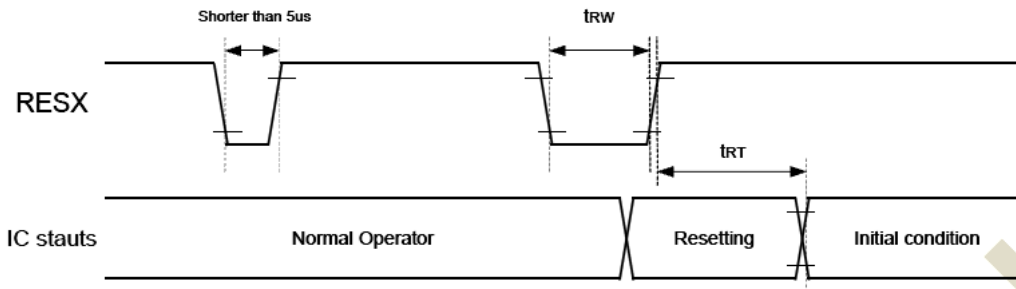


Figure 11.1: Reset input timings

Symbol	Parameter	Related pins	Min.	Max.	Unit
t_{RW}	Reset pulse width ⁽²⁾	RESX	10	-	μs
t_{RT}	Reset complete time ⁽³⁾	-	-	5 (Note 5)	ms
		-	-	120 (Note 6, 7)	ms

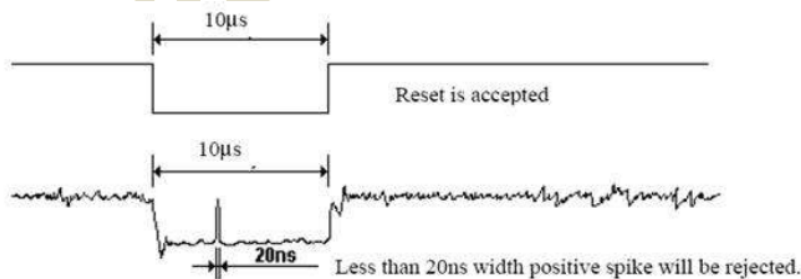
Note: (1) The reset complete time also required time for loading ID bytes from OTP to registers. This loading is done every time when there is HW reset cancel time (t_{RT}) within 5 ms after a rising edge of RESX.

(2) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5 μs	Reset Rejected
Longer than 10 μs	Reset
Between 5 μs and 10 μs	Reset Start

(3) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.

(4) Spike Rejection also applies during a valid reset pulse as shown below:



(5) When Reset is applied during Sleep In Mode.

(6) When Reset is applied during Sleep Out Mode.

(7) It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

(8) After Sleep Out Command, it is necessary to wait 120msec then send RESX.

Table 11.3: Reset timings

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7. LCD Module Out-Going Quality Level

7.1 VISUAL & FUNCTION INSPECTION STANDARD

7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

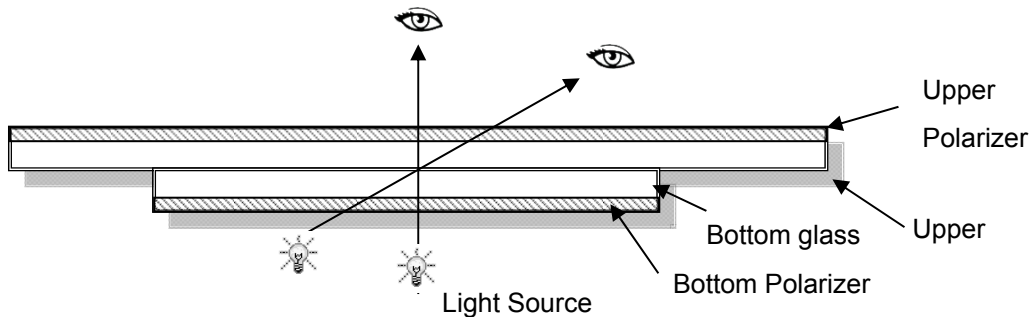
Temperature : $25\pm 5^{\circ}\text{C}$

Humidity : $65\%\pm 10\%\text{RH}$

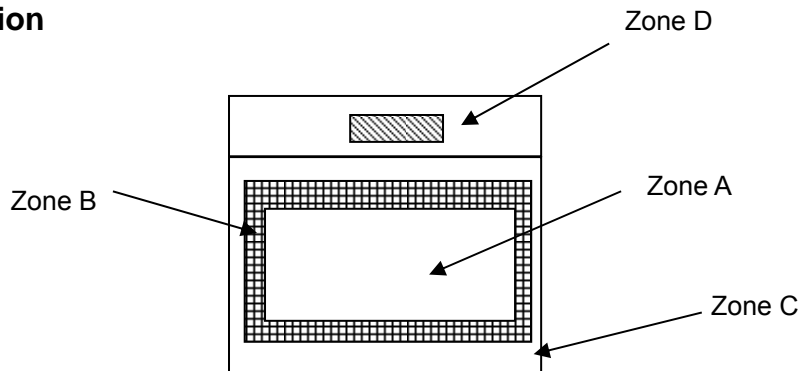
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



7.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

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7.1.3 Sampling Plan

According to GB/T 2828.1-2003 ; , normal inspection, Class II

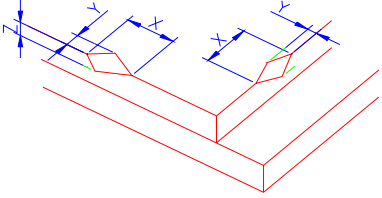
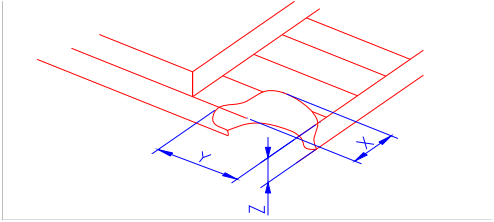
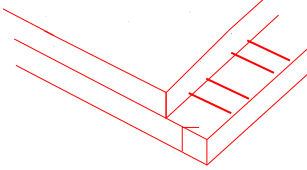
AQL:

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

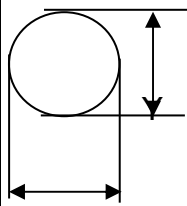
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot, Dim spot, Polarizer Bubble ; Polarizer accidented spot.	
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="756 667 1455 817"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td><Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						
	(2)LCD corner broken	 <table border="1" data-bbox="836 1122 1375 1223"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	≤L	≤T
X	Y	Z						
≤3.0mm	≤L	≤T						
	(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>						

2.0

Spot defect



X

$$\Phi = (X+Y)/2$$

① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.10$	Ignore		
$0.10 < \Phi \leq 0.25$	4(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.35$	3		
$\Phi > 0.4$	0		

② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.1$	Ignore		
$0.10 < \Phi \leq 0.25$	4(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.35$	3		
$\Phi > 0.4$	0		

③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.3 < \Phi \leq 0.5$	3(distance $\geq 10\text{mm}$)		
$\Phi > 0.5$	1		

④ Pixel bad points (light dot, Dim dot, color dot)



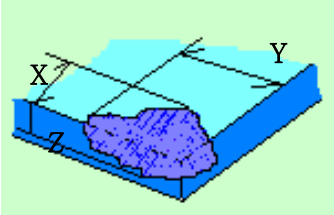
Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore		
$0.2 < \Phi \leq 0.3$	2(distance $\geq 10\text{mm}$)		
$\Phi > 0.4$	1		

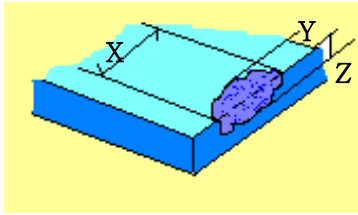
⑤ Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.3 < \Phi \leq 0.4$	4(distance $\geq 10\text{mm}$)		
$0.4 < \Phi \leq 0.5$	3		
$\Phi > 0.5$	1		

3.0	Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)	Width(mm)	Length(m m)	Acceptable Qty		
				A	B	C
		$\Phi \leq 0.05$	Ignore	Ignore		
		$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$		
		$0.07 < W \leq 0.08$	$L \leq 4.0$	$N \leq 2$		
		$0.08 < W$	Define as spot defect			
4.0	Electronic Comp onents SMT	Not allow missing parts, solderless connection, cold solder joint, mis match, The positive and negative polarity opposite				
5.0	Display color& B rightness	1. Color: Measuring the color coordinates, The measurement standar d according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measu rement standard according to the datasheet or Samples.				
6.0	LCD Mura	By 5% ND filter invisible.				

7.0	RTP Related	TP film bubble/ accidented spot	Size Φ (mm)	Acceptable Qty			
				A	B	C	
			$\Phi \leq 0.1$	Ignore			
			$0.1 < \Phi \leq 0.25$	4 (distance ≥ 10 mm)			
			$0.25 < \Phi \leq 0.35$	3			
				$\Phi > 0.4$	1		
		TP film scratch	Width(mm)	Length(mm)	Acceptable Qty		
					A	B	C
			$\Phi \leq 0.05$	Ignore	Ignore		
			$0.05 < W \leq 0.06$	$L \leq 5.0$	$N \leq 3$		
$0.07 < W \leq 0.08$	$L \leq 4.0$		$N \leq 2$				
		$0.08 < W$	Define as spot defect				

		Assembly deflection	beyond the edge of backlight $\leq 0.2\text{mm}$								
		Bulge (undulation included)	The ITO film plumped below 0.40mm, it's ok. 								
		Newton Ring	Newton Ring area $> 1/3$ TP area NG Newton Ring area $\leq 1/3$ TP area OK								
		TP corner broken X : length Y : width Z : height	<table border="1" data-bbox="699 1487 1139 1680"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$X \leq 3\text{mm}$</td> <td>$Y \leq 3\text{mm}$</td> <td>$Z < \text{COVER thickness}$ s</td> </tr> </tbody> </table>		X	Y	Z	$X \leq 3\text{mm}$	$Y \leq 3\text{mm}$	$Z < \text{COVER thickness}$ s	
X	Y	Z									
$X \leq 3\text{mm}$	$Y \leq 3\text{mm}$	$Z < \text{COVER thickness}$ s									
*Circuitry broken is not allowed.											

			X	Y	Z	
		TP edge broken	X≤4mm	Y≤2mm	Z<COVER thickness	
		X : length Y : width Z : height	* Circuitry broken is not allowed.			

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

8. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	70°C,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20°C, 96HR	
High Temperature Storage	80°C, 96HR	
Low Temperature Storage	-30°C, 96HR	
High Temperature & High Humidity Operating	+60°C, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-30°C,30 min ↔ +80°C,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15°C~35°C, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX)	

Remark:

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 5~10pcs.
- 3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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9. Cautions and Handling Precautions

9.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

9.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

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10. Packing

---TBD-----

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