



# PHOENIX DISPLAY INTERNATIONAL, INC.

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## PHOENIX DISPLAY INTERNATIONAL, INC

### SPECIFICATION FOR LCD MODULE

<b>CUSTOMER</b>	
<b>PART NUMBER</b>	PDI101WSBH-12
<b>DESCRIPTION</b>	10.1" 1024 x 3 (RGB) x 600
<b>VERSION</b>	V1.0
<b>ISSUE DATE</b>	05-Jan-18

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### Document Revision History

<b>Revision</b>	<b>Date</b>	<b>Page</b>	<b>Description</b>	<b>Changed BY</b>
<b>V1.0</b>	<b>2018/1/5</b>	<b>--</b>	<b>First issue</b>	<b>Aron</b>

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# 1. LCM Specification

## 1.1 Description

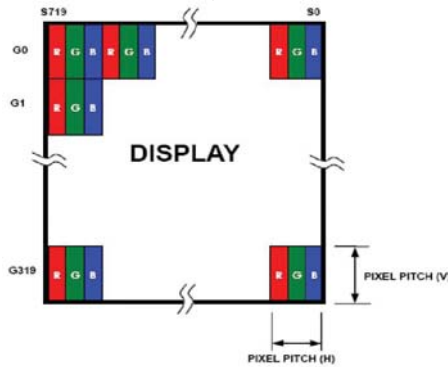
TST101WSBH-12 is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a FPC, and a WLED-backlight unit. The active display area is 10.1 inches diagonally measured and the native resolution is 1024\*RGB\*600. Features of this product are listed in the following table.

## 1.2 Functions & Features

**Table1.1 Module Functions & Features**

Parameter	Value	Unit
LCD Mode	a-Si TFT/transmissive	-
Color	16.2M	-
Display Resolution	1024*3(RGB)*600	pixels
Outline Dimension	235.0(W) *143.0(H) *4.5(T)	mm
Active Area(A.A)	222.72*(W) *125.28(H)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	12 O'clock	
Display Mode	Normally WHITE	
IC Package Type	COG	-
Surface Treatment	Anti-Glare,Hardness:3H	
Back-light	White LED*24CHIP	pcs
Operation Temperature	-20~70	°C
Storage Temperature	-30~80	°C

**Pixel Arrangement**



# 2. Mechanical Specification

**GENERAL TOLERANCE: ±0.2**

LCD Type	10.1" TFT Transmissive, Normally white, TN
Resolution	1024(RGB) * 600
View Direction	12 O'CLOCK
Driver IC	HX8382+HX8689
Color Depth	16.7M
Interface Types	RGB24-bit
Operating voltage	3.3V
TP/Lens	With CTP(GT928)
Backlight LEDs	24 LEDs, 240mA, 3.3V
Surface luminance	500 cd/m <sup>2</sup>
Operating temperature	-20 ~ +70 °C
Storage Temperature	-30 ~ +80 °C
Storage Humidity	0% ~ 90% max

**High Temp & High Humidity Operation:** To=60°C, H=90%RH

**30mA/LED**

**EVV片, 上砂下光**

**DETAIL A (5:1)**

**Front View**

Dimensions: 143±0.3(BL Outline), 128.5±0.3(BL Opening), 125.28(TFT A A), 68.4, 5.76, 116.65, 222.2(TFT A A), 225.8±0.3(BL Opening), 10.1" TFT, 1024 \* RGB \* 600, 105.2±0.5, 11.46, 69.3±0.5, 10.1" TFT, 1024 \* RGB \* 600, 116.65, 222.2(TFT A A), 225.8±0.3(BL Opening), 10.1" TFT, 1024 \* RGB \* 600, 105.2±0.5, 11.46, 69.3±0.5

**Side View**

Dimension: 1.6±0.3

**Back View**

**LCM PIN**

1	VEB+	26	G1
2	VEB+	27	G0
3	VEB-	28	R7
4	VEB-	29	RC
5	GND	30	RC
6	VE00	31	R4
7	VE00	32	R3
8	MODE	33	R2
9	DE	34	RL
10	VS	35	RO
11	HS	36	GND
12	BT	37	DECLK
13	BC	38	GND
14	BC	39	L/R
15	BC	40	UD
16	BS	41	VEH
17	B2	42	VEL
18	B1	43	AVDD
19	B0	44	RESET
20	G7	45	NC
21	G6	46	VE0M
22	G5	47	DITTB
23	G4	48	GND
24	G3	49	NC
25	G2	50	NC

**Need to pay attention to the key size with \***

版本(Version)	变更记录(Change History)	日期(Date)	视角(View):	比例(Proportion)	设计(DESIGN)	审核(AUDITING)	批准(APPROVED)
V1			单位(Unit):	页 面(Page):	1 / 1		
V2			产品型号(Product Type):	TST101WSBH-12		2017.11.30	2017.11.30

### 3. Electrical Units

#### 3.1 Electrical Specification

<Table3. Electrical specifications>

Item	Symbol	Unit	Value			Note
			Min	Typ	Max	
Power voltage	DVDD	V	3.0	3.3	3.6	
	AVDD	V	9.4	9.6	9.8	
	VGH	V	20	21	22	-
	VGL	V	-9	-8	-7	
Input signal voltage	VCOM	V	3.3	3.8	4.3	

**Notes:**

1. VGH is TFT Gate operating voltage.
2. VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuates with same phase as Vcom.
3. Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.
4. DVDD setting should match the signals output voltage (refer to Note 3) of customer' s system board.
5. DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

#### 3.2 Pin Descriptions

##### 3.2.1 TFT LCD Panel interface FPC Pin Description

Pin NO.	Function Descriptions	Symbol
1	LED Anode	LED+
2	LED Anode	LED+
3	LED Cathode	LED -
4	LED Cathode	LED -
5	Ground	GND
6	Common Voltage	VCOM
7	Digital Power	DVDD
8	DE/SYNC mode select Normally pull high H:DE mode. L:HSD/VSD mode	MODE
9	Date Enable signal	DE
10	Vertical sync input.Negative polarity	VSD
11	Horizontal sync input.Negative polarity	HSD
12	Blue Date Input(MSB)	B7

13-18	Blue Data Input	B6-B1
19	Blue Data Input(LSB)	B0
20	Green Data Input(MSB)	G7
21-26	Green Data Input	G6-G1
27	Green Data Input(LSB)	G0
28	Red Data Input(MSB)	R7
29-34	Red Data Input	R6-R1
35	Red Data Input(LSB)	R0
36	Power ground	GND
37	Clock input	DCLK
38	Ground	GND
39	Left or Right Display Control	SHLR
40	Up / Down Display Control	UPDN
41	Positive Power for TFT	VDDG
42	Negative Power for TFT	VEEG
43	Analog Power	AVDD
44	Global rest pin.Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high.(R=10K	RSTB
45	Not connect	NC
46	Common Voltage	VCOM
47	Dithering setting DITH= “ H ” 6bit resolution(last 2 bit of input data)truncated DITH= “H” 6bit resolution(default setting)	DITH
48	Power ground	GND
49	Not connection	NC
50	Not connection	NC

**Remarks:**

1)UPDN and SHLR control function

UPDN	SHLR	FUNCTION
0	1	Normal display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right ,Inverse Up and Down

### 3.3.1 Electrical characteristics (Ta=25°C)

### 3.3.2 TFT-LCD Current Consumption

**Table 3.2:**

Item	Symbol	Unit	Test Condition	Min	Typ.	Max	Note
Gate on power current	IVGH	mA	VGH=21V	-	TDB		-
Gate off power current	IVGL	mA	VGL= -7.0V	-	TDB		-
Analog power current	IVDD	mA	VDD=3.3V	-	TDB		-
Analog power current	IAVDD	mA	AVDD=9.6V	-	TDB		

### 3.4 Back-light Specification

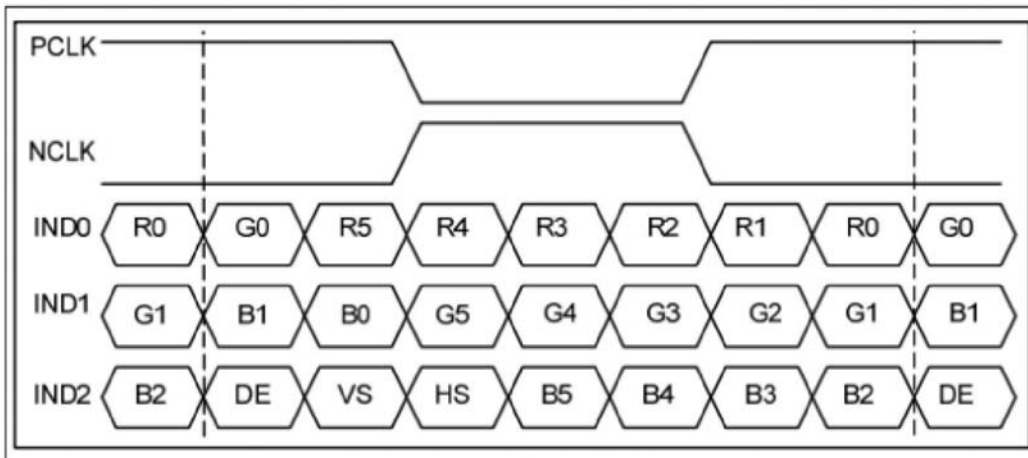
**Table 3.3 Back-light Specification**

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF	Only	9.0	9.3	9.6	V
Supply Current	IF	Backlight	30*8=240			mA
Average Brightness	IV	Backlight Current IF=240mA		--		Cd/m2
CIE Color Coordinate	X	Backlight Current IF=240mA	-		-	-
	Y		-		-	
Uniformity	B	Backlight Current IF=240mA	80	-	-S	(%)
Color	White					

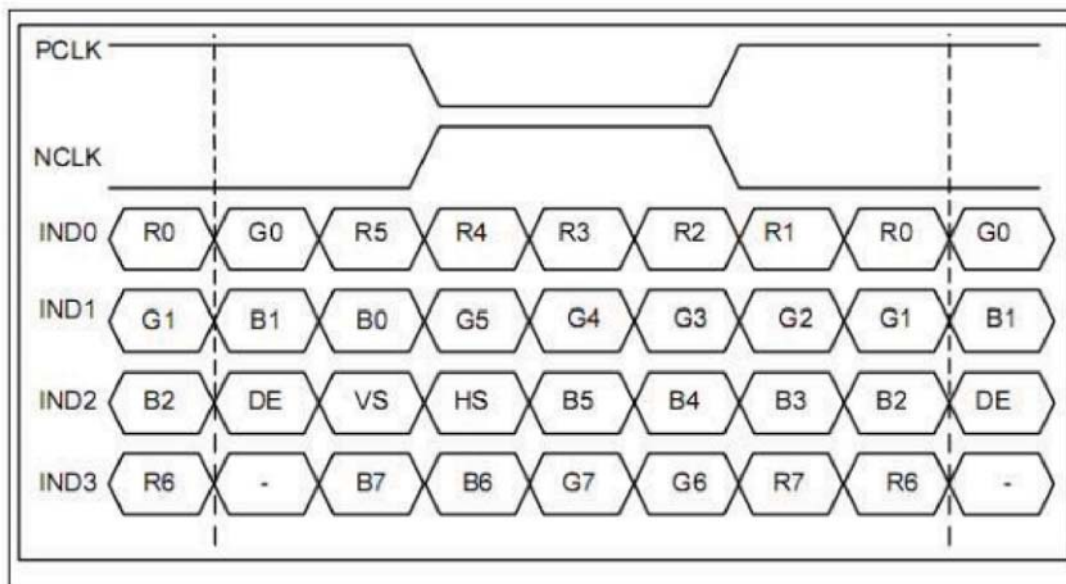


## 4. Timing Characteristics

### 4.1. 6bit LVDS input



### 4.2. 8bit LVDS input

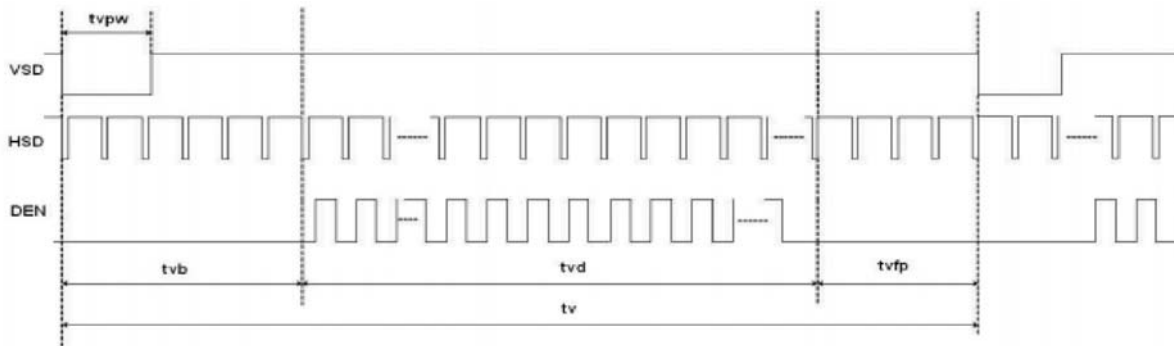


### 4.3 Interface Timing (DE mode)

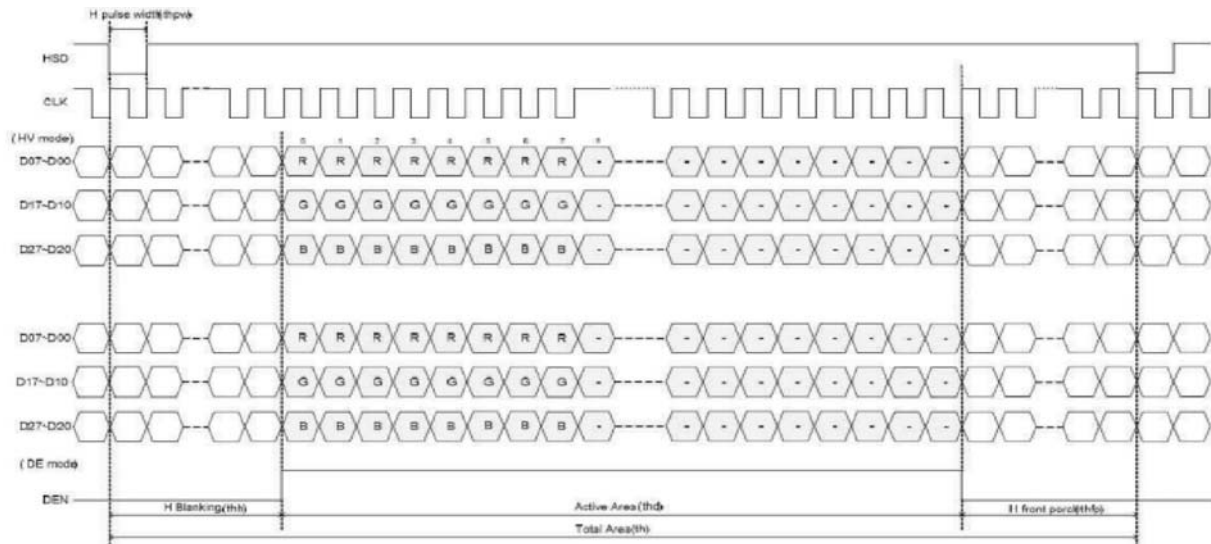
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Frame Period	t1	610	635	800	line
Vertical Display Time	t2	600	600	600	line
Vertical Blanking Time	t3	10	35	200	line
1 Line Scanning Time	t4	1114	1344	1400	clock
Horizontal Display Time	t5	1024	1024	1024	clock
Horizontal Blanking Time	t6	90	320	376	clock
Clock Rate	t7	37.4	51.2	72.8	MHz

#### Timing Diagram of Interface Signal (DE mode)

##### (1) Vertical input timing



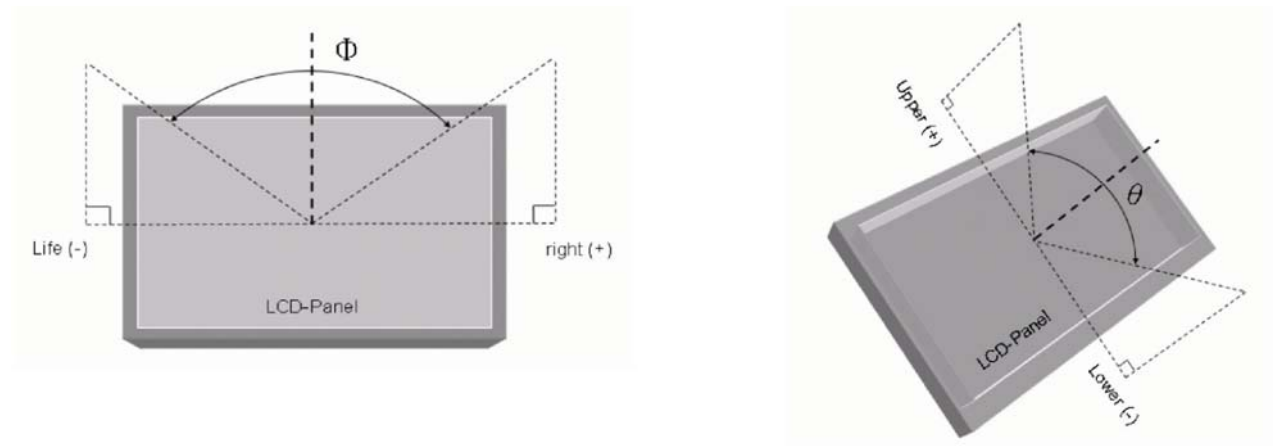
##### (2) Horizontal Vertical input timing



## 5 Optical Specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (With PZ)	T		—	-	—		
Contrast	CR		500	600	—		(1)(2)
Response time	Rising	TR	—	4	8	msec	(1)(3)
	Falling	TF	—	12	24		
White luminance(center)	YL		450	500	-	cd/m <sup>2</sup>	I=240mA
Color gamut	S		—	50	—	%	C light
Color chromaticity (CIE1931)	White	W <sub>x</sub>	⊖=0 Normal viewing angle	0.300	0.304	0.308	(1)(4) CF Glass C light
		W <sub>y</sub>		0.335	0.339	0.343	
	Red	R <sub>x</sub>		0.597	0.601	0.605	
		R <sub>y</sub>		0.320	0.324	0.328	
	Green	G <sub>x</sub>		0.297	0.301	0.305	
		G <sub>y</sub>		0.563	0.567	0.571	
	Blue	B <sub>x</sub>		0.139	0.143	0.147	
		B <sub>y</sub>		0.169	0.173	0.177	
Viewing angle	Hor.	⊖L	CR>10	70	80	—	
		⊖R		70	80	—	
	Ver.	⊖U		50	60		
		⊖D		60	70		
Optima View Direction						(5)	

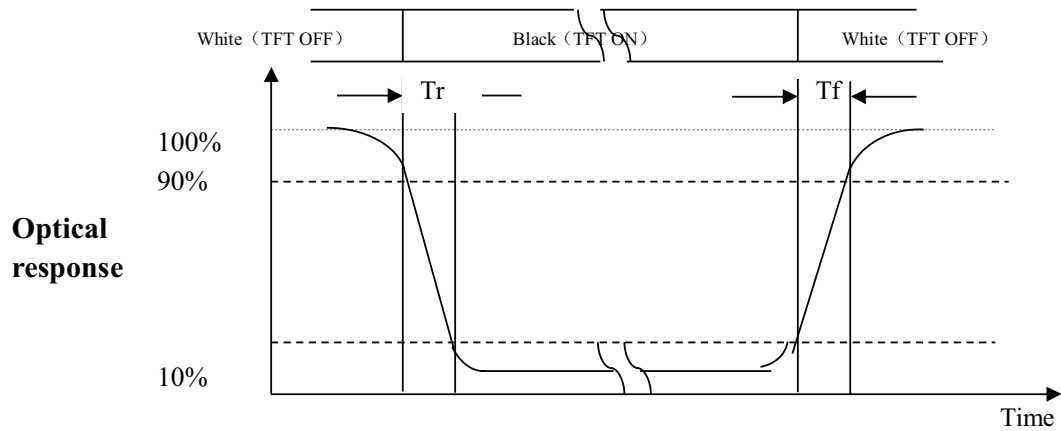
Note (1) Definition of Viewing Angle:



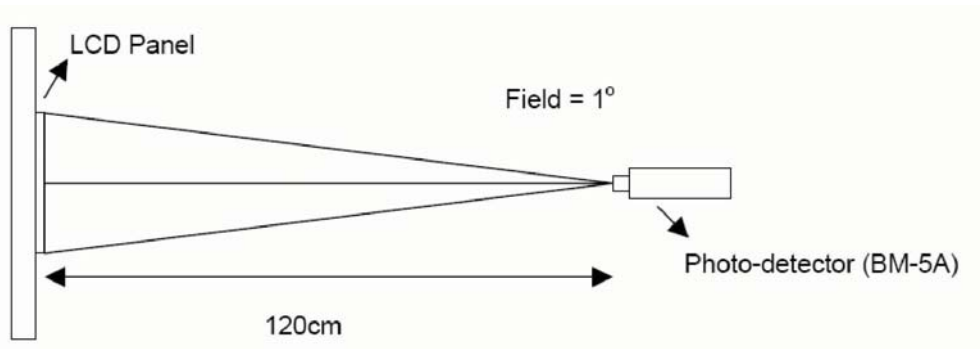
Note (2) Definition of Contrast Ratio (CR):  
measured at the center point of pane

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time: Sum of  $T_R$  and  $T_F$



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction).

## 6 Reliability Test Items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80°C, 240hrs	
2	Low Temperature Storage	Ta=-30°C, 240hrs	
3	High Temperature Operation	Ta=+70°C, 240hrs	
4	Low Temperature Operation	Ta=-20°C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+70°C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30°C(30min) → +80°C(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G <sup>2</sup> /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

### Reliability Test Criteria:

Display function should be no change under normal operating condition.

## 7. Handling Precautions

### 7.1 Safety

The liquid crystal in the LCD is poisonous. Keep away from your mouth and eyes. If the liquid crystal contacts with your skin, mouse or clothes, use soap to wash it off immediately.

### 7.2 Handling

- i. The LCD panel is made by thin glass. Prevent the panel from mechanical shock or putting excessive force on its surface.
- ii. The polarizer attached on the display is very easy to be damaged, handle it with special attention.
- iii. To avoid contamination on the display surface, do not touch the display surface with bare hands.
- iv. The transparent electrodes may be disconnected if you use the LCD panel under dew-condensing environment.

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v. The characteristics of the semiconductor devices may be affected when they are exposed to light, possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, make sure the application and the mounting of the panel are designed so that the IC is not exposed to light.

### **7.3 Static Electricity**

Ground soldering iron tips, tools and testers when you operate. Also ground your body when handling the products and store the products in an anti-electrostatic container.

### **7.4 Storage**

Store the products in a dark place where the temperature is within the range of  $25\pm 10$  and with low humidity (65%RH or less). Do not store the LCD product in an atmosphere containing organic solvents or corrosive gases.

### **7.5 Cleaning**

Do not wipe the polarizer with dry cloth, as it might cause scratching. Wipe the polarizer with a soft cloth soaked with petroleum IPA. Other chemical might damage the panel.