

LCM Specification

Product type
产品内容

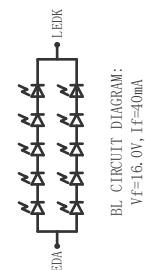
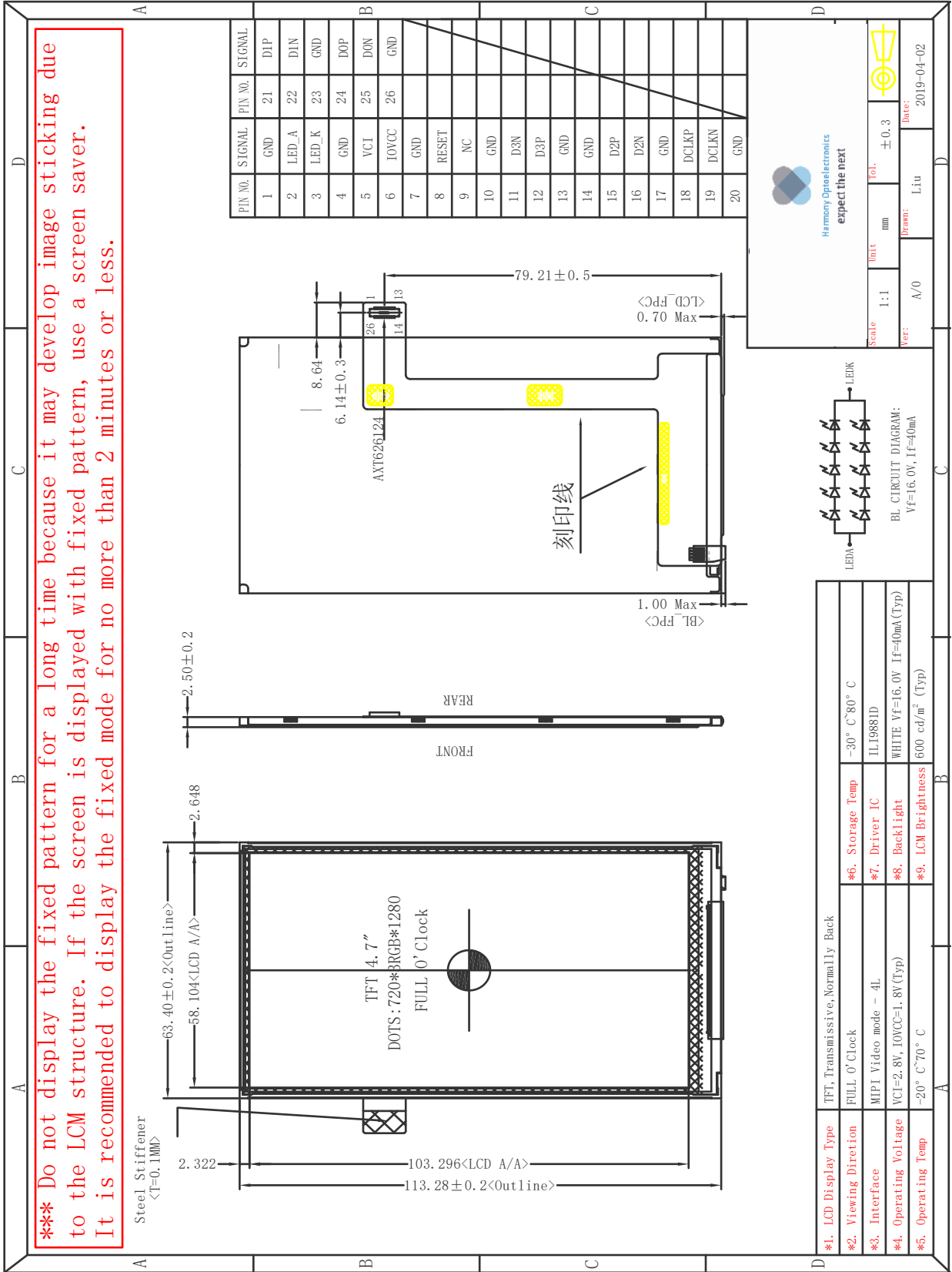
TFT LCD Module
720 x 3RGB x 1280 Dots
4.7" TFT LCD

1. General Feature:

Item	Standard Value	Unit
Display Size	4.7"	--
Number of Pixels	720(H)x3(RGB)*1280(V)	--
Active Area	58.104(H) *103.296(V)	mm
Outline Dimension	63.40(H) ×113.28× 2.50(V)	mm
Viewing Direction	FULL O'clock	-
Interface	MIPI Video Mode - 4L	-
LCM Driver IC	ILI9881D	-
LCM Driver Condition	IOVCC=1.8V,VCI=2.8V (Typ)	V
Backlight	White LED	-
Touch Panel	Without Touch Panel	-
CTP Driver IC	---	
CTP Driver Condition	---	
Operation Temperature	-20~70	°C
Storage Temperature	-30~80	°C

2.Outline Dimensions

*** Do not display the fixed pattern for a long time because it may develop image sticking due to the LCM structure. If the screen is displayed with fixed pattern, use a screen saver. It is recommended to display the fixed mode for no more than 2 minutes or less.



#1. LCD Display Type	TFT, Transmissive, Normally Back
#2. Viewing Direction	FULL 0'Clock
#3. Interface	MPI Video mode - 4L
#4. Operating Voltage	VCI=2.8V, IOVCC=1.8V (Typ)
#5. Operating Temp	$-20^{\circ}C \sim 70^{\circ}C$
#6. Storage Temp	$-30^{\circ}C \sim 80^{\circ}C$
#7. Driver IC	IL1988ID
#8. Backlight	WHITE $V_f = 16.0V$ $I_f = 40mA$ (Typ)
#9. LCM Brightness	600 cd/m^2 (Typ)

Harmony Optoelectronics
 expect the next

Scale: 1:1
 Unit: mm
 Tol.: ± 0.3

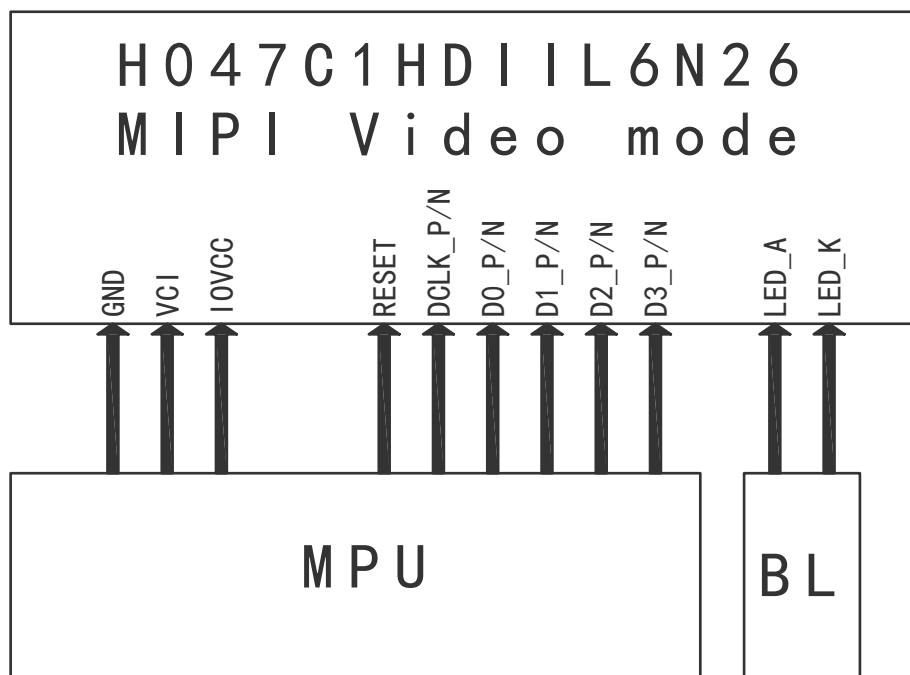
Ver: A/0
 Drawn: Liu
 Date: 2019-04-02

3. Pin Description

3.1 Pin Description

Pin NO.	Symbol	Description
1	GND	Ground
2	LED_A	LED Anode
3	LED_K	LED Cathode
4	GND	Ground
5	VCI	Analog Power
6	IOVCC	Power supply for I/O system.
7	GND	Ground
8	RESET	Reset Pin
9	NC	No Connect
10	GND	Ground
11	D3N	Negative polarity of low voltage differential data signal.
12	D3P	Positive polarity of low voltage differential data signal.
13	GND	Ground
14	GND	Ground
15	D2P	Positive polarity of low voltage differential data signal.
16	D2N	Negative polarity of low voltage differential data signal.
17	GND	Ground
18	DCLKP	Positive polarity of low voltage differential clock signal.
19	DCLKN	Negative polarity of low voltage differential clock signal.
20	GND	Ground
21	D1P	Positive polarity of low voltage differential data signal.
22	D1N	Negative polarity of low voltage differential data signal.
23	GND	Ground
24	D0P	Positive polarity of low voltage differential data signal.
25	D0N	Negative polarity of low voltage differential data signal.
26	GND	Ground
---END---		

3.2 Wiring Diagram



4. Electrical Characteristics

4-1 TFT LCD Module Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Unit
Interface logic circuits	IOVCC	-	1.75	1.8	3.3	V
Analog Power supply	VCI	-	2.65	2.8	3.3	V
TFT Gate on voltage	VGH	-	12.0	-	15.0	V
TFT Gate off voltage	VGL	-	-8.0	-	-12.0	V

4-2 LED back light specification (per chip)

Item	Symbol	Condition	Min	Type	Max	Unit
Forward voltage	Vt	If=20mA	14.0	16.0	17.0	V
Forward current	Ipn	/1-chip	-	40	-	mA
Luminance(With LCD)	Lv	If=40mA	-	600	-	cd/m ²
Luminous color	White					

5. OPTICAL SPECIFICATION

5.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance 1 lux and temperature = 25 ± 2°C) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. The center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement.

5.2 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ L	CR>10	-	80	-	Deg.	Note 1
		Θ R		-	80	-	Deg.	
	Vertical	Θ U		-	80	-	Deg.	
		Θ D		-	80	-	Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$	1200	1500	-		Note2
Color Gamut		CG		-	-	-	%	
White Chromaticity		Wx		-	(0.293)	-		
		Wy		-	(0.329)	-		
Reproduction of color	Red	Rx	$\Theta = 0^\circ$	-	(0.665)	-		Note4 (Based on C Light)
		Ry		-	(0.319)	-		
	Green	Gx		-	(0.257)	-		
		Gy		-	(0.577)	-		
	Blue	Bx		-	(0.137)	-		
		By		-	(0.095)	-		
Response Time (Rising + Falling)		Tr+Tf	$\Theta = 0^\circ$ Ta= 25°C	-	25	-	ms	Note5
Transmittance(with Polarizer)		Tr		-	(4.3)	-	%	Note3

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 FIGUR 1) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Transmittance is the Value without APF and without CG.

4. The color chromaticity coordinates specified in the above table 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.

5. The electro-optical response time measurements shall be made as FIGURE 2 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_f .

Figure1 Measurement Set Up

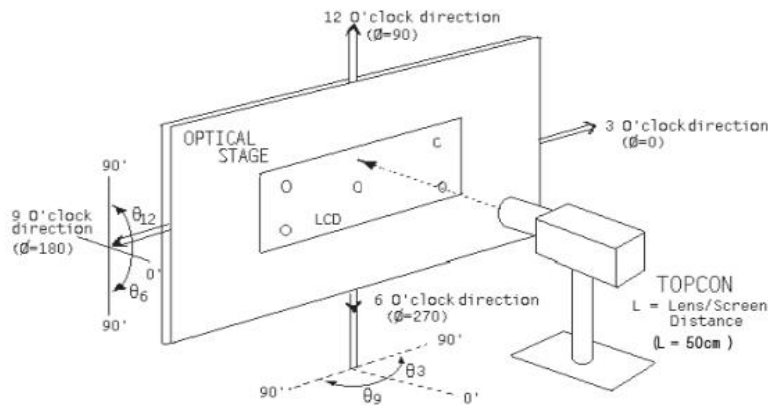
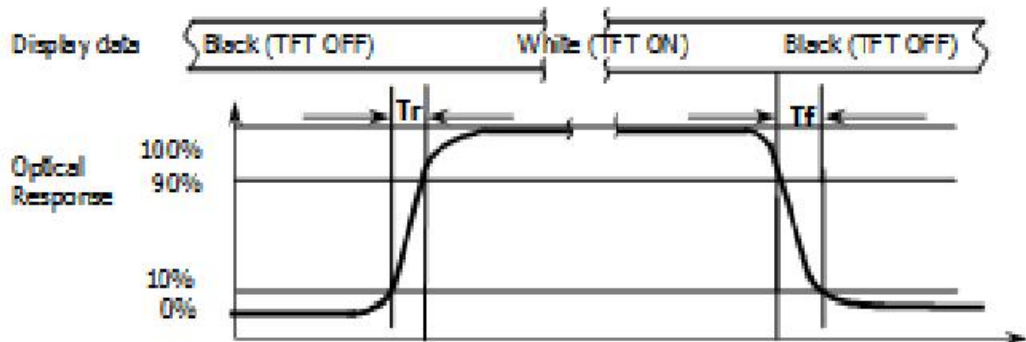
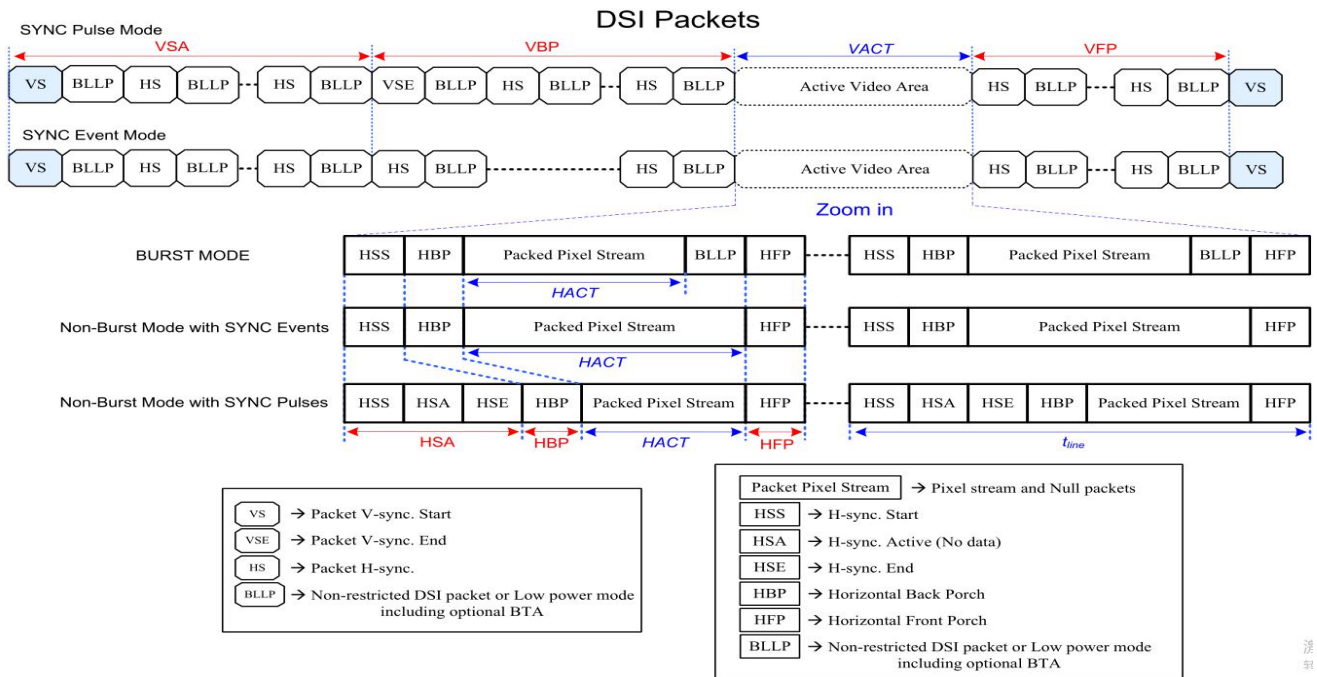


Figure2 Response Time Testing



6.MIPI Interface Characteristics

6-1 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 _{bps}	385		Note 5	Mbps/lane

1 UI=1/Bit rate

$$HAS(\text{pixel}) = (tHSA \times \text{lane number}) / (UI \times \text{pixel format})$$

$$HBP(\text{pixel}) = (tHBP \times \text{lane number}) / (UI \times \text{pixel format})$$

$$HFP(\text{pixel}) = (tHFP \times \text{lane number}) / (UI \times \text{pixel format})$$

$$\text{Frame Rate} = \frac{BR_{bps} \times \text{Lane}_{num}}{(VACT+VSA+VBP+VFP) \times (HACT+HSA+HBP+HFP) \times \text{Pixel Format}}$$

Example : BR_{bps} = 457Mbps/lane, 1UI=2.1883ns, Frame rate=60Hz, VACT=1280, VSA=2, VBP=30, VFP=20, HACT=720, HSA=33, HBP=100, HFP=100, Lane_{num}=4(lane), Pixel Format=24(bit).

Note:

1. Lane_{num}: Data lane of MIPI-DSI.
2. Pixel Format: Please reference to "4.1DSI System Interface".
3. The formula exists slightly error because of the host-transmission way.
4. The best frame rate setting : 2 data lanes : 50~60 Hz / 3 data lanes : 50~70 Hz / 4 data lanes : 50~70 Hz.
5. Please reference to "Table 39: Limited Clock Channel Speed".
6. The minimum values of this table mean the limitation of IC without considering the panel GIP. The actual values of VSA, VBP and VFP will be changed by different panel GIP setting.

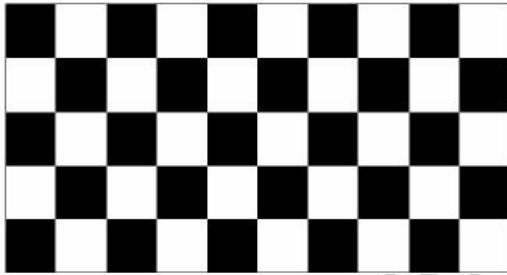
7. RELIABILITY TEST

7-1 Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Storage	Ta=+80 o C, 240hrs	
Low Temperature Storage	Ta=-30 o C, 240hrs	
High Temperature Operation	Ta=+70 o C, 240hrs	
Low Temperature Operation	Ta=-20 o C, 240hrs	
High Temperature and High Humidity (Operating)	Ta=+60 o C, 90%RH, 240hrs	

Note: (1) All tests above are practiced at module type.

(2) There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.



(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

7-2 Shock and Vibration

ITEMS	CONDITIONS
Packing Shock (Non-Operation)	<ul style="list-style-type: none"> ● Shock level:980m/s² ● Waveform:1/2 Sine wave,6msec ● ±X, ±Y ±Z,each axis 1 times
Packing Vibration (Non-Operation)	<ul style="list-style-type: none"> ● Frequency range:8-33.3HZ ● Stoke:1.0mm ● Sweep: 10Hz-50Hz ● x,y,z 2 hours for each direction

7-3 Electrostatic Discharge

TEST ITEM	CONDITIONS
ESD (Non-operation)	150pF,330 Ω , Contact±4KV,Air :±8KV.Note 1
	200pF,0 Ω , ±200V Contact test.Note 2

Note:Measure Point:

- 1.LCD glass and metal bezel
- 2.IF connector pins

8.HANDDLING & CAUTIONS

8-1 Caution For Operation

◆Since the LCM is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass maybe broken.

◆It is indispensable to drive the LCM within the specified voltage limit since the higher voltage than the limit causes LCM's life shorter. An electro-chemical reaction due to DC causes undesirable deterioration of the LCM so that the use of DC drive should avoid.

◆Do not connect or disconnect the LCM to or from the system when power is on.

◆Never use the LCM under abnormal conditions of high temperature and high humidity.

◆When expose to drastic fluctuation of temperature(hot to cold or cold to hot), the LCM may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCM's surface which may affect the operation of the polarizer on the LCM.

◆Response time will be extremely delay at lower temperature than the operating temperature range and on the other hand LCM may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCM. The LCM will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

◆Do not display the fixed pattern for a long time because it may develop image sticking due to the LCM structure. If the screen is displayed with fixed pattern, use a screen saver. It is recommended to display the fixed mode for no more than 2 minutes or less.

◆Do not disassemble and/or re-assemble LCM module

7-2 Caution Against Static Charge

◆The LCM use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.

◆Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.

◆Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

◆In handling the LCM, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary

9.LCD display initialization code

```
Void Panel_Initial_Code(void)
```

```
{
```

```
T. B.D
```

```
}
```

```
Void Panel_SleepIn_Mode (void)
```

```
{
```

```
LCD_ILI9881D_CMD(0xFF); //Page0
```

```
LCD_ILI9881D_INDEX(0x98);
```

```
LCD_ILI9881D_INDEX(0x81);
```

```
LCD_ILI9881D_INDEX(0x00);
```

```
LCD_ILI9881D_CMD(0x28); //Display Off
```

```
Delaysms(50);
```

```
LCD_ILI9881D_CMD(0x10); //Sleep-In
```

```
Delaysms(120);} 
```

```
Void Panel_SleepOut_Mode (void)
```

```
{
```

```
LCD_ILI9881D_CMD(0xFF); //Page0
```

```
LCD_ILI9881D_INDEX(0x98);
```

```
LCD_ILI9881D_INDEX(0x81);
```

```
LCD_ILI9881D_INDEX(0x00);
```

```
LCD_ILI9881D_CMD(0x11); //Sleep-Out
```

```
Delaysms(120);
```

```
LCD_ILI9881D_CMD(0x29); //Display On
```

```
Delaysms(50);
```

```
}
```

--END--