LCM Specification

☐Preliminary specification

☑Final Specification

Project No. 项目编号	H040A2WVIIL5C33
Customer 客户名称	
Module No. 客户型号	
Product type 产品内容	TFT LCD Module 480 x 3RGB x 800 Dots 4.0”TFT LCD

Signature by customer:
客户确认签章：

☐Trial production ☐Mass production

编　　制	电子审核	结构审核	批　　准
Y.L			

深圳市鑫洪泰电子科技有限公司

Shenzhen Hot Display Technology Co.,Ltd

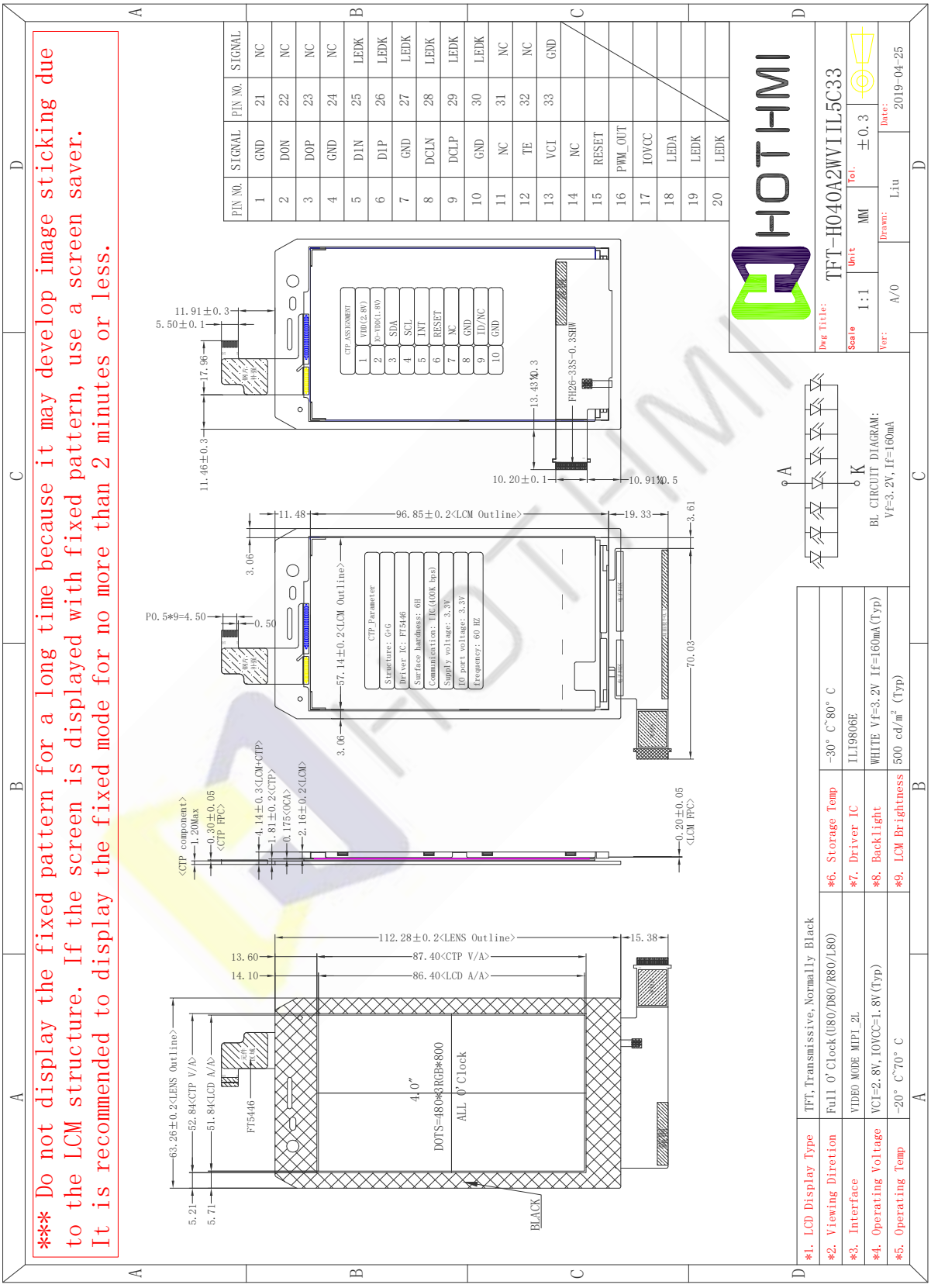
1 Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
A	2019-4-10	First Release.	Y.L	

1. General Feature:

Item	Standard Value	Unit
Display Size	4.0”	--
Number of Pixels	480(H)x3(RGB)*800(V)	--
Active Area	51.84(H) *86.40(V)	mm
LCM Outline Dimension	57.14(H) ×96.85(V)× 2.16(V)	mm
Viewing Direction	FULL O’Clock	-
Interface	Video Mode MIPI-2L	-
Driver IC	ILI9806E	-
Driver Condition	VCI=2.8V,IOVCC=1.8V(Typ)	V
Backlight	White LED	-
Touch Panel	Cap Touch Panel	-
Operation Temperature	-20~70	℃
Storage Temperature	-30~80	℃

2.Outline Dimensions



3. Pin Description

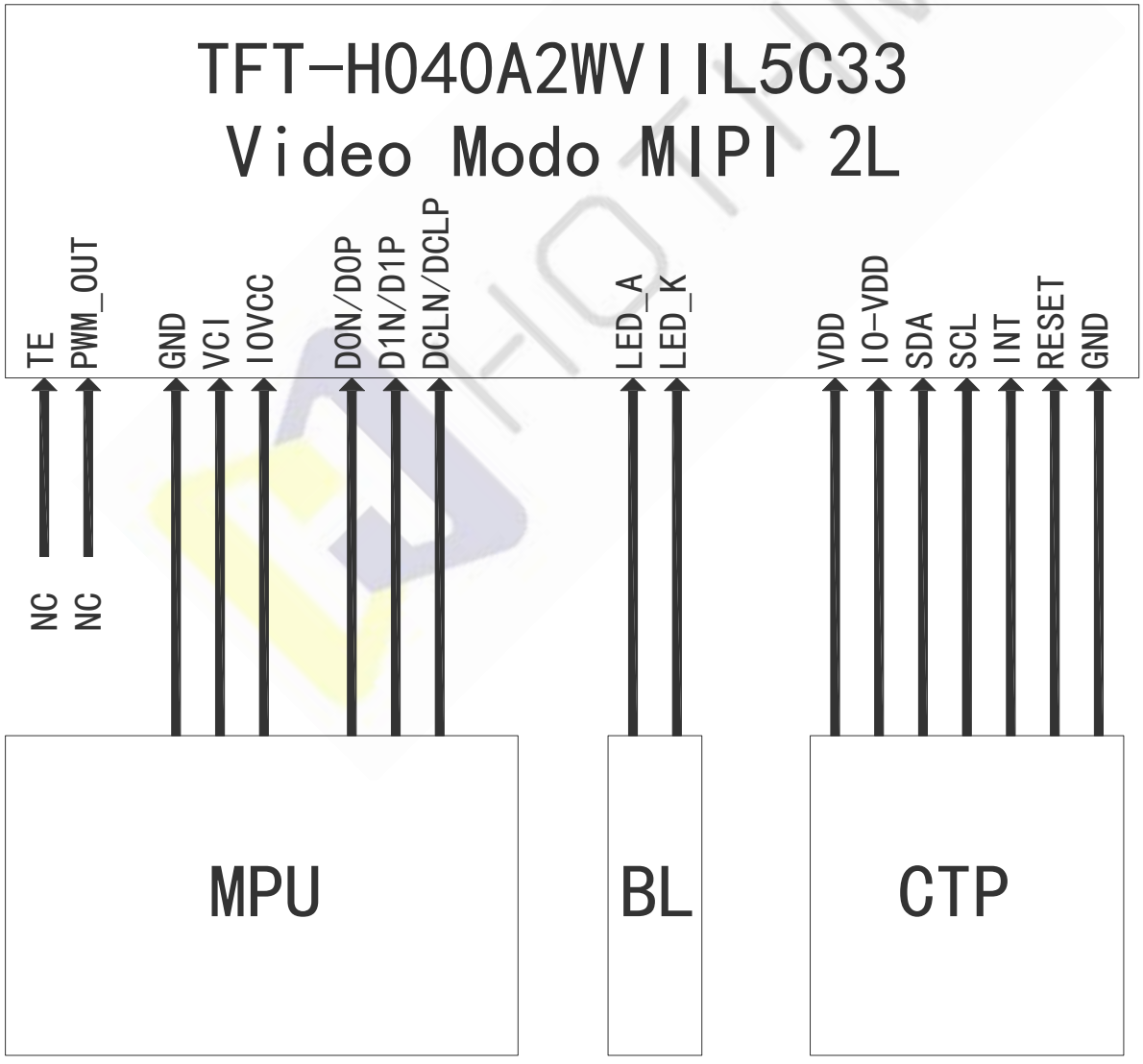
3.1 LCM Pin Description

Pin NO.	Symbol	Description
1	GND	Ground
2	D0N	MIPI DSI differential data pair
3	D0P	MIPI DSI differential data pair
4	GND	Ground
5	D1N	MIPI DSI differential data pair
6	D1P	MIPI DSI differential data pair
7	GND	Ground
8	DCLN	MIPI DSI differential data pair
9	DCLP	MIPI DSI differential data pair
10	GND	Ground
11	NC	No Connector
12	TE	No Connector
13	VCI	Analog Power(2.65 ~ 3.3 V)
14	NC	No Connector
15	RESET	Chip reset signal
16	PWM_OUT	Backlight adjust input
17	IOVCC	Power(1.65 ~ 3.3 V)
18	LED_A	LED Anode(+3.2V/160mA)
19-20	LED_K	LED Cathode
20-24	NC	No Connector
25-30	LED_K	LED Cathode
31-32	NC	No Connector
33	GND	Ground
- - END - -		

3.2 CTP Pin Description

Pin NO.	Symbol	Description
1	VDD(2.8V)	CTP Power(2.8V)
2	IO-VDD(1.8V)	CTP Power(1.8V)
3	SDA	CTP SDA Data
4	SCL	CTP SCL Data
5	INT	CTP Interrupt
6	RESET	CTP Reset
7	NC	No Connector
8	GND	Ground
9	ID/NC	No Connector
10	GND	Ground

3.3 Wiring Diagram



4. Electrical Characteristics

4-1 TFT LCD Module Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Uint
Interface logic circuits	IOVCC	-	1.65	1.8	3.3	V
Analog Power supply	VCI	-	2.65	2.8	3.3	V
TFT Gate on voltage	VGH	-	10.0	-	16.0	V
TFT Gate off voltage	VGL	-	-16.0	-	-10.0	V

4-2 LED back light specification (pera chip)

Item	Symbol	Condition	Min	Type	Max	Uint
Forward voltage	Vt	If=20mA	3.0	3.2	3.4	V
Forward current	Ipn	/1-chip	-	160	-	mA
Luminance(With LCD)	Lv	If=160mA	-	500	-	cd/㎡
Luminous color	White					

5. OPTICAL SPECIFICATION

5.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance 1lux and temperature = 25 2℃) 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	70	80	-	Deg.	Note 1
		Θ R		70	80	-	Deg.	
	Vertical	Θ U		70	80	-	Deg.	
		Θ D		70	80	-	Deg.	
Contrast ratio		CR	Θ = 0°	550	800	-		Note2
Color Gamut		CG		-	-	-	%	
White Chromaticity		Wx	Θ = 0°	-	-	-		
		Wy		-	-	-		
Reproduction of color	Red	Rx		-	-	-		Note4 (Based on C Light)
		Ry		-	-	-		
	Green	Gx		-	-	-		
		Gy		-	-	-		
	Blue	Bx		-	-	-		
		By		-	-	-		
Response Time (Rising + Falling)		Tr+Tf	Θ = 0° Ta= 25℃	-	35	-	ms	Note5
Transmittance(with Polarizer)		Tr		-	-	-	%	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 Θ = 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 Tr, and 90% to 10% is Tf.

Figure1 Measurement Set Up

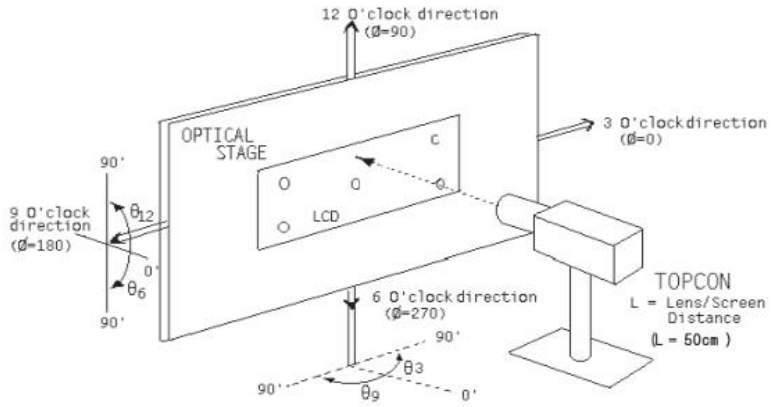
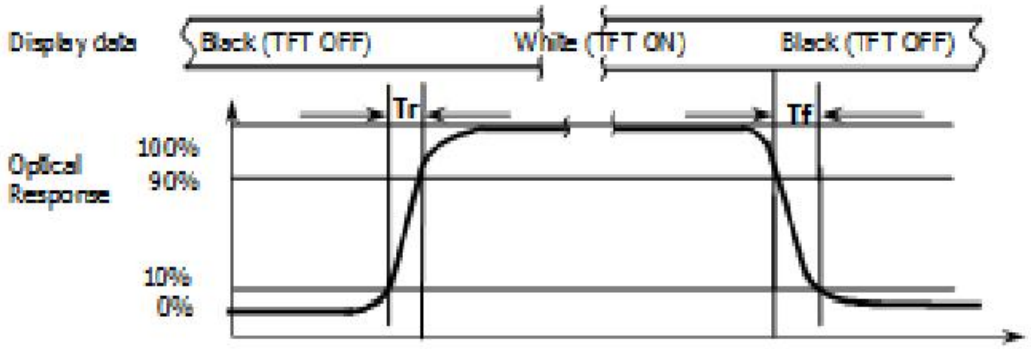


Figure2 Response Time Testing



6.Timing Characteristics of Input Signals

6-1 High Speed Mode – Clock Channel Timing

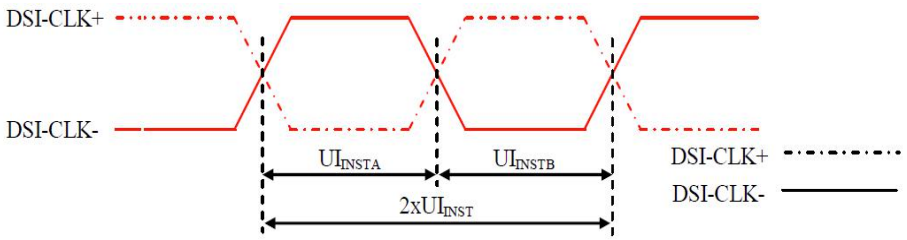


Figure 1 DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	4	25	ns
DSI-CLK+/-	UI_{INSTA},UI_{INSTB}	UI instantaneous Half	2	12.5	ns

Note: $UI = UI_{INSTA} = UI_{INSTB}$

Table 1 DSI Clock Channel Timing

6-2 High Speed Mode – Data Clock Channel Timing

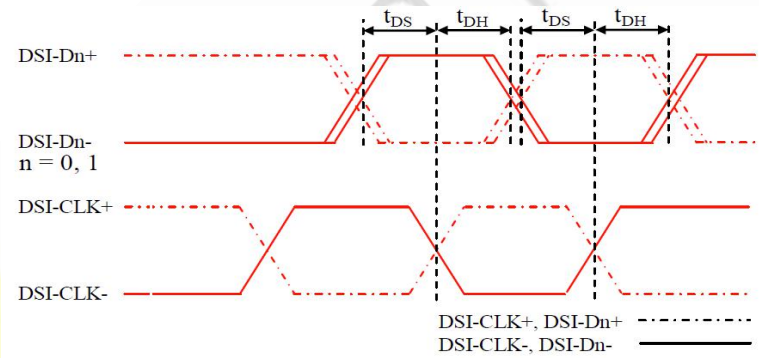


Figure 2 DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DSI-Dn+/- , n=0 and 1	t_{DS}	Data to Clock Setup time	0.15xUI	-
	t_{DH}	Clock to Data Hold Time	0.15xUI	-

Table 2 DSI Data to Clock Channel Timings

6-3 CTP Characteristics

Item	Spec			Unit	Remark
	MIN	TYP	MAX		
Structure	G+G (LENS T=1.1MM,SENSORT=0.55MM)				
Driver IC	FT5446				
Linearity	≤ 3.0%			%	
Touch Point	5			点	
Voltage	2.8	-	3.3	V	
Chattering Time	-	-	15	ms	
Transparency	85	-	-	%	
Operation Force	-	-	10	g	
Surface Hardness	6	-	-	H	
Tapping Durability	1000,000	-	-	times	
Hitting Durability	100,000	-	-	times	
Operation Temp	-20	-	70	℃	
Storage Temp	-30	-	80	℃	

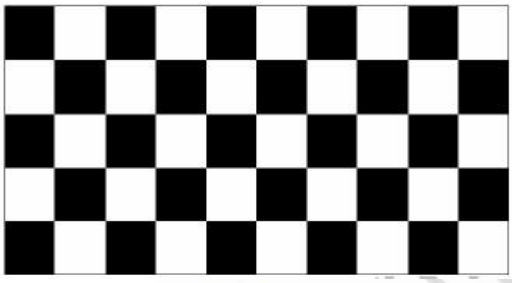
7. RELIABILITY TEST

7-1 Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	60℃ ; 120hrs	
High Temperature Storage	70℃ ; 120hrs	
High Temperature High Humidity Operation	60℃; 90%RH ; 120hrs (No condensation)	
Low Temperature Operation	-10℃ ; 120hrs	
Low Temperature Storage	-20℃ ; 120hrs	
Thermal Shock	-30℃ (0.5hr) ~ 80℃ (0.5hr) ; 100 Cycles	Non-Operating
Image Sticking	25℃ ; 2hrs	1

Note 1: Condition of Image Sticking test：25℃ ±2℃

Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.After 5 mins, the mura must be disappeared completely .



(a) Test Pattern (chess board Pattern)

(b) Gray Pattern

7-2 Shock and Vibration

ITEMS	CONDITIONS
Packing Shock (Non-Operation)	● Shock level:980m/s^2 ● Waveform:1/2 Sine wave,6msec ● ±X, ±Y ±Z,each axis 1 times
Packing Vibration (Non-Operation)	● 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,330Ω， Contact±4KV,Air :±8KV.Note 1
	200pF,0Ω， ±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 initi(void)

{

   res=1;

   delay(1);

   res=0;

   delay(10);

   res=1;

   delay(200);

//*************************//LCD SETING

write_command(0xFF);          // Change to Page 1 CMD

write_data(0xFF);

write_data(0x98);

write_data(0x06);

write_data(0x04);

write_data(0x01);



write_command(0x08);          //Output     SDA

write_data(0x10);
```

```
write_command(0x20);          //set DE/VSYNC mode     平台注意

write_data(0x00);


write_command(0x21);          //DE = 1 Active

write_data(0x01);


write_command(0x30);          //Resolution setting 480 X 800

write_data(0x02);


write_command(0x31);          //Inversion setting 2-dot

write_data(0x02);


write_command(0x60);

write_data(0x07);


write_command(0x61);

write_data(0x06);


write_command(0x62);

write_data(0x06);
```

```
write_command(0x63);
write_data(0x04);

write_command(0x40); //BT  AVDD,AVDD 倍压
write_data(0x18); //10,14

write_command(0x41);//AVDD, AVEE设置
write_data(0x33); //avdd +5.4v,avee-5.2v ;55

write_command(0x42);  //VGL ,VGH  SET
write_data(0x11);

write_command(0x43);//Default
write_data(0x09);

write_command(0x44);
write_data(0x0C);

write_command(0x46); //增加
```

```
write_data(0x55);


write_command(0x47); //增加
write_data(0x55);


write_command(0x45);
write_data(0x14);


write_command(0x50);          //VREG1
write_data(0x50);


write_command(0x51);          //VREG2
write_data(0x50);


write_command(0x52);          //Flicker MSB
write_data(0x00);


write_command(0x53);          //Flicker LSB
write_data(0x38); //VCOM
```

```
write_command(0xA0);        //Positive Gamma
write_data(0x00);
write_command(0xA1);        //
write_data(0x09);
write_command(0xA2);        //
write_data(0x0C);
write_command(0xA3);        //
write_data(0x0F);
write_command(0xA4);        //
write_data(0x06);
write_command(0xA5);        //
write_data(0x09);
write_command(0xA6);        //
write_data(0x07);
write_command(0xA7);        //
write_data(0x16);
write_command(0xA8);        //
write_data(0x06);
write_command(0xA9);        //
write_data(0x09);
```

```
write_command(0xAA);        //
write_data(0x11);
write_command(0xAB);        //
write_data(0x06);
write_command(0xAC);        //
write_data(0x0E);
write_command(0xAD);        //
write_data(0x19);
write_command(0xAE);        //
write_data(0x0E);
write_command(0xAF);        //
write_data(0x00);


write_command(0xC0);        //Negative Gamma
write_data(0x00);
write_command(0xC1);        //
write_data(0x09);
write_command(0xC2);        //
write_data(0x0C);
write_command(0xC3);        //
```

```
write_data(0x0F);
write_command(0xC4);          //
write_data(0x06);
write_command(0xC5);          //
write_data(0x09);
write_command(0xC6);          //
write_data(0x07);
write_command(0xC7);          //
write_data(0x16);
write_command(0xC8);          //
write_data(0x06);
write_command(0xC9);          //
write_data(0x09);
write_command(0xCA);          //
write_data(0x11);
write_command(0xCB);          //
write_data(0x06);
write_command(0xCC);          //
write_data(0x0E);
write_command(0xCD);          //
```

```
write_data(0x19);

write_command(0xCE);          //

write_data(0x0E);

write_command(0xCF);          //

write_data(0x00);



write_command(0xFF);          // Change to Page 6 CMD for GIP timing

write_data(0xFF);

write_data(0x98);

write_data(0x06);

write_data(0x04);

write_data(0x06);



write_command(0x00);          //

write_data(0xA0);

write_command(0x01);          //

write_data(0x05);

write_command(0x02);          //

write_data(0x00);

write_command(0x03);          //
```

```
write_data(0x00);
write_command(0x04);          //
write_data(0x01);
write_command(0x05);          //
write_data(0x01);
write_command(0x06);          //
write_data(0x88);
write_command(0x07);          //
write_data(0x04);
write_command(0x08);          //
write_data(0x01);
write_command(0x09);          //
write_data(0x90);
write_command(0x0A);          //
write_data(0x04);
write_command(0x0B);          //
write_data(0x01);
write_command(0x0C);          //
write_data(0x01);
write_command(0x0D);          //
```

```
write_data(0x01);
write_command(0x0E);          //
write_data(0x00);
write_command(0x0F);          //
write_data(0x00);


write_command(0x10);          //
write_data(0x55);
write_command(0x11);          //
write_data(0x50);
write_command(0x12);          //
write_data(0x01);
write_command(0x13);          //
write_data(0x85);
write_command(0x14);          //
write_data(0x85);
write_command(0x15);          //
write_data(0xC0);
write_command(0x16);          //
write_data(0x0B);
```

```
write_command(0x17);        //
write_data(0x00);
write_command(0x18);        //
write_data(0x00);
write_command(0x19);        //
write_data(0x00);
write_command(0x1A);        //
write_data(0x00);
write_command(0x1B);        //
write_data(0x00);
write_command(0x1C);        //
write_data(0x00);
write_command(0x1D);        //
write_data(0x00);


write_command(0x20);        //
write_data(0x01);
write_command(0x21);        //
write_data(0x23);
write_command(0x22);        //
```

```
write_data(0x45);
write_command(0x23);          //
write_data(0x67);
write_command(0x24);          //
write_data(0x01);
write_command(0x25);          //
write_data(0x23);
write_command(0x26);          //
write_data(0x45);
write_command(0x27);          //
write_data(0x67);


write_command(0x30);          //
write_data(0x02);
write_command(0x31);          //
write_data(0x22);
write_command(0x32);          //
write_data(0x11);
write_command(0x33);          //
write_data(0xAA);
```

```
write_command(0x34);          //
write_data(0xBB);
write_command(0x35);          //
write_data(0x66);
write_command(0x36);          //
write_data(0x00);
write_command(0x37);          //
write_data(0x22);
write_command(0x38);          //
write_data(0x22);
write_command(0x39);          //
write_data(0x22);
write_command(0x3A);          //
write_data(0x22);
write_command(0x3B);          //
write_data(0x22);
write_command(0x3C);          //
write_data(0x22);
write_command(0x3D);          //
write_data(0x22);
```

```
write_command(0x3E);          //
write_data(0x22);
write_command(0x3F);          //
write_data(0x22);
write_command(0x40);          //
write_data(0x22);
write_command(0x52);          //
write_data(0x12);
write_command(0x53);          //
write_data(0x12);


write_command(0xFF);          // Change to Page 7 CMD for GIP timing
write_data(0xFF);
write_data(0x98);
write_data(0x06);
write_data(0x04);
write_data(0x07);


write_command(0x17);          //
write_data(0x32);
```

```
write_command(0x02);          //
write_data(0x17);

write_command(0x18);          //
write_data(0x1D);

write_command(0xE1);          //
write_data(0x79);

write_command(0xFF);          // Change to Page 0 CMD for Normal command
write_data(0xFF);
write_data(0x98);
write_data(0x06);
write_data(0x04);
write_data(0x00);

write_command(0x3A);
write_data(0x70); //24BIT
```

```
write_command(0x11);
delay(120);
write_command(0x29);
delay(50);
}
//*********************************************
void EnterSleep (void)
{
    write_command(0x28);
    delay(10);
    write_command(0x10);
  }
//*********************************************************
void ExitSleep (void)
 {
    write_command(0x11);
    delay(120);
    write_command(0x29);
   }
```

- - END - -