LCM Specification

☑Preliminary specification

☐Final Specification

Project No. 项目编号	TFT-H020A3QVIFT2N15
Customer 客户名称	
Module No. 客户型号	
Product type 产品内容	TFT LCD Module 240 x 3RGB x 320 Dots 2.0”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			

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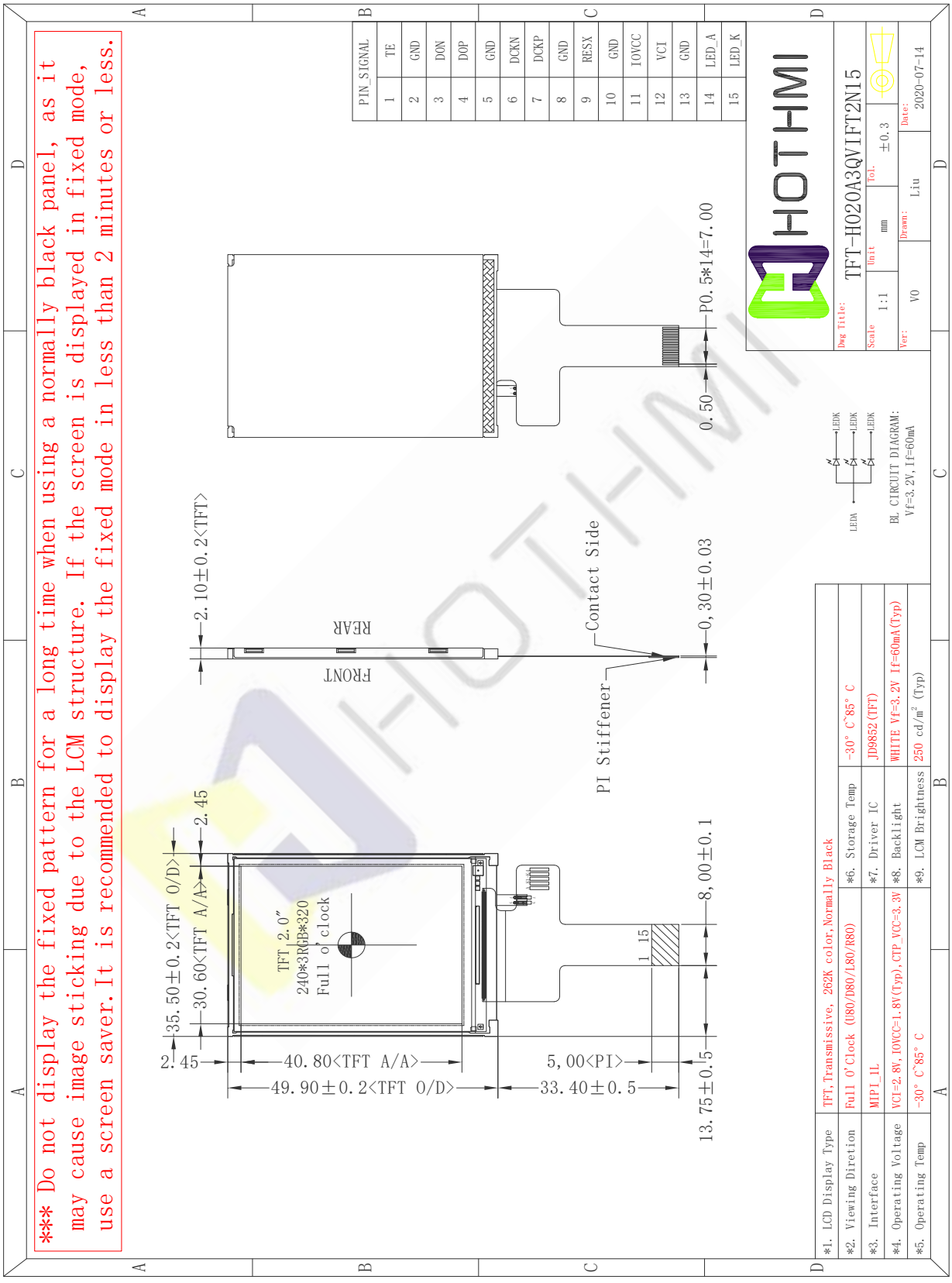
1 Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
0	2020-09-15	First Release.	Y.L	

1. General Feature:

Item	Standard Value	Unit
Display Size	2.0”	--
Number of Pixels	240(H)x3(RGB)*320(V)	--
Active Area	30.60(H) *40.80(V)	mm
Outline Dimension	35.50(H) ×49.90(V)× 2.10(D)	mm
Viewing Direction	Full O'clock	-
Interface	MIPI-1L (Video mode)	-
Driver IC	JD9852	-
Display Colors	262K	-
Driver Condition	VCI=2.8V，IOVCC=1.8V	V
Backlight	White LED	-
Touch Panel	Without Touch Panel	-
CTP Driver IC	- - -	
CTP Driver Condition	VDD=3.3V	
Operation Temperature	-30~85	℃
Storage Temperature	-30~85	℃

2.Outline Dimensions

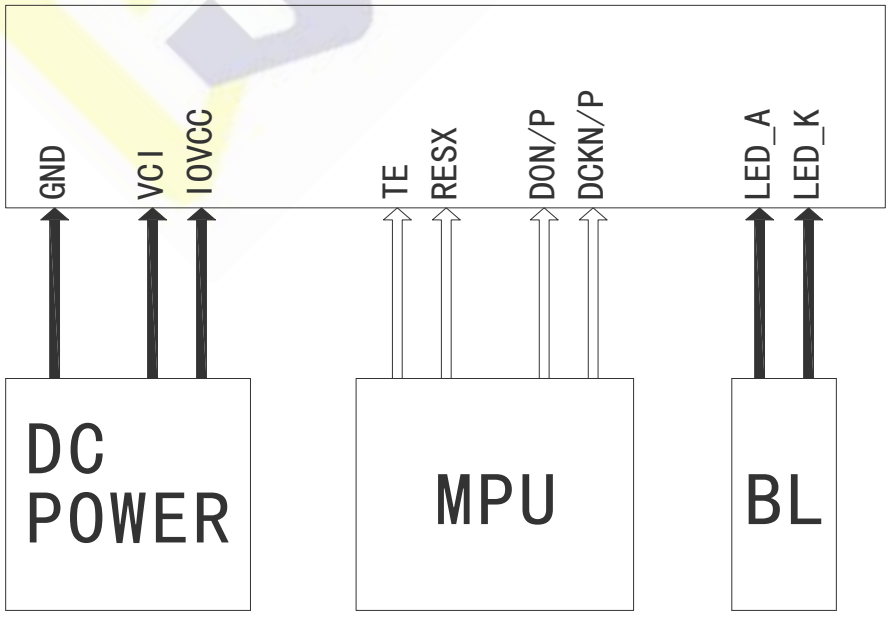


3. Pin Description

3.1 Pin Description

Pin NO.	Symbol	Description
1	TE	Tearing effect output pin to synchronize MPU to frame writing. If not used, open this pin.
2	GND	Ground
3	D0N	MIPI-DSI Data differential signal input pins.
4	D0P	MIPI-DSI Data differential signal input pins.
5	GND	Ground
6	DCKN	MIPI-DSI CLOCK differential signal input pins.
7	DCKP	MIPI-DSI CLOCK differential signal input pins.
8	GND	Ground
9	RESX	Global reset pin. Active low to enter reset state.
10	GND	Ground
11	IOVCC	Logic Power(1.75 ~ 3.3 V,1.8V Type)
12	VCI	Analog Power(2.6 ~ 3.3 V,2.8V Type)
13	GND	Ground
14	LED_A	LED Anode
15	LED_K	LED Cathode
---END---		

3.2 Wiring Diagram



4. Electrical Characteristics

4-1 TFT LCD Module Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Uint
Interface logic circuits	IOVCC	-	1.75	1.8	3.3	V
Analog Power supply	VCI	-	2.6	2.8	3.3	V
TFT Gate on voltage	VGH	-	10.0	-	16.0	V
TFT Gate off voltage	VGL	-	-13.0	-	-7.0	V

4-2 LED back light specification (pera chip)

Item	Symbol	Condition	Min	Type	Max	Uint
Forward voltage	Vt	If=20mA	2.8	3.2	3.4	V
Forward current	Ipn	/1-chip	-	60	-	mA
Luminance(With LCD)	Lv	If=60mA	-	250	-	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	-	85	-	Deg.	Note 1
		Θ R		-	85	-	Deg.	
	Vertical	Θ U		-	85	-	Deg.	
		Θ D		-	85	-	Deg.	
Contrast ratio		CR	Θ = 0°	800	1000	-		Note2
Color Gamut		CG		55	60	-	%	
White Chromaticity		Wx	Θ = 0°	-0.02	0.318	+0.02		
		Wy			0.346			
Reproduction of color	Red	Rx			0.635			Note4 (Based on C Light)
		Ry			0.336			
	Green	Gx			0.295			
		Gy			0.575			
	Blue	Bx			0.133			
		By			0.123			
Response Time (Rising + Falling)		Tr+Tf	Θ = 0° Ta= 25℃	-	35	45	ms	Note5
Transmittance(with Polarizer)		Tr		-	4.65	-	%	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

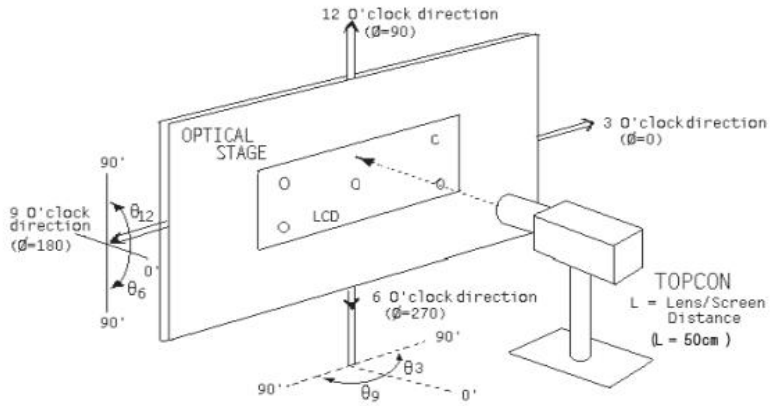
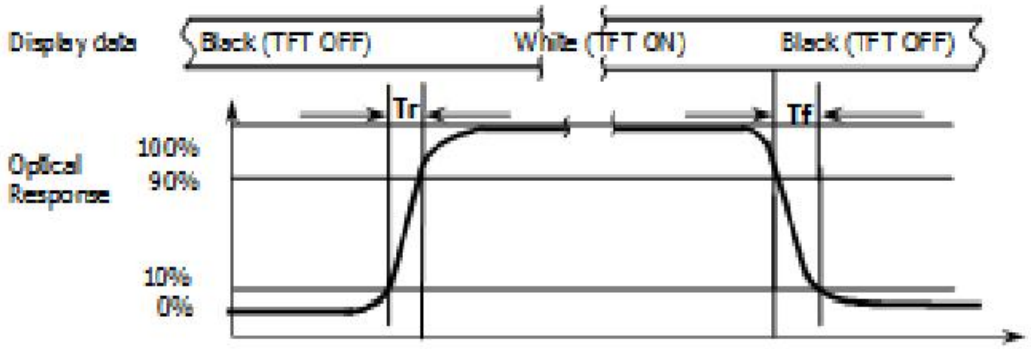


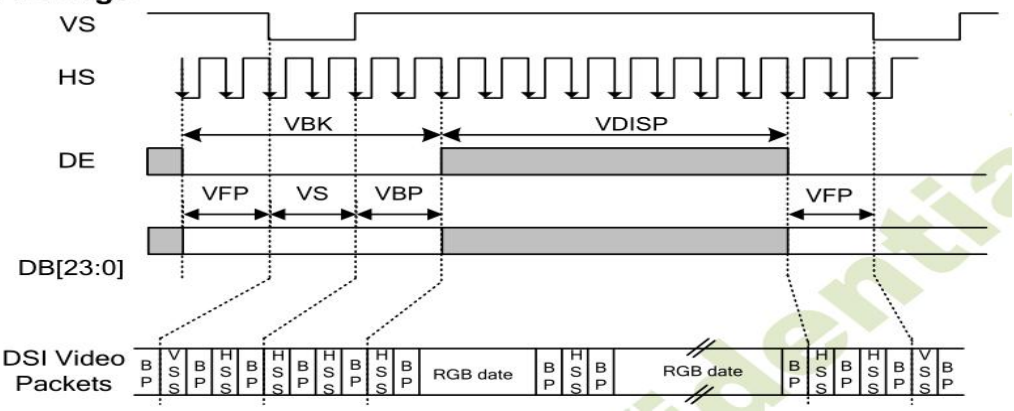
Figure2 Response Time Testing



6. Timing Characteristics of Input Signals

6-1 Timings for DSI Video mode

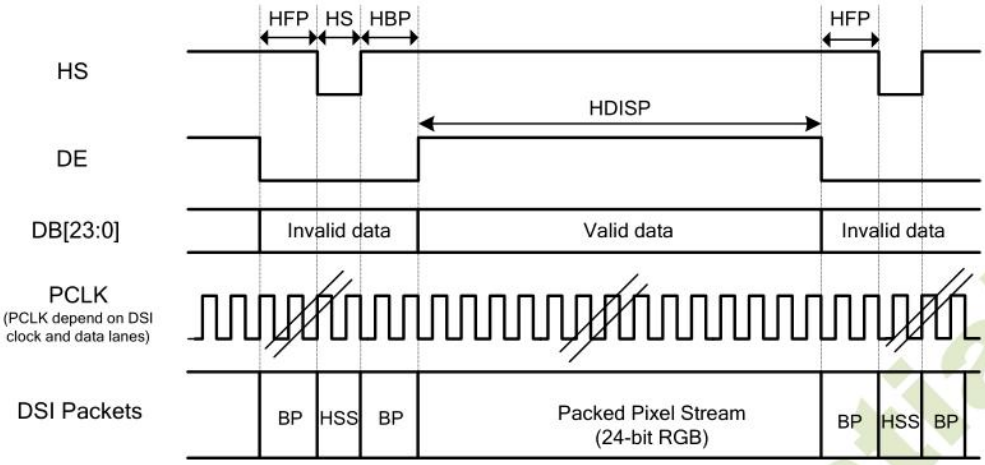
Vertical Timings



Resolution=240x320 (TA=25°C, IOVCC=1.8V, VCI=2.8V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical low pulse width	VS	-	2	-	Note(1)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(1)	Line
Vertical blanking period	VBK	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	320	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Horizontal Timings



Resolution=240x320 (TA=25°C, IOVCC=1.8V, VCI=2.8V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS low pulse width	HS	-	6	-	78	DCK
Horizontal back porch	HBP	-	5	-	78	DCK
Horizontal front porch	HFP	-	5	-	78	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	16	-	88	DCK
Horizontal active area	HDISP	-	-	240	-	DCK

Note: (1) HS+HBP>0.5uS.

(2) HFP>0.5uS.

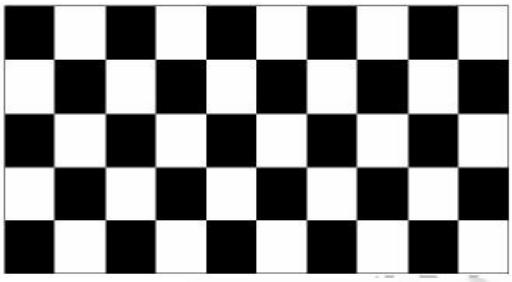
7. RELIABILITY TEST

7-1 Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Storage	Ta=+85 o C, 120hrs	
Low Temperature Storage	Ta=-30 o C, 120hrs	
High Temperature Operation	Ta=+85 o C, 120hrs	
Low Temperature Operation	Ta=--30 o C, 120hrs	
High Temperature and High Humidity (Operating)	Ta=+60 o C, 90%RH, 120hrs	

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)	● 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 when using a normally black panel, as it may cause image sticking due to the LCM structure. If the screen is displayed in fixed mode, use a screen saver.It is recommended to display the fixed mode in less than 2 minutes or less.

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

8-2 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)
{
   //Resolution:240x320
   //External system porch setting: VS=2 ,VBP=6 ,VFP=8 ,HS=4 ,HBP=20 ,HFP=40
   //Frame rate:60HZ
   //MIPI CLK:74Mhz
   //Power:VCI=2.8, IOVCC=1.8

   LCD_nReset=1;
   Delayms(5);
   LCD_nReset=0;
   Delayms(10);
   LCD_nReset=1;
   Delayms(120);

   SSD_CMD(0xDF); //Password
   SSD_PAR(0x98);
   SSD_PAR(0x51);
   SSD_PAR(0xE9);

   SSD_CMD(0xDE);
   SSD_PAR(0x00);

   SSD_CMD(0xB7);
   SSD_PAR(0x1E);
   SSD_PAR(0x85);
   SSD_PAR(0x1E);
   SSD_PAR(0x33);

   SSD_CMD(0xC8); //gamma2.0 //gamma2.5
   SSD_PAR(0x3F);     //0x3F          //0x3F
   SSD_PAR(0x32);     //0x34          //0x30
   SSD_PAR(0x29);     //0x2B          //0x27
   SSD_PAR(0x28);     //0x2A          //0x25
   SSD_PAR(0x2A);     //0x2C          //0x27
   SSD_PAR(0x2C);     //0x2E          //0x28
   SSD_PAR(0x26);     //0x28          //0x22
   SSD_PAR(0x24);     //0x27          //0x21
```

```
SSD_PAR(0x22);  //0x25          //0x1F
SSD_PAR(0x21);  //0x24          //0x1D
SSD_PAR(0x1D);  //0x21          //0x18
SSD_PAR(0x12);  //0x17          //0x0D
SSD_PAR(0x0E);  //0x14          //0x0A
SSD_PAR(0x09);  //0x0E          //0x04
SSD_PAR(0x04);  //0x0A          //0x00
SSD_PAR(0x06);  //0x06          //0x06
SSD_PAR(0x3F);  //0x3F          //0x3F
SSD_PAR(0x32);  //0x34          //0x30
SSD_PAR(0x29);  //0x2B          //0x27
SSD_PAR(0x28);  //0x2A          //0x25
SSD_PAR(0x2A);  //0x2C          //0x27
SSD_PAR(0x2C);  //0x2E          //0x28
SSD_PAR(0x26);  //0x28          //0x22
SSD_PAR(0x24);  //0x27          //0x21
SSD_PAR(0x22);  //0x25          //0x1F
SSD_PAR(0x21);  //0x24          //0x1D
SSD_PAR(0x1D);  //0x21          //0x18
SSD_PAR(0x12);  //0x17          //0x0D
SSD_PAR(0x0E);  //0x14          //0x0A
SSD_PAR(0x09);  //0x0E          //0x04
SSD_PAR(0x04);  //0x0A          //0x00
SSD_PAR(0x06);  //0x06          //0x06

SSD_CMD(0xB9);
SSD_PAR(0x33);
SSD_PAR(0x08);
SSD_PAR(0xCC);

SSD_CMD(0xBB);
SSD_PAR(0x46);
SSD_PAR(0x7A);
SSD_PAR(0x30);
SSD_PAR(0x40);
SSD_PAR(0x6C);
SSD_PAR(0x60);
SSD_PAR(0x70);
SSD_PAR(0x70);
```

```
SSD_CMD(0xBC);
SSD_PAR(0x38);
SSD_PAR(0x3C);

SSD_CMD(0xC0);
SSD_PAR(0x31);
SSD_PAR(0x20);

SSD_CMD(0xC1);
SSD_PAR(0x12);

SSD_CMD(0xC3);
SSD_PAR(0x08);
SSD_PAR(0x00);
SSD_PAR(0x0A);
SSD_PAR(0x10);
SSD_PAR(0x08);
SSD_PAR(0x54);
SSD_PAR(0x45);
SSD_PAR(0x71);
SSD_PAR(0x2C);

SSD_CMD(0xC4);
SSD_PAR(0x00);
SSD_PAR(0xA0);
SSD_PAR(0x79);
SSD_PAR(0x0E);
SSD_PAR(0x0A);
SSD_PAR(0x16);
SSD_PAR(0x79);
SSD_PAR(0x0E);
SSD_PAR(0x0A);
SSD_PAR(0x16);
SSD_PAR(0x79);
SSD_PAR(0x0E);
SSD_PAR(0x0A);
SSD_PAR(0x16);
SSD_PAR(0x82);
SSD_PAR(0x00);
SSD_PAR(0x03);
```

```
SSD_CMD(0xD0);
SSD_PAR(0x04);
SSD_PAR(0x0C);
SSD_PAR(0x6A);
SSD_PAR(0x0F);
SSD_PAR(0x00);
SSD_PAR(0x03);

SSD_CMD(0xD7);
SSD_PAR(0x13);
SSD_PAR(0x00);

SSD_CMD(0xDE);
SSD_PAR(0x02);

SSD_CMD(0xB8);
SSD_PAR(0x1D);
SSD_PAR(0xA0);
SSD_PAR(0x2F);
SSD_PAR(0x2C);
SSD_PAR(0x2B);

SSD_CMD(0xC1);
SSD_PAR(0x10);
SSD_PAR(0x66);
SSD_PAR(0x66);
SSD_PAR(0x01);

SSD_CMD(0xC4);
SSD_PAR(0x70);
SSD_PAR(0x01);

SSD_CMD(0xDE);
SSD_PAR(0x00);

SSD_CMD(0x11);     // SLPOUT
Delayms(120);
```

```
SSD_CMD(0xDE);
SSD_PAR(0x02);

SSD_CMD(0xC5);
SSD_PAR(0x4E);
SSD_PAR(0x00);
SSD_PAR(0x00);

SSD_CMD(0xCA);
SSD_PAR(0x30);
SSD_PAR(0x20);
SSD_PAR(0xF4);

SSD_CMD(0xDE);
SSD_PAR(0x04);

SSD_CMD(0xD3);
SSD_PAR(0x3C);
SSD_CMD(0xDE);
SSD_PAR(0x00);

SSD_CMD(0x29);     // SLPOUT
Delayms(150);
}
```

--END--