

# 液晶模组规格书

## LCM Specification

初定规格 Preliminary specification

正式规格 Official specifications

项目编号 Project No.	TFT-H024B12QVIFT8N15		
客户名称 Customer			
客户型号 Module No.			
产品描述 Product Description	TFT LCD Module 240 x 3RGB x 320 Dots 2.4" TFT LCD		
客户确认签章: Signature by customer:			
<input type="checkbox"/> 小批量试产 Trial production <input type="checkbox"/> 大批量生产 Mass production			
编制	电子审核	结构审核	批准
Liu.YL			

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## Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
0	2021-07-14	First Release.	Liu. YL	



**一、基本特征 General Feature:**

Item	Standard Value	Unit
显示尺寸 Display Size	2.4"	--
分辨率 Number of Pixels	240 (H) x3 (RGB) *320 (V)	--
显示区域 Active Area	36.72 (H) *48.96 (V)	mm
外形尺寸 Outline Dimension	42.52 (H) × 59.86 (V) × 2.20 (D) <TFT>	mm
观看方向 Viewing Direction	全方向 Full 0' Clock	-
接口 Interface	MIPI-1L (Video mode)	-
驱动芯片 Driver IC	JD9852	-
驱动电压 Driver Condition	VCI=2.8V, IOVCC=1.8V	V
背光 Backlight	白色 LED White LED	-
触摸屏 Touch Panel	不带触摸屏 Whitout Touch Panel	-
触摸屏驱动芯片 CTP Driver IC	- - -	
摸屏驱动电压 CTP Driver Condition	VDD=3.3V	
液晶工作温度 Operation Temperature	-20~70	℃
液晶储存温度 Storage Temperature	-30~80	℃

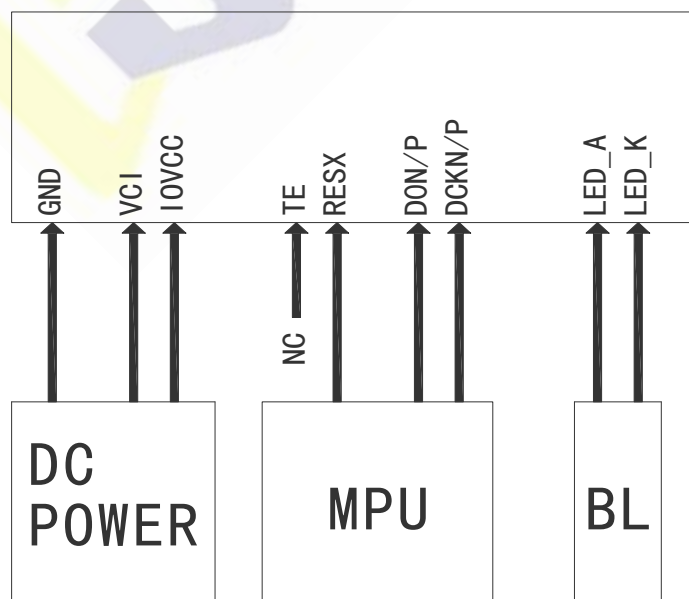


### 三、引脚说明 Pin Description

#### 3.1 模组引脚说明 TFT Pin Description

Pin	Symbol	Description
1	TE	No Connect
2	GND	Ground
3	DON	MIPI-DSI Data differential signal input pins.
4	DOP	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 接线说明 Wiring instructions



## 四、电气特性 Electrical Characteristics

### 4-1 TFT 模组工作条件 TFT LCD Module Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Unit
数字电源 Digital Power	IOVCC	-	1.75	1.8	3.3	V
模拟电源 Digital Power	VCI	-	2.6	2.8	3.3	V
TFT 栅极导通电压 TFT Gate on voltage	VGH	-	10.0	-	16.0	V
TFT 栅极关断电压 TFT Gate off voltage	VGL	-	-16.0	-	-10.0	V

### 4-2 背光工作条件 LED back light specification

Item	Symbol	Condition	Min	Type	Max	Unit
工作电压 Forward voltage	Vt	If=20mA	2.8	3.2	3.4	V
工作电流 Forward current	Ipn	/1-chip	-	100	-	mA
亮度 (带 LCD) Luminance (With LCD)	Lv	If=100mA	-	800	-	cd/m <sup>2</sup>
颜色 Luminous color	White					

### 4-3 触摸屏工作条件 CTP Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Unit
模拟电源 Digital Power	VDD	-	2.8	3.30	3.60	V
I/O 数字电源 I/O Digital Power	IOVDD	-	2.8	3.30	3.60	V

## 五、光学规格 OPTICAL SPECIFICATION

### 5.1 概述 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance 1lux and temperature = 25 °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  $\theta$  and  $\Phi$  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 光学规格 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	$\Theta$ L	CR>10	-	80	-	Deg.	Note 1
		$\Theta$ R		-	80	-	Deg.	
	Vertical	$\Theta$ U		-	80	-	Deg.	
		$\Theta$ D		-	80	-	Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$	1000	1500	-		Note2
Color Gamut		CG		65	70	-	%	
White Chromaticity		Wx			0.307			
		Wy			0.334			
Reproduction of color	Red	Rx	$\Theta = 0^\circ$	-0.02	0.652	+0.02		Note4 (Based on C Light)
		Ry			0.322			
	Green	Gx			0.276			
		Gy			0.582			
	Blue	Bx			0.141			
		By			0.091			
Response Time (Rising + Falling)		Tr+Tf	$\Theta = 0^\circ$ Ta= 25°C	-	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  $\Theta = 0$  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.

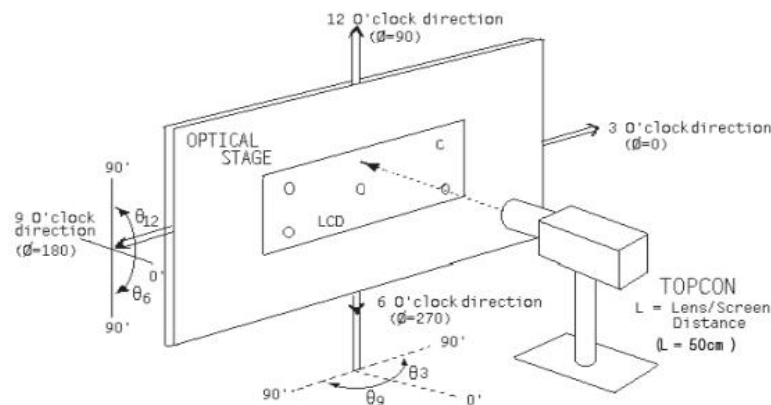
$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

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

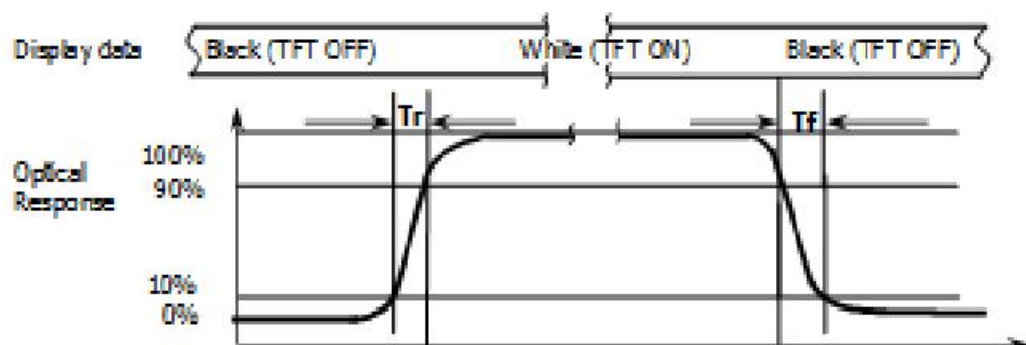
4. The color chromaticity coordinates specified in the above table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

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**

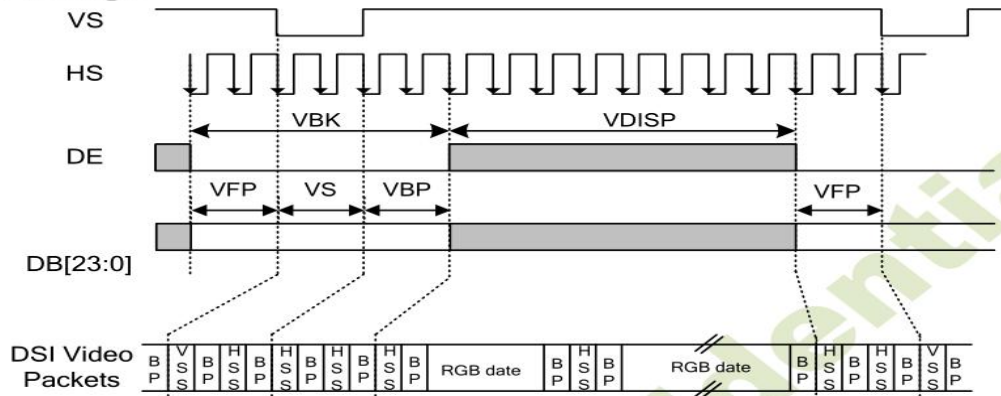




## 六、时序特性 Timing Characteristics

### 6-1 DSI 视频模式的时序 Timings for DSI Video mode

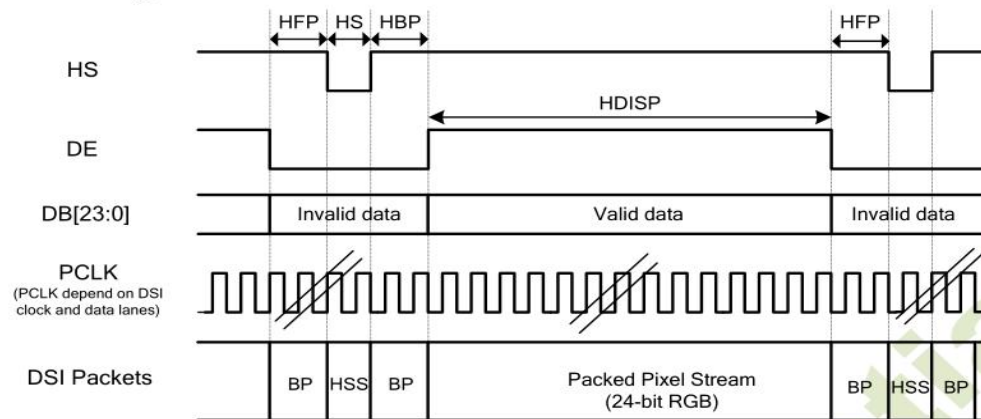
#### Vertical Timings



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.

## 七、可靠性测试 RELIABILITY TEST

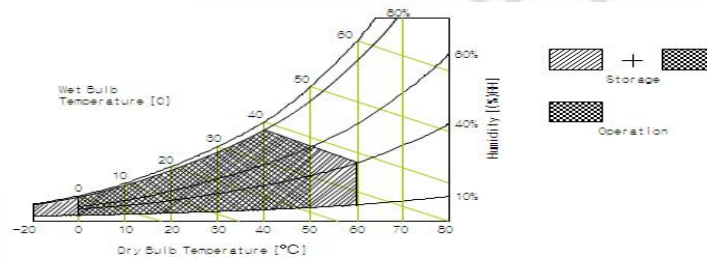
### 7-1 温度和湿度 Temperature and Humidity

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. Liquid Crystal driving voltage. Due to the characteristics of LC Material, this voltage varies with environmental temperature.

2. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 °C max. and no condensation of water.



### 7-2 冲击和振动 Shock and Vibration

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

### 7-3 静电放电测试 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

## 八、处理和注意事项 HANDDLING & CAUTIONS

### 8-1 操作注意事项 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 防静电措施 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

## 九、初始化代码 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:55.8MHZ
    //Power:VCI=2.8, IOVCC=1.8
    //Compare ID Register:page0 R04H=[0x98,0x52]

    //PASSWORD
    SSD_Number(0x04);
    SSD_CMD(0xDF); //Password
    SSD_PAR(0x98);
    SSD_PAR(0x51);
    SSD_PAR(0xE9);
    //----- PAGE0 -----
    SSD_Number(0x02);
    SSD_CMD(0xDE);
    SSD_PAR(0x00);

    //VGMP, VGSP, VGMN, VGSN 4.4
    SSD_Number(0x05);
    SSD_CMD(0xB7);
    SSD_PAR(0x16); //1E
    SSD_PAR(0x7D); //81
    SSD_PAR(0x16); //1E
    SSD_PAR(0x3B); //2F

    //Set_R_GAMMA
    SSD_Number(0x21);
    SSD_CMD(0xC8);
    SSD_PAR(0x3F);
    SSD_PAR(0x2B);
    SSD_PAR(0x22);
    SSD_PAR(0x21);
    SSD_PAR(0x23);
    SSD_PAR(0x26);
    SSD_PAR(0x21);
}
```

SSD\_PAR(0x22);  
SSD\_PAR(0x22);  
SSD\_PAR(0x22);  
SSD\_PAR(0x1E);  
SSD\_PAR(0x15);  
SSD\_PAR(0x11);  
SSD\_PAR(0x0A);  
SSD\_PAR(0x09);  
SSD\_PAR(0x0E);  
SSD\_PAR(0x3F);  
SSD\_PAR(0x2B);  
SSD\_PAR(0x22);  
SSD\_PAR(0x21);  
SSD\_PAR(0x24);  
SSD\_PAR(0x27);  
SSD\_PAR(0x22);  
SSD\_PAR(0x22);  
SSD\_PAR(0x22);  
SSD\_PAR(0x21);  
SSD\_PAR(0x1E);  
SSD\_PAR(0x14);  
SSD\_PAR(0x11);  
SSD\_PAR(0x0A);  
SSD\_PAR(0x09);  
SSD\_PAR(0x0E);

//POW\_CTRL

SSD\_Number(0x04);  
SSD\_CMD(0xB9);  
SSD\_PAR(0x33);  
SSD\_PAR(0x08);  
SSD\_PAR(0xCC);

//DCDC\_SEL

SSD\_Number(0x09);  
SSD\_CMD(0xBB);  
SSD\_PAR(0x47); //VGH 14.75, VGL-10  
SSD\_PAR(0x7A);  
SSD\_PAR(0x30);  
SSD\_PAR(0x40); //3

```
SSD_PAR(0x7C); //6  
SSD_PAR(0x60);  
SSD_PAR(0x70); //50  
SSD_PAR(0x70);
```

```
//VDDD_CTRL  
SSD_Number(0x03);  
SSD_CMD(0xBC);  
SSD_PAR(0x38);  
SSD_PAR(0x3C);
```

```
//SETSTBA  
SSD_Number(0x02);  
SSD_CMD(0xC0);  
SSD_PAR(0x31);  
SSD_PAR(0x20);
```

```
//SETPANEL(default)  
SSD_Number(0x02);  
SSD_CMD(0xC1);  
SSD_PAR(0x12);
```

```
//SETRGBCYC  
SSD_Number(0x0A);  
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);
```

```
//SETRGBCYC(default)  
SSD_Number(0x12);  
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);
```

```
//SET_GD(default)  
SSD_Number(0x07);  
SSD_CMD(0xD0);  
SSD_PAR(0x04);  
SSD_PAR(0x0C);  
SSD_PAR(0x6A);  
SSD_PAR(0x0F);  
SSD_PAR(0x00);  
SSD_PAR(0x03);
```

```
//RAMCTRL(default)  
SSD_Number(0x03);  
SSD_CMD(0xD7);  
SSD_PAR(0x13);  
SSD_PAR(0x00);
```

```
//----- PAGE2 -----  
SSD_Number(0x02);  
SSD_CMD(0xDE);  
SSD_PAR(0x02);  
Delays(1);
```

```
//DCDC_SET  
SSD_Number(0x06);
```

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

```
//SETRGBCYC2  
SSD_Number(0x05);  
SSD_CMD(0xC1);  
SSD_PAR(0x10);  
SSD_PAR(0x66);  
SSD_PAR(0x66);  
SSD_PAR(0x01);
```

```
//----- PAGE0 -----  
SSD_Number(0x02);  
SSD_CMD(0xDE);  
SSD_PAR(0x00);
```

```
// sleep out  
SSD_Number(0x01);  
SSD_CMD(0x11); // SLPOUT  
Delays(120);
```

```
// display on  
SSD_Number(0x01);  
SSD_CMD(0x29); // SLPOUT  
}
```

--END--