

LCM Specification

Preliminary specification

Final Specification

Project No. 项目编号	TFT-H043A7WVIST5N40		
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 4.3" TFT LCD		
Signature by customer: 客户确认签章:			
<input type="checkbox"/> Trial production		<input type="checkbox"/> Mass production	
编 制	电子审核	结构审核	批 准
Liu.YL			

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
0	2020-01-15	First Release.	Liu.YL	
1	2020-03-10	Modify Outline Dimensions	Liu.YL	
2	2020-07-23	Modify Outline Dimensions	Liu.YL	
3	2020-09-09	Operating temperature correction	Liu.YL	
4	2021-02-03	Modify Outline Dimensions	Liu.YL	

1. General Feature:

Item	Standard Value	Unit
Display Size	4.3"	--
Number of Pixels	480(H)x3(RGB)*800(V)	--
Active Area	56.16(H) *93.60(V)	mm
LCM Outline Dimension	60.86(H) ×102.57× 2.30(V)	mm
Viewing Direction	Full O'Clock	-
LCM Interface	RGB +9b_SPI(fall)/16b_SPI(rise) Interface	-
LCM Driver IC	ST7701S	-
Display colors	16.7M	-
LCM Driver Voltage	IOVCC=1.8V,VCI=3.3V (Typ)	V
Backlight	White LED	-
Touch Panel	Without Touch Panel	-
CTP Driver IC	---	-
CTP Driver Voltage	---	V
CTP I/O Digital Voltage	---	V
Operation Temperature	-20~60	°C
Storage Temperature	-30~80	°C



HOT-HMI

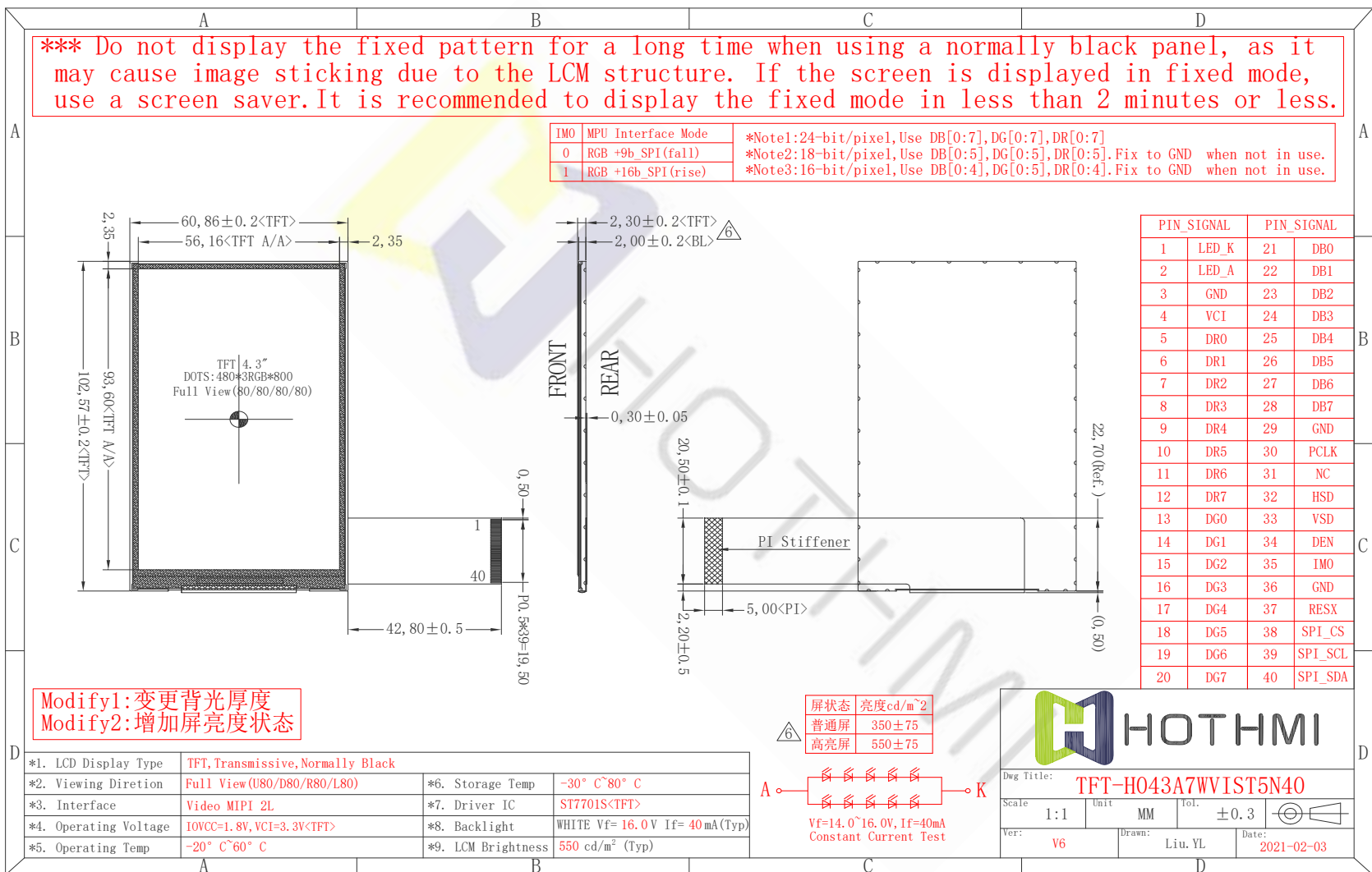
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2021年02月03日

TFT-H043A7WV1ST5N40

Rev:4

2.Outline Dimensions

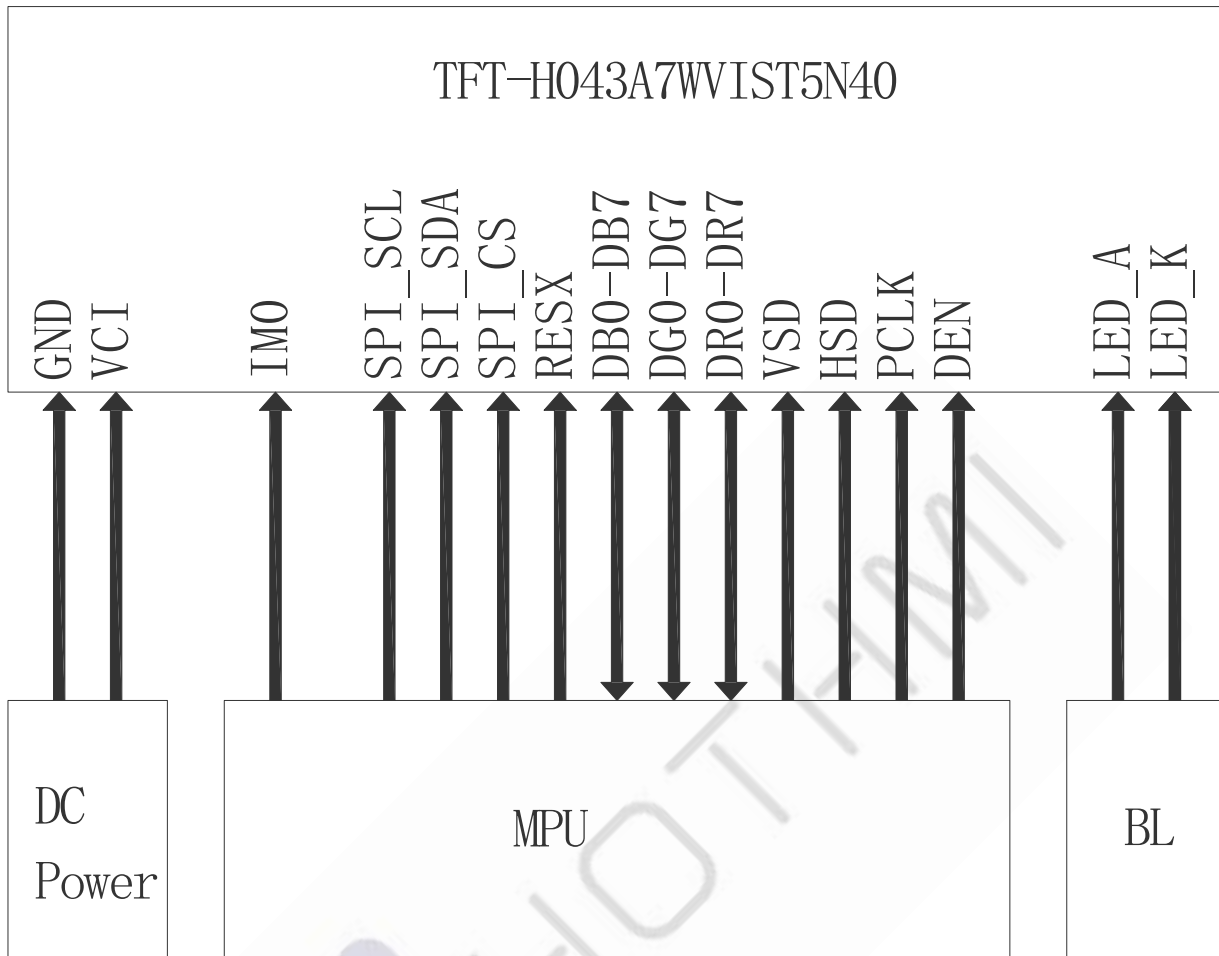


3. Pin Description

3.1 Pin Description

Pin NO.	Symbol	Description
1	LED_K	LED Cathode
2	LED_A	LED Anode
3	GND	Ground
4	VCI	Analog Power
5-12	DR0-DR7	Red data bus.If not used, please fix this pin at GND.
13-20	DG0-DG7	Green data bus.If not used, please fix this pin at GND.
21-28	DB0-DB7	Blue data bus.If not used, please fix this pin at GND.
29	GND	Ground
30	PCLK	Pixel clock input pin
31	DISP_NC	No Connector
32	HSD	Horizontal sync signal
33	VSD	Vertical sync signal
34	DEN	Data input enable. Low: access enabled;High: access inhibited
35	IM0	MPU Interface select
36	GND	Ground
37	RESX	TFT Reset Pin
38	SPI_CS	A chip select signal
39	SPI_SCL	Serial clock input
40	SPI_SDA	Serial data input/output bidirectional pin
---END---		

3.2 Wiring Diagram



IMO	MPU Interface Mode
0	RGB+9b_SPI (fall)
1	RGB+16b_SPI (rise)

RGB Pixe	RGB Data bus
24-bit	DB[0:7], DG[0:7], DR[0:7]
18-bit	DB[0:5], DG[0:5], DR[0:5]
16-bit	DB[0:4], DG[0:5], DR[0:4]
Fix to GND when not in use.	

4. Electrical Characteristics

4-1 TFT LCD Module Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Unit
Interface logic circuits	IOVCC	-	1.65	1.80	3.30	V
Analog Power supply	VCI	-	2.80	3.30	3.60	V
TFT Gate on voltage	VGH	-	10.0	12	16.0	V
TFT Gate off voltage	VGL	-	-15.0	-12	-10.0	V

4-2 LED back light specification (pera chip)

Item	Symbol	Condition	Min	Type	Max	Unit
Forward voltage	Vt	If=20mA	14.0	15.5	16.0	V
Forward current	Ipn	/1-chip	-	40	-	mA
Luminance(With LCD)	Lv	If=40mA	-	550	-	cd/m ²
Luminous color	White					

Note1: Test subject luminance at a constant current

Note1: Test with highlight LCM

4-3 CTP Operating Conditions

Item	Symbol	Condition	Min	Type	Max	Unit
Power Supply Voltages	VDD	-	2.50	2.80	3.60	V
I/O Digital Voltage	IOVDD	-	-	2.80	-	V
Operating Temperature	Topr	-	-	-	-	°C
Storage Temperature	Tstg	-	-	-	-	°C

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°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	$\Theta = 0^\circ$	1000	1500	-		Note2
Color Gamut		CG		65	70	-	%	
White Chromaticity		Wx		-	0.299	-		
		Wy		-	0.324	-		
Reproduction of color	Red	Rx	$\Theta = 0^\circ$	-	0.645	-		Note4 (Based on C Light)
		Ry		-	0.319	-		
	Green	Gx		-	0.271	-		
		Gy		-	0.594	-		
	Blue	Bx		-	0.138	-		
		By		-	0.098	-		
Response Time (Rising + Falling)		Tr+Tf	$\Theta = 0^\circ$ Ta= 25°C	-	35	40	ms	Note5
Transmittance		Tr		-	4.35		%	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

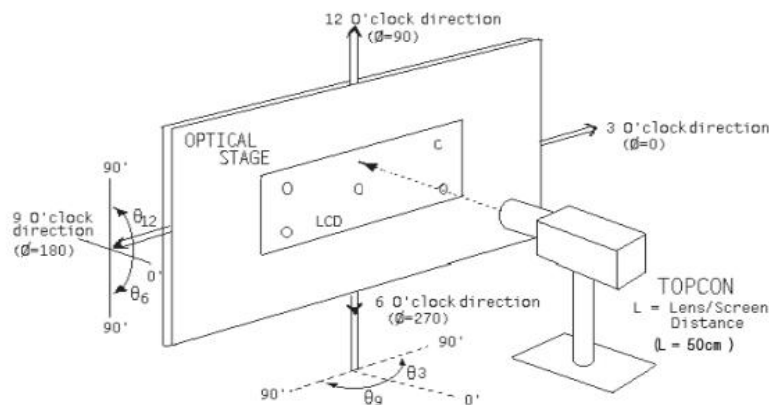
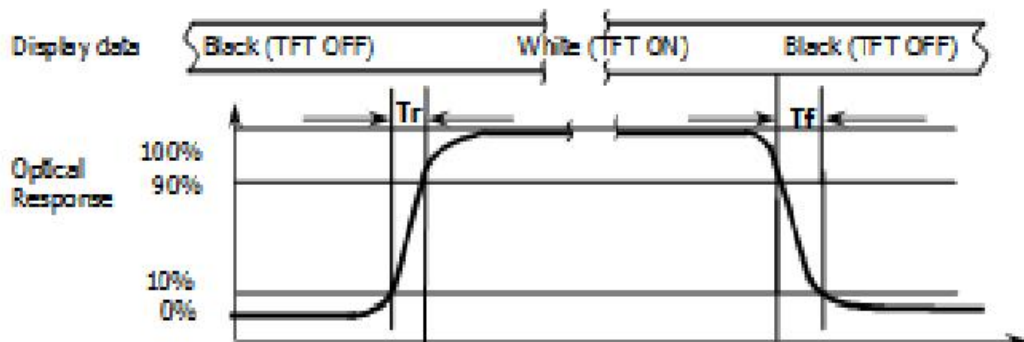
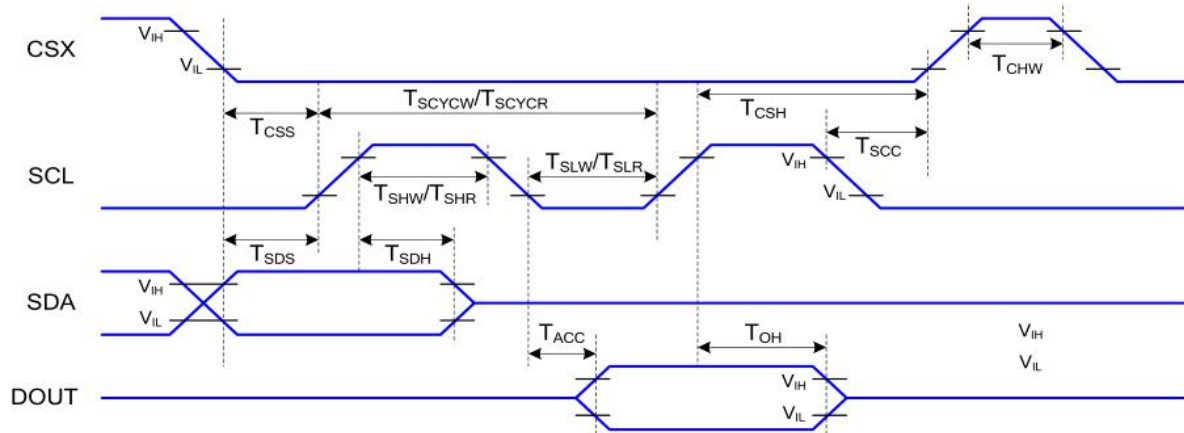


Figure2 Response Time Testing

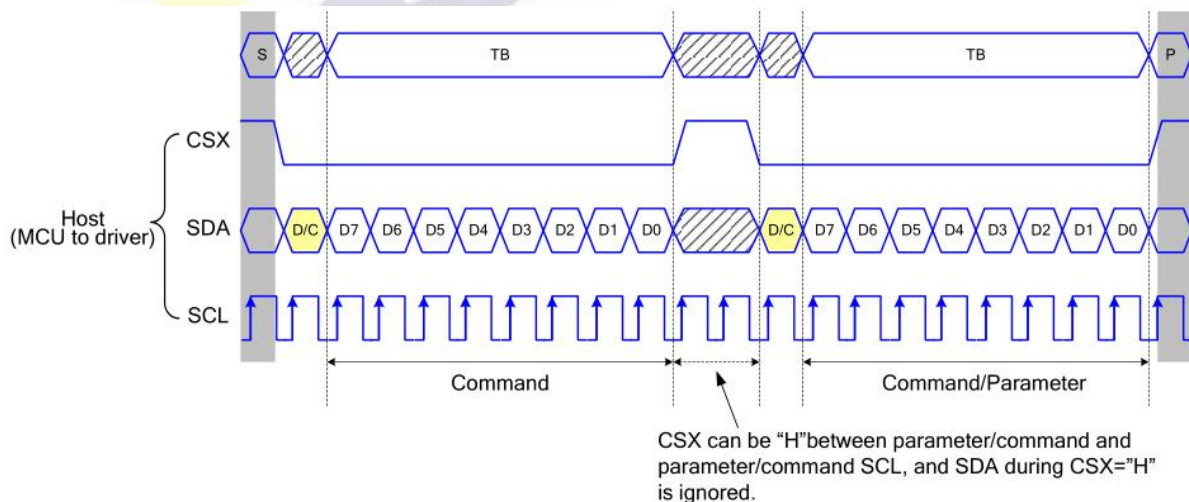


6. Timing Characteristics of Input Signals

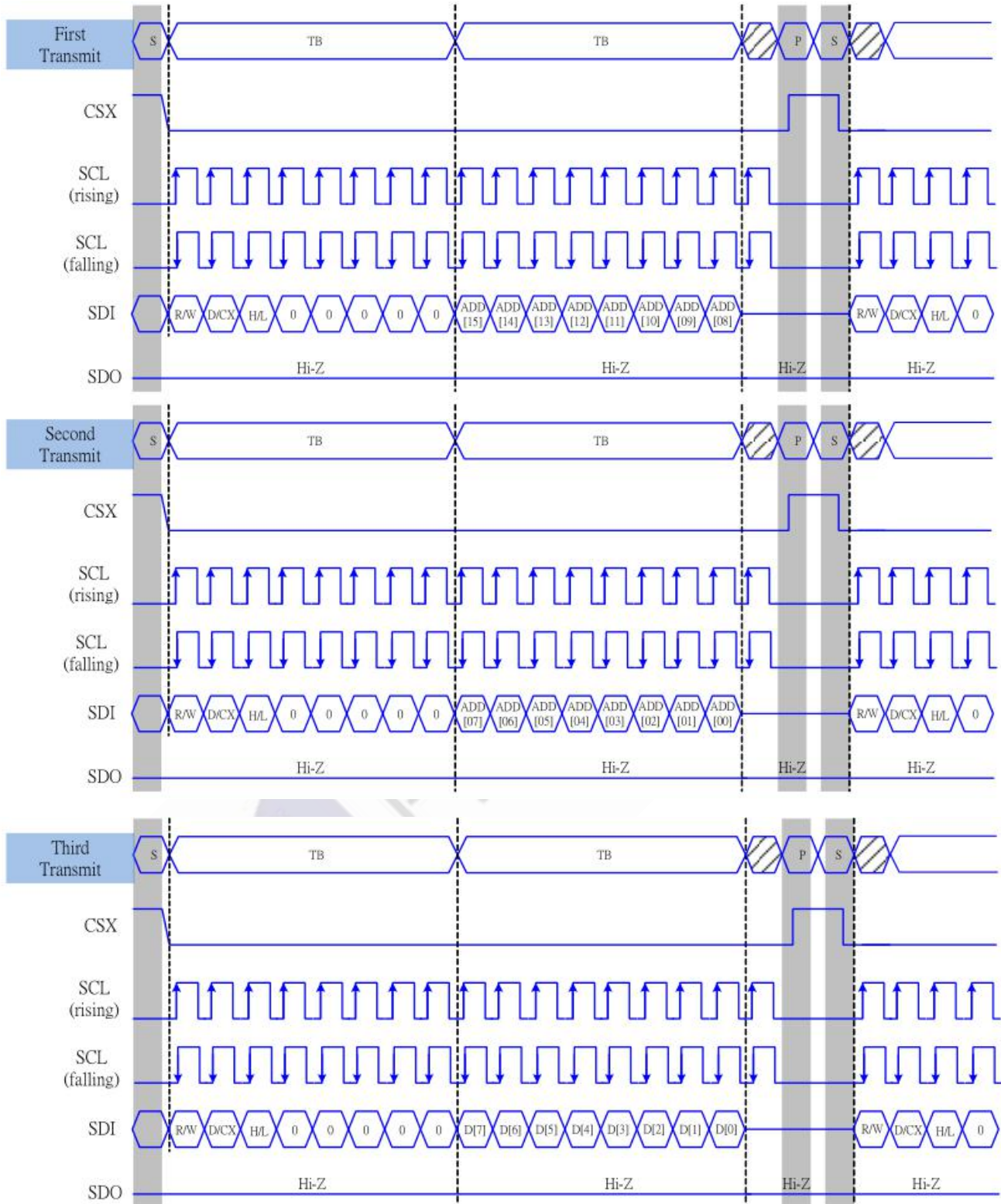
6-1 Serial Interface Characteristics



Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

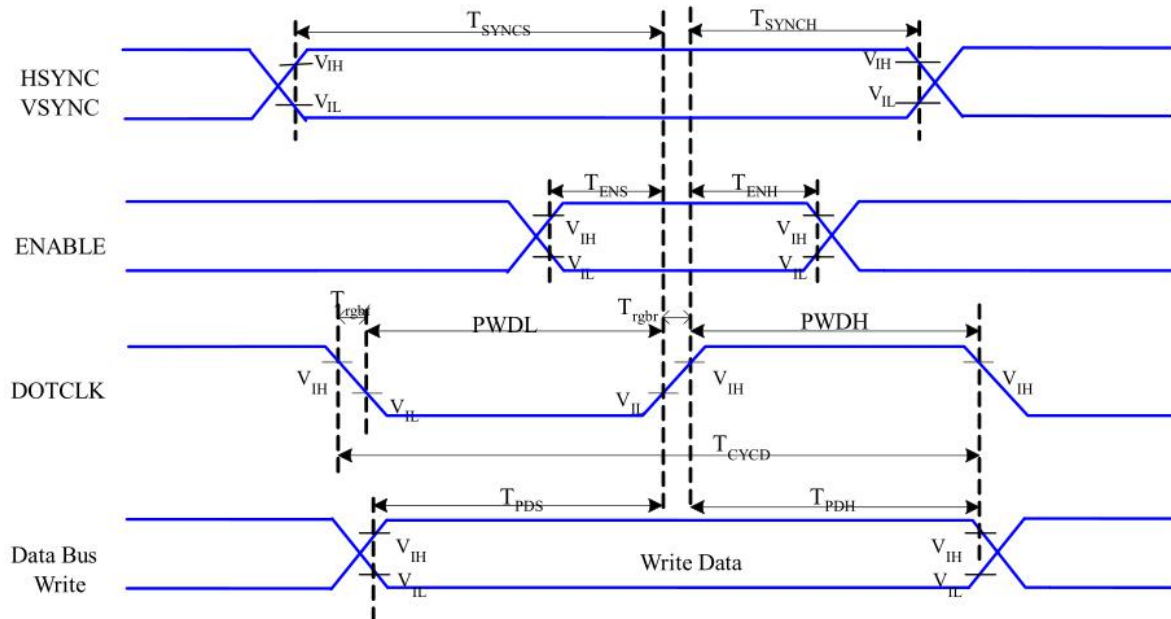


3-line serial interface(9 bits) write mode



3-line serial interface(16 bits) write mode

6-2 RGB Interface Characteristics



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

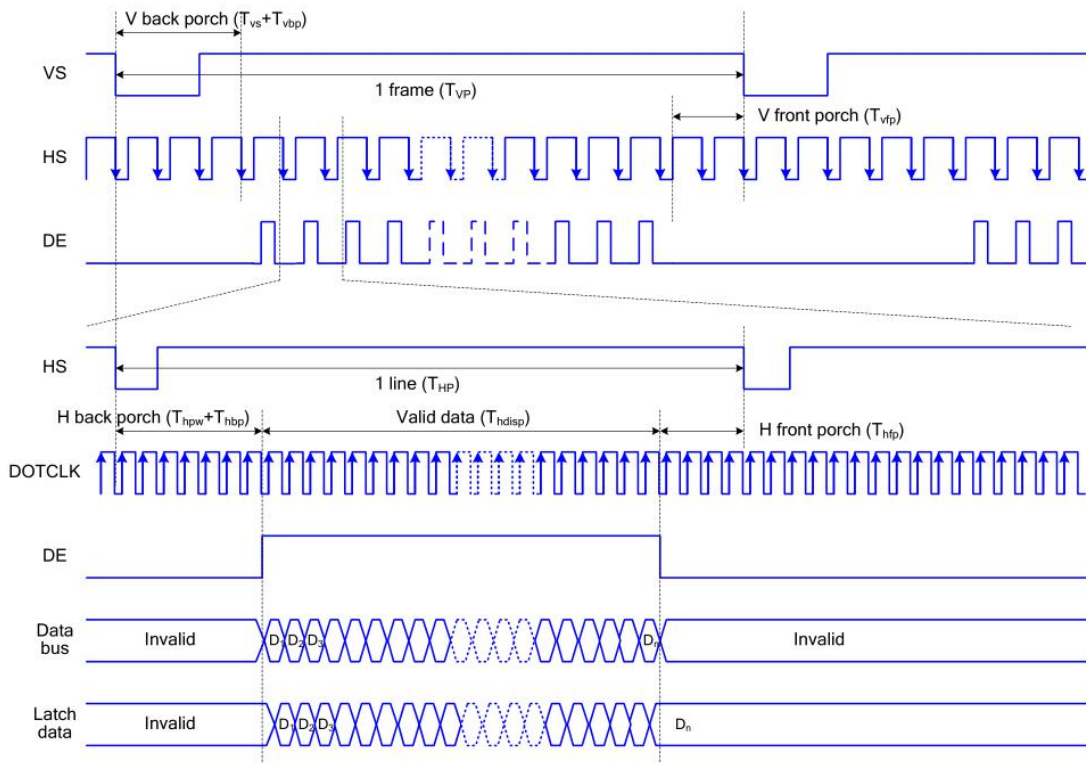
Please refer to the following table for the setting limitation of RGB interface signals.

Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync. Width	hpw	1	-	255	Clock
Horizontal Sync. Back Porch	hbp	1	--	255	Clock
Horizontal Sync. Front Porch	hfp	1	--	-	Clock
Vertical Sync. Width	vs	1	--	254	Line
Vertical Sync. Back Porch	vbp	1	--	254	Line
Vertical Sync. Front Porch	vfp	2	--	--	Line

Note:

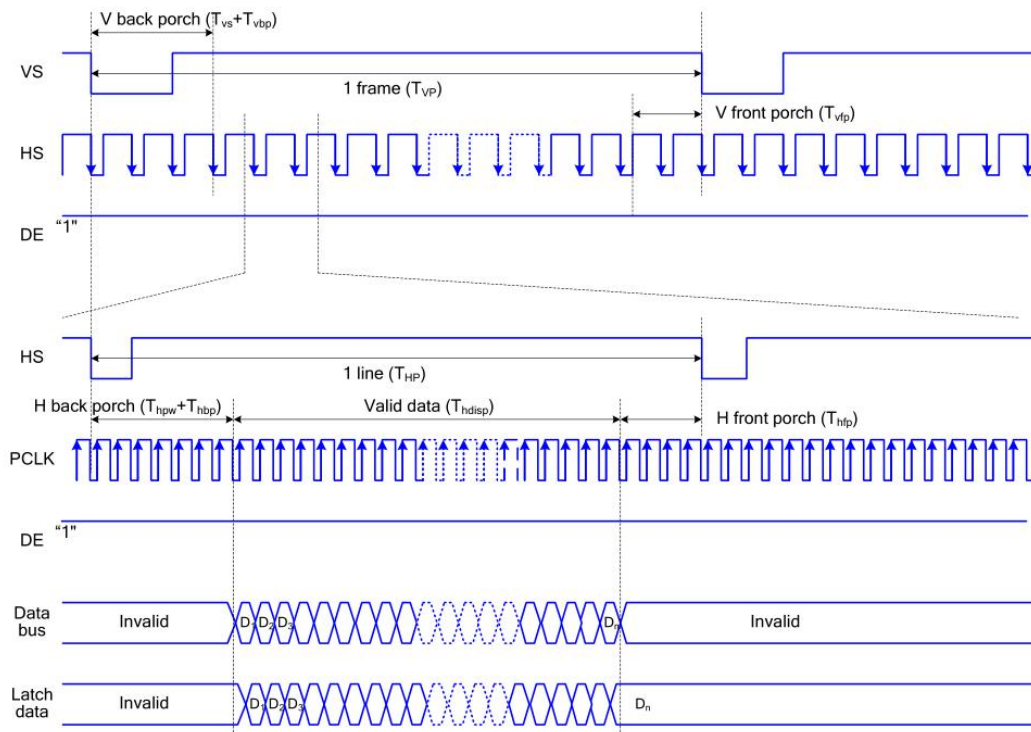
1. Typical value are related to the setting frame rate is 60Hz..

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

The timing chart of RGB interface HV mode is shown as follows.



Note: TFT-H043A7WVIST5N40 supports two kinds of RGB interface, DE mode and HV mode.

Uses command C3h to select RGB interface mode. DE mode by default.

7. RELIABILITY TEST

7-1 Temperature and Humidity

Test Item	Test Condition	Check Time
High Temp Storage	Ta= 80°C	240 hrs
Low Temp Storage	Ta= -30°C	240 hrs
High Temp Operation	Ta= 70°C	240 hrs
Low Temp Operation	Ta= -20°C	240 hrs
High Temp & High Humidity Operation	Ta=60°C H=90%RH	240 hrs

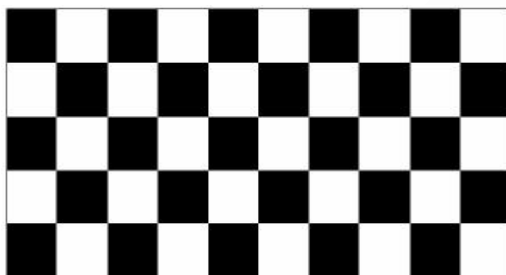
Note: (1) Ta : Ambient temperature

(2) All judgments of display are performed after temp of panel returns to room temperature

(3) Display function should be no change under normal operating condition.

(4) Under no condensation of dew

(5)*INX only guarantee the above 5 test items. INX wouldn't guarantee the others not shown as the above ones..



(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,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

```
/*
//Our 51 SCM test board parameters are for reference only
//480*800
#define HDP 480-1 //Hsync Display period
#define VDP 800-1 //Vertical Display period

#define HT HPS+LPS+HPW //TH
#define HPS 80 //HFP
#define LPS 70 //HBP
#define HPW 5 //

#define VT 850 //VH
#define VPS 25 //VFP
#define FPS 10 //VBP
#define VPW 10 //
*/
//External system porch setting:125>VBP ≥10, VFP ≥10
//Line Time:19uS
//Frame Rate:60Hz
Void Panel_initial_code(void)
{
    SPI_CS=0;
    SPI_RES=1;
    Delay(100);
    SPI_RES=0;
    Delay(1000);
    SPI_RES=1;
    Delay(1000);

    SPI_WriteComm(0xFF);
    SPI_WriteData(0x77);
    SPI_WriteData(0x01);
    SPI_WriteData(0x00);
    SPI_WriteData(0x00);
    SPI_WriteData(0x13);

    SPI_WriteComm(0xEF);
    SPI_WriteData(0x08);
```



```
SPI_WriteComm(0xFF);  
SPI_WriteData(0x77);  
SPI_WriteData(0x01);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x10);
```

```
SPI_WriteComm(0xC0);  
SPI_WriteData(0x63);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xC1);  
SPI_WriteData(0x0A);  
SPI_WriteData(0x0C);
```

```
SPI_WriteComm(0xC2);  
SPI_WriteData(0x31);  
SPI_WriteData(0x08);
```

```
SPI_WriteComm(0xCC);  
SPI_WriteData(0x18);
```

```
SPI_WriteComm(0xB0);  
SPI_WriteData(0x00);  
SPI_WriteData(0x08);  
SPI_WriteData(0x10);  
SPI_WriteData(0x0E);  
SPI_WriteData(0x11);  
SPI_WriteData(0x07);  
SPI_WriteData(0x08);  
SPI_WriteData(0x08);  
SPI_WriteData(0x08);  
SPI_WriteData(0x25);  
SPI_WriteData(0x04);  
SPI_WriteData(0x12);  
SPI_WriteData(0x0F);  
SPI_WriteData(0x2C);  
SPI_WriteData(0x30);  
SPI_WriteData(0x1F);
```

```
SPI_WriteComm(0xB1);  
SPI_WriteData(0x00);  
SPI_WriteData(0x11);  
SPI_WriteData(0x18);  
SPI_WriteData(0x0C);  
SPI_WriteData(0x10);  
SPI_WriteData(0x05);  
SPI_WriteData(0x07);  
SPI_WriteData(0x09);  
SPI_WriteData(0x08);  
SPI_WriteData(0x24);  
SPI_WriteData(0x04);  
SPI_WriteData(0x11);  
SPI_WriteData(0x10);  
SPI_WriteData(0x2B);  
SPI_WriteData(0x30);  
SPI_WriteData(0x1F);
```

```
SPI_WriteComm(0xFF);  
SPI_WriteData(0x77);  
SPI_WriteData(0x01);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x11);
```

```
SPI_WriteComm(0xB0);  
SPI_WriteData(0x4D);
```

```
SPI_WriteComm(0xB1);  
SPI_WriteData(0x39);
```

```
SPI_WriteComm(0xB2);  
SPI_WriteData(0x87);
```

```
SPI_WriteComm(0xB3);  
SPI_WriteData(0x80);
```

```
SPI_WriteComm(0xB5);  
SPI_WriteData(0x47);
```

SPI_WriteComm(0xB7);
SPI_WriteData(0x8A);

SPI_WriteComm(0xB8);
SPI_WriteData(0x20);

SPI_WriteComm(0xB9);
SPI_WriteData(0x10);
SPI_WriteData(0x13);

SPI_WriteComm(0xC0);
SPI_WriteData(0x09);

SPI_WriteComm(0xC1);
SPI_WriteData(0x78);

SPI_WriteComm(0xC2);
SPI_WriteData(0x78);

SPI_WriteComm(0xD0);
SPI_WriteData(0x88);
Delays (120);
SPI_WriteComm(0xE0);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x02);

SPI_WriteComm(0xE1);
SPI_WriteData(0x04);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x05);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x00);
SPI_WriteData(0x20);
SPI_WriteData(0x20);

```
SPI_WriteComm(0xE2);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
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SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xE3);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x33);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xE4);  
SPI_WriteData(0x22);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xE5);  
SPI_WriteData(0x04);  
SPI_WriteData(0x34);  
SPI_WriteData(0xAA);  
SPI_WriteData(0xAA);  
SPI_WriteData(0x06);  
SPI_WriteData(0x34);  
SPI_WriteData(0xAA);  
SPI_WriteData(0xAA);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xE6);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x33);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xE7);  
SPI_WriteData(0x22);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xE8);  
SPI_WriteData(0x05);  
SPI_WriteData(0x34);  
SPI_WriteData(0xAA);  
SPI_WriteData(0xAA);  
SPI_WriteData(0x07);  
SPI_WriteData(0x34);  
SPI_WriteData(0xAA);  
SPI_WriteData(0xAA);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xEB);  
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SPI_WriteData(0x00);  
SPI_WriteData(0x40);  
SPI_WriteData(0x40);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);
```

```
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SPI_WriteData(0x00);
```

```
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SPI_WriteData(0xFF);  
SPI_WriteData(0xFF);  
SPI_WriteData(0xB0);  
SPI_WriteData(0x54);  
SPI_WriteData(0xAF);
```

```
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SPI_WriteData(0x10);  
SPI_WriteData(0x0D);  
SPI_WriteData(0x04);  
SPI_WriteData(0x08);  
SPI_WriteData(0x3F);  
SPI_WriteData(0x1F);
```

```
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SPI_WriteData(0x01);  
SPI_WriteData(0x00);  
SPI_WriteData(0x00);  
SPI_WriteData(0x13);
```

```
SPI_WriteComm(0xE8);  
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x0E);
```

```
SPI_WriteComm(0xFF);
```

```
SPI_WriteData(0x77);
```

```
SPI_WriteData(0x01);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0x11);
```

```
Delays (120);
```

```
SPI_WriteComm(0xFF);
```

```
SPI_WriteData(0x77);
```

```
SPI_WriteData(0x01);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x13);
```

```
SPI_WriteComm(0xE8);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x0C);
```

```
Delays (50);
```

```
SPI_WriteComm(0xE8);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0xFF);
```

```
SPI_WriteData(0x77);
```

```
SPI_WriteData(0x01);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteData(0x00);
```

```
SPI_WriteComm(0x3A);
```

```
SPI_WriteData(0x77); //55=16bit(RGB565);66=18bit(RGB666);77或默认不写3AH是  
=24bit(RGB888)
```

```
SPI_WriteComm(0x29);
```

```
Delays (120);
```

```
}
```

```
Void Panel_SleepIn_Mode (void)
{
SPI_WriteComm(0x28);
Delays (120);
SPI_WriteComm(0x10);
Delays (120);
}
Void Panel_SleepOut_Mode (void)
{
SPI_WriteComm(0x11);
Delays (120);
SPI_WriteComm(0x29);
Delays (120);
}
```

--- END ---