SPECIFICATION

[◉] Preliminary Specification
[ ] Final Specification

Description **8.4” 800xRGBx600 TFT-LCD Module**

Part Number **P0840SVN1ME00**

Customer		Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date	Approved By	Date
		S_Ebi	20230816
		Reviewed By	
		Longping Deng	20230816
		Prepared By	
		Hongwei Liu	20230816
Comments:			

* This cover page is for your Comments and Signatures back to TIANMA.

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1.0	2023/08/16	-	Preliminary spec release	Hongwei Liu

CONTENTS

1. Summary

1.1 General Description

This is a 8.4 inch a-Si TFT-LCD module with Normal- White technology. It is composed of a TFT-LCD panel, a driver circuit, FPC, and a LED backlight unit.

1.2 Features

- Interface: RGB 24bit
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03
- Compliant with the European RoHS Directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

2. General Specifications

Feature		Spec	Unit
Display Spec	Size	8.4 inch	
	Resolution	800(RGB)x600	
	Pixel Pitch	0.213x0.213	mm
	TFT Active Area	170.4 (W) X127.8(H)	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	TN, Normally White	
	Surface Treatment	Anti-Glare	
	Viewing Direction	12 o'clock	
	Gray Scale Inversion Direction	6 o'clock	
Mechanical Characteristics	LCM (W x H x D)	189.75x 149.4 x 4.8	mm
	Weight	245	g
Optical Characteristics	Luminance	350	cd/m^2
	Contrast Ratio	500	
	NTSC	50%	%
	Viewing Angle	60/80/80/80/	degree
Electrical Characteristics	Interface	RGB 24 bits	
	Color Depth	262K/16.2M	color
	Power Consumption	LCD:660mW(Black pattern) Backlinght:1728mW	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
Matching connector	**FH28-60S-0.5SH(Hirose)**

Table 3.1.1 Connector information

Pin	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	NC	-	No connection	
3	VCC	P	Power supply	
4	R0	I	Red data Input(LSB)	
5	R1	I	Red data Input	
6	R2	I	Red data Input	
7	R3	I	Red data Input	
8	R4	I	Red data Input	
9	R5	I	Red data Input	
10	R6	I	Red data Input	
11	R7	I	Red data Input(MSB)	
12	G0	I	Green data Input(LSB)	
13	G1	I	Green data Input	
14	G2	I	Green data Input	
15	G3	I	Green data Input	
16	G4	I	Green data Input	
17	G5	I	Green data Input	
18	G6	I	Green data Input	
19	G7	I	Green data Input(MSB)	
20	B0	I	Blue data Input(LSB)	
21	B1	I	Blue data Input	
22	B2	I	Blue data Input	
23	B3	I	Blue data Input	
24	B4	I	Blue data Input	
25	B5	I	Blue data Input	
26	B6	I	Blue data Input	
27	B7	I	Blue data Input(MSB)	
28	DCLK	I	Clock input(Latch data at falling edge)	
29	DE	I	Data enable	Note1
30	HSYNC	I	Horizontal sync input. Negative polarity	Note1
31	VSYNC	I	Vertical sync input. Negative polarity	Note1
32	MODE3	I	DE/SYNC mode select .normally pull high H:DE mode .L:HV mode	
33	RSTB	I	Global reset pin. RSTB=“0”,module reset; RSTB=“1”normal operation	
34	STBYB	I	Standby mode, normally pull high STBYB="1",normal operation STBYB="0",source driver will turn off, all output are high-Z	
35	SHLR	I	Source right or left sequence control, normally pull high SHLR="L", shift left: last data=S1<-S2…S1200=first data ; SHLR="H", shift right :first data=S1->S2…S1200=last data	

36	VCC	P	Power supply	
37	UPDN	I	Gate up or down scan control. Normally pull low UPDN="L" , DOWN shift :G1->G2…->G600 ; UPDN="H", up shift: G1<-G2…<-G600	Note3
38	GND	P	Ground	
39	GND	P	Ground	
40	NC	-	No connection	
41	NC	-	No connection	
42	DITH	I	Dithering setting DITH="H" 6bit resolution (last 2 bits of input data truncated, default setting) DITH="L" 8bit resolution	
43	NC	-	No connection	
44	NC	-	No connection	
45	NC	-	No connection	
46	NC	-	No connection	
47	NC	-	No connection	
48	NC	-	No connection	
49	NC	-	No connection	
50	NC	-	No connection	
51	NC	-	No connection	
52	NC	-	No connection	
53	NC	-	No connection	
54	NC	-	No connection	
55	NC	-	No connection	
56	NC	-	No connection	
57	NC	-	No connection	
58	NC	-	No connection	
59	GND	P	Ground	
60	NC	-	No connection	

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection
Note2: All of the GND pins should be connected to the system ground.
Note3: This LCD module supports SYNC & SYNC-DE & DE mode, the pin setting is different from each other. Please refer to the descriptions.

3.2 CN2 Pin assignment (Back Light)

Connector Information	
Matching connector	SBHT-002T-P0.5

Table 3.2.1 Connector information

No	Symbol	I/O	Description	Wire Color
1	LEDA	P	LED driving anode (high voltage)	Red
2	LEDK	P	LED driving cathode (low voltage)	White

Table 3.2.2 Pin Assignment for Back Light Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	5.0	V	Note1
Input voltage	V_{IN}	-0.3	5.0	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 4.1 Absolute Maximum Ratings

Note1: Input voltage include all input data.
Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.
Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VCC	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	VIL	0	--	0.3xVCC	V	
	High Level	VIH	0.7xVCC	--	VCC	V	
Output Signal Voltage	Low Level	VOL	--	--	GND+0.4	V	
	High Level	VOH	VCC-0.4	--	--	V	
Power Consumption	Black Mode (60Hz)		--	660	--	mW	Black pattern
	Standby Mode			400		mW	

Table 5.1.1 Operating Voltages

Note1: Indicated the subsequent version may be updated.

5.2 DC Characteristics for Backlight Driving

Item	Symbol	Min	Typ	Max	Unit	Remark
Channel1	I_F	-	180	225	mA	Note 1
Forward Voltage	V_F	-	9.0	9.6	V	
Backlight Power Consumption	W_{BL}	-	1728	-	mW	
Life Time	-	-	30,000	-	Hrs	Note 3

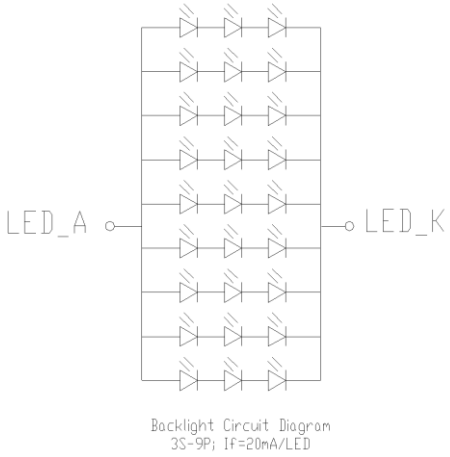
Table 5.2.1 LED Backlight Characteristics

Note1: I_F is defined for each channel.

Note2: Optical performance should be evaluated at Ta=25℃ only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition, The life time of LED will be reduced.

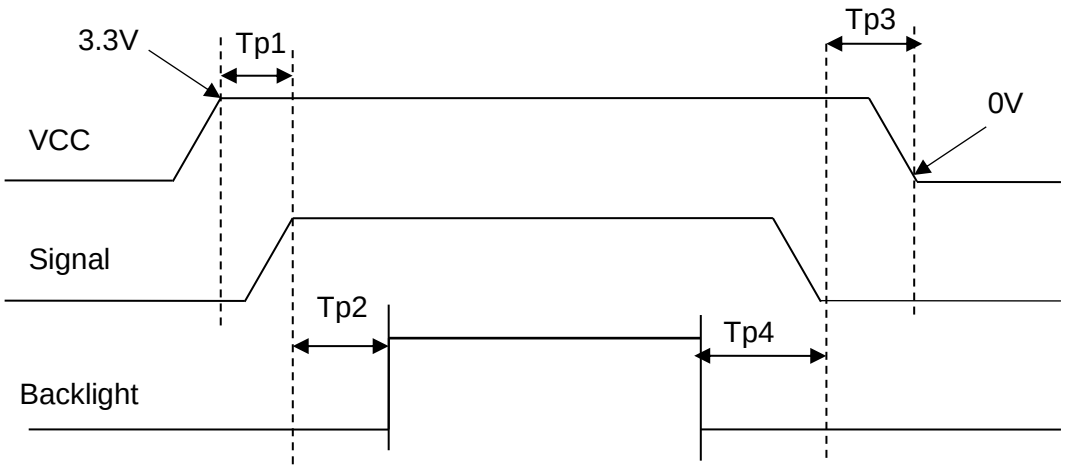
Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.



5.3 Recommended Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.3V to signal starting	Tp1	5	-	50	ms	
VCC rising time	Tr	0.1	-	20	ms	Note1
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VCC 0V	Tp3	5	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

Table 5.3 Power ON/OFF Sequence



Note1: T1< T2.
Note2: The low level of these signals and analog powers are GND level.
Note3: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.
Note4: The power on/off sequence is the first version. It will be updated when the design is fixed.
Note5: BL is the voltage applied to backlight. Keep it turned off until the display has stabilized.

5.4 LCD Module Block Diagram

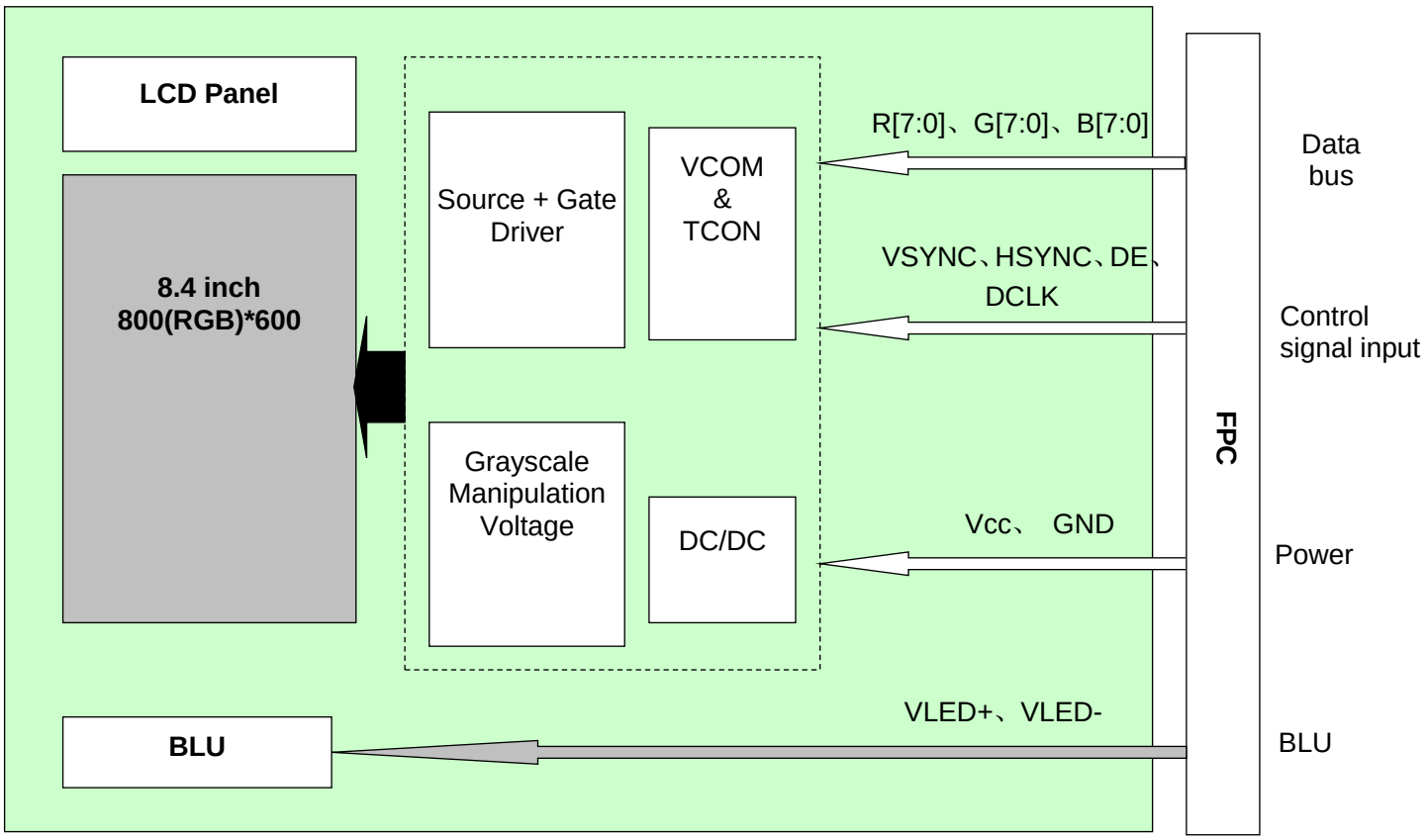


Figure 5.5.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 AC characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Remark
HSYNC Setup Time	T_{hst}	5	-	-	ns	
HSYNC Hold Time	T_{hhd}	5	-	-	ns	
VSYNC Setup Time	T_{vst}	5			ns	
VSYNC Hold Time	T_{vhd}	5	-	-	ns	
Data Setup Time	T_{dsu}	5			ns	
Data Hold Time	T_{dhd}	5	-	-	ns	
DE Setup Time	T_{esu}	5	-	-	ns	
DE Hold Time	T_{ehd}	5	-	-	ns	
CLKIN Cycle Time	T_{cph}	14	-	-	ns	
CLKIN Pulse Width	T_{cwh}	40	50	60	%	
Output stable time	Tsst	-	-	6	us	
VCC Power ON Slew rate	Tpor	-	-	20	ms	From 0V to 90% VCC
RSTB pulse width	TRst	50	-	-	us	DCLK = 65MHz

Table 6.1.1 Input Setup Timing Parameters Requirement

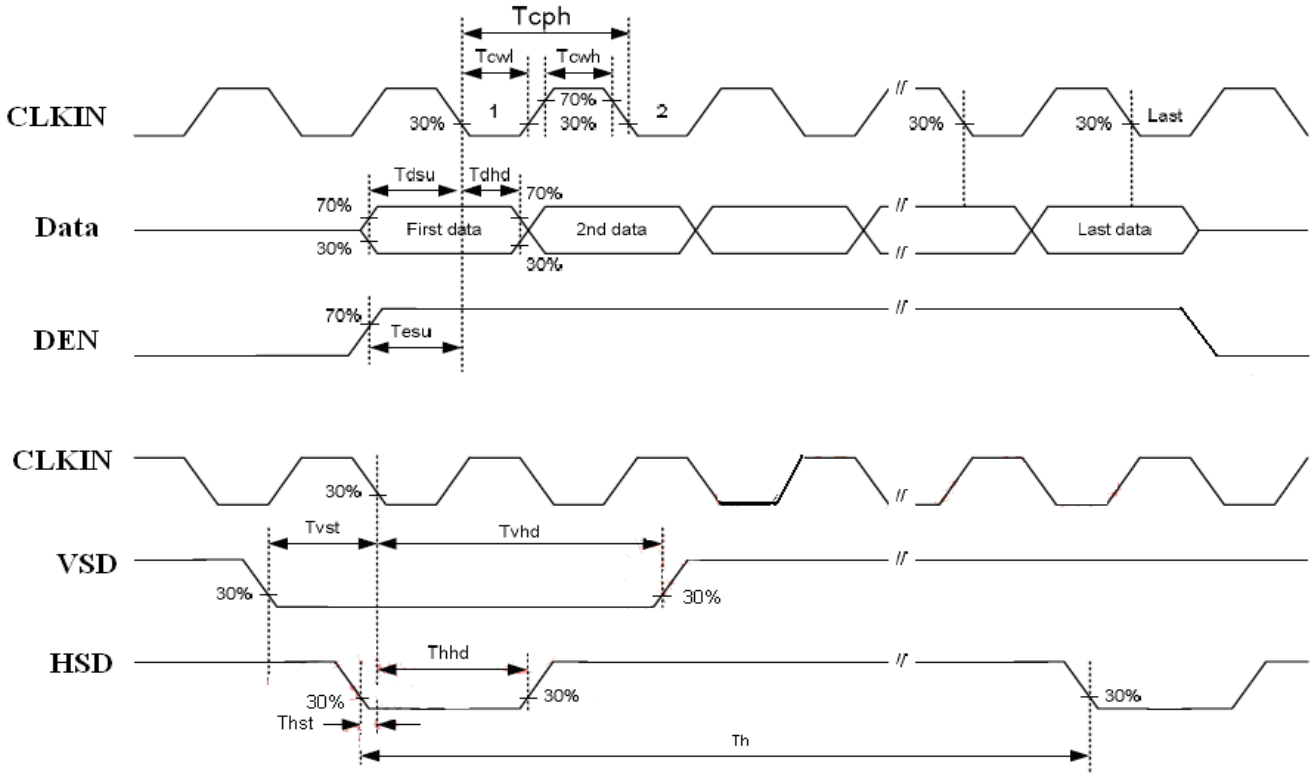


Figure 6.1.1 Clock and Data Input Timing Diagram

6.2 Data Input Timing Parameter Setting

6.2.1 Input timing at DE mode

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Dclk frequency(Frame rate=60HZ)		Fclk	33.3	39.6	60	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	TH	910	1000	1300	Tclk	
	Horizontal blanking	THC	110	200	500	Tclk	Note1
	Valid Data Width	THD	-	800	-	Tclk	
Vertical section	Vertical total	TV	610	660	800	TH	
	Vertical blanking	TVC	10	60	200	TH	Note1
	Valid Data Width	TVD	-	600	-	TH	

Table 6.2.1 Data Input Timing (DE mode)

6.2.2 Input timing at HV mode

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Dclk frequency(Frame rate=60HZ)		Fclk	34.5	39.6	50	MHz	Tclk=1/Fclk
Horizontal section	Horizontal pulse width	THPW	1	-	40	Tclk	
	Horizontal total	TH	900	1000	1200	Tclk	
	Horizontal back porch	THB	88	88	88	Tclk	
	Horizontal front porch	THFP	12	112	312	Tclk	
	Valid Data Width	THD	-	800	-	Tclk	
Vertical section	Vertical pulse width	TVPW	1	-	20	TH	
	Vertical total	TV	640	660	700	TH	
	Vertical back porch	TVB	39	39	39	TH	
	Vertical front porch	TVFP	1	21	61	TH	
	Valid Data Width	TVD	-	600	-	TH	

Table 6.2.2 input timing (HV mode)

Note1: In HV mode, it is necessary to keep it on typical value.

6.3 Data Input Timing Diagram

6.3.1 Vertical Input Timing Diagram

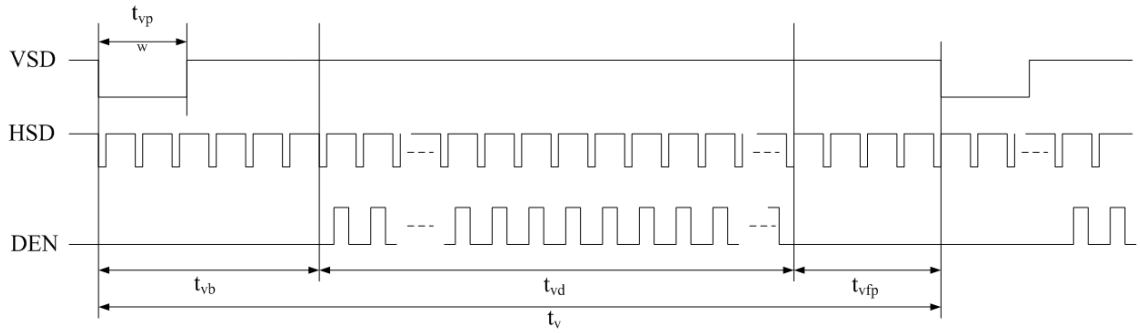


Figure 6.3.1 Vertical Input Timing Diagram

6.3.2 Horizontal Input Timing Diagram

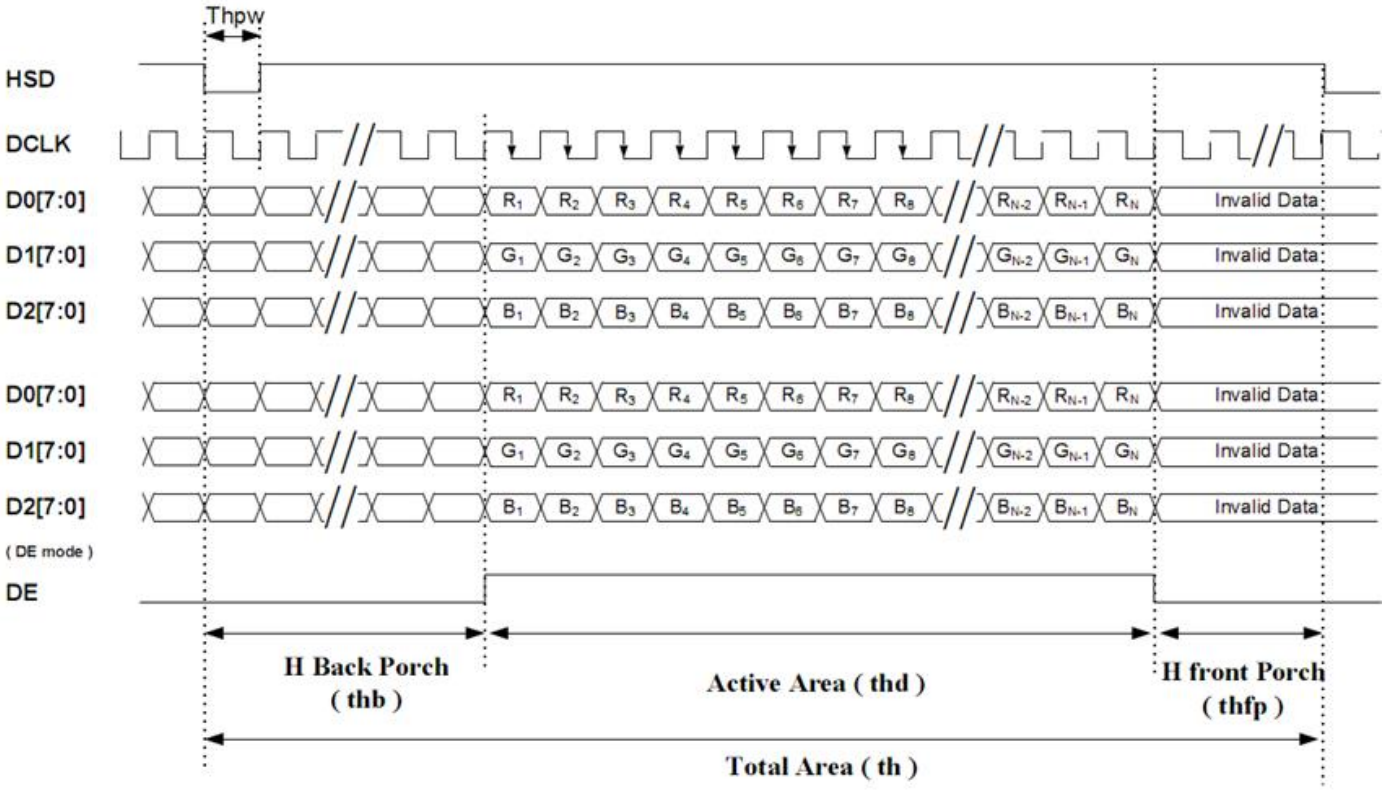


Figure 6.3.2 Vertical Input Timing Diagram

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	-	degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ=0°	400	500			Note 3
Response Time		T_{ON}	25℃	-	20	30	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.260	0.310	0.360		Note 1,5
		y		0.280	0.330	0.380		
	Red	x		0.551	0.601	0.651		Note 1,5
		y		0.281	0.331	0.381		
	Green	x		0.307	0.357	0.407		Note 1,5
		y		0.527	0.577	0.627		
	Blue	x		0.102	0.152	0.202		Note 1,5
		y		0.056	0.106	0.156		
Uniformity		U		70	75		%	Note 6
NTSC		-		45	50		%	Note 5
Luminance		L		280	350		cd/m^2	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. I_F= 180 mA, and the ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical characteristics are measured at the center point of the LCD screen.

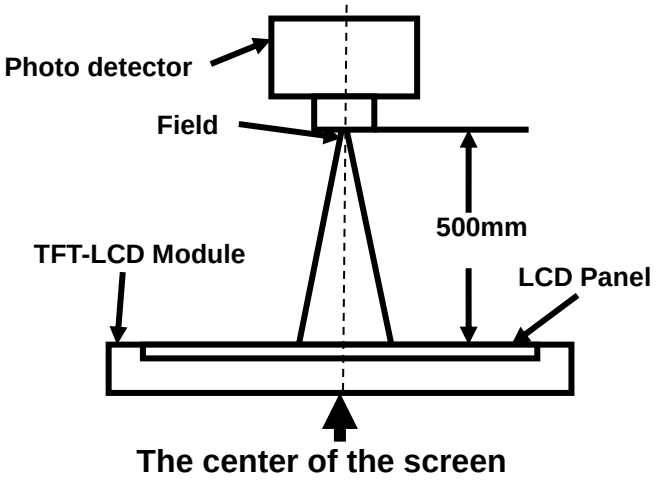


Fig1. Measurement Set Up

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD 。

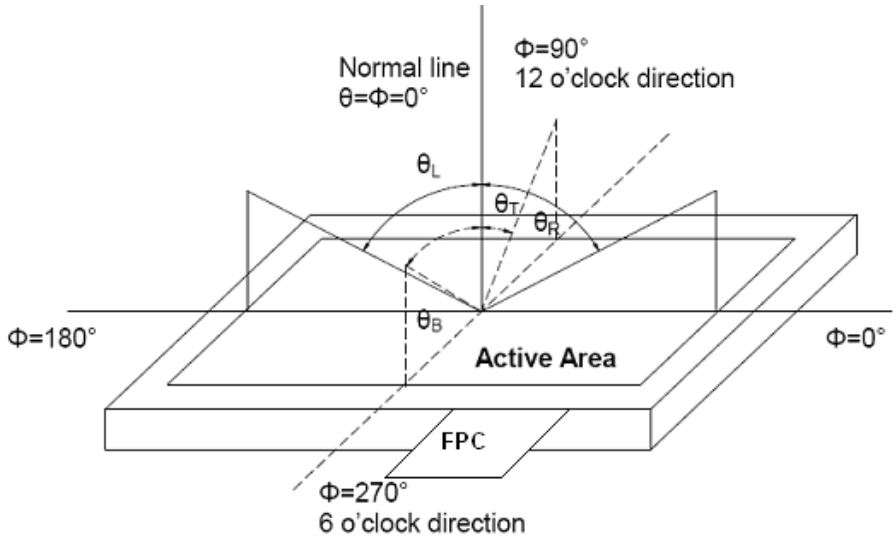


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note4: Definition of Response time

For TN LCM,the response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_r) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_f) is the time between photo detector output intensity changed from 10% to 90%.

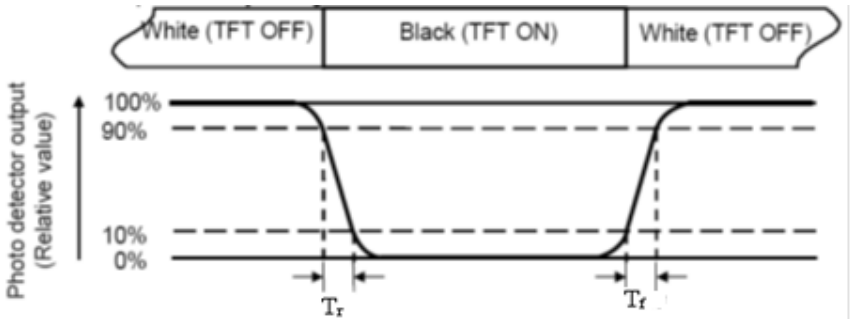


Fig3. Response Time Testing(TN)

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

L-------Active area length; W----- Active area width

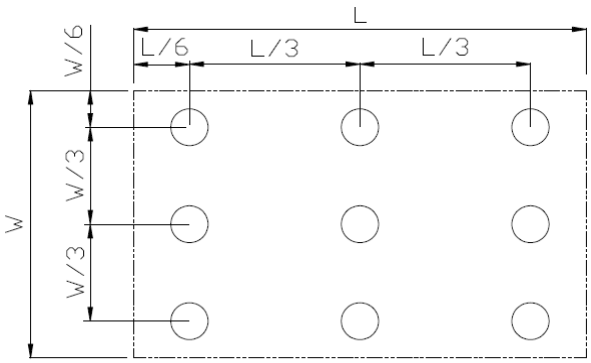


Fig5. Luminance Uniformity Measurement Locations(9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

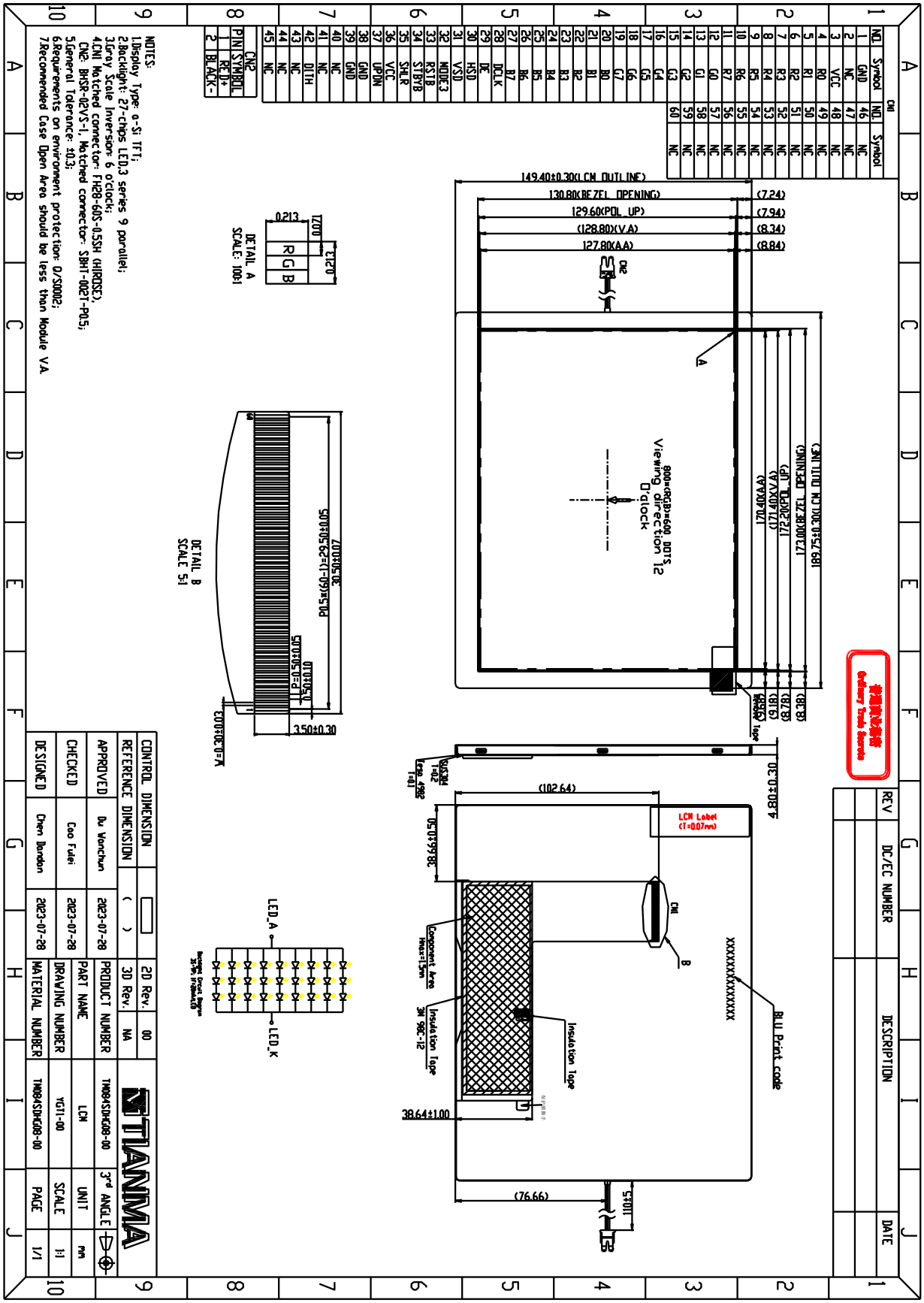
8. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	+70℃，240H	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃，240H	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃，240H	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃，240H	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity(non-operation)	+60℃，90%RH，240H	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃，30min~80℃，30min，change time：5min，100cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF，R=330Ω，5point/panel Air：±8kv，5times； Contact：±4kv，5times； （Environment：15℃~35℃，30%~60%，86Kpa~106Kpa）	IEC61000-4-2:2001 GB/T17626.2-2006
8	Package Vibration	5-20-200HZ，PSD：0.01-0.01-0.001 Total:0.781g2/HZ,x/y/z 30min）	GB/T 4857.23-2012
9	Package Drop Test	Height: 60 cm,1 corner, 3edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

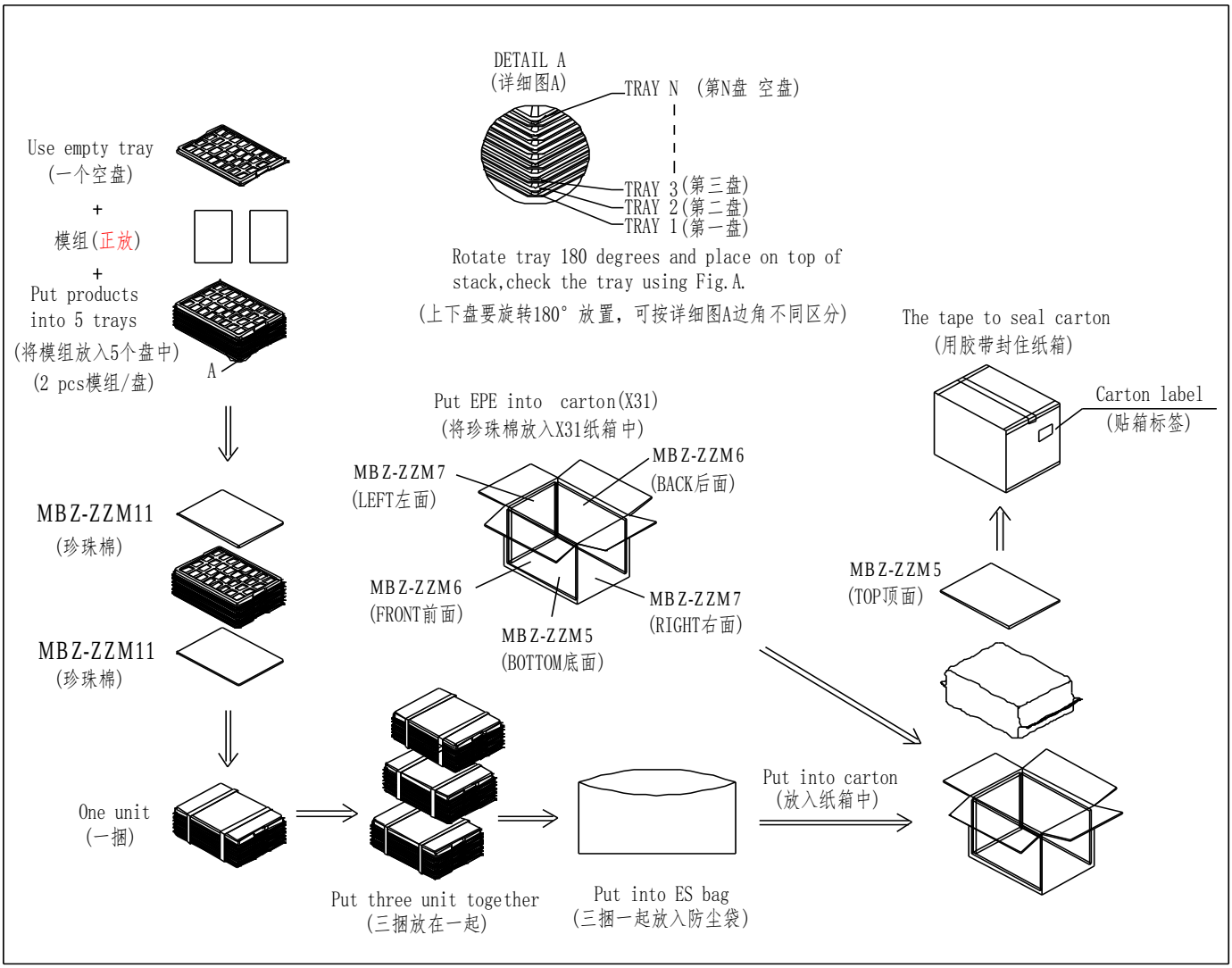
9. Mechanical Drawing



10. Packing Instruction

No	Item	Materiel	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	P0840SVN1ME00	189.75x149.40x4.80	0.245	30	
2	Tray	PET	460×300×19	0.222	18	
3	Dust-Proof Bag	PE	700×550	0.05	1	
4	Anti-static pearl-cotton	EPE	490*330*15	0.025	2	
5	Anti-static pearl-cotton	EPE	490*300*15	0.02	2	
6	Anti-static pearl-cotton	EPE	300*300*15	0.015	2	
7	Anti-static pearl-cotton	EPE	470*310*12	0.018	6	
8	Carton	Paper	510×350×350	1.0	1	
9	Beauty-grain	Tape	25x10	0．001	30	
10	Total Weight	12.654 kg±10%				

Table10.1 Packing instruction



11. Precautions for Use of LCD Modules

11.1 Handling Precautions

(1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
(2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
(5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
- Water
- Ketone
- Aromatic solvents

(6) Do not disassemble the LCD Module.
(7) If powered off, do not apply the input signals.
(8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
(9) Be sure to ground your body when handling the LCD Modules.
(10) Tools used for assembly, must be properly grounded.
(11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
(12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

11.2 Storage precautions

(1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
(2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 ℃ at normal humidity.
(3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

11.5 Safety Precautions

(1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
(2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
(3) LED driver should be designed to limit or stop its function when over current is detected on the LED.