

SPECIFICATION

☐ Preliminary Specification
☒ Final Specification

Description **13.3" 1920xRGBx1080 TFT-LCD Module**
Part Number **P1330FHF1ME10**

Customer		Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date	Approved By	Date
_____	_____	Xiaoxing Ding	20230227
_____	_____	Reviewed By	
		Guangkun An	20230227
		Prepared By	
		Hongwei Liu	20230227
Comments:			

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

REVISION HISTORY

Rev	Date	Page	Revision Items	Editor
1.0	2021/07/11	All	Preliminary release.	MingxuXiao
1.1	2021/04/20	Page4&16	Add weight of LCM	Xuelian Xin
		Page7	Update backlight power supply current&voltge& consumption	
		Page 15	Update drawing of LCM	
		Page 11	Update chromaticity of white &Add min CR 700	Jie Chen
		Page4	Update IC to RM91M39FK	Dong Qin
		Page6	Update Absolute Maximum Ratings& Electrical Characteristics	Dong Qin
		Page10	ADD 5.5 Timing	Dong Qin
1.2	2021/09/07	All	All: Update the model No. P1330FHF1ME10	Hongwei Liu
		Page 15	Update drawing of LCM	Xuelian Xin
1.3	2021/12/03	All	Update according to the new template of the specification	Hongwei Liu
	2021/12/03	Page4	Update VCC max to 3.6V	Zuying Zhang
	2021/12/03	Page 5	Update LCD Power Consumption & Add note 5	Zuying Zhang
	2021/12/03	Page 5	Update 5.3	Zuying Zhang
1.4	2022/5/31	Page 2	The Display Mode was corrected to SFT	Hongwei Liu
		Page 15	Update drawing of LCM	Xuelian Xin
1.5	2022/09/27	Page 5	Update Remark of BL	Xuelian Xin
2.0	2023/02/27	All	Fianl Spec release	Hongwei Liu
		Page2&10	Add information of Matching connector& Uniformity typ.	Xuelian Xin
		Page 6	Update the table	Zuying Zhang

CONTENTS

1. SUMMARY.....	1
1.1 General Description.....	1
1.2 Features	1
2. GENERAL SPECIFICATIONS.....	1
3. INPUT / OUTPUT TERMINALS.....	2
3.1 CN1 Pin assignment (LCD Interface)	2
4. ABSOLUTE MAXIMUM RATINGS	3
5. ELECTRICAL CHARACTERISTICS	4
5.1 DC Characteristics for Panel Driving.....	4
5.2 DC Characteristics for Backlight Driving.....	4
5.3 Recommended Power ON/OFF Sequence.....	5
5.4 LCD Module Block Diagram	7
6. TIMING CHARACTERISTICS	8
6.1 Display Edp1.2 Reference Circuit.....	8
6.2 EDP1.2 Data Format.....	8
6.3 DP Characteristics	9
6.4 Timing	10
7. OPTICAL CHARACTERISTICS	10
8. RELIABILITY TEST.....	13
9. MECHANICAL DRAWING	14
10. PACKING INSTRUCTION.....	15
11. PRECAUTIONS FOR USE OF LCD MODULES.....	17
11.1 Handling Precautions.....	17
11.2 Storage precautions	18
11.3 Transportation Precautions	18
11.4 Screen saver Precautions.....	18
11.5 Safety Precautions	18

1. Summary

1.1 General Description

This is a 13.3 inch a-Si TFT-LCD module with Normal-black technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle
- High resolution
- Wide temperature range
- Interface: EDP 1.2
- LED driver integrated
- Surface treatment ; AG
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: E170632)
- 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	13.3 inch	
	Resolution	1920(RGB)x1080	
	Pixel Pitch	0.153x0.153	mm
	TFT Active Area	293.76x165.24	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT	
	Surface Treatment	Anti-Glare	
	Viewing Direction	All	
	Gray Scale Inversion Direction	NA	
Mechanical Characteristics	LCM (W x H x D)	305.35 x 178.56 x 3.7	mm
	Weight	346±5 %	g
Optical Characteristics	Luminance	350	cd/m ²
	Contrast Ratio	1000:1	
	NTSC	72	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	EDP1.2	
	Color Depth	16.7 Million	color
	Power Consumption	LCD:2200; Backlight:5184	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	IPEX 20455-030E-76
Matching connector	IPEX 20453-030T-XX or equivalent

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	NC	-	No connect	
2	GND	P	Ground	
3	D1-	I	eDP Rx lane 1, negative	
4	D1+	I	eDP Rx lane 1, positive	
5	GND	P	Ground	
6	D0-	I	eDP Rx lane 0, negative	
7	D0+	I	eDP Rx lane 0, positive	
8	GND	P	Ground	
9	AUX+	I/O	Edp AUX ch, positive	
10	AUX-	I/O	Edp AUX ch, negative	
11	GND	P	Ground	
12	VCC	P	Power for LCD 3.3V	
13	VCC	P	Power for LCD 3.3V	
14	NC	-	No connect	
15	GND	P	Ground	
16	GND	P	Ground	
17	Edp_HPDP	O	Hot Plug Detection	
18	PWM	I	BLU Diming	
19	NC	-	No connect	
20	VCC_LED-	P	BLU Ground	
21	VCC_LED-	P	BLU Ground	
22	VCC_LED-	P	BLU Ground	
23	VCC_LED-	P	BLU Ground	
24	VCC_LED-	P	BLU Ground	
25	VCC_LED-	P	BLU Ground	
26	EDP_LED_EN	I	BLU Enable	
27	NC	-	No connect	
28	VCC_LED+	P	Power for BLU (12V type)	
29	VCC_LED+	P	Power for BLU (12V type)	
30	NC	-	No connect	

Table 3.1.2 Pin Assignment for LCD Interface

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

Note2: All of the GND pins should be connected to the system ground.

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	3.6	V	Note1
BL_POWER Input	VCC_LED+	-0.3	28	V	
BL_PWM signal input	PWM	-0.3	5.5	V	
BL ENABLE	EDP_LED_EN	-0.3	5.5	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta≤50°C
		--	≤55	%	50°C < Ta≤60°C
		--	≤36	%	60°C < Ta≤70°C
		--	≤24	%	70°C < Ta≤80°C
Absolute Humidity	AH	--	≤70	g/m ³	Ta>70°C

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
Power Supply for LCD	VCC	3.2	3.3	3.4	V	
Hot plug Detect	Edp_HPDP	-	3.3	-	V	TCON output HPD 3.3Vtyp
LCD Power Consumption	P_VDD	-	2.2	2.5	W	Test at White pattern

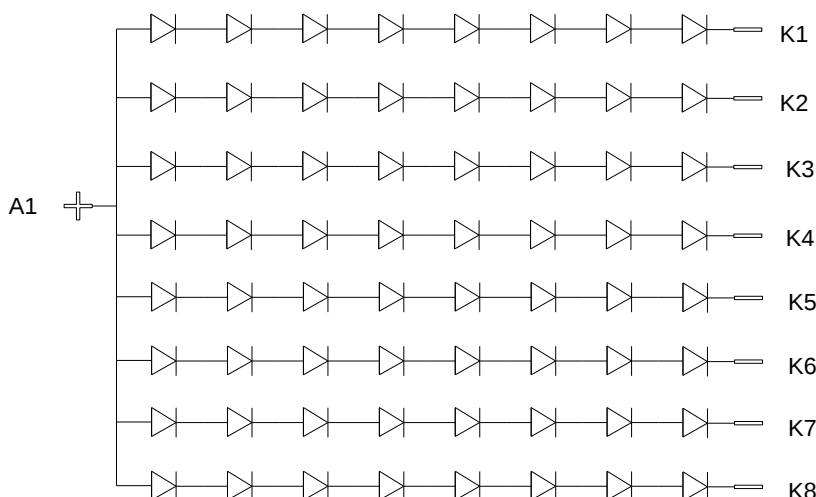
Table 5.1.1 Operating Voltages

Note1: Indicated the subsequent version may be updated.

5.2 DC Characteristics for Backlight Driving

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Backlight power supply voltage		VCC_LED+	11.5	12	12.5	V	64 LEDs (8 LED Parallel,8LED Serial)
Backlight power supply current		I VCC_LED+	-	432		mA	
Backlight power consumption		P_LED	-	5184		mW	
Input voltage for PWM signal	High level	-	1.3	-	5	V	
	Low level	-	0	-	0.15	V	
Input voltage for VLED_EN	High level	-	1.6	-	5	V	
	Low level	-	0	-	1	V	
VLED_PWM frequency		Fpwm	100	-	20k	HZ	
VLED_PWM duty		D	1		100	%	
LED life time		-	-	30000		H	

Table 5.2.1 LED Backlight Characteristics



Note1: I_F is defined for each channel.

Note2: Optical performance should be evaluated at $T_a=25^{\circ}\text{C}$ only.

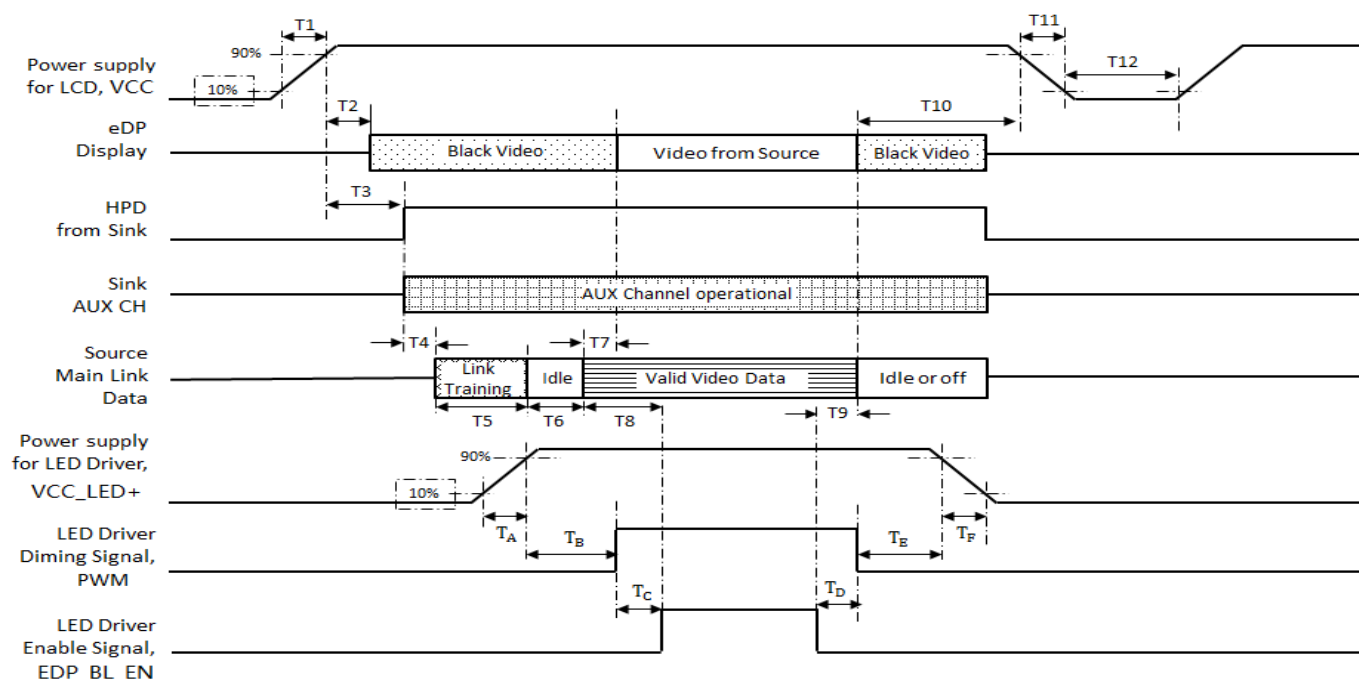
Note3: If LED is driven by high current, high ambient temperature & humidity condition, The life time of LED will be reduced.

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

Note5:

Dimming Frequency (Hz)	Duty (Min.)	Duty (Max.)
$100 < f_{PWM} \leq 200$	0.16%	100%
$200 < f_{PWM} \leq 500$	0.40%	100%
$500 < f_{PWM} \leq 1k$	0.80%	100%
$1k < f_{PWM} \leq 2k$	1.60%	100%
$2k < f_{PWM} \leq 5k$	4.00%	100%
$5k < f_{PWM} \leq 10k$	8.00%	100%
$10k < f_{PWM} \leq 20k$	16.00%	100%

5.3 Recommended Power ON/OFF Sequence



Industrial Display Module

Parameters	Description	Reqd. by	Value		Unit	Notes
			Min	Max		
T1	Power tail rise time, 10% to 90%	Source	0.5	10	ms	-
T2	Delay from LCD VCC to black video generation	Sink	0	200	ms	Automatic Black Video generation prevents display noise until valid video data is received from the Source
T3	Delay from LCD VCC to HPD high	Sink	0	200	ms	Sink AUX Channel must be operational upon HPD high
T4	Delay from HPD high to link training initialization	Source	-	-	ms	Allows for source to read Link capacity and initialize
T5	Link training duration	Source	-	-	ms	Dependent on Source link training Protocol
T6	Link Idle	Source	-	-	ms	Min Accounts for required BS-Idle pattern. Max allows for Source frame synchronization
T7	Delay from valid video Data from Source to video on display	Sink	0	50	ms	Max value allows for Sink to valid video Data and Timing. At the end of T7, Sink will indicate the detection of valid video data by setting SINK_STATUS bit to logic 1(DPCD 00205h, bit 0), and Sink will no longer generate automatic Black video
T8	Delay from valid video Data from Source to Backlight on	Source	150	-	ms	Source must assure display video is stable
T9	Delay from Backlight off to end of valid video Data	Source	150	-	ms	Source must assure backlight is no longer illuminated. At the end of T9, Sink will indicate the detection of no valid video data by setting the SINK_STATUS bit to logic 0 (DPCD 00205h, bit 0), and Sink will automatically display Black Video.
T10	Delay from end of valid video data from Source to Power off	Source	0	500	ms	Black video will be displayed after receiving idle or off signals from Source
T11	LCD VCC power rail fall time, 90% to 10%	Source	0.5	10	ms	-
T12	LCD VCC Power off time	Source	500	-	ms	-
T _A	VCC LED+ rail rise time, 10% to 90%	Source	0.5	10	ms	-
T _F	VCC LED+ rail fall time, 90% to 10%	Source	0.5	10	ms	-
T _B	Delay from VCC LED+ to Dimming signal PWM on	Source	0	-	ms	-
T _E	Delay from Dimming signal PWM off to VCC LED+ off	Source	0	-	ms	-
T _C	Delay from diming signal PWM on to Enable signal EDP_BL_EN	Source	0.5	-	ms	-
T _D	Delay from Enable signal EDP_BL_EN off to diming signal PWM off	Source	0.5	-	ms	-

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

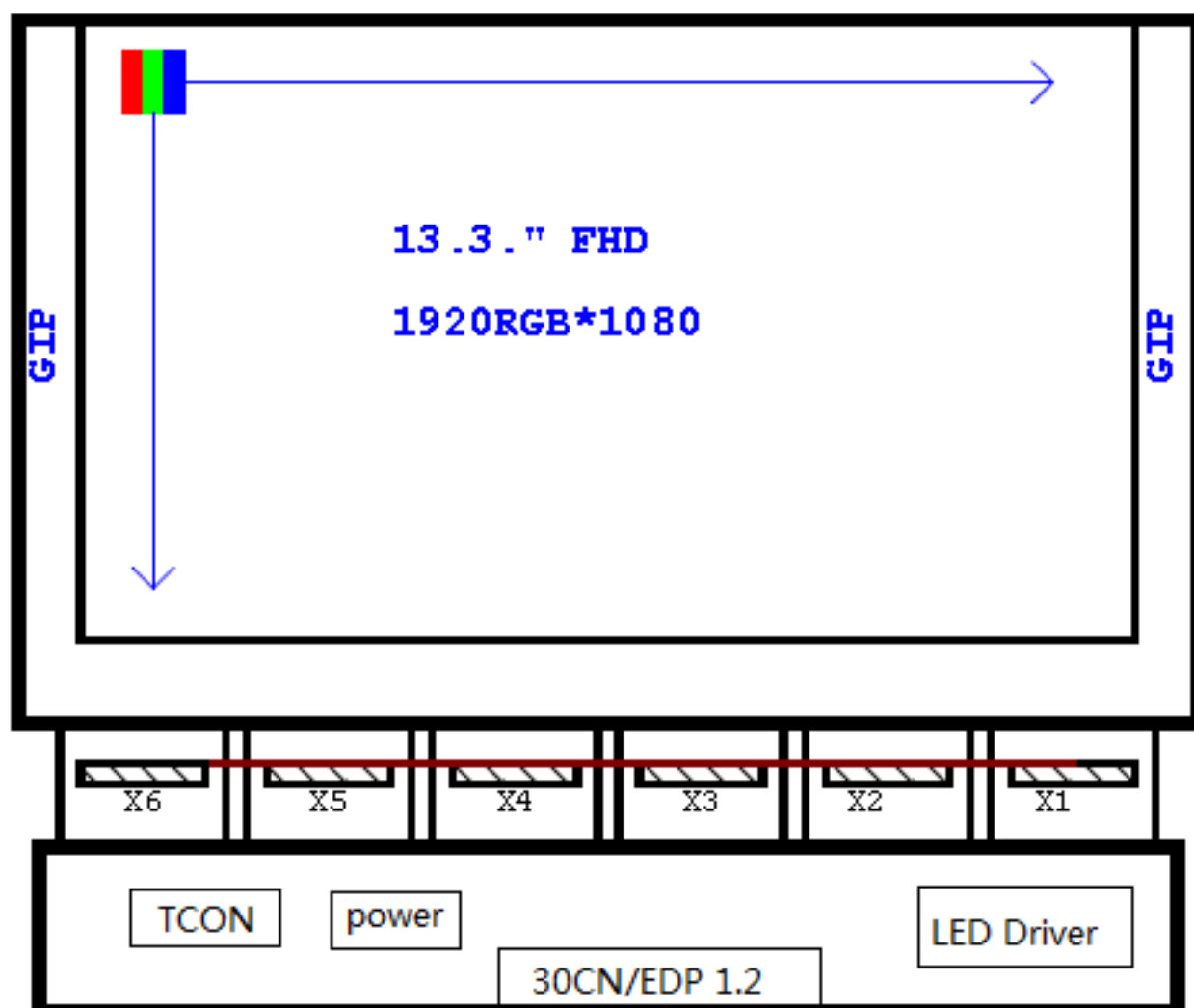
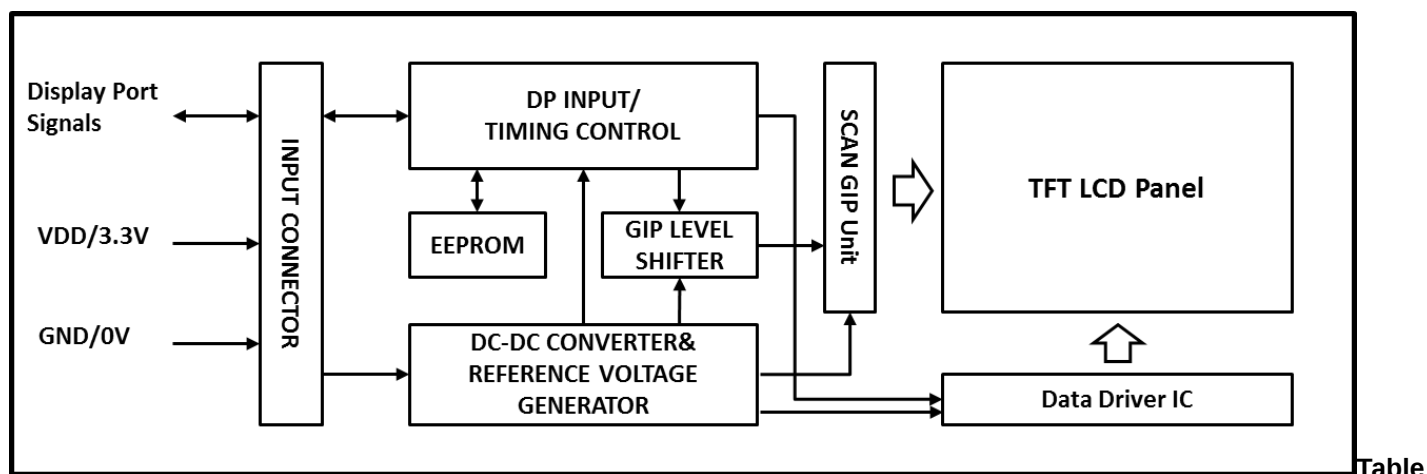


Figure 5.5.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 Display Edp1.2 Reference Circuit



6.2 EDP1.2 Data Format

Lane 0	Lane 1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0

Table 6.2.1 24 bpp RGB Mapping to a Two Lane Main Link

6.3 DP Characteristics

6.3.1 Aux Channel Characteristics

Symbol and Parameter	Test Conditions	Min	Typ ²	Max	Unit
UI: Unit Interval for AUX channel		0.4	0.5	0.6	μs
V _{AUX-TX_DIFF-p-p} : AUX differential peak-to-peak voltage when driving (TX)		400		1000	mV
V _{AUX-RX_DIFF-p-p} : AUX differential peak-to-peak voltage when receiving (RX)		250		1360	mV
V _{AUX-DC-CM-RX} : AUX common mode voltage when receiving			GND		V
V _{AUX-DC-CM-TX} : AUX common mode voltage when transmitting			0.15		V
I _{AUX-SHORT} : AUX channel short circuit current				20	mA
R _{AUX-DIFF} : Differential termination resistance		80	100	120	Ω
R _{AUX-SE} : Single-ended termination resistance		40	50	60	Ω
C _{AUX} : AUX AC coupling capacitor		75		200	nF

6.3.2 Main Link Characteristics

Symbol and Parameter	Test Conditions	Min	Typ ²	Max	Unit
Spread spectrum clock, down-spreading by SOURCE			0.5		%
V _{RX-DIFF-p-p} : Differential peak-to-peak input voltage at package pins		100		1320	mV
Maximum adaptive/programmable equalization level at 1.35GHz			9		dB
V _{RX-DC-CM} : Rx input DC common mode voltage			GND		V
R _{RX-DIFF} : Differential termination resistance		80	100	120	Ω
R _{RX-SE} : Single-ended termination resistance		40		60	Ω
I _{RX-SHORT} : Rx short circuit current limit				20	mA
L _{RX-SKEW_INTRA_PAIR} : Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR				150	ps
L _{RX-SKEW_INTRA_PAIR} : Intra-pair skew at Rx package pins (RBR) RX intra-pair skew tolerance at RBR				300	ps
Receiver Jitter Tolerance for High Bit Rate (HBR) Total jitter tolerance at 2MHz Total jitter tolerance at 10MHz Total jitter tolerance at 20MHz Total jitter tolerance at 100MHz		1227 548 505 491			mUI mUI mUI mUI
Receiver Jitter Tolerance for Reduced Bit Rate (RBR) Total jitter tolerance at 2MHz Total jitter tolerance at 10MHz Total jitter tolerance at 20MHz		1648 778 747			mUI mUI mUI

6.4 Timing

Symbol	Typ	Unit
PixelClock	139	MHz
HACT	1920	PixelClock
HBP	48	PixelClock
HFP	64	PixelClock
HSA	48	PixelClock
VACT	1080	Line
VBP	41	Line
VFP	3	Line
VSA	6	Line

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10		88	-	degree	Note2,3
		θB			88	-		
		θL			88	-		
		θR			88	-		
Contrast Ratio		CR	θ=0°	700	1000	-		Note 3
Response Time		T _{ON}	25℃	-	25	35	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.243	0.293	0.343		Note 1,5
		y		0.253	0.303	0.353		
	Red	x		0.586	0.636	0.686		Note 1,5
		y		0.291	0.341	0.391		
	Green	x		0.28	0.33	0.38		Note 1,5
		y		0.575	0.625	0.675		
	Blue	x		0.103	0.153	0.203		Note 1,5
		y		0.024	0.074	0.124		
Uniformity		U		75	80	-	%	Note 6
NTSC		-		67	72	-	%	Note 5
Luminance		L		300	350		cd/m ²	Note 7

Test Conditions:

1. IF= 432 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. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

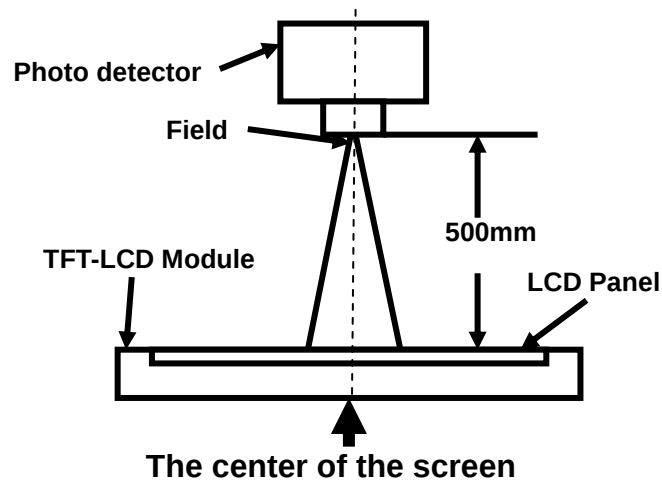


Fig1. Measurement Set Up

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

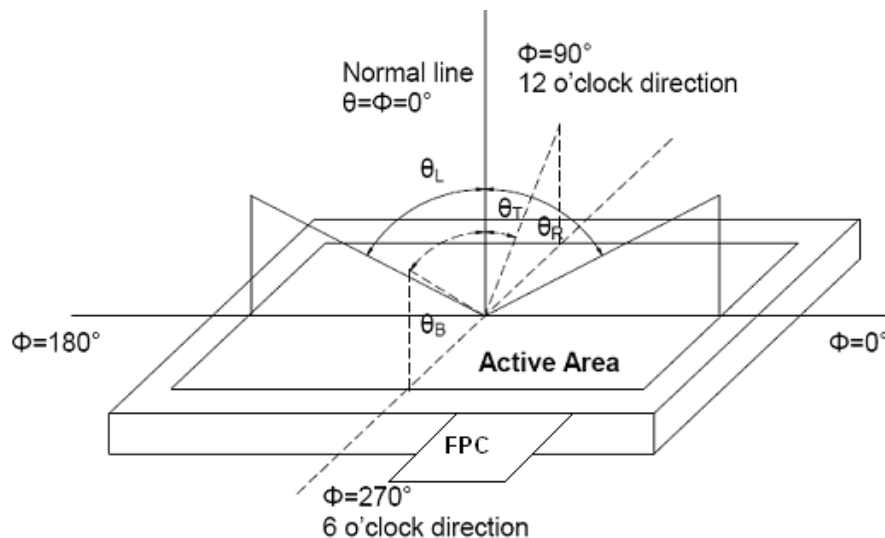


Fig2. Measurement viewing angle

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%.

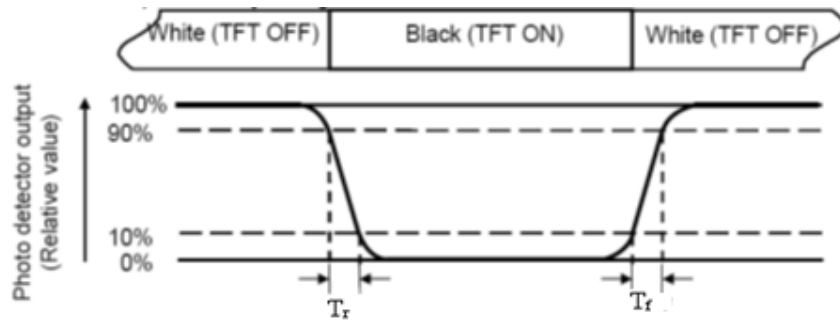


Fig3. Response Time Testing(TN)

For SFT 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 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.

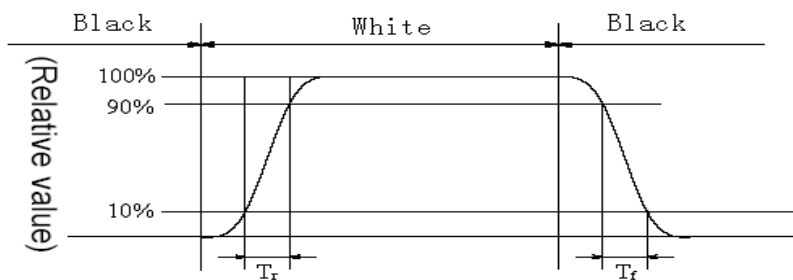


Fig4. Response Time Testing(SFT)

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) = L_{min} / L_{max}

L_{max} : The measured Maximum luminance of all measurement position.

L_{min} : The measured Minimum luminance of all measurement position.

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

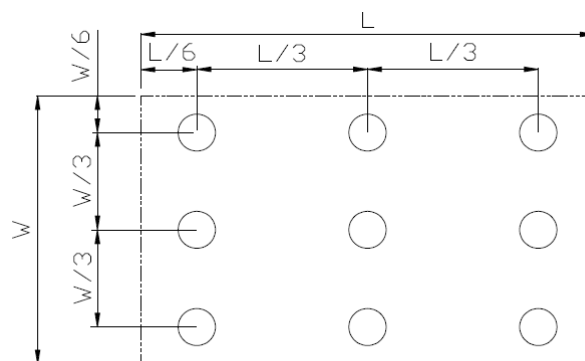


Fig5. Luminance Uniformity Measurement Locations(9 points)

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	Vibration (non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz ~ 55Hz ~ 10Hz 2hours for each direction of X.Y.Z (6 hours total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:60 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

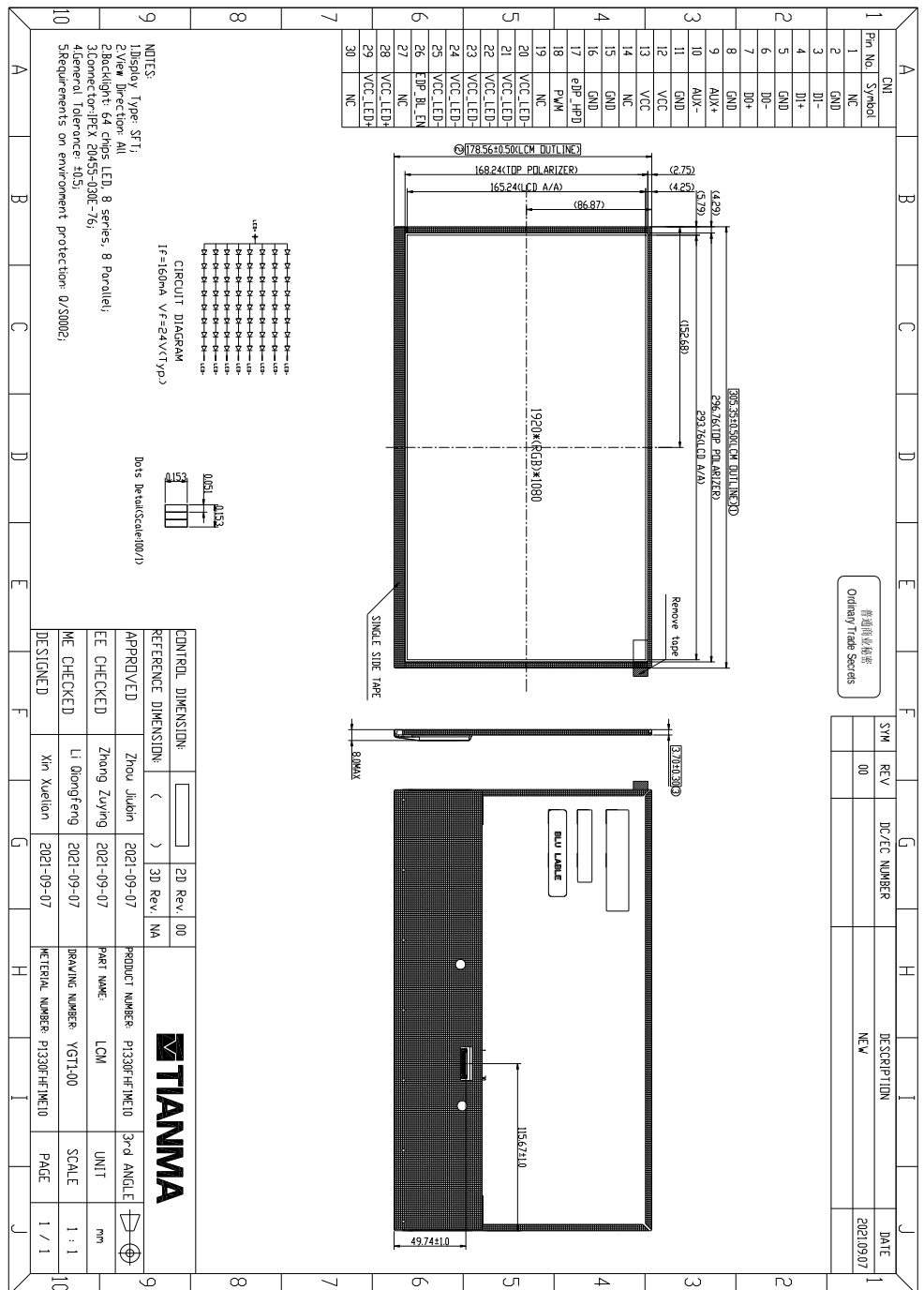
Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 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

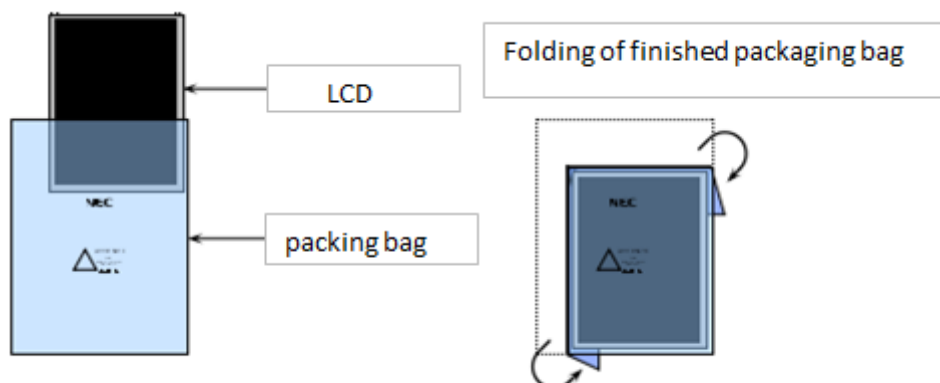
No	Item	Model (Material)	Dimensions(m m)	Unit Weight(Kg)	Q'ty	Remark
1	LCM module	P1330FHF1ME10	305.35×178.56×3.7	0.3466	10	
2	Partition board	Corrugated paper	362×179	0.033	2	
3	Anti-static Bag	LD-PE	360×255×0.05	0.015	10	
4	EPP-Bottom	EPP	444×415×170	0.253	1	
5	EPP-TL	EPP	444×154×120	0.086	1	
	EPP-TR	EPP	444×154×120	0.086	1	
	EPE	EPE	444×410×6	0.021	1	
	Carton	Corrugated paper	447×415×328	1.179	1	
6	Total weight	5.3±5%Kg				

1. Single package

1) Put the LCD module into the packaging bag: as shown in the figure below

2) After the LCD module is put into the packaging bag of the finished product, the surplus part of the opening part is folded inward.

Note: the front of the module panel should be on the printed side of the packaging bag



2. Inner packing

1) Packing preparation

Assemble the cardboard box, bind the bottom with tape, and put EPE into the carton, as shown in the figure below



2) EPP bottom is placed on the top of EPE, and finally the clapboard is inserted into the grooves on both sides of the bottom plate, as shown in the figure below



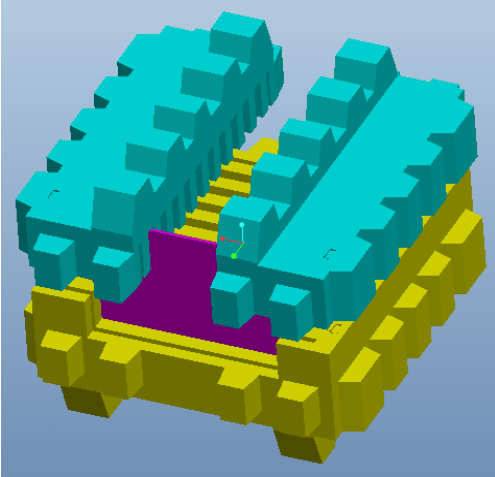
3) Packaging

The module in the electrostatic bag should be put into the packing box according to the following conditions

- When storing the work, take the finished product with both hands
- PCB board side up
- Place in the same direction
- When the rest is only the remainder, it should be concentrated in the center of the box

After the packaging of the finished product is finished, put the upper left and right cover plates into the wall part of the component to press the finished product,

Note: the front (screen) of the module is consistent with the arrow direction above the EPP, as shown in the red circle below



4) Packing case sealing

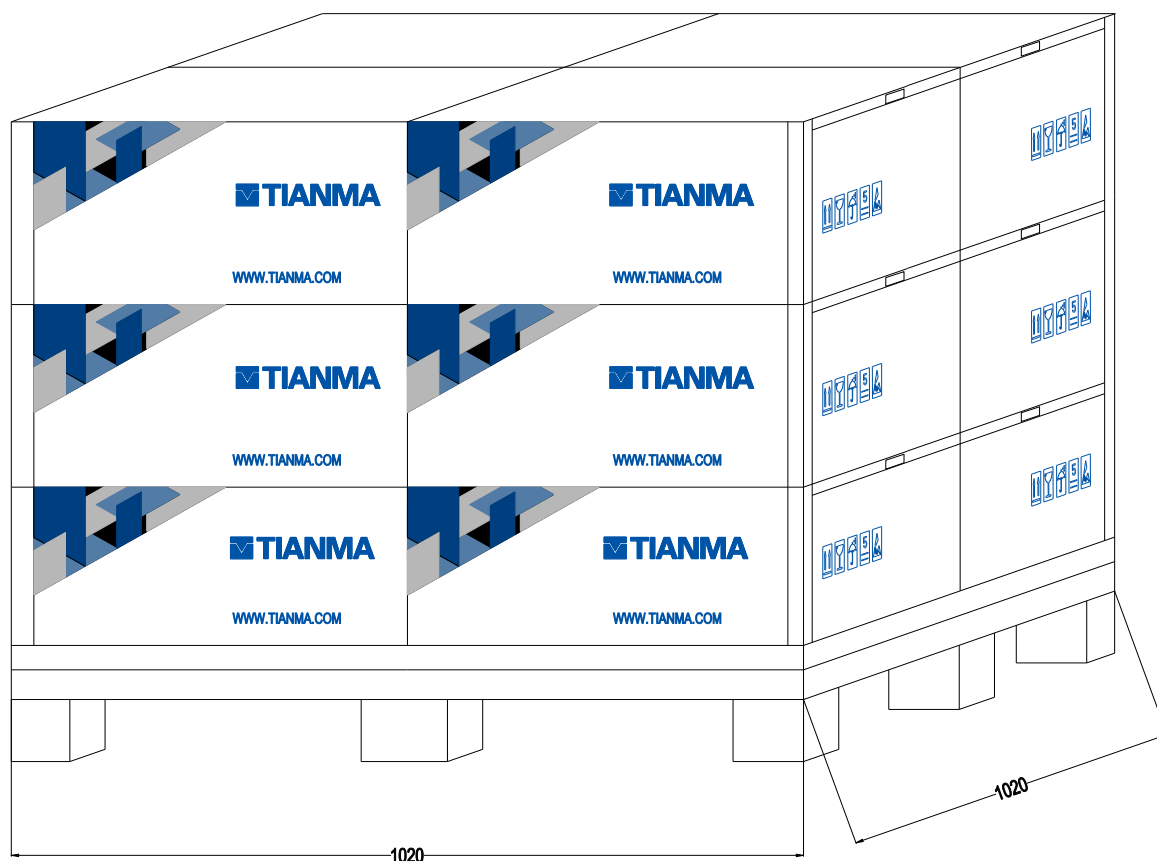
Close the box cover and seal with tape

5) Label the box on the box

Label the carton on the short side of the carton (the side of the print number) above the item number, and align the left side with the left edge of the logo

6) Carton stack

The stacking number of cartons is 2 * 2, each layer * is 3layers



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 °C 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.