SPECIFICATION

[◉] Preliminary Specification
[ ] Final Specification

Description **10.1” 1024xRGBx600 TFT-LCD Module**

Part Number **P1010WSN1ME00**

Customer		Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date	Approved By	Date
		Ding Xiaoxing	2023/8/30
		Reviewed By	
		AN Guangkun	2023/8/30
		Prepared By	
		Duan Jing	2023/8/30
Comments:			

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

REVISION HISTORY

Rev	Date	Page	Revision Items	Editor
1.0	2023-8-30	-	Preliminary SPEC released.	Duan Jing

CONTENTS

1. Summary

1.1 General Description

This is a 10.1 inch a-Si TFT-LCD module with Normal- White technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, and a LED backlight unit.

1.2 Features

- Interface: LVDS 6/8bit
- LED driver integrated
- Surface treatment AG
- This product will comply with UL E333987
- This product will comply with the European RoHS directive (2011/65/EU) and Delegated Directive (2015/863/EU,Amending Annex II of 2011/65/EU)

2. General Specification

Feature		Spec	Unit
Display Spec.	Size	10.1 inch	
	Resolution	1024(RGB)x600	
	Pixel Pitch (mm)	0.2175x0.2088	mm
	TFT Active Area	222.72 x 125.28	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)	235.00 x 143.00 x 4.9	mm
	Weight	202	g
Optical Characteristics	Luminance	450	cd/m^2
	Contrast ratio	800	
	NTSC	47	%
	Viewing angle(R/L/U/D)	80/80/75/80(TN)	degree
Electrical Characteristics	Interface	1 port LVDS(6/8bit selectable)	
	Color Depth	262K/16.7M	color
	Power consumption	LCD:726(Black pattern) Backlinght:5400mW(Duty=100%)	mW

Table 2.1 General TFT Specifications

Note 1: For TN LCM: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: LCM weight tolerance: ± 5%

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	IPEX 20455-040E-66 or equivalent
Matching connector	IPEX 20453-040T-01 or equivalent

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	NC	-	No connection(Reserve)	
2	VCCS	P	Power supply(3.3V typ)	
3	VCCS	P	Power supply(3.3V typ)	
4	VEDID	P	DDC 3.3V power	If EDID function is not used, please keep it floating.
5	NC	-	No connection(Reserved for TM test)	
6	CLKEDID	I	DDC clock	If EDID function is not used, please keep it floating.
7	DATAEDID	I	DDC data	
8	Rxin0-	I	LVDS differential data input(R0~R5,G0)	
9	Rxin0+	I		
10	VSS	P	Ground	
11	Rxin1-	I	LVDS differential data input(G1~G5,B0~B1)	
12	Rxin1+	I		
13	VSS	P	Ground	
14	Rxin2-	I	LVDS differential data input (B2~B5,-,-,DE)	
15	Rxin2+	I		
16	VSS	P	Ground	
17	RxCLK-	I	LVDS differential clock input	
18	RxCLK+	I		
19	VSS	P	Ground	
20	Rxin3-	I	LVDS differential data input (R6~R7,G6~G7,B6~B7)	
21	Rxin3+	I		
22	VSS	P	Ground	
23	NC	-	No connection(Reserved for TM test)	

24	NC	-	No connection(Reserved for TM test)	
25	VSS	P	Ground	
26	NC	-	No connection(Reserved for TM test)	
27	SEL68	I	LVDS 6/8 bit selection control. SEL68="H":8bit SEL68="L" or NC:6bit	Note2
28	VSS	P	Ground	
29	SHLR	I	Horizontal display direction control Internally pulled high with 4.7KΩ resistor.	Note3
30	UPDN	I	Vertical display direction control Internally pulled low with 4.7KΩ resistor.	
31	LED_GND	P	LED ground	
32	LED_GND	P	LED ground	
33	LED_GND	P	LED ground	
34	NC	-	No connection(Reserve)	
35	LED_PWM	I	PWM control signal of LED converter	
36	LED_EN	I	Enable control signal of LED converter	
37	NC	-	No connection(Reserve)	
38	LED_VCCS	P	LED power supply(12V typ)	
39	LED_VCCS	P	LED power supply(12V typ)	
40	LED_VCCS	P	LED power supply(12V typ)	

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection
Note2: Connect to GND for 6bit LVDS input.
Note3: User could leave 29&30th pin open to use default setting.
Scan direction is shown as below (PCB at down side):

PCB side ⇨

SHLR=H, UPDN=L

SHLR=L, UPDN=H

4. Absolute Maximum Ratings

GND=0V

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCCS	-0.3	5.0	V	Note1
EDID drive Voltage	VEDID	-0.3	4	V	
Converter Input Voltage	LED_VCCS	4.2	24	V	
Converter Control Signal Voltage	LED_PWM	-0.3	5.0	V	
Converter Control Signal Voltage	LED_EN	-0.3	5.0	V	
Operating Temperature	TOPR	-20	70	℃	Note2、Note3
Storage Temperature	TSTG	-30	80	℃	
Relative Humidity Note1	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 4.1 Absolute Maximum Ratings

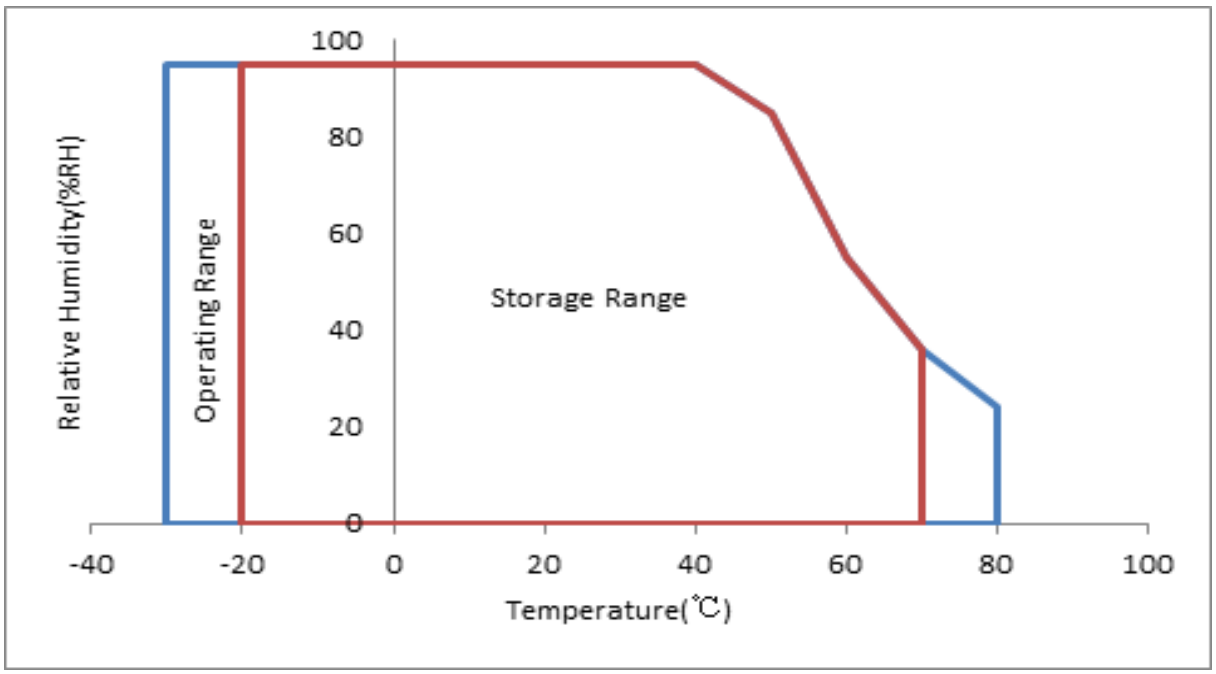


Table 4.2 Absolute Maximum Ratings chart

Note1: Input voltage include Rxin -/+、Rxin 1-/+、Rxin 2-/+、RxCLK--/+、Rxin 3-/+、SEL68、SHLR、UPDN

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.
When exceeded the maximum ratings, 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

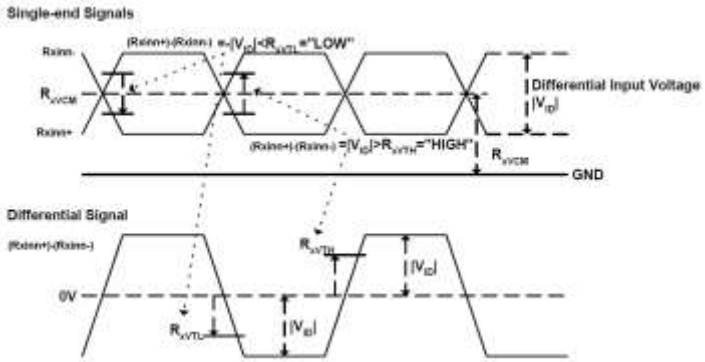
GND=0V, Ta = 25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
POWER Supply Voltage	VCCS	3.20	3.30	3.40	V	
Differential input high threshold voltage	R_{xVTH}	-	-	+0.2	V	R_{xVCM} =1.2V Note2
Differential input low threshold voltage	R_{xVTL}	-0.2	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	VCCS-1.2	V	
Differential input common mode voltage	R_{xVCM}	$\|V_{ID}\|/2$	-	VCCS-1.2-$\|V_{ID}\|/2$	V	
Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	
Current of VCCS Power supply	IVDD	-	220	-	mA	
Power consumption of VCCS	WVDD	-	726	-	mW	
Inrush current of VCCS	Irush	-	-	1.5	A	Note4

Table 5.1.1 Operating Voltages

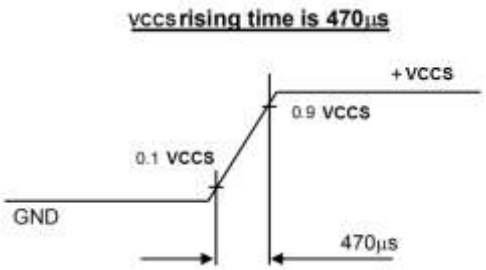
Note1:To test the current dissipation, use “all Black Pattern”.

Note2: LVDS characteristics



Note3:Rxinn+/Rxinn-(n=0,1,2,3)

Note4: Inrush current definition.



5.2 DC Characteristics for Backlight Driving

GND=0V, Ta = 25℃

Item		Symbol	Min	TYP	MAX	Unit	Remark
Power supply voltage		LED_VCCS	11.5	12	12.5	V	
Power supply current		I_{LED}	-	450	-	mA	
Input voltage for PWM signal	High	VDFH1	1.6	-	LED_VCCS	V	
	Low	VDFL1	0	-	0.8	V	
Input voltage for EN signal	High	VDFH2	1.6	-	LED_VCCS	V	
	Low	VDFL2	0	-	0.8	V	
PWM frequency		fpwm	100	-	8K	Hz	
PWM duty cycle		Dim(Fpwm=100 ~8khz)	1	-	-	%	Dim setting must be more than minimum always
PWM pulse width		tPWH	5	-	-	us	
LED lifetime		--	20000	30000	-	hrs	

Table 5.2.1 LED Backlight Characteristics

Note 1: Optical performance should be evaluated at Ta=25℃ only.
2: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.
3: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data.

5.3 Recommended Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCCS on to VCCS stable	Tp1	0.5	-	20	ms	
VCCS stable to signal on	Tp2	0	-	50	ms	
Signal on to LED_EN on	Tp3	200	-	-	ms	
LED_PWM on to LED_EN on	Tp4	0	-	200	ms	
LED_VCCS to LED_PWM on	Tp5	10	-	-	ms	
LED_VCCS on to LED_VCCS stable	Tp6	0.5	-	10	ms	
VCCS off time	Tp7	0	-	10	ms	
VCCS off to next VCCS on	Tp8	1000	-	-	ms	

Signal off before VCCS off	Tp9	0	-	50	ms	
LED_EN off before signal off	Tp10	200	-	-	ms	
LED_EN off before LED_PWM off	Tp11	0	-	200	ms	
LED_PWM off before LED_VCCS off	Tp12	10	-	-	ms	

Table 5.3.1 Power ON/OFF Sequence

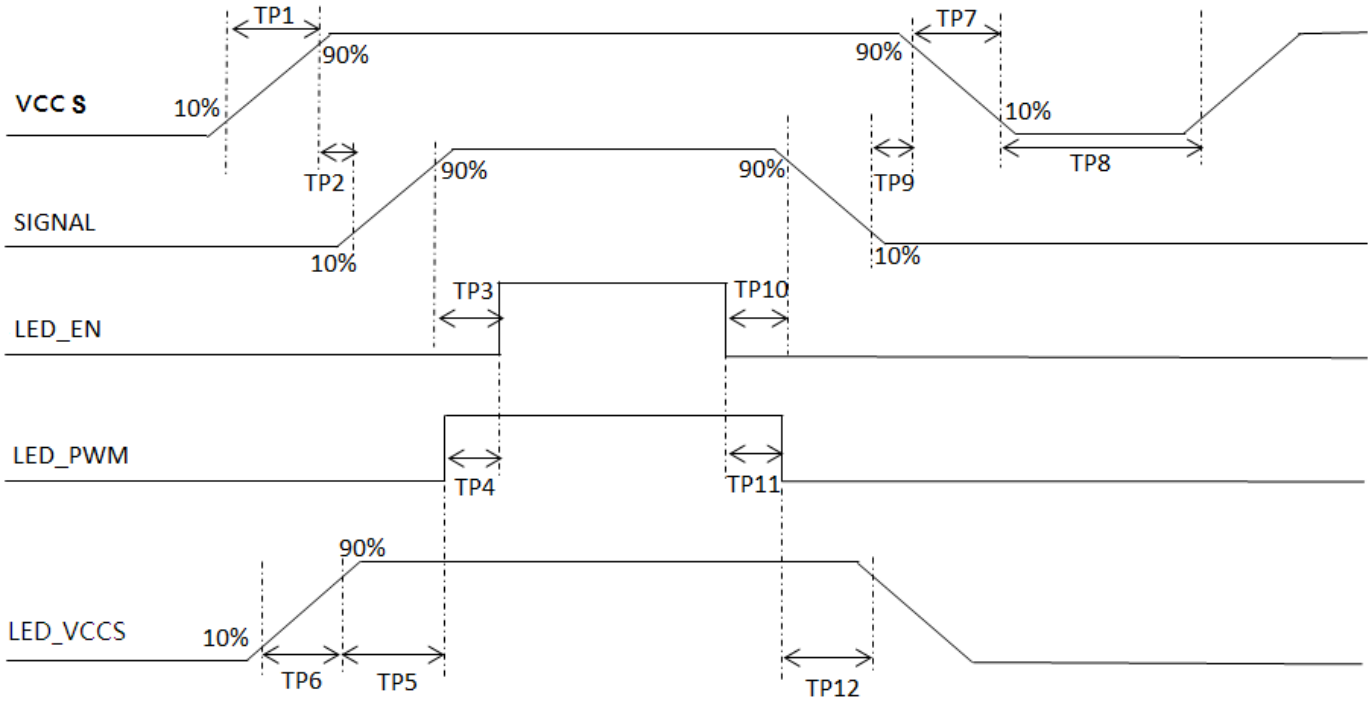


Figure 5.3.2 Power ON/OFF Sequence

Note1: T1 means the time of input voltage rise from 10% to 90% of VCCS.
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: Keep backlight turned off until the display has stabilized.

5.4 LCD Module Block Diagram

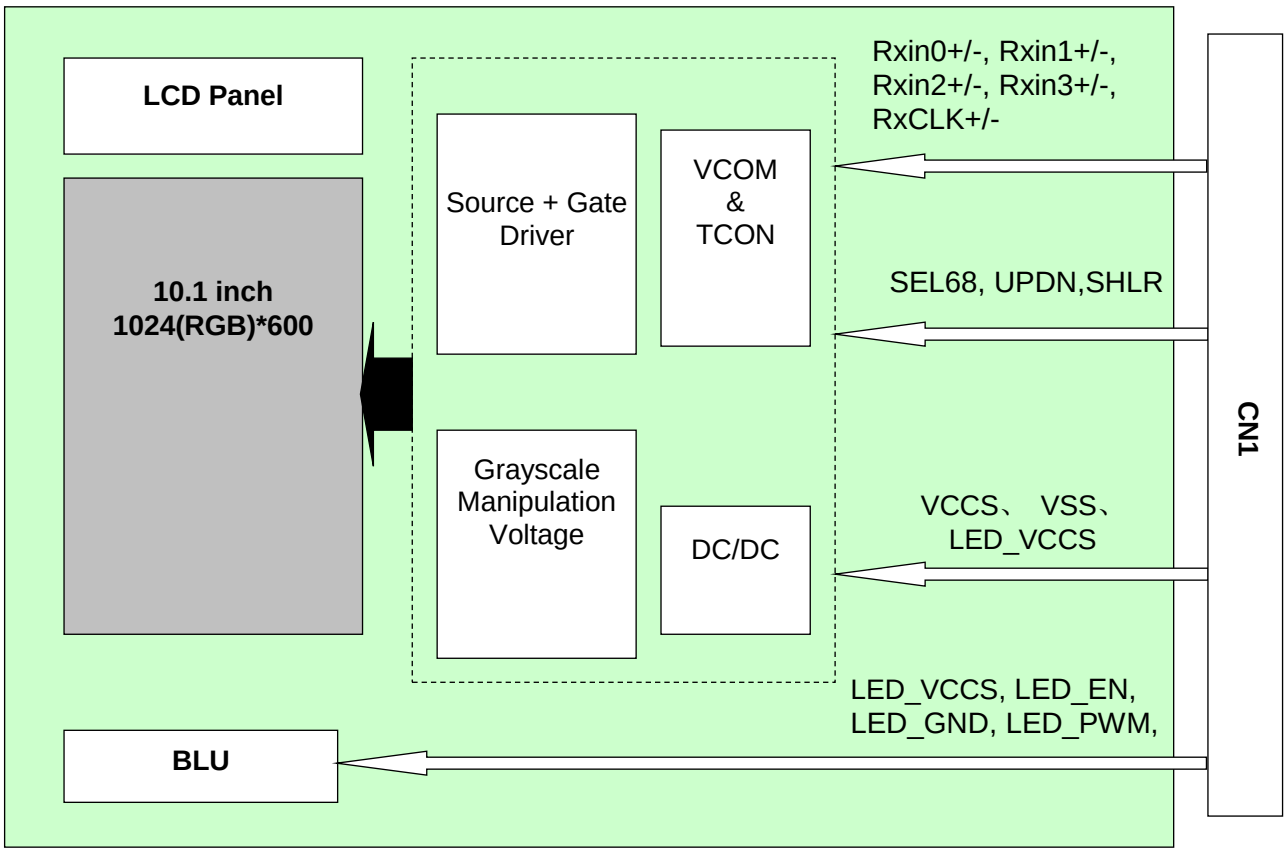


Figure 5.4.1 LCD Module Block Diagram

6. Timing Characteristics

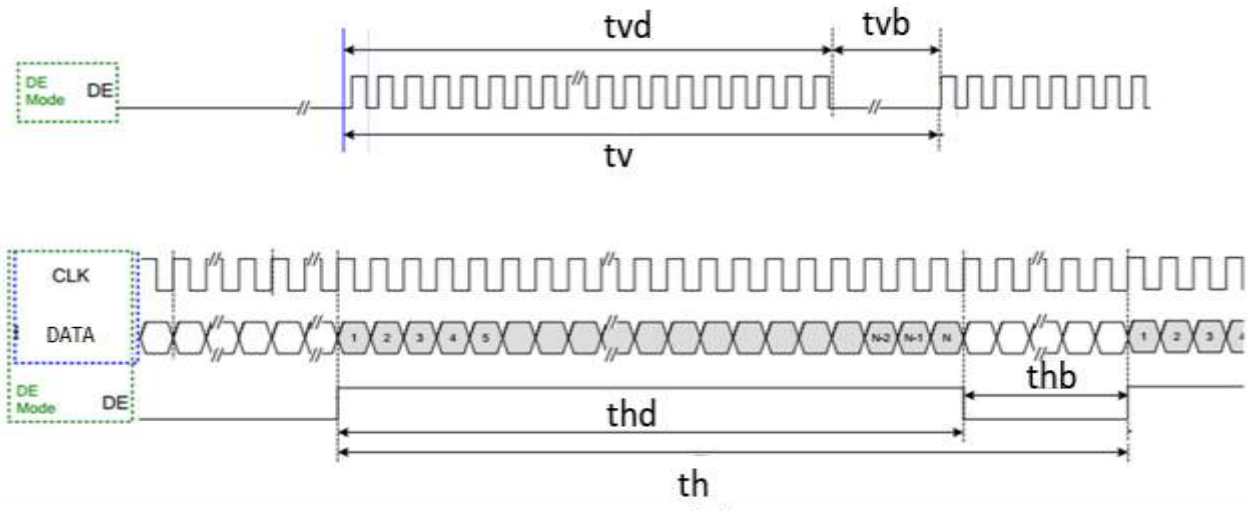
6.1 Data input timing table

VCC=3.3V, GND=0V, Ta=25℃

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Dclk frequency(Frame rate=60HZ)		Fclk	46.2	51.2	59.1	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	th	1239	1344	1372	Tclk	
	Horizontal blanking	thb	215	320	348	Tclk	
	Valid Data Width	thd	1024			Tclk	
Vertical section	Vertical total	tv	622	635	718	TH	
	Vertical blanking	tvb	22	35	118	TH	
	Valid Data Width	tvd	600			TH	

Table 6.1.1 Input timing (DE mode)

6.2 Data input timing diagram



6.3 LVDS AC characteristics

VCC=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Dclk Frequency	R_{XFCLK}	46.2	-	59.1	MHZ	
Input Data Skew Margin	T_{RSKM}	-	-	500	ps	$\|V_{ID}\|$=400mV R_{XVCM}=1.2V R_{XFCLK}=71MHz
Clock High Time	T_{LVCH}	-	4/(7*RXFCLK)	-	ns	
Clock Low Time	T_{LVCL}	-	3/(7*RXFCLK)	-	ns	

Table 6.3.1 LVDS AC characteristics

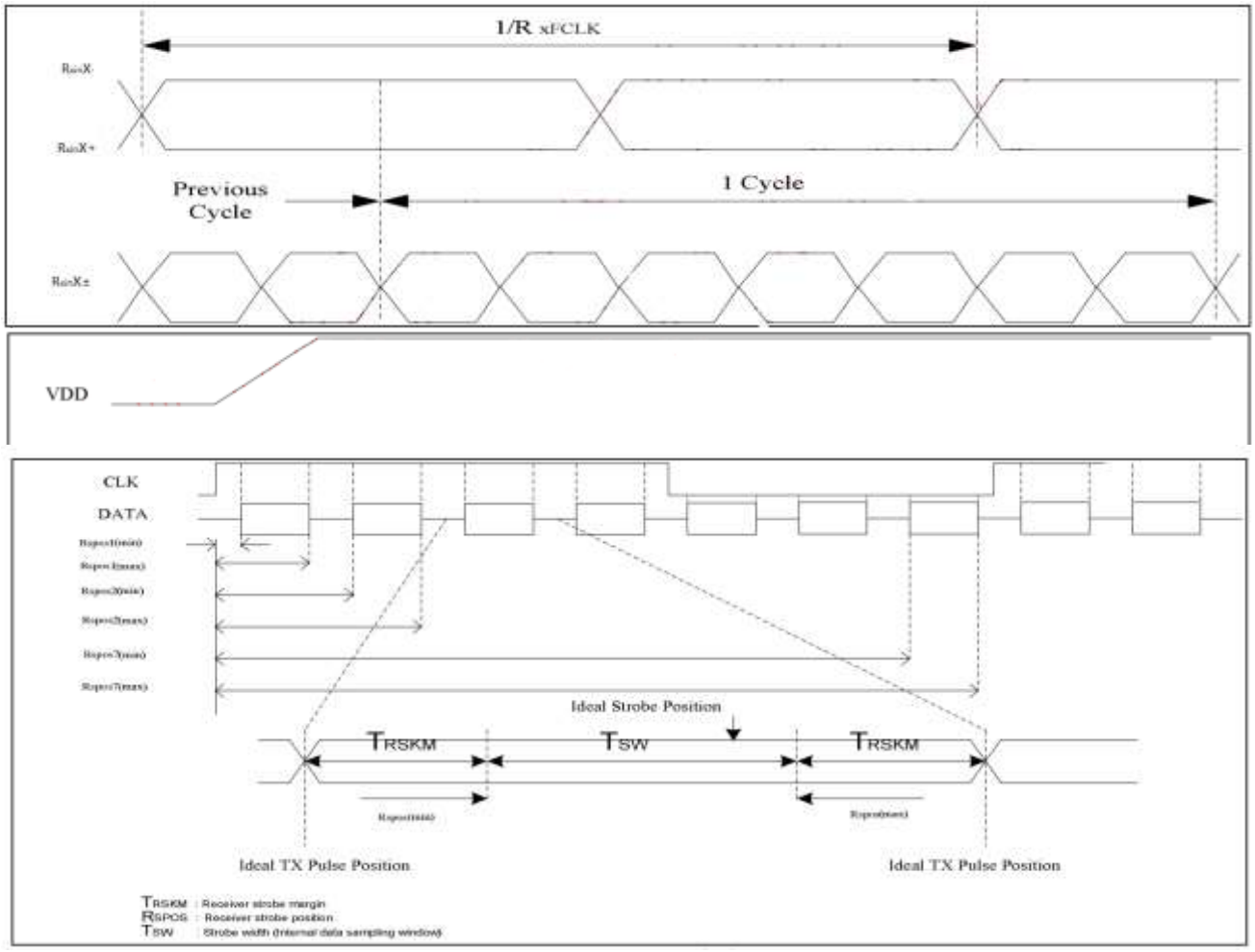


Figure 6.3.2 LVDS AC characteristics

6.4 LVDS data mapping

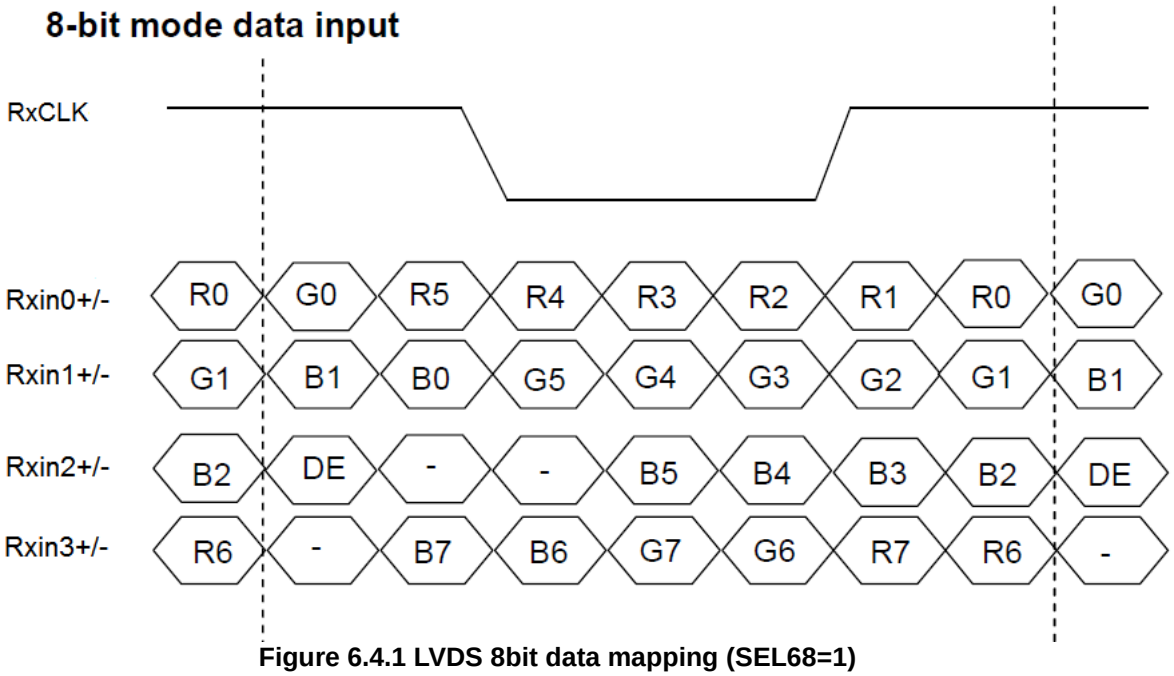


Figure 6.4.1 LVDS 8bit data mapping (SEL68=1)

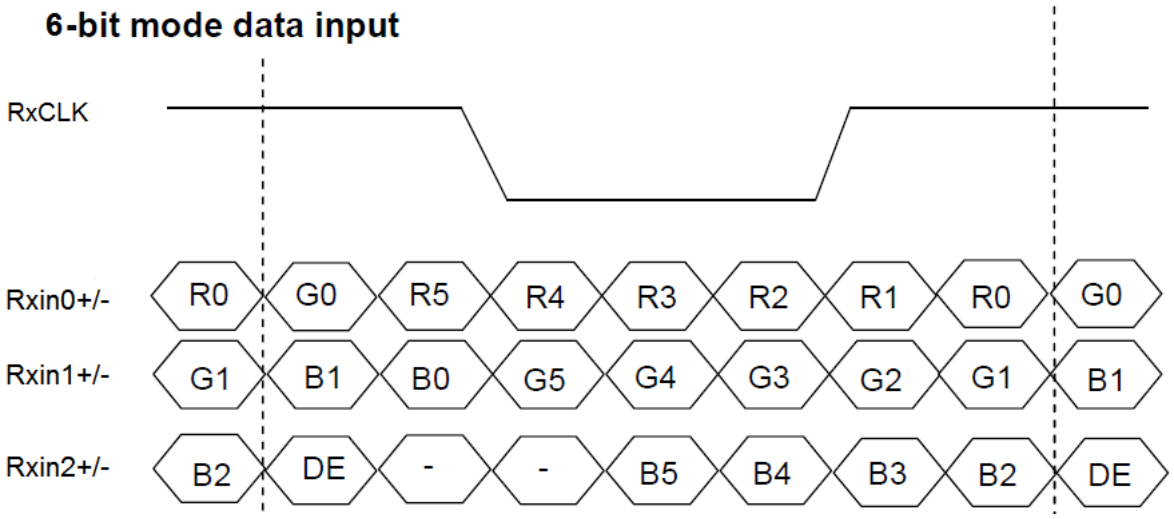


Figure 6.4.2 LVDS 8bit data mapping (SEL68=0)

7. Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	75	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ=0°	600	800			Note 3
Response Time		T_{ON}	25℃	-	16	28	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.263	0.313	0.363		Note 1,5
		y		0.279	0.329	0.379		
	Red	x		0.524	0.574	0.624		Note 1,5
		y		0.285	0.335	0.385		

	Green	x		0.280	0.330	0.380		Note 1,5
		y		0.525	0.575	0.625		
	Blue	x		0.108	0.158	0.208		Note 1,5
		y		0.090	0.140	0.190		
Uniformity		U		70	80	-	%	Note 6
NTSC		-		42	47	-	%	Note 5
Luminance		L		360	450	-	cd/m^2	Note 7

Table 7.1 Optical characteristics

Test Conditions:

1. PWM duty=100%. Ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: 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.

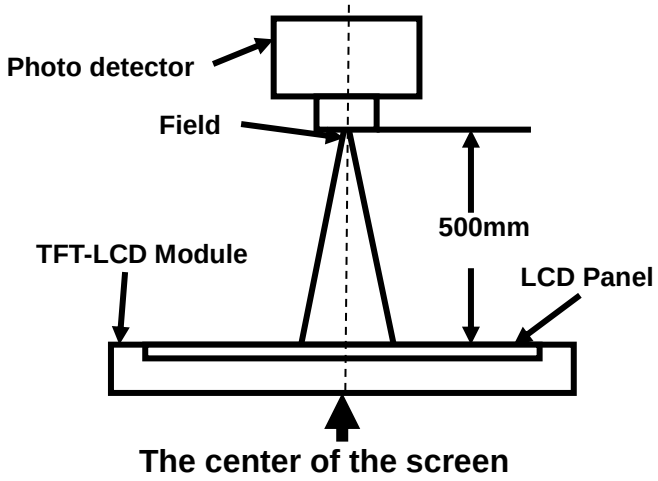


Fig1. Measurement Set Up

Note 2: Definition of viewing angle range and measurement system. viewing angle is measured at the center point of the LCD 。

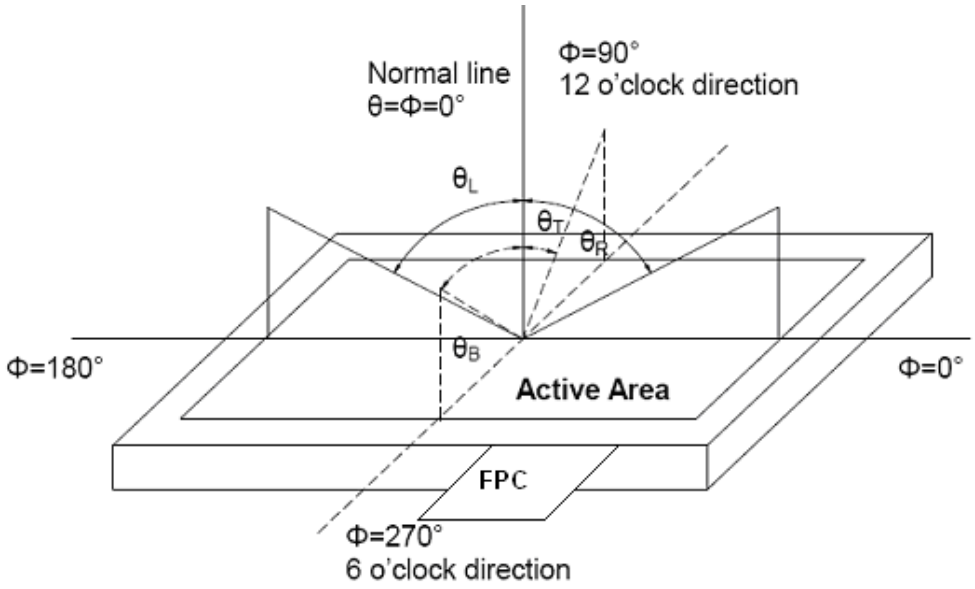


Fig2. Measurement viewing angle

Note 3: 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%.

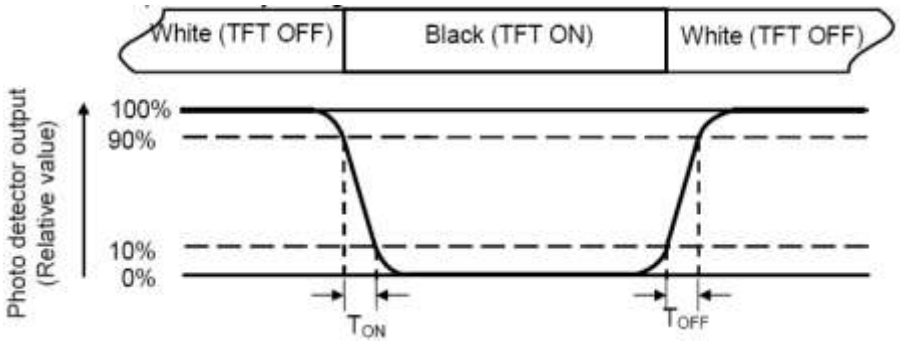


Fig3. Response Time Testing(TN)

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: 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

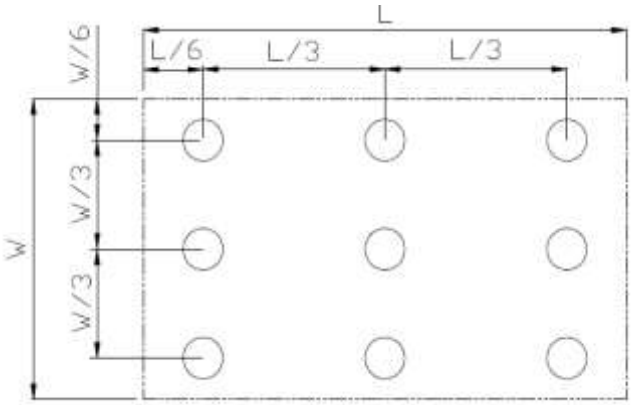


Fig5. Luminance Uniformity Measurement Locations(9 points)

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

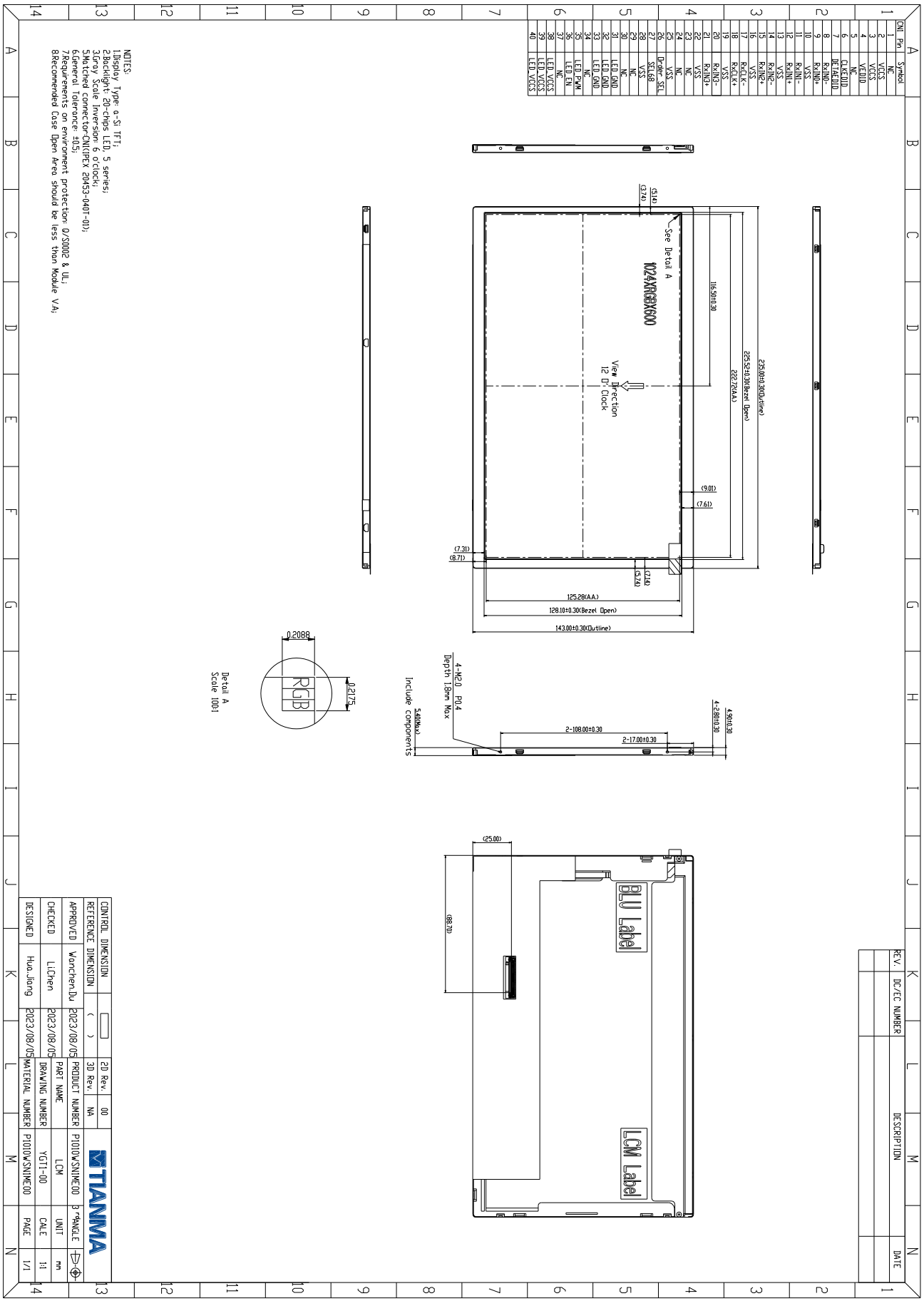
No	Test Item	Condition	Remarks
1	High Temperature Operation	+70℃,240hrs	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20℃,240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80℃,240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30℃,240 hrs	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	+60℃, 90% RH 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min,100 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF, R=330Ω,9points/panel Air:± 15KV, 25times, Contact:± 8KV, 25 times,	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Stroke:1.5G Sweep:10Hz~100Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	50G 20ms, ± X,± Y,± Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—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(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	P1010WSN1ME00	235×143×4.9	0.202	32	
2	Tray	PET	485×330×16	0.256	18	
3	Dust-proof Bag	PE	700×545×0.05	0.050	1	
4	Carton	Corrugated Paper	544×365×250	1.01	1	
5	BOX	Corrugated Paper	520×345×111	0.38	2	
6	EPE	EPE	485×330×5	0.016	2	
7	Label	Label	100×52	0.001	1	
8	Total weight	12.9 Kg±5%				

Table10.1 Packing instruction

The detail of packaging method is shown as below:

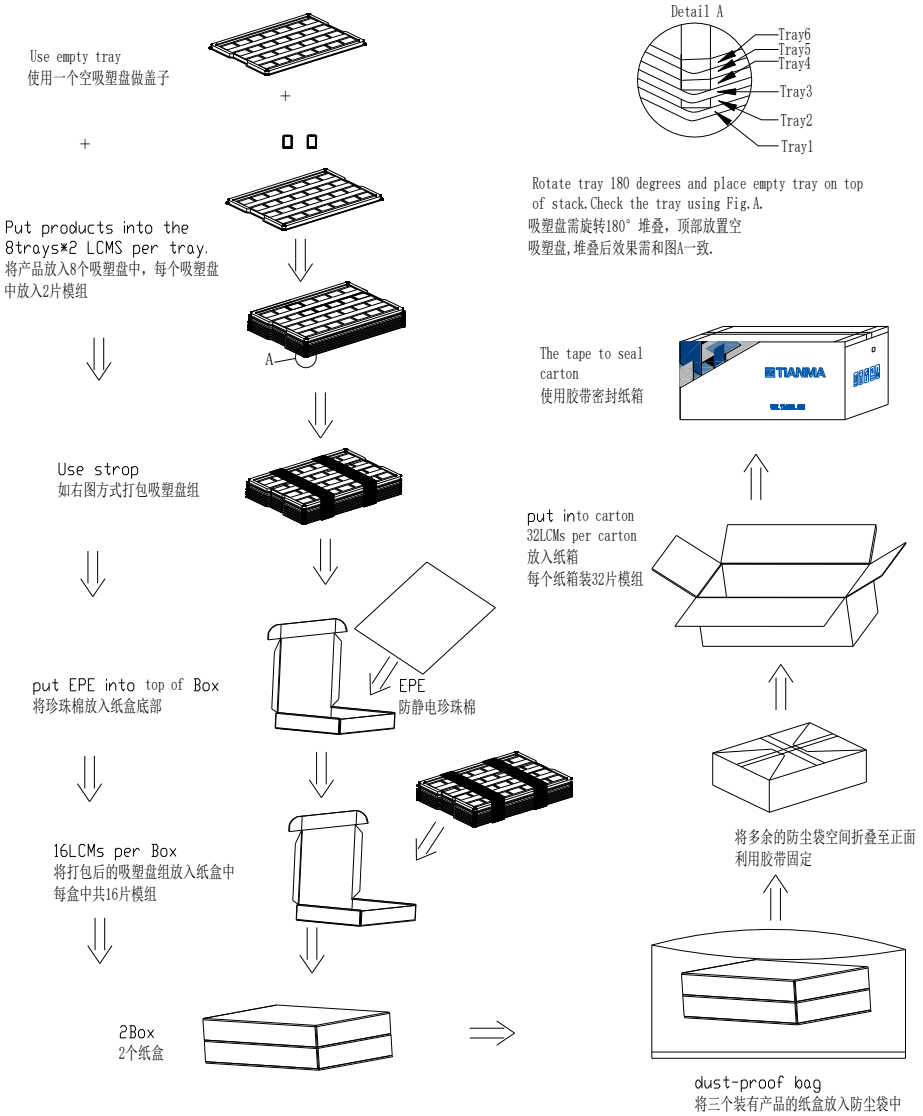


Figure10.1 Packing instruction

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.