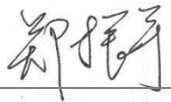


SPECIFICATION

[] Preliminary Specification
[●] Final Specification

Description 10.1” 1280xRGBx800 TFT-LCD Module
Part Number P1010WXF1MB10

Customer		Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
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* This cover page is for your Comments and Signatures back to TIANMA.

ProfessionalDisplay Module

Rev	Date	Page	Revision Items	Editor
1.0	2023-Aug-18	-	Preliminary spec	Yao Zhang
1.1	2024-Apr-15	15	Update drawing.	Yao Zhang
		4-10	Update timing.	
		11	Update Optical Characteristics	
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		5	Update 5.1 Driving TFT LCD Panel	
		11	Update I _F = 200 mA	
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2.5	2025-May-26	2	Update Contrast Ratio from 800:1 to 1200:1	Yao Zhang
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CONTENTS

1. SUMMARY.....	1
5.1 General Description.....	1
5.2 Features	1
2. GENERAL SPECIFICATIONS.....	2
3. INPUT / OUTPUT TERMINALS.....	3
5.1 CN1 Pin assignment (LCD Interface)	3
4 ABSOLUTE MAXIMUM RATINGS	4
5 ELECTRICAL CHARACTERISTICS	5
5.1 Driving TFT LCD Panel	5
5.2 LVDS Data Input Timing	5
5.3 Driving Backlight.....	7
5.4 Block Diagram	8
6 TIMING CHART	9
6.1 LVDS signal timing characteristics	9
6.2 Input Clock and Data timing Diagram:	9
6.3 LVDS data input format	10
6.4 Power On/Off Sequence	10
7. OPTICAL CHARACTERISTICS	11
8. RELIABILITY TEST.....	14
9. MECHANICAL DRAWING	15
10. PACKING INSTRUCTION.....	17
11. PRECAUTIONS FOR USE OF LCD MODULES.....	19
11.1 Handling Precautions.....	19
11.2 Storage precautions.....	19
11.3 Transportation Precautions	19
11.4 Screen saver Precautions.....	19
11.5 Safety Precautions	19

1. Summary

1.1 General Description

This is a 10.1 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
- Interface: LVDS
- LED driver integrated

- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: E333987)
- 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	10.1 inches	
	Resolution	1280(RGB)x800	
	Pixel Pitch	0.1695x0.1695	mm
	TFT Active Area	216.96x135.60	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	HC	
	Viewing Direction	All	
	Gray Scale Inversion Direction	NA	
Mechanical Characteristics	LCM (W x H x D)	231.22x150.60x4.30	mm
	Weight	290±5%	g
Optical Characteristics	Luminance	500	cd/m ²
	Contrast Ratio	1200:1	
	NTSC	50	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	1 port LVDS, 6/8 bits selectable	
	Color Depth	262 K/16.7 M	color
	Power Consumption	LCD:825; Backlight:4020	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	MSAK24025P40D
Matching connector	20645-040T-01 or equivalent

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	NC	-	No Connection	
2	VDD	P	Power Supply +3.3V	
3	VDD	P	Power Supply +3.3V	
4	VDD	P	Power Supply +3.3V	
5	NC	-	No Connection	
6	NC	-	No Connection	
7	NC	-	No Connection	
8	Rxin0-	I	-LVDS differential data input(R0~R5,G0)	
9	Rxin0+	I	+LVDS differential data input(R0~R5,G0)	
10	GND	P	Power ground	
11	Rxin1-	I	-LVDS differential data input(G1~G5,B0~B1)	
12	Rxin1+	I	+LVDS differential data input(G1~G5,B0~B1)	
13	GND	P	Power ground	
14	Rxin2-	I	-LVDS differential data input(B2~B5,HS,VS,DE)	
15	Rxin2+	I	+LVDS differential data input(B2~B5,HS,VS,DE)	
16	GND	P	Power ground	
17	RxCLK-	I	-LVDS differential data input	
18	RxCLK+	I	+LVDS differential data input	
19	GND	P	Power ground	
20	Rxin3-	I	-LVDS differential data input(R6~R7,G6~G7,B6~B7)	Connect to GND in 6 bit mode
21	Rxin3+	I	+LVDS differential data input(R6~R7,G6~G7,B6~B7)	
22	GND	P	Power ground	
23	NC	-	No Connection	
24	NC	-	No Connection	
25	GND	P	Power ground	
26	NC	-	No Connection	
27	SEL6/8	-	SEL6/8="H", 6bit; SEL6/8="L", 8bit	
28	GND	P	Power ground	
29	NC	-	No Connection	
30	NC	-	No Connection	
31	VLED_GND	P	VLED Ground	

32	VLED_GND	P	VLED Ground	
33	VLED_GND	P	VLED Ground	
34	NC	-	No Connection	
35	VLED_PWM	P	Backlight dimming control	Don't leave it open.
36	VLED_EN	P	Backlight on/off control (1 :ON , 0:OFF)	
37	NC	-	No Connection	
38	VLED	P	Backlight power supply	
39	VLED	P	Backlight power supply	
40	VLED	P	Backlight power supply	

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.

4 Absolute Maximum Ratings

5.1 Driving TFT LCD Panel

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
LCD Input Voltage	VDD	-0.3	3.9	V	
Voltage Input	Vin	-0.3	VDD+0.3	V	Note1
LVDS Supply Voltage	VLVDS	-0.3	5	V	Note2
Backlight Input Voltage	VLED	-0.3	27	V	
VLED_PWM	PWM	-0.3	27	V	
VLED_EN	EN	-0.3	27	V	
Operating Temperature	T _{op}	-20.0	70.0	°C	
Storage Temperature	T _{st}	-30.0	80.0	°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 3.1 absolute maximum rating

Note1: Voltage Input Voltage include SEL6/8.

Note2: LVDS Supply Voltage include Rxin0-/+, Rxin1-/+, Rxin2-/+, Rxin3-/+, RxCLK-/+,

Note3: 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.

5 Electrical Characteristics

5.1 Driving TFT LCD Panel

VDD=3.3V, GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power supply Voltage	VDD	3.0	3.3	3.6	V	
Power supply current	IDD	-	250	375	mA	
Power consumption	P	-	825	1237	mW	Note1
Input Signal Voltage	VIL	0	-	0.3*VDD	V	Note2
	VIH	0.7*VDD	-	VDD	V	
Differential input high threshold voltage	R _{XVTH}	—	—	+0.1	V	Note3
Differential input Low threshold voltage	R _{XVTL}	-0.1	—	—	V	
Input voltage range	R _{XVIN}	0	—	VDD-1.0	V	
Differential input common mode voltage	R _{XVCM}	0.6	1.2	2.4- V _{ID} /2	V	
Differential input voltage	V _{ID}	0.2	0.4	0.6	V	

Table 4.1 LCD module electrical characteristics

Note1: Power consumption test is under white pattern @60Hz;

Note2: Input Signal Voltage includes SEL6/8;

Note3: $R_{xVCOM}=1.2V$

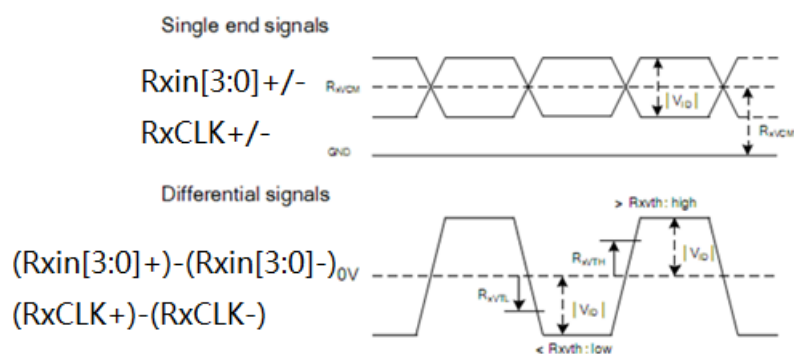


Figure 6.1.1 Clock and Data Input Timing Diagram

5.2 LVDS Data Input Timing

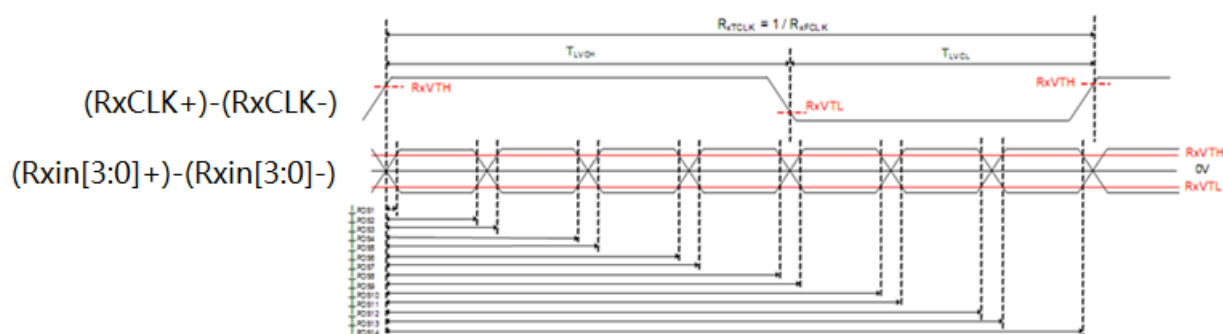


Figure 6.2.1 LVDS Input Timing

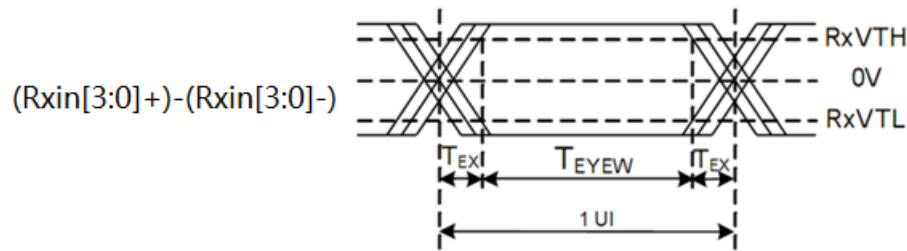


Figure 6.2.2 LVDS Input Timing

VDD=VDD_LVDS=3.0~3.6V; GND=0, T_A=-20~85℃

Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock Frequency	RxFCLK	70.2	71.9	75.02	MHZ
Clock period	RxTCLK	13.33	-	14.24	ns
1 data bit time	UI	-	1/7	-	RxTCLK
Clock high time	TLVCH	-	4	-	UI
Clock low time	TLVCL	-	3	-	UI
Position 1	TPOS1	-0.25	0	0.25	UI
Position 2	TPOS2	0.75	-	1.25	UI
Position 3	TPOS3	0.75	1	1.25	UI
Position 4	TPOS4	1.75	-	2.25	UI
Position 5	TPOS5	1.75	2	2.25	UI
Position 6	TPOS6	2.75	-	3.25	UI
Position 7	TPOS7	2.75	3	3.25	UI
Position 8	TPOS8	3.75	-	4.25	UI
Position 9	TPOS9	3.75	4	4.25	UI
Position 10	TPOS10	4.75	-	5.25	UI
Position 11	TPOS11	4.75	5	5.25	UI
Position 12	TPOS12	5.75	-	6.25	UI
Position 13	TPOS13	5.75	6	6.25	UI
Position 14	TPOS14	6.75	-	7.25	UI
Input eye width	TEYEW	0.5	-	-	UI
Input eye border	TEX	-	-	0.25	UI

Table 6.2.1 LVDS Input Timing

5.3 Driving Backlight

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Backlight power supply voltage	VLED	11	12	13	V	
Backlight power supply current	I_LED	-	335	-	mA	40mA per string.
Backlight power consumption	P_LED	-	4020	6030	mW	
Input voltage for VLED_PWM signal	High level	-	1.9	-	V	
	Low level	-	-	0.8	V	
Input voltage for VLED_EN	High level	-	1.9	-	V	
	Low level	-	-	0.8	V	
VLED_PWM frequency	Fpwm	100	-	30K	HZ	
VLED_PWM duty	D	3	-	100	%	Note1
Operating Life Time	--	--	50000	--	hrs	Note2

Note 1: According to LED driver IC characteristics, the minimum value of VLED_PWM duty may vary with VLED_PWM frequency, higher the frequency, bigger the duty.

Note 2: Optical performance should be evaluated at Ta=25°C only.

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

Operating life means brightness goes down to 50% of initial brightness.

Typical operating life time is an estimated data.



CIRCUIT DIAGRAM

5.4 Block Diagram

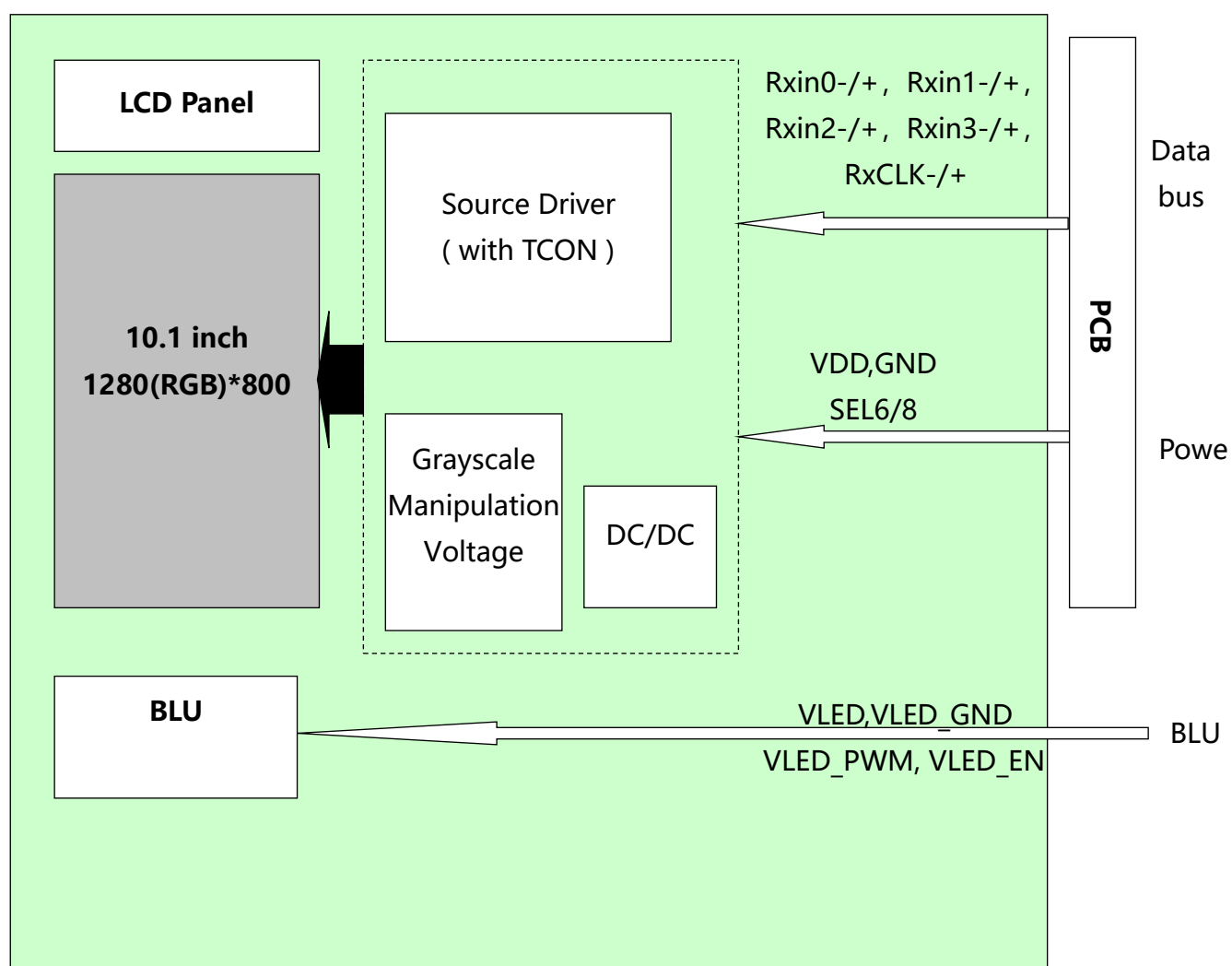


Figure 5.2.1 LCD Module Block Diagram

6 Timing Chart

6.1 LVDS signal timing characteristics

VDD=3.3V, GND=0V, Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Clock Frequency	tCLK	70.2	71.9	75.02	MHz	
Horizontal blanking time	thb	140	144	154	tCLK	tHBP+tHFP+tVHPW
Horizontal display area	thd	1280			tCLK	
Horizontal period	th	1420	1424	1434	tCLK	
Vertical blanking time	tvb	24	42	72	tH	tVBP+tVFP+tVPW
Vertical display area	tbd	800			tH	
Vertical period	tv	824	842	872	tH	
Frame Rate	FR	60			Hz	

Table 6.1 timing parameter

6.2 Input Clock and Data timing Diagram:

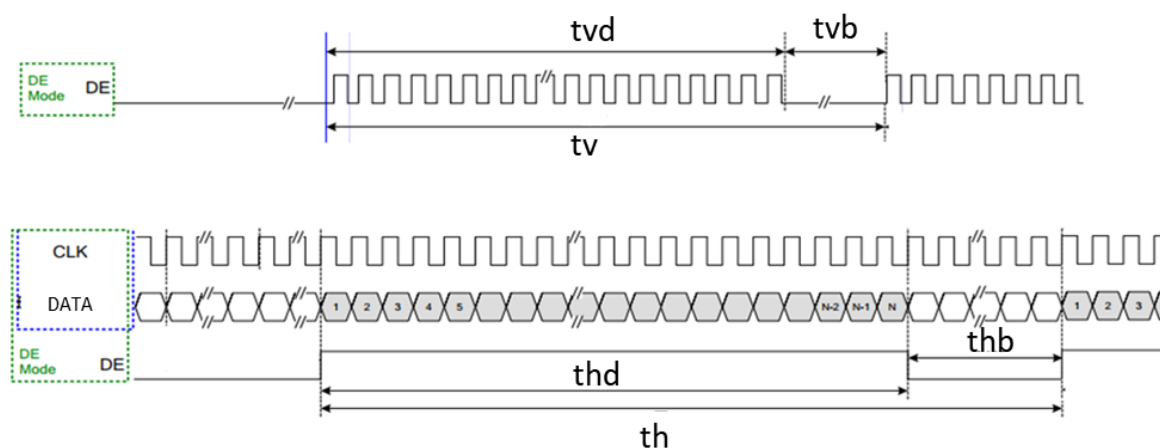
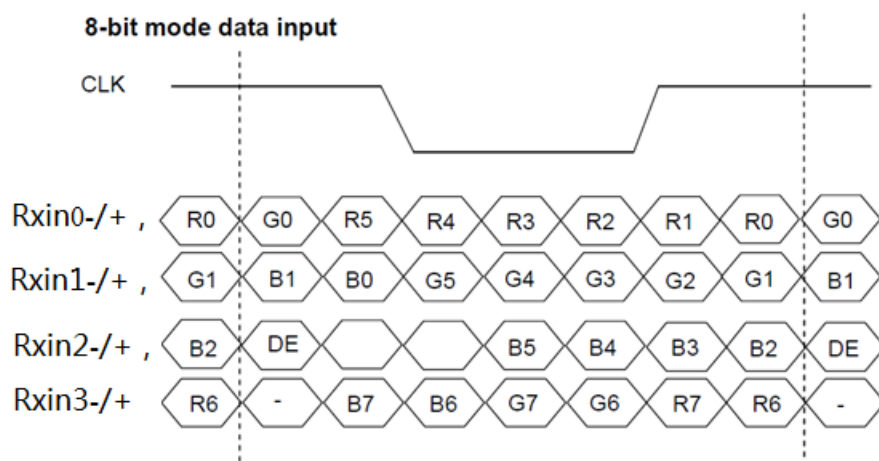


Figure 6.2 Input signal data timing

6.3 LVDS data input format



6.4 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD on to VDD stable	Tp1	1	-	3	ms	
VDD stable to signal on	Tp2	20	-	50	ms	
Signal on to VLED_EN on	Tp3	200	-	-	ms	
PWM on to VLED_EN on	Tp4	0	-	200	ms	
VLED to PWM on	Tp5	10	-	-	ms	
VLED on to VELD stable	Tp6	1	-	10	ms	
VDD off time	Tp7	0	-	10	ms	
VDD off to next VDD on	Tp8	2	-	-	s	
Signal off before VDD off	Tp9	0	-	50	ms	
VLED_EN off before signal off	Tp10	200	-	-	ms	
VLED_EN off before PWM off	Tp11	0	-	200	ms	
PWM off before VLED off	Tp12	10	-	-	ms	

Table 6.4 Power on/off sequence

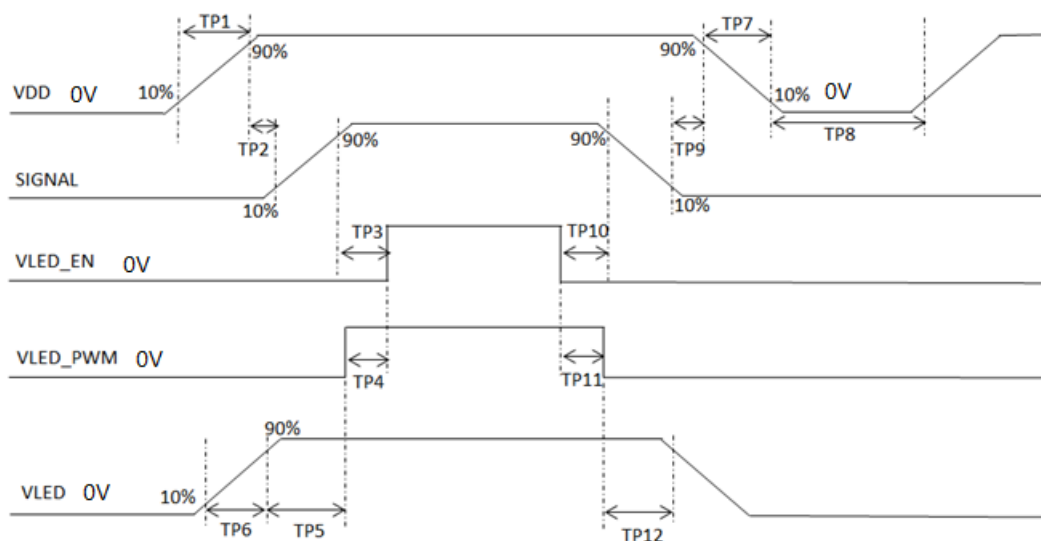


Figure 6.4 Interface power on/off sequence

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	75	88		degree	Note2,3
		θB		75	88			
		θL		75	88			
		θR		75	88			
Contrast Ratio		CR	θ=0°	900	1200			Note 3
Response Time		T _{ON}	25℃		10	15	ms	Note 4
		T _{OFF}			15	25		
Chromaticity	White	x	Backlight is on	0.262	0.312	0.362		Note 1,5
		y		0.286	0.336	0.386		
	Red	x		0.538	0.588	0.638		Note 1,5
		y		0.269	0.319	0.369		
	Green	x		0.293	0.343	0.393		Note 1,5
		y		0.548	0.598	0.648		
	Blue	x		0.107	0.157	0.207		Note 1,5
		y		0.059	0.109	0.159		
Uniformity		U		75	80		%	Note 6
NTSC		-			50		%	Note 5
Luminance		L		400	500		cd/m ²	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. $I_F = 200$ 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.

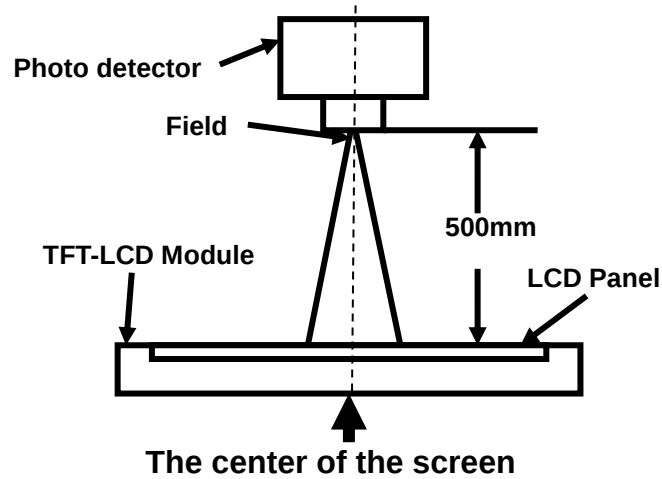


Fig1. Measurement Set Up

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

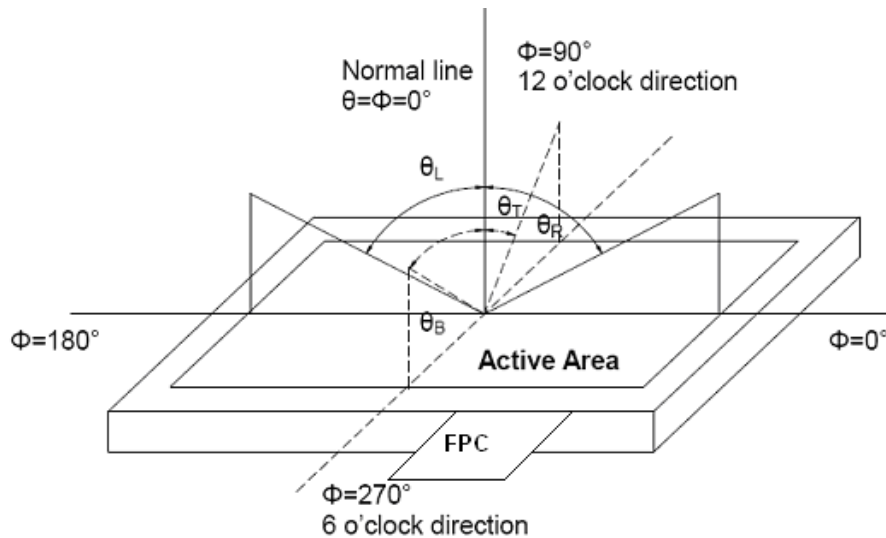


Fig2. Measurement viewing angle

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

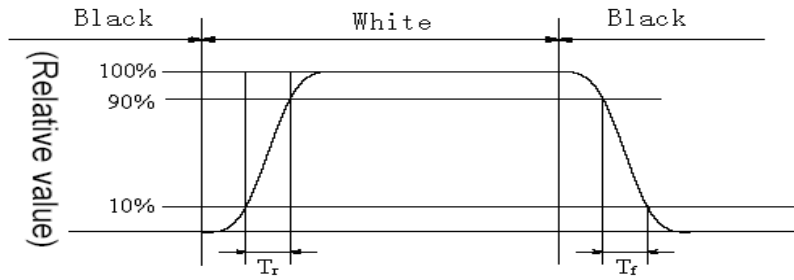


Fig4. Response Time Testing(SFT)

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

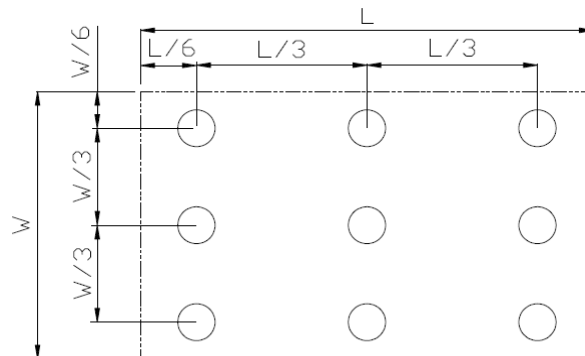


Fig5. Luminance Uniformity Measurement Locations(9 points)

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	Ts=+70℃, 240hrs	(Note1) IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	Ta=+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	(Note2) IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min,100cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	Electro Static Discharge (operation)	C=150pF,R=330Ω; Contact:±4Kv, 5times; Air: ± 8KV,5times;	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:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

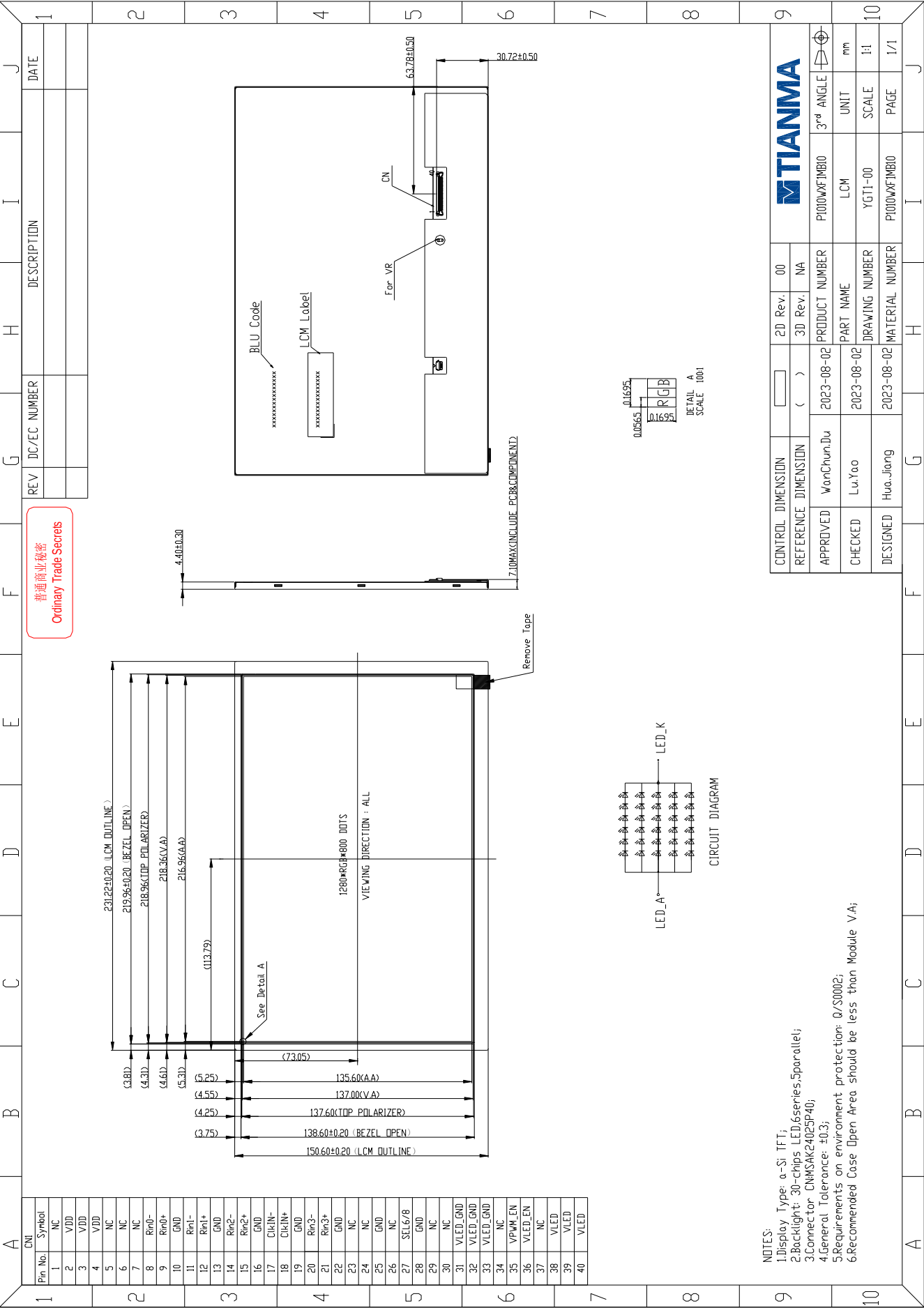
Table 8.1 RA test condition

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.

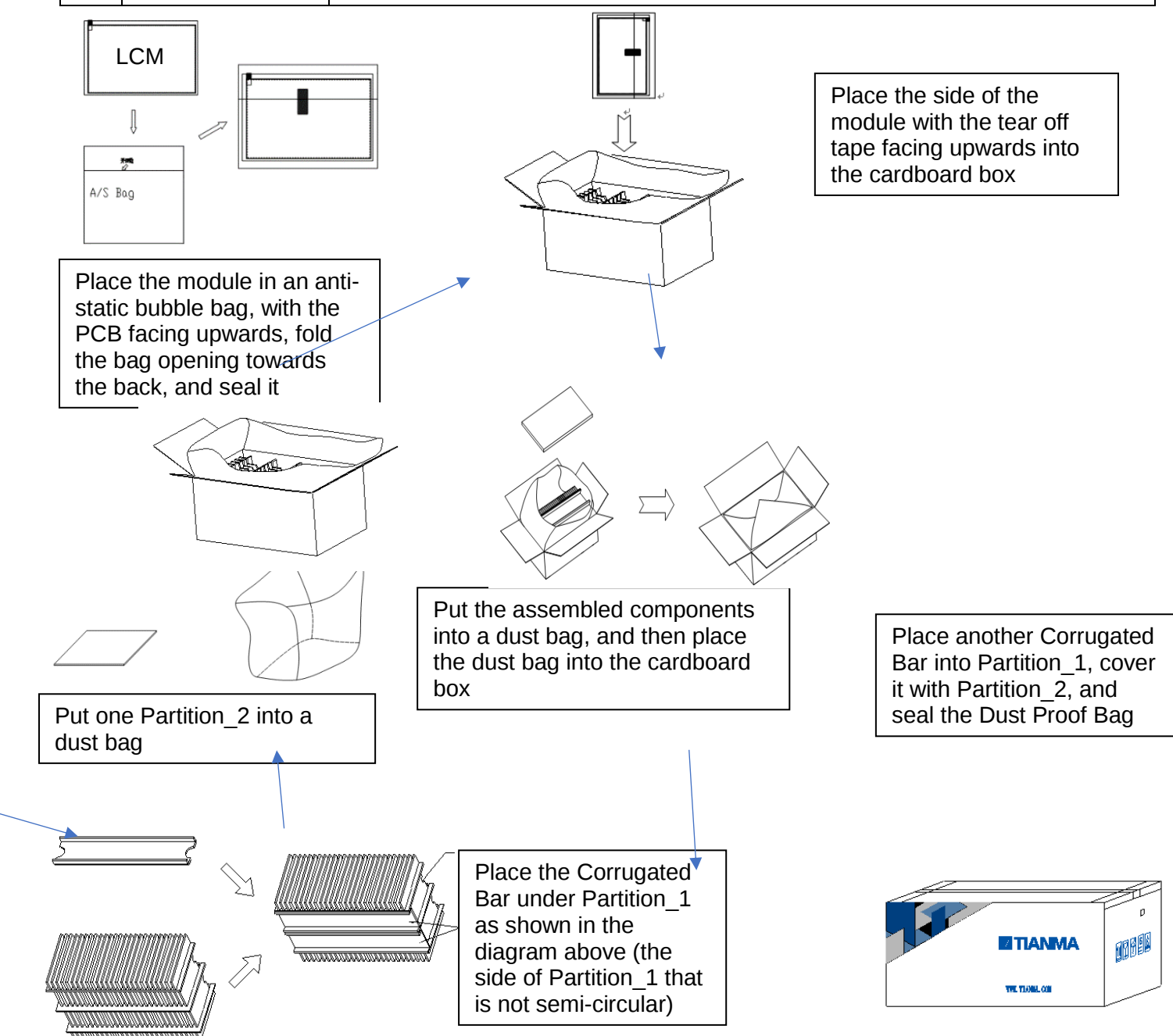
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

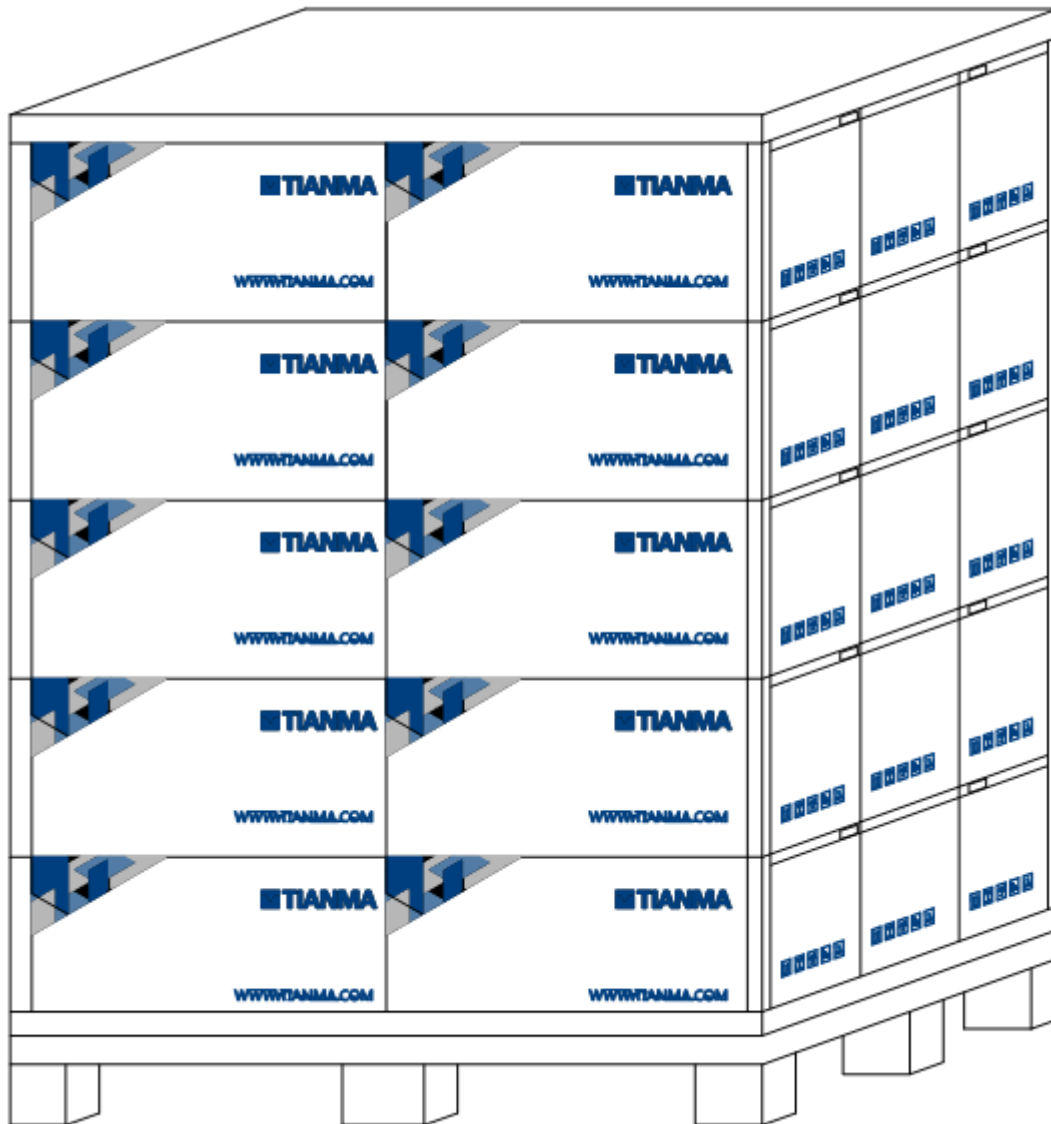
9. Mechanical Drawing



10. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Q'ty	Remark
1	LCM	P1010WXF1MB10	231.22×150.60×4.40	0.29	19	
2	Dust-Proof Bag	PE	700×545mm	0.046	1	
3	Anti Static Bag	PE	246×240mm	0.0065	1	
4	Partition_1	Corrugated paper	527×348×217mm	1.571	1	
5	Partition_2	Corrugated Paper	505×332×5mm	0.098	2	
6	Corrugated Bar	Corrugated Paper	527×244×7mm	0.057	2	
7	Carton	Corrugated paper	544×365×250mm	1.12	1	
8	Label	Paper	100×52mm	0.001	1	
9	Tape	NA	10×30	0.001	19	
10	Total weight	8.5835 +/-5% kg				





2*3 Each layer
5 layer in total

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.