

SPECIFICATION

[] Preliminary Specification
[●] Final Specification

Description 10.1” 1280xRGBx800 TFT-LCD Module
Part Number P1010WXF1MA01

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

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1.1	2024/Mar/06	3	Connector: HD1S040HA1 chang to 20455-040E-66	Yao Zhang
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		5	Add Inrush current for driving panel. Update the current and power of the backlight driver.	
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CONTENTS

1. SUMMARY.....	1
1.1 General Description.....	1
1.2 Features	1
2. GENERAL SPECIFICATIONS.....	2
3. INPUT / OUTPUT TERMINALS.....	3
3.1 CN1 Pin assignment (LCD Interface)	3
4. ABSOLUTE MAXIMUM RATINGS	4
5. ELECTRICAL CHARACTERISTICS	5
6. TIMING CHART	8
8. OPTICAL CHARACTERISTICS	10
9. RELIABILITY TEST.....	13
10. MECHANICAL DRAWING	14
11. PACKING INSTRUCTION.....	15
12. PRECAUTIONS FOR USE OF LCD MODULES.....	18
12.1 Handling Precautions.....	18
12.2 Storage precautions	18
12.3 Transportation Precautions	18
12.4 Screen saver Precautions.....	18
12.5 Safety Precautions	18

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 luminance
 - Wide temperature range
 - 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)	229.8*149*6.2	mm
	Weight	275 +/-5%	g
Optical Characteristics	Luminance	1000	cd/m ²
	Contrast Ratio	1200:1	
	NTSC	50	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	LVDS, 6/8bit selectable	
	Color Depth	262 K/16.7 M	color
	Power Consumption	LCD: 1400 Backlight: 7500	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	20455-040E-66 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	Non-null connection
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 (NC: 100%duty cycle)	
36	VLED_EN	P	Backlight on/off control (1 or NC: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.

Note3: This LCD module supports DE mode. Please refer to the descriptions.

4. Absolute Maximum Ratings

4.1 Driving TFT LCD Panel

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Voltage Input	VDD	-0.3	5	V	Note1
Operating Temperature	T _{op}	-30	80	°C	
Storage Temperature	T _{st}	-45	85	°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 rating

Note1: Input voltage include Rxin0-/+, Rxin1-/+, Rxin2-/+, Rxin3-/+, RxCLK-/+, SEL6/8, VDD.

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.

5. Electrical Characteristics

5.1 Driving TFT LCD Panel

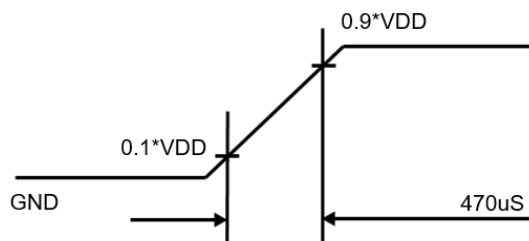
VDD=3.3V, GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power supply Voltage	VDD	3	3.3	3.6	V	
Power supply ripple	Vp-p	-	-	100	mV	
Power supply current	I _{VDD}	-	424	510	mA	Note1
Power consumption	P	-	1400	1700	mW	
Differential input voltage	V _{ID}	200	400	600	mV	
Differential input common voltage	RxVCM	0.6	1.2	2.4- V _{ID} /2	V	
Differential input threshold voltage	Low level	RxVTL	-100	-	mV	RxVCM=1.2V
	High level	RxVTH	-	100	mV	
Inrush current	I _{rush}	-	-	400	mA	

Table 5.1 LCD module electrical characteristics

Note1: White pattern 60Hz

Note2: Inrush current should be tested under VDD rising time 470us.



5.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark	
Backlight power supply voltage	VLED	10.8	12	13.2	V		
Backlight power supply current	I_LED	-	620	-	mA		
Backlight power consumption	P_LED	-	7500	-	mW		
Input voltage for VLED_PWM signal	High level	-	1.2	-	5.3	V	
	Low level	-	0	-	0.4	V	
Input voltage for VLED_EN	High level	-	1.5	-	5.3	V	
	Low level	-	0	-	0.8	V	
VLED_PWM frequency	Fpwm	200		10K	HZ		
VLED_PWM duty	D	0.2		100	%	Note1	
Dimming Frequency (Hz)	Duty (Min.)					Duty (Max.)	
100 < fPWM ≤ 500	0.2%					100%	
500 < fPWM ≤ 1k	0.4%					100%	
1k < fPWM ≤ 2k	0.8%					100%	
2k < fPWM ≤ 5k	1.5%					100%	
5k < fPWM ≤ 10k	3%					100%	
Operating Life Time	--	--	50000	--	hrs	Note2	

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

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

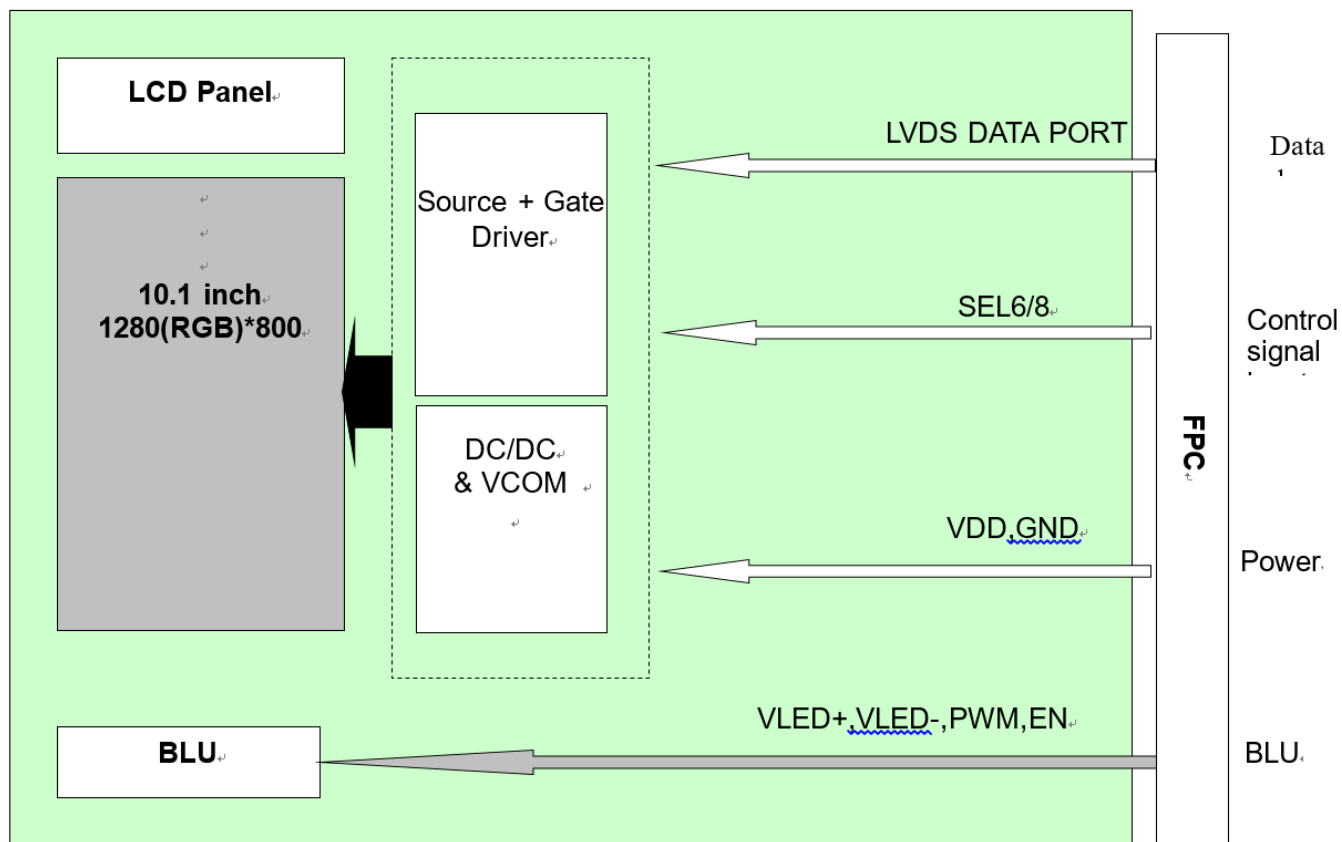
If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

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

Typical operating life time is estimated data.

5.3 Block Diagram

▪ LCD Module Block Diagram



6. Timing Chart

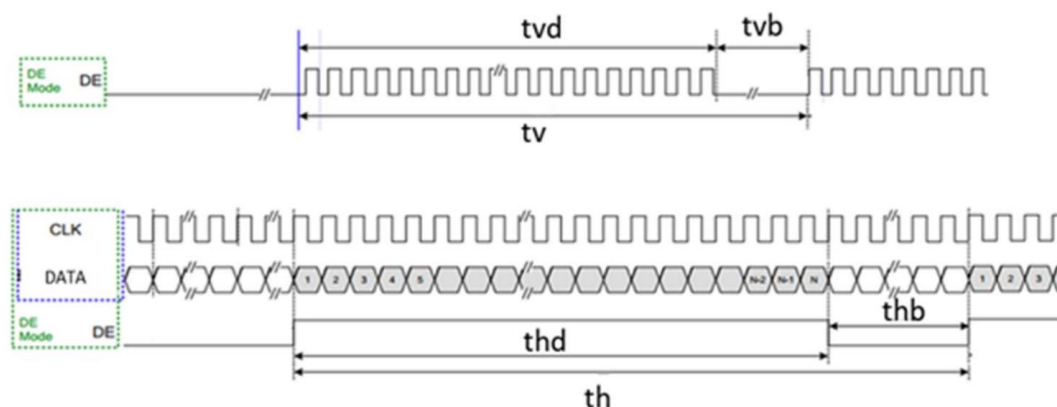
6.1 LVDS signal timing characteristics

VDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Value			Unit	Note
		min	typ	max		
CLK frequency	t _{clk}	70.1	71.9	74.9	Mhz	
Horizontal blanking time	t _{hb}	140	144	154	t _{clk}	
Horizontal display area	t _{hd}	1280			t _{clk}	
Horizontal period	t _h	1420	1424	1434	t _{clk}	
Vertical blanking time	t _{vb}	23	42	71	t _h	
Vertical display area	t _{vd}	800	800	800	t _h	
Vertical period	t _v	823	842	871	t _h	
Frame Rate	F	60			Hz	

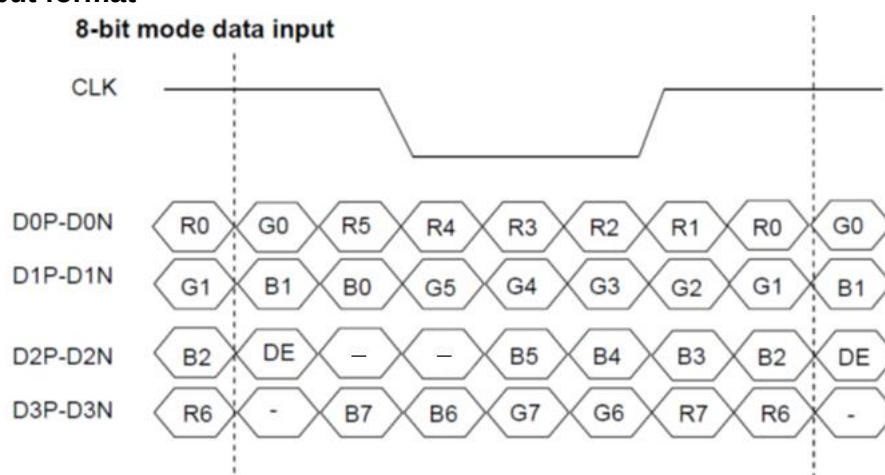
Table 6.1 timing parameter

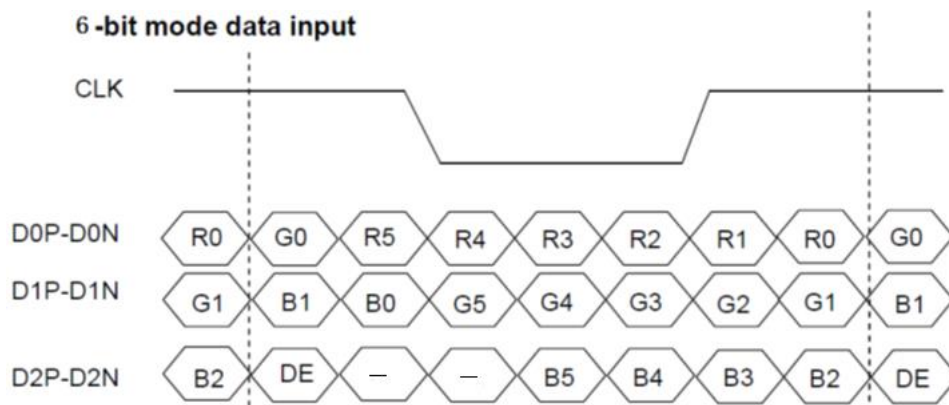
6.2 Input Clock and Data timing Diagram:



NOTE:DATA include Rxin0-/+, Rxin1-/+, Rxin2-/+, Rxin3-/+

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	0.5	-	3	ms	
VDD stable to signal on	Tp2	4	-	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	0.5	-	10	ms	
VDD off time	Tp7	1	-	5	ms	
VDD off to next VDD on	Tp8	700	-	-	ms	
Signal off before VDD off	Tp9	200	-	-	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

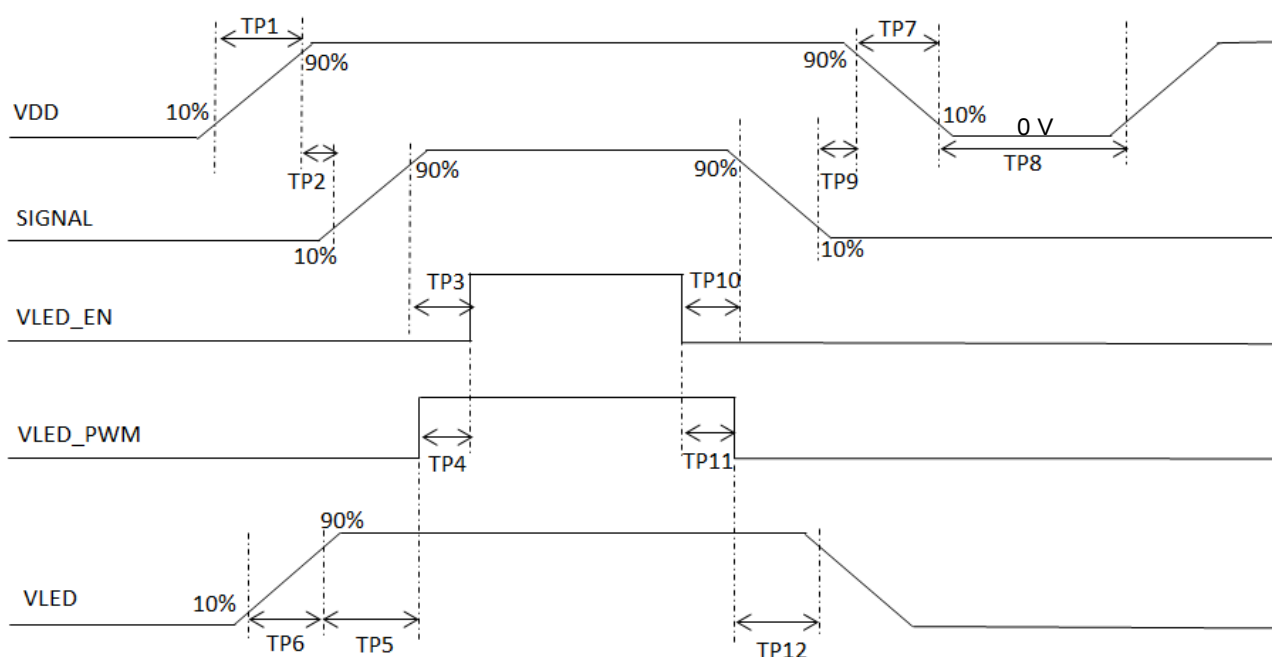


Figure 6.4 Interface power on/off sequence

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	85	88		degree	Note2,3
		θB		85	88			
		θL		85	88			
		θR		85	88			
Contrast Ratio		CR	θ=0°	900	1200			Note 3
Response Time		T _{ON}	25℃	-	25	40	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.242	0.292	0.342		Note 1,5
		y		0.266	0.316	0.366		
	Red	x		0.535	0.585	0.635		Note 1,5
		y		0.269	0.319	0.369		
	Green	x		0.282	0.332	0.382		Note 1,5
		y		0.535	0.585	0.635		
	Blue	x		0.100	0.150	0.200		Note 1,5
		y		0.056	0.106	0.156		
Uniformity		U		75	80		%	Note 6
NTSC		-		45	50		%	Note 5
Luminance		L		800	1000		cd/m ²	Note 7

Table 8.1 Optical Parameters

Test Conditions:

1. $I_F = 620$ 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.

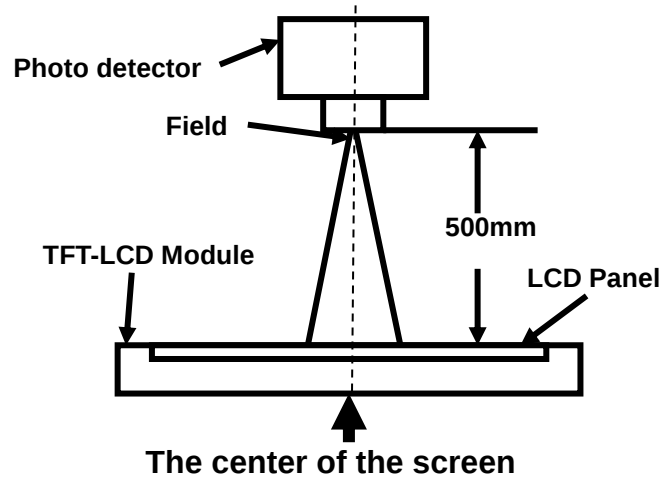


Fig1. Measurement Set Up

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

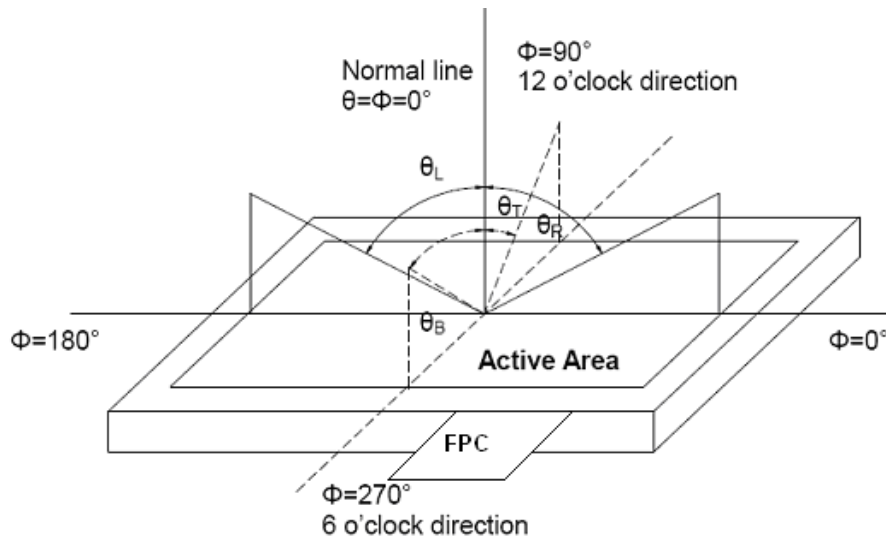


Fig2. Measurement viewing angle

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

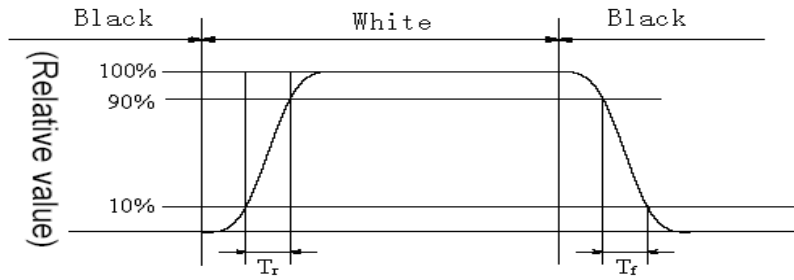


Fig4. Response Time Testing(SFT)

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

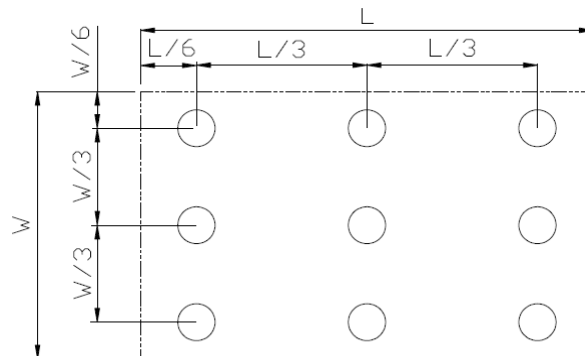


Fig5. Luminance Uniformity Measurement Locations(9 points)

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	Ta=+80℃, 240hrs	(Note1) IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	Ta=+85℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	Ta=-40℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Electro Static Discharge (operation)	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
7	Package Vibration (non-operation)	Frequency range: : 5-20-200HZ · PSD : 0.01-0.01-0.001 Total:0.781g2/HZ, Times : x/y/z direction each 30min	IEC60068-2-6:1982 GB/T2423.10—1995
8	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
9	Package Drop Test	Weight≤10Kg, Height:80cm; Weight > 10Kg,, Height:60cm; 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995
10	Mechanical vibration(non-operation)	5~100Hz 19.60m/s ² 1min/cycle 120times per X/Y/Z	GB/T 2423.10-2019

Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample

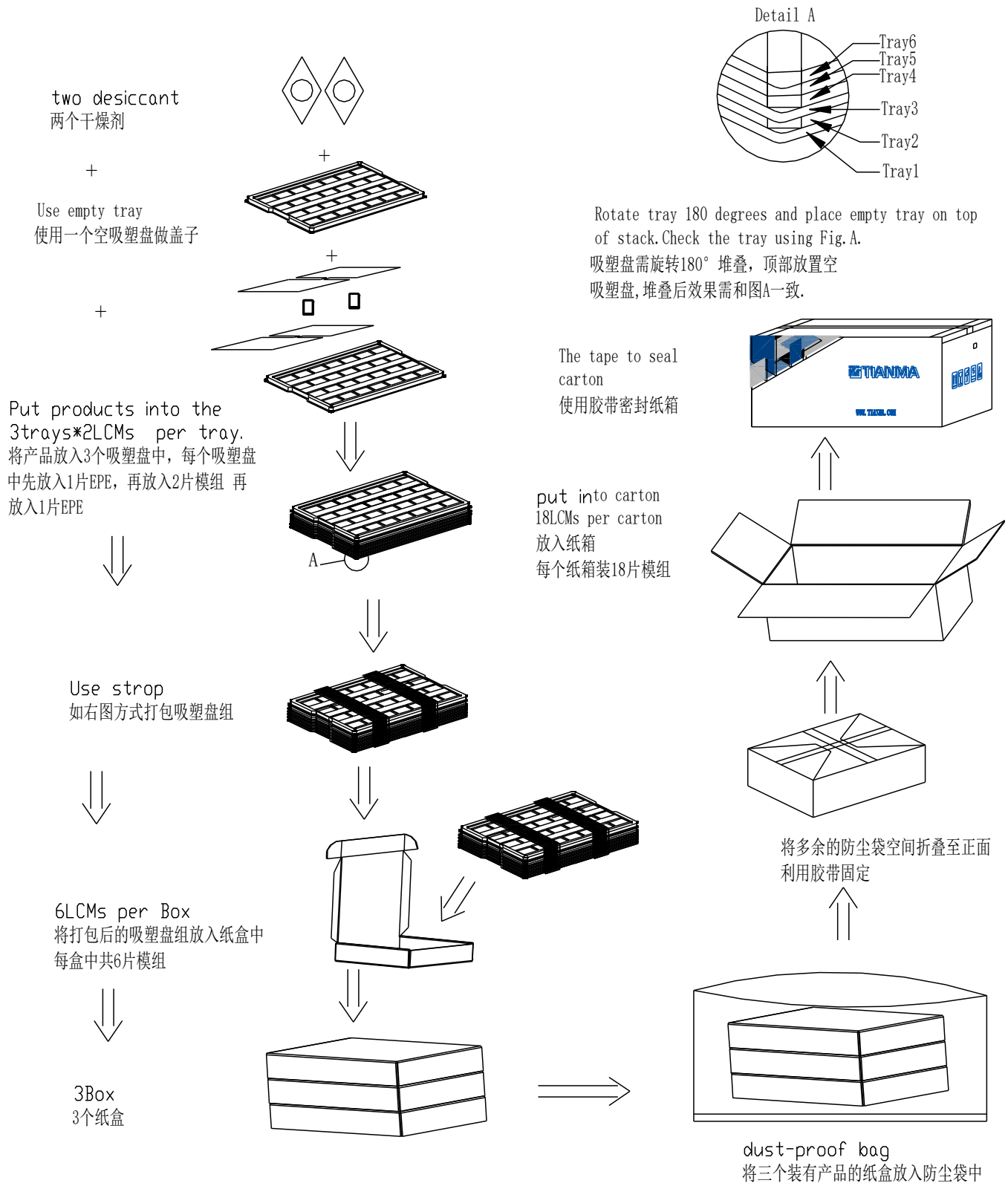
Note2: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

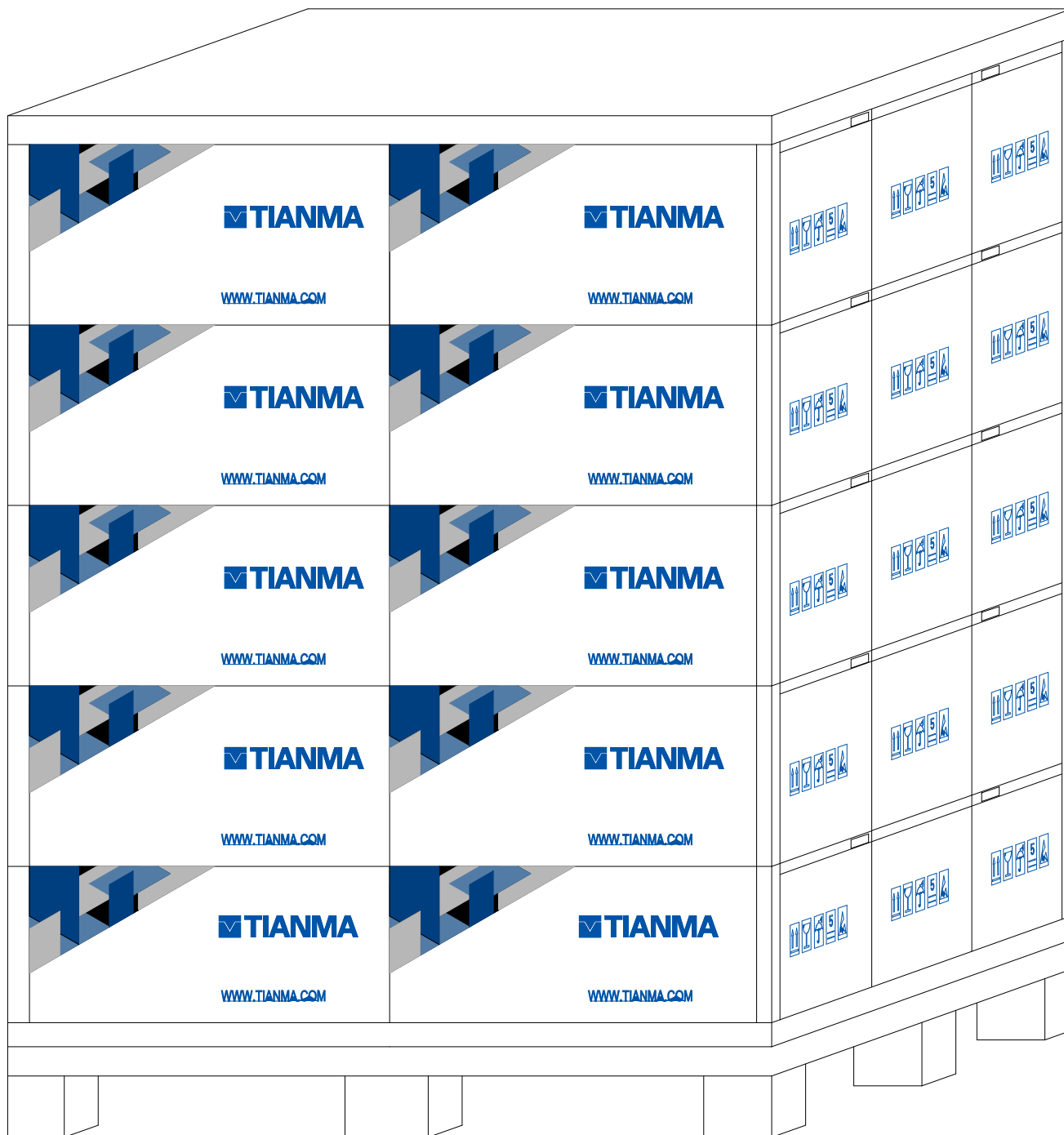
Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

Tianma Microelectronics Co., Ltd.

10. Packing Instruction

No	Item	Model (Material)	Dimensions(m m)	Unit Weight(Kg)	Q'ty	Remark
1	LCM module	P1010WXF1MA01	229.8×149.0×9.11	0.275	18	
2	Tray	PET (Transmit)	485×330×22.2	0.245	12	
3	Dust-Proof Bag	PE	700×545	0.021	1	
4	Desiccant	Desiccant	45×35	0.002	6	
5	Pearl EPE	TM101JDHG32-00 YPF1-00	293.3×228.2×1	0.012	9	
6	Pearl EPE	TM101JDHG32-00 YPF2-00	379.9×228.2×1	0.016	9	
7	BOX	CORRUGATED PAPER	520×345×74	0.3879	3	
8	Carton	CORRUGATED PAPER	544×365×250	1.01	1	
9	Label	Paper	100×52	0.0001	1	
10	Total weight	10.3488KG +/-5%				





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.