SPECIFICATION

[●] Preliminary Specification
[ ] Final Specification

Description **12.1” 1024x768 TFT-LCD Module**

Part Number **P1210XGF1MB10**

Customer		Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date	Approved By	Date
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		Prepared By	
		Gang Li	2025/7/7
Comments:			

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

REVISION HISTORY

Rev	Date	Page	Revision Items	Editor
1.0	2025/7/7	-	Preliminary Specification released.	Gang Li

CONTENTS

1. Summary

1.1 General Description

This is a 12.1 inch a-Si TFT-LCD module with Normal- Black technology. It is composed of a TFT-LCD panel, a driver circuit, FPC, PCB, Bezel, and a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle.
- Long LED life time.
- Interface: LVDS 6/8 bits.
- Acquisition product for UL62368-1/CSA C22.2 No.xxxxxx.
- 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	12.1 inches	
	Resolution	1024x768	
	Pixel Pitch	0.240 (H) x 0.240 (V)	mm
	TFT Active Area	245.76 x 184.32	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	Anti-Glare	
	Viewing Direction	All Direction	
Mechanical Characteristics	LCM (W x H x D)	260.5x204.0x8.4	mm
	Weight	535	g
Optical Characteristics	Luminance	500	cd/m2
	Contrast Ratio	1000:1	
	NTSC	72	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	LVDS 6/8 bits	
	Color Depth	16.7M/262K	color
	Power Consumption	LCD:396 Backlight:6480	mW @White Pattern

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
Connector type	P-TWO 187191-20101-3
Matching connector	JAE FI-SE20ME or equivalent.

Table 3.1.1 Connector information

Pin No.	Symbol	I/O	Function	Remark
1	RX3+	I	Positive LVDS differential data input	
2	RX3-	I	Negative LVDS differential data input	
3	GND	P	Ground	
4	SEL6/8	I	6-bit / 8-bit input select for LVDS interface. High：8bit Low：6bit.	
5	GND	P	Ground	
6	RXC+	I	Positive LVDS differential clk input	
7	RXC-	I	Negative LVDS differential clk input	
8	GND	P	Ground	
9	RX2+	I	Positive LVDS differential data input	
10	RX2-	I	Negative LVDS differential data input	
11	GND	P	Ground	
12	RX1+	I	Positive LVDS differential data input	
13	RX1-	I	Negative LVDS differential data input	
14	GND	P	Ground	
15	RX0+	I	Positive LVDS differential data input	
16	RX0-	I	Negative LVDS differential data input	
17	reLR	I	L: Normal scan H: Reverse scan	
18	reUD	I	L: Normal scan H: Reverse scan	
19	VCC	P	3.3V power supply	
20	VCC	P	3.3V power supply	

Table 3.1.2 Pin Assignment for LCD Interface

Note1:I---Input, O---Output, P--- Power/Ground
Note2: All of the GND Pins should be connected to the system ground.
Note3: reLR / reUD Function Description as below (PCB at up side)

reLR=L, reUD=L reLR=H, reUD=H

Note4: VESA standard only. This LCD module only supports DE mode

3.2 CN2 Pin assignment (Back Light)

Connector Information	
Connector type	91208-01001-H01 (ACES)
Matching connector	91209-01011 (ACES) or equivalent

Table 3.2.1 Connector information

Pin	Symbol	I/O	Description	Remark
1	VI	P	+12V Power supply	
2	VI	P	+12V Power supply	
3	VI	P	+12V Power supply	
4	VI	P	+12V Power supply	
5	VGND	P	Backlight driver ground	
6	VGND	P	Backlight driver ground	
7	VGND	P	Backlight driver ground	
8	VGND	P	Backlight driver ground	
9	EN	I	Backlight on/off control. H: ON, L:OFF	
10	PWM	I	Brightness adjustment signal	

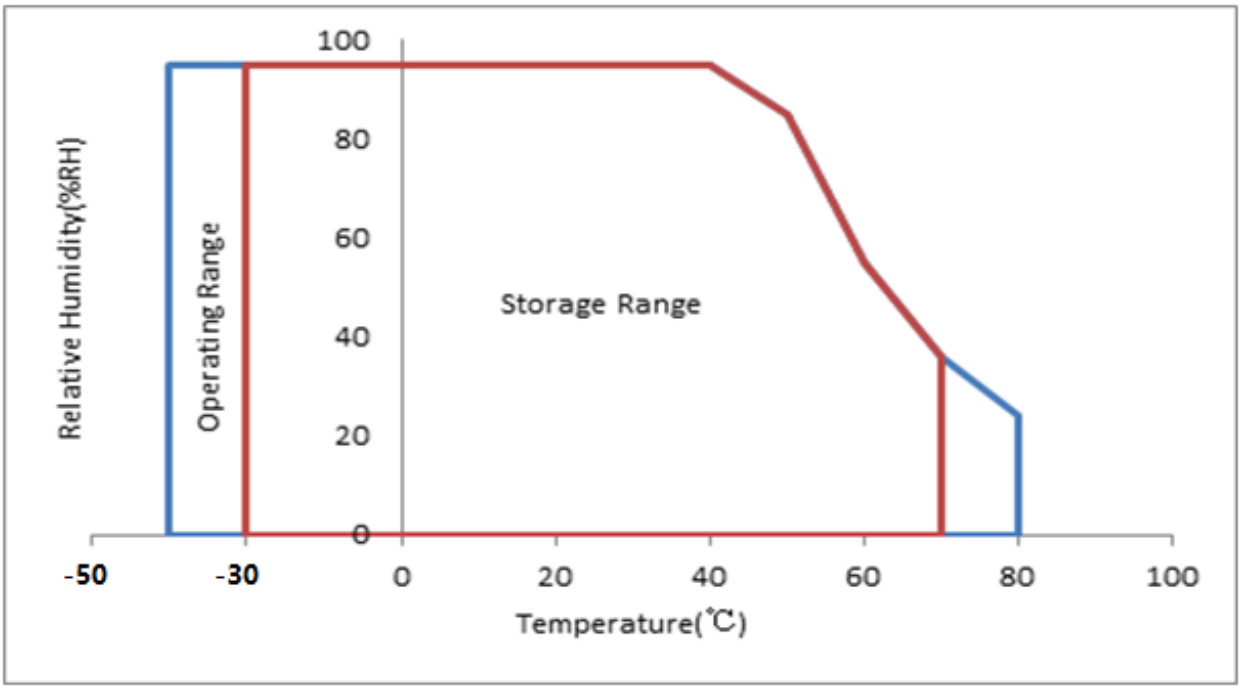
Table 3.2.2 Pin Assignment for Back Light Interface

Note1: P--- Power/Ground, I---Input

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.5	5	V	
Input voltage	V_{IN}	-0.5	5	V	Note1
	V_{LVDS}	0	2	V	Note2
Power Voltage for LED Driver	VI	-0.3	18	V	
Input voltage for LED Driver	V_{INLED}	-0.3	6	V	Note5
Operating Temperature	Top	-30	70	℃	-
Storage Temperature	Tst	-40	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＞80℃

Table 4.1 Absolute Maximum Ratings



Note1: Input voltage include reUD,reLR,SEL6/8,VCC.
Note2: Including RX0+/-, RX1+/-, RX2+/-, RX3+/-,RXC+/-.
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.
Note4: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 damaged.
Note5: VINLED represents EN and PWM.

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

VCC=3.3V,GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage		VCC	3.2	3.3	3.4	V	without ripple
Power Supply Voltage Ripple		--	--	--	100	mV	
Power supply current		ICC	-	120	180	mA	white pattern
LCD power consumption		P	-	396	-	mW	
LVDS differential input voltage		|Vid|	0.1	-	(1.5-RVCM)*2	V	
LVDS common input voltage		Vcm	1.0	1.2	1.4	V	
LVDS differential input threshold voltage		V_{TH}	-	-	+50	mV	
		V_{TL}	-50	-	-	mV	
Logic Input Voltage	Low level	V_{IL}	0	-	0.3VCC	mV	
	High level	V_{IH}	0.7VCC	-	VCC	mV	
Inrush current		Irush	-	-	1	A	Note1

Table 5.1.1 Operating Voltages

Note1: VCC rising time is 470us for inrush current test.

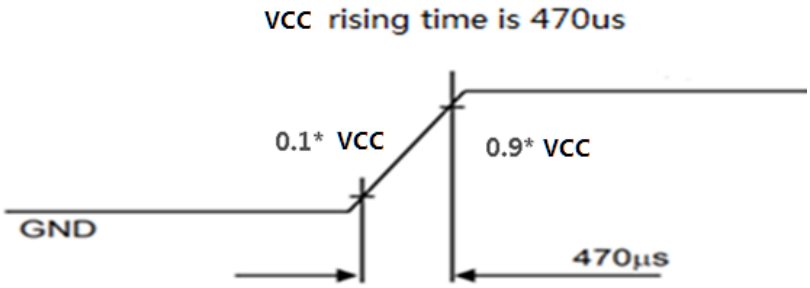


Figure 5.1.1 VCC rising time

Note2: Indicated the subsequent version may be updated.

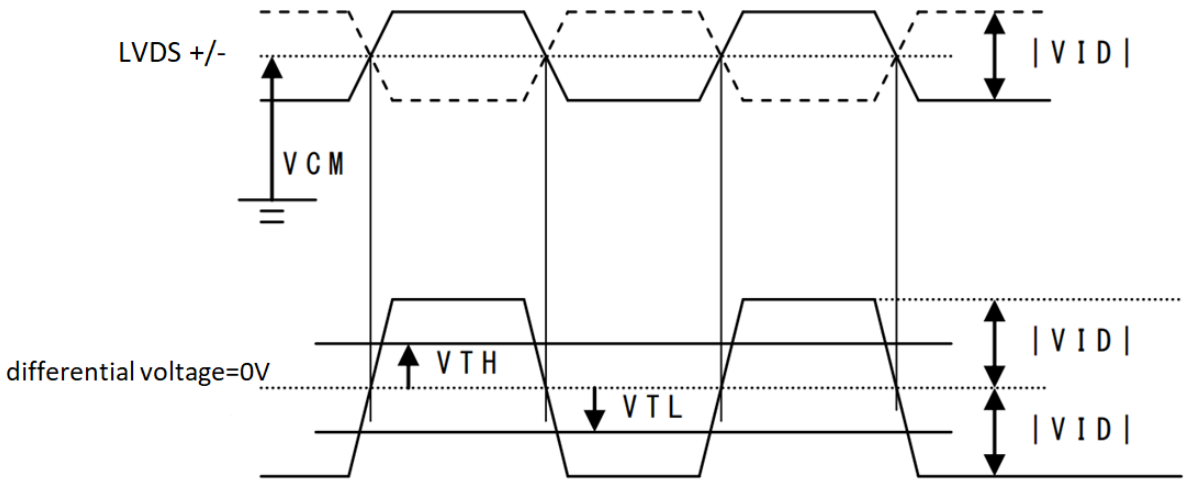


Figure 5.1.2 LVDS DC characteristics

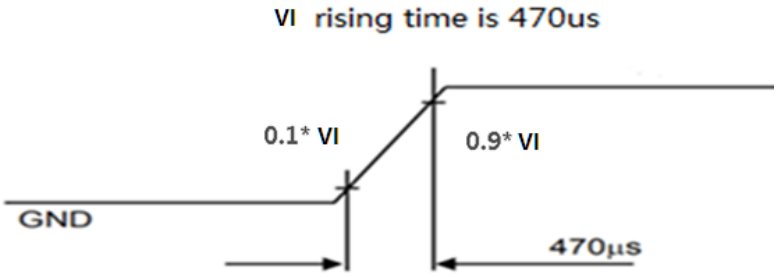
5.2 DC Characteristics for Backlight Driving

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Backlight driver Voltage	V_I	11	12	13	V	
VI inrush current	Inrush	-	-	1	A	Note2
Backlight driver current	I_F	--	540	--	mA	
Backlight Power Consumption	W_{BL}	--	6480	--	mW	
Permissible ripple voltage	VRPD	--	--	100	mVp-p	for VI
Backlight on/off control signal EN	EN_H	2.1	--	3.3	V	
	EN_L	0	--	0.8		
Backlight dimming control signal PWM	PWM_H	2.1	--	3.3	V	Note3
	PWM_L	0	--	0.8		
PWM frequency	F_{PWM}	100	--	50K	HZ	
PWM duty ratio	D_{PWM}	5	--	100	%	
LED life time	--	50000	70000	--	Hrs	Note4

Table 5.2.1 LED Backlight Characteristics

Note 1: Optical performance should be evaluated at Ta=25℃only.
Note 2: PWM duty ratio may vary with different frequency.
Higher the frequency, higher the minimum duty ratio.
Note 3: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.
Note 4: VI rising time for inrush current test.



5.3 DC Characteristics For Fuse

Parameter	Fuse Type	Rating	Clear-time at 25℃	
VI for Backlight	F0603HI2000V032T	32V 2A	4 A	60 seconds(max)

Table 5.3.1 Fuse's characteristics

5.4 Recommended Power ON/OFF Sequence

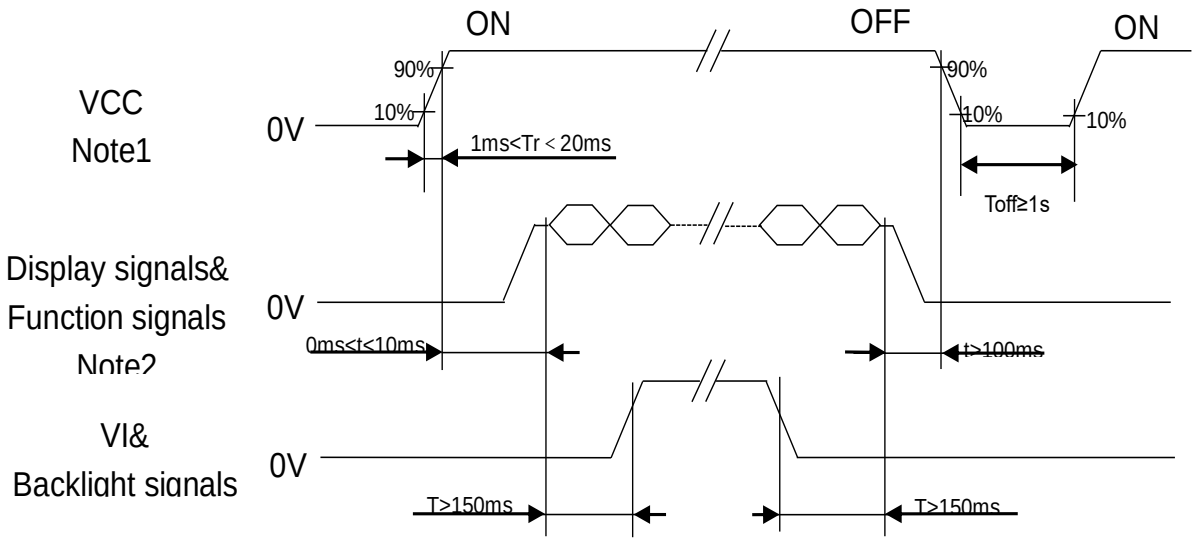
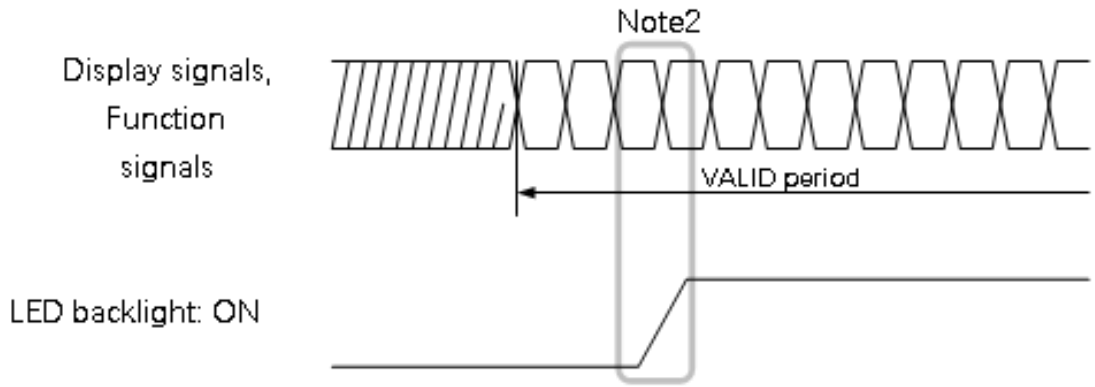


Figure 5.4.1 Power On/off sequence

Note1: If there is a voltage variation (voltage drop) at the rising edge of VCC below 3.0V, there is a possibility that a product does not work due to a protection circuit.
Note2: Display signals (RX0+/-, RX1+/-, RX2+/-, RX3+/- and RXC+/-) and function signals (SEL6/8,reLR,reUD) must be set to Low or High-impedance, except the VALID period (See above sequence diagram), in order to avoid the circuitry damage.
If some of display and function signals of this product are cut while this product is working, even if the signal input to it once again, it might not work properly. If a customer stops the display and function signals, VCC also must be shut down.

LED driver board



Note1: These are the display and function signals for LCD panel signal processing board.
Note2: The backlight should be turned on within the valid period of display and function signals, in order to avoid unstable data display.

5.5 LCD Module Block Diagram

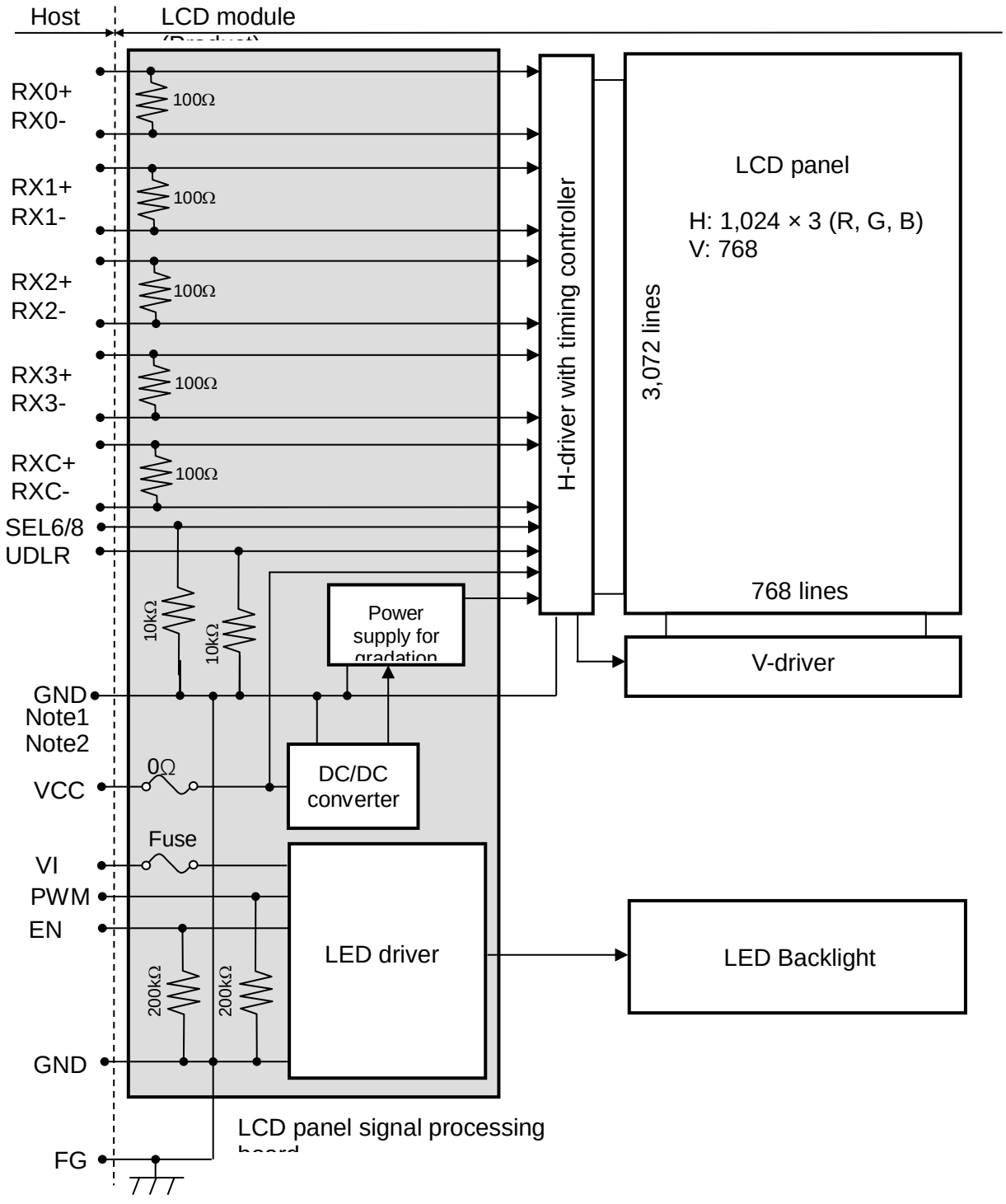


Figure 5.5.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 LVDS interface AC characteristics

Item	Symbol	Min	Typ	Max	Unit	Remark
LVDS Clock Frequency	RXFCLK	50.5	-	57.8	MHz	
LVDS Clock Period	1/RXFCLK	17.3	-	19.8	ns	
1 data bit time	UI	-	1/7	-	1/RXFCLK	
Input data skew margin	TRSKM	-	-	0.2	UI	|VID|=100mV VCM=1.2V
Position 1	Rspos1	-0.2	0	0.2	UI	
Position 2	Rspos2	0.8	1	1.2	UI	
Position 3	Rspos3	1.8	2	2.2	UI	
Position 4	Rspos4	2.8	3	3.2	UI	
Position 5	Rspos5	8	4	4.2	UI	
Position 6	Rspos6	4.8	5	5.2	UI	
Position 7	Rspos7	5.8	6	6.2	UI	
Clock high time	TLVCH	-	4/(7*RXFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7*RXFCLK)	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	

Table 6.1.1 LVDS interface AC characteristic

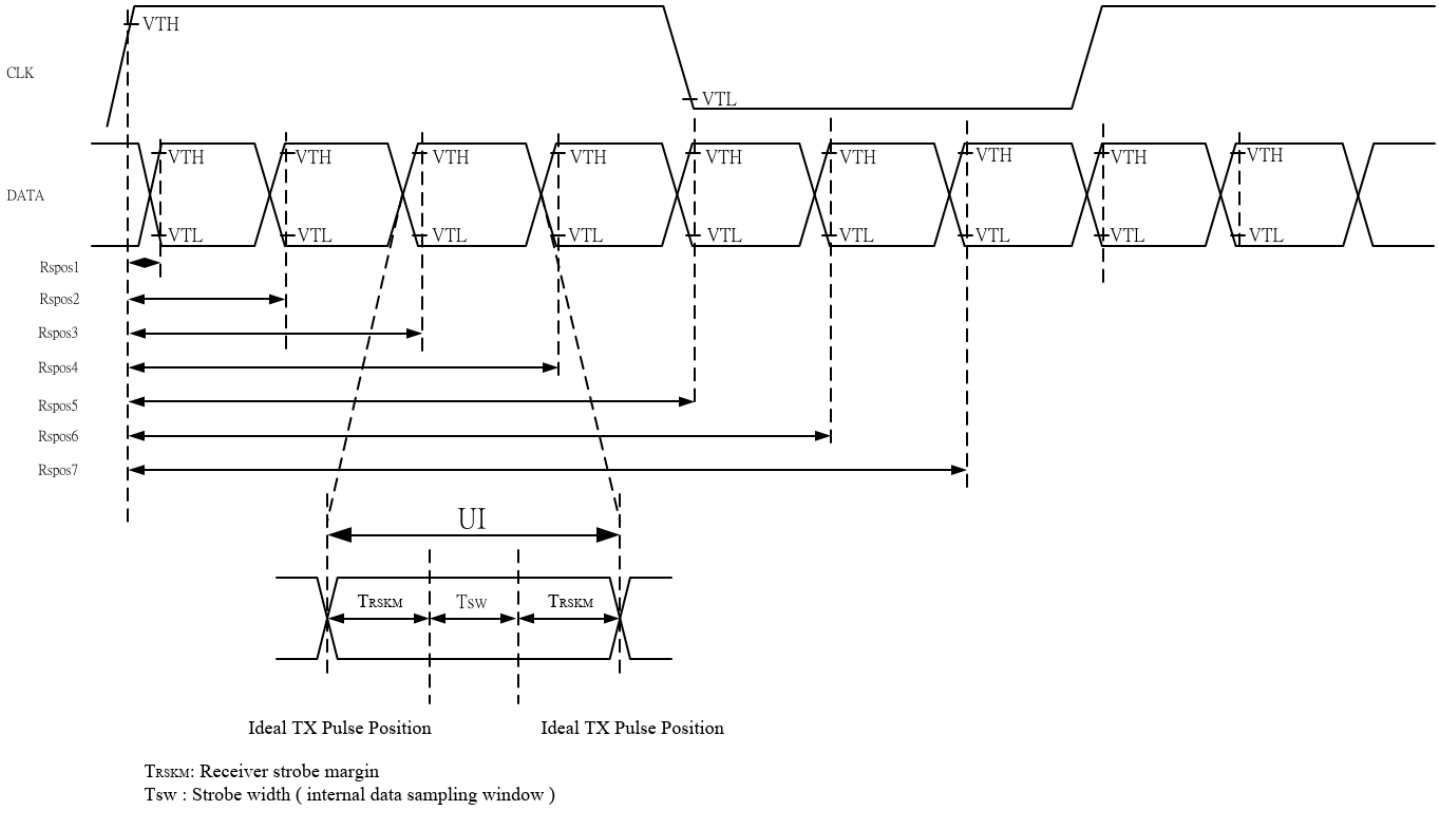


Figure 6.1.2 LVDS Data Skew

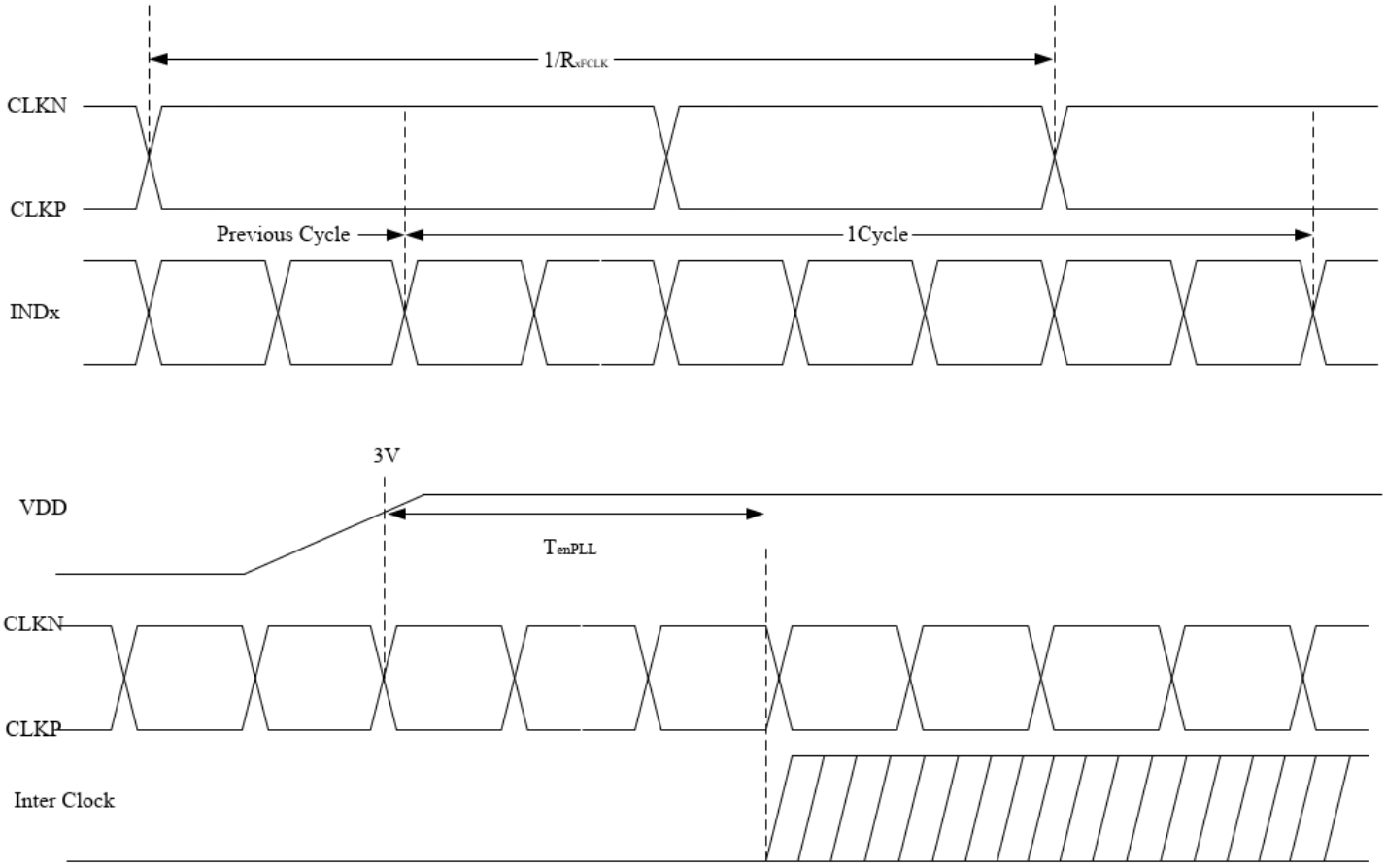


Figure 6.1.3 Clock and Data Input Timing Diagram

6.2 Data Input Timing Parameter Setting

DE mode for 1024RGBx768

Parameter			Symbol	Min.	Typ.	Max.	Unit	Remark
CLK	Frequency		1/tc	50.50	50.66	57.8	MHz	19.74ns(typ.)
DE	Horizontal	Display area	thd	1024			CLK	
		Period time	th	-	21.477	-	μs	46.561 kHz (typ.)
				1086	1088	1151	CLK	
	Vertical (One frame)	Display area	tvd	768			H	
		Period time	tv	-	16.666	-	ms	60.0Hz (typ.)
				775	776	837	H	
	Frame Rate		FR	--	60	--	HZ	

Table 6.2.1 Data Input Timing Parameters

6.3 LVDS Interface Timing Characteristics

6.3.1 LVDS Input Data Format 8-bit LVDS VESA

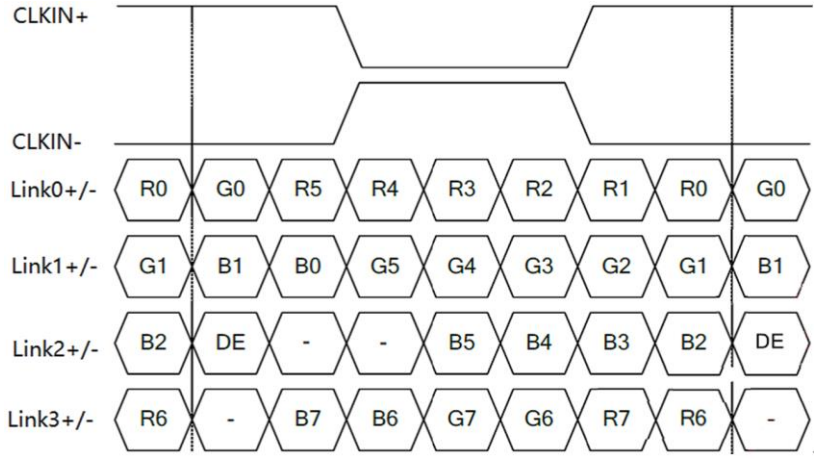


Figure 6.3.1 8-bit LVDS data mapping

6.3.2 LVDS Input Data Format 6-bit LVDS VESA

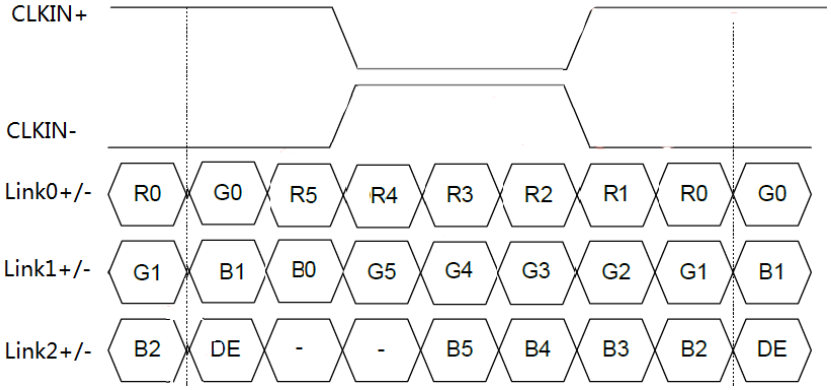


Figure 6.3.2 LVDS data mapping

6.4 LVDS Input Timing Format

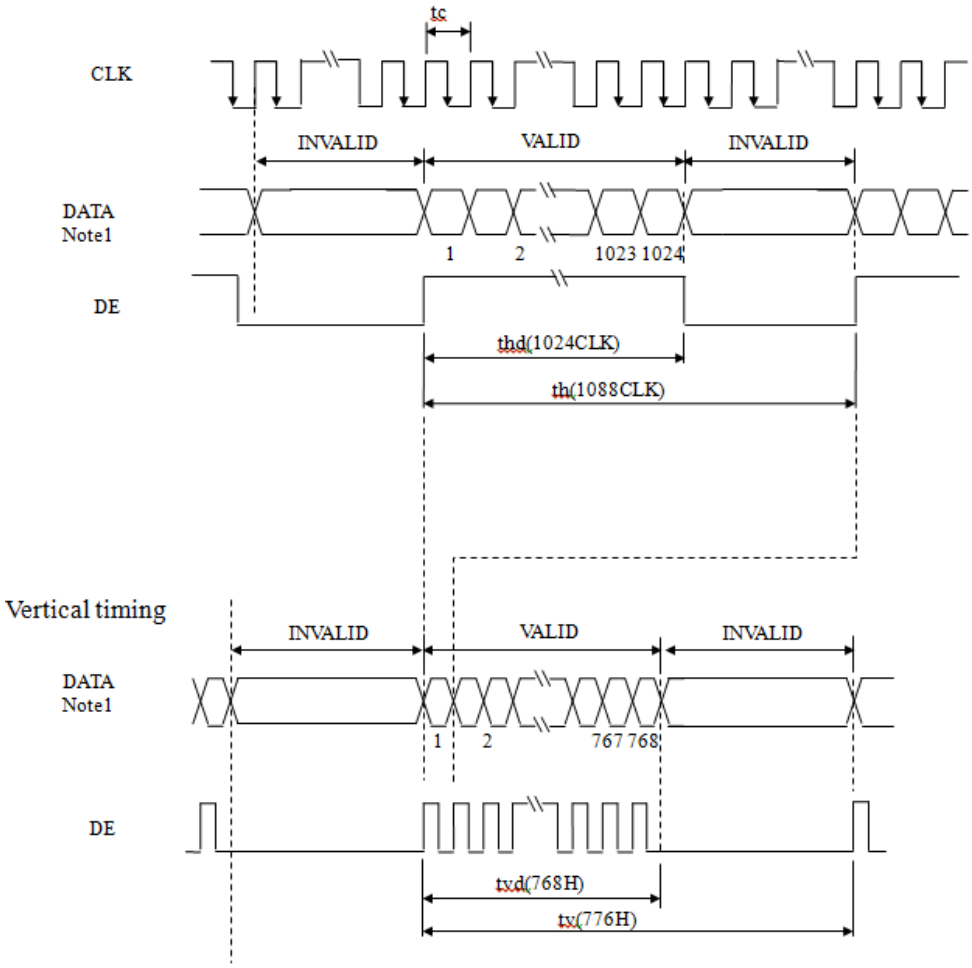


Figure 6.4.1 Recommended input timing of LVDS transmitter

Note1: DATA = R0-R7, G0-G7, B0-B7

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	80	88	--	Degree	Note2,3
		θB		80	88	--		
		θL		80	88	--		
		θR		80	88	--		
Contrast Ratio		CR	θ=0°	800	1000	--		Note 3
Response Time		T_{ON}	25℃	--	25	35	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.251	0.301	0.351		Note 1,5
		y		0.275	0.325	0.375		
	Red	x		0.589	0.639	0.689		Note 1,5
		y		0.285	0.335	0.385		
	Green	x		0.239	0.289	0.339		Note 1,5
		y		0.562	0.612	0.662		
	Blue	x		0.098	0.148	0.198		Note 1,5
		y		0.009	0.059	0.109		
Luminance Uniformity		U	-	75	80		%	Note 6
NTSC				65	72	--	%	Note 5
Luminance		L		400	500		cd/m^2	Note 7

Table 7.1 Optical Parameters

Test Conditions:

1. I_F= 115 mA/LED, 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.

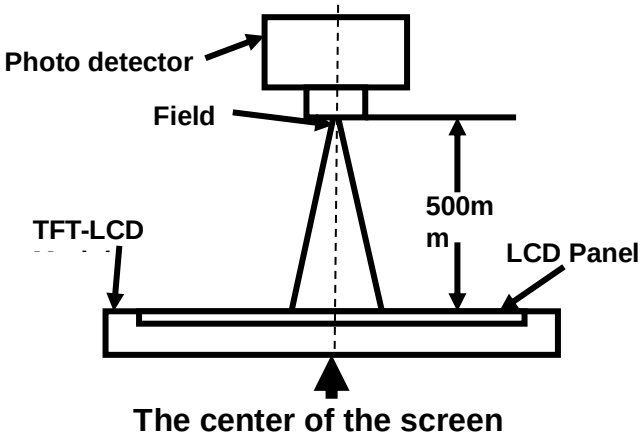


Fig1. Measurement Set Up

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

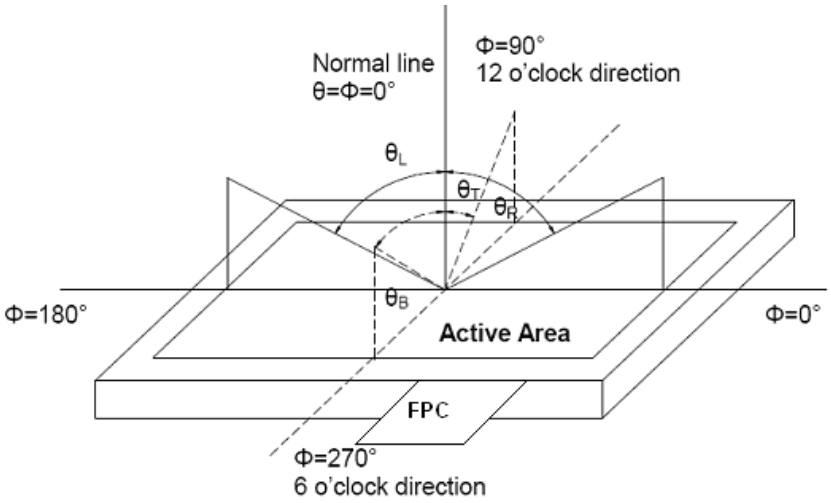


Fig2. Measurement viewing angle

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

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%.

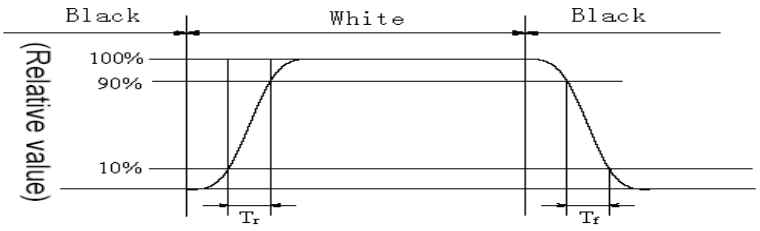


Fig4. Response Time Testing

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

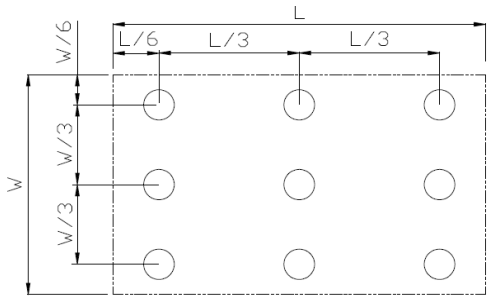


Fig5. Luminance Uniformity Measurement Locations(9 points)

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	Ta = +70℃,240 hours	IEC60068-2-2 GB2423.2
2	Low Temperature Operation	Ta = -30℃, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-2 GB2423.2
4	Low Temperature Storage	Ta = -40℃, 240 hours	IEC60068-2-1 GB2423.1
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	IEC60068-2-78 GB/T2423.3
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	ESD	C=150pF,R=330Ω,5point/panel Air:±15KV,5times; Contact:±8KV,5times (Environment:15℃~35℃, 30%RH~60%RH.86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
8	Vibration Test (non-operation)	5~100HZ，19.60m/s2 1min/cycle 120times Per X/Y/Z	IEC60068-2-6 GB/T17626.6
9	Mechanical Shock (non-operation)	539m/s2, 11ms 5times ±X、±Y、±Z	IEC60068-2-27 GB/T2423.5
10	Vibration test	5Hz~20Hz~200Hz， 0.01g2/Hz~0.01g2/Hz~0.001g2/Hz，X/Y/Z per 30min	GB/T 4857.5-1992
11	Package Drop Test	Height:60cm, 1corner,3 edges,6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Table 8.1 RA test condition

Note1: Ta 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, only guarantee the operation of the product, but don't guarantee all of the cosmetic specification.

9. Mechanical Drawing

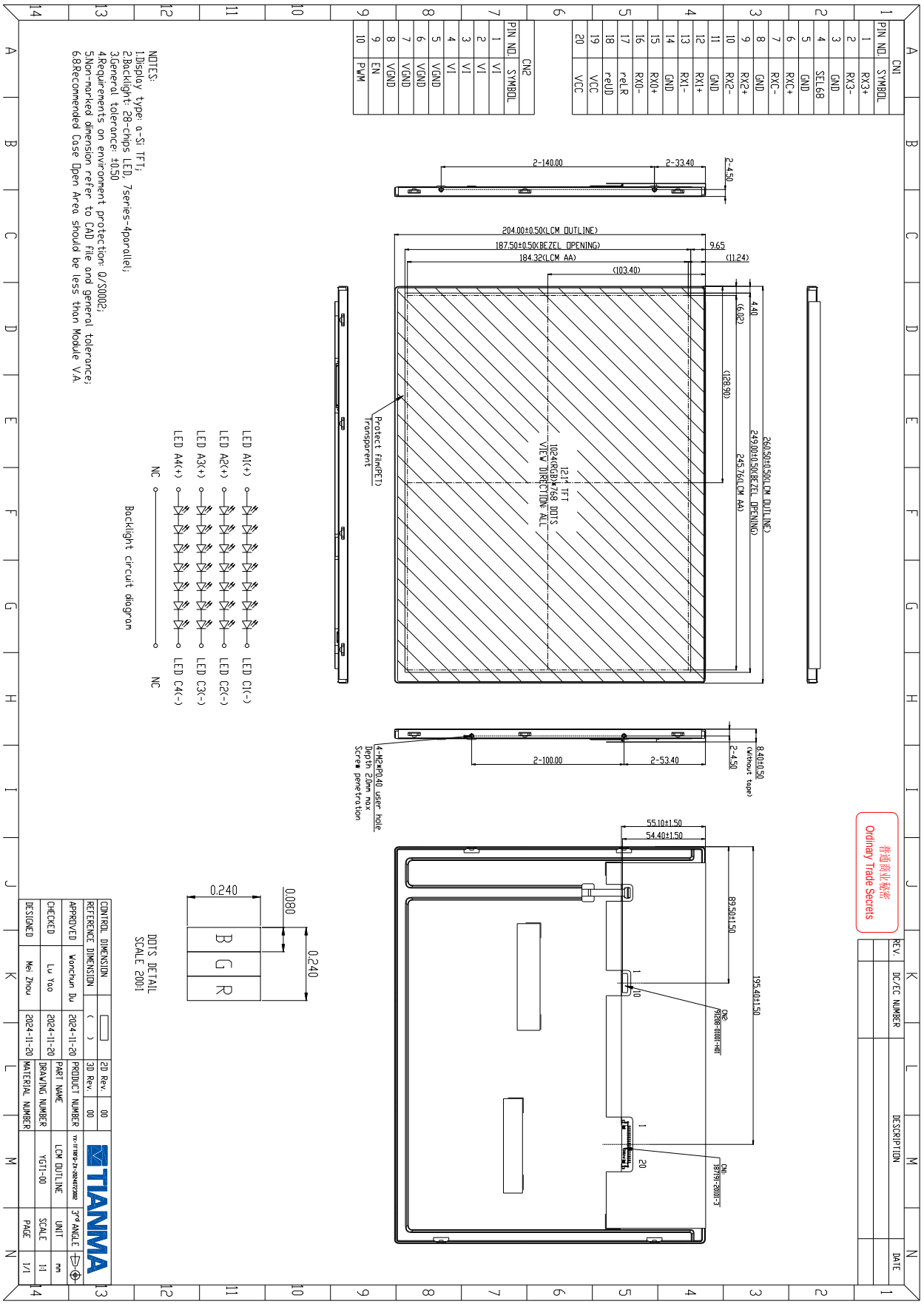


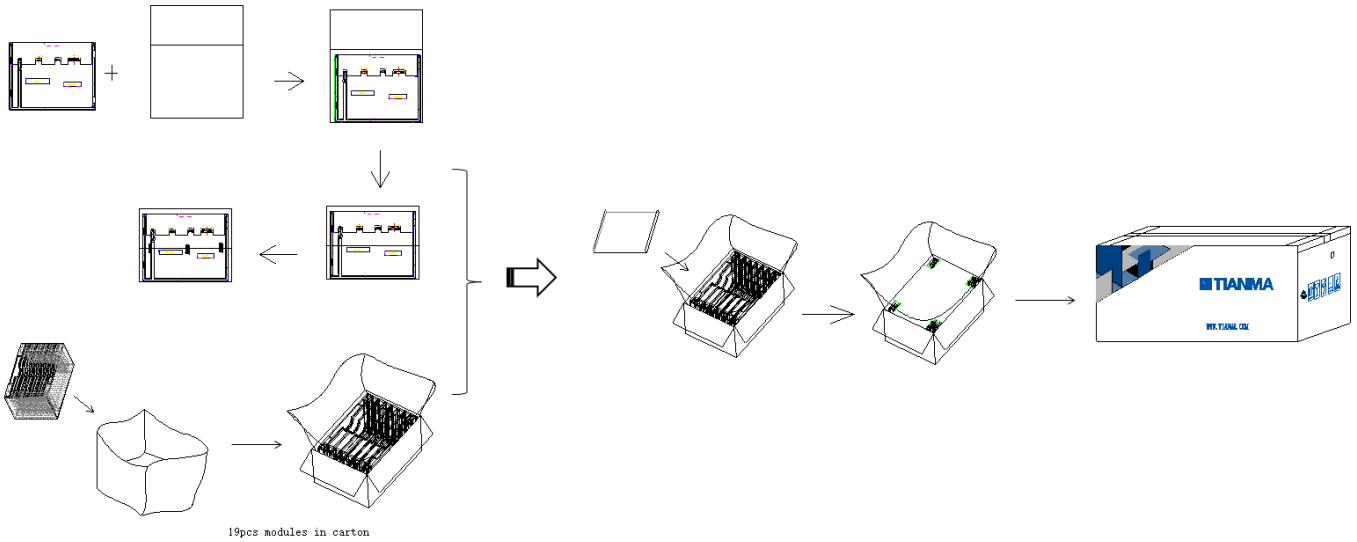
Figure 9.1 Mechanical Drawing

10. Packing Instruction

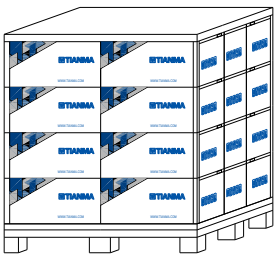
No	Item	Model (Material)	Dimensions(mm)	Weight(Kg)	Quantity	Remark
1	LCM module	P1210XGF1MB10	260.5×204.0×8.4	0.535	19	
2	Paper card	Corrugated Paper	527×348×285	1.650	1	
3	Dust-proof Bag	PE	700×545×0.05	0.021	1	
4	Carton	Corrugated Paper	544×365×312.5	1.11	1	
5	Paper board	Corrugated Paper	527×348×6	0.130	1	
6	Paper rack	Corrugated Paper	461×227×28	0.035	1	
7	Label	Label	100×52	0.001	1	
8	Masking tape	Tape	485×330×5	0.001	57	
9	ESD bubble bag	PE	340×280×6	0.012	19	
10	Total weight	13.397±5%KG				

Table 10.1 Packing materials

Packing details is shown as below:



Cartons on pallet: 2*3*4
Pallet size: 1100×1100mm



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.