DATA MODUL

SPECIFICATION

TIANMA

P1210XGF1MB00

12.1" - XGA – LVDS

Version: 2.0
Date: 15.05.2023

Note: This specification is subject to change without prior notice

SPECIFICATION

[ ] Preliminary Specification
[◉] Final Specification

Description **12.1” 1024xRGBx768 TFT-LCD Module**

Part Number **P1210XGF1MB00**

Customer		Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
Signatures	Date	Approved By	Date
		Zhijie Song	2023/05/15
		Reviewed By	
		Zhijie Song	2023/05/15
		Prepared By	
		Shuqin Ai	2025/05/15

REVISION HISTORY

Rev	Date	Page	Revision Items	Editor
1.0	2021-04-12	-	Preliminary Specification Released.	Chunliang_qian
1.1	2021-05-10	-	modify Selection of scan direction	Chunliang_qian
1.2	2021-05-31	-	modify The circuit diagram of BLU	Chunliang_qian
1.3	2021-08-31	-	modify response Time	Chunliang_qian
1.4	2021-09-13	-	modify BLU Driving	Chunliang_qian
1.5	2021-10-25	-	modify LED Driver	Chunliang_qian
1.6	2022-12-1	-	Update TBD item;	Shuqin _Ai
2.0	2023-5-15	-	1. Update UL No. 2. Final spec released	Shuqin _Ai

CONTENTS

1. Summary

1.1 General Description

This is a 12.1 inch a-Si TFT-LCD module with normal- black SFT technology. It is composed of a TFT-LCD panel, a driver circuit, PCB, a LED backlight unit.

1.2 Features

- Ultra-wide viewing angle (Super Fine TFT (SFT));
- LCM Interface: 1port LVDS 8bit / 6bit;
- High NTSC
- Acquisition product for CSA C22.2 No. 62368-1-14(File number: E250878)
- 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
Display Spec.	Size	12.1 inch
	Resolution	1024(RGB) x 768
	Technology Type	SFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel Pitch (mm)	0.240 (H) x 0.240 (V)
	Display Mode	Transmissive, Normally Black
	Surface Treatment(Up Polarizer)	HC
	Viewing Direction	All direction
Mechanical Characteristics	LCM (W x H x D) (mm)	260.5 x 203 x 9.5
	Active Area(mm)	245.76 x 184.32
	With /Without TSP	Without Touch Screen
	LCM connector type(CN1)	FI-SEB20P-HFE
	Backlight connector type(CN2)	SM10B-SHLS-TF(LF)(SN)
	Weight (g)	556g
Electrical Characteristics	Interface	1port LVDS 8bit / 6bit
	Color Depth	16.7M&262K

Table 2 General TFT Specifications

Note 1: Viewing direction for best image quality is different from TFT definition, there is a180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: +/- 5%

3. Input / Output Terminals

3.1 CN1 Pin assignment (CN1)

CN1 Connector: FI-SEB20P-HFE(JAE) or equivalent

Pin No.		Symbol	Signal	Input data signal: 8-bit		Input data signal: 6-bit	Remarks
				MAP A	MAP B		
1	A	D3+	Pixel data	R0-R1,G0-G1,B0-B1	R6-R7,G6-G7,B6-B7	-	
	B	GND	Ground	-		Ground	
2	A	D3-	Pixel data	R0-R1,G0-G1,B0-B1	R6-R7,G6-G7,B6-B7	-	
	B	GND	Ground	-		Ground	
3		DPS	Selection of scan direction	High: Normal scan Low: Reverse scan			Default H Note2
4		FRC	Selection of the number of colors	High		Low	Default H
5		GND	Ground	Ground			
6		CLK+	Pixel clock	Pixel clock			
7		CLK-					
8		GND	Ground	Ground			
9		D2+	Pixel data	B4-B7,DE		B2-B5,DE	
10		D2-					
11		GND	Ground	Ground			
12		D1+	Pixel data	G3-G7,B2-B3		G1-G5,B0-B1	
13		D1-					
14		GND	Ground	Ground			
15		D0+	Pixel data	R2-R7,G2		R0-R5,G0	
16		D0-					
17		GND	Ground	Ground			
18		MSL	Selection of LVDS input map	Low		High	Default H
19		VCC	Power supply	Power supply			
20		VCC					

Note1: All of the GND Pins should be connected to the system ground.

Note2: Scanning direction please refer to below picture: The following figures are seen from a front view.

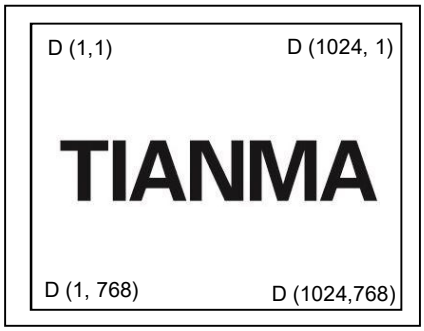


Figure1. Normal scan (DPS: High)

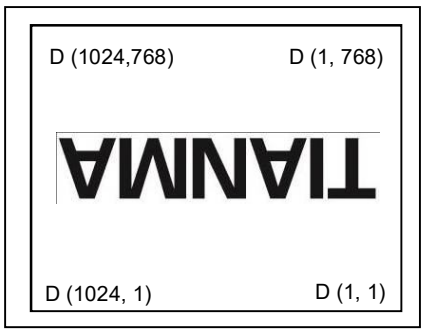


Figure3.1. Reverse scan (DPS: Low)

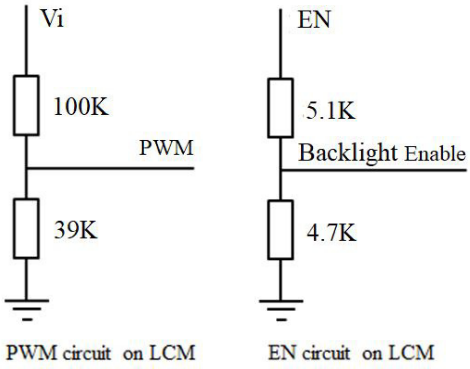
3.2 CN2 Pin assignment (CN2)

CN2 connector: SM10B-SHLS-TF(LF)(SN)(JST)

No	Symbol	I/O	Description	Remarks
1	VI	P	Converter input voltage	
2	VI	P	Converter input voltage	
3	VI	P	Converter input voltage	
4	VI	P	Converter input voltage	
5	V_{GND}	P	Converter ground	
6	V_{GND}	P	Converter ground	
7	V_{GND}	P	Converter ground	
8	V_{GND}	P	Converter ground	
9	EN	I	Enable pin	Default L(Note1)
10	PWM	I	Backlight Adjust	Default H(Note2)

Table 3.2 Pin Assignment for backlight

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection
Note2: The circuit diagram of PWM on LCM is as follows:
Note3: The circuit diagram of EN on LCM is as follows:



4. Absolute Maximum Ratings

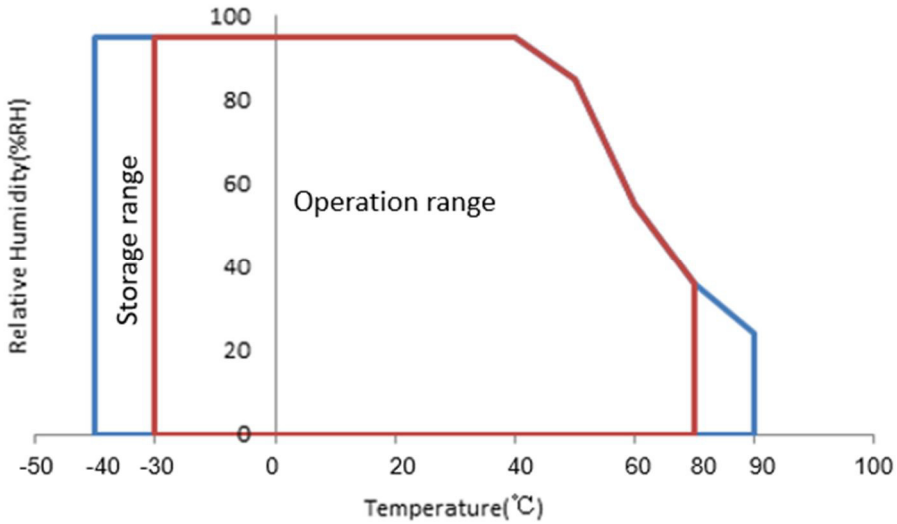
4.1 Driving TFT LCD panel

GND=0V, Ta = 25℃

Parameter			Symbol	Rating	Unit	Remarks
Power supply voltage	LCD panel signal processing board		VCC	-0.3 to +5.0	V	Ta= 25°C
	LED driver		Vi	9V to 28V		
Input voltage for signals	Logic Input Voltage	Low level	VIL	0 to 0.3VCC	V	
		High level	VH	0.7VCC to VCC		
	LED driver		PWM	0 to 5	V	
			EN	0 to 15		
Storage temperature			Tst	-40 to +90	°C	-
Operating temperature		Front surface	TopF	-30 to +80	°C	Note1
		Rear surface	TopR	-30 to +80	°C	Note2
Relative humidity Note4			RH	≤ 95	%	Ta ≤ 40°C
				≤ 85	%	40°C < Ta ≤ 50°C
				≤ 55	%	50°C < Ta ≤ 60°C
				≤ 36	%	60 < Ta ≤ 70°C
				≤ 24	%	70 < Ta ≤ 80°C
Absolute humidity Note3			AH	≤ 70 Note4	g/m^3	Ta = 80°C

Table 4.1 Absolute Maximum Ratings

Note1: Measured at LCD panel surface (including self-heat)
Note2: Measured at LCD module's rear shield surface (including self-heat)
Note3: No condensation
Note4: Water amount at Ta= 80°C and RH= 24%



5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

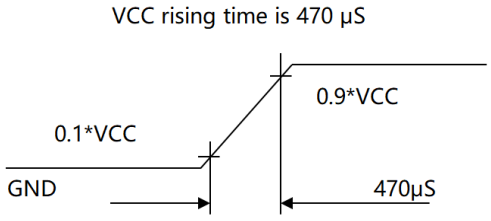
GND=0V, Ta = 25℃

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		VCC	3.2	3.3	3.4	V	-
Power supply current		ICC	-	135	202	mA	at VCC= 3.3V Note1
Permissible ripple voltage		VRPC	-	-	100	mVp-p	for VCC
Differential Input common Mode voltage		RXVCM	1	1.2	1.4	V	
Differential input voltage		|VID|	0.1	-	(1.5-RxVCM)*2	mV	
Inrush current		Irush	-	-	1	A	Note2
Input voltage for DPS,FRC and MSL signal	High	VFH1	0.7VCC	-	VCC	V	CMOS level
	Low	VFL1	0	-	0.3VCC		

Table 5.1 Operating Voltages

Note1: Typical picture is White

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



5.2 DC Characteristics for Backlight Driving

Parameter		Symbol	min.	typ.	max.	Unit	Remarks
Power supply voltage		Vi	11.2	12.0	12.8	V	Note1
Power supply current Note2		Ii	-	490	612	mA	Note4
Permissible ripple voltage		VRPD	-	-	200	mVp-p	for VDD
Input voltage for PWM signal	High	VDFH1	1.2	-	4.5	V	-
	Low	VDFL1	0	-	0.35	V	
Input voltage for EN signal	High	VDFH2	6	12	14	V	-
	Low	VDFL2	0	-	3	V	
PWM frequency		f_{PWM}	200	-	10K	Hz	Note5, Note6
PWM duty ratio		DR_{PWM}	5%	-	100	%	Note7
PWM pulse width		tPWH	10	-	-	μs	
LED Life Time		LT	-	50000	-	Hrs	Note8

Note1: When designing of the power supply, take the measures for the prevention of surge voltage.
Note2: The power supply lines (Vi and GND) may have ripple voltage during luminance control of LED. There is the possibility that the ripple voltage produces acoustic noise and signal wave noise in audio circuit and so on. Put a capacitor between the power supply lines (Vi and GND) to reduce the noise if necessary.
Note3: This value excludes peak current such as overshoot current.
Note4: At the maximum luminance control
Note5: A recommended f_{PWM} value is as follows.

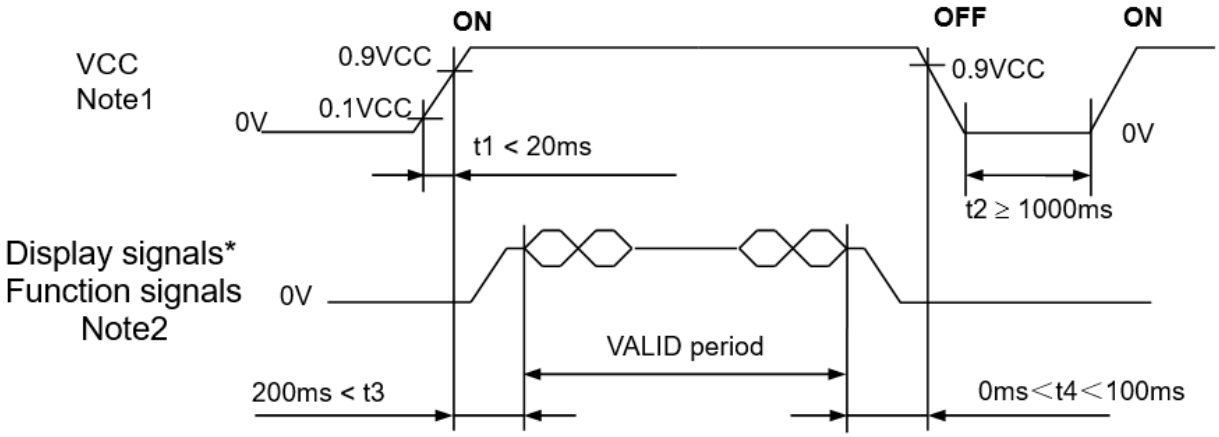
$$f_{PWM} = \frac{2n-1}{4} \times fv$$

$$(n = \text{integer}, fv = \text{frame frequency of LCD module})$$

Note6: Depending on the frequency used, some noise may appear on the screen, please conduct a thorough evaluation.
Note7: The recommended PWM frequency is 200Hz to 10kHz, but the LED current cannot be 100% proportional to duty cycle, especially for high frequency and low duty ratio.
While the EN signal is high, do not set the tPWH (PWM pulse width) is less than 0.1μs. It may cause abnormal working of the backlight. In this case, turn the backlight off and then on again by EN signal.
Note8: 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 Recommended LCD Power ON/OFF Sequence

5.3.1 LCD power ON/OFF sequence



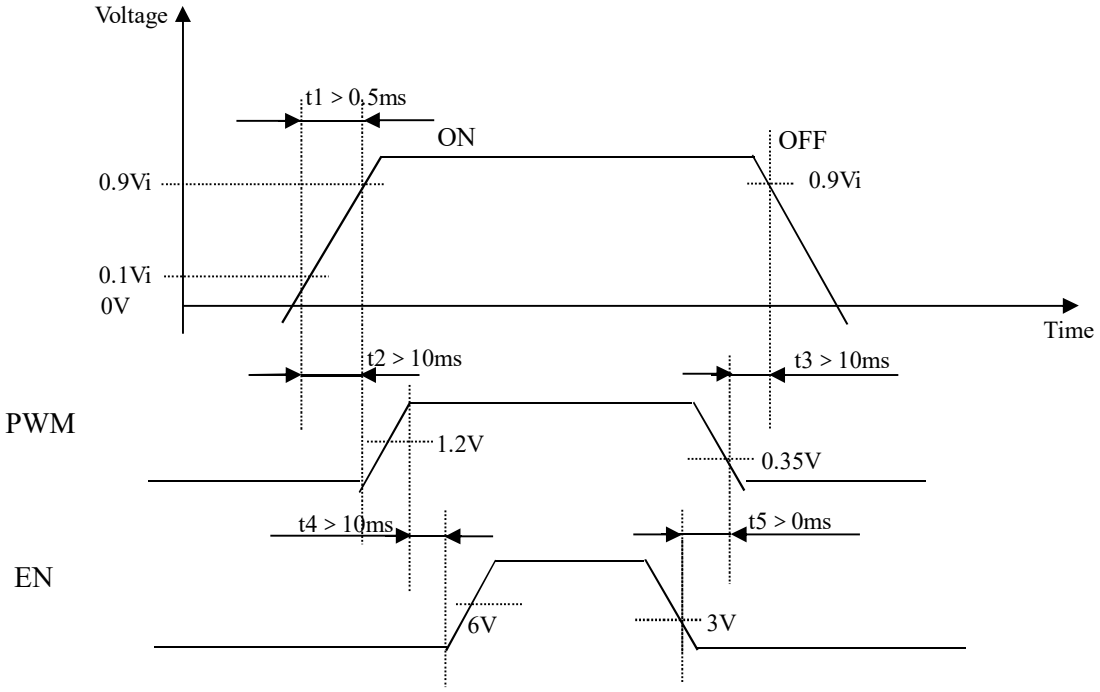
* These signals should be measured at the terminal of 100Ω resistance.

Figure 5.3.1 Power on sequence

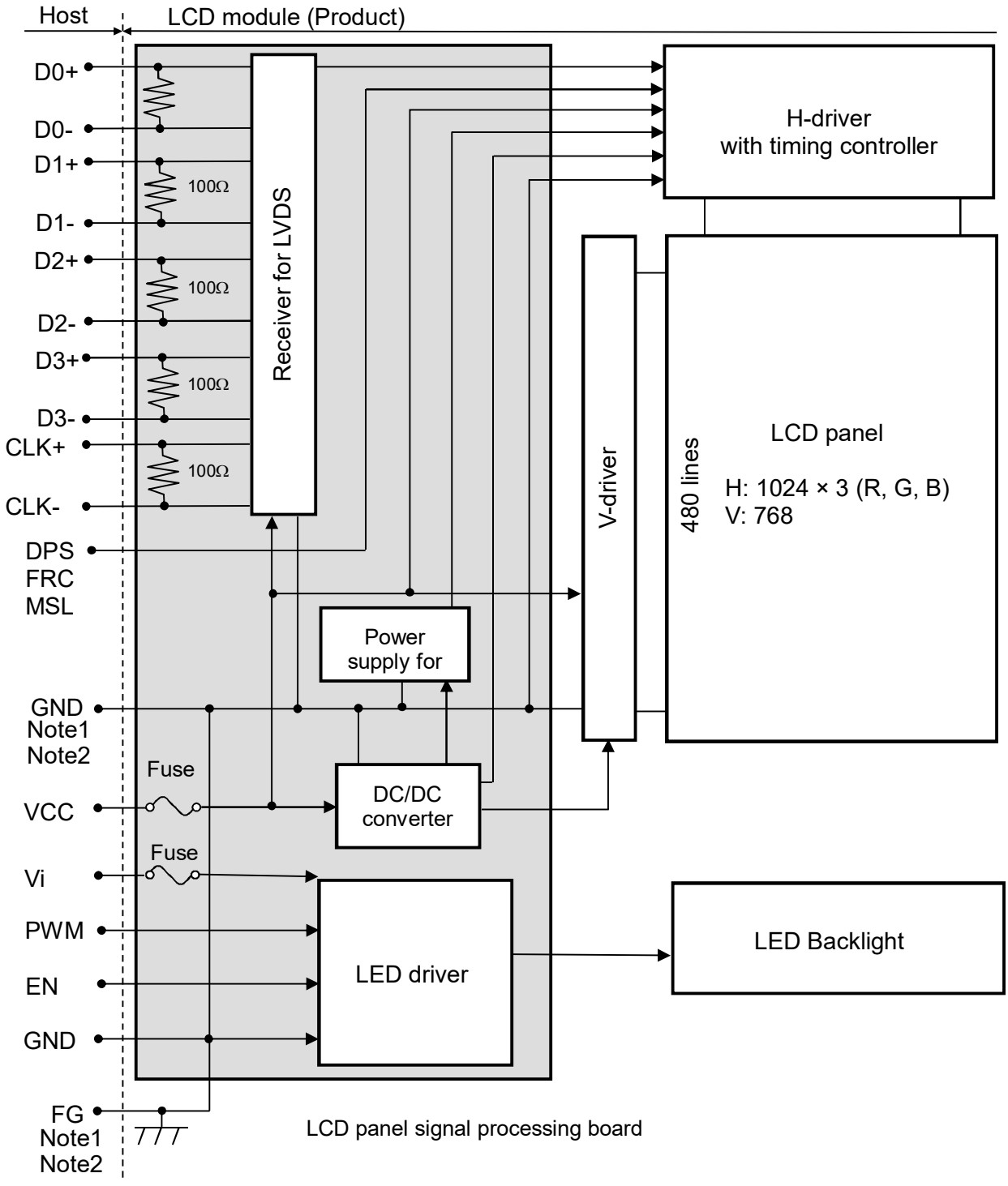
Note1: If there is a voltage variation (voltage drop) at the rising edge of VCC below 3.0V, there is a possibility that a product does not work due to a protection circuit.

Note2: Display signals (D0+/-, D1+/-, D2+/- and CLK+/-) and function signals (DPS) 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 normally. If a customer stops the display and function signals, VCC also must be shut do

5.3.2 LED driver



5.4 LCD Module Block Diagram



Note1: GND (Signal ground) is connected to FG (Frame ground) in the LCD module
Note2: GND and FG must be connected to customer equipment's ground, and it is recommended that these grounds to be connected together in customer equipment.

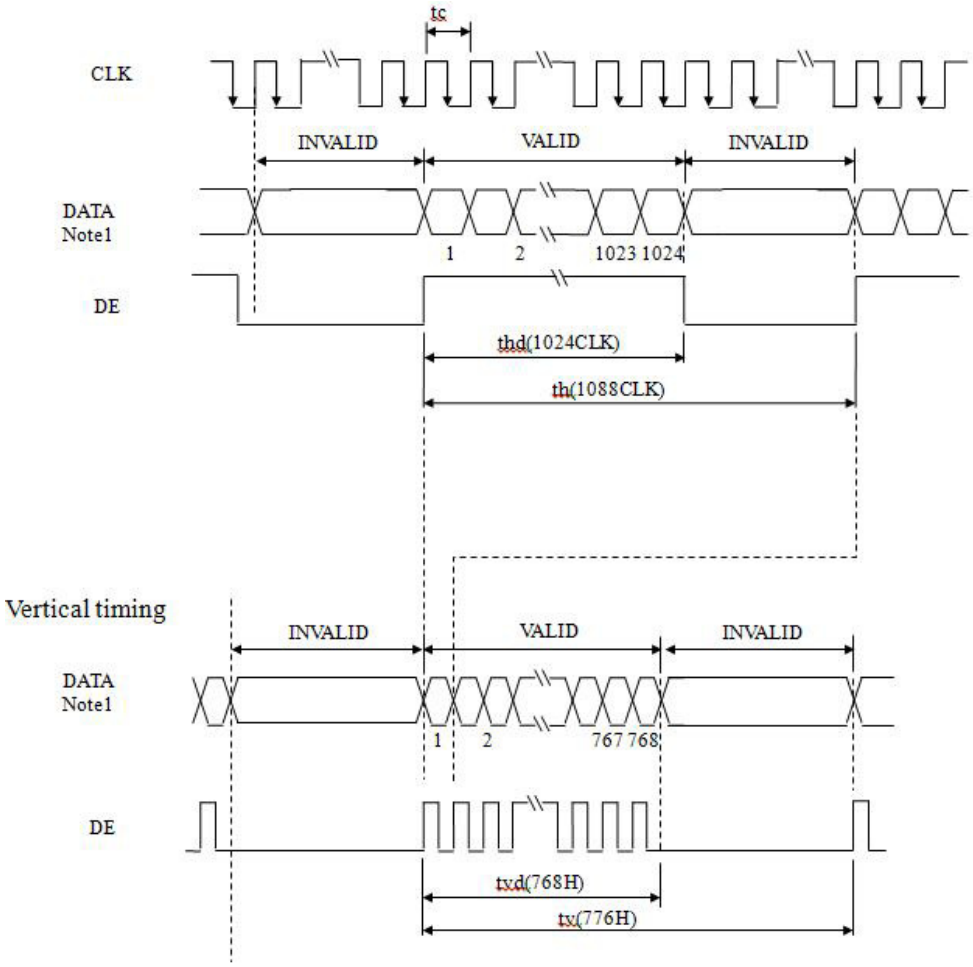
6. Timing Characteristics

6.1 Timing Characteristics

Parameter			Symbol	min.	typ.	max.	Unit	Remarks
CLK	Frequency		1/tc	50.34	50.66	65.34	MHz	19.739ns (typ.)
DE	Horizontal	Cycle	th	-	21.477	-	μs	46.561 kHz (typ.)
				1084	1,088	1214	CLK	
		Display period	thd	1024			CLK	-
	Vertical (One frame)	Cycle	tv	-	16.666	-	ms	60.0Hz (typ.)
				774	776	897	H	
		Display period	tvd	768			H	-

Note1: Definition of parameters is as follows:
tc= 1CLK, th= 1H
Note2: See the data sheet of LVDS transmitter.
Note3: Vertical cycle (tv) should be specified in integral multiple of Horizontal cycle (th)

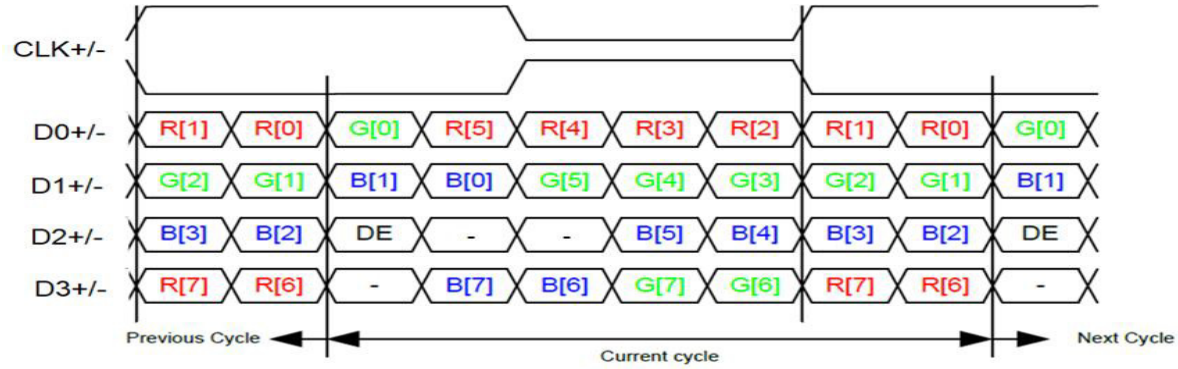
6.2 Input signal timing chart



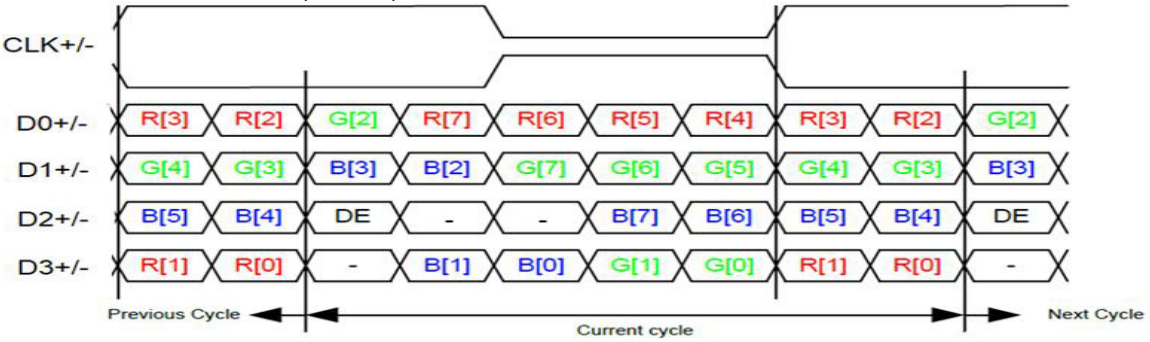
Note1: DATA = R0-R7, G0-G7, B0-B7

6.3 LVDS data input format

Input data signal: 8-bit



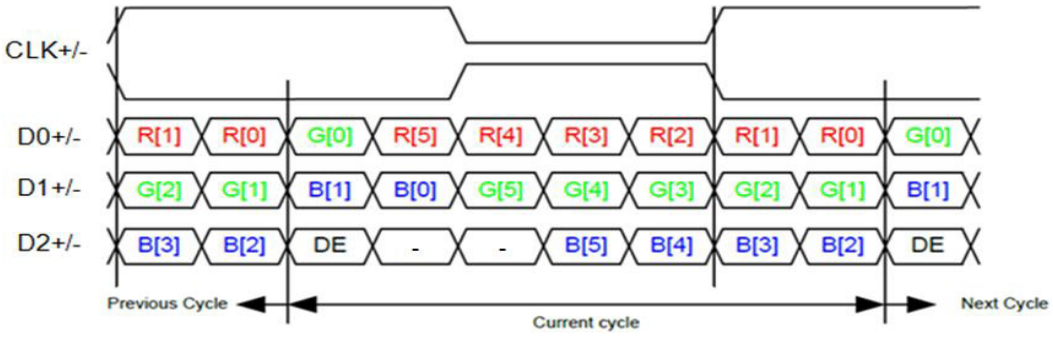
VESA (MAP B) format



JEIDA (MAP A) format

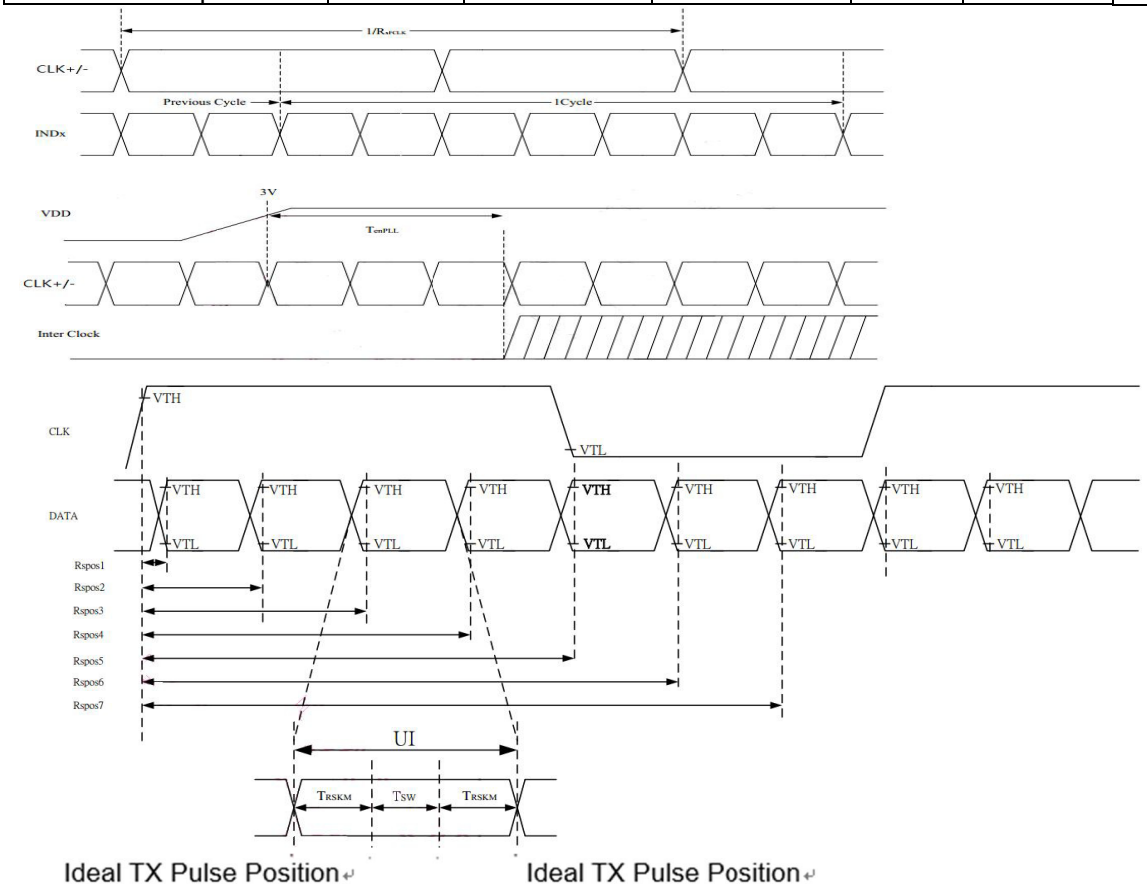
Note1: LSB (Least Significant Bit) – R0, G0, B0, MSB (Most Significant Bit) – R7, G7, B7
Note2: Twist pair wires with 100Ω (Characteristic impedance) should be used between LCD panel signal processing board and LVDS transmitter.

Input data signal: 6-bit



6.4 LVDS RX AC SPEC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	RXFCLK	10	-	110	MHz	
1 data bit time	UI	1/7	1/RXFCLK			
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	
Input data skew margin	TRSKM	-	-	0.2	UI	|VID|=100mV RXVCM=1.2V RXFCLK=75MHz
Clock high time	TLVCH	-	4/(7*RXFCLK)	-	ns	
Clock low time	TLVCL	-	3/(7*RXFCLK)	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	



TRSKM: Receiver strobe margin
Tsw : Strobe width (internal data sampling window)
VTH=Rxvcm+|VID|/2, VTL=Rxvcm-|VID|/2

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	70	88	-	Degree	Note 2
		θB		70	88	-		
		θL		70	88	-		
		θR		70	88	-		
Contrast Ratio		CR	θ=0°	800	1000	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	25	35	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.253	0.303	0.353	-	Note5 Note1
		y		0.287	0.337	0.387		
	Red	x		0.589	0.639	0.689		
		y		0.286	0.336	0.386		
	Green	x		0.238	0.288	0.338		
		y		0.568	0.618	0.668		
	Blue	x		0.099	0.149	0.199		
		y		0.017	0.067	0.117		
Uniformity		U	-	75	80	-	%	Note1 Note6
NTSC		-	-	65	72	-	%	Note 5
Luminance		L	-	400	500	-	cd/m^2	Note1

Table 7.1 Optical Parameters

Test Conditions:

1. The ambient temperature is 25±2℃.humidity is 65±7%
2. The test systems refer to Note 1 and Note 2.

stable forward current should be input, the ambient temperature is 25℃

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.

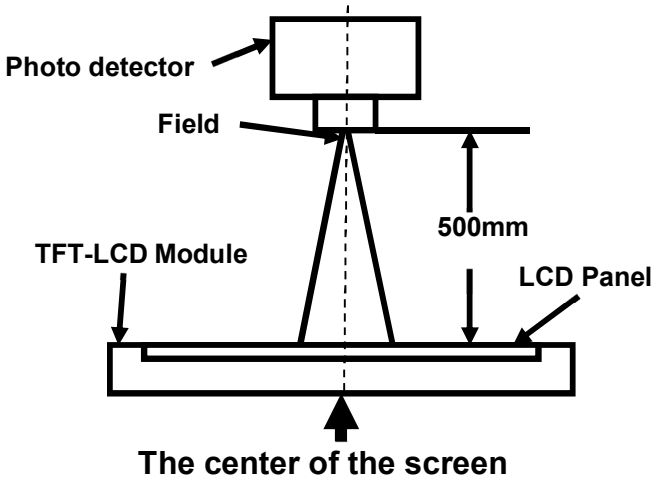


Fig1. Measurement Set Up

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

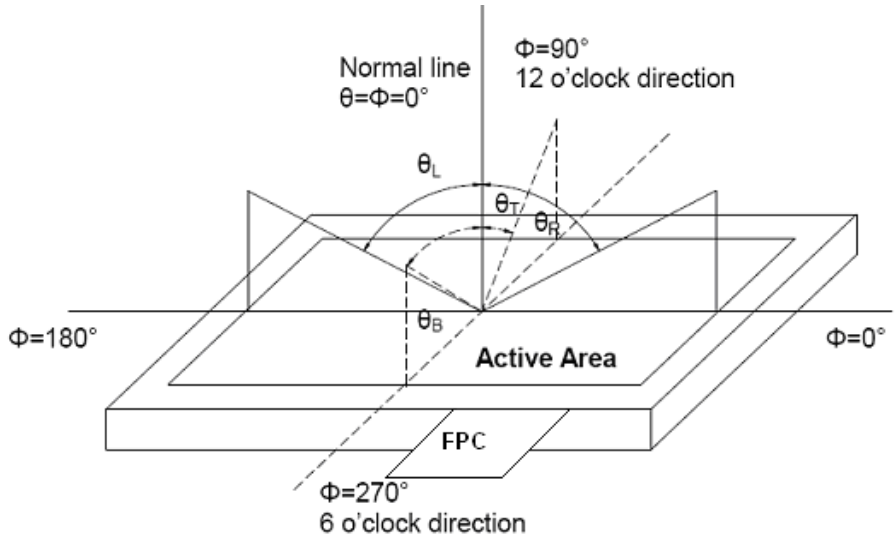


Fig2. Measurement viewing angle

Note3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

The luminance of white and black should be measured at perpendicular direction.

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%.

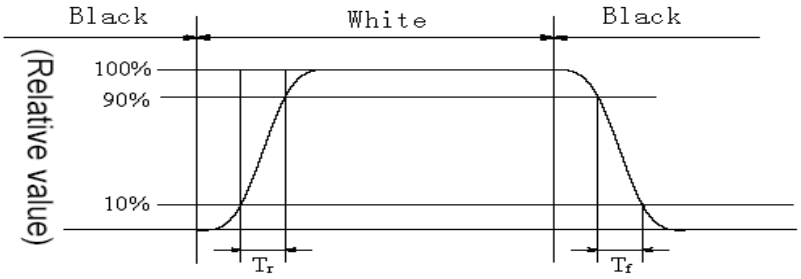


Fig4. Response Time Testing(SFT)

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) = 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

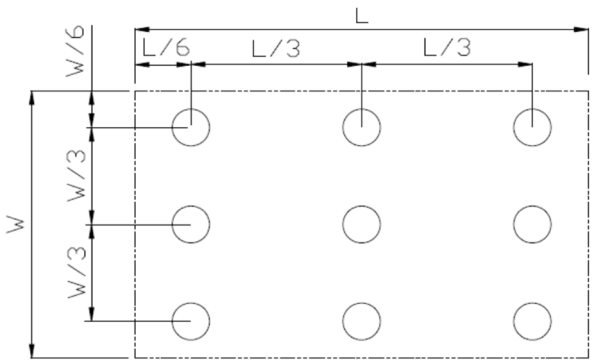


Fig5. Luminance Uniformity Measurement Locations (9 points)

Note7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	Ta = +80℃,240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Operation	Ta = -30℃, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +90℃, 240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -40℃, 240 hours	IEC60068-2-1 GB2423.1
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	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,9point/panel Air: ±15Kv,5 times Contact: ±8Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa) Level C is acceptable.	IEC61000-4-2 GB/T17626.2
8	Vibration Test (Non Op)	5~100HZ，19.60m/s2 1min/cycle 120times Per X/Y/Z	IEC60068-2-6 GB/T17626.6
9	Mechanical Shock (Non Op)	539m/s2, 11ms 5times ±X,±Y,±Z	IEC60068-2-27 GB/T2423.5

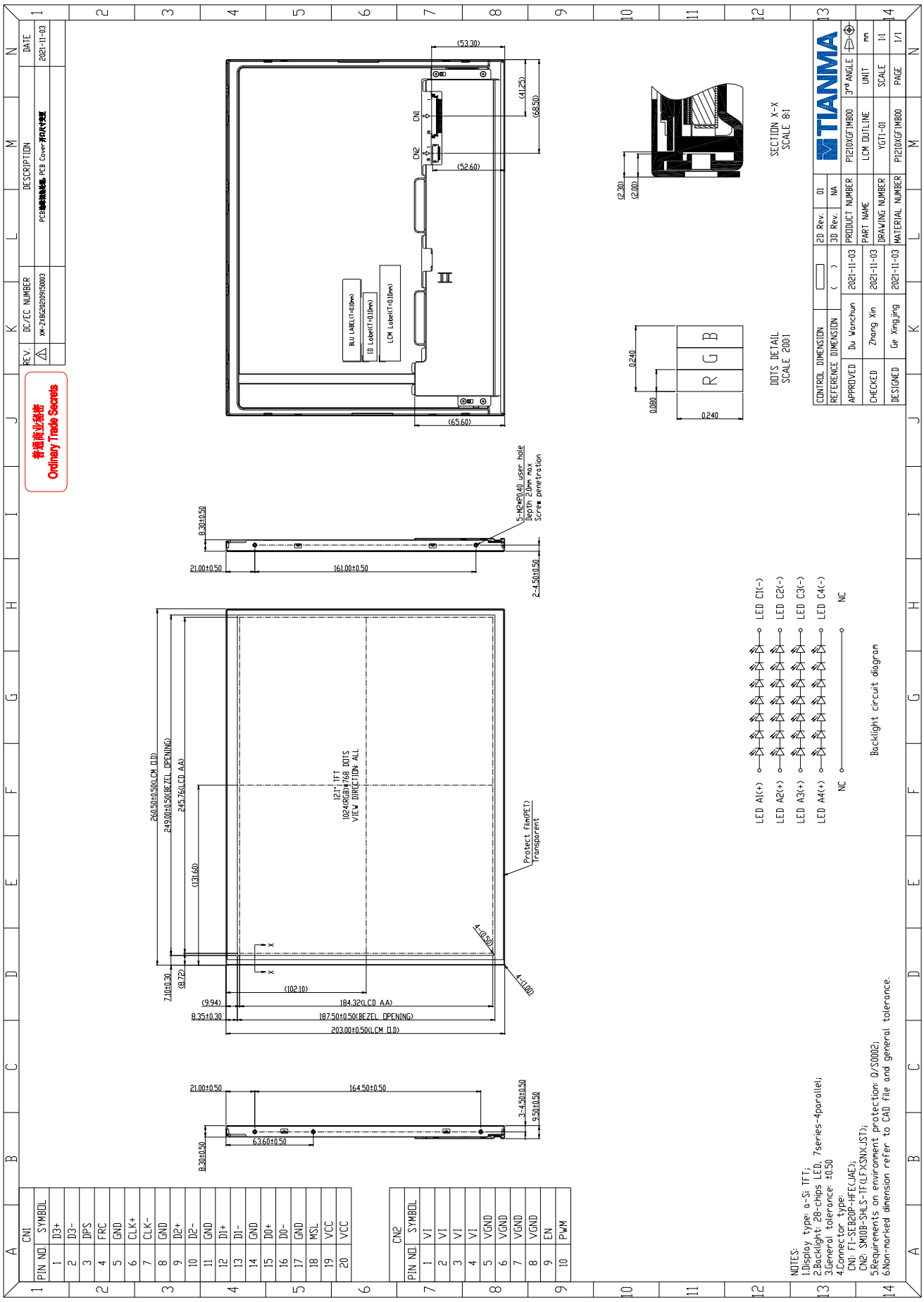
Table 8.1 RA test condition

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.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

9. Mechanical Drawing

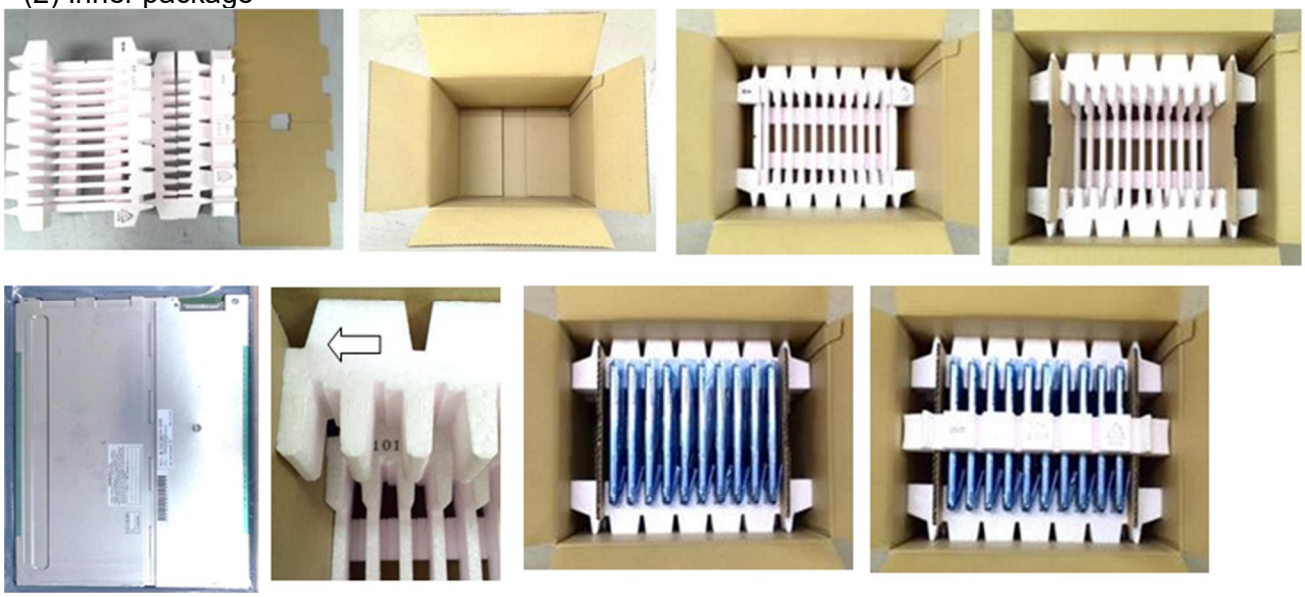


10. Packing Instruction

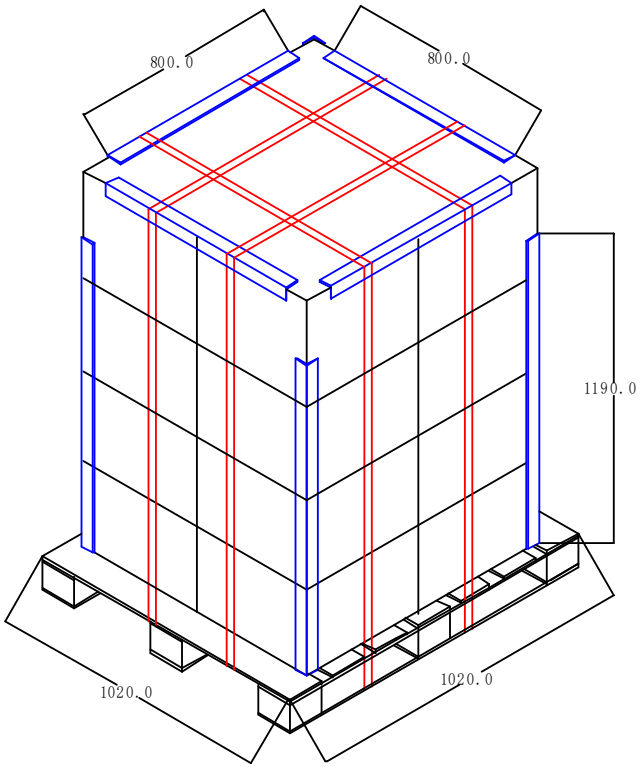
No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	P1210XGF1MB00	260.5×203×9.5	0.55	10	
2	Partition broad	Corrugated paper	271×215	0.032	2	
3	Anti-static Bag	LD-PE	435×325×0.05	0.015	10	
4	EPP-Bottom	EPP	430×390×140	0.116	1	
5	EPP-Top	EPP	430×90×40	0.017	1	
6	Carton	Corrugated paper	433×395×310	1.068	1	
7	Total weight	6.92 Kg±5 %				

(1) single piece package:

(2) Inner package



Stock method (2*2*4)



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 ℃/ humidity30% ~ 75%.
(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

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DATA MODUL AG

Landsberger Straße 322
DE-80687 Munich
Phone: +49-89-56017-0

DATA MODUL WEIKERSHEIM GMBH

Lindenstraße 8
DE-97990 Weikersheim
Phone: +49-7934-101-0

More information and worldwide locations can be found at
DATA MODUL AG I www.data-modul.com