

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
3.2 CN2 Pin assignment (Back Light)	4
4. ABSOLUTE MAXIMUM RATINGS	5
5. ELECTRICAL CHARACTERISTICS	6
5.1 DC Characteristics for Panel Driving	6
5.2 LVDS mode DC electrical characteristics	6
5.3 DC Characteristics for Backlight Driving	7
5.4 Recommended Power ON/OFF Sequence	7
5.5 LCD Module Block Diagram	8
5.6 Fuse	8
6. TIMING CHARACTERISTICS	9
6.1 AC characteristics	9
6.2 Data Input Timing Parameter Setting	10
6.3 Timing Diagram	11
6.4 LVDS Data Mapping(VESA Standard)	11
7. OPTICAL CHARACTERISTICS	12
8. RELIABILITY TEST	15
9. MECHANICAL DRAWING	16
10. PACKING INSTRUCTION	17
11. PRECAUTIONS FOR USE OF LCD MODULES.....	18
11.1 Handling Precautions	18
11.2 Storage precautions	18
11.3 Transportation Precautions	18
11.4 Screen saver Precautions	18
11.5 Safety Precautions	18

1. Summary

1.1 General Description

This is a 10.4 inch a-Si TFT-LCD module with Normal-Black technology. It is composed of a TFT-LCD panel, driver IC, PCB, and a LED backlight unit.

1.2 Features

- Display mode (SFT, Normally black)
- Wide view angle(88/88/88/88)
- High luminance(1300nits)
- Long LED life time (100K Hrs)
- Interface(1 port LVDS)
- Anti-vibration, vibration level(6.8G)
- Surface treatment(AG)
- 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	10.4	inches
	Resolution	1024(RGB)x768	
	Pixel Pitch	0.2055x0.2055	mm
	TFT Active Area	210.432x157.824	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	Anti-Glare	
	Viewing Direction	all	
Mechanical Characteristics	LCM (W x H x D)	230.00x180.2x9.5	mm
	Weight	430	g
Optical Characteristics	Luminance	1300	cd/m ²
	Contrast Ratio	1000:1	
	NTSC	50	%
	Viewing Angle	88/88/88/88	degree
Electrical Characteristics	Interface	1port LVDS	
	Color Depth	262K/16.7 M	color
	Power Consumption	LCD: 1485 Backlight: 8928	mW

Table 2.1 General TFT Specifications

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
Connector type	JAE FI-SEB20P-HFE
Matching connector	FI-S20S or compatible

Table 3.1.1 Connector information

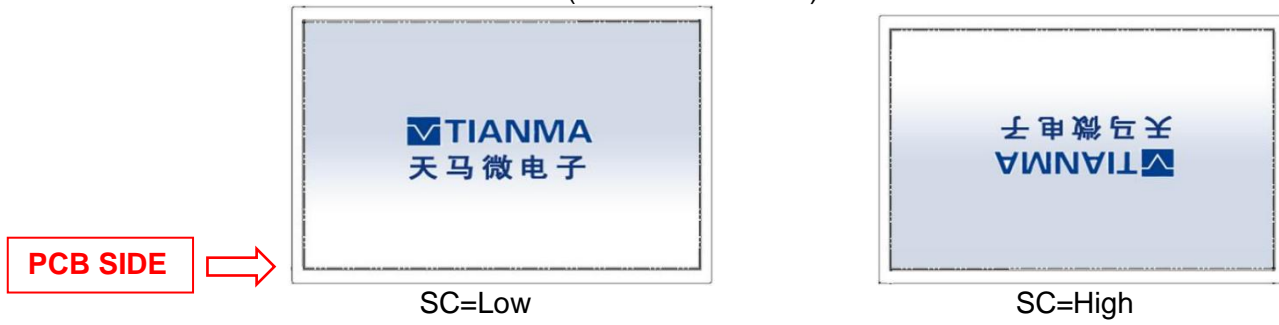
No.	Name	Symbol	Pin Function Description	Remark
1	VCC	P	Power supply(+3.3V)	
2	VCC	P	Power supply(+3.3V)	
3	GND	P	Ground	
4	GND	P	Ground	
5	Link 0-	I	- LVDS differential data input(R0~R5,G0)	
6	Link 0+	I	+ LVDS differential data input(R0~R5,G0)	
7	GND	P	Ground	
8	Link 1-	I	- LVDS differential data input(G1~G5,B0~B1)	
9	Link 1+	I	+ LVDS differential data input(G1~G5,B0~B1)	
10	GND	P	Ground	
11	Link 2-	I	- LVDS differential data input (B2~B5,-,-,DE)	
12	Link 2+	I	+ LVDS differential data input (B2~B5,-,-,DE)	
13	GND	P	Ground	
14	CLKIN-	I	- LVDS differential data input	
15	CLKIN+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	Link 3-	I	- LVDS differential data input(R6~R7,G6~G7,B6~B7)	
18	Link 3+	I	+ LVDS differential data input(R6~R7,G6~G7,B6~B7)	
19	MODE	I	6-bit/8-bit input select. MODE low :6-bit MODE high : 8-bit MODE is pull-down to GND with a 11kΩ resistor internally	Don't leave it open.
20	SC	I	Display direction select. SC low: Up to down, left to right. SC high :Down to up, right to left. SC is pull-down to GND with a 11kΩ resistor internally	Don't leave it open.

Table 3.1.2 Pin Assignment for LCD Interface

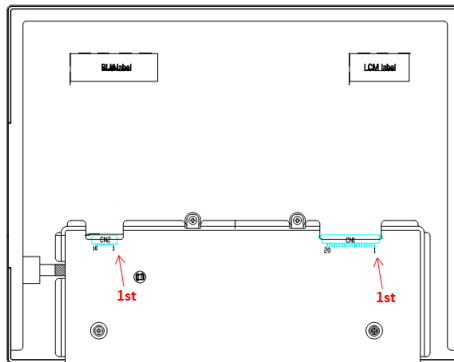
Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

Note3: Scan direction is shown as below(PCB at down side):



Note4: 1st pin location (back side view)



3.2 CN2 Pin assignment (Back Light)

Connector Information	
Connector type	SM10B-SHLS-TF(LF)(SN)
Matching connector	SHLP-10V-S-B or compatible

Table 3.2.1 Connector information

No.	Name	Symbol	Pin Function Description	Remark
1	NC	-	No connection	
2	NC	-	No connection	
3	LED_K1		LED Cathode 1	
4	LED_A1		LED Anode1	
5	LED_A2		LED Anode2	
6	LED_K2		LED Cathode 2	
7	LED_K3		LED Cathode 3	
8	LED_A3		LED Anode3	
9	LED_A4		LED Anode4	
10	LED_K4		LED Cathode 4	

Table 3.2.2 Pin Assignment for Back Light Interface

4. Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.5	5.0	V	Note1
Input voltage	V _{IN}	-0.5	5.0	V	
Operating Temperature	Top	-30	80	°C	
Storage Temperature	Tst	-40	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 Ratings

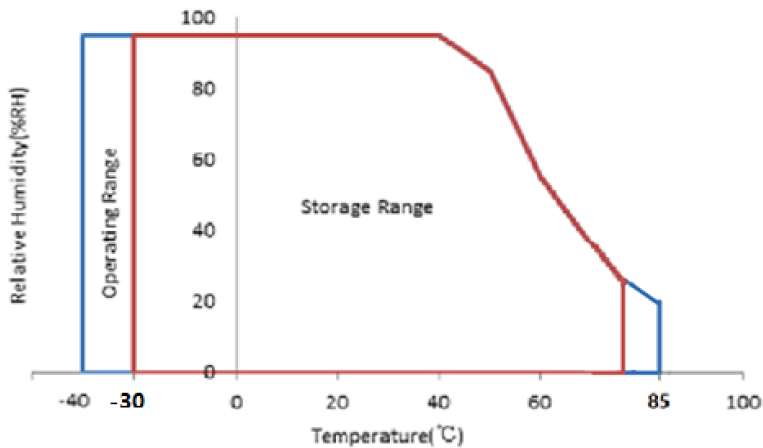


Figure 4.2 Absolute Maximum Ratings chart

Note1: Input voltage include all input data (Logic circuit).

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. 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 destroyed

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage	VCC	3.0	3.3	3.6	V	Include ripple
Power supply ripple	Vp-p	-	-	100	mV	
Power supply current	ICC	300	450	675	mA	
Differential input voltage	V _{id}	200	-	600	mV	
Differential input common voltage	V _{cm}	-	1.2	-	V	
Differential input threshold voltage	Low level	V _T L	-100	-	-	mV
	High level	V _T H	-	-	100	mV
Input Signal Voltage	Low	V _{IL}	0	-	0.3xVCC	V
	High	V _{IH}	0.7xVCC	-	VCC	V
Power Consumption	P	--	1485	--	mW	White pattern

Table 5.1 DC Characteristics

5.2 LVDS mode DC electrical characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Differential Input high Threshold voltage	R _{xVTH}	-	-	+0.2	V	R _{xVCM} =1.2V
Differential Input Low Threshold voltage	R _{xVTL}	-0.2	-	-	V	
Input voltage range (signaled-end)	R _{xVIN}	0	-	VCC-1.2	V	
Differential Input common Mode voltage	R _{xVCM}	V _{ID} /2	-	VCC-1.2- V _{ID} /2	V	
Differential Input voltage	V _{ID}	0.2	-	0.6	V	

Table 5.2 LVDS DC characteristics

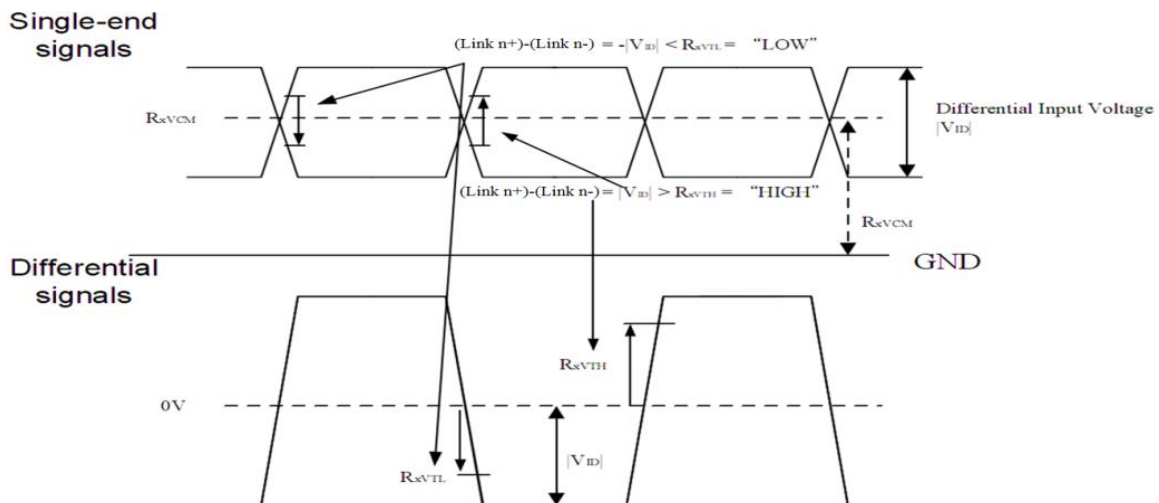


Figure 5.2 LVDS DC characteristics

5.3 DC Characteristics for Backlight Driving

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	480	--	mA	24 LEDs (4 LED Parallel, 6 LED Serial)
Forward Current Voltage	V_F	--	18.6	20.4	V	
Backlight Power Consumption	W_{BL}	--	8928	--	mW	
LED life time	--	70000	100000	--	Hrs	

Table 5.3 LED Backlight Characteristics

Note1: I_F is defined for total channel.

Note2: Optical performance should be evaluated at $T_a=25^\circ\text{C}$ only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data.

5.4 Recommended Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC on to VCC stable	t_1	1	-	20	ms	-
VCC stable to signal on	t_2	35	-	-	ms	-
Signal off before VCC off	t_3	0	-	35	ms	-
VCC off to next VCC on	t_4	500	-	-	ms	-
Signal on to VLED on	t_5	200	-	-	ms	Recommended value
VLED off before signal off	t_6	200	-	-	ms	-

Table 5.4 Power on/off sequence

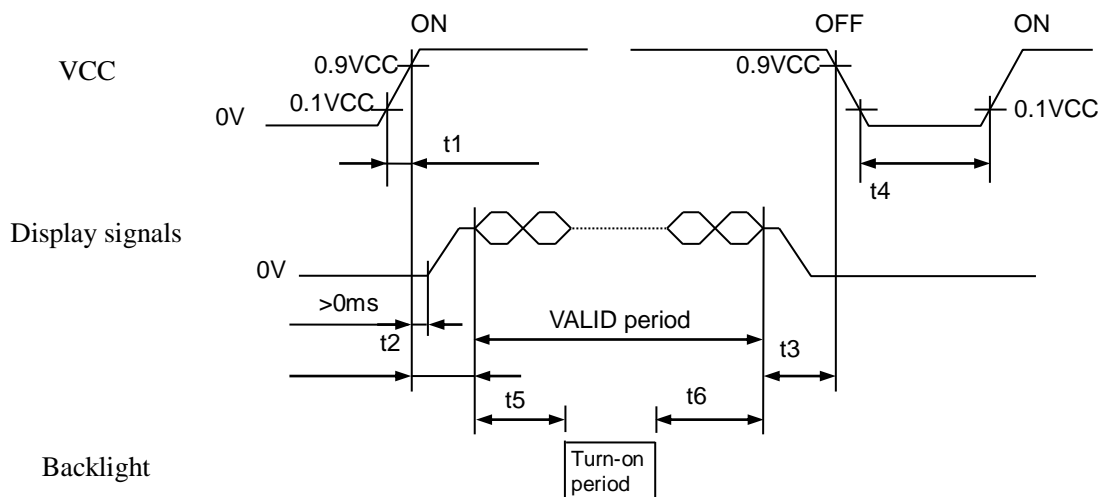


Figure 5.4 Power on/off sequence

Note1: The low level of these signals and analog powers are GND level.

Note2: 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.

Note3: LED is the voltage applied to backlight. Keep it turned off until the display has stabilized.

5.5 LCD Module Block Diagram

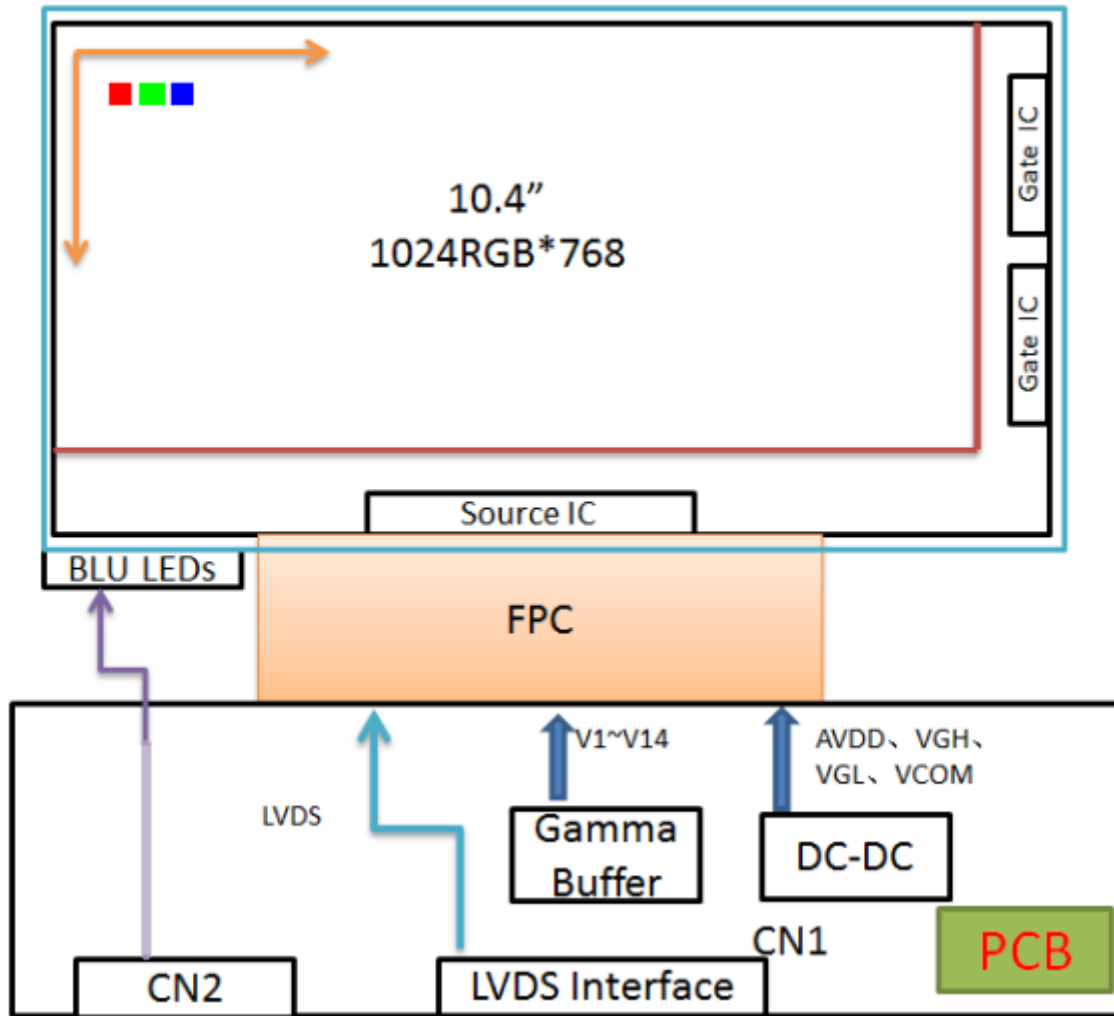


Figure 5.5 LCD Module Block Diagram

5.6 Fuse

Parameter	Fuse		Rating	Clear-time at 25°C	
	Type	Supplier			
VCC	F0603HI2000V032T	AEM	32V 2A	4 A	60 seconds(max)

Table 5.6 Fuse parameter

Note: The power supply's rated current must be more than the fusing current. If it is less than the fusing current, the fuse may not blow in a short time, and then nasty smell, smoke and so on may occur.

6. Timing Characteristics

6.1 AC characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Clock frequency	R_{xFCLK}	53	-	71	MHz	
Input data skew margin	T_{RSKM}	-	-	500	ps	$ V_{ID} =400mV$ $R_{xVCM}=1.2V$ $R_{xFCLK}=71MHz$
Clock high time	T_{LVCH}	-	$4/(7 * R_{xFCLK})$	-	ns	
Clock low time	T_{LVCL}	-	$3/(7 * R_{xFCLK})$	-	ns	
PLL wake-up time	T_{enPLL}	-	-	150	μs	

Table 6.1 LVDS AC Characteristics

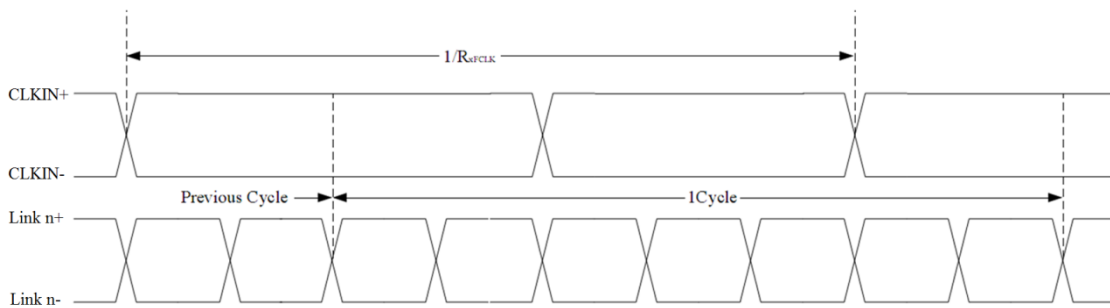


Figure 6.1.1 LVDS mode AC electrical characteristics 1

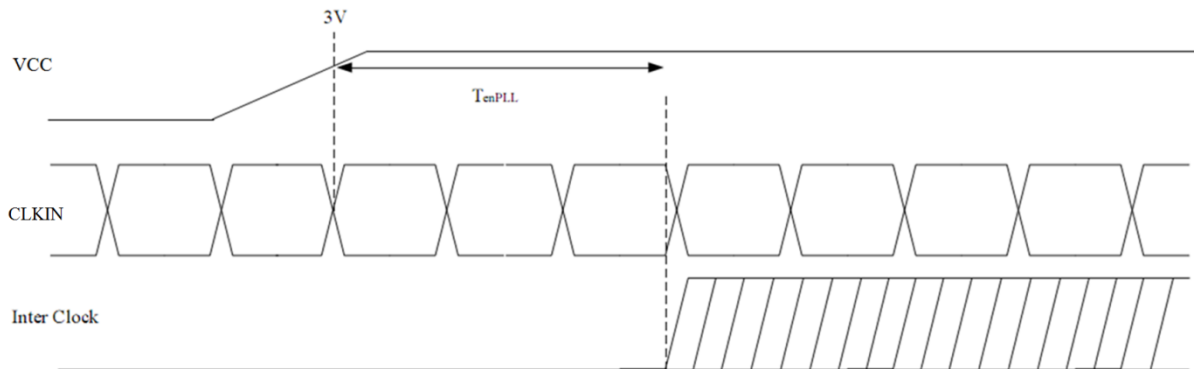


Figure 6.1.2 LVDS mode AC electrical characteristics 2

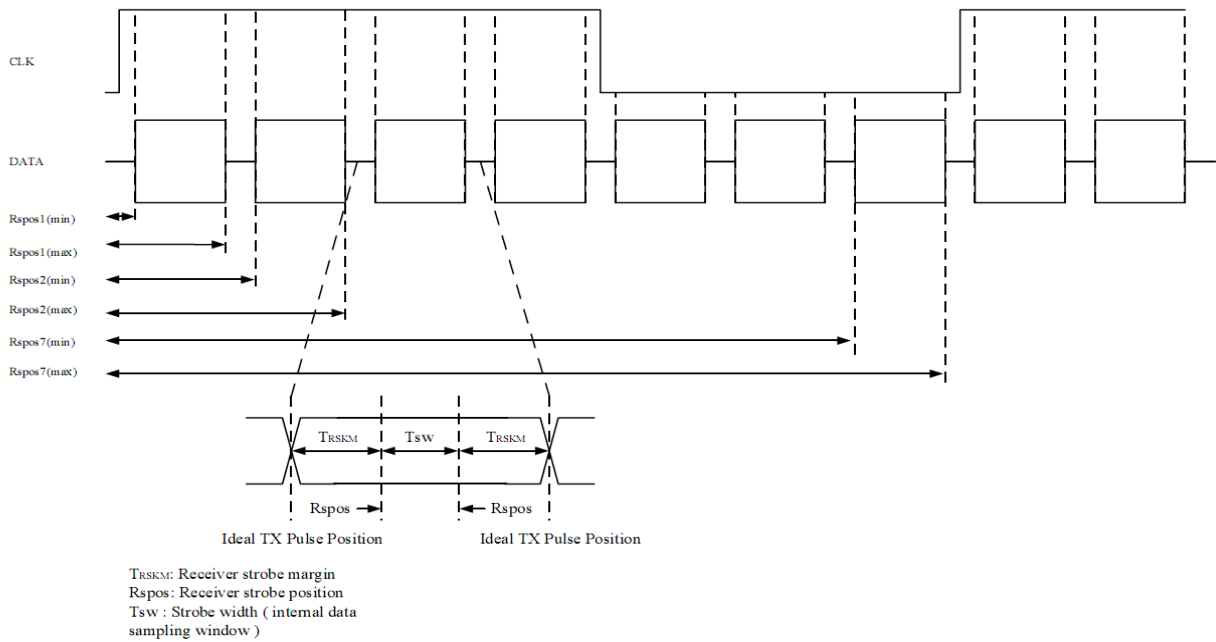


Figure 6.1.3 LVDS mode AC electrical characteristics 3

6.2 Data Input Timing Parameter Setting

Parameter	Symbol	Min	Typ	Max	Unit	Remark
CLK frequency	1/t _{clk}	53	65	71	MHz	
Horizontal blanking time	thbt	112	320	376	t _{clk}	thbp + thfp=(160+160)
Horizontal display area	thd	1024			t _{clk}	
Horizontal period	th	1136	1344	1400	t _{clk}	
Vertical blanking time	tvbt	10	38	77	th	tvbp + tvfp=(23+15)
Vertical display area	tvd	768			th	
Vertical period	tv	778	806	845	th	
Frame Rate	F	-	60	-	Hz	

Table 6.2 Data Input Timing Parameters(DE mode)

Note: Normal setting as below

thbp=160, thfp=160, tvbp=23, tvfp=15, horizontal/vertical pulse width=2

6.3 Timing Diagram

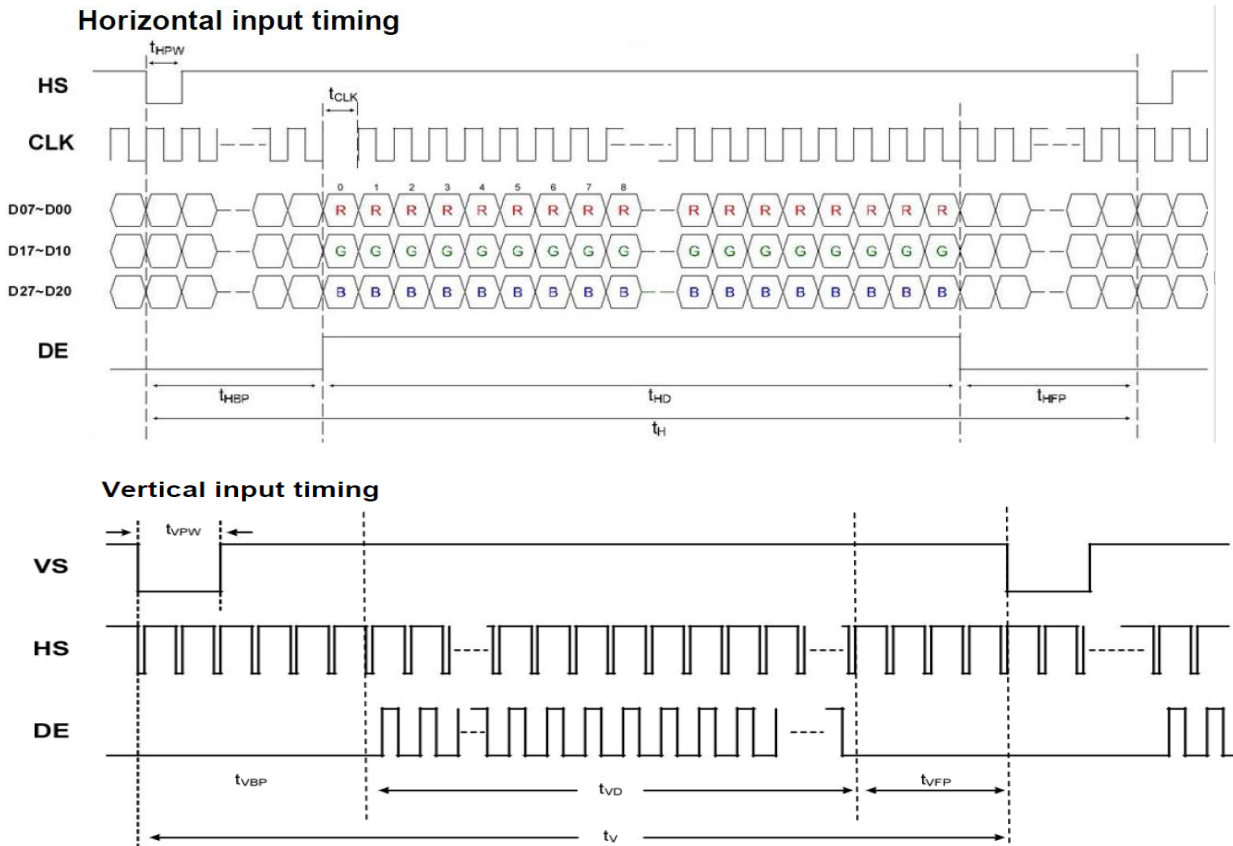


Figure 6.3.2 Input timing

6.4 LVDS Data Mapping(VESA Standard)

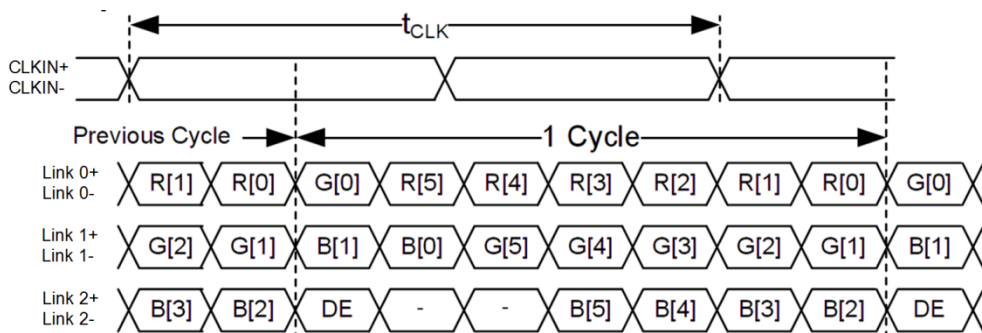


Figure 6.4.1 Data Input Format for LVDS when MODE=L(6bit)

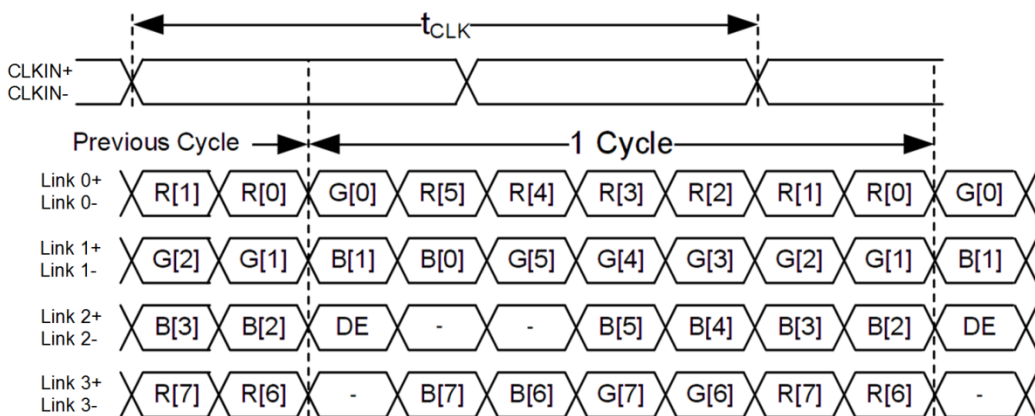


Figure 6.4.2 Data Input Format for LVDS when MODE=H(8bit)

7. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	$CR \geq 10$	78	88	-	Degree	Note 2
	θB		78	88	-		
	θL		78	88	-		
	θR		78	88	-		
Contrast Ratio	CR	$\theta=0^\circ$	800	1000	-		Note1 Note3
Response Time	T_{ON}	25°C	-	35	50	ms	Note1 Note4
	T_{OFF}						
Chromaticity	White	Backlight is on	x	0.263	0.313	0.363	Note1 Note5
			y	0.279	0.329	0.379	
	Red		x	0.563	0.613	0.663	
			y	0.283	0.333	0.383	
	Green		x	0.289	0.339	0.389	
			y	0.539	0.589	0.639	
	Blue		x	0.099	0.149	0.199	
			y	0.075	0.125	0.175	
Uniformity	U		75	80	-	%	Note1 Note6
NTSC	N		45	50	-	%	Note 5
Luminance (Without TP)	L		1150	1300	-	cd/m ²	Note1 Note7

Table 7.1 Optical Parameters

Test Conditions:

1. $I_F= 480$ mA, and the ambient temperature is 25°C.
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.

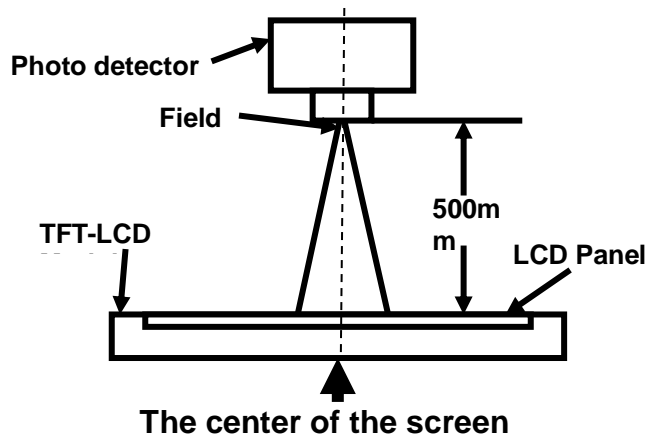


Fig1. Measurement Set Up

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

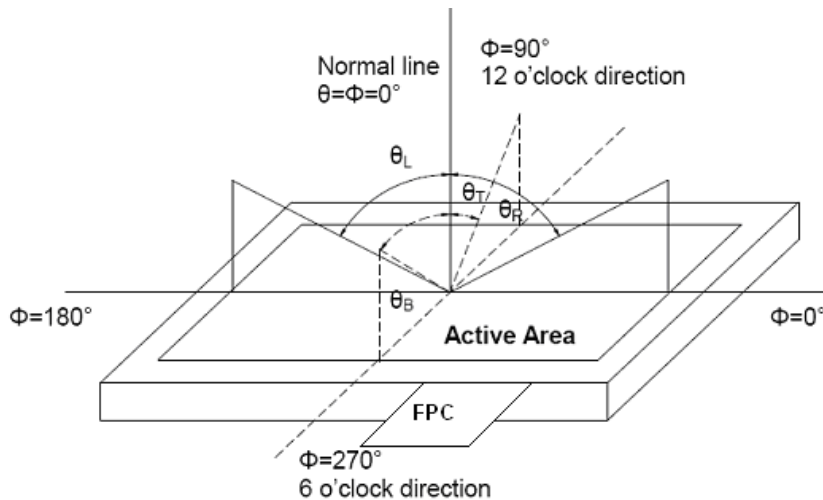


Fig2. Measurement viewing angle

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%.

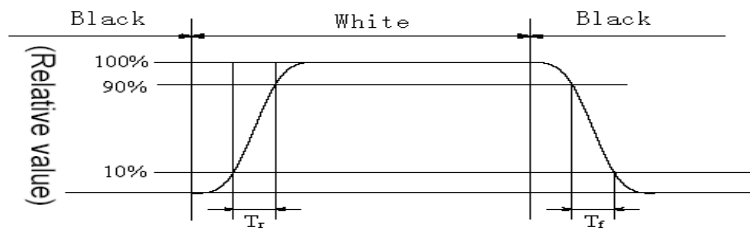


Fig3. Response Time Testing

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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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

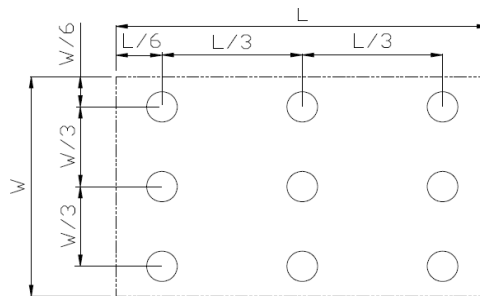


Fig4. Luminance Uniformity Measurement Locations (9 points)

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°C, 500 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Operation	Ta = -30°C, 500 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +85°C, 500 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -40°C, 500 hours	IEC60068-2-1 GB2423.1
5	High Temperature and Humidity Operation	Ta = +60°C, 90% RH max, 500 hours	IEC60068-2-78 GB/T2423.3
6	Thermal Shock (non-operation)	-40°C 30 min~+85°C 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,25times; Contact:±8Kv,25times (Environment:15°C~35°C, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.6
8	Vibration Test (non-operation)	Vibration level: 66.64m/s ² (6.8G) Waveform: sinusoidal Frequency range: 20~500Hz Frequency sweep rate: 0.5 octave/min Duration: one sweep from 20 to 500Hz in each of three mutually perpendicular axis(each x,y,z axis:1hour,total 3hrs)	GB/T 2423.10-2019; GB/T 2423.56-2018
9	Shock Test	Shock level:1470m/s ² (150G) Waveform: half sinusoidal wave,2ms Number of shocks: one shock input in each direction of three mutually perpendicular axis for a total of six shock inputs	GB/T 2423.5-2019
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	GB/T 4857.5-1992
11	Package Vibration	Frequency : 5-20-200HZ , PSD : 0.01-0.01-0.001 Total:0.781g ² /HZ, x/y/z axis per 30min)	GB/T 4857.23-2012

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

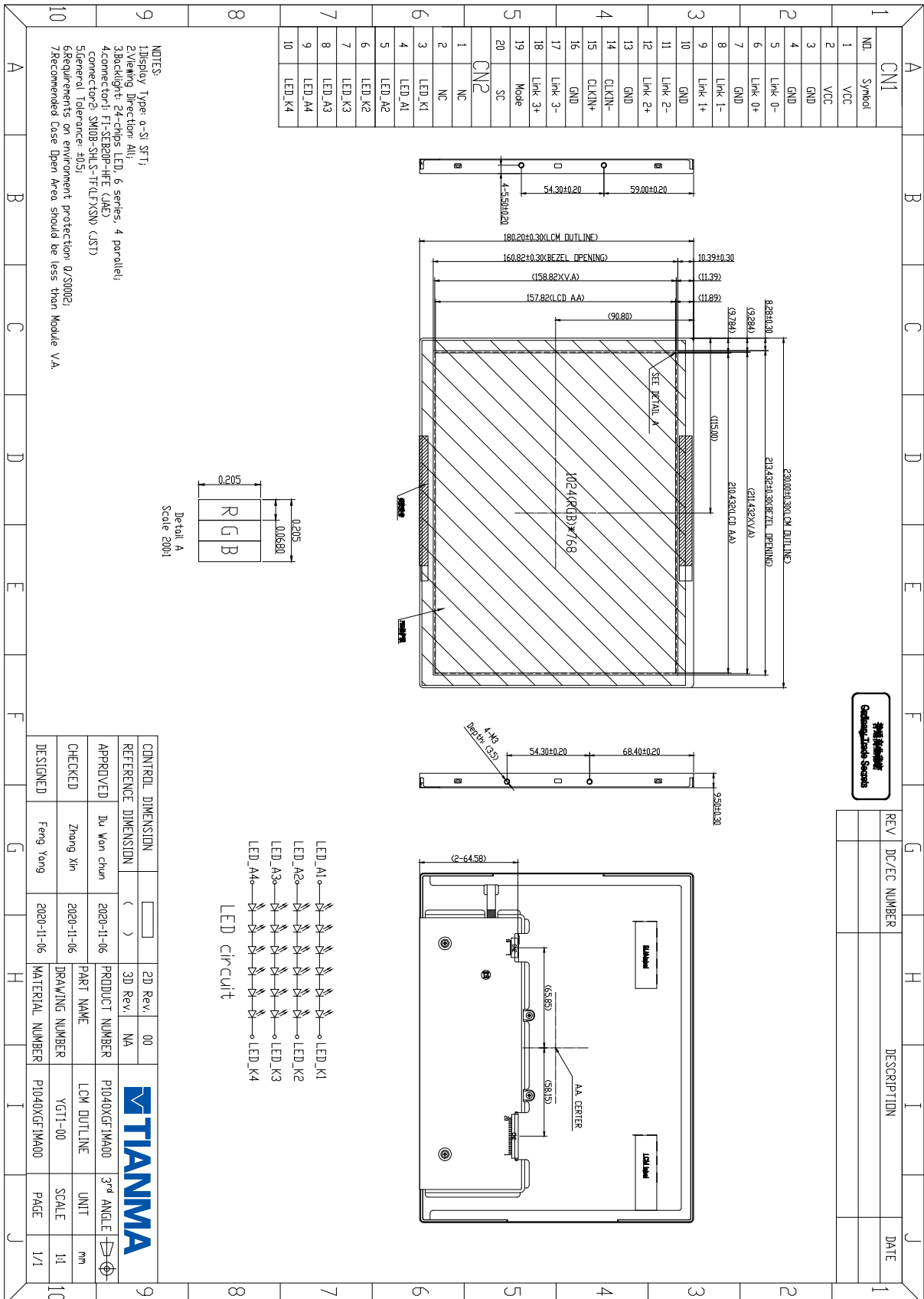


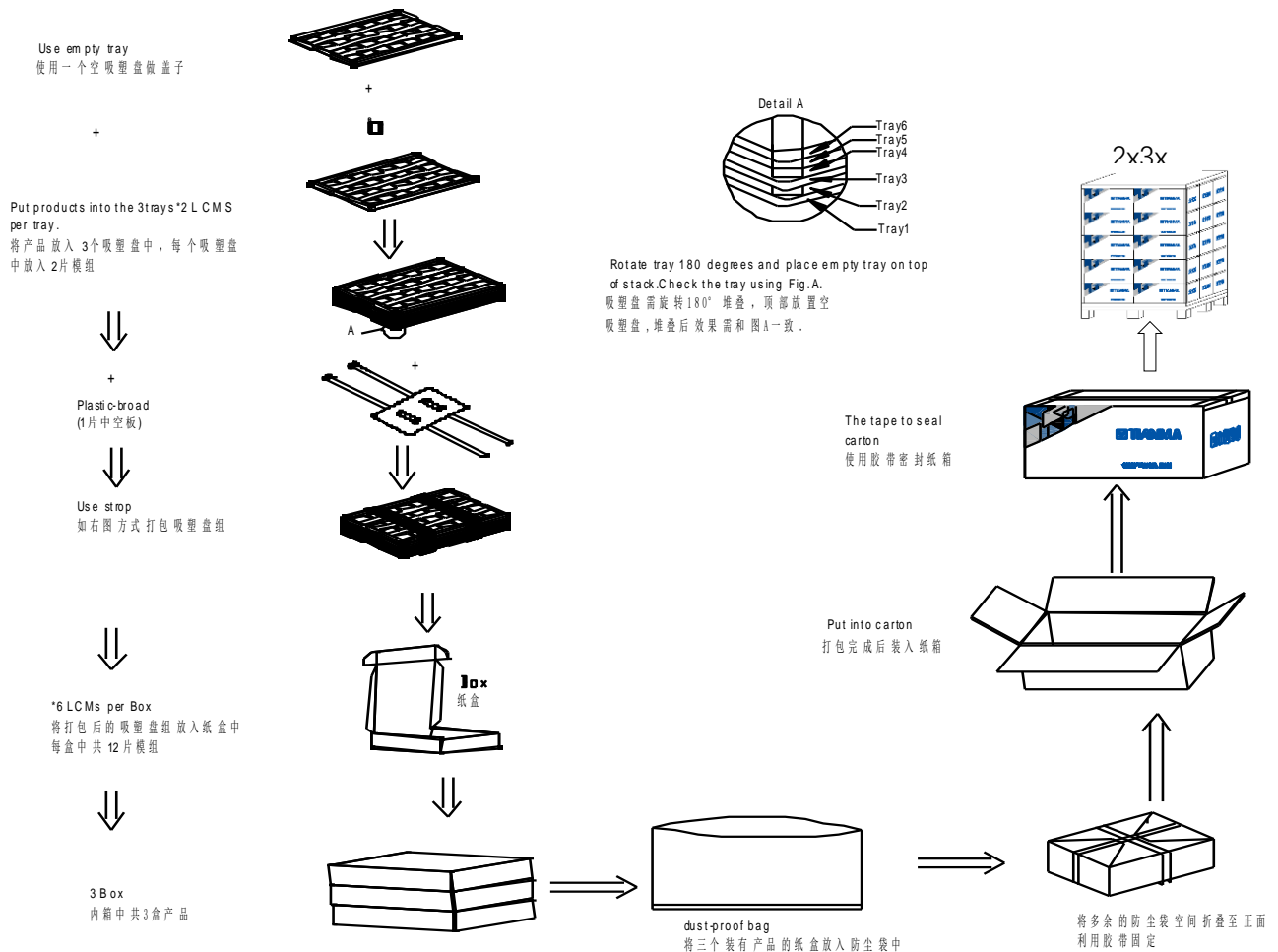
Fig9. Mechanical drawing

10. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM	P1040XGF1MA00	230.00x180.2x9.5	0.430	18	
2	Tray	PET(Transmit)	485x330x21.5	0.215	12	
3	Dust-Proof Bag	PE	235mm x 150mx 0.05	---	1	
4	Box	Corrugated paper	520x345x74	0.388	3	
5	Carton	Corrugated paper	544x365x250	1.01	1	
6	Plastic Board	EPE	485x330x5	0.05	3	
7	Total weight	12.64 ±5% Kg				

Table10.Packing instruction

Note: LCM quantity per tray:2 pcs. Total LCM quantity in Carton: 2x 9=18 pcs



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.