TIANMA

MODEL NO   :   __TM103XDGP01__

MODEL VERSION: __00__

SPEC VERSION :   __2.0__

ISSUED DATE: __2020-06-24__

☐Preliminary Specification
■Final Product Specification

Customer : _____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Bei Lei	Longping Deng	Minhong Kim

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
2.0	2020-06-24	Final Specification Release.	Bei Lei

1. General Specifications

Feature		Spec
Display Spec.	Size	10.25inch
	Resolution	1920(RGB) X 720
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.1269 x 0.1269
	Display Mode	Normally Black
	Surface Treatment	HC
	Viewing Direction	All
	Gray Scale Inversion Direction	N/A
Mechanical Characteristics	LCM (W x H x D) (mm)	262.04x110.30x8.4
	Active Area(mm)	243.65 x 91.37
	With /Without TSP	Without TSP
	Connection Type	LCM:JUSTCONN 101049-205050 BL:JUSTCONN 101049-201050
	LED Numbers	24LEDs
	Weight (g)	447
Electrical Characteristics	Interface	LVDS 8-bit VESA
	Color Depth	16.7M
	Driver IC	NT51625*3+NT52602*1

Note 1: Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: ± 5%

2 Input/Output Terminals

2.1 Pin assignment (TFT Interface)

Recommend connector: JUSTCONN 101049-205050

No	Symbol	I/O	Description	Remarks
1	GND	P	Ground	
2	GND	P	Ground	
3	GND	P	Ground	
4	VDD	P	Power supply for LCD. (VDD=3.3V)	
5	VDD	P	Power supply for LCD. (VDD=3.3V)	
6	VDD	P	Power supply for LCD. (VDD=3.3V)	
7	VDD	P	Power supply for LCD. (VDD=3.3V)	
8	GND	P	Ground	
9	NC(SDA)	N	Tianma internal used Custom must floating	
10	NC(SCL)	N	Tianma internal used Custom must floating	Note1
11	NC(CSB)	N	Tianma internal used Custom must floating	
12	GND	P	Ground	
13	OLV0N	I	Odd LVDS data input 0-	
14	OLV0P	I	Odd LVDS data input 0+	
15	GND	P	Ground	
16	OLV1N	I	Odd LVDS data input 1-	
17	OLV1P	I	Odd LVDS data input 1+	
18	GND	P	Ground	
19	OLV2N	I	Odd LVDS data input 2-	
20	OLV2P	I	Odd LVDS data input 1+	
21	GND	P	Ground	
22	OLVCKN	I	Odd LVDS Clock input -	
23	OLVCKP	I	Odd LVDS Clock input +	
24	GND	P	Ground	
25	OLV3N	I	Odd LVDS data input 3-	
26	OLV3P	I	Odd LVDS data input 3+	

27	GND	P	Ground	
28	ELV0N	I	Even LVDS data input 0-	
29	ELV0P	I	Even LVDS data input 0+	
30	GND	P	Ground	
31	ELV1N	I	Even LVDS data input 1-	
32	ELV1P	I	Even LVDS data input 1+	
33	GND	P	Ground	
34	ELV2N	I	Even LVDS data input 2-	
35	ELV2P	I	Even LVDS data input 2+	
36	GND	P	Ground	
37	ELVCKN	I	Even LVDS Clock input -	
38	ELVCKP	I	Even LVDS Clock input +	
39	GND	P	Ground	
40	ELV3N	I	Even LVDS data input 3-	
41	ELV3P	I	Even LVDS data input 3+	
42	GND	P	Ground	
43	RESET	I	Global reset pin, active low	
44	STBYB	I	Standby mode setting pin, active low	
45	SHLR	I	Horizontal shift direction(source output)selection	Note 2
46	UPDN	I	Vertical shift direction(gate output)selection	Note 2
47	Fail_T	O	Output for fail detection	Note 3
48	GND	P	Ground	
49	NC	N	No connect	
50	NC(VDD_OTP)	N	Tianma internal used Custom must floating	Note1

I/O definition:

I----Input   O----Output   I/O----Input/Output   P----Power/Ground   N—No Connect

Note 1: Custom must floating
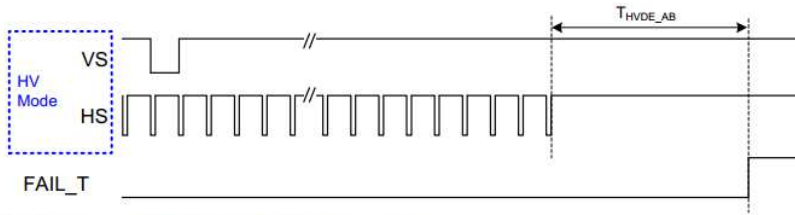Note 2: SHLR and UPDN controlde by customer
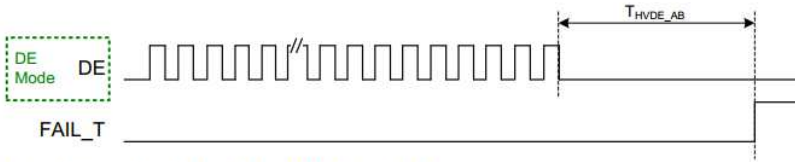
SHLR=H,UPDN=H

SHLR=L,UPDN=H

SHLR=H,UPDN=L

SHLR=L,UPDN=H

Note 3: Fail_T：normally pull L in IC，active "H"(when Hsync or Vsync or Clk miss，this pin will pull "H")

Figure 5. **HV Mode AB_IND operation**

Figure 6. **DE Mode AB_IND Operation**

Note: For 1920RGBx720 resolution, $T_{HVDS\_AB} \sim= 10.7$ms for DE and HS detection.~60ms for VS detection.

The Clock Error Detection function monitors the Clock signal, if the clock pulse stopped longer than the criterion, AB_IND will output High for error indication.
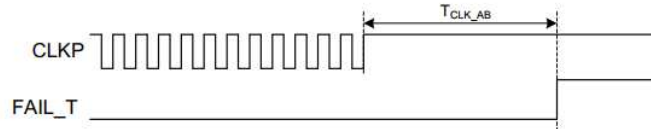
Figure 7. **Clock Error AB_IND Operation**

Note: For 1920RGBx720 resolution, $T_{CLK\_AB} \sim= 234$us

When CLK lost,Tsp_det is about 234us.

When DE/HS lost,Tsp_det is about 10.7ms.

When HV lost,Tsp_det is about 60ms.

Don't connect this pin to an output pin in customer system,it may be connected to input pin or NC.

Please keep no any pull up or pull low resister connect to this pin on your system when this pin is used for fail detection.

2.2 Pin assignment (backlight Interface)

Recommend connector: JUSTCONN 101049-201050

No	Symbol	I/O	Description	Remarks
1	A1	P	LED Anode	
2	A2	P	LED Anode	
3	A3	P	LED Anode	
4	NC	N	Keep this pin open	
5	THER+	O	Thermistor +	
6	THER-	O	Thermistor -	
7	NC	N	Keep this pin open	
8	C3	P	LED Cathode	
9	C2	P	LED Cathode	
10	C1	P	LED Cathode	

I/O definition:

I----Input   O----Output   I/O----Input/Output   P----Power/Ground

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	Min	Max	Unit	Remark
Logic Supply Voltage	VDD	-0.5	5	V	
Operating Temperature	T_{OPR}	-30	85	℃	
Storage Temperature	T_{STG}	-40	90	℃	
Relative Humidity (Note1)	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＞70℃

Note 1: Ta means the ambient temperature.
   It is necessary to limit the relative humidity to the specified temperature range.
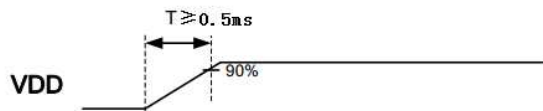   Condensation on the module is not allowed.

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

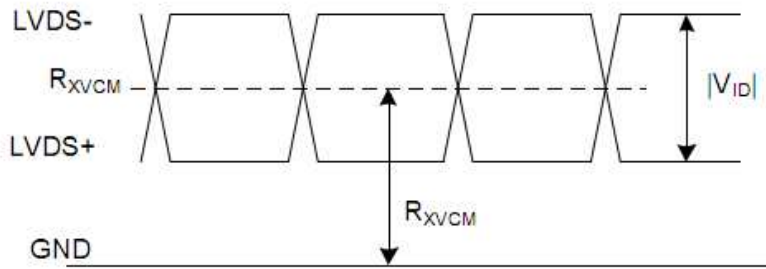| Item	Symbol	Min	Typ	Max	Unit	Remark
Logic Supply Voltage	VDD	3.2	3.3	3.4	V	
Permissible Inrush current of VDD	Ivdd	--	--	920	MA	Note 1
Input High Voltage	V_{IH}	0.7*VDD	--	VDD	V	Note 2
Input Low Voltage	V_{IL}	GND	--	0.3*VDD	V	
Power Consumption	White mode (60Hz)	--	900	1350	MW	Note 3

Note 1:

Note 2: Contain RESET, STBYB, SHLR, UPDN.

Note 3: VDD=3.3V.

LVDS Interface DC characteristic

Parameter	Symbol	Condition	Spec			Unit
			Min	Typ	Max	
Differential input high threshold voltage	R_{xVTH}		-	-	+0.2	V
Differential input low threshold voltage	R_{xVTL}		-0.2-	-	-	V
Differential input common mode voltage	R_{xVCM}	-	1	1.2	1.7-|Vid|/2	V
Differential input voltage	|Vid|	-	0.2	-	0.6	V
Differential input leakage current	Ilvleak		-10	-	10	uA
LVDS terminal match resistor	R_{LVDS}			100		Ω

Single-end Signal：

Differential Signal
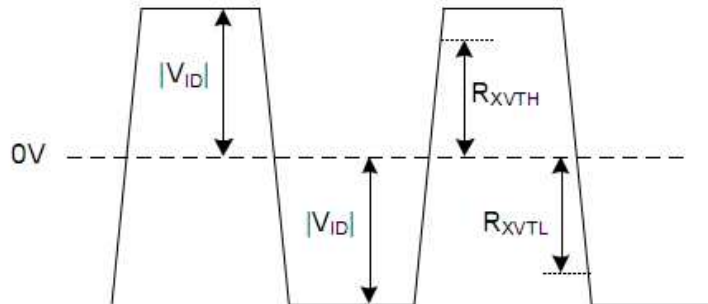
4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_{BL}	--	90	--	mA	
Forward Voltage	V_{BL}	21.6	24.24	26.6	V	
Power Consumption	W_{BL}	5.83	6.55	7.18	mW	
Operating Life Time	--	--	20000	--	Hrs	

Note 1: The figure below shows the connection of backlight LED. Each LED : I=90 mA, V =3.03V.
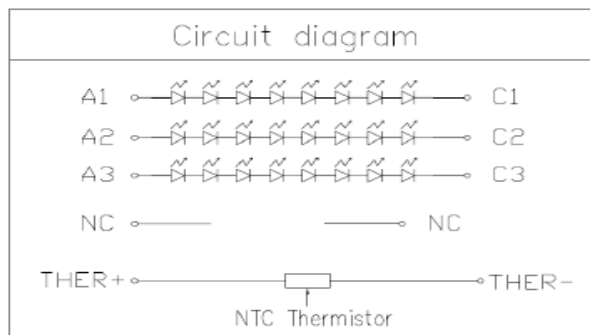
Note 2: IF is defined for one channel LED.Optical performance should be evaluated at Ta=25℃ only. If LED is driven by high current, high ambient temperature & humidity condition, the life time of

LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note 3: It is suggested customer to make sure the LCM module is well heat dissipation. It is preliminary suggested to start de-rating from 65℃ of the NTC sensor.

Note 4: The NTC thermistor Part No. is NCP15XH103F0SRC. NTC thermistor is included in LED circuit. Pls refer to appendix for NTC temperature behavior.

Note 5: LED current's de-rating in backlight, please refer to the following chart. (Just for reference, Tianma will arrange test at sample phase).

Item	Value	Remarks
Type	NCP15XH103F0SRC	Murata
Resistance Tolerance	10kΩ ±1%	Ta=25℃
Temperature Characteristic	Nominal B-Constant 3350-3399K	Ta=25 to +85℃
Permissive Operating Current	0.31mA	Ta=25℃
Absolute Maximum Power Consumption	100mW	Ta=25℃

Note 6: The de-rating curve for the backlight is shown below. The de-rating temperature is >75℃
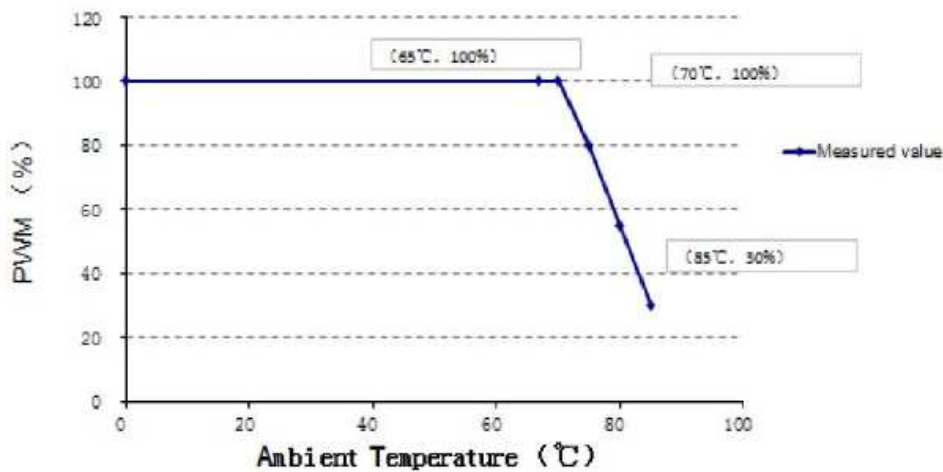
4.3 Clock Diagram
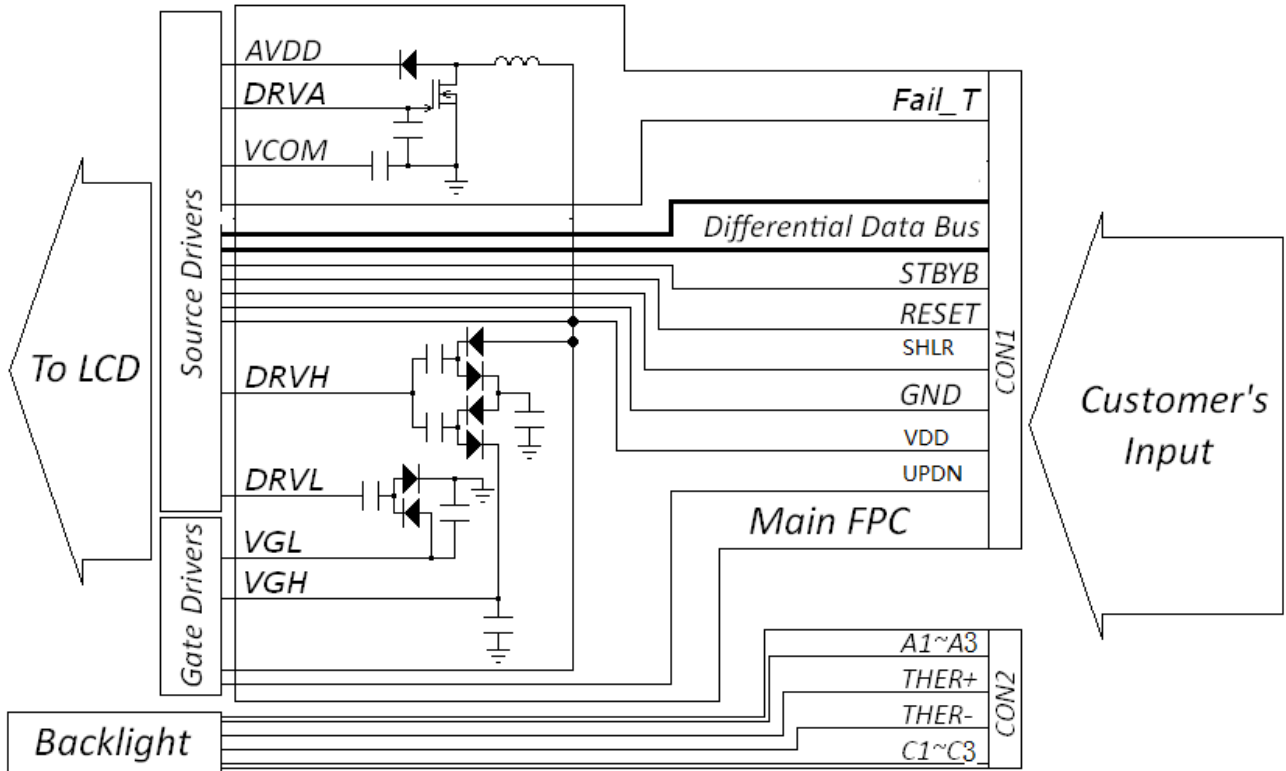
5 Timing Characteristics

5.1 Input timing
5.1.1 Input timing table

Parameter	Symbol	Unit	Min.	Typ.	Max.	REMARKS
Clock Frequency	f_{dck}	MHz	44.6	44.7	50.2	
H Total Time	T_{hp}	clocks	1020	1024	1150	
H Active Time	HA	clocks		960		
V Total Time	T_{vp}	lines	726	728	849	
V Active Time	VA	lines		720		
V Frequency	f_v	Hz	-	60Hz	-	

Note：Above of all these information is just for reference，the final information should be based on the test result of module and be set for module in initial code.
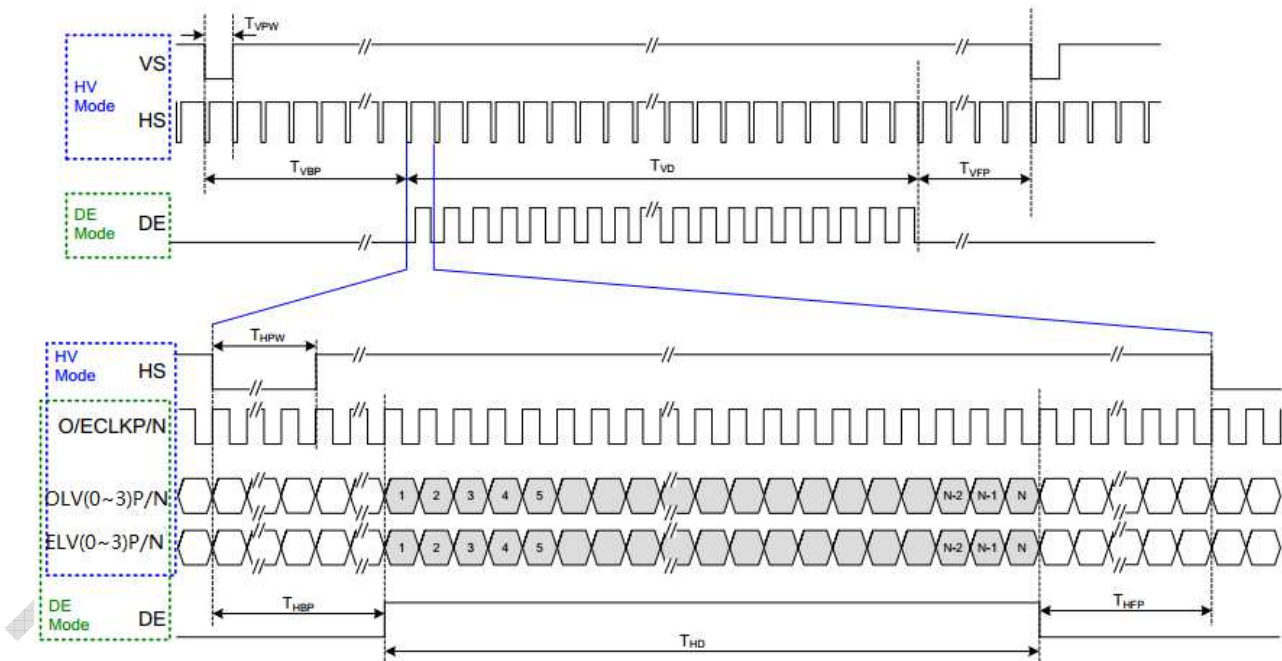Timing will update later

5.1.2 LVDS input timing format

Figure 5.1.2. LVDS input timing format
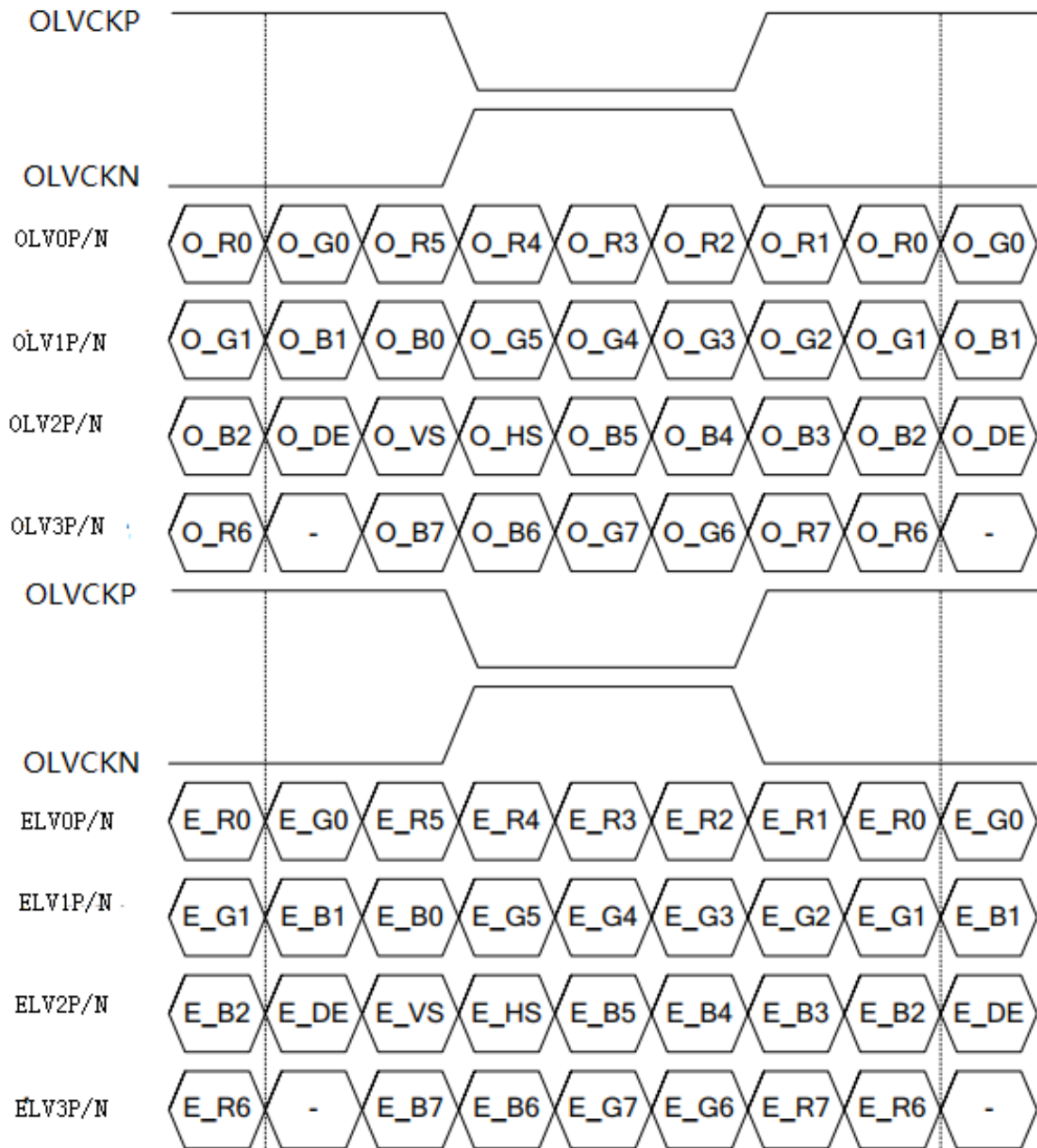
5.1.3 Dual-Link LVDS input Data Format

Figure5.1.3   8-bit LVDS Dual Link VESA

5.2 LVDS interface AC characteristic

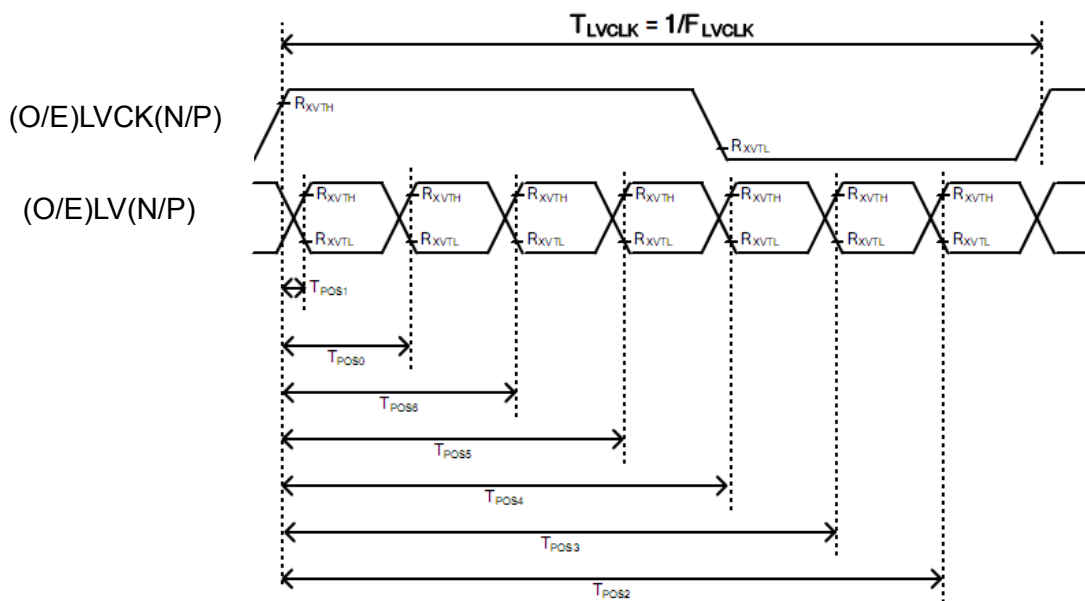| Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	FLVCLK	25	-	85	MHz	Refer to input timing table for each display resolution.
Clock Period	TLVCLK	11.76	-	40	ns	
Clock high time	TLVCH	-	4/(7* TLVCLK)	-	ns	
Clock low time	TLVCL	-	3/(7* TLVCLK)	-	ns	
Input data skew margin	TRSKM	-	-	0.25	UI	VCC_IF=1.8V w/o SSC
Strobe width	TSW	0.5	-	-	UI	
1 data bit time	UI	-	1/7	-	TLV CLK	
Position 1	TPOS1	-0.25	0	0.25	UI	
Position 0	TPOS0	0.75	1	1.25	UI	
Position 6	TPOS6	1.75	2	2.25	UI	
Position 5	TPOS5	2.75	3	3.25	UI	
Position 4	TPOS4	3.75	4	4.25	UI	
Position 3	TPOS3	4.75	5	5.25	UI	
Position 2	TPOS2	5.75	6	6.25	UI	

Figure5.2.1   LVDS input timing
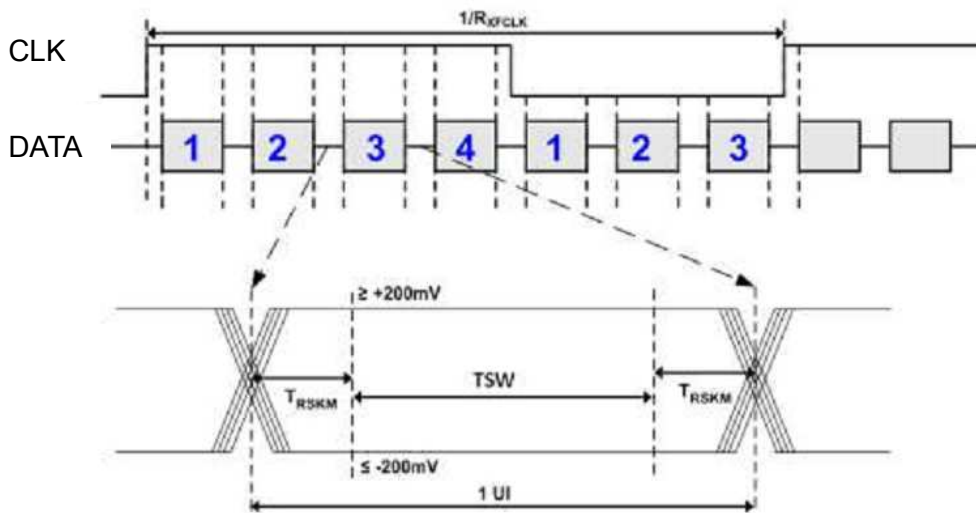
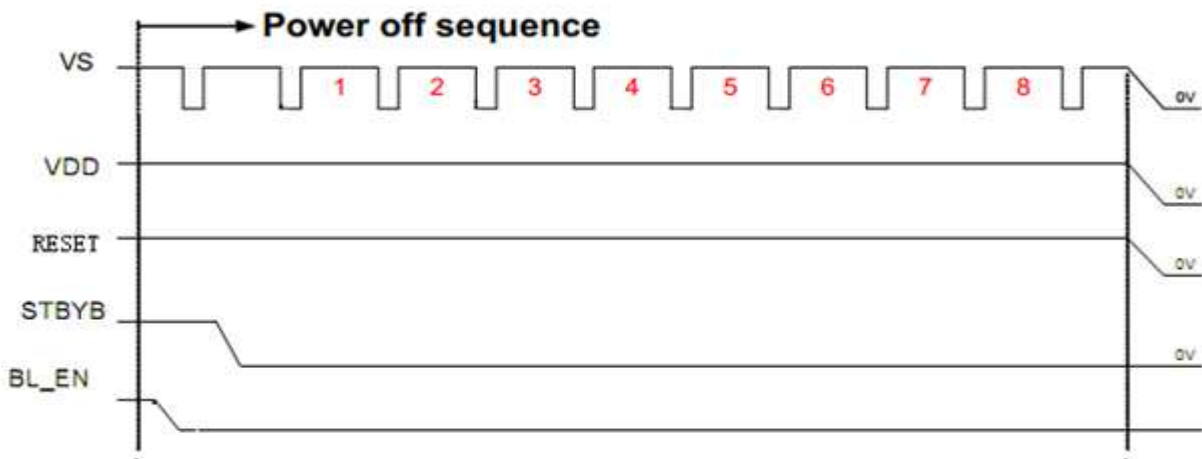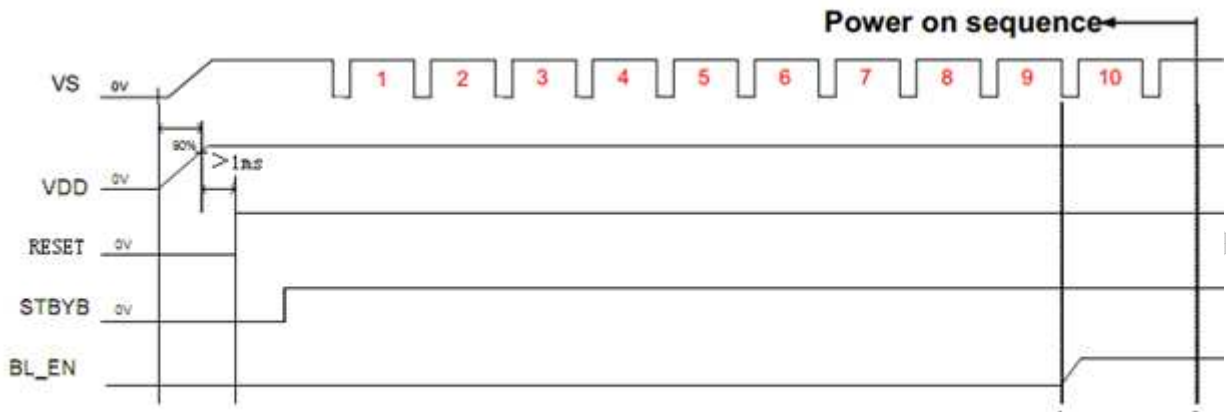Figure5.2.2 LVDS Data Skew
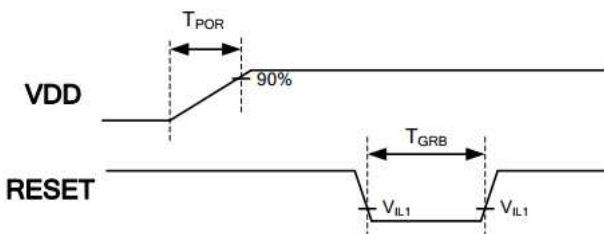
5.3 Power on/off sequence

5.4 VDD/RESET Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD power source slew time	T_{POR}	0.5	-	20	ms	From 0V to 90% VDD
RESET active pulse width	T_{GRB}	1	-	-	ms	VDDIO = 3.3V

6 Optical Characteristics

6.1 Optical Specification

Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
View Angles		θT	CR≧10	80	88	--	Degree	Note 2
		θB		80	88	--		
		θL		80	88	--		
		θR		80	88	--		
Contrast Ratio		CR	θ=0°	700	1000	--		Note1 Note3
Response Time		T_{ON}	25℃	--	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.240	0.290	0.340		Note5, Note1
		y		0.257	0.307	0.357		
	Red	x		0.579	0.629	0.679		
		y		0.285	0.335	0.385		
	Green	x		0.250	0.300	0.350		
		y		0.583	0.633	0.683		
	Blue	x		0.098	0.148	0.198		
		y		0.012	0.062	0.112		
Uniformity		U		75	80	--	%	Note1 Note6
NTSC				65	75	--	%	Note 5
Luminance		L		600	800	--	cd/m^2	Note1 Note7

Test Conditions:

1. V_F =3.03V, I_F =90mA(LED current), the ambient temperature is 25℃.

2. The test systems refer to Note 1 and Note2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.
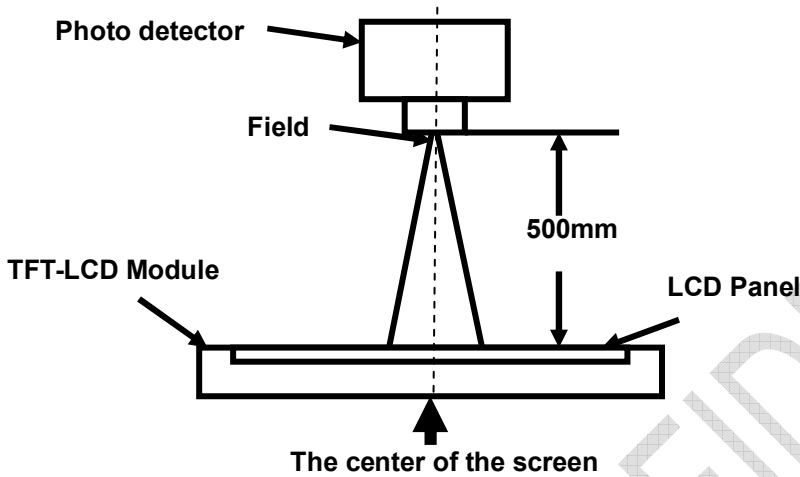
Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by EZ-Contrast。
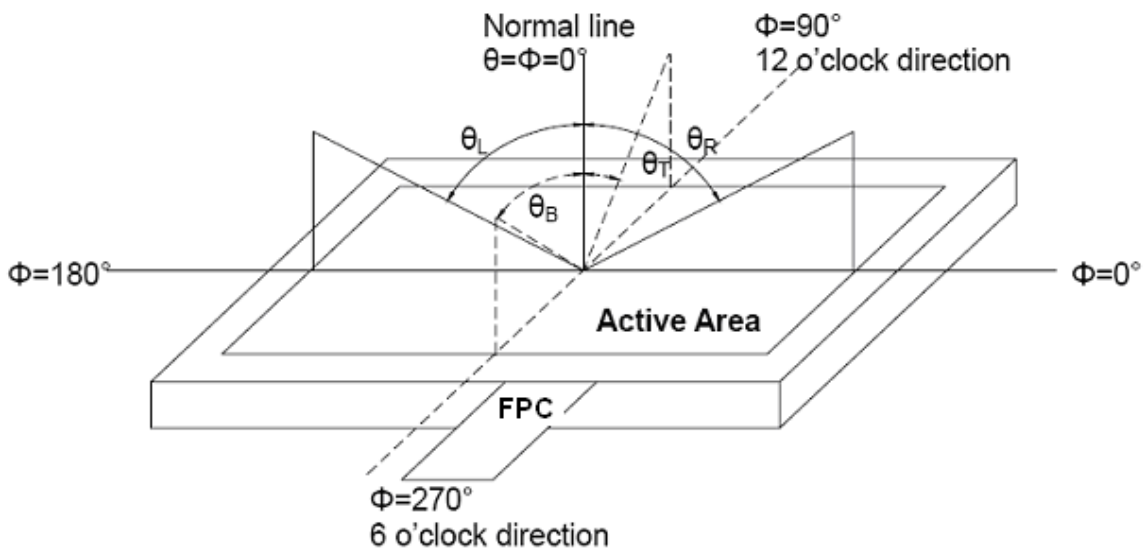

Fig. 1 Definition of viewing angle

Note 3: 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 driven by Vwhite.

"Black state": The state is that the LCD should driven by Vblack.

Vwhite: To be determined   Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 10% to 90%. And fall time (TOFF) is the time between photo detector output intensity changed from 90% to 10%.
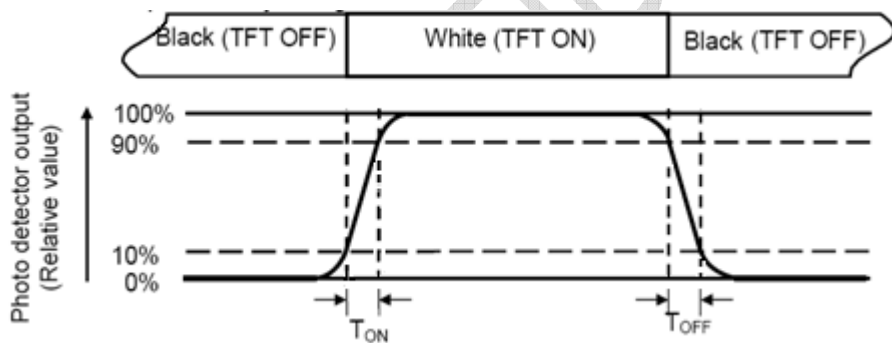
Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

L-------Active area length W----- Active area width

Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.
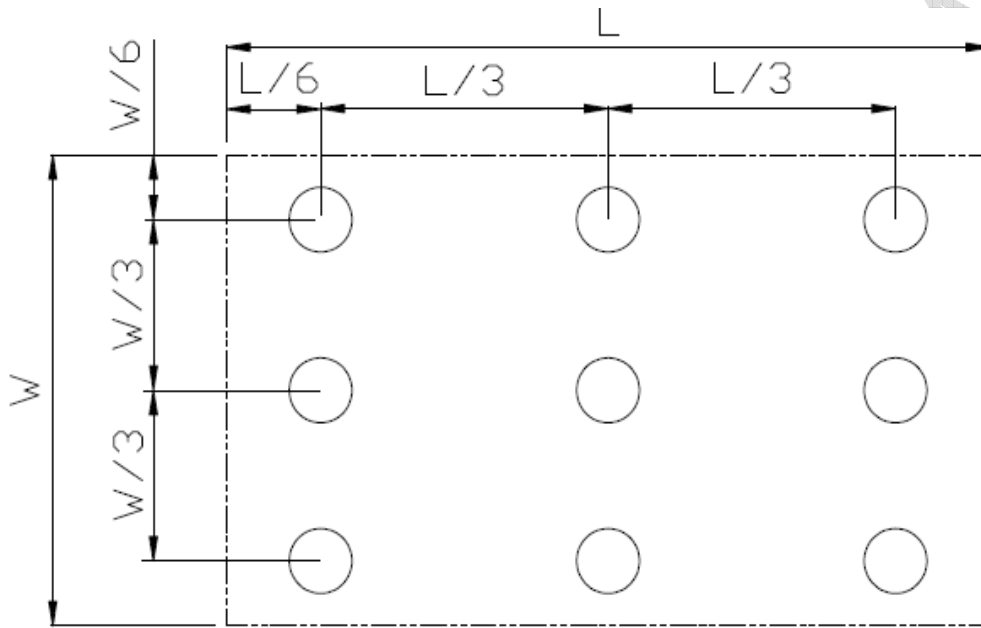
Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

Measure the luminance of white state at center point.

7 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta=+85℃, 240hrs	IEC60068-2-2:2007 GB2423.2-2008
2	Low Temperature Operation	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=+90℃, 240hrs	IEC60068-2-2:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-40℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	Temperature & Humidity Operation	Ta=60℃, 90% RH 240 hours	IEC60068-2-78 :2001 GB/T2423.3-2016
6	Thermal Shock (Non-operation)	-40℃ 30 min~+85℃ 30 min, Change time:5min, 100 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984 GB2423.22-2012
7	Electro Static Discharge (Operation)	C=150pF, R=330Ω，5points/panel Air:±15KV, 5times; Contact:±8KV, 5 times; （Environment: 15℃～35℃, 30%～60%, 86Kpa～106Kpa）	IEC61000-4-2:2001 GB/T17626.6-2006
8	Vibration (Non-operation)	Frequency range：10~55Hz Stroke：1.5mm Sweep：10Hz~55Hz~10Hz 2h for x,y,z（total 6h）	IEC60068-2-6:1982 GB/T2423.10-2019
9	Shock (Non-operation)	Half Sine Wave 60G ,6ms,±X,±Y,±Z 3times for each direction	GB/T 2423.5-2019
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	GB/T 4857.5-1992

Note 1: Ta is the ambient temperature of sample.

Note 2: Before cosmetic and function test, the product must have enough recovery time, at least 2 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.

8 Mechanical Drawing
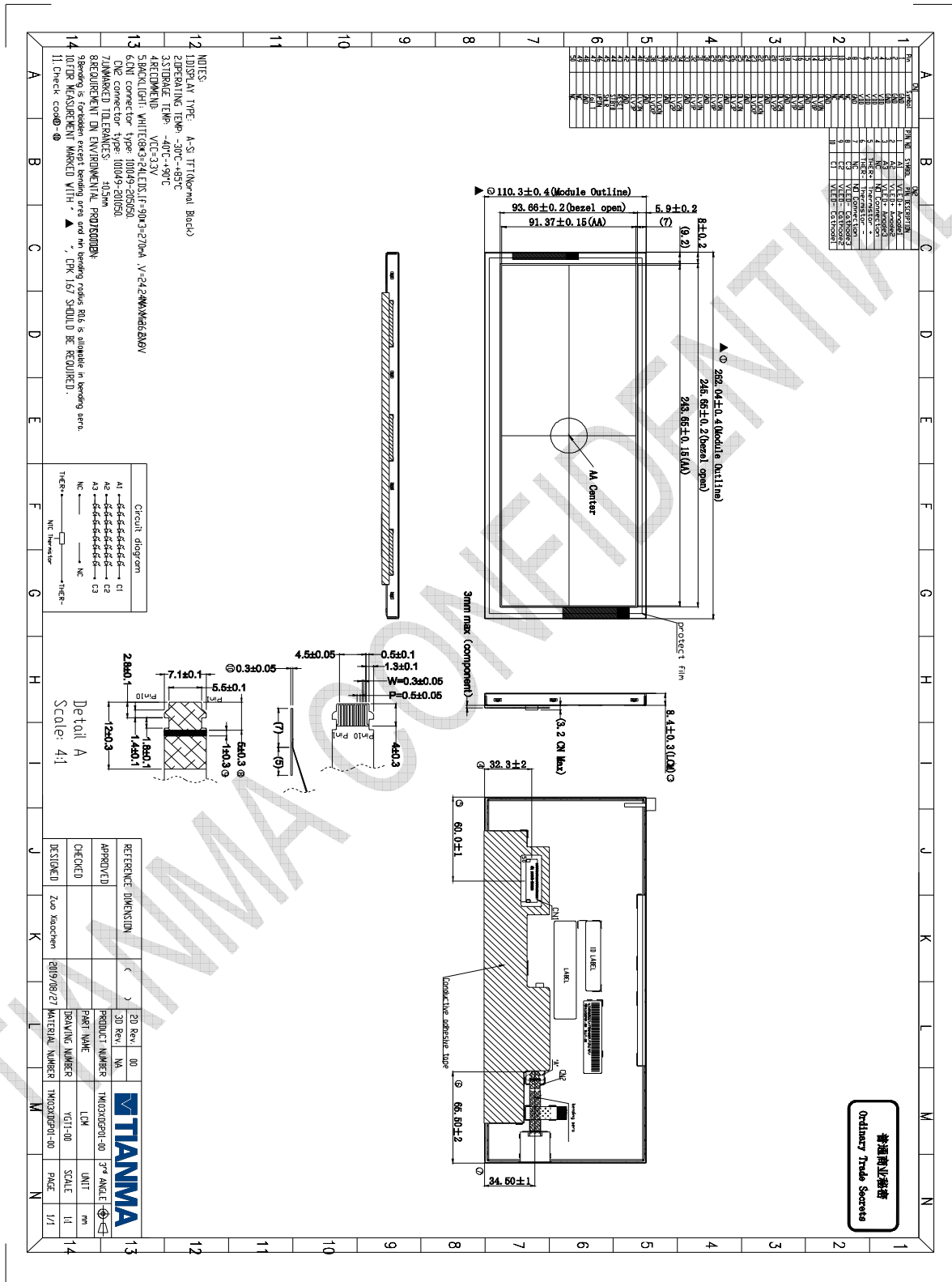
9   Packing drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM103XDGP01-00	262.04x110.30x8.4	0.447	17	
2	PP BOX(BOTTOM)	PP BOX盒底	533*368*165	0.415	1	
3	PP BOX(UP)	PP BOX盒盖	529*364*35	0.172	1	
4	Carton	Corrugated Paper	550*385*202	1	1	
5	Anti-static bag	防静电袋	305*170	~	17	
6	Tape	美纹胶带	30*10	~	17	
7	Desiccant	干燥剂	45*48	0.003	16	
8	Label	标签	80*60	~	1	
9	Velcro	魔术贴	1300*25		2	
	Total weight	9.234±5%Kg				

纸箱堆叠数：每层 5 箱*共 5 层；栈板尺寸：1200*1000mm

Put the module into anti-static bag
单片模组装入静电袋中
the opening of bag Follow the FPC
静电袋开口方向与模组FPC侧同向

The bag is folded to the back of module and fixed with tape
将电袋折到模组背部并用美纹胶带固定
the tape should avoid components and pasted in the center
美纹胶带需避开PC元器件去居中贴胶

Module=17set
模组=17 set
EPP BOX BOTTOM=1 set
PP箱=1set

Desiccants=16pcs
干燥剂=16包

PP BOX TOP=1pcs

carton and ppbox
GAP 5mm
纸箱和ppbox之间间隙5mm

1. Use packaging tapes to seal PP box, seal length one and a half circle
使用胶带将PP-BOX密封，缠封长度一圈半

2. Tie the box with two Velcro sticks
用两吸魔术贴把箱Box

Use packaging tapes to seal carton
使用胶带对纸箱密封

Customer Label
客户 标签

TM Label
TM 标签

PE film pack two layers from down to up, at the top of the pocket layer. Notice PE film need packaging the pallet side and the carton sureface.
(PE 膜由下向上至顶面包两层。)
(注意：PE 膜需要包裹到栈板的侧面及纸箱的顶面)

1 Pallet=25 Box

Pallet label area
(栈板标签区域)

carton's surface with label be outside
(纸箱标签侧朝外)

The Four package belts are packaged as '#', every location of the four belts is quarter of the pallet spec.
(四根打包带打包成"#"字形，位置约为栈板规格的四分之一处)

8 edges should be encapsulated by carboards
(护角对应日条边打包)

Notes:
Pallet total height(栈板总高度)1160mm
According to the choice of the mode of transportation to reduce stacked layers.
(可以根据运输方式的选择来减少堆叠层数)

10 Precautions For Use of LCD modules

10.1 Handling Precautions

10.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

－ Isopropyl alcohol

－ Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

－ Water

－ Ketone

－ Aromatic solvents

10.1.6. Do not attempt to disassemble the LCD Module.

10.1.7. If the logic circuit power is off, do not apply the input signals.

10.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1. Be sure to ground the body when handling the LCD Modules.

10.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage Precautions

10.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃   Relatively humidity: ≤80%

10.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.