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MODEL NO : TM123XDGP01**MODEL VERSION: 00****SPEC VERSION : 2.1****ISSUED DATE: 2021-05-27**

- ☐ Preliminary Specification
☒ Final Product Specification

Customer : _____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Panpan Cao	Longping_Deng	Xiaoxing Ding

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[illegible]

1 General Specifications

Feature		Spec
Display Spec.	Size	12.3 inch
	Resolution	1920(RGB) x 720
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.15225 x 0.15225
	Display Mode	TM with Normally Black
	Surface Treatment	HC
	Viewing Direction	All direction
Mechanical Characteristics	LCM (W x H x D) (mm)	305.92 x 123.62 x 7 (typ.)
	Active Area(mm)	292.32×109.62
	With /Without TSP	Without TSP
	Connector Type	LCM:FH41-50S-0.5SH BL:FH52-10S-0.5SH
	LED Numbers	4 parallels 8serials
	Weight (g)	322
Electrical Characteristics	Interface	2-port LVDS (VESA)
	Color Depth	16.7M

Note 1: Requirements on Environmental Protection: Q/S0002

Note 2: LCM weight tolerance: $\pm 5\%$

2 Input/Output Terminals

2.1 TFT LCD panel

Connector Type : FH41-50S-0.5SH

No	Symbol	I/O	Description	Remark
1	GND	P	GND	
2	GND	P	GND	
3	VLCD	P	Power supply for LCD (3.3V)	
4	VLCD	P	Power supply for LCD (3.3V)	
5	VLCD	P	Power supply for LCD (3.3V)	
6	VLCD	P	Power supply for LCD (3.3V)	
7	GND	P	GND	
8	GND	P	GND	
9	NC	N	Tianma internal used Custom must floating	Note1
10	NC	N	Tianma internal used Custom must floating	
11	GND	P	GND	
12	GND	P	GND	
13	OLV0N	I	Odd LVDS data input 0-	
14	OLV0P	I	Odd LVDS data input 0+	
15	GND	P	GND	
16	OLV1N	I	Odd LVDS data input 1-	
17	OLV1P	I	Odd LVDS data input 1+	
18	GND	P	GND	
19	OLV2N	I	Odd LVDS data input 2-	
20	OLV2P	I	Odd LVDS data input 2+	
21	GND	P	GND	
22	OCLKN	I	Odd LVDS Clock input -	
23	OCLKP	I	Odd LVDS Clock input +	
24	GND	P	GND	
25	OLV3N	I	Odd LVDS data input 3-	
26	OLV3P	I	Odd LVDS data input 3+	
27	GND	P	GND	
28	ELV0N	I	Even LVDS data input 0-	
29	ELV0P	I	Even LVDS data input 0+	
30	GND	P	GND	
31	ELV1N	I	Even LVDS data input 1-	
32	ELV1P	I	Even LVDS data input 1+	
33	GND	P	GND	
34	ELV2N	I	Even LVDS data input 2-	
35	ELV2P	I	Even LVDS data input 2+	
36	GND	P	GND	
37	ECLKN	I	Even LVDS Clock input -	
38	ECLKP	I	Even LVDS Clock input +	

39	GND	P	GND	
40	ELV3N	I	Even LVDS data input 3-	
41	ELV3P	I	Even LVDS data input 3+	
42	GND	P	GND	
43	NC(CSB)	N	Tianma internal used Custom must floating	Note1
44	RESET	I	Global reset pin, RESET=H,normal operation. RESET=L,The controller is in reset state.	
45	NC	N	Tianma internal used Custom must floating	
46	NC	N	Tianma internal used Custom must floating	
47	HVR	I	Horisontally and Vertically Inverted	Note 2
48	STYB	I	Standby mode control STYB="H", Normal operation. STYB="L", Source output GNDA level.	
49	ASIL	O	Output for fail detection	Note 3
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: HVR controled by customer

HVR	Function	Remark
H	Left→Right, Top→Bottom	Default
L	Right→Left, Bottom→Top	-



Type 1 (Default HVR="H")



Type 2 (HVR="L")

Note 3: ASIL: normally pull L in IC, active “H”(when Hsync or Vsync or Clk miss, this pin will pull “H”

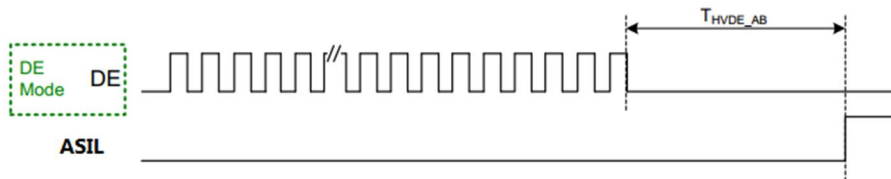


Figure 2.1.3 DE Mode AB_IND Operation

Note: For 1920RGBx720 resolution, $T_{HVDS_AB} \approx 10.7\text{ms}$ 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.

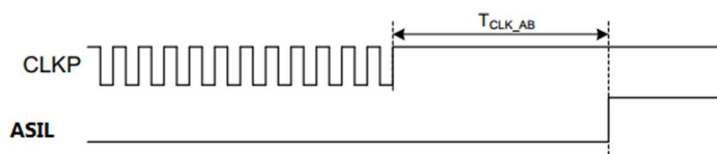


Figure 2.1.4 Clock Error AB_IND Operation

Note: For 1920RGBx720 resolution, $T_{CLK_AB} \approx 234\mu\text{s}$

When CLK lost, T_{sp_det} is about 234us.

When DE lost, T_{sp_det} is about 10.7ms.

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 resistor connect to this pin on your system when this pin is used for fail detection.

2.2 Pin assignment for one of the backlight interface

Connector type: FH52-10S-0.5SH

No	Symbol	I/O	Description	Remark
1	A1/A2	P	LED positive1/2	
2	A3/A4	P	LED positive3/4	
3	NC	N	No connection	
4	C1	P	LED negative1	
5	C2	P	LED negative2	
6	C3	P	LED negative3	
7	C4	P	LED negative4	
8	NC	N	No connection	
9	NTC-	O	Connector Thermistor Resistor	
10	NTC+	O	Connector Thermistor Resistor	

I/O definition:

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

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
supply voltage	VLCD	-0.5	5	V	
Operating Temperature	Top	-30	85	°C	
Storage Temperature	Tst	-40	90	°C	

Note 1: Ta means the ambient temperature.

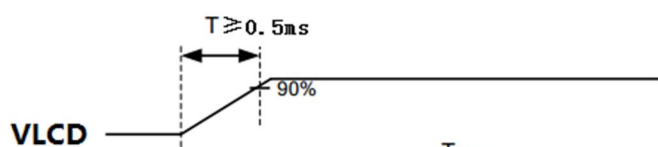
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed.

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage	VLCD	3.2	3.3	3.4	V	
Permissible Inrush current of VDD	Ivldc	--	--	1200	mA	Note 1
Input High Voltage	V _{IH}	0.7*VLCD	--	VLCD	V	Note 2
Input Low Voltage	V _{IL}	GND	--	0.3*VLCD	V	
Power Consumption	White mode (60Hz)		1070	1605	mW	Note 3

Note 1:



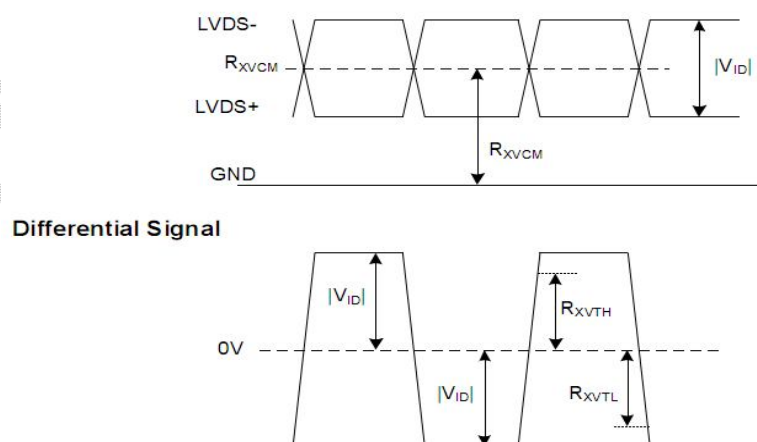
Note 2: Contain RESET, STYB,HVR

Note 3: VLCD=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- V _{id} /2	V
Differential input voltage	V _{id}	-	0.2	-	0.6	V

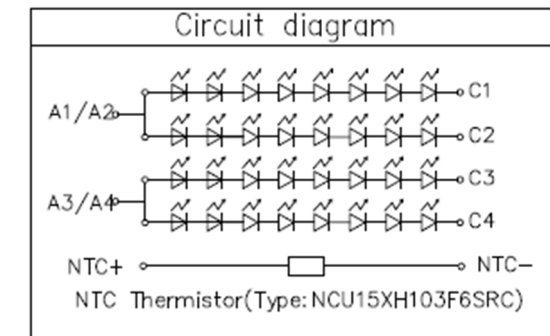
Single-end Signal:



4.2 DC Characteristics for Backlight Driving

Item		Symbol	Min	Typ	Max	Unit	Remark
Forward Current	+ 25℃	I_F		120		mA	Note1
Forward voltage	+ 25℃	V_{BL}		24		V	$I_F=120mA$
Backlight Power Consumption	+ 25℃	W_{BL}		11.5		W	$I_F=120mA$
Life Time		-	30000	-	-	Hrs	Note2

Table 4.2.1 LED backlight characteristics



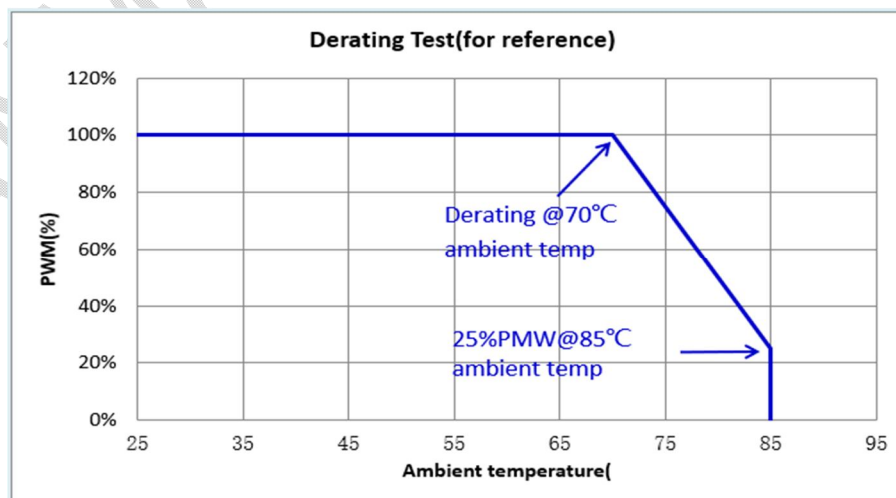
Note 1: $I_F=120mA$ is defined for one channel LED, There are total 4 LED channels in back light unit Under LCM operating, the stable forward current should be inputted.

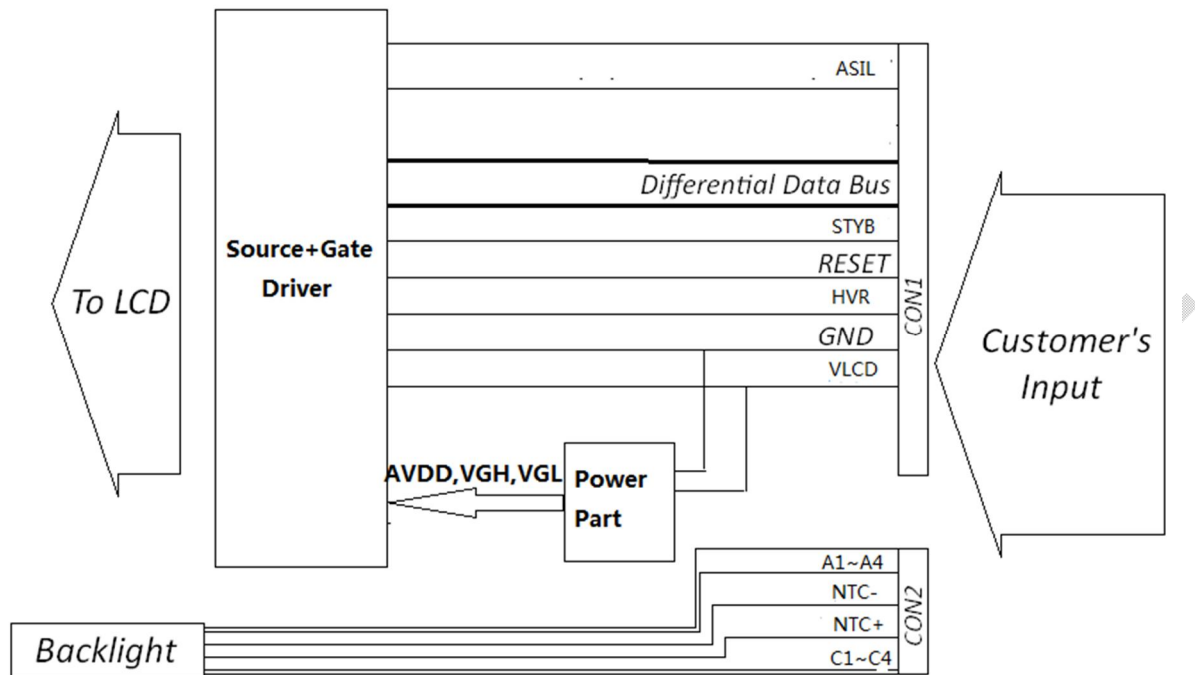
Note 2: Optical performance should be evaluated at $T_a=25^\circ C$ only. If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% of original brightness.

Note 3: it is suggested Customer to make sure the LCM module in the system is well heatdissipation.

Note 4: The NTC thermistor Part No.is NCU15XH103F6SRC. NTC thermistor is included in LED circuit. pls refer to appendix for NTC temperature behavior.

Note 5: The LED circuit de-rating curve evaluated as below,LED forward current should follow the De-rating curve and the NTC resistance should not be below 0.xx kΩ.



4.3 Block Diagram


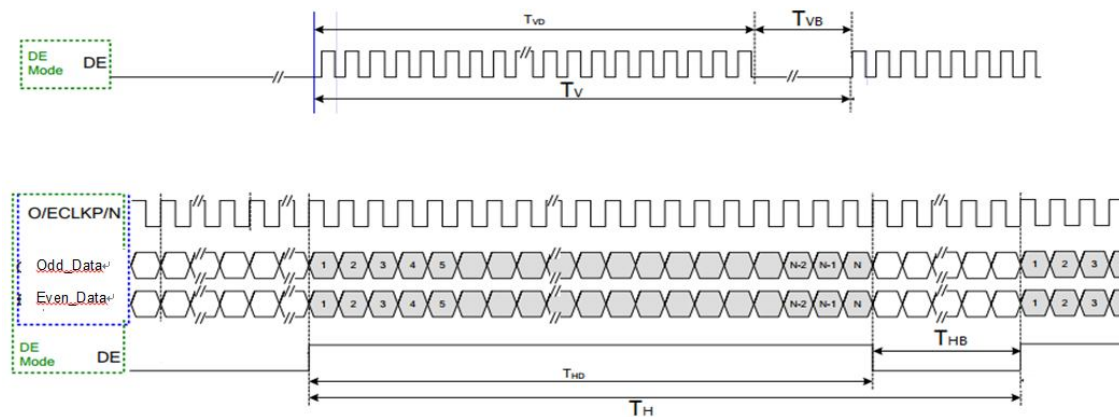
5 Timing Characteristics

5.1 Input Timing

5.1.1 Input timing chart

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	F_{CLK}	44.6	44.7	50.2	MHz
Horizontal display area	T_{HD}		960		CLK
HS period time	T_H	1023	1024	1060	CLK
HS blanking	T_{HB}	60	64	190	CLK
Vertical display area	T_{VD}		720		H
VS period time	T_V	726	728	849	H
VS blanking	T_{VB}	6	8	129	H
V Frequency	f_v		60		Hz

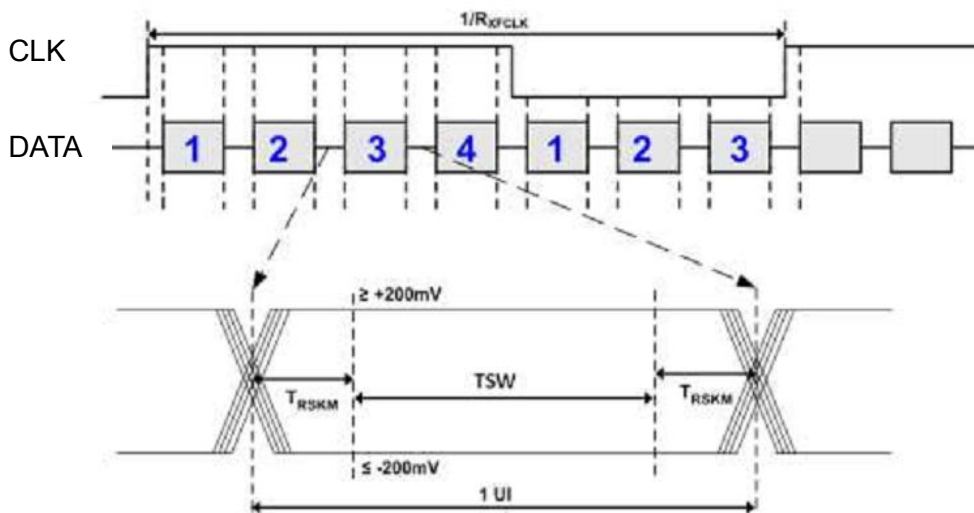
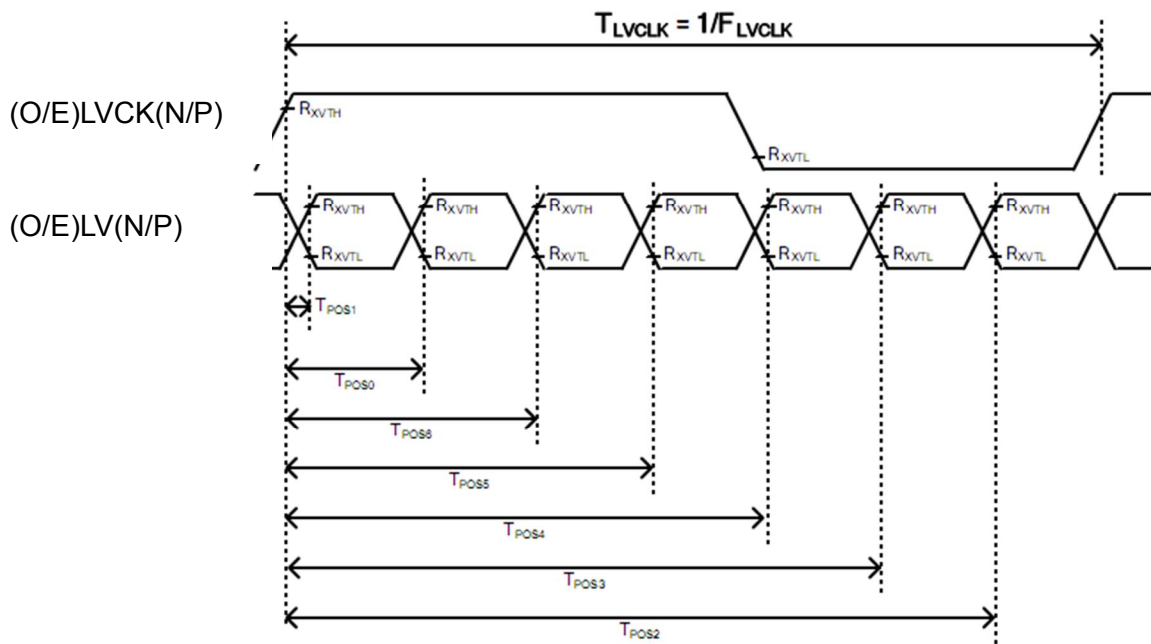
5.1.2 LVDS input timing format



5.2 LVDS timing

5.2.1 LVDS Timing

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	-	$4/(7 \cdot TLVCLK)$	-	ns	
Clock low time	TLVCL	-	$3/(7 \cdot TLVCLK)$	-	ns	
Input data skew margin	TRSKM	-	-	0.25	UI	$V_{CC_IF}=1.8V$ 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	



5.2.2 dual-Link LVDS input Data Format

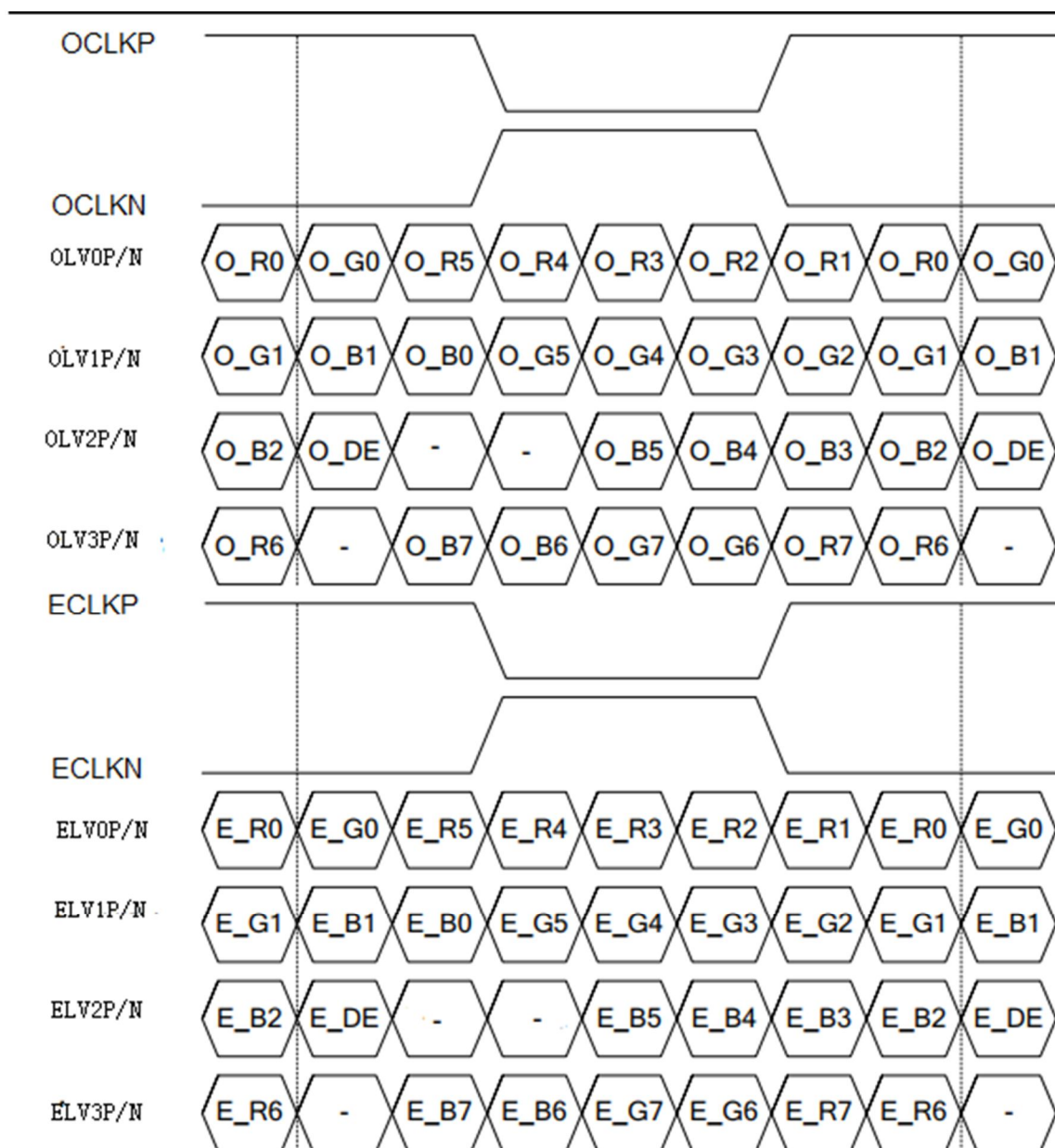
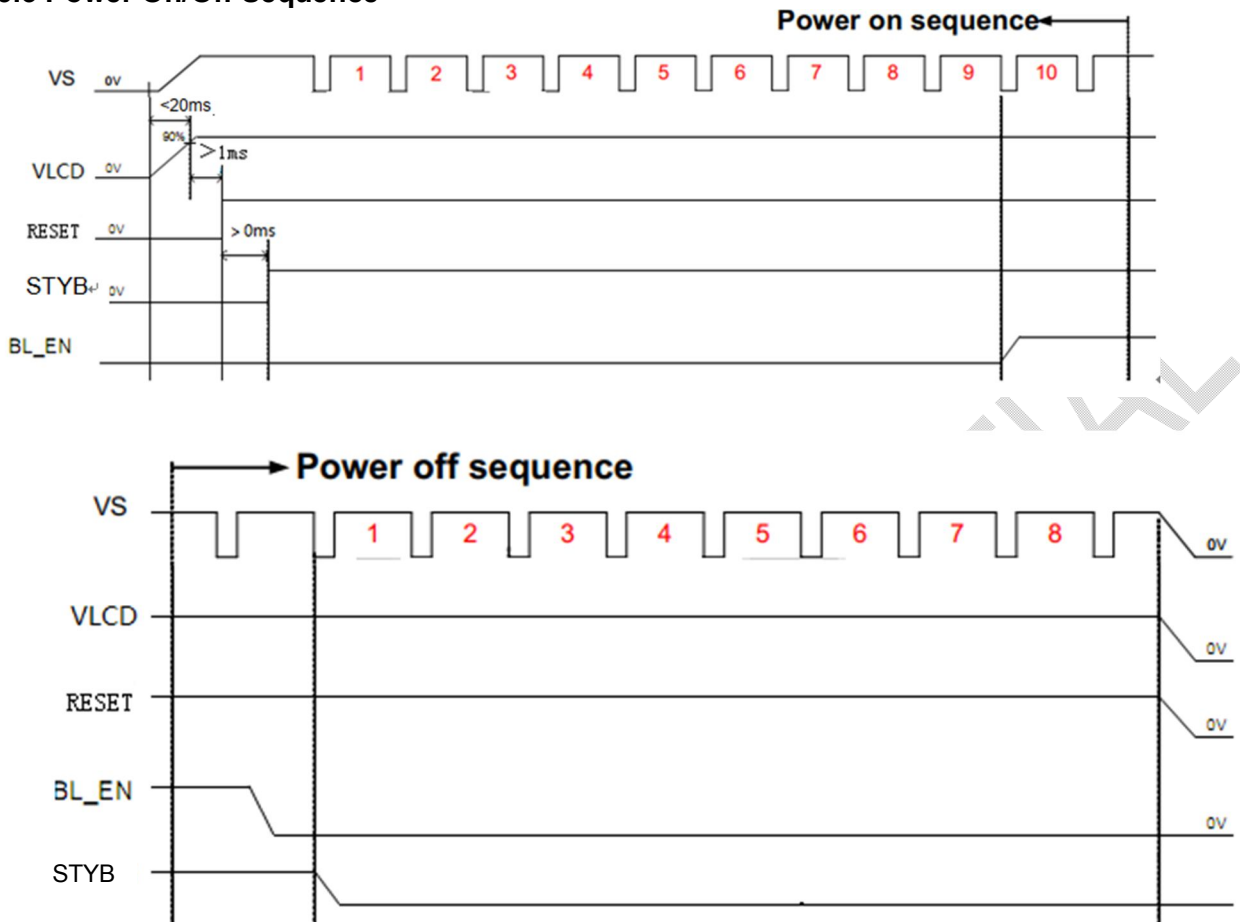


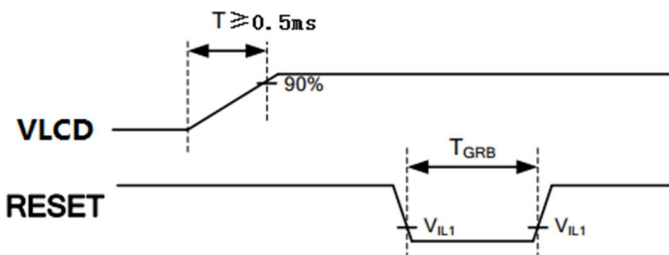
Figure 5.2.2 8-bit LVDS Dual Link VESA

5.3 Power On/Off Sequence



5.4 VLCD/RESET Timing

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



6 Optical Characteristics

Ta=25℃

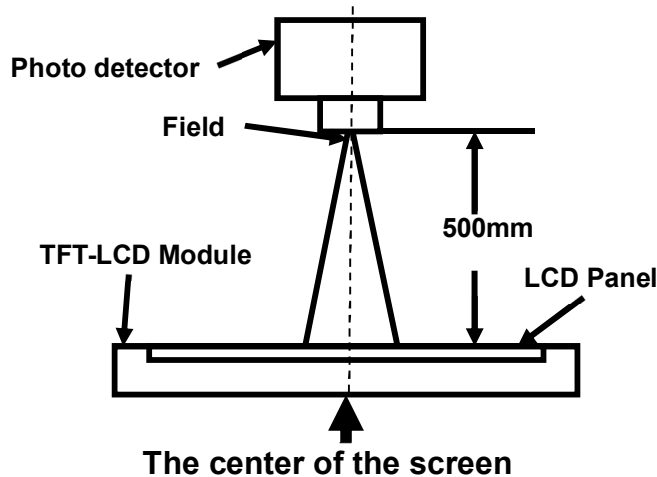
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	U	CR≥10	80	88	--	Degree	
	D		80	88	--		
	L		80	88	--		
	R		80	88	--		
Contrast Ratio	CR	Perpendicular, 25℃	900	1100	--		Note3
Response Time	Ton+Toff	25℃	--	--	20	ms	Note4
Chromaticity	W	x	0.247	0.297	0.347		Note5
		y	0.276	0.326	0.376		
	Red	x	0.581	0.631	0.681		
		y	0.287	0.337	0.387		
	Green	x	0.250	0.300	0.350		
		y	0.585	0.635	0.685		
	Blue	x	0.098	0.148	0.198		
		y	0.013	0.063	0.113		
Uniformity	U		75	80	--	%	Note6
NTSC		Perpendicular	72	75	--	%	Note5
Luminance	L	Perpendicular, 25℃	1100	1400	--	cd/m ²	Note7 LCD module

Test Conditions:

1. $I_F = 90\text{mA}$ (one channel), there are total 4 LED channels in back light unit Under LCM operating , the stable forward current should be inputted, the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

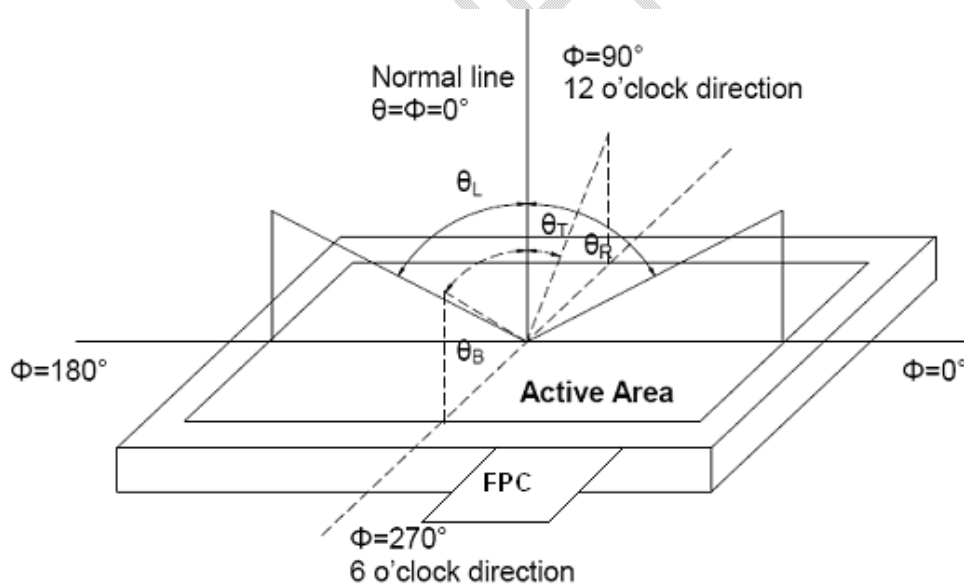
Note 1: Definition of optical measurement system.

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.



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 drive by V_{white} .

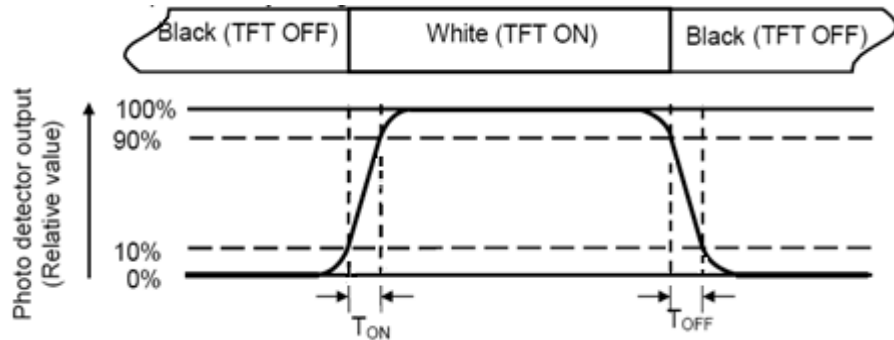
“Black state”: The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

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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 (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.


Note 5: Definition of color chromaticity (CIE1931)

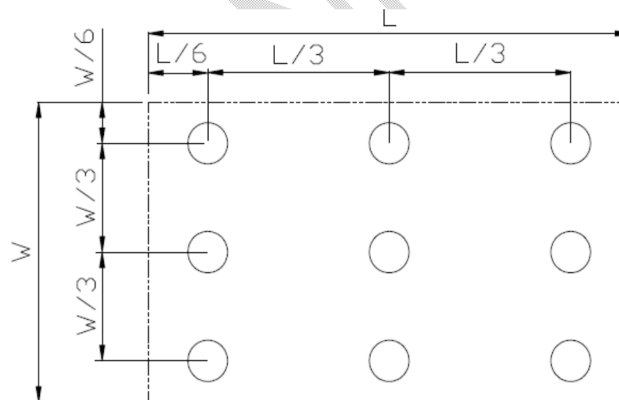
Color coordinates measured at center point of LCD.

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.

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

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



$L_{\max}$: The measured Maximum luminance of all measurement position.

$L_{\min}$: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

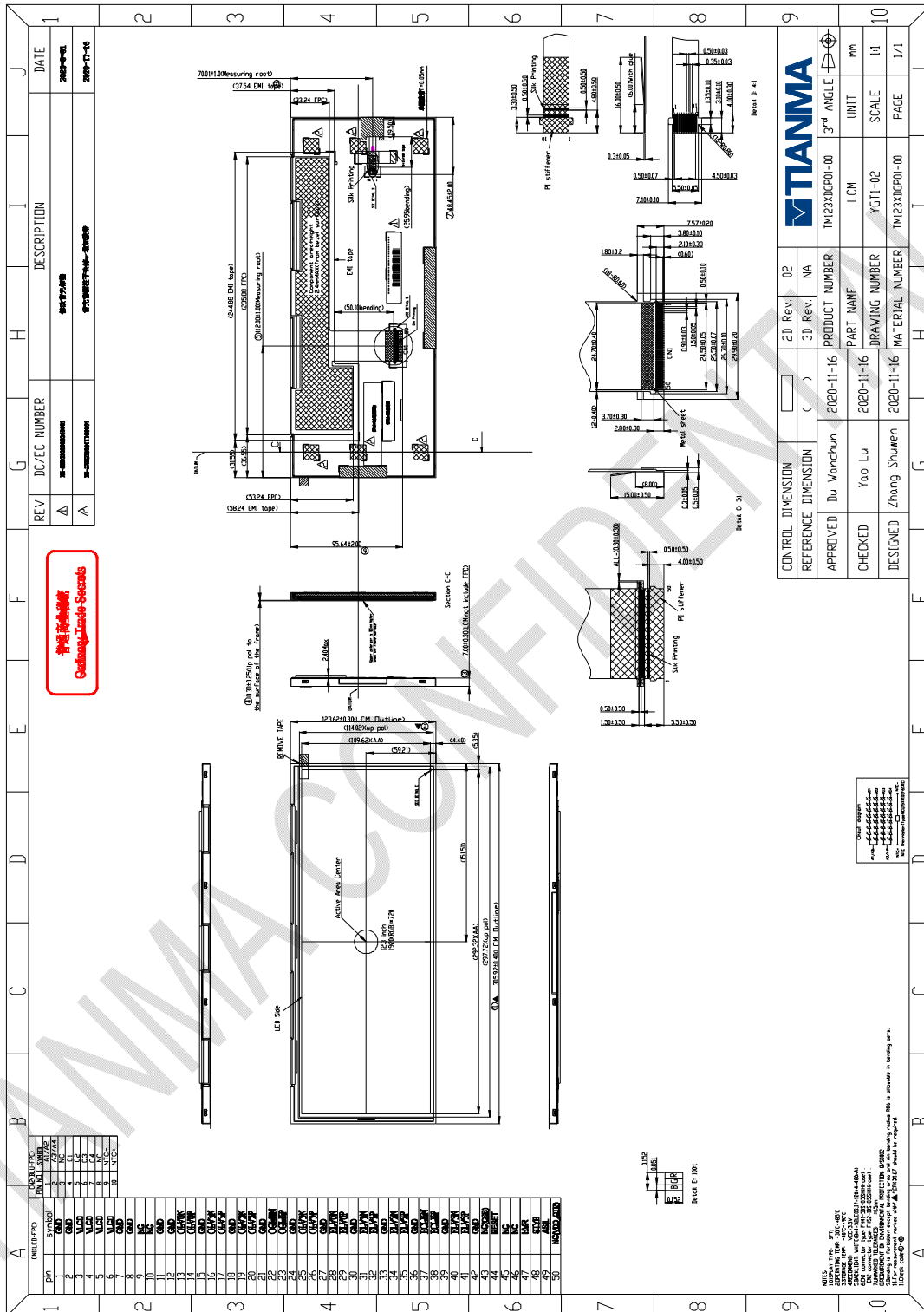
7 Environmental / Reliability Test

N o	Test Item	Test condition	Criterion
1	High Temperature Storage	95℃ 240H RH<=45% Restore 24H at 25℃ Power off	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Storage	-40℃ 240H Restore 24H at 25℃ Power off	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Operation	+85 240H RH<=45% Restore 24H at 25℃ Power on	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Operation	-30℃ 240H Restore 24H at 25℃ Power on	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & Humidity Operation	60℃, 90%RH 240H Restore 24H at 25℃ Power on	IEC60068-2-78 :2001 GB/T2423.3—2016
6	Thermal Shock (non-operation)	-40℃→ change→+85℃ 30min 5min 30min, 100cycle Restore 24H at 25℃	Start with cold temperature, End with high temperature, IEC60068-2-14:1984, GB2423.22-2012
7	Vibration (Non-operation)	Frequency: 10~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 120min for each direction of X.Y.Z.	IEC60068-2-6:1982 GB2423.10-2019
8	Shock (Non-operation)	Half Sine Wave 60G ,6ms,±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—2019
9	ESD	C=150 pF、R=330 Ω, 5point/panel Air V=±8kV; Contact V=±4kV, 5 times/ each point	IEC61000-4-2:2001 GB/T 17626.6-2006
10	Package Vibration	Frequency range: 5-20-200HZ, PSD : 0.01-0.01-0.001 Total:0.781g ² /Hz, 30min for each direction of X.Y.Z.	GB/T 2423.56-2018
11	Package Drop	Height: 60 cm, 1corner,3edges,6surfaces Total weight≤10Kg , Height:80cm; Total weight> 10Kg, , Height:60cm;	GB/T 4857.5-1992

Note 1: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

Note 2: 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



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9 Packing Drawing

Per Carton

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Material Number
1	LCM module	TM123XDGP01-00	305.92×123.62×7.00	0.322	18	5.796
2	Tray	PET	485×330×18.5	0.22	12	2.64
3	Dust-proof Bag	PE	700×545×0.05	0.021	1	0.021
4	Carton	Corrugated Paper	544×365×250	1.01	1	1.01
5	EPE	EPE	485×330×5mm	0.016	6	0.096
6	BOX	Corrugated Paper	520×345×74mm	0.38	3	1.14
7	Label		100×52	0.001	1	0.001
8	Total weight	10.7±5% Kg				

(Packaging Specification and Quantity)

(1) LCM quantity per tray: 2row×1column =2
(2) Total LCM quantity in Carton: Number of PET trays 5× quantity per tray 2= 10
Note: Please refer to the data from “estimated report about the dimension and stack of Carton “ about stacking carton

Use empty tray
使用一个空吸塑盘做盖子

+

Put products into the
3trays*2 LCMS per tray.
将产品放入3个吸塑盘中，每个吸塑盘
中放入2片模组



Use strap
如右图方式打包吸塑盘组



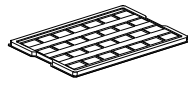
put EPE at the bottom of
little box
将EPE 放置在包装盒的底面



put LEM into little
box,4tray with 6LCM for
every box
将EPE 放置在包装盒的底面，每盒装
4tray, 6pcs模组

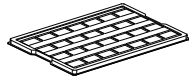


put EPE at the top of
little box
将EPE 放置在包装盒的顶面

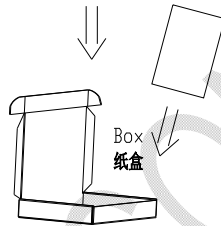


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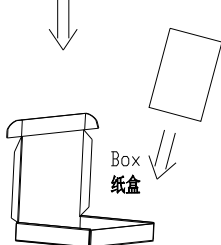
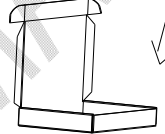
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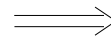
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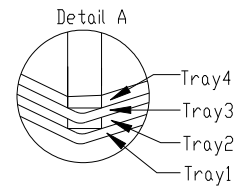
Box
纸盒



Box
纸盒



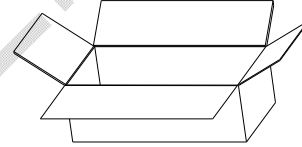
3 Box
内箱中共3盒产品



Rotate tray 180 degrees and place on top
of stack. Check the tray using Fig.A.

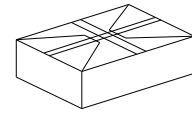
吸塑盘需旋转180° 堆叠，顶部放置空
吸塑盘，堆叠后效果需和图A一致。

The tape to seal
carton
attach label
使用胶带密封纸箱
贴附标签

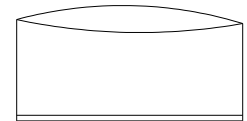


put into carton
12tray with 18 LCMS per
carton
装入纸箱，
每个纸箱中装12个tray，18个模组

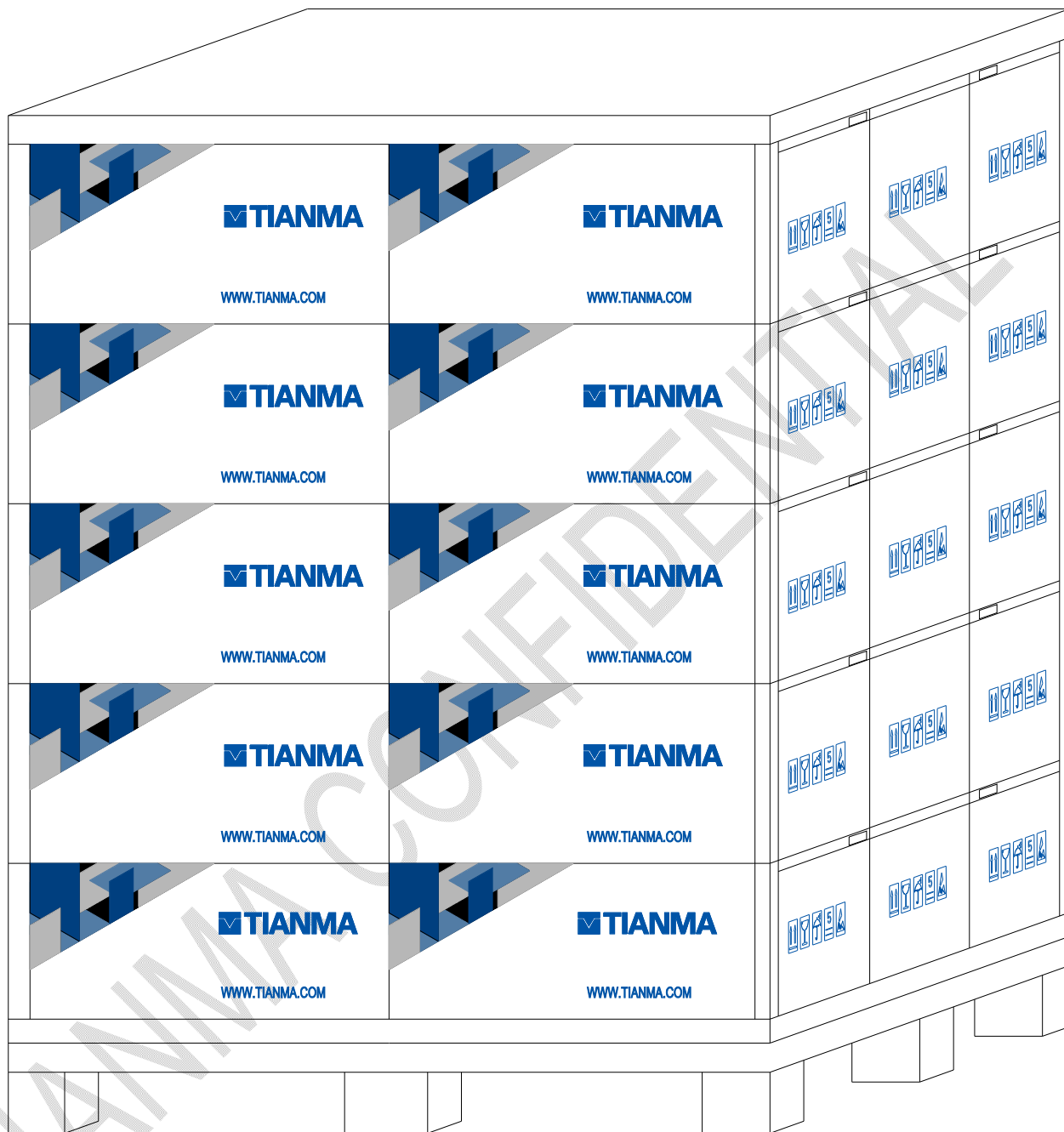
将多余的防尘袋空间折叠至正面
利用胶带固定



dust-proof bag
将2个装有产品的纸盒放入防尘袋中



纸箱堆叠数按2*3每层*共5层



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

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