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APOLLO DISPLAY
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DISPLAY
TECHNOLOGY

MODEL NO   :   **TM101JDHG30**

MODEL VERSION: **00**

SPEC VERSION :   **V2.0**

ISSUED DATE: **2016-05-12**

☐ **Preliminary Specification**
■ **Final Product Specification**

Customer :

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Gang.li	Longping.Deng	**Feng.Qin**

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2015-10-10	Preliminary Specification Released.	Gang.li
1.1	2015-11-04	Update more details.	Gang.li
1.2	2016-01-05	Update mechanical drawing.	Gang.li
1.3	2016-03-07	Update backlight power consumption on page8; Update packaging method on page19.	Gang.li
2.0	2016-05-12	Update optical characteristics. Final specification released.	Gang.li

1   General Specifications

Feature		Spec
Display Spec.	Size	10.1 inch
	Resolution	1280(RGB) x 800
	Technology Type	SFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel Pitch (mm)	0.1695x0.1695
	Display Mode	Transmissive, Normally Black
	Surface Treatment(Up Polarizer)	HC
	Viewing Direction	All direction
Mechanical Characteristics	LCM (W x H x D) (mm)	231.22x150.60x4.30
	Active Area(mm)	216.96x135.60
	With /Without TSP	Without TSP
	Matching Connection Type	IPEX 20453-040T-1 or compatible
	Weight (g)	280
Electrical Characteristics	Interface	1port LVDS, 6/8bit selectable
	Color Depth	262K/16.7M
	Driver IC	ST5084*1,ST5821*3

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 TFT LCD Panel

Connector type:JAE HD1S040HA1 or compatible
Mating Connector:IPEX 20453-040T-1 or compatible

No	Symbol	I/O	Description	Comment
1	NC	-	No Connection	
2	VDD	P	Power Supply +3.3V	
3	VDD	P	Power Supply +3.3V	
4	VDD	P	Power Supply +3.3V	
5	NC	-	No Connection	
6	NC	-	No Connection	
7	NC	-	No Connection	
8	Rxin0-	I	-LVDS differential data input(R0~R5,G0)	
9	Rxin0+	I	+LVDS differential data input(R0~R5,G0)	
10	GND	P	Power ground	
11	Rxin1-	I	-LVDS differential data input(G1~G5,B0~B1)	
12	Rxin1+	I	+LVDS differential data input(G1~G5,B0~B1)	
13	GND	P	Power ground	
14	Rxin2-	I	-LVDS differential data input(B2~B5,HS,VS,DE)	
15	Rxin2+	I	+LVDS differential data input(B2~B5,HS,VS,DE)	
16	GND	P	Power ground	
17	RxCLK-	I	-LVDS differential data input	
18	RxCLK+	I	+LVDS differential data input	
19	GND	P	Power ground	
20	Rxin3-	I	-LVDS differential data input(R6~R7,G6~G7,B6~B7)	Connect to GND in 6 bit mode
21	Rxin3+	I	+LVDS differential data input(R6~R7,G6~G7,B6~B7)	
22	GND	P	Power ground	
23	NC	-	No Connection	
24	NC	-	No Connection	
25	GND	P	Power ground	
26	NC	-	No Connection	
27	SEL6/8	-	SEL6/8="H", 6bit; SEL6/8="L" ,8bit	
28	GND	P	Power ground	
29	NC	-	No Connection	
30	NC	-	No Connection	
31	VLED_GND	P	VLED Ground	
32	VLED_GND	P	VLED Ground	
33	VLED_GND	P	VLED Ground	
34	NC	-	No Connection	
35	VLED_PWM	P	Backlight dimming control	
36	VLED_EN	P	Backlight on/off control	
37	NC	-	No Connection	
38	VLED	P	Backlight power supply	
39	VLED	P	Backlight power supply	
40	VLED	P	Backlight power supply	

Note: I/O definition:

I-----Input   P----Power/Ground

3   Absolute Maximum Ratings

3.1   Driving TFT LCD Panel

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Voltage Input	Vin	-0.50	5.00	V	Note1
Operating Temperature	T_{op}	-20.0	70.0	℃	
Storage Temperature	T_{st}	-30.0	80.0	℃	
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＞70℃

Table 3.1 absolute maximum rating

Note1: Input voltage include Rxin0-/+, Rxin1-/+, Rxin2-/+, Rxin3-/+, RxCLK-/+, SEL6/8,VDD.

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.

4   Electrical Characteristics

4.1   Driving TFT LCD Panel

VCC=3.3V,GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power supply Voltage		VDD	3.00	3.30	3.60	V	
Power supply ripple		Vp-p	-	-	100	mV	
Power supply current		IDD	-	280	-	mA	
Power consumption		P	-	924	-	mW	Note1
Differential input voltage		|Vid|	200	-	600	mV	
Differential input common voltage		Vcm	-	1.2	-	V	
Differential input threshold voltage	Low level	VTL	-100	-	-	mV	
	High level	VTH	-	-	100	mV	
Inrush current		Irush	-	-	1.5	A	

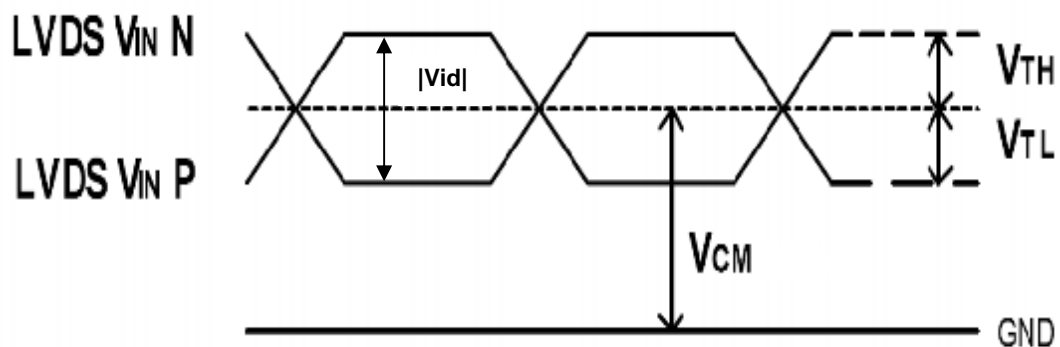**Table 4.1 LCD module electrical characteristics**

Figure4.1 LVDS DC characteristics

Note1: To test the current dissipation, using the "color bar" testing pattern shown as below:

1. White
2. Yellow
3. Cyan
4. Green
5. Magenta
6. Red
7. Blue
8. Black

Figure 4.1.2 Current dissipation testing pattern

4.2 Driving Backlight

Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark	
Backlight power supply voltage		VLED	5.5	12	12.5	V		
Backlight power supply current		I_LED	-	322	-	mA		
Backlight power consumption		P_LED	-	3864	-	mW		
Input voltage for VLED_PWM signal	High level	-	2.0	-	5.0	V		
	Low level	-	0	-	0.4	V		
Input voltage for VLED_EN	High level	-	2.0	-	5.0	V		
	Low level	-	0	-	0.4	V		
VLED_PWM frequency		Fpwm	200	-	20k	HZ		
VLED_PWM duty		D	5		100	%	Note1	
Operating Life Time		--	--	50000	--	hrs	Note2	

Note 1: According to LED driver IC characteristics, the minimum value of VELD_PWM duty may vary with VLED_PWM frequency, higher the frequency, bigger the duty.

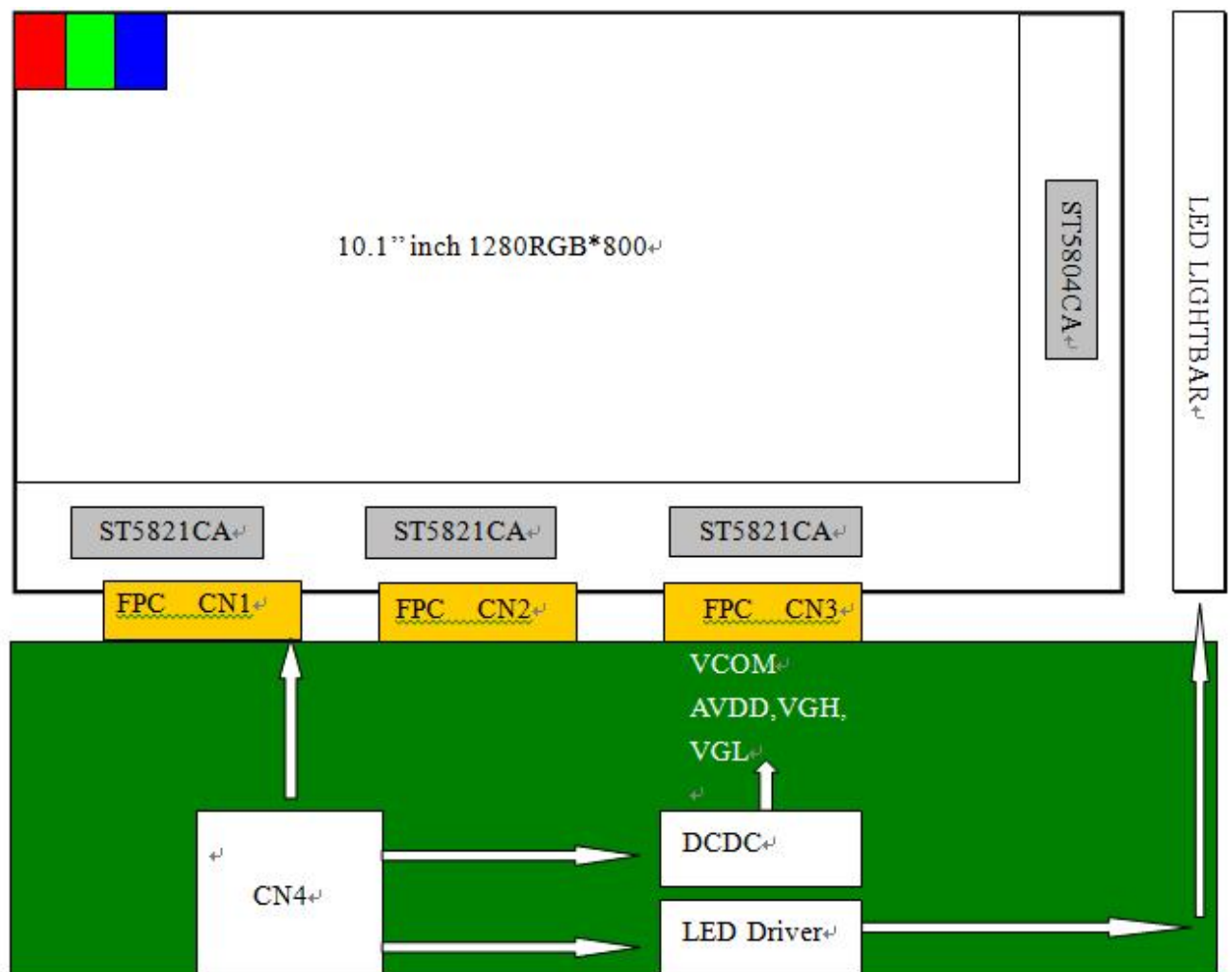Note 2: Optical performance should be evaluated at Ta=25℃ only.

   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.

4.3 Block Diagram

```
10.1" inch 1280RGB*800

ST5804CA          LED LIGHTBAR

ST5821CA    ST5821CA    ST5821CA

FPC  CN1    FPC  CN2    FPC  CN3

                VCOM
                AVDD,VGH,
                VGL

        CN4     DCDC

                LED Driver
```

5 Timing Chart

5.1 LVDS signal timing characteristics

VCC=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
CLK frequency	1/tclk	62.6	68.2	78.1	MHz	
Horizontal blanking time	tHBT	20	69	164	tclk	thbp + tHFP
Horizontal back porch	tHBP	-	5	164- tHFP	tclk	
Horizontal display area	tHD	-	1280	-	tclk	
Horizontal front porch	tHFP	15	64	159	tclk	
Horizontal period	tH	1300	1349	1444	tclk	
Horizontal pulse width	tHPW	-	1	256	tclk	
Vertical blanking time	tVBT	5	42	101	tH	tVBP + tVFP
Vertical back porch	tVBP	-	2	101- tVFP	tH	
Vertical display area	tVD	-	800	-	tH	
Vertical front porch	tVFP	3	40	99	tH	
Vertical period	tV	803	842	901	tH	
Vertical pulse width	tVPW	-	1	128	tH	
Frame Rate	F	-	60	-	HZ	

Table 5.1 timing parameter

5.2 Input Clock and Data timing Diagram:

Vertical input timing
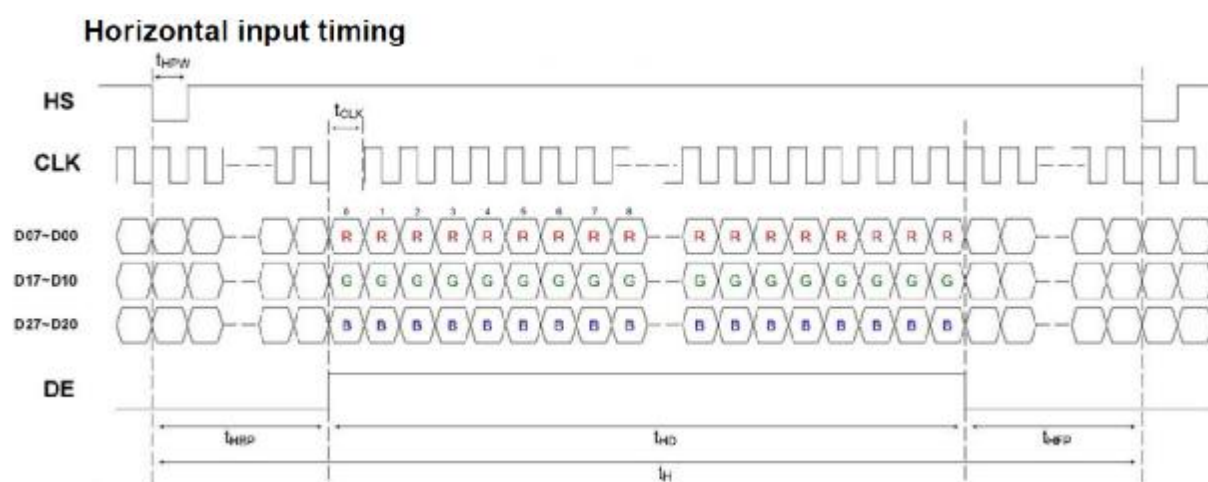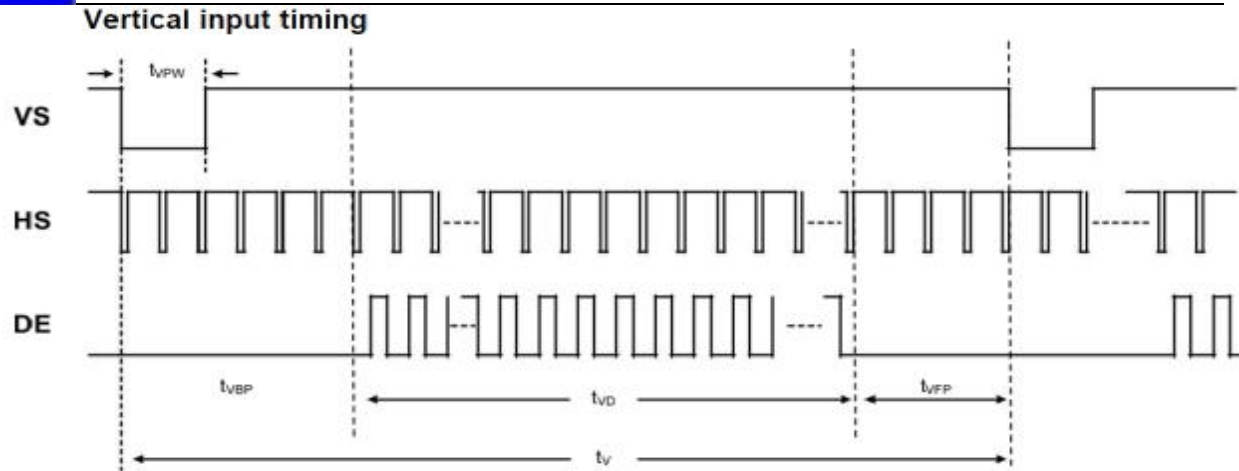
Figure 5.2 Input signal data timing

5.3 LVDS data input format
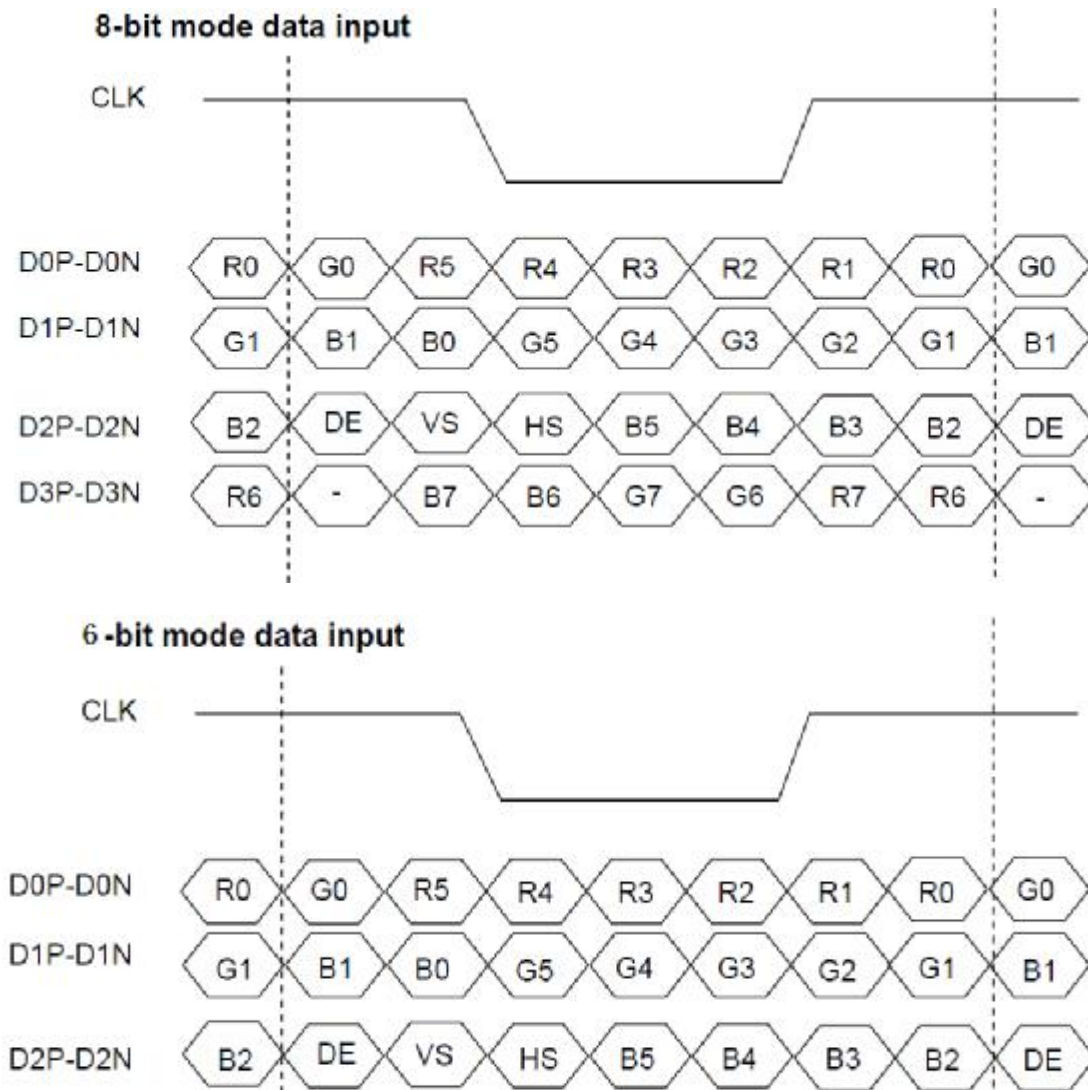
5.4 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD on to VDD stable	Tp1	0.5	-	10	ms	
VDD stable to signal on	Tp2	0	-	50	ms	
Signal on to VLED_EN on	Tp3	200	-	-	ms	
PWM on to VLED_EN on	Tp4	0	-	200	ms	
VLED to PWM on	Tp5	10	-	-	ms	
VLED on to VELD stable	Tp6	0.5	-	10	ms	
VDD off time	Tp7	0	-	10	ms	
VDD off to next VDD on	Tp8	500	-	-	ms	
Signal off before VDD off	Tp9	0	-	50	ms	
VLED_EN off before signal off	Tp10	200	-	-	ms	
VLED_EN off before PWM off	Tp11	0	-	200	ms	
PWM off before VLED off	Tp12	10	-	-	ms	

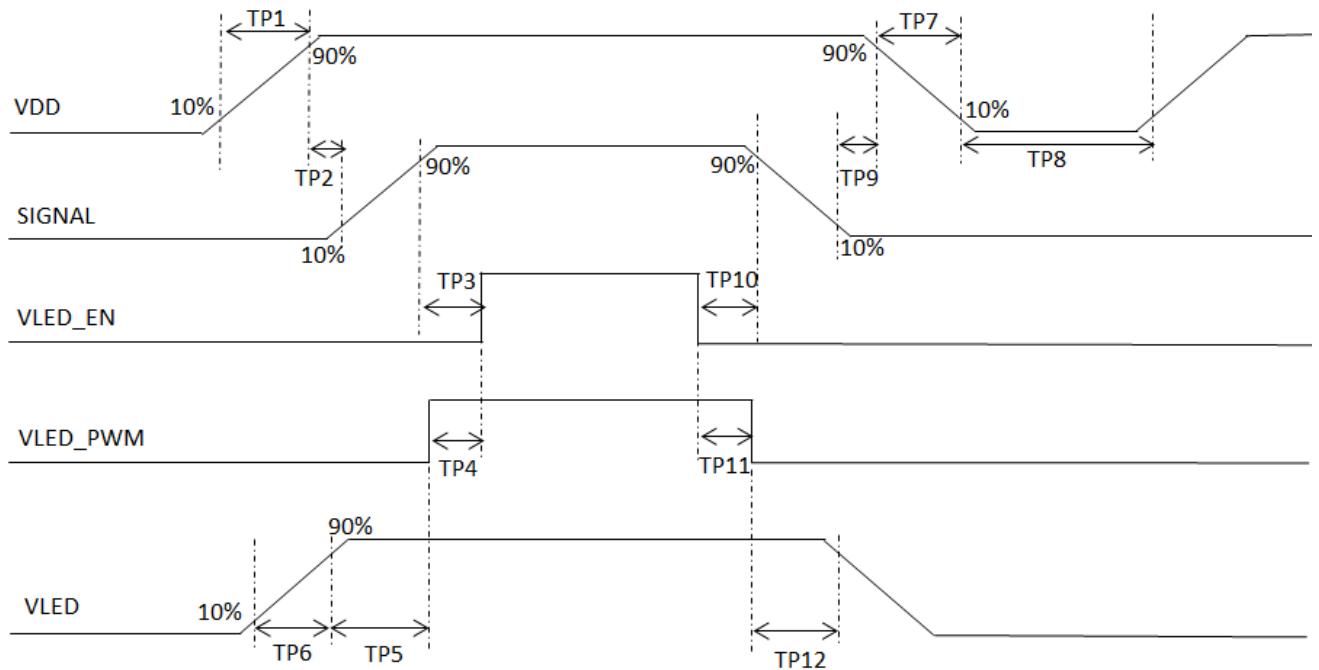**Table 5.1 Power on/off sequence**

Figure 5.2 Interface power on/off sequence

6 Optical Characteristics

6.1 Optical Specification

Ta=25 ℃

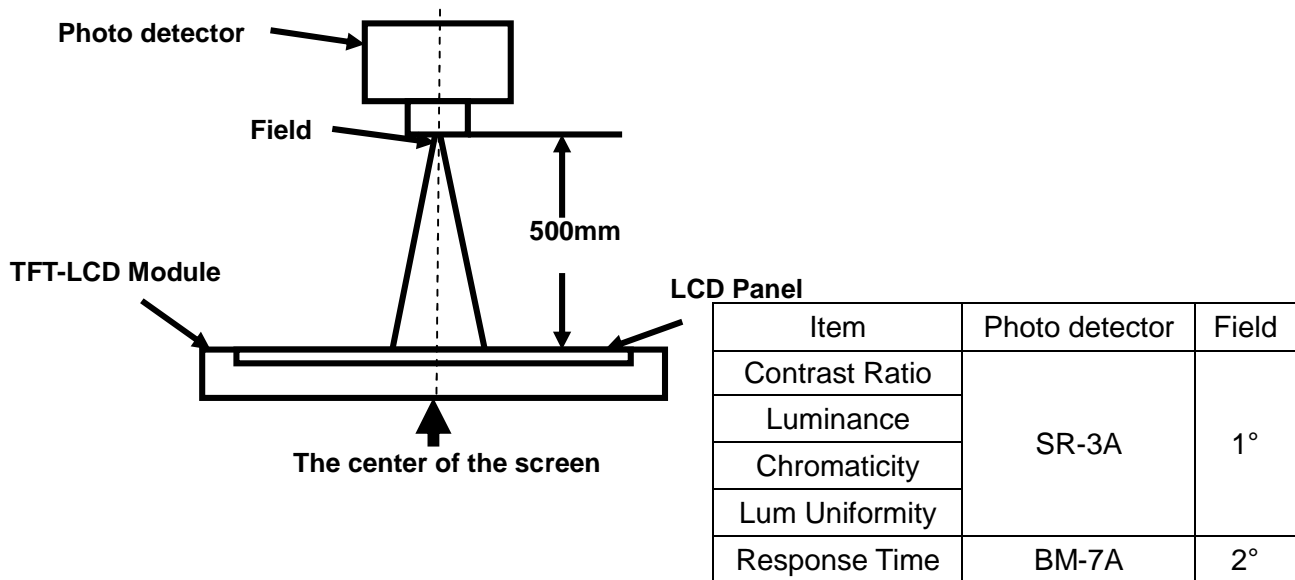| Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	75	85	-	Degree	Note 2
		θB		75	85	-		
		θL		75	85	-		
		θR		75	85	-		
Contrast Ratio		CR	θ=0°	600	800	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	10	15	ms	Note1 Note4
		T_{OFF}		-	15	25		
Chromaticity	White	x	Backlight is on	0.252	0.302	0.352	-	Note5 Note1
		y		0.277	0.327	0.377		
	Red	x		0.528	0.578	0.628		
		y		0.272	0.322	0.372		
	Green	x		0.296	0.346	0.396		
		y		0.528	0.578	0.628		
	Blue	x		0.104	0.154	0.204		
		y		0.042	0.092	0.142		
Uniformity		U	-	75	80	-	%	Note1 Note6
NTSC		-	-	-	50	-	%	Note 5
Luminance		L		400	500	-	cd/m^2	Note1 Note7

Test Conditions:

1. The ambient temperature is 25±2℃.humidity is 65±7%

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.

Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

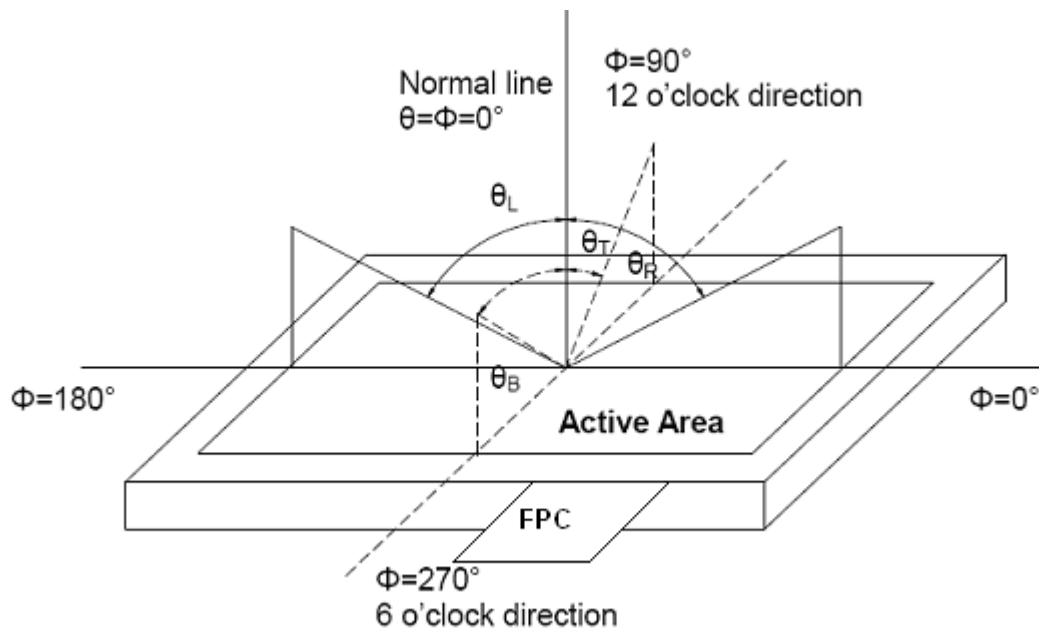viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

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 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.
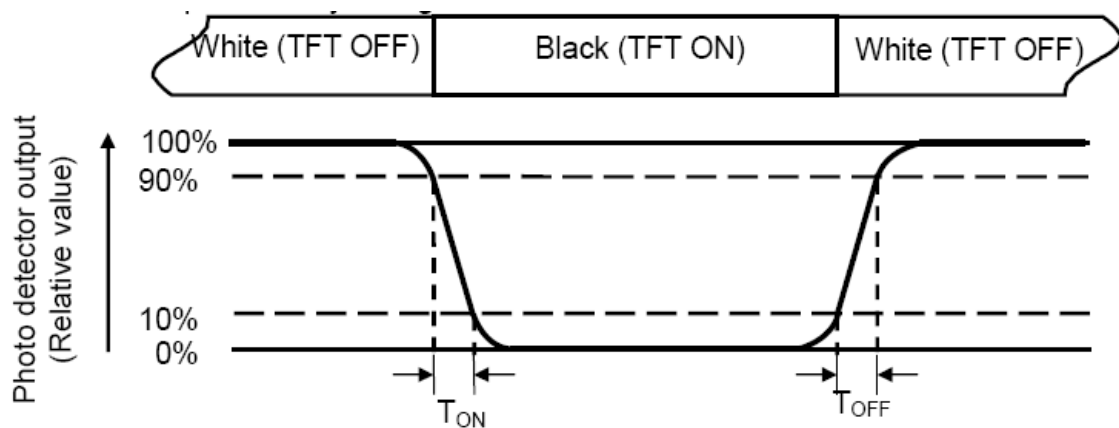
Note 5: Definition of color chromaticity (CIE1931)

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.

Luminance Uniformity(U) = Lmin/ Lmax
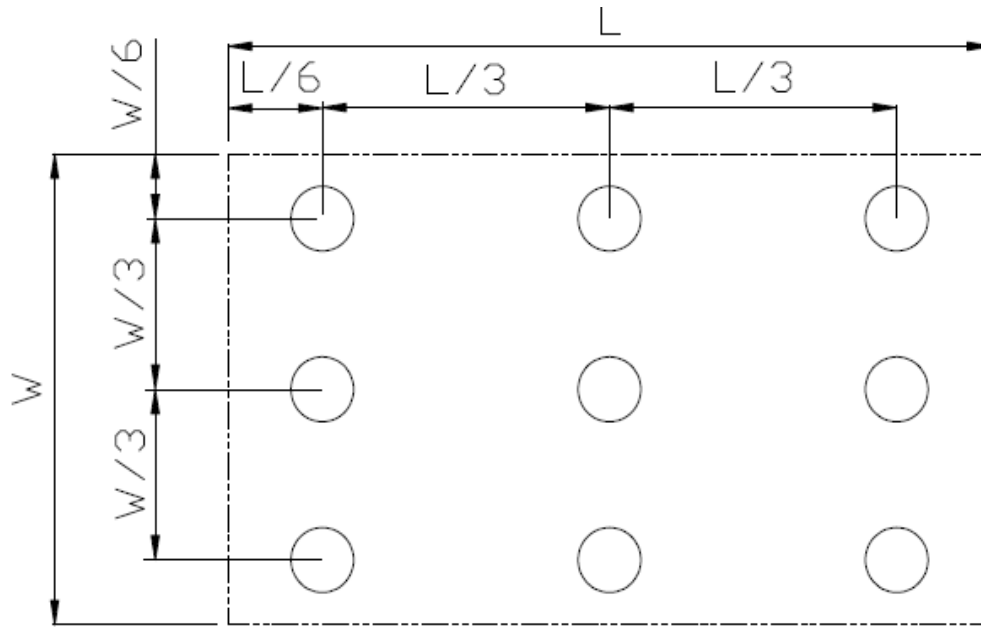
L-------Active area length W----- Active area width

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.
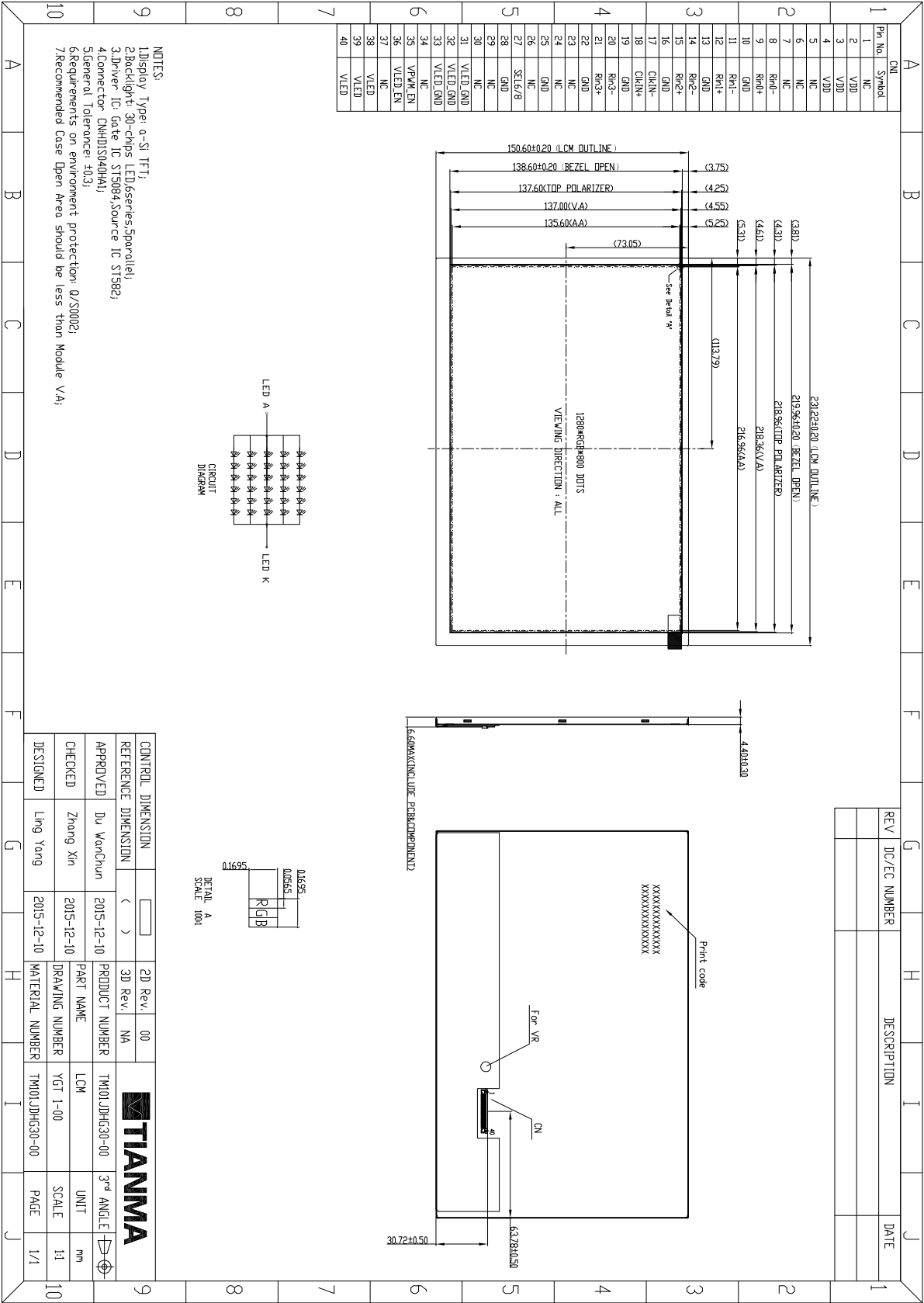
7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	Ts=+70℃, 240hrs	(Note1) IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	Ta=+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	Ta = +60℃, 90% RH max,240 hours	(Note2) IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min,100cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	Electro Static Discharge (operation)	C=150pF,R=330Ω; Contact:±4Kv, 5times; Air:±8KV,5times;	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (non-operation)	Frequency range:10～55Hz, Stroke:1.5mm Sweep:10Hz～55Hz～10Hz 2hours for each direction of X.Y.Z (6 hours total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

8　Mechanical Drawing

CN1

Pin No.	Symbol
1	NC
2	NC
3	VDD
4	VDD
5	NC
6	NC
7	NC
8	Rin0-
9	Rin0+
10	GND
11	Rin1-
12	Rin1+
13	GND
14	Rin2-
15	Rin2+
16	GND
17	ClkIN-
18	ClkIN+
19	GND
20	Rin3-
21	Rin3+
22	GND
23	NC
24	NC
25	GND
26	NC
27	SEL6/8
28	GND
29	NC
30	NC
31	VLED_GND
32	VLED_GND
33	VLED_GND
34	NC
35	VPWM_EN
36	VLED_EN
37	NC
38	VLED
39	VLED
40	VLED

NOTES:
1.Display Type: a-Si TFT;
2.Backlight: 30-chips LED,6series,5parallel;
3.Driver IC: Gate IC ST5084,Source IC ST582;
4.Connector CN:HD1S040HA1;
5.General Tolerance: ±0.3;
6.Requirements on environment protection: 0/S0002;
7.Recommended Case Open Area should be less than Module V.A;

CIRCUIT DIAGRAM
LED A
LED K

150.60±0.20 (LCM OUTLINE)
138.60±0.20 (BEZEL OPEN)
137.60(TOP POLARIZER)
137.00(V.A)
135.60(A.A)
(3.75)
(4.25)
(4.55)
(5.25)
(3.8)
(4.3)
(4.6)
(5.3)
(73.05)
(113.79)

231.2±0.20 (LCM OUTLINE)
219.96±0.20 (BEZEL OPEN)
218.96(TOP POLARIZER)
218.36(V.A)
216.96(A.A)

1280xRGBx800 DOTS
VIEWING DIRECTION : ALL

See Detail "A"

4.40±0.30
6.60MAX(INCLUDE PCB&COMPONENT)

DETAIL A
SCALE 100:1
0.1695
0.0565
R G B

Print code
XXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXX

For VR
CN
30.72±0.50
63.78±0.50

CONTROL DIMENSION		
REFERENCE DIMENSION	( )	2D Rev.
APPROVED	Du WanChun	3D Rev.
CHECKED	Zhang Xin	PART NAME
DESIGNED	Ling Yang	DRAWING NUMBER
		MATERIAL NUMBER

PRODUCT NUMBER TM101JDHG30-00
00 NA
LCM YGT 1-00
TM101JDHG30-00
3rd ANGLE
2015-12-10
2015-12-10
2015-12-10
PAGE 1/1
SCALE 1:1
UNIT mm

REV | DC/EC NUMBER | DESCRIPTION | DATE

9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM101JDHG30	231.22x150.60x4.30	0.28	19	
2	Dust-Proof Bag	PE	700×545mm	0.046	1	
3	Anti-Static Bag	PE	246×240mm	0.004	1	
4	Partition_1	Corrugated paper	527×348×217mm	1.571	1	
5	Partition_2	Corrugated Paper	505×332×5mm	0.098	2	
6	Corrugated Bar	Corrugated Paper	527×244×7mm	0.057	2	
7	Carton	Corrugated paper	544×365×250mm	1.12	1	
8	Total weight(Kg)	8.371kg±5%				

The packing method is shown as below:

9.1　Put module into anti-static bag
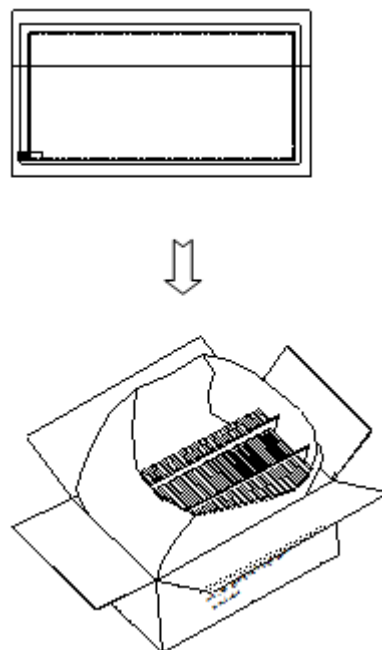

开口处

A/S Bag
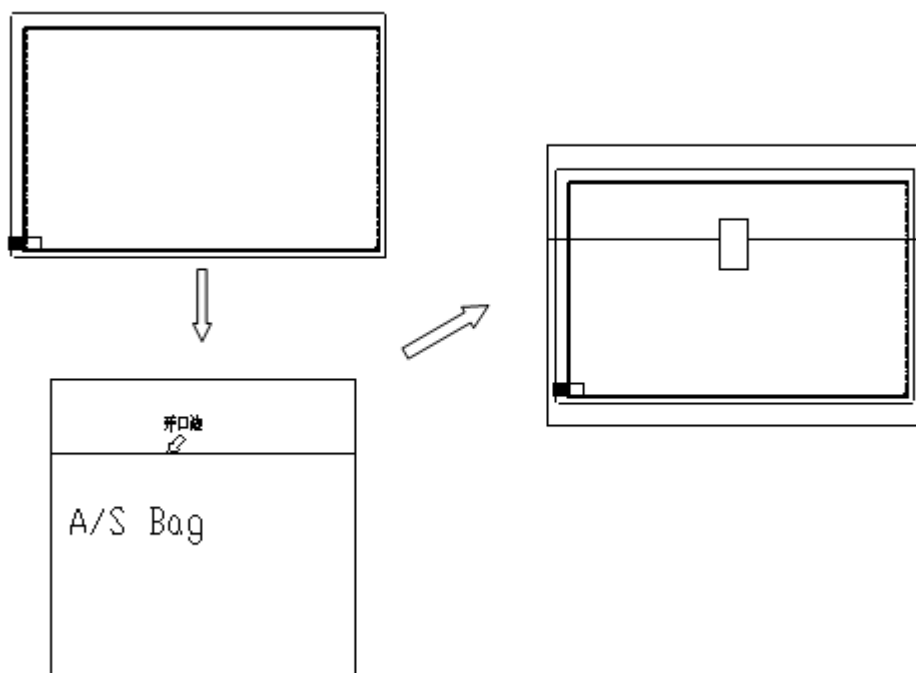
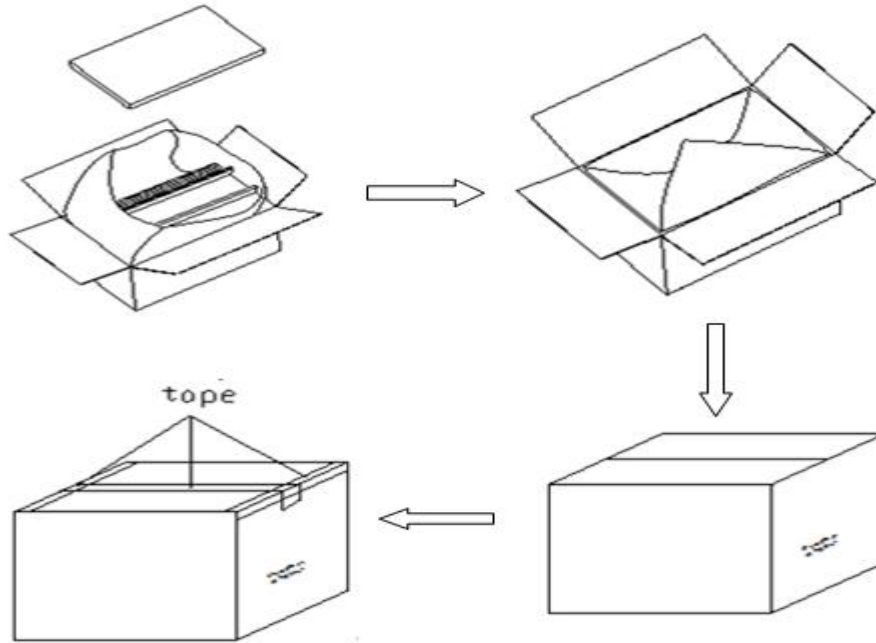**9.2**   Dummy packing assembling
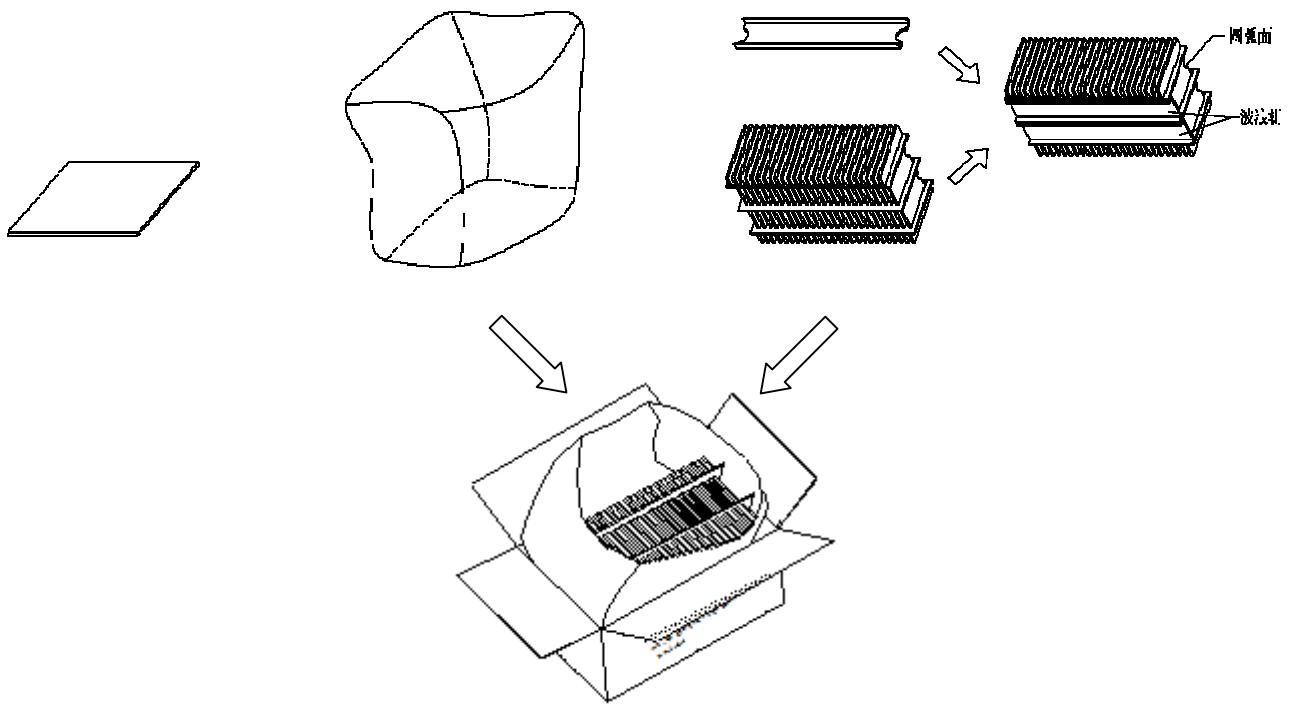
9.3   LCD module assembling

9.4 Box sealent

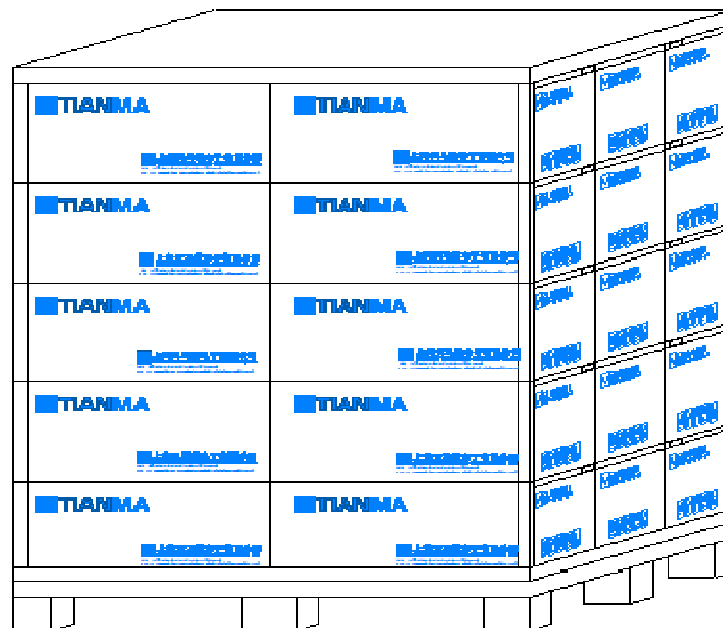tope

9.5 Stacking method(2x3x5)

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.

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