MODEL NO. : TM104SDHG30

MODEL VERSION: 02

SPEC VERSION : V2.0

ISSUED DATE: 2020-03-16

☐Preliminary Specification
☑Final Product Specification

Customer :

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by
Gang.Li	Longping.Deng	Kevin.Kim

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2019-08-06	Preliminary Specification Released.	Gang.Li
2.0	2020-03-16	Update more details.Final specification released.	Gang.Li

1 General Specifications

Feature		Spec
Display Spec.	Size	10.4 inch
	Resolution	800(RGB) x 600
	Interface	TTL 24bits
	Technology Type	a-Si
	Pixel Pitch (mm)	0.264x0.264
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti-Glare(3H)
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	228.40x175.40x6.20
	Active Area(mm)	211.20x158.40
	With /Without TSP	Without Touch panel
	Matching Connector Type	CN1:Hirose FH28-60S-0.5SH CN2:JST SM02B-BHSS-1-TB
	Weight (g)	341
Electrical Characteristics	Interface	TTL(24bit RGB)
	Color Depth	16.2M
	Driver IC	ST5651CB+ST5021

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

Matching Connector: Hirose FH28-60S-0.5SH

No	Symbol	I/O	Description	Comment
1	GND	P	Power Ground	
2	AVDD	P	Power Supply	
3	VCC	P	Power Supply	
4	R0	I	Red data Input(LSB)	Note
5	R1	I	Red data Input	
6	R2	I	Red data Input	
7	R3	I	Red data Input	
8	R4	I	Red data Input	
9	R5	I	Red data Input	
10	R6	I	Red data Input	
11	R7	I	Red data Input(MSB)	
12	G0	I	Green data Input(LSB)	
13	G1	I	Green data Input	
14	G2	I	Green data Input	
15	G3	I	Green data Input	
16	G4	I	Green data Input	
17	G5	I	Green data Input	
18	G6	I	Green data Input	
19	G7	I	Green data Input(MSB)	
20	B0	I	Blue data Input(LSB)	
21	B1	I	Blue data Input	
22	B2	I	Blue data Input	
23	B3	I	Blue data Input	
24	B4	I	Blue data Input	
25	B5	I	Blue data Input	
26	B6	I	Blue data Input	
27	B7	I	Blue data Input(MSB)	
28	DCLK	I	Clock input(Latch data at falling edge)	
29	DE	I	Data enable	
30	HSYNC	I	Horizontal sync input. Negative polarity	
31	VSYNC	I	Vertical sync input. Negative polarity	
32	MODE	I	DE/SYNC mode select .normally pull high H:DE mode .L:HV sync mode	
33	NC	-	No connection	
34	NC	-	No connection	
35	NC	-	No connection	
36	VCC	P	Power Supply	
37	NC	-	No connection	
38	GND	P	Power Ground	
39	GND	P	Power Ground	
40	AVDD	P	Power Supply	
41	VCOM		VCOM DC input	
42	NC	-	No connection	
43	NC	-	No connection	

44	NC	-	No connection	
45	NC	-	No connection	
46	NC	-	No connection	
47	NC	-	No connection	
48	NC	-	No connection	
49	NC	-	No connection	
50	NC	-	No connection	
51	NC	-	No connection	
52	NC	-	No connection	
53	NC	-	No connection	
54	NC	-	No connection	
55	NC	-	No connection	
56	VGH	P	TFT turn on voltage	
57	VCC	P	Power Supply	
58	VGL	P	TFT turn off voltage	
59	GND	P	Power Ground	
60	NC	-	No connection	

Note: For RGB565 or RGB666 interface，users should connect the LSB of R/G/B pins to the ground.

I/O definition:

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

2.2 CN2(BackLight Connector)

Connector: JST BHSR-02VS-1 Matching connector:SM02B-BHSS-1-TB

No	Symbol	I/O	Description	Wire Color
1	LEDA	P	LED driving anode (high voltage)	**Red**
2	LEDK	P	LED driving cathode (low voltage)	White

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.50	5.00	V	Maximum value due to MOS characteristics, user should set on advised value.
	AVDD	-0.50	15.00	V	
	VGH	-0.30	42.00	V	
	VGL	-20.00	0.30	V	
	VGH-VGL	-0.30	40.00	V	
Signal Input	Vin	-0.50	5.00	V	Note1
Operating Temperature	T_{op}	-10.0	60.0	℃	
Storage Temperature	T_{st}	-20.0	70.0	℃	
Operating and Storage Humidity	HSTG	-	90	%（RH）	Exceed 90%RH may cause abnormal display
Relative Humidity (Note2)	RH	--	≤90	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m^3	Ta＞70℃

Table 3.1 absolute maximum rating

Note1: Input voltage include R0~R5, G0~G5, B0~B5, DCLK, HSYNC, VSYNC, etc.

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
Digital supply Voltage		VCC	3.00	3.30	3.60	V	
Analog supply Voltage		AVDD	10.8	11	11.2	V	Very important voltage, exceed this value may cause abnormal display
Gate on voltage		VGH	24	25	26	V	
Gate off voltage		VGL	-7.5	-7.0	-6.5	V	
Common Electrode Driving Signal		VCOM	4.05	4.10	4.15	V	
Input Signal Voltage	Low Level	V_{IL}	0	-	0.3xVCC	V	R0~R7,G0~G7,0~B7,DE, DCLK,HSYNC,VSYNC,MODE, RESET, DITH
	High Level	V_{IH}	0.7xVCC	-	VCC	V	
Current of digital supply voltage		I_{VCC}	-	8	-	mA	VCC=3.3V,all black pattern
Current of analog supply voltage		I_{AVDD}	-	36	-	mA	AVDD=11V
Current of Gate on voltage		I_{VGH}	-	0.85	-	mA	VGH=25V
Current of Gate off voltage		I_{VGL}	-	1.7	-	mA	VGL=-7.0V
Current of Vcom		Ivcom		0.002	-	mA	VCOM=4.10V
Power consumption		P	-	456	-	mW	This value may vary with different patterns.

Table 4.1 LCD module electrical characteristics

4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	240	-	mA	Note 1
Forward Current Voltage	V_F	-	9.6	-	V	Note 1
Backlight Power Consumption	WBL	-	2304	-	mW	Note 1
Operating Life Time	LT	-	30000	-	hrs	Note 2

Note 1: The figure below shows the connection of backlight LED.

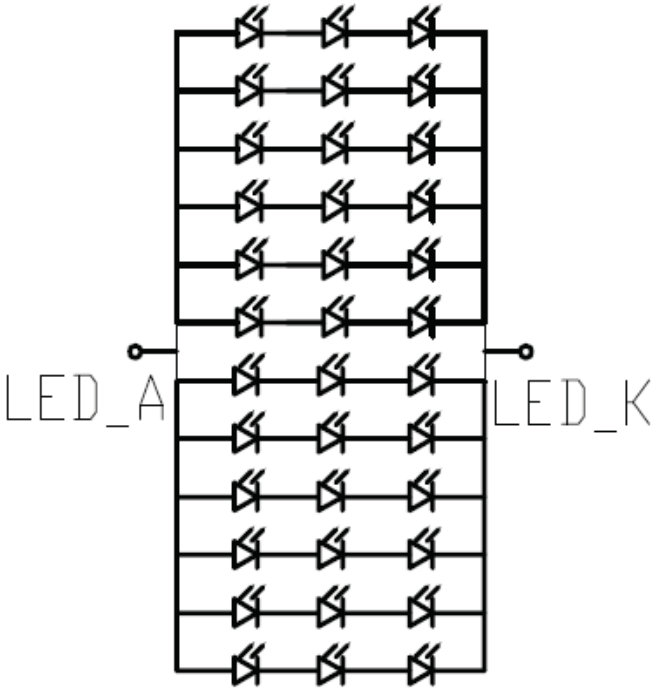


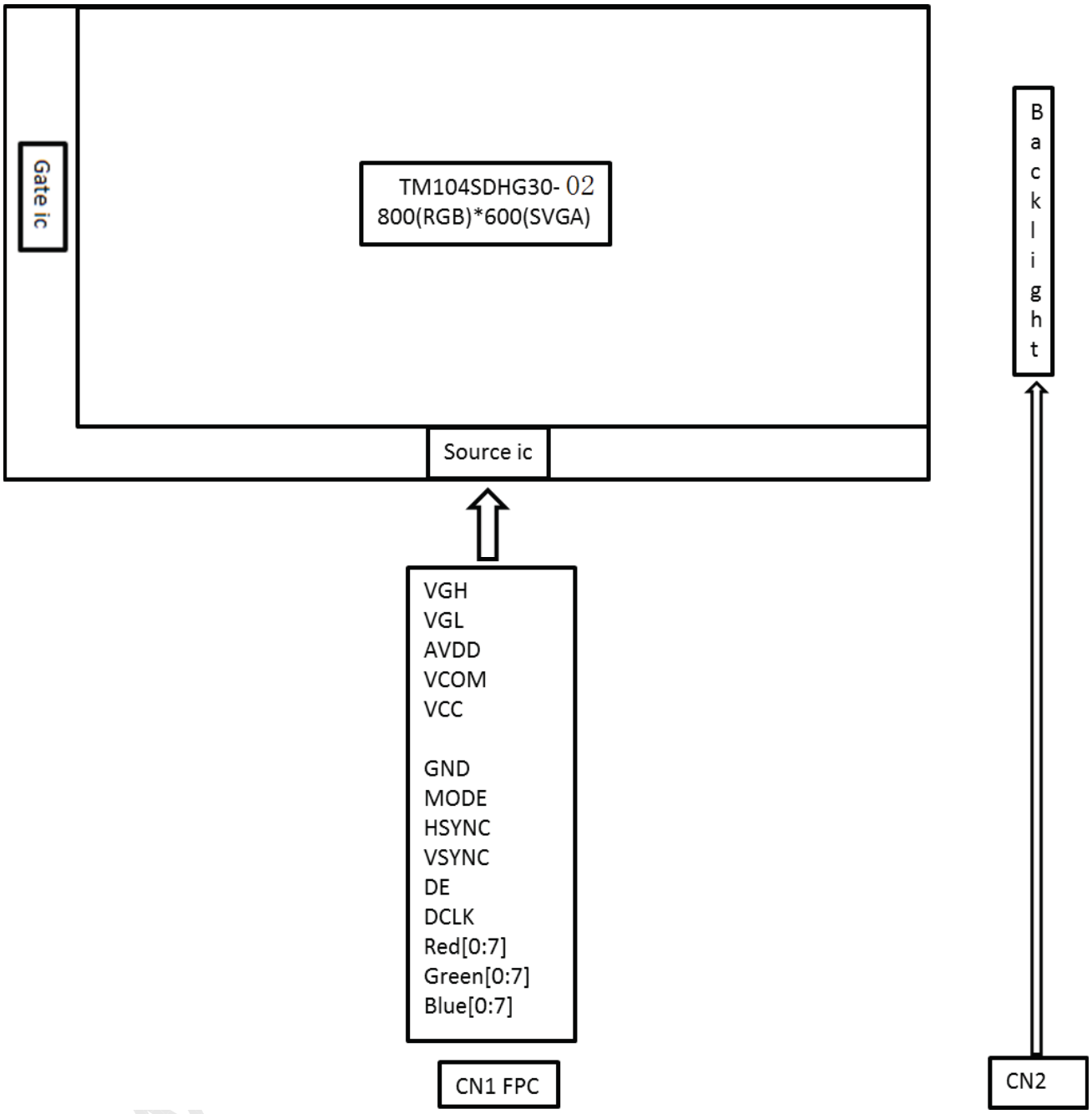
Figure 4.2 LED connection of backlight

Note 2: I_F is defined for twelve channels.

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.

Note3: One channel: I=20mA.

4.3 Block Diagram



5 Timing Chart

5.1 Timing Parameter

VCC=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
CLKIN Frequency	Fclk	-	65	71	MHz	VDD=2.3V~3.6V
CLKIN Cycle Time	Tclk	14.1	15.4	-	ns	
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	64	-	CLKIN	
Time from HSD to LD	Thld	-	64	-	CLKIN	
Time from HSD to STV	Thstv	-	2	-	CLKIN	
Time from HSD to CKV	Thckv	-	20	-	CLKIN	
Time from HSD to OEV	Thoev	-	4	-	CLKIN	
LD pulse width	Twld	-	10	-	CLKIN	
CKV pulse width	Twckv	-	66	-	CLKIN	
OEV pulse width	Twoev	-	74	-	CLKIN	

Table 5.1 timing parameter

5.2 Input Clock and Data timing Diagram:

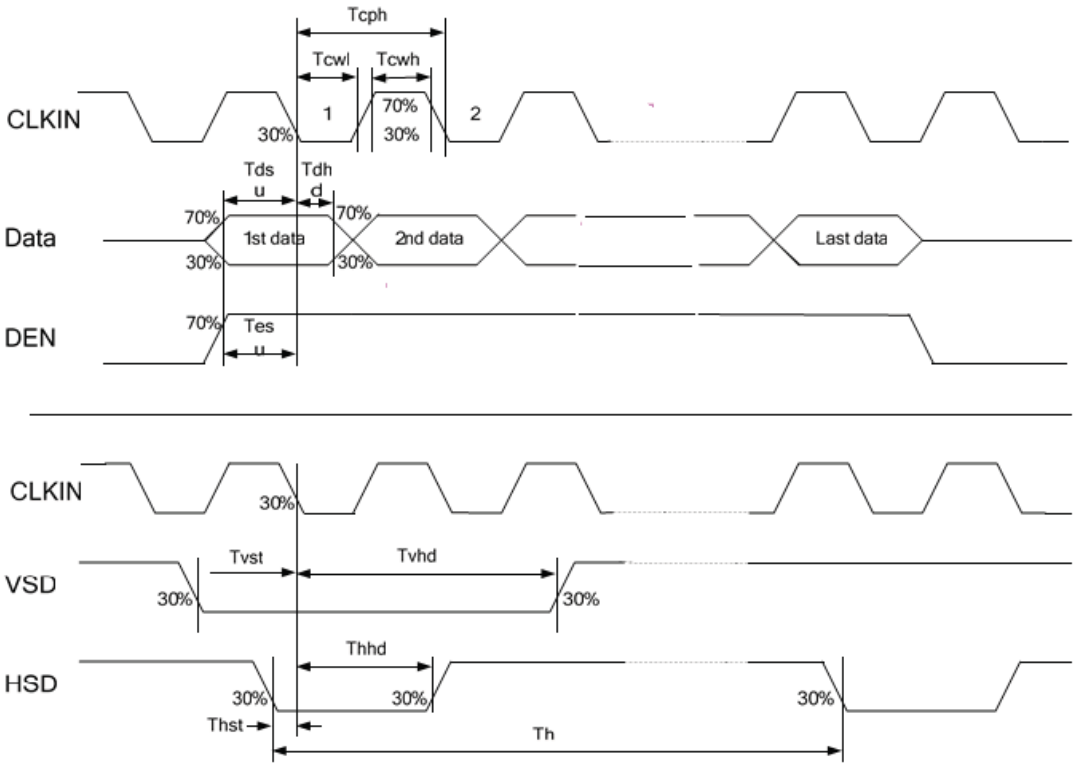


Figure 5.2 Input signal data timing

5.3 Recommended Input Timing setting of TCON

●HV SYNC MODE

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
Dclk frequency		Fclk	34.5	39.6	50.4	MHz	
HSD	Horizontal total	Th	900	1000	1200	Tclk	
	Horizontal blanking	Thb	100	200	400	Tclk	
	Valid Data Width	Thd		800		Tclk	
	Pulse Width	Thpw	1	-	40	Tclk	
	Back Porch	Thb		88		Tclk	
	Front Porch	Thfp	12	112	312	Tclk	
VSD	Frame rate	-	-	60	70	Hz	
	Vertical total	Tv	640	660	700	Th	
	Valid Data Width	Tvd		600		Th	
	Pulse Width	Tvpw	1	-	20	Th	
	Back Porch	Tvb		39		Th	
	Front Porch	Tvfp	1	21	61	Th	

Note: DE signal is necessary.

●DE MODE

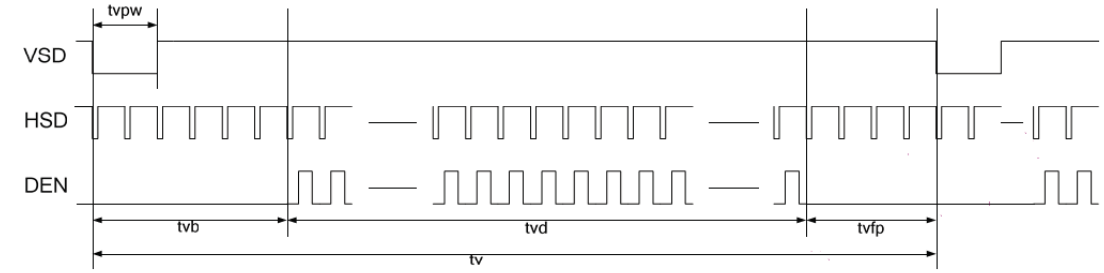
Parameter		Symbol	Min	Typ	Max	Unit	Remark
DCLK Frequency		Fclk	32.6	39.6	62.4	MHZ	
HSD	Horizontal total	Th	890	1000	1300	tclk	
	Valid Data Width	Thd		800		tclk	
	Horizontal blanking	Thb+ Thfp	90	200	500	tclk	
VSD	Vertical total	Tv	610	660	800	th	
	Valid Data Width	Tvd		600		th	
	Vertical blanking	Tvb+ Tvfp	10	60	200	th	

Note: HSD&VSD signal is unnecessary.

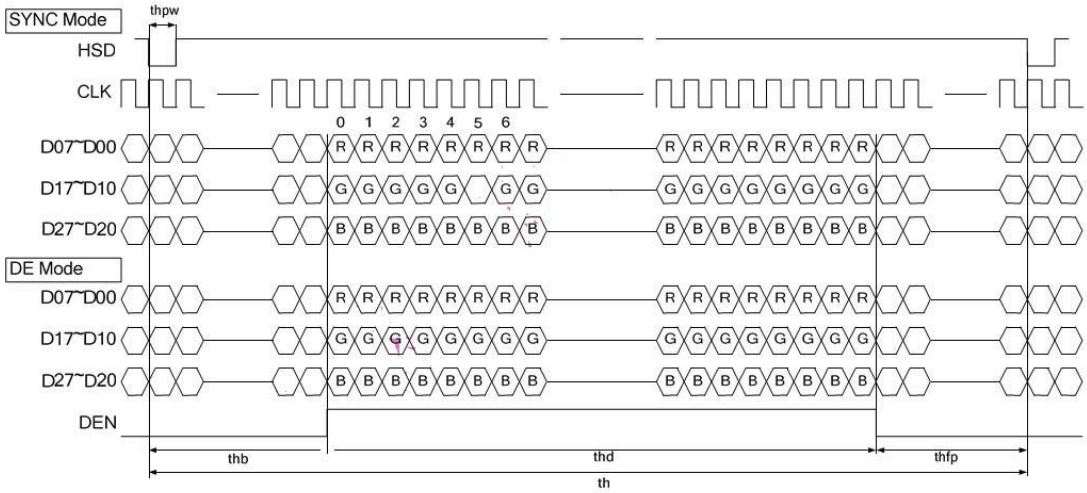
●Data input timing format

Vertical timing

Vertical input timing



Horizontal timing



5.4 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.3V rising time	T1	0.5	-	20	ms	
VCC to AVDD on time	T2	16	-	-	ms	
AVDD to VGL on time	T3	>0	16.7	-	ms	
VGL to VGH on time	T4	>0	16.7	-	ms	
VGH to DATA on time	T5	>0	-	-	ms	
DATA to BL on time	T6	>0	-	-	ms	

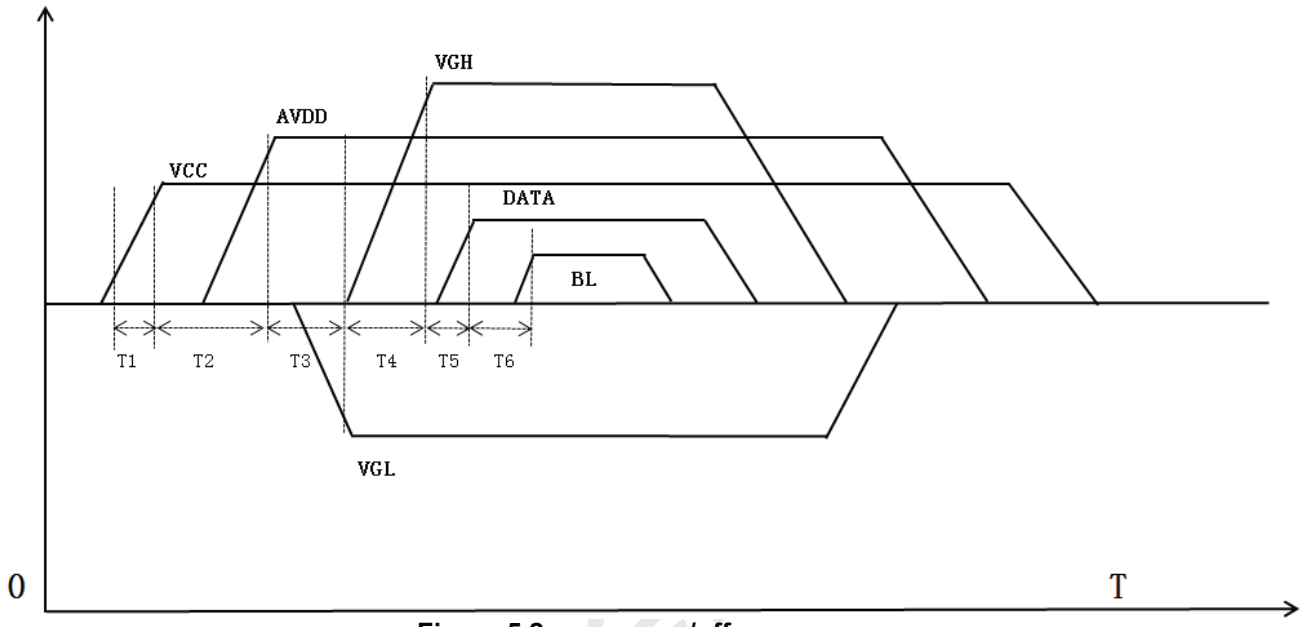


Figure 5.2 power on/off sequence

Note:1. Power on sequence: VCC➔AVDD➔VGL➔VGH➔DATA ON➔BACKLIGHT ON
2. Power off sequence: BACKLIGHT OFF➔DATA OFF➔VGH➔VGL➔AVDD➔VCC
3. When VCC turned on, the rising time T1 should less than 20ms.
4. AVDD stable to VCC stable time T2 should better longer than 1 frame time.
5. The power off sequence can be set according to power on settings.
6. It is advised that LCD power turned on much later than system when RGB pin is multiple used for system initial.

6 Optical Characteristics

6.1 Optical Specification

Ta=25℃

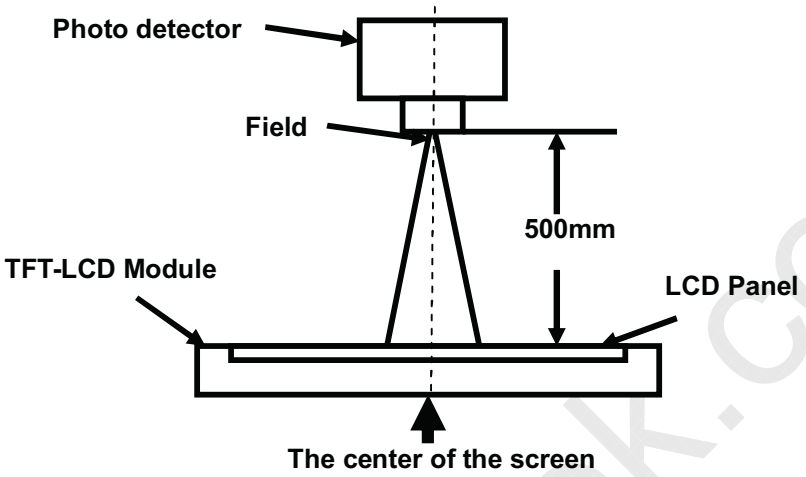
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	-	Degree	Note 2
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		$T_{ON+}T_{OFF}$	25℃	-	25	35		
Chromaticity	White	x	Backlight is on	0.252	0.302	0.352	-	Note5 Note1
		y		0.269	0.319	0.369		
	Red	x		0.549	0.599	0.649		
		y		0.295	0.345	0.395		
	Green	x		0.278	0.328	0.378		
		y		0.498	0.548	0.598		
	Blue	x		0.102	0.152	0.202		
		y		0.047	0.097	0.147		
Uniformity		U	-	75	80	-	%	Note1 Note6
NTSC		-	-	45	50	-	%	Note 5
Luminance		L		300	350	-	cd/m^2	Note1 Note7

Test Conditions:

1. The ambient temperature is 25±2℃.
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。

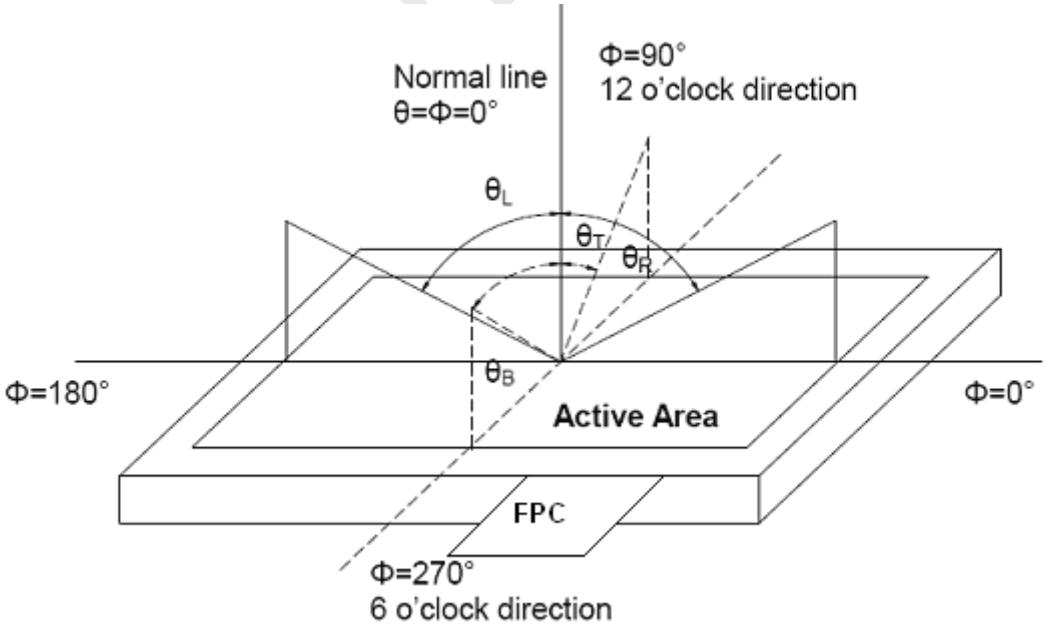


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

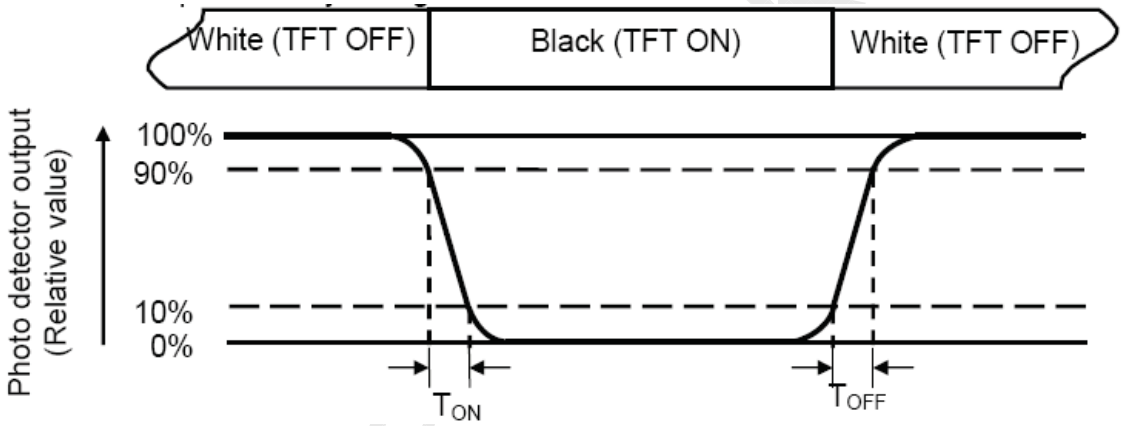
“White state “:The state is that the LCD should driven by Vwhite.

“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

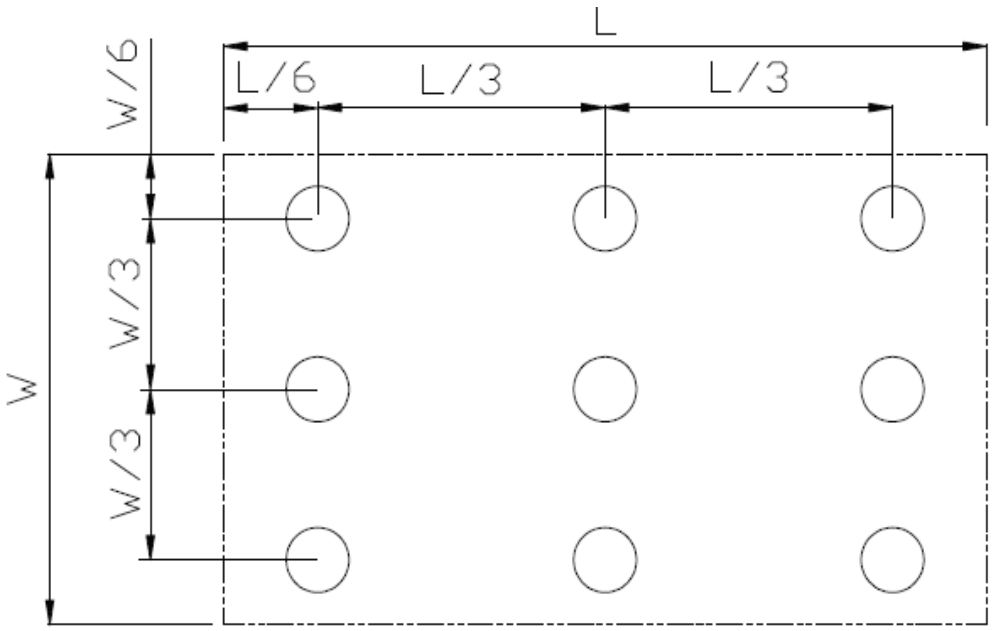


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance :

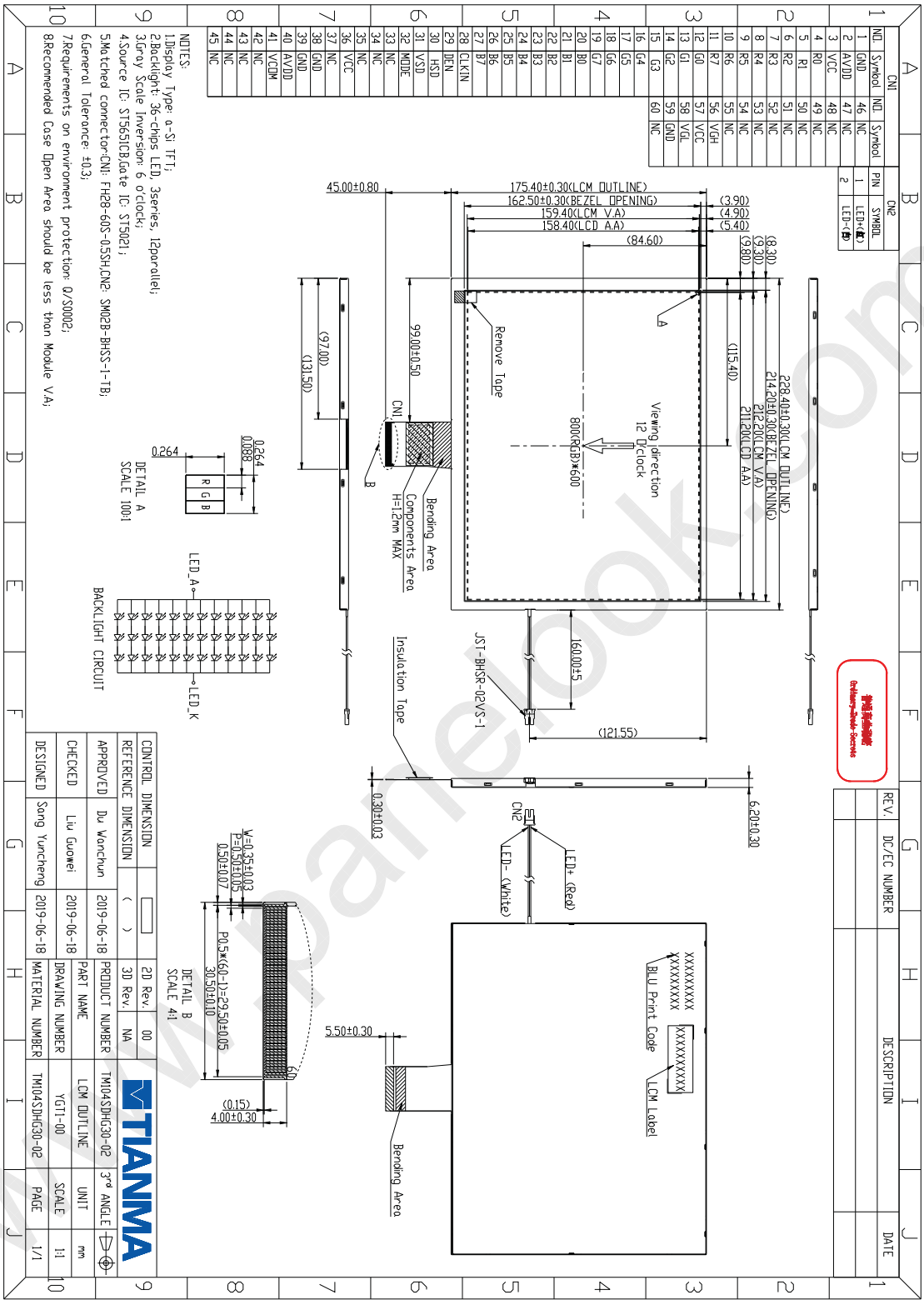
Measure the luminance of white state at center point.

7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	Ta=+60℃, 240hrs	Note1 IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta= -10℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	Ta=+70℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	Ta= -20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	Ta = +50℃, 80% RH max, 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2016
6	Thermal Shock (non-operation)	-10℃ 30 min~+60℃ 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, Air:±8Kv, Contact:±4Kv, 5times/terminal	IEC61000-4-2:2001 GB/T17626.6-2006
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—2019
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27:1987 GB/T2423.5—2019
10	Package Drop Test	Height:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T4857.5—1992
11	Package Vibration Test	Frequency： 5-20-200HZ， PSD ： 0.01-0.01-0.001 Total:0.781g2/HZ, x/y/z each direction 30min）	IEC60068-2-34 GB/T4857.23—2012

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

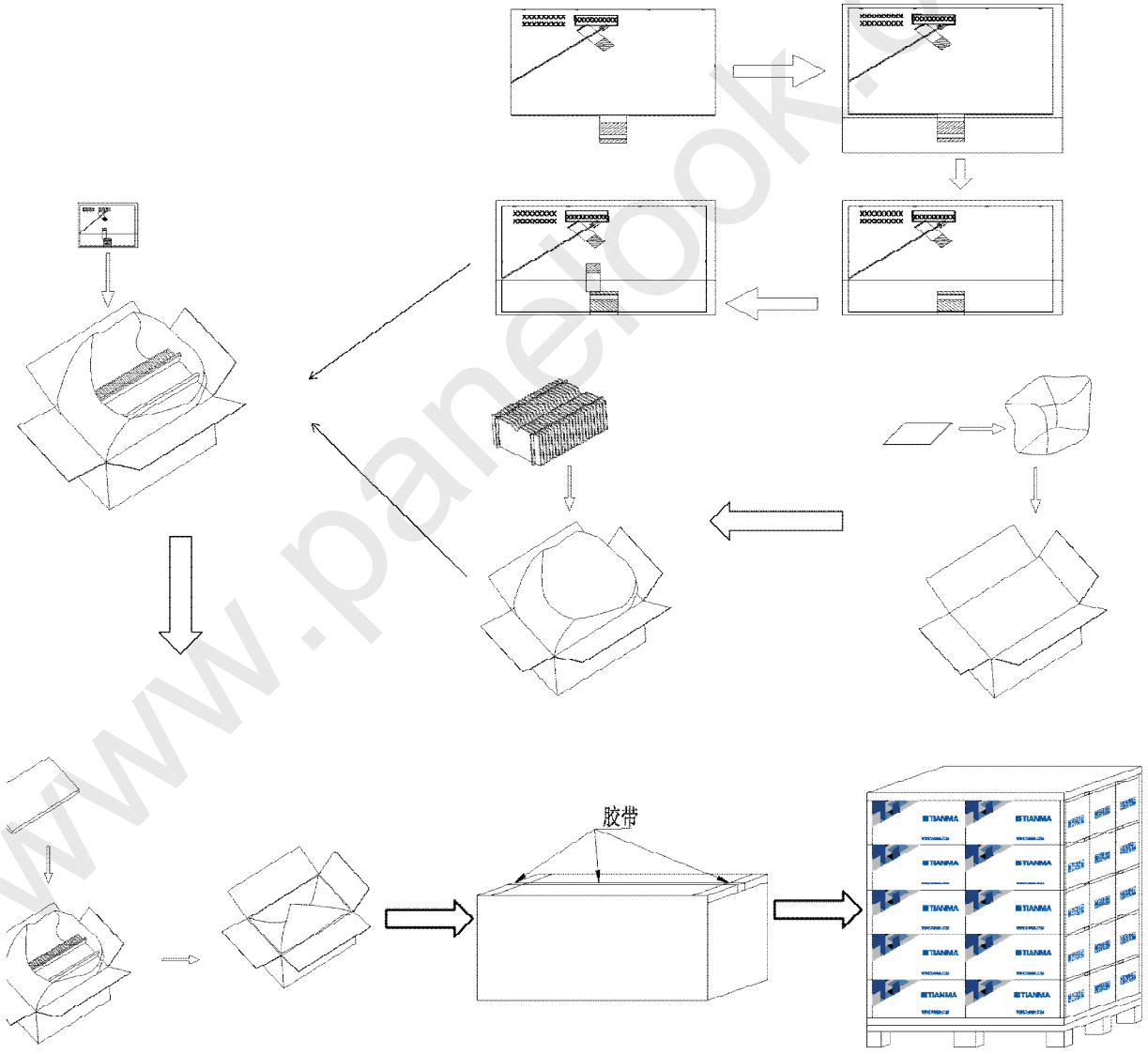
8 Mechanical Drawing



9 Packing Drawing

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM104SDHG30-01	228.40×175.40×6.20	0.341	22	
2	Carton	Corrugated paper	544×365×250	0.74	1	
3	Anti-Static Bag	-	250×250	0.0054	22	
4	Beauty-grain	-	30×10	0.0001	44	
5	Dust-Proof Bag	PE	700×545	0.06	1	
6	Partition_1	Corrugated paper	527.00×348.00×185.00	1.2	1	
7	EPE	-	525.00×345.00×20.00	0.072	2	
8	Label	-	100×52	0.001	1	
9	Total weight	（9.77±5%）kg				

The detail of packaging method is shown as below:



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.