MODEL NO.: TM090RDSG01-00

ISSUED DATE: 2015-07-07

VERSION: Ver. 1.1

■**Preliminary Specification**
□**Final Product Specification**

Customer:

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Approved by	Checked by	Prepared by

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2015-5-13	First Specification Release	Hongkang Yan
1.1	2015-07-07	Change LCM name from TM090RDHG01-00 toTM090RDSG01-00	Ke ke

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1 General Specifications

1.1 General Specifications

Feature		Spec
Display Spec	Size	9 inch
	Resolution	800(RGB)×480
	Interface	TTL
	Color Depth	16.2M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.2475(H) ×0.2327(V)
	Pixel Configuration	R.G.B. Stripe
	Display Mode	TM with Normally White
	Surface Treatment (Up Polarizer)	Anti Glare
	Viewing Direction (Note 1)	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D)(mm)	211.10×126.50×5.60
	Active Area (W x H)(mm)	198.00 × 111.70
	With /Without TSP	Without TSP
	Weight (g)(Note 3)	285 g
	LED Numbers	33 LEDS

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: RoHS

Note 3: Weight tolerance: +/- 5%

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2 Input/Output Terminals

2.1 INPUT TERMINALS PIN ASSIGNMENT

Pin No.	Symbol	I/O (Note1)	Description	Comment
1	LEDA	P	LED Anode	Note1
2	LEDA	P	LED Anode	-
3	LEDK	P	LED Cathode	-
4	LEDK	P	LED Cathode	-
5	GND	P	Ground	-
6	VCOM	P	Common Voltage	-
7	DVDD	P	Digital power input,	-
8	MODE	I	DE/SYNC mode select. Normally pull high： 0 : SYNC mode 1 : DE mode DE Mode: Mode="H", Hsync and Vsync must pull high. SYNCMode: Mode="L" , DE must be connected to GND.	-
9	DE	I	DATA INPUT Enable	-
10	VSYNC	I	Vertical Synchronization	-
11	HSYNC	I	Horizontal Synchronization	-
12	B7	I	Blue data(MSB)	-
13	B6	I	Blue data	-
14	B5	I	Blue data	-
15	B4	I	Blue data	-
16	B3	I	Blue data	-
17	B2	I	Blue data	-
18	B1	I	Blue data	-
19	B0	I	Blue data(LSB)	-
20	G7	I	Green data(MSB)	-
21	G6	I	Green data	-
22	G5	I	Green data	-
23	G4	I	Green data	-
24	G3	I	Green data	-
25	G2	I	Green data	-
26	G1	I	Green data	-
27	G0	I	Green data(LSB)	-
28	R7	I	RED data(MSB)	-
29	R6	I	RED data	-
30	R5	I	RED data	-
31	R4	I	RED data	-
32	R3	I	RED data	-
33	R2	I	RED data	-
34	R1	I	RED data	-
35	R0	I	RED data(LSB)	-
36	GND	P	Ground	-
37	DCLK	I	Parallel RGB clock input	-

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38	GND	P	Ground	-
39	L/R	I	Left / Right shift control, 0 : Shift left : S1200→S1199→…→S2→S1 1 : Shift right, S1→S2→S3→…→S1200	-
40	U/D	I	Up / Down rotate control 0:Up to down G960→G959→…→G2→G1 1:Down to up G1→G2→…→G959→G960	-
41	VGH	P	Power supply for Gate on output	
42	VGL	P	Power supply for Gate off output	
43	AVDD	P	Analog power input	
44	Reset	I	Global reset pin	
45	NC	-		
46	VCOM	P	common voltage	
47	Dither	I	Dithering function enable/disable, 1 :Enable;0: Disable	
48	GND	P	Ground	
49	NC	-		
50	NC	-		

Note1: I/O----definition, I----Input, O----Output, P----Power

2.2 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	DVDD	Up to Down, Left to Right
DVDD	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
DVDD	DVDD	Down to Up, Left to Right

3 Absolute Maximum Ratings

AGND=GND=0V, Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Digital supply voltage	DVDD	-0.5	5.0	V	-
Analog supply voltage	AVDD	-0.5	15	V	-
Power supply voltage 1	VGH	-0.3	42	V	-
Power supply voltage 2	VGL	VGH-42	+0.3	V	-
Operating temperature	T_{OPR}	-20	70	℃	-
Storage temperature	T_{STG}	-30	80	℃	-

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4 Electrical Characteristics

4.1 Recommended Operating Condition

GND=0V, Ta = 25℃

Item	Symbol	Min	Typ.	Max	Unit	Remark
Digital Supply Voltage	DVDD	2.7	3.3	3.6	V	-
Analog Supply Voltage	AVDD	10	TBD	11	V	-
Gate On Voltage	VGH	16	TBD	18	V	-
Gate Off Voltage	VGL	-4	TBD	-6	V	-
Common Electrode Driving Signal	VCOM	3	TBD	5	V	-

4.2 Power Consumption

AGND=GND=0V, Ta = 25℃

Item	Symbol	Condition	Min	Typ.	Max	Unit	Remark
Digital Supply Current	I_{VCC}	-		TBD		mA	-
Analog Supply Current	I_{AVDD}	-		TBD		mA	-
Gate On Current	I_{VGH}	-		TBD		mA	-
Gate Off Current	I_{VGL}	-		TBD		mA	-
Power Consumption	Pane l& Gamma			TBD		mW	-

Note1: Checkered flag pattern for Typ.;

4.3 Recommended Driving Condition for Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	20	-	mA	33 LEDs (3 LED Serial, 11 LED Parallel)
Forward Voltage	V_F	9.0	9.9	10.5	V	
Backlight Power Consumption	W_{BL}	-	2.178	-	W	
Operating Life Time	-	20000	-	-	Hrs	I_F =20mA

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 11 LED Parallel).For each LED: I_F (1/11) =20mA, V_F (1/3) =3.3V.

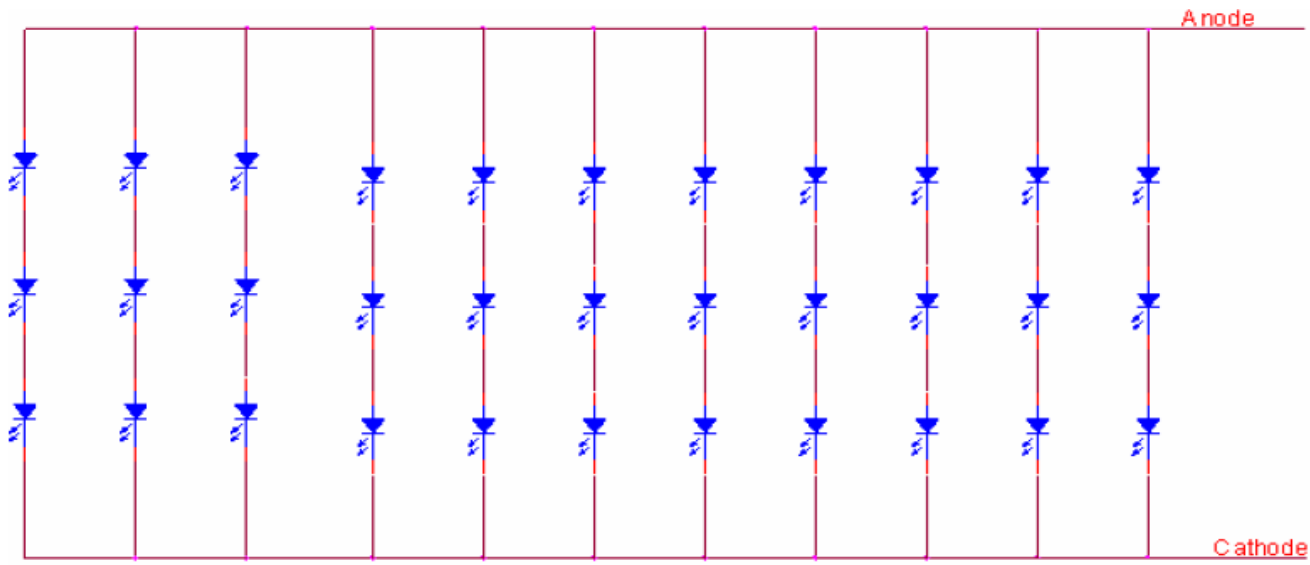
Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F 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

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

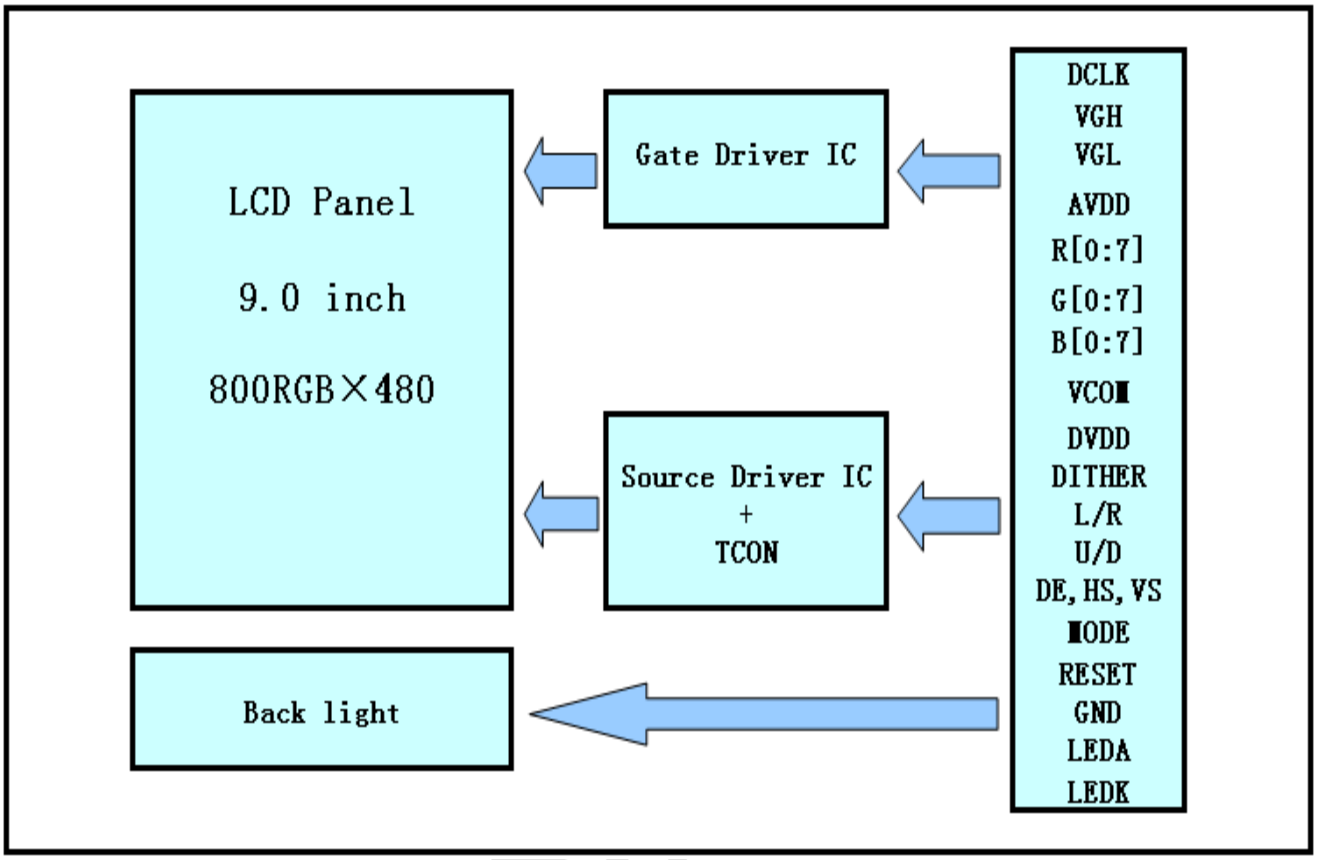


Note4: The LED driving condition is defined for each LED module

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4.4 Block Diagram



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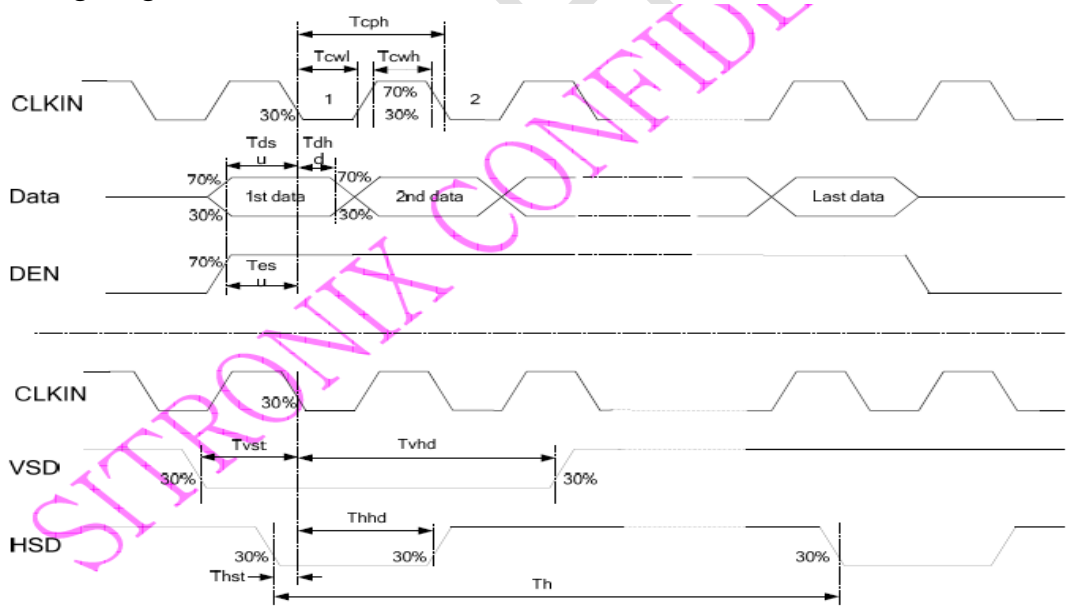
5 Interface Timing

5.1 Input Clock and Data Timing

TTL mode

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
VDD Power on Slew Rate	T_{POR}	-	-	20	ms	From 0V to 90% VDD
GRB pulse width	T_{RST}	50	-	-	us	Clkin=65MHz
CLKIN cycle time	Tcph	14			ns	
CLKIN pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	5	-	-	ns	
VSD hold time	Tvhd	5	-	-	ns	
HSD setup time	Thst	5	-	-	ns	
HSD hold time	Thhd	5	-	-	ns	
Data setup time	Tdsu	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to clkin
Date hold time	Tdhd	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to clkin
DE setup time	Tesu	5	-	-	ns	
DE hold time	Tehd	5	-	-	ns	
Output stable time	Tsst	-	-	6	us	10% to 90% target voltage. CL=90pF, R=10Kohm(Cascade)
				3		Dual gate

Input Timing diagram:



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5.2 Recommended Timing Setting Of TCON

MODE="H" : DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
CLKIN frequency@ Frame rate = 60Hz	fclk	26.2	29.2	54.6	MHz
Horizontal display area	thd		800		CLKIN
1 Horizontal Line	th	890	928	1300	
HSD Blanking	thb+thfp	90	128	500	
Vertical display area	tvd		480		H
1 vertical Line	tv	490	525	700	
VSD Blankking	tvb+tvfp	10	45	220	

MODE="L" : SYNC mode

Horizontal input timing

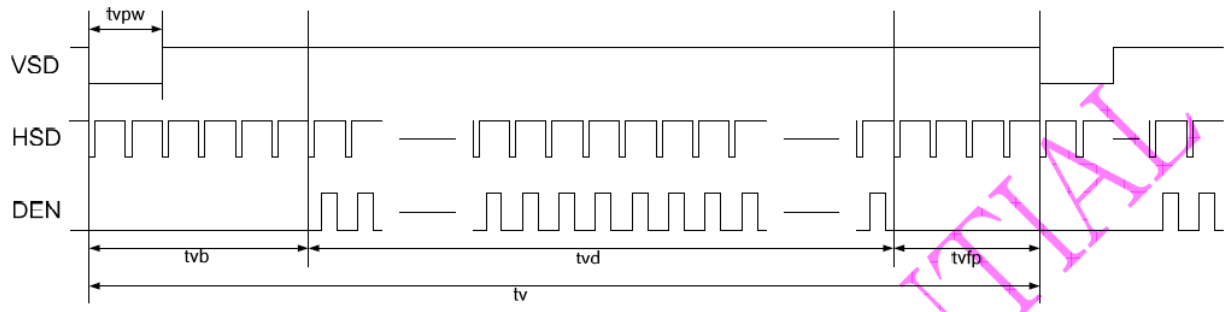
Parameter	Symbol	Value			Uint
		Min.	Typ.	Max.	
CLKIN frequency@ Frame rate = 60Hz	fclk	27.7	29.2	39.6	MHz
Horizontal display area	thd		800		CLKIN
1 Horizontal Line	th	900	928	1100	
HSD pulse width	thpw	1	-	40	
HSD Blanking	thb		88		
HSD Front Porch	thfp	12	40	212	

Vertical input timing

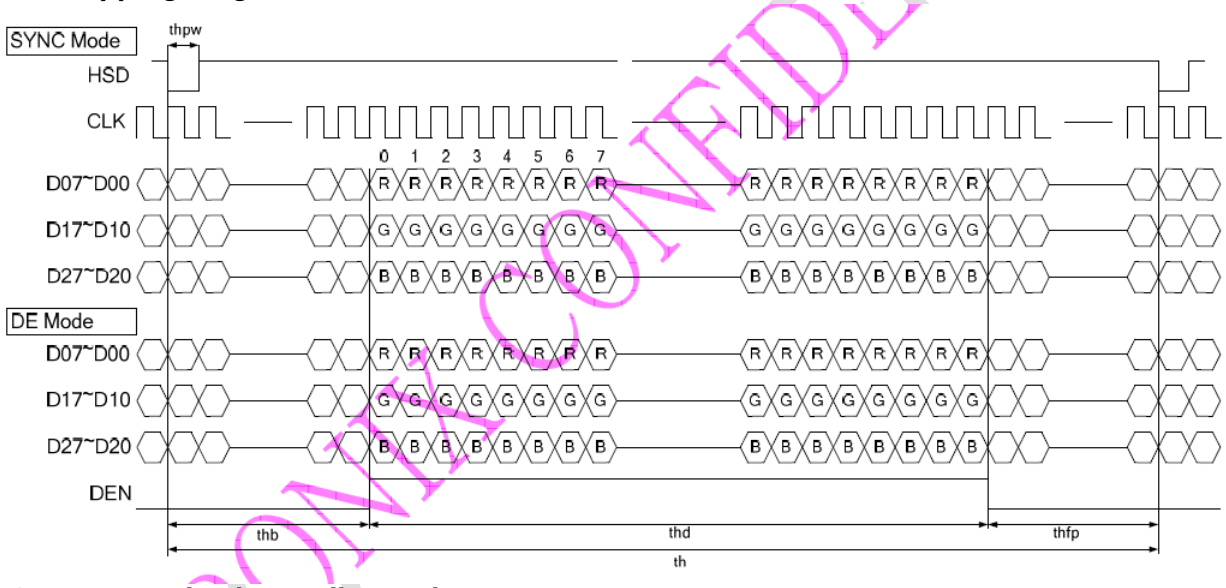
Parameter	Symbol	Value			Uint
		Min.	Typ.	Max.	
Vertical display area	tvd		480		H
VSD period time	tv	513	525	600	
VSD pulse width	tvpw	1	-	3	
VSD Blanking	tvb		32		
VSD Front Porch	tvfp	1	13	88	

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Horizontal and vertical input timing:



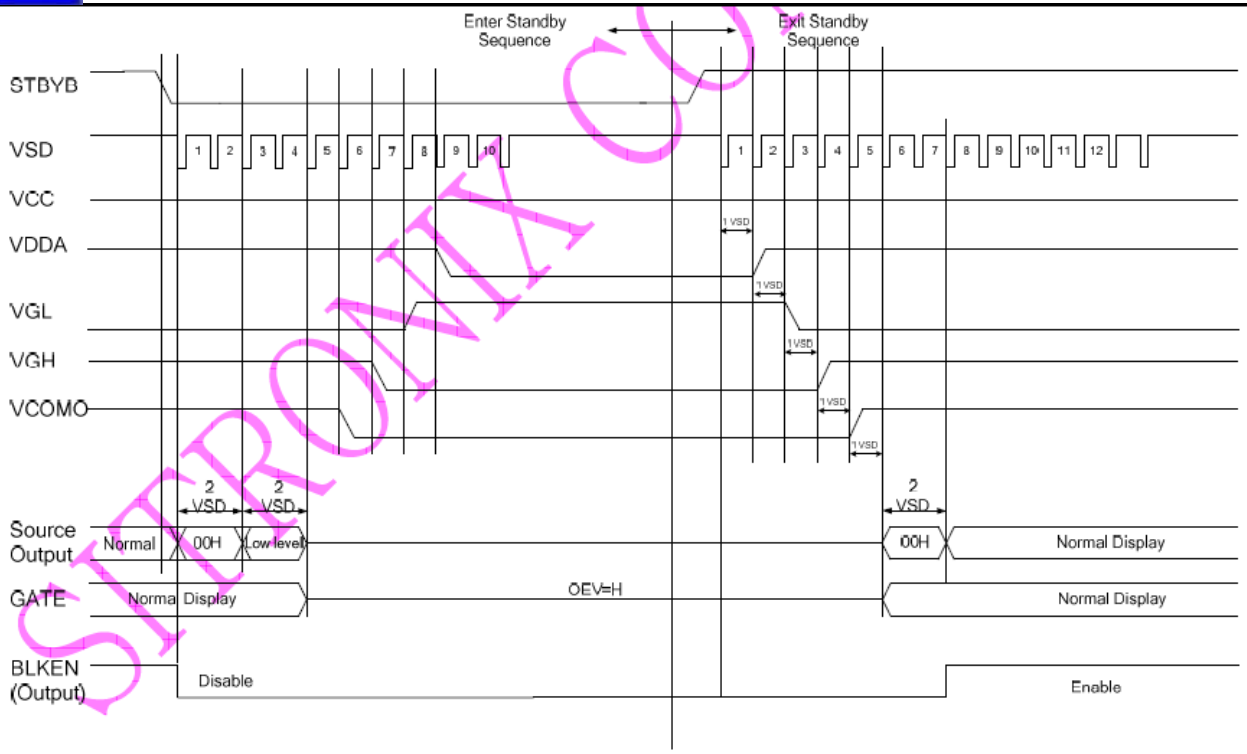
Data mapping diagram:



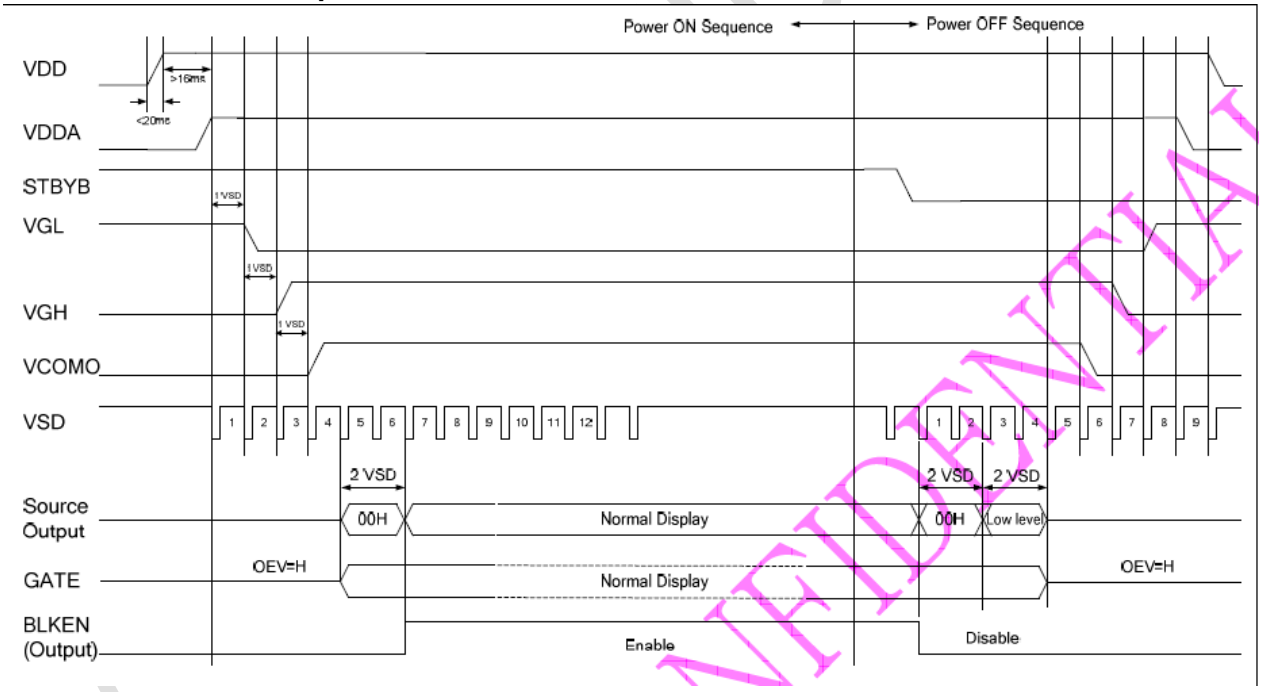
5.3 Enter and exit standby mode sequence

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5.4 Power ON/OFF Sequence



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6 Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max	Unit	Remark
View Angles		θT	CR≧10	-	50	-	Degree	Note 2
		θB		-	70	-		
		θL		-	70	-		
		θR		-	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	25	-	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.263	0.313	0.363	-	Note5 Note1
		y		0.279	0.329	0.379		
	Red	x		0.535	0.585	0.635		
		y		0.305	0.355	0.405		
	Green	x		0.290	0.340	0.390		
		y		0.520	0.570	0.620		
	Blue	x		0.096	0.146	0.196		
		y		0.045	0.095	0.145		
NTSC		-	-	-	50	-	%	Note5
Luminance		L	-	300	350	-	cd/m^2	Note1 Note7
Uniformity		U		70	75	-	%	Note1 Note6

Test Conditions:

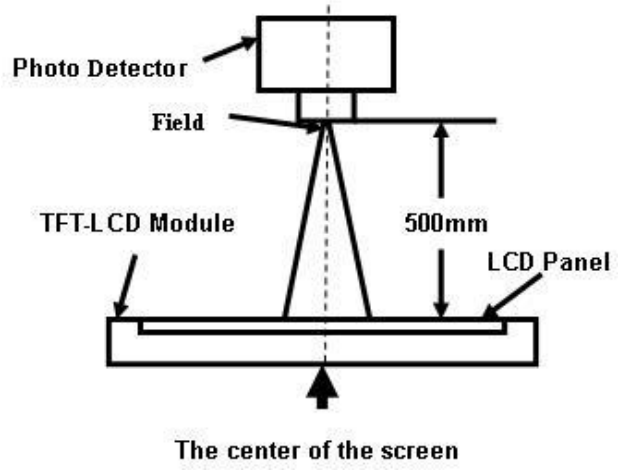
1. The ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note2.

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Note 1: Definition of optical measurement system

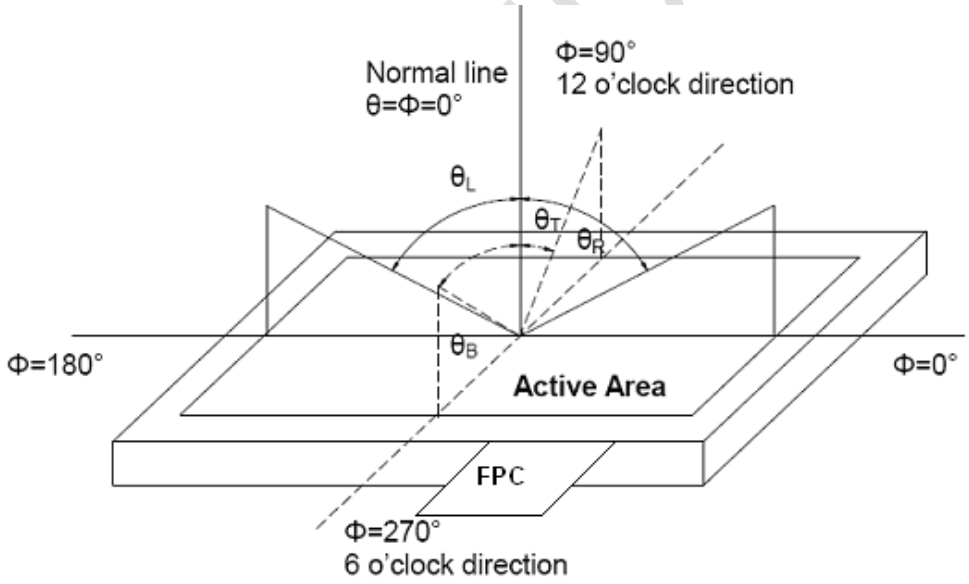
The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	
Response Time	TRD100	-

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).



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 Vwhite.

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

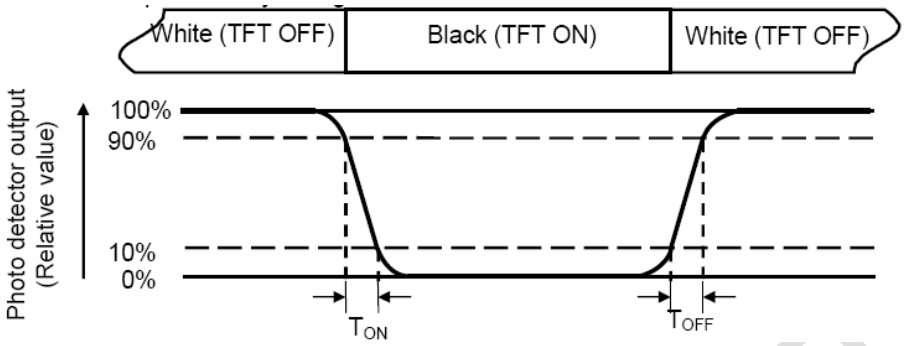
Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and

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"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)

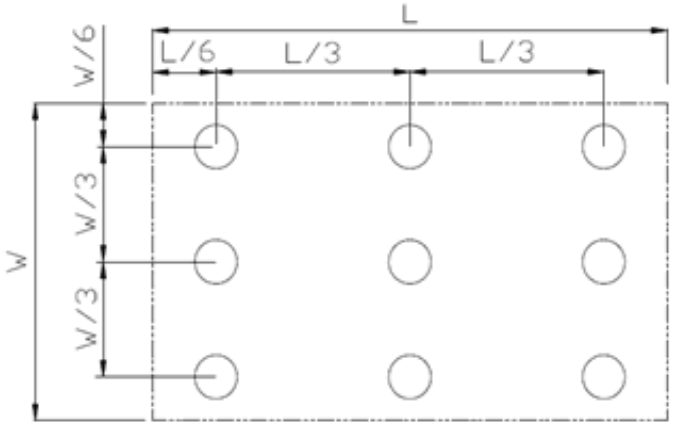
Color coordinates measured at center point of LCD.

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.

Luminance Uniformity (U) = Lmin/ Lmax

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



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.

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7 Environmental / Reliability Test

No.	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours (Note1)	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours (Note2)	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max, 240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min ~ +80℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF, R=330Ω, 5point/panel Air: ±8Kv, 5times; Contact: ±4Kv, 5times (Environment: 15℃~35℃, 30%~60%. 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range: 10~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X, ±Y, ±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height: 80cm, 1corner, 3edges, 6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

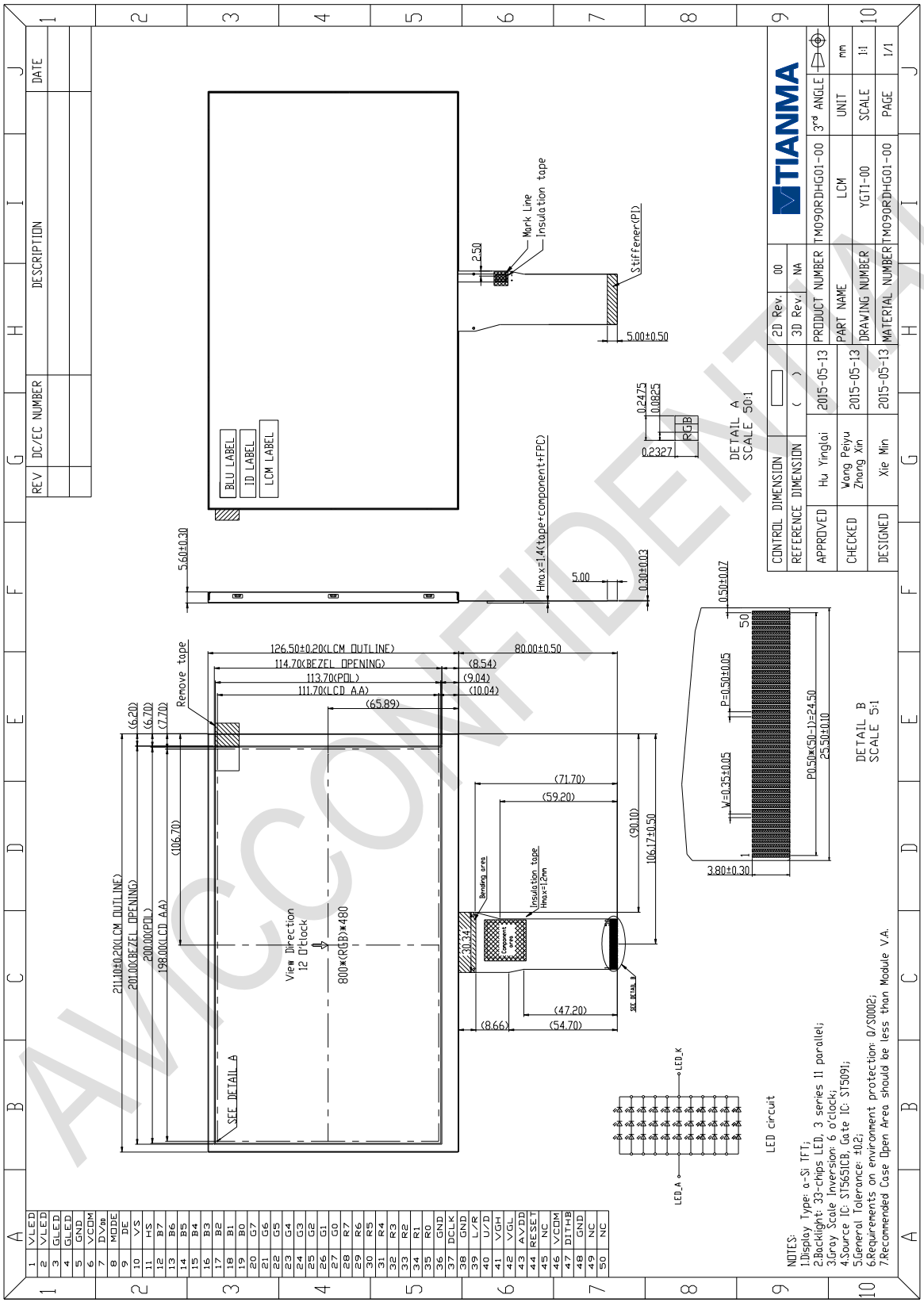
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.

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8 Mechanical Drawing

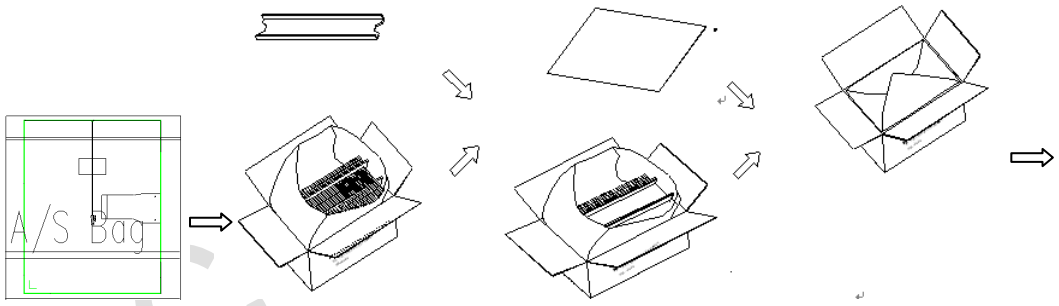


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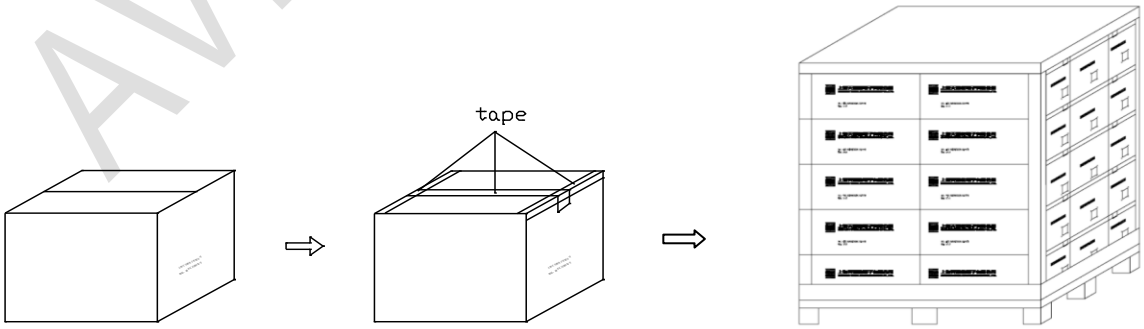
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9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM090RDH01-00	211.1×126.5×5.6	0.285	50	
2	Partition_ 1	Corrugated paper	513×333×251		1	
3	Anti-static Bag	PE	161X253X0.05	0.001	48	Anti-static
4	Dust-Proof Bag	PE	700X545	0.06	1	
5	Partition_ 2	Corrugated Paper	505X332X4.0	0.098	2	
6	Corrugated Bar	Corrugated paper	348X173	0.057	6	
7	Carton	Corrugated paper	544X365X250	1.12	1	
8	Total weight	15.337±5% kg				



LCM module



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10 Precautions for Use of LCD Panels

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 Panel 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 Panel.

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 Panels.

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 Panel 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 Panels, avoid exposure to direct sunlight or to the light of fluorescent lamps.

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

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

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

10.3 Transportation Precautions

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

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