MODEL NO. : TM043NBHG04-00

ISSUED DATE: 2014-11-13

VERSION : Ver 1.0

■Preliminary Specification
□Final Product Specification

Customer :_____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Yuntian GUAN		

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2014-11-5	Preliminary Specification Release	Yuntian GUAN

1.General Specifications

Feature		Spec
Display Spec.	Size	4.3inch
	Resolution	480（RGB）x272
	Technology Type	a-si
	Pixel Configuration	16.7M
	Pixel pitch(mm)	R.G.B Vertical Stripe
	Display Mode	TN,NW
	Surface Treatment	AG
	Viewing Direction	6 O'Clock
	Gray Scale Inversion Direction	12 O'Clock
Mechanical Characteristics	LCM (W x H x D) (mm)	105.50x67.20x4.10
	Active Area(mm)	95.04x53.856
	With /Without TSP	With TSP
	Connection Type	ZIF
	LED Numbers	16 LEDs
	Weight (g)	TBD
Electrical Characteristics	Interface	RGB 24 bits
	Color Depth	16.7M
	Driver IC	ST8272T

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

No	Symbol	I/O	Description	Comment
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power supply	
5	R0	I	Data input	
6	R1	I	Data input	
7	R2	I	Data input	
8	R3	I	Data input	
9	R4	I	Data input	
10	R5	I	Data input	
11	R6	I	Data input	
12	R7	I	Data input	
13	G0	I	Data input	
14	G1	I	Data input	
15	G2	I	Data input	
16	G3	I	Data input	
17	G4	I	Data input	
18	G5	I	Data input	
19	G6	I	Data input	
20	G7	I	Data input	
21	B0	I	Data input	
22	B1	I	Data input	
23	B2	I	Data input	
24	B3	I	Data input	
25	B4	I	Data input	
26	B5	I	Data input	
27	B6	I	Data input	
28	B7	I	Data input	
29	GND	P	Ground	
30	DCLK	I	Clock for input data. Data latched at falling edge of this signal.	
31	DISP	I	Standby mode. DISP =“1”: Normally operation. DISP =“0”: Standby mode.	
32	HSYNC	I	Horizontal sync input with negative polarity.	
33	VSYNC	I	Vertical sync input with negative polarity.	
34	DE	I	Data input enable.	
35	NC	——	No connection	
36	GND	P	Ground.	
37	X_R	O	XR	
38	Y_B	O	YD	
39	X_L	O	XL	
40	Y_T	O	YU	

Note1：Please add the FPC connector type and matched one if necessary.

Note2：I——Input，O——Output，P——Power/Ground

3.Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDD	-0.3	4.6	V	
Logic Input Voltage Range	R[7: 0], G[7: 0], B[7: 0], VSYNC,HSYNC,DE,DCLK,DISP	-0.3	VDD+0.3	V	
Back Light Forward Current	I_{LED}		40	mA	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

4. Electrical Characteristics

4.1 LCD Module

GND=0V，Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VDD	3.0	3.3	3.6	V	
Logic Input Voltage	Low Level	V_{IL}	DGND	—	0.3* VDD	V	
	High Level	V_{IH}	0.7* VDD	—	VDD	V	
Logic Output Voltage	Low Level	V_{OL}	DGND	—	DGND+0.4	V	
	High Level	V_{OH}	VDD-0.4	—	VDD	V	
(Panel+LSI) Power Consumption		Black Mode (60Hz)		TBD		mA	
		Standby Mode			50	uA	

Table 4.1 LCD module electrical characteristics

4.2 Backlight Unit

Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	—	40	—	mA	16 LED(8 LED Serial，2 LED Parallel)
Forward Current Voltage	V_F	—	25.6	—	V	
Backlight Power Consumption	W_{BL}	—	1024	—	mW	
LED life time		10000	20000			

Table 4.2 Backlight Unit Electrical Characteristics

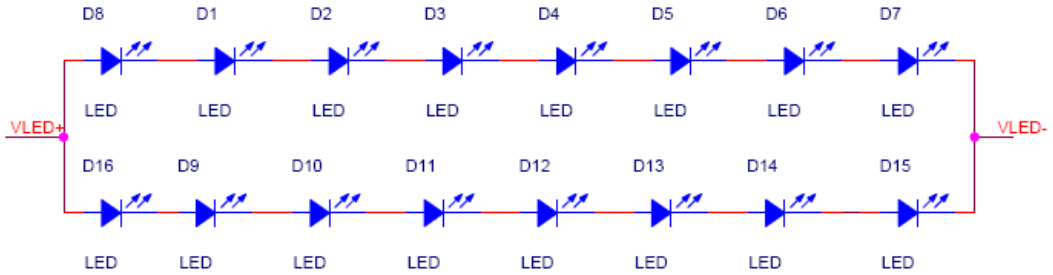
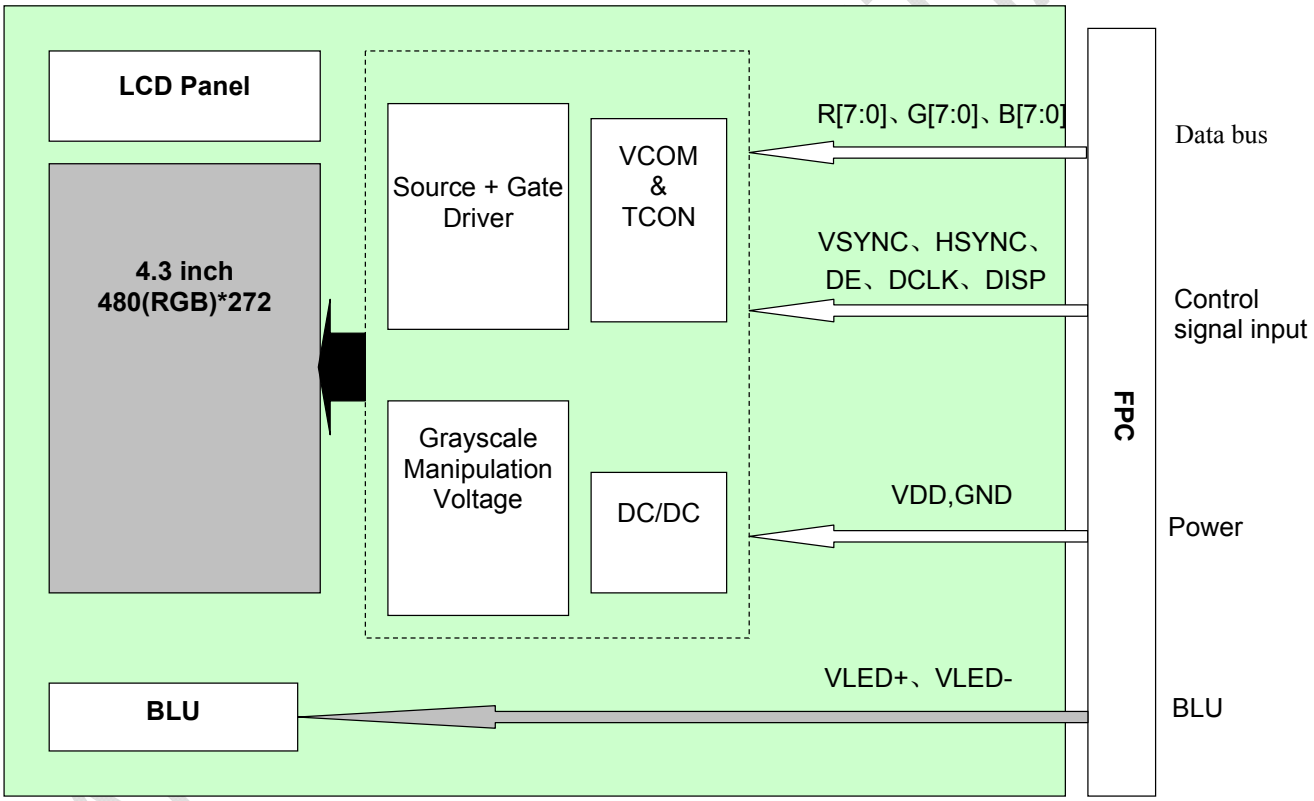


Figure 4.2.1 LED Driver Circuit

4.3 BLOCK DIAGRAM

LCD module diagram



5. Timing Chart

5.1 AC Characteristics

VDDI= 1.8V, VDD= 3.3V, AGND= 0V

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	1	-	-	DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	

Table 5.1 AC Characteristics

5.2 AC Timing Diagram

5.2.1Clock and Data Input Timing Diagram

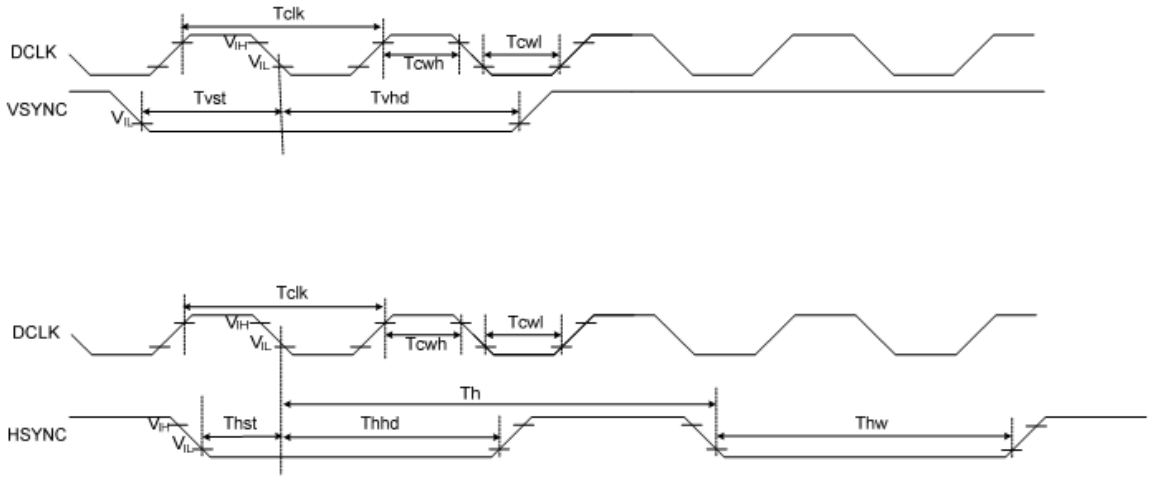


Figure 5.2.1 Clock and Data Input Timing Diagram

5.2.1.1 SYNC Mode

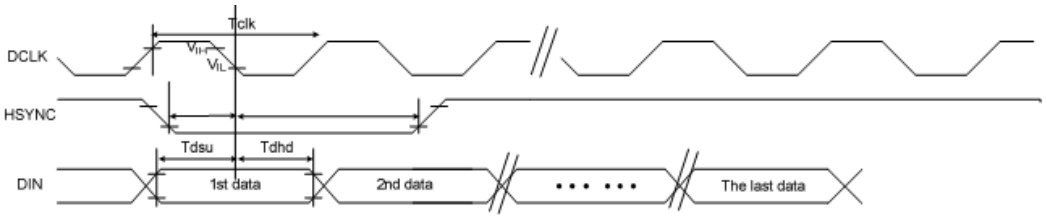


Figure 5.2.1.1 SYNC Mode

5.2.1.2 SYNC-DE Mode

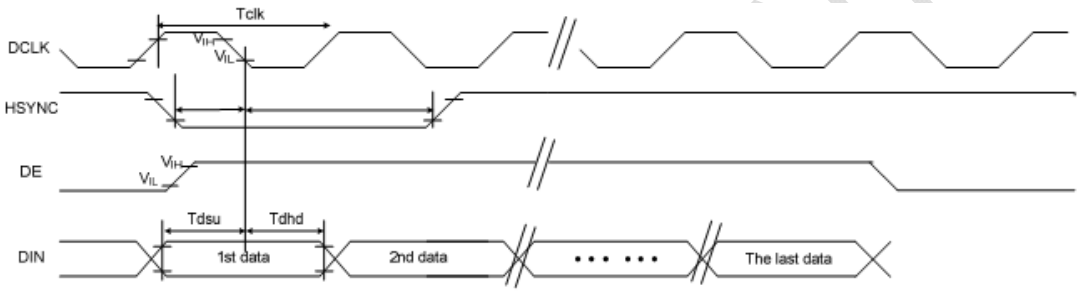


Figure 5.2.1.2 SYNC-DE Mode

5.3 RGB Input Timing Table

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	8	9	12	MHz	
DCLK Period		Tclk	83	111	125	ns	
HSYNC	Period Time	Th	485	525	532	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	3	43	50	DCLK	By H_Blanking setting
	Front Porch	Thfp	2	2	2	DCLK	
	Pulse Width	Thw	1	1	1	DCLK	
VSYNC	Period Time	Tv	275	285	303	H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12	30	H	By V_Blanking setting
	Front Porch	Tvfp	1	1	1	H	
	Pulse Width	Tvw	1	1	1	H	

Table 5.3 RGB Input Timing Table

5.4 Data Input Format

5.4.1 SYNC Mode Timing Diagram

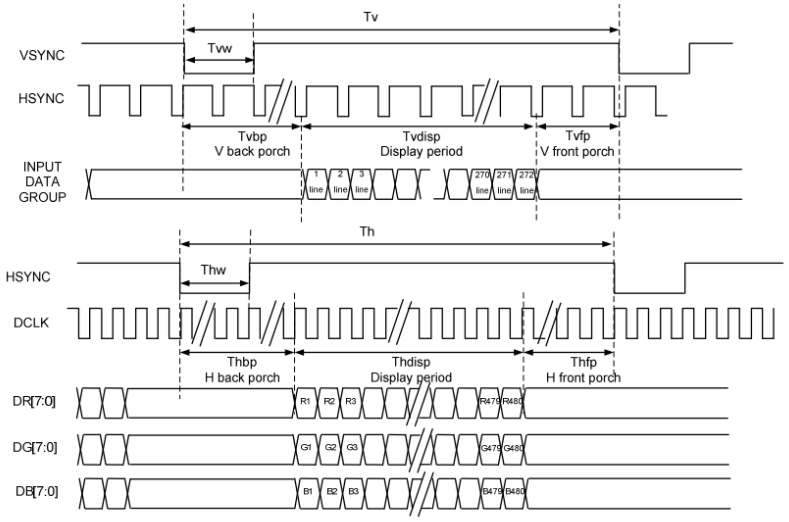


Figure 5.4.1 SYNC Mode Timing Diagram

5.4.2 SYNC-DE Mode Timing Diagram

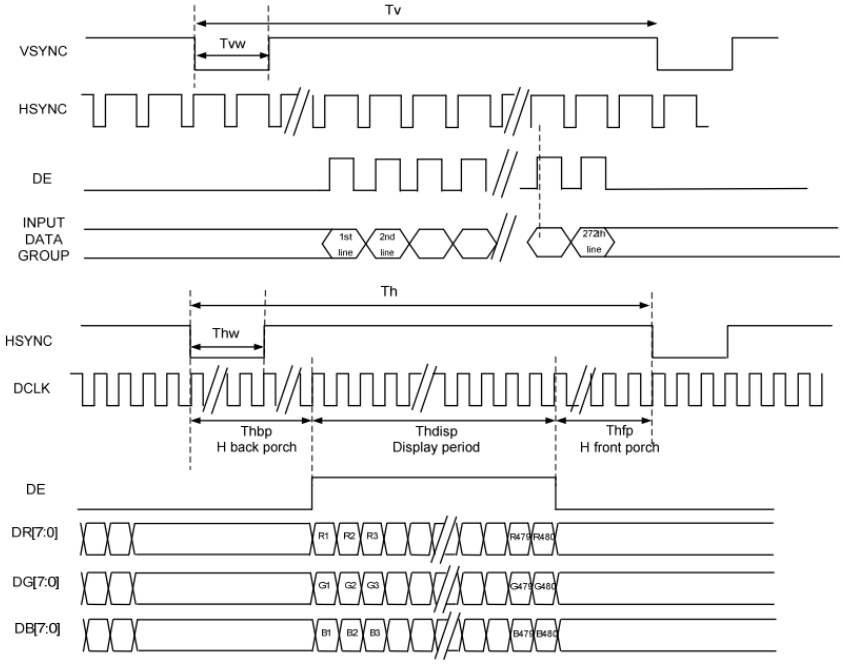


Figure 5.4.2 SYNC-DE Mode Timing Diagram

5.5 POWER ON/OFF SEQUENCE

5.5.1 POWER ON SEQUENCE

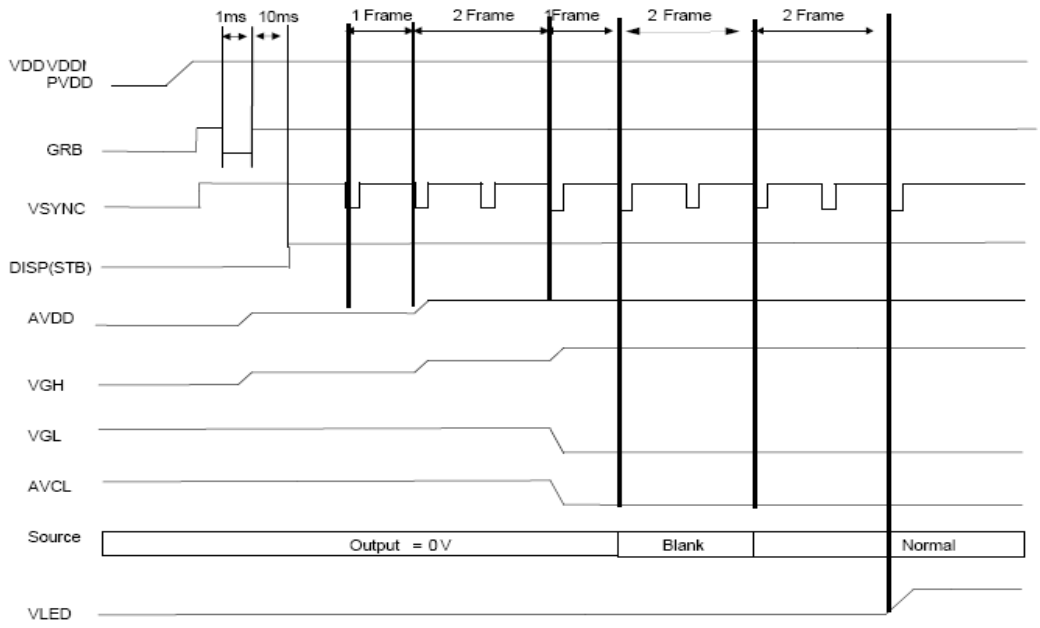


Figure 5.5.1 Power on Sequence

5.5.2 POWER OFF SEQUENCE

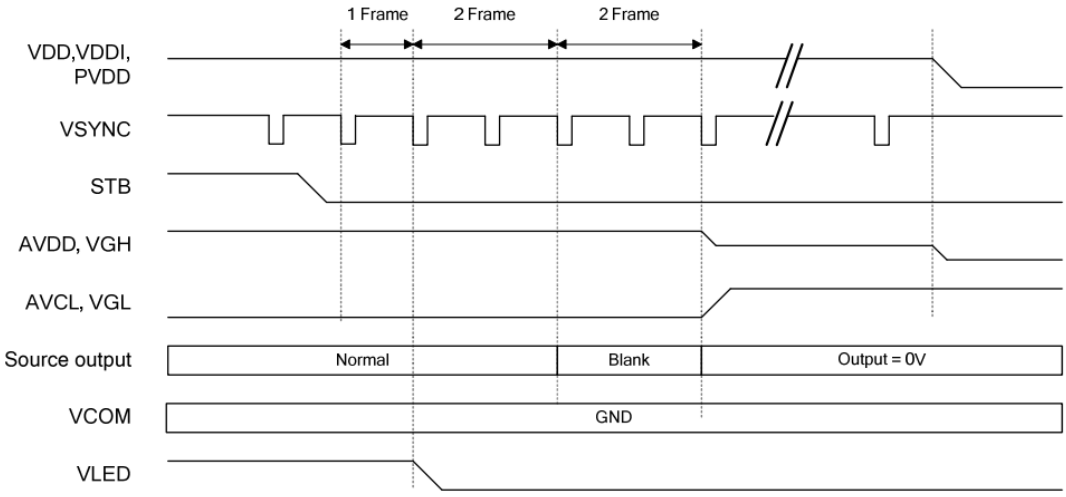


Figure 5.5.2 Power off Sequence

6. Touch Screen Panel Specifications

6.1 Electrical Characteristics

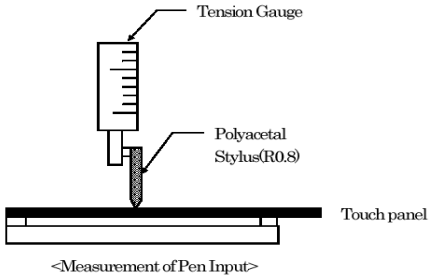
Item		Min.	Typ.	Max.	Unit	
Linearity		---	---	1.5%	---	Each axis: X and Y
Operating Voltage		---	5.0	10.0	V	DC
Resistance	X axis:	480	---	1100	Ω	
	Y axis:	120	---	450	Ω	
Chattering Time		---	---	10.0	ms	
Insulation Resistance		20	---	---	MΩ	@DC25V

6.2 Touch Panel Mechanical & Reliability Characteristics

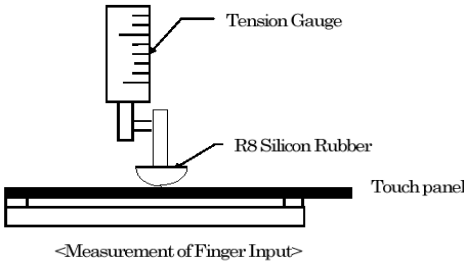
Item	Value			Unit	Remark
	Min	Typ	Max		
Activation	80	-	160	gf	Note 1
Durability-surface scratching	Write 100000	-	-	characters	Note 2
Durability-surface pitting	1000000	-	-	touches	Note 3
Surface hardness	3			H	JIS K5400

Note1:

1. Input DC 5V on X direction , Drop off Polyacetal Stylus(R0.8),until output voltage stabilize ,then get the activation force；
2. R8 Silicon rubber for finger Activation force test；
3. Test point： 9 points。



<Measurement of Pen Input>



<Measurement of Finger Input>

Note2:

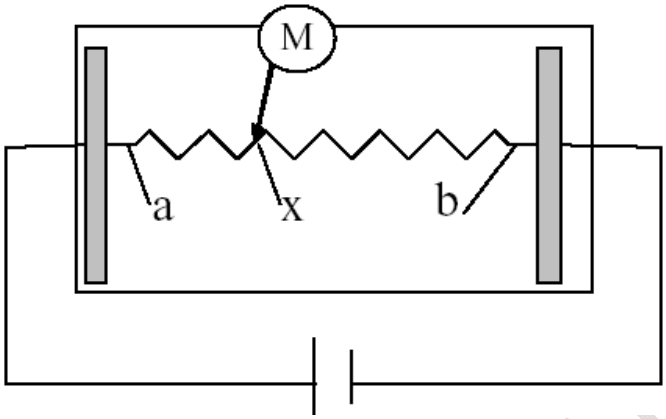
End shape: R0.8mm(Stylus)
Load force: 150gf
Writing speed: 60 mm/sec
Material of Pen: Polyacetal resin
Sliding length: 10~100 mm

Note3:

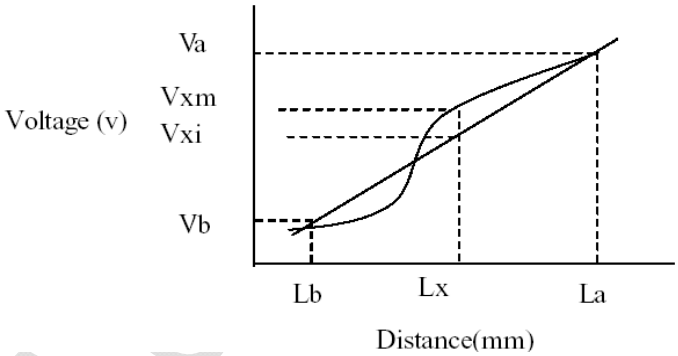
End shape: R8.0mm, Material of Pen: Silicon rubber
Hardness: 60°
Load force: 100gf
Frequency: 2 Hz

6.3 Electrical Characteristic

Linearity Definition

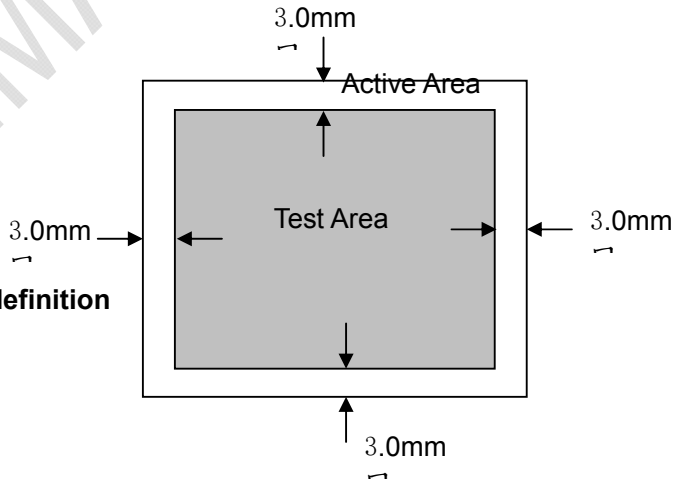


Va: maximum voltage in the active area of touch panel
Vb: minimum voltage in the active area of touch panel
X: random measuring point
Vxm: actual voltage of Lx point
Vxi: theoretical voltage of Lx point



Linearity = [|Vxi-Vxm |/(Va-Vb)]*100%

Note: Test area is as follows and operation force is 150gf(single layer ITO Film), polyacetal stylus: R0.8mm.

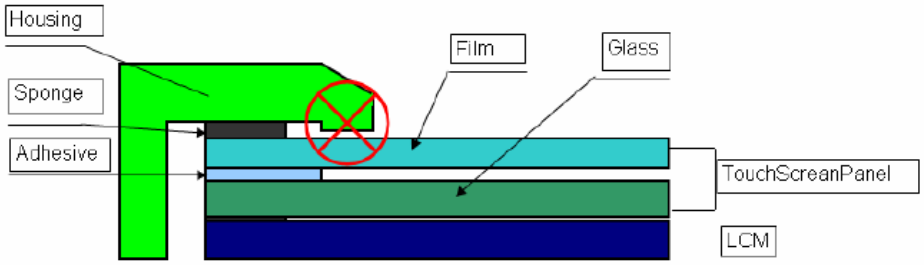


Chattering measure definition

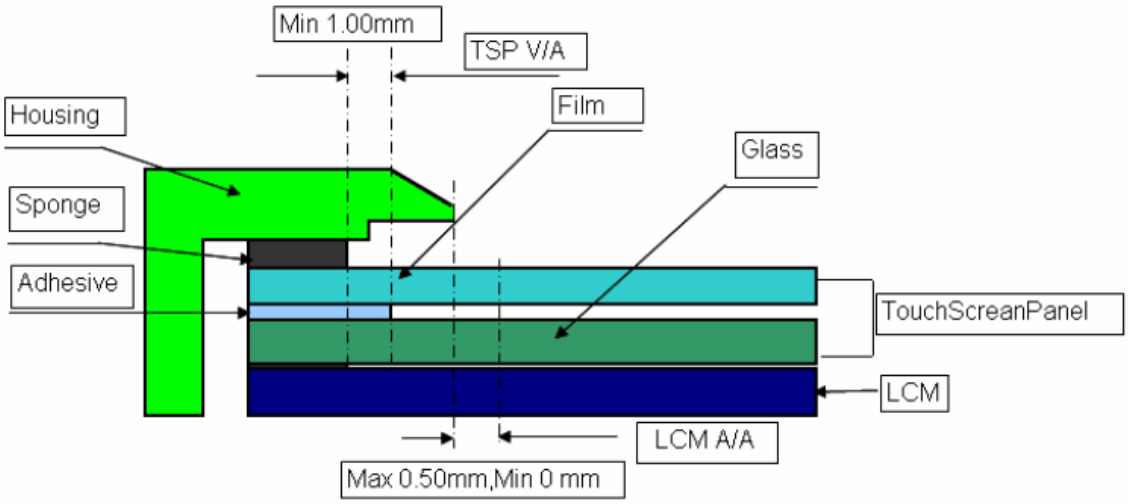
6.4 Housing design guide

Housing design follow as below

1. Avoid the design that housing overlap and press on the active area of the LCM
2. Give enough gap(Over 0.5mm at compressed) between the housing and TSP to Protect wrong operating.



3. Use a buffer material(Gasket) between the TSP and housing to protect damage and wrong operating
4. Avoid the design that buffer material overlap and press on the inside of TSP view area.



7 Optical Characteristics

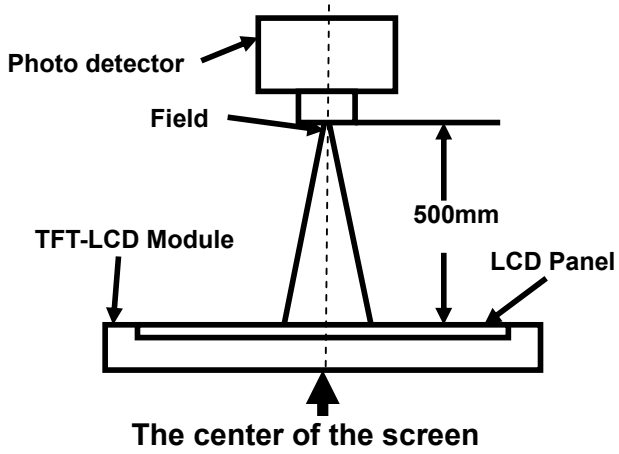
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≤10	60	70		Degree	Note2,3
		θB		50	60			
		θL		60	70			
		θR		60	70			
Contrast Ratio		CR	θ=0°	600	800			Note 3
Response Time		T_{ON}	25℃		25	35	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.257	0.307	0.357		Note 1,5
		y		0.280	0.330	0.380		
	Red	x		0.532	0.582	0.632		Note 1,5
		y		0.299	0.349	0.399		
	Green	x		0.294	0.344	0.394		Note 1,5
		y		0.538	0.588	0.638		
	Blue	x		0.101	0.151	0.201		Note 1,5
		y		0.049	0.099	0.149		
Uniformity		U			80		%	Note 6
NTSC				45	50		%	Note 5
Luminance		L		700	800		cd/m^2	Note 7

Test Conditions:

1. I_F= **40** mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

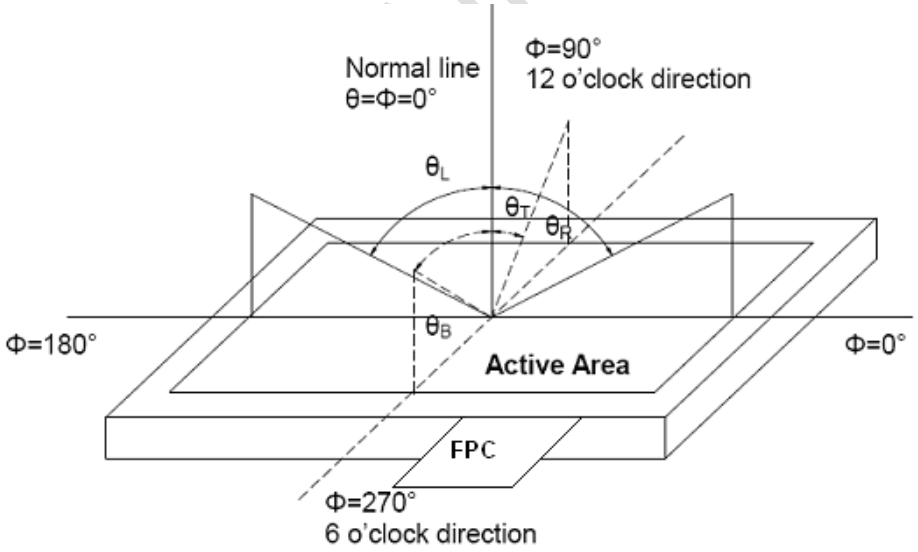
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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)。



Note 3: Definition of contrast ratio

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

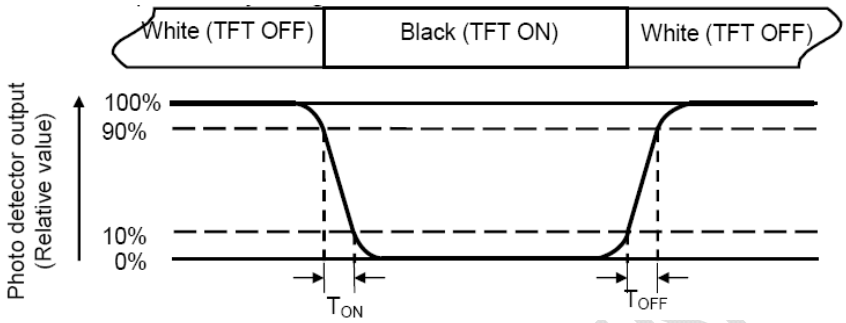
"White state ": The state is that the LCD should drive by Vwhite.

"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 “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)

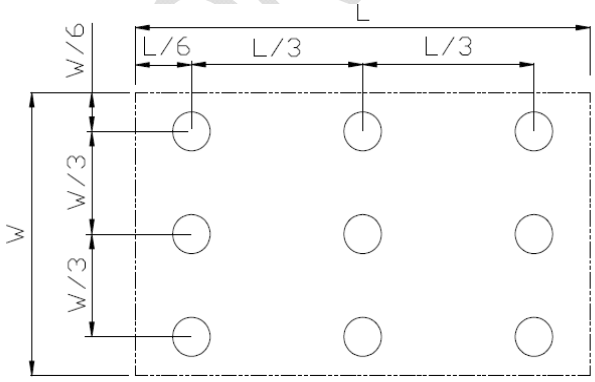
Color coordinates measured at center point of LCD.

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.

8. Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	T= +70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	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 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF, R=330Ω，5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; （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)(Package condition)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Random Vibration: 0.015GxG/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total)	IEC60068-2-32:1990 GB/T2423.8—1995

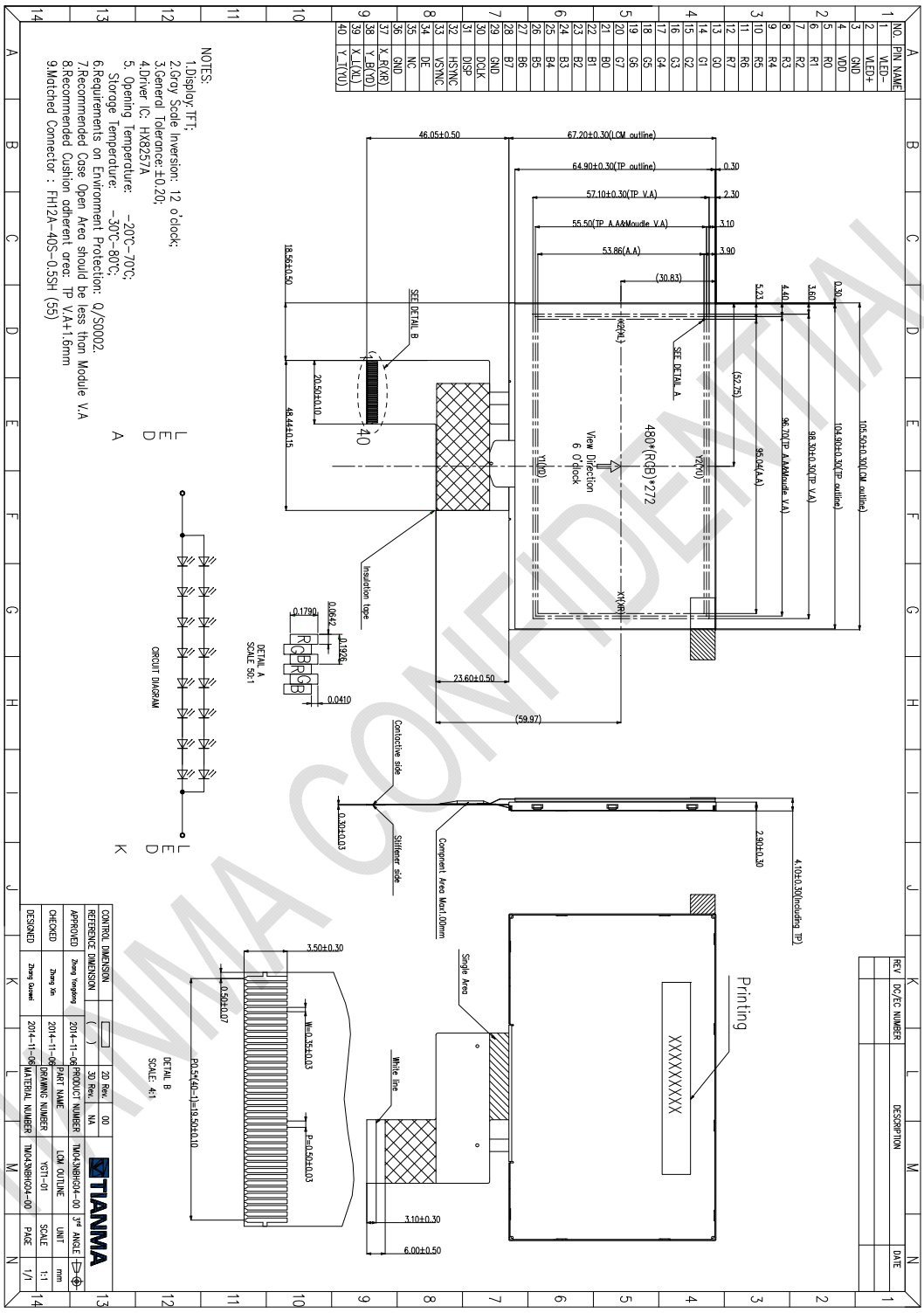
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

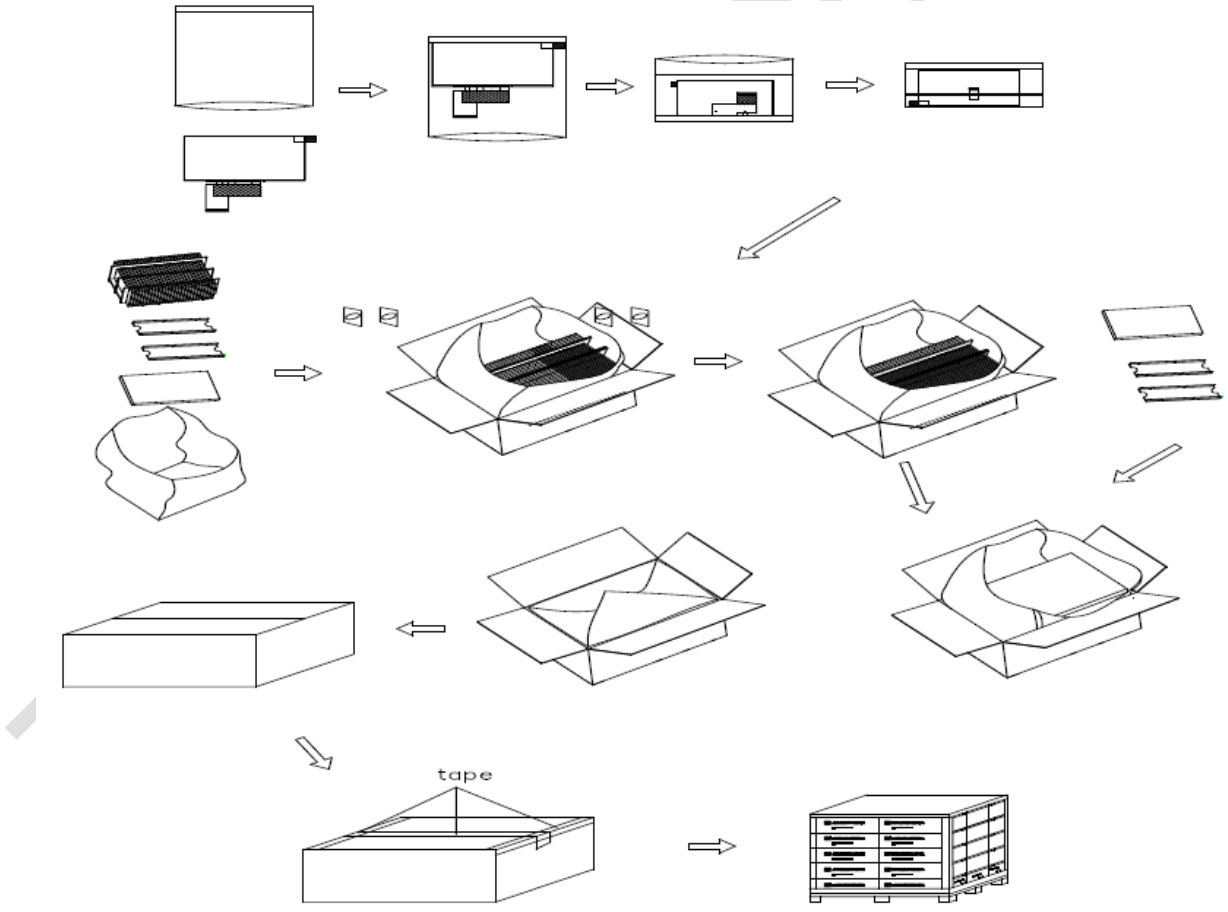
Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

9. Mechanical Drawing



10. Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM043NBH02-00	105.5*67.2*4.1	TBD	112	
2	Partition_1	Corrugated Paper	513*333*106	0.7	2	
3.	Anti-Static Bag	PE	175.8*125*0.05	0.0007	112	Anti-static
4	Dust-Proof Bag	PE	700X530	0.0600	1	
5	Partition_2	Corrugated Paper	505*332*4.00	0.09	3	
6	Corrugated Bar	Corrugated Paper	513*117*3	0.04	8	
7	Carton	Corrugated Paper	530*350*250	1.1000	1	
8	Total weight	TBD Kg				



11. Precautions for Use of LCD Modules

a) Handling Precautions

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

ii. 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.

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

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

v. 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

vi. Do not attempt to disassemble the LCD Module.

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

viii. 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.

b) Storage precautions

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

ii. 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%

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

c) Transportation Precautions

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