



**MODEL NO. :** TM043NBH02

**ISSUED DATE:** 2010-8-23

**VERSION :** Ver 1.0

- Preliminary Specification
- Final Product Specification

**Customer :** \_\_\_\_\_

Approved by	Notes

**SHANGHAI TIANMA Confirmed :**

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice



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## 1 General Specifications

	Feature	Spec
<b>Display Spec.</b>	Size	4.3 inch
	Resolution	480(RGB)x272
	Interface	RGB 24 bits
	Color Depth	16.7M
	Technology Type	a-Si
	Pixel Configuration	R.G.B Vertical Stripe
	Display Mode	TN,NW
	Surface Treatment	AG
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
<b>Mechanical Characteristics</b>	LCM (W x H x D) (mm)	105.50x67.20x4.15
	Active Area(mm)	95.04x53.856
	With /Without TSP	With TSP
	Weight (g)	TBD
	LED Numbers	10 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: Q/S0002

Note 3: LCM weight tolerance:  $\pm 5\%$



## 2 Input/Output Terminals

### 2.1 TFT LCD Panel

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 rising 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. If unused, please pull high level.	

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33	VSYNC	I	Vertical sync input with negative polarity. If unused, please pull high level.	
34	DE	I	Data input enable. If unused, please pull low level.	
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	

Note 1: I—Input, O—Output, P—Power/Ground



### 3 Absolute Maximum Ratings

#### 3.1 Driving TFT LCD Panel

Ta =25°C

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDD	-0.3	4.0	V	
Back Light Forward Current	I <sub>LED</sub>		25	mA	For each LED
Operating Temperature	T <sub>OPR</sub>	-20	70	°C	
Storage Temperature	T <sub>STG</sub>	-30	80	°C	



## 4 Electrical Characteristics

### 4.1 Driving TFT LCD Panel

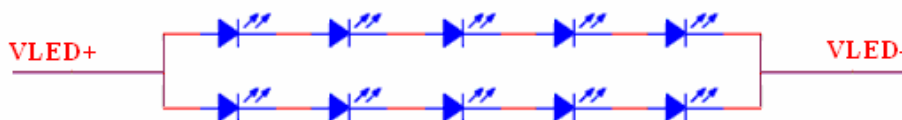
GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage	VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	$V_{IL}$	0	—	$0.3 \times VDD$	V
	High Level	$V_{IH}$	$0.7 \times VDD$	—	VDD	V
Output Signal Voltage	Low Level	$V_{OL}$	—	—	$0.3 \times VDD$	V
	High Level	$V_{OH}$	$0.7 \times VDD$	—	VDD	V
(Panel+LSI) Power Consumption	Black Mode (60Hz)		TBD		mW	
	Standby Mode		TBD		mW	

### 4.2 Backlight Unit

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	$I_F$	--	20	25	mA	For each LED
Forward Current Voltage	$V_F$	--	3.2	—	V	For each LED
Backlight Power Consumption	$W_{BL}$	--	640	—	mW	For total LEDs

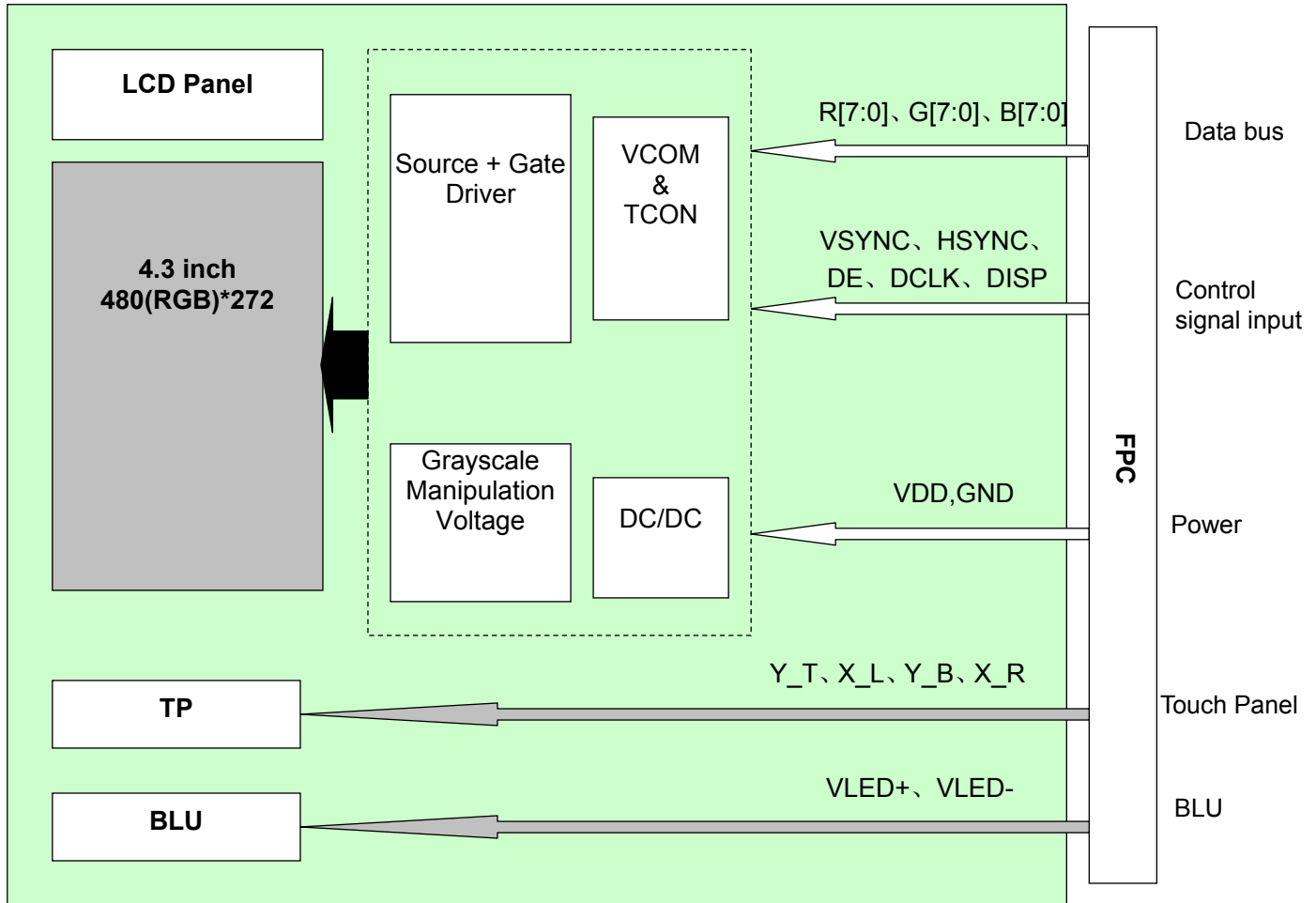






4.3 Block Diagram

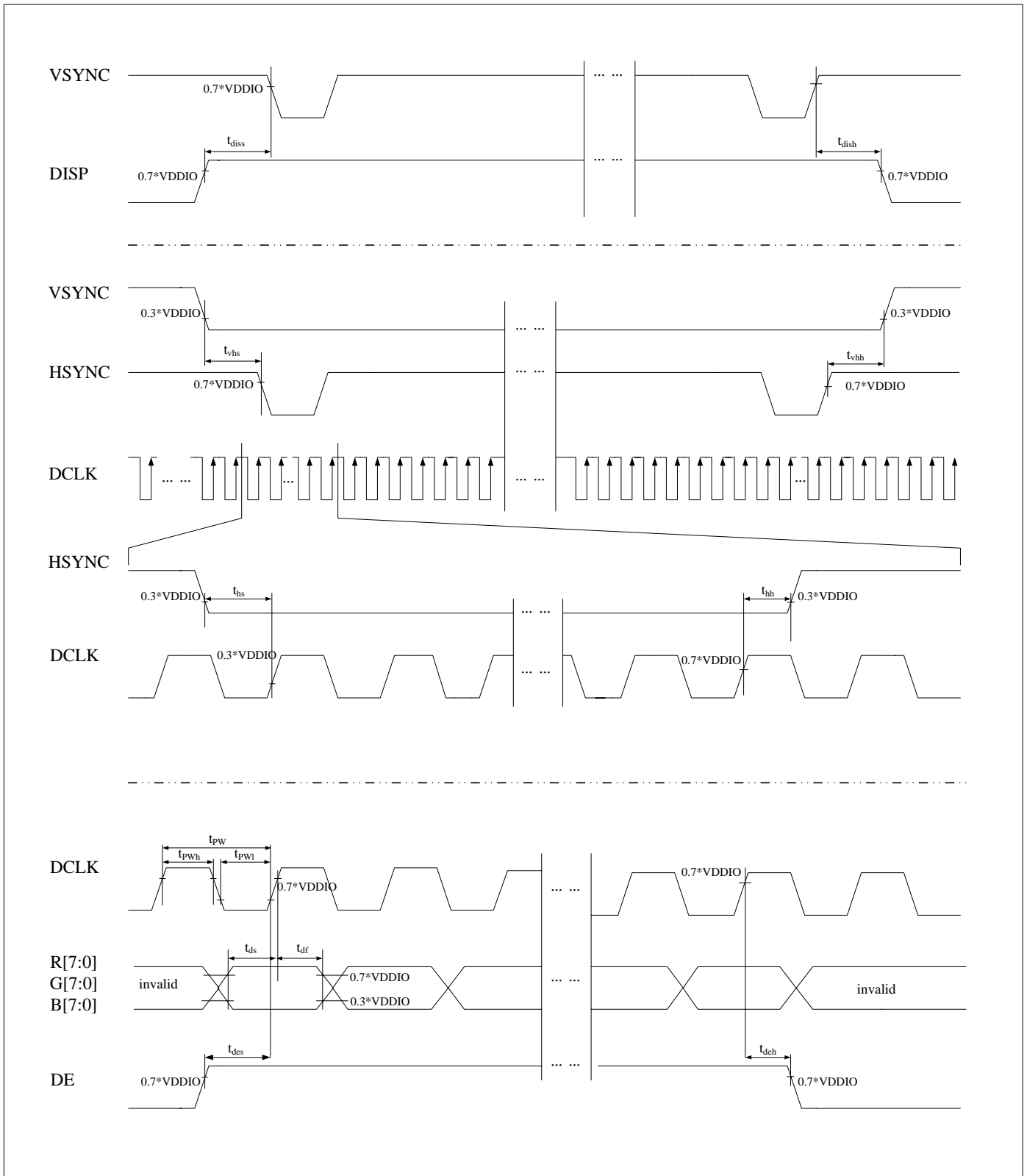
LCD module diagram





## 5 Timing Chart

### 5.1 Input Setup Timing



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## 5.2 Input Setup Timing Parameter Setting

VDD=3.3V Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK Cycle Time	$T_{pw}$	66.7	-	-	ns	
DCLK Pulse High Width	$T_{pwh}$	26.7	-	-	ns	
DCLK Pulse Low Width	$T_{pwl}$	26.7	-	-	ns	
DE Setup Time	$T_{des}$	10	-	-	ns	
DE Hold Time	$T_{deh}$	10	-	-	ns	
HSYNC Setup Time	$T_{hs}$	10	-	-	ns	
HSYNC Hold Time	$T_{hh}$	10	-	-	ns	
VSYNC Setup Time	$T_{vhs}$	10	-	-	ns	
VSYNC Hold Time	$T_{vhh}$	10	-	-	ns	
Data Setup Time	$T_{ds}$	10	-	-	ns	
Data Hold Time	$T_{dh}$	10	-	-	ns	
DISP Setup Time	$T_{diss}$	10	-	-	us	
DISP Hold Time	$T_{dish}$	10	-	-	ms	

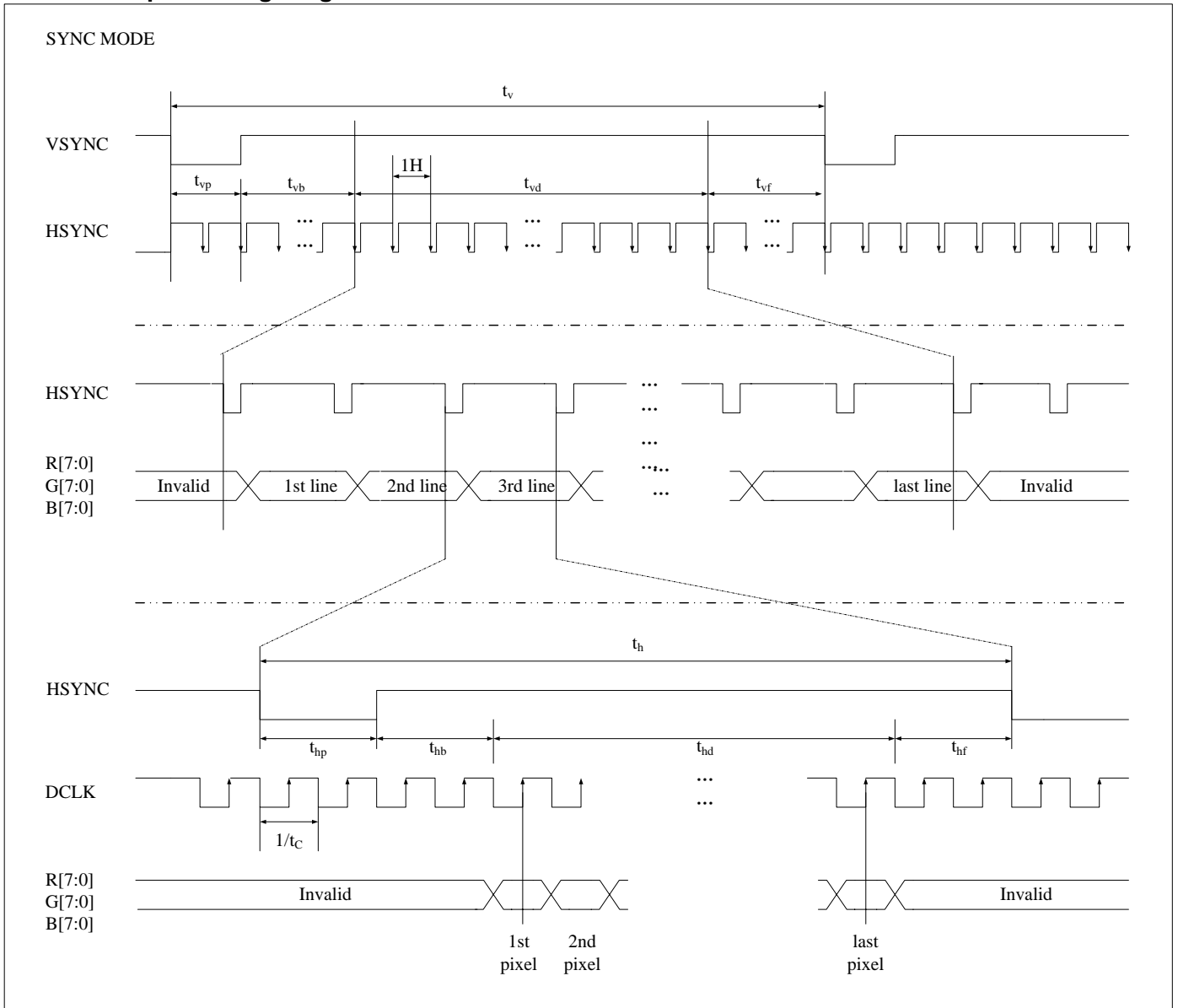
Note 1:  $t_r=t_f=2ns$ .  $t_r$ ,  $t_f$  is defined 10% to 90% of signal amplitude.

Note 2: For parallel interface, maximum clock frequency is 15MHz.



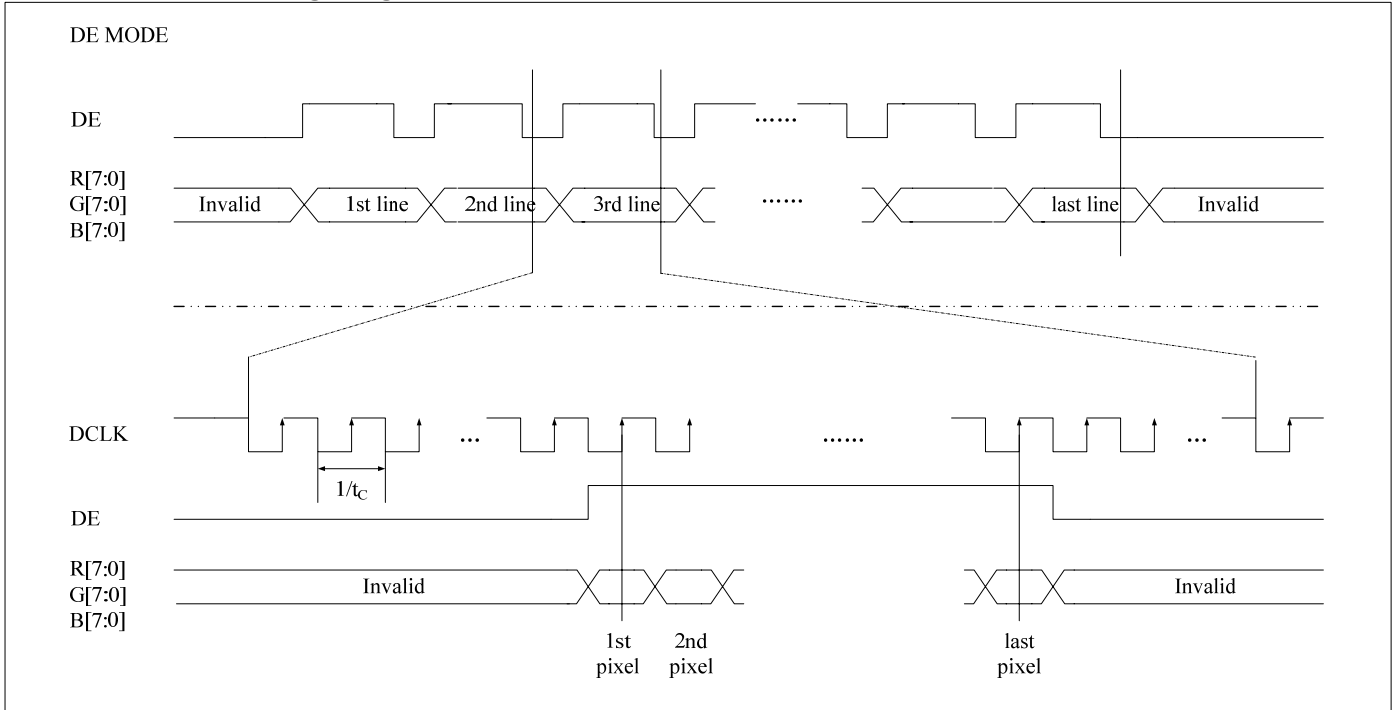
### 5.3 Data Input Format

#### 5.3.1 Data Input Timing Diagram under SYNC Mode





5.3.2 Data Input Timing Diagram under DE Mode



5.4 Data Input Timing Parameter Setting

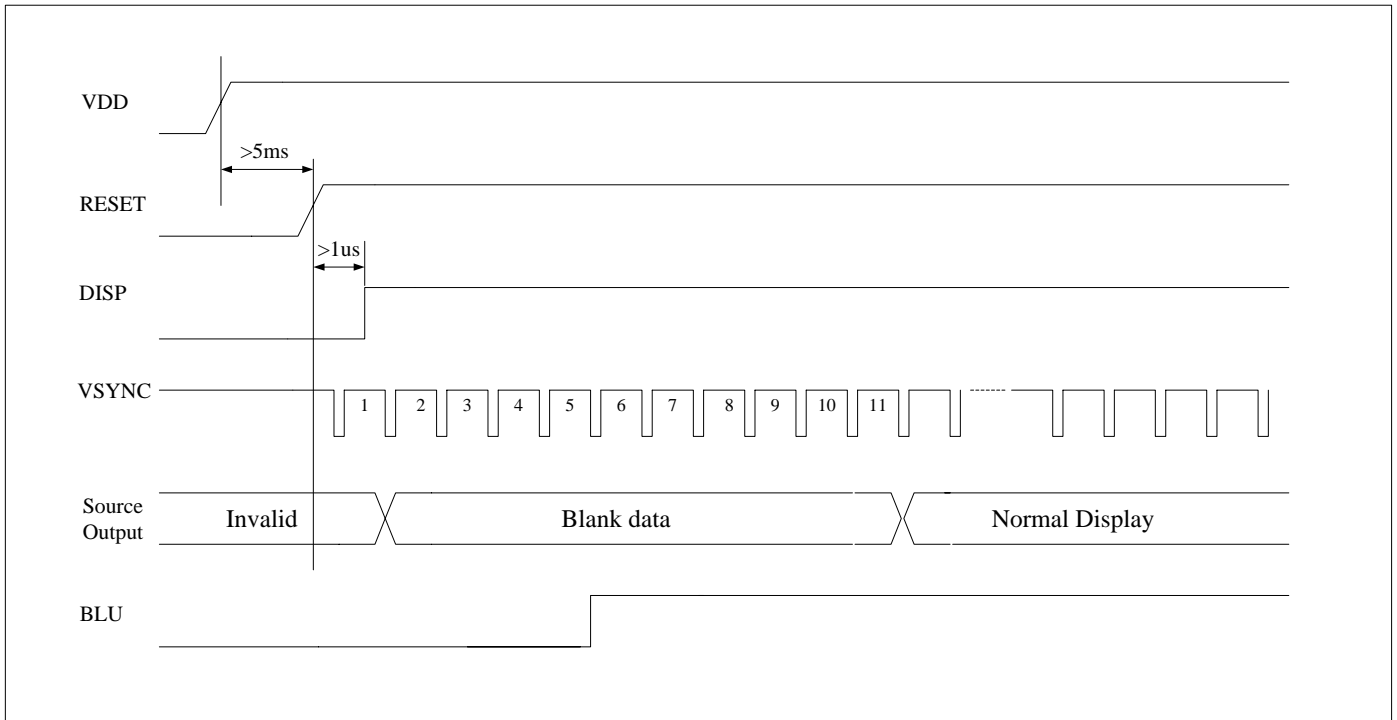
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	$f_{clk}$	-	9	15	MHZ
HSYNC frequency	$1/t_h$	-	17.14	-	KHz
VSYNC frequency	$1/t_v$	-	59.94	-	Hz
Horizontal cycle	$t_h$	525	525	605	DCLK
Horizontal display period	$t_{hd}$	480			DCLK
Horizontal pulse width	$t_{hp}$	2	41	41	DCLK
Horizontal back porch	$t_{hb}$	2	2	41	DCLK
Horizontal front porch	$t_{hf}$	2	2	82	DCLK
Vertical cycle	$t_v$	285	286	399	HSYNC
Vertical display period	$t_{vd}$	272			HSYNC
Vertical pulse width	$t_{vp}$	1	10	11	HSYNC
Vertical back porch	$t_{vb}$	1	2	11	HSYNC
Vertical front porch	$t_{vf}$	1	2	227	HSYNC

Note 1: Unit: CLK=1/  $f_{CLK}$  , H=  $t_h$ ,

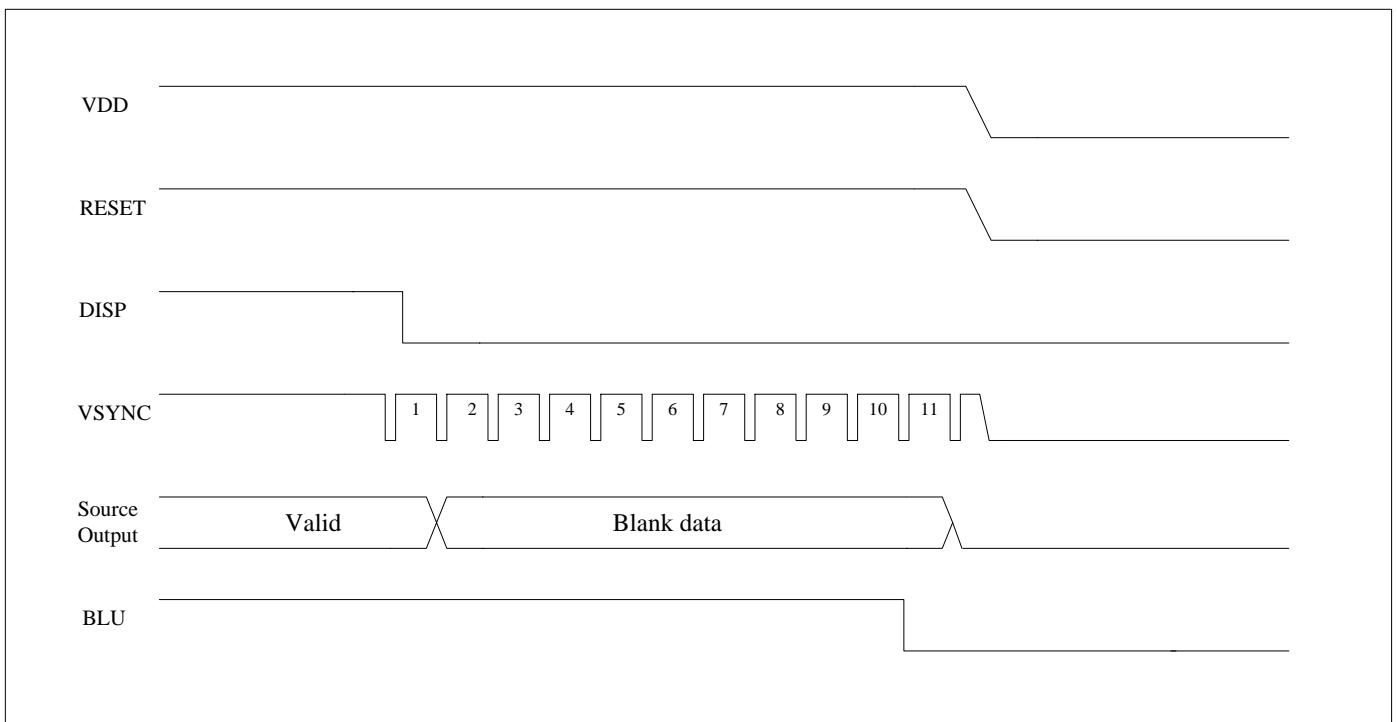
Note 2: It is necessary to keep  $t_{vp}+t_{vb}=12$  and  $t_{hp}+t_{hb}= 43$  in sync mode. DE mode is unnecessary to keep it.



### 5.5 Power ON Sequence



### 5.6 Power Off Sequence





## 6 Optical Characteristics

Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	$\theta T$	$CR \geq 10$	60	70	-	Degree	Note2,3
	$\theta B$		40	50	-		
	$\theta L$		60	70	-		
	$\theta R$		60	70	-		
Contrast Ratio	CR	$\theta=0^\circ$	400	450	-		Note 3
Response Time	$T_{ON}$	25°C	-	20	30	ms	Note 4
	$T_{OFF}$						
Chromaticity	White	Backlight is on	x	0.265	0.315	0.365	Note 1,5
			y	0.278	0.328	0.378	
	Red		x	0.540	0.590	0.640	Note 1,5
			y	0.300	0.350	0.400	
	Green		x	0.290	0.340	0.390	Note 1,5
			y	0.500	0.550	0.600	
	Blue		x	0.094	0.144	0.194	Note 1,5
			y	0.050	0.100	0.150	
Uniformity	U			75	-	%	Note 6
NTSC			-	50	-	%	Note 5
Luminance	L		230	280	-	cd/m <sup>2</sup>	Note 7

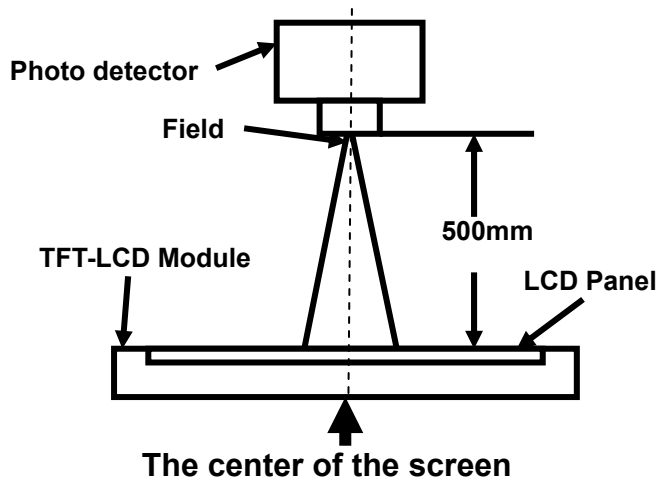
Test Conditions:

1.  $I_F = 22$  mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

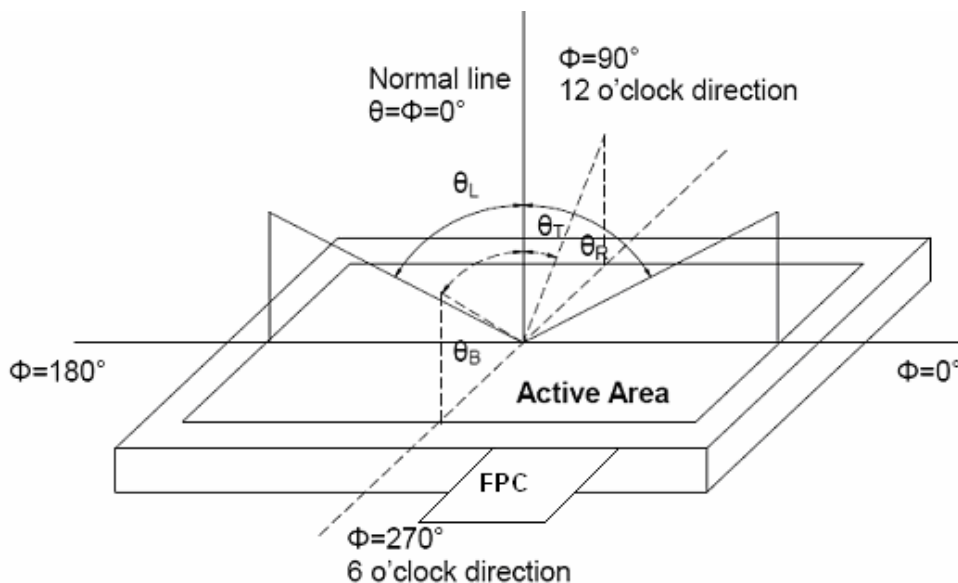
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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 V<sub>white</sub>.

“Black state”: The state is that the LCD should drive by V<sub>black</sub>.

V<sub>white</sub>: To be determined    V<sub>black</sub>: To be determined.

Note 4: Definition of Response time

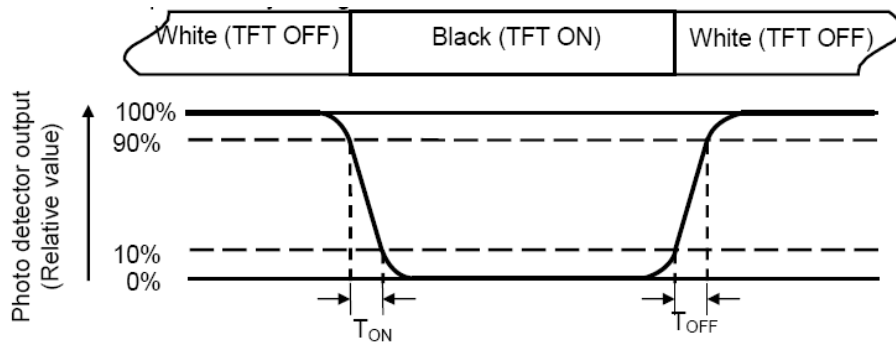
The response time is defined as the LCD optical switching time interval between “White” state and

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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)

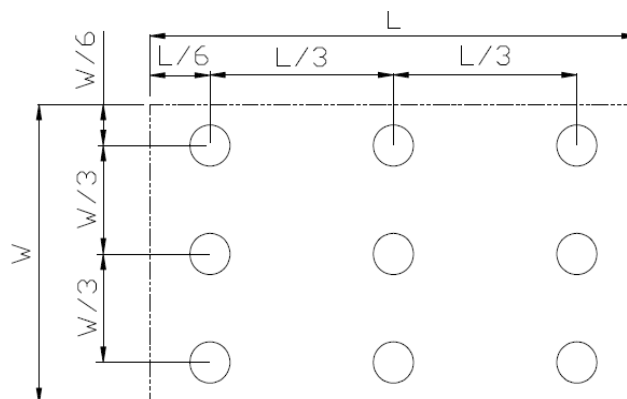
Color coordinates measured at center point of LCD.

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.

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

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 Tests**

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+70°C, 240hrs	Note1 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta=-20°C, 240hrs	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta=+80°C, 240hrs	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta=-30°C, 240hrs	IEC60068-2-1 GB2423.1
5	High Temperature & High Humidity Storage	Ta=+60°C, 90% RH 240 hours	Note2 IEC60068-2-78 GB/T2423.3
6	Thermal Shock (Non-operation)	-30°C 30 min~+70°C 30 min, Change time:5min, 20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	Electro Static Discharge (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; (Environment: 15°C~35°C, 30%~60%, 86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
8	Vibration (Non-operation)	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 GB/T2423.10
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8
11	Package Vibration 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)	IEC60068-2-34 GB/T2423.11

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

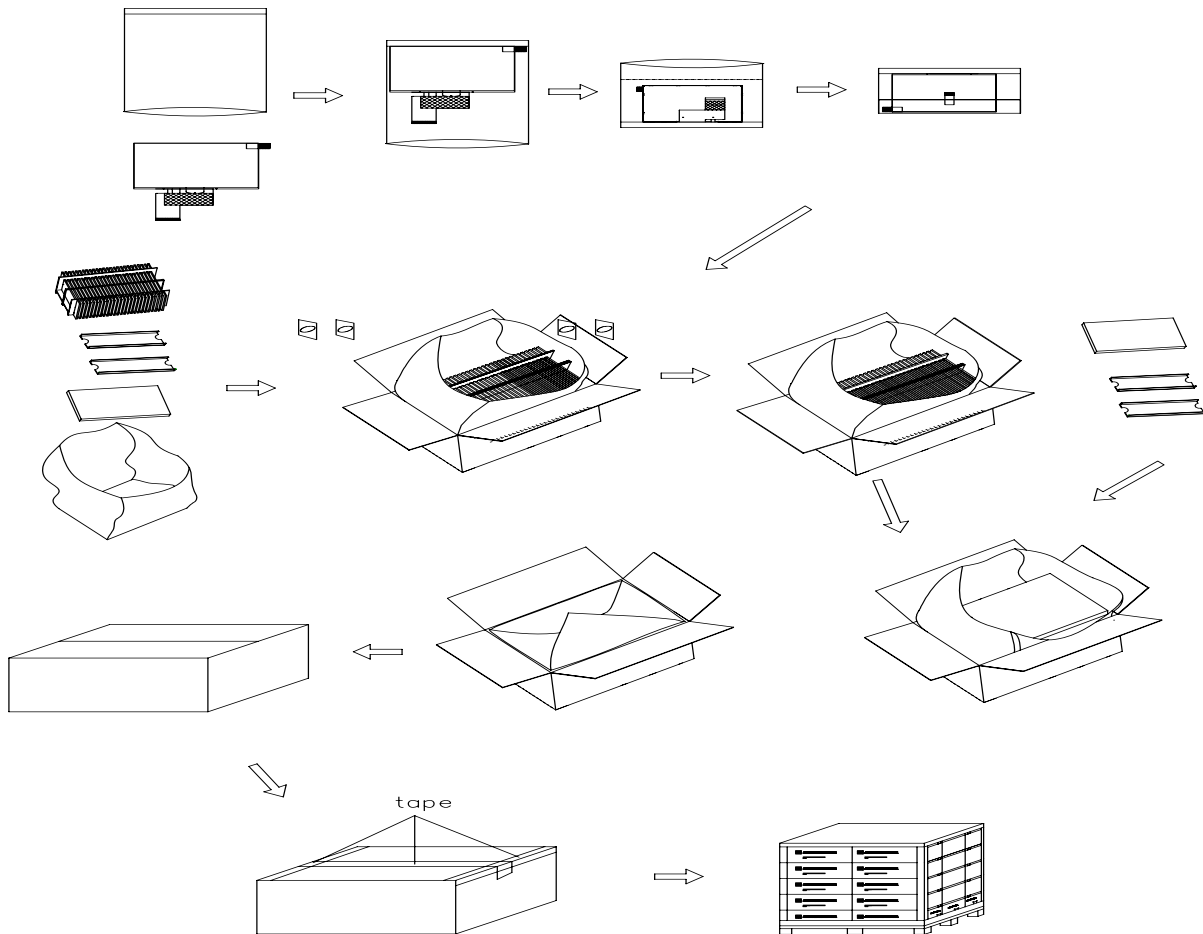
Note2: Ta is the ambient temperature of sample.





### 9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM043NBH02	105.5x67.2x4.1	TBD	112	
2	Partition_1	Corrugated Paper	513x333x106	0.7	2	
3.	Anti-Static Bag	PE	175.8x125x0.05	0.0007	112	Anti-static
4	Dust-Proof Bag	PE	700x530	0.0600	1	
5	Partition_2	Corrugated Paper	505x332x4.00	0.09	3	
6	Corrugated Bar	Corrugated Paper	513x117x3	0.04	8	
7	Carton	Corrugated Paper	530x350x250	1.1000	1	
8	Total weight	TBD Kg				



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## 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°C ~ 40°C 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.