



PHOENIX DISPLAY INTERNATIONAL, INC.

PHOENIX DISPLAY INTERNATIONAL, INC

SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDIS090AWX01HS
DESCRIPTION	9.0" WXGA 1280(RGB)X240 Dots
VERSION	3.0
ISSUE DATE	14-Apr-17

COMPANY ADDRESS:

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2. General Specifications

Feature		Spec
Characteristics	Size	9.0 inch
	Resolution	1280(horizontal)*240(Vertical)
	Interface	LVDS
	Connect type	Connector
	Display Colors	16.7M
	Technology type	a-Si
	Pixel pitch (mm)	0.17475*0.17475
	Pixel Configuration	R.G.B.-Stripe
	Display Mode	Normally Black
	Driver IC	TBD
	Viewing Direction	IPS ALL
Mechanical	LCM (W x H x D) (mm)	237.00*58.95*4.00
	Active Area(mm)	223.68*42.00
	Weight (g)	TBD
	LED Numbers	40 LEDs

Note 1: Requirements on Environmental Protection: RoHs

Note 2: LCM weight tolerance: +/- 5%

3. Input/Output Terminals

Pin No.	Signal	I/O	Description	Note
1	NC	-	No connection	
2	SHLR	I	Horizontal scan direction control	
3	UPDN	I	Vertical scan direction control	
4	VDD	PI	Digital Power Supply Voltage	
5	GND	G	Digital Ground	
6	GRB	I	Global reset pin(Low active)	
7	NC	-	No connection	
8	GND	G	Digital Ground	
9	CLKP	I	Positive LVDS differential clock input	
10	CLKN	I	Negative LVDS differential clock input	
11	GND	G	Digital Ground	
12	PIND0	I	Positive LVDS differential input	
13	NIND0	I	Negative LVDS differential input	
14	GND	G	Digital Ground	
15	PIND1	I	Positive LVDS differential input	
16	NIND1	I	Negative LVDS differential input	
17	GND	G	Digital Ground	
18	PIND2	I	Positive LVDS differential input	
19	NIND2	I	Negative LVDS differential input	
20	GND	G	Digital Ground	
21	PIND3	I	Positive LVDS differential input	
22	NIND3	I	Negative LVDS differential input	
23	GND	G	Digital Ground	
24	GND	G	Digital Ground	
25	VDD	PI	Digital Power Supply Voltage	
26	VDD	PI	Digital Power Supply Voltage	
27	GND	G	Digital Ground	
28	NC	-	No connection	
29	VDDA	PI	Analog Power Supply Voltage	
30	VDDA	PI	Analog Power Supply Voltage	
31	VDDA	PI	Analog Power Supply Voltage	
32	VDDA	PI	Analog Power Supply Voltage	
33	VDDA	PI	Analog Power Supply Voltage	
34	NC	-	No connection	
35~40	GNDA	G	Analog Ground	

4. Absolute Maximum Rating

Item	Symbol	MIN	Typ	MAX	Unit	Remark
Supply Voltage	V _{DD}	-0.3	-	5.0	V	-
Operating Temperature	T _{OPR}	-30	-	85	°C	-
Storage Temperature	T _{STG}	-40	-	95	°C	

5. Timing characteristics

5.1 Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply	V _{DD}	3	3.3	3.6	V	Note 1
	I _{VDD}	25	30	80	mA	Note 1
	I _{VDD} inrush current			500	mA	
	V _{DDA}	3	3.3	3.6	V	Note 1
	I _{VDDA}	200	380	800	mA	Note 1
	I _{VDDA} inrush current			1.2	A	
	V _{DD}	3	3.3	3.6	V	Note 1

Note 1: Test pattern is the following picture.



Fig. 3. Test pattern for power specification

5.2 LED Driving Conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	200	-	mA	
Forward Voltage	V_F	11.5	12.8	14.1	V	
Backlight Power consumption	W_{BL}	-	2.56	-	W	
LED Lifetime		-	25000	-	Hrs	

Note 1: Each LED: $I_F = 20 \text{ mA}$, $V_F = 3.2 \pm 0.2 \text{ V}$.

Note 2: Optical performance should be evaluated at $T_a = 25^\circ \text{C}$ only.

Note 3: 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% initial brightness. Typical operating life time is estimated data.

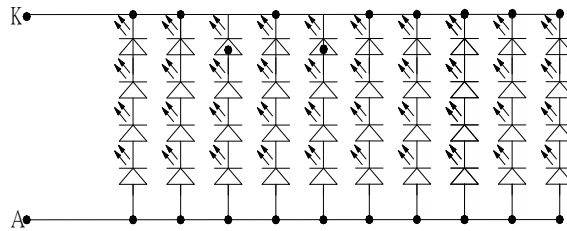
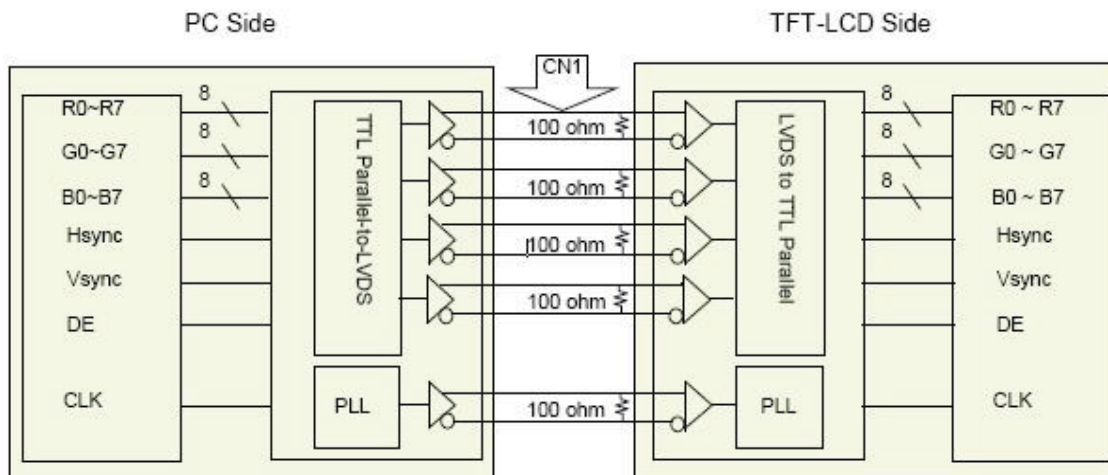
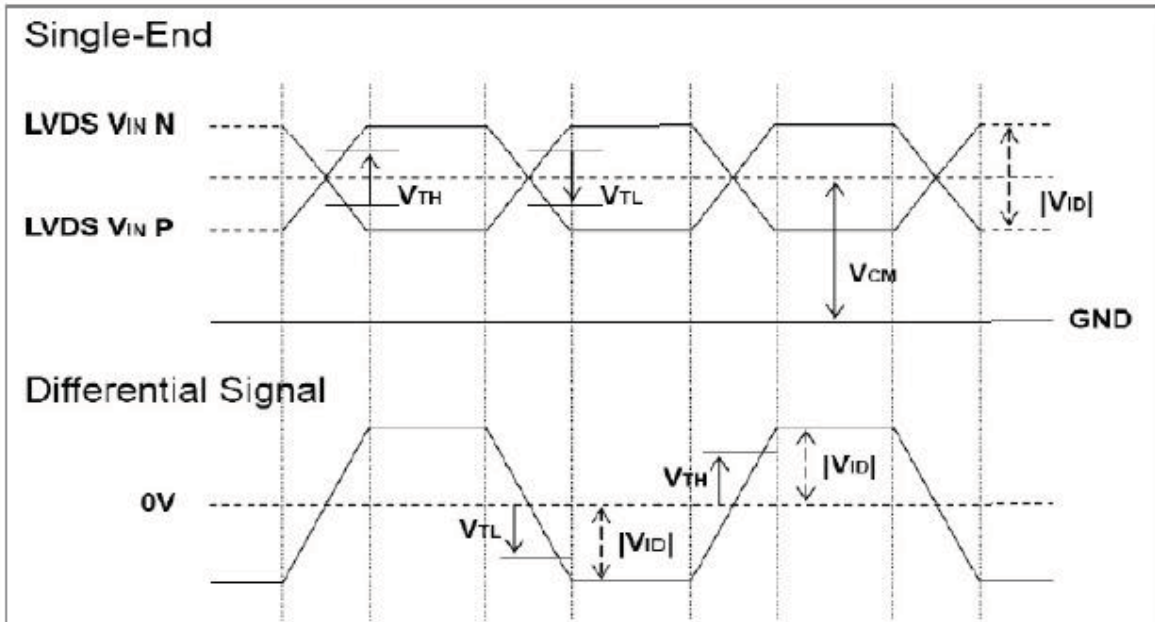


Figure: LED connection of backlight(Constant Current)

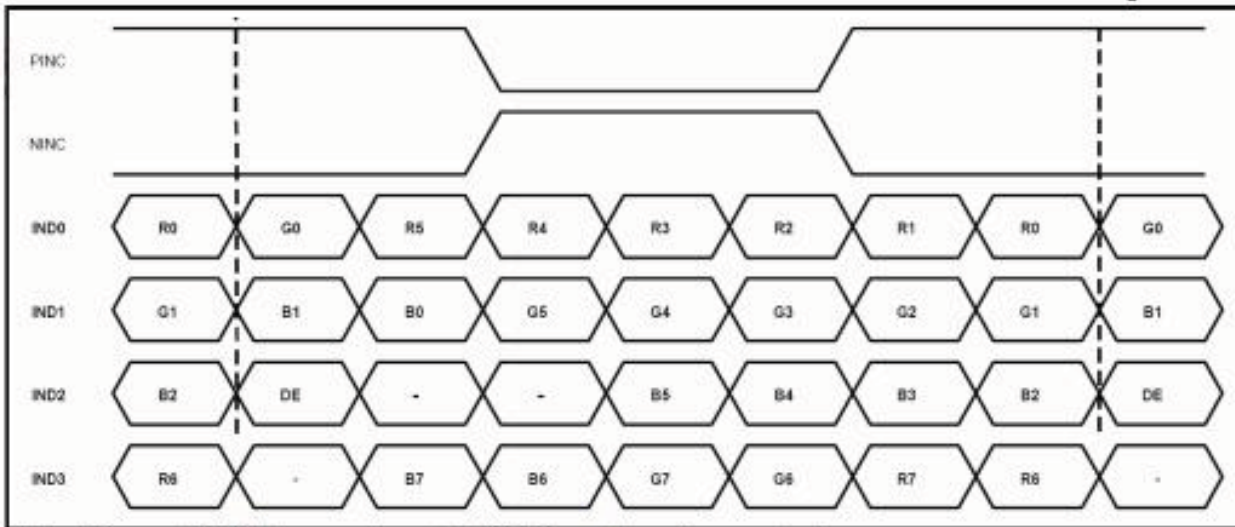
5.3 LVDS Interface



5.4 LVDS Input signal



5.5 8bit LVDS input

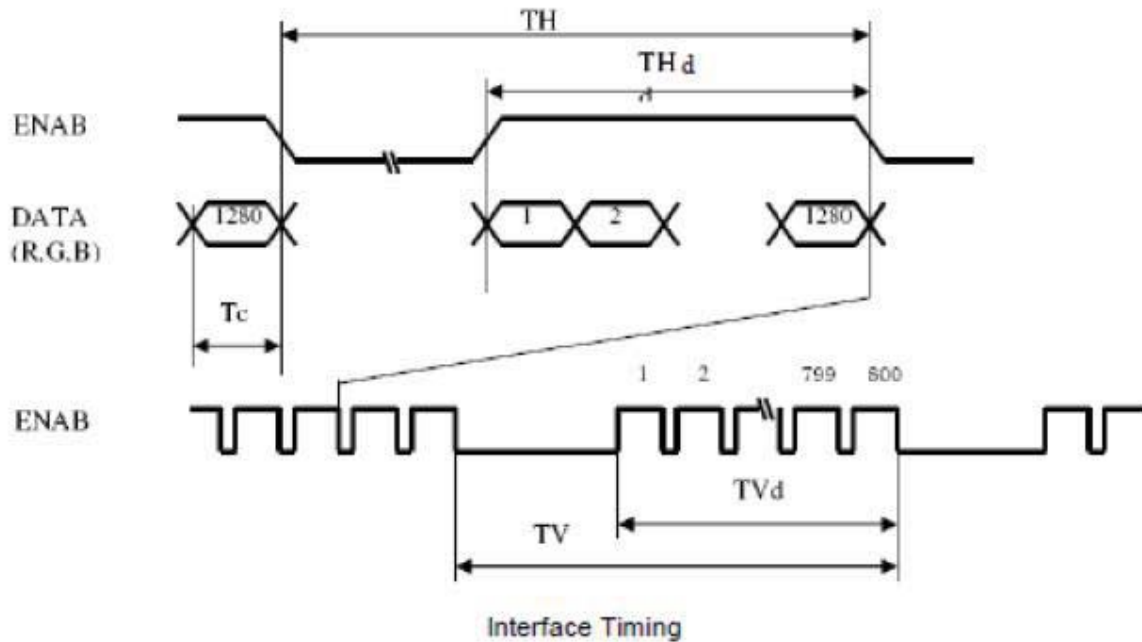


Note: Support DE timing mode only, SYNC mode not supported.

5.6 SIGNAL TIMING SPECIFICATION

5.6.1 The DE mode.

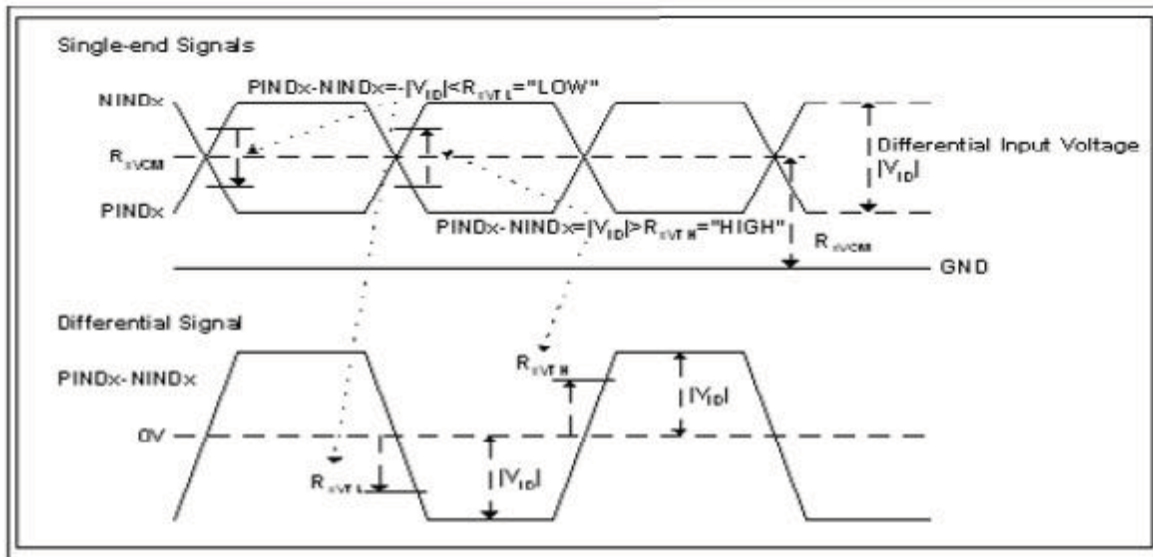
Parameter		Symbol	MIN	TYP	MAX	Unit	Remark
CLK Frequency		Fclk	63	69	84	MHz	
HSYNC	Period	T_H	1388	1480	1528	CLK	
	Horizontal display area	T_{HD}	1280			CLK	
	Blanking	$T_{HBP}+T_{HFP}$	108	200	289	CLK	
VSYNC	Period	T_V	757	773	850	HS	
	Vertical display area	T_{VD}	720			HS	
	Blanking	$T_{VBP}+T_{VFP}$	37	53	130	HS	



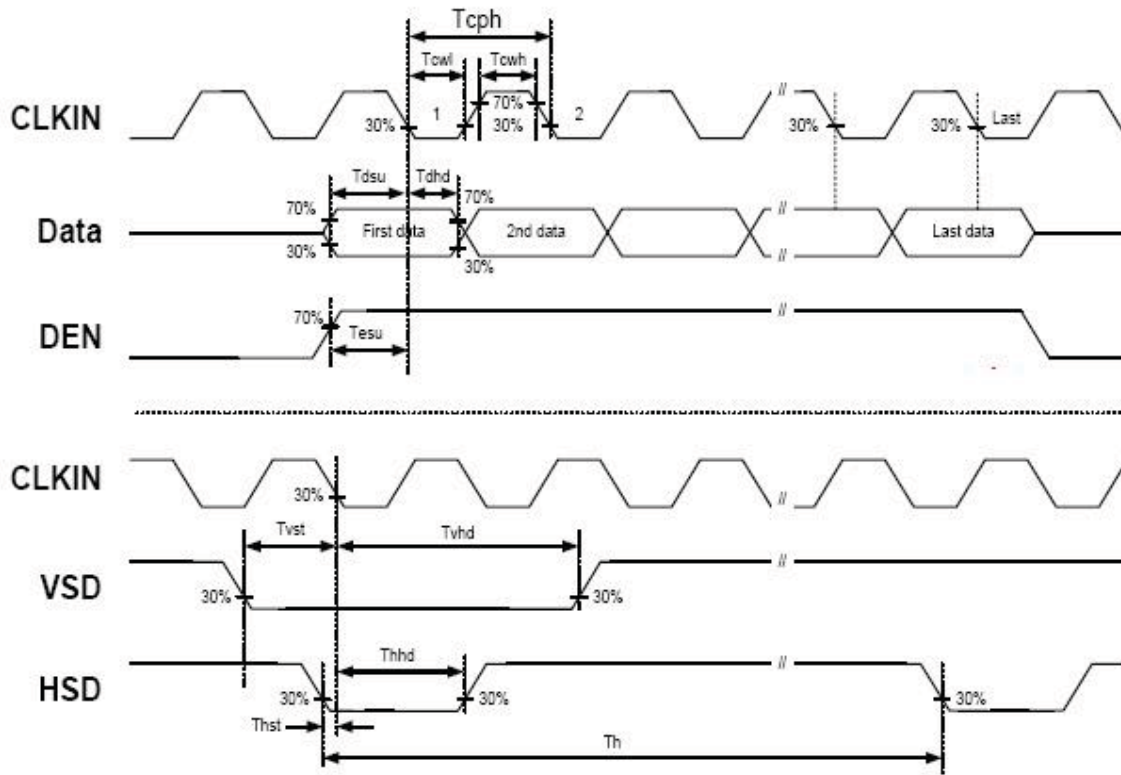
5.6.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 6.

<Table 6. LVDS Rx Interface Timing Specification>



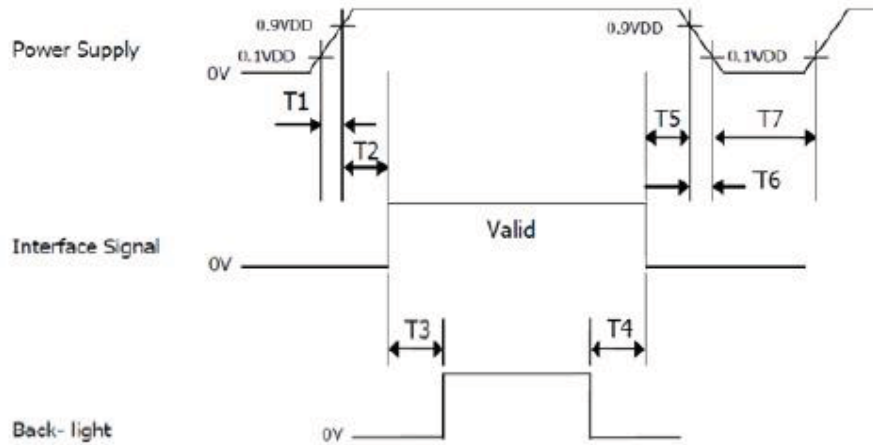
5.7 Signal Timing Waveforms of Interface Signal. Input Clock and Data Timing Diagram



5.8 Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below

Power-On/Off Timing Sequence:



Parameter	Values			Units
	Min	Typ	Max	
T1	0	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.5	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

6. Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time		Tr+Tf	-	-	25	35	ms	FIG.1	Note4
Contrast Ratio		CR		800	1000	-	-	FIG.2	Note1
Surface luminance		LV	$\theta = 0^\circ$	550	600	-	cd/m ²	FIG.2	Note2
Luminance uniformity		Yu	$\theta = 0^\circ$	-	80	-	%	FIG.2	Note3
Viewing angle		θ Cr>10	$\phi = 90^\circ$	-	80	-	deg	FIG.3	Note6
			$\phi = 270^\circ$	-	80	-	deg	FIG.3	
			$\phi = 0^\circ$	-	80	-	deg	FIG.3	
			$\phi = 180^\circ$	-	80	-	deg	FIG.3	
Chromaticity	Red	R _x	$\theta = 0^\circ$	0.619	0.629	0.649	-	FIG.2 CIE1931	Note5
		R _y		0.310	0.330	0.350	-		
	Green	G _x	$\phi = 0^\circ$	0.320	0.340	0.360	-		
		G _y		0.590	0.610	0.630	-		
	Blue	B _x	Ta=25°	0.127	0.147	0.167	-		
		B _y		0.026	0.046	0.066	-		
	White	W _x	0.305	0.315	0.335	-			
		W _y	0.310	0.320	0.330	-			

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

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

For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is based on TOPCON's BM-5 or BM-7 photo detector or compatible.

Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

L_v = Average Surface Luminance with all white pixels ($P_1, P_2, P_3, \dots, P_n$)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}{\text{Maximum surface luminance with all white pixels } (P_1, P_2, P_3, \dots, P_n)}$$

Note4. 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_r) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_f) is the time between photo detector output intensity changed from 10% to 90%.

For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position P5. For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is based on Autronic-Melchers' s ConoScope or DMS series Instruments or compatible.

FIG.1. The definition of response Time

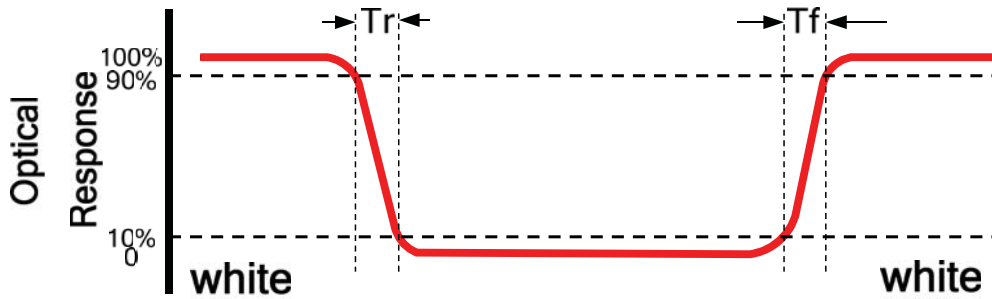


FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity

Size : $S \leq 5"$ (see Figure a) A : 5 mm B : 5 mm
 H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

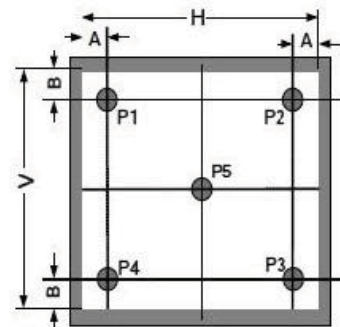


Figure a

Size : $5" < S \leq 12.3"$ (see Figure b) H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

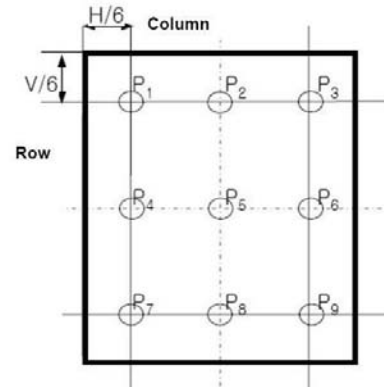


Figure b

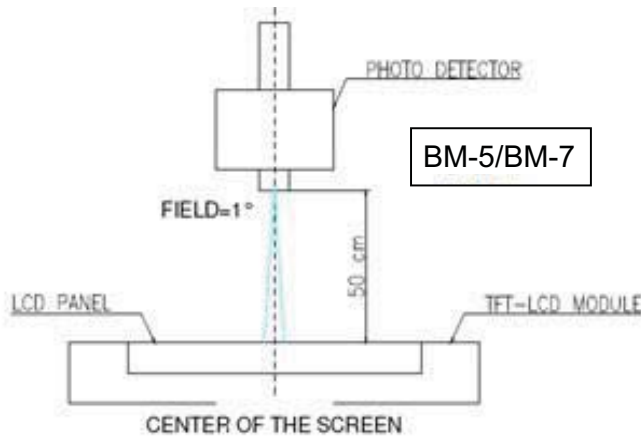
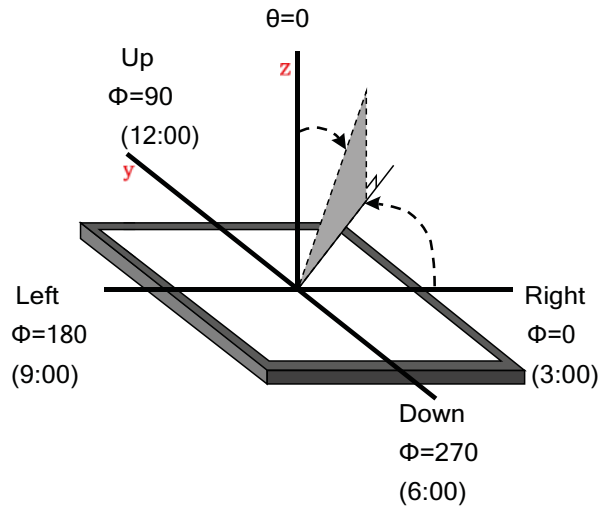


Figure c

FIG.3.The definition of viewing angle



7. Environmental / Reliability Tests

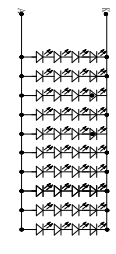
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +85°C, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -30°C, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +95°C, 120hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -40°C, 120hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60°C, 90% RH max, 120 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-20°C 30 min ~ +60°C 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Discharge (Operation) Static	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15°C ~ 35°C, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note:1. Ts is the temperature of panel's surface.

2. Ta is the ambient temperature of sample.

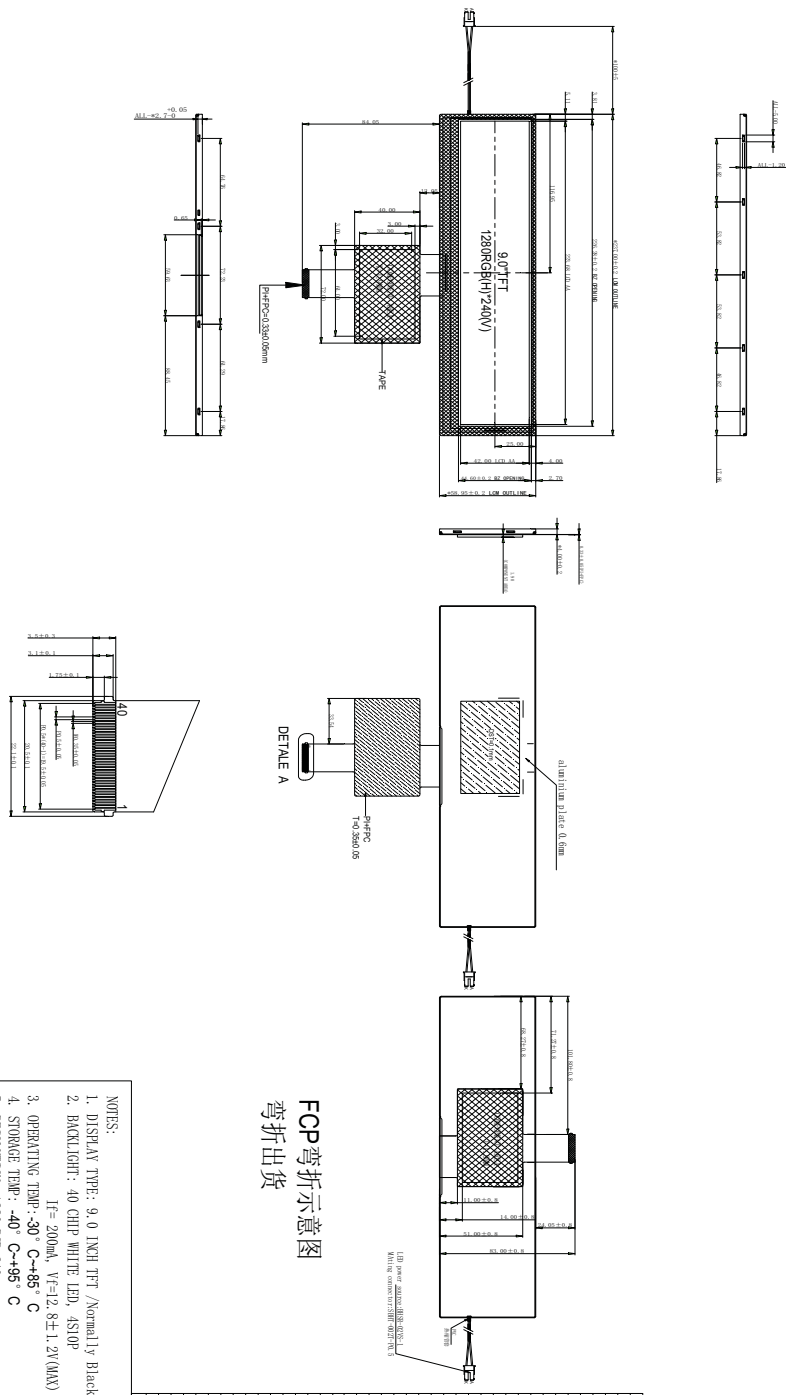
3. The size of sample is 5pcs.

8. Mechanical Drawing



CIRCUIT DIAGRAM

REV.	DATE	MODIFICATION	INTERFACE	LVDS Interface	FILE NO	PART NO.
1.0	2016.08.29	Fix issue	FPC Connector (FH52-40S-0.5SH)	FPC Connector (FH52-40S-0.5SH)	CPT-DWG-S090AVX01HS	S090AVX01HS
			VIEWING DIRECTION	ALL	DWN	REV. 1.0
			DIRECTION	FREE	Li Huang 2016.08.29	SHEET OF 1/1
					Li Huang 2014.08.29	TOLERANCE UNLESS SPECIFIED
					PROJECTION 3RD	UNIT MM
						SCALE #0.2
						1:1



FCP弯折示意图
弯折出货

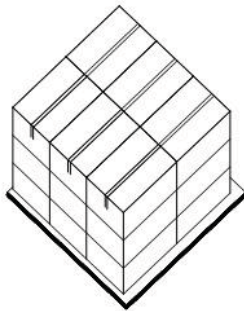
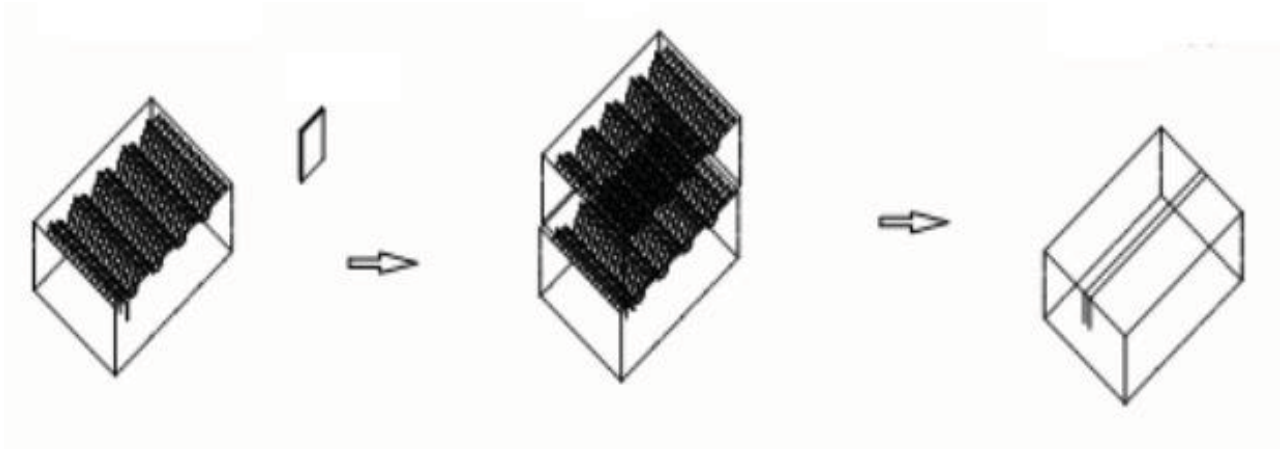
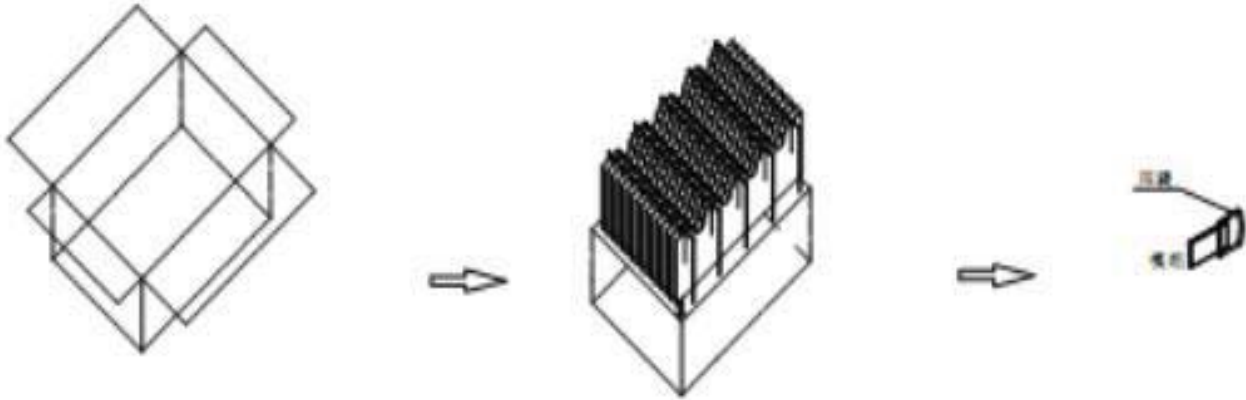
NOTES:

1. DISPLAY TYPE: 9.0 1XCH TFT /Normally Black
2. BACKLIGHT: 40 CHIP WHITE LED, 4S10P
If= 200mA, Vf=12.8±1.2V(MAX);
3. OPERATING TEMP: -30° C~+85° C
4. STORAGE TEMP: -40° C~+95° C
5. RESOLUTION: 1280(RGB)x240
6. Luminance: 600cd/m2 (typ)
7. * () *reference dimension, **critical dimension
8. RoHS Compliant

1	REV.	1.0
2	DATE	2016.08.29
3	BY	LI HUANG
4	CHKD	LI HUANG
5	DATE	2016.08.29
6	BY	LI HUANG
7	CHKD	LI HUANG
8	DATE	2016.08.29
9	BY	LI HUANG
10	CHKD	LI HUANG
11	DATE	2016.08.29
12	BY	LI HUANG
13	CHKD	LI HUANG
14	DATE	2016.08.29
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32	DATE	2016.08.29
33	BY	LI HUANG
34	CHKD	LI HUANG
35	DATE	2016.08.29
36	BY	LI HUANG
37	CHKD	LI HUANG
38	DATE	2016.08.29
39	BY	LI HUANG
40	CHKD	LI HUANG

9. Packing

Packing Method



10. TFT-LCD Module Inspection Criteria

10.1 Scope

The incoming inspection standards shall be applied to TFT - LCD Modules (hereinafter Called "Modules") that supplied by CDTech Technology LTD.

10.2 Incoming Inspection

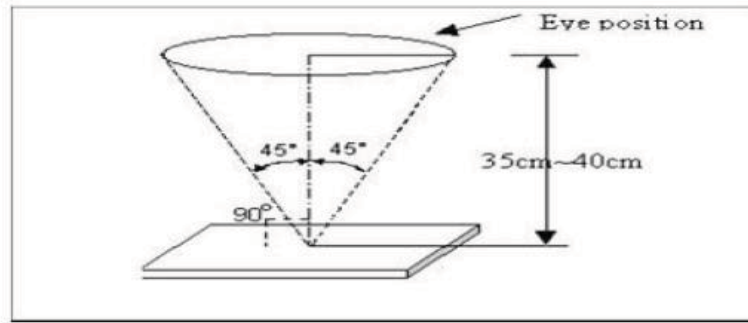
The customer shall inspect the modules within twenty calendar days of the delivery date (the "inspection period") at its own cost. The result of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to The seller, If the results of the inspecting from buyer does not send to the seller within twenty Calendar days of the delivery date. The modules shall be regards as acceptance. Should the customer fail to notify the seller within the inspection period, the buyers Right to reject the modules shall be lapsed and the modules shall be deemed to have Been accepted by the buyer

10.3 Inspection Sampling

- 3.1. Lot size: Quantity per shipment lot per model
- 3.2. Sampling type: Normal inspection, Single sampling
- 3.3. Inspection level: II
- 3.4. Sampling table: MIL-STD-105E
- 3.5. Acceptable quality level (AQL)
Major defect: AQL=0.65 Minor defect: AQL=1.50

10.4 Inspection Conditions

- 4.1 Ambient conditions:
 - a. Temperature: Room temperature $25 \pm 5^{\circ}\text{C}$
 - b. Humidity: $(60 \pm 10) \% \text{RH}$
 - c. Illumination: Single fluorescent lamp non-directive (300 to 700 Lux)
- 4.2 Viewing distance
The distance between the LCD and the inspector's eyes shall be at least 35 ± 5 cm.
- 4.3 Viewing Angle
U/D: $45^{\circ} / 45^{\circ}$, L/R: $45^{\circ} / 45^{\circ}$



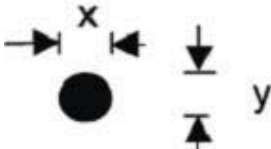
10.5 Inspection Criteria

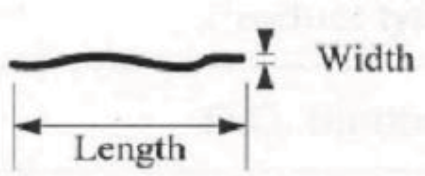
Defects are classified as major defects and minor defects according to the degree of Defectiveness defined herein.

10.5.1 Major defect

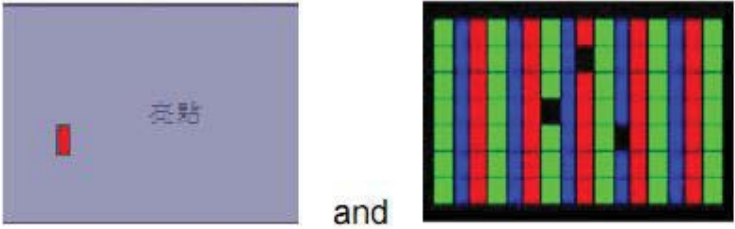
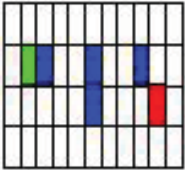
Item No	Items to be inspected	Inspection Standard
5.1.1	All functional defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
5.1.2	Missing	Missing function component
5.1.3	Crack	Glass Crack

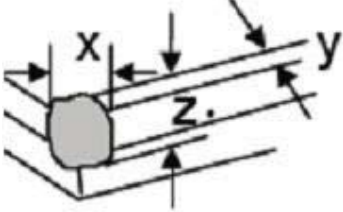
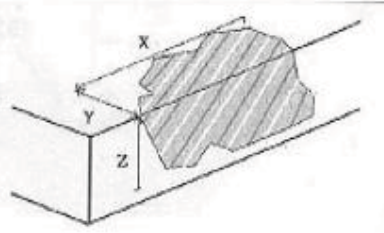
10.5.2 Minor defect

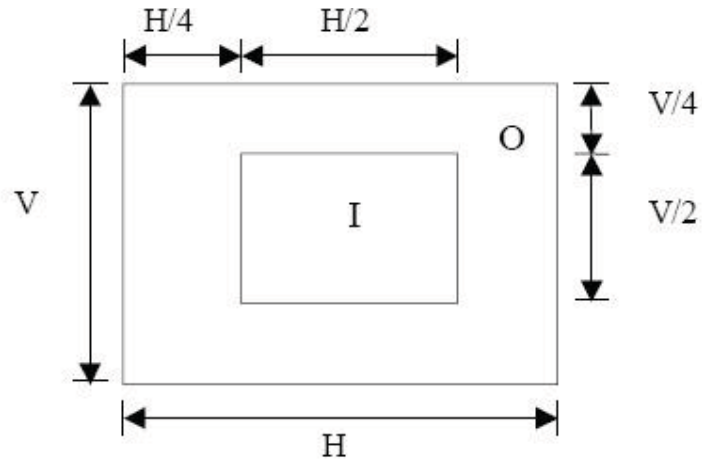
Item No	Items to be inspected	Inspection standard	
5.2.1	Spot Defect Including Black spot White spot Pinhole Foreign particle Polarizer dirt	For dark/white spot is defined $\phi = (x+y) / 2$ 	
		Size ϕ (mm)	Acceptable Quantity
		$\phi \leq 0.2$	Ignore
		$0.2 < \phi \leq 0.3$	$N \leq 5$
		$0.3 < \phi$	Not allowed

5.2.2	Line Defect Including Black line White line Scratch	Define:	
			
		Width(mm) Length(mm)	Acceptable Quantity
		$W \leq 0.05$	Ignore
		$0.05 < W \leq 0.1$ $0.3 < L \leq 3.0$	$N \leq 3$
$L > 3.0$	Not allowed		

5.2.3	Polarizer Dent/Bubble	Size ϕ (mm)	Acceptable Quantity
		$\Phi \leq 0.2$	Ignore
		$0.2 < \Phi \leq 0.3$	$N \leq 2$
		$\Phi > 0.3$	Not allowed

5.2.4	Electrical Dot Defect	Bright and Black dot define:		
				
		and		
				
		Two Adjacent Dot		
		Inspection pattern: Full white , Full black , Red , green and blue screens		
		Acceptable Quantity		
Item		Single Dot	Adjacent 2dots	Total
Black dot defect		4	2	4
Bright dot defect		2	1	2
Total Dot				6

5.2.5	Glass defect	 <p>1. Corner Fragment:</p>	
		Size(mm)	Acceptable Quantity
		$X \leq 3\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	Ignore T: Glass thickness X: Length Y: Width Z: thickness
		<p>2. Side Fragment:</p> 	
		Size(mm)	Acceptable Quantity
		$X \leq 5.0\text{mm}$ $Y \leq 1\text{mm}$ $Z \leq T$	T: Glass thickness X: Length Y: Width Z: thickness



I area & O area

- Note:
- 1). Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.
 - 2). The distance between two bright dot defects (red, green, blue, and white) should be larger than 15mm.
 - 3). The distance between black dot defects or black and bright dot defects should be more than 5mm apart.
 - 4). Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

10.6 Mechanics specification

As for the outside dimension, weight of the modules, please refer to product specification
For more details

11. Precautions for Use of LCD modules

11.1 Handling Precautions

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

11.1.2. 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.

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

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

11.1.5. 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
- Ketene
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

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

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. 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.

11.2 Storage Precautions

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

11.2.2. 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%

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

11.3 Transportation Precautions

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