深圳显旸光电科技有限公司
Shenzhen Xianyang Optoelectronic Technology Co., Ltd

PRODUCTION SPECIFICATION OF LCD MODULE

MODULE NO.：XY010QQV01-H1136A

Customer Name:		
Customer Part Number:		
Approved By:	Date:	

Prepared By	Checked By	Approved By

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Revision History

Rev	Issued Date	Description	Page	Editor
1.0	Dec 18.2017	First release	All	

1   General Specifications

Feature		Specifications
Display Spec.	LCD type	0.96 inch
	Resolution (H*V)	80（RGB）×160
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Normally Black
	Surface Treatment	Glare
	Viewing Direction	All
	Gray Scale Inversion Direction	No
Mechanical Characteristics	OutlineDimensions (W x H x T) (mm)	13.70*28.10*1.57
	Active Area(mm)	10.80*21.70
	With /Without Touch screen	Without
	Match Connector Type	No Connector
	Backlight Type	LED
	Weight (g)	TBD
Electrical Characteristics	Interface	4SPI
	Number of color	64K/262K
	Driver IC	ST7735S

Note 1:   Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

2 Pin Assignment

NO.	PIN NAME	Description
1	TP0	NC
2	TP1	NC
3	SDA	Serial input/output signal in serial interface mode
4	SCL	In Serial Interface, this is used as SCL.
5	RS	In 4-line SPI, this pin is used as D/CX (data/ command selection).
6	RES	This signal will reset the device and it must be applied to properly
7	CS	Chip Selection Pin
8	GND	Power Ground
9	NC	NC
10	VCI 2.8V	Power Supply 2.8V
11	LEDK	LED Cathode
12	LEDA	LED anode
13	GND	Power Ground

3 Absolute Maximum Ratings

GND=0V, Ta= 25℃

Item	Symbol	Value	Unit
Power supply voltage for logic	V_{DD}	0.3~3.6	V
Input voltage	Vin	V_{DD}+0.3	V
Operating temperature	Topr	-20 to 70	℃
Storage temperature	Tstg	-30 to 80	℃

Note: Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken.

They do not assure operations.

Note2: Background color changes slightly depending on ambient temperature. This Phenomenon is reversible.

Ta≦70℃: 75%RH max

Ta>70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note3: Ta at -30℃ will be <48hrs, at 80 ℃ will be <120hrs

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

Item	Symbol	Min.	Max.	Unit	Note
LC Operating Voltage	VOP	--	4.5	V	*1,*2
Operating Temperature	T_{OP}	-20	70	℃	
Storage Temperature	T_{ST}	-30	80	℃	
Operating Ambient Humidity	H_{OP}	10	*4	RH	*3
Storage Humidity	H_{ST}	10	*4	RH	*3

Note:

*1. At 25±5℃

*2. Due to the characteristics of LC Material, the Liquid Crystal driving voltage varies with environmental temperature.

*3. Non-condensation.

*4. Temp.≤ 60℃,90%RH Max.

Temp. > 60℃,Absolute humidity shall be less than 90%RH.
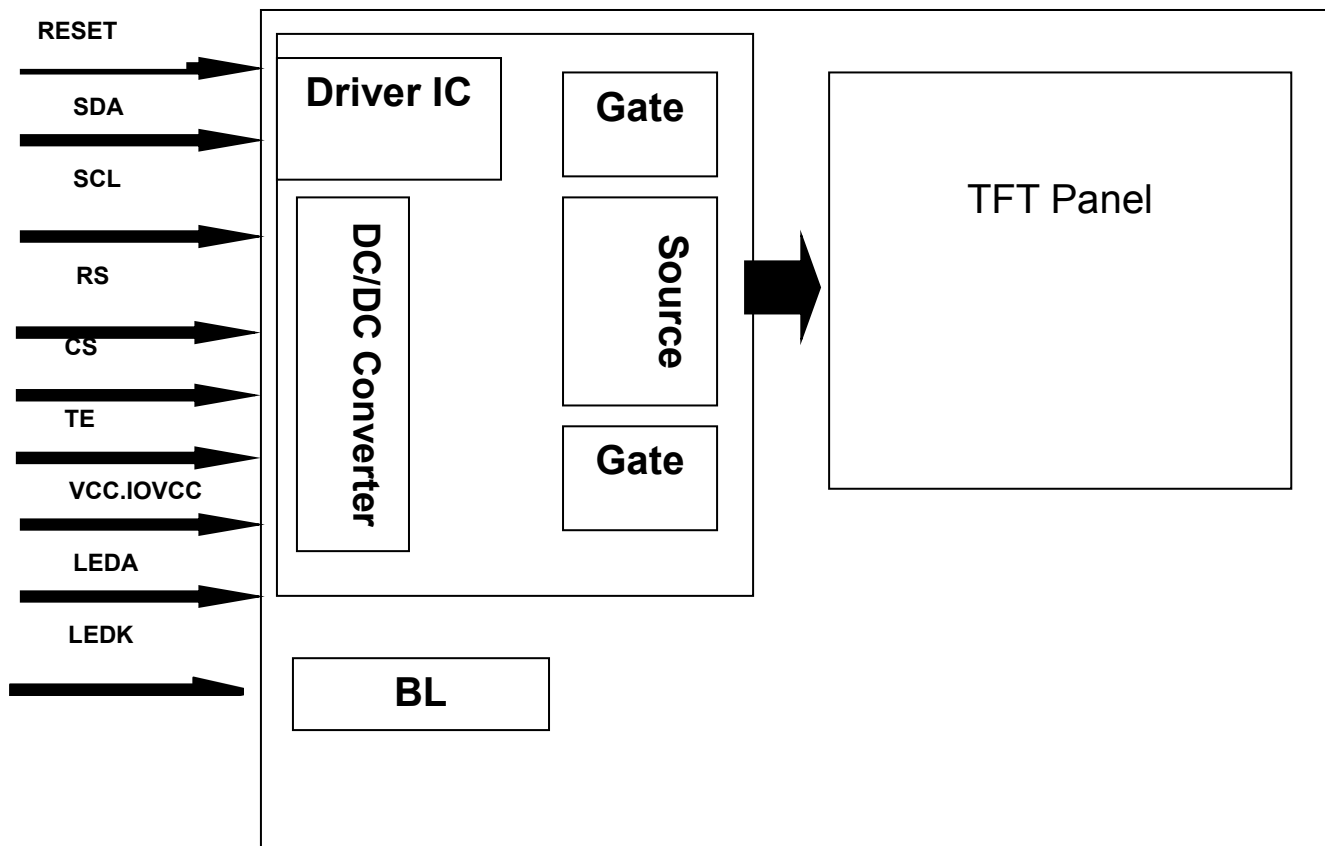
4.2   Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	20	23	mA	
Forward Voltage	V_F	-	3.2	-	V	
Connection mode		--	1P	--		
LED number	/		1		pcs	

Note1: 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% initial brightness. Typical operating life time is estimated data.
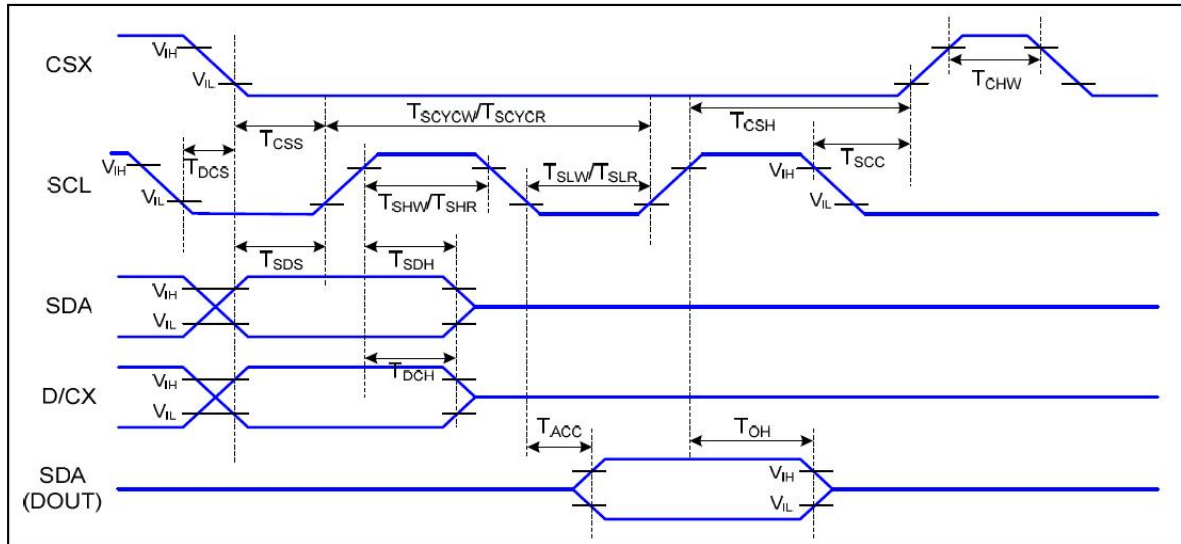
LEDA ────▷|──── LEDK

If=20mA Vf=2.8V~3.3V

4.3   Block Diagram

RESET

SDA

SCL

RS

CS

TE

VCC.IOVCC

LEDA

LEDK

Driver IC

DC/DC Converter

Gate

Source

Gate

TFT Panel

BL

5 INTERFACE TIMING

5.1 System Bus Read/Write Characteristics.

8.4 Serial Interface Characteristics (4-line Serial)

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TSLR	SCL "L" Pulse Width (Read)	60		ns	
D/CX	TDCS	D/CX Setup Time	10		ns	
	TDCH	D/CX Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

5.2 Power ON/OFF Timing
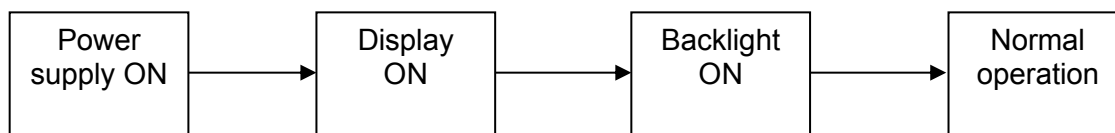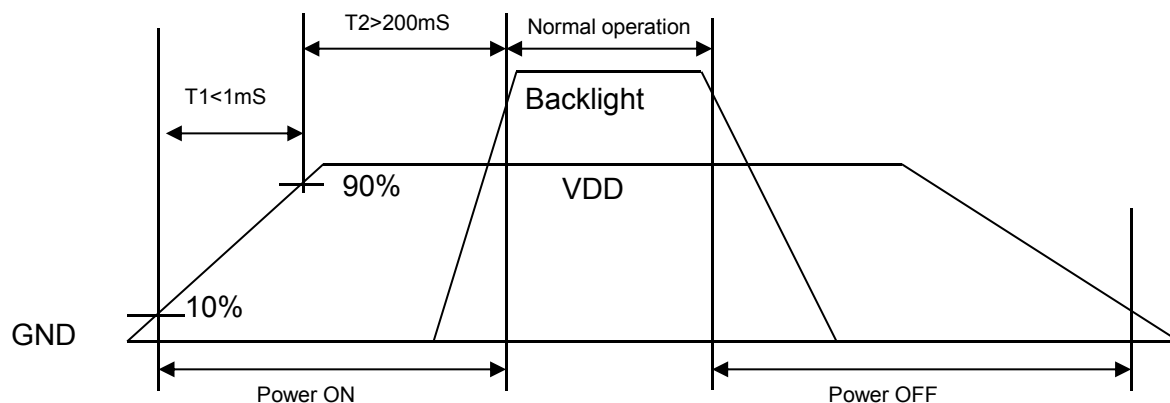
Power ON sequence
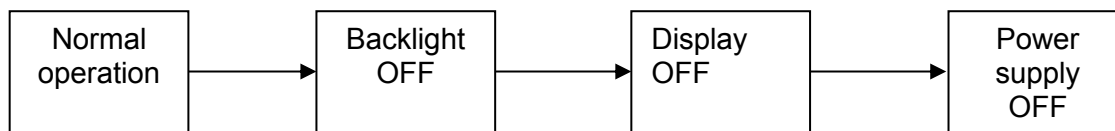


Power OFF sequence

6 Optical Characteristics

Ta=25℃

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	CR≧10	-	80	-	Degree	Note 2
	θB		-	80	-		
	θL		-	80	-		
	θR		-	80	-		
Contrast Ratio	CR	θ=0°	600	700	-	-	Note1 Note3
Response Time	T_{ON}	25℃	-	30	40	ms	Note1 Note4
	T_{OFF}						
Uniformity	U	-	70	80	-	%	Note1 Note6
NTSC	-	-	-	70	-	%	Note 5
Luminance	L		300	350	-	cd/m²	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=20mA, 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.
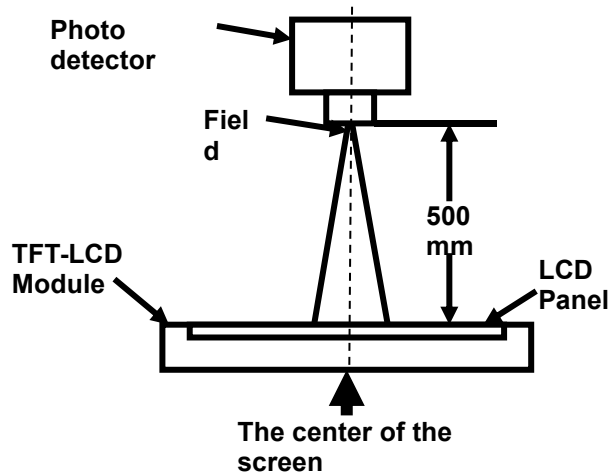
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

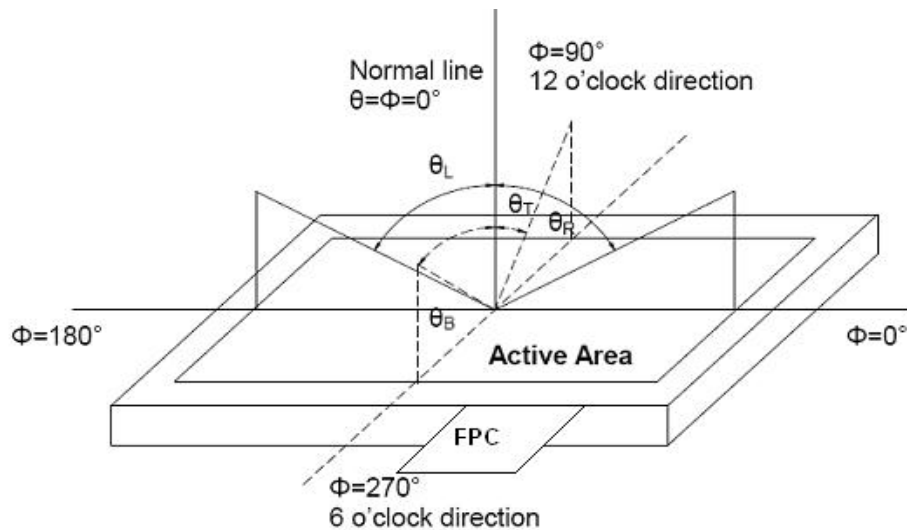viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

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 be driven by Vwhite.

"Black state": The state is that the LCD should be 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%.
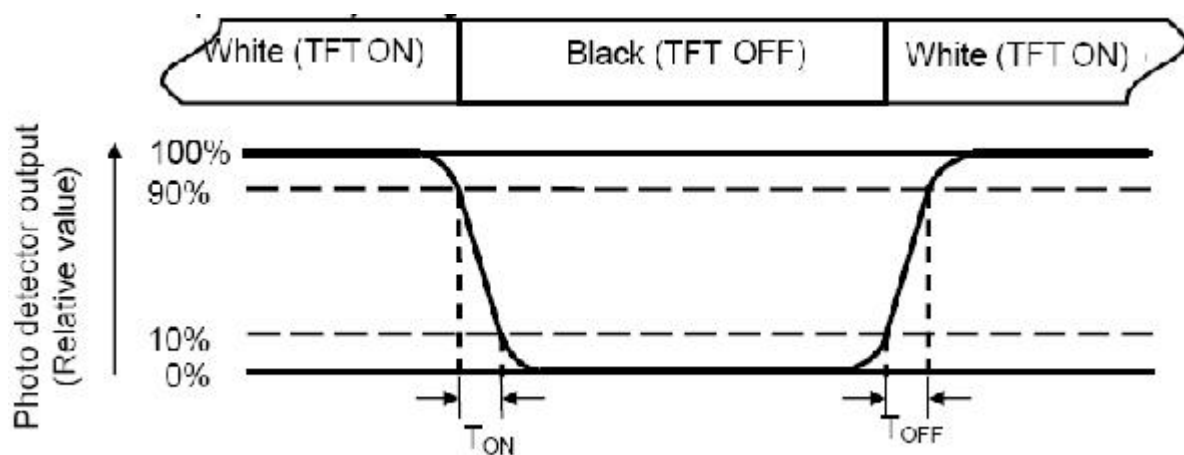
Note 5: Definition of color chromaticity (CIE1931)

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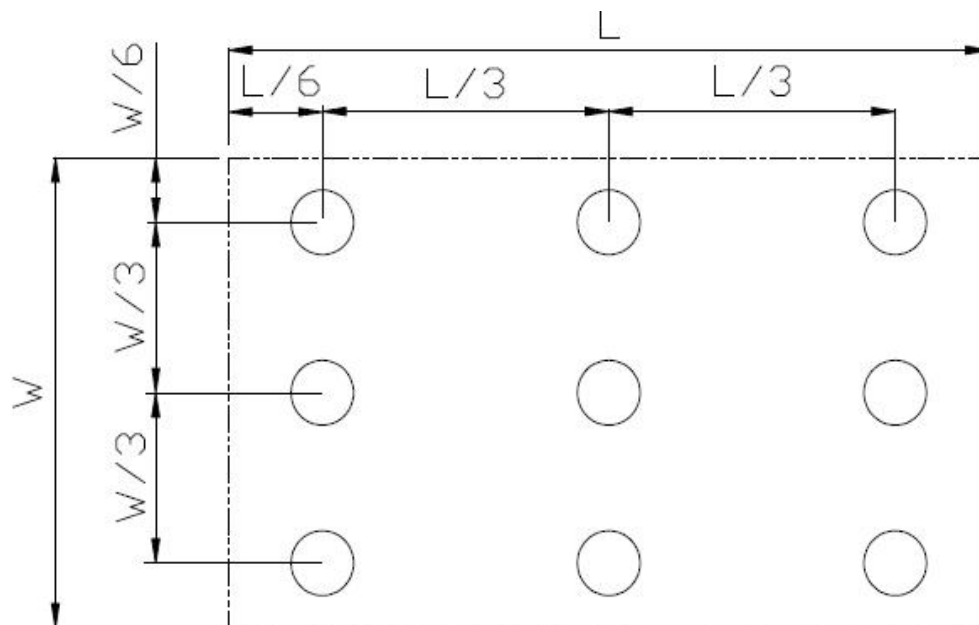
L-------Active area length W----- Active area width

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

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	120	No abnormalities in functions and appearance
High temp. Operating	70°C	120	
Low temp. Storage	-30°C	120	
Low temp. Operating	-20°C	120	
Humidity	40°C/ 90%RH	120	
Thermal Shock(Non-operation)	-20°C ← 25°C →70°C (0.5 hour ← 5 min → 0.5 hour)	10cycles	

8 Mechanical Drawing

Notes:
1. Unit:mm.
2. Modification rev. number.
3. All radii without dimension R0.3mm.
4. All draft angles to be 1.5°
5. Unspecified Tolerances is :±0.30mm.
6. Driver IC: LCD(ST7735S)
7. LCD Driver Voltage :2.8±0.3V
8. BACK LIGHT: LED (WHITE).
9. Operating Temperature : -20° — +70° C
10. Storage Temperature : -30° — +80° C
11. Requirements on Environmental Protection: ROHS HSF

0.96″
80*RGB*160
ALL OLOCK

LEDA —▷|— LEDK
If=20mA Vf=2.8V~3.3V
背光灯电路图

Pin Assignment	
NO.	SYMBOL
1	TP0
2	TP1
3	SDA
4	SCL
5	RS
6	RES
7	CS
8	GND
9	NC
10	VCC
11	LEDK
12	LEDA
13	GND

9 Precautions For Use of LCD Modules

9.1   Handling Precautions

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

9.1.1.2 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.

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

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

9.1.1.5 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

9.1.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

9.1.1.12   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.

9.1.1.13   Storage precautions

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

9.1.1.15   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:

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

9.2   Transportation Precautions

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