PRODUCTION SPECIFICATION
OF LCD MODULE
MODULE NO.：LH013QVV01-H1055A

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	JUN 12,2018	First release	All	

1   General Specifications

Feature		Specifications
Display Spec.	LCD type	1.3 inch
	Resolution (H*V)	240(RGB)×240
	Technology Type	a-Si TFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Transmissive / Normally Black
	Surface Treatment	Anti-Glare
	Viewing Direction	ALL
Mechanical Characteristics	OutlineDimensions (W x H x T) (mm)	26*29.22*1.9
	Active Area(mm)	23.4*23.4
	With /Without Touch screen	Without
	Match Connector Type	
	Backlight Type	White LED
	Weight (g)	TBD
Electrical Characteristics	Interface	3wire SPI
	Number of color	262K
	Driver IC	ST7789V

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	I/O	Description
1	LED+		LED Anode
2	LED-		LED Cathode
3	GND	P	Ground
4	VCC2.8V		Power Supply 2.8V Voltage
5	IOVCC		Power Supply 1.8V Voltage
6	GND	P	Ground
7	CS	I	Chip select
8	RESET	I	Reset
9	NC	-	None connect
10	LSCK	I	Serial Clock
11	NC	-	None connect
12	SDA	I	Serial data
13	NC	-	None connect
14	TE	I	Tearing effect
15	NC	-	None connect

Note1:   I/O definition: I-----Input   O---Output   P----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	℃

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	V_{DD}	2.6	2.8	-	V	-
Supply current	I_{DD}	-	-	15	mA	V_{DD}=2.8V,Ta=25℃
Input voltage	V_{IH}	0.8VDD	-	VDD	V	-
	V_{IL}	0	-	0.2VDD	V	
Input leakage current	I_{IL}	-1.0	-	1.0	mA	V_{IN}=V_{DD} or V_{SS}

Note: Voltage greater than above may damage the module.

All voltages are specified relative to VSS=0V.

4.2 Driving Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	40	50	mA	
Forward Voltage	V_F	-	3.2	-	V	
Connection mode	P	--	2 Parallel	--		
LED number	/		2		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.
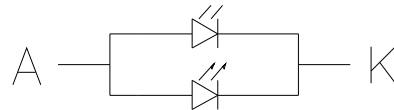
4.3   Block Diagram
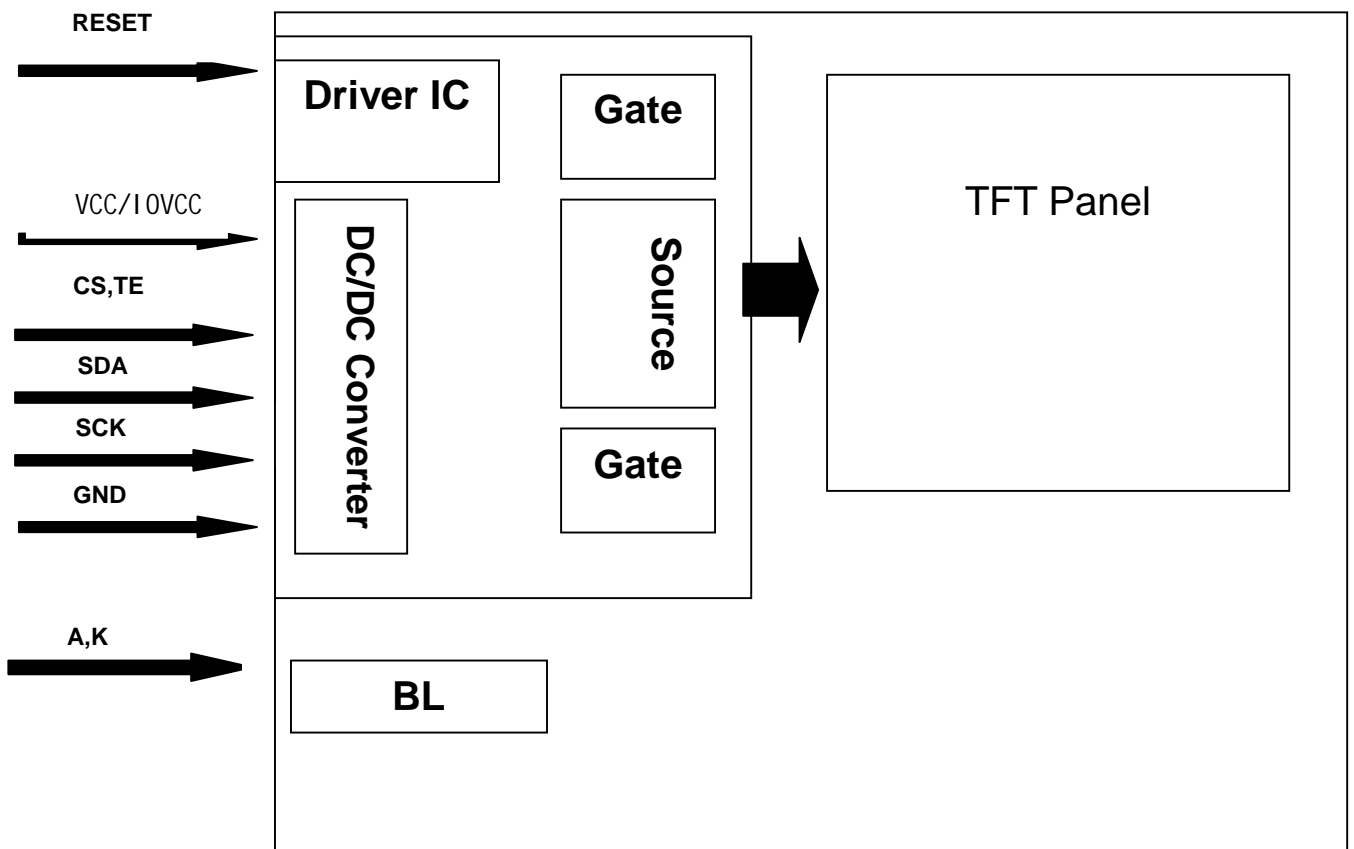
5   INTERFACE TIMING
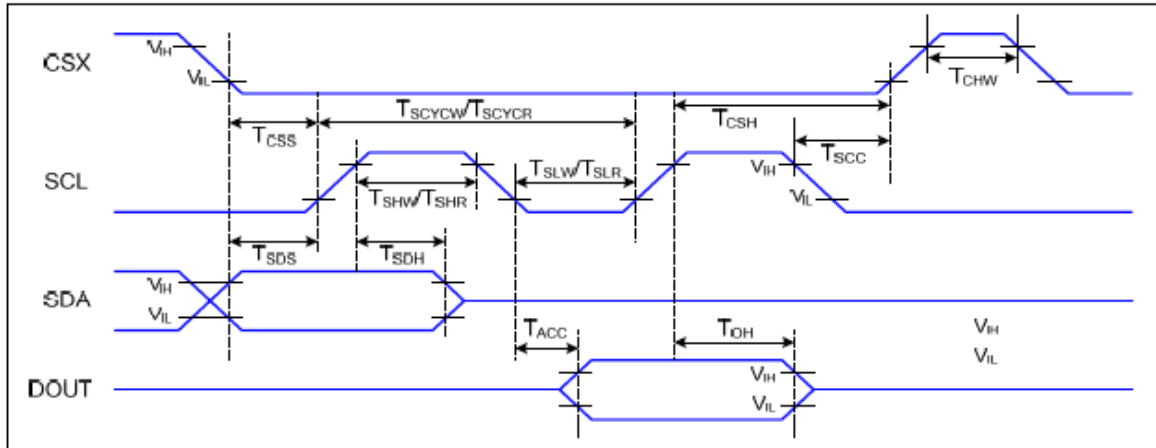
5.1 SPI Interface Characteristics.

Figure 4 3-line serial Interface Timing Characteristics

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 to 70 ℃

| Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Table 5 3-line serial Interface Characteristics

5.2 Power ON/OFF Timing
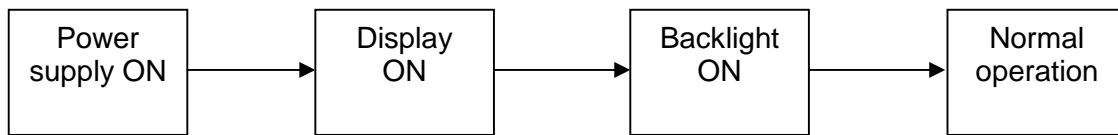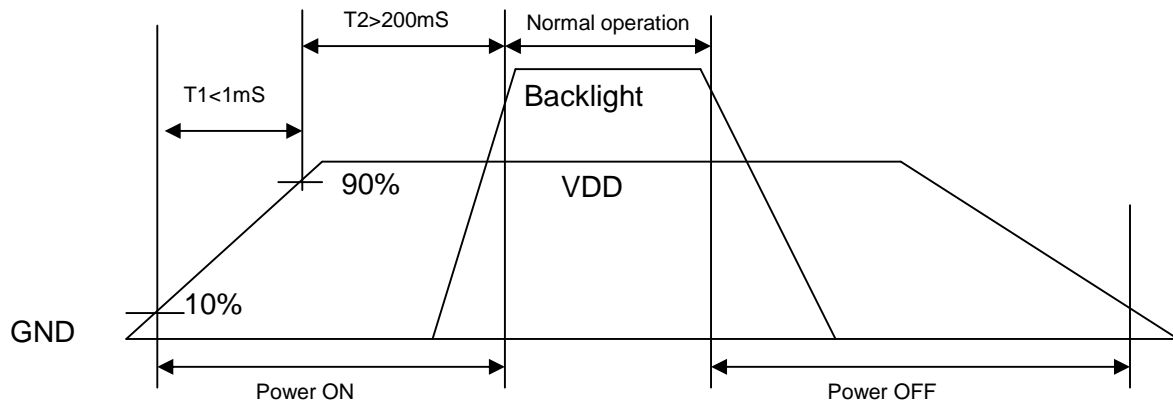
Power ON sequence
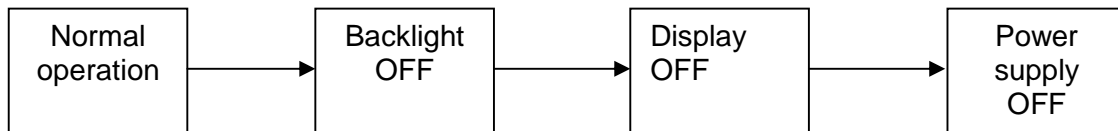

Power OFF sequence

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	800	-	-	Note1 Note3
Response Time	T_{ON}	25℃	-	30	35	ms	Note1 Note4
	T_{OFF}						
Uniformity	U	-	70	80	-	%	Note1 Note6
NTSC	-	-	-	50	-	%	Note 5
Luminance	L		250	280	-	cd/m^2	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=40mA (One LED channel), 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.
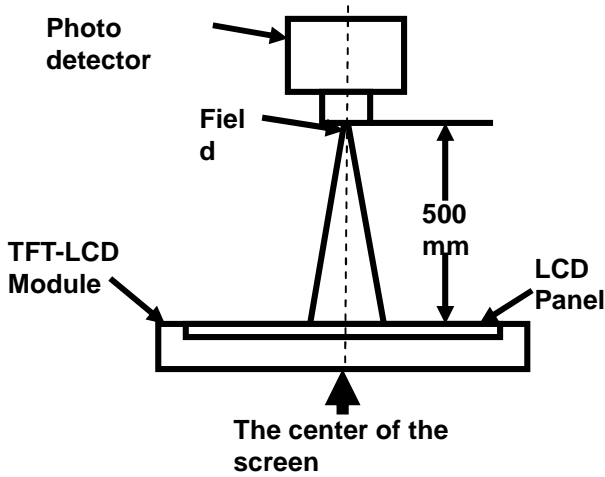
Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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

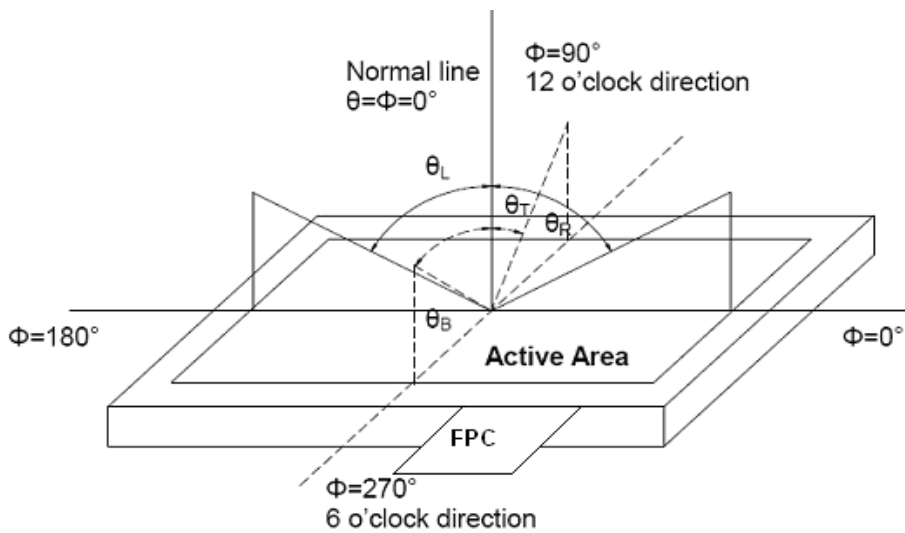viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。

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%.
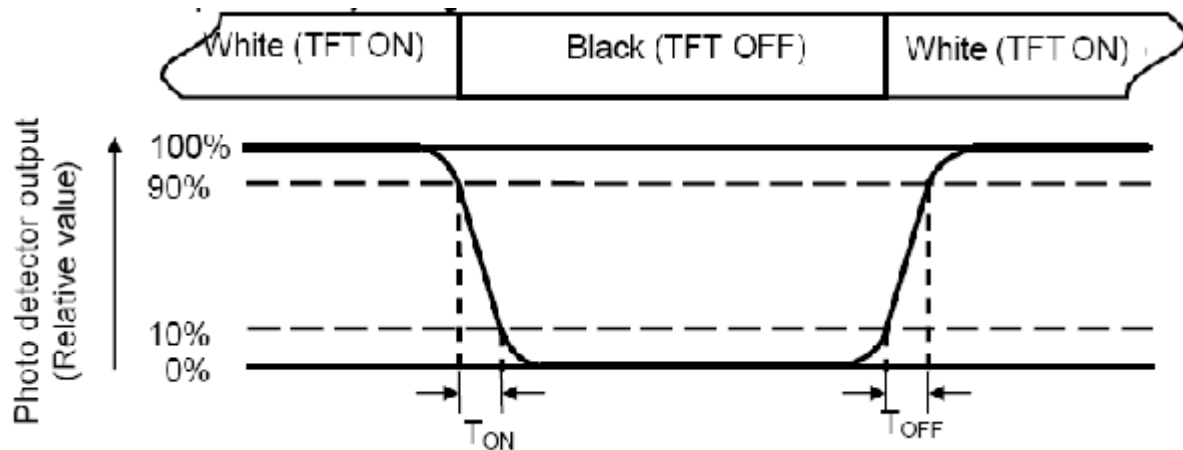
Note 5: Definition of color chromaticity (CIE1931)

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
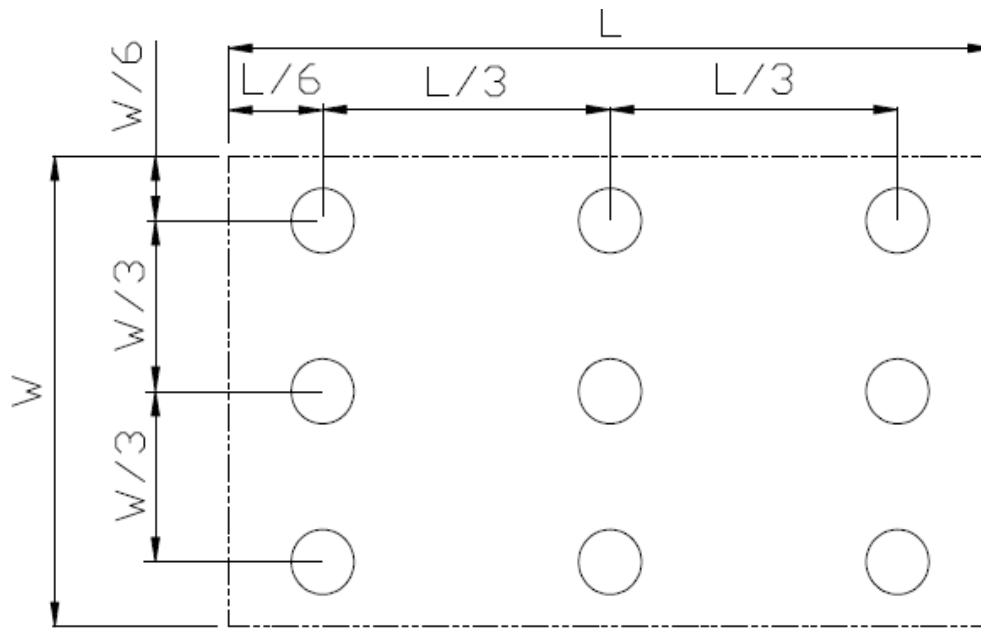
Fig. 2 Definition of uniformity

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

Date:(日期)

2018.06.12

DESIGN:(设计)

CHECKED:(检查)

APPROVED:(批准)

Page:(页数)　1/1

图纸视角:

SPECIFICATION

CUSTOMER'S CODE:(客户型号)

CODE:(料号)

L013QVV01-H1055A　规 格

EDITION:(版本号)　01

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 ±0.20mm
6. Driver IC:ST7789V
7. LCD Driver Voltage :2.8±0.3V
8. Color :White
9. Operating Temperature : -20° -- +70° C
10.Storage Temperature: -30° -- +80° C
11.Requirements on Environmental Protection: RHS HSF

Customer Name:
客户名称

Approval Date:
承认日期

Approved By:
承认

Please Confirm This Drawing On/Before
请 签 回 此 图

标示　日期　更改内容　签署

29.22±0.1
23.4LCD AA
14.21±0.3
1.4
1.4
26.2±0.1
23.4LCD AA
1.3"TFT
240&8x240
VIEW ALL

14.5±0.3
15
4.8
1
3
PI补强

LED CIRCUIT DIAGRAM
A ──▷|── K

0.2±0.03(PI+FPC)

1.9
1.3 MAX
0.46 MIN
槽深

0.3
1
15
4.8
4.2
3.6
0.3
0.6
2.5

BL-T13P04V0 01 日期

26.2
29.22

PIN	Description
1	LED-
2	LED-
3	GND
4	VCC2.8v
5	IOV 1.8v
6	GND
7	CS
8	RESET
9	NC
10	ISCK
11	NC
12	ISDA
13	NC
14	TE
15	NC

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

9.1.1.17   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.