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SPECIFICATION

VXT350MHLS -03C

☐ Preliminary Specification

☐ Final Specification



CUSTOMER:

Made By:

Checked By:

Approved By:

Quality:

Date:

Note:

Approved By:

Date:

Note:

2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2021.05.19	V0		The first release	YGM

3. General Specifications

VXT350MHLS-03C is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light ,CTP unit. The 3.5'' display area contains 320x (RGB) x 240 pixels and can display up to 16.7M colors. This product accords with ROHS environmental criterion..

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.7M		1
Viewing Direction	ALL	O'Clock	
Gray scale inversion direction	FREE	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	76.9X63.9X4.8	mm	2
Active Area(W×H)	70.08X52.56	mm	
Number of Dots	320 X 240	dots	
TFT Controller	ST7272A	-	
CTP driver	FT5346	-	
Power Supply Voltage	3.3	V	
Backlight	6S-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder.With CTP

REVISE	Revision note	DATE
V0	First	2019.12.13

Pin No. Assignment

Pin No.	Assignment
1	SCL(3.3V)
2	SDA(3.3V)
3	VDD
4	RST
5	INT
6	GND

CIRCUIT DIAGRAM:

LED+ ~ ~ ~ ~ ~ -0LED-
6EA 20mA

DETAIL A

DETAIL A (2/1)

VIEWING DIRECTION : ALL

VIEWING DIRECTION : U/L/D/R 80/80/80/80

TFT Driver IC : ST7272A

TFT Driver IC : FT5346

Top : -20° C ~ 70° C, Tst : -30° C ~ 80° C

GENERAL TOLERANCE: ±0.2

LCM Lumiance:LED/250cd/m²(Typical)

NOTES:

- DISPLAY TYPE: 3.5TFT, NORMALLY BLACK
- VIEWING DIRECTION : U/L/D/R 80/80/80/80
- TFT Driver IC : ST7272A
- TFT Driver IC : FT5346
- Top : -20° C ~ 70° C, Tst : -30° C ~ 80° C
- GENERAL TOLERANCE: ±0.2
- LCM Lumiance:LED/250cd/m²(Typical)

5. Absolute Maximum Ratings($T_a=25^{\circ}\text{C}$)

5.1 Electrical Absolute Maximum Ratings.($V_{ss}=0\text{V}$, $T_a=25^{\circ}\text{C}$)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	4.0	V	1, 2
	VDD-CTP	2.7	3.6	V	1, 2

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged.
Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. $V_{DD} > V_{SS}$ must be maintained.
3. Please be sure users are grounded when handing LCD Module.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30°C	80°C	-20°C	70°C	1,2
Humidity	-	-	-	-	3

Notes:

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
The phenomenon is reversible.
3. $T_a \leq 40^{\circ}\text{C}$:85%RH MAX.
 $T_a > 40^{\circ}\text{C}$:Absolute humidity must be lower than the humidity of 85%RH at 40°C .

6. Electrical Specifications

6.1 Electrical characteristics for LCD($V_{ss}=0\text{V}$, $T_a=25^{\circ}\text{C}$)

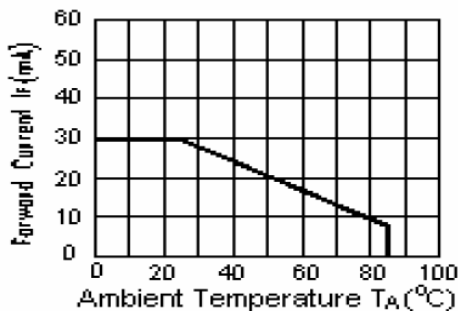
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
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Power supply		VCC	Ta=25°C	3.0	3.3	3.6	V	
Power supply		VDD-C TP	Ta=25°C	2.8	-	3.3	V	
Input voltage	'H'	V _{IH}	V _{CC} =3.3V	0.8V _{CC}	-	V _{CC}	V	
	'L'	V _{IL}	V _{CC} =3.3V	0	-	0.2V _{CC}	V	
Current Consumption		I _{CC1}	Normal mode	-	TBD	-	mA	1
		I _{CC2}	Sleep mode	-	TBD	-	mA	1

Note 1:Tested in 1×1 chessboard pattern.

6.2.LED backlight specification(VSS=0V ,Ta=25 °C)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V _f	I _f =20mA	16.2	18.0	19.8	V	
Uniformity	ΔBp	I _f =20mA	75	80	-	%	
Life Time	time	I _f =20mA	20K	-		hours	1



Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25 °C

6.3 Interface signals

Pin No.	Symbol	I/O	Function
1-2	LED-	P	LED power cathode
3-4	LED+	P	LED power anode
5	NC	-	No connection
6	NC	-	No connection
7	NC	-	No connection
8	RESET	I	Reset pin,Not use should be connect to "H".
I _{LED} VS TEMP		I	SPI interface data enable signal, Not use

			should be connect to “H”.
10	SPCLK	I	SPI interface clock ,Not use should be connect to “H”.
11	SPDAT	I	SPI interface data, Not use should be connect to “H”.
12-19	B0-B7	I	Blue data bus
20-27	G0-G7	I	Green data bus
28-35	R0-R7	I	Red data bus
36	HSYNC	I	Horizontal sync signal, default is negative polarity
37	VSYNC	I	Vertical sync signal, default is negative polarity
38	DCLK	I	Data clock input
39-40	NC	-	No connection
41-42	VCC	P	System power
43	NC	-	No connection
44	NC	-	No connection
45-46	NC	-	No connection
47	VD	I	Vertical scan direction control pin. This pin must be connected to “H” or “L” according to system application.
48	HD	I	Horizontal scan direction control pin. This pin must be connected to “H” or “L” according to system application.
49	PS	I	Set parallel or serial RGB interface L Serial 8 bit RGB interface, G0-G7 are used. H Parallel 24 bit RGB interface
50	DISP	I	DISP sets the display mode. L Standby mode H Normal display mode
51	NC	-	No connection
52	DE	I	Data enable pin,Display access is enabled when DE is “H”.
53-54	GND	P	Ground

CTP interface

Pin No	Symbol	I/O	Function
1	SCL	I	Serial clock
2	SDA	I	Serial Input/output data bus
3	VDD	P	CTP Power supply

4	RESET	I	Reset the display
5	INT	I	External Interrupt to the IC of CTP
6	GND	P	Ground.

6.4 Input timing

ST7272A Parallel RGB 建议时序

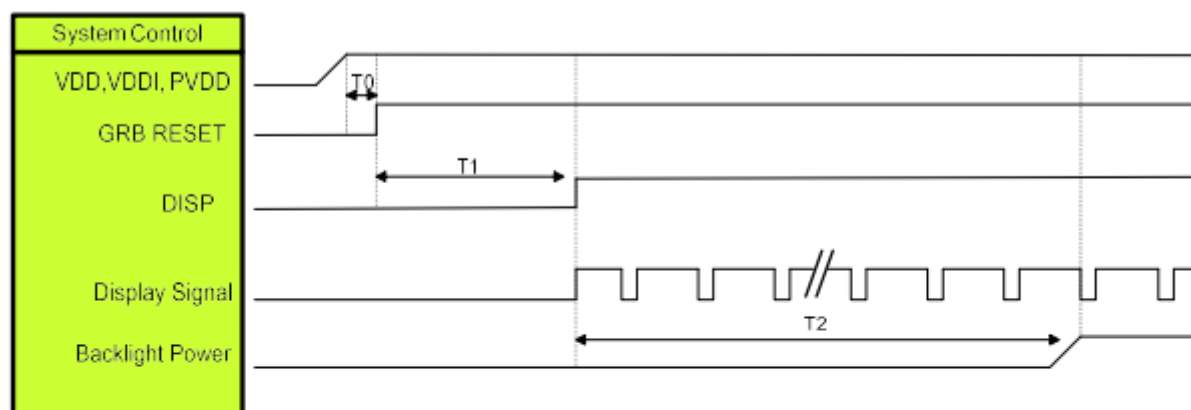
Parallel 24-bit RGB Input Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	5	6	8	MHz	
DCLK Period	Tclk	125	167	200	ns	
HSYN _C	Period Time	Th	325	371	438	DCLK
	Display Period	Thdisp		320		DCLK
	Back Porch	Thbp	3	43	43	DCLK
	Front Porch	Thfp	2	8	75	DCLK
	Pulse Width	Thw	2	4	43	DCLK
VSYN _C	Period Time	Tv	244	260	289	HSYNC
	Display Period	Tvdisp		240		HSYNC
	Back Porch	Tvbp	2	12	12	HSYNC
	Front Porch	Tvfp	2	8	37	HSYNC
	Pulse Width	Tvw	2	4	12	HSYNC

ST7272A Serial RGB 建议时序

Serial 8-bit RGB Input Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	15	18	21	MHz	
DCLK Period		Tclk	47	55	66	ns	
HSYNC	Period Time	Th	965	1011	1078	DCLK	
	Display Period	Thdisp		960		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

6.5 Power on/off sequence

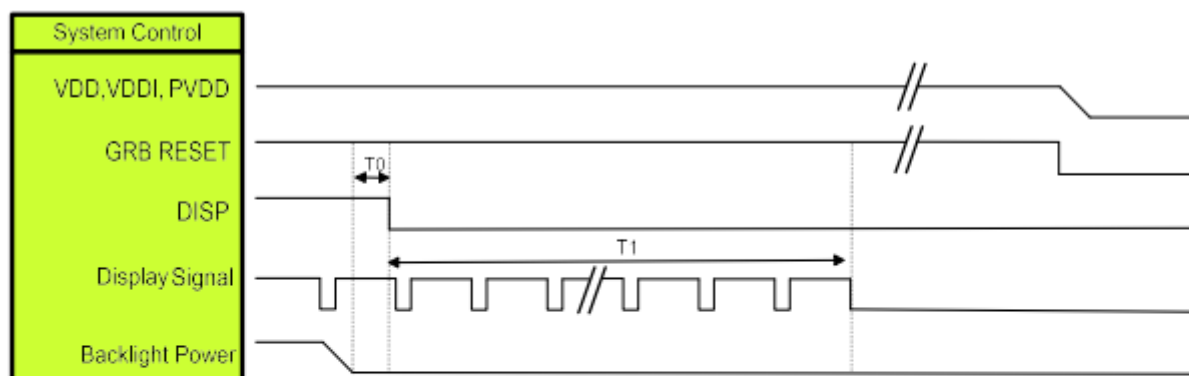
Power on sequence



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Power off sequence :



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	80	ms

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

7. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note					
Brightness	Bp		$\theta=0^{\circ}$ F=0°	-	250	-	Cd/m²	1					
Uniformity	ΔBp			75	80	-	%	1,2					
Viewing Angle	3:00		Cr≥10	-	80	-	Deg	3					
	6:00			-	80	-							
	9:00			-	80	-							
	12:00			-	80	-							
Contrast Ratio	Cr		Ta=25°C F=0°	640	800		-	4					
Response Time	Tr+Tf			-	30	40	ms	5					
Color of CIE Coordinate	W	x	$\theta=0^{\circ}$ F=0°	Typ -0.05	TBD	Typ +0.05	-	1,6					
		y			TBD		-						
	R	x			TBD		-						
		y			TBD		-						
	G	x			TBD		-						
		y			TBD		-						
	B	x			TBD		-						
		y			TBD		-						
	NTSC Ratio				S				45	50	-	%	

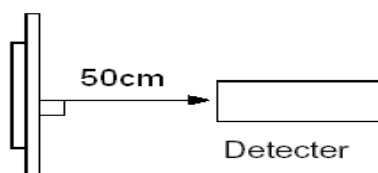
Note: The parameter is slightly changed by temperature, driving voltage and materiel

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)

Measuring condition:

- *Measuring surroundings: Dark room.*
- *Measuring temperature: Ta=25 °C.*
- *Adjust operating voltage to get optimum contrast at the center of the display.*

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

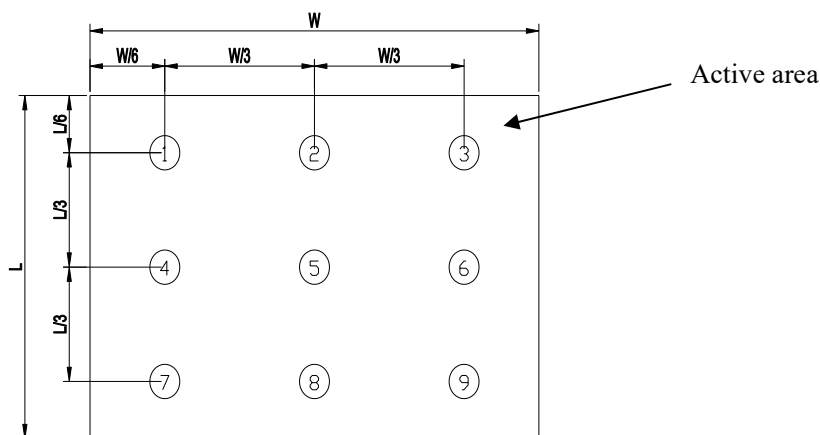


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp \text{ (Min.)} / Bp \text{ (Max.)} \times 100 \text{ (\%)}$$

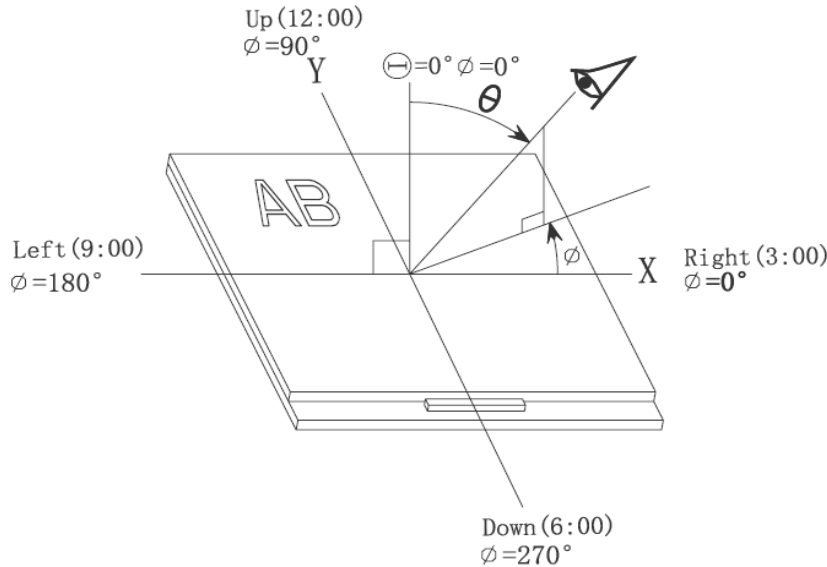
Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.

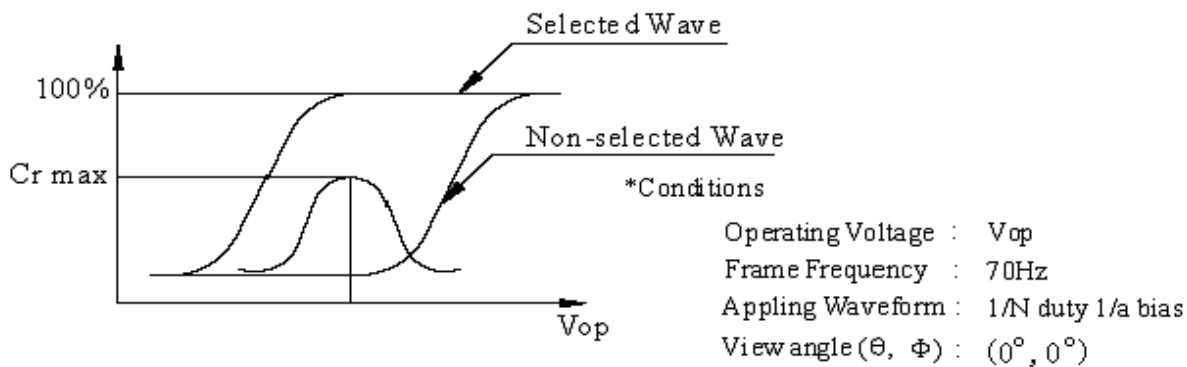


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



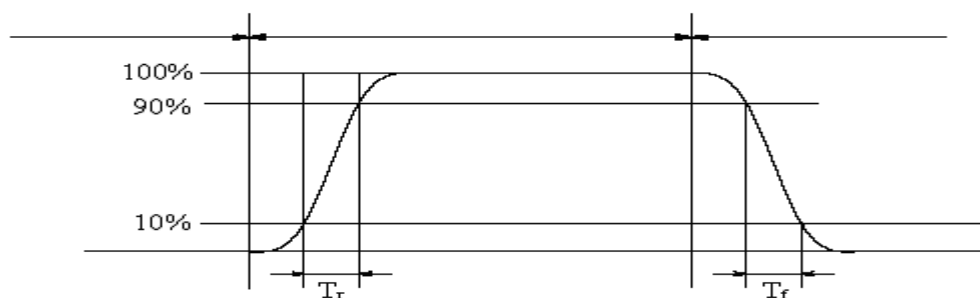
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



$$\text{Contrast ratio}(Cr) = \frac{\text{Brightness of selected dots}}{\text{Brightness of non-selected dots}}$$

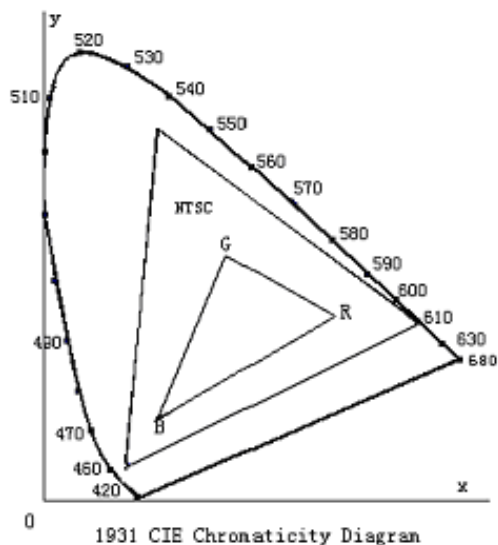
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

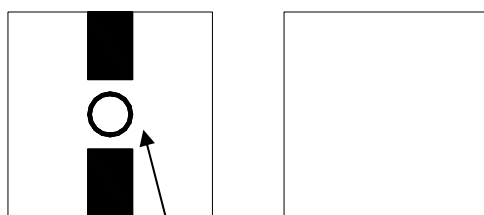


Color gamut:

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 7: Definition of cross talk.

Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100



Pattern A

Pattern B

Measurement point(center)

Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

Test Item	Test condition	Remark
High Temperature Storage	Ta = 80℃ 96hrs	Note1,Note3, 4
Low Temperature Storage	Ta = -30℃ 96hrs	Note1,Note3, 4
High Temperature Operation	Ts = 70℃ 96hrs	Note2,Note3, 4
Low Temperature Operation	Ta = -20℃ 96hrs	Note1,Note3, 4
Operation at High Temperature/Humidity	+60℃, 90%RH 96hrs	Note3, 4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 10 cycles, Start with cold temperature and end with high temperature.	Note3, 4
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)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	±2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: 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.

Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

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

9.1.2 *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.*

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

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

9.1.5 *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

9.1.6 *Do not attempt to disassemble the LCD Module.*

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

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

- a. Be sure to ground the body when handling the LCD Modules.*
- b. Tools required for assembly, such as soldering irons, must be properly ground.*
- c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.*
- d. 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.*

9.2 Storage precautions

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

9.2.2 *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%

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

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

END