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PRODUCT SPECIFICATIONS

For Customer:_____ ☐ : APPROVAL FOR SPECIFICATION

Customer Model No.:_____ ☐ : APPROVAL FOR SAMPLE

Module No.: ZW-T024HQI-25 Date : 2021-08-31

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For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

2. Revision Record

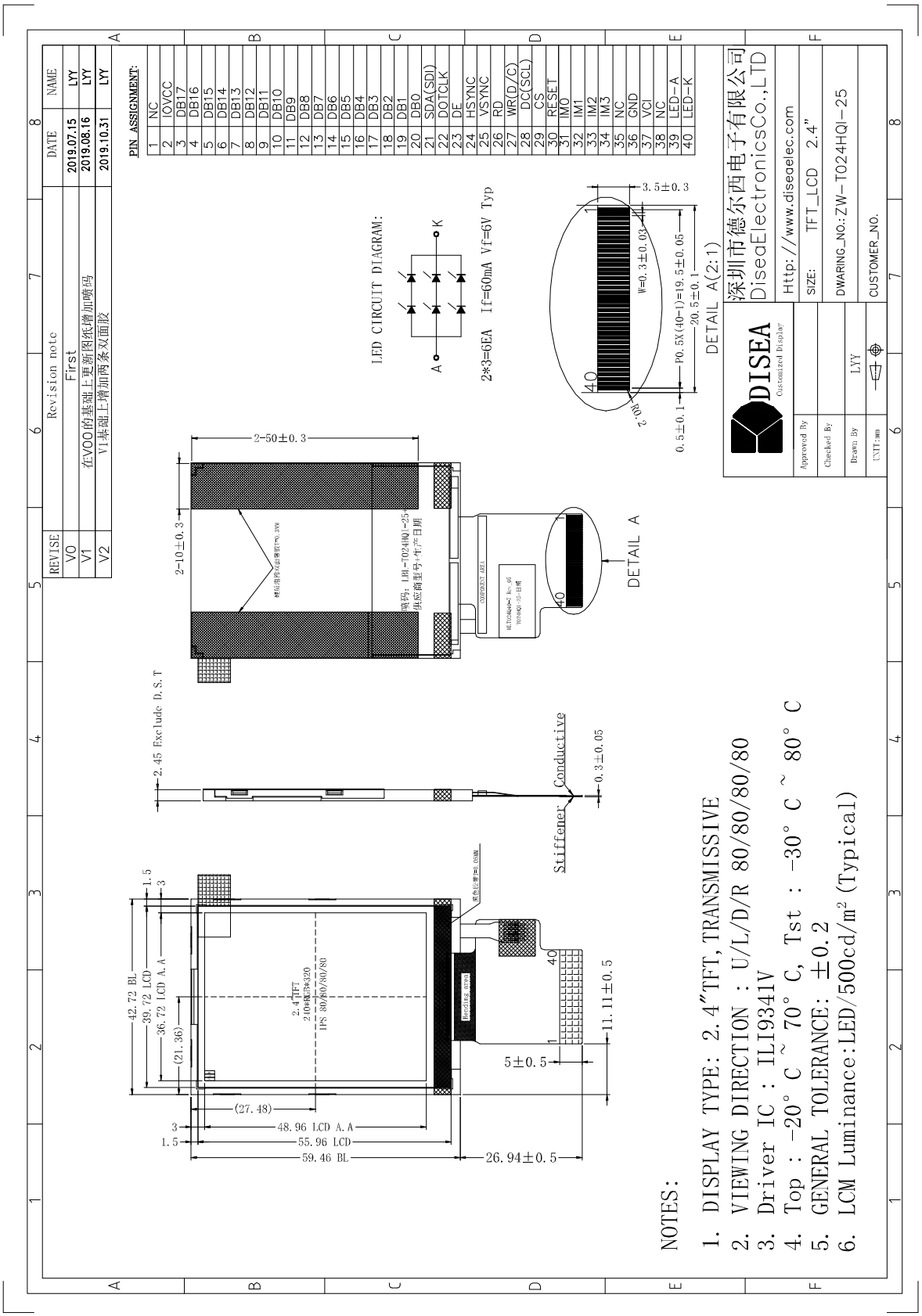
Date	Rev.No.	Page	Revision Items	Prepared
2021-08-31	**V0**		**The first release**	**John**

3. General Specifications

ZW-T024HQI-25 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit. The 2.4′′ display area contains 240x320 pixels and can display up to 262K colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	262K		
Viewing Direction	ALL	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	2.4	inch	
Active Area(W×H)	36.72X48.96	mm	
Number of Dots	240×320	dots	
Controller	ILI9341V	-	
Power Supply Voltage	2.8	V	
Outline Dimensions	42.72×59.46×2.45	mm	
Backlight	6-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB/MCU/SPI	-	

4.Outline.Drawing



5. Absolute Maximum Ratings(Ta=25℃)

5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

Item	Symbol	Min.	Max.	Unit	Note
Supply Voltage(Logic)	V_{CI}	-0.3	4.6	V	1，2
Supply Voltage(Digital)	IO_{VCC}	-0.3	4.6	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℃	80℃	-20℃	70℃	1,2
Humidity	-	-	-	-	3

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. Ta<=40℃:85%RH MAX.

   Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

6. Electrical Specifications and Instruction Code

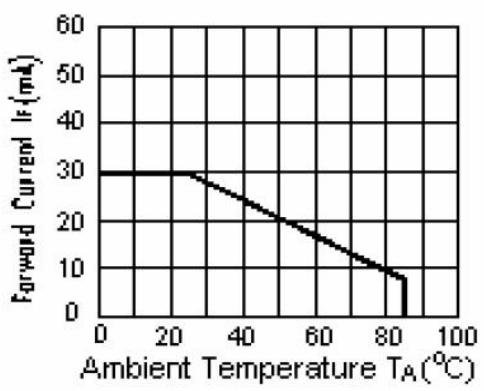
6.1 Electrical characteristics(Vss=0V ,Ta=25℃)

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Voltage(Logic)		V_{CI}	Ta=25℃	2.6	2.8	3.3	V	
Voltage(Digital)		IOVCC	Ta=25℃	1.65	2.8	3.3	V	
Input voltage	'H'	V_{IH}	V_{CI}=2.8V	0.8V_{CI}	-	V_{CI}	V	
	'L'	V_{IL}	V_{CI}=2.8V	0	-	0.2V_{CI}	V	
Current Consumption		I_{CI1}	Normal mode	-	8	13	mA	
		I_{CI2}	Sleep mode	-	0.1	-	mA	

Note: 1. Tested in 1×1 chessboard pattern.

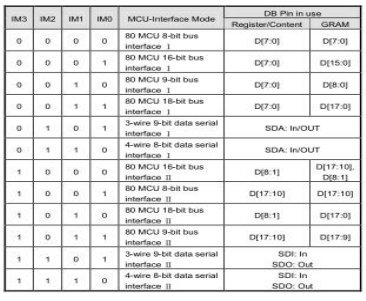
6.2 LED backlight specification(VSS=0V ,Ta=25℃)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V_f	If=20X3mA	-	6.0	-	V	
Uniformity	ΔBp	If=20X3mA	80	-	-	%	



ILED VS TEMP

6.3 Interface signals

Pin No.	Symbol	I/O	Function
1	NC	-	No connection
2	IOVCC	P	Digital I/O pad power supply
3-20	DB17-DB0	I	data bus
21	SDA(SDI)	I	When IM3=0,serves as a serial in/out signal.(SDA) When IM3=”1”, serves as a serial in signal.(SDI) The data is applied on the rising edge of the SCL signal. If ont used, fix this pin at IOVCC or GND
22	DOTCLK	I	Data clock signal for RGB interface operation
23	DE	I	Data enable signal for RGB interface operation
24	HSYNC	I	Line sync signal
25	VSYNC	I	Frame sync signal
26	RD	I	8080-I/8080-II system: serves as a read signal an MCU read data at the rising edge.
27	WR(D/C)	I	8080-I/8080-II system: serves as a write signal an MCU write data at the rising edge. 4-line system:serves as Data or Command select. In serial interface “2-data-lane data” transfers mode, serves as a second data pin
28	DC(SCL)	I	(DC)This pin is used to select “Data or Command” in the parallel interface SCL：Serial data clock in serial bus system
29	CS	I	Chip select signal
30	RESET	I	System Reset
31-34	IM0-IM3	I	System interface select. 
35	NC	-	No connection
36	GND	P	Ground.
37	VCI	P	Power supply
38	NC	P	No connection
39	LED-A	P	LED back light(Anode)
40	LED-K	P	LED back light(Cathode)

IM3	IM2	IM1	IM0	MCU-Interface Mode	DB Pin in use	
					Register/Content	GRAM
0	0	0	0	80 MCU 8-bit bus interface I	D[7:0]	D[7:0]
0	0	0	1	80 MCU 16-bit bus interface I	D[7:0]	D[15:0]
0	0	1	0	80 MCU 9-bit bus interface I	D[7:0]	D[8:0]
0	0	1	1	80 MCU 18-bit bus interface I	D[7:0]	D[17:0]
0	1	0	1	3-wire 9-bit data serial interface I	SDA: In/OUT	
0	1	1	0	4-wire 8-bit data serial interface I	SDA: In/OUT	
1	0	0	0	80 MCU 16-bit bus interface II	D[8:1]	D[17:10], D[8:1]
1	0	0	1	80 MCU 8-bit bus interface II	D[17:10]	D[17:10]
1	0	1	0	80 MCU 18-bit bus interface II	D[8:1]	D[17:0]
1	0	1	1	80 MCU 9-bit bus interface II	D[17:10]	D[17:9]
1	1	0	1	3-wire 9-bit data serial interface II	SDI: In SDO: Out	
1	1	1	0	4-wire 8-bit data serial interface II	SDI: In SDO: Out	

7. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	425	500	-	Cd/m^2	1
Uniformity	⊿Bp			80	-	-	%	1,2
Viewing Angle	3:00		Cr≥10	-	80	-	Deg	3
	6:00			-	80	-		
	9:00			-	80	-		
	12:00			-	80	-		
Contrast Ratio	Cr		θ=0° Φ=0°	640	800	-	-	4
Response Time	T_r			-	10		ms	5
	T_f			-	10		ms	
Color of CIE Coordinate	W	x	θ=0° Φ=0°		0.31		-	1,6
		y			0.33		-	
	R	x			0.51		-	
		y			0.34		-	
	G	x			0.31		-	
		y			0.56		-	
	B	x			0.15		-	
		y			0.14		-	
NTSC Ratio	S			50	60	-	%	

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

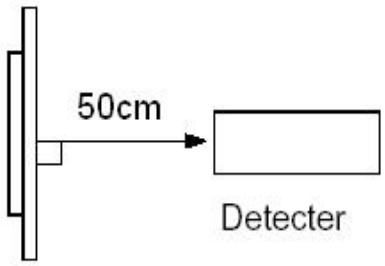
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.

- 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.

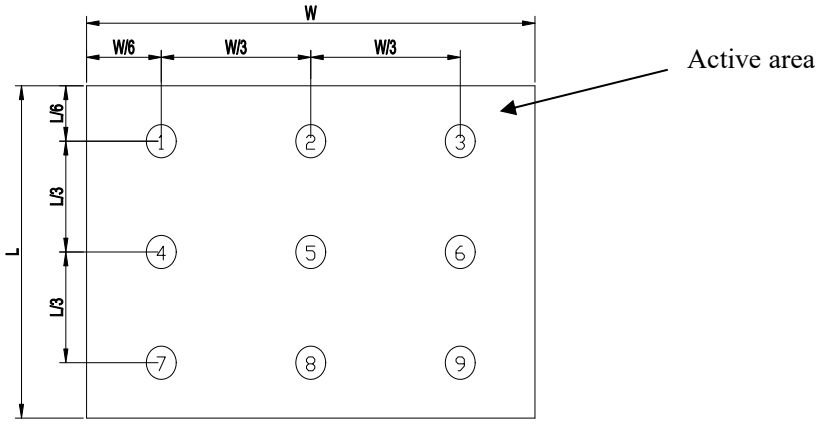


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

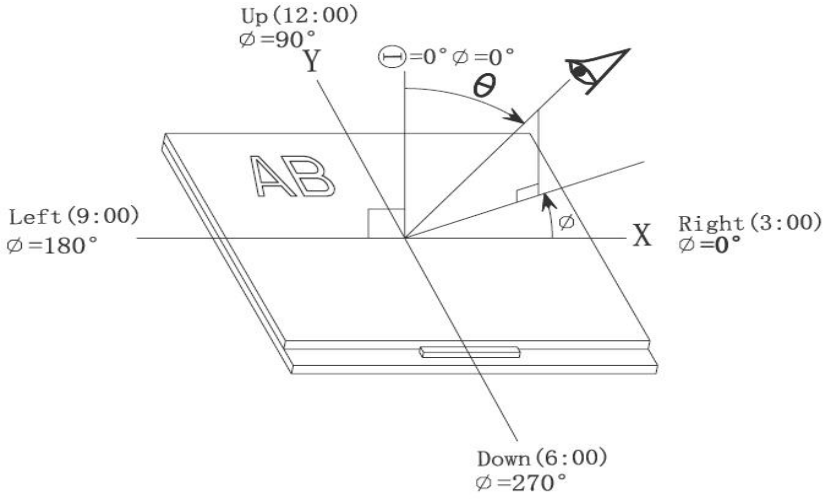
Bp (Max.) = Maximum brightness in 9 measured spots

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

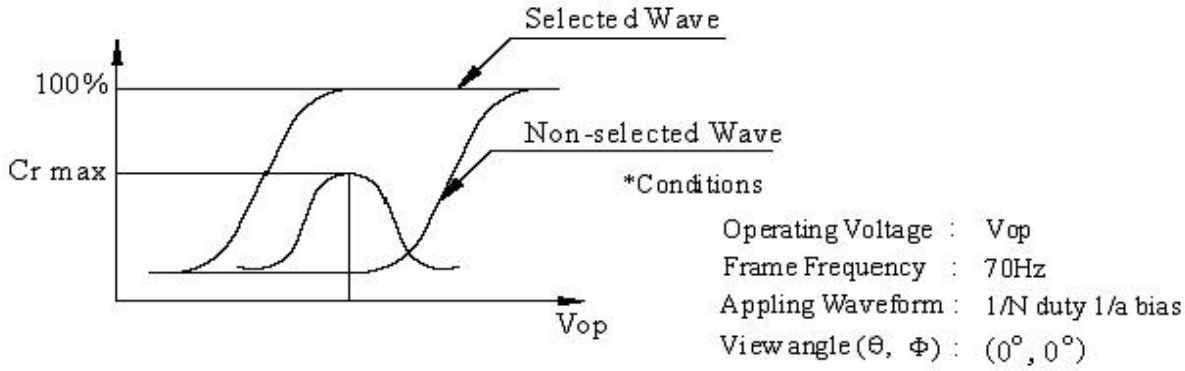


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



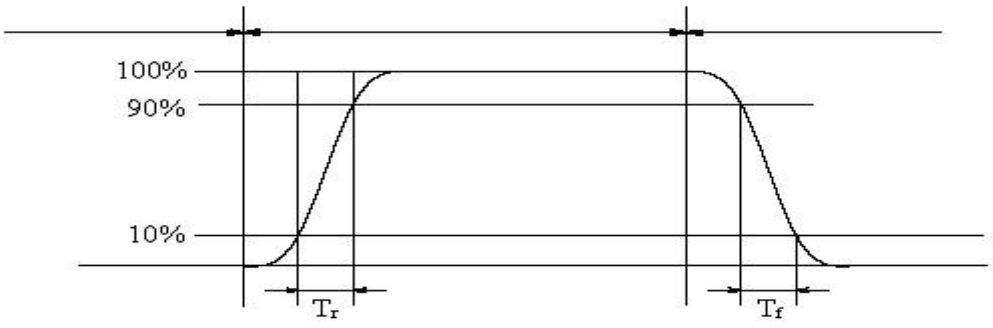
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

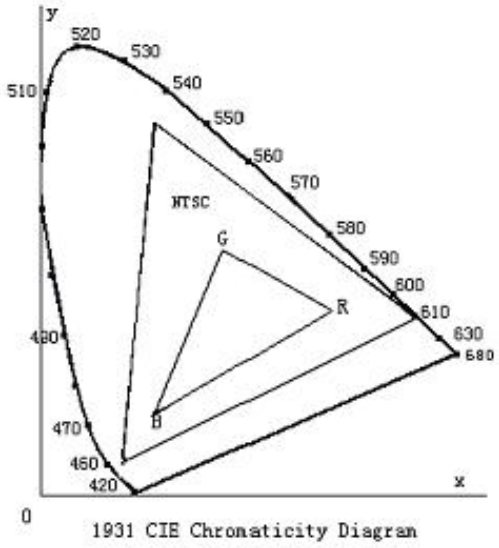
Note 5: Definition of Response time. (Test LCD using DMS501):

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

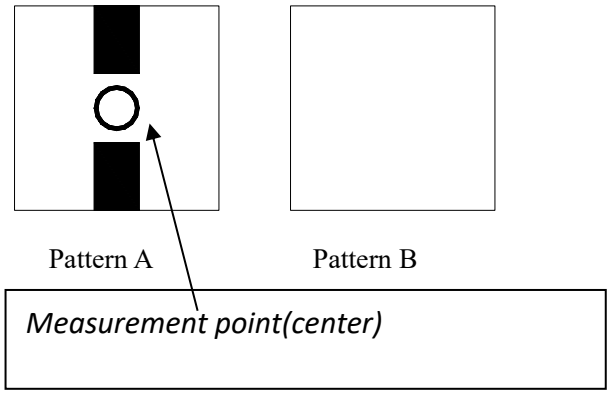
Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.



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



Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	-30℃←——→80℃ after 5 cycle, Restore 2H at 25℃ 30min 5min 30min Power off	
7	Vibration Test	10Hz~150Hz, 100m/s^2, 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave,300m/s^2,11ms	

Note: Operation: Supply 2.8V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

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℃ ～ 40℃

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