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**LCM CODE (Ver.) : GJX0128A4-15HN**

**Description: 1.28''a-Si TFT Liquid Crystal Display**

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## 1. SPECIFICATIONS

### 1.1 Features

Item	Standard Value
Display Type	240(R+G+B) * 240Dots
LCD Type	a-Si TFT, Positive, Transmissive
Viewing Direction	ALL O'clock
Backlight	2 LED White Color
Interface	4-WIRE SPI interface
Controller/driver IC	GC9A01

### 1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	43(W) x 43(L) x 3.05(T)	mm
Viewing Area	32.9(W) x32.9(L)	mm
Active Area	32.4(W) x32.4(L)	mm
Pixel pitch	/	mm

Note: For detailed information please refer to LCM drawing

### 1.3 Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit
Power Supply Voltage	V <sub>DD</sub>	-	-0.3	4.6	V
LCD Driver Supply Voltage	V <sub>GH-VSS</sub>	-	-0.3	18.5	V
Input voltage	V <sub>in</sub>		-0.3	4.6	V
Operating Temperature	T <sub>OP</sub>	-	-20	+70	°C
Storage Temperature.	T <sub>ST</sub>	-	-30	+80	°C
Storage Humidity	H <sub>D</sub>	T <sub>a</sub> < 40 °C	-	90	%RH

## 1.4 DC Electrical Characteristics

$V_{DD} = 2.4 \sim 3.3V$ ,  $V_{SS} = 0V$ ,  $T_a = 25^\circ C$

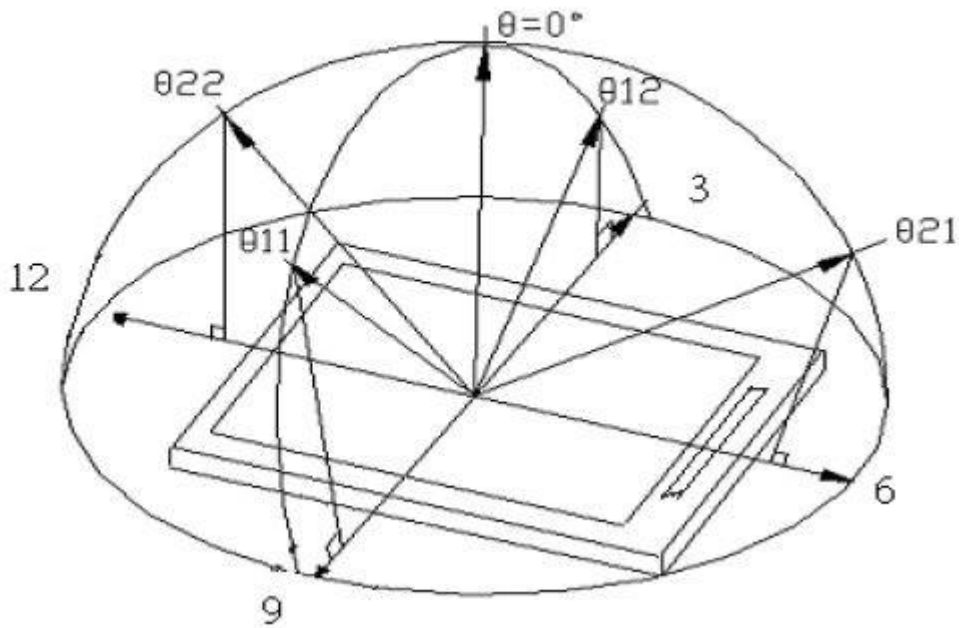
Item	Symbol	Condition	Min.	Type	Max.	Unit
Logic Supply Voltage	$V_{DD}$	-	2.4	2.8	3.3	V
“H” Input Voltage	$V_{IH}$	-	$0.8 V_{DD}$	-	$V_{DD}$	V
“L” Input Voltage	$V_{IL}$	-	$V_{SS}$	-	$0.2 V_{DD}$	V
“H” Output Voltage	$V_{OH}$	-	$0.8V_{DD}$	-	$V_{DD}$	V
“L” Output Voltage	$V_{OL}$	-	$V_{SS}$	-	$0.2 V_{DD}$	V
Supply Current	$I_{DD}$	$V_{DD} = 2.8V$	-	4	6	mA

## 1.5 Optical Characteristics

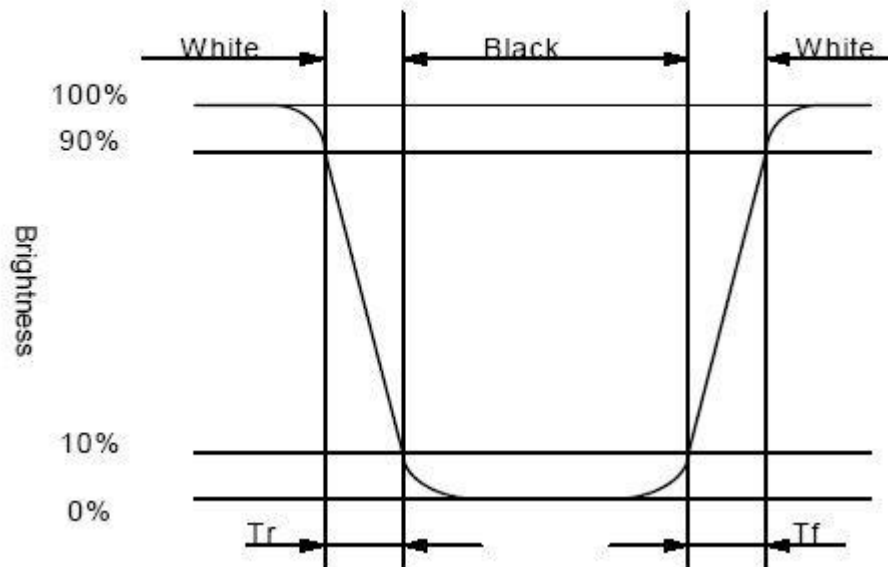
$T_a = 25^\circ C$

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	$\theta_{11}, \theta_{12}$	$C \geq 10, \phi = 0^\circ$	--	80	--	Note6-1
	$\theta_{21}$		--	80	--	Note6-1
	$\theta_{22}$		--	80	--	Note6-1
Contrast Ratio	C	$\theta = 0^\circ, \phi = 0^\circ$	--	800	--	--
Response Time(rise)	tr	$\theta = 0^\circ, \phi = 0^\circ$	--	15ms	--	Note6-3
Response Time(fall)	tf	$\theta = 0^\circ, \phi = 0^\circ$	--	15ms	--	Note6-3
Luminance	B	$\theta = 0^\circ \quad \phi = 0^\circ$	--	--	--	cd/m <sup>2</sup>

Note 6-1 : The definitions of viewing angles



Note 6-3 : The definition of response time :



## 1.6 Backlight & LED Characteristics

### Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	20 (1 LED)	mA
Reverse Voltage	VR	Ta =25℃	-	5	V
Power Dissipation	PO	Ta =25℃	-	198	mW
Operating Temperature	T <sub>OP</sub>	-	-20	70	℃
Storage Temperature	T <sub>ST</sub>	-	-30	80	℃
Solder Temp. for 3 Seconds	-	-	-	260	℃

### Electrical / Optical Characteristics

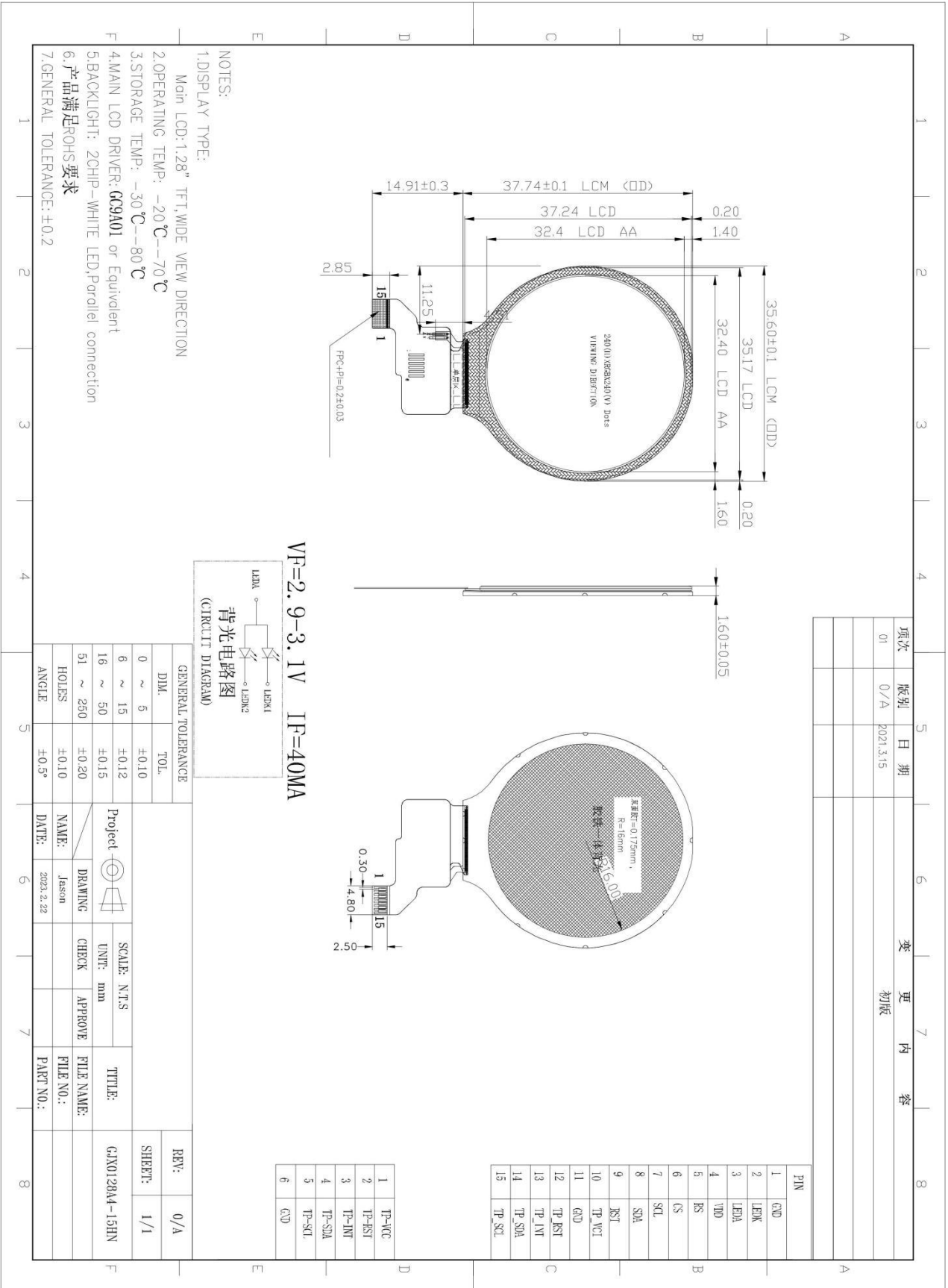
VSS = 0V, Ta =25℃

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 40mA	2.8	3.0	3.2	V
Reverse Current	IR	VR= 5V	-	-	50	uA
Average Brightness (without LCD)	IV	IF= 40mA	-	-	-	cd/m <sup>2</sup>
CIE Color Coordinate (without LCD)	X	IF= 40mA	0.260	-	0.310	—
	Y		0.260	-	0.310	
Color	WHITE					

\*1 This value will be changed while mass production.

# 2. MODULE STRUCTURE

## 2.1 Counter Drawing



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## Interface Pin Description

NO	SYMBOL	FUNCTION
1	GND	Power ground
2	LEDK	BACK LIGHT -
3	LEDA	BACK LIGHT +
4	VDD	Power supply for the analog circuit. 2.8V
5	RS	data or command select signal input
6	CS	chip select signal input(low active)
7	SCL	Serial clock input
8	SDA	Serial data input
9	RESET	Reset pin
10	TP_VCI	Power supply for display logic circuits
11	GND	Power ground
12	TP_RST	Reset Pin for TP, Active low.
13	TP_INT	INT pin for TP
14	TP_SDA	SDA pin for TP
15	TP_SCL	SCL pin for TP

### 2.3 Timing Characteristics

Please refer to GC9A01 DATASHEET.

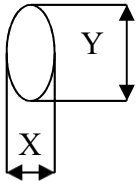
### 2.4 Display Command

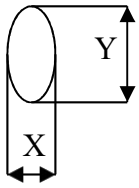
Please refer to GC9A01 DATASHEET.



### 3. INSPECTION SPECIFICATIONN

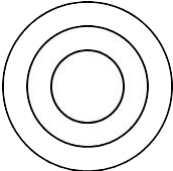
NO.	Item	Inspection Standard	Result	Note
1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical, horizontal segment 4) Short circuit 5) Backlight no lighting, flickering and abnormal lighting.	Reject	
2	Missing	Missing component	Reject	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed		

NO.	Item	Inspection Standard	Note																			
4	Clear Spots	$\phi = (X+Y) / 2$  A: AA area(Display area) B: VA area (Visual area) C: Out of VA <div style="text-align: right;">  </div>																				
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Zone \ Size</th> <th colspan="3">Acceptable Quantity</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.1\text{mm}</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>0.1\text{mm} &lt; \phi \leq 0.2\text{mm}</math></td> <td>3</td> <td colspan="2" rowspan="3">Ignore</td> </tr> <tr> <td><math>0.2\text{mm} &lt; \phi \leq 0.25\text{mm}</math></td> <td>2</td> </tr> <tr> <td><math>\phi &gt; 0.25\text{mm}</math></td> <td>0</td> </tr> </tbody> </table>	Zone \ Size	Acceptable Quantity			A	B	C	$\phi \leq 0.1\text{mm}$	Ignore			$0.1\text{mm} < \phi \leq 0.2\text{mm}$	3	Ignore		$0.2\text{mm} < \phi \leq 0.25\text{mm}$	2	$\phi > 0.25\text{mm}$	0	
Zone \ Size	Acceptable Quantity																					
	A	B	C																			
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$\phi > 0.25\text{mm}$	0																					

NO.	Item	Inspection Standard	Note																												
5	Dim Spots	$\phi = (X+Y) / 2$ <p>A: AA area(Display area)            B: VA area (Visual area)            C: Out of V.A.</p>  <table border="1" data-bbox="459 660 1053 996"> <thead> <tr> <th rowspan="2">Zone Size</th> <th colspan="3">Acceptable Quantit</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.3\text{mm}</math></td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.3\text{mm} &lt; \phi \leq 0.6\text{mm}</math></td> <td colspan="2">2</td> </tr> <tr> <td><math>\phi &gt; 0.6\text{mm}</math></td> <td colspan="2">0</td> </tr> </tbody> </table>	Zone Size	Acceptable Quantit			A	B	C	$\phi \leq 0.3\text{mm}$	Ignore		Ignore	$0.3\text{mm} < \phi \leq 0.6\text{mm}$	2		$\phi > 0.6\text{mm}$	0													
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$0.3\text{mm} < \phi \leq 0.6\text{mm}$	2																														
$\phi > 0.6\text{mm}$	0																														
6	Line defect	<table border="1" data-bbox="459 1048 1252 1406"> <thead> <tr> <th colspan="2">Size (mm)</th> <th colspan="3">Acceptable Quantity</th> </tr> <tr> <th>L (Length)</th> <th>W (width)</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Ignore</td> <td><math>W \leq 0.03</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>L &lt; 5.0</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td colspan="2">2</td> <td rowspan="2">Ignore</td> </tr> <tr> <td></td> <td><math>0.05 &lt; W</math></td> <td colspan="2">Define as spot defect</td> </tr> </tbody> </table>	Size (mm)		Acceptable Quantity			L (Length)	W (width)	A	B	C	Ignore	$W \leq 0.03$	Ignore			$L < 5.0$	$0.03 < W \leq 0.05$	2		Ignore		$0.05 < W$	Define as spot defect						
Size (mm)		Acceptable Quantity																													
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$L < 5.0$	$0.03 < W \leq 0.05$	2		Ignore																											
	$0.05 < W$	Define as spot defect																													
7	Polarizer Scratch	<table border="1" data-bbox="459 1458 1252 1753"> <thead> <tr> <th colspan="2">Size (mm)</th> <th colspan="3">Acceptable Quantity</th> </tr> <tr> <th>L (Length)</th> <th>W (width)</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>Ignore</td> <td><math>W \leq 0.03</math></td> <td colspan="3">Ignore</td> </tr> <tr> <td><math>L \leq 10</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td colspan="2">2</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>L &lt; 5.0</math></td> <td><math>0.05 &lt; W \leq 0.08</math></td> <td colspan="2">1</td> </tr> <tr> <td></td> <td><math>0.08 &lt; W</math></td> <td colspan="2">0</td> </tr> </tbody> </table>	Size (mm)		Acceptable Quantity			L (Length)	W (width)	A	B	C	Ignore	$W \leq 0.03$	Ignore			$L \leq 10$	$0.03 < W \leq 0.05$	2		Ignore	$L < 5.0$	$0.05 < W \leq 0.08$	1			$0.08 < W$	0		
Size (mm)		Acceptable Quantity																													
L (Length)	W (width)	A	B	C																											
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$L < 5.0$	$0.05 < W \leq 0.08$	1																													
	$0.08 < W$	0																													

8	Polarize Air bubble	Zone Size		Acceptable Quantity		
				A	B	C
		$\phi \leq 0.2\text{mm}$		Ignore		Ignore
		$0.2\text{mm} < \phi \leq 0.3\text{mm}$		2		
		$0.3\text{mm} < \phi \leq 0.5\text{mm}$		1		
		$\phi > 0.5\text{mm}$		0		

### Newton Ring

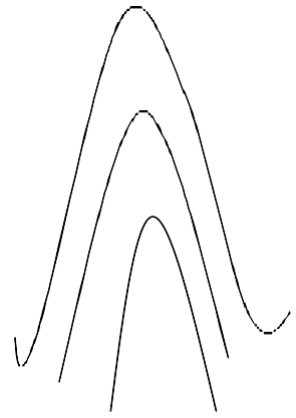
NO.	Item	Inspection Standard	Note
9	Inerratic	<p>1 When Newton ring dimension is more than 1/3 of sample dimension, it is regarded as a defect.</p> <p>2 When Newton ring dimension is less than 1/3 of sample dimension is not affect font effect and line distortion under a ceiling fluorescent light, it is acceptable.</p>	

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1. As long as Newton ring affects font effect and line distortion under a ceiling fluorescent light, it is regarded as a defect.

When  $\phi \leq 10\text{mm}$ , it is acceptable



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## **4. PRECAUTION RELATING PRODUCT HANDLING**

### **4.1 SAFETY**

- 4.1.1** If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.
- 4.1.2** If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

### **4.2 HANDLING**

- 4.2.1** Avoid any strong mechanical shock which can break the glass.
- 4.2.2** Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.
- 4.2.3** Do not remove the panel or frame from the module.
- 4.2.4** The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)
- 4.2.5** Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the Surface of plate.
- 4.2.6** Do not touch the display area with bare hands , this will stain the display area.
- 4.2.7** Do not use ketonic solvent & aromatic solvent. Use with a soft cloth soaked with A cleaning naphtha solvent.
- 4.2.8** To control temperature and time of soldering is  $280 \pm 10^{\circ}\text{C}$  and 3-5 sec.
- 4.2.9** To avoid liquid (include organic solvent) stained on LCM.

### **4.3 STORAGE**

- 4.3.1** Store the panel or module in a dark place where the temperature is  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and the humidity is below 65% RH.
- 4.3.2** Do not place the module near organics solvents or corrosive gases.
- 4.3.3** Do not crush, shake , or jolt the module.