



MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0177J1T-1

This module uses ROHS material

For Customer's Acceptance:

Customer	
Approved	
Comment	

This specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for this product or release of this order.

Revision	1.5
Engineering	
Date	2016-06-07
Our Reference	



CONTENTS

- GENERAL INFORMATION
- EXTERNAL DIMENSIONS
- ABSOLUTE MAXIMUM RATINGS
- ELECTRICAL CHARACTERISTICS
- BACKLIGHT CHARACTERISTICS
- ELECTRO-OPTICAL CHARACTERISTICS
- INTERFACE DESCRIPTION
- BLOCK DIAGRAM
- APPLICATION NOTES
- RELIABILITY TEST CONDITIONS
- INSPECTION CRITERION
- PRECAUTIONS FOR USING LCD MODULES
- PACKING SPECIFICATION
- PRIOR CONSULT MATTER

**■ GENERAL INFORMATION**

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	1.77	Inch
Viewing direction	6:00 (without image inversion and least brightness change)	O' Clock
Gray scale inversion direction	12:00 (contrast peak located at)	O' Clock
LCM (W × H × D)	34.7×46.7×2.5	mm ³
Active area (W×H)	28.03×35.04	mm ²
Pixel pitch (W×H)	0.219×0.219	mm ²
Number of dots	128 (RGB) × 160	/
Driver IC	ST7735S	/
Backlight type	2 LEDs	/
Interface type	SPI	/
Color depth	65K	/
Pixel configuration	R.G.B vertical stripe	/
Surface treatment	TBD	/
Input voltage	2.8	V
With/Without TSP	Without TSP	/
Weight	TBD	g

Note 1: RoHS compliant;

Note 2: LCM weight tolerance: ± 5% .

**■ ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Min	Max	Unit
Analog supply voltage	VCC	-0.3	4.8	V
Logic supply voltage	IOVCC	-0.3	4.6	V
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C
Supply current(one LED)	I _{LED}	-	30	mA
Humidity	RH	-	90%(Max60 °C)	RH

■ ELECTRICAL CHARACTERISTICS**DC CHARACTERISTICS**

Parameter	Symbol	Min	Typ	Max	Unit
Analog supply voltage	VCC	2.5	2.8	3.3	V
Logic supply voltage	IOVCC	1.8	2.8	3.3	V
Input voltage'H'level	VIH	0.7VCC	-	VCC	V
Input voltage'L'level	VIL	-0.3	-	0.3VCC	V
Input leakage current	I _{LKG}	-	-	-	μA

■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Voltage for LED backlight	VL	6.0	6.4	6.8	V	
Current for LED backlight	IL	-	15	20	mA	
LED life time	-	20000	-	-	Hrs	

■ ELECTRO-OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+Tf	$\theta=0^\circ$ $\varnothing=0^\circ$ $T_a=25^\circ\text{C}$	-	30	-	ms	Fig.1	4
Contrast ratio	Cr		-	500	-	---	FIG2.	1
Luminance uniformity	δ WHITE		80	85	-	%	FIG2.	3
Surface Luminance	Lv		-	320	-	cd/m ²	FIG 2.	2
Viewing angle range	θ	$\varnothing = 90^\circ$	-	65	-	deg	FIG3.	6
		$\varnothing = 270^\circ$	-	55	-	deg	FIG3.	
		$\varnothing = 0^\circ$	-	65	-	deg	FIG3.	
		$\varnothing = 180^\circ$	-	65	-	deg	FIG3.	
CIE (x, y) chromaticity	Red x	$\theta=0^\circ$ $\varnothing=0^\circ$ $T_a=25^\circ\text{C}$	-	0.633	-	-	FIG 2.	5
	Redy		-	0.329	-			
	Greenx		-	0.297	-			
	Greeny		-	0.577	-			
	Bluex		-	0.133	-			
	Bluey		-	0.129	-			
	Whitex		-	0.294	-			
	White y		-	0.334	-			

Note1. Contrast Ratio(CR) is defined mathematically by the following formula. For more information see FIG 2.:

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P 1,P2, P 3,P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3,P4, P5)}}$$

Note2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.

$$L_v = \text{Average Surface Luminance with all white pixels (P1, P2, P 3,P4, P5)}$$

Note3. The uniformity in surface luminance (δ WHITE) is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P}_1, \text{P}_2, \text{P}_3, \text{P}_4, \text{P}_5)}{\text{Maximum Surface Luminance with all white pixels (P}_1, \text{P}_2, \text{P}_3, \text{P}_4, \text{P}_5)}$$

Note4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1..

Note5. CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5. For more information see FIG 2.

Note6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on TOPCON's BM-5 photo detector.

Note8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle

FIG.1. The definition of Response Time

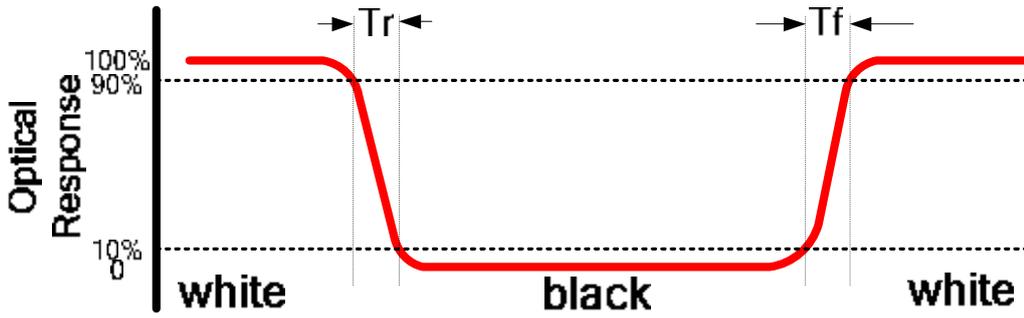


FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm
 B : 5 mm
 H, V : Active Area
 Light spot size $\varnothing=5\text{mm}$, 500mm distance from the LCD surface to detector lens
 measurement instrument is TOPCON's luminance meter BM-5

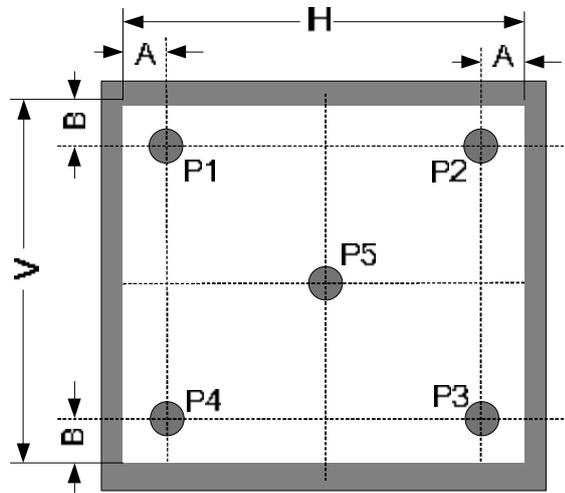
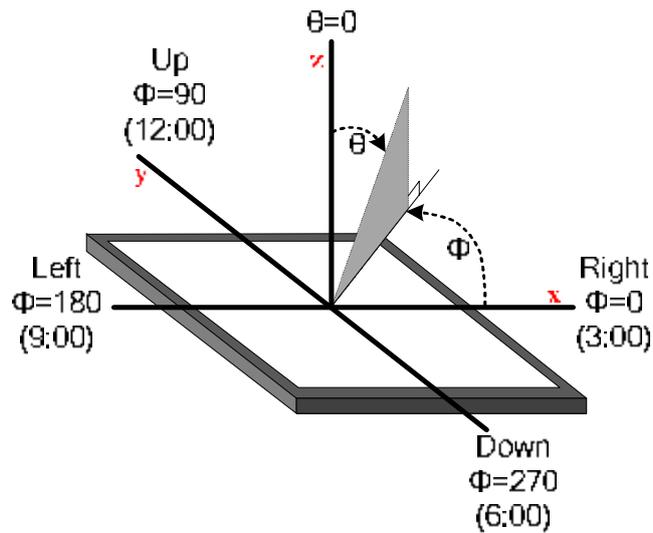


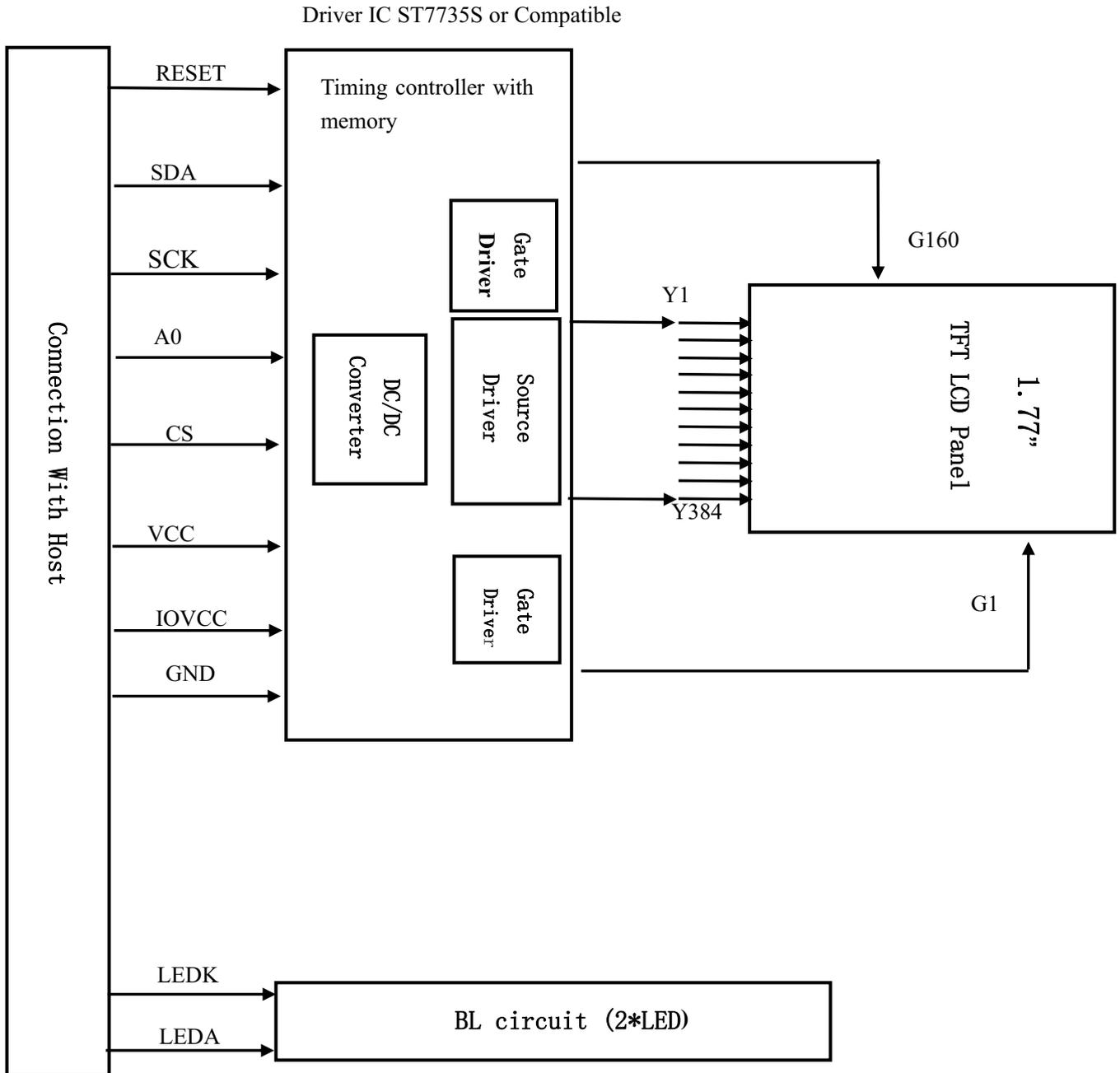
FIG.3. The definition of viewing angle



**■ INTERFACE DESCRIPTION**

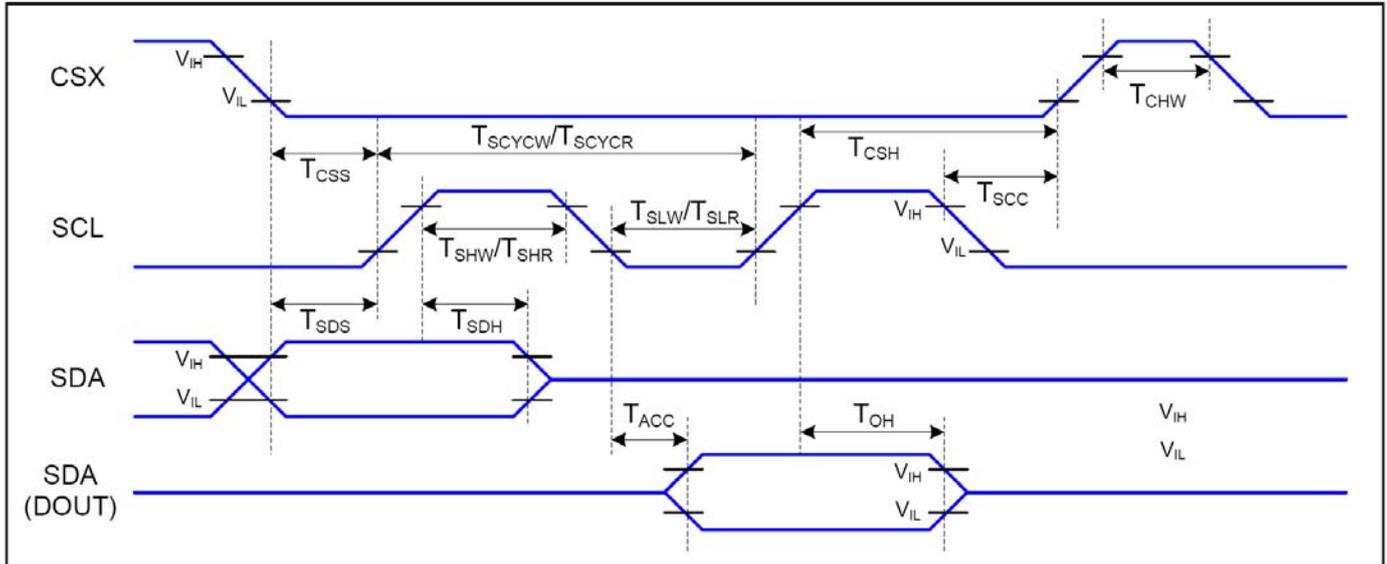
Pin No.	Symbol	Description
1	GND	Ground
2	LEDK	Backlight LED Power
3	LEDA	Backlight LED Ground
4	GND	Ground
5	RESET	Hardware Reset
6	A0	A0=0 select command;A0=1 select data
7	SDA	SPI Interface Data
8	SCK	SPI Interface Data Clock
9	VCC	Power supply
10	IOVCC	Power supply
11	CS	Chip select
12	GND	Ground

■ BLOCK DIAGRAM



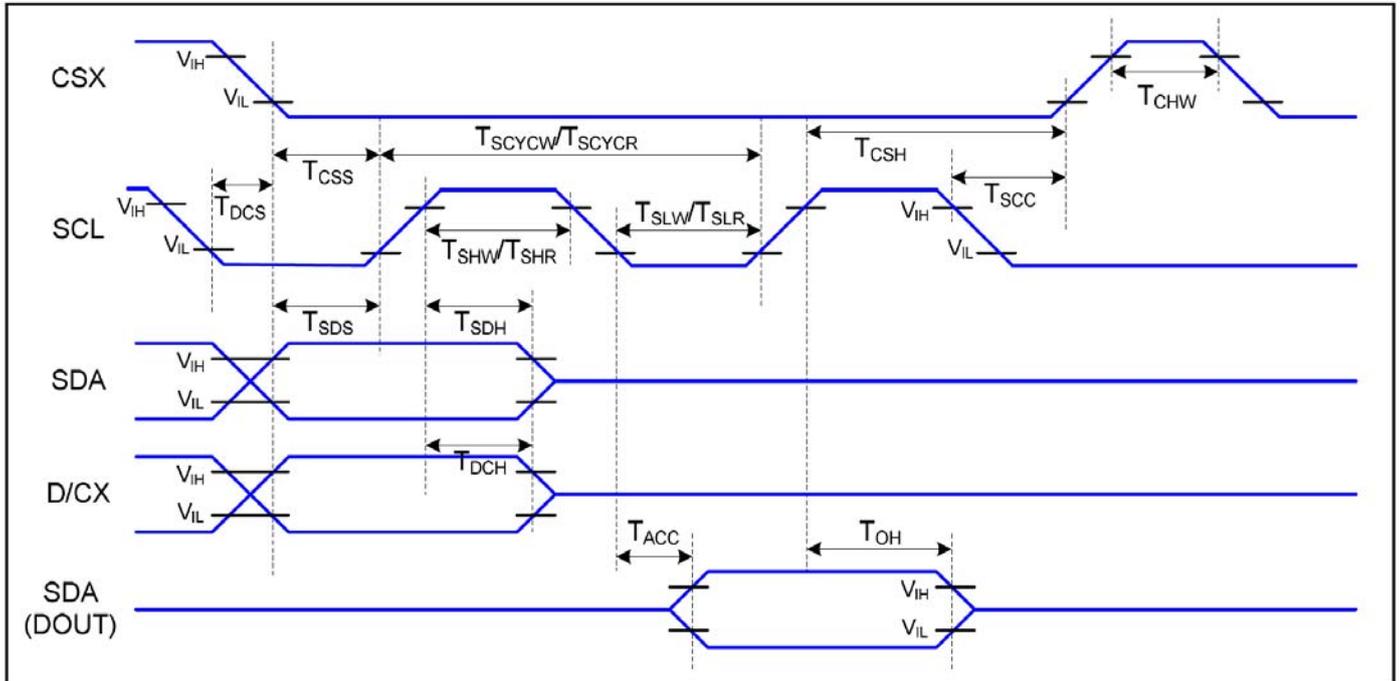
■ APPLICATION NOTES

1. Serial Interface Characteristics (3-Line Serial)



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) (DOUT)	T _{SDS}	Data setup time	10		ns	For maximum CL=30pF For minimum CL=8pF
	T _{SDH}	Data hold time	10		ns	
	T _{ACC}	Access time	10	50	ns	
	T _{OH}	Output disable time	15	50	ns	

2. Serial Interface Characteristics (4-Line Serial)



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T _{CSS}	Chip select setup time (write)	45		ns	
	T _{CSH}	Chip select hold time (write)	45		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	-write command & data ram
	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	-read command & data ram
	T _{SHR}	SCL "H" pulse width (Read)	60		ns	
	T _{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T _{DCS}	D/CX setup time	10		ns	
	T _{DCH}	D/CX hold time	10		ns	
SDA (DIN) (DOUT)	T _{SDS}	Data setup time	10		ns	For maximum CL=30pF For minimum CL=8pF
	T _{SDH}	Data hold time	10		ns	
	T _{ACC}	Access time	10	50	ns	
	T _{OH}	Output disable time	15	50	ns	

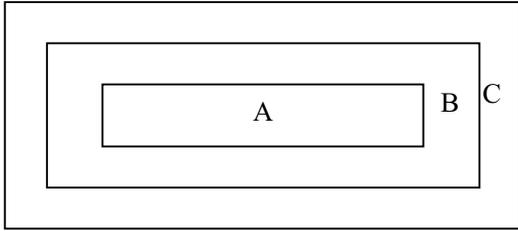
**■ RELIABILITY TEST CONDITIONS**

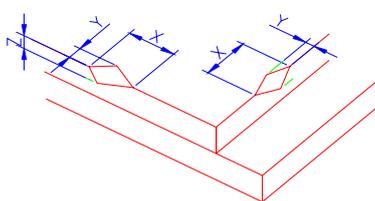
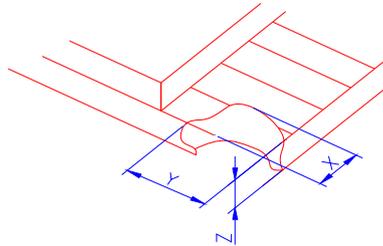
No.	Test Item	Test Condition	Remarks
1	High Temperature Storage Test	T=80°C 120h	Note2
2	Low Temperature Storage Test	T=-30°C 120h	Note1,2
3	High Temperature Operation Test	T=70°C 120h	
4	Low Temperature Operation Test	T=-20°C 120h	Note1
5	High Temperature and High Humidity Operation Test	Ta=40°C,90%RH 120h	Note1,2
6	Thermal Shock Test (Non-operating)	-30°C(30Min)~25°C(5Min)~80°C(30Min) 100Cycles	
7	Vibration Test (Non-operating)	Frequency:10~55Hz Amplitude: 1.5mm Sweep Time: 11Mins Test Period: 6 Cycles For Each Direction Of X,Y,Z	
8	Shock Test (Non-operating)	100G, 6Ms Direction: ±X,±Y, ±Z Cycle: 3Times	
9	Electro Static Discharge Test	Voltage: ±8KV R:330Ω C:150pF Air Discharge, 10 Time.	

Note 1: Without water condensation

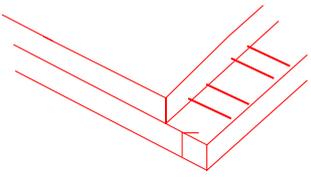
Note 2: The function test shall be conducted after 2 hours storage at the room temperature and humidity after removed from the test chamber.

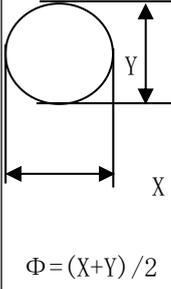
INSPECTION CRITERION

 <p>OUTGOING QUALITY STANDARD</p>	<p>PAGE 1 OF 6</p>
<p>TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA</p>	
<p>This specification is made to be used as the standard acceptance/rejection criteria for TFT module.</p> <p>1 Sample plan</p> <p>Sampling plan according to GB/T2828.1-2003/ISO 2859-1: 1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:</p> <p>Major defect: AQL 0.65</p> <p>Minor defect: AQL 1.5</p> <p>2. Inspection condition</p> <p>Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.</p> <p>3. Definition of inspection zone in LCD.</p> <div data-bbox="528 1108 1046 1339" data-label="Diagram">  </div> <p>Zone A: character/Digit area</p> <p>Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)</p> <p>Zone C: Outside viewing area (invisible area after assembly in customer's product)</p> <p>Fig.1 Inspection zones in an LCD.</p> <p>Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.</p>	

 OUTGOING QUALITY STANDARD	PAGE 2 OF 6								
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA									
4. Inspection standards									
No	Items to be inspected	Criteria	Classification of defects						
1	Functional defects	1) No display,open or miss line 2) Display abnormally,short 3) Backlight no lighting,abnormal lighting 4) TP no function	Major						
2	Missing	Missing component							
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed							
4	Color tone	Color unevenness,refer to limited sample	Minor						
5	Soldering appearance	Good soldering,peeling off is not allowed							
6	LCD/Polarizer/TP	Black/white,spot/line,scratch,crack,etc.							
Number	Items	Criteria(mm)							
1.0 LCD Crack/broken Note: X:Length Y:Width Z:Height L:Length of ITO T:Height of LCD	1) The edge of LCD broken	 <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="width: 30%; text-align: center;">X</td> <td style="width: 30%; text-align: center;">Y</td> <td style="width: 30%; text-align: center;">Z</td> </tr> <tr> <td style="text-align: center;">$\leq 3.0\text{mm}$</td> <td style="text-align: center;"><Inner border line of the seal</td> <td style="text-align: center;">$\leq T$</td> </tr> </table>		X	Y	Z	$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$
	X	Y	Z						
$\leq 3.0\text{mm}$	<Inner border line of the seal	$\leq T$							
2) LCD cornet broken	 <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="width: 30%; text-align: center;">X</td> <td style="width: 30%; text-align: center;">Y</td> <td style="width: 30%; text-align: center;">Z</td> </tr> <tr> <td style="text-align: center;">$\leq 3.0\text{mm}$</td> <td style="text-align: center;">$\leq L$</td> <td style="text-align: center;">$\leq T$</td> </tr> </table>		X	Y	Z	$\leq 3.0\text{mm}$	$\leq L$	$\leq T$	
X	Y	Z							
$\leq 3.0\text{mm}$	$\leq L$	$\leq T$							



OUTGOING QUALITY STANDARD		PAGE 3 OF 6
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA		
Number	Items	Criteria(mm)
	3) LCD crack	 Crack Not allowed

 OUTGOING QUALITY STANDARD		PAGE 4 OF 6																									
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA																											
2.0	Spot defect	Criteria(mm)																									
	 $\Phi = (X+Y) / 2$	1) Light dot (LCD/TP/Polarizer black/white spot,light dot,pinhole,dent,stain)																									
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size(mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.10$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.10 < \Phi \leq 0.15$</td> <td colspan="3" style="text-align: center;">3(distance ≥ 10mm)</td> </tr> <tr> <td style="text-align: center;">$0.15 < \Phi \leq 0.20$</td> <td colspan="3" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$0.20 < \Phi$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table>			Zone Size(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3(distance ≥ 10 mm)			$0.15 < \Phi \leq 0.20$	1			$0.20 < \Phi$	0		
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		2) Dim spot (LCD/TP/Polarizer dim dot,light leakage,dark spot)																									
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OUTGOING QUALITY STANDARD		PAGE 5 OF 6																												
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA																														
	Line defect (LCD/TP/ Polarizer/ black/white line,scratch, stain)	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="2">$N \leq 2$</td> <td rowspan="2">Ignore</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="2">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="3">Define as spot defect</td> <td></td> </tr> </tbody> </table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$		Ignore	$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$		$0.08 < W$	Define as spot defect				
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3.0	Polarizer bubble	<table border="1"> <thead> <tr> <th rowspan="2">Size(mm) Zone</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.4$</td> <td colspan="3">2(distance ≥ 10mm)</td> </tr> <tr> <td>$0.4 < \Phi \leq 0.6$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.6 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Size(mm) Zone	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.4$	2(distance ≥ 10 mm)			$0.4 < \Phi \leq 0.6$	1			$0.6 < \Phi$	0			Ignore				
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$0.6 < \Phi$	0																													
4.0	SMT	According to IPC-A-610C class II standard.Function defect and missing part are major defect,the others are minor defect.																												
	TP bubble/ accidented spot	<table border="1"> <thead> <tr> <th rowspan="2">Size Φ (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">2(distance ≥ 10mm)</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.3$</td> <td colspan="3">1</td> </tr> <tr> <td>$0.3 < \Phi$</td> <td colspan="3">0</td> </tr> </tbody> </table>	Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2(distance ≥ 10 mm)			$0.2 < \Phi \leq 0.3$	1			$0.3 < \Phi$	0			Ignore				
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OUTGOING QUALITY STANDARD		PAGE 6 OF 6																				
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■ PRECAUTIONS FOR USING LCD MODULES

1 Handling Precautions

- 1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- 1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- 1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- 1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.
- 1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
 - Isopropyl alcohol
 - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- 1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solventsWipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.
- 1.7 Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- 1.8 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- 1.9 Do not attempt to disassemble or process the LCD module.
- 1.10 NC terminal should be open. Do not connect anything.
- 1.11 If the logic circuit power is off, do not apply the input signals.
- 1.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
 - Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
 - To reduce the amount of static electricity generated, do not conduct assembling

and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.

- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board.

- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

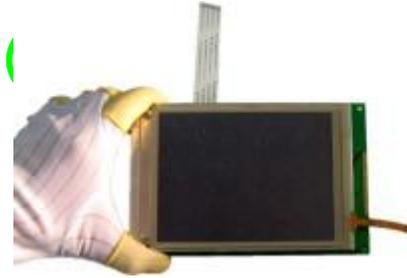
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist the LCM.

2 Handling precaution for LCM

2.1 LCM is easy to be damaged. Please note below and be careful for handling.

2.2 Correct handling:

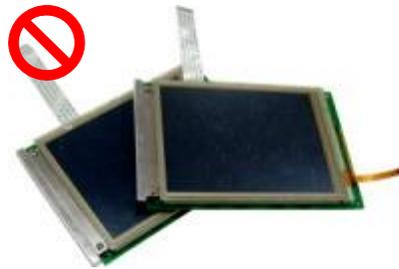


As above picture, please handle with anti-static gloves around LCM edges.

2.3 Incorrect handling:



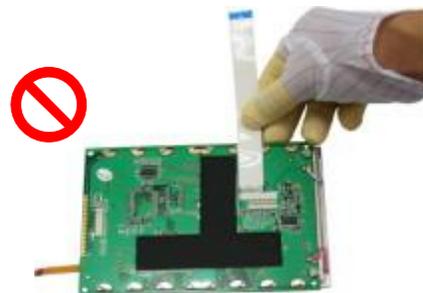
Please don't touch IC directly.



Please don't stack LCM.



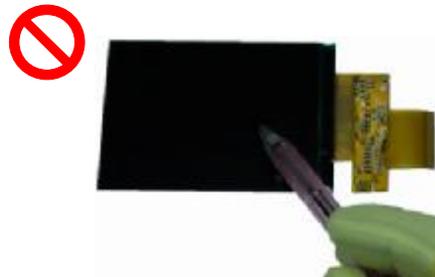
Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.



Please don't hold the surface of IC.



Please don't operate with sharp stick such as pens.

3 Storage Precautions

3.1 When storing the LCD modules, the following precaution are necessary.

- 3.1.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.
- 3.1.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.
- 3.1.3 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).

3.2 Others 其它

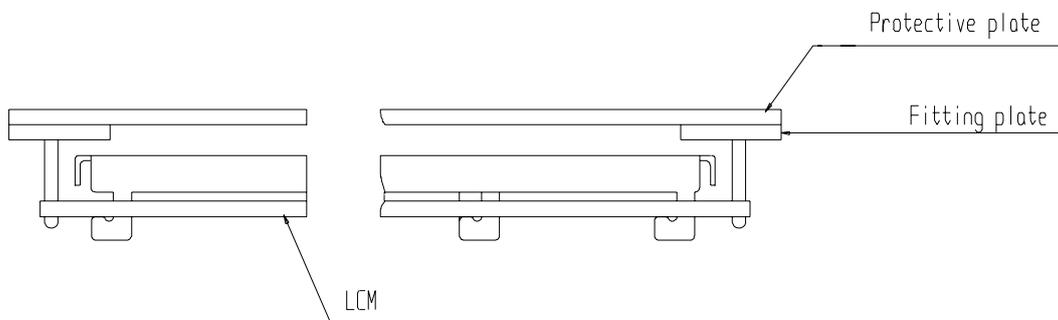
- 3.2.1 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
- 3.2.2 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- 3.2.3 To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
 - 3.2.3.1 - Exposed area of the printed circuit board.
 - 3.2.3.2 -Terminal electrode sections.

4 USING LCD MODULES

4.1 Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

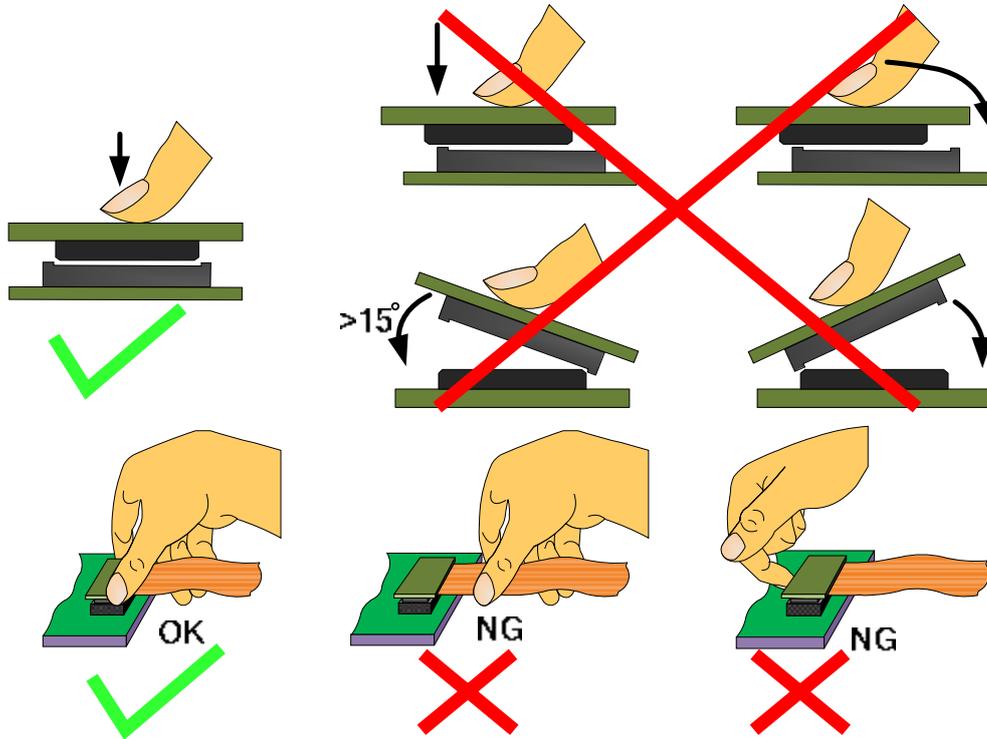
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



4.1.2 When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be $\pm 0.1\text{mm}$.

4.2 Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



4.3 Precaution for soldering the LCM

	Manual soldering	Machine drag soldering	Machine press soldering
No RoHS Product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 15-17 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
RoHS Product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Speed : 15-17 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

- 4.3.1 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.
- 4.3.2 When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- 4.3.3 When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

4.4 Precautions for Operation

- 4.4.1 Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.
- 4.4.2 It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- 4.4.3 Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operating temperature.
- 4.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- 4.4.5 A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.
- 4.4.6 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.
- 4.4.7 Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

4.5 Safety

- 4.5.1 It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- 4.5.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

4.6 Limited Warranty

Unless agreed between Multi-Inno and customer, Multi-Inno will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Multi-Inno LCD acceptance standards for a period of one year from date of production. Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and/or replacement on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

4.7 Return LCM under warranty

4.7.1 No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

4.7.1.1 - Broken LCD glass.

4.7.1.2 - PCB eyelet is damaged or modified.

4.7.1.3 - PCB conductors damaged.

4.7.1.4 - Circuit modified in any way, including addition of components.

4.7.1.5 - PCB tampered with by grinding, engraving or painting varnish.

4.7.1.6 - Soldering to or modifying the bezel in any manner.

4.7.2 Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

■ PACKING SPECIFICATION

Please consult our technical department for detail information.

■ PRIOR CONSULT MATTER

1. ① For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without notice on our customer.
② For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the test on our samples.