



**MULTI-INNO TECHNOLOGY CO., LTD.**

[www.multi-inno.com](http://www.multi-inno.com)

## LCD MODULE SPECIFICATION

**Model : MI0350AKT-1**

This module uses ROHS material

### For Customer's Acceptance:

Customer	
Approved	
Comment	

The standard product 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 the standard product or release of the order.

Revision	1.0
Engineering	
Date	2014-03-24
Our Reference	



**REVISION RECORD**

<b>REV NO.</b>	<b>REV DATE</b>	<b>CONTENTS</b>	<b>REVISED PAGE NO.</b>
1.0	2014-03-24	First Release	

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**■ GENERAL INFORMATION**

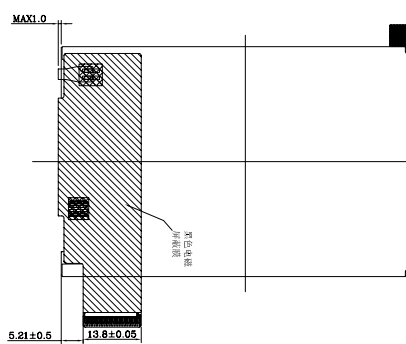
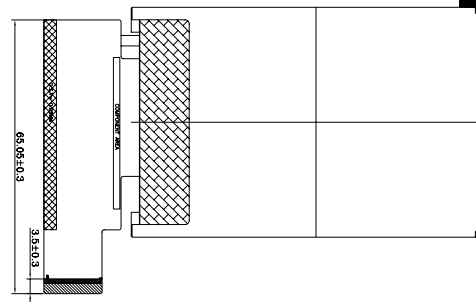
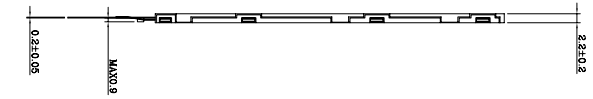
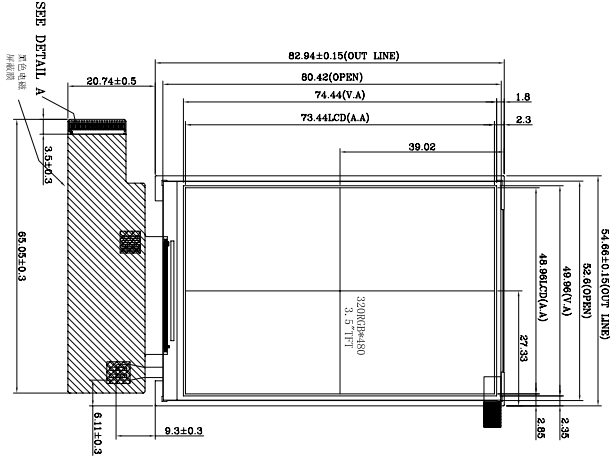
Item	Contents	Unit
LCD type	TFT/Transmissive/Normally black	/
Size	3.5	Inch
Viewing direction	Full viewing angle	O' Clock
LCM (W × H × D )	54.66×82.94×2.20	mm <sup>3</sup>
Active area (W×H)	48.96×73.44	mm <sup>2</sup>
Number of dots	320 (RGB) × 480	/
Driver IC	HX8357D	/
Backlight type	6 LEDs	/
Interface type	SPI+18bit RGB	/
Color depth	262K	/
Pixel configuration	R.G.B vertical stripe	/
Input voltage	2.8	V
With/Without TSP	Without TSP	/
Weight	TBD	g

Note 1: RoHS compliant;

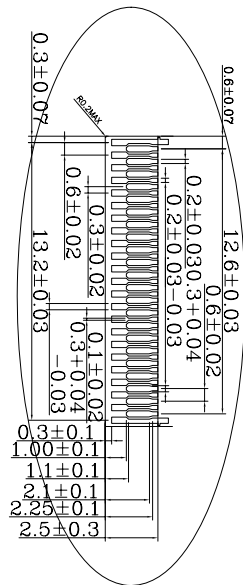
Note 2: LCM weight tolerance: ± 5% .

**EXTERNAL DIMENSIONS**

1	Q60
2	A
3	A
4	K
5	K
6	Q60
7	VCC (2.8V/1.8V)
8	VCC (2.8V/1.8V)
9	VCC (2.8V/1.8V)
10	48.96(V.A)
11	48.96(C.A.A)
12	HS0NC
13	HS0NC
14	HS0NC
15	HS0NC
16	HS0NC
17	D17
18	D16
19	D15
20	D14
21	D13
22	D12
23	D11
24	D10
25	D9
26	D8
27	D7
28	D6
29	D5
30	D4
31	D3
32	D2
33	D1
34	D0
35	S0
36	S1
37	HS0/SAL
38	HS0/SAL
39	D0/CX
40	CSX
41	LE
42	LE
43	NC
44	NC
45	NC



DETAIL A  
SCALE: 5:1



A-A

CIRCUIT

- NOTES:
1. DISPLAY TYPE: TFT-TRANSMISSIVE,NORMALLY BLACK.
  2. OPERATING VOLTAGE: VCC=2.8V.
  3. VIEWING DIRECTION: FULL VIEWING ANGLE.
  4. IC DRIVER: HX8357D.
  5. OPERATING TEMP: -20°C ~ 70°C.
  6. STORAGE TEMP: -30°C ~ 80°C.
  7. LED BACKLIGHT: 6-WHITE LED, If=20mA,Vf=19.2V.
  8. GENERAL TOLERANCE: ±0.2.
  9. RECOMMENDED CASE OPEN AREA SHOULD BE LESS THAN MODULE V.A.
  10. CONNECT: HRS FH26-45S-0.35HW.
  11. RoHS COMPLIANT.

CUSTOMER APVL		DATE	
DRAWN	SCALE	TITLE	
DFIG CHK	UNIT	MM	MI0350AKT-1
ENGR CHK		MODEL	
APPROVAL			
MULTI-INNO TECHNOLOGY CO.,LTD.		DWG NO	PAGE
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**■ ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	IOVCC	-0.3	4.6	V
Supply voltage for analog	VCC	-0.3	4.6	V
Input voltage	VIN	-0.3	IOVCC+0.3	V
Supply current (one LED)	I <sub>LED</sub>	-	30	mA
Operating temperature	T <sub>OP</sub>	-20	70	°C
Storage temperature	T <sub>ST</sub>	-30	80	°C

**■ ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage for logic	IOVCC	1.65	2.8	3.3	V
Supply voltage for analog	VCC	2.5	2.8	3.3	V
Input leakage current	I <sub>LKG</sub>	-	-	-	μA
Input voltage 'H' level	V <sub>IH</sub>	0.7VCC	-	VCC	V
Input voltage 'L' level	V <sub>IL</sub>	-0.3	-	0.3VCC	V

**■ BACKLIGHT CHARACTERISTICS**

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
LED forward voltage	V <sub>f</sub>	-	19.2	-	V	
Input backlight current	I <sub>f</sub>	-	20	-	mA	

**■ELECTRO-OPTICAL CHARACTERISTICS**

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+Tf	θ=0° ∅=0° Ta=25°C	-	25	35	ms	FIG 1.	4
Contrast ratio	Cr		400	800	-	---	FIG 2.	1
Luminance uniformity	δ WHITE		80	85	-	%	FIG 2.	3
Surface Luminance	Lv		-	350	-	cd/m <sup>2</sup>	FIG 2.	2
Viewing angle range	θ	∅ = 90°	80	-	-	deg	FIG 3.	6
		∅ = 270°	80	-	-	deg	FIG 3.	
		∅ = 0°	80	-	-	deg	FIG 3.	
		∅ = 180°	80	-	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	-	0.614	-	FIG 2.	5	
		y	-	0.372	-			
	Green	x	-	0.300	-			
		y	-	0.657	-			
	Blue	x	-	0.142	-			
		y	-	0.065	-			
	White	x	-	0.350	-			
		y	-	0.380	-			

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3,P4, P5)}}$$

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

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

Note 3. 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.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}$$

Note 4. 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. The test equipment is Autronic-Melchers's ConoScope. Series.

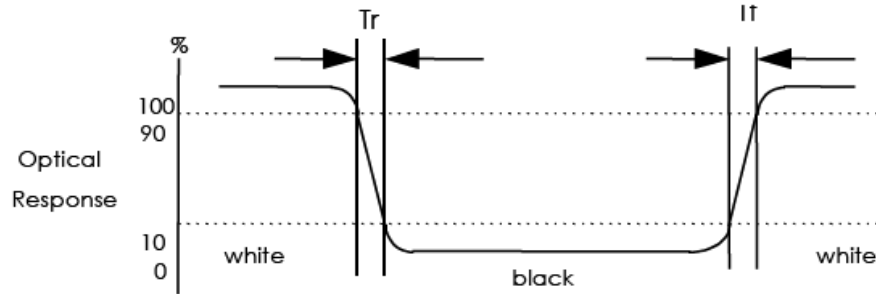
Note 5. CIE (x, y) chromaticity, The x, y value is determined by measuring luminance at each test position 1 through 5,and then make average value.

Note 6. 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.

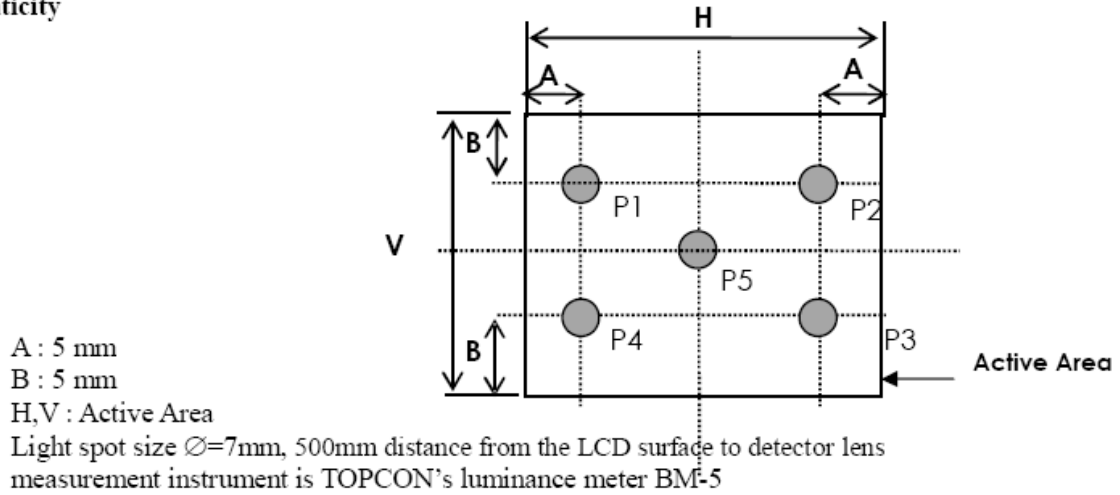
Note 7. For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments For contrast ratio, Surface Luminance, Luminance uniformity, CIE The test data is base on TOPCON's BM-5 photo detector.

**FIG. 1 The definition of Response Time**

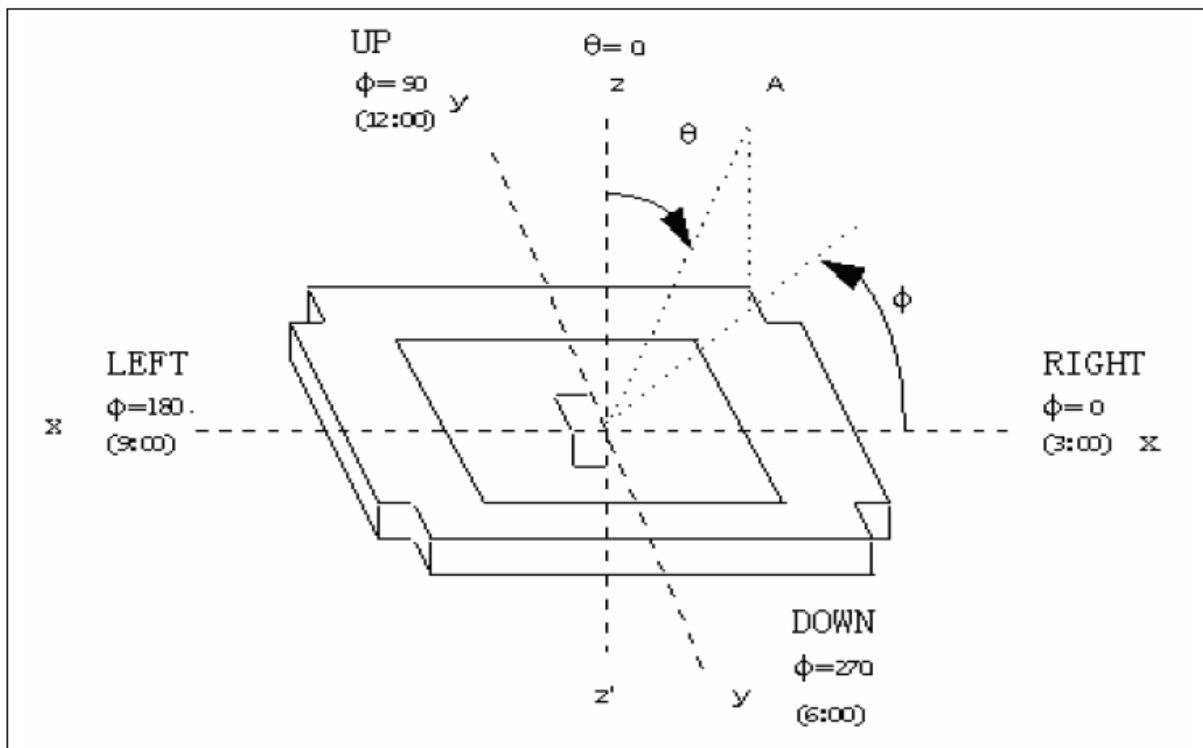
The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.



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



**FIG. 3 The definition of viewing angle**





**■ INTERFACE DESCRIPTION**

Pin No.	Symbol	Description
1	GND	Power ground
2-3	LEDA	Anode of LED backlight
4-5	LEDK	Cathode of LED backlight
6-7	GND	Power ground
8	VCC	Power voltage (2.8V)
9	IOVCC	Power voltage (1.8/2.8V)
10	RESET	Reset signal input terminal, active at "L"
11	VSYNC	Vertical sync input in RGB mode
12	HSYNC	Horizontal sync input in RGB mode
13	GND	Power ground
14	DOTCLK	Pixel clock input in RGB mode
15	GND	Power ground
16	DE	Data Enable input in RGB mode
17-34	DB17-DB0	Data bus
35	SDO	Serial data output pin
36	SDI	Serial data input pin
37	RDX	Read signal
38	WRX/SCL	Write signal/ Serial clock
39	D/CX	Data/command select signal
40	CSX	Chip select signal input terminal, active at "L"
42	TE	Tearing effect output pin to synchronies MCU to frame writing
42	NC	No connect
43	NC	No connect
44	NC	No connect
45	NC	No connect

Note: The MPU system interface mode is selected by R1,R2,R3,R4,R5,R6 on FPC.

When R1,R4,R5=0,R2,R3,R6 NC,select SPI+RGB,and we select this mode on this FPC.

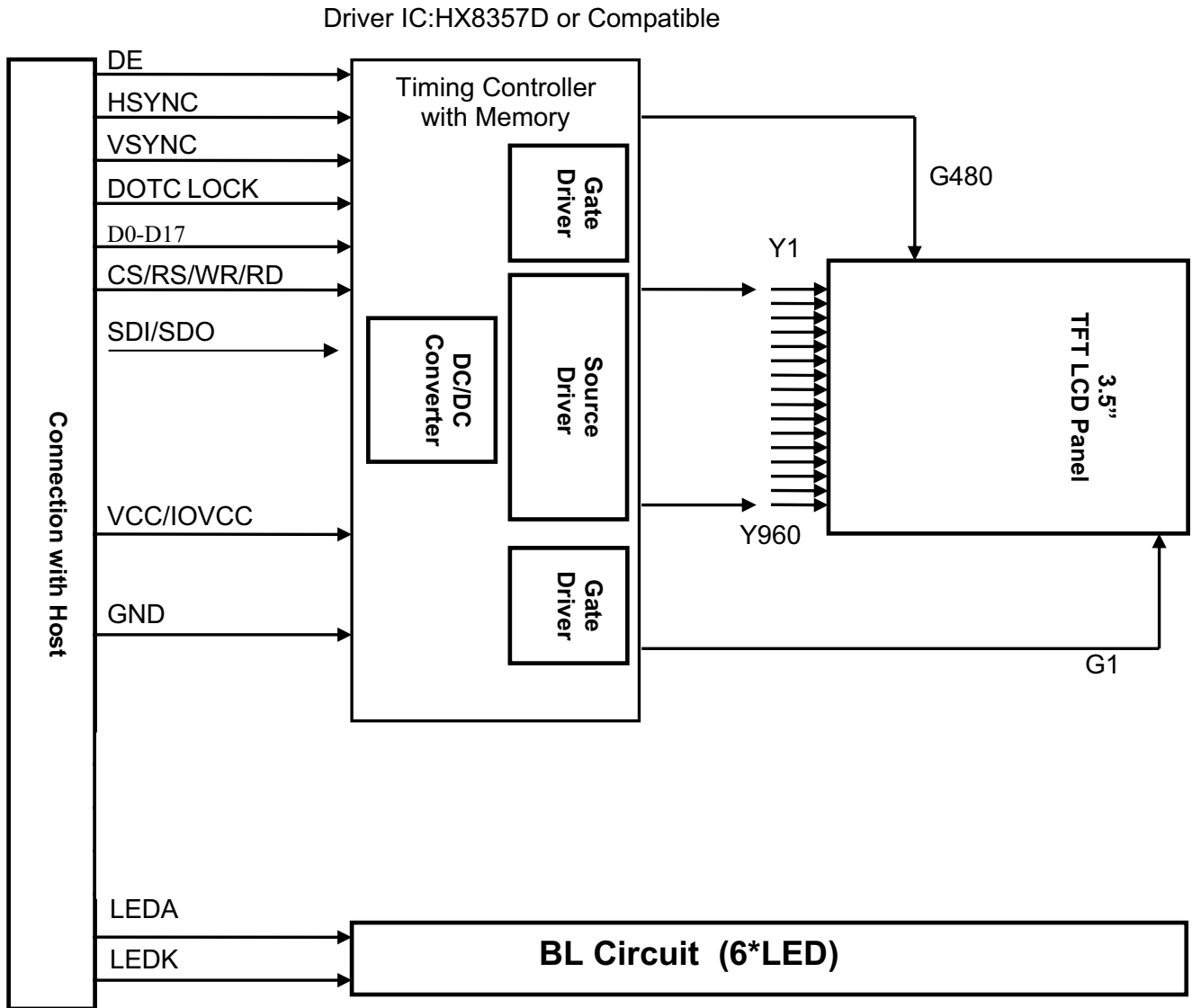
When R2,R3,R6=0,R1,R4,R5 NC,select i80-system 18 bit interface DB0-DB17 used.

When R2,R3,R6=0,R1,R4,R5 NC,select i80-system 16 bit interface DB0-DB15 used.

When R1,R3,R6=0,R2,R4,R5 NC,select i80-system 8 bit interface DB0-DB7 used.

When R1,R4,R6=0,R2,R3,R5 NC,select i80-system 9 bit interface DB0-DB8 used.

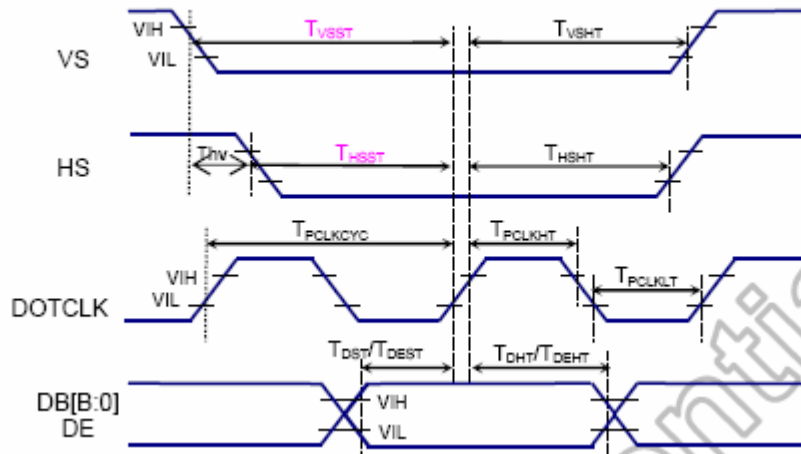
■ BLOCK DIAGRAM



## ■ APPLICATION NOTES

### 1 Timing Characteristics

#### 1.1 DPI Interface Characteristics


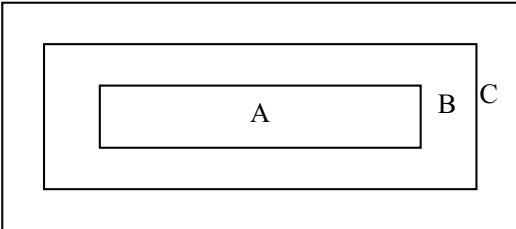


Item	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Pixel low pulse width	T <sub>CLKLT</sub>		15	-	-	ns
Pixel high pulse width	T <sub>CLKHT</sub>		15	-	-	ns
Vertical Sync. set-up time	T <sub>VSST</sub>		15	-	-	ns
Vertical Sync. hold time	T <sub>VSHT</sub>		15	-	-	ns
Horizontal Sync. set-up time	T <sub>HSST</sub>		15	-	-	ns
Horizontal Sync. hold time	T <sub>HSHT</sub>		15	-	-	ns
Data Enable set-up time	T <sub>DEST</sub>		15	-	-	ns
Data Enable hold time	T <sub>DEHT</sub>		15	-	-	ns
Data set-up time	T <sub>DST</sub>		15	-	-	ns
Data hold time	T <sub>DHT</sub>		15	-	-	ns
Phase difference of sync signal falling edge	Thv		0	-	320	Dotclk

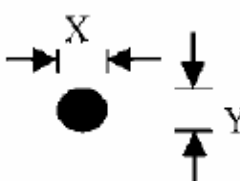
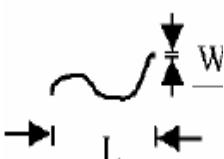
**■ RELIABILITY TEST**

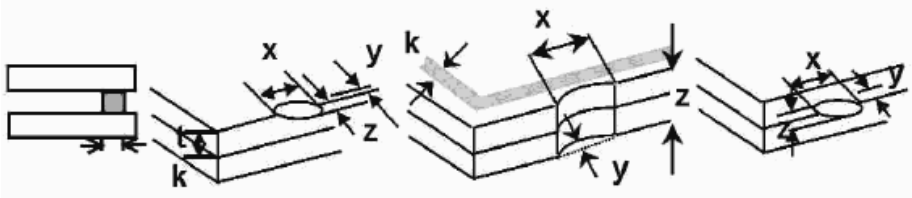
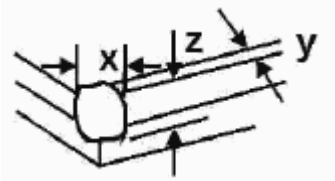
No.	Test Item	Test Condition
1	High Temperature Storage	$80 \pm 2^{\circ}\text{C}/240\text{hours}$
2	Low Temperature Storage	$-30 \pm 2^{\circ}\text{C}/240\text{hours}$
3	High Temperature Operating	$70 \pm 2^{\circ}\text{C}/240\text{hours}$
4	Low Temperature Operating	$-20 \pm 2^{\circ}\text{C}/240\text{hours}$
5	Temperature Cycle	$-30 \pm 2^{\circ}\text{C} \sim 25 \sim 80 \pm 2^{\circ}\text{C} \times 10\text{cycles}$ (30min.) (5min.) (30min.)
6	Damp Proof Test	$60^{\circ}\text{C} \pm 5^{\circ}\text{C} \times 90\%\text{RH}/240\text{hours}$
7	Vibration Test	Frequency: 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep time: 12 min X,Y,Z 2 hours for each direction.
8	Packing drop test	According to ISTA 1A 2001
9	Electrical static discharge	Air: $\pm 4\text{KV } 150\text{pF}/330\Omega$ 5 times
		Contact: $\pm 2\text{KV } 150\text{pF}/330\Omega$ 5 time

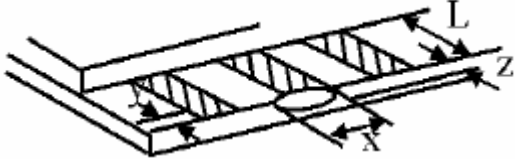
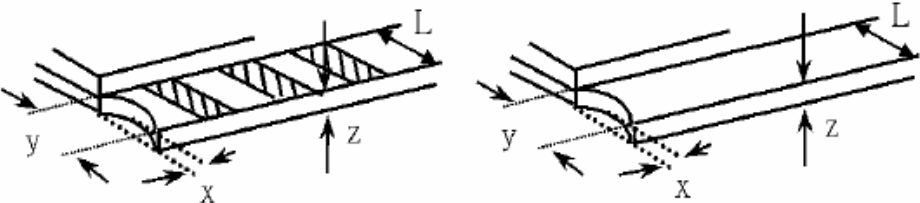
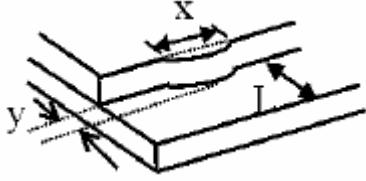
■ INSPECTION CRITERION

 <p style="text-align: center;">OUTGOING QUALITY STANDARD</p>	<p style="text-align: center;">PAGE 1 OF 7</p>
<p>TITLE:FUNCTIONAL TEST &amp; INSPECTION CRITERIA</p>	
<p>This specification is made to be used as the standard acceptance/rejection criteria for Wider Screen TFT-LCD module product.</p> <p><b>1. Sample plan</b></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 style="padding-left: 40px;">Major defect: AQL 0.65</p> <p style="padding-left: 40px;">Minor defect: AQL 1.5</p> <p><b>2. Inspection condition</b></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. (Normal temperature 20~25 C and normal humidity 60± 15%RH).</p> <p><b>3. Definition of Inspection Item.</b></p> <p>3.1 Definition of inspection zone in LCD.</p> <div style="text-align: center; margin: 20px 0;">  </div> <p>Zone A: character/Digit area          Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)          Zone C: Outside viewing area (invisible area after assembly in customer’s product)          ZoneB+ZoneC= Around opaque <u>edge</u> area on TP.</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>	

**4. Major Defect**

NO	Item	Criterion	AQL												
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	0.65												
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display $\leq 0.25\text{mm}$ , no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	2.5												
03	LCD and Touch Panel black spots, white spots, contamination (non - display)	3.1 Round type: As following drawing $\Phi = (X+Y) / 2$  <table border="1" data-bbox="821 996 1353 1216"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.20</math></td> <td>2</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.25</math></td> <td>2</td> </tr> <tr> <td><math>0.25 &lt; \Phi \leq 0.30</math></td> <td>1</td> </tr> <tr> <td><math>0.30 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p>* Densely spaced: No more than two spots within 3mm.</p>	Size(mm)	Acceptable Q' ty	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	2	$0.25 < \Phi \leq 0.30$	1	$0.30 < \Phi$	0	2.5
		Size(mm)	Acceptable Q' ty												
$\Phi \leq 0.10$	Accept no dense														
$0.10 < \Phi \leq 0.20$	2														
$0.20 < \Phi \leq 0.25$	2														
$0.25 < \Phi \leq 0.30$	1														
$0.30 < \Phi$	0														
3.2 Line type: (As following drawing)  <table border="1" data-bbox="726 1355 1353 1568"> <thead> <tr> <th>Length(m m)</th> <th>Width(mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.02</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.05</math></td> <td rowspan="2">2</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.08</math></td> </tr> <tr> <td>---</td> <td><math>0.08 &lt; W</math></td> <td>Rejection</td> </tr> </tbody> </table> <p>* Densely spaced: No more than two lines within 3mm.</p>	Length(m m)	Width(mm)	Acceptable Q' ty	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.05$	2	$L \leq 2.5$	$0.03 < W \leq 0.08$	---	$0.08 < W$	Rejection	2.5
Length(m m)	Width(mm)	Acceptable Q' ty													
---	$W \leq 0.02$	Accept no dense													
$L \leq 3.0$	$0.02 < W \leq 0.05$	2													
$L \leq 2.5$	$0.03 < W \leq 0.08$														
---	$0.08 < W$	Rejection													

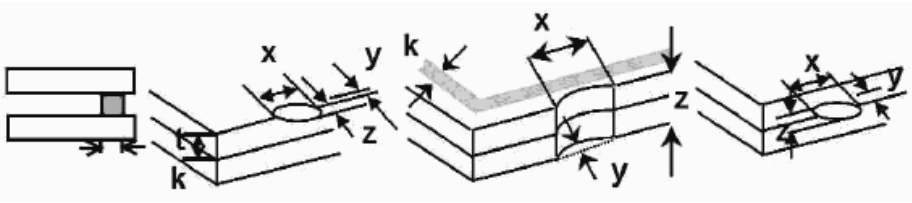
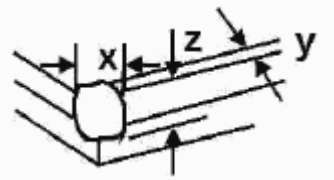
NO	Item	Criterion	AQL																		
04	Polarizer bubbles	<p>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction</p> <table border="1" data-bbox="855 371 1353 591"> <thead> <tr> <th>Size <math>\Phi</math> (mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.20</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.50</math></td> <td>3</td> </tr> <tr> <td><math>0.50 &lt; \Phi \leq 1.00</math></td> <td>2</td> </tr> <tr> <td><math>1.00 &lt; \Phi</math></td> <td>0</td> </tr> <tr> <td>Total Q' ty</td> <td>3</td> </tr> </tbody> </table>	Size $\Phi$ (mm)	Acceptable Q' ty	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Q' ty	3	2.5						
Size $\Phi$ (mm)	Acceptable Q' ty																				
$\Phi \leq 0.20$	Accept no dense																				
$0.20 < \Phi \leq 0.50$	3																				
$0.50 < \Phi \leq 1.00$	2																				
$1.00 < \Phi$	0																				
Total Q' ty	3																				
05	Scratches	Follow NO.3 -2 Line Type.																			
06	Chipped glass	<p>Symbols:  x: Chip length      y: Chip width      z: Chip thickness  k: Seal width      t: Glass thickness      a: LCD side length  L: Electrode pad length</p> <p>6.1 General glass chip:  6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="416 1088 1235 1200"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></td> </tr> </tbody> </table> <p>⊙ Unit: mm  ⊙ If there are 2 or more chips, x is the total length of each chip</p> <p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="416 1581 1235 1693"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></td> </tr> </tbody> </table> <p>⊙ Unit: mm  ⊙ If there are 2 or more chips, x is the total length of each chip</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length																			
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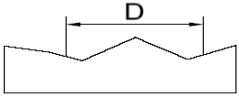
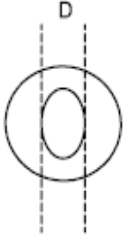
NO	Item	Criterion	AQL																
07	Glass crack	<p>Symbols:            x: Chip length      y: Chip width      z: Chip thickness            k: Seal width      t: Glass thickness      a: LCD side length            L: Electrode pad length</p> <p>7.2 Protrusion over terminal:            7.2.1 Chip on electrode pad:</p>  <table border="1" data-bbox="549 757 1235 913"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq 0.5\text{mm}</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>7.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="549 1256 1235 1413"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq L</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.            ⊙ If the product will be heat sealed by the customer, the alignment mark must not be damaged.</p> <p>7.2.3 Substrate protuberance and internal crack</p>  <table border="1" data-bbox="879 1697 1318 1854"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td><math>y \leq 1/3L</math></td> <td><math>X \leq a</math></td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$X \leq a$	2.5
y: Chip width	x: Chip length	z: Chip thickness																	
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y: width	x: length																		
$y \leq 1/3L$	$X \leq a$																		





NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	2.5 2.5 0.65
10	Bezel	Bezel must comply with product specifications.	2.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	2.5 2.5 2.5 2.5 0.65 0.65
12	FPC	12.1 FPC terminal damage $\cong$ 1/2 FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage $\cong$ 1/2 alignment area and can not affect the function , we judge accept.	2.5 2.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC.	2.5 0.65

NO	Item	Criterion	AQL												
14	Touch Panel Chipped glass	<p>Symbols:            x: Chip length      y: Chip width      z: Chip thickness            k: Seal width      t: Touch Panel Total thickness      a: LCD side length            L: Electrode pad length</p> <p>14.1 General glass chip:            14.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="389 842 1209 1059"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>z \leq t</math></td> <td><math>\leq 1/2 k</math> and not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> </table> <p>⊙ Unit: mm            ⊙ If there are 2 or more chips, x is the total length of each chip</p> <p>14.1.2 Corner crack:</p>  <table border="1" data-bbox="389 1406 1209 1624"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>z \leq t</math></td> <td><math>\leq 1/2 k</math> and not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> </table> <p>⊙ Unit: mm            ⊙ If there are 2 or more chips, x is the total length of each chip</p>	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	2.5
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NO	Item	Criterion	AQL										
15	Touch Panel (Fish eye, dent and bubble on film)	<table border="1" data-bbox="421 353 954 539"> <thead> <tr> <th>SIZE (mm)</th> <th>Acceptable Q' ty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.2</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.2 &lt; D \leq 0.4</math></td> <td>5</td> </tr> <tr> <td><math>0.4 &lt; D \leq 0.5</math></td> <td>2</td> </tr> <tr> <td><math>0.5 &lt; D</math></td> <td>0</td> </tr> </tbody> </table>  	SIZE (mm)	Acceptable Q' ty	$\Phi \leq 0.2$	Accept no dense	$0.2 < D \leq 0.4$	5	$0.4 < D \leq 0.5$	2	$0.5 < D$	0	2.5
SIZE (mm)	Acceptable Q' ty												
$\Phi \leq 0.2$	Accept no dense												
$0.2 < D \leq 0.4$	5												
$0.4 < D \leq 0.5$	2												
$0.5 < D$	0												
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion ( $\leq 2.5\%$ ), it is acceptable.	2.5										
17	Touch Panel Linearity	Less than 2.5% is acceptable.	2.5										
18	LCD Ripple	Touch the touch panel, can not see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	2.5										
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65										

## ■ PRECAUTIONS FOR USING LCD MODULES

### Handing Precautions

(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.

(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.

(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).

(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. 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 is contacting with room temperature air.

(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 alcohol

Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(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.

(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.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(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 remove 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 dried. 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

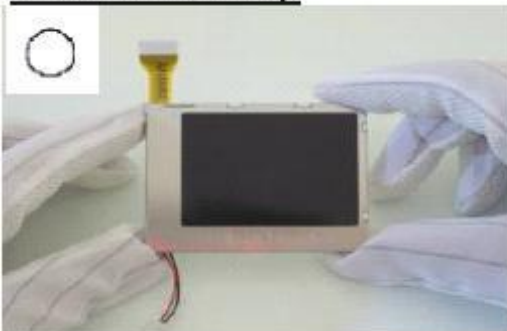
(13) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- 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 LCM.

**Handling precaution for LCM**

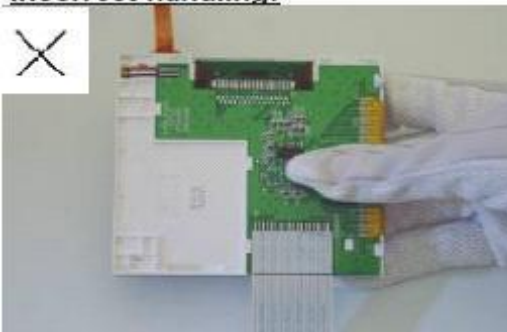
LCM is easy to be damaged.  
Please note below and be careful for handling!

**Correct handling:**

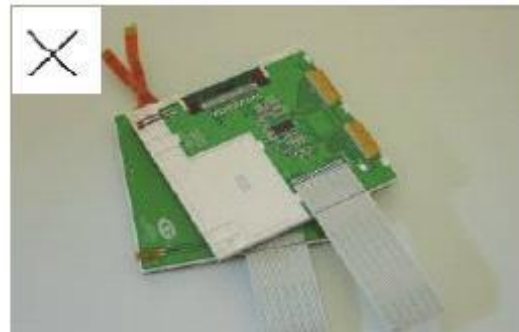


As above picture, please handle with anti-static gloves around LCM edges.

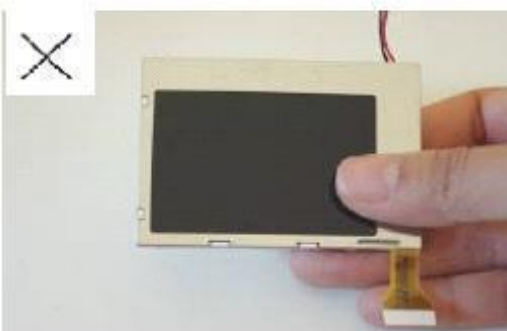
**Incorrect handling:**



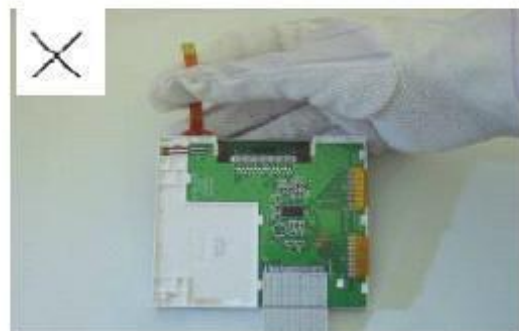
Please don't touch IC directly.



Please don't stack LCM.



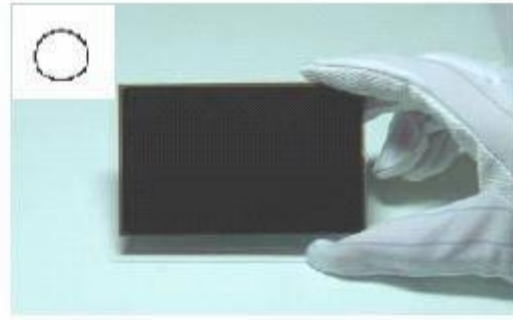
Please don't hold the surface of panel.



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

**Handling precaution for LCD**

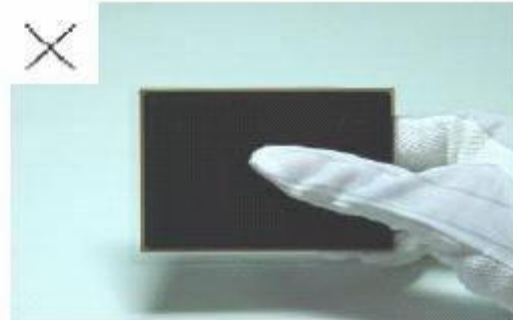
LCD is easy to be damaged.  
Please note below and be careful for handling!

**Correct handling:**

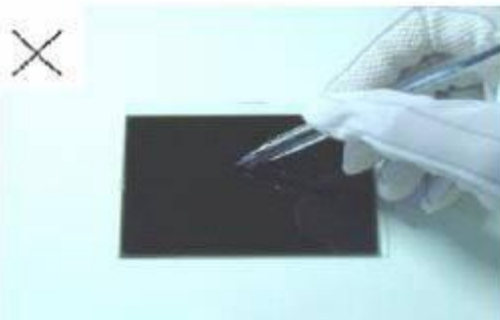
As above photo, please handle with anti-static gloves around LCD edges.

**Incorrect handling:**

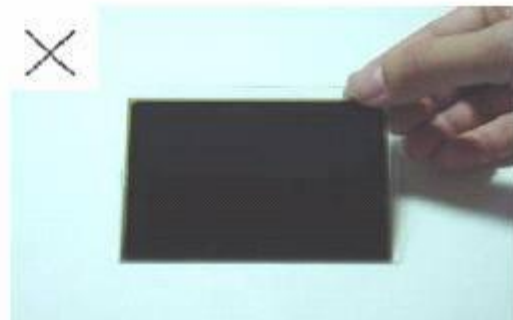
Please don't stack the LCDS.



Please don't hold the surface of LCD.



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



Please don't touch ITO glass without anti-static gloves.

### Storage Precautions

When storing the LCD modules, the following precaution is necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
- (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) 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.

#### Others

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.

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.

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.

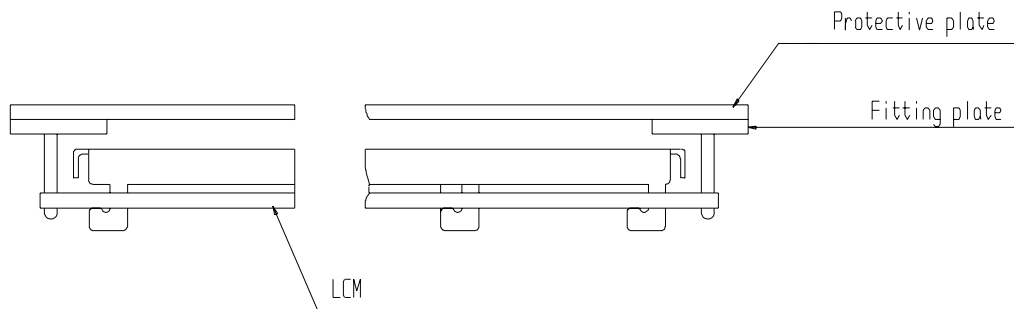
- Exposed area of the printed circuit board.
- Terminal electrode sections.

### USING LCD MODULES

#### 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.

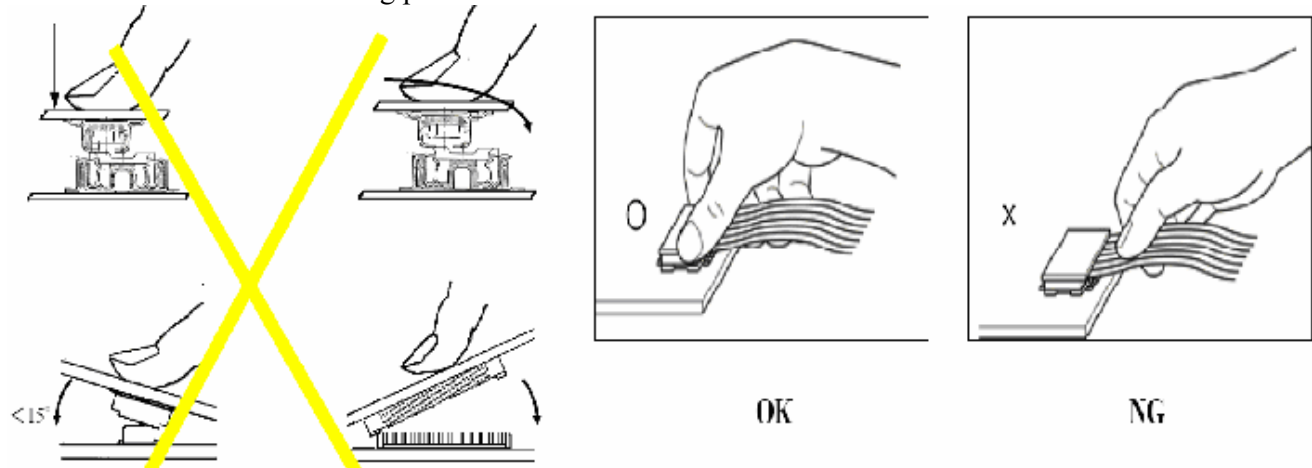
- (1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



- (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  $\pm 0.1$ mm.

#### 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



**Precaution for soldering to the LCM**

	Hand soldering	Machine drag soldering	Machine press soldering
No ROHS product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 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. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

(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.

(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.

(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.

**Precautions for Operation**

(1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

(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.

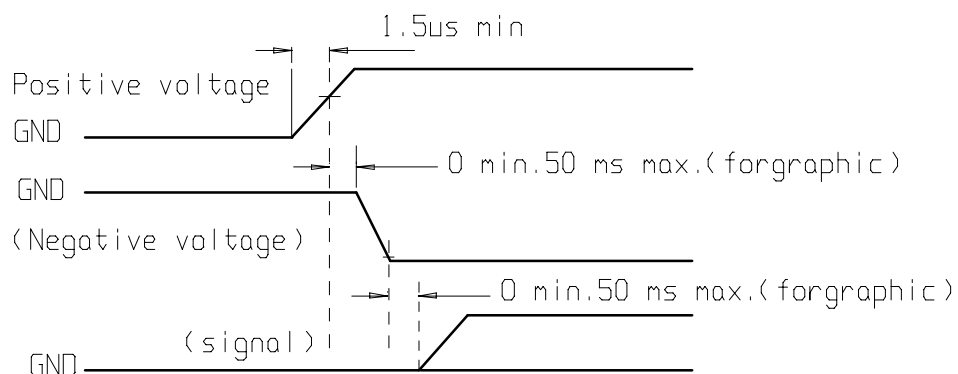
(3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating temperature.

(4) 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.

(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.

(6) Input each signal after the positive/negative voltage becomes stable.

(7) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.





**Safety**

(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.

(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.

**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 (copies available upon request) 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.

**Return LCM under warranty**

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

- Broken LCD glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

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.

**■ PRIOR CONSULT MATTER**

- 1.①For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without notice on our customer.  
②For 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.