MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0430J1T-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	2013-08-23
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2009/04/02	Intial preliminary	
1.1	2009/09/14	Change outline drawing from v1.0 to v1.1	
1.2	2009/11/19	Modify: PIN connections Change outline drawing from v1.1 to v1.3 Modify: Package information	
1.3	2010/10/08	1.Add VLED range 2.Modify: Block diagram 3.Revise sequences of supply voltage and signals 4.Revise Optical characteristics 5.Revise LCM product label define	
1.4	2010/12/28	1.Modify: Vsync cycle 2.Add: Brightness uniformity of the arthmetic formula. 　Modify: Note7:Measured at the center area of the panel with all pixels are white.	
1.5	2013/08/23	Add LED life time	

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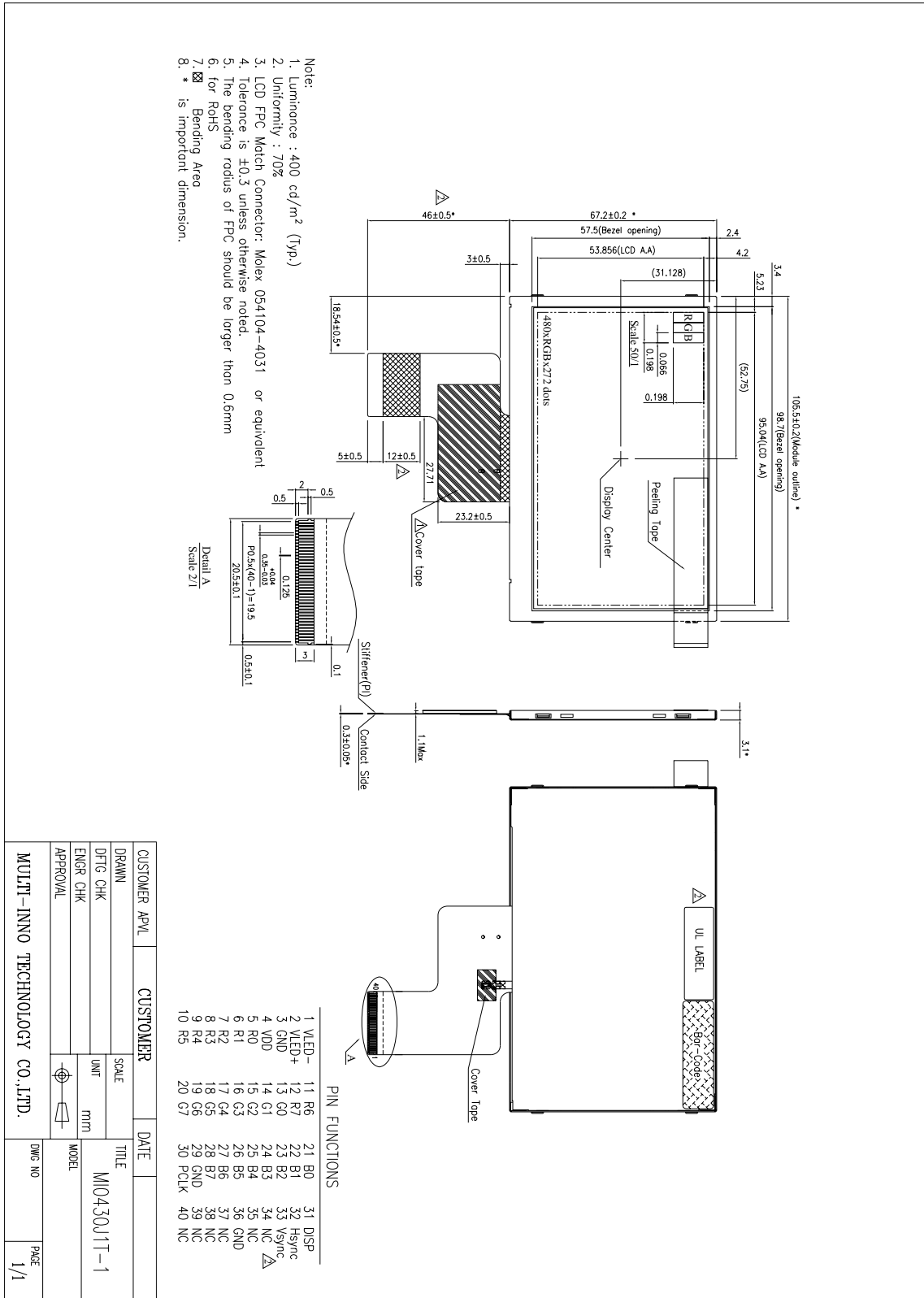
■PACKING SPECIFICATION

■PRIOR CONSULT MATTER

■ **GENERAL INFORMATION**

Item	Contents	Unit
LCD type	TFT	/
Size	4.3	Inch
Viewing direction	Full viewing angle	O' Clock
LCM (W × H × D)	105.50×67.20×3.10	mm^3
Active area (W×H)	95.04×53.856	mm^2
Dot pitch (W×H)	0.660×0.198	mm^2
Number of dots	480 (RGB) × 272	/
Backlight type	7 LEDs	/
Interface type	24 bits RGB	/
Color depth	16.7M	/
Pixel configuration	R.G.B stripe	/
Surface treatment	Anti-glare	/
Input voltage	3.3	V
With/Without TSP	Without RTP	/
Weight	54	g

Note 1: RoHS compliant;
Note 2: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONŞ

Note:
1. Luminance : 400 cd/m² (Typ.)
2. Uniformity : 70%
3. LCD FPC Match Connector: Molex 054104-4031 or equivalent
4. Tolerance is ±0.3 unless otherwise noted.
5. The bending radius of FPC should be larger than 0.6mm
6. for RoHS
7. ⊠ Bending Area
8. * is important dimension.

PIN FUNCTIONS

1 VLED−	11 R6	21 B0	31 DISP
2 VLED+	12 R7	22 B1	32 Hsync
3 GND	13 G0	23 B2	33 Vsync
4 VDD	14 G1	24 B3	34 NC
5 R0	15 G2	25 B4	35 NC
6 R1	16 G3	26 B5	36 GND
7 R2	17 G4	27 B6	37 NC
8 R3	18 G5	28 B7	38 NC
9 R4	19 G6	29 GND	39 NC
10 R5	20 G7	30 PCLK	40 NC

MULTI−INNO TECHNOLOGY CO.,LTD.

CUSTOMER APVL	CUSTOMER		DATE	
DRAWN				
DFTG CHK	SCALE		TITLE	
ENGR CHK	UNIT	mm	MODEL	MI0430J1T−1
APPROVAL			DWG NO	
				PAGE 1/1

■ **ABSOLUTE MAXIMUM RATINGS**

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max60 °C)	RH

■ **ELECTRICAL CHARACTERISTICS**

DC CHARACTERISTICS

Parameter of DC characteristics	Symbol	Min	Typ	Max	Unit
Power supply voltage	VDD	3.0	3.3	3.6	V
Power Current	Idd	-	12	-	mA
Ripple voltage	V_{RFVDD}	-	-	100	mVp-p
	V_{RFVDD}	-	-	100	mVp-p
Input voltage 'H' level	VIH	0.7VDD	-	VDD	V
Input voltage 'L' level	VIL	0	-	0.3VDD	V

■ **BACKLIGHT CHARACTERISTICS**

Ta= 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_L	-	20	-	mA	
VLED voltage	V_L	21.0	23.1	26.6	V	I_L=20 mA
LED life time		20,000	-	-	Hrs	

VLED+ ▷|▷|▷|▷|▷|▷|▷| VLED-
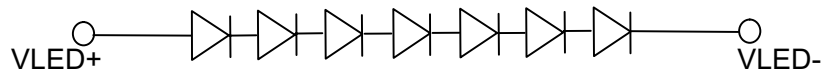
■ ELECTRO-OPTICAL CHARACTERISTICS

Item of electro-optical characteristics	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+Tf	θ=0° ∅=0° Ta=25℃	-	25	-	ms	FIG 1.	4
Contrast ratio	Cr		-	300	-	--	FIG 2.	1
Luminance uniformity	δ WHITE		70	-	-	%	FIG 2.	3
Surface Luminance	Lv		320	400	-	cd/m^2	FIG 2.	2
Viewing angle range	θ	∅ = 90°	70	80	–	deg	FIG 3.	6
		∅ = 270°	70	80	–	deg	FIG 3.	
		∅ = 0°	70	80	–	deg	FIG 3.	
		∅ = 180°	70	80	–	deg	FIG 3.	
CIE (x, y) chromaticity	Red x	θ=0° ∅=0° Ta=25℃	-	-	-	-	FIG 2.	5
	Red y		-	-	-	-		
	Green x		-	-	-	-		
	Green y		-	-	-	-		
	Blue x		-	-	-	-		
	Blue y		-	-	-	-		
	White x		0.27	0.32	0.37	-		
	White x		0.28	0.33	0.38	-		

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

$$ContrastRatio = \frac{Average\ Surface\ Luminance\ with\ all\ white\ pixels\ (P1, P2, P3, P4, P5)}{Average\ Surface\ Luminance\ with\ all\ black\ pixels\ (P1, P2, P3, P4, P5)}$$

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

Lv = Average Surface Luminance with all white pixels   (P1, P2, P3, 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.

$$\delta\ WHITE = \frac{\textbf{Minimum}\ Surface\ Luminance\ with\ all\ white\ pixels\ (P_1, P_2, P_3, P_4, P_5)}{\textbf{Maximum}\ Surface\ Luminance\ with\ all\ white\ pixels\ (P_1, P_2, P_3, P_4, P_5)}$$

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 conrast 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 transmissive module,Gray scale reverse occurs in the direction of   panel viewing angle.

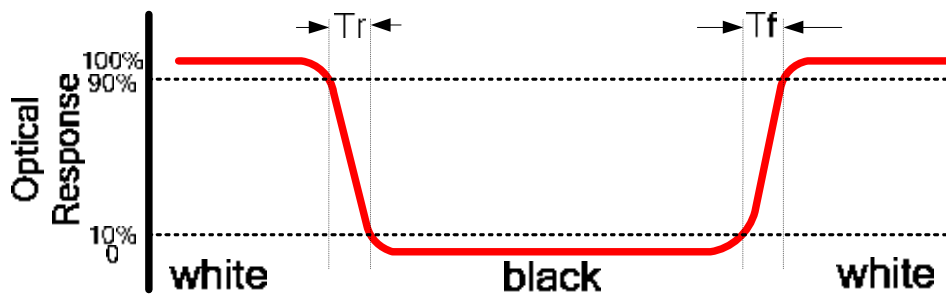**FIG.1.   The definition of Response Time**

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 $\varnothing$=5mm, 500mm distance from the LCD surface to detector lens
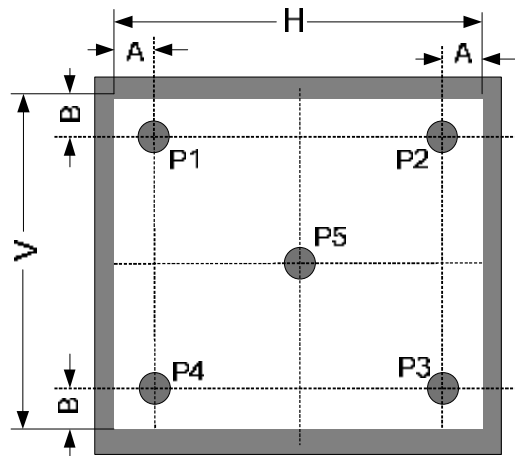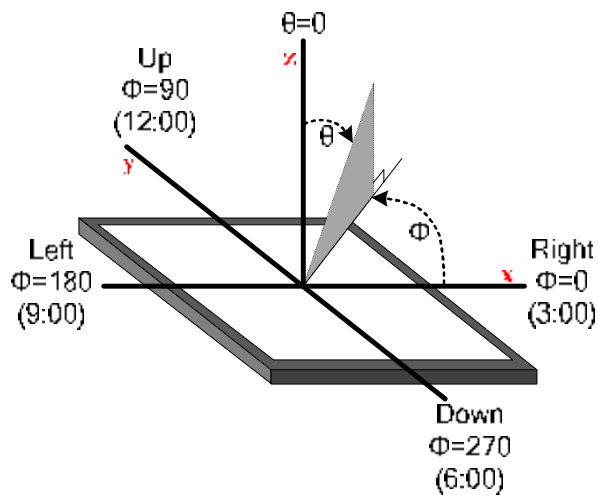measurement instrument is TOPCON's luminance meter BM-5

FIG.3.   The definition of viewing angle

■ **INTERFACE DESCRIPTION**

Pin No	Symbol	Function	Remark
1	VLED-	LED Power Source input terminal (Cathode side)	
2	VLED+	LED Power Source input terminal (Anode side)	
3	GND	Ground	
4	VDD	Power Supply : +3.3V	
5	R0	Red pixel data(LSB)	
6	R1	Red pixel data	
7	R2	Red pixel data	
8	R3	Red pixel data	
9	R4	Red pixel data	
10	R5	Red pixel data	
11	R6	Red pixel data	
12	R7	Red pixel data(MSB)	
13	G0	Green pixel data(LSB)	
14	G1	Green pixel data	
15	G2	Green pixel data	
16	G3	Green pixel data	
17	G4	Green pixel data	
18	G5	Green pixel data	
19	G6	Green pixel data	
20	G7	Green pixel data(MSB)	
21	B0	Blue pixel data(LSB)	
22	B1	Blue pixel data	
23	B2	Blue pixel data	
24	B3	Blue pixel data	
25	B4	Blue pixel data	
26	B5	Blue pixel data	
27	B6	Blue pixel data	
28	B7	Blue pixel data(MSB)	
29	GND	Ground	
30	PCLK	clock signal to sample each data	
31	DISP	Display ON/OFF Signal ON=H, OFF=L	
32	HSYNC (HS)	Horizontal synchronous signal	
33	VSYNC (VS)	Vertical synchronous signal	
34	NC	No Connection	
35	NC	No Connection	
36	GND	Ground	
37	NC	No Connection	
38	NC	No Connection	
39	NC	No Connection	
40	NC	No Connection	

■ **REFERENCE APPLICATION CIRCUIT**

Please consult our technical department for detail information.

■ REFERENCE APPLICATION NOTES

1.1 INPUT SIGNAL TIMING SPECIFICATIONS

The specification of input signals timing is as the following table and timing diagram.

(T_A =25ºC, VDD=2.25V~3.6V, GND= 0V)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Clock cycle	f_{CLK}	5	9	12	MHz	
Hsync cycle	1/th	-	16.95	-	KHZ	
Vsync cycle	1/tv	-	58.85	-	HZ	
Horizontal Signal						
Horizontal cycle	Th	490	531	605	CLK	
Horizontal display period	Thdisp	-	480	-	CLK	
Horizontal front porch	Thfp	2	8	-	CLK	
Horizontal pulse width	Thw	1	-	-	CLK	
Horizontal back porch	Thbp	8	43	-	CLK	
Vertical Signal						
Vertical cycle	Tv	275	288	335	H[(1)]	
Vertical display period	Tvdisp	-	272	-	H[(1)]	
Vertical front porch	Tvfp	1	4	-	H[(1)]	
Vertical pulse width	Tvw	1	10	-	H[(1)]	
Vertical back porch	Tvbp	2	12	-	H[(1)]	

Note:
✧ In case of using the slow frequency, the deterioration of display flicker etc may occur.
✧ The timing characteristics are basically fixed as above.
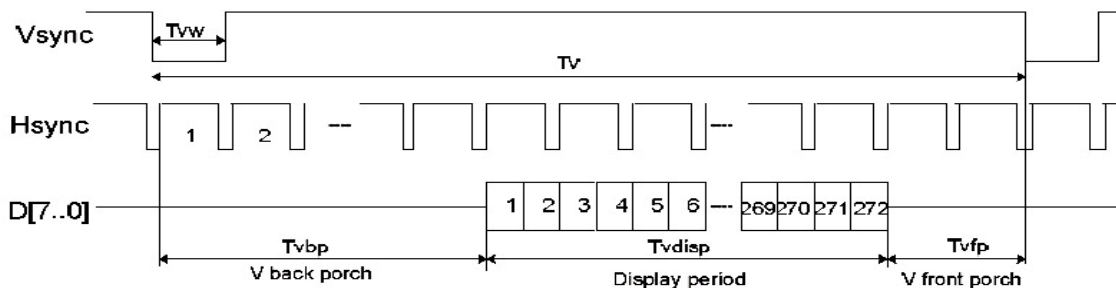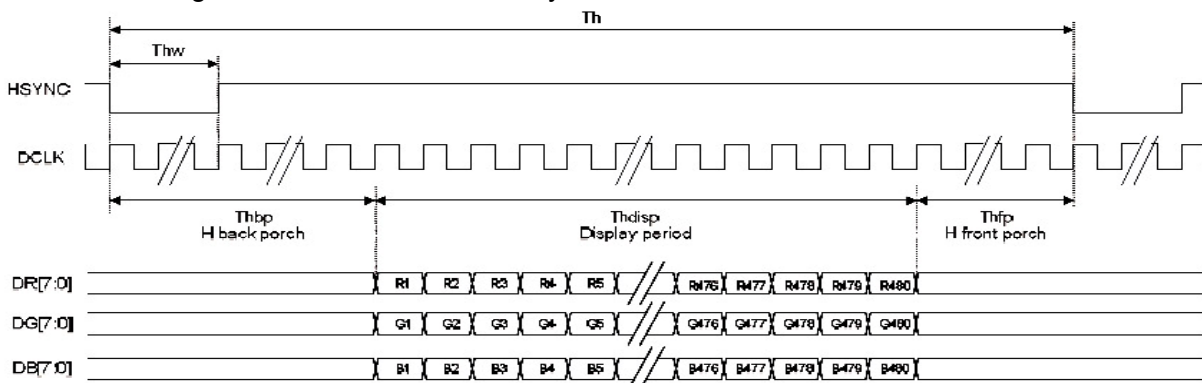
Figure 1-1 Sync mode Input timing

1.2 Color DATA INPUT ASSIGNMENT

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	R5	R4	R3	R2	R1	R0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[NOTE] :
1) Definition of Gray level : Color(n) : n to show the Gray level，n is the more high and the light more bright.
2) Data:1-High, 0-Low.

1.3 Sequences of supply voltage and signals

1.3.1 Power on Sequence
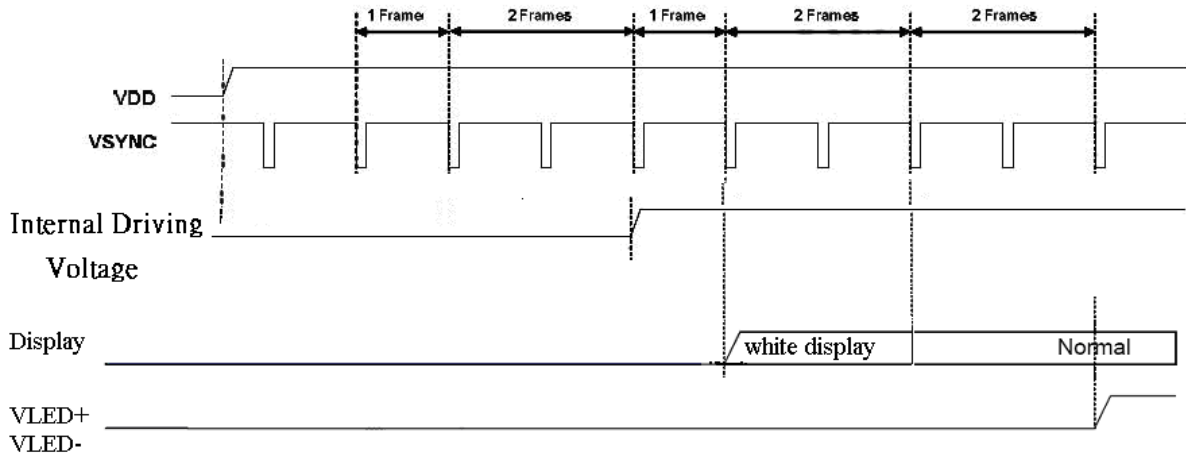
1.3.2 Power off Sequence
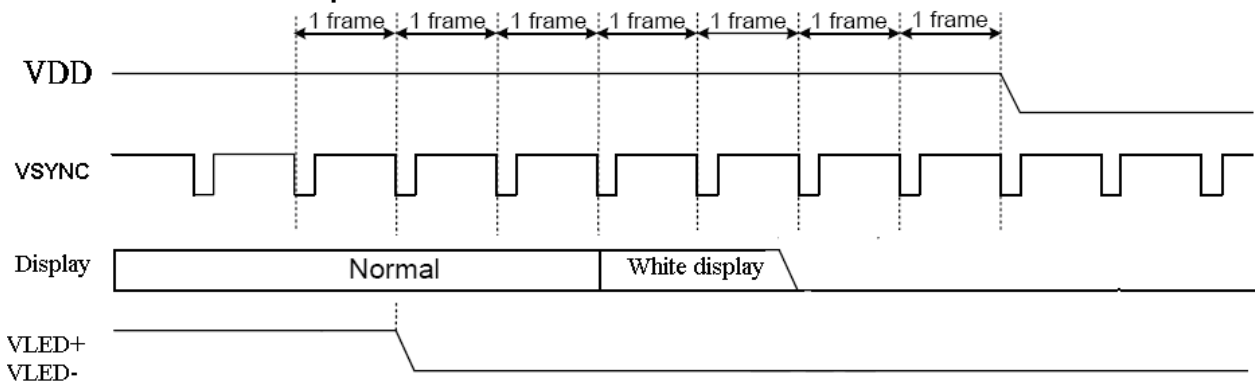
■ RELIABILITY TEST CONDITIONS

No.	Test Item	Test Condition
1	High Temperature Storage	80±2℃/240 hours
2	Low Temperature Storage	-30±2℃/240 hours
3	High Temperature Operating	70±2℃/240 hours
4	Low Temperature Operating	-20±2℃/240 hours
5	Temperature Cycle storage	-30±2℃~25~80±2℃×200cycles (30min.)　(5min.)　(30min.)
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours
7	Vibration Test (no-operation)	Frequency：0~55Hz Amplitude:1.5mm Sweep time: 11min 6 cycles for each direction of X.Y.Z
8	ESD test (No operation)	±2KV

■ INSPECTION CRITERION

This specification is made to be used as the standard acceptance/rejection criteria for Normal LCM Product.

1 Sample plan

Sampling plan according to GB/T2828.1-2003/ISO 2859-1：1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

Major defect: AQL 0.65

Minor defect: AQL 1.5

2. Inspection condition

● 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).

● Driving voltage

The Vop value from which the most optimal contrast can be obtained near the specified Vop in the specification (Within ±0.5V of the typical value at 25°C.).

3. Definition of inspection zone in LCD.
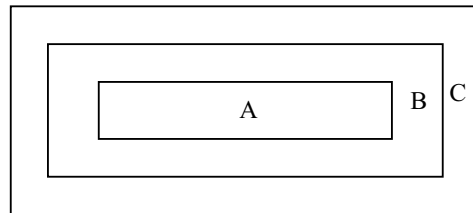
Zone A: character/Digit area

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)

Fig.1 Inspection zones in an LCD.

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.

4.Inspection Standard

4.1 Major Defect
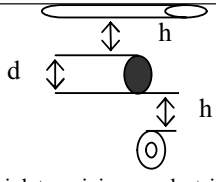
Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	

4.2 Cosmetic Defect
4.2.1 Module Cosmetic Criteria

No.	Item	Judgement Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on Printed Circuit Boards	visible copper foil ($\varnothing$0.5mm or more) on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No accretion of metallic foreign matters (Not exceed $\varnothing$0.2mm)	Minor Minor
6	Stain	No stain to spoil cosmetic badly	Minor
7	Plate discoloring	No plate fading, rusting and discoloring	Minor

8	Solder amount
	
	1. Lead parts
		a. Soldering side of PCB
		  Solder to form a 'Filet'
		  all around the lead.
		  Solder should not hide the
		  lead form perfectly. (too much)
		b. Components side
		  (In case of 'Through Hole PCB')
		
		Solder to reach the Components side of PCB.
			Minor

	2. Flat packages	Either 'Toe' (A) or 'Seal' (B) of the lead to be covered by 'Filet'. Lead form to be assume over solder.	Minor
	3. Chips	(3/2) H $\geq$ h $\geq$ (1/2) H	Minor
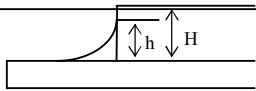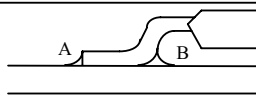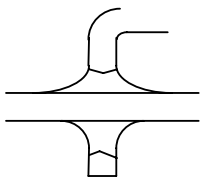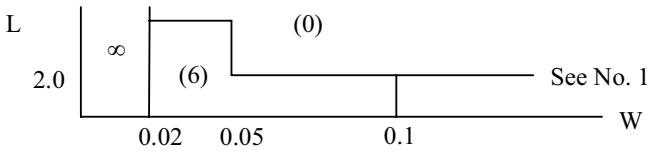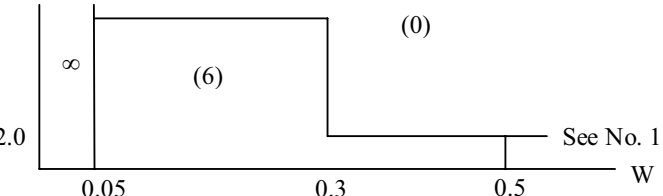
| 9 | Solder ball/Solder splash | a. The spacing between solder ball and the conductor or solder pad h ≥0.13mm The diameter of solder ball d $\leq$0.15mm.
 b. The quantity of solder balls or solder Splashes isn't beyond 5 in 600 mm ^{2} .
 c. Solder balls/Solder splashes do not violate minimum electrical clearance.
  d. Solder balls/Solder   splashes must be entrapped/encapsulated Or attached to the metal surface .

 NOTE: Entrapped/encapsulated/attached is intended to mean that normal service environment of the product will not cause a solder ball to become dislodged. | Minor

 Minor

 Major

 Minor |

4.2.2 Cosmetic Criteria (Non-Operating)
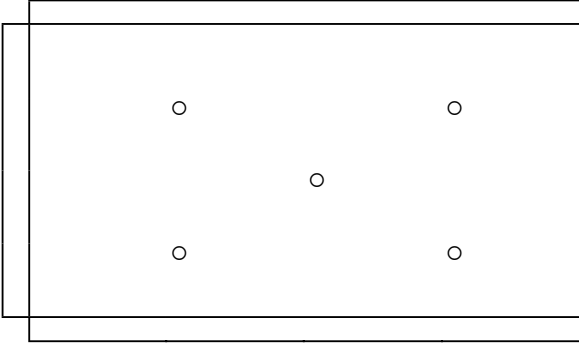
No.	Defect	Judgment Criterion	Partition
1	Spots	In accordance with *Screen Cosmetic Criteria (Operating) No.1*.	Minor
2	Lines	In accordance with *Screen Cosmetic Criteria (Operating) No.2*.	Minor
3	Bubbles in polarizer		Minor

Size : d mm	Acceptable Qty in active area
d ≤ 0.3	Disregard
0.3 < d ≤ 1.0	3
1.0 < d ≤ 1.5	1
1.5 < d	0

No.	Defect	Judgment Criterion	Partition
4	Scratch	In accordance with spots and lines operating cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
5	Allowable density	Above defects should be separated more than 30mm each other.	Minor
6	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-lit type should be judged with back-lit on state only.	Minor
7	Contamination	Not to be noticeable.	Minor

4.2.3 Cosmetic Criteria (Operating)

No.	Defect	Judgment Criterion	Partition
1	Spots	A) Clear	Minor

Lcd size	Size : d mm	Acceptable Qty in active area
Lcd size≤8.0'	d≤0.1	Disregard
	0.1＜d≤0.2	6
	0.2＜d≤0.3	2
	0.3 < d	0
Lcd size＞8.0'	d ≤0.1	Disregard
	0.1＜d≤0.3	10
	0.3＜d≤0.5	5
	0.5 < d	0

Note :   Including pin holes and defective dots which must be within one pixel size; Total defective point shall not exceed 6 pcs no more than 8 inch LCD and 10PCS for more than 8 inch LCD.

B) Unclear

Lcd size	Size : d mm	Acceptable Qty in active area
Lcd size≤ 8.0'	d≤0.2	Disregard
	0.2＜d≤0.5	6
	0.5＜d≤0.7	2
	0.7＜d	0
Lcd size ＞8.0'	d≤0.2	Disregard
	0.2＜d≤0.5	10
	0.5＜d≤0.7	3
	0.7＜d≤1.0	1
	1.0< d	0

Note :   Total defective point shall not exceed 6 pcs for no more than 8 inch LCD and 10PCS for more than 8 inch LCD.

No.	Defect	Judgment Criterion	Partition
2	Lines	A) Clear	Minor

```
L
      2.0  | ∞        (0)
           |    (6)              See No. 1
           |_____  W
            0.02  0.05      0.1
```

Note :   ( ) - Acceptable Qty in active area
     L   - Length (mm)
     W   - Width (mm)
     ∞   - Disregard

B) Unclear

```
L
           | ∞     _____(0)
           |    (6)|
      2.0  |_____|_____  See No. 1
                          W
            0.05    0.3   0.5
```

'Clear'   = The shade and size are not changed by V_{op}.
'Unclear' = The shade and size are changed by V_{op}.

3	Rubbing line	Not to be noticeable.	Minor
4	Allowable density	Above defects should be separated more than 10mm each other.	Minor
5	Rainbow	Not to be noticeable.	Minor
6	Dot size	To be 95% ~ 105% of the dot size (Typ.) in drawing. Partial defects of each dot (ex. pin-hole) should be treated as 'Spot'. (see *Screen Cosmetic Criteria (Operating) No.1*)	Minor
7	Uneven brightness (only back-lit type module)	Uneven brightness must be BMAX / BMIN $\leq$ 2 - BMAX : Max. value by measure in 5 points - BMIN : Min. value by measure in 5 points Divide active area into 4 vertically and horizontally. Measure 5 points shown in the following figure. ○ : Measuring points	Minor

Note :

(1) Size : d = (long length + short length) / 2

(2) The limit samples for each item have priority.

(3) Complex defects are defined item by item, but if the numbers of defects are defined in above table, the total number should not exceed 10.

(4) In case of 'concentration', even the spots or the lines of 'disregarded' size should not allowed. Following three situations should be treated as 'concentration'.

- 7 or over defects in circle of $\varnothing$5mm.

- 10 or over defects in circle of $\varnothing$10mm.

- 20 or over defects in circle of $\varnothing$20mm.

■ PRECAUTIONS FOR USING LCD MODULES

1   Handing 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 alcohol
       Do 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 solvents
       Wipe 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.
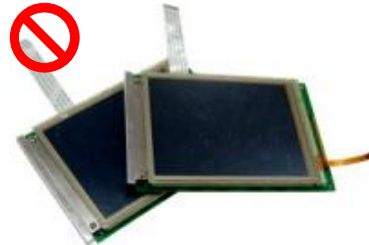   **2.2   Correct handling:**

As above picture, please handle with anti-static gloves around LCM edges.
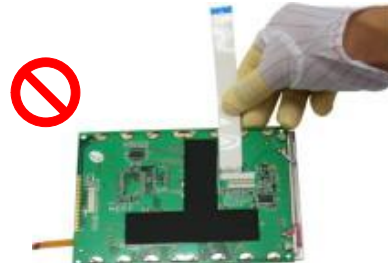
   2.3   Incorrect handling:

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

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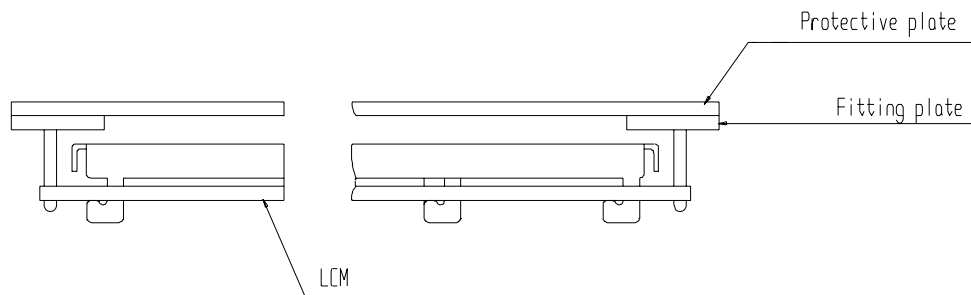
　4.1.2　When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

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
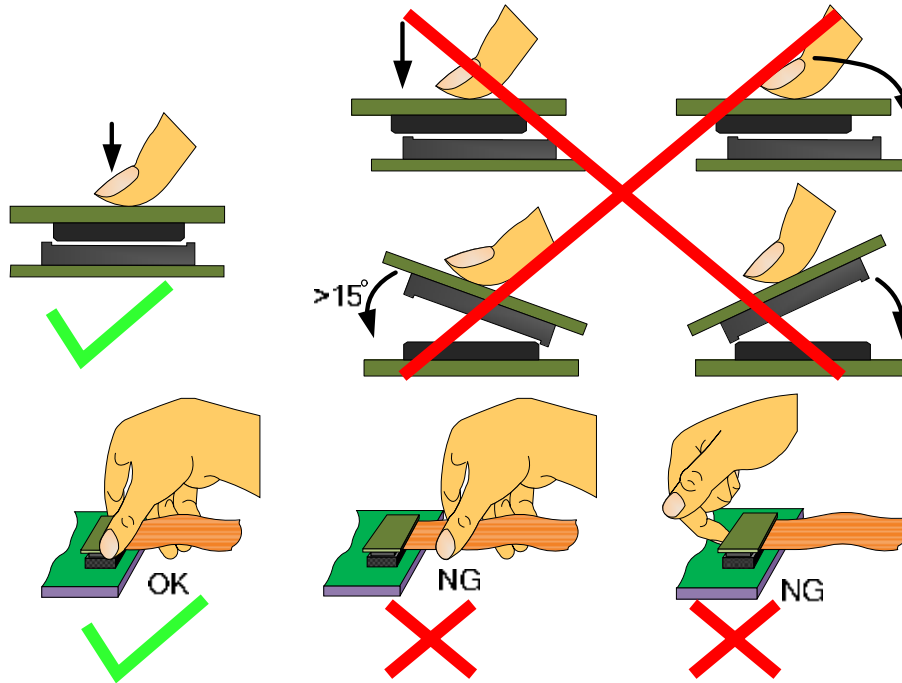
4.3   Precaution for soldering the LCM

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

2　For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.

3　If you have special requirement about reliability condition, please let us know before you start the test on our samples.