MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0570B1T

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.2
Engineering	
Date	2012-02-22
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2009-12-30	First Release	
1.1	2010-01-18	Update operation temperature Update chromaticity parameter	
1.2	2012-02-22	Update viewing direction	

CONTENTS

■ **GENERAL INFORMATION**

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	5.7	Inch
Viewing direction	6:00	O' Clock
Gray scale inversion direction	12:00	O' Clock
LCM (W × H × D)	144.00×104.60×12.30	mm^3
Active area (W×H)	115.20×86.40	mm^2
Pixel pitch (W×H)	0.180×0.180	mm^2
Number of dots	640 (RGB) × 480	/
Backlight type	21 LEDs	/
Interface type	RGB 18 bits	/
Color depth	262K	/
Pixel configuration	R.G.B vertical stripe	/
Surface treatment(Up polarizer)	Anti-glare(3H)	/
Input voltage	3.3	V
With/Without TSP	Without TSP	/
Weight	TBD	g

Note 1:Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.
Note 2 : RoHS compliant;
Note 3: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONS

CN1 Pin Asign

Pin NO.	Symbol
1	GND
2	CK
3	Hsync
4	Vsync
5	GND
6	R0
7	R1
8	R2
9	R3
10	R4
11	R5
12	GND
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	GND
20	B0
21	B1
22	B2
23	B3
24	B4
25	B5
26	GND
27	ENAB
28	VCC
29	VCC
30	R/L
31	U/D
32	NC
33	GND

CN2 Pin Asign

PIN#	Symbol	Cable color
1	AN1	Red
2	AN2	Red
3	AN3	Red
4	CA1	White
5	CA2	Blue
6	CA3	Black

Notes:
1. unmarked tolerance:±0.50mm;
2. Display Type: a-Si TFT ;
3. Operating Temperature:-20℃~+70℃;
4. Storage Temperature:-30℃~+85℃;
5. Gray Scale Inversion: 12 o'clock;
6. Viewing Direction: 6 o'clock;
7. CN2 LED Power source Connector:SHLP-06V-S-B(JST) or Compatible,
   Mating Connector:SM06B-SHLS-TF(JST) or Compatible;
8. CN1 Connector type: 089H33-000100-G2-R (STARCONN)
9. Requirement on Environment Protection:RoHS Compliant.

DETAIL A
5.7" VGA 640*480

View direction
(6' Clock)

Display Area Center

104.60±0.50
89.40(bezel opening)
88.60(Top Polarizer)
86.40(AA)
51.10
68.30
115.20(AA)
117.40(Top Polarizer)
118.20(bezel opening)
144.00±0.50

DETAIL A
6061
0.18
0.06
0.18
RGB

CN2

(2.30typ)
12.8max.

(11.40)
80.00±5.00

4-M2.60±0.1

The hole for nominal size 3mm se lf-tapping
screw attachment depth 3.5mm(4 p oint)
Suggested applying torque 0.15~0. 2Nm

LCM LABEL
BLU LABEL
CN1

2-136.60
4.50
3.70±0.30
(20.60)
(29.20)
4.10±0.30
50.80
2-96.40

CUSTOMER APVL		DATE	
DRAWN			TITLE
DFTG CHK		SCALE	MI0570B1T
ENGR CHK		UNIT	mm
APPROVAL	·	MODEL	

CUSTOMER

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DWG NO

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■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Power voltage	VCC	-0.5	5.0	V
Input voltage	VIN	-0.5	5.0	V
Operating temperature	T_{OP}	-20	70	°C
Storage temperature	T_{ST}	-30	85	°C
Humidity	RH	-	90%(Max60°C)	RH

Note 1:The parameter is for driver IC(gate driver,source driver) only.

Note 2:Signals include R0~R5,G0~G5,B0~B5,CK,Hsync,Vsync,Enable,R/L,U/D.

■ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	VCC	3.0	3.3	3.6	V
Permissive input ripple voltage	V_{RF}	-	-	100	mVp-p
Input voltage ' H ' level	V_{IH}	0.7VCC	-	VCC	V
Input voltage ' L ' level	V_{IL}	0	-	0.3VCC	V
Common electrode driving siganl	VCOM	-	TBD	-	V
Current of VCC power supply	I_{VCC}	-	TBD	TBD	mA

Note 1:For different LCM,the value may have a bit of difference.

Note 2:To test the current dissipation,use "all Balck Pattern".

■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Series 1 forward current	I_1	-	25	-	mA	
Series 2 forward current	I_2	-	25	-	mA	Note 1
Series 3 forward current	I_3	-	25	-	mA	
Forward voltage	V_{BL}	19.95	-	25.9	V	
Backlight power consumption	W_{BL}	-	1732.5	-	mW	
Life time	-	25,000	50,000	-	Hrs	Note 3

Note 1: I_F is defined for one channel LED. There are total three LED channels in back light unit

Note 2: Optical performance should be evaluated at Ta=25℃ only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.
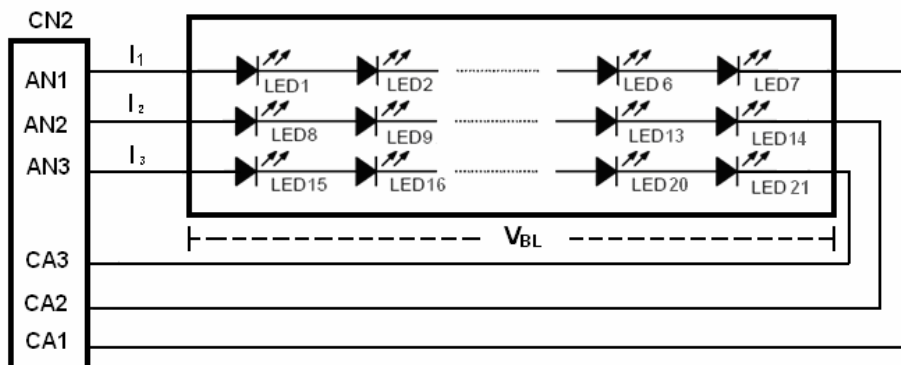
LED connection of backlight

■**ELECTRO-OPTICAL CHARACTERISTICS**

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf		-	20	30	ms	FIG 1.	4
Contrast ratio		Cr	θ=0°	400	500	-	---	FIG 2.	1
Luminance uniformity		δ WHITE	∅=0° Ta=25℃	75	80	-	%	FIG 2.	3
Surface Luminance		Lv		320	400	-	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	60	70	-	deg	FIG 3.	6
			∅ = 270°	50	60	-	deg	FIG 3.	
			∅ = 0°	60	70	-	deg	FIG 3.	
			∅ = 180°	60	70	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	θ=0° ∅=0° Ta=25℃	0.548	0.598	0.648		FIG 2.	5
		y		0.292	0.342	0.392			
	Green	x		0.284	0.334	0.384			
		y		0.535	0.585	0.635			
	Blue	x		0.092	0.142	0.192			
		y		0.052	0.102	0.152			
	White	x		0.252	0.302	0.352			
		y		0.279	0.329	0.379			
NTSC	-	-	-	-	50	-	%	-	-

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.

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

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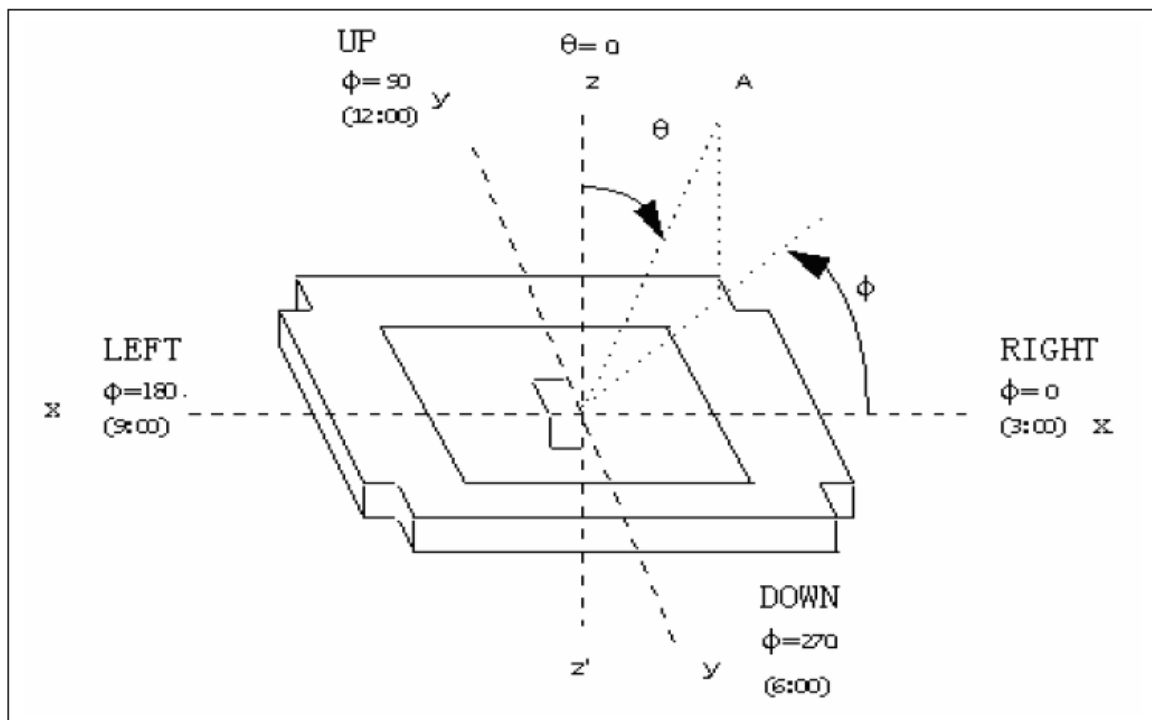
Note 5. CIE (x, y) chromaticity，The x, y value is determined by measuring luminance at each test position 1 through 5,and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the 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.

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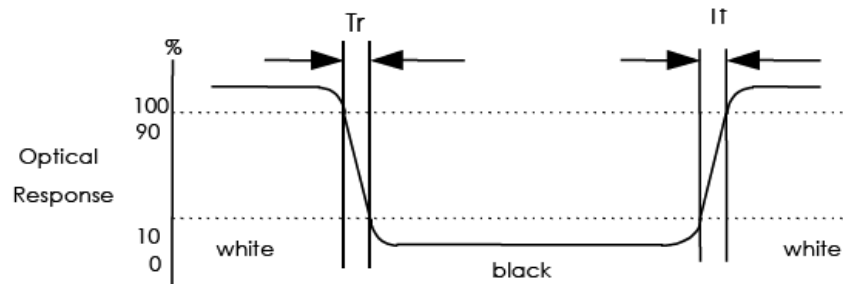
FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=7mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5
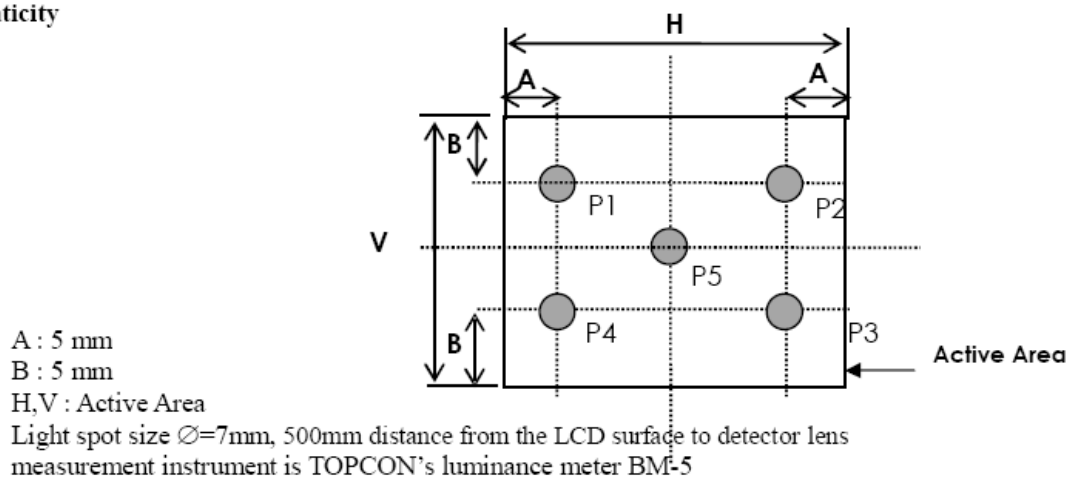
FIG. 3 The definition of viewing angle

■ **INTERFACE DESCRIPTION**

1. CN1 pin assignment (Signal interface)

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	CK	I	Dot clock. Latch data at falling edge of CK.	
3	Hsync	I	Horizontal sync signal in SYNC mode. Pull low or floating when DE mode.	
4	Vsync	I	Vertical sync signal in SYNC mode. Pull low or floating when DE mode.	
5	GND	P	Ground	
6	R0	I	Red data (LSB)	
7	R1	I	Red data	
8	R2	I	Red data	
9	R3	I	Red data	
10	R4	I	Red data	
11	R5	I	Red data (MSB)	
12	GND	P	Ground	
13	G0	I	Green data(LSB)	
14	G1	I	Green data	
15	G2	I	Green data	
16	G3	I	Green data	
17	G4	I	Green data	
18	G5	I	Green data(MSB)	
19	GND	P	Ground	
20	B0	I	Blue data(LSB)	
21	B1	I	Blue data	
22	B2	I	Blue data	
23	B3	I	Blue data	
24	B4	I	Blue data	
25	B5	I	Blue data(MSB)	
26	GND	P	Ground	
27	ENAB	I	Data enable signal in DE mode. This pin must pull high when SYNC mode.	
28	VCC	P	Power supply	
29	VCC	P	Power supply	
30	R/L	I	Set horizontal scan direction: Low/NC: left to right;　High: right to left	
31	U/D	I	Set vertical scan direction: High/NC: up to down;　Low: down to up	
32	NC	-	No connection	
33	GND	P	Ground	

Note1:　I/O definition:
I----Input　　O----Output　　P----Power/Ground
Note2: CN1 Matching FPC type: 33 pin, pitch: 0.5mm, height: 0.3mm.

2. CN2 pin assignment (Backlight interface)

Connector type: SHLP-06V-S-B (JST)

No	Symbol	I/O	Description	Comment
1	AN1	P	LED Anode Terminal	Red
2	AN2	P	LED Anode Terminal	Red
3	AN3	P	LED Anode Terminal	Red
4	CA1	P	LED Cathode Terminal	White
5	CA2	P	LED Cathode Terminal	Blue
6	CA3	P	LED Cathode Terminal	Black

Note1: CN2 Matching Connector type: SM06B-SHLS-TF (JST)
Note2:P: Power/GND; I: input pin; I/O: input or output pin;

■ BLOCK DIAGRAM
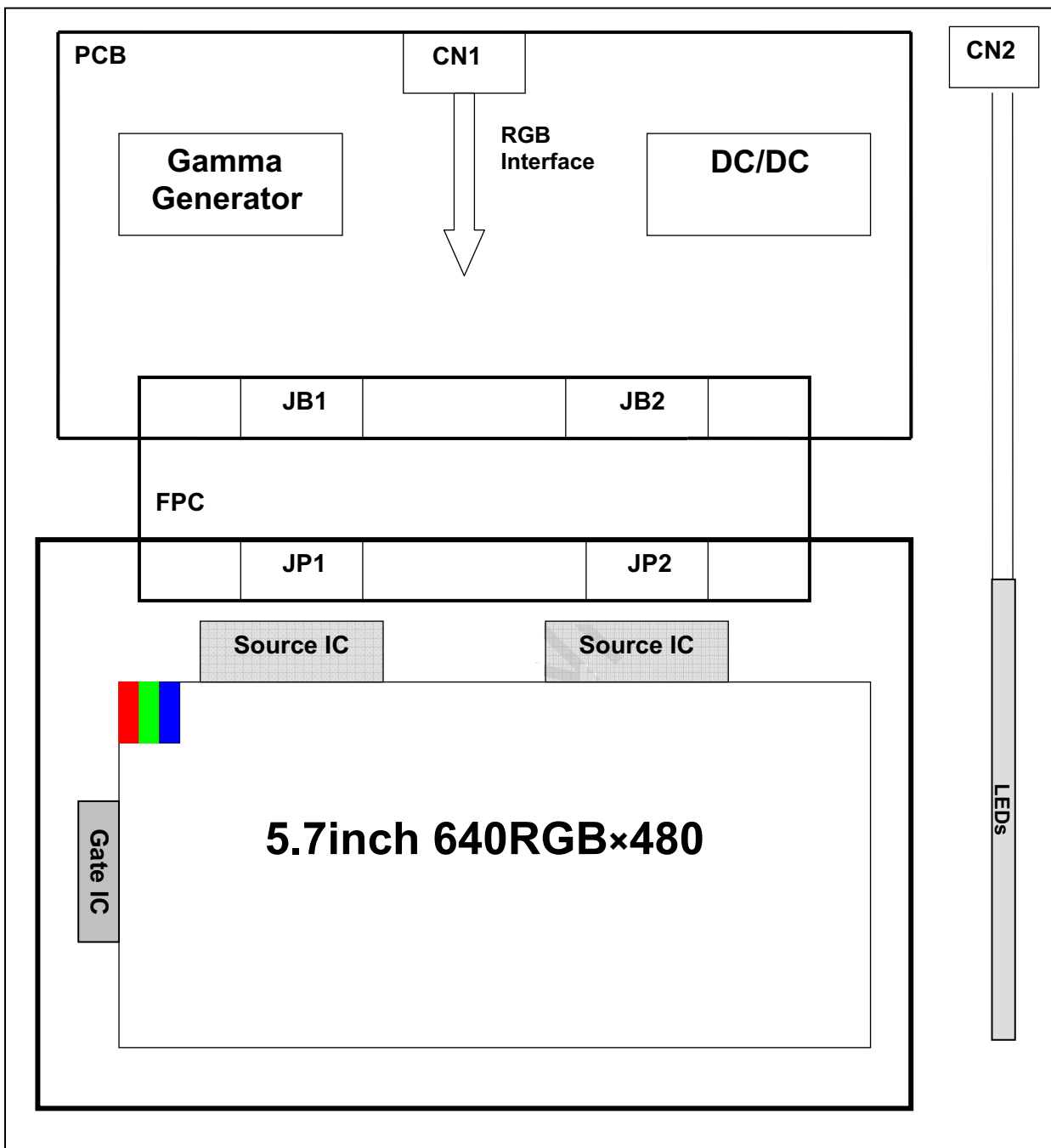
■ APPLICATION NOTES

1. Data input timing

1.1 SYNC mode

Parameter	Symbol	Symbol	Min	Typ	Max	Unit
CK	Dotclk frequency	Fclk	24.8	25.2	34.2	MHz
	Dotclk cycle	Tclk	29.24	39.68	40.32	ns
Hsync	Horizontal display area	Thd	640	640	640	Tclk
	1 horizontal line	Th	800	800	1000	Tclk
	Hsync pulse width	Thpw	1	-	-	Tclk
	Horizontal blank	Thb	144	144	144	Tclk
	Horizontal front porch	Thfp	16	16	216	Tclk
Vsync	Frame rate	-	-	60	-	Hz
	Vertical display area	Tvd	480	480	480	Th
	Vsync period time	Tv	516	525	570	Th
	Vsync pulse width	Tvpw	1	-	-	Th
	Vsync blank	Tvb	35	35	35	Th
	Vsync front porch	Tvfp	1	10	55	Th

Table 1.1 SYNC mode input timing

1.2 DE mode

Description		Symbol	Min	Typ	Max	Unit
CK	Dot clock frequency	Fclk	24.8	25.2	34.2	MHz
Horizontal section	Horizontal total	Th	800	800	1000	Tclk
	H Total blank	Thb+Thfp	160	160	360	Tclk
	Valid Data Width	Thd	640	640	640	Tclk
Vertical section	Frame rate	-	-	60	-	Hz
	Vertical total	Tv	516	525	570	Th
	V total blank	Tvb+Tvfp	36	45	90	Th
	Valid Data Width	Tvd	480	480	480	Th

Note: The LCM could auto-detect which mode is working.

Table 1.2 DE mode input timing

1.3. Timing Diagram
1.3.1 Vertical Input Timing
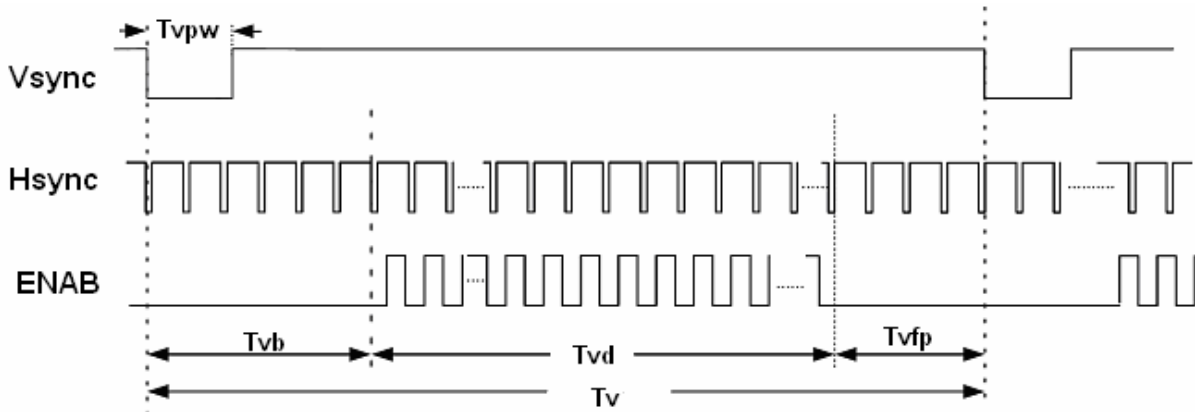
Figure 1.3.1 Vertical input timing

1.3.2 Horizontal Input Timing
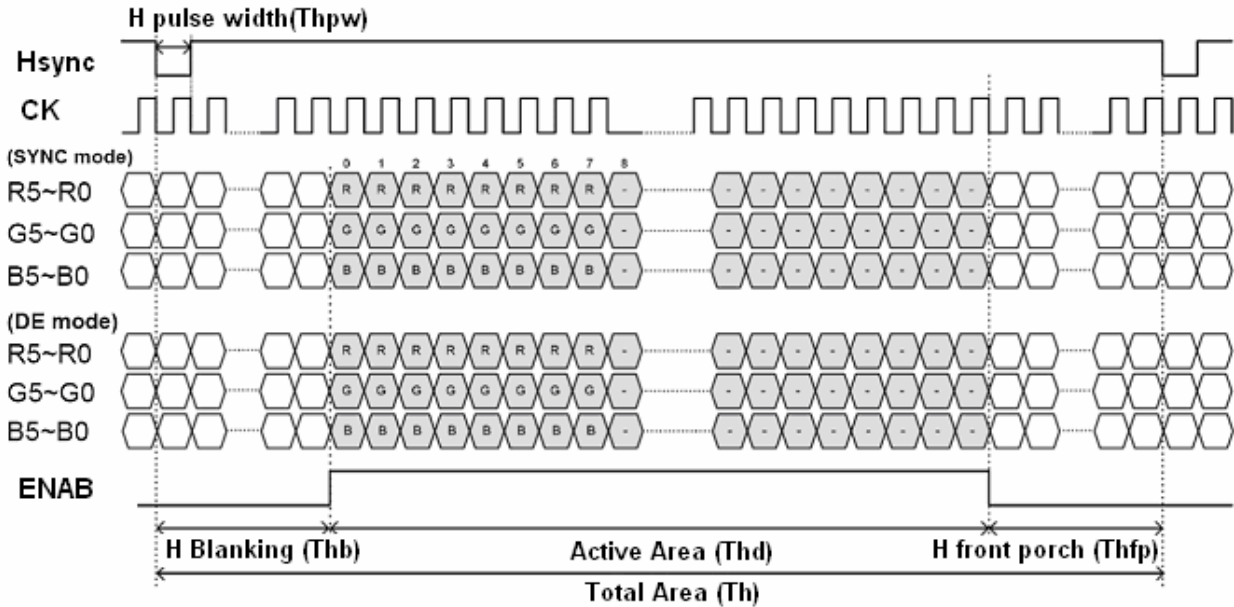
Figure 1.3.2 Horizontal input timing

1.4 AC input characteristics

(VCC=3.3V, GND=0V, Ta=25℃)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
CK pulse duty	Tcwh	40%	50%	60%	Tclk	
Vsync setup time	Tvst	8	-	-	ns	
Vsync hold time	Tvhd	8	-	-	ns	
Hsync setup time	Thst	8	-	-	ns	
Hsync hold time	Thhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	Rn, Gn, Bn to Dotclk
Data hold time	Tdhd	8	-	-	ns	Rn, Gn, Bn to Dotclk
ENAB setup time	Tesu	8			ns	

Table 1.4 AC input characteristics
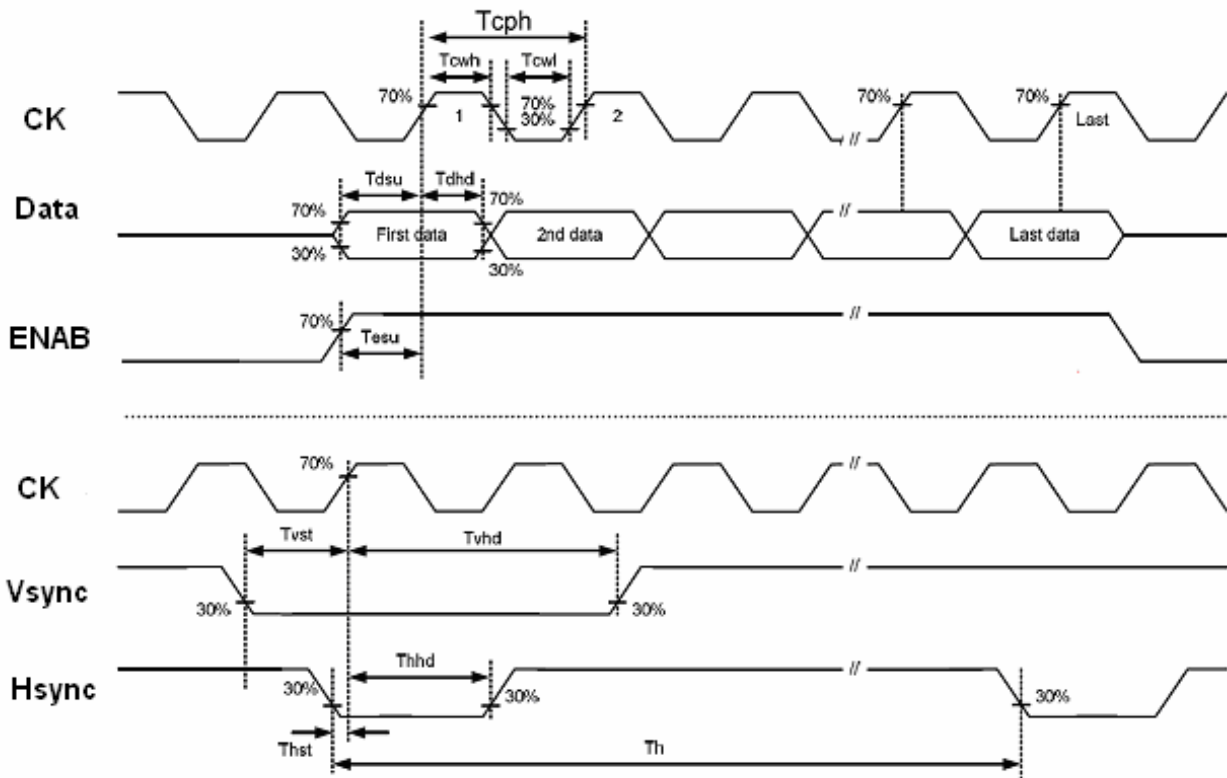
Figure 1.4 AC input characteristics

1.5 Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.0V to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	50	-	-	ms	
Signal off to VCC 3.0V	Tp3	0	-	50	ms	
Backlight off to signal off	Tp4	50	-	-	ms	

Table 1.5 Power on/off sequence
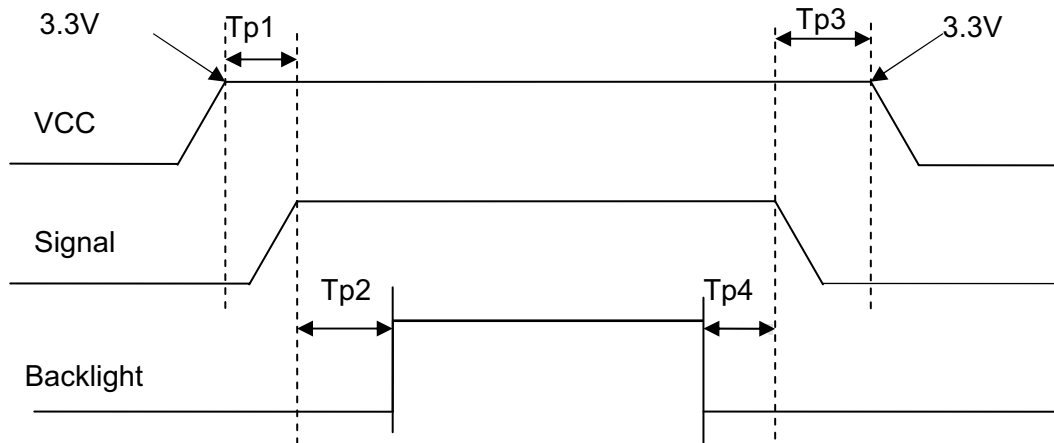
Figure 1.5 Power on/off sequence

■ **RELIABILITY TEST**

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	85±2℃/240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	70±2℃/240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Operating	-20±2℃/240 hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	-20±2℃~25~60±2℃×100cycles (30min.)　(5min.)　(30min.)	Start with cold temperature, End with high temperature, IEC60068-2-14 GB2423.22
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours	IEC60068-2-78 GB/T2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~200Hz, Stroke:1.5mm Sweep:10Hz~200Hz~10Hz 30 minutes for each direction of X,Y,Z(1.5 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:80cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330Ω,5points/panel Air:±15KV,5times Contact:±8KV,5times(Environment: 15℃~35℃,30%~60%,86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	Half sine wave:50G 20ms,±X,±Y,±Z 3times each direction	IEC60068-2-27 GB/T2423.5
11	Package vibration test	Random vibration: 0.015G*G/Hz for 5-200Hz,-6dB/Octave from 200-400Hz 2 hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-34 GB/T2423.11

Note 1:Ts is the temperature of panel's surface.
Note 2:Ta is the ambient temperature of sample.

■ **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.
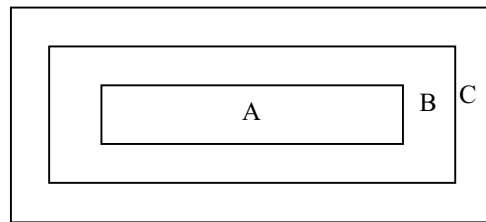
Fig.4

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.4 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.
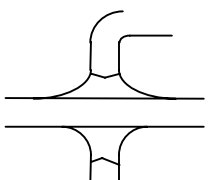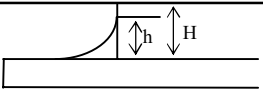
4.Inspection Standard
4.1 Major Defect

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
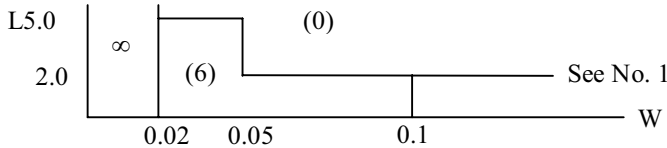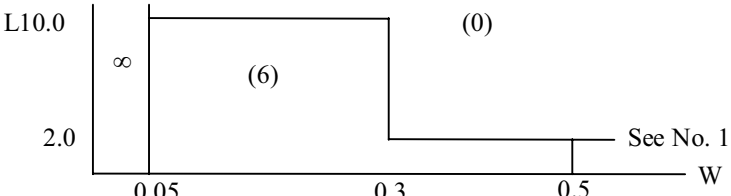
No.	Item	Judgement Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on Printed Circuit Boards	visible copper foil ($\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 ≥ h ≥ (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.	Minor Minor Major
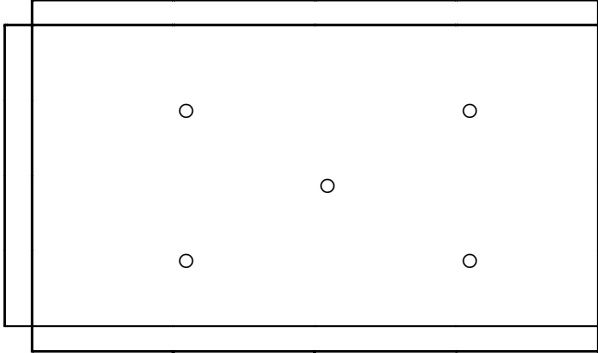
		d. Solder balls/Solder splashes must be entrapped/encapsulated Or attached to the metal surface . NOTE: Entrapped/encapsulated/attached is intended to mean that normal service environment of the product will not cause a solder ball to become dislodged.	Minor

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	<table><tr><td>Size : d mm</td><td>Acceptable Qty in active area</td></tr><tr><td>d ≤ 0.3</td><td>Disregard</td></tr><tr><td>0.3 < d ≤ 1.0</td><td>3</td></tr><tr><td>1.0 < d ≤ 1.5</td><td>1</td></tr><tr><td>1.5 < d</td><td>0</td></tr></table>	Minor
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 <table><tr><td>Lcd size</td><td>Size : d mm</td><td>Acceptable Qty in active area</td></tr><tr><td rowspan=4>Lcd size≤ 8.0'</td><td>d≤0.1</td><td>Disregard</td></tr><tr><td>0.1＜d≤0.2</td><td>6</td></tr><tr><td>0.2＜d≤0.3</td><td>2</td></tr><tr><td>0.3 < d</td><td>0</td></tr><tr><td rowspan=4>Lcd size＞8.0'</td><td>d ≤0.1</td><td>Disregard</td></tr><tr><td>0.1＜d≤0.3</td><td>10</td></tr><tr><td>0.3＜d≤0.5</td><td>5</td></tr><tr><td>0.5 < d</td><td>0</td></tr></table> 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 <table><tr><td>Lcd size</td><td>Size : d mm</td><td>Acceptable Qty in active area</td></tr><tr><td rowspan=4>Lcd size≤ 8.0'</td><td>d≤0.2</td><td>Disregard</td></tr><tr><td>0.2＜d≤0.5</td><td>6</td></tr><tr><td>0.5＜d≤0.7</td><td>2</td></tr><tr><td>0.7＜d</td><td>0</td></tr><tr><td rowspan=5>Lcd size ＞8.0'</td><td>d≤0.2</td><td>Disregard</td></tr><tr><td>0.2＜d≤0.5</td><td>10</td></tr><tr><td>0.5＜d≤0.7</td><td>3</td></tr><tr><td>0.7＜d≤1.0</td><td>1</td></tr><tr><td>1.0< d</td><td>0</td></tr></table> Note : Total defective point shall not exceed 6 pcs for no more than 8 inch LCD and 10PCS for more than 8 inch LCD.	Minor
2	Lines	A) Clear L5.0 ∞ (0) 2.0 (6) See No. 1 0.02 0.05 0.1 W Note : ( ) - Acceptable Qty in active area L - Length (mm) W - Width (mm) ∞ - Disregard B) Unclear L10.0 ∞ (0) (6) 2.0 See No. 1 0.05 0.3 0.5 W 'Clear' = The shade and size are not changed by V_{op}. 'Unclear' = The shade and size are changed by V_{op}.	Minor

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 ≤ 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. O : 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 ∅5mm.
         - 10 or over defects in circle of ∅10mm.
         - 20 or over defects in circle of ∅20mm.

■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.
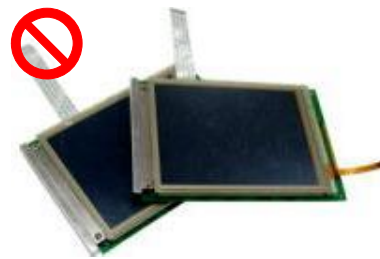
Handling precaution for LCM

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.
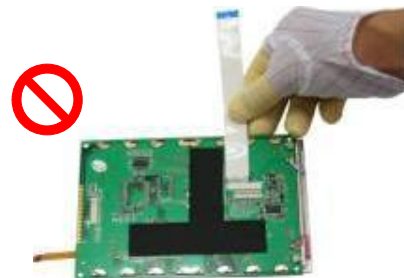
Incorrect handling:
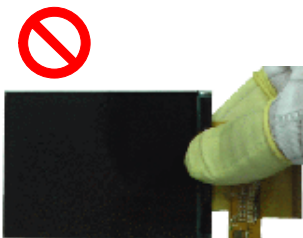

Please don't touch IC directly.

Please don't stack LCM.

Please don't hold the surface of panel.

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

Please don't hold the surface of IC.

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

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.
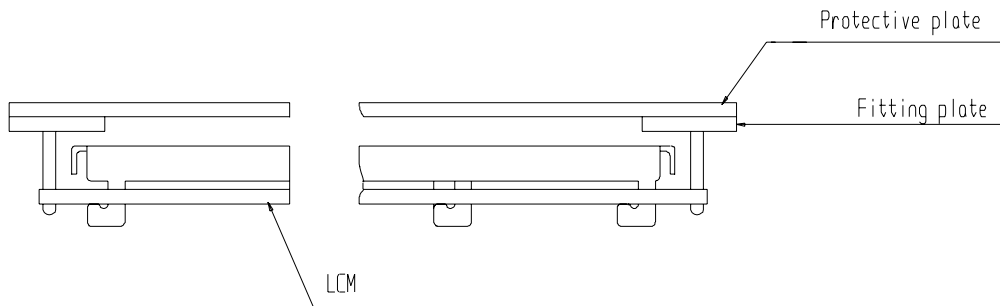
　　- Exposed area of the printed circuit board.

　　-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 ±0.1mm.

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
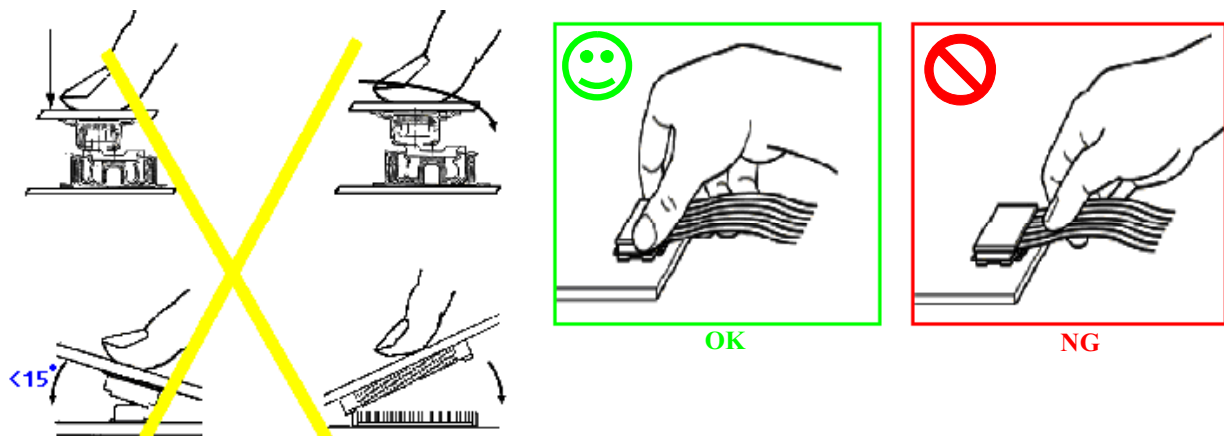
Precaution for soldering the LCM

	Manual soldering	Machine drag soldering	Machine press soldering
No ROHS product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 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 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.

(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.