MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0570I1T-5

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2012/02/01	Preliminary Specification	

CONTENTS

■ **GENERAL INFORMATION**

Item	Contents	Unit
LCD type	TFT/Transimissive/Normally white/Wide view	/
Size	5.7	Inch
Viewing direction	12:00	O' Clock
Gray scale inversion direction	6:00	O' Clock
LCM (W × H × D)	144.00×104.60×14.50	mm^3
Active area (W×H)	115.20×86.40	mm^2
Pixel size (W×H)	0.120×0.360	mm^2
Number of dots	320 (RGB) × 240	/
Backlight type	30 LEDs	/
Interface type	RGB 18 bits	/
Color depth	262K	/
Pixel configuration	R.G.B vertical stripe	/
Input voltage	3.3	V
With/Without TSP	With TSP	/
Weight	195	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
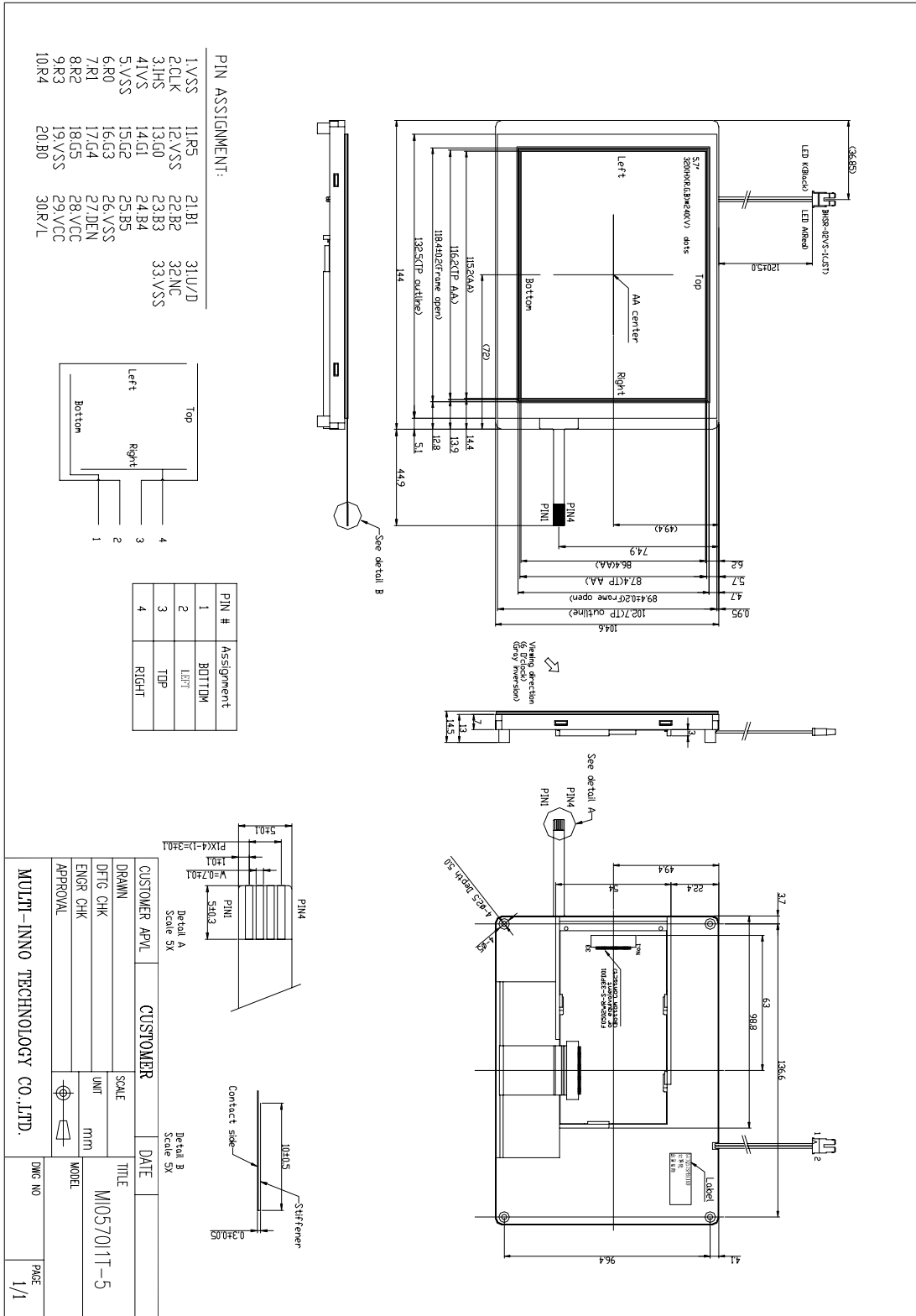
■ ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
Power supply voltage	VCC	-0.3	5.0	V
Input voltage	VIN	-0.3	Vcc+0.3	V
Permissive input ripple voltage	V_{RF}	-	100	mVp-p
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.
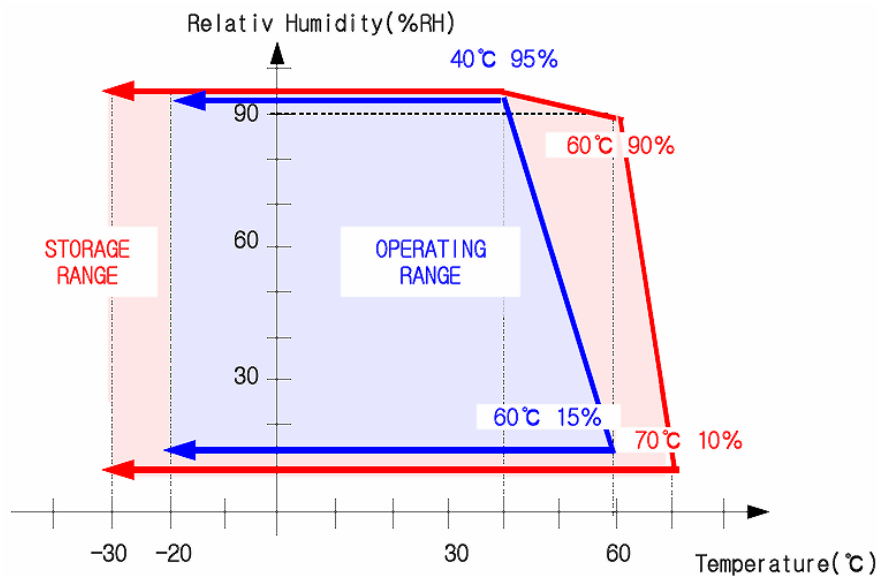
Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.
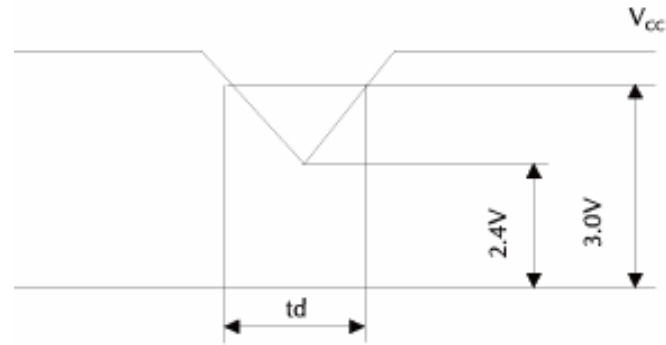
■ ELECTRICAL CHARACTERISTICS
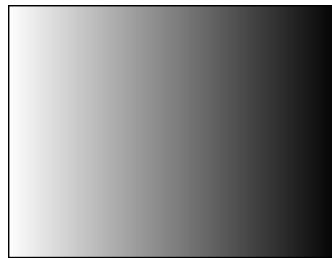
DC CHARACTERISTICS

(Ta=25±2°C, V_{SS}=GND=0)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCC	3.0	3.3	3.6	V	Note 1
Input Voltage for logic	H Level	VIH	0.7VDD	-	VDD	V	
	L Level	VIL	0	-	0.3VDD	V	
Power Supply current		ICC		(65)	(90)	mA	Note 2

Note1:   Vcc-dip conditions

Vcc-dip conditions should also follow the Vcc-turn-on conditions

$Td \leq 10ms$

Note2:   fv =60Hz , Ta=25°C , Display pattern : 64 Gray pattern

■ BACKLIGHT CHARACTERISTICS

The Back-light system is an edge-lighting type with 30 white LED(Light Emitting Diode)s. The characteristics of 30 white LEDs are shown in the following tables.

(Ta= Room Temp)

Characteristics		Symbol	Min.	Typ.	Max.	Unit	Note
Current		I_B	-	200	250	mA	(1)
Voltage Forward		V_F	-	(9.6)	(10.5)	V	
Power Consumption		P_{BL}	-	(1920)	(2625)	mW	(2)
LED Life Time	25°C	-	(30000)	-	-	hr	(3)

Note (1) LEDS in 3 series x 10 parallel type.

(2) Where I_B = 200mA, V_F = 9.6, $P_{BL} = V_F \times I_B$

(3) The environmental conducted under ambient air flow ,at Ta=25±2°C,60%RH±5%

■ 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℃	-	40	55	ms	Fig.1	4
Contrastratio	Cr		300	450	-	---	FIG2.	1
Luminance uniformity	δ WHITE		70	80	-	%	FIG2.	3
Surface Luminance	Lv		850	960	-	cd/m^2	FIG 2.	2
Viewing angle range	θ	∅ = 90°	40	50	-	deg	FIG3.	6
		∅ = 270°	55	65	-	deg	FIG3.	
		∅ = 0°	55	65	-	deg	FIG3.	
		∅ = 180°	55	65	-	deg	FIG3.	
NTSC ratio	---	---	-	50	-	%	-	-
CIE (x, y) chromaticity	Red x	θ=0° ∅=0° Ta=25℃	0.610	0.640	0.670		FIG 2.	5
	Red y		0.314	0.344	0.374			
	Green x		0.268	0.298	0.328			
	Green y		0.553	0.583	0.613			
	Blue x		0.107	0.137	0.167			
	Blue y		0.139	0.159	0.179			
	White x		0.282	0.312	0.342			
	White y		0.309	0.339	0.369			

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

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

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

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

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

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

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.
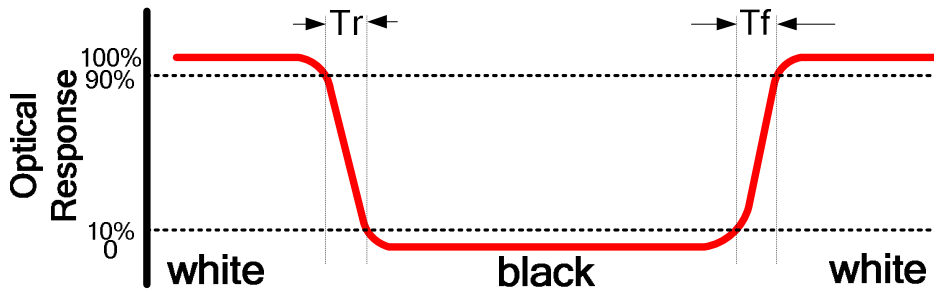
FIG.1.   The definition of Response Time

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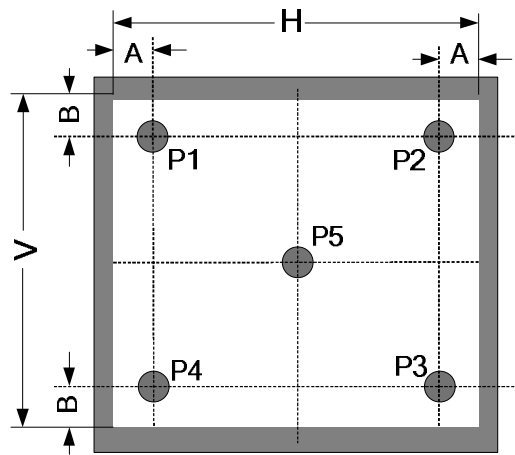measurement instrument is TOPCON's luminance meter BM-5

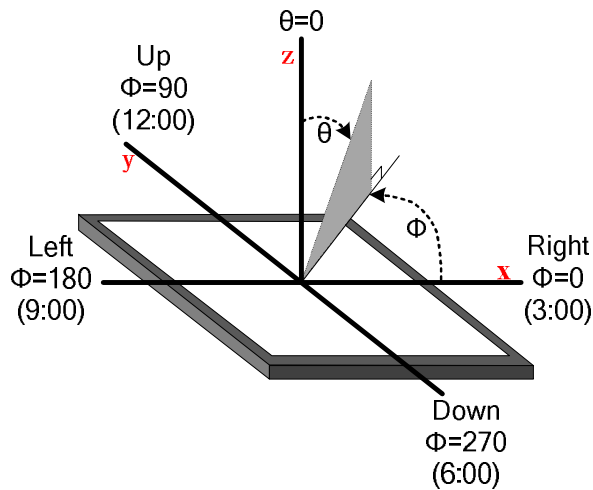**FIG.3.   The definition of viewing angle**

■ INTERFACE DESCRIPTION

1.1 Pin Assignment

Pin No.	Symbol	I/O	Function	Remark
1	DGND	--	GND	
2	DCLK	I	Clock signal for sampling each data signal	
3	Hsync	I	Horizontal synchronous signal (Negative)	
4	Vsync	I	Vertical synchronous signal (Negative)	
5	GND	I	GND	
6	R0	I	RED data signal (LSB)	
7	R1	I	RED data signal	
8	R2	I	RED data signal	
9	R3	I	RED data signal	
10	R4	I	RED data signal	
11	R5	I	RED data signal (MSB)	
12	GND	--	GND	
13	G0	I	GREEN data signal (LSB)	
14	G1	I	GREEN data signal	
15	G2	I	GREEN data signal	
16	G3	I	GREEN data signal	
17	G4	I	GREEN data signal	
18	G5	I	GREEN data signal (MSB)	
19	GND	--	GND	
20	B0	I	BLUE data signal(LSB)	
21	B1	I	BLUE data signal	
22	B2	I	BLUE data signal	
23	B3	I	BLUE data signal	
24	B4	I	BLUE data signal	
25	B5	I	BLUE data signal(MSB)	
26	GND	--	GND	
27	DEN	I	Signal to settle the horizontal display position (Positive)	Note5-1
28	VCC	--	3.3V power supply	
29	VCC	--	3.3V power supply	
30	LRC	I	Horizontal display mode select signal H: Normal L: Left / Right reverse mode	Note5-2
31	UDC	I	Vertical display mode select signal L: Normal H: Up / Down reverse mode	Note5-2
32	NC	--	No Connection	
33	GND	I	GND	

Note1 - 1 The horizontal display start timing is settled in accordance with a rising timing of ENAB signal. In case ENAB is fixed "Low", the horizontal start timing is determined. Don't keep ENAB "High" during operation.

Note 1 - 2

R/L=H, U/D=L

R/L=L, U/D=L

R/L=H, U/D=H

R/L=L, U/D=H
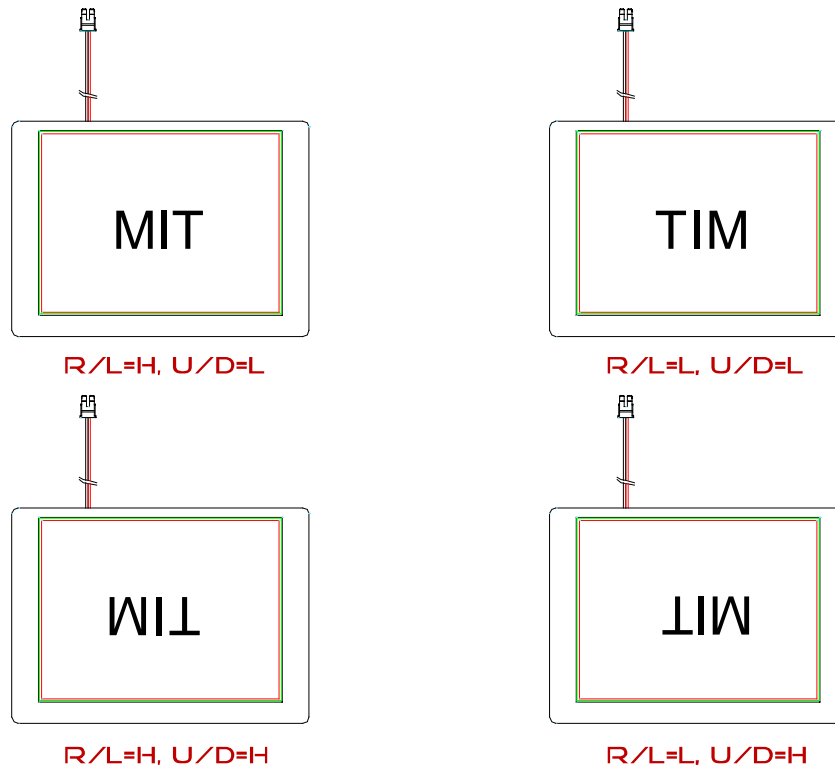
1.2   Block Diagram
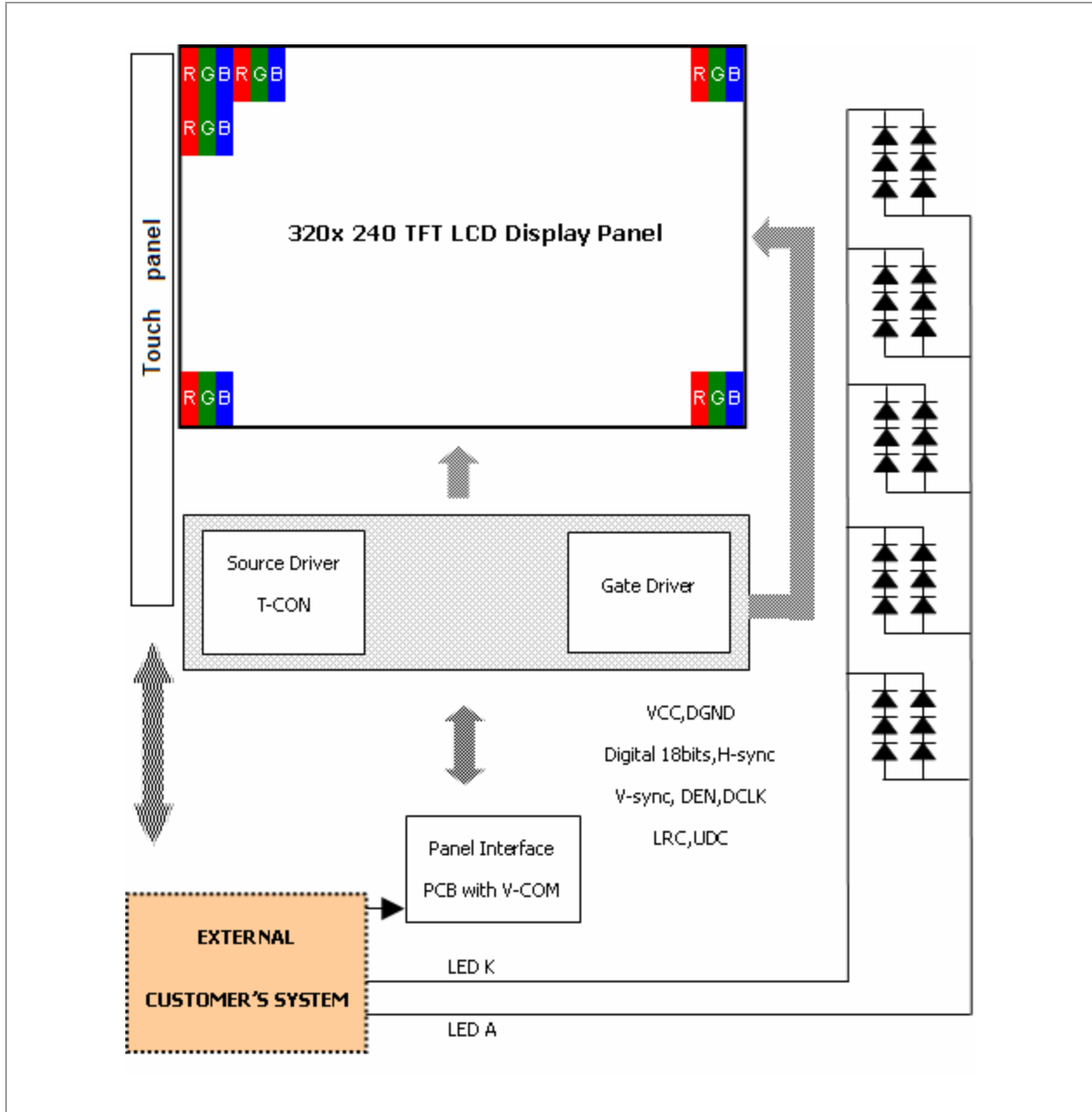
1.3   Back-light Unit (BLU)

Pin No.	Symbol	Function	Remark
1	LEDA	Power Supply for LED backlight	Red
2	LEDK	GND for LED backlight	Black

Connector: JST BHSR-02VS-1

2. Touch Screen Panel

2.1 Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-	-	1.5	%	Analog X and Y directions
Terminal resistance	200	-	900	Ω	X (Glass side)
	200	-	900	Ω	Y (Film side)
Insulation resistance	20	-	-	MΩ	DC 25V
Voltage	-	5.0	15	V	DC
Chattering	-	-	15	ms	100kΩ pull-up
Transparency	-	80	-	%	Anti-glare

2.2 Mechanical & Reliability Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Operation force	-	60	100	g	
Hitting Test	1,000,000	-	-	times	
Surface hardness	(3)	-	-	H	According to (JIS-K5400)

2.3 Pin Assignment

Pin No.	Symbol	Function	Remark
1	YD	Touch Panel Bottom Side	
2	XL	Touch Panel Left Side	
3	YU	Touch Panel Top Side	
4	XR	Touch Panel Right Side	

■ REFERENCE APPLICATION NOTES

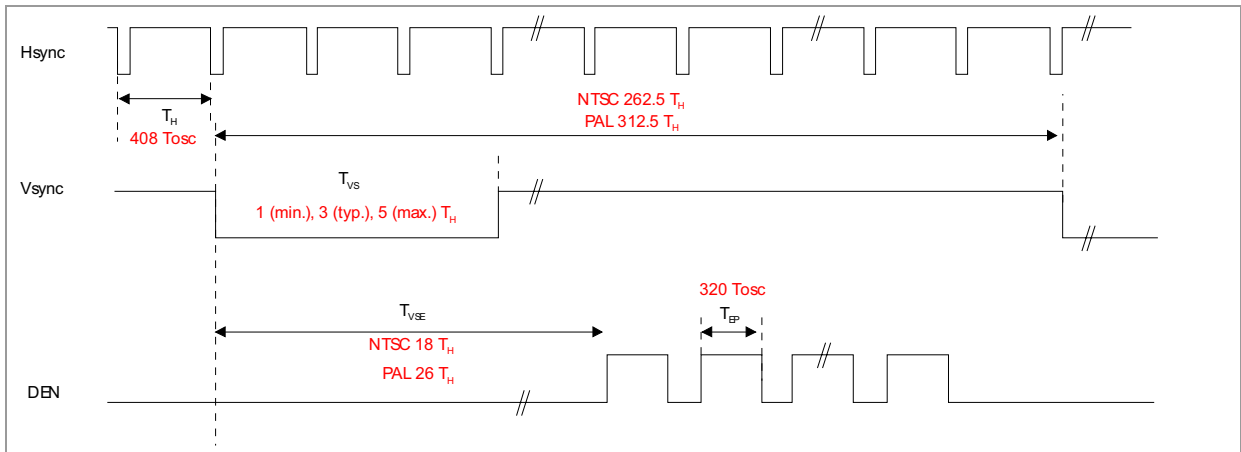### 1.1AC Timing Characteristic of The LCD

1.1.1Timing Condition

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	DCLK period		TOSC	-	156	-	ns	
	Frequency		FOSC	-	6.4	-	MHz	
	DCLK High plus width		TCH	-	78	-	ns	
	DCLK Low plus width		TCL	-	78	-	ns	
RGB DATA	Data setup time		TSU	12	-	-	ns	
	Data hold time		THD	12	-	-	ns	
Hsync	Hsync period		TH	-	408	-	TOSC	
	Hsync pulse width		THS	5	30	-	TOSC	
	Back-Porch		THB		38		TOSC	
	Front-Porch		THF		20		TOSC	
	Hsync rising time		TCr	-	-	700	ns	
	Hsync falling time		TCf	-	-	300	ns	
Vsync	Vsync period	NTSC			262	-	TH	
		PAL		-	312	-	TH	
	Vsync pulse width		TVS	1	3	5	TH	
	Back-Porch	NTSC	TVB		15		TH	
		PAL			23		TH	
	Display Period		TVD		240		TH	
	Front Porch	NTSC	TVF		5		TH	
		PAL			46		TH	
	Vsync rising time		TVr	-	-	700	ns	
	Vsync falling time		TVf	-	-	1.5	µs	
	Vsync falling to Hsync rising time for odd field		THVO	1	-	-	TOSC	
	Vsync falling to Hsync falling time for even field		THVE	1	-	-	TOSC	
DEN	Vsync-DEN time	NTSC	TVSE	-	18	-	TH	
		PAL	TVSE	-	26	-	TH	
	Hsync-DEN time		THE	36	68	88	TOSC	
	DEN plus width		TEP	-	320	-	TOSC	

Note : If DEN is fixed to low, the SYNC mode is used. Otherwise DE mode is used. When SYNC mode is used, 1st data start from 68th CLK after H-sync falling
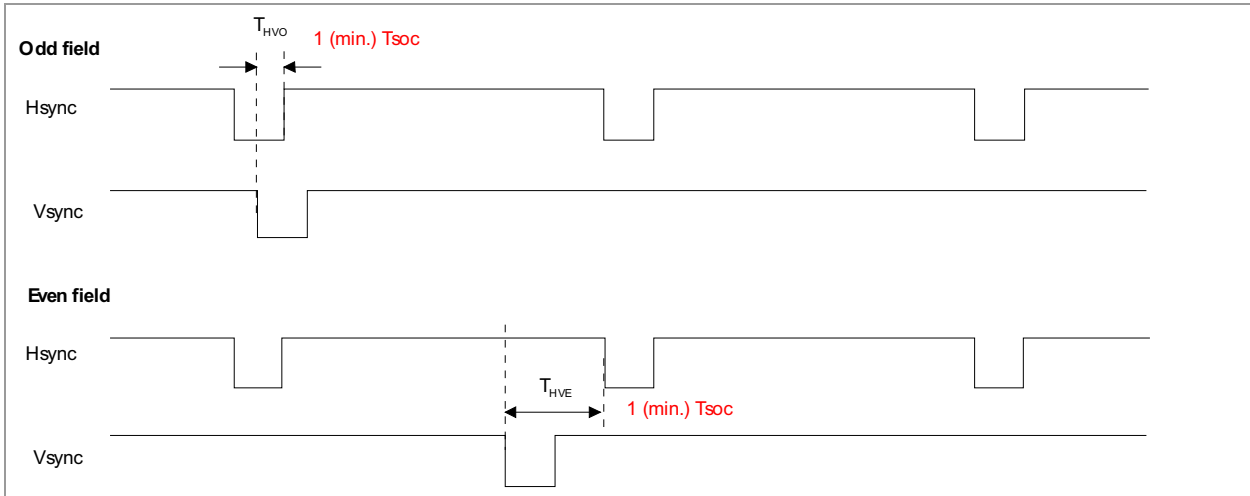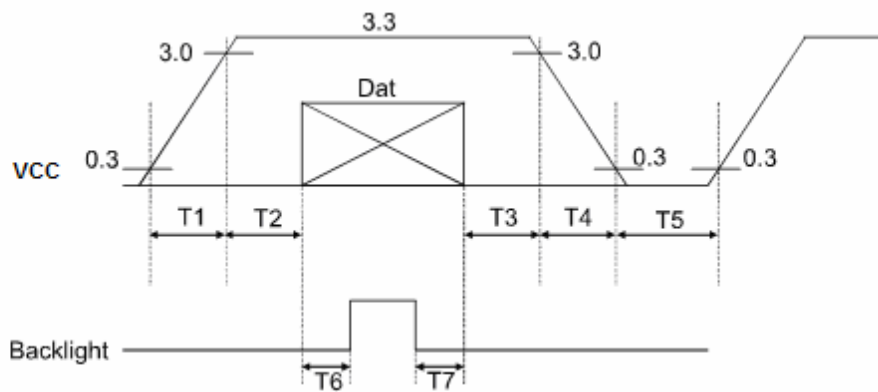
1.1.2 Horizontal Display Timing

Note Data is latched rising edge trigger of CLK

156ns (typ.)
Tosc

DCLK

12ns(min.) T_{SL} T_{HC} 12ns(min.)

R0~R5   Blanking data   1st   2nd   3rd   479th   480th

G0~G5   Blanking data   1st   2nd   3rd   479th   480th

B0~B5   Blanking data   1st   2nd   3rd   479th   480th

DEN

T_{HE}

30(typ.) Tosc T_{HS} 38(typ.) Tosc T_{HF} 20(typ.) Tosc

Hsync

68th CLK T_H 408 Tosc

If DEN is fixed to low the SYNC mode is used. Otherwise DE mode is used.
When SYNC mode is used "st data start from68th CLK after Hsync falling.

1.1.3 Vertical Display Timing

Hsync

T_H 408 Tosc

NTSC 262.5 T_H
PAL 312.5 T_H

Vsync

T_{VS}
1 (min.), 3 (typ.), 5 (max.) T_H

320 Tosc

T_{VSE}
NTSC 18 T_H
PAL 26 T_H T_{EP}

DEN

1.1.4 Hsync and Vsyne Timing

1.2 Display On/Off Sequence :

Data: DCLK, R0 ~ R5, G0 ~ G5, B0 ~ B5, DE
T1≤10ms, 50ms≤T2, 0<T3≤50ms, 0<T4≤10ms, 1s≤T5, 200ms≤T6, 200ms≤T7

3. Displayed Color and Input Data

		Color & Gray Scale	Data Signal																			
			R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
		Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
		Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
		Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
		Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
		Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Red(61)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Green(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Green(61)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
		Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
		Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.
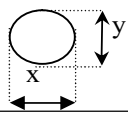
■ **RELIABILITY TEST CONDITIONS**

No.	Test Item	Test Condition	Inspection after test
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	Damp proof Test operating	60℃±5℃×90%RH/240 hours	
6	Vibration test	Vibration Frequency:10~55Hz. Total fixed amplitude:1.5mm. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	
7	Dropping test	To be measured after dropping from 60cm high on the concrete surface in packing state.	

■ **INSPECTION CRITERION**

	OUTGOING QUALITY STANDARD	PAGE 1 OF 7
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA		

This specification is made to be used as the standard acceptance/rejection criteria for Color mobile phone LCM with touch panel.

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.

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.

OUTGOING QUALITY STANDARD	PAGE 2 OF 7
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

4. Inspection standards

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.	
4.1.4	linearity	No more than 1.5%	

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard			Classification of defects
4.2.1	**Clear Spots** Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, size Φ is defined as $\Phi = \dfrac{(x+y)}{2}$			Minor

For dark/white spot, size Φ is defined as $\Phi = \dfrac{(x+y)}{2}$

1.

Zone Size(mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10＜Φ≤0.15	2		
0.15＜Φ≤0.20	1		
0.20＜Φ	0		

2.

Zone Size(mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10＜Φ≤0.15	3		
0.15＜Φ≤0.25	2		
0.25＜Φ	0		

Clear Spots

TP Dirt   Minor

OUTGOING QUALITY STANDARD	PAGE 3 OF 7
TITLE: FUNCTIONAL TEST & INSPECTION CRITERIA	

3.

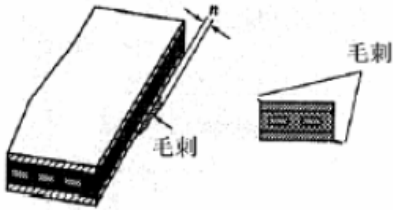| **Dim Spots**	Size(mm) \ Zone	Acceptable Qty			Minor
		A	B	C	
Circle shaped and dim edged defects	$\Phi \leqslant 0.2$	Ignore		Ignore	
	$0.20 < \Phi \leqslant 0.40$	2			
	$0.40 < \Phi \leqslant 0.60$	1			
	$0.60 < \Phi$	0			

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.2	**Line defect** Black line, White line, Foreign material on polarizer	size(mm) / Acceptable Qty table: | size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W≤0.02	Ignore		Ignore
L≤3.0	0.02<W≤0.03	2		
L≤2.0	0.03<W≤0.05	1		
	0.05<W	Define as spot defect				Minor

size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W≤0.02	Ignore		Ignore
L≤3.0	0.02<W≤0.03	2		
L≤2.0	0.03<W≤0.05	1		
	0.05<W	Define as spot defect		

Foreign material on TP film

The line can be seen after mobile phone in the operating condition:

size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W≤0.03	Ignore		Ignore
L≤5.0	0.03<W≤0.05	3		
	0.05<W	Define as spot defect		

If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 4.2.2.

If the scratch can be seen only in non-operating condition or some special angle, judge by the following.

OUTGOING QUALITY STANDARD	PAGE 4 OF 7
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4.2.3	**Dim line defect** Polarizer scratch TP film scratch	Size(mm)		Acceptable Qty			Minor

4.2.3 — Dim line defect (Polarizer scratch, TP film scratch) — Minor

L(Length)	W(Width)	Zone A	B	C
Ignore	W≤0.03	Ignore		Ignore
5.0＜L≤10.0	0.03＜W≤0.05	2		
L≤5.0	0.05＜W≤0.08	1		
	0.08＜W	0		

4.2.4 — Polarize Air bubble — Minor

Air bubbles between glass & polarizer

2. Zone / Size(mm)	Acceptable Qty A	B	C
Φ≤0.2	Ignore		Ignore
0.20＜Φ≤0.30	2		
0.30＜Φ≤0.50	1		
0.50＜Φ	0		

4.3. Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
		(i) Chips on corner A:LCD Glass defect | X	Y	Z | |≤2.0|≤S|Disregard| Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.	Minor

X	Y	Z
≤2.0	≤S	Disregard

Notes: S=contact pad length
Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.

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4.3.5	Glass defect	B:TP Glass defect <table>X(mm), Y(mm), Z(mm)</table>	Minor

B:TP Glass defect

X(mm)	Y(mm)	Z(mm)
≤3.0	≤3.0	Disregard

(ii)Usual surface cracks

A:LCD Glass defect

X	Y	Z
≤3.0	<Inner border line of the seal	Disregard

B:TP Glass defect

X(mm)	Y(mm)	Z(mm)
≤6.0	<2.0	Disregard

Minor

(iii) Crack

　Cracks tend to break are not allowed.

crack

Major

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4.4   Parts Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
	4.4.1 Parts contraposition	1、Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2、Not allow chip or solder component is off center more than 50% of the pad outline.	Major
	4.4.2 SMT	According to the <Acceptability of electronic assemblies> IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.	

TITLE: FUNCTIONAL TEST & INSPECTION CRITERIA

| 4.4.3
TP Defect | 1、 Pattern font：
Pattern fonts are clear and symmetrical，pattern fonts filter lightly are allowed; The fort line is not allow to thinner or thicker than 1/3of normal size, and swing is not more than 0.1mm. the line is smooth and not broken.

2、The wing forward in the side of Visual Area：
The length of wing forward inside of the Visual Area: n≤0.2mm；
Not excess 3 point，and the distanceD≥20mm。

3、Film impression:With operation, must be invisibility.
4、Touch panel knob：if writing function normally,it could be allowed.

5、 Newton ring
Without operation, the color circle of Regularity or Non-regularity from the normal or slope angle of view.
1、**Regularity**： The area of the newton ring is less than 1/3 area of the touch panel; and no character affected and line distorted after touch panel   lightening. It's ok.
2、 **Non-regularity** ： The area of the Newton ring is less than the 1/2   area of touch panel with lightening. And no character affected and line

 | Minor |

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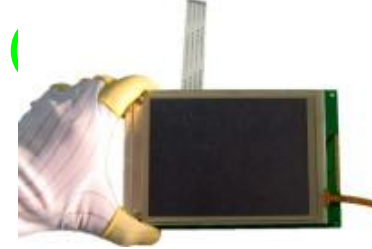
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- 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.
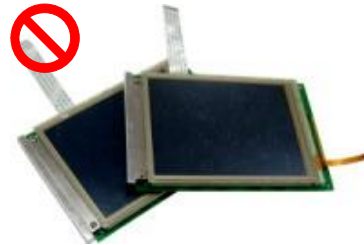### 2.2   Correct handling:

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

2.3   Incorrect handling:

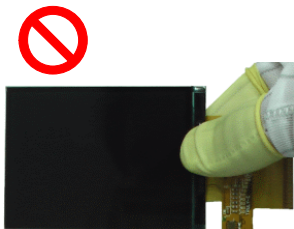
Please don't touch IC directly.
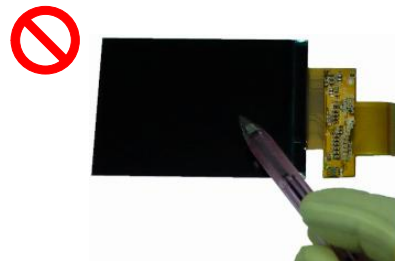
Please don't stack LCM.

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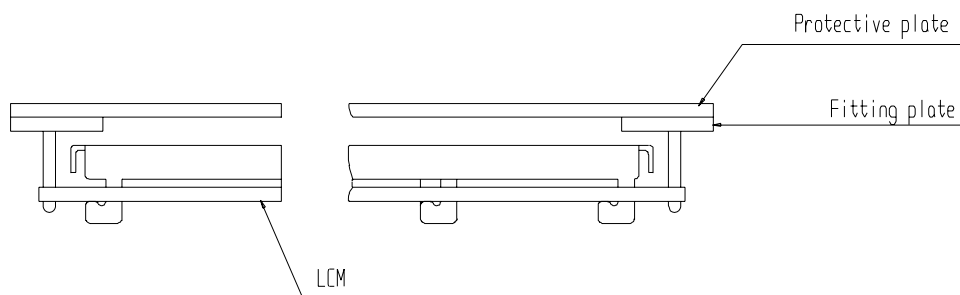
  4.1.2 When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

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
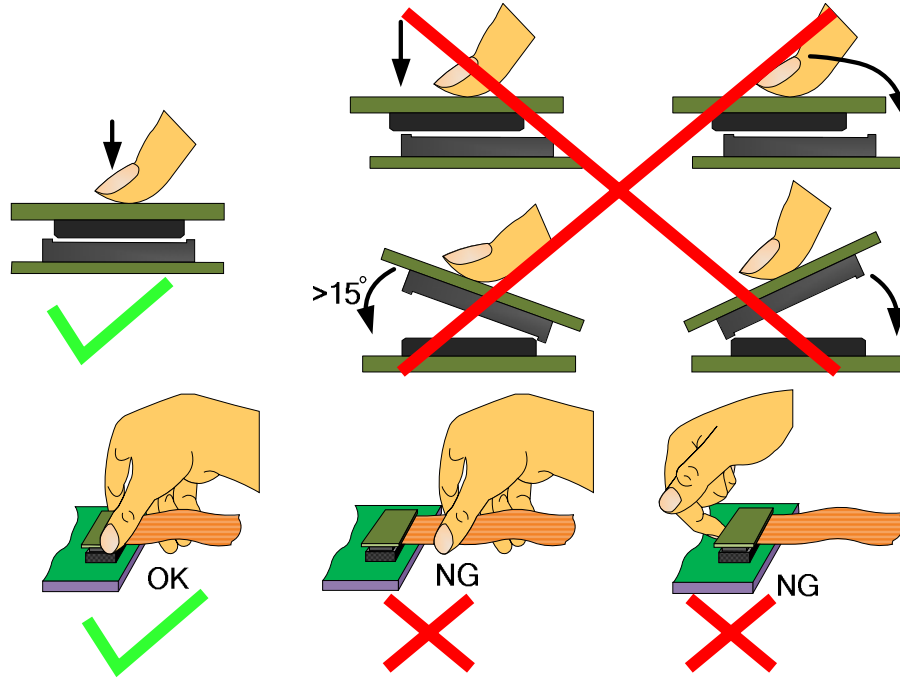
4.3   Precaution for soldering the LCM

	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.