



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

**www.multi-inno.com**

## **LCD MODULE SPECIFICATION**

**Model : MI0570PT-3**

**For Customer's Acceptance:**

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	2012-10-04
Our Reference	

## REVISION RECORD

[illegible]



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**■ 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 )	144.00×104.60×13.50	mm <sup>3</sup>
Active area (W×H)	115.20×86.40	mm <sup>2</sup>
Pixel pitch (W×H)	0.360×0.360	mm <sup>2</sup>
Number of dots	320 (RGB) × 240	/
Backlight type	15 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	With TSP	/
Weight	TBD	g

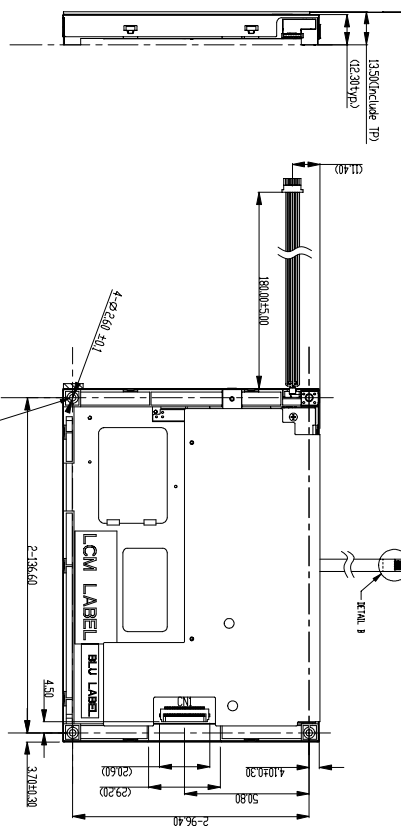
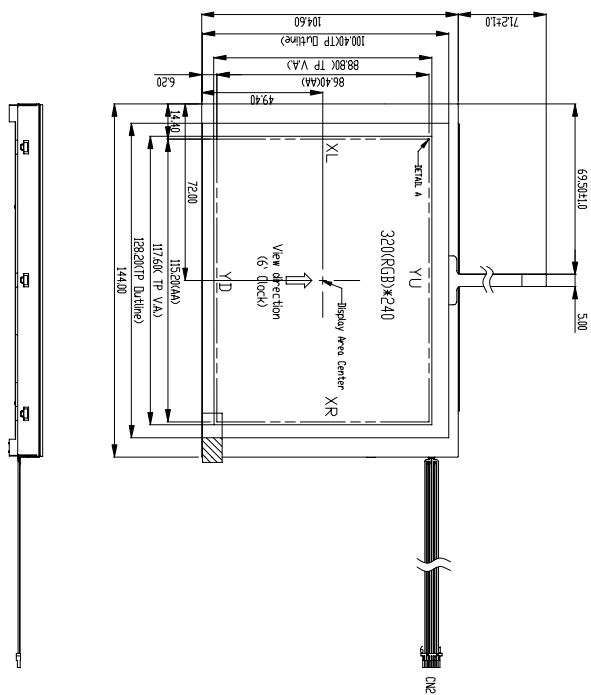
Note 1:Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.

Note 2 : RoHS compliant;

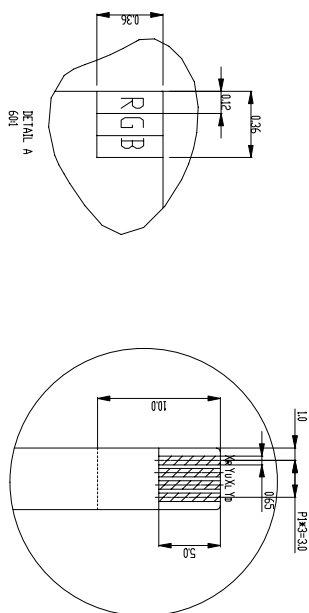
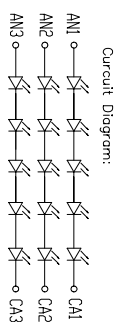
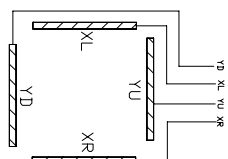
Note 3: LCM weight tolerance: ± 5% .

## ■ EXTERNAL DIMENSIONS

CN1	Pn	Assign
1	GND	
2	DI0LK	
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	ENABLE	
28	VCC	
29	VCC	
30	R/L	
31	U/D	
32	NC	
33	GND	




The hole for nominal size 3mm self-tapping screw attachment depth 3.5mm(4 point)  
Suggested applying torque 0.15~0.2Nm



**Notes:**  
 Turned tolerance±0.50mm;  
 2.Display 1 type a-Si TFT;  
 3.Storage Temperature:-20°C~+70°C;  
 4.Storage Temperature:-30°C~+80°C;  
 5.Gray Scale Inversion 12 b/Color;  
 6.GN2 LED Power source Connector:SH-P-06V-S-BUST) or  
 Connector:SH-P-06V-S-BUST) or Compatible; Mating Connector:SM66-SH-S-TF(LIST) or Compatible;  
 7.DCN1 Connector type: 089H33-00000-62-R (STARLINK)  
 8.Requirement on Environment Protection:RoHS compliant

CNE		Pin Assign	
PIN NO	Symbol	Cable color	
1	AN1	Red	
2	AN2	Red	
3	AN3	Red	
4	CM1	White	
5	CM2	Blue	
6	CA3	Black	

CUSTOMER P.W.L.	CUSTOMER	DATE		
DRAWN		SCALE	TITLE	
DWG CHK		UNIT	M0570PT-3	
ENGR CHK		mm		
APPROVAL		MODEL		
MULTI-INNO TECHNOLOGY CO.,LTD.		DWG NO	PAGE	
			1/1	

## ■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 <sub>OP</sub>	-20	70	°C
Storage temperature	T <sub>ST</sub>	-30	80	°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,DOTCLK,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
Analog supply voltage	AVDD	9.6	10	10.4	V
Gate on voltage	VGH	17.1	19	20.9	V
Gate off voltage	VEE	-7.7	-7	-6.3	V
Input voltage 'H' level	V <sub>IH</sub>	0.7VCC	-	VCC	V
Input voltage 'L' level	V <sub>IL</sub>	0	-	0.3VCC	V
Output voltage 'H' level	V <sub>OH</sub>	0.8VCC	-	-	V
Output voltage 'L' level	V <sub>OL</sub>	GND	-	0.2VCC	V
Common electrode driving signal	VCOM	-	4.52	-	V
Current of VCC power supply	I <sub>VCC</sub>	-	110	-	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".

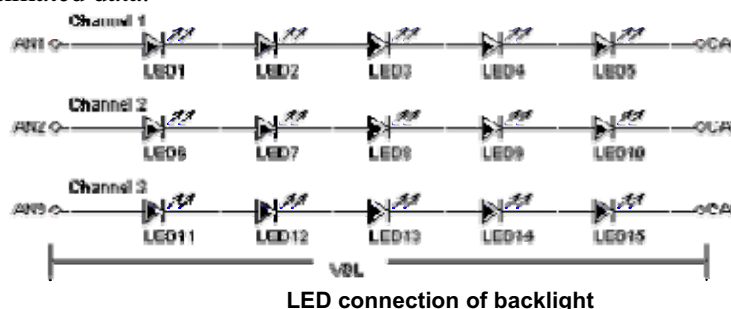
## ■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Channel 1	I <sub>channel 1</sub>	-	25	-	mA	Note 1
Channel 2	I <sub>channel 2</sub>	-	25	-	mA	
Channel 3	I <sub>channel 3</sub>	-	25	-	mA	
Forward voltage	V <sub>BL</sub>	14.85	-	18.15	V	
Backlight power consumption	W <sub>BL</sub>	-	1238	-	mW	
Life time	-	25,000	50,000	-	Hrs	Note 3

Note 1:I<sub>F</sub> 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°C 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.



## ■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	$\theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25℃	-	40	60	ms	FIG 1.	4
Contrast ratio		Cr		400	500	-	---	FIG 2.	1
Luminance uniformity		$\delta$ WHITE		75	80	-	%	FIG 2.	3
Surface Luminance		Lv		250	320	-	cd/m <sup>2</sup>	FIG 2.	2
Viewing angle range		$\theta$	$\varnothing = 90^{\circ}$	60	70	-	deg	FIG 3.	6
			$\varnothing = 270^{\circ}$	50	60	-	deg	FIG 3.	
			$\varnothing = 0^{\circ}$	60	70	-	deg	FIG 3.	
			$\varnothing = 180^{\circ}$	60	70	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	$\theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25℃	0.560	0.610	0.660	FIG 2.	5	
		y		0.300	0.350	0.400			
	Green	x		0.285	0.335	0.385			
		y		0.525	0.575	0.625			
	Blue	x		0.085	0.135	0.185			
		y		0.075	0.125	0.175			
	White	x		0.270	0.320	0.370			
		y		0.310	0.360	0.410			
NTSC	-	-	-	-	50	-	%	-	-

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

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

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

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

Note 3. The uniformity in surface luminance ,  $\delta$  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.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope. Series.

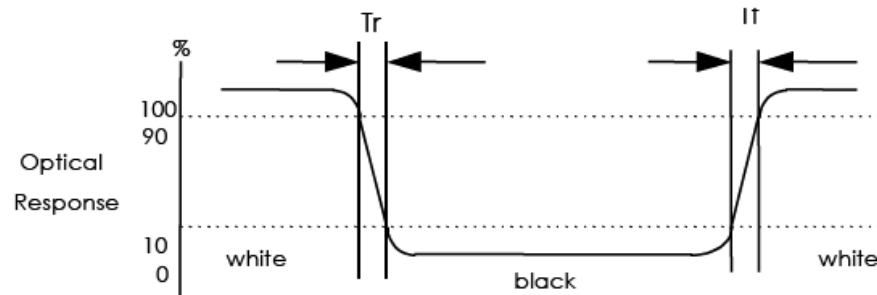
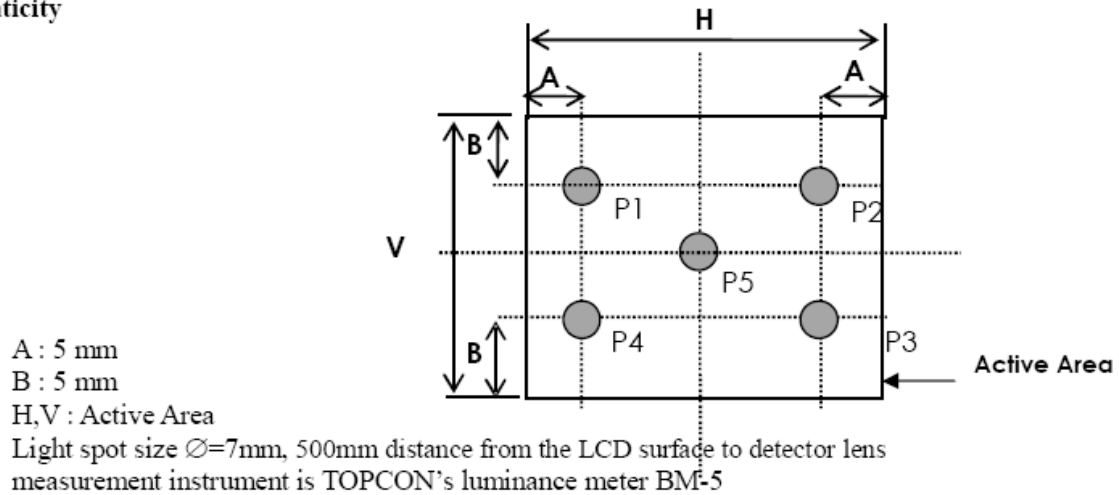
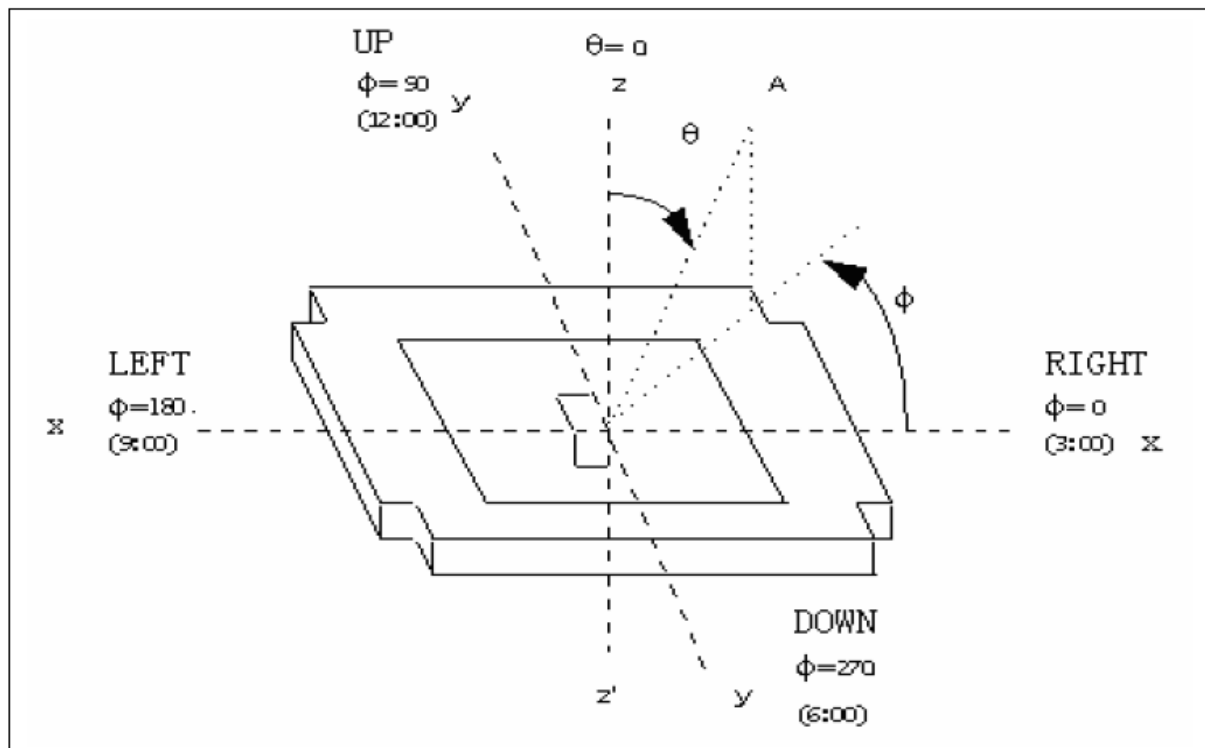
Note 5. CIE (x, y) chromaticity, The x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

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

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

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


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

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




## ■ INTERFACE DESCRIPTION

### 1. CN1 pin assignment (Signal interface)

Connector type: 089H33-000100-G2-R (STARCONN)

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	DOTCLK	I	Dot clock. Latch data at falling edge of DOTCLK.	
3	Hsync	I	Horizontal sync signal in SYNC mode. Pull low or floating in DE mode.	
4	Vsync	I	Vertical sync signal in SYNC mode. Pull low or floating in 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	ENABLE	I	Data enable signal in DE mode. This pin must pull high in 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 driving anode 1 (high voltage)	
2	AN2	P	LED driving anode 2 (high voltage)	
3	AN3	P	LED driving anode 3 (high voltage)	
4	CA1	P	LED driving cathode 1 (low voltage)	
5	CA2	P	LED driving cathode 2 (low voltage)	
6	CA3	P	LED driving cathode 3 (low voltage)	

Note1: CN2 Matching Connector type: SM06B-SHLS-TF (JST)

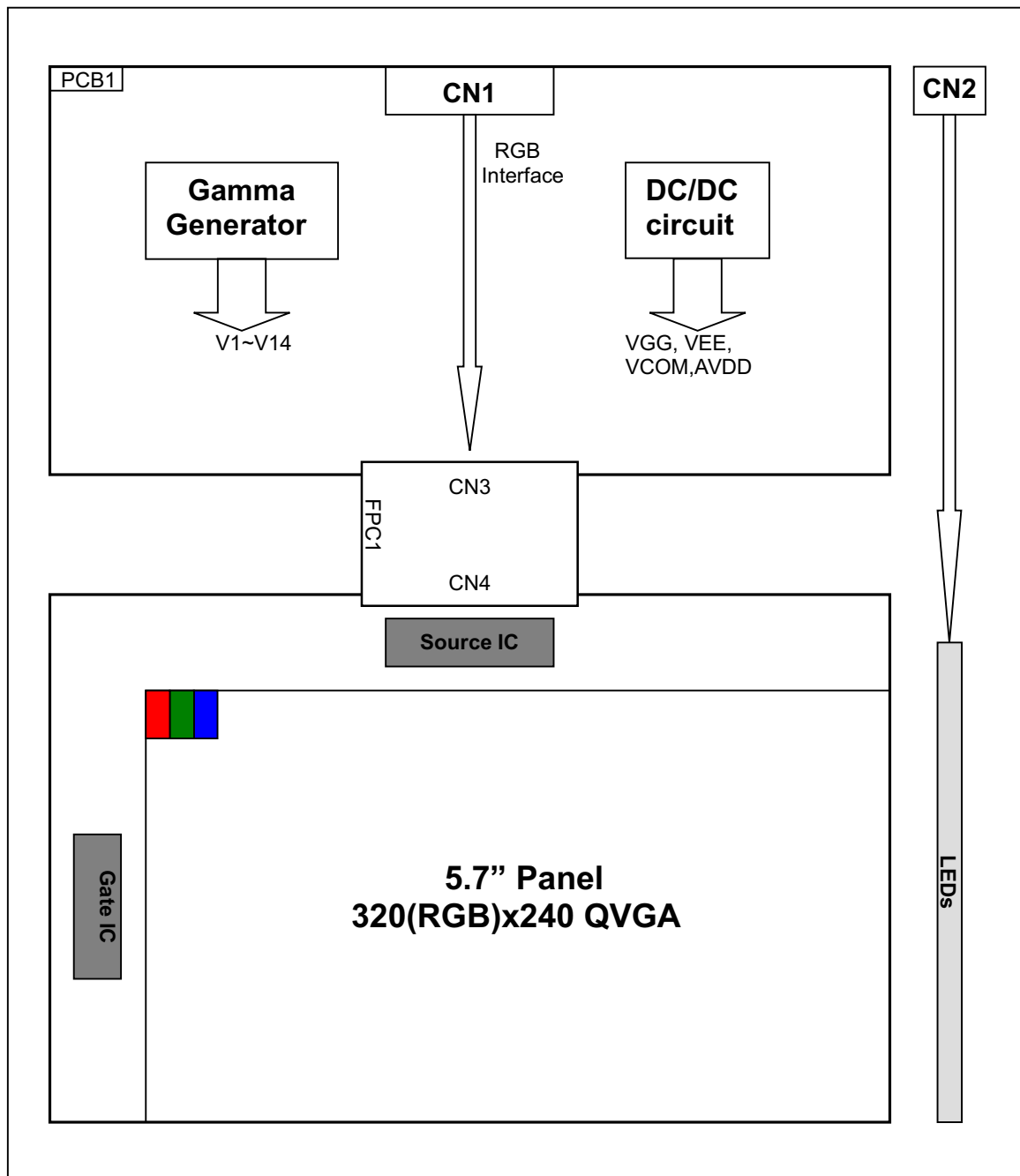
**2. CN3 pin assignment (Touchpanel interface)**

Used FPC: pitch 1.0 mm, T=0.3mm, 4 pin

No	Symbol	I/O	Description	Remark
1	XR	I	X right side	
2	YU	I	Y 12 O'clock side	
3	XL	I	X left side	
4	YD	I	Y 6 O'clock side	

Note1: CN3 Matching Connector type: SFW4R-1STAE1-LF (FCI)

## ■ BLOCK DIAGRAM



## ■ APPLICATION NOTES

### 1. Data Input Timing

#### 1.1 SYNC mode

Parameter	Symbol	Symbol	Min	Typ	Max	Unit
DOTCLK	DOTCLK frequency	Fclk	6.2	6.4	12.1	MHz
	DOTCLK cycle	Tclk	82.64	156.25	161.29	ns
Hsync	Horizontal display area	Thd	320	320	320	Tclk
	1 horizontal line	Th	406	408	560	Tclk
	Hsync pulse width	Thpw	1	-	-	Tclk
	Horizontal blanking	Thb	70	70	70	Tclk
	Horizontal front porch	Thfp	16	18	170	Tclk
Vsync	Frame rate	-	-	60	65	Hz
	Vertical display area	Tvd	240	240	240	Th
	Vsync period time	Tv	254	263	360	Th
	Vsync pulse width	Tvpw	1	-	-	Th
	Vsync blanking	Tvb	13	13	13	Th
	Vsync front porch	Tvfp	1	10	107	Th

Table 1.1 SYNC mode

#### 1.2 DE mode

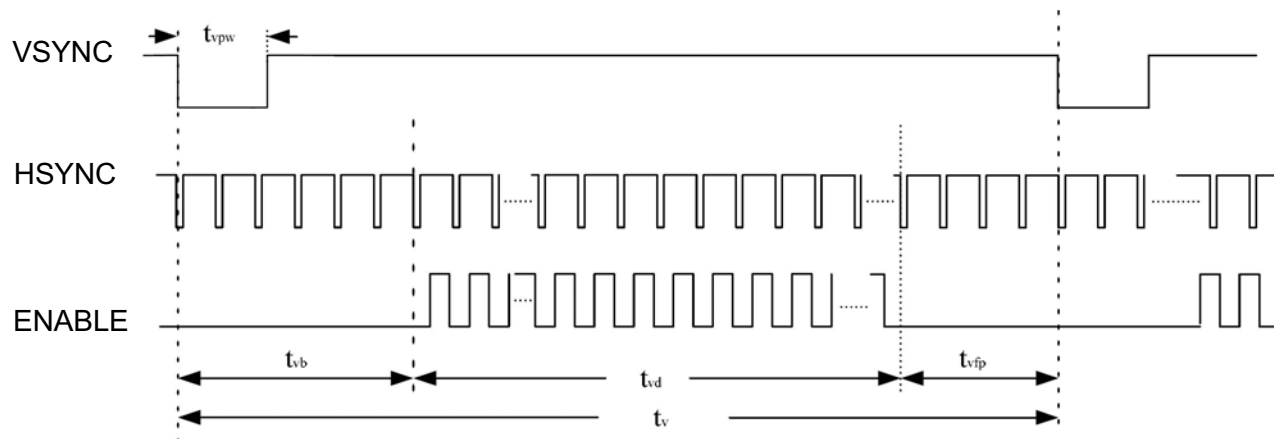
Description		Symbol	Min.	Typ.	Max.	Unit
DOTCLK frequency		Fclk	6.2	6.4	12.1	MHz
Horizontal section	Horizontal total	Th	406	408	560	Tclk
	H Total blank	Thb+Thfp	86	88	240	Tclk
	Valid Data Width	Thd	320	320	320	Tclk
Vertical section	Frame rate	-	-	60	65	Hz
	Vertical total	Tv	254	263	360	Th
	V total blank	Tvb+Tvfp	14	23	120	Th
	Valid Data Width	Tvd	240	240	240	Th

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

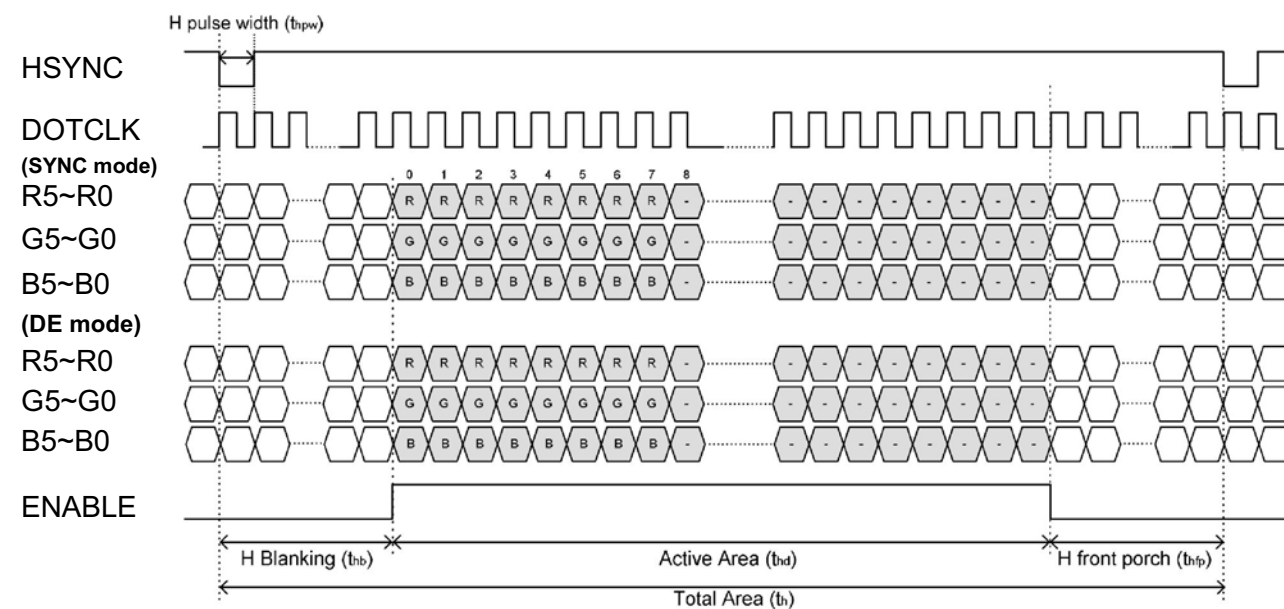
Table 1.2 DE mode

### 1.3 Timing Diagram

#### 1.3.1 Vertical Input Timing



#### 1.3.2 Horizontal Input Timing



### 1.4 AC input characteristics

(VCC=3.3V, GND=0V, Ta=25°C)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
DOTCLK pulse duty	Tcwh	40%	50%	60%	Tclk	Tcph is DCLK cycle
VSYNC setup time	Tvst	10	-	-	ns	
VSYNC hold time	Tvhd	10	-	-	ns	
HSYNC setup time	Thst	10	-	-	ns	
HSYNC hold time	Thhd	10	-	-	ns	
Data setup time	Tdsu	10	-	-	ns	Rn, Gn, Bn to DCLK
Data hold time	Tdhd	10	-	-	ns	Rn, Gn, Bn to DCLK
Enable setup time	Tesu	10			ns	

Table 1.4 AC input characteristics

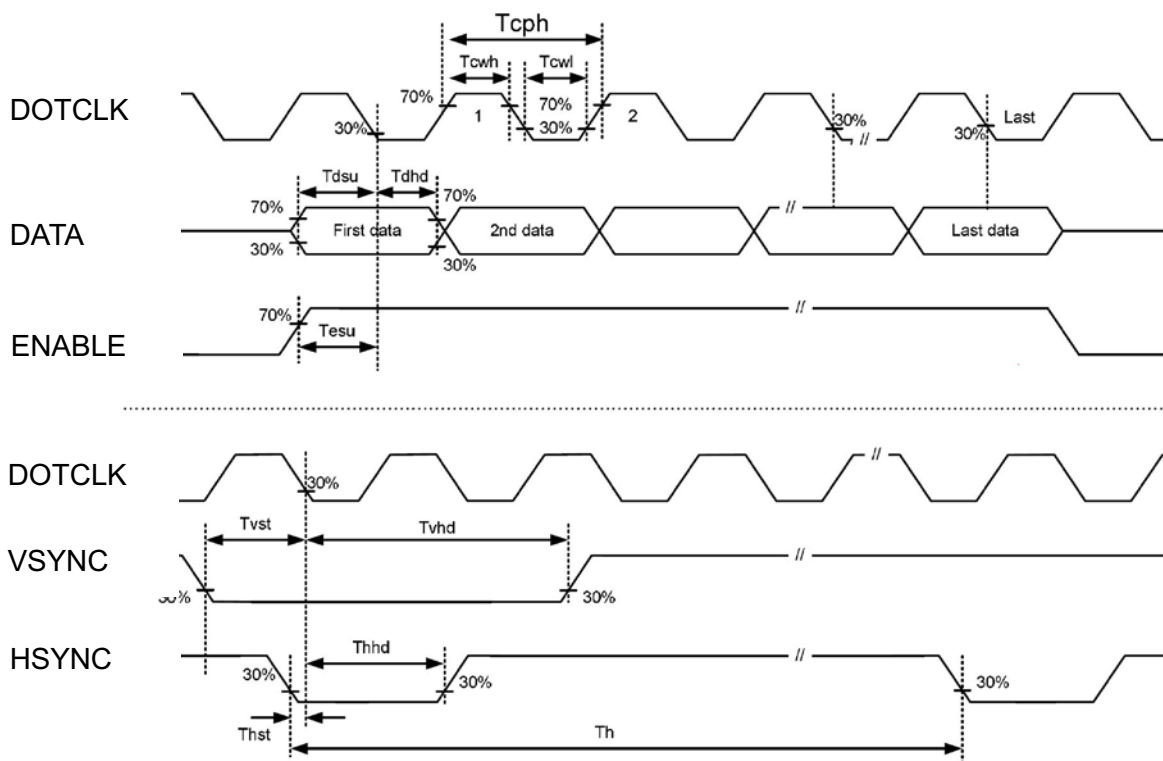


Figure 1.4 AC input characteristics

### 5.5 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	5	-	50	ms	
Backlight off to signal off	Tp4	50	-	-	ms	

Table 1.5 Power on/off sequence

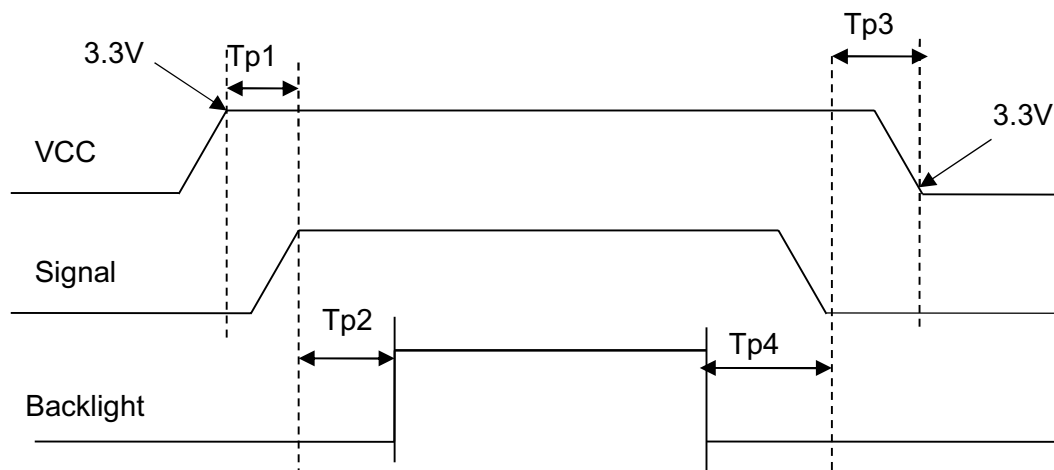


Figure 1.5 Power on/off sequence

**■ RELIABILITY TEST**

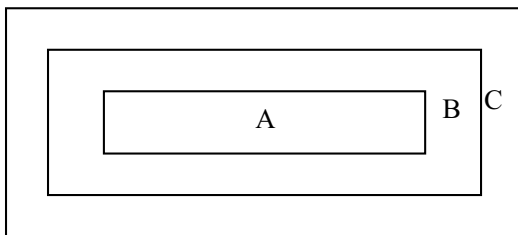
No.	Test Item	Test Condition	Remark
1	High Temperature Storage	$80 \pm 2^{\circ}\text{C}/240$ hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	$-30 \pm 2^{\circ}\text{C}/240$ hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	$70 \pm 2^{\circ}\text{C}/240$ hours	Note 1,IEC60068-2-1 GB2423.2
4	Low Temperature Operating	$-20 \pm 2^{\circ}\text{C}/240$ hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	$-20 \pm 2^{\circ}\text{C} \sim 25 \sim 60 \pm 2^{\circ}\text{C} \times 100$ cycles (30min.) (5min.) (30min.)	Start with cold temperature, End with high temperature, IEC60068-2-14 GB2423.22
6	Damp proof Test operating	$60^{\circ}\text{C} \pm 5^{\circ}\text{C} \times 90\%\text{RH}/240$ hours	Note 2,IEC60068-2-78 GB/T2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:60 cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330 $\Omega$ ,5points/panel Air: $\pm 15\text{KV}$ ,5times Contact: $\pm 8\text{KV}$ ,5times(Environment: $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$ ,30%~60%,86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	Half sine wave:60G 6ms, $\pm X$ , $\pm Y$ , $\pm Z$ 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

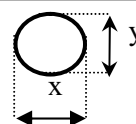
Note 1:Ts is the temperature of panel's surface.

Note 2:Ta is the ambient temperature of sample.



## ■ INSPECTION CRITERION

OUTGOING QUALITY STANDARD	PAGE 1 OF 8
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	MDS Product
<p>This specification is made to be used as the standard acceptance/rejection criteria for minimum 4.3 ” Color mobile phone LCM.</p> <p><b>1 Sample plan</b></p> <p>Sampling plan according to GB/T2828.1-2003/ISO 2859-1 : 1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:</p> <p>Major defect: AQL 0.65</p> <p>Minor defect: AQL 1.5</p> <p><b>2. Inspection condition</b></p> <p>Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.</p> <p><b>3. Definition of inspection zone in LCD</b></p> <div data-bbox="418 1079 938 1312" data-label="Diagram">  </div> <p>Zone A: character/Digit area</p> <p>Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)</p> <p>Zone C: Outside viewing area (invisible area after assembly in customer's product)</p> <p>Fig.1 Inspection zones in an LCD.</p> <p>Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.</p>	

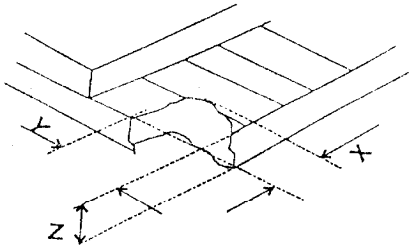
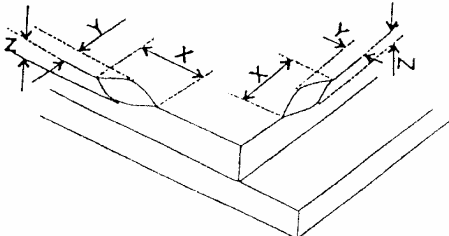
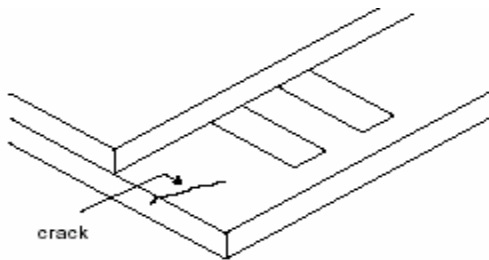
OUTGOING QUALITY STANDARD			PAGE 2 OF 8																										
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA			MDS Product																										
4. Inspection standards																													
4.1 Major Defect																													
Item No	Items to be inspected	Inspection Standard		Classification 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.																											
4.2 Cosmetic Defect																													
Item No	Items to be inspected	Inspection Standard		Classification of defects																									
For dark/white spot, size Φ is defined as $\Phi = \frac{(x+y)}{2}$ 																													
4.2.1	Clear Spots  Black and white Spot defect Pinhole, Foreign Particle, Dirt under polarizer	<table><tr><th rowspan="2">Zone Size(mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ ≤ 0.1</td><td colspan="3">Ignore</td></tr><tr><td>0.10 &lt; Φ ≤ 0.20</td><td colspan="3">2</td></tr><tr><td>0.20 &lt; Φ ≤ 0.25</td><td colspan="3">1</td></tr><tr><td>0.25 &lt; Φ</td><td colspan="3">0</td></tr></table>			Zone Size(mm)	Acceptable Qty			A	B	C	Φ ≤ 0.1	Ignore			0.10 < Φ ≤ 0.20	2			0.20 < Φ ≤ 0.25	1			0.25 < Φ	0			Minor	
Zone Size(mm)	Acceptable Qty																												
	A	B	C																										
Φ ≤ 0.1	Ignore																												
0.10 < Φ ≤ 0.20	2																												
0.20 < Φ ≤ 0.25	1																												
0.25 < Φ	0																												



OUTGOING QUALITY STANDARD			PAGE 3 OF 8																																
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA			MDS Product																																
Item No	Items to be inspected	Inspection Standard			Classification of defects																														
4.2.1	Dim Spots  Circle shaped and dim edged defects	<table><tr><td rowspan="2">Zone Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td><math>\Phi \leq 0.2</math></td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td><math>0.20 &lt; \Phi \leq 0.40</math></td><td colspan="2">2</td></tr><tr><td><math>0.40 &lt; \Phi \leq 0.60</math></td><td colspan="2">1</td></tr><tr><td><math>0.60 &lt; \Phi</math></td><td colspan="2">0</td></tr></table>			Zone Size(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.2$	Ignore		Ignore	$0.20 < \Phi \leq 0.40$	2		$0.40 < \Phi \leq 0.60$	1		$0.60 < \Phi$	0		Minor										
		Zone Size(mm)	Acceptable Qty																																
			A	B	C																														
		$\Phi \leq 0.2$	Ignore		Ignore																														
		$0.20 < \Phi \leq 0.40$	2																																
		$0.40 < \Phi \leq 0.60$	1																																
$0.60 < \Phi$	0																																		
4.2.2	Line defect Black line, White line, Foreign material under polarizer	<table><tr><td colspan="2">Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">Zone</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>Ignore</td><td><math>W \leq 0.02</math></td><td colspan="2">Ignore</td><td rowspan="5">Ignore</td></tr><tr><td><math>L \leq 5.0</math></td><td><math>0.02 &lt; W \leq 0.03</math></td><td colspan="2">2</td></tr><tr><td><math>L \leq 3.0</math></td><td><math>0.03 &lt; W \leq 0.05</math></td><td colspan="2">1</td></tr><tr><td></td><td><math>0.05 &lt; W</math></td><td colspan="2">Define as spot defect</td></tr></table>			Size(mm)		Acceptable Qty			L(Length)	W(Width)	Zone			A	B	C	Ignore	$W \leq 0.02$	Ignore		Ignore	$L \leq 5.0$	$0.02 < W \leq 0.03$	2		$L \leq 3.0$	$0.03 < W \leq 0.05$	1			$0.05 < W$	Define as spot defect		Minor
		Size(mm)		Acceptable Qty																															
		L(Length)	W(Width)	Zone																															
				A	B	C																													
		Ignore	$W \leq 0.02$	Ignore		Ignore																													
		$L \leq 5.0$	$0.02 < W \leq 0.03$	2																															
		$L \leq 3.0$	$0.03 < W \leq 0.05$	1																															
			$0.05 < W$	Define as spot defect																															

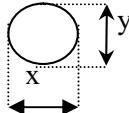



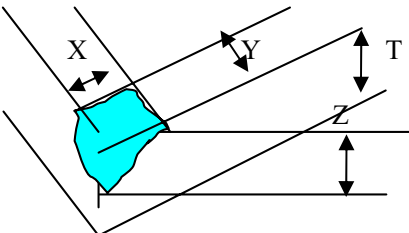
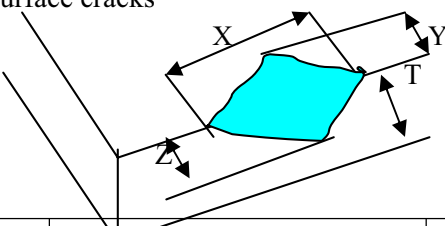
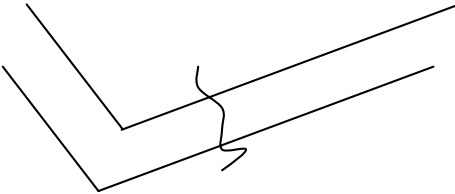
OUTGOING QUALITY STANDARD				PAGE 4 OF 8			
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA				MDS Product			
4.2.3	Polarizer scratch	Inspection Standard					Classification of defects
		If the Polarizer scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 4.2.2.					
		If the Polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following.					
		Size(mm)		Acceptable Qty			
		L(Length)	W(Width)	Zone			
				A	B	C	
		Ignore	$W \leq 0.03$	Ignore		Ignore	
		$5.0 < L \leq 10.0$	$0.03 < W \leq 0.05$	2			
		$L \leq 5.0$	$0.05 < W \leq 0.08$	1			
			$0.08 < W$	0			
4.2.4	Polarize Air bubble	Air bubbles between glass & polarizer					Minor
		<div>2. Zone Size(mm)</div>		Acceptable Qty			
				A	B	C	
		$\Phi \leq 0.2$	Ignore			Ignore	
		$0.20 < \Phi \leq 0.30$	2				
		$0.30 < \Phi \leq 0.50$	1				
		$0.50 < \Phi$	0				

OUTGOING QUALITY STANDARD		PAGE 5 OF 8							
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA		MDS Product							
Item No	Items to be inspected	Inspection Standard	Classification of defects						
4.2.5	Glass defect	<p>(i) Chips on corner</p>  <table border="1"><thead><tr><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>≤2.0</td><td>≤S</td><td>Disregard</td></tr></tbody></table> <p>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.</p>	X	Y	Z	≤2.0	≤S	Disregard	Minor
		X	Y	Z					
		≤2.0	≤S	Disregard					
<p>(ii)Usual surface cracks</p>  <table border="1"><thead><tr><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>≤5.0</td><td>&lt;Inner border line of the seal</td><td>Disregard</td></tr></tbody></table>	X	Y	Z	≤5.0	<Inner border line of the seal	Disregard	Minor		
X	Y	Z							
≤5.0	<Inner border line of the seal	Disregard							
<p>(iii) Crack</p> <p>Cracks tend to break are not allowed.</p> 	Major								



OUTGOING QUALITY STANDARD		PAGE 6 OF 8	
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA		MDS Product	
Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.6	Parts alignment	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.	Minor
4.2.7	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.	

OUTGOING QUALITY STANDARD				PAGE 7 OF 8				
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA				MDS Product				
5. TP Cosmetic Defect.								
Item No	Items to be inspected	Inspection Standard				Classification of defects		
5.1	Black and white Spot defect Foreign Particle,	For dark/white spot, size Φ is defined as $\Phi = \frac{(x+y)}{2}$						
		<div>Zone</div> <div>Size(mm)</div>		Acceptable Qty				<div>distance 5mm over</div>
				A	B+C			
		Φ ≤ 0.15		Ignore				
		0.15 < Φ ≤ 0.25		6				
		0.25 < Φ ≤ 0.50		4				
		Φ > 0.5		0				
Total defective dots shall not exceed 6 pcs on the same TP.								
Item No	Items to be inspected	Inspection Standard				Classification of defects		
5.2	Black line, White line, Scratch, Foreign material under film,					<div>distance 5mm over</div>		
		Size(mm)		Acceptable Qty				
		L(Length)	W(Width)	Zone				
				A	B+C			
		Ignore	W ≤ 0.03	Ignore				
		L ≤ 5.0	0.03 < W ≤ 0.05	5				
		L ≤ 5.0	0.05 < W ≤ 0.1	2				
			0.1 < W	0				

		OUTGOING QUALITY STANDARD	PAGE 8 OF 8						
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA									
5. TP Cosmetic Defect									
Item No	Items to be inspected	Inspection Standard	Classification of defects						
5.3	TP defect ,	<p>(i) Chips on corner</p>  <table border="1" data-bbox="469 770 1101 864"><tr><td>X(mm)</td><td>Y(mm)</td><td>Z(mm)</td></tr><tr><td>≤3.0</td><td>≤3.0</td><td>Z&lt;T</td></tr></table>	X(mm)	Y(mm)	Z(mm)	≤3.0	≤3.0	Z<T	Minor
		X(mm)	Y(mm)	Z(mm)					
		≤3.0	≤3.0	Z<T					
<p>(ii) Usual surface cracks</p>  <table border="1" data-bbox="427 1263 1144 1359"><tr><td>X(mm)</td><td>Y(mm)</td><td>Z(mm)</td></tr><tr><td>≤6.0</td><td>&lt;2.0</td><td>Z&lt;T</td></tr></table>	X(mm)	Y(mm)	Z(mm)	≤6.0	<2.0	Z<T	Minor		
X(mm)	Y(mm)	Z(mm)							
≤6.0	<2.0	Z<T							
<p>(iii) Crack</p> <p>Cracks tending to break are not allowed.</p> 	Major								
5.4	Total number of dots	The total number of luminous dots, dark dots, contamination particles, bubbles, scratch defects, pinholes must not exceed 10 /piece on the same TP.							



## ■ PRECAUTIONS FOR USING LCD MODULES

### Handling 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.

### **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.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the 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.

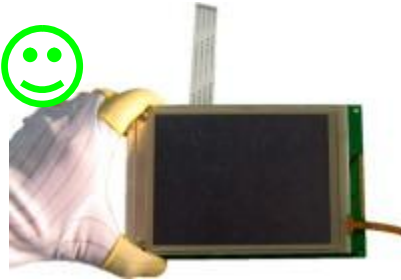
To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

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

## 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:

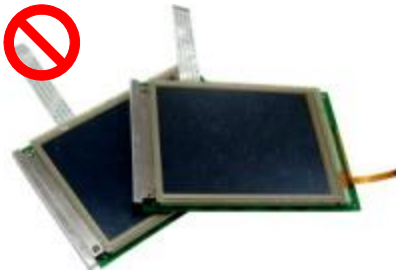


As above picture, please handle with anti-static gloves around LCM edges.

### 2.3 Incorrect handling:



Please don't touch IC directly.



Please don't stack LCM.



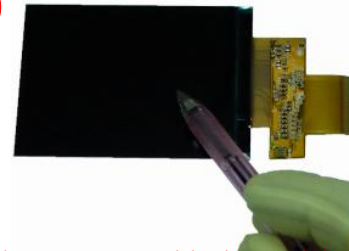
Please don't hold the surface of panel.



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 Transportation Precautions

- 3.2.1 During shipment, please handle with care. The packaging bag can not be broken, step on trap. Packaging Carton layer height can not be over two meters.
- 3.2.2 The transportation process should pay attention to the waterproof and moisture-proof measures. Product can not be watering. Ethylene sealed bags can not be unsealed.

3.3 Others

- 3.3.1 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.
- 3.3.2 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.
- 3.3.3 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.
  - 3.3.3.1 - Exposed area of the printed circuit board.
  - 3.3.3.2 -Terminal electrode sections.

### 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 : 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

- 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.