MULTI-INNO TECHNOLOGY CO., LTD.

LCD MODULE SPECIFICATION

Model : MI0240ST-3

Revision	1.0
Engineering	
Date	
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2010-09-23	Full spec	

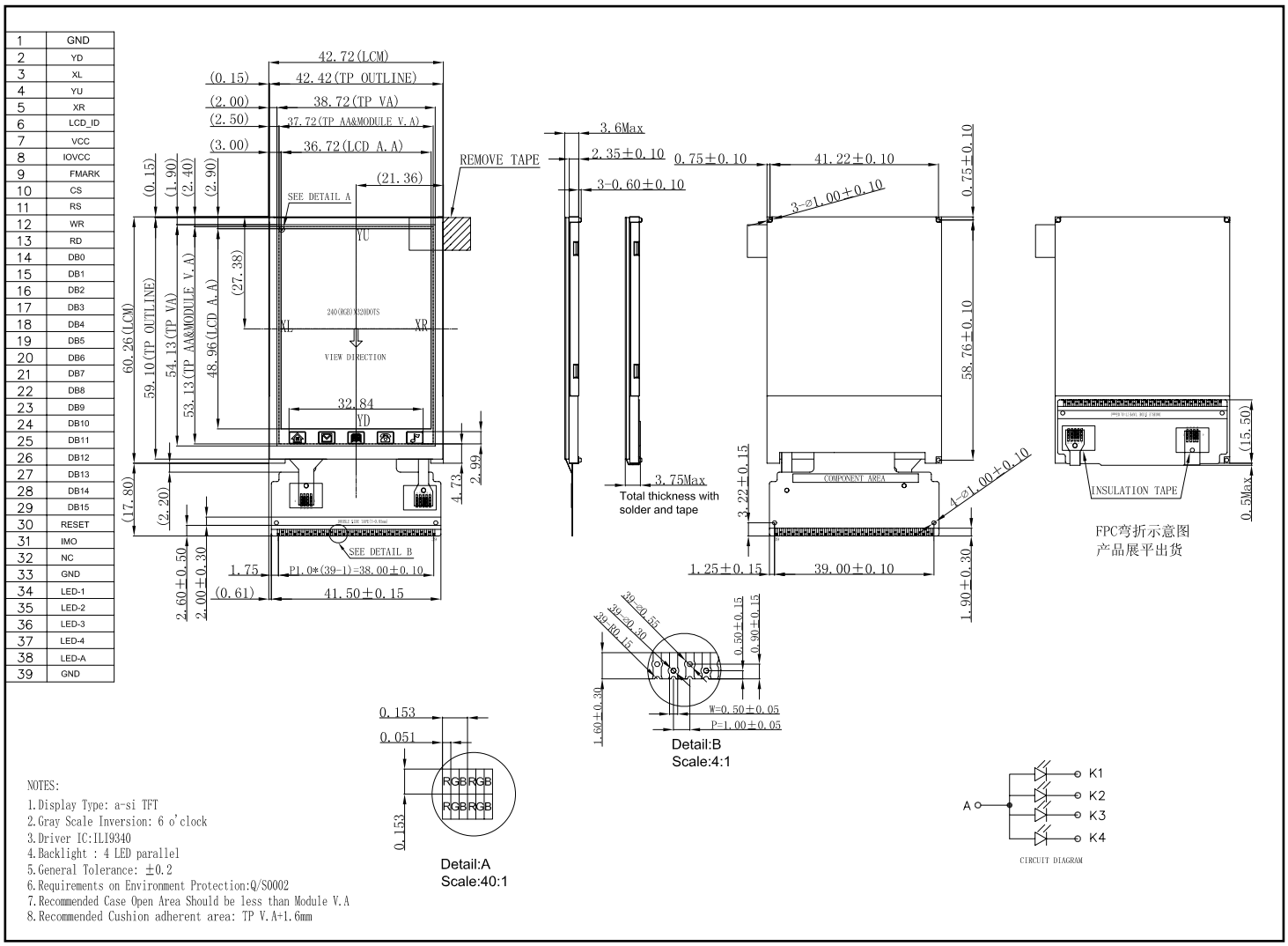
CONTENTS

WRITTEN BY	CHECKED BY	APPROVED BY

■ GENERAL INFORMATION

Item	Contents	Unit/note
LCD type	TFT-LCD, TRANSMISSIVE	/
Viewing direction	12:00 O' Clock	6 O' Clock (Good viewing)
Module area (W × H)	42.72 × 60.26	mm^2
Active area (W×H)	36.72 × 48.96	mm^2
Number of Dots	240RGB × 320	/
Dot size (W × H)	0.051 × 0.153	mm^2
Dot pitch (W × H)	0.153 × 0.153	mm^2
Driver IC	ILI9340	/
Backlight Type	4LED	/
Interface Type	CPU 8/16bit	/
Input voltage	2.8	V
Module Power consumption	192	mw
Module weight	13.1	g

■ EXTERNAL DIMENSIONS



■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	V_{CC},IOV_{CC}	-0.3	4.6	V
Input voltage	V_{IN}	-0.3	IOV_{CC} +0.5	V
Operating temperature	T_{OP}	-20	60	°C
Storage temperature	T_{ST}	-30	70	°C
Humidity	RH		90%(Max60°C)	RH

■ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

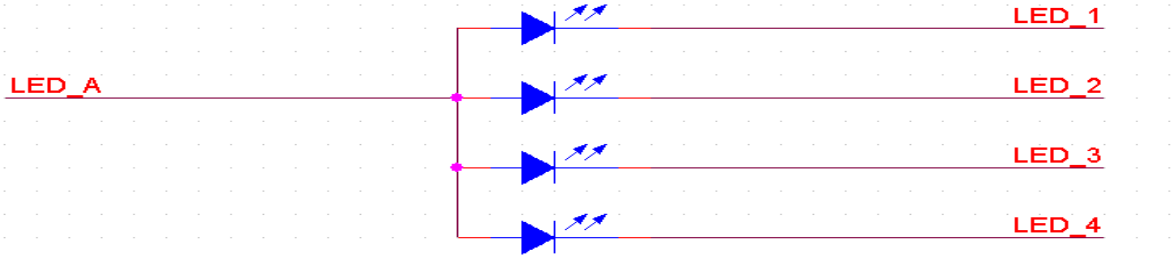
GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	1.8/2.8	3.3	V	
Analog Supply Voltage		VCC	2.3	2.8	3.3	V	
Input Signal Voltage	Low Level	V_{IL}	0.8x IOVCC	-	IOVCC	V	DB0-DB17,IM0,IM3,RD, RS,CS,WR,RESET
	High Level	V_{IH}	-	-	0.2xIOVCC	V	
Output Signal Voltage	Low Level	V_{OL}	0.8xIOVCC	-	-	V	
	High Level	V_{OH}	-	--	0.2xIOVCC	V	

■ BACKLIGHT CHARACTERISTICS

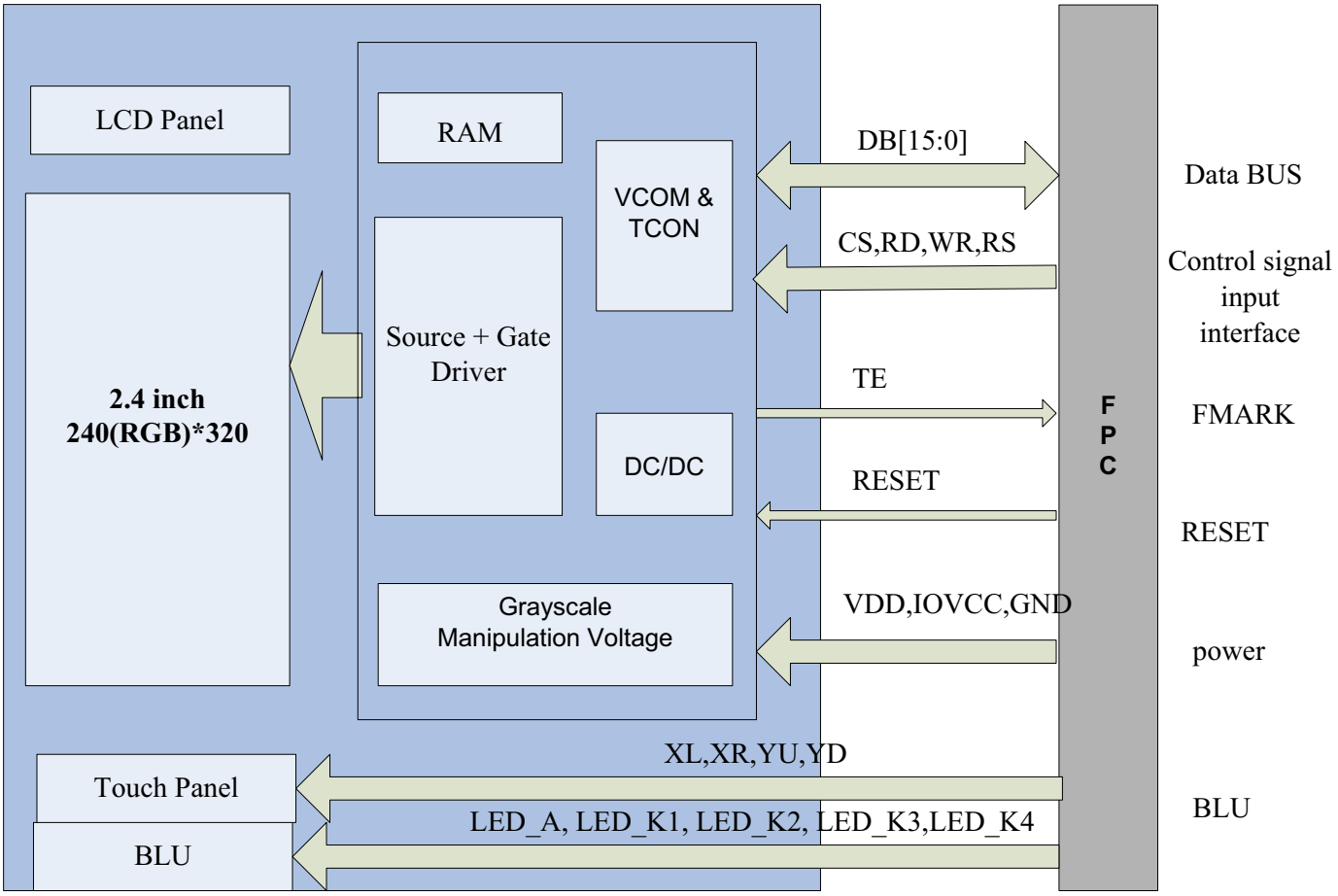
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	15	-	mA	For each LED
Forward Voltage	V_F	2.9	3.2	3.4	V	For each LED
Power Consumption	W_{BL}	-	192	-	mW	4 LEDs

Note1: Figure below shows the connection of backlight LED.



Note 2: One LED: 1/4xI_F =15 mA, V_F =3.2V

Block Diagram



■ TOUCH SCREEN PANEL SPECIFICATIONS

1.Electrical Characteristics

Item	Min	Typ	Max	Unit	Note
Linearity	-	-	1.5	%	X-Axis,Y-Axis
Terminal Resistance	-	TBD	-	Ω	X(Glass side)
	-	TBD	-	Ω	Y(Film side)
Insulation Resistance	10	-	-	MΩ	DC 25V
Operating voltage	-	5	-	V	DC
Response Time	-	-	10	Ms	-
Transmittance	80	-	-	%	-

Note 1) : Do not operate it with a thing except a polyacetal pen(tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil

2.Mechanical & Durability Characteristics

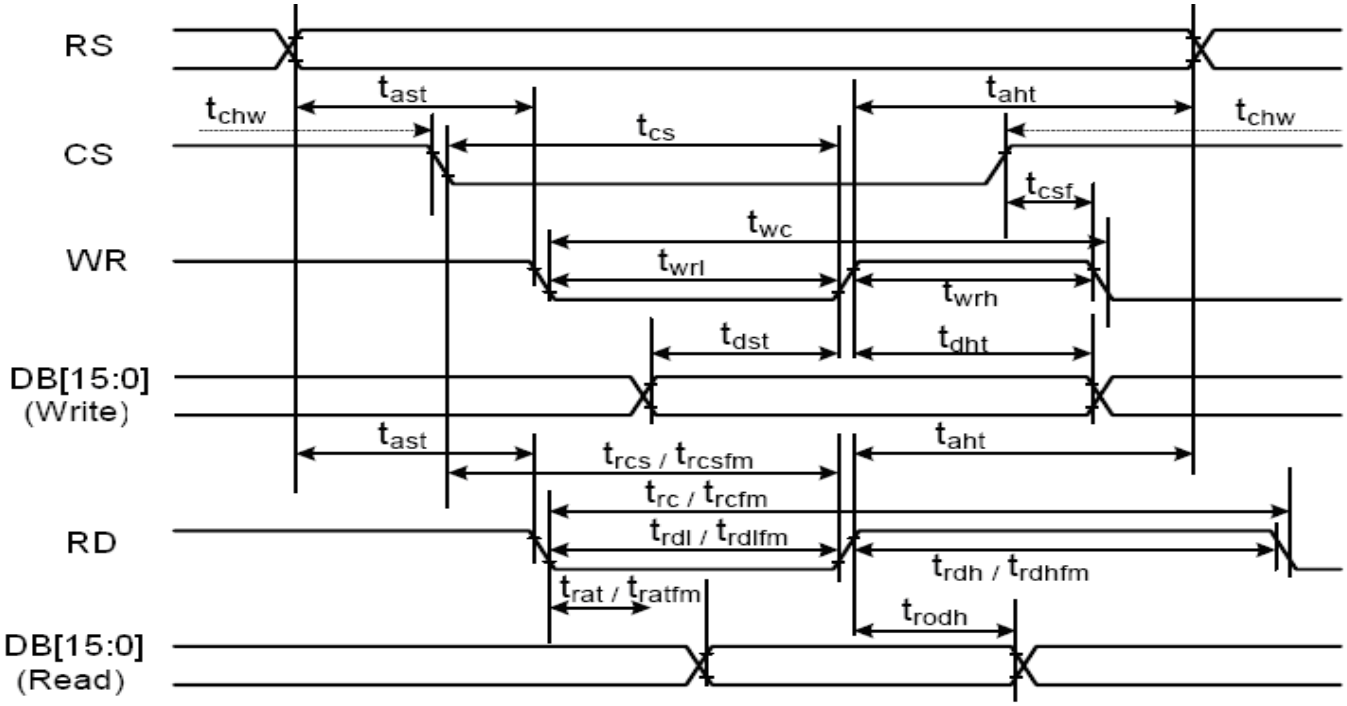
Item	Min	Typ	Max	Unit	Note
Operating Force	50	-	200	G	(1)
Touch Test	1,000,000	-	-	Times	(2)
Handwriting Friction Test	100,000	-	-	Times	(3)
Surface hardness	3	-	-	H	(4)

Note (1) Pen : 0.8N or less (R0.8mm)
Finger : 0.8N or less (0.8mm)
(2) Measusuement for Center part of Panel
-Hitting Pad : Tip R8mm Silicon Rubber & Tip R0.8mm Stylus pen
-Lode :150gf
-Speed :2times/sec
-Electric lode :None
(3) Measuremenf for 2.0mm inside of transparent insulation
-Sliding Pen : Tip R0.8mm Stylus pen
-Lode :150gf
-Speed :60mm/sec
-Sliding Length :25mm
-Electric lode : None
(4) Pressure 500gf , 45deg

3. Integration Design Guide

- Avoid the design that Front-case overlap and press on the active area of the touch-panel.
- Give enough gap (over 0.5mm at compressed) between the front case and touch-panel to protect wrong operating.
- Use a buffer material(Gasket) between the touch-panel and Front-case to protect damage and wrong operating.
- Avoid the design that buffer material overlap and press on the inside of touch-panel viewing area.

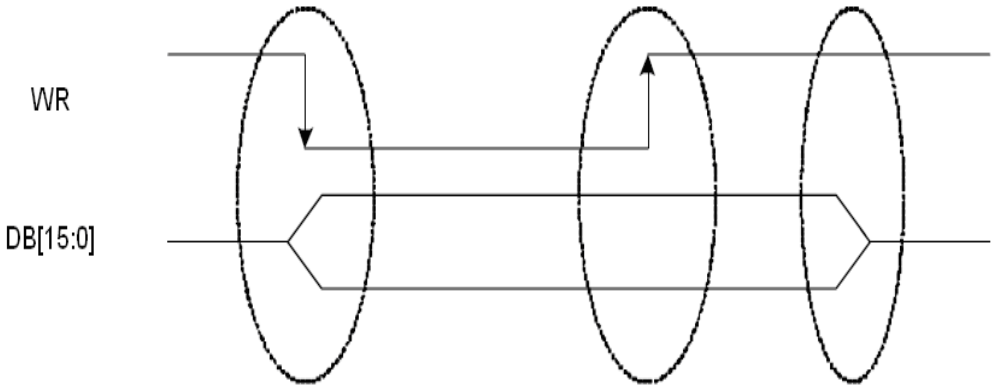
■ TIMING OF POWER SUPPLY



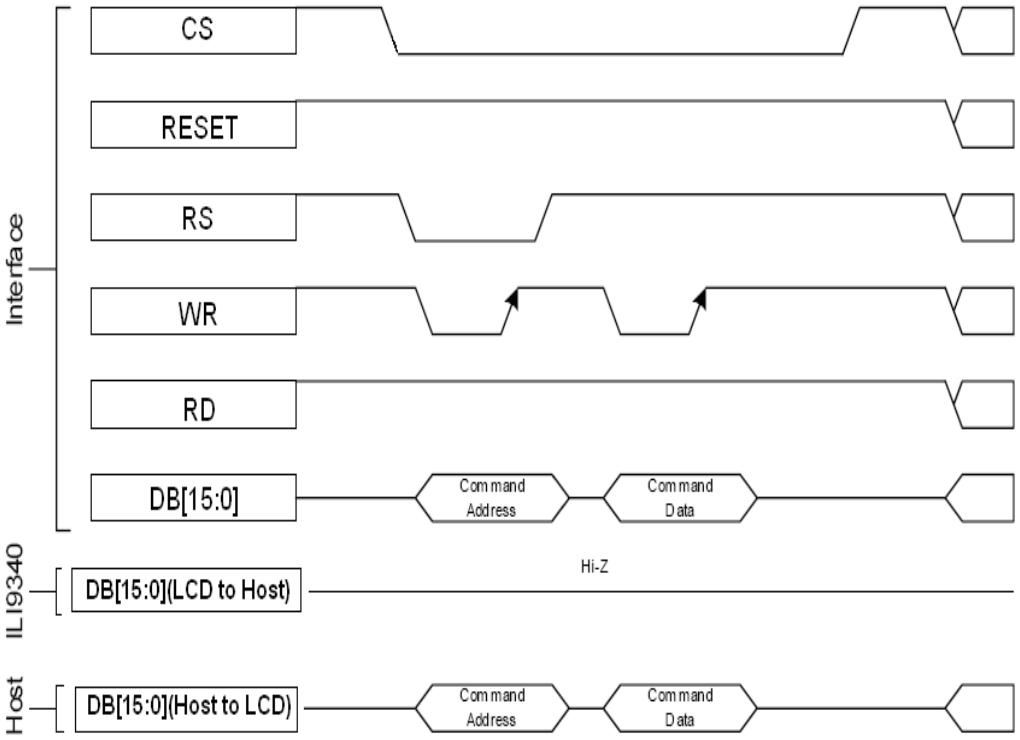
Timing Parameter

Signal	Symbol	Parameter	min	max	Unit	Description
RS	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	10	-	ns	
CS	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WR	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RD(FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RD(ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
DB[15:0]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

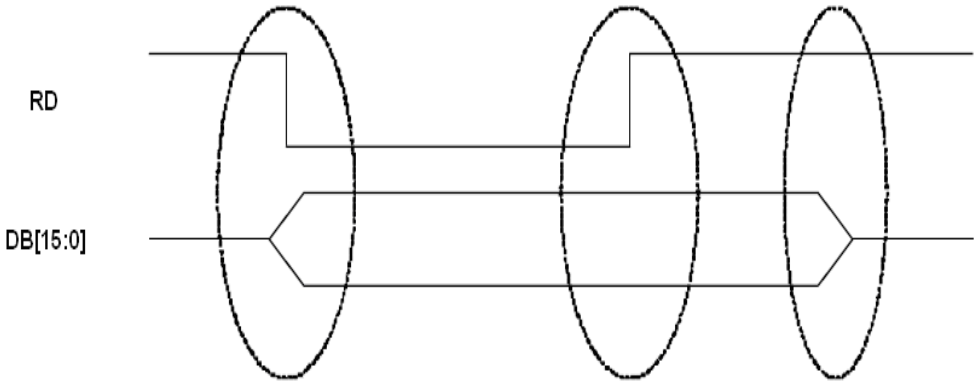
Registr Write/Read Timing Parameter



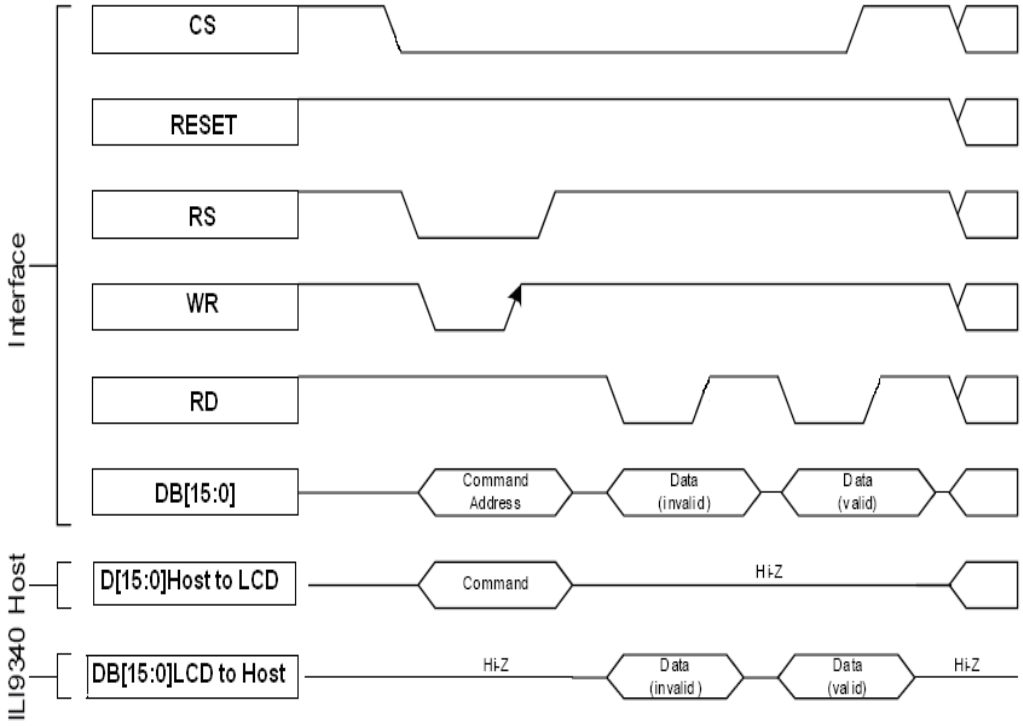
Note: WR is an unsynchronized signal (It can be stopped)



16-bit System Bus Interface Timing(Register Write Timing)



Note: WR *is an unsynchronized signal (It can be stopped).*



16-bit System Bus Interface Timing(Register Read Timing)

GRAM write/read timing

16-bit Read/Write GRAM Data format

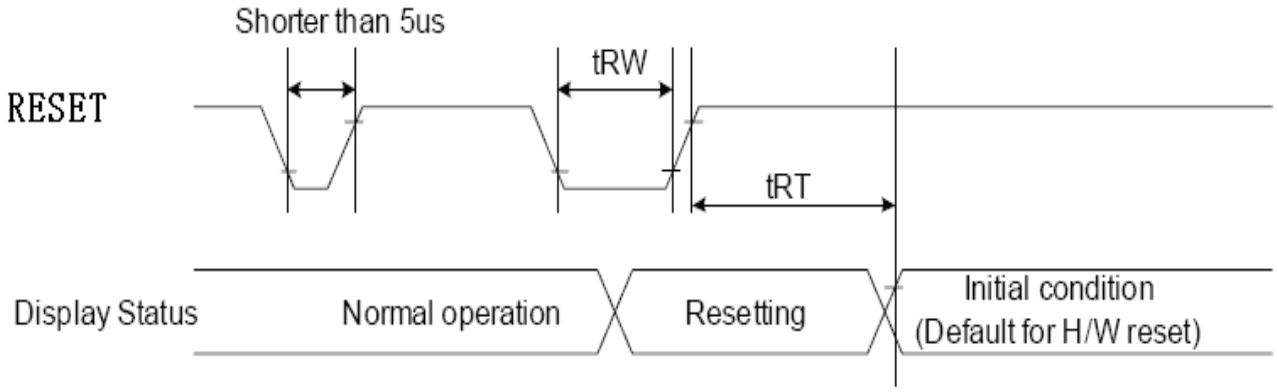
Count	0	1	2	3	…	238	239	240
RS	0	1	1	1	…	1	1	1
DB15		0R4	1R4	2R4	…	237R4	238R4	239R4
DB14		0R3	1R3	2R3	…	237R3	238R3	239R3
DB13		0R2	1R2	2R2	…	237R2	238R2	239R2
DB12		0R1	1R1	2R1	…	237R1	238R1	239R1
DB11		0R0	1R0	2R0	…	237R0	238R0	239R0
DB10		0G5	1G5	2G5	…	237G5	238G5	239G5
DB9		0G4	1G4	2G4	…	237G4	238G4	239G4
DB8		0G3	1G3	2G3	…	237G3	238G3	239G3
DB7	C7	0G2	1G2	2G2	…	237G2	238G2	239G2
DB6	C6	0G1	1G1	2G1	…	237G1	238G1	239G1
DB5	C5	0G0	1G0	2G0	…	237G0	238G0	239G0
DB4	C4	0B4	1B4	2B4	…	237B4	238B4	239B4
DB3	C3	0B3	1B3	2B3	…	237B3	238B3	239B3
DB2	C2	0B2	1B2	2B2	…	237B2	238B2	239B2
DB1	C1	0B1	1B1	2B1	…	237B1	238B1	239B1
DB0	C0	0B0	1B0	2B0	…	237B0	238B0	239B0

16-bit Read/Write GRAM Data format(65K)

Count	0	1	2	3	…	358	359	360
RS	0	1	1	1	…	1	1	1
DB15		0R5	0B5	1G5	…	238R5	238B5	239G5
DB14		0R4	0B4	1G4	…	238R4	238B4	239G4
DB13		0R3	0B3	1G3	…	238R3	238B3	239G3
DB12		0R2	0B2	1G2	…	238R2	238B2	239G2
DB11		0R1	0B1	1G1	…	238R1	238B1	239G1
DB10		0R0	0B0	1G0	…	238R0	238B0	239G0
DB9					…			
DB8					…			
DB7	C7	0G5	1R5	1B5	…	238G5	239R5	239B5
DB6	C6	0G4	1R4	1B4	…	238G4	239R4	239B4
DB5	C5	0G3	1R3	1B3	…	238G3	239R3	239B3
DB4	C4	0G2	1R2	1B2	…	238G2	239R2	239B2
DB3	C3	0G1	1R1	1B1	…	238G1	239R1	239B1
DB2	C2	0G0	1R0	1B0	…	238G0	239R0	239B0
DB1	C1				…			
DB0	C0				…			

16-bit Read/Write GRAM Data format(262K)

5.4 Reset Timing Characteristics



Signal	Symbol	Parameter	Min	Max	Unit
RESET	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

■ APPLICATION CIRCUIT

Please consult our technical department for detail information.

■ INITIAL CODE

Please consult our technical department for detail information.

■ELECTRO-OPTICAL CHARACTERISTICS

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	-	Degree	Note 2
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500	-		Note1 Note3
Response Time		Ton	25℃	-	20	30	ms	Note1 Note4
		Toff						
Chromaticity	White	x	Backlight is on	0.240	0.290	0.340		Note5, Note1
		y		0.270	0.320	0.370		
	Red	x		0.542	0.592	0.642		
		y		0.294	0.344	0.394		
	Green	x		0.285	0.332	0.385		
		y		0.531	0.581	0.631		
	Blue	x		0.099	0.149	0.199		
		y		0.054	0.104	0.154		
Uniformity		U		-	80	-	%	Note1 Note6
NTSC				-	53	-	%	Note 5
Luminance		L		210	250	-	cd/m^2	Note1 Note7

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

$$\textbf{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}{\text{Average Surface Luminance with all black pixels } (P_1, P_2, P_3, P_4, P_5)}$$

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

Lv = Average Surface Luminance with all white pixels $(P_1, P_2, P_3, P_4, P_5)$

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.

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

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.

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,CIE The test data is base on TOPCON's BM-5 photo detector.

Note8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle

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".

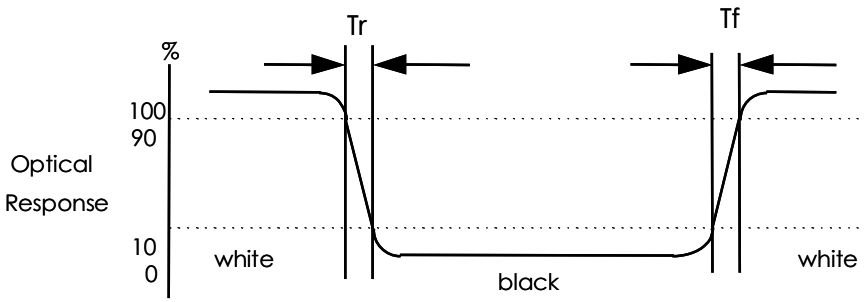


FIG.2. Measuring method for Contrast ratio,surface luminance, Luminance uniformity , CIE (x, y) chromaticity

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

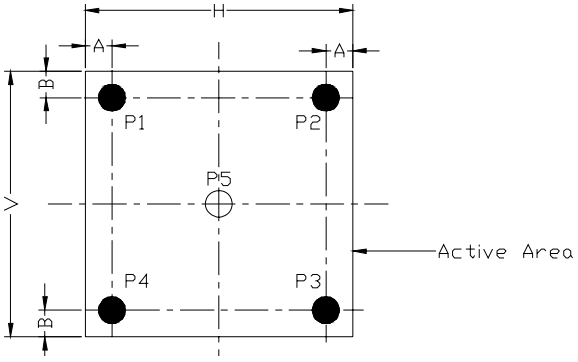
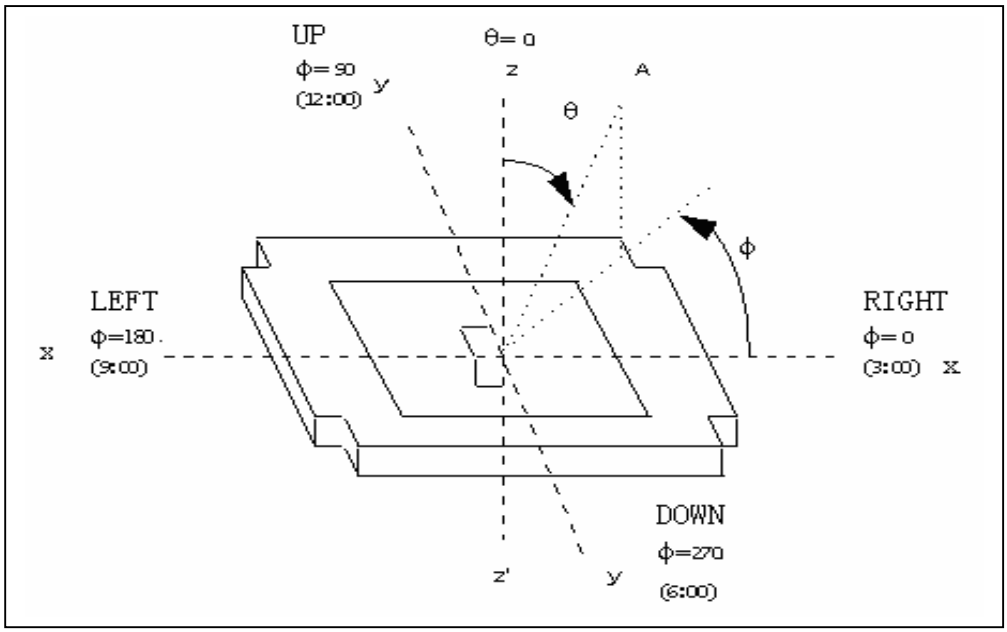


FIG.3. The definition of viewing angle



■ INTERFACE DESCRIPTION

No	Symbol	I/O	Description	Comment
1	GND	P	Power Ground	
2	YD	O	Touch Panel Bottom Side	
3	XL	O	Touch Panel Left Side	
4	YU	O	Touch Panel Up Side	
5	XR	O	Touch Panel Right Side	
6	LCD_ID	O	LCD identify signal. The voltage is about 2.470V when VCC is 2.8V.	
7	VCC	P	Power Supply of Analog	
8	IOVCC	P	Power Supply of Logic	
9	FMARK	O	Tearing effect output pin to synchronize MPU to frame writing	
10	CS	I	Chip select signal	
11	RS	I	Register select signal	
12	WR	I	Write enables signal	
13	RD	I	Read enables signal	
14	DB0	I/O	Data Input	
15	DB1	I/O	Data Input	
16	DB2	I/O	Data Input	
17	DB3	I/O	Data Input	
18	DB4	I/O	Data Input	
19	DB5	I/O	Data Input	
20	DB6	I/O	Data Input	
21	DB7	I/O	Data Input	
22	DB8	I/O	Data Input	
23	DB9	I/O	Data input	
24	DB10	I/O	Data input	
25	DB11	I/O	Data input	
26	DB12	I/O	Data input	
27	DB13	I/O	Data input	
28	DB14	I/O	Data input	
29	DB15	I/O	Data input	
30	RESET	I	Reset signal	
31	IM0	I	Mode select signal	Note2
32	NC	-	Floating	
33	GND	P	Power Ground	
34	LED_1	P	LED light cathode	
35	LED_2	P	LED light cathode	
36	LED_3	P	LED light cathode	
37	LED_4	P	LED light cathode	
38	LED_A	P	LED light anode	
39	GND	P	Power Ground	

Note1: I/O definition：I-----Input O---Output P----Power/ Ground NC--- Not Connected

Note2:

IM0	Interface	Data Bus Use	
		Register/Content	GRAM
0	8080 MCU 16_Bit Parallel	DB7~DB0	DB15~DB0
1	8080 MCU 8_Bit Parallel	DB15~DB8	DB15~DB8

■ RELIABILITY TEST

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	80±2℃/200 hours	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.missing segments; 5.Glass crack; 6.Current Idd is twice higher than initial value.
2	Low Temperature Storage	-30±2℃/200 hours	
3	High Temperature Operating	70±2℃/120 hours	
4	Low Temperature Operating	-20±2℃/120 hours	
5	Temperature Cycle	-20±2℃~25~70±2℃×10cycles (30min.) (5min.) (30min.)	
6	Damp Proof Test	50℃±5℃×90%RH/120 hours	
7	Vibration Test	Frequency：10Hz~55Hz~10Hz Amplitude：1.5mm, X，Y，Z direction for total 3hours (Packing condition)	
8	Dropping test	Drop to the ground from 1m height, one time, every side of carton. (Packing condition)	
9	ESD test	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	

Remark:
1.The test samples should be applied to only one test item.
2.Sample size for each test item is 5~10pcs.
3.For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.
4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
Using ionizer(an antistatic blower) is recommended at working area in order to reduce electro-static voltage.
When removing protection film from LCM panel, peel off the tag slowly(recommended more than one second) while blowing with ionizer toward the peeling face to minimize ESD which may damage electrical circuit..
5.EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6. Please use automatic switch menu(or roll menu) testing mode when test operating mode.

■ INSPECTION CRITERIA

OUTGOING QUALITY STANDARD	PAGE 1 OF 6
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	MDS Product

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

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:

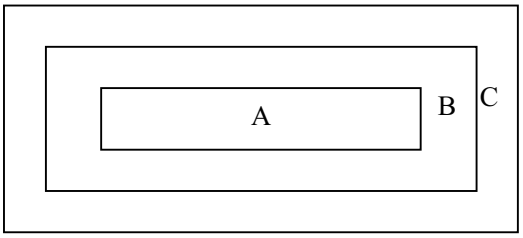
Major defect: AQL 0.65

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.

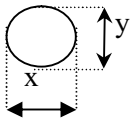
OUTGOING QUALITY STANDARD	PAGE 2 OF 6
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	MDS Product

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
4.2.1	Clear Spots Black and white Spot defect Pinhole, Foreign Particle, Dirt under polarizer	For dark/white spot, size Φ is defined as $\Phi = \frac{(x+y)}{2}$ 	Minor
	Dim Spots Circle shaped and dim edged defects	2.	Minor

1.

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

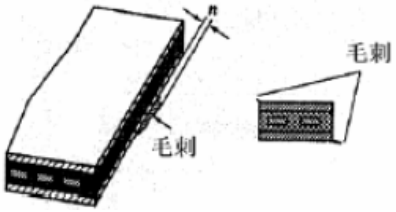
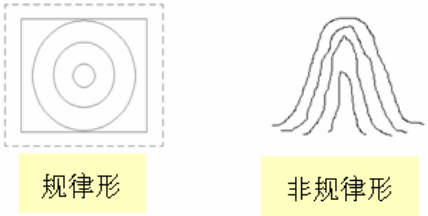
2.

Size(mm) \ 2. Zone	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.20<Φ≤0.40	3		
0.40<Φ≤0.60	2		
0.60<Φ≤0.80	1		
0.80<Φ	0		

4.2. Cosmetic Defect

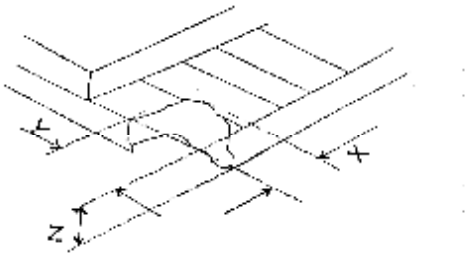
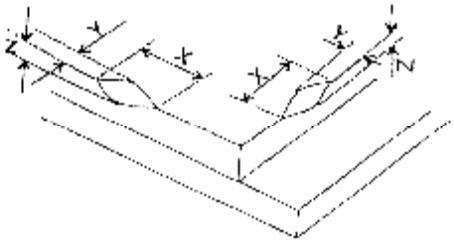
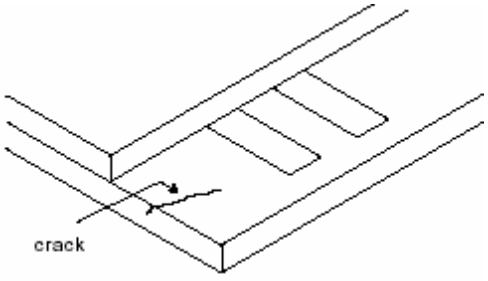
<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td>4.2.2</td><td>Line defect
Black line,
White line,
Foreign material under polarizer,</td><td>
<table>
<tr><th colspan="2">Size(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th rowspan="2">L(Length)</th><th rowspan="2">W(Width)</th><th colspan="3">Zone</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Ignore</td><td>W≤0.02</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>L≤3.0</td><td>0.02＜W≤0.03</td><td colspan="2">2</td></tr>
<tr><td>L≤2.0</td><td>0.03＜W≤0.05</td><td colspan="2">1</td></tr>
<tr><td></td><td>0.05＜W</td><td colspan="2">Define as spot defect</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>4.2.3</td><td>Polarizer scratch</td><td>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.
<table>
<tr><th colspan="2">Size(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th rowspan="2">L(Length)</th><th rowspan="2">W(Width)</th><th colspan="3">Zone</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>5.0＜L≤10.0</td><td>0.03＜W≤0.05</td><td colspan="2">2</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.08</td><td colspan="2">1</td></tr>
<tr><td></td><td>0.08＜W</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>4.2.4</td><td>Polarize
Air bubble</td><td>Air bubbles between glass & polarizer
<table>
<tr><th rowspan="2">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≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.20＜Φ≤0.30</td><td colspan="2">2</td></tr>
<tr><td>0.30＜Φ≤0.50</td><td colspan="2">1</td></tr>
<tr><td>0.50＜Φ</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
</table>

<table>
<tr><td>4.2.5</td><td>Foreign material on TP film</td><td>The line can be seen after mobile phone in the operating condition:
<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>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>L≤5.0</td><td>0.03＜W≤0.05</td><td colspan="2">3</td></tr>
<tr><td></td><td>0.05＜W</td><td colspan="2">Define as spot defect</td></tr>
</table></td><td>Minor</td></tr>
<tr><td></td><td>Dim Spots
Circle shaped and dim edged defects</td><td>
<table>
<tr><td rowspan="2">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>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.20＜Φ≤0.40</td><td colspan="2">2</td></tr>
<tr><td>0.40＜Φ≤0.60</td><td colspan="2">1</td></tr>
<tr><td>0.60＜Φ</td><td colspan="2">0</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>4.2.6</td><td>Dim line defect
Polarizer scratch
TP film scratch</td><td>
<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>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>5.0＜L≤10.0</td><td>0.03＜W≤0.05</td><td colspan="2">2</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.08</td><td colspan="2">1</td></tr>
<tr><td></td><td>0.08＜W</td><td colspan="2">0</td></tr>
</table></td><td>Minor</td></tr>
</table>

	4.2.7 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.  图案字体 Pattern font 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.  TP鼓 TP knob 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  规律形 非规律形	Minor

OUTGOING QUALITY STANDARD	PAGE 6 OF 6
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	MDS Product

4.3. Cosmetic Defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="3">4.3.5</td><td rowspan="3">Glass defect</td><td>(i) Chips on corner
 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤2.0</td><td>≤S</td><td>Disregard</td></tr></table>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.</td><td>Minor</td></tr>
<tr><td>(ii)Usual surface cracks
 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0</td><td><Inner border line of the seal</td><td>Disregard</td></tr></table></td><td>Minor</td></tr>
<tr><td>(iii) Crack
Cracks tend to break are not allowed.
 
</td><td>Major</td></tr>
<tr><td>4.3.6</td><td>Parts alignment</td><td>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.</td><td>Minor</td></tr>
<tr><td>4.3.7</td><td>SMT</td><td>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.</td><td></td></tr>
</table>

■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

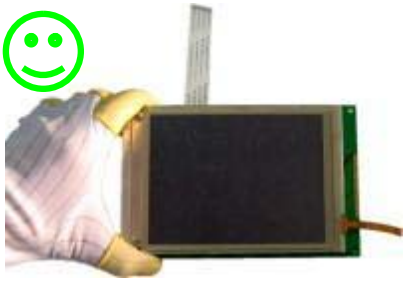
（13）Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- 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.

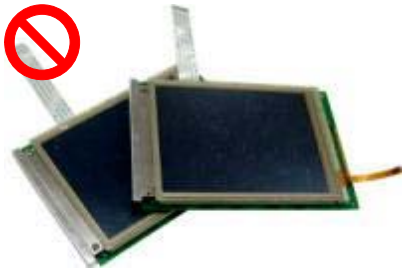
Correct handling:



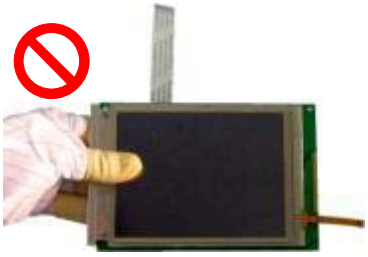
As above picture, please handle with anti-static gloves around LCM edges.

Incorrect handling:

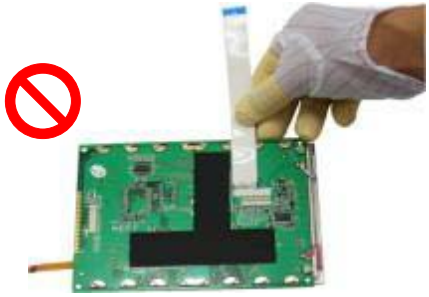
Please don't touch IC directly.



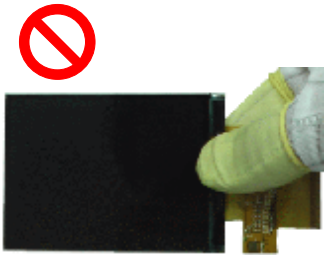
Please don't stack LCM.



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.

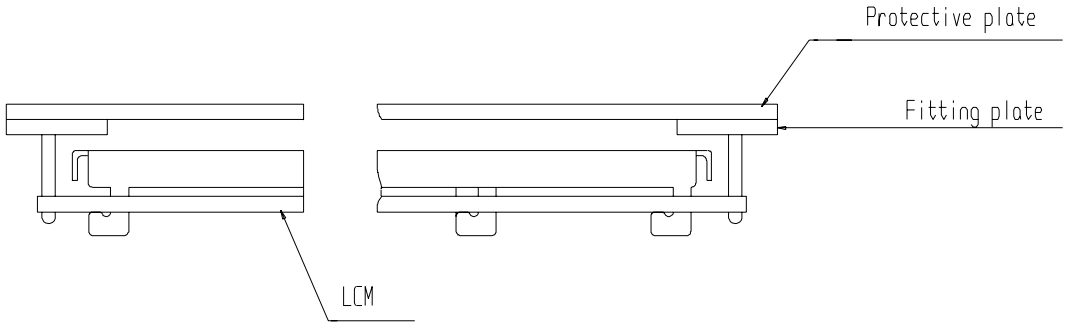
- Exposed area of the printed circuit board.
-Terminal electrode sections.

■ 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.

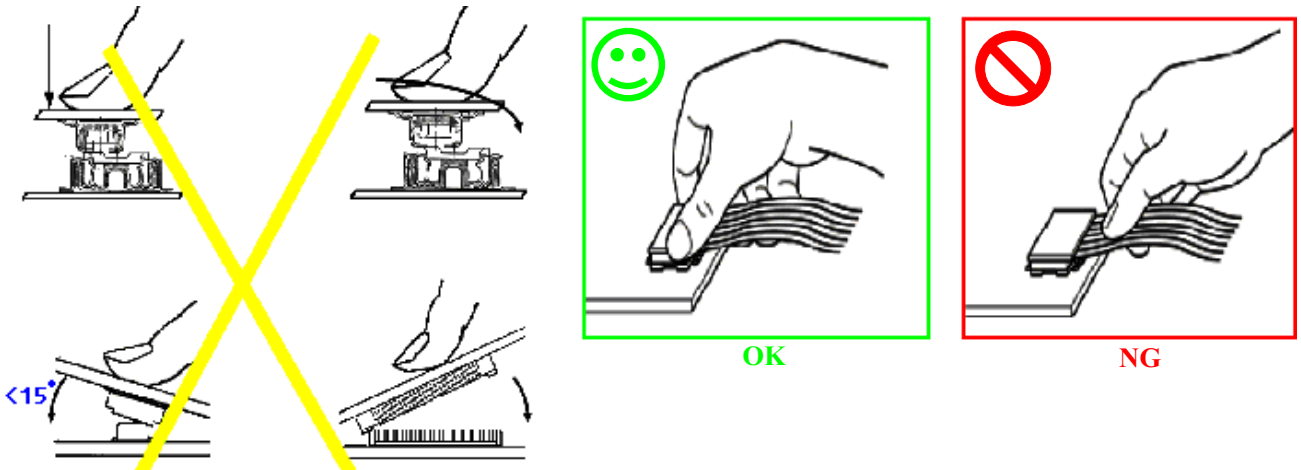
(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(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 betweenMulti-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-Innowithin 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability ofMulti-Inno limited to repair and/or replacement on the terms set forth above. Multi-Innowill 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.