MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0600AT

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.1
Engineering	
Date	2011-10-28
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2009-07-17	Preliminary Specification Release	
1.1	2011-10-28	Final Specification Release	

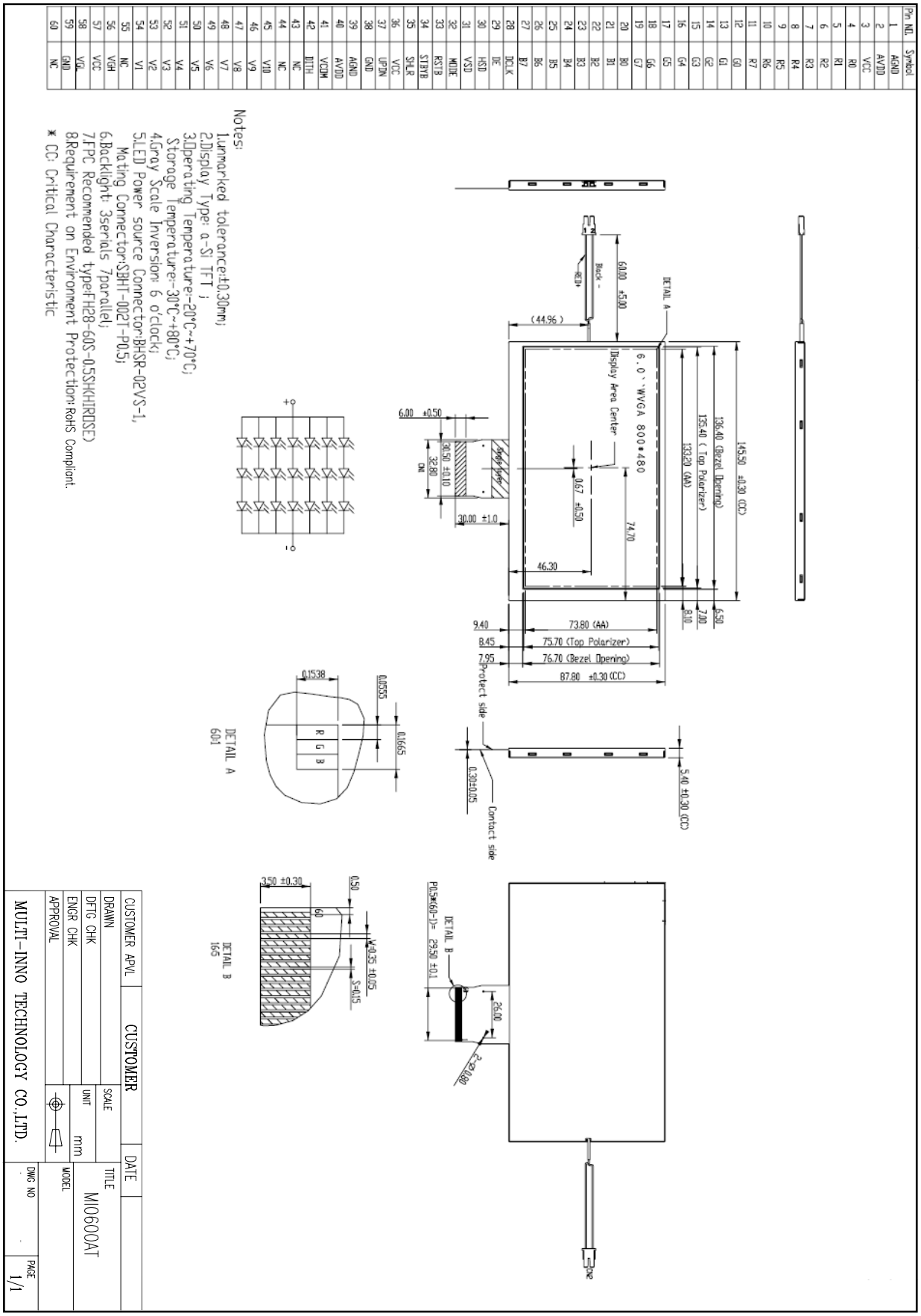
CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	6.0	Inch
Viewing direction	12:00	O' Clock
Gray scale inversion direction	6:00	O' Clock
LCM (W × H × D)	145.50×87.80×5.40	mm^3
Active area (W×H)	133.20×73.80	mm^2
Pixel pitch (W×H)	0.1665×0.1538	mm^2
Number of dots	800 (RGB) × 480	/
Backlight type	21 LEDs	/
Interface type	RGB 24 bits with TCON	/
Color depth	16M	/
Pixel configuration	R.G.B vertical stripe	/
Surface treatment(Up polarizer)	Anti glare	/
Input voltage	3.3	V
With/Without TSP	Without TSP	/
Weight	113.25	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	Symbol	Min	Max	Unit
Power voltage	VCC	-0.5	5.0	V
	AVDD	-0.5	13.5	V
	VGH	-0.3	40.0	V
	VGL	-20.0	0.3	V
	VGH-VGL	-0.3	40.0	V
Back light forward current	I_{LED}	-	25	mA
Operating temperature	Top	-20	70	°C
Storage temperature	Tst	-30	80	°C
Humidity	RH	-	90%(Max60°C)	RH

■ELECTRICAL CHARACTERISTICS

1.1 Recommended Operating Condition

Parameter	Symbol	Min	Typ	Max	Unit
Digital supply voltage	VCC	3.0	3.3	3.6	V
Analog supply voltage	AVDD	9.34	9.84	10.33	V
Gate on voltage	VGH	17.1	19.0	20.9	V
Gate off voltage	VGL	-7.7	-7.0	-6.3	V
Common electrode driving signal	VCOM	3.84	3.86	3.88	V
Input level of gamma voltage	V1-V5	0.4xAVDD	-	AVDD-0.1	V
	V6-V10	0.1	-	0.6xAVDD	V
Input voltage ' H ' level	V_{IH}	0.7VCC	-	VCC	V
Input voltage ' L ' level	V_{IL}	0	-	0.3VCC	V
Output voltage ' H ' level	V_{OH}	0.8VCC	-	VCC	V
Output voltage ' L ' level	V_{OL}	0	-	VCC	V

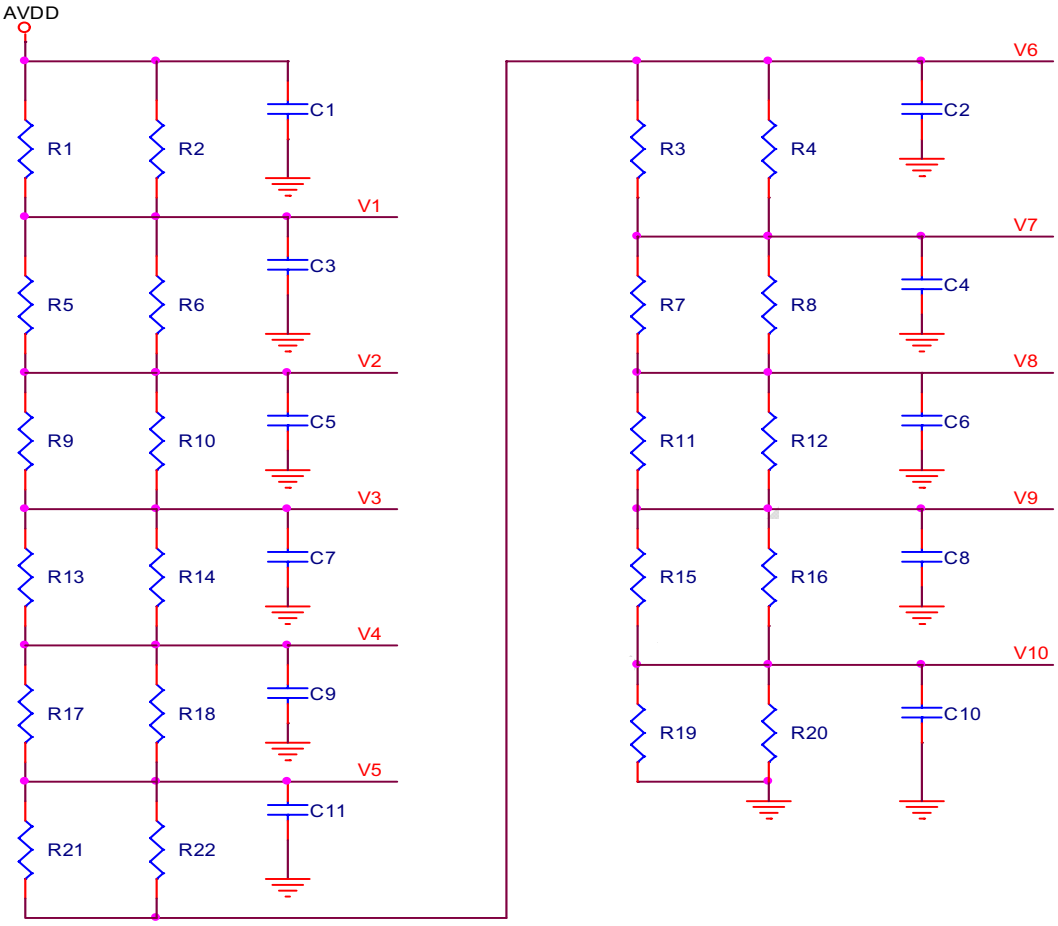
Note: The value is for design stage only.

1.2 Gamma Correction Voltage Setting

1.2.1 Gamma Correction Reference Voltage Setting

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
Gamma correction reference voltage V1~V14	V1	-	9.60	AVDD-0.1	V	
	V2	-	7.89	-	V	
	V3	-	7.34	-	V	
	V4	-	6.92	-	V	
	V5	-	5.00	-	V	
	V6	-	4.83	-	V	
	V7	-	2.95	-	V	
	V8	-	2.49	-	V	
	V9	-	1.94	-	V	
	V10	AGND+0.1	0.23	-	V	

1.2.2 Gamma Correction Reference Voltage Setting



1.2.3 Gamma Correction Resistance Value

Symbol	Unit	Resistance	Symbol	Unit	Resistance
R1	Ω	39	R3	Ω	200
R2	Ω	39	R4	Ω	3000
R5	Ω	1000	R7	Ω	910
R6	Ω	200	R8	Ω	43
R9	Ω	91	R11	Ω	91
R10	Ω	130	R12	Ω	130
R13	Ω	43	R15	Ω	1000
R14	Ω	910	R16	Ω	200
R17	Ω	200	R19	Ω	43
R18	Ω	3000	R20	Ω	47
R21	Ω	33	C1~C11	uF	1.0 (16V)
R22	Ω	33			

Note: Setting the resistance only when AVDD=9.840V, AGND=GND=0V;

■ BACKLIGHT CHARACTERISTICS

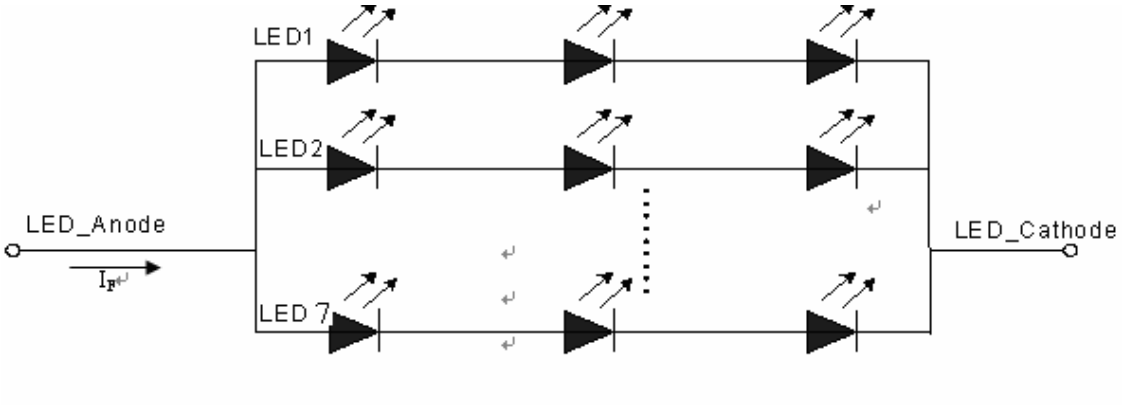
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	140.0	175.0	mA	21 LEDs (3 LED Serial, 7 LED Parallel)
Forward Voltage	V_F	-	9.6	-	V	
Backlight Power Consumption	W_{BL}	-	1.344	1.680	W	
Operating Life Time	--	10,000	20,000		Hrs	

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 7 LED Parallel).For each LED:I_F(1/7)=20mA, V_F(1/3)=3.2V.

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED.Optical performance should be evaluated at Ta=25℃ only. 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.

Note4: The LED driving condition is defined for each LED module.



■ POWER CONSUMPTION

AGND=GND=0V, Ta = 25

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Digital Supply Current	I_{VCC}	VCC=3.3V	-	5	10.0	mA	
Analog Supply Current	I_{AVDD}	AVDD=9.84V	-	25	35.0	mA	
Gate On Current	I_{VGH}	VGH=19.0V	-	0.4	0.6	mA	
Gate Off Current	I_{VGL}	VGL=-7.0V	-	0.4	0.6	mA	
Power Consumption	Panel&Gamma		-	0.3	-	W	
	Backlight		-	1.344	1.680	W	
	Total		-	1.644	-	W	

■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	θ=0° ∅=0° Ta=25℃	---	40	60	ms	FIG 1.	4
Contrast ratio		Cr		400	500	---	---	FIG 2.	1
Luminance uniformity		δ WHITE		75	80	---	%	FIG 2.	3
Surface Luminance		Lv		320	400	---	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	50	60	---	deg	FIG 3.	6
			∅ = 270°	60	70	---	deg	FIG 3.	
			∅ = 0°	60	70	---	deg	FIG 3.	
			∅ = 180°	60	70	---	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	θ=0° ∅=0° Ta=25℃	0.525	0.575	0.625		FIG 2.	5
		y		0.275	0.325	0.375			
	Green	x		0.295	0.345	0.395			
		y		0.525	0.575	0.625			
	Blue	x		0.100	0.150	0.200			
		y		0.065	0.115	0.165			
	White	x		0.255	0.305	0.355			
		y		0.280	0.330	0.380			
NTSC Ratio		S		---	50	---	%		

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

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3,P4, P5)}}$$

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

Lv = Average Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)

Note 3. The uniformity in surface luminance ， δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

$$\delta\ \text{WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}$$

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

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

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

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

FIG. 1 The definition of Response Time

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

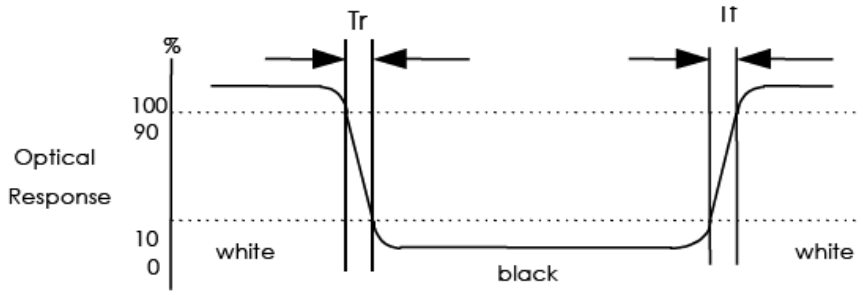
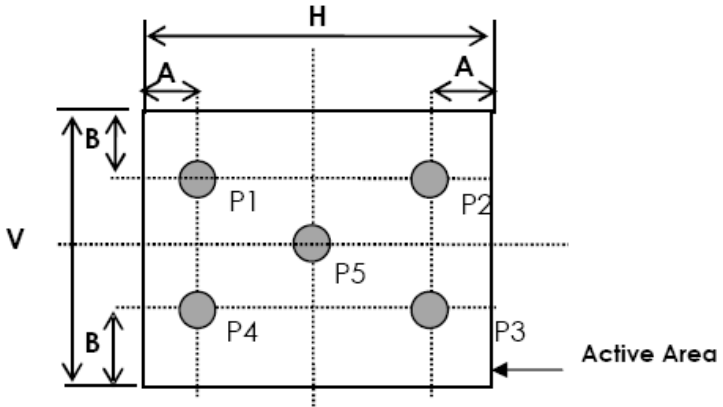
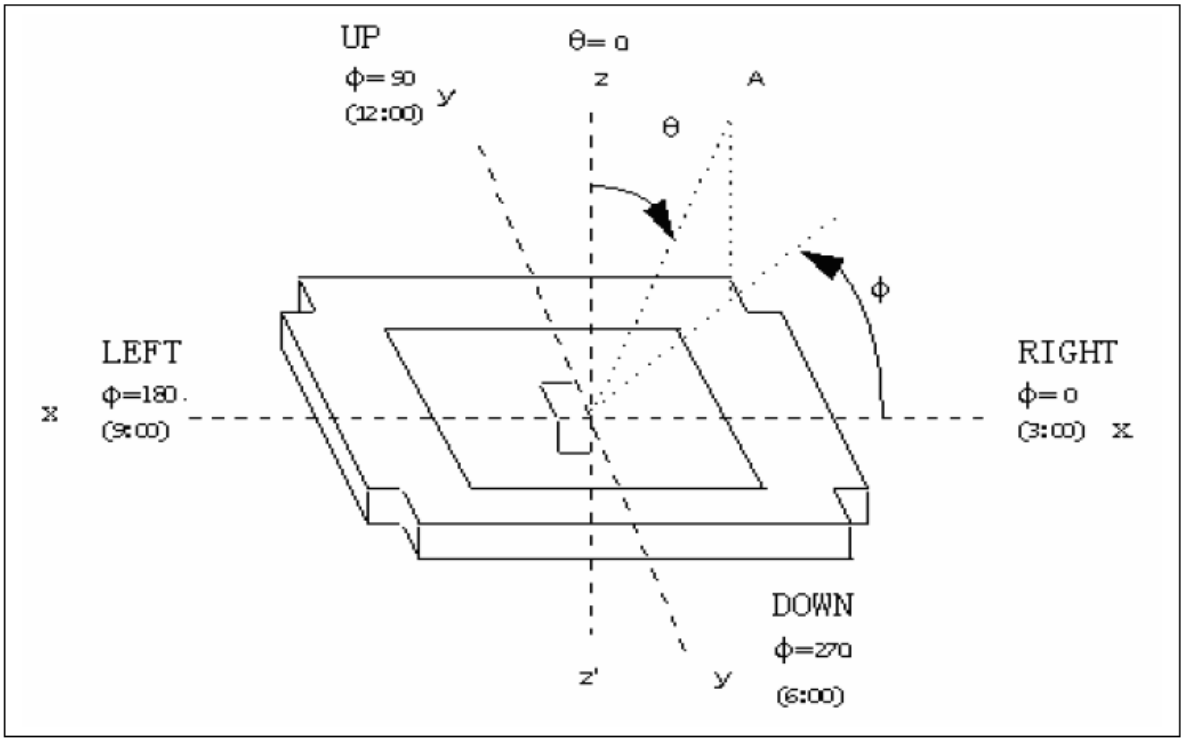


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity



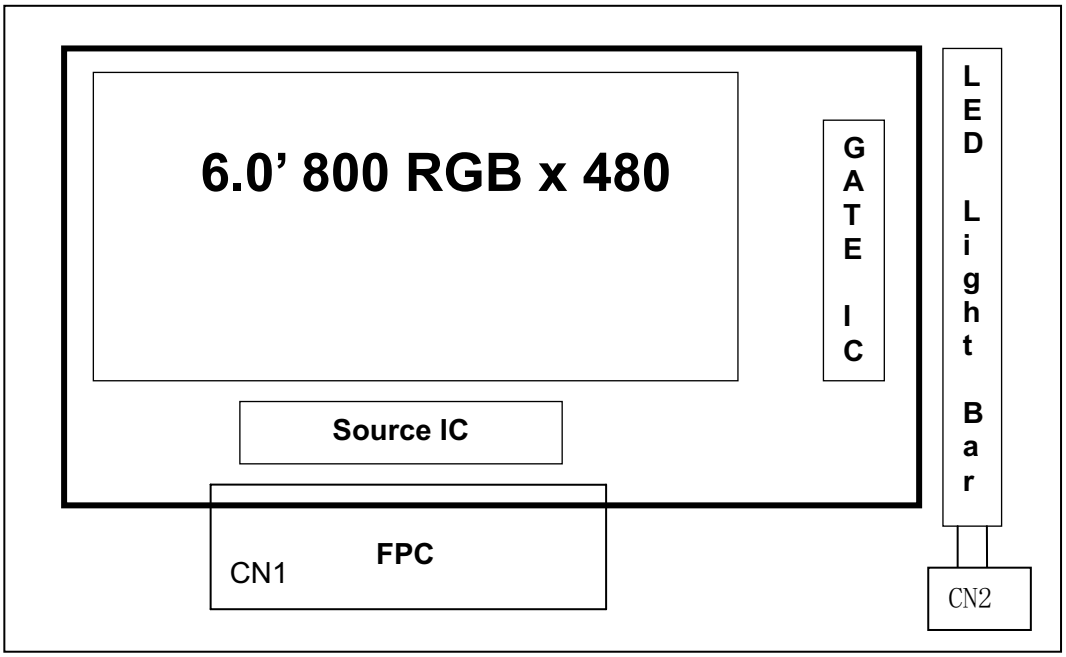
A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=7mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

FIG. 3 The definition of viewing angle



■ INTERFACE DESCRIPTION

1.BlockDiagram



2 Input/Output Terminals

2.1 CN1 of FPC

Matching Connector of FH28S-60S-0.5SH (HIROSE)

Pin	Symbol	I/O	Description	Remark
1	AGND	P	Ground	
2	AVDD	P	Analog Power	
3	VCC	P	Digital Power Supply	
4	R0	I	Red Data(LSB)	
5	R1	I	Red Data	
6	R2	I	Red Data	
7	R3	I	Red Data	
8	R4	I	Red Data	
9	R5	I	Red Data	
10	R6	I	Red Data	
11	R7	I	Red Data	
12	G0	I	Green Data(LSB)	
13	G1	I	Green Data	
14	G2	I	Green Data	
15	G3	I	Green Data	
16	G4	I	Green Data	
17	G5	I	Green Data	
18	G6	I	Green Data	
19	G7	I	Green Data	
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	
26	B6	I	Blue Data	
27	B7	I	Blue Data	

28	DCLK	I	Clock Input	
29	DE	I	Data Enable Signal	
30	HSD	I	Horizontal Sync Input. Negative Polarity	
31	VSD	I	Vertical Sync Input. Negative Polarity	
32	MODE	I	DE/SYNC Mode Select. H: DE mode, L: SYNC mode	
33	RSTB	I	Global Reset Pin	
34	STBYB	I	Standby Mode Select H: normal operation, L: standby mode	
35	SHLR	I	Source Right or Left Sequence Control	
36	VCC	P	Digital Power	
37	UPDN	I	Gate Up or Down Scan Control	
38	GND	P	Ground	
39	AGND	P	Ground	
40	AVDD	P	Analog Power	
41	VCOM	I	Common Voltage Input	
42	DITH	I	Dithering Setting. H: 6bit Resolution, L: 8bit Resolution	
43	NC	N	No Connection	
44	NC	N	No Connection	
45	V10	I	Gamma Voltage 10	
46	V9	I	Gamma Voltage 9	
47	V8	I	Gamma Voltage 8	
48	V7	I	Gamma Voltage 7	
49	V6	I	Gamma Voltage 6	
50	V5	I	Gamma Voltage 5	
51	V4	I	Gamma Voltage 4	
52	V3	I	Gamma Voltage 3	
53	V2	I	Gamma Voltage 2	
54	V1	I	Gamma Voltage 1	
55	NC	N	No Connection	
56	VGH	P	Positive Power for TFT	
57	VCC	P	Digital Power	
58	VGL	P	Negative Power for TFT	

59	GND	P	Ground	
60	NC	N	No Connection	

Note: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No Connection

2.2 CN2 of LED BLU Connector

Matching Connector of BHSR-02VS-1

Pin	Symbol	I/O	Description	Remark
1	LED+	P	LED Anode	Red Cable
2	LED-	P	LED Cathode	White Cable

2.3 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	VCC	Up to Down, Left to Right
VCC	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
VCC	VCC	Down to Up, Left to Right

■ APPLICATION NOTES

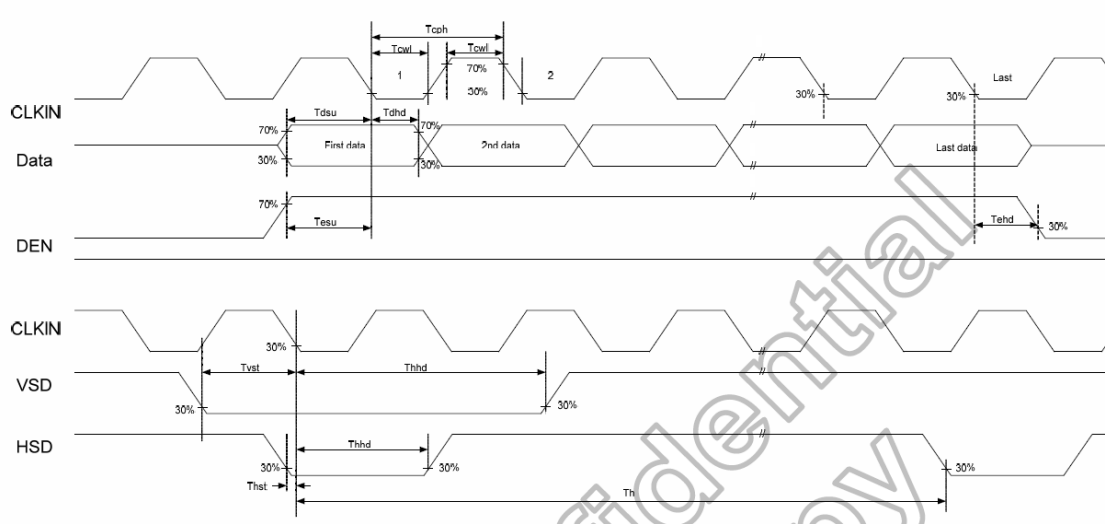
1 Timing Chart

1.1 TFT-LCD Input Timing

VCC=3.3V, AVDD=9.84V, AGND=GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
DCLK Frequency	Fclk	-	30.0	40.0	MHz	
DCLK Cycle Time	Tcph	-	33.3	25	ns	
DCLK Pulse Width	Tcw	40%	50%	60%	Tcph	
VSD Setup Time	Tvst	8			ns	
VSD Hold Time	Tvhd	8	-	-	ns	
HSD Setup Time	Thst	8			ns	
HSD Hold Time	Thhd	8	-	-	ns	
Data Setup Time	Tdsu	8			ns	Data to DCLK
Data Hold Time	Tdhd	8	-	-	ns	Data to DCLK
DE Hold Time	Tehd	8	-	-	ns	
DE Setup Time	Tesu	8	-	-	ns	
RSTB Pulse Width	Trst	50	-	-	us	

Input clock and data timing waveform



1.2 Recommended Timing Setting Of TCON

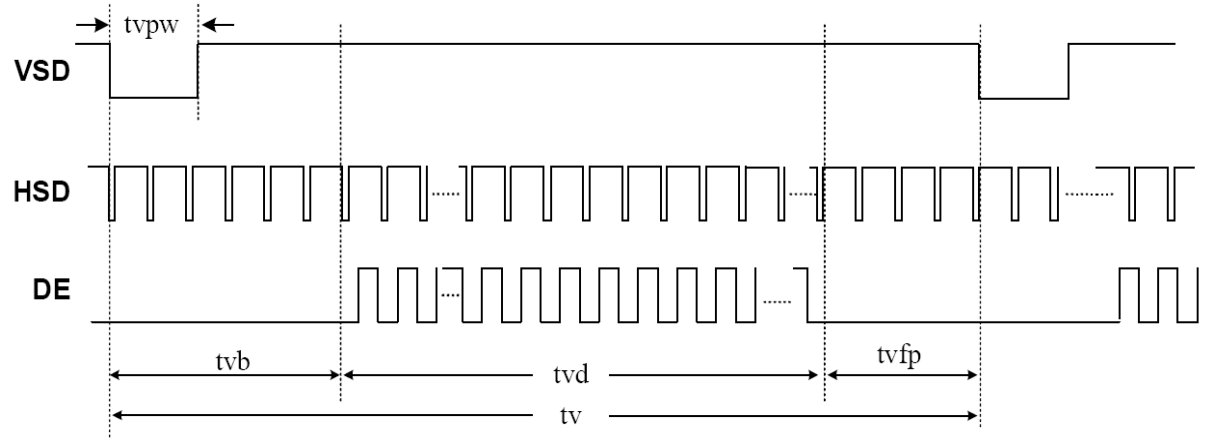
TCON (Embedded In Source IC) Input Timing (DCLK, HSD, VSD, DE)

VCC=3.3V, AVDD=9.84V, AGND=GND=0V, Ta=25

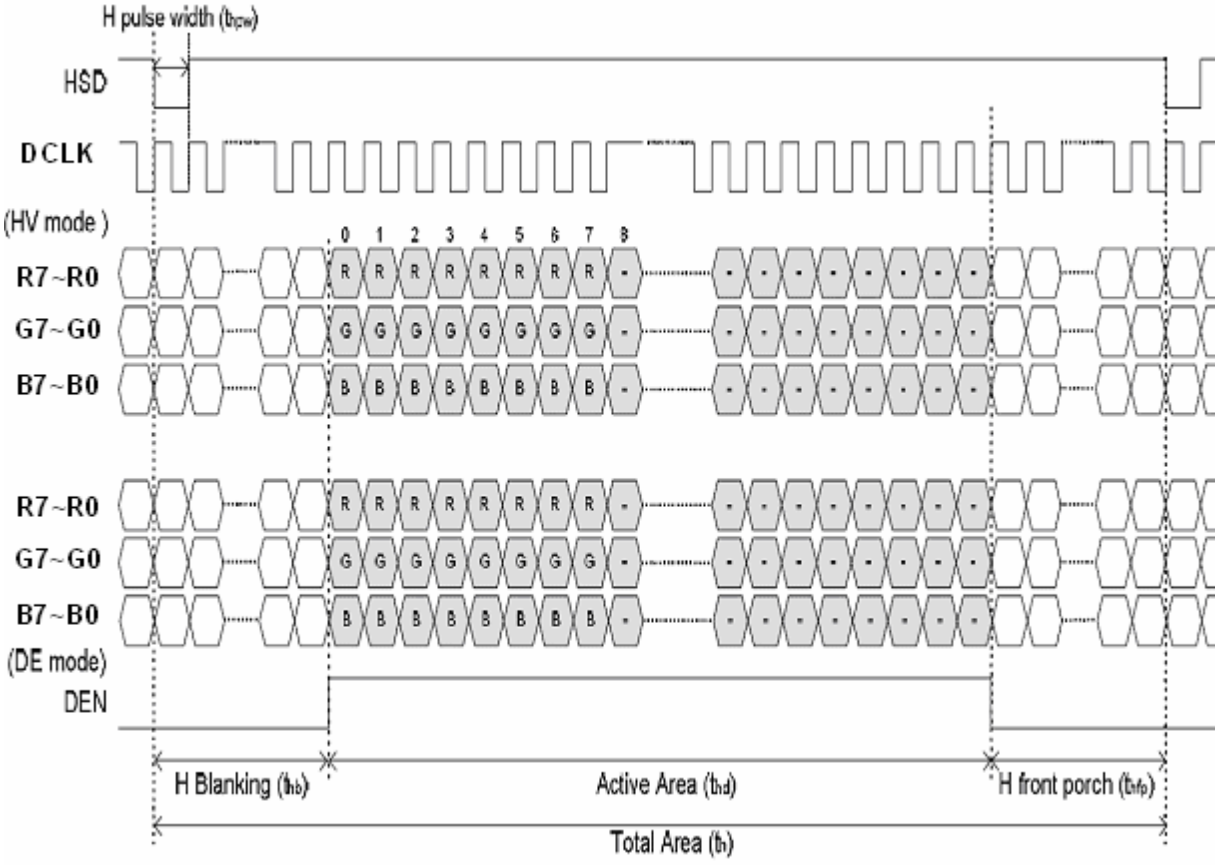
Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	Fclk	-	30.0	40.0	MHZ	
	tclk	-	33.3	25.0	ns	
HSD	th	928	928	928	tclk	
	thd	800	800	800	tclk	
	thpw	1	48	-	tclk	
	thb	-	88	-	tclk	
	thfp	-	40	-	tclk	
VSD	tv	-	525	-	t	
	tvd	480	480	480	th	
	tvpw	-	3	-	th	
	tvb	-	32	-	th	
	tvfp	-	13	-	th	

Note: DE timing refer to HSD, VSD input timing.

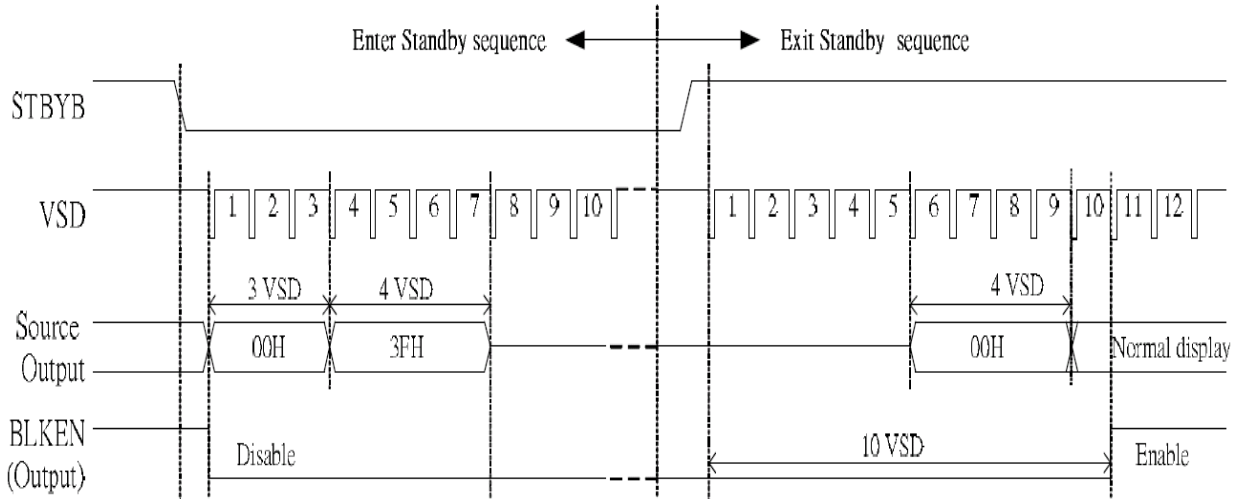
TCON Vertical Input Timing Diagram HV



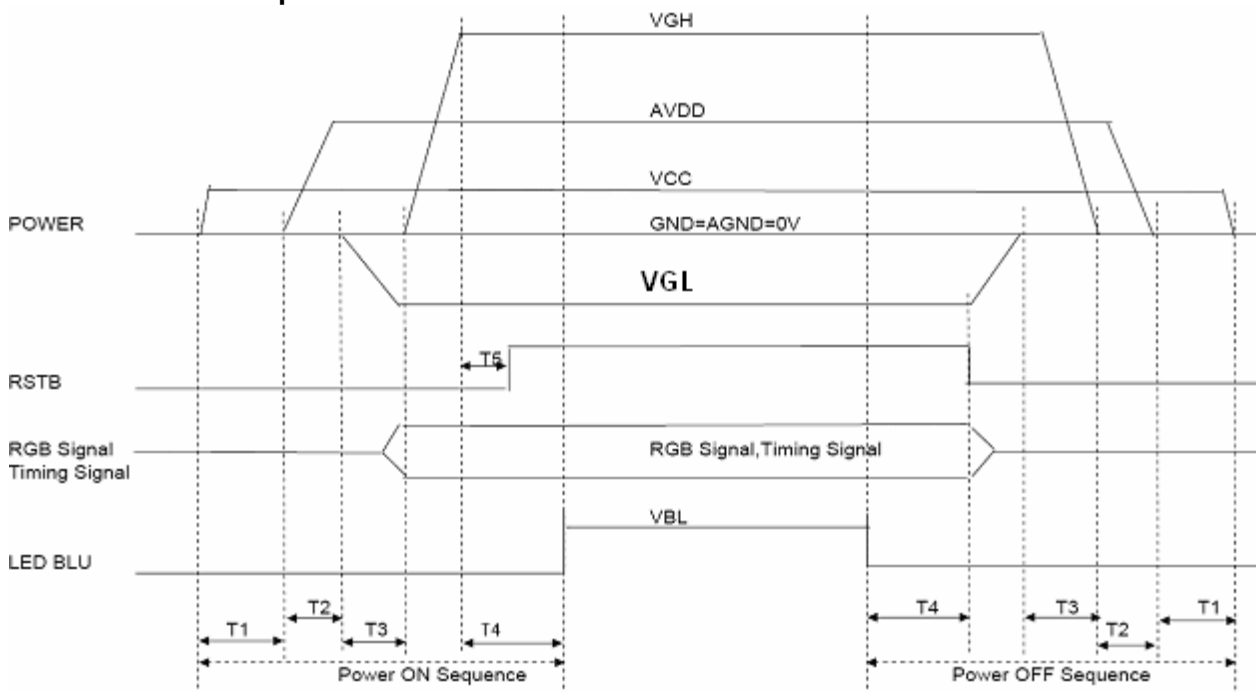
TCON Horizontal Input Timing Diagram



Enter and Exit Standby Mode Sequence



1.3 Power On/Off Sequence



Note: T1≥20ms, T2≥20ms, T3≥5ms, T4≥100ms, T5≥5ms.

■ RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	80±2℃/240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	70±2℃/240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Operating	-20±2℃/240 hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	-30±2℃~25~80±2℃×100cycles (30min.) (5min.) (30min.)	Start with cold temperature, End with high temperature, IEC60068-2-14 GB2423.22
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours	IEC60068-2-78 GB/T2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:60cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330Ω,5points/panel Air: ±8KV,5times Contact: ±4KV,5times(Environment: 15℃~35℃,30%~60%,86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	Half sine wave:100G 6ms, ±X, ±Y, ±Z 3times each direction	IEC60068-2-27 GB/T2423.5

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 4
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

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:

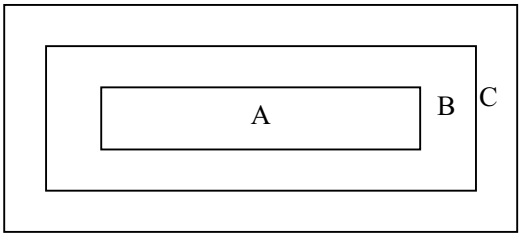
Major defect: AQL 0.65

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.

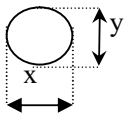
OUTGOING QUALITY STANDARD	PAGE 2 OF 4
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

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.	

4.2 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		

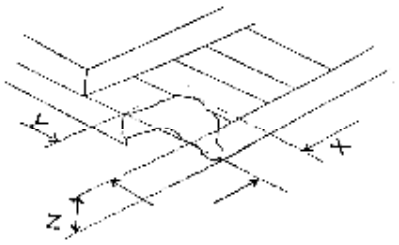
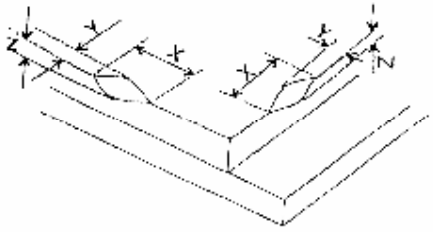
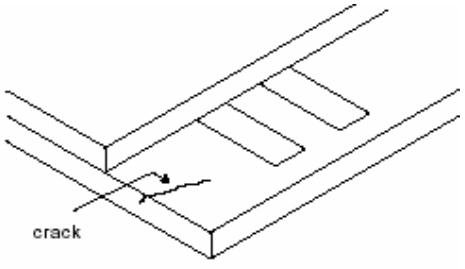
OUTGOING QUALITY STANDARD	PAGE 3 OF 4
TITLE: FUNCTIONAL TEST & INSPECTION CRITERIA	

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="4">Acceptable Qty</th></tr>
<tr><th rowspan="2">L(Length)</th><th rowspan="2">W(Width)</th><th colspan="3">Zone</th><th rowspan="2"></th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Ignore</td><td>W≤0.02</td><td colspan="3">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>L≤3.0</td><td>0.02＜W≤0.03</td><td colspan="3">2</td></tr>
<tr><td>L≤2.0</td><td>0.03＜W≤0.05</td><td colspan="3">1</td></tr>
<tr><td></td><td>0.05＜W</td><td colspan="3">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="4">Acceptable Qty</th></tr>
<tr><th rowspan="2">L(Length)</th><th rowspan="2">W(Width)</th><th colspan="3">Zone</th><th rowspan="2"></th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td colspan="3">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="3">2</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.08</td><td colspan="3">1</td></tr>
<tr><td></td><td>0.08＜W</td><td colspan="3">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>

OUTGOING QUALITY STANDARD	PAGE 4 OF 4
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

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.

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.

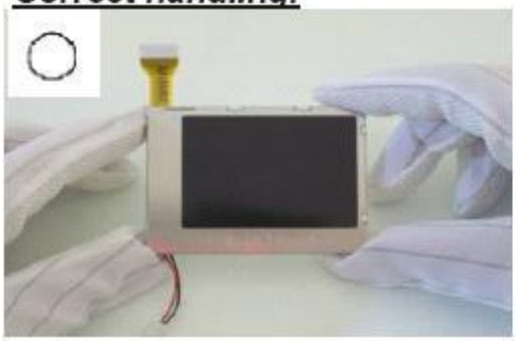
To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

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

Handling precaution for LCM

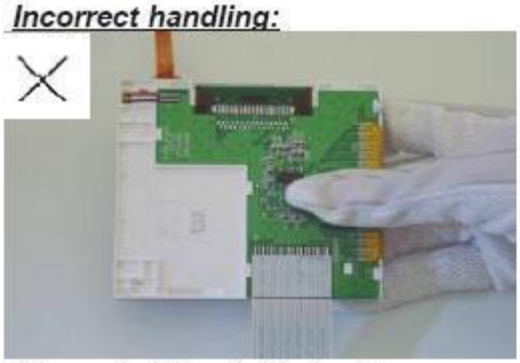
LCM is easy to be damaged.
Please note below and be careful for handling!

Correct handling:

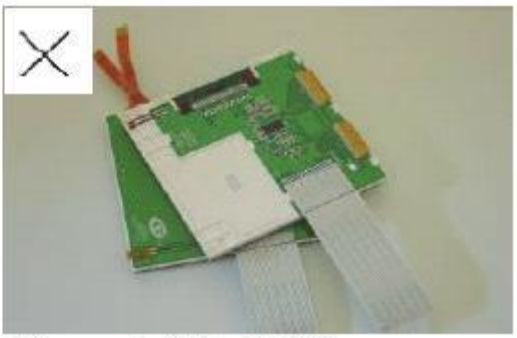


As above picture, please handle with anti-static gloves around LCM edges.

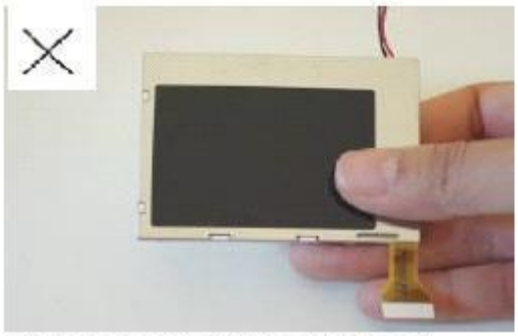
Incorrect handling:



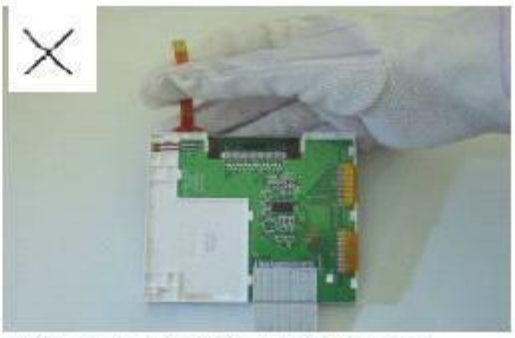
Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel.

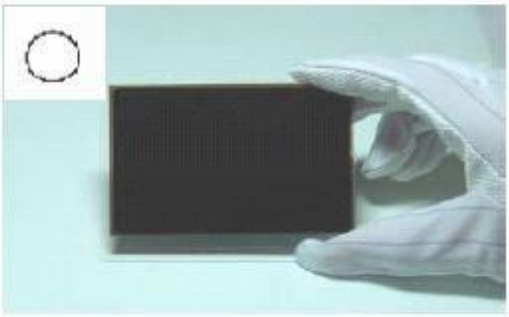


Please don't stretch interface of output, such as FPC cable.

Handling precaution for LCD

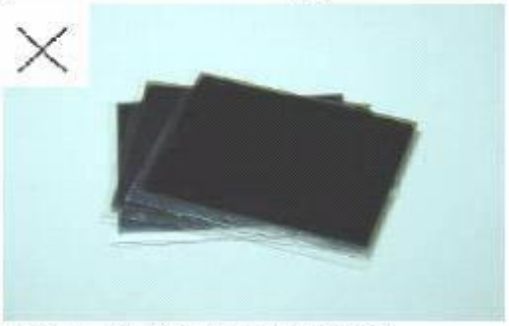
LCD is easy to be damaged.
Please note below and be careful for handling!

Correct handling:

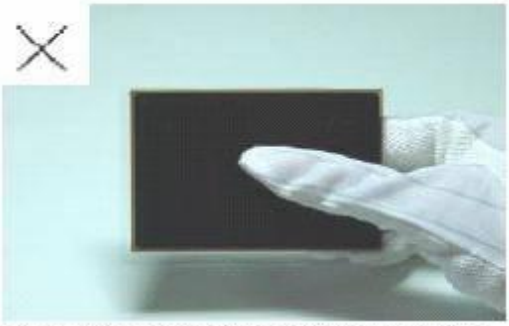


As above photo, please handle with anti-static gloves around LCD edges.

Incorrect handling:

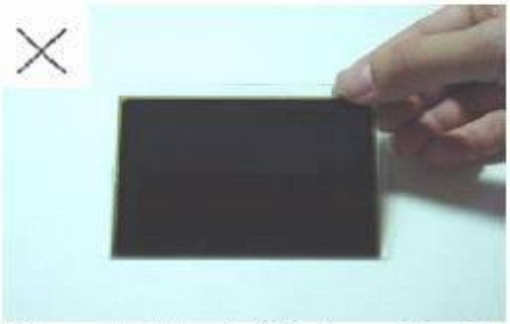


Please don't stack the LCDS.



Please don't hold the surface of LCD.

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



Please don't touch ITO glass without anti-static gloves.

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.

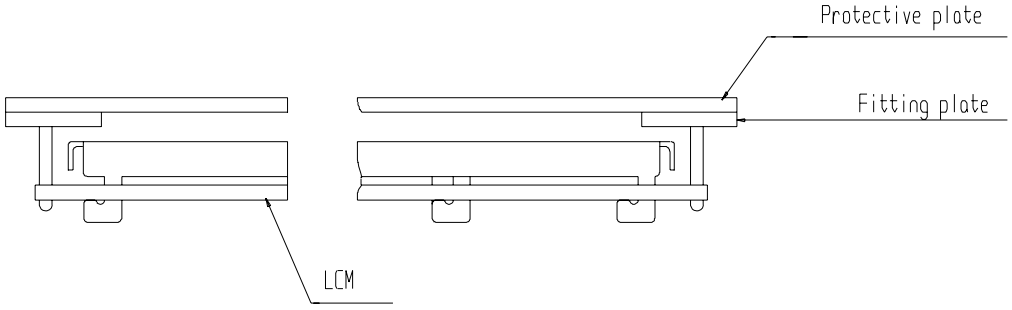
- Exposed area of the printed circuit board.
-Terminal electrode sections.

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.

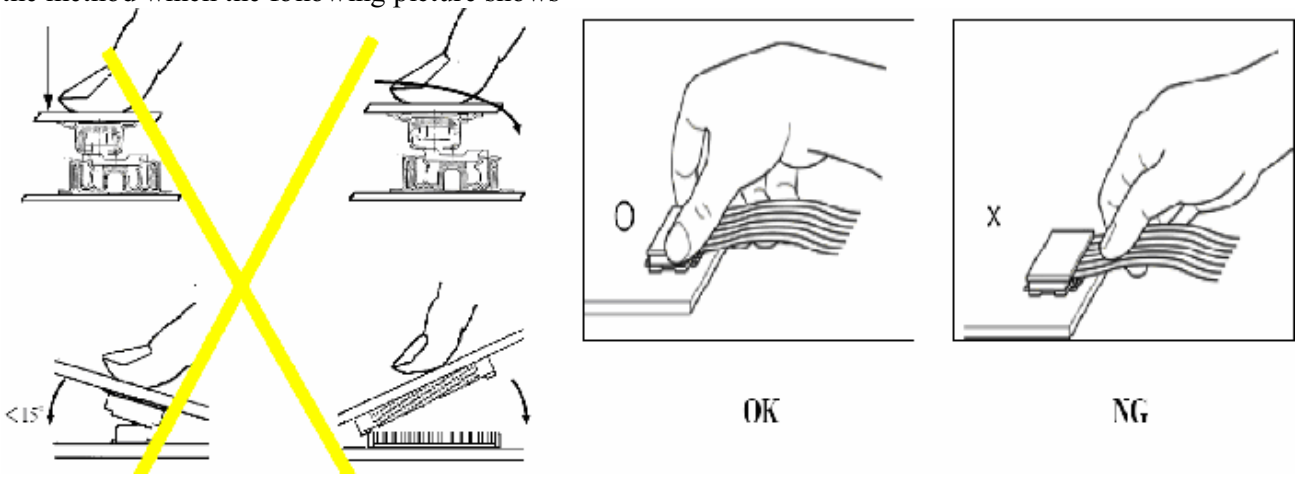
(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(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 to the LCM

	Hand 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.

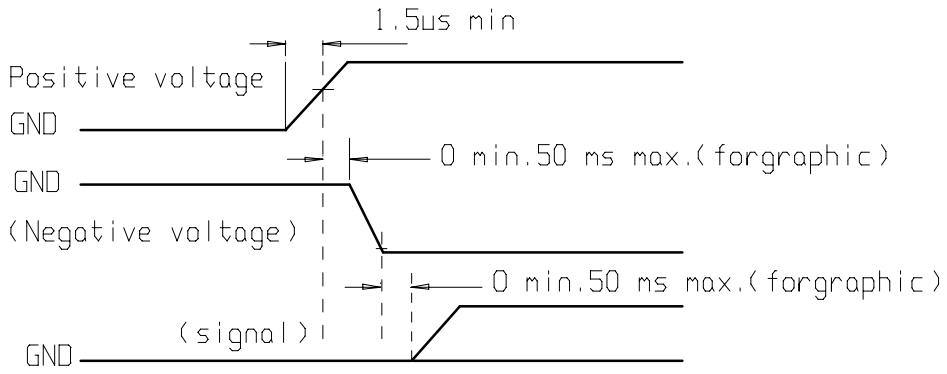
(3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating 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 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-Inno within 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-Inno will not be responsible for any subsequent or consequential events.

Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

■ PRIOR CONSULT MATTER

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

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

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