



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

[www.multi-inno.com](http://www.multi-inno.com)

## LCD MODULE SPECIFICATION

**Model : MI0500PT-7**

This module uses ROHS material

**For Customer's Acceptance:**

Customer	
Approved	
Comment	

The standard product specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for the standard product or release of the order.

Revision	1.7
Engineering	
Date	2018-09-27
Our Reference	

**REVISION RECORD**

REV NO.	REV DATE	CONTENTS	REMARKS																																																																																																																																																																																																										
1.0	2013-12-03	First release																																																																																																																																																																																																											
1.1	2014-07-16	LED life time changed from 20000(min) to 30000 hours(min),50000 hours(typ)	P.6																																																																																																																																																																																																										
1.2	2015-02-02	Correcet the marked dimensions	P.5																																																																																																																																																																																																										
1.3	2015-08-05	Delete the internal structure lines of backlight on the front viewing of the outline drawing, no change at TFT design and TFT product at all.	P.5																																																																																																																																																																																																										
1.4	2015-08-05	Add FPC marked dimension	P.5																																																																																																																																																																																																										
1.5	2018-01-31	<p>Update CIE chromaticity:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="12" style="text-align: center; vertical-align: middle;">CIE (x, y) chromaticity</td> <td rowspan="2" style="text-align: center;">Red</td> <td style="text-align: center;">x</td> <td rowspan="6" style="text-align: center; vertical-align: middle;"> <math>\theta=0^\circ</math>  <math>\phi=0^\circ</math>  <math>T_a=25^\circ\text{C}</math> </td> <td style="text-align: center;">0.540</td> <td style="text-align: center;">0.590</td> <td style="text-align: center;">0.640</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.300</td> <td style="text-align: center;">0.350</td> <td style="text-align: center;">0.400</td> </tr> <tr> <td rowspan="2" style="text-align: center;">Green</td> <td style="text-align: center;">x</td> <td style="text-align: center;">0.298</td> <td style="text-align: center;">0.348</td> <td style="text-align: center;">0.398</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.520</td> <td style="text-align: center;">0.570</td> <td style="text-align: center;">0.620</td> </tr> <tr> <td rowspan="2" style="text-align: center;">Blue</td> <td style="text-align: center;">x</td> <td style="text-align: center;">0.095</td> <td style="text-align: center;">0.145</td> <td style="text-align: center;">0.195</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.060</td> <td style="text-align: center;">0.110</td> <td style="text-align: center;">0.160</td> </tr> <tr> <td rowspan="2" style="text-align: center;">White</td> <td style="text-align: center;">x</td> <td style="text-align: center;">0.270</td> <td style="text-align: center;">0.320</td> <td style="text-align: center;">0.370</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.310</td> <td style="text-align: center;">0.360</td> <td style="text-align: center;">0.410</td> </tr> </table> <p style="text-align: center;">↓ to</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="12" style="text-align: center; vertical-align: middle;">CIE (x, y) chromaticity</td> <td rowspan="2" style="text-align: center;">Red</td> <td style="text-align: center;">x</td> <td rowspan="6" style="text-align: center; vertical-align: middle;"> <math>\theta=0^\circ</math>  <math>\phi=0^\circ</math>  <math>T_a=25^\circ\text{C}</math> </td> <td style="text-align: center;">0.539</td> <td style="text-align: center;">0.589</td> <td style="text-align: center;">0.639</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.303</td> <td style="text-align: center;">0.353</td> <td style="text-align: center;">0.403</td> </tr> <tr> <td rowspan="2" style="text-align: center;">Green</td> <td style="text-align: center;">x</td> <td style="text-align: center;">0.302</td> <td style="text-align: center;">0.352</td> <td style="text-align: center;">0.402</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.538</td> <td style="text-align: center;">0.588</td> <td style="text-align: center;">0.638</td> </tr> <tr> <td rowspan="2" style="text-align: center;">Blue</td> <td style="text-align: center;">x</td> <td style="text-align: center;">0.095</td> <td style="text-align: center;">0.145</td> <td style="text-align: center;">0.195</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.055</td> <td style="text-align: center;">0.105</td> <td style="text-align: center;">0.155</td> </tr> <tr> <td rowspan="2" style="text-align: center;">White</td> <td style="text-align: center;">x</td> <td style="text-align: center;">0.262</td> <td style="text-align: center;">0.312</td> <td style="text-align: center;">0.362</td> </tr> <tr> <td style="text-align: center;">y</td> <td style="text-align: center;">0.289</td> <td style="text-align: center;">0.339</td> <td style="text-align: center;">0.389</td> </tr> </table>	CIE (x, y) chromaticity	Red	x	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	0.540	0.590	0.640	y	0.300	0.350	0.400	Green	x	0.298	0.348	0.398	y	0.520	0.570	0.620	Blue	x	0.095	0.145	0.195	y	0.060	0.110	0.160	White	x	0.270	0.320	0.370	y	0.310	0.360	0.410	CIE (x, y) chromaticity	Red	x	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	0.539	0.589	0.639	y	0.303	0.353	0.403	Green	x	0.302	0.352	0.402	y	0.538	0.588	0.638	Blue	x	0.095	0.145	0.195	y	0.055	0.105	0.155	White	x	0.262	0.312	0.362	y	0.289	0.339	0.389	P.7																																																																																																																														
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1.7	2018-09-27	<p>Correct the thickness from 3.1mm (max). to 3.0+/-0.2mm.</p> <p>Spec. correction only, products have no changes.</p>	P.4, P.5																																																																																																																																																																																																										



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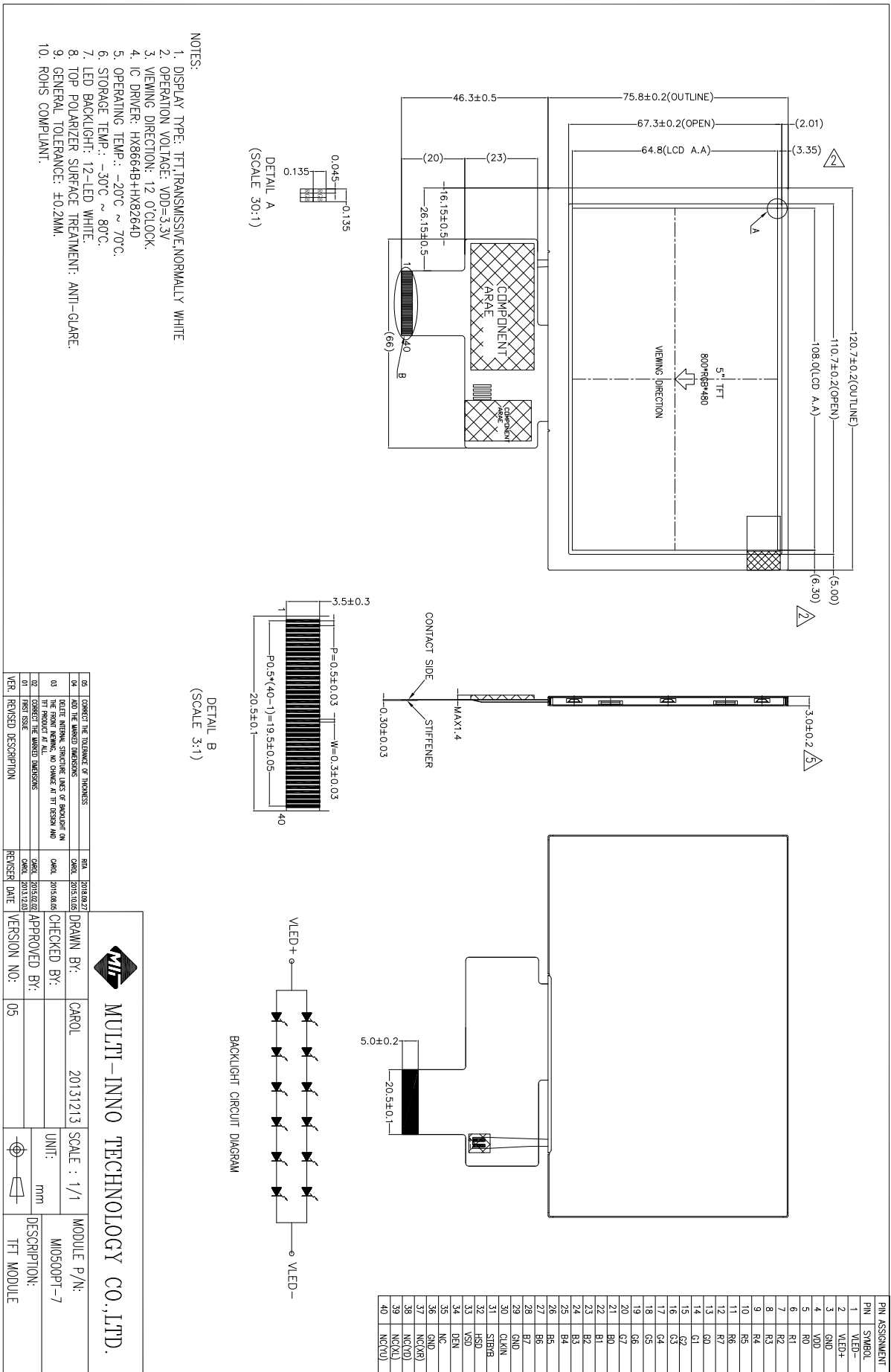
**■ GENERAL INFORMATION**

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	5.0	Inch
Viewing direction	12:00(without image inversion and least brightness change)	O' Clock
Gray scale inversion direction	6:00 (contrast peak located at)	O' Clock
LCM (W × H × D )	120.7×75.8×3.0	mm <sup>3</sup>
Active area (W×H)	108.0×64.8	mm <sup>2</sup>
Pixel pitch (W×H)	0.135×0.135	mm <sup>2</sup>
Number of dots	800 (RGB) × 480	/
Driver IC	HX8664B+HX8264D	/
Backlight type	12 LEDs	/
Interface type	24bit RGB	/
Color depth	16.7M	/
Pixel arrangement	RGB vertical stripe	/
Top polarizer surface treatment	Anti-glare	/
Backlight power consumption	730	mW
Panel power consumption	350	mW
Input voltage	3.3	V
With/Without TSP	Without TSP	/
Weight	TBD	g

Note 1: RoHS compliant;

Note 2: LCM weight tolerance: ± 5% .

**EXTERNAL DIMENSIONS**



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

NO.	REVISION	DESCRIPTION	DATE
01	INITIAL ISSUE		2013.12.23
02	CORRECT THE WAVED DIMENSIONS		2015.02.22
03	CORRECT THE WAVED DIMENSIONS		2015.02.22
04	CORRECT THE WAVED DIMENSIONS		2015.02.22
05	CORRECT THE WAVED DIMENSIONS		2015.02.22

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04	CORRECT THE WAVED DIMENSIONS		2015.02.22
05	CORRECT THE WAVED DIMENSIONS		2015.02.22

**■ ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	4.0	V
Input voltage for logic	VIN	-0.5	VDD+0.3	V
Supply current (one LED)	I <sub>LED</sub>	-	60	mA
Operating temperature	T <sub>OP</sub>	-20	70	°C
Storage temperature	T <sub>ST</sub>	-30	80	°C

**■ ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	VDD	3.0	3.3	3.6	V
Input leakage current	I <sub>LKG</sub>	-	-	-	μA
Input voltage 'H' level	V <sub>IH</sub>	0.7VDD	-	VDD	V
Input voltage 'L' level	V <sub>IL</sub>	0	-	0.3VDD	V

**■ BACKLIGHT CHARACTERISTICS**

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	V <sub>f</sub>	-	19.2	-	V	Ta=25±2°C, 60%RH±5%
Forward current	I <sub>f</sub>	-	40	-	mA	
Power consumption	W <sub>BL</sub>	-	768	-	mW	
Operating life time	-	30000	50000	-	Hrs	

Note :

Operating life time means brightness goes down to 50% initial brightness;

The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions;

Typical operating life time is an estimated data.

**■ELECTRO-OPTICAL CHARACTERISTICS**

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+Tf	$\theta=0^\circ$ $\varnothing=0^\circ$ $T_a=25^\circ\text{C}$	-	20	-	ms	FIG 1.	4
Contrast ratio	Cr		-	500	-	---	FIG 2.	1
Luminance uniformity	$\delta$ WHITE		75	80	-	%	FIG 2.	3
Surface Luminance	Lv		550	600	-	cd/m <sup>2</sup>	FIG 2.	2
Viewing angle range	$\theta$	$\varnothing = 90^\circ$	40	50	-	deg	FIG 3.	6
		$\varnothing = 270^\circ$	60	70	-	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	$\theta=0^\circ$ $\varnothing=0^\circ$ $T_a=25^\circ\text{C}$	0.539	0.589	0.639	FIG 2.	5
		y		0.303	0.353	0.403		
	Green	x		0.302	0.352	0.402		
		y		0.538	0.588	0.638		
	Blue	x		0.095	0.145	0.195		
		y		0.055	0.105	0.155		
	White	x		0.262	0.312	0.362		
		y		0.289	0.339	0.389		

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

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P}_1, P_2, P_3, P_4, P_5)}{\text{Average Surface Luminance with all black pixels (P}_1, P_2, P_3, P_4, P_5)}$$

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

$$L_v = \text{Average Surface Luminance with all white pixels (P}_1, P_2, P_3, P_4, P_5)$$

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.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P}_1, P_2, P_3, P_4, P_5)}{\text{Maximum Surface Luminance with all white pixels (P}_1, P_2, P_3, P_4, P_5)}$$

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 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.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of Response Time

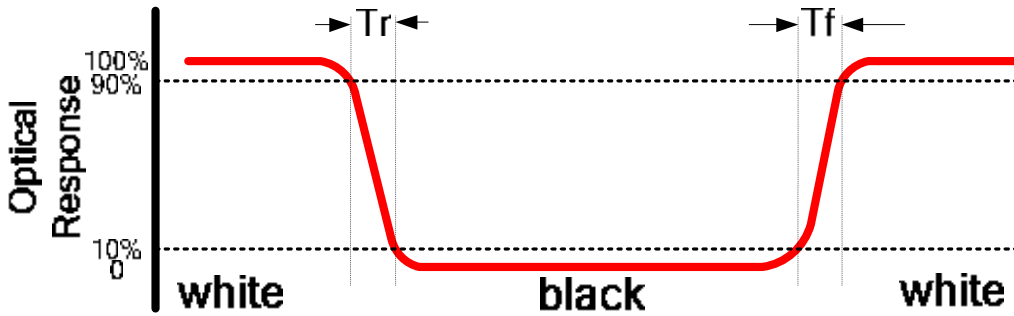


FIG.2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

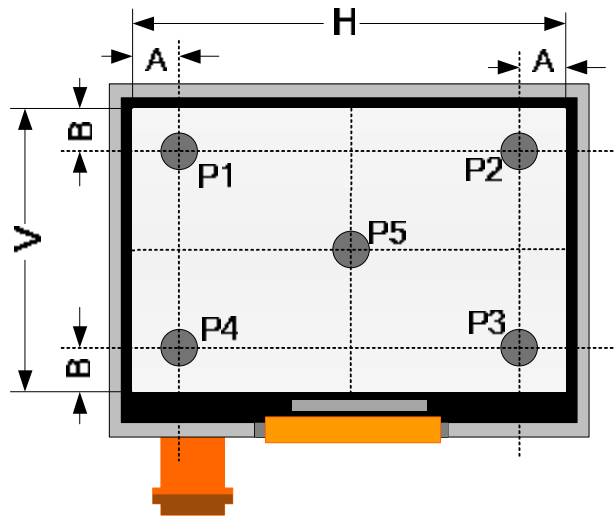
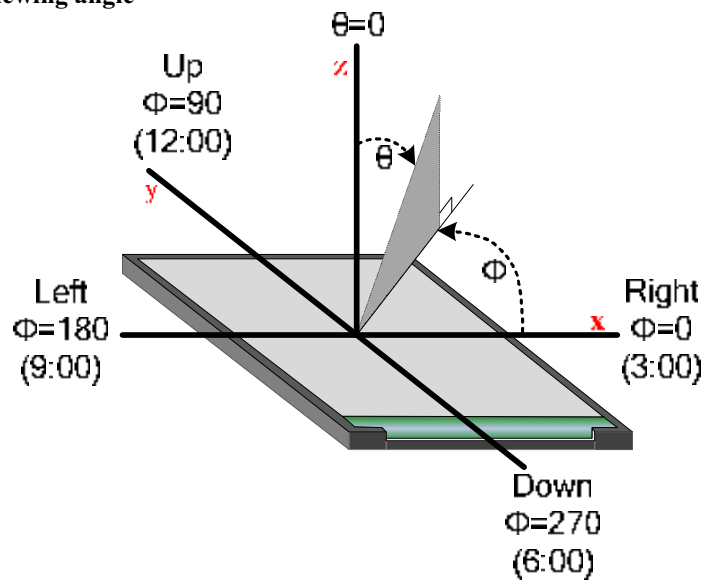


FIG.3. The definition of viewing angle

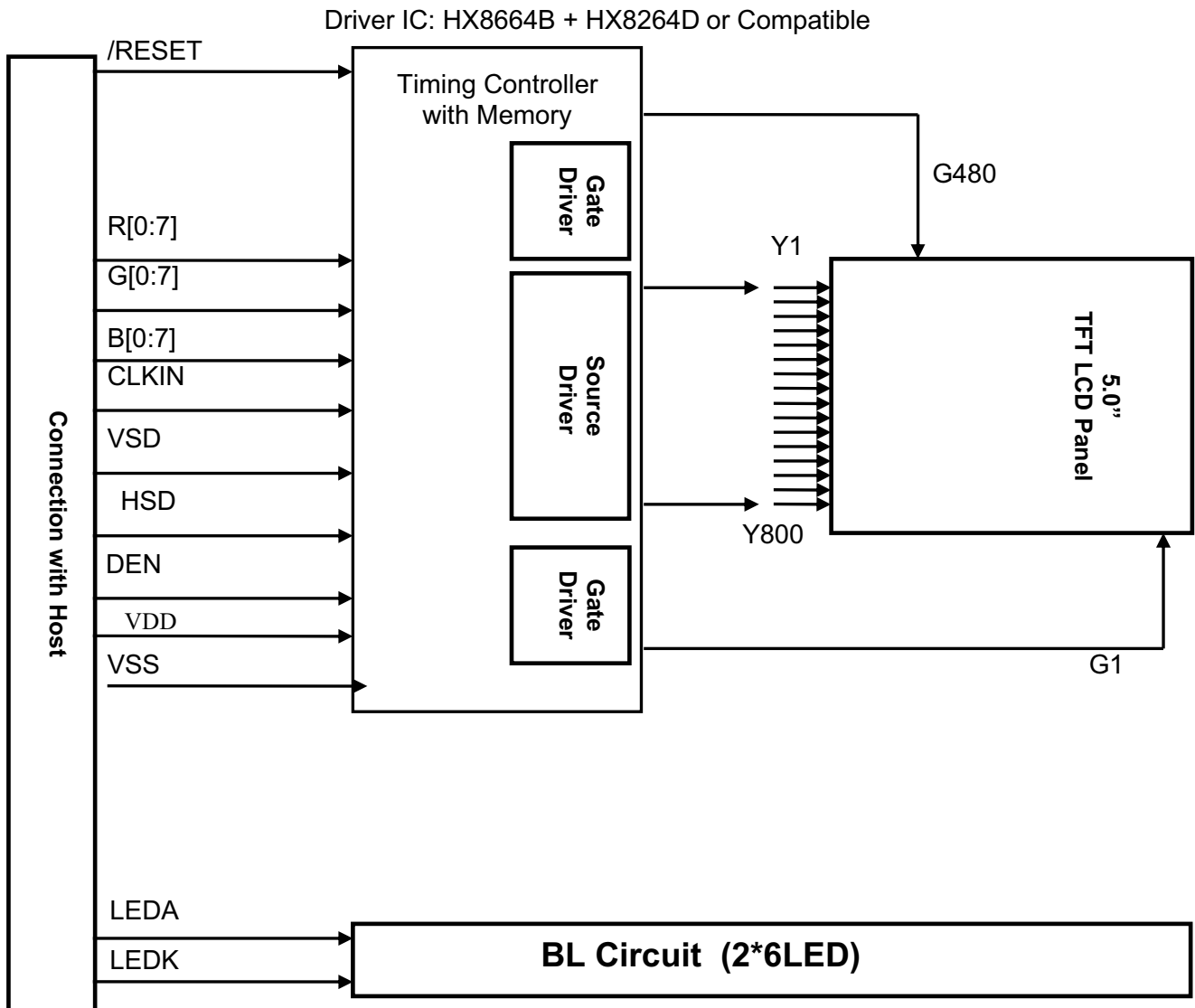




**■ INTERFACE DESCRIPTION**

NO.	SYMBOL	DESCRIPTION
1	VLED-	Cathode of LED backlight.
2	VLED+	Anode of LED backlight.
3	GND	Ground.
4	VDD	Power supply.
5	R0	Red data.(LSB)
6	R1	Red data.
7	R2	Red data.
8	R3	Red data.
9	R4	Red data.
10	R5	Red data.
11	R6	Red data.
12	R7	Red data.(MSB)
13	G0	Green data.(LSB)
14	G1	Green data.
15	G2	Green data.
16	G3	Green data.
17	G4	Green data.
18	G5	Green data.
19	G6	Green data.
20	G7	Green data.(MSB)
21	B0	Blue bus.(LSB)
22	B1	Blue bus.
23	B2	Blue bus.
24	B3	Blue bus.
25	B4	Blue bus.
26	B5	Blue bus.
27	B6	Blue bus.
28	B7	Blue bus.(MSB)
29	GND	Power supply.
30	CLKIN	Pixel clock, data sampling at the CLKIN falling edge.
31	STBYB	Display control/standby mode selection. STBYB="Low": Standby;(Default) STBYB="High": Normal display.
32	HSD	Horizontal sync signal.
33	VSD	Vertical sync signal.
34	DEN	Data input enable.
35	NC	No connection.
36	GND	Ground.
37	XR	TP right electrode.
38	YD	TP bottom electrode.
39	XL	TP left electrode.
40	YU	TP top electrode.

NOTE:For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If ENB signal is fixed low. SYNC mode is used. Otherwise, DEN+SYNC is used

**■ BLOCK DIAGRAM**

## ■ APPLICATION CIRCUIT NOTES

### 1. AC Characteristics

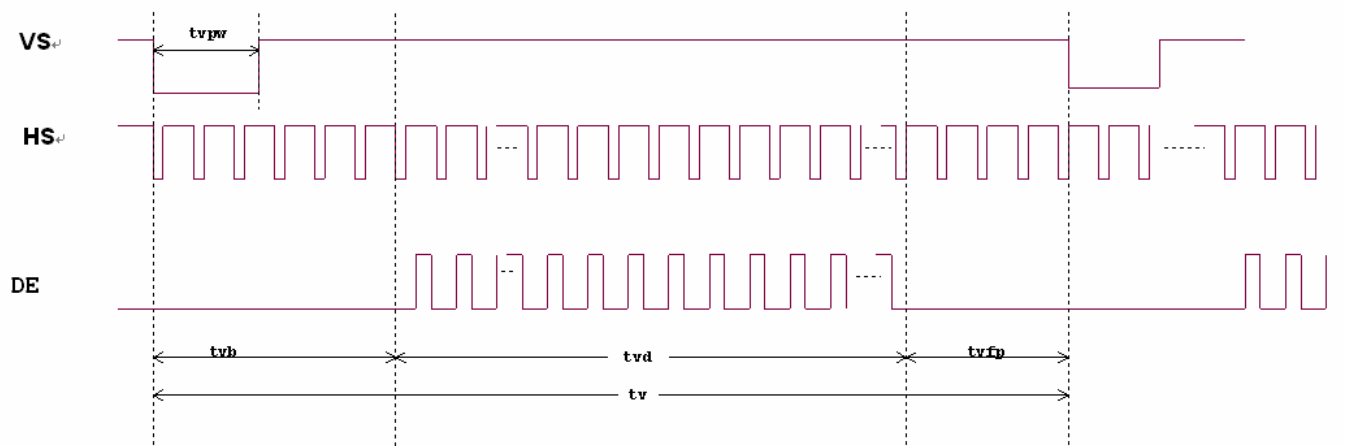
#### 1.1 AC electrical characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hold time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hold time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	10	-	-	ms	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

### 1.2 Data input format



Horizontal input timing diagram.



Vertical input timing diagram.

**1.2.1 Timing**

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk		30	50	MHz	
One Horizontal Line	th	889	928	1143	DCLK	
HS pulse width	thpw	1	48-	255	DCLK	
HS Blanking	thb		88		DCLK	
HS Front Porch	thfp	1	40	255	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	513	525	767	TH	
VS pulse width	tvpw	3	3	255	TH	
VS Blanking	tvb		32		TH	
VS Front Porch	tvfp	1	13	255	TH	


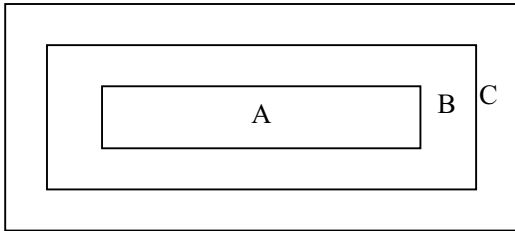
**■ RELIABILITY TEST**

No.	Test Item	Test Condition	Remarks
1	High Temperature Storage Test	80°C±2°C/240Hrs.	Note2
2	Low Temperature Storage Test	-30°C±2°C/240Hrs.	Note1,2
3	High Temperature Operation Test	70°C±2°C/120Hrs.	
4	Low Temperature Operation Test	-20°C±2°C/120Hrs.	Note1
5	High Temperature and High Humidity Operation Test	60±5°C, 90%RH 120Hrs.	Note1,2
6	Thermal Shock Test (Non-operating)	-30±2°C(30Min.)~25±2°C(5Min.)~80±2°C(30Min.) 10Cycles	
7	Vibration Test (Non-operating)	Frequency:10~55Hz Amplitude: 1.5mm Sweep Time: 11Mins Test Period: 6 Cycles For Each Direction Of X, Y, Z (Packing Condition)	
8	Shock Test (Non-operating)	100G, 6Ms Direction: ±X, ±Y, ±Z Cycle: 3 Times	
9	Electro Static Discharge Test	R:330Ω, C:150pF, 5points/panel Air: ±8KV, 5times; Contact:±4KV, 5times; (Environment:15°C ~35°C, 30%~60%, 86Kpa~106Kpa)	

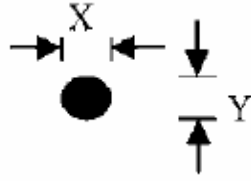
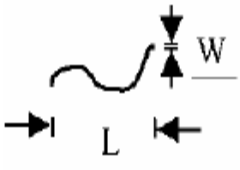
Note 1: Without water condensation

Note 2: The function test shall be conducted after 2 hours storage at the room temperature and humidity after removed from the test chamber.

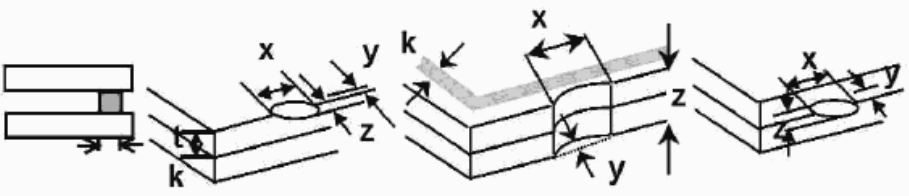
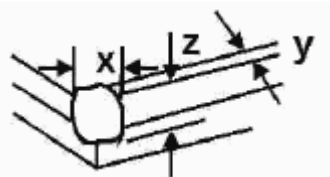
■ INSPECTION CRITERION

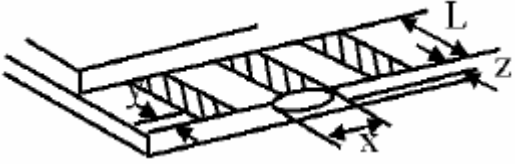
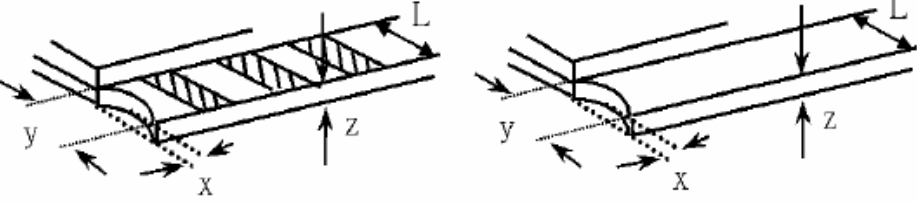
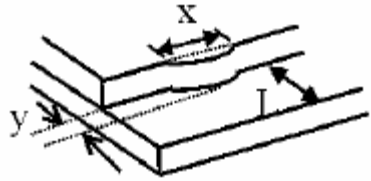
 <p>OUTGOING QUALITY STANDARD</p>	<p>PAGE 1 OF 7</p>
<p>TITLE:FUNCTIONAL TEST &amp; INSPECTION CRITERIA</p>	<p>MDS Product</p>
<p>This specification is made to be used as the standard acceptance/rejection criteria for TFT module.</p> <p>1 Sample plan</p> <p>Sampling plan according to GB/T2828.1-2003/ISO 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>2. Inspection condition</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>3. Definition of inspection zone in LCD.</p> <div data-bbox="523 1131 1040 1361" data-label="Diagram">  <p>The diagram shows three nested rectangles representing inspection zones. The innermost rectangle is labeled 'A'. The middle rectangle is labeled 'B' on its right side. The outermost rectangle is labeled 'C' on its right side.</p> </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>	

**4. Inspection standards**

NO	Item	Criterion	AQL												
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	<b>0.65</b>												
02	Black or White spots or Bright spots or Color spots on LCD (Display only)	2.1 White and black or color spots on display $\leq 0.25\text{mm}$ , no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	<b>1.5</b>												
03	LCD and Touch Panel black spots, white spots, contamination (non – display)	3.1 Round type: As following drawing $\Phi = (X+Y) / 2$  <table border="1" data-bbox="829 963 1364 1176"> <thead> <tr> <th>Size(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.20</math></td> <td>2</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.25</math></td> <td>2</td> </tr> <tr> <td><math>0.25 &lt; \Phi \leq 0.30</math></td> <td>1</td> </tr> <tr> <td><math>0.30 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p style="text-align: right;">* Densely spaced: No more than two spots within 3mm.</p>	Size(mm)	Acceptable Q'ty	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	2	$0.25 < \Phi \leq 0.30$	1	$0.30 < \Phi$	0	<b>1.5</b>
		Size(mm)	Acceptable Q'ty												
$\Phi \leq 0.10$	Accept no dense														
$0.10 < \Phi \leq 0.20$	2														
$0.20 < \Phi \leq 0.25$	2														
$0.25 < \Phi \leq 0.30$	1														
$0.30 < \Phi$	0														
3.2 Line type: (As following drawing)  <table border="1" data-bbox="734 1288 1364 1489"> <thead> <tr> <th>Length(m m)</th> <th>Width(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.02</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.05</math></td> <td rowspan="2">2</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.08</math></td> </tr> <tr> <td>---</td> <td><math>0.08 &lt; W</math></td> <td>Rejection</td> </tr> </tbody> </table> <p style="text-align: right;">* Densely spaced: No more than two lines within 3mm.</p>	Length(m m)	Width(mm)	Acceptable Q'ty	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.05$	2	$L \leq 2.5$	$0.03 < W \leq 0.08$	---	$0.08 < W$	Rejection	<b>1.5</b>
Length(m m)	Width(mm)	Acceptable Q'ty													
---	$W \leq 0.02$	Accept no dense													
$L \leq 3.0$	$0.02 < W \leq 0.05$	2													
$L \leq 2.5$	$0.03 < W \leq 0.08$														
---	$0.08 < W$	Rejection													

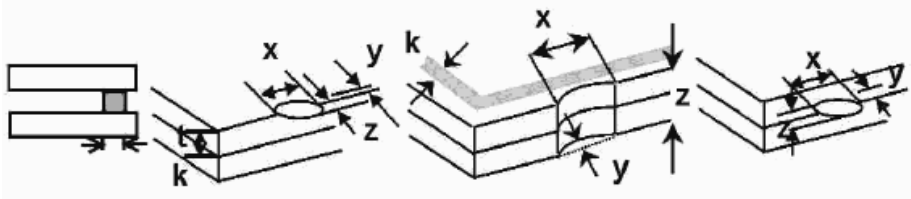
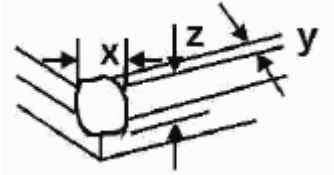


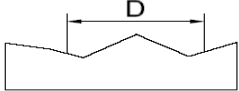
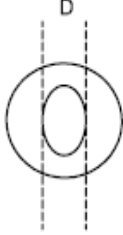
NO	Item	Criterion	AQL																		
04	Polarizer bubbles	<p>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction</p> <table border="1" data-bbox="850 353 1348 562"> <thead> <tr> <th>Size <math>\Phi</math>(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.20</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.50</math></td> <td>3</td> </tr> <tr> <td><math>0.50 &lt; \Phi \leq 1.00</math></td> <td>2</td> </tr> <tr> <td><math>1.00 &lt; \Phi</math></td> <td>0</td> </tr> <tr> <td>Total Q'ty</td> <td>3</td> </tr> </tbody> </table>	Size $\Phi$ (mm)	Acceptable Q'ty	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Q'ty	3	1.5						
Size $\Phi$ (mm)	Acceptable Q'ty																				
$\Phi \leq 0.20$	Accept no dense																				
$0.20 < \Phi \leq 0.50$	3																				
$0.50 < \Phi \leq 1.00$	2																				
$1.00 < \Phi$	0																				
Total Q'ty	3																				
05	Scratches	Follow NO.3 -2 Line Type.																			
06	Chipped glass	<p>Symbols:  x: Chip length    y: Chip width    z: Chip thickness  k: Seal width    t: Glass thickness    a: LCD side length  L: Electrode pad length</p> <p>6.1 General glass chip:  6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="387 996 1204 1102"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed <math>1/3k</math></td> <td><math>x \leq 1/8a</math></td> </tr> </tbody> </table> <p>⊙ Unit: mm</p> <p>⊙ If there are 2 or more chips, x is the total length of each chip</p> <p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="387 1460 1204 1565"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed <math>1/3k</math></td> <td><math>x \leq 1/8a</math></td> </tr> </tbody> </table> <p>⊙ Unit: mm</p> <p>⊙ If there are 2 or more chips, x is the total length of each chip</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$	1.5
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$																			
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$																			

NO	Item	Criterion	AQL																
07	Glass crack	<p>Symbols:            x: Chip length    y: Chip width    z: Chip thickness            k: Seal width    t: Glass thickness    a: LCD side length            L: Electrode pad length</p> <p>7.2 Protrusion over terminal:            7.2.1 Chip on electrode pad:</p>  <table border="1" data-bbox="541 678 1217 824"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq 0.5\text{mm}</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>7.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="541 1144 1217 1290"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq L</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>⊙ If there chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.            ⊙ If the product will be heat sealed by the customer, the alignment mark must not be damaged.</p> <p>7.2.3 Substrate protuberance and internal crack</p>  <table border="1" data-bbox="871 1525 1305 1666"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td><math>y \leq 1/3L</math></td> <td><math>X \leq a</math></td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$X \leq a$	1.5
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$																	
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$																	
y: width	x: length																		
$y \leq 1/3L$	$X \leq a$																		



NO	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	1.5
09	Backlight elements	9.1 Illumination source flickers when lit. 9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards. 9.3 Backlight doesn't light or color is wrong.	1.5 1.5 0.65
10	Bezel	Bezel must comply with product specifications.	1.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination. 11.2 COB seal surface may not have pinholes through to the IC. 11.3 The height of the COB should not exceed the height indicated in the assembly diagram. 11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places. 11.5 Parts on PCB must be the same as on the production characteristic chart, There should be no wrong parts, missing parts or excess parts. 11.6 The jumper on the PCB should conform to the product characteristic chart.	1.5 1.5 1.5 1.5 0.65 0.65
12	FPC	12.1 FPC terminal damage $\leq$ 1/2 FPC terminal width and can not affect the function , we judge accept. 12.2 FPC alignment hole damage $\leq$ 1/2 alignment area and can not affect the function , we judge accept.	1.5 1.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicle. 13.2 No short circuits in components on PCB or FPC.	1.5 0.65

NO	Item	Criterion	AQL												
14	Touch Panel Chipped glass	<p>Symbols:            x: Chip length    y: Chip width    z: Chip thickness            k: Seal width    t: Touch Panel Total thickness    a: LCD side length            L: Electrode pad length</p> <p>14.1 General glass chip:            14.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="395 734 1216 954"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>Z \leq t</math></td> <td><math>\leq 1/2 k</math> and not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> </table> <p>⊙ Unit: mm            ⊙ If</p> <p>there are 2 or more chips, x is the total length of each chip</p> <p>14.1.2 Corner crack:</p>  <table border="1" data-bbox="395 1263 1216 1482"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>z \leq t</math></td> <td><math>\leq 1/2 k</math> and not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> </table> <p>⊙ Unit: mm            ⊙ If</p> <p>there are 2 or more chips, x is the total length of each chip</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	z: Chip thickness	y: Chip width	x: Chip length	$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$	1.5
		z: Chip thickness	y: Chip width	x: Chip length											
$Z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$													
z: Chip thickness	y: Chip width	x: Chip length													
$z \leq t$	$\leq 1/2 k$ and not over viewing area	$x \leq 1/8a$													

NO	Item	Criterion	AQL										
15	Touch Panel(Fish eye、dent and bubble on film)	<table border="1" data-bbox="405 367 938 539"> <thead> <tr> <th>SIZE(mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.2</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.2 &lt; D \leq 0.4</math></td> <td>5</td> </tr> <tr> <td><math>0.4 &lt; D \leq 0.5</math></td> <td>2</td> </tr> <tr> <td><math>0.5 &lt; D</math></td> <td>0</td> </tr> </tbody> </table>  	SIZE(mm)	Acceptable Q'ty	$\Phi \leq 0.2$	Accept no dense	$0.2 < D \leq 0.4$	5	$0.4 < D \leq 0.5$	2	$0.5 < D$	0	1.5
SIZE(mm)	Acceptable Q'ty												
$\Phi \leq 0.2$	Accept no dense												
$0.2 < D \leq 0.4$	5												
$0.4 < D \leq 0.5$	2												
$0.5 < D$	0												
16	Touch Panel Newton ring	Newton ring dimension $\leq 1/2$ touch panel area and not affect font and line distortion( $\leq 2.5\%$ ), it is acceptable.	1.5										
17	Touch Panel Linearity	Less than 2.5% is acceptable.	1.5										
18	LCD Ripple	Touch the touch panel , can not see the LCD ripple. Pen: R 1.0mm silicon rubber. Operation Force: 80g	1.5										
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin loose or missing pins. 19.3 Product packaging must the same as specified on packaging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65										

## ■ PRECAUTIONS FOR USING LCD MODULES

### 1 Handling Precautions

- 1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- 1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- 1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- 1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.
- 1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
  - Isopropyl alcohol
  - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- 1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
  - Water
  - Ketone
  - Aromatic solventsWipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.
- 1.7 Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- 1.8 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- 1.9 Do not attempt to disassemble or process the LCD module.
- 1.10 NC terminal should be open. Do not connect anything.
- 1.11 If the logic circuit power is off, do not apply the input signals.
- 1.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  - Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
  - Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
  - To reduce the amount of static electricity generated, do not conduct assembling

and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

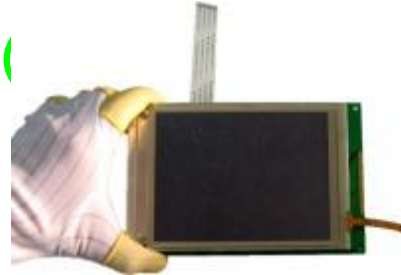
1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist the LCM.

## 2 Handling precaution for LCM

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

### 2.2 Correct handling:

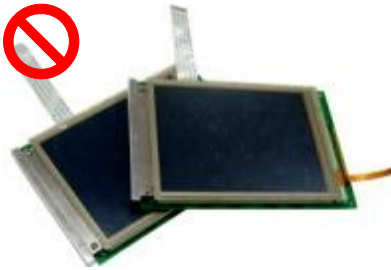


As above picture, please handle with anti-static gloves around LCM edges.

### 2.3 Incorrect handling:



Please don't touch IC directly.



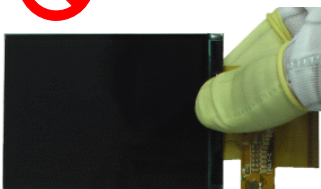
Please don't stack LCM.



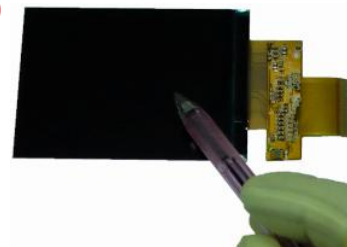
Please don't hold the surface of panel.



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



Please don't hold the surface of IC.



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



### 3 Storage Precautions

- 3.1 When storing the LCD modules, the following precaution are necessary.
- 3.1.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.
  - 3.1.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.
  - 3.1.3 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).
- 3.2 Others 其它
- 3.2.1 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
  - 3.2.2 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
  - 3.2.3 To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
    - 3.2.3.1 - Exposed area of the printed circuit board.
    - 3.2.3.2 -Terminal electrode sections.

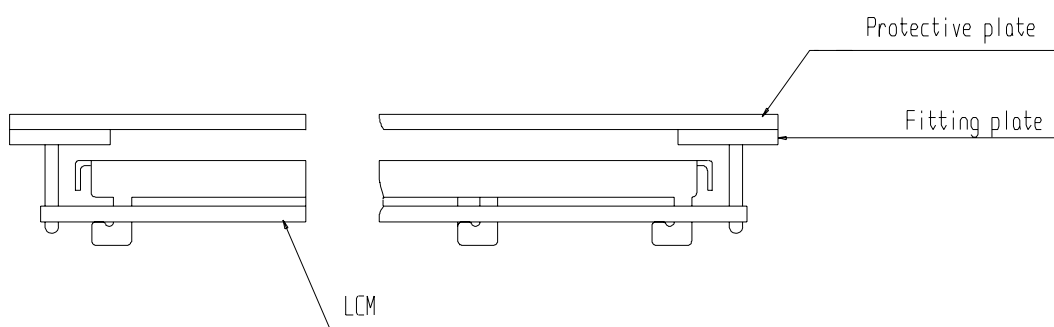
### 4 USING LCD MODULES

#### 4.1 Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below.

Attend to the following items when installing the LCM.

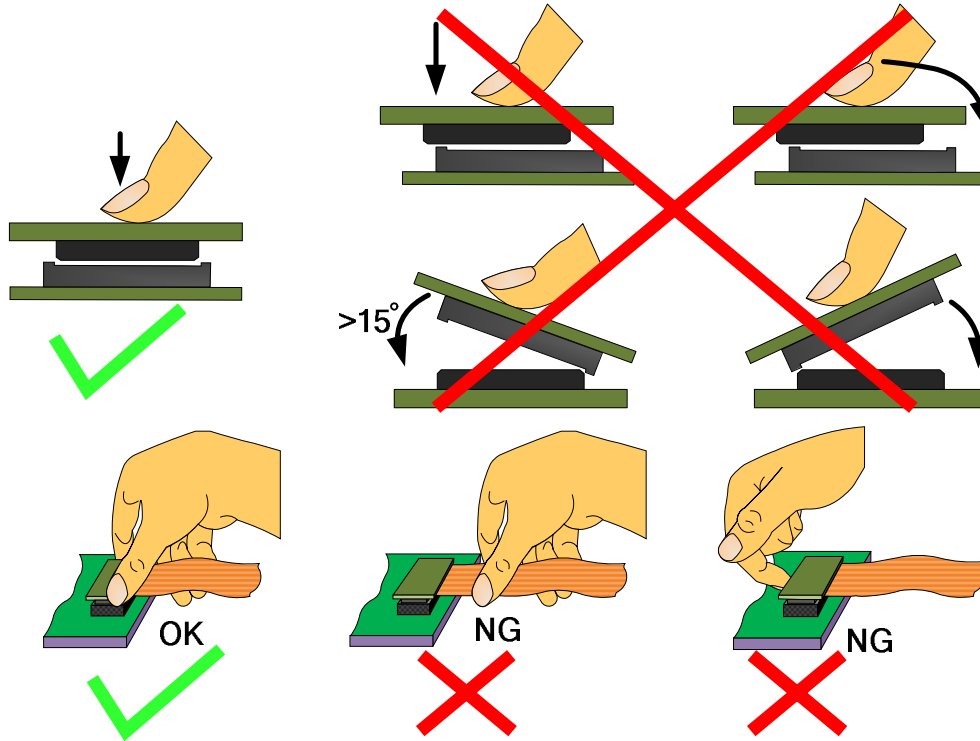
- 4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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

#### 4.2 Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



### 4.3 Precaution for soldering the LCM

	Manual soldering	Machine drag soldering	Machine press soldering
No RoHS Product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 15-17 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
RoHS Product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Speed : 15-17 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

- 4.3.1 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.
- 4.3.2 When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- 4.3.3 When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

### 4.4 Precautions for Operation

- 4.4.1 Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.
- 4.4.2 It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- 4.4.3 Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operating temperature.
- 4.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- 4.4.5 A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.
- 4.4.6 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.
- 4.4.7 Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

### 4.5 Safety

- 4.5.1 It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- 4.5.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

#### 4.6 Limited Warranty

Unless agreed between Multi-Inno and the customer, Multi-Inno will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Multi-Inno LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and/or replace on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

#### 4.7 Return LCM under warranty

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

4.7.1.1 - Broken LCD glass.

4.7.1.2 - PCB eyelet is damaged or modified.

4.7.1.3 -PCB conductors damaged.

4.7.1.4 - Circuit modified in any way, including addition of components.

4.7.1.5 - PCB tampered with by grinding, engraving or painting varnish.

4.7.1.6 - Soldering to or modifying the bezel in any manner.

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

### ■ PACKING SPECIFICATION

Please consult our technical department for detail information.

### ■ PRIOR CONSULT MATTER

- 1 For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without prior notice to our customer.
- 2 For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.
- 3 If you have special requirement about reliability condition, please let us know before you start the test on our samples.