



MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI1040GT-10

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.1
Engineering	
Date	2013-01-28
Our Reference	



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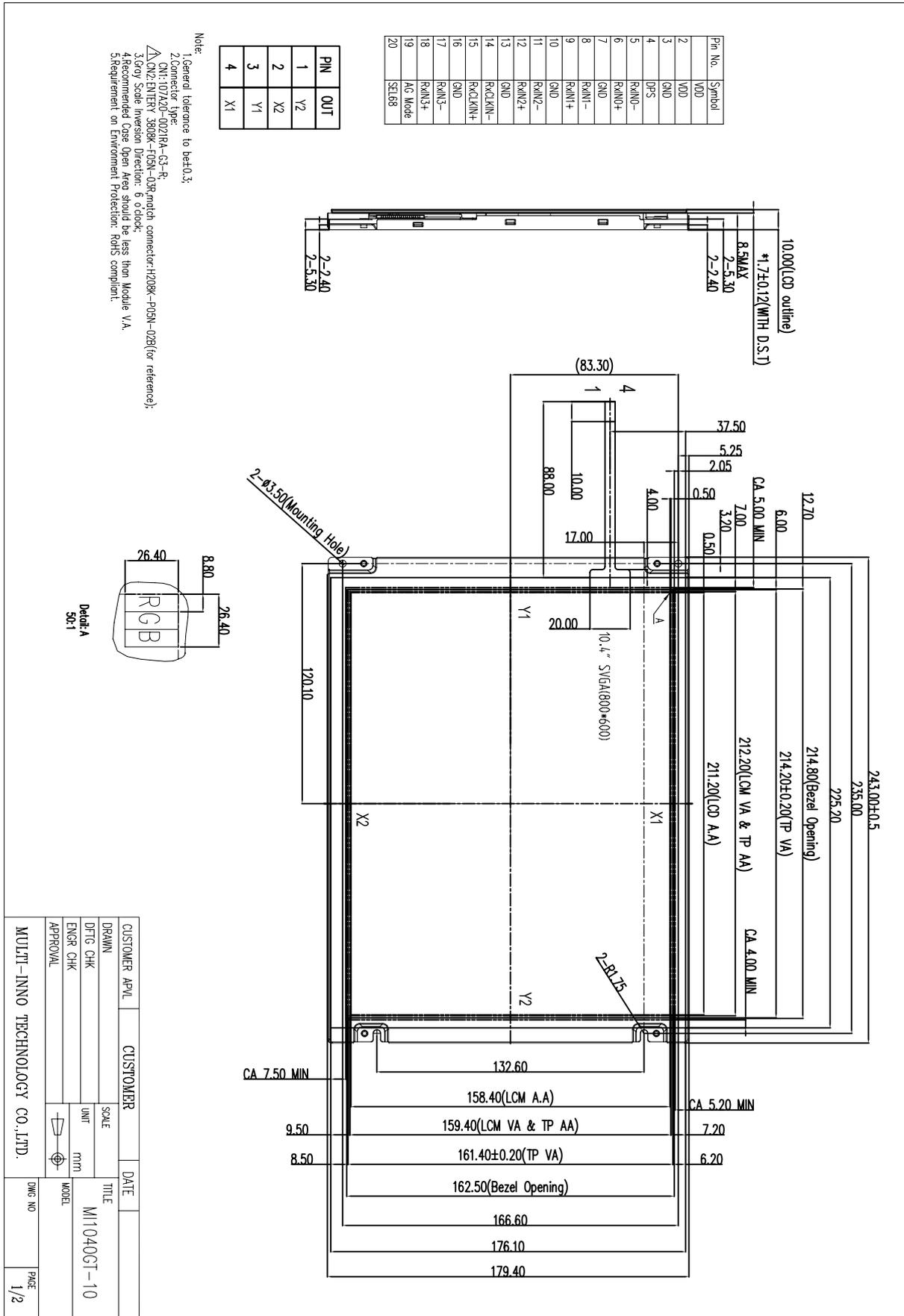
**■ GENERAL INFORMATION**

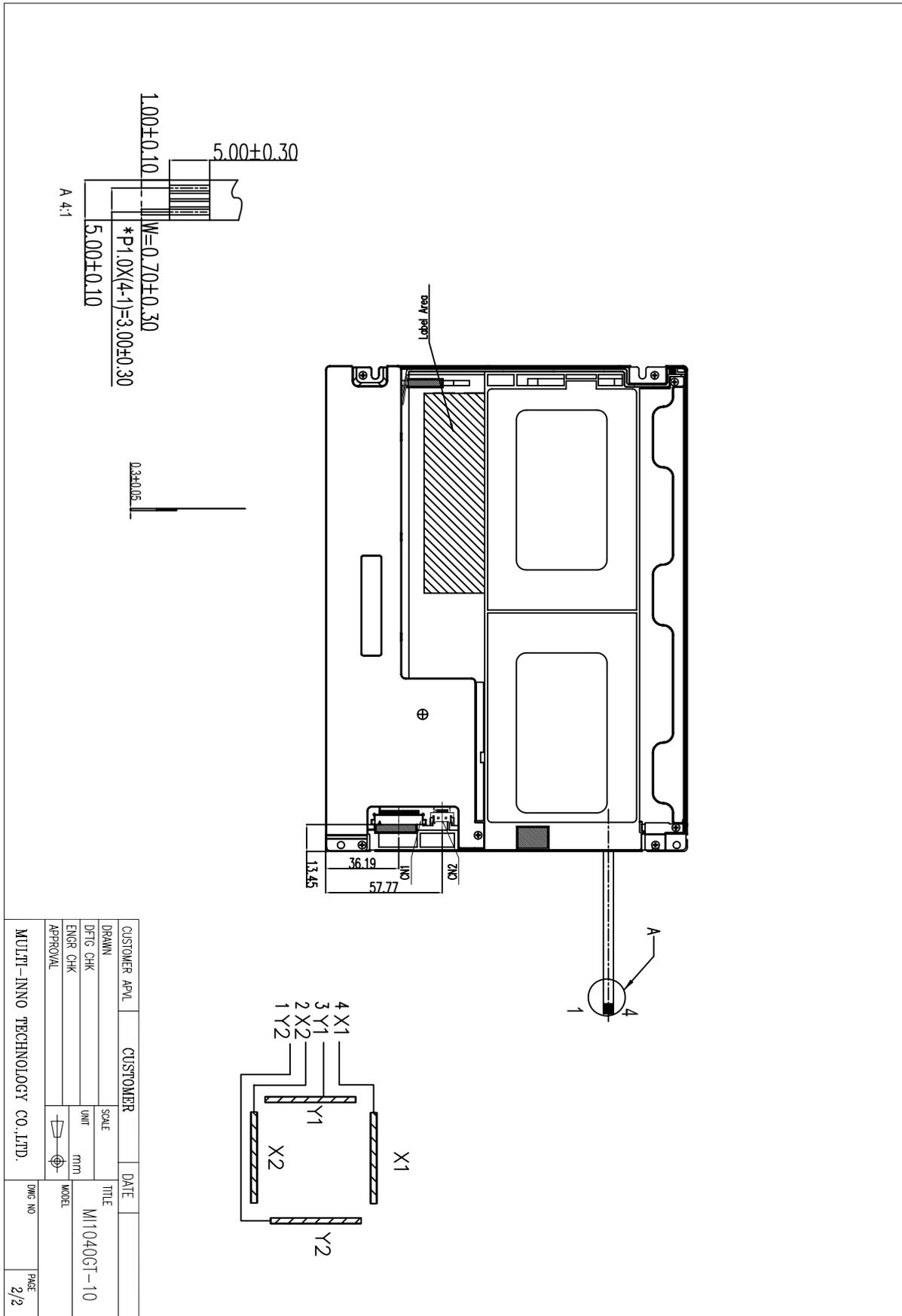
Item of general information	Contents	Unit
LCD type	TFT/Transmissive/Normally White	/
Size	10.4	Inch
Viewing Direction	12:00 (without image inversion and least brightness change)	O' Clock
Gray Scale Inversion Direction	6:00 (contrast peak located at)	O' Clock
Module area (W × H×T)	243.00×179.40×10.2	mm ³
Active area (W×H)	211.20×158.40	mm ²
Number of Dots	800RGB×600	/
Pixel pitch (W × H)	0.264×0.264	mm ²
Surface Treatment(Up Polarizer)	Anti-Glare(3H)	/
Interface Type	LVDS 8-bit/6-bit	/
Input voltage	3.3	V
Color Depth	16.7M/262K	/
Backlight Type	LED	/
Weight	TBD	g
With/Without TSP	With TP	/

Note 1: RoHS compliant;

Note 2: LCM weight tolerance: ± 5% .

EXTERNAL DIMENSIONS





■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	5.0	V	
Power for LED driving circuit	VCC	-0.3	13.5	V	
Input voltage	V _{IN}	-0.3	5.0	V	Note1
Input voltage for backlight	V _t	-0.5	7.0	V	Note2
Operating Temperature	T _{OPR}	-10	60	°C	
Storage Temperature	T _{STG}	-20	70	°C	

Note1: V_{IN} represents RxIN0±, RxIN1±, RxIN2±, RxIN3±, RxCLKIN±, DPS, AGMode, SEL68.

Note2: V_t represents EN and Dimming.

■ ELECTRICAL CHARACTERISTICS

Driving TFT LCD Panel

GND=0V, Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage	VDD	3.0	3.3	3.6	V	
LVDS Differential input high threshold	V _{TH}	-	-	+100	mV	V _{CMLVDS} =1.2V
LVDS Differential input low threshold	V _{TL}	-100	-	-	mV	V _{CMLVDS} =1.2V
Differential input voltage	V _{ID}	0.1	-	0.6	V	
LVDS input common mode voltage	V _{CMLVDS}	V _{ID} /2	-	1.4-(V _{ID} /2)	V	
Common Electrode Driving Signal	VCOM	-	4.30	-	V	Note1
Sync Frequency	FVD	-	60	70	Hz	
VDD Power Consumption	I _{VDD}	-	340	380	mA	Note2

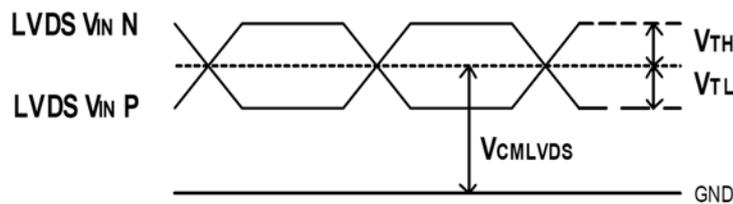


Figure 4.1.1 LVDS DC timing diagram

DC Timing Diagram 1: LVDS waveform

Note1: For different LCM, the value may have a bit of difference.

Note2: To test the current dissipation, use "all Black Pattern" test pattern.



■ BACKLIGHT CHARACTERISTICS

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Power for LED driving circuit	VCC	10.8	12.0	12.6	V	
Current of Backlight Power	I _{VCC}	-	360	396	mA	100% PWM Duty
Backlight Power Consumption	W _{BL}	-	4320	4989.6	mW	100% PWM Duty
Dimming Frequency	F _{PWM}	200	-	20K	Hz	
Dimmingduty cycle	-	-	-	100%	-	
High Level Input Voltage	V _{IH}	3	-	-	V	For Dimming, EN pin
Low Level Input Voltage	V _{IL}	-	-	0.8	V	For Dimming, EN pin
LED Life Time	-	-	(50000)	-	hrs	Note 1

Note1: Optical performance should be evaluated at Ta=25°C 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.

■ ELECTRO-OPTICAL CHARACTERISTICS

Item of electro-optical characteristics	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+ Tf	θ=0° ∅=0° Ta=25°C	25	40	-	ms	Fig.1	4
Contrast ratio	Cr		400	500	-	---	FIG 2.	1
Luminance uniformity	δ WHITE		70	80	-	%	FIG 2.	3
Surface Luminance	Lv		-	440	-	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.	
NTSC ratio	---	---	-	50	-	%	-	-
CIE (x, y) chromaticity	Red x	θ=0° ∅=0° Ta=25°C	-	0.590	-	-	FIG 2.	5
	Red y		-	0.354	-	-		
	Green x		-	0.337	-	-		
	Green y		-	0.581	-	-		
	Blue x		-	0.149	-	-		
	Blue y		-	0.120	-	-		
	White x		-	0.309	-	-		
	White y		-	0.349	-	-		

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

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

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

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

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

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P}_1, \text{P}_2, \text{P}_3, \text{P}_4, \text{P}_5)}{\text{Maximum Surface Luminance with all white pixels (P}_1, \text{P}_2, \text{P}_3, \text{P}_4, \text{P}_5)}$$

- Note4. Response time is the time required for the display to transition from White to black(Rise Time, T_r) and from black to white(Decay Time, T_f). For additional information see FIG 1..
- Note5. CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5. For more information see FIG 2.
- Note6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the 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.
- Note7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is base on TOPCON's BM-5 photo detector.
- Note8. For TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle.

FIG.1. The definition of Response Time

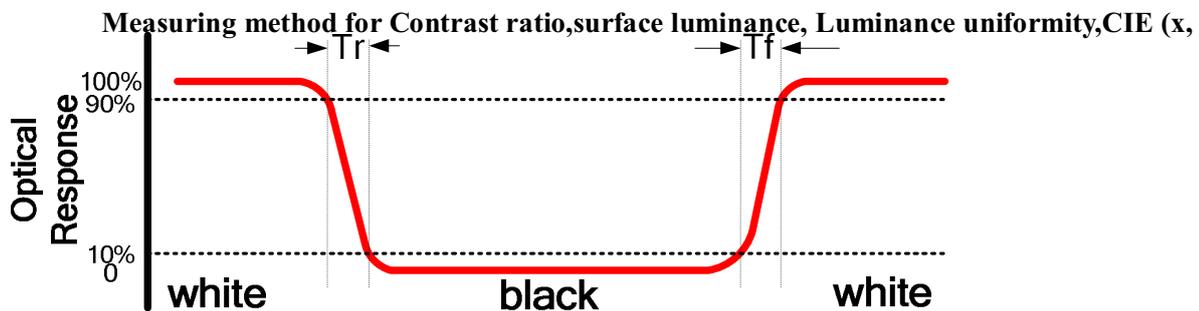


FIG.2. y) chromaticity

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

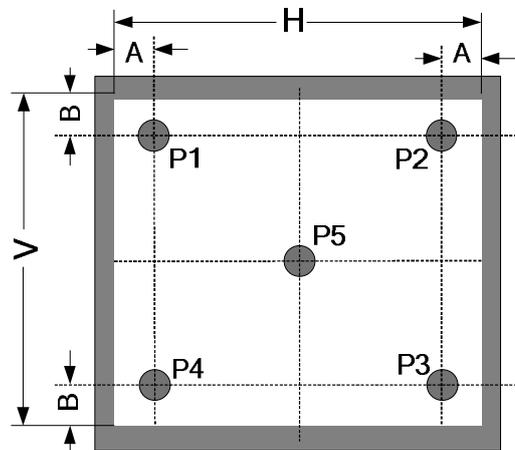
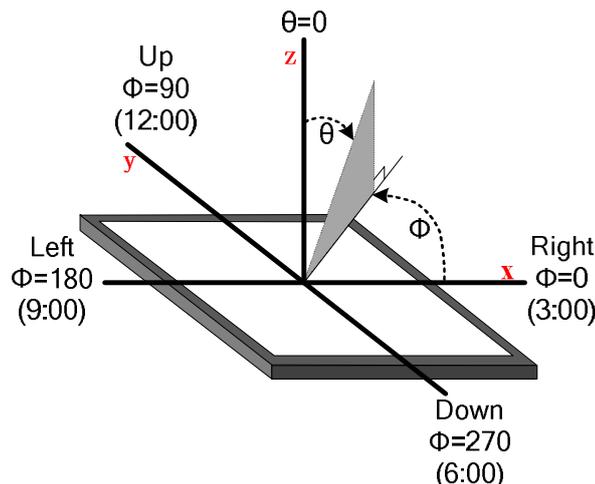


FIG.3. The definition of viewing angle



**■ INTERFACE DESCRIPTION****1.1 TFT LCD Panel**

CN1 Connector type: 107A20-0021RA-G3-R

No	Symbol	I/O	Description	Comment
1	VDD	P	Power Supply	
2	VDD	P	Power Supply	
3	GND	P	Ground	
4	DPS	I	Reverse Scan Function [H: Enable; L/NC: Disable]	Note3
5	RxIN0-	I	LVDS receiver signal channel 0. LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)	Note2
6	RxIN0+	I		
7	GND	P	Ground	
8	RxIN1-	I	LVDS receiver signal channel 1. LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)	Note2
9	RxIN1+	I		
10	GND	P	Ground	
11	RxIN2-	I	LVDS receiver signal channel 2 LVDS Differential Data Input (B2, B3, B4, B5, DE)	Note2
12	RxIN2+	I		
13	GND	P	Ground	
14	RxCLKIN-	I	LVDS receiver signal clock	Note2
15	RxCLKIN+	I		
16	GND	P	Ground	
17	RxIN3-	I	LVDS receiver signal channel 3, NC for 6-bit LVDS Input. LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV) for 8-bit LVDS input.	Note2
18	RxIN3+	I		
19	AGMode	I	Aging Mode setting [H: Aging Mode; L/NC: Normal]	
20	SEL68	P	6-bit/8-bit LVDS data input selection [H: 8-bit L/NC: 6-bit]	Note2

P: Power/GND; I: input pin;

Table 1.1 input terminal pin assignment

Note1: CN1 Match Connector type: DF19G-20S-1C or compatible

Note2: LVDS 6-bit data mapping when SEL68=L/NC as follows:

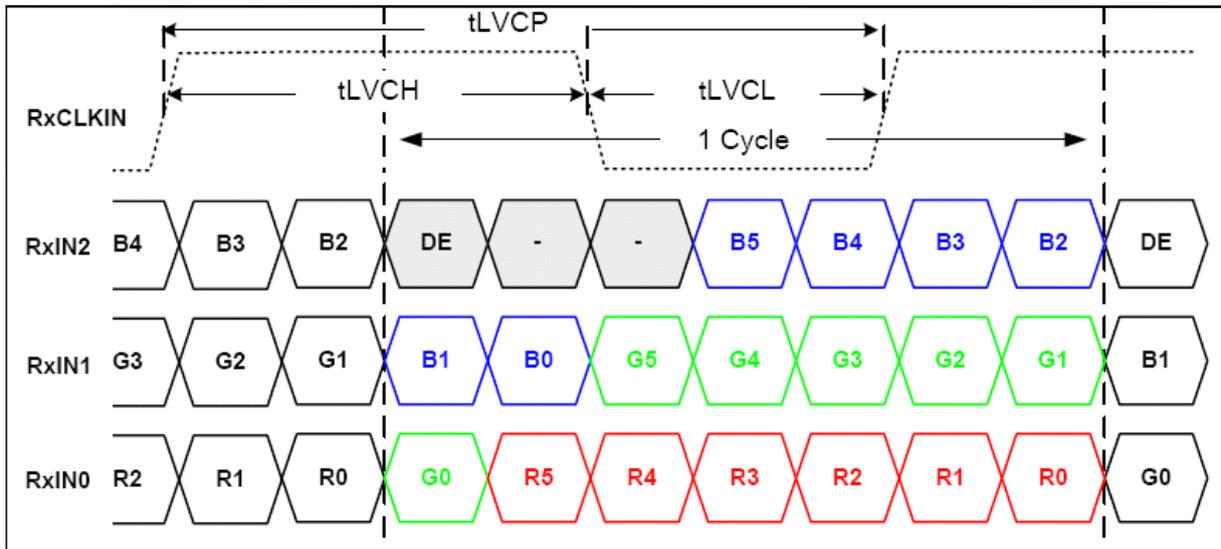


Figure 1.1.1 Input signal data mapping

LVDS 8-bit data mapping when SEL68=H as follows:

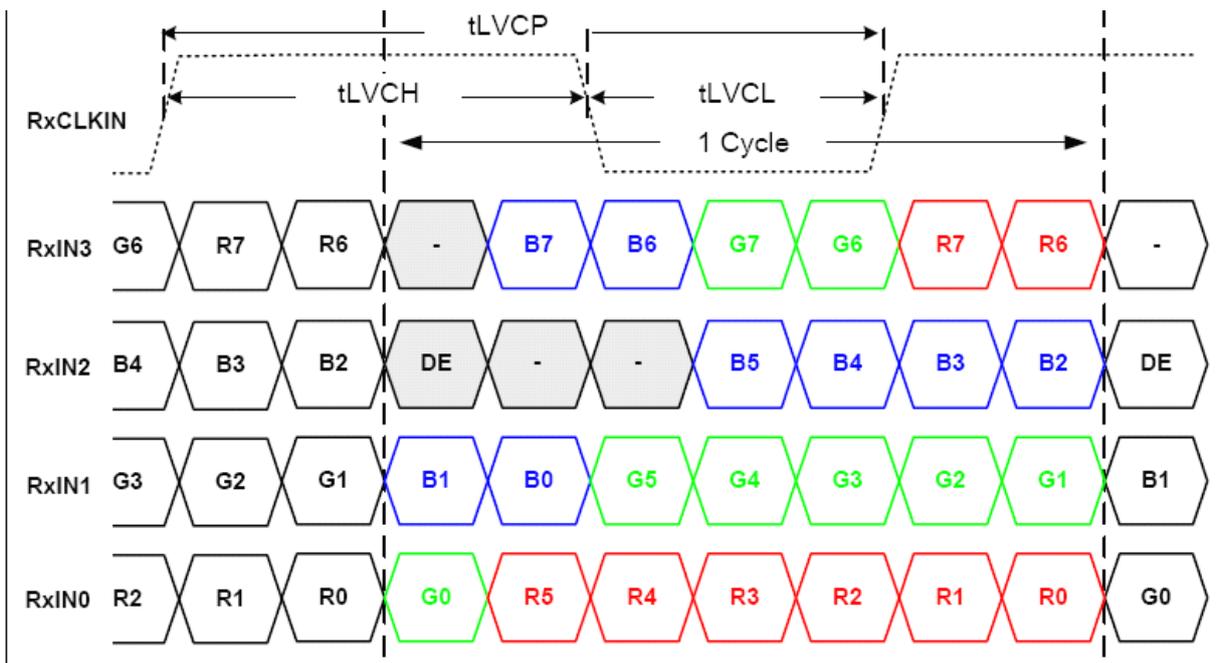


Figure 1.1.2 Input signal data mapping

Note3: DPS: Scan direction setting

DPS	Horizontal Scan direction	Vertical Scan direction
High	Right to left	Down to up
Low/NC	Left to right	Up to down

1.2 CN2(Backlight Connector)

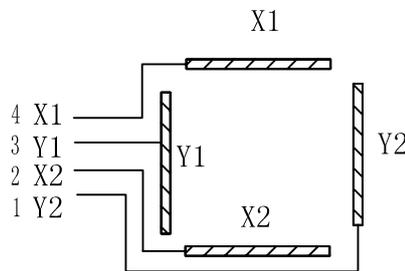
Connector type: 3808K-F05N-03R (ENTERY)

No	Symbol	I/O	Description	Remark
1	VCC	P	Power for LED driving circuit.12.0V input.	
2	PGND	P	Ground for LED driving circuit. 0V input.	
3	EN	I	Backlight enable setting. High: enabled; Low: disable.	
4	Dimming	I	PWM signal for adjusting luminance of backlight.	
5	NC	-	No connection	

Match connector: H208K-P05N-02B (ENTERY)

1.3 Touch screen panel section

Pin No.	Symbol	I/O	Function	Remark
1	Y2	Top	Top electrode-differential analog	
2	X2	Right	Right electrode-differential analog	
4	X1	Left	Left electrode-differential analog	
3	Y1	Bottom	Bottom electrode-differential analog	



■ TOUCH SCREEN PANEL SPECIFICATIONS

1. ELECTRICAL CHARACTERISTICS

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal Resistance	200	-	600	Ω	X(Film side)
	350	-	1030	Ω	Y(Glass side)
Insulation resistance	20	-	-	M Ω	DC 25V
Voltage	-	-	10	V	DC
Chattering	-	-	10	ms	100k Ω pull-up
Transparency	78	-	-	%	

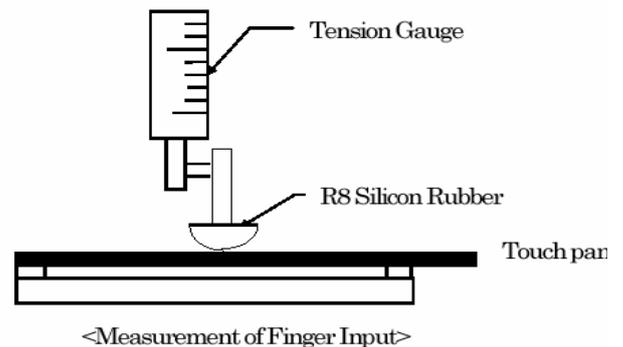
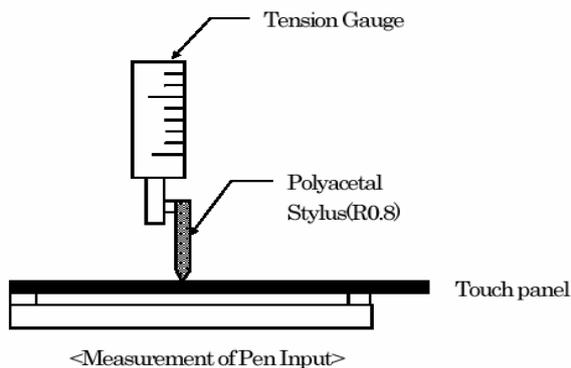
Note: Avoid operating with hard or sharp material such as a ball point pen or a mechanical pencil except a polyacetal pen (tip R0.8mm or less) or a finger.

2. MECHANICAL & RELIABILITY CHARACTERISTICS

Item	Value			Unit	Remark
	Min.	Typ.	Max.		
Active force	80	-	-	gf	Note 1
Durability-surface scratching	Write 100,000	-	-	characters	Note 2
Durability-surface pitting	1,000,000	-	-	touches	Note 3
Surface hardness	3	-	-	H	

Note 1: Active force test condition

- (1) Input DC 5V on X direction, Drop off Polyacetal Stylus (R0.8), until output voltage stabilize, then get the activation force ◦
- (2) R8.0mm Silicon rubber for finger Activation force test
- (3) Test point: 9 points



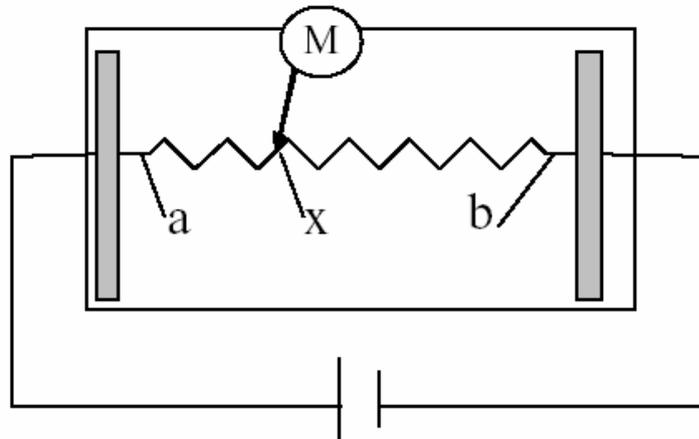
Note 2: Measurement for surface area.

- Scratch 100,000 times straight line on the film with a stylus change every 20,000 times.
- Force: 250gf.
- Speed: 60mm/sec.
- Stylus: R0.8 polyacetal tip.

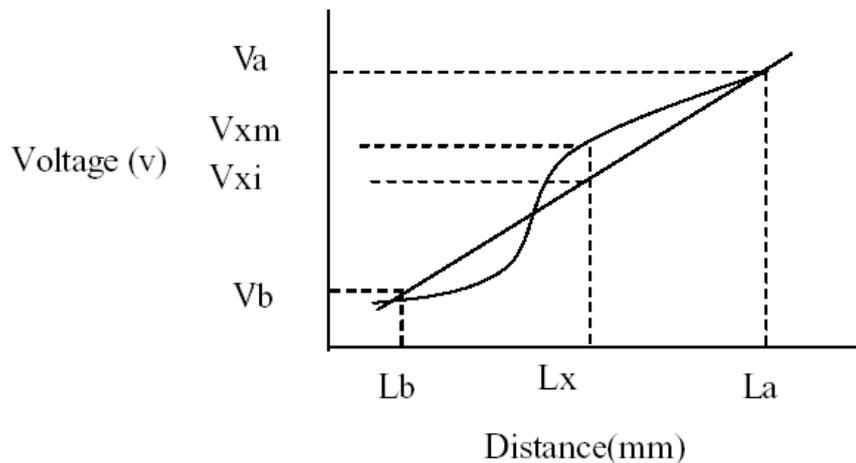
Note 3: Pit 1,000,000 times on the film with a R0.8 silicon rubber.

- Force: 250gf.
- Speed: 2times/sec.

3. LINEARITY DEFINITION

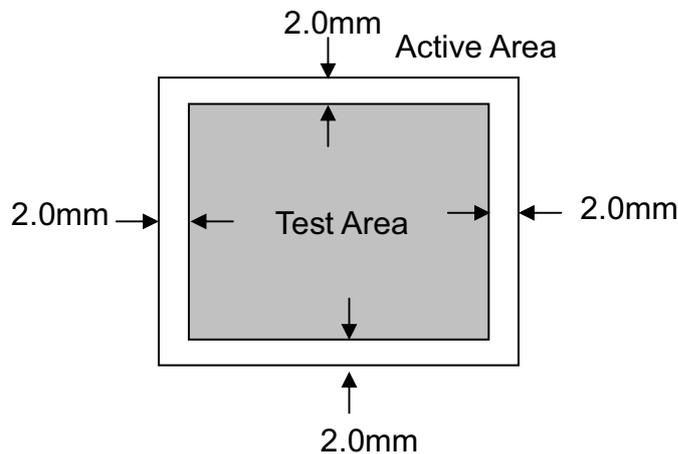


- Va: maximum voltage in the active area of touch panel
- Vb: minimum voltage in the active area of touch panel
- X: random measuring point
- Vxm: actual voltage of Lx point
- Vxi: theoretical voltage of Lx point



$$\text{Linearity} = \frac{|Vxi - Vxm|}{(Va - Vb)} * 100\%$$

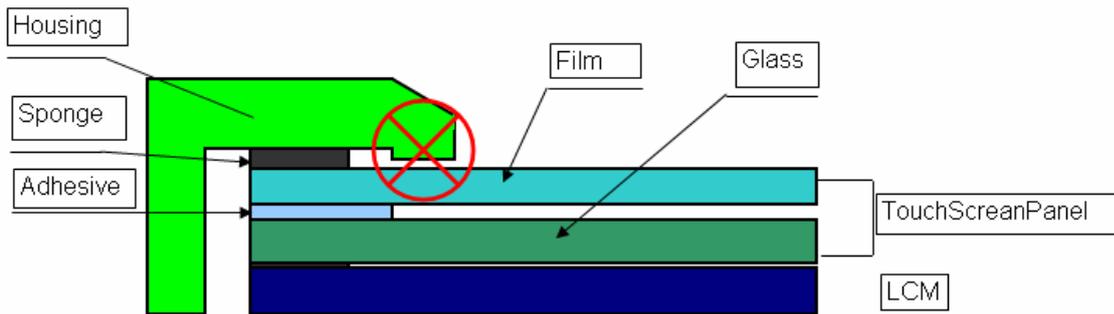
Note: Test area is as follows and operation force is 150gf.



4. HOUSING DESIGN GUIDE

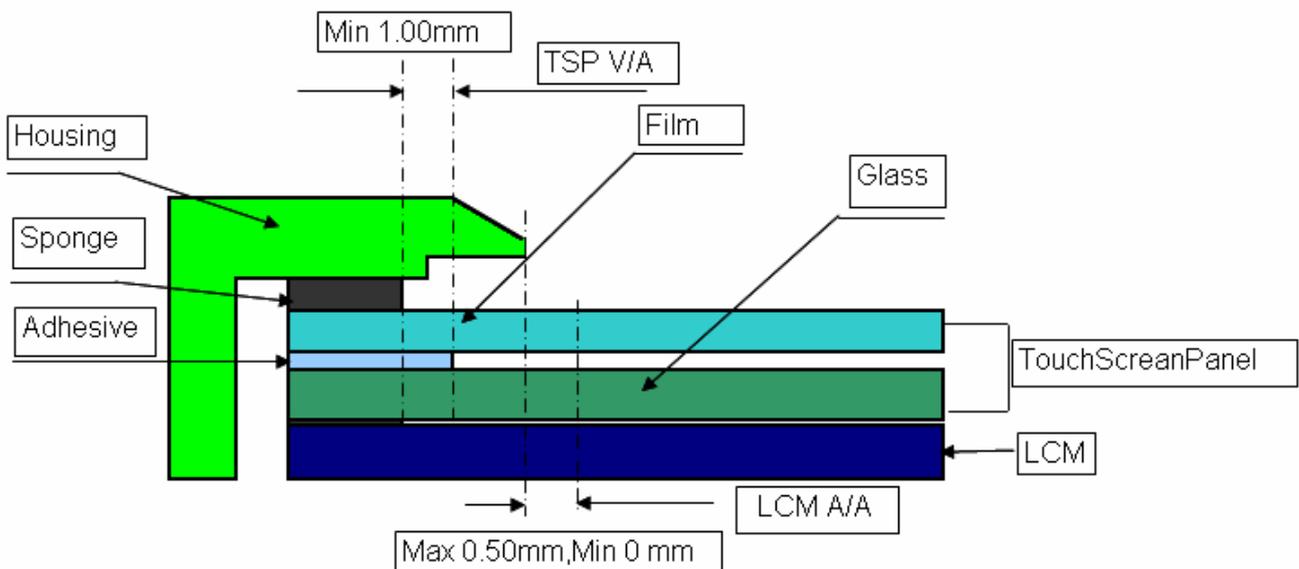
Housing design follow as below.

- 1) Avoid the design that housing overlap and press on the active area of the LCM.
- 2) Give enough gap(over 0.5mm at compressed) between the housing and TSP to protect wrong operating.



- 3) Use a buffer material(Gasket) between the TSP and housing to protect damage and wrong operating.

overlap and press on the inside of TSP view area.



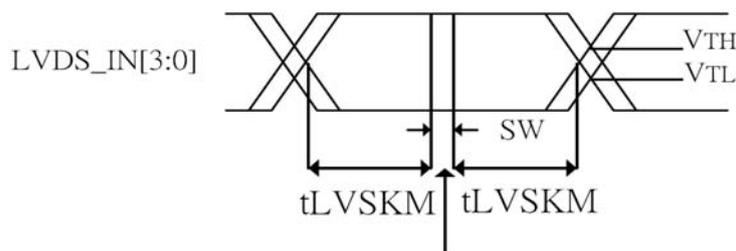
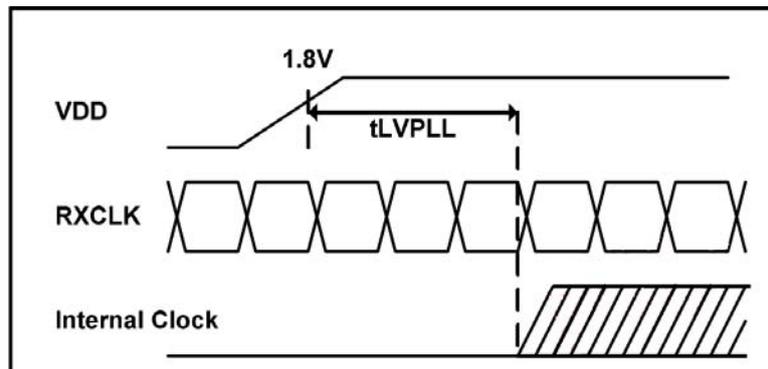
APPLICATION NOTES

1 Timing Chart

1.1 Timing Parameter

Item	Symbol	Min	Typ	Max	Unit	Condition
Clock period	tLVCP	20.0	25	31.25	ns	
Clock high time	tLVCH	-	14.29	-	ns	
Clock low time	tLVCL	-	10.71	-	ns	
PLL wake-up time	tLVPLL	-	-	1	ms	
Input skew margin	tLVSKM	400	-	-	ps	f=85MHz

Table 1.1 timing parameter



Ideal Strobe Position

SW: Setup and Hold time

AC Timing Diagram 3: LVDS timing skew margin.

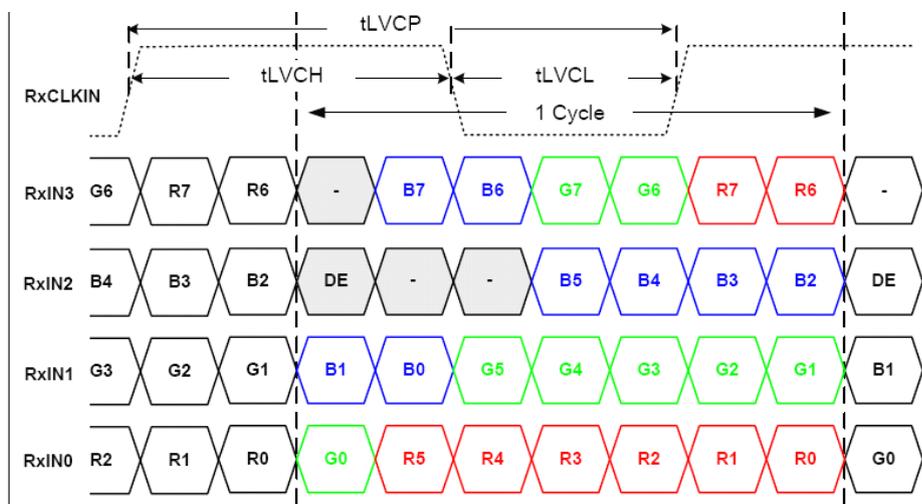


Figure 1.1 Input signal data timing

1.2 Power On/Off Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VDD 3.0V to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD 3.0V	Tp3	5	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

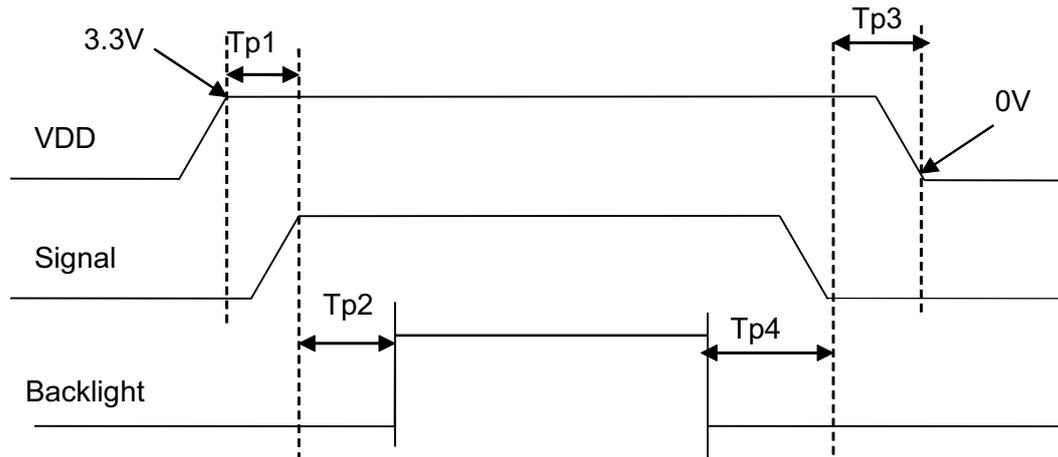


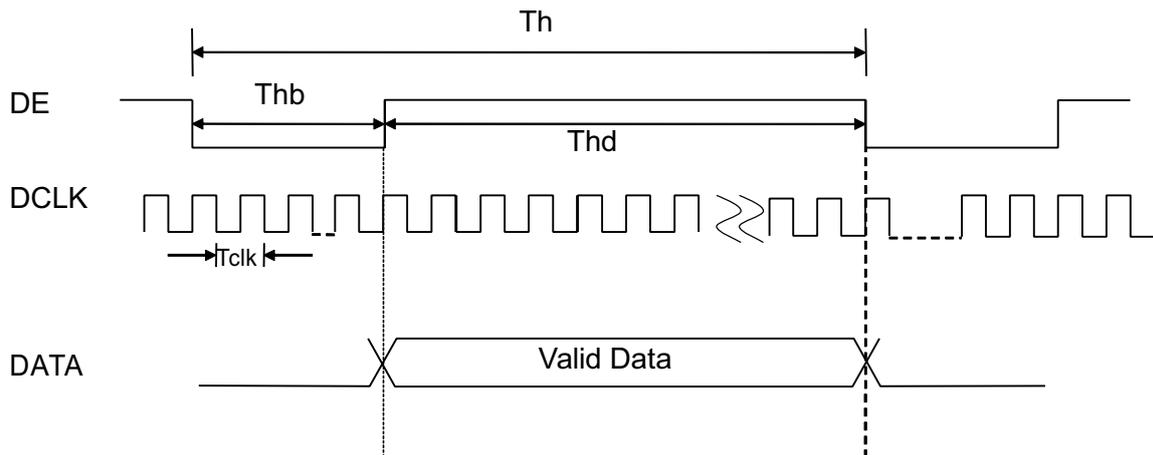
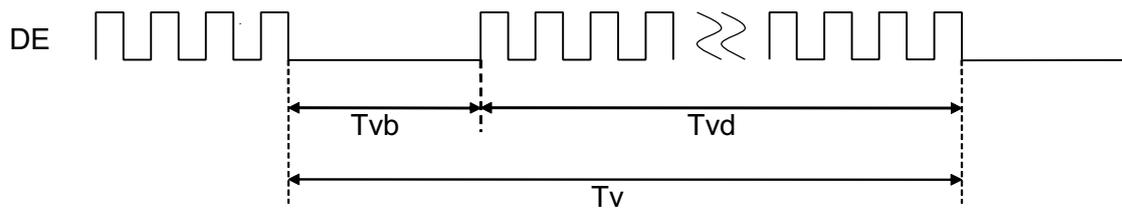
Figure 1.2 Interface power on/off sequence

1.3 Recommended Input Timing of LVDS transmitter

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
	Dclk frequency	1/Tclk	32	40	50	MHz	
Horizontal section	Horizontal total	Th	866	1056	1064	Tclk	
	Horizontal blanking	Thb	66	256	264	Tclk	
	Valid Data Width	Thd	800	800	800	Tclk	
Vertical section	Frame rate	-	-	60	70	Hz	
	Vertical total	Tv	604	628	800	Th	
	Vertical blanking	Tvb	4	28	200	Th	
	Valid Data Width	Tvd	600	600	600	Th	

Note: DE signal is necessary.

Input Timing Control Conditions





■ RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	$70 \pm 2^\circ\text{C}/240$ hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	$-20 \pm 2^\circ\text{C}/240$ hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	$60 \pm 2^\circ\text{C}/240$ hours	Note 1 IEC60068-2-1,GB2423.2
4	Low Temperature Operating	$-10 \pm 2^\circ\text{C}/240$ hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	$-20 \pm 2^\circ\text{C} \sim 25 \sim 70 \pm 2^\circ\text{C} \times 100$ cycles (30min.) (5min.) (30min.)	Start with cold temperature, with high temperature, IEC60068-2-14:1984 GB2423.22
6	Damp proof Test operating	$60^\circ\text{C} \pm 5^\circ\text{C} \times 90\%\text{RH}/240$ hours	Note 2 IEC60068-2-78,GB2423.3
7	Vibration Test (non-operation)	Frequency range:10Hz~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z(6 hours for total)	IEC60068-2-6 GB/T2423.10
8	Package drop test	Height:80 cm,1 corner,3 edges,6 surfaces	IEC60068-2-32,GB2423.8
9	ESD test (operation)	C=150pF,R=330Ω Air: ±15Kv Contact: ±8Kv 10 times/terminal	IEC61000-4-2 GB/T17626.2
10	Shock(non-operation)	80G 6ms, ±X,±Y,±Z 3times each direction	IEC60068-2-27 GB/T2423.5
11	Package vibration test	Random vibration: 0.015GxG/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each dirction of X,Y,Z (6 hours for total)	IEC60068-2-34 GB/T2423.11

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

Note 2:Ta is the ambient temperature of sample.

■ INSPECTION CRITERION

 <p>OUTGOING QUALITY STANDARD</p>	<p>PAGE 1 OF 8</p>
<p>TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA</p>	

This specification is made to be used as the standard acceptance/rejection criteria for Wider Screen TFT-LCD module product.

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

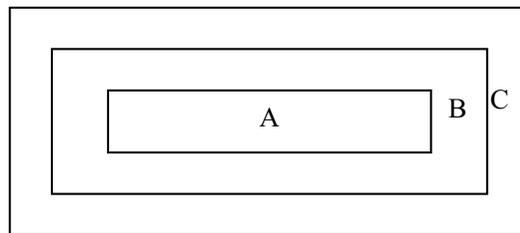
Minor defect: AQL 1.5

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 Item.

3.1 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)

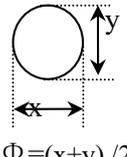
ZoneB+ZoneC= Around opaque edge area on TP.

Fig.1 Inspection zones in an LCD.

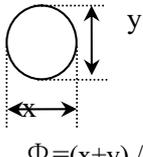
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

3.2 Definition of some visual defect

<p>Bright dot.</p>	<p>Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.</p>
<p>Dark dot.</p>	<p>Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture, or pure whiter picture.</p>
<p>Dark / Bright Lines.</p>	<p>Lines on display which appear dark/bright and usually result from the contamination.</p>

 OUTGOING QUALITY STANDARD		PAGE 2 OF 8																		
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA																				
4. Major Defect																				
Item No	Items to be inspected	Inspection Standard		Classification of defects																
4.1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Back-light no lighting, flickering and abnormal lighting.		Major																
4.2	Missing	Missing component																		
4.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.																		
4.4	Crack	Creaks tend to break are not allowed.																		
5. Minor Defect																				
Item No	Items to be inspected	Inspection Standard		Classification of defects																
5.1	Bright dot defect.  $\Phi = (x+y) / 2$	<table border="1"> <thead> <tr> <th rowspan="2">Zone Size(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="2">Acceptable (clustering of spot not allowed)</td> <td rowspan="3">Acceptable</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.25$</td> <td colspan="2">N ≤ 6.</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.50$</td> <td colspan="2">N ≤ 2</td> </tr> </tbody> </table>	Zone Size(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.15$	Acceptable (clustering of spot not allowed)		Acceptable	$0.15 < \Phi \leq 0.25$	N ≤ 6.		$0.25 < \Phi \leq 0.50$	N ≤ 2		Minor
		Zone Size(mm)		Acceptable Qty																
			A	B	C															
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Zone Size(mm)		Acceptable Q'ty																		
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5.2	Dark dot defect.	<table border="1"> <thead> <tr> <th rowspan="2">Zone Size(mm)</th> <th colspan="3">Acceptable Q'ty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="2">Acceptable</td> <td rowspan="3">Acceptable</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.30$</td> <td colspan="2">N ≤ 6</td> </tr> <tr> <td>$0.30 < \Phi \leq 0.50$</td> <td colspan="2">N ≤ 4</td> </tr> </tbody> </table>		Zone Size(mm)	Acceptable Q'ty			A	B	C	$\Phi \leq 0.15$	Acceptable		Acceptable	$0.15 < \Phi \leq 0.30$	N ≤ 6		$0.30 < \Phi \leq 0.50$	N ≤ 4	
Zone Size(mm)	Acceptable Q'ty																			
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$0.15 < \Phi \leq 0.30$	N ≤ 6																			
$0.30 < \Phi \leq 0.50$	N ≤ 4																			
5.3	Bright / Dark line.	$0.01 < W \leq 0.10, \quad 0.30 < L \leq 1.50,$ $N \leq 1$		Acceptable																
Note: 1. Total defective dots shall not exceed 6 pcs. 2. Minimum distance between defective dots is more than 5mm. 3. 2 Adjacent dark sub pixel defect or bright sub pixel defect is not more than 1pair. 4. W: Width, L: Length, N: Count.																				

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TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

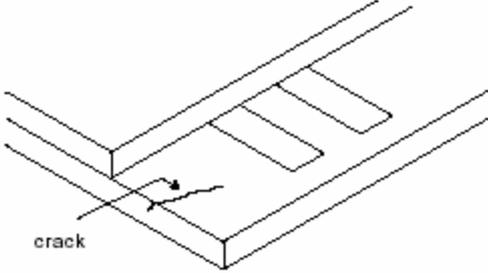
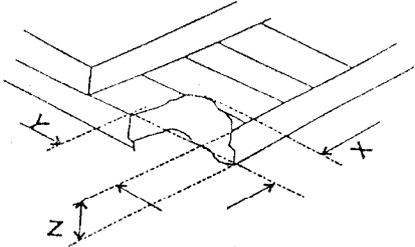
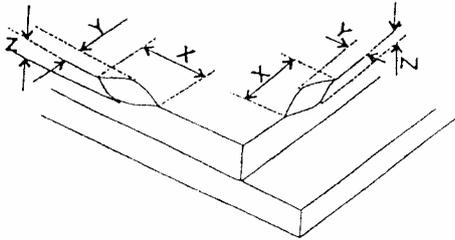
Item No	Items to be inspected	Inspection Standard	Classification of defects																										
5.4	Linear defect Foreign material under polarizer,	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">Size(m)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th rowspan="2" style="text-align: center;">L(Length)</th> <th rowspan="2" style="text-align: center;">W(Width)</th> <th colspan="3" style="text-align: center;">Zone</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Ignore</td> <td style="text-align: center;">$W \leq 0.05$</td> <td colspan="2" style="text-align: center;">Acceptable</td> <td rowspan="3" style="text-align: center; vertical-align: middle;">Acceptable</td> </tr> <tr> <td style="text-align: center;">$L \leq 5.0$</td> <td style="text-align: center;">$0.05 < W \leq 0.15$</td> <td colspan="2" style="text-align: center;">$N \leq 5$</td> </tr> <tr> <td style="text-align: center;">$5.0 \leq L$</td> <td style="text-align: center;">$0.15 \leq W$</td> <td colspan="2" style="text-align: center;">0</td> </tr> </tbody> </table>	Size(m)		Acceptable Qty			L(Length)	W(Width)	Zone			A	B	C	Ignore	$W \leq 0.05$	Acceptable		Acceptable	$L \leq 5.0$	$0.05 < W \leq 0.15$	$N \leq 5$		$5.0 \leq L$	$0.15 \leq W$	0		Minor
	Size(m)		Acceptable Qty																										
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	Circular Defect, Foreign material under polarizer, <div style="text-align: center; margin-top: 10px;">  <p>$\Phi = (x+y) / 2$</p> </div>	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Zone Size(mm)</th> <th colspan="3" style="text-align: center;">Acceptable Q'ty</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.25$</td> <td colspan="2" style="text-align: center;">Acceptable</td> <td rowspan="3" style="text-align: center; vertical-align: middle;">Acceptable</td> </tr> <tr> <td style="text-align: center;">$0.25 < \Phi \leq 0.50$</td> <td colspan="2" style="text-align: center;">$N \leq 4$</td> </tr> <tr> <td style="text-align: center;">$0.50 \leq \Phi$</td> <td colspan="2" style="text-align: center;">0</td> </tr> </tbody> </table>	Zone Size(mm)	Acceptable Q'ty			A	B	C	$\Phi \leq 0.25$	Acceptable		Acceptable	$0.25 < \Phi \leq 0.50$	$N \leq 4$		$0.50 \leq \Phi$	0		Minor									
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$0.25 < \Phi \leq 0.50$	$N \leq 4$																												
$0.50 \leq \Phi$	0																												
5.5	Polarizer defect.	5.4.1 Polarizer Position (i) Shifting in position should not exceed the glass outline dimension. (ii) Incomplete covering of the viewing area due to shifting is not allowed. 5.4.2 Dirt on polarizer Dirt which can be wiped easily should be accepted. 5.4.3 Polarizer Nick & Dent <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th rowspan="3" style="text-align: center;">Sizes(mm)</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th colspan="3" style="text-align: center;">Zone</th> </tr> <tr> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi < 0.25$</td> <td colspan="2" style="text-align: center;">Acceptable</td> <td rowspan="3" style="text-align: center; vertical-align: middle;">Acceptable</td> </tr> <tr> <td style="text-align: center;">$0.25 \leq \Phi \leq 0.5$</td> <td colspan="2" style="text-align: center;">$N \leq 4$</td> </tr> <tr> <td style="text-align: center;">$\Phi > 0.5$</td> <td colspan="2" style="text-align: center;">0</td> </tr> </tbody> </table>	Sizes(mm)	Acceptable Qty			Zone			A	B	C	$\Phi < 0.25$	Acceptable		Acceptable	$0.25 \leq \Phi \leq 0.5$	$N \leq 4$		$\Phi > 0.5$	0		Minor						
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MI		OUTGOING QUALITY STANDARD	PAGE 4 OF 8																												
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA																															
5. Minor Defect																															
5.6	Polarizer defect	5.4.4 Air bubbles between glass & polarizer:			Minor																										
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Size(mm)	Acceptable Qty																														
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$\Phi > 1.5$	0																														
		5.4.5 Polarizer scratch			Minor																										
		(i) If the Polarizer scratch can be seen after cover assembling or in the operating condition, judge by the line defect of 5.4. (ii) If the Polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following.																													
		<table border="1"> <thead> <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> </thead> <tbody> <tr> <td>Ignore</td> <td>$W \leq 0.02$</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$1.0 < L \leq 5.0$</td> <td>$0.02 < W \leq 0.2$</td> <td colspan="2">$N \leq 4$</td> </tr> <tr> <td>$5.0 < L$</td> <td>$0.2 < W$</td> <td colspan="2">0</td> </tr> </tbody> </table>			Size(mm)		Acceptable Qty			L(Length)	W(Width)	Zone			A	B	C	Ignore	$W \leq 0.02$	Ignore		Ignore	$1.0 < L \leq 5.0$	$0.02 < W \leq 0.2$	$N \leq 4$		$5.0 < L$	$0.2 < W$	0		
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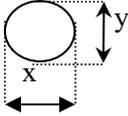
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5. Minor Defect

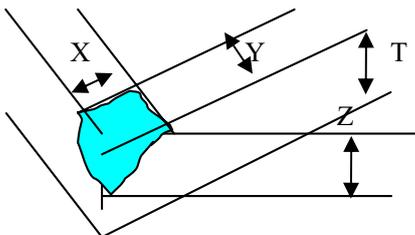
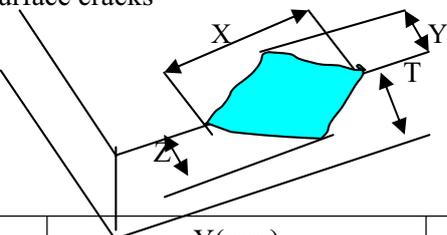
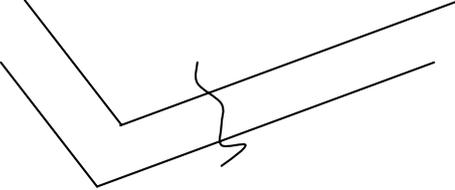
Item No	Items to be inspected	Inspection Standard	Classification of defects								
5.7	Glass defect	(i) Crack Cracks are not allowed.	Minor								
											
		(ii) TFT chips on corner	Minor								
		 <table border="1" style="margin-top: 10px;"> <thead> <tr> <th style="text-align: center;">X</th> <th style="text-align: center;">Y</th> <th style="text-align: center;">Z</th> <th style="text-align: center;">Acceptable</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">≤ 3.0</td> <td style="text-align: center;">≤ 3.0</td> <td style="text-align: center;">Not more than the thickness of glass.</td> <td style="text-align: center;">$N \leq 3.$</td> </tr> </tbody> </table> <p>Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</p>	X	Y	Z	Acceptable	≤ 3.0	≤ 3.0	Not more than the thickness of glass.	$N \leq 3.$	
X	Y	Z	Acceptable								
≤ 3.0	≤ 3.0	Not more than the thickness of glass.	$N \leq 3.$								
		(iii) Usual surface cracks	Minor								
		 <table border="1" style="margin-top: 10px;"> <thead> <tr> <th style="text-align: center;">X</th> <th style="text-align: center;">Y</th> <th style="text-align: center;">Z</th> <th style="text-align: center;">Acceptable</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">≤ 1.5</td> <td style="text-align: center;">≤ 1.5</td> <td style="text-align: center;">Not more than the thickness of glass.</td> <td style="text-align: center;">$N \leq 4.$</td> </tr> </tbody> </table> <p>It is only applicable to the upper glass of LCD.</p>	X	Y	Z	Acceptable	≤ 1.5	≤ 1.5	Not more than the thickness of glass.	$N \leq 4.$	
X	Y	Z	Acceptable								
≤ 1.5	≤ 1.5	Not more than the thickness of glass.	$N \leq 4.$								

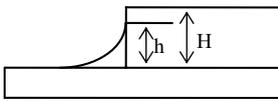
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6. TP Cosmetic Defect.

Item No	Items to be inspected	Inspection Standard	Classification of defects																							
6.1	Black and white Spot defect Foreign Particle,	<p>For dark/white spot, size Φ is defined as $\Phi = \frac{(x+y)}{2}$</p>  <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Size(mm)</th> <th colspan="2">Zone</th> <th rowspan="2">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B+C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.15$</td> <td colspan="2" style="text-align: center;">Ignore</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">distance 5mm over</td> </tr> <tr> <td style="text-align: center;">$0.15 < \Phi \leq 0.25$</td> <td colspan="2" style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">$0.25 < \Phi \leq 0.50$</td> <td colspan="2" style="text-align: center;">4</td> </tr> <tr> <td style="text-align: center;">$\Phi > 0.5$</td> <td colspan="2" style="text-align: center;">0</td> </tr> <tr> <td colspan="4" style="text-align: center;">Total defective dots shall not exceed 6 pcs on the same TP.</td> </tr> </tbody> </table>	Size(mm)	Zone		Acceptable Qty	A	B+C	$\Phi \leq 0.15$	Ignore		distance 5mm over	$0.15 < \Phi \leq 0.25$	6		$0.25 < \Phi \leq 0.50$	4		$\Phi > 0.5$	0		Total defective dots shall not exceed 6 pcs on the same TP.				Minor
Size(mm)	Zone			Acceptable Qty																						
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Item No	Items to be inspected	Inspection Standard	Classification of defects																																	
6.2	Black line, White line, Scratch, Foreign material under film,	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <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+C</th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Ignore</td> <td style="text-align: center;">$W \leq 0.03$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$L \leq 5.0$</td> <td style="text-align: center;">$0.03 < W \leq 0.05$</td> <td colspan="3" style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">$L \leq 5.0$</td> <td style="text-align: center;">$0.05 < W \leq 0.1$</td> <td colspan="3" style="text-align: center;">2</td> </tr> <tr> <td></td> <td style="text-align: center;">$0.1 < W$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table>	Size(mm)		Acceptable Qty			L(Length)	W(Width)	Zone			A	B+C		Ignore	$W \leq 0.03$	Ignore			$L \leq 5.0$	$0.03 < W \leq 0.05$	5			$L \leq 5.0$	$0.05 < W \leq 0.1$	2				$0.1 < W$	0			Minor
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6. TP Cosmetic Defect									
Item No	Items to be inspected	Inspection Standard	Classification of defects						
6.3	TP defect	(i) Chips on corner  <table border="1" data-bbox="486 817 1117 913"> <thead> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> </thead> <tbody> <tr> <td>≤3.0</td> <td>≤3.0</td> <td>Z<T</td> </tr> </tbody> </table>	X(mm)	Y(mm)	Z(mm)	≤3.0	≤3.0	Z<T	Minor
		X(mm)	Y(mm)	Z(mm)					
		≤3.0	≤3.0	Z<T					
(ii) Usual surface cracks  <table border="1" data-bbox="443 1310 1161 1406"> <thead> <tr> <th>X(mm)</th> <th>Y(mm)</th> <th>Z(mm)</th> </tr> </thead> <tbody> <tr> <td>≤6.0</td> <td><2.0</td> <td>Z<T</td> </tr> </tbody> </table>	X(mm)	Y(mm)	Z(mm)	≤6.0	<2.0	Z<T	Minor		
X(mm)	Y(mm)	Z(mm)							
≤6.0	<2.0	Z<T							
(iii) Crack Cracks tending to break are not allowed. 	Major								
6.4	Total number of dots	The total number of luminous dots, dark dots, contamination particles, bubbles, scratch defects, pinholes must not exceed 10 /piece on the same TP.							

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7. Module Cosmetic Criteria			
Item No	Items to be inspected	Inspection Standard	Classification of defects
1	Difference in Spec.	None allowed	Major
2	Pattern peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing No soldering bridge No cold soldering	Major Major Minor
4	Resist flaw on Printed Circuit Boards	visible copper foil ($\varnothing 0.5\text{mm}$ or more) on substrate pattern.	Minor
5	Accretion of metallic Foreign matter	No accretion of metallic foreign matters (Not exceed $\varnothing 0.2\text{mm}$).	Minor Minor
6	Stain	No stain to spoil cosmetic badly.	Minor
7	Plate discoloring	No plate fading, rusting and discoloring.	Minor
8	Solder amount	a. Soldering side of PCB Solder to form a 'Filet' all around the lead. Solder should not hide the lead form perfectly. (too much)	Minor
	1. Lead parts	b. Components side (In case of 'Through Hole PCB') Solder to reach the Components side of PCB.	
	2. Flat packages	Either 'Toe' (A) or 'Seal' (B) of the lead to be covered by 'Filet'. Lead form to be assume over solder.	
3. Chips	$(3/2) H \geq h \geq (1/2) H$		Minor
9	Solder ball/Solder splash	a.The spacing between solder ball and the conductor or solder pad $h \geq 0.13\text{mm}$.The diameter of solder ball $d \leq 0.15\text{mm}$.	Minor Minor Major Minor
		b.The quantity of solder balls or solder. Splashes isn't beyond 5 in 600mm^2 .	
		c.Solder balls/Solder splashes do not violate minimum electrical clearance.	
		d.Solder balls/Solder splashes must be entrapped / encapsulated or attached to the metal surface .	
		Note: Entrapped/encapsulated/attached is intended to mean that normal service environment of the product will not cause a solder ball to become dislodged.	

■ 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:

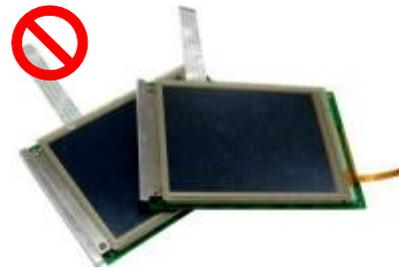


As above picture, please handle with anti-static gloves around LCM edges.

2.3 Incorrect handling:



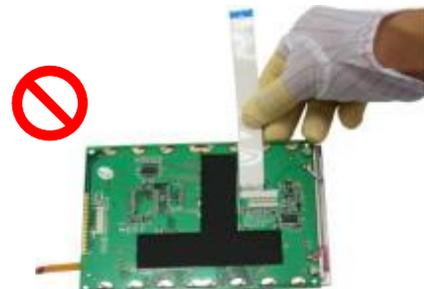
Please don't touch IC directly.



Please don't stack LCM.



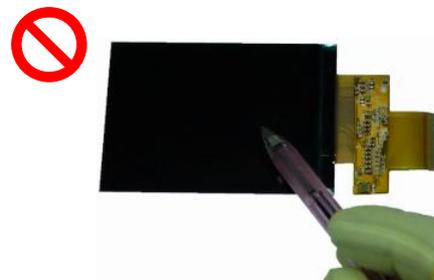
Please don't hold the surface of panel.



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

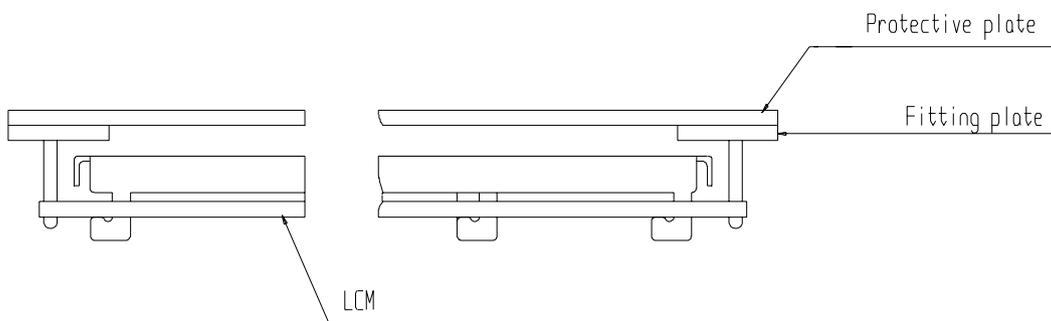
- 3.2.1 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
- 3.2.2 If the LCD modules have been operating 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.

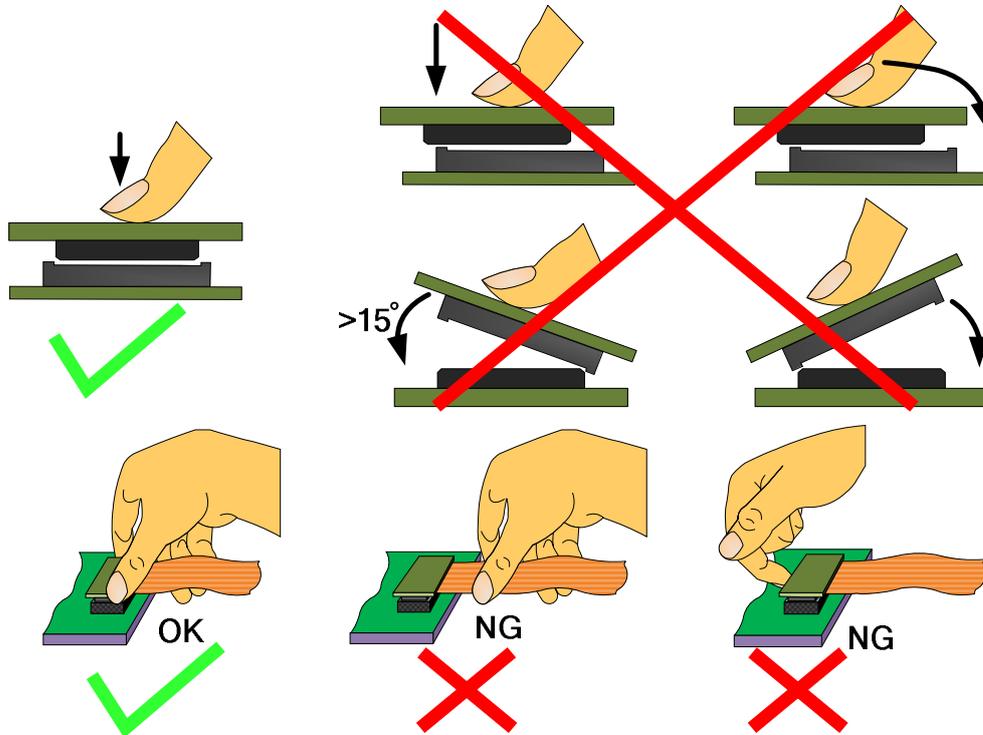
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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 ± 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.