MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0700B1T-2

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.2
Engineering	
Date	2011-02-25
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2010/09/01	Preliminary　Specification	
1.1	2010/12/19	1.　Add ROHS Compliance Description 2.　Modify Block Diagram	
1.2	2011/02/25	1.　Update Backlight Unit 2.　Update Power Supply current 3.　Add Power Signal sequence 4.　Add Data Mapping 5.　Modify Contrast ratio Value	

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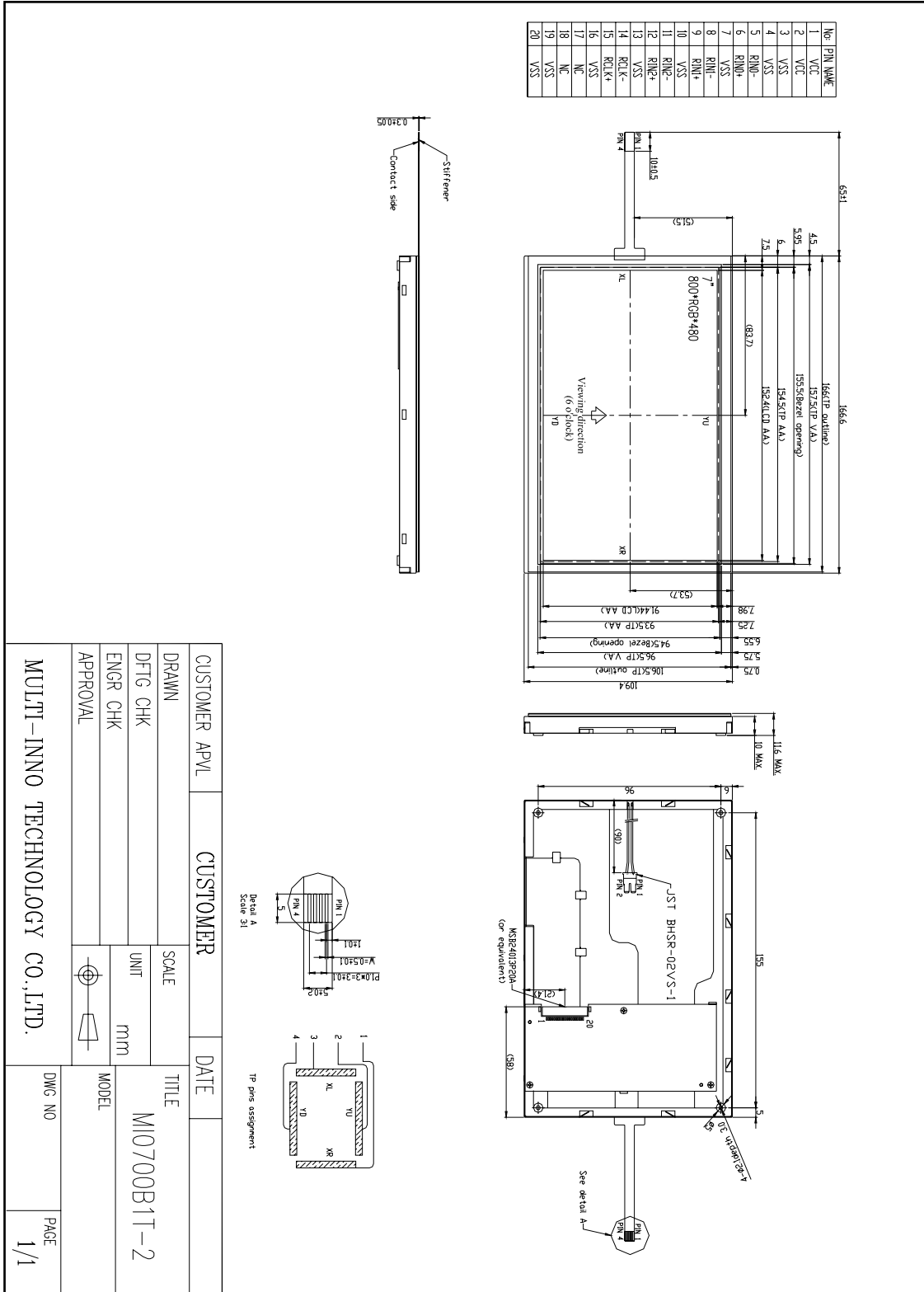
■PRIOR CONSULT MATTER

■ **GENERAL INFORMATION**

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	7.0	Inch
Viewing direction	12:00	O' Clock
Gray scale inversion direction	6:00	O' Clock
LCM (W × H × D)	166.60×109.40×11.60	mm^3
Active area (W×H)	152.40×91.44	mm^2
Pixel pitch (W×H)	0.1905×0.1905	mm^2
Number of dots	800 (RGB) × 480	/
Backlight type	39 LEDs	/
Interface type	LVDS receiver 18 bit interface	/
Color depth	262K	/
Pixel configuration	R.G.B vertical stripe	/
Surface treatment	Anti-glare and hard coating(3H)	/
Input voltage	3.3	V
With/Without TSP	With TSP	/
Weight	220	g

Note 1:Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.
Note 2 : RoHS compliant;
Note 3: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONS

■ ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
Power supply voltage	VCC	-0.3	4.0	V
Input voltage	VIN	-0.3	Vcc+0.3	V
Current of Backlight Unit	IB	-	325	mA
Voltage of Backlight Unit	VB	-	10.5	V
Operating temperature	Top	-20	70	°C
Storage temperature	TST	-30	80	°C

Note (1) 95 % RH Max. (40 ° C ≥ Ta). Maximum wet-bulb temperature at 39 ° C or less. (Ta > 40 ° C) No condensation.

Note (2) In case of below 0° , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guarantied at operating temperature. Contrast, response time, another display quality are evaluated at +25° C.
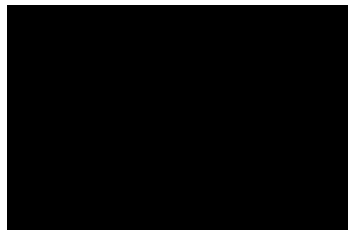
■ ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS   (Ta=25±2°C, V_{SS}=GND=0)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply		VCC	3.0	3.3	3.6	V	
Input Voltage for logic	Differential Input High Threshold	VTH			+100	mV	
	Differential Input Low Threshold	VTL	-100			mV	
Power Supply current		ICC	-	215	250	mA	Note 1

Note1:   fv =60Hz , Ta=25°C , Display pattern : Black pattern

■ BACKLIGHT CHARACTERISTICS

The Back-light system is an edge-lighting type with 39 white LED (Light Emitting Diode)s. The characteristics of 39 white LEDs are shown in the following tables.

(Ta= Room Temp)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Voltage	VB	9.3	9.9	10.5	V	
Forward Current	IB	-	260	-	mA	(1)
Power Consumption	P_{BL}	-	2574	-	mW	(2)
LED Life time	-	40000	-	-	hr	(3)

Note (1) LEDs in 3 series x 13 parallel type.

(2) Where IB = 260mA, VB = 9.9, P_{BL} = VB × IB

(3) The environmental conducted under ambient air flow ,at Ta=25±2°C, 60%RH±5%

■ ELECTRO-OPTICAL CHARACTERISTICS

Item of electro-optical characteristics	Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time	Tr+ Tf		-	20	30	ms	Fig.1	4
Contrastratio	Cr	θ=0° ∅=0° Ta=25℃	350	400	-	---	FIG2.	1
Luminance uniformity	δ WHITE		70	75	-	%	FIG2.	3
Surface Luminance	Lv		650	800	-	cd/m^2	FIG 2.	2
Viewing angle range	θ	∅ = 90°	45	55	-	deg	FIG3.	6
		∅ = 270°	55	65	-	deg	FIG3.	
		∅ = 0°	55	65	-	deg	FIG3.	
		∅ = 180°	55	65	-	deg	FIG3.	
NTSC ratio	---	---	-	-	-	%	-	-
CIE (x, y) chromaticity	Red x	θ=0° ∅=0° Ta=25℃	-	-	-		FIG 2.	5
	Red y		-	-	-			
	Green x		-	-	-			
	Green y		-	-	-			
	Blue x		-	-	-			
	Blue y		-	-	-			
	White x		0.280	0.330	0.380			
	White y		0.320	0.370	0.420			

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.

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

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.

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

Note4.　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..

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 conrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note7.　For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity 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.
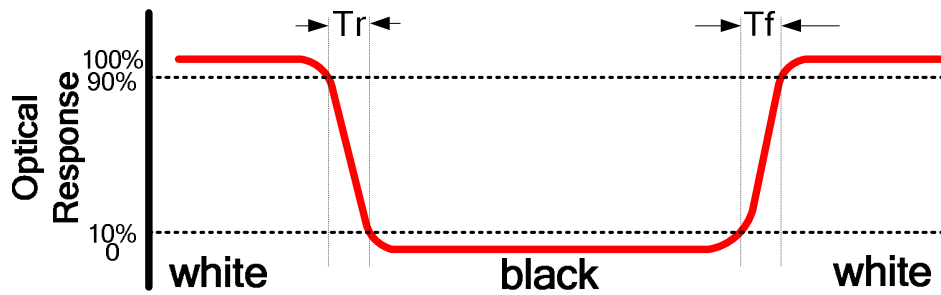
FIG.1.　　The definition of Response Time

FIG.2.　　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 $\varnothing$=5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

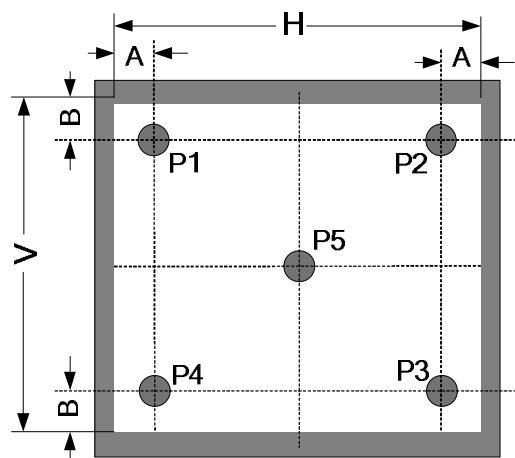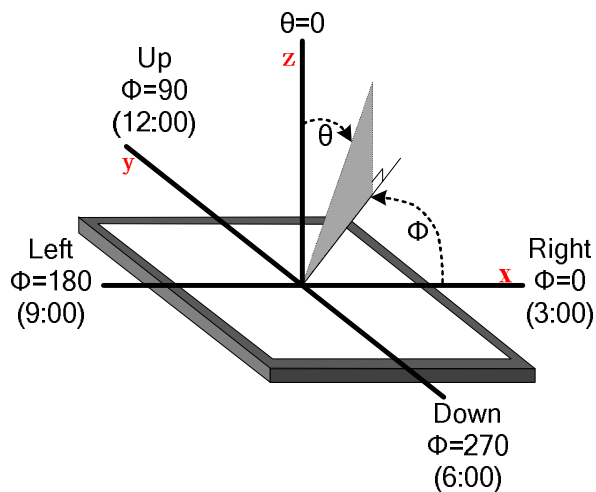**FIG.3.　　The definition of viewing angle**

■ **INTERFACE DESCRIPTION**

1.1   Pin Assignment (connector part No: MSB24013P20HA or equivalent.)

Pin No.	Symbol	I/O	Function	Remark
1	VCC	P	Power Supply +3.3V	
2	VCC	P	Power Supply +3.3V	
3	VSS	P	Ground	
4	VSS	P	Ground	
5	RIN0-	I	Negative LVDS differential data input	
6	RIN0+	I	Positive LVDS differential data input	
7	VSS	P	Ground	
8	RIN1-	I	Negative LVDS differential data input	
9	RIN1+	I	Positive LVDS differential data input	
10	VSS	P	Ground	
11	RIN2-	I	Negative LVDS differential data input	
12	RIN2+	I	Positive LVDS differential data input	
13	VSS	P	Ground	
14	RCLK-	I	Negative LVDS differential clock input	
15	RCLK+	I	Positive LVDS differential clock input	
16	VSS	P	Ground	
17	NC	-	NO Connect	
18	NC	-	NO Connect	
19	VSS	P	Ground	
20	VSS	P	Ground	

I: Input, P: Power

Notes:

1) NC Pin must be retained; this pin can't contact VSS or other signal.

2) VSS Pin must ground contact, can not be floating.
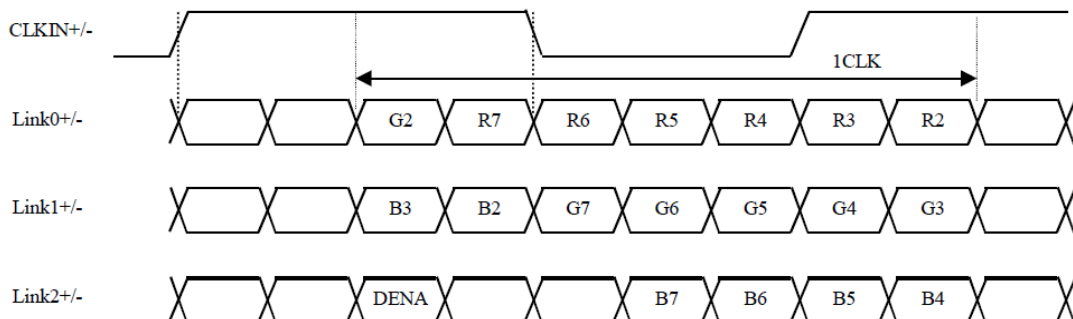
1.2　　Touch Panel Unit (Connector Part No: CVILUX CF25041D0R0-10)

Pin No.	Symbol	Function	Remark
1	XR	Touch panel Right	
2	YU	Touch panel Top	
3	XL	Touch panel Left	
4	YD	Touch panel Bottom	

1.3　　Back Light Unit (Connector Part No: JST:BHSR-02VS-01(N) or equivalent.)

Pin No.	Symbol	Function	Remark
1	LEDA	Power Supply for LED backlight	RED
2	LEDK	GND for LED backlight	BLACK

2.1 Touch Panel

　　2.1.1　Electrical Characteristics

Item	Min.	Typ.	Max.	Unit	Note
Linearity	-2	-	2	%	Analog X and Y directions
Terminal resistance	200	-	1000	Ω	Y(Glass side)
	200	-	1000	Ω	X(Film side)
Insulation resistance	20	-	-	MΩ	DC 25V
Voltage	3.0	-	5.0	V	DC
Response time	-	-	10	$\leqq$ms	

■ REFERENCE APPLICATION NOTES

3.1 AC Timing Characteristic of The LCD

　　3.1.1　Timing Condition (DE only mode)

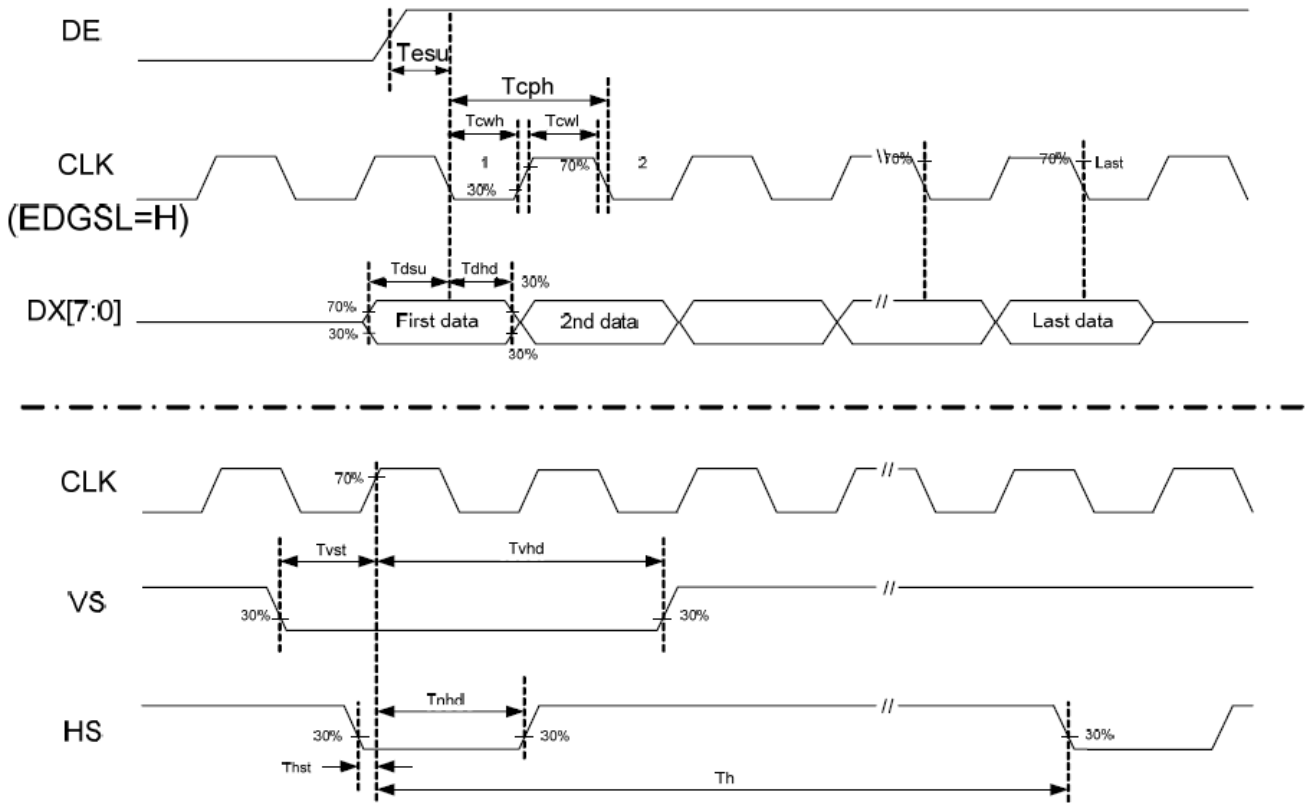| Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	CLK frequency	F_{CPH}	29.4	33.26	42.48	MHz	
	CLK period	T_{CPH}	-	30.06	-	ns	
	CLK pulse duty	T_{CWH}	40	50	60	%	
DE	DE period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}	
	DE pulse width	T_{DEH}	-	800	-	T_{CPH}	
	DE frame blanking	T_{DEB}	10	45	110	$T_{DEH}+T_{DEL}$	
	DE frame width	T_{DE}	-	480	-	$T_{DEH}+T_{DEL}$	
	DE setup time	T_{esu}	6	-	-	ns	
Data	Data setup time	T_{dsu}	6	-	-	ns	
	Data hold time	T_{dhd}	6	-	-	ns	

3.1.2 Timing Characteristic

3.1.2.1 DE and RGB Data Input Timing
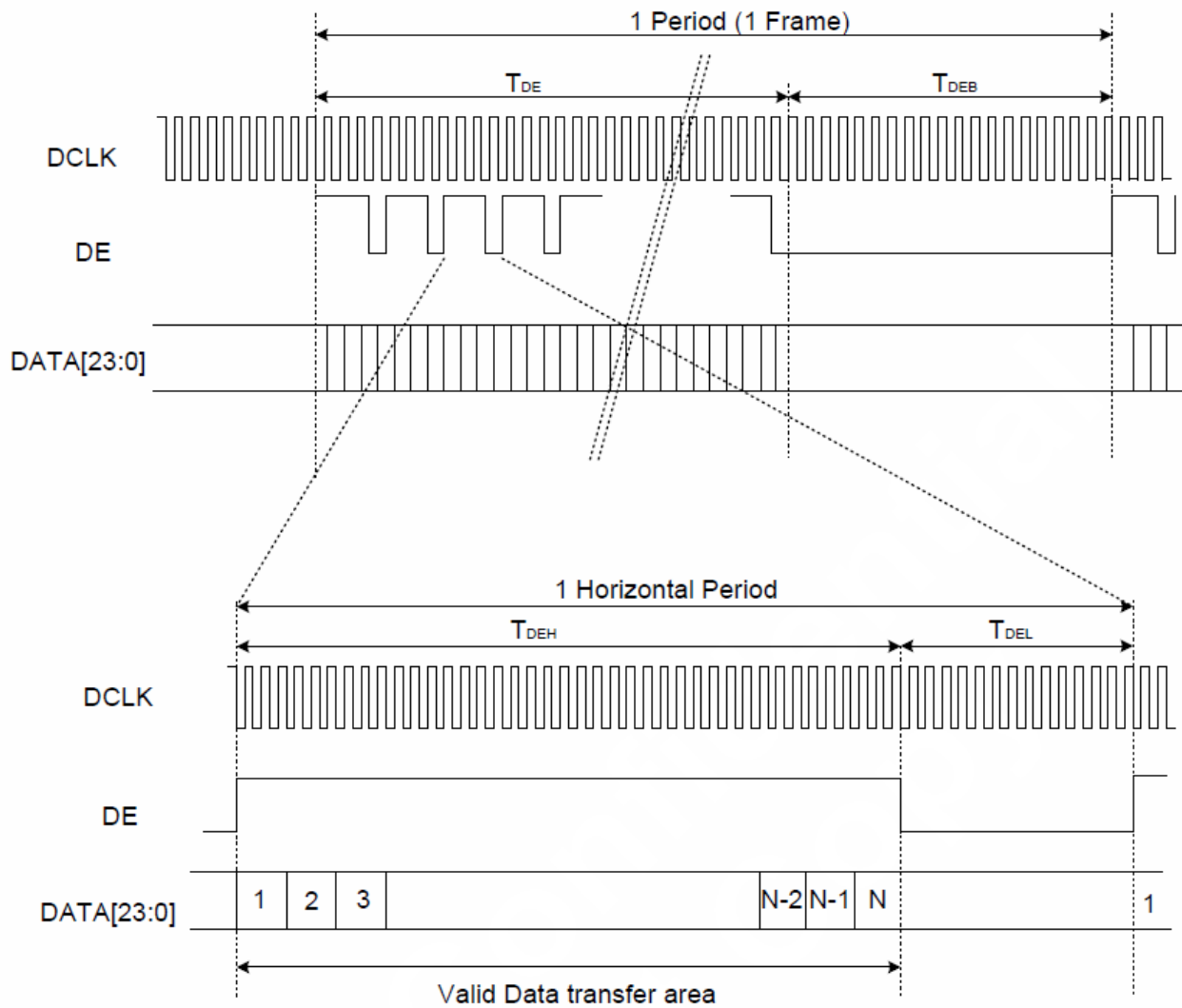
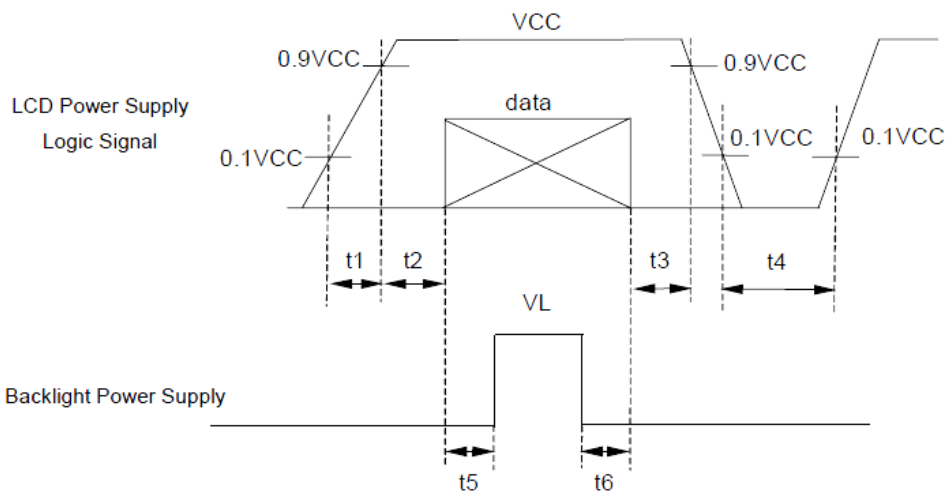### 3.1.2.2 Clock and Data input waveforms

3.2   Power Signal sequence

$t1 \leq 10$ ms
$0 < t2 \leq 50$ ms
$0 < t3 \leq 50$ ms

200 ms $\leq t4$
200 ms $\leq t5$
$0 \leq t6$

3.3 LVDS Switching Characteristics

3.3.1 LVDS Timing Condition

Symbol	Parameter		Min.	Typ.	Max.	Unit.	Note
tRCP	CLK OUT Period	VCC = 3.0 - 3.6V	11.76	T	50.0	ns	
		VCC = 2.5 - 3.6V	14.28	T	50.0	ns	
tRCH	CLK OUT High Time		-	4T/7	-	ns	
tRCL	CLK OUT Low Time		-	3T/7	-	ns	
tRCD	RCLK +/- to CLK OUT Delay		-	5T/7	-	ns	
tRS	TTL Data Setup to CLK OUT		0.35T-0.3	-	-	ns	
tRH	TTL Data Hold from CKL OUT		0.45T-1.6	-	-	ns	
tTLH	TTL Low to High Transition Time		-	2.0	3.0	ns	
tTHL	TTL High to Low Transition Time		-	1.8	3.0	ns	
tRIP1	Input Data Position0 (T = 11.76ns)		-0.4	0.0	0.4	ns	
tRIP0	Input Data Position1 (T = 11.76ns)		T/7-0.4	T/7	T/7+0.4	ns	
tRIP6	Input Data Position2 (T = 11.76ns)		2T/7-0.4	2T/7	2T/7+0.4	ns	
tRIP5	Input Data Position3 (T = 11.76ns)		3T/7-0.4	3T/7	3T/7+0.4	ns	
tRIP4	Input Data Position4 (T = 11.76ns)		4T/7-0.4	4T/7	4T/7+0.4	ns	
tRIP3	Input Data Position5 (T = 11.76ns)		5T/7-0.4	5T/7	5T/7+0.4	ns	
tRIP2	Input Data Position6 (T = 11.76ns)		6T/7-0.4	6T/7	6T/7+0.4	ns	
tRPLL	Phase Lock Loop Set				10.0	ms	

3.3.2 LVDS AC Timing
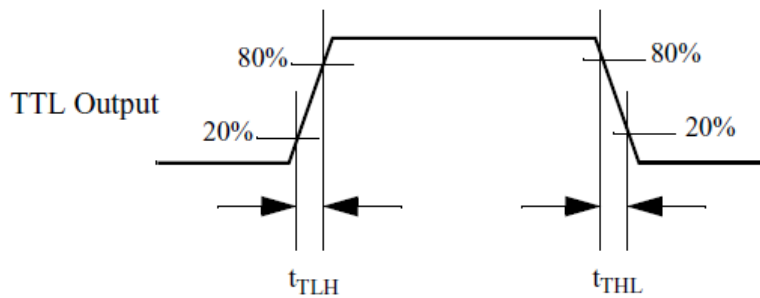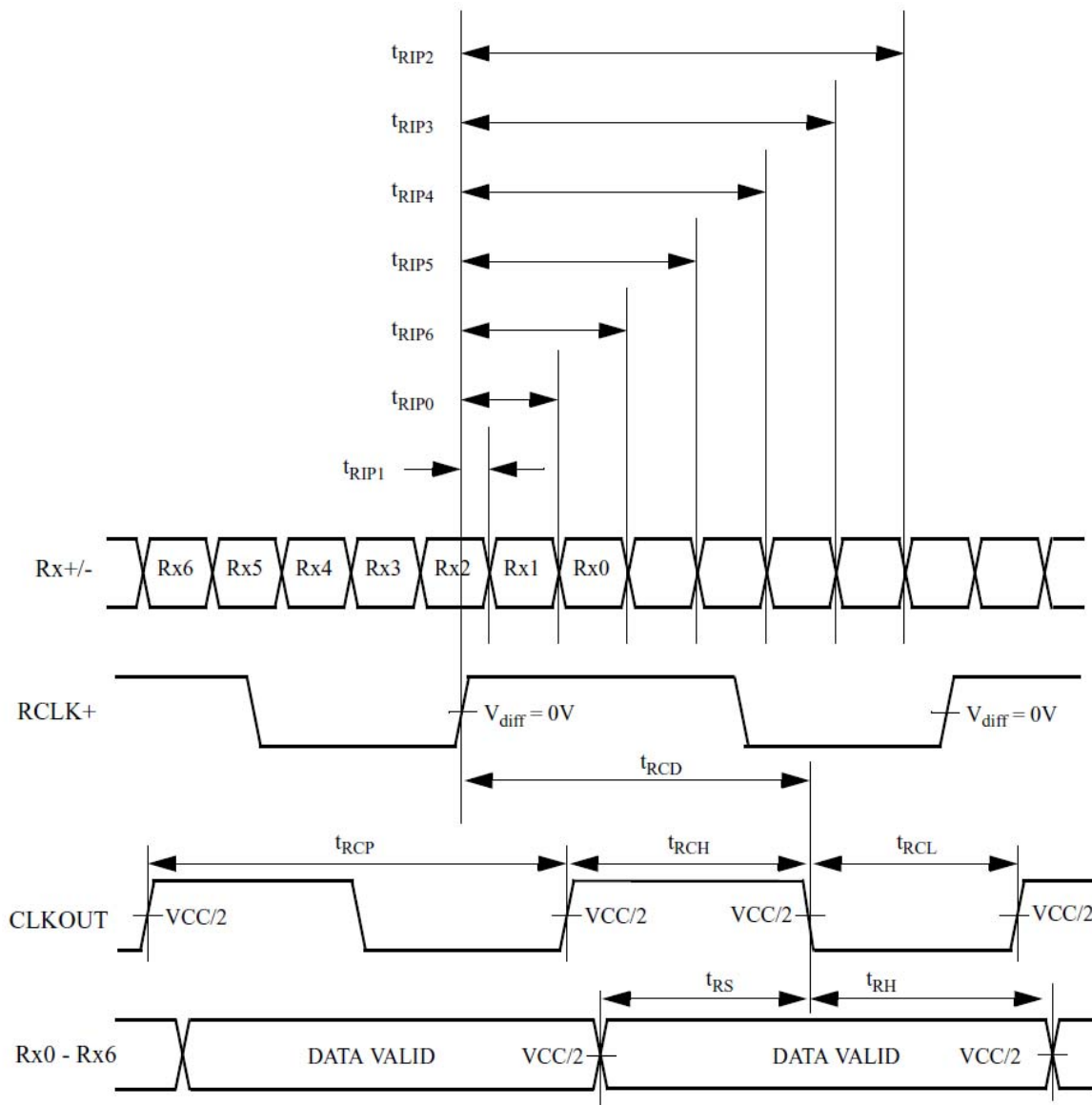
3.4 Displayed Color and Input Data

		Color & Gray Scale	Data Signal																		
			R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
		Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
		Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
		Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
		Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
		Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
		White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
		Red(61)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Red(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
		Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Green(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		Green(61)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Green(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
		Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue		Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
		Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
		Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
		Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.
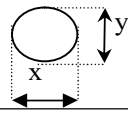
■ **RELIABILITY TEST CONDITIONS**

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	80±2℃/240 hours	
2	Low Temperature Storage	-30±2℃/240 hours	
3	High Temperature Operating	70±2℃/240 hours	
4	Low Temperature Operating	-20±2℃/240 hours	
5	Damp proof Test operating	60℃±5℃×90%RH/240 hours	
6	Vibration test	Vibration Frequency:10~55Hz. Total fixed amplitude:1.5mm. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	
7	Dropping test	To be measured after dropping from 60cm high on the concrete surface in packing state.	

■ **INSPECTION CRITERION**

OUTGOING QUALITY STANDARD	PAGE　1　OF　7
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

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

1 Sample plan

　　Sampling plan according to GB/T2828.1-2003/ISO 2859-1：1999 and ANSI/ASQC Z1.4-1993, normal level 2 and based on:

　　　　Major defect: AQL 0.65

　　　　Minor defect: AQL 1.5

2. Inspection condition

　　Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.

3. Definition of inspection zone in LCD.

　　Zone A: character/Digit area

　　Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)

　　Zone C: Outside viewing area (invisible area after assembly in customer's product)

　　Fig.1 Inspection zones in an LCD.

　　Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for
　　　　　quality and assembly of customer's product.
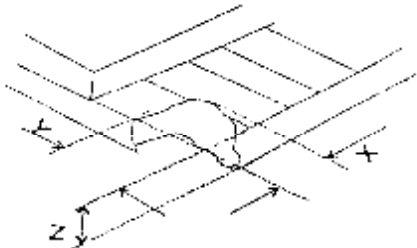
OUTGOING QUALITY STANDARD	PAGE 2 OF 7
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

4. Inspection standards

4.1 Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.1.4	linearity	No more than 1.5%	

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.1	**Clear Spots** Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt	For dark/white spot, size Φ is defined as $\Phi = \dfrac{(x+y)}{2}$ 1. <table><tr><td>Zone Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>$\Phi \leqslant 0.1$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.10 < \Phi \leqslant 0.15$</td><td colspan="2">2</td></tr><tr><td>$0.15 < \Phi \leqslant 0.20$</td><td colspan="2">1</td></tr><tr><td>$0.20 < \Phi$</td><td colspan="2">0</td></tr></table>	Minor
	Clear Spots TP Dirt	2. <table><tr><td>Zone Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>$\Phi \leqslant 0.1$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.10 < \Phi \leqslant 0.15$</td><td colspan="2">3</td></tr><tr><td>$0.15 < \Phi \leqslant 0.25$</td><td colspan="2">2</td></tr><tr><td>$0.25 < \Phi$</td><td colspan="2">0</td></tr></table>	Minor

	OUTGOING QUALITY STANDARD	PAGE　3　OF　7
TITLE: FUNCTIONAL TEST & INSPECTION CRITERIA		

3.

Dim Spots

Circle shaped and dim edged defects

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

Minor

4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.2	**Line defect** Black line, White line, Foreign material on polarizer	size(mm) / Acceptable Qty table below	Minor

Line defect:

size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W≤0.02	Ignore		Ignore
L≤3.0	0.02＜W≤0.03	2		
L≤2.0	0.03＜W≤0.05	1		
	0.05＜W	Define as spot defect		

Foreign material on TP film

The line can be seen after mobile phone in the operating condition:

size(mm)		Acceptable Qty		
L(Length)	W(Width)	zone		
		A	B	C
Ignore	W≤0.03	Ignore		Ignore
L≤5.0	0.03＜W≤0.05	3		
	0.05＜W	Define as spot defect		

If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 4.2.2.

If the scratch can be seen only in non-operating condition or some special angle, judge by the following.

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4.2.3	**Dim line defect** Polarizer scratch TP film scratch	Size(mm)		Acceptable Qty			Minor

		L(Length)	W(Width)	Zone			
				A	B	C	
		Ignore	W≤0.03	Ignore		Ignore	
		5.0＜L≤10.0	0.03＜W≤0.05	2			
		L≤5.0	0.05＜W≤0.08	1			
			0.08＜W	0			

4.2.4	Polarize Air bubble	Air bubbles between glass & polarizer					Minor

2. Zone Size(mm)	Acceptable Qty			
	A	B	C	
Φ≤0.2	Ignore		Ignore	
0.20＜Φ≤0.30	2			
0.30＜Φ≤0.50	1			
0.50＜Φ	0			

4.3. Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
		(i) Chips on corner A:LCD Glass defect Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.	Minor

X	Y	Z
≤2.0	≤S	Disregard

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4.3.5	Glass defect	B:TP Glass defect	Minor

B:TP Glass defect

X(mm)	Y(mm)	Z(mm)
≤3.0	≤3.0	Disregard

(ii)Usual surface cracks

A:LCD Glass defect

X	Y	Z
≤3.0	<Inner border line of the seal	Disregard

B:TP Glass defect

X(mm)	Y(mm)	Z(mm)
≤6.0	<2.0	Disregard

Minor

(iii) Crack

Cracks tend to break are not allowed.

crack

Major
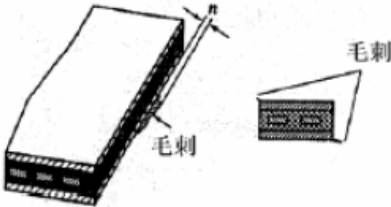
OUTGOING QUALITY STANDARD	PAGE 6 OF 7
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4.4   Parts Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
	4.4.1 Parts contraposition	1、Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2、Not allow chip or solder component is off center more than 50% of the pad outline.	Major
	4.4.2 SMT	According to the <Acceptability of electronic assemblies> IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.	

TITLE: FUNCTIONAL TEST & INSPECTION CRITERIA

| 4.4.3 TP Defect | 1、 Pattern font：

Pattern fonts are clear and symmetrical，pattern fonts filter lightly are allowed; The fort line is not allow to thinner or thicker than 1/3of normal size, and swing is not more than 0.1mm. the line is smooth and not broken.

2、The wing forward in the side of Visual Area：

The length of wing forward inside of the Visual Area: $n \leq 0.2mm$；

Not excess 3 point，and the distanceD$\geq$20mm。

3、Film impression:With operation, must be invisibility.

4、Touch panel knob：if writing function normally,it could be allowed.

5、 Newton ring

Without operation, the color circle of Regularity or Non-regularity from the normal or slope angle of view.

1、**Regularity**： The area of the newton ring is less than 1/3 area of the touch panel; and no character affected and line distorted after touch panel lightening. It's ok.

2、 **Non-regularity** ： The area of the Newton ring is less than the 1/2 area of touch panel with lightening. And no character affected and line | Minor |

图案字体　Pattern font

毛刺　毛刺

TP鼓　TP knob

规律形　　非规律形

■ **PRECAUTIONS FOR USING LCD MODULES**

1　Handing 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 alcohol
　　　Do 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 solvents
　　　Wipe 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

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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.
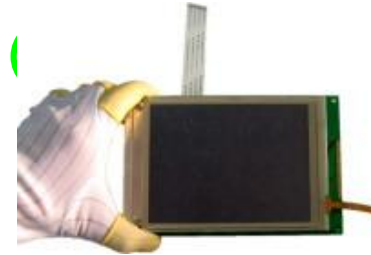
     - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

     - 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:

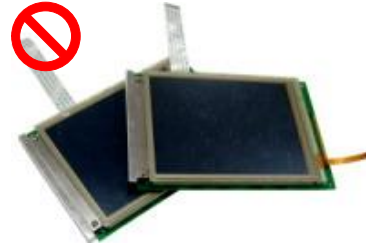As above picture, please handle with anti-static gloves around LCM edges.

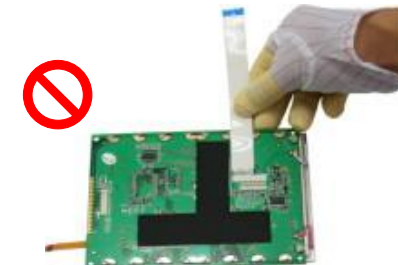**2.3   Incorrect handling:**

Please don't touch IC directly.
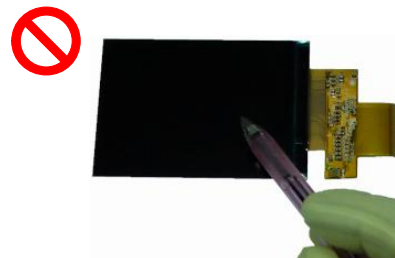

Please don't stack LCM.

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

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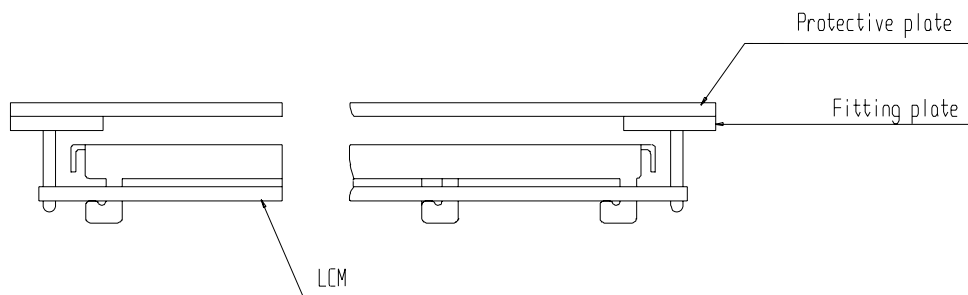
4.1.2 When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

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

>15°

OK

NG

NG
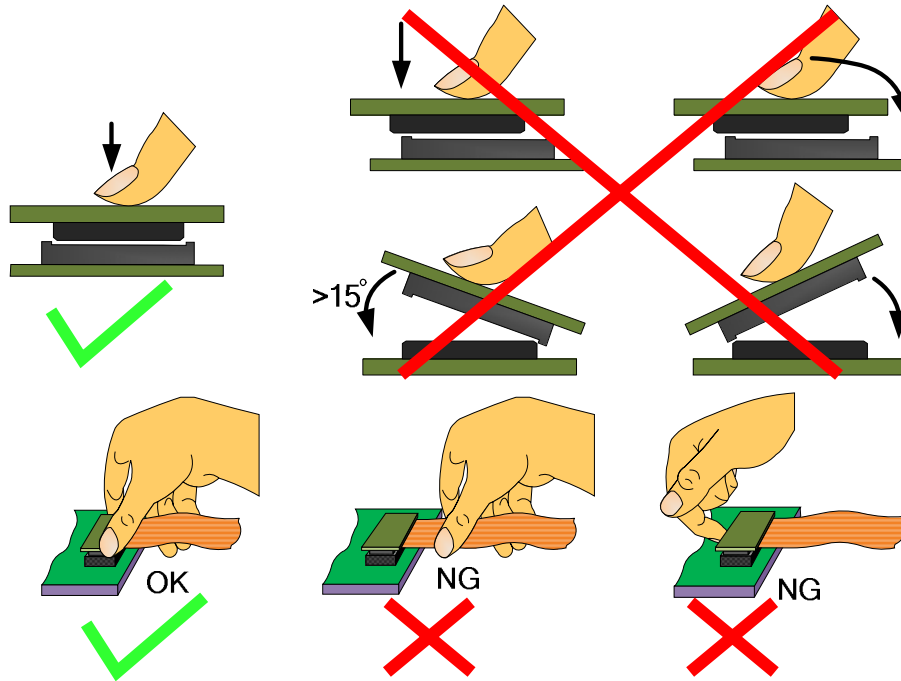
4.3   Precaution for soldering the LCM

	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.