MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI1010HT-2

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	2013-06-30
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-06-30	First Release	

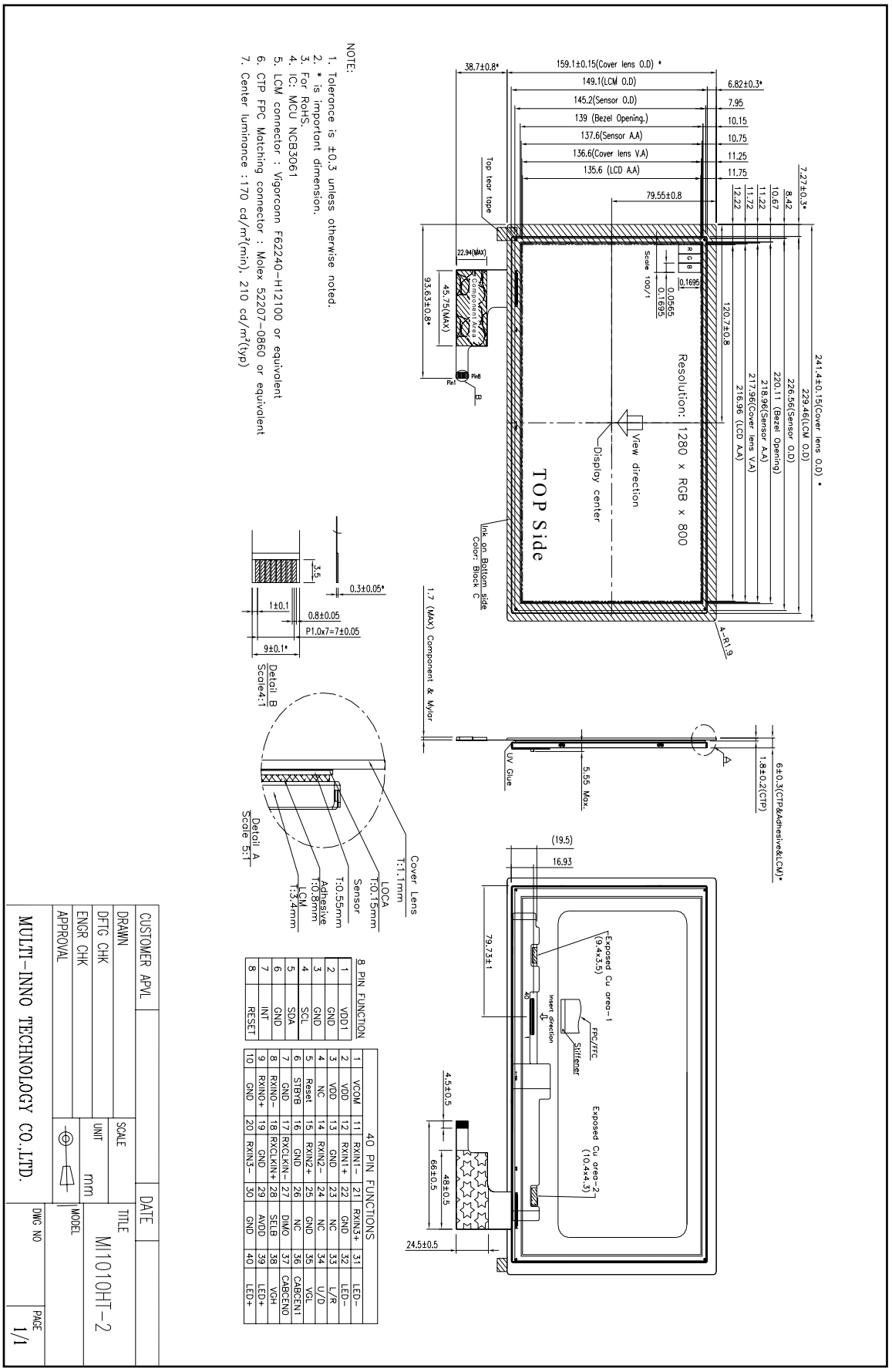
CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	TFT/Transmissive/Normally white	/
Size	10.1	Inch
Viewing direction	6:00	O' Clock
Gray scale inversion direction	12:00	O' Clock
LCM (W × H × D)	241.40×159.10×6.00	mm^3
Active area (W×H)	216.96×135.60	mm^2
Pixel pitch (W×H)	0.0565×0.1695	mm^2
Number of dots	1280 (RGB) × 800	/
CTP IC driver	MCU NCB3061	/
Backlight type	36 LEDs	/
Interface type	LVDS	/
Color depth	262K	/
Pixel arrangement	R.G.B stripe	/
Cover lens surface treatment	Glare,Hard coating(7H)	/
Input voltage	3.3	V
With/Without TSP	With CTP	/
Weight	TBD	g

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

■ EXTERNAL DIMENSIONS



■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Power voltage	DVDD	-0.3	5.0	V
	AVDD	6.5	13.5	V
	VGH	-0.3	42	V
	VGL	-20	0.3	V
	VGH-VGL	-	40	V
LED reverse voltage(each LED)	VR	-	5.0	V
LED forward current(each LED)	IF	-	20	mA
Operating temperature	TOP	-20	60	°C
Storage temperature	TST	-30	70	°C
Humidity	RH	-	90%(Max60°C)	RH

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times.Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 2: VR Conditions: Zener Diode 20mA

■ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Power voltage	VDD	3.0	3.3	3.6	V
	AVDD	10.8	11	11.2	V
	VGH	19.7	20	20.3	V
	VGL	-6.5	-6.8	-7.1	V
Input signal voltage	Vcom	3.6	-	4.0	V
Input voltage ' H ' level	VIH	0.7DVDD	-	DVDD	V
Input voltage ' L ' level	VIL	0	-	0.3DVDD	V

Note 1: Besure to apply DVDD and VGL to the LCD first, and then apply VGL.
Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer’ s system board.
Note 3: LVDS, Reset.

CURRENT CONSUMPTION

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Current for Driver	IGH	-	TBD	-	V	VGH =20V
	IGL	-	TBD	-	V	VGL =-6.8V
	IDVDD	-	TBD	-	V	DVDD =3.3V
	IAVDD	-	TBD	-	V	AVDD =11V

■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Voltage for LED backlight	VL	-	9.3	10.2	V	Note 1
Current for LED backlight	IL	-	240	250	mA	
LED life time	-	-	20,000	-	Hrs	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL=240mA.

Note 2: The " LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25 ℃ and IL =240mA. The LED lifetime could be decreased if operating IL is lager than 240mA.

■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	θ=0° ∅=0° Ta=25℃	-	25	50	ms	FIG 1.	4
Contrast ratio		Cr		500	700	-	---	FIG 2.	1
Luminance uniformity		δ WHITE		70	75	-	%	FIG 2.	3
Surface Luminance		Lv		170	210	-	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	65	75	-	deg	FIG 3.	6
			∅ = 270°	60	70	-	deg	FIG 3.	
			∅ = 0°	65	75	-	deg	FIG 3.	
			∅ = 180°	65	75	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	θ=0° ∅=0° Ta=25℃	-	-	-		FIG 2.	5
		y		-	-	-			
	Green	x		-	-	-			
		y		-	-	-			
	Blue	x		-	-	-			
		y		-	-	-			
	White	x		0.26	0.31	0.36			
		y		0.28	0.33	0.38			

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

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

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

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

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

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

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

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

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

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

FIG. 1 The definition of Response Time

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

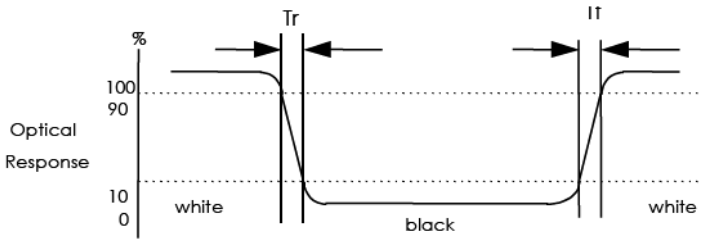
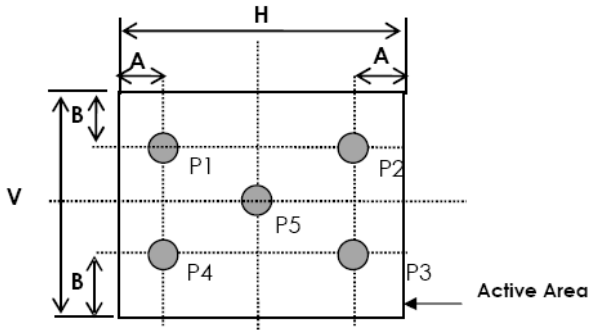
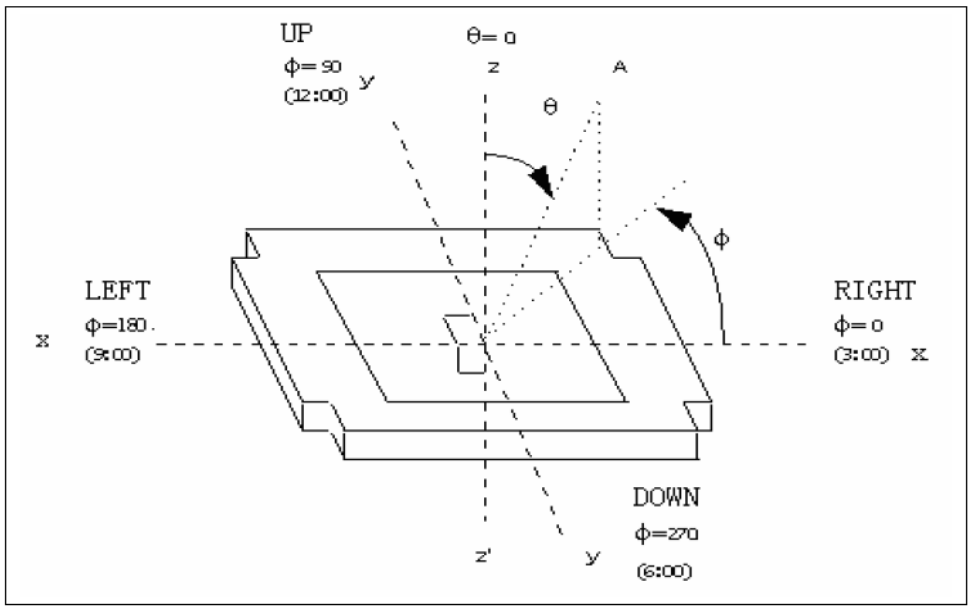


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity



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

FIG. 3 The definition of viewing angle



■ INTERFACE DESCRIPTION

Pin #	Signal Name	I/0	Description	Remarks
1	VCOM	I	Common voltage	
2	VDD	P	Power supply	
3	VDD	P	Power supply	
4	NC	--	No connection	
5	Reset	I	Global reset pin.	
6	STBYB	I	Standby mode, Normally pulled high STBYB = “1”, normal operation STBYB = “0”, timing controller, source driver will turn off, all output are High-Z	
7	GND	P	Power Ground	
8	Rxin0-	I	－LVDS differential data input	
9	Rxin0+	I	＋LVDS differential data input	
10	GND	P	Power Ground	
11	Rxin1-	I	－LVDS differential data input	
12	Rxin1+	I	＋LVDS differential data input	
13	GND	P	Power Ground	
14	Rxin2-	I	－LVDS differential data input	
15	Rxin2+	I	＋LVDS differential data input	
16	GND	P	Power Ground	
17	RXCLKIN-	I	- LVDS differential clock input	
18	RXCLKIN+	I	+LVDS differential clock input	
19	GND	P	Power Ground	
20	Rxin3-	I	－LVDS differential data input	
21	Rxin3+	I	+LVDS differential data input	
22	GND	P	Power Ground	
23	NC	--	No connection	
24	NC	--	No connection	
25	GND	P	Power Ground	
26	NC	--	No connection	
27	DIMO	O	Backlight CABC controller signal output	
28	SELB	I	6bit/8bit mode select	Note1
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Power Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	Note3
34	U/D	I	Vertical inversion	Note3

35	VGL	P	Gate OFF Voltage	
36	CABCEN1	I	CABC H/W enable	Note2
37	CABCEN0	I	CABC H/W enable	Note2
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power

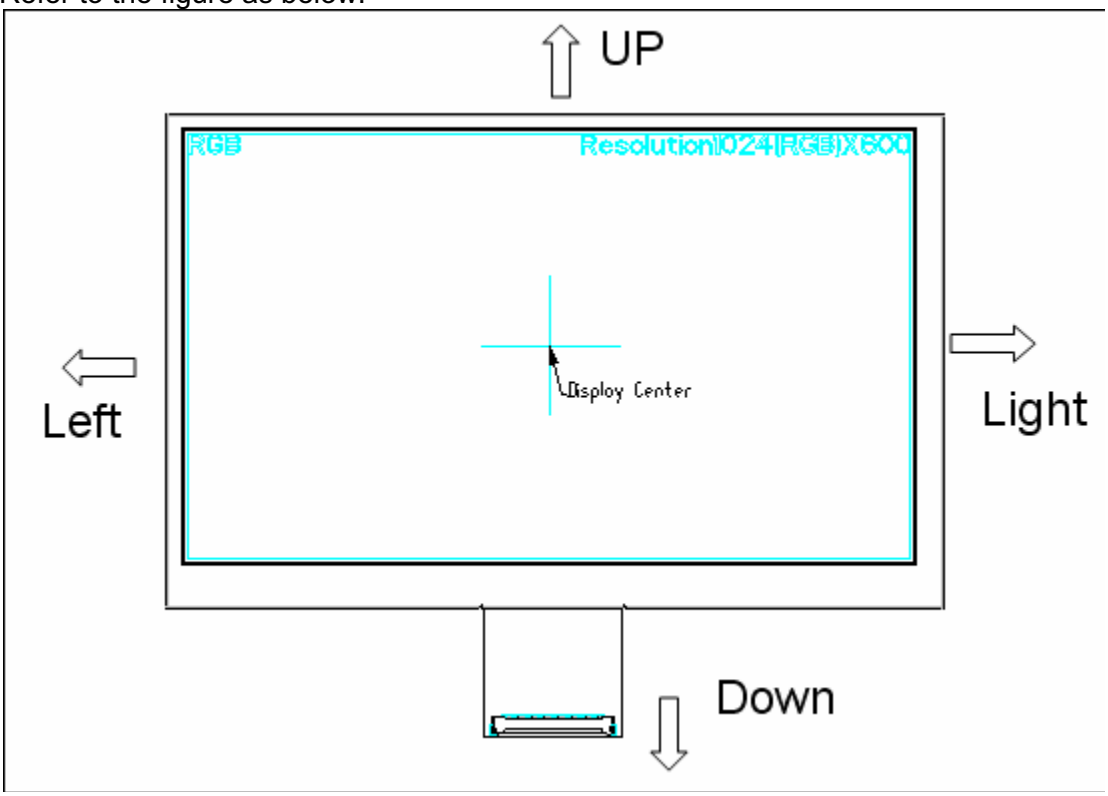
Note1: If LVDS input data is 6 bits ,SELB must be set to High;
If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC_EN="00", CABC OFF.
When CABC_EN="01", user interface image.
When CABC_EN="10", still picture.
When CABC_EN="11", moving image.
When CABC off, don't connect DIMO, else connect it to backlight.

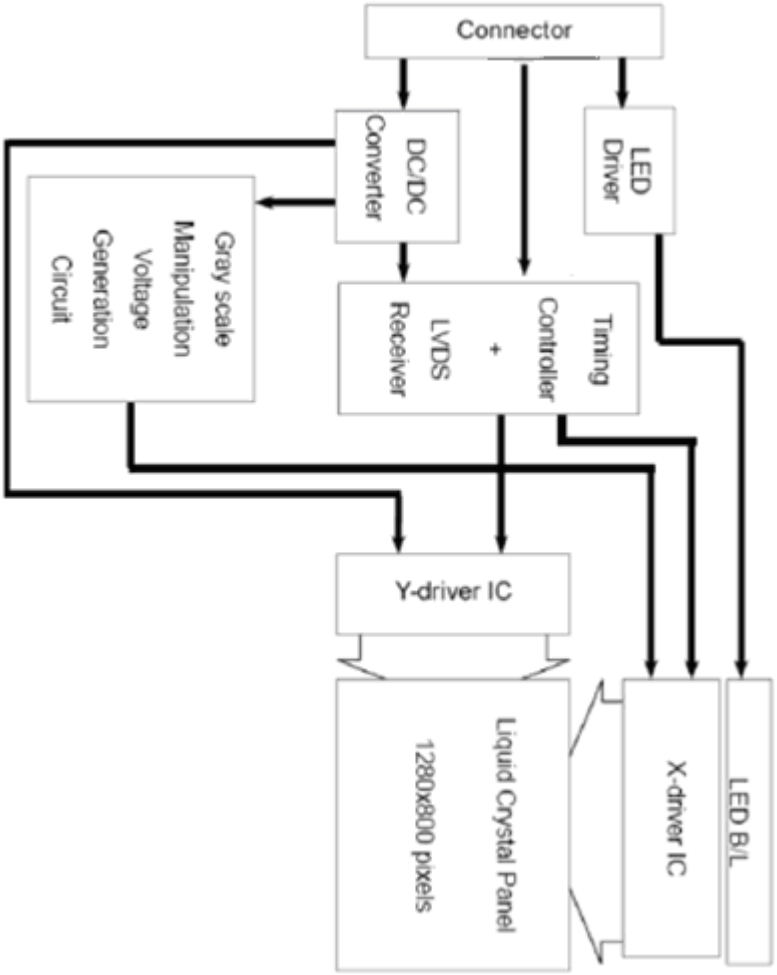
Note3: When L/R="0", set right to left scan diction.
When L/R="1", set left to right scan diction.
When U/D="0", set top to bottom scan diction
When U/D="1", set bottom to top scan direct

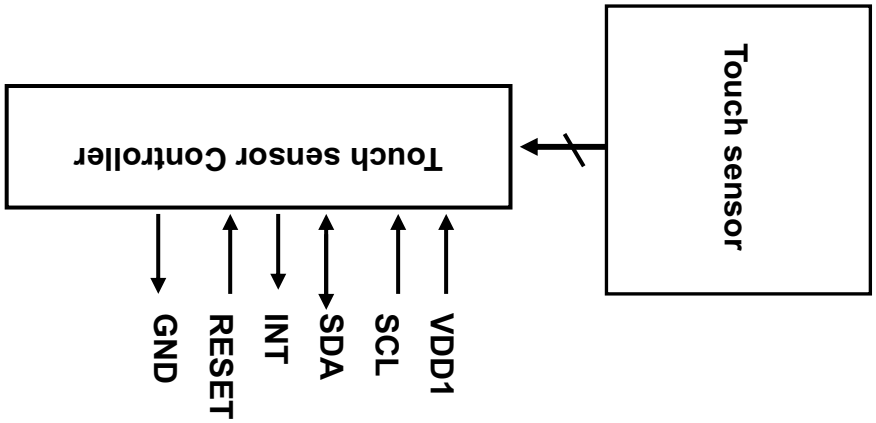
Note: Definition of scanning direction.

Refer to the figure as below:



■ BLOCK DIAGRAM





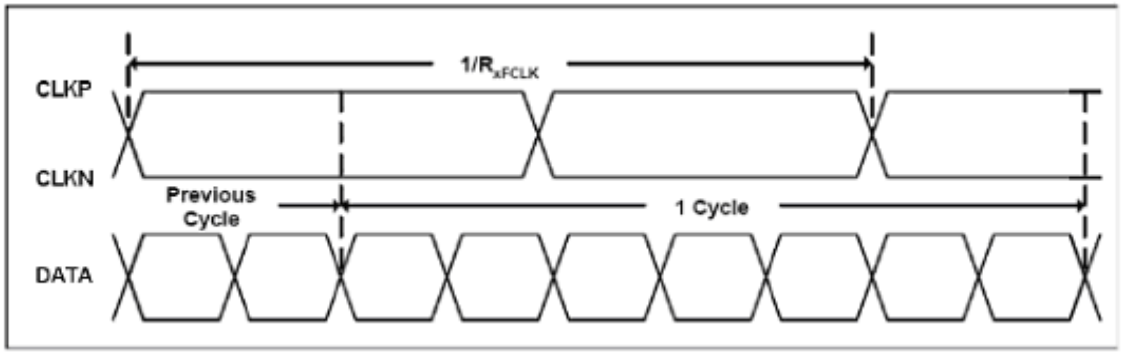
■ APPLICATION NOTES

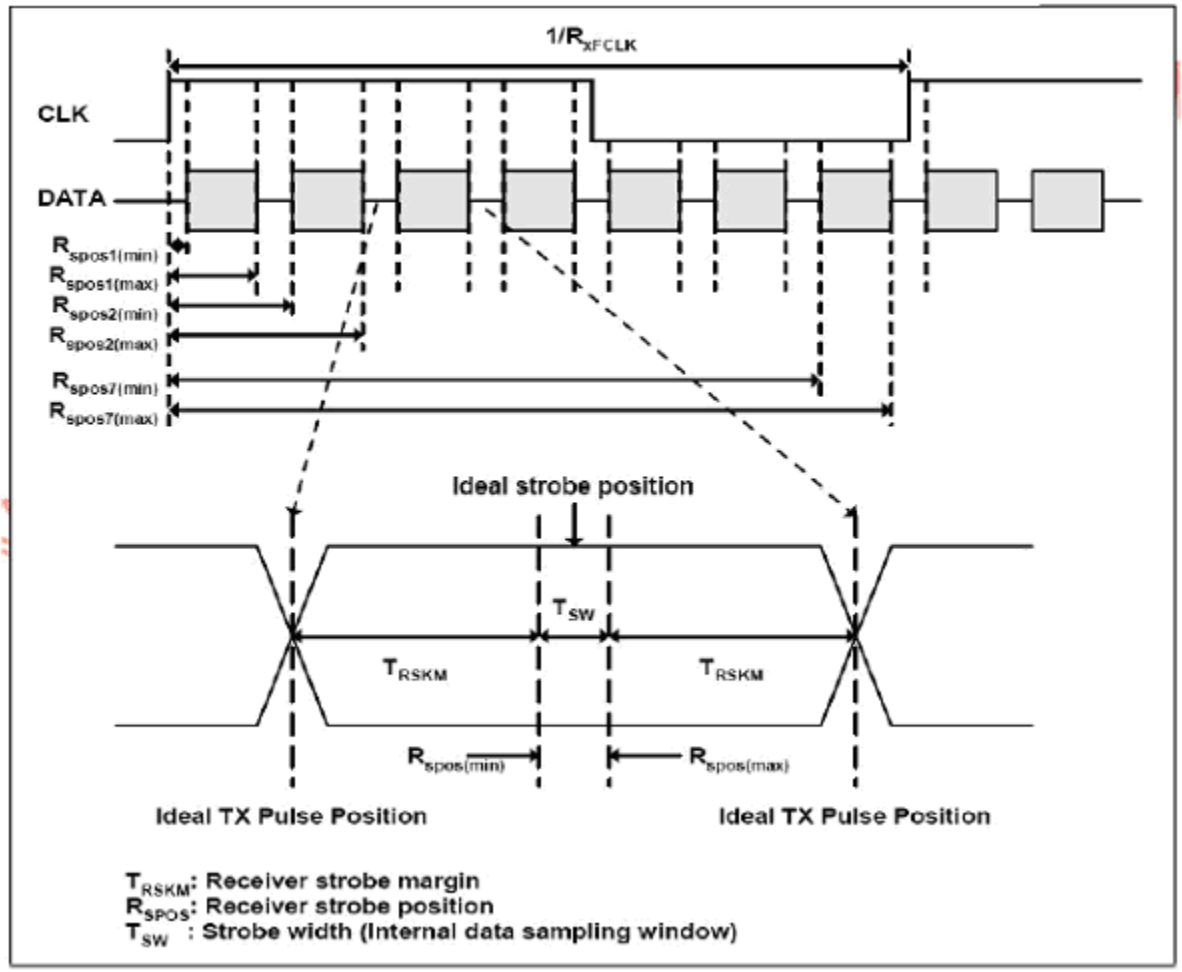
1. Timing Characteristics

1.1 AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	R_{xFCLK}	20	72.4	81	MHz	
Input data skew margin	T_{RSKM}	500	-	-	ps	
Clock high time	T_{LVCH}	-	4/(7* R_{xFCLK})	-	ns	
Clock low time	T_{LVCL}	-	3/(7* R_{xFCLK})	-	ns	

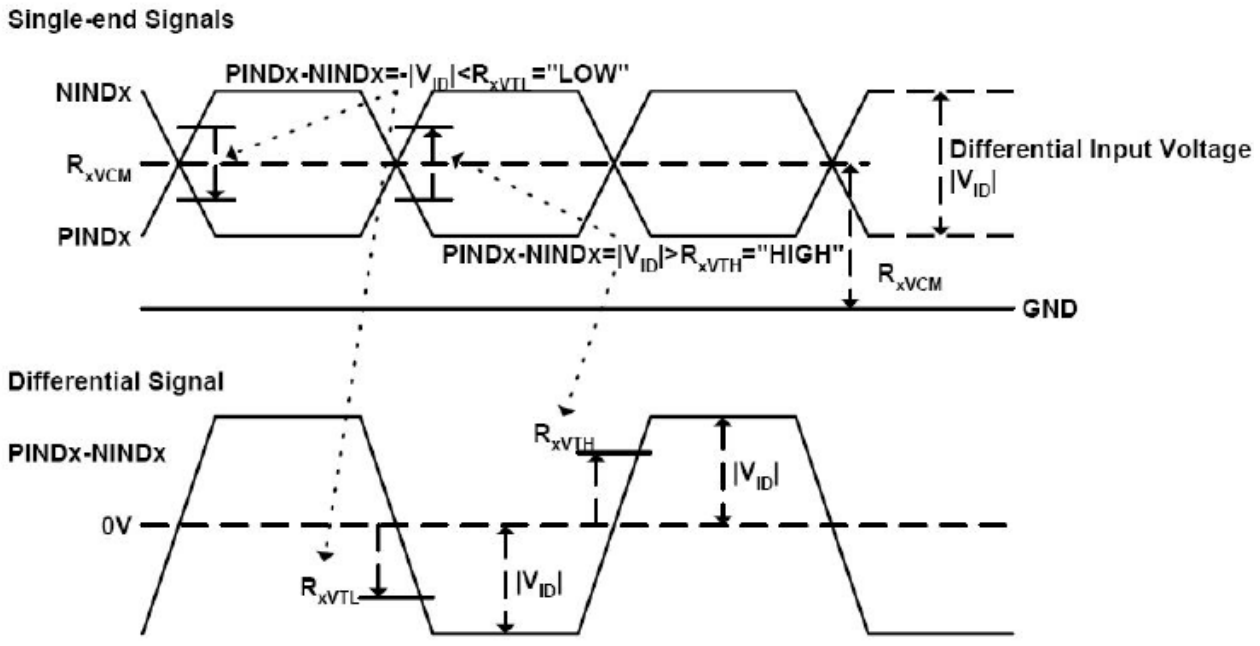
1.2 Input Clock and Data Timing Diagram





1.3 DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	R_{XVCM}=1.2V
Differential input low Threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	VDD-1.2+ |VID|/2	V	
Differential input common mode voltage	R_{xVCM}	|VID|/2	-	VDD-1.2	V	
Differential voltage	$\|V_{ID}\|$	0.2	-	0.6	V	
Differential input leakage current	RV_{xliz}	-10	-	+10	uA	
LVDS digital Operating Current	Iddlvds	-	TBD	TBD	mA	Fclk=81MHz , VDD=3.3V
LVDS digital Standby Current	Istlvds	-	TBD	TBD	uA	Clock & all Functions are stopped

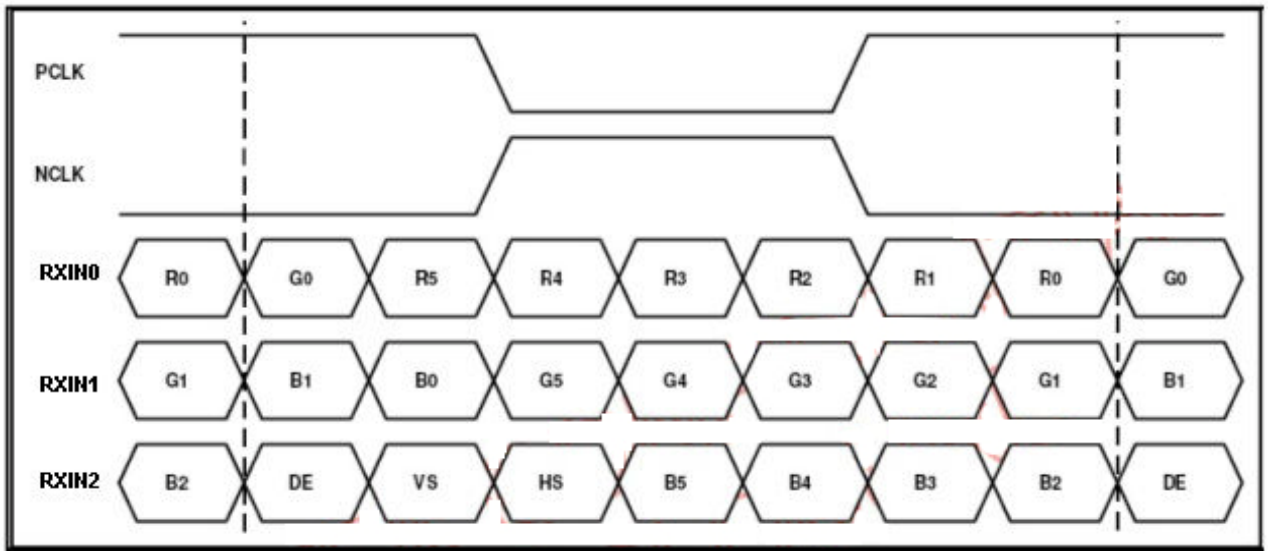


1.4 Timing

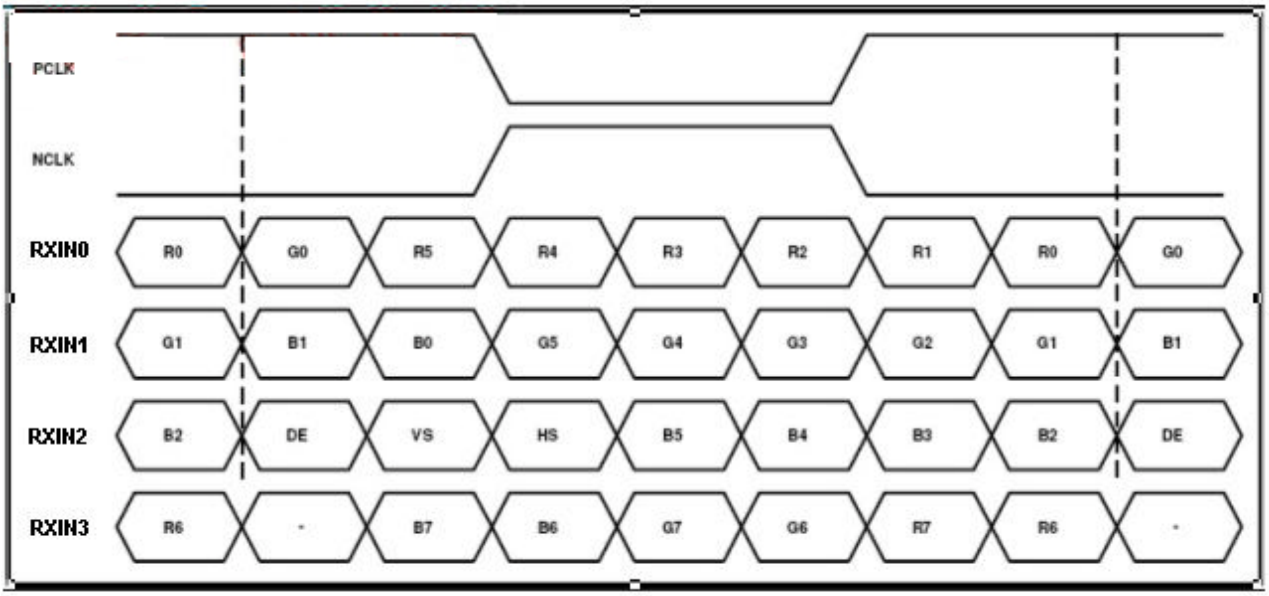
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	66.6	72.4	78.9	MHz	Frame rate=60Hz
Horizontal display area	thd		1280		DCLK	
HS period time	th	1370	1440	1500	DCLK	
HS Blanking	thb	90	160	220	DCLK	
Vertical display area	tvd		800		H	
VS period time	tv	810	838	877	H	
VS Blanking	thb	10	38	77	H	

1.5 Data Input Format

6bit LVDS input

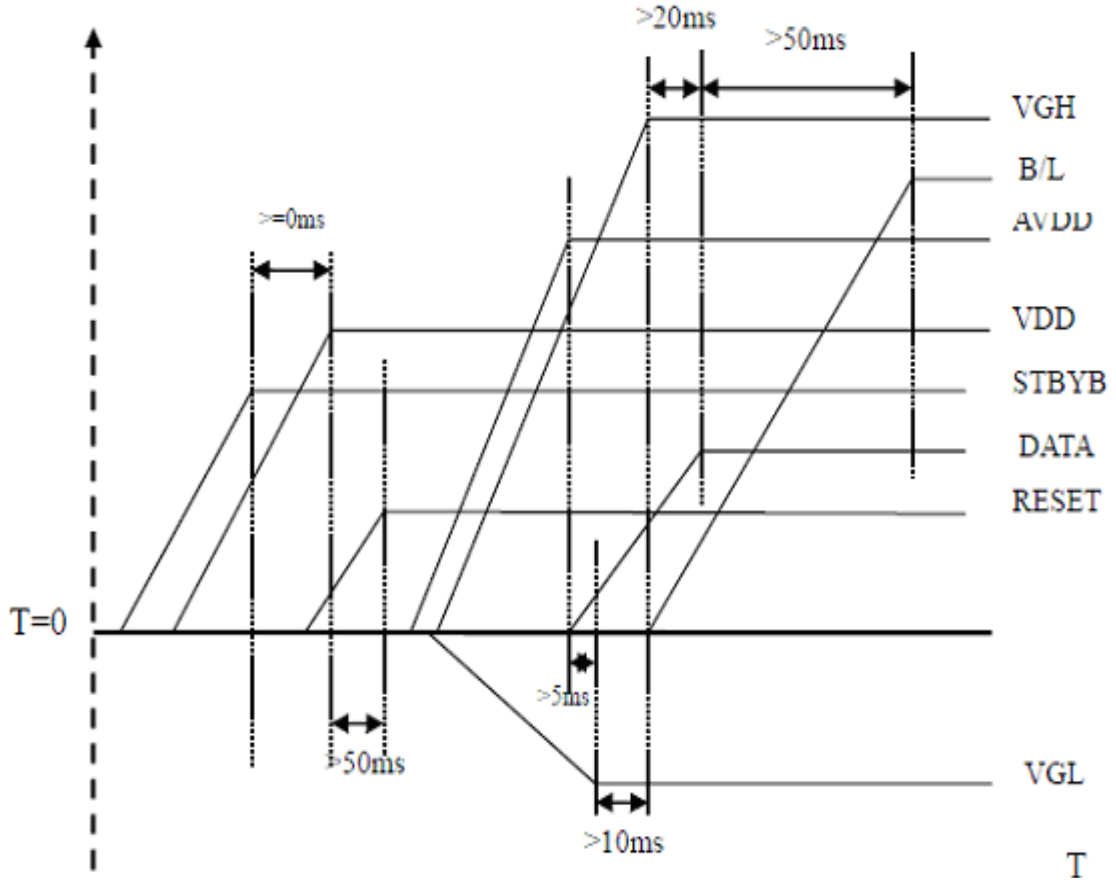


8bit LVDS input

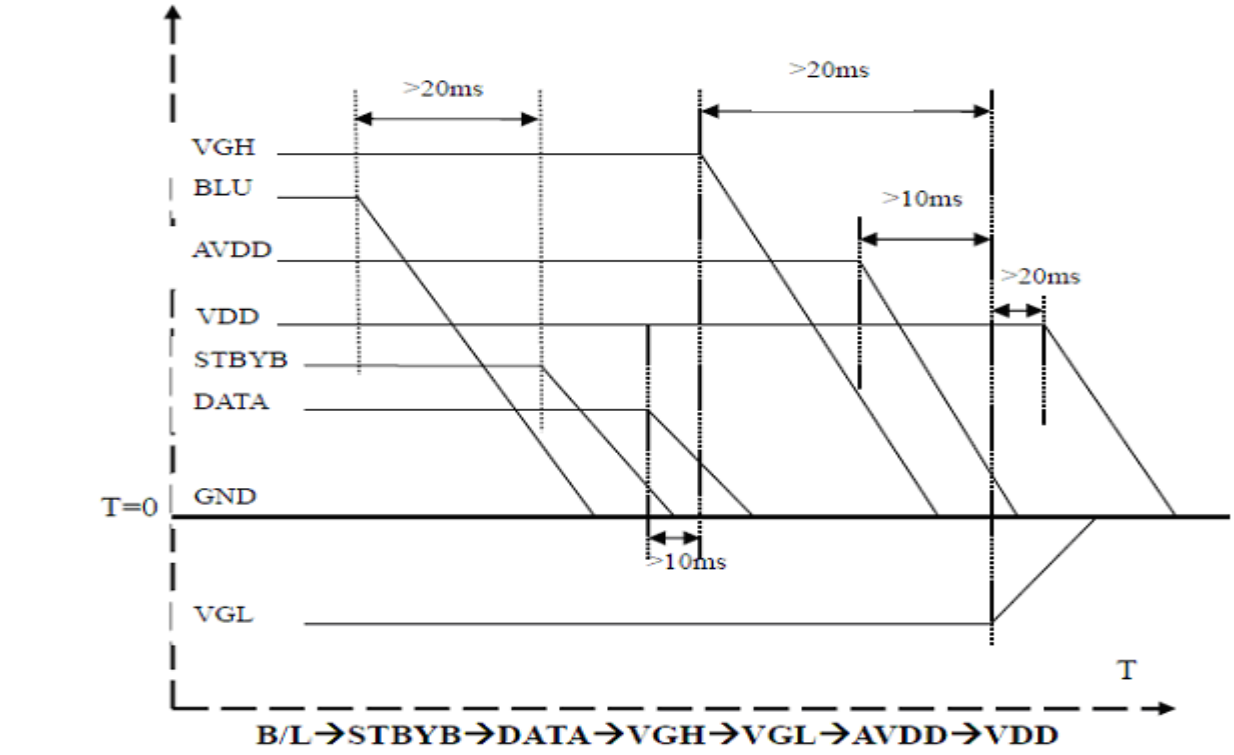


2. Power Sequence

a. Power on:



b. Power off:

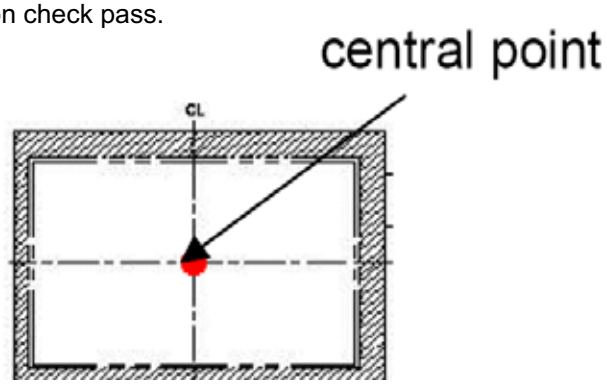


■ CTP GENERAL SPECIFICATIONS

1. CTP main feature

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	10	
Transparency	≧83	%
Haze	≦5.0	%
Response time	TBD	ms
Report rate	TBD	Points/sec
Point hitting life time	1,000,000 times min.	Note 1

Note 1: Use 8 mm diameter silicon rubber/force 3N to knock on the same point twice per second (no-operating), after test function check pass.



2. CTP Absolute Maximum Rating

Symbol	Description	Min	Typ	Max	Unit	Notes
VDD1	Supply voltage	0.3	-	5.5	V	
VIO	DC input voltage	-0.3	-	VDD1 +0.3	V	

3. CTP Electrical Characteristic

Symbol	Description	Min	Typ	Max	Unit	Notes
VDD1	Supply voltage	2.7	-	5.5	V	
GND	Supply voltage	-0.3	-	-	V	
I	Active Mode	-	30	-	mA	AtVDD1=3.3V
VIH	Input H voltage	0.4 VDD1	-	VDD1+0.5	V	
VIL	Input L voltage	-0.5	-	0.2 VDD1	V	

4. CTP Pin Connections

No.	Name	I/O	Description
1	VDD1	P	Power Voltage for digital circuit
2	GND	P	Power ground
3	GND	P	Power ground
4	SCL	I	Clock; 100KHz
5	SDA	I/O	Serial data access
6	GND	P	Power ground
7	INT	O	Active low when data output from touch panel
8	RESET	I	Reset

5. Timing Characteristic

5.1 Host Interface

The interface to host consist the following signals:

- I2C slave interface
- Interrupt(INT) from NCB3061 to Host

The details of the I2C slave address are described in section. The interrupt (INT) signal is used for NCB3061 to inform the host when the point data is ready for the host to receive.

5.2 I2C Slave Interface

NCB3061 supports I2C slave interface with provide two wires, serial data (SDA) and serial clock (SCL), to carry information transfers at up to 1000 kbit/s(Fast mode plus). Data is transferred synchronously to SCL on the SDA line on a byte-by-byte basis. Each data byte is 8 bits long. Each transaction begins with a START (S) and can be terminated by a STOP (P). Please refer the following section for the details.

5.2.1 Slave Address transfer

The first byte of data transferred by the host is the slave address. The slave address is

7 bits long followed by a R/W bit. NCB3061 will be respond by retuning an acknowledge bit by pulling the SDA low at the 9th when the slave address is matching.

5.2.2 Data Transfer

Data is transferred on a byte-by-byte basis in the direction specified by the R/W bit sent by the master. Each transferred byte is followed by an acknowledge bit on the 9th SCL clock cycle. For Read operation, the master as the receiving device signals a NACK to the slave, the slave will release the SDA line and get into standby for next transaction. For write operation, the slave signals a NACK, the master can generate a STOP command to abort the current transaction

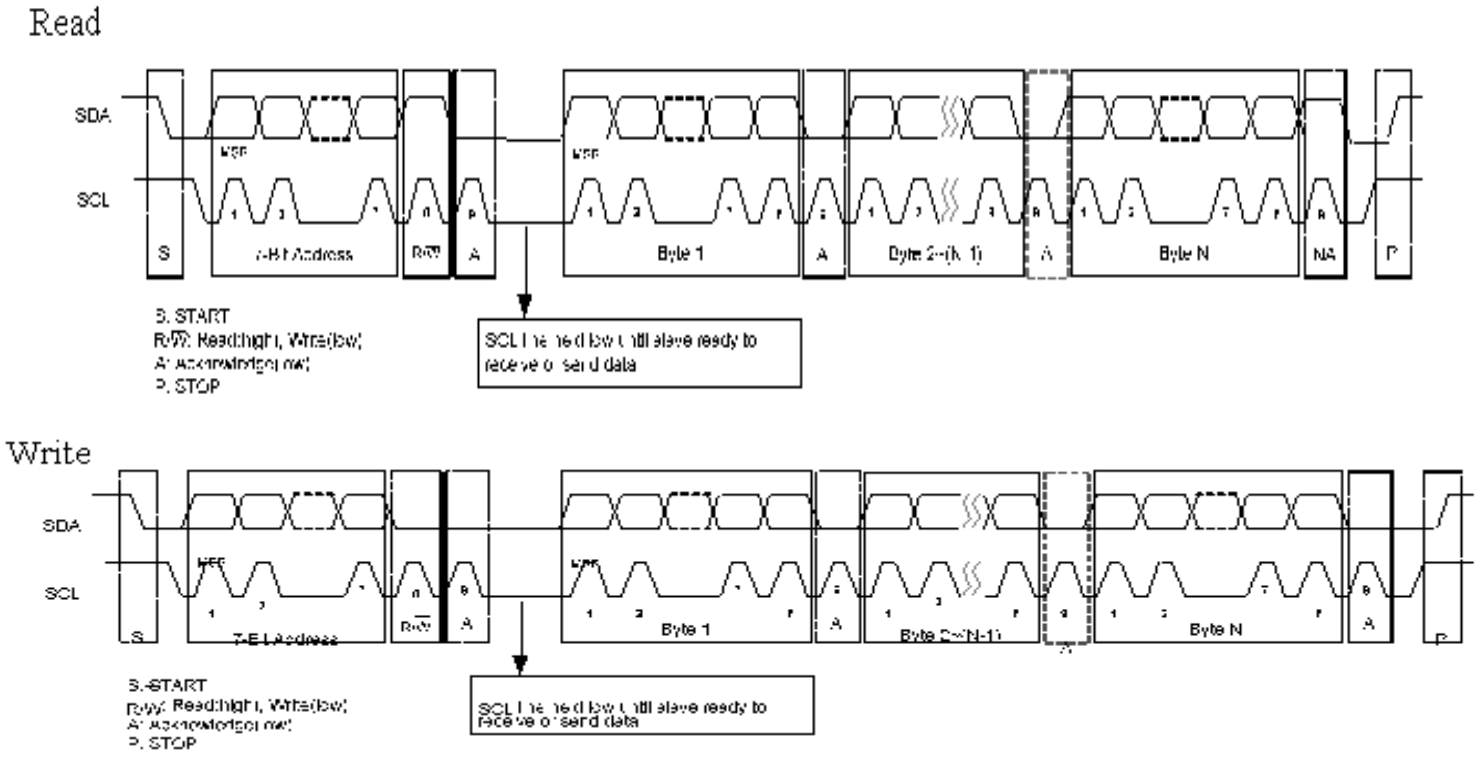


Figure5-1 I2C Waveform

6. CTP Interface and Data Format

Figure6-2 is the waveform of I2C fast mode timing

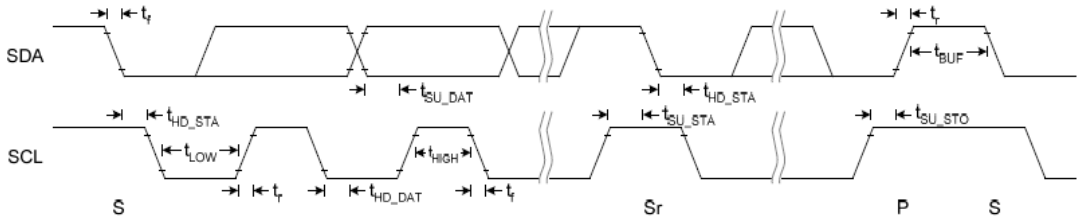


Figure6-2 I2C Waveform

Table is the timing characteristic of I2C fast mode plus

Conditions: DVDD=3.3V, GND=0V, T_{OP}=25

Parameter	Symbol	Specification			
		MIN.	TYP.	MAX.	UNIT
SCL clock frequency	fSCL	0	-	1000	kHz
Low period of the SCL clock	tLOW	0.5	-	-	us
High period of the SCL clock	tHIGH	0.26	-	-	us
Set up time for a repeated START condition	tSU_STA	0.26	-	-	us
Hold time for a repeated START condition. After this period, the first clock pulse is generated	tHD_STA	0.26	-	-	us
Data set up time	tSU DAT	50	-	-	ns
Data hold time	tHD DAT	0	-	-	us
Signal falling time of SDA and SCL	tf		-	120	ns
Signal rising time of SDA and SCL	tr			120	ns
Data set up time	tSU DAT	100			ns
Data hold time	tHD DAT	0		0.9	us
Set up time for STOP condition	tSU_STO	0.26			us
Bus free time between a STOP and START condition	tBUF	0.5			us
Capacitive load for each bus line	Cb			550	pF

■ RELIABILITY TEST

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	70±2℃/240 hours	IEC68-2-2
2	Low Temperature Storage	-30±2℃/240 hours	IEC68-2-1
3	High Temperature Operating	60±2℃/240 hours	IEC68-2-2
4	Low Temperature Operating	-20±2℃/240 hours	IEC68-2-1
5	Temperature Cycle	-10±2℃~25~50±2℃×100cycles	IEC68-2-14
6	Damp Proof Test	40℃±5℃×90%RH/240 hours	IEC68-2-3
7	Vibration Test	Frequency range: 10Hz~55Hz Amplitude:1.5mm, Sweep time:11mins 6 cycles for each direction of X,Y,Z.	IEC68-2-6
8	ESD test	Air discharge:±15KV, Indirect contact discharge:±8KV	IEC-61000-4-2

■ INSPECTION CRITERION

1. Appearance Specification

1.1 Inspection condition

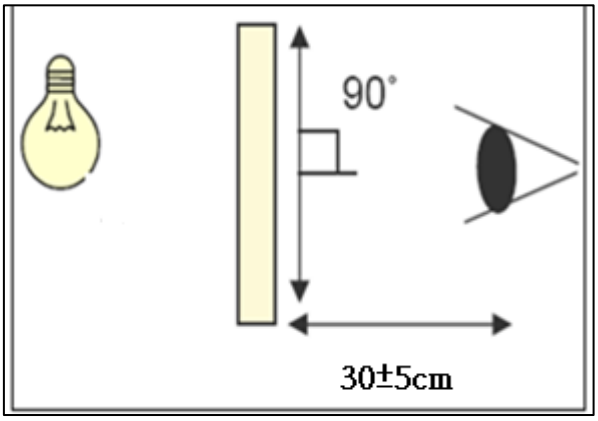
1.1.1 Inspection conditions

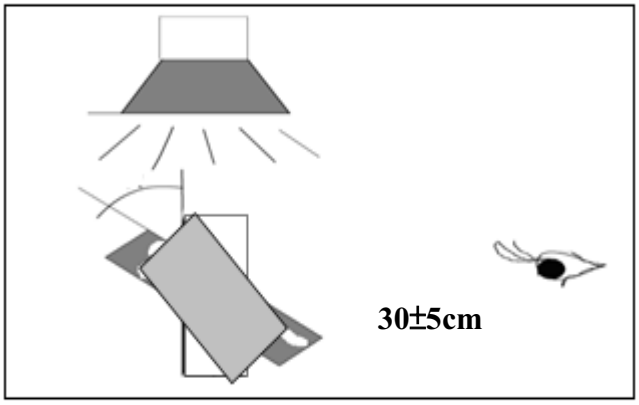
1.1.1.1 Inspection Distance : 30 ± 5 cm

1.1.1.2 View Angle:

(1) Inspection that light pervious to the product: 90±15°

(2) Inspection that light reflects on the product: 90±15°



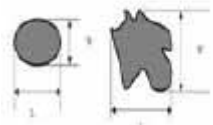
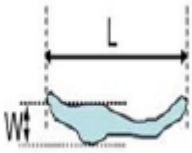


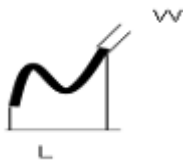
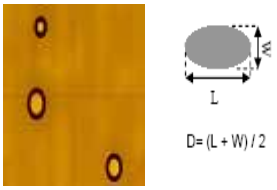
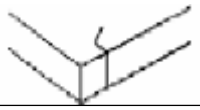
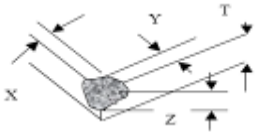
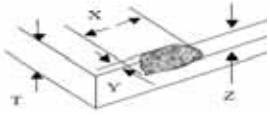
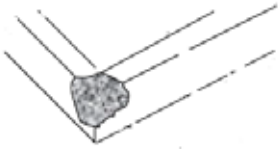
1.1.2 Environment conditions:

Ambient Temperature :	25±5℃
Ambient Humidity :	30~75%RH
Ambient Illumination	600~800 lux

1.2 Inspection Parameters

Appearance inspection standard (D: diameter, L: length; W: width, Z: height, T: glass thickness)

<table>
<tr><th>Inspection item</th><th>Inspection standard</th><th>Description</th></tr>
<tr><td>Foreign material in dot shape</td><td>
<table>
<tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr>
<tr><td>D≦0.5</td><td>Ignored</td></tr>
<tr><td>0.5<D≦0.8, distance>5</td><td>n≦3</td></tr>
<tr><td>D＞0.8</td><td>0</td></tr>
</table>
</td><td> 
D= (L + W) / 2</td></tr>
<tr><td>Foreign material in line shape</td><td>
<table>
<tr><td>SPEC</td><td>Acceptable</td></tr>
<tr><td>W≦0.05 and L≦7</td><td>Ignored</td></tr>
<tr><td>0.05<W≦0.08, L≦7, distance >5</td><td>n≦3</td></tr>
<tr><td>W>0.08 or L>7</td><td>0</td></tr>
</table>
</td><td> 
L : Long W : Width</td></tr>
<tr><td>Contamination</td><td>It is acceptable if the dirt can be wiped.</td><td></td></tr>
</table>

<table>
<tr><td>Scratch</td><td><table><tr><td>SPEC</td><td>Acceptable</td></tr><tr><td>W≦0.05 and L≦7</td><td>Ignored</td></tr><tr><td>0.05<W≦0.08, L≦7, distance >5</td><td>n≦3</td></tr><tr><td>0.08<W≦0.1, L≦7, distance >5</td><td>n≦2</td></tr><tr><td>W>0.1 or L>7</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td>Inspection item</td><td>SPEC</td><td>Description</td></tr>
<tr><td>Bubble</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>D≦0.2</td><td>Ignored</td></tr><tr><td>Non visible area</td><td>Ignored</td></tr><tr><td>0.2<D≦0.3, distance >5</td><td>n≦3</td></tr><tr><td>D＞0.3</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td>Cover & Sensor Crack</td><td>Prohibited</td><td>  </td></tr>
<tr><td>Cover angle missing</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>Side/Bottom</td><td>Ignored</td></tr><tr><td>It is prohibited if the defect appears on the front.</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td>Inspection item</td><td>SPEC</td><td>Description</td></tr>
<tr><td>Cover edge break</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>X≦ 2.0, Y≦ 2.0, Z≦T</td><td>Ignored</td></tr><tr><td>X>2.0, Y>2.0, Z＞T</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td>Sensor angle missing/edge break</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>Damage circuit or function.</td><td>0</td></tr><tr><td>It can be seen from the front of cover visible area.</td><td>0</td></tr></table></td><td> 
  </td></tr>
</table>

<table>
<tr><td>Sensor flange</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>Do not affect assembly.</td><td>Ignored</td></tr></table></td><td>  </td></tr>
<tr><td>Ink</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>word unclear, inverted, mistake, break line</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>Bubble under protection film</td><td><table><tr><td>SPEC (unit: mm)</td><td>Acceptable</td></tr><tr><td>NA</td><td></td></tr></table></td><td></td></tr>
<tr><td>Function</td><td>Prohibited</td><td></td></tr>
</table>

1.3 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.
Lot size: Quantity of shipment lot per model.
Sampling type: normal inspection, single sampling
Sampling table: MIL-STD-105E
Inspection level: Level II

	Definition		
Class of defects		AQL 0.65%	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
		AQL 1.5%	It is a defect that will not result in functioning problem with deviation classified.

■ PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded. make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated

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

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

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

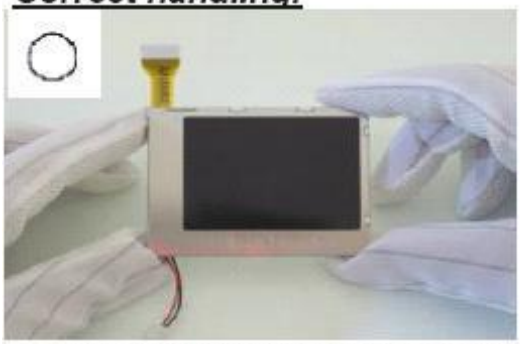
To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

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

Handling precaution for LCM

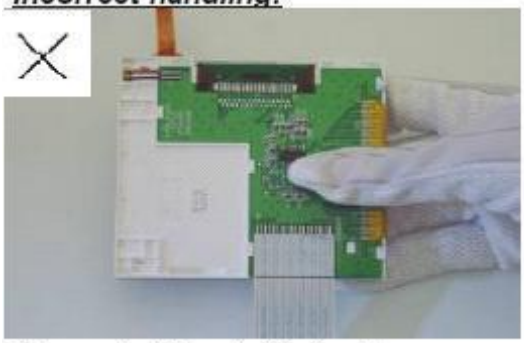
LCM is easy to be damaged.
Please note below and be careful for handling!

Correct handling:

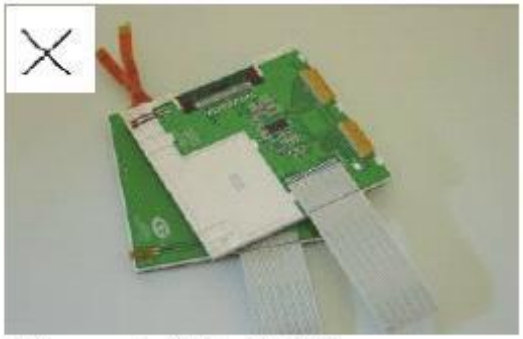


As above picture, please handle with anti-static gloves around LCM edges.

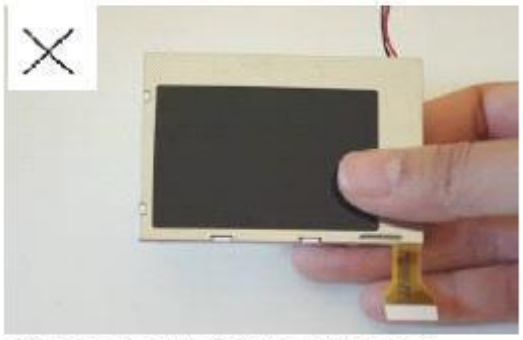
Incorrect handling:



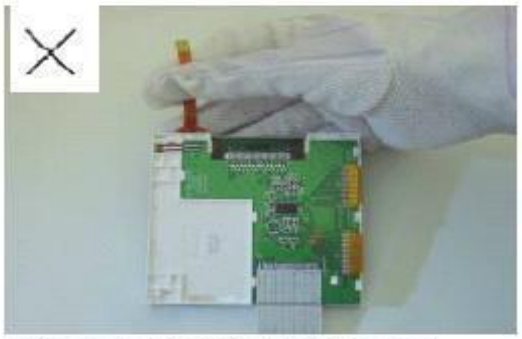
Please don't touch IC directly.



Please don't stack LCM.



Please don't hold the surface of panel.

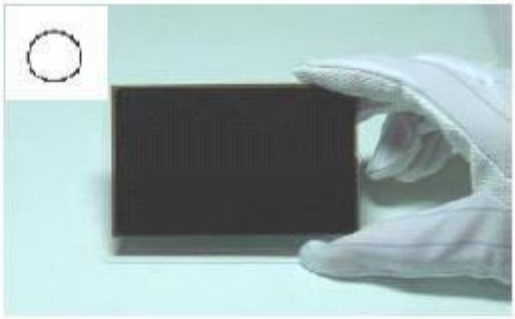


Please don't stretch interface of output, such as FPC cable.

Handling precaution for LCD

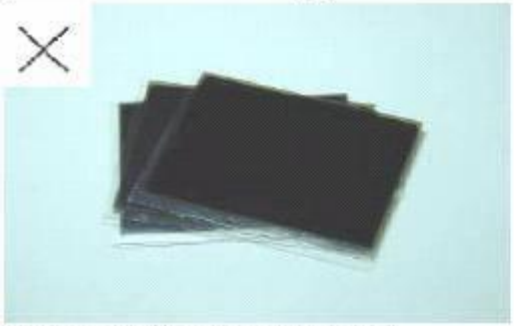
LCD is easy to be damaged.
Please note below and be careful for handling!

Correct handling:



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

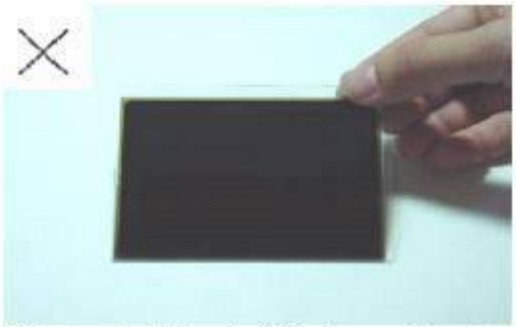
Incorrect handling:



Please don't stack the LCDS.

Please don't hold the surface of LCD.

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



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

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the anti-static electricity container in which they were shipped.

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

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

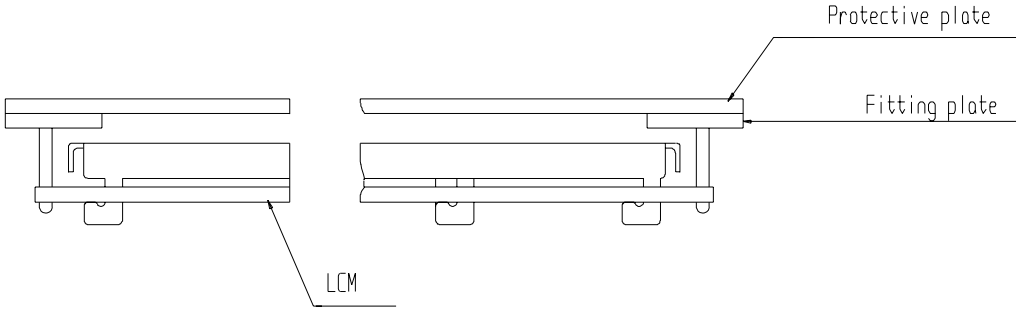
- Exposed area of the printed circuit board.
-Terminal electrode sections.

USING LCD MODULES

Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

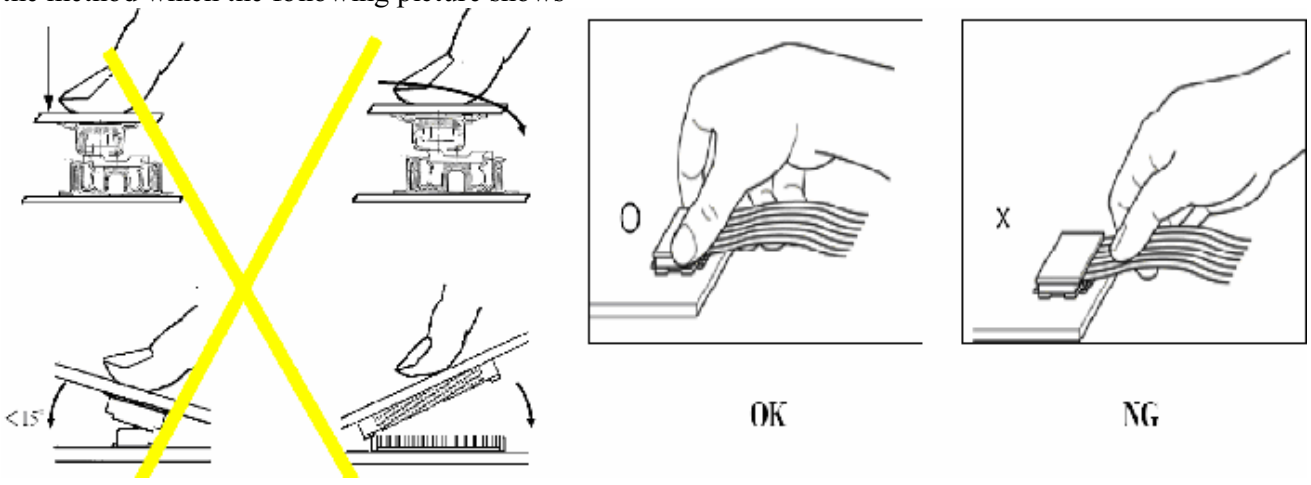
(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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

Precaution for assemble the module with BTB connector:

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



Precaution for soldering to the LCM

	Hand soldering	Machine drag soldering	Machine press soldering
No ROHS product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
ROHS product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

(1) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

(1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

(2) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

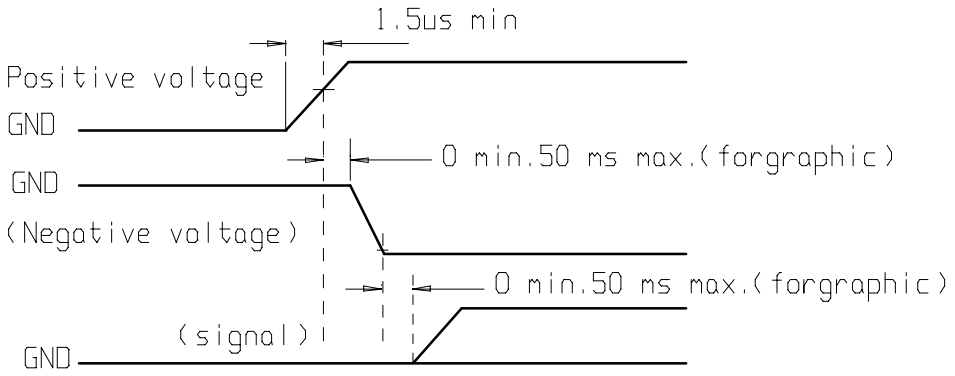
(3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating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

(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(5) A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature,50%RH or less is required.

(6) Input each signal after the positive/negative voltage becomes stable.

(7) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.



Safety

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

Limited Warranty

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

Return LCM under warranty

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

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

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

■ PRIOR CONSULT MATTER

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

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

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