MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI1040GT-6

This module uses ROHS material

For Customer's Acceptance:

Customer	
Approved	
Comment	

This specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for this product or release of this order.	Revision	1.0
	Engineering	
	Date	2013-11-08
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-11-08	Preliminary release	

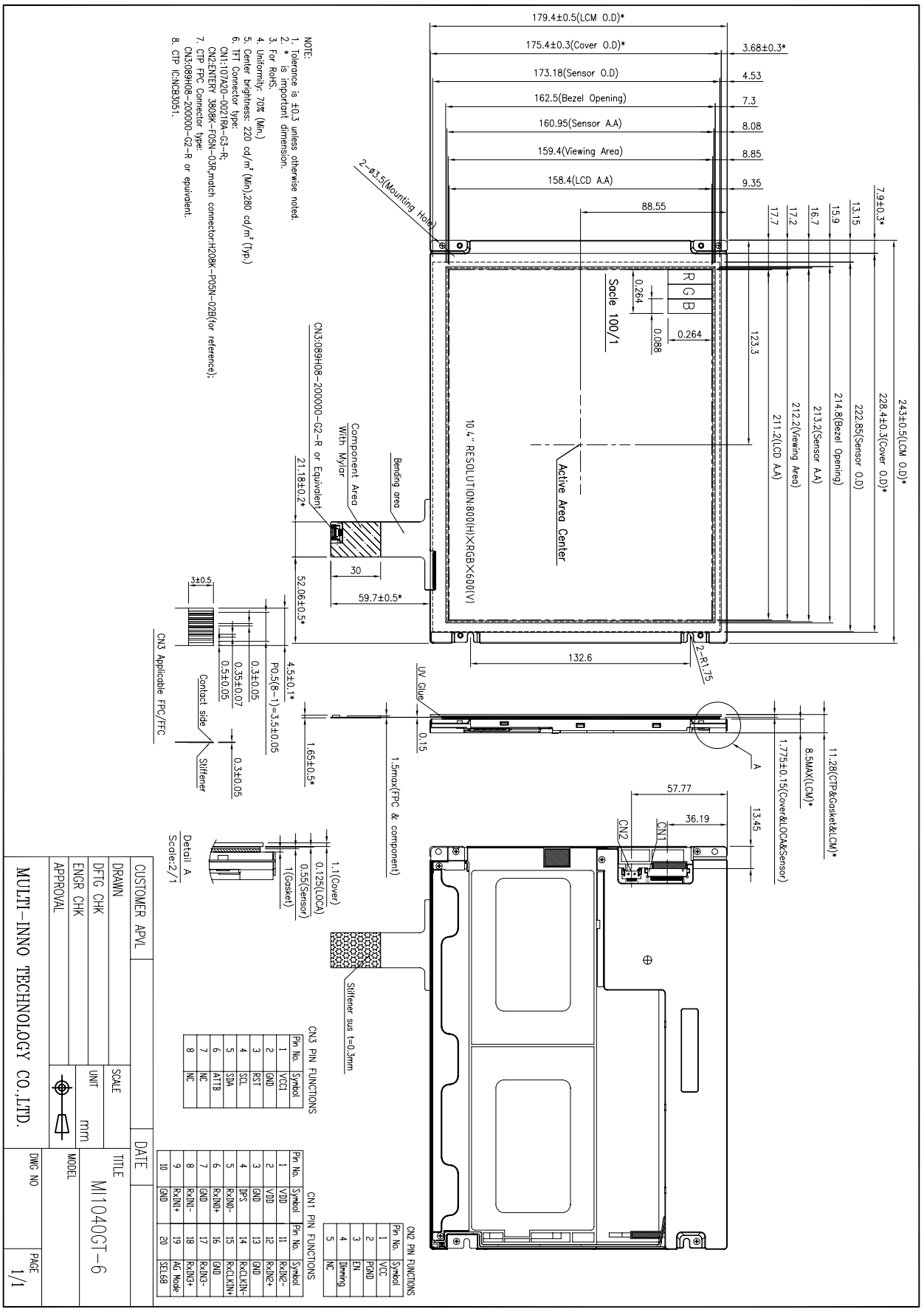
CONTENTS

■ GENERAL INFORMATION

Item	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
LCM (W × H)× D	243.00×179.40×11.28	mm^3
Active area (W×H)	211.20×158.40	mm^2
Pixel pitch (W×H)	0.264×0.264	mm^2
Number of dots	800 (RGB) × 600	/
Backlight type	40 LEDs	/
Interface type	LVDS 8-bit/6-bit	/
Color depth	16.7M/262K	/
Pixel configuration	R.G.B vertical stripe	/
Surface treatment(Up polarizer)	Anti-Glare(3H)	/
Input voltage	3.3	V
With/Without TSP	With CTP	/
Weight	TBD	g

Note 1 : RoHS compliant;
Note 2: LCM weight tolerance: ± 5% .

■ EXTERNAL DIMENSIONS



■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Power voltage	VDD	-0.3	5.0	V
Power for LED driving circuit	VCC	-0.3	13.5	V
Input voltage	VIN	-0.3	5.0	V
Input voltage for backlight	Vt	-0.5	7.0	V
Operating temperature	TOP	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max60°C)	RH

Note1: VIN represents RxIN0±,RxIN1±,RxIN2±,RxIN3±,RxCLKIN±,DPS,AG mode,SEL68.

Note2: Vt represents EN and Dimming.

■ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit	Remark
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	
Input current	I_{IN}	-10	-	10	μA	
Supply voltage	VDD	3.0	3.3	3.6	V	
Common electrode driving signal	VCOM	-	4.3	-	V	Note 1
Sync frequency	FVD	-	60	70	Hz	
VDD power consumption	I_{DD}	-	340	380	mA	Note 2

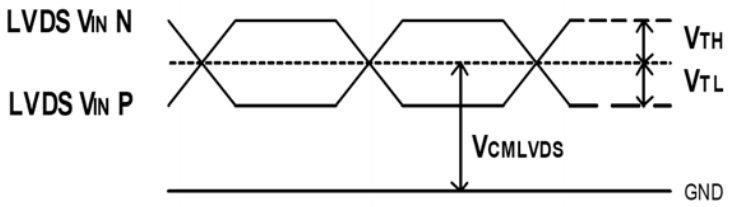


Figure 1.1 LVDS DC timing diagram

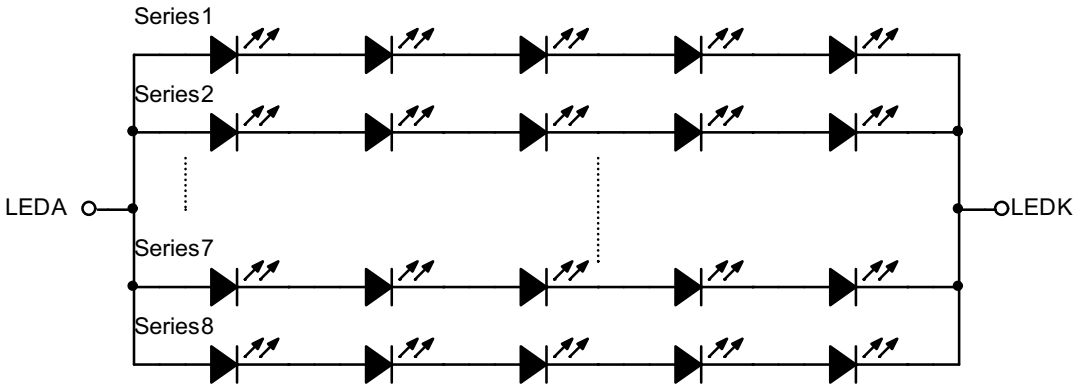
Note1: For different LCM, the value may have a bit of difference.

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

■ BACKLIGHT CHARACTERISTICS

Parameter	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}	-	0.32	-	A	100% PWM Duty
Backlight Power Consumption	W_{BL}	-	3.84	-	W	100% PWM Duty
Dimming Frequency	F_{PWM}	200	-	20K	Hz	
Dimming duty cycle	-	0	-	100%	-	
High Level Input Voltage	V_{IH}	2	-	-	V	For Dimming, EN pin
Low Level Input Voltage	V_{IL}	-	-	0.8	V	For Dimming, EN pin
LED Life Time	-	25000	(50000)	-	hrs	Note 1

Note 1: The LED driving condition is defined for total backlight consumption.
Note 2: Forward Voltage adjusting should depend on Forward Current setting.



LED connection of backlight

Note3: I_F is defined for one channel LED.
Optical performance should be evaluated at Ta=25℃ only.
If LED is driven by high current, high ambient temperature & humidity condition.
The life time of LED will be reduced.
Operating life means brightness goes down to 50% initial brightness.
Typical operating life time is estimated data.

■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	θ=0° ∅=0° Ta=25℃	-	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		220	280	-	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	50	60	-	deg	FIG 3.	6
			∅ = 270°	60	70	-	deg	FIG 3.	
			∅ = 0°	60	70	-	deg	FIG 3.	
			∅ = 180°	60	70	-	deg	FIG 3.	
CIE (x, y) chromaticity	Red	x	θ=0° ∅=0° Ta=25℃	0.5592	0.6092	0.6592		FIG 2.	5
		y		0.3052	0.3552	0.4052			
	Green	x		0.2649	0.3149	0.3649			
		y		0.5053	0.5553	0.6053			
	Blue	x		0.0897	0.1367	0.1897			
		y		0.0896	0.1396	0.1896			
	White	x		0.2545	0.3045	0.3545			
		y		0.2946	0.3446	0.3946			
NTSC	-	-	-	-	50	-	%	-	-

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

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

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

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

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

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

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

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

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

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

FIG. 1 The definition of Response Time

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

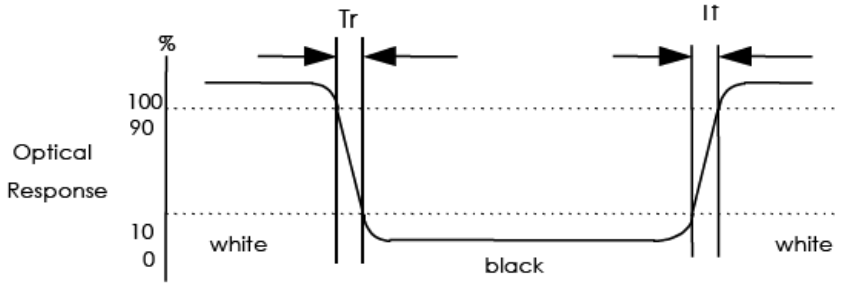
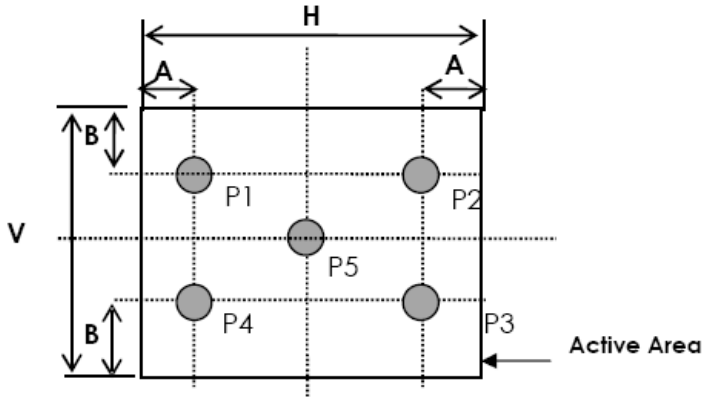
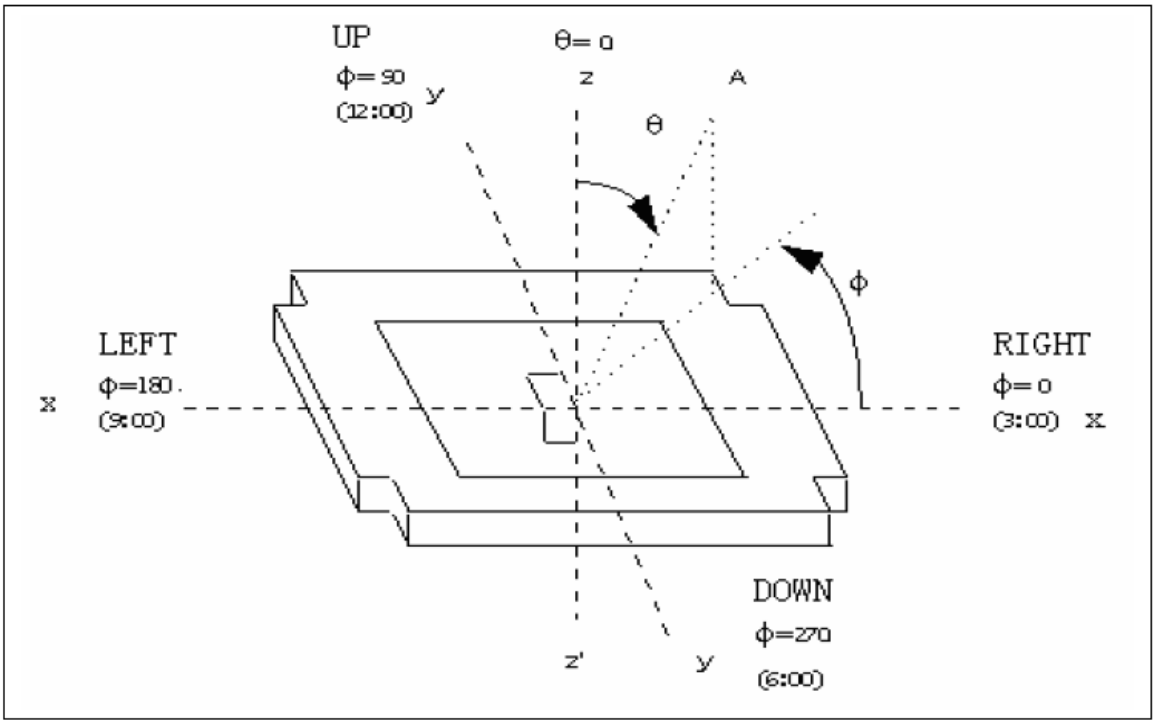


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity



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

FIG. 3 The definition of viewing angle



■ INTERFACE DESCRIPTION

1. 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:

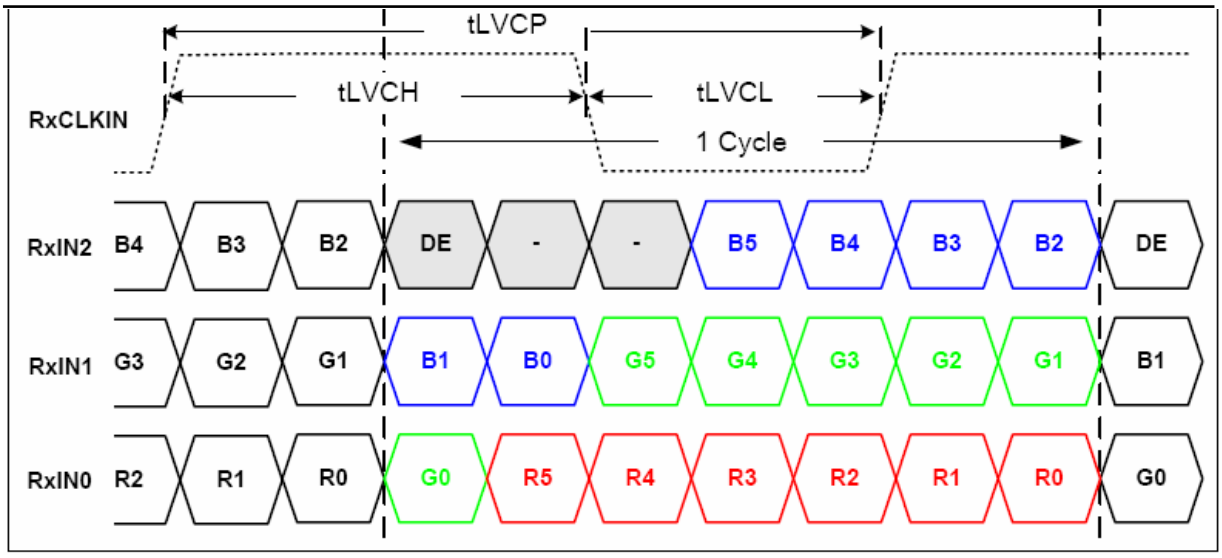
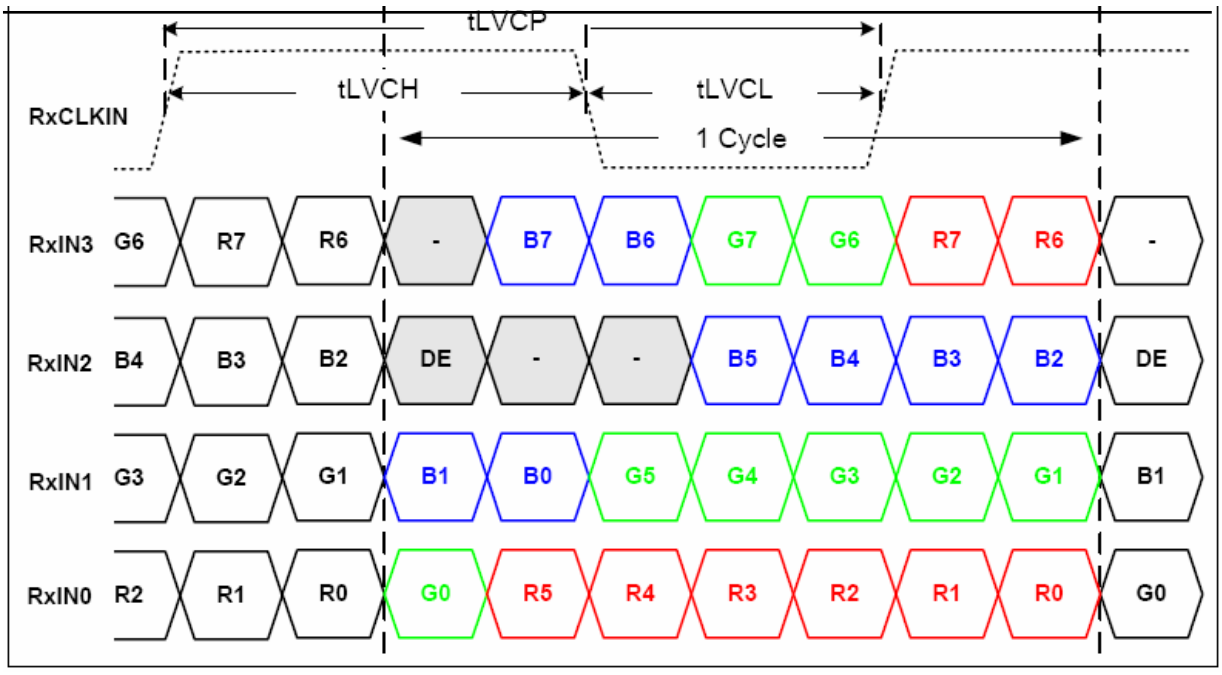


Figure 1.1.1 Input signal data mapping

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



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

2.2 CN2(Backlight Connector)

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

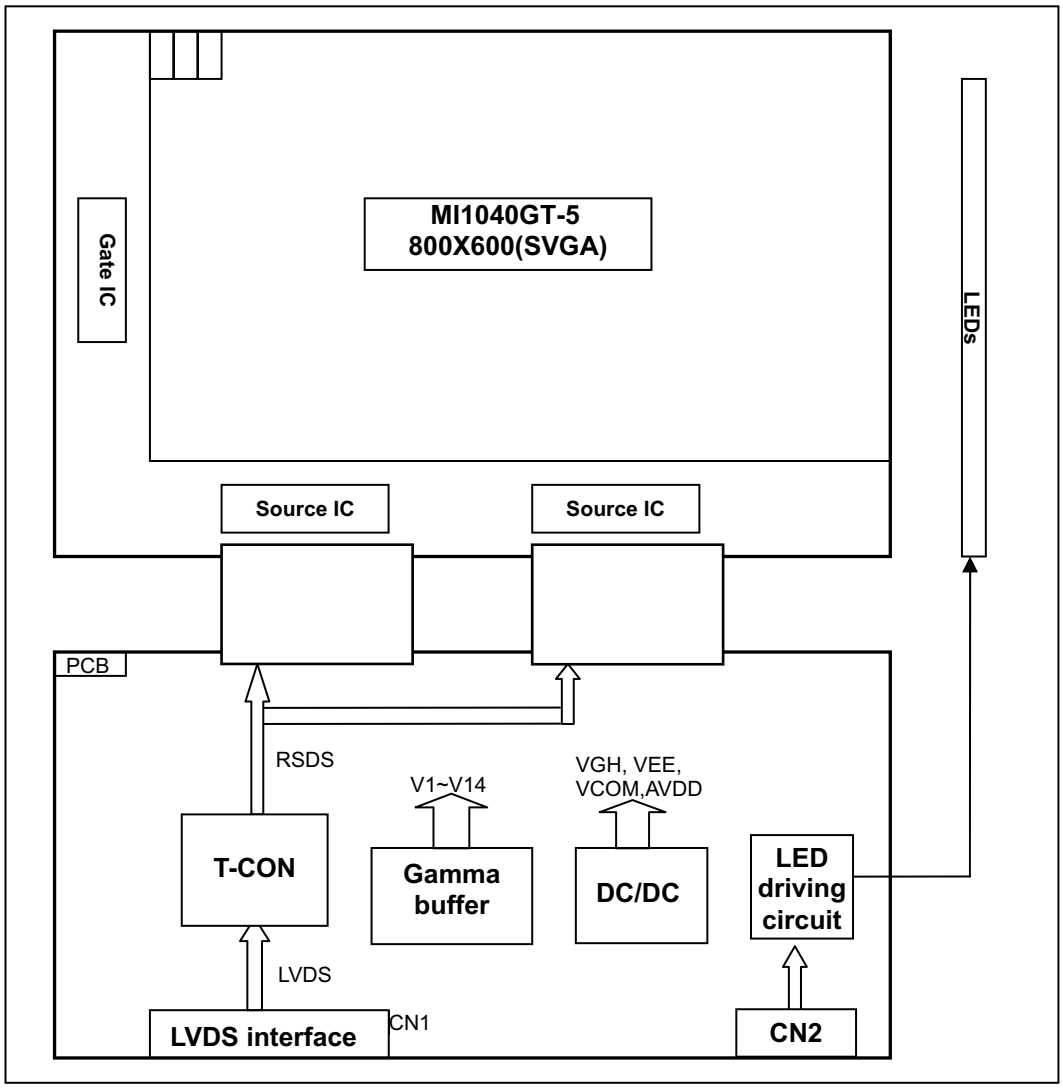
No	Symbol	I/O	Description	Remark
1	VCC	P	Power for LED driving circuit.12.0V input.	
2	PGND	P	Ground for LED driving circuit. 0V input.	
3	EN	I	Backlight enable setting. High: enabled; Low: disable.	
4	Dimming	I	PWM signal for adjusting luminance of backlight.	
5	NC	-	No connection	

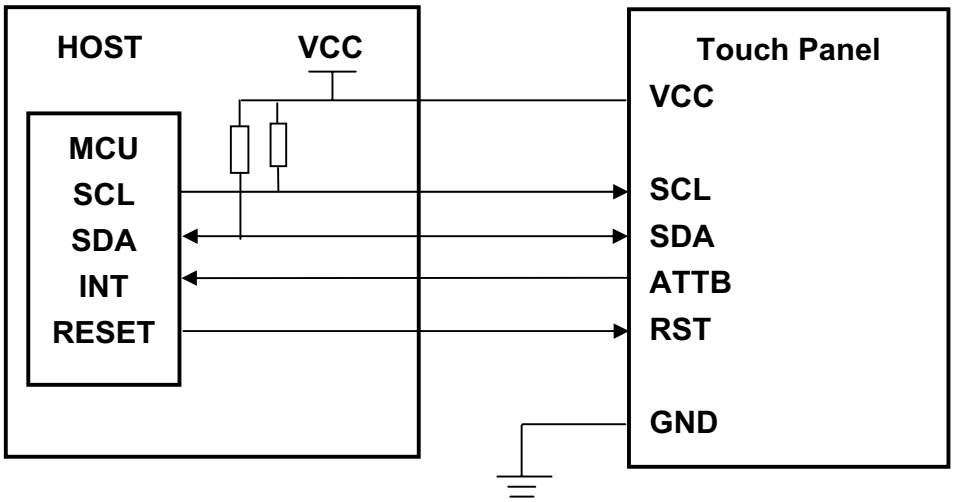
Match connector: H208K–P05N-02B (ENTERY)

2.3 CN3(CTP PIN Connections)

No.	Name	I/O	Description
1	VCC	P	Power; VCC=3.3V(typ.)
2	GND	P	Power ground
3	RST	I	Active Low global reset signal input. Normally pull high.
4	SCL	I	Clock; 100KHz
5	SDA	I/O	Serial data access
6	ATTB	O	Active low when data output from touch panel
7	NC	-	No connect
8	NC	-	No connect

■ BLOCK DIAGRAM





Note：1. USE APPROPRIATE RESISTOR VALUE DURING HIGH SPEED SCL CLOCK.
SUGGESTION : RESISTOR RECOMMENDATION：2.2K ohm.

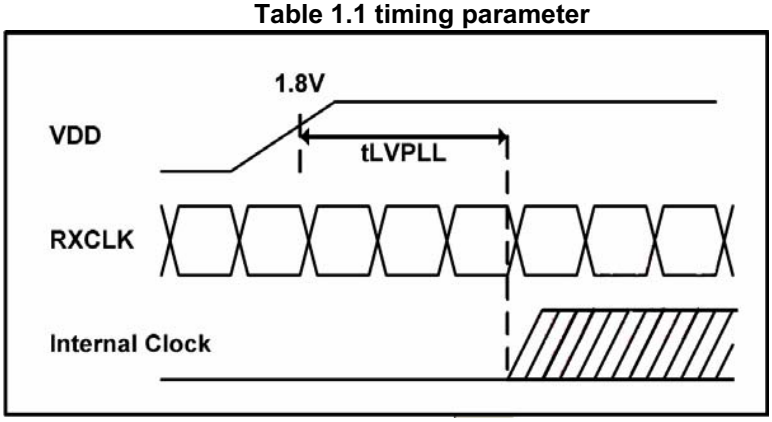
■ APPLICATION NOTES

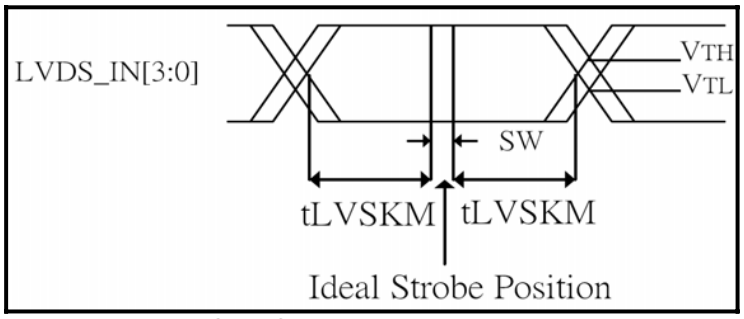
1. Timing Chart

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 marign	tLVSKM	400	-	-	ps	f=85MHz

Table 1.1 timing parameter





SW: Setup and Hold time

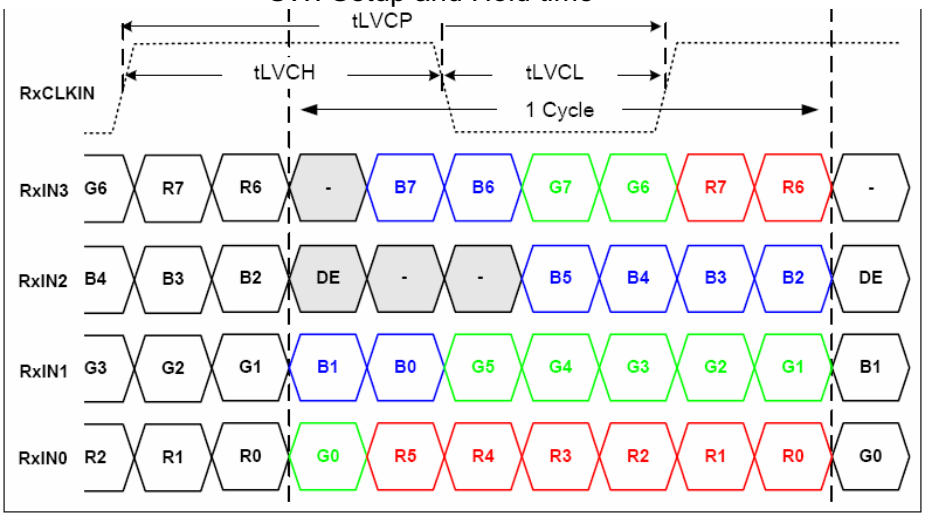


Figure 1.1 Input signal data timing

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	

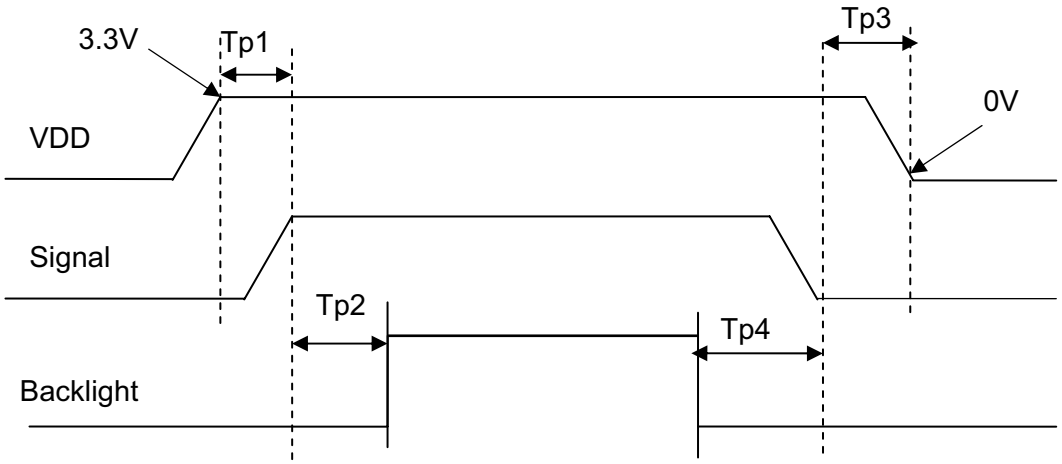


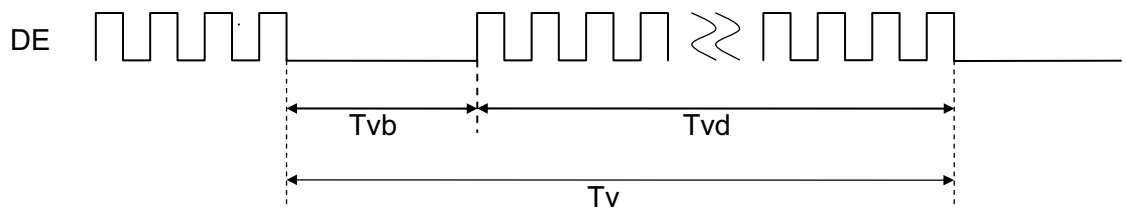
Figure 1.2 Interface power on/off sequence

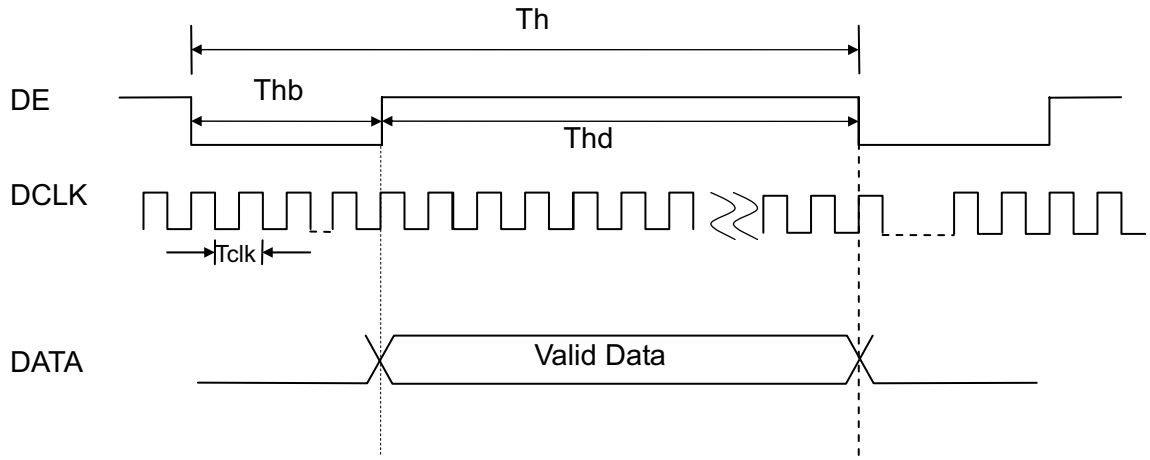
1.3 Recommended Input Timing of LVDS transmitter

	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


DE
Tvb
Tvd
Tv

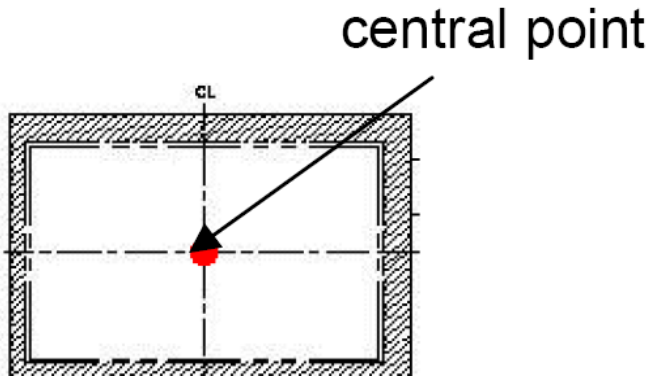

Th
DE
Thb
Thd
DCLK
Tclk
DATA
Valid Data

■ CTP GENERAL SPECIFICATIONS

1. GENERAL SPECIFICATIONS

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	10	
Outline Dimension	228.4(W) x 175.4(H) x 1.775 (D)	mm
Sensor Active area	213.2(W) x 160.95(H)	mm
Transparency	≧85%	%
Haze	≦5.0%	%
Hardness	7H (typ.) [by JIS K5400]	Pencil hardness
Weight	T.B.D	g
Report rate	200(Max)	Points/sec
Response time	11(Max)	ms
Origin Point	The upper left corner	
Point hitting life time	1,000,000 times min.	Note 1

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



2. ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC	Power Supply voltage	-0.3	-	+5.5	V	
VIO	I/O input voltage	-0.3	-	VCC+0.3	V	

3. ELECTRICAL CHARACTERISTICS

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC	Power Supply voltage	2.7	-	5.5	V	
GND	Power Ground	-0.3	-	-	V	
I_{normal}	Normal operation mode	-	30	-	mA	At VCC=3.3V
I_{sleep}	Sleep Mode	-	15	-	uA	
VIH	Input H voltage	0.4VCC	-	VCC+0.5	V	
VIL	Input L voltage	-0.3	-	0.2VCC	V	

4. TIMING SPECIFICATIONS

4.1 Figure4-1 is the waveform of I2C fast mode timing

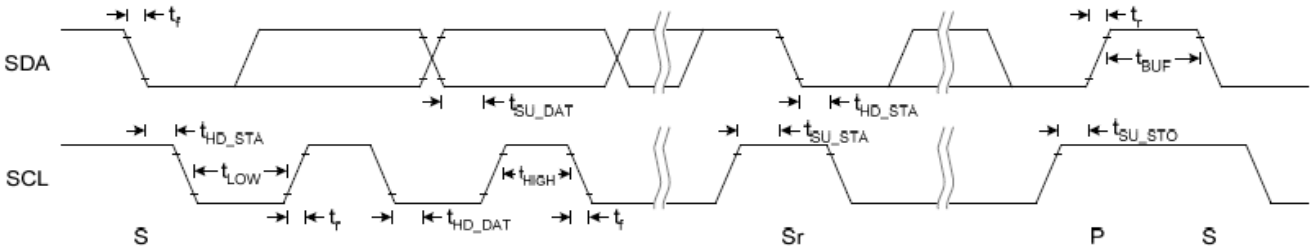


Figure4-1 I2C Waveform

Table is the timing characteristic of I2C fast mode plus

Conditions: VCC=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

4.2 I2C Interface Protocol

4.2.1 Default I2C Address

The default I2C Address of NCB30x1 is 0x55 (7-bit address)

4.2.2 Register Read

For reading the registers value from NCB30x1, the I2C host has to tell the NCB30x1 the "start register address" before reading the corresponding register value.

I2C Start	I2C Addr(W)	Start Reg. Addr.LB(a)	Start Reg. Addr.HB(a)	I2C Stop	I2C Start	I2C Addr(R)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I2C Stop

4.2.3 Register Write

For writing the registers of NCB30x1, the host has to tell the NCB30x1 the "start register address". Register value would be written to the register with address starting from the "start register address"

I2C Start	I2C Addr(W)	Start Reg. Addr.LB(a)	Start Reg. Addr.HB(a)	Value of Reg(a)	Value of Reg(a+1)	...	Value of Reg(a+n)	I2C Stop

4.3 Register Definitions

NCB30x1 provides an register interface for host to configure device attributes and retrieve information. The registers are listed bellow.

Register Addr	Name	Attribute	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x00F9	ReportID	R	ReportID for							
0x00FA	Message1	R	Message							
0x00FB	Message2	R	Message							
0x00FC	Message3	R	Message							
0x00FD	Message4	R	Message							
0x00FE	Message5	R	Message							
0x00FF	Message6	R	Message							
0x0100	Message7	R	Message							
0x0101	Reserved	Reserved	Reser							
0x0102	Reset	R/W	Re							
0x0103	BackUpNV	R/W	Backup							
0x0104	Calibrate	R/W	Calibr							
0x0105	ReportAll	R/W	Report Current							
0x0106	Reserved	Reserved	Reser							
0x0107	Diagnostic	R/W	Diagnostic Debug Command							
0x0108	IdleAcqInt	R/W	Idle Acquisition							
0x0109	ActAcqInt	R/W	Active Acquisition							
0x010A	Reserved	Reserved	Reser							
0x010B	Orient	R/W	Reserved					InvertY	InvertX	Switch
0x010C	XRangeLsB	R/W	X Resolution Low							
0x010D	XRangeMsB	R/W	X Resolution High							
0x010E	YRangeLsB	R/W	Y Resolution Low							
0x010F	YRangeMsB	R/W	Y Resolution High							

■ RELIABILITY TEST

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	80±2℃/240 hours	IEC60068-2-1 GB2423.2
2	Low Temperature Storage	-30±2℃/240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Operating	70±2℃/240 hours	Note 1 IEC60068-2-1,GB2423.2
4	Low Temperature Operating	-20±2℃/240 hours	IEC60068-2-1 GB2423.1
5	Temperature Cycle storage	-30±2℃~25~80±2℃×100cycles (30min.) (5min.) (30min.)	Start with cold temperature, with high temperature, IEC60068-2-14:1984 GB2423.22
6	Damp proof Test operating	60℃±5℃×90%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: ±8Kv Contact: ±6Kv 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

1. Appearance Specification

1.1 Inspection condition

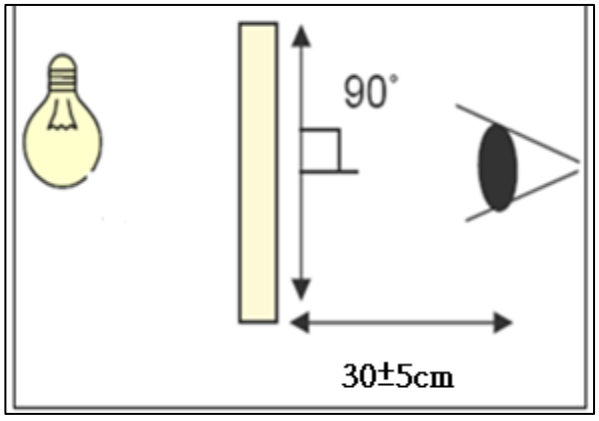
1.1.1 Inspection conditions

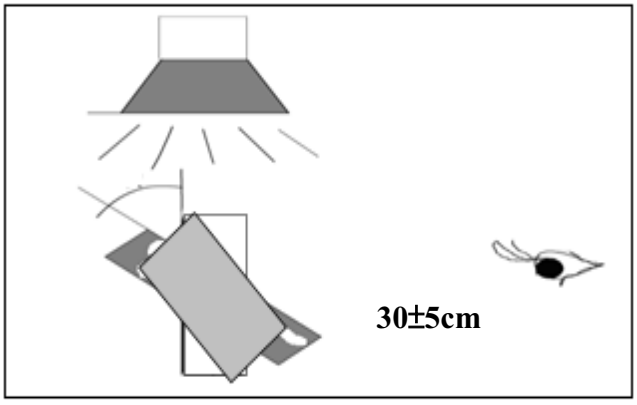
1.1.1.1 Inspection Distance : 30 ± 5 cm

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°



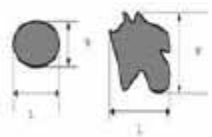
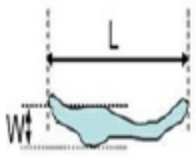


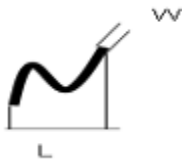
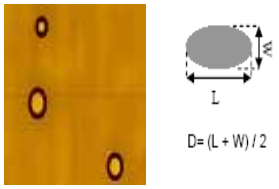
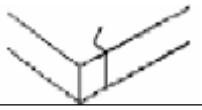
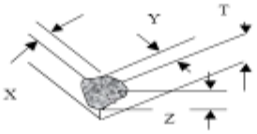
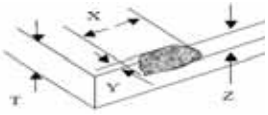
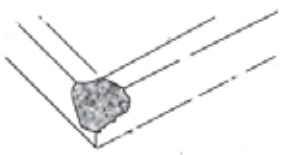
1.1.2 Environment conditions:

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><th>SPEC</th><th>Acceptable</th></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><th>SPEC (unit: mm)</th><th>Acceptable</th></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><th>SPEC (unit: mm)</th><th>Acceptable</th></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><th>SPEC (unit: mm)</th><th>Acceptable</th></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><th>SPEC (unit: mm)</th><th>Acceptable</th></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

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

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.

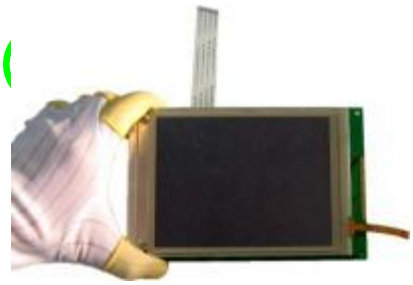
1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- 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.

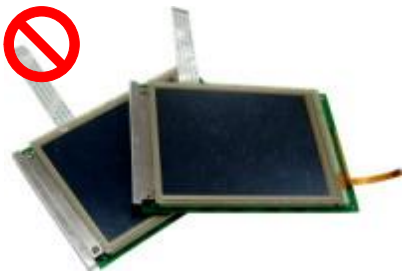
2.2 Correct handling:



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

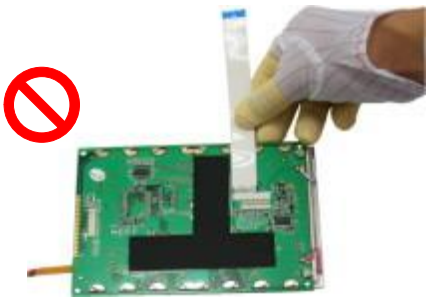
2.3 Incorrect handling:

Please don't touch IC directly.

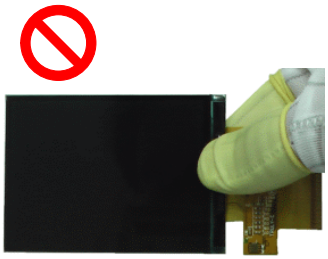


Please don't stack LCM.

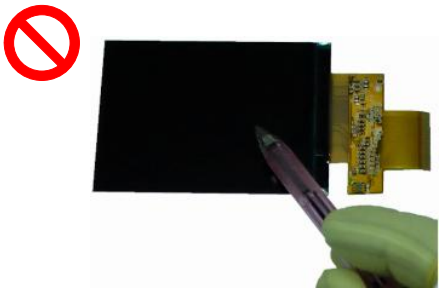
Please don't hold the surface of panel.



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.

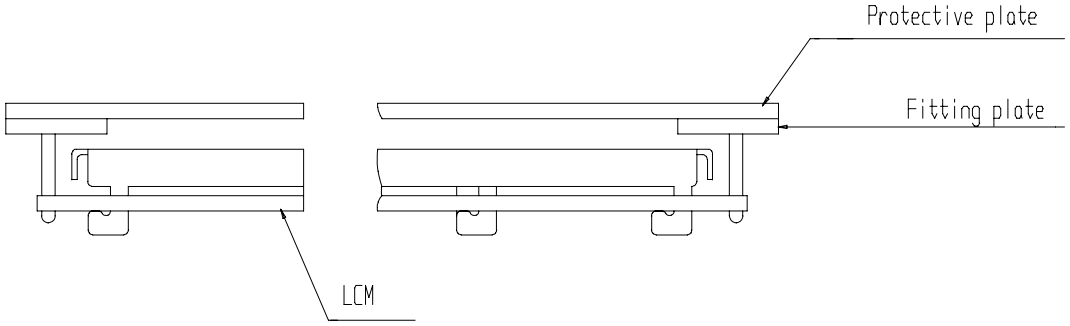
3.2.3.2 -Terminal electrode sections.

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.

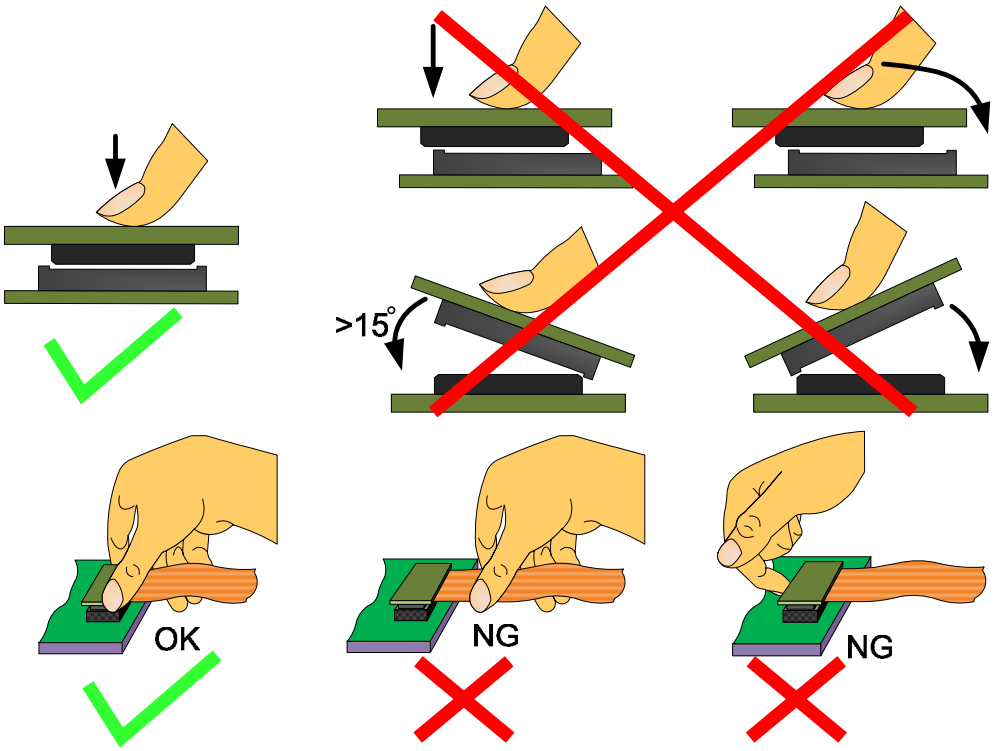
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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



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.