MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0700S4T-3

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	1.2
	Engineering	
	Date	2013-08-28
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-02-27	First Release	
1.1	2013-07-25	Change LCD thinkness Update VGH,VGL,AVDD parameters Update LED forward current parameters Update current consumption	
1.2	2013-08-28	Update Timing	

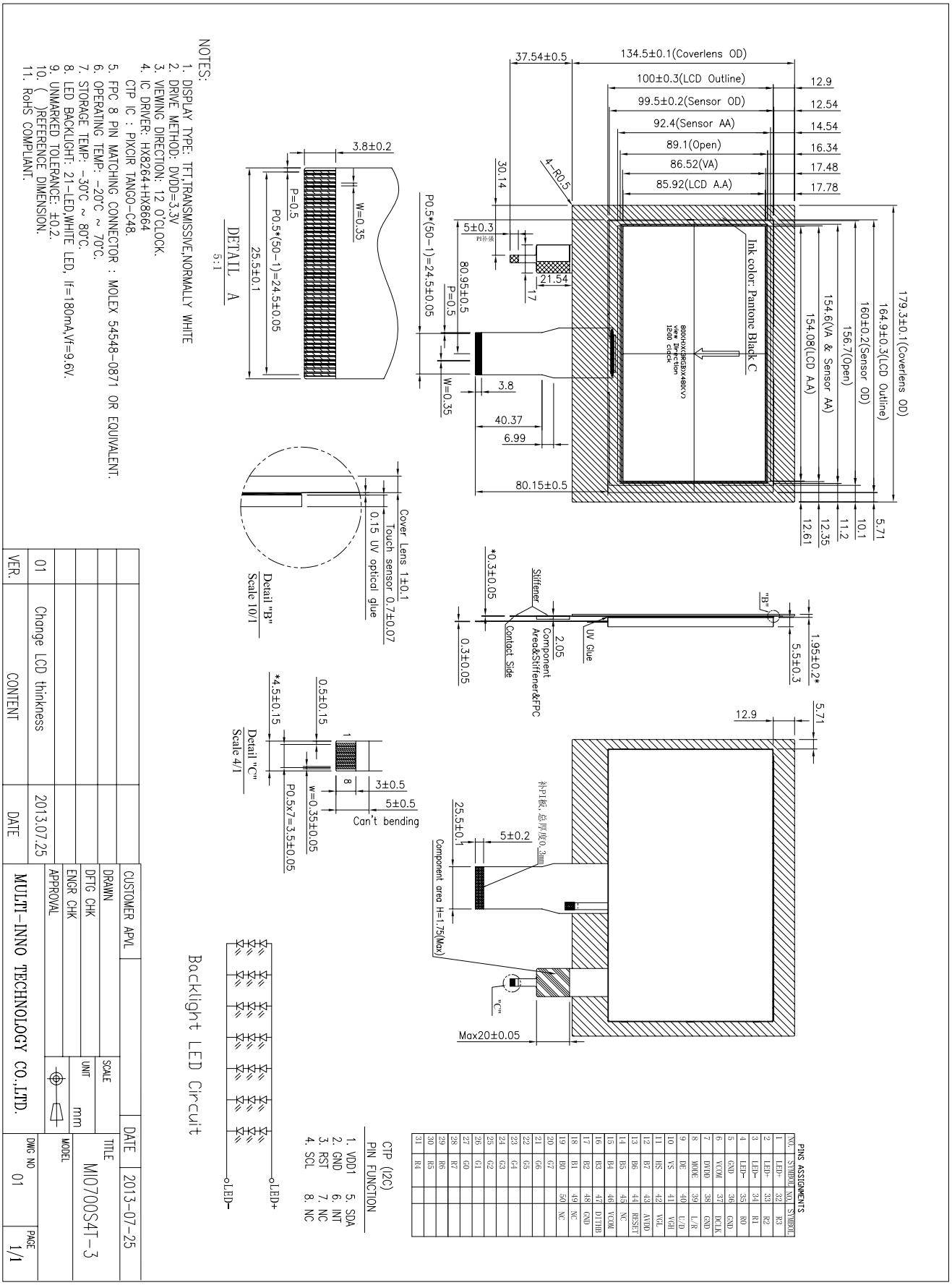
CONTENTS

■ GENERAL INFORMATION

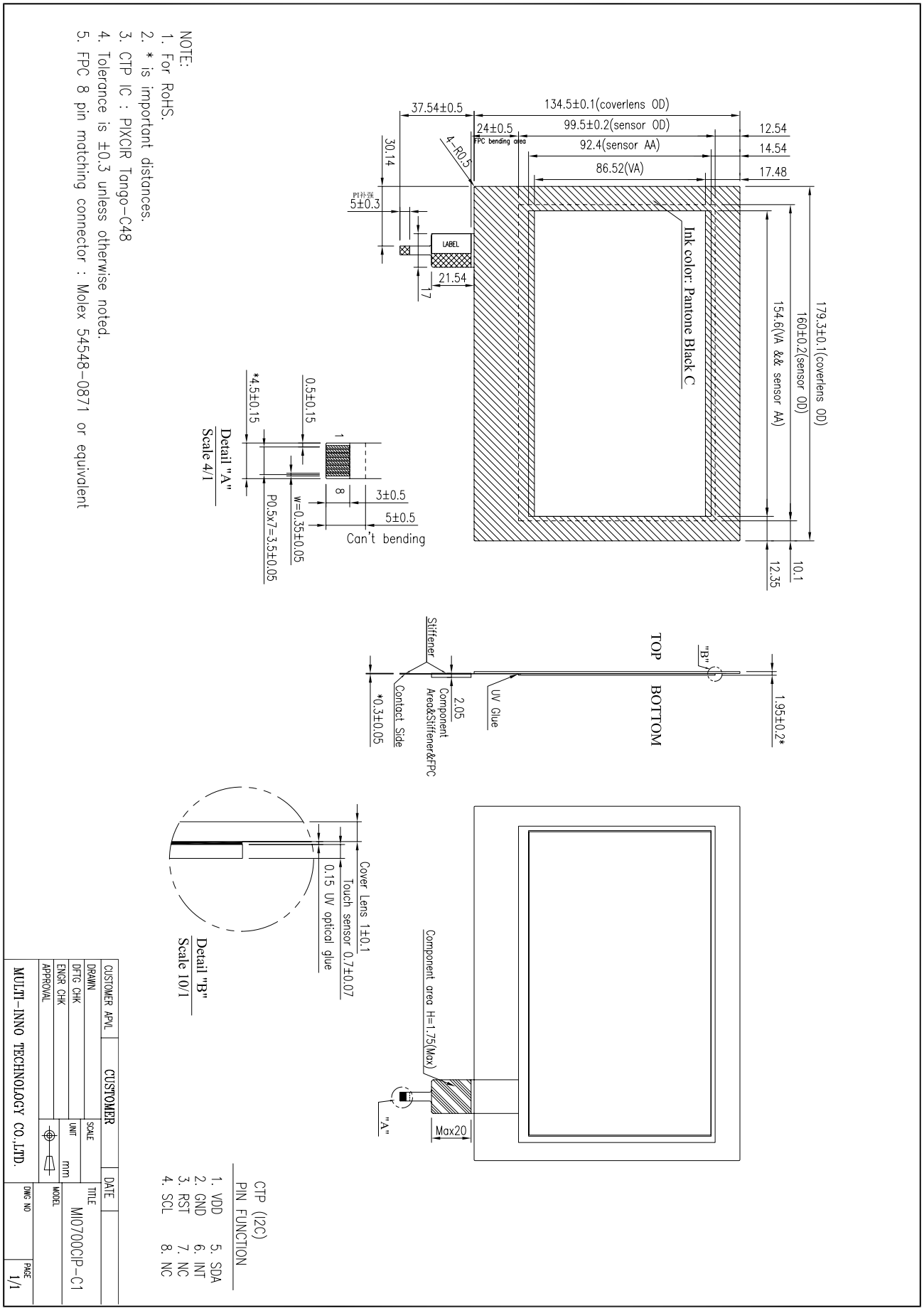
Item	Contents	Unit
LCD type	TFT/Transmissve/Normally white	/
Size	7.0	Inch
Viewing direction	12:00	O' Clock
Gray scale inversion direction	6:00	O' Clock
LCM (W× H × D)	179.30×134.50×7.45	mm^3
Active area (W×H)	154.08×85.92	mm^2
Pixel size (W×H)	0.0642×0.1790	mm^2
Number of dots	800 (RGB) × 480	/
Driver IC	HX8264+HX8664	/
Backlight type	21 LEDs	/
Interface type	24bit RGB	/
Color depth	16.7M	/
Surface treatment	Anti-glare	/
Color arrangement	RGB-stripe	/
Backlight power consumption	1.728	W
Panel power consumption	327	mW
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



■ CTP OUTLINE DRAWING



■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	43.0	V
	VGL	-20.0	0.3	V
	VGH-VGL	12.0	40.0	V
LED reverse voltage	V_R	-	1.2	V
LED forward current	I_F	-	30	mA
Operating temperature	TOP	-20	70	°C
Storage temperature	TST	-30	80	°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	DVDD	3.0	3.3	3.6	V
	AVDD	9.4	9.6	9.8	V
	VGH	17.0	18.0	19.0	V
	VGL	-6.6	-6.0	-5.4	V
Input signal voltage	Vcom	3.8	4.0	4.2	V
Input logic high voltage	VIH	0.7DVDD	-	DVDD	V
Input logic low voltage	VIL	0	-	0.3DVDD	V

Note 1: Be sure to apply DV_{DD} and V_{GL} to the LCD first, and then apply V_{GH}
Note 2: DV_{DD} setting should match the signals output voltage (refer to Note 3) of customer's system board.
Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

CURRENT CONSUMPTION

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I_{GH}	-	0.5	1	mA	V_{GH} =18.0V
	I_{GL}	-	0.5	1	mA	V_{GL} = -6.0V
	IDV_{DD}	-	8	15	mA	DV_{DD} =3.3V
	IAV_{DD}	-	30	40	mA	AV_{DD} =9.6V

■ BACKLIGHT CHARACTERISTICS

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Voltage for LED backlight	VL	9.3	9.9	10.5	V	Note 1
Current for LED backlight	IL	170	180	200	mA	
LED life time	-	20,000	-	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and $_L$ =180mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_L =180mA. The LED lifetime could be decreased if operating I_L is lager than 180mA.

■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
Contrastratio	Cr		400	500	-	—	FIG 2.	1
Luminance uniformity	δ WHITE		70	75	-	%	FIG 2.	3
Surface Luminance	Lv		270	340	-	cd/m^2	FIG 2.	2
Viewing angle range	θ	∅ = 90°	40	50	-	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℃	TBD	TBD	TBD		FIG 2.	5
	Red y		TBD	TBD	TBD			
	Green x		TBD	TBD	TBD			
	Green y		TBD	TBD	TBD			
	Blue x		TBD	TBD	TBD			
	Blue y		TBD	TBD	TBD			
	White x		0.260	0.310	0.360			
	White y		0.280	0.330	0.380			

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".

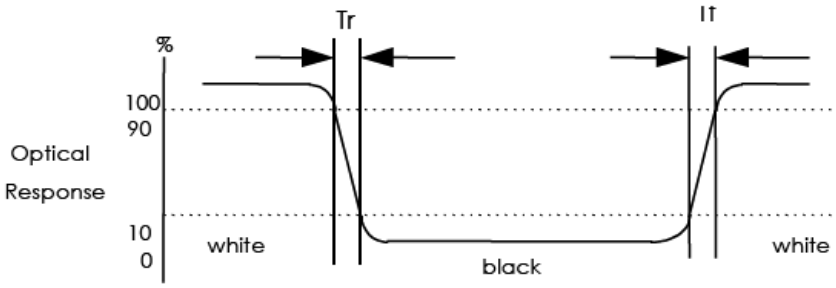
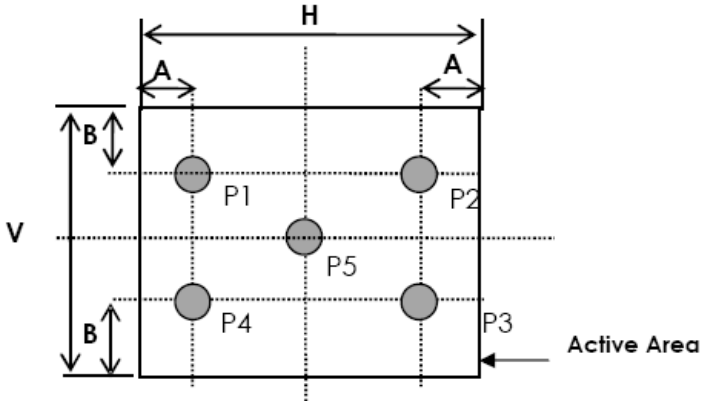
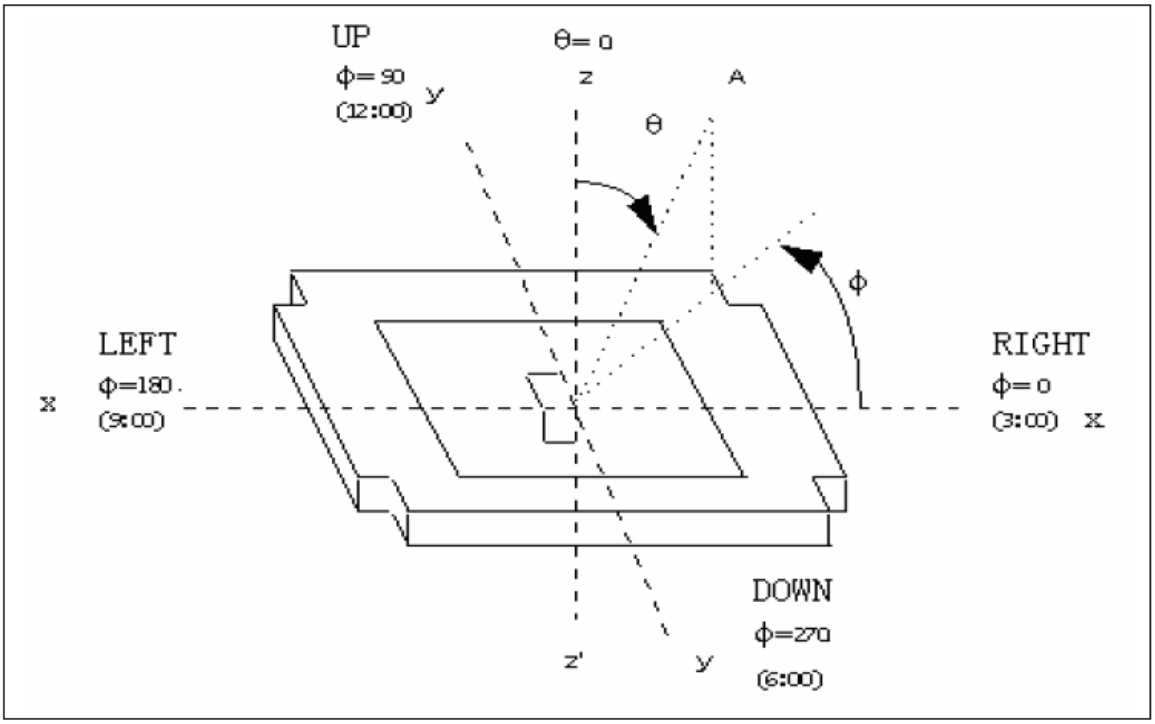


FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity



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

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Functi	Remark
1	V_{LED+}	P	Power for LED backlight (Anode)	
2	V_{LED+}	P	Power for LED backlight (Anode)	
3	V_{LED-}	P	Power for LED backlight (Cathode)	
4	V_{LED-}	P	Power for LED backlight (Cathode)	
5	GND	P	Power ground	
6	V_{COM}	I	Common voltage	
7	DV_{DD}	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	Note 2
27	G0	I	Green data(LSB)	Note 2

28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data(LSB)	Note 2
36	GND	P	Power Ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power Ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	Up/down selection	Note 4,5
41	V_{GH}	P	Gate ON Voltage	
42	V_{GL}	P	Gate OFF Voltage	
43	AV_{DD}	P	Power for Analog Circuit	
44	RESET	I	Global reset pin.	Note 6
45	NC	-	No connection	
46	V_{COM}	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power Ground	
49	NC	-	No connection	
50	NC	-	No connection	

I: input, O: output, P: Power

Note 1: DE/SYNC mode select. Normally pull high.
When select DE mode, MODE="1", VS and HS must pull high.
When select SYNC mode, MODE= "0", DE must be grounded.

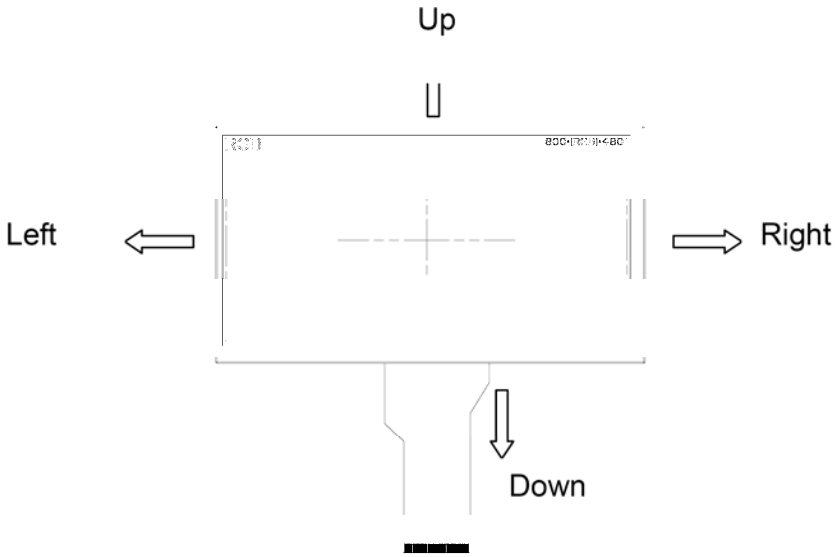
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode.

Set of scan control input		Scanning direction
U/D	L/R	
GND	DV_{DD}	Up to down, left to right
DV_{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV_{DD}	DV_{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1",Disable internal dithering function,
When DITHB="0",Enable internal dithering function.

■ APPLICATION NOTES

1. Timing Characteristics

1.1 AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	Thst	8	-	-	ns	
HS hold time	Thh	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvh	8	-	-	ns	
Data setup time	Tds	8	-	-	ns	
Data hole time	Tdh	8	-	-	ns	
DE setup time	Tes	8	-	-	ns	
DE hole time	Teh	8	-	-	ns	
DV_{DD} Power On Slew rate	TPOR	-	-	20	ms	From 0 to 90% DV_{DD}
RESET pulse width	TRst	1	-	-	ms	
DCLK cycle time	Tco	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	

1.2. Data Input Format

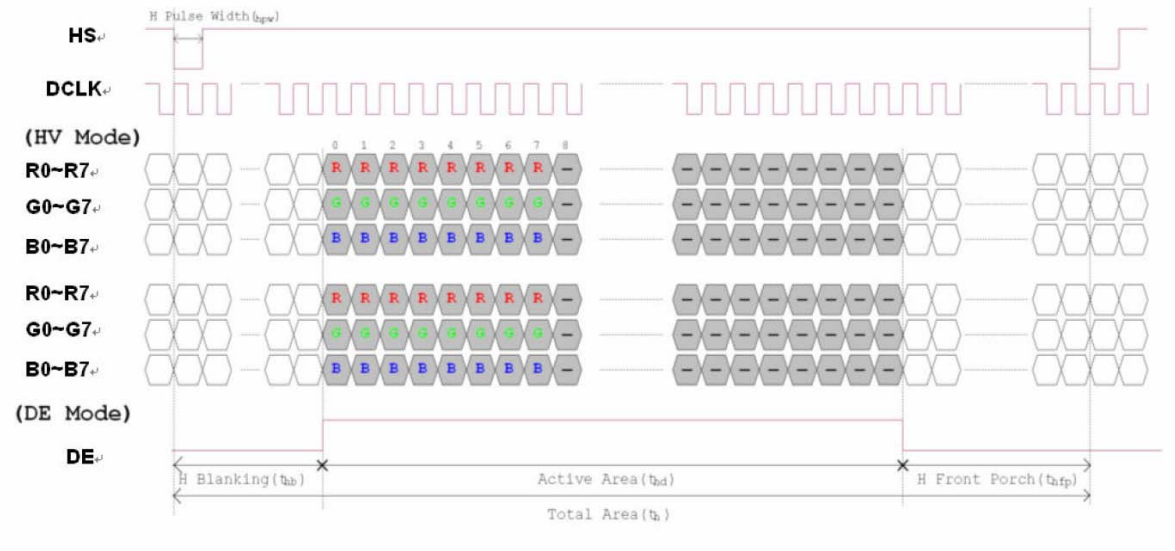


Figure 1 Horizon input timing diagram

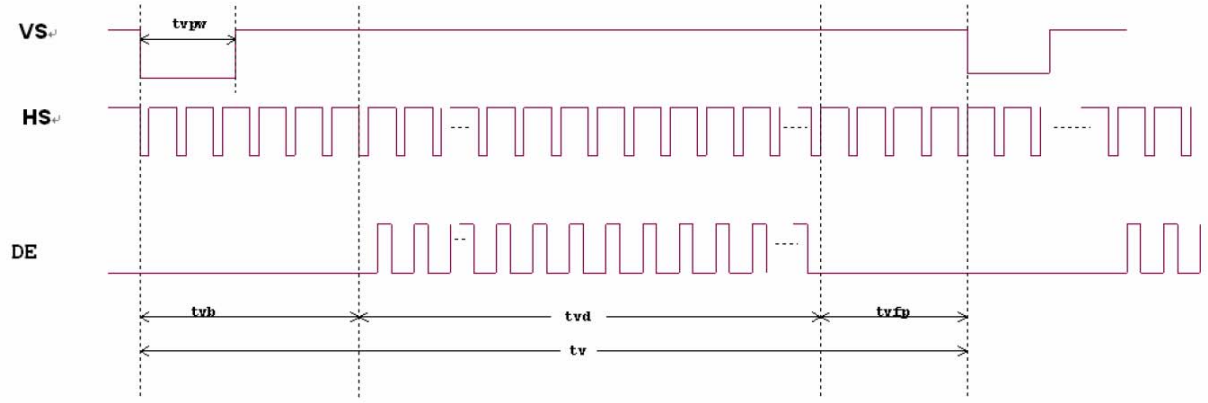


Figure 2 Vertical input timing diagram

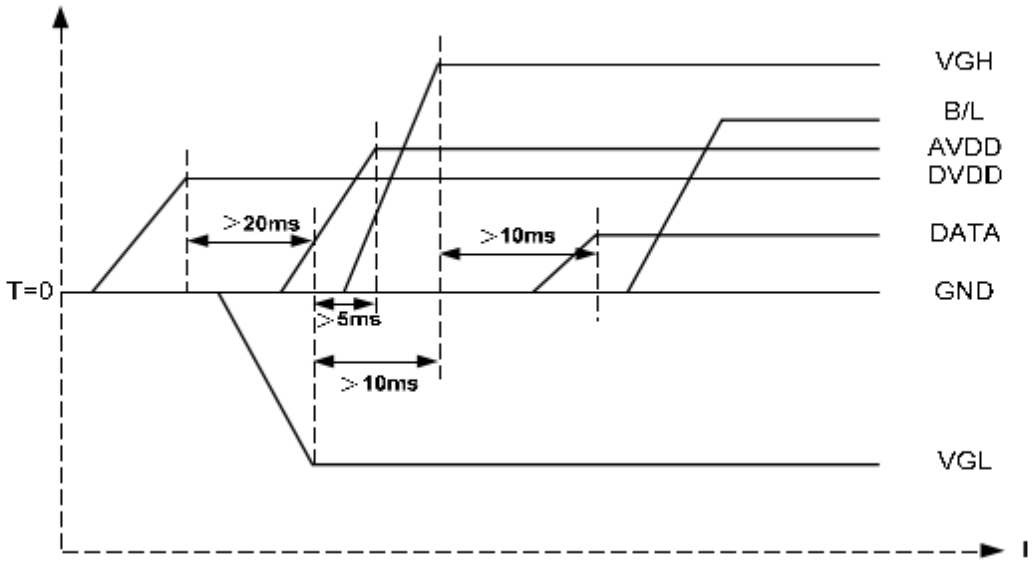
1.3. Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	29.0	33.0	38.0	MHz	
One Horizontal Line	th	1026	1056	1086	DCLK	
HS pulse width	thpw	-	30	-	DCLK	
HS Blanking	thb	-	46	-	DCLK	
HS Front Porch	thfp	180	210	240	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	515	525	535	TH	
VS pulse width	tvpw	-	13	-	TH	
VS Blanking	tvb	-	23	-	TH	
VS Front Porch	tvfp	12	22	32	TH	

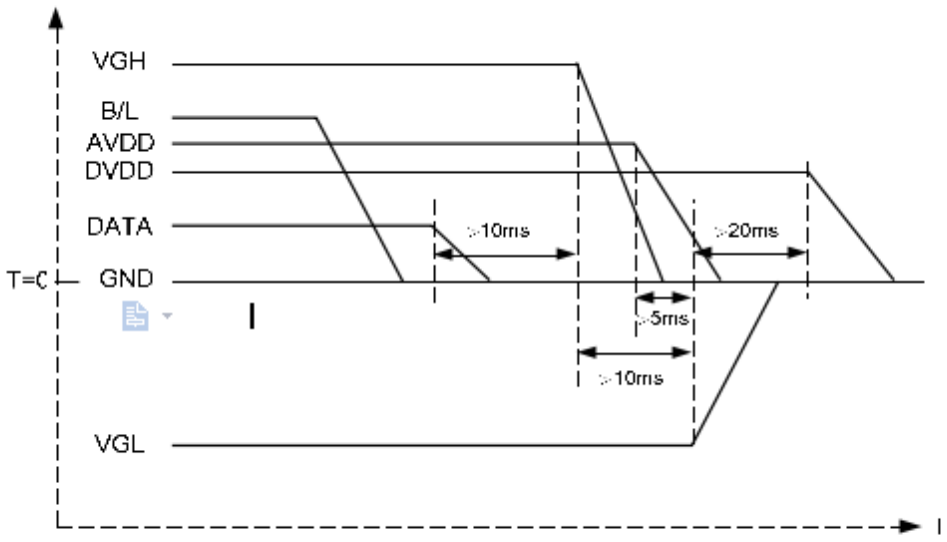
2. Power Sequence

a. Power on:



DV_{DD}→VGL→VGH→Data→B/L

b. Power off:



B/L→Data→VGH→VGL→DV_{DD}

Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS,VS,DE.

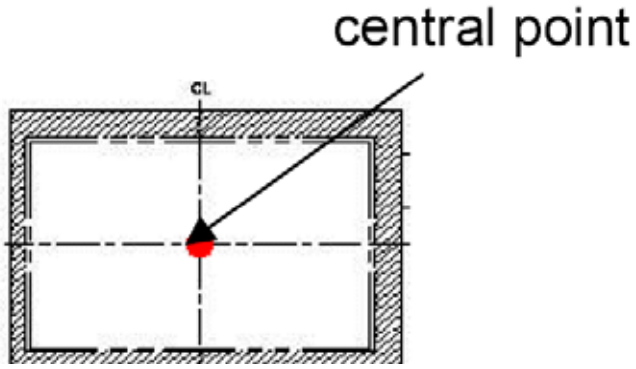
■CTP GENERAL SPECIFICATIONS

1. GENERAL SPECIFICATIONS

Composition: 7inch Capacitive Touch Panel (CTP).
Interface: I^2C for the CTP.

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	5	
Resolution	1024 x 600	dots
Outline Dimension	179.3(W) x 134.5(H) x 1.95(D)	mm
Sensor Active Area	154.6(W)(typ.) x92.4(H)(typ.)	mm
Transparency	≧85%	%
Haze	≦5.0%	%
Hardness	7H (typ.)[by JIS K5400]	Pencil hardness
Weight	TBD	g
Report rate	Max：122	Points/sec
Response time	15	ms
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. ABSOLUTE MAXIMUM RATINGS

Symbol	Description	Min	Typ	Max	Unit	Notes
VDD	Supply voltage	-0.3	-	6.5	V	
VIO	DC input voltage	-0.3	-	VDD+0.3	V	

3. ELECTRICAL CHARACTERISTICS

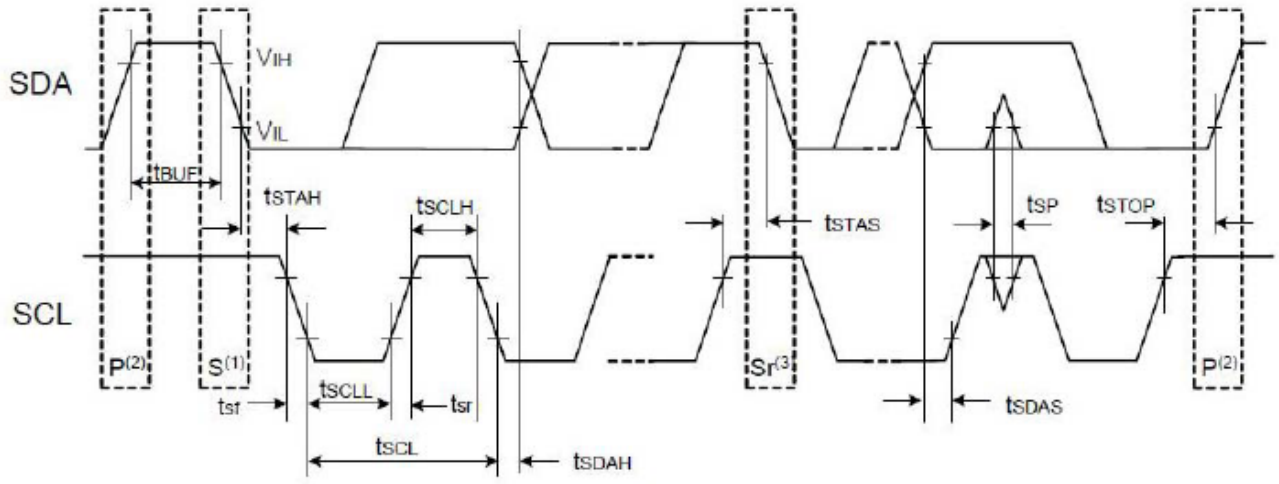
Symbol	Description	Fingers	F_{scan}(Hz)	Min	Typ	Max	Unit
VDD	Supply voltage			2.5	3.3	3.6	V
GND	Supply voltage			-	0	-	V
VIH	Input H voltage			0.8VDD	-	VDD	V
VIL	Input L voltage			0	-	0.2VDD	V
	System clock frequency					20	MHz
	CPU clock frequency					20	MHz
I	Active mode	1	280		-	4	mA
		2	160		-	5	mA
		3	90		-	5.2	mA
		4	80		-	5.4	mA
		5	75		-	5.6	mA
Isleep	Sleep mode	0	10		-	0.11	mA
	Deep sleep mode	-			-	50	uA
Ifreeze	Freeze mode	-			-	2	uA
	bootload	-			-	6.2	mA
	Calibration	-			-	6.2	mA

4. TIMING SPECIFICATIONS

4.1 CTP Interface and Data Format [Slave address is 0x5C (7 bit addressing)]

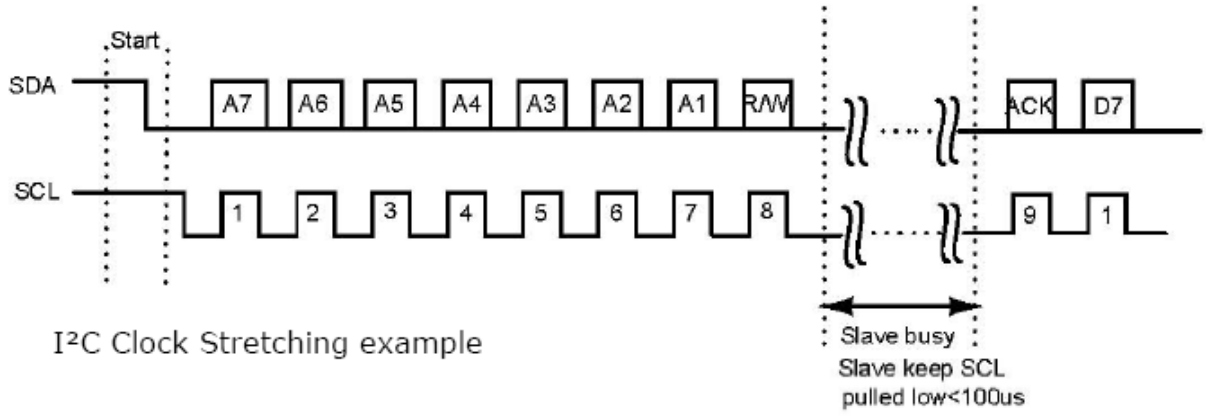
Communication protocol: I^2C

Clock frequency: 100 KHz (400 KHz Fast mode)



Note：(1) Start Condition ;(2)Stop Condition;(3)Retransmit start condition

Symbol	Description	Min	Max	Unit
tSCL	SCL input cycle time	12tcyc+600	-	ns
tSCLH	SCL input H width	3tcyc+300	-	
tSCLL	SCL input L width	5tcyc+500	-	
tSF	SCL, SDA input fall time		300	
tSP	SCL, SDA input spike pulse rejection time		1 tcyc	
tSUF	SDA input bus-free time	5tcyc		
tSTAH	Start condition input hold time	3tcyc		
tSTAS	Retransmit start condition input setup time	3tcyc		
tSTOP	Stop condition input setup time	3tcyc		
tSDAS	Data input setup time	1tcyc+40		
tSDAH	Data Input hold time	10		



I²C Clock Stretching example

The protocol for data exchange has been designed with the following considerations
1 Most of the data traffic is read operation to get the finger or fingers position
2 Read operations do need an initial write operation.
3 Write operations are most of the time power management and interrupt setting instructions
4 Interrupt pulse width setting adjustments need a write operation.

S	START
P	STOP
A	Acknowledge
N	No acknowledge
W	WRITE
R	READ
DATA	8-bit

From slave to Master	From Master to Slave

4.2 Timing Characteristic

Read Operation

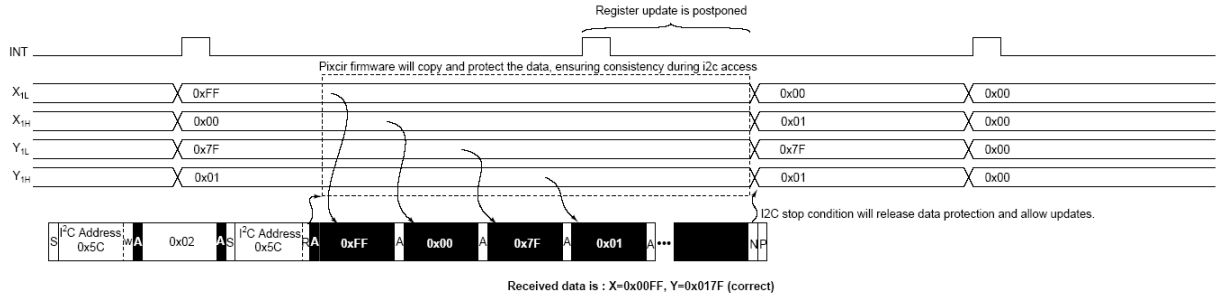
Read packets have variable content length, decided by the host. It is available to do a single read operation or a sequential read operation. Therefore, the beginning register address is needed to set before a read operation. And the data sent exactly follow the register table 9, table 11, table 12, and table 15. And, the firmware in the slave will use a memory copy of the register for I2C slave read operation, so that firmware can continue updates, and I2C slave is still using a consistent (but old) coordinates for read operation as below,

Read operation

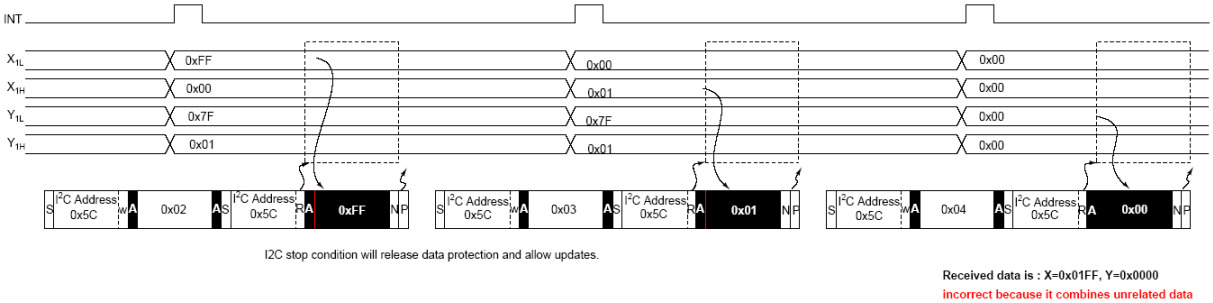
In a sequential read operation, the first data sent by the MSI device is therefore the touching register, and then the X and Y coordinates of the first finger, then 2nd finger, 3rd finger, 4th finger and then coordinates of the 5th finger, and so on. Refer in below,

Coordinates read operation

If the host does not finish the read operation when the INT line is set again, the slave firmware will delay to update coordinates registers for I²C read operation until the host finish the read operation referred to below



I²C stop condition will release data protection and allow the slave firmware update the coordinates registers for I²C read operation. So, the host has the change to give incorrect data when it gets the coordinates data with single read operation. Because the host sends many times for I²C stop condition in each multi-fingers coordinate's position reading, it will give the slave firmware chance to update the coordinates registers for I²C read operation, the host will give a combine unrelated data combines new and old coordinates together, referred to below

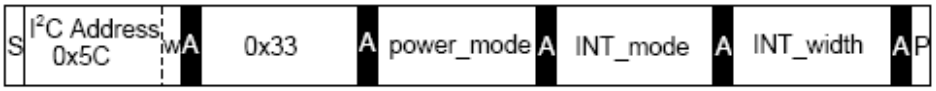


Coordinates read operation explanation

Write Operation

Write packets have variable content length, decided by the host. Write operation stops when host issues an I2C STOP symbol. The write packet is illustrated in below. Following the I2C device address, the first byte of the write packet is always the destination register address, referred in table 9, table 11, table 12, and table 15. Subsequent data values are written at the register pointed by the address, immediately upon reception of the byte. The address counter is automatically incremented. Subsequent data bytes are treated in continuation of the writing operation.

Write operation.



Write mode setting operation .

Note1：MSI Registers

Address	Type	Name	Description	Category
0	char	touching	Bitfield, see table 10	touch
1	char	buttons	Buttons bitfield	
2 (lsb) 3 (msb)	int	posx1	Finger #1 X position	
4 (lsb) 5 (msb)	int	posy1	Finger #1 Y position	
6	char	id1	Finger #1 identificator	
7 (lsb) 8 (msb)	int	posx2	Finger #2 X position	
9 (lsb) 10 (msb)	int	posy2	Finger #2 Y position	
11	char	id2	Finger #2 identificator	
12 (lsb) 13 (msb)	int	posx3	Finger #3 X position	
14 (lsb) 15 (msb)	int	posy3	Finger #3 Y position	
16	char	id3	Finger #3 identificator	
17 (lsb) 18 (msb)	int	posx4	Finger #4 X position	
19 (lsb) 20 (msb)	int	posy4	Finger #4 Y position	
21	char	id4	Finger #4 identificator	
22 (lsb) 23 (msb)	int	posx5	Finger #5 X position	
24 (lsb) 25 (msb)	int	posy5	Finger #5 Y position	
26	char	id5	Finger #5 identificator	
27	char	strength1	Finger #1 strength	
28	char	strength2	Finger #2 strength	
29	char	strength3	Finger #3 strength	
30	char	strength4	Finger #4 strength	
31	char	strength5	Finger #5 strength	

Bit 0,1,2	Nb of fingers touching (NBF)
Bit 3	Noise flag (indicates the report is unreliable) (NOI)
Bit 4	message flag (indicates a message string is sent by slave) (MSG)
Bit 5	buffer indicates the master has missed more than 2 reports, which are stored in buffer array (BUF)
Bit 6	palm flag (indicates the algorithm has a palm or similar blocking issue) (PAL)
Bit 7	water flag, indicates the algorithm has a rejected inputs due to water (WAT)

Address	Type	Name	Description	Category
32 (lsb) 33 (msb)	int	initial_distance	Distance separating fingers on the first time multitouch is detected	gesture
34 (lsb) 35 (msb)	int	distance	Distance separating fingers	
36 (lsb) 37 (msb)	int	ratio	100·distance / initial_distance	
38	char	water_level		monitor
39	char	noise_level		
40	char	palm_level		
41	char	signal_x		
42	char	signal_y		
43 50	char	button1 button8	Signal level of the buttons	buttons
51	char	power_mode	Power management register. See §2.2.3 and table 16	power management
52	char	INT_mode	Control of the ATTb pin, see §2.2.4 and table 17	
53	char	INT_width	ATTb pulse width	
54-57	char		reserved for future use	
58	char	SPECOP	Special operation . See table 13	special operations
59 (lsb) 60 (msb)	int	EEPROM_read_addr	Address used during special operation	
61	char	Engineering_cmd	Allows, with I²c, to send "hyperterminal like commands" for engineering modes	
62 (lsb) 63 (msb)	int	CRC	FLASH CRC value (must be requested by SPECOP), excluding "EEPROM" zone	version
64-95	char	version[0..31]	Customer version control (32bytes) (imap to "eeprom")	

96-135	char	message[0..39]	Null terminated ASCII message string for engineering and debug purpose	
136 (lsb) 137 (msb)	int	RAW_CTRL	Controls RAW data mode (internal, raw, etc. . .) see table 14	
138	char	cross_x	X coordinate for method 1 crossing node measurement request	method 1
139	char	cross_y	Y coordinate for method 1 crossing node measurement request	
140 (lsb) 142 (msb)	int	cross_node	Measurement result for method 1	
142 (lsb) 143 (msb) 144 (lsb) 145 (msb) etc.	int int int	RAW[0..69] shared with history_buffer	Raw data, content controlled by RAW_CTRL register, or alternatively, history buffer (see below)	RAW data

0	Normal operation
1	"EEPROM" read operation, start address must be written in EEPROM_read_addr
2	"EEPROM" write operation NOT IMPLEMENTED
3	Calibration
4	CRC checksum of the application in Flash

Bit 0 Bit 1	Choose function (0: history buffer, 1: RAW data, 2: system info) See table 15
Bit 2	Method (0 0r 1)
Bit 3	Show offset correction (and low-pass fiter for M0)
Bit 4	Show m0 sensitivity adjustment (bit3 must also be set)
Bit 5	M1 pattern small (0) or pattern large (1)
Bit 6	M1 sense direction (0:Y,1:X)
Bit 7	M1 band scan. if 0, only report a single cross node. If 1,report a full X axis scan at RAW position
Bit 8	Disable Algorithm
Bit 9	Enable single shot RAW refresh, must be set to 1 and bit9 to 0. Auto back to 0 and bit9 to 1 after single shot is done
Bit 10	Refresh frozen after single shot is done when 1. Set to 0 to release the freeze and go back to normal refreshing
Bit 11	
Bit 12	
Bit 13	
Bit 14	
Bit 15	

Address	Type	Name	Description	Category
142	char	interval	Subsampling rate when filling the history buffer. Disable: 0. Keep all points: 1. Keep one out of two: 2. Etc.	history buffer
143	char	buffer_level	Number of fingers report in the buffer	
144 (lsb) 145 (msb)	int	posx	Coordinate X of the reported point, at time=0	
146 (lsb) 147 (msb)	int	posy	Coordinate Y of the reported point, at time=0	
148 (lsb) 149 (msb)	int	posx	Coordinate X of the reported point at time=1	
150 (lsb) 151 (msb)	int	posy	Coordinate Y of the reported point at time=1	
...				
298 (lsb) 299 (msb)	int	posx	Coordinate X of the reported point, at time=19	
300 (lsb) 301 (msb)	int	posy	Coordinate Y of the reported point, at time=19	

4.3 Operating Mode Register

4.3.1 POWER_MODE Register

Address	Name	Description of POWER_MODE Register
7-4	IDLE_PERIOD[3-0]	Refer to ALLOW_SLEEP function description Idle_period_time = k * 16 * Active_scan_period_time [s]， with k = value of IDLE_PERIOD[3-0] Active_scan_period_time = duration [s] of a scan period in active mode.
3	-	Not used
2	ALLOW_SLEEP	Allow self demotion from active to sleep mode, provide that this flag is set. If the MSI device is in active mode and no fingers is detected for more than IDLE_PERIOD time, then it allow AUTO JUMP to sleep mode. If this flag is not set, the host must explicitly switch the device from active to sleep mode.
1-0	POWER_MODE[1-0]	Power mode setting of the MSI device: 00:Active Mode 01:Sleep Mode 10:Deep Sleep Mode 11:Freeze Mode

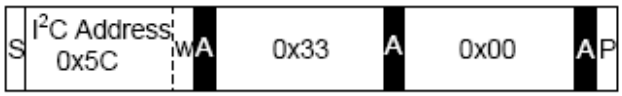
4.3.2 INT_MODE Register

Address	Name	Description
7-4	-	Not used
3	EN_INT	0:disable interrupt mode 1:enable interrupt mode
2	INT_POL	0:the interrupt is low active(default) 1:the interrupt is high active
1-0	INT_MODE[1-0]	00:INT assert periodically 01:INT assert only when finger moving 10:INT assert only when finger touch(default)

4.3.3 Power management

Active mode

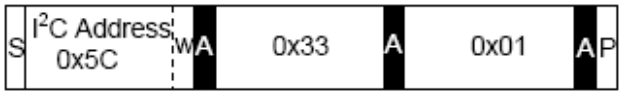
In this mode, the slave resumes with a new scan directly after each I²C transfer (after INT rising edge). This is used to reach the highest refresh rate, but also has the highest current consumption. Below shows how to force the slave into Active mode.



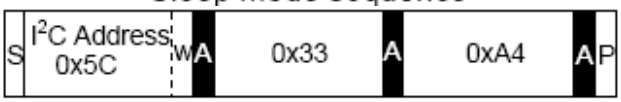
Active mode sequence

Sleep mode

This mode is selected to decrease the current consumption during low activity phases on the sensor, which need a lower refresh rate(10Hz). The MSI can automatically switch to Active mode(when finger is detected, provided that ALLOW_SLEEP bit is set in the POWER_MODE register) or by set POWER_MODE register. Also, the MSI can automatically switch from Active to Sleep mode when no finger is detected for more than IDLE_PERIOD time, provided that ALLOW_SLEEP bit is set in the POWER_MODE register. Figure 44 shows how to force the slave into Sleep mode. Below shows how to force the slave into Sleep mode can automatically switch, provided IDLE_PERIOD=10.



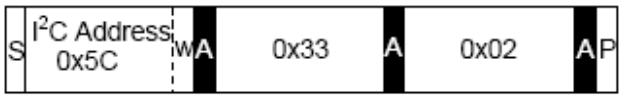
Sleep mode sequence



Sleep mode automatically switch sequence

Deep Sleep mode

This mode is selected to achieve the minimum consumption during very low activity phases on the sensor, which need a lowest refresh rate (1Hz). The MSI only can switch to Deep Sleep mode by set POWER_MODE register. Below shows how to force the slave into Deep Sleep mode.

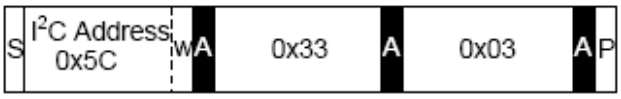


Deep Sleep mode sequence

Freeze mode

In this mode, the slave MCU internal clock source is stopped, and consumption is only MOS leakage. Below shows how to force the slave into Freeze mode. There are two ways to wake up from freeze mode.

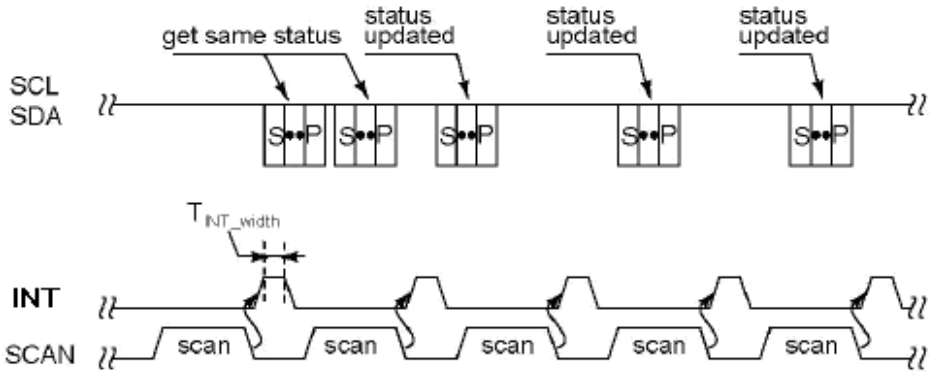
- RST pin pull down (connect to the Ground) (default)
- INT pin change (“1 to 0” or “0 to 1”)



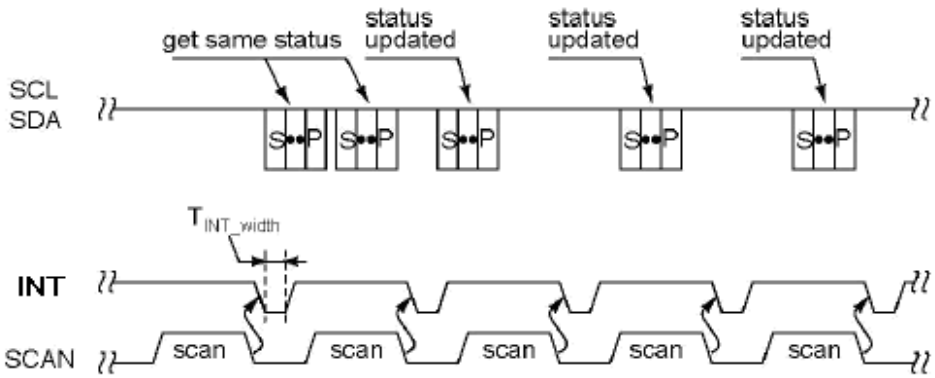
Freeze mode sequence

4.3.4 Transition of INT line

When INT_MODE=00 in the INT MODE register, the slave will set the INT line with INT_width pulse width after each scan in order to request the attention from the host, as shown in below

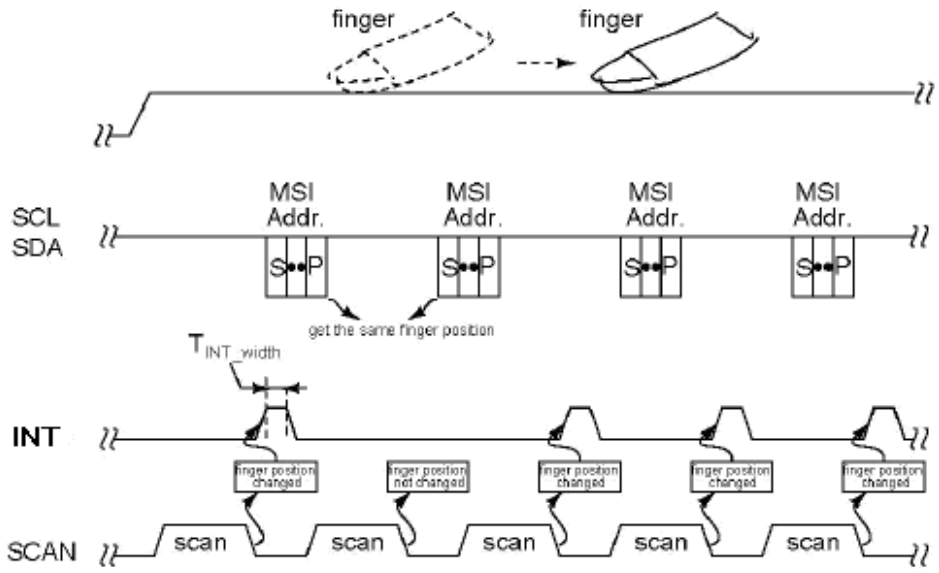


INT line pull up by slave (INT_POL=1, INT_MODE=00 in the INT mode register)



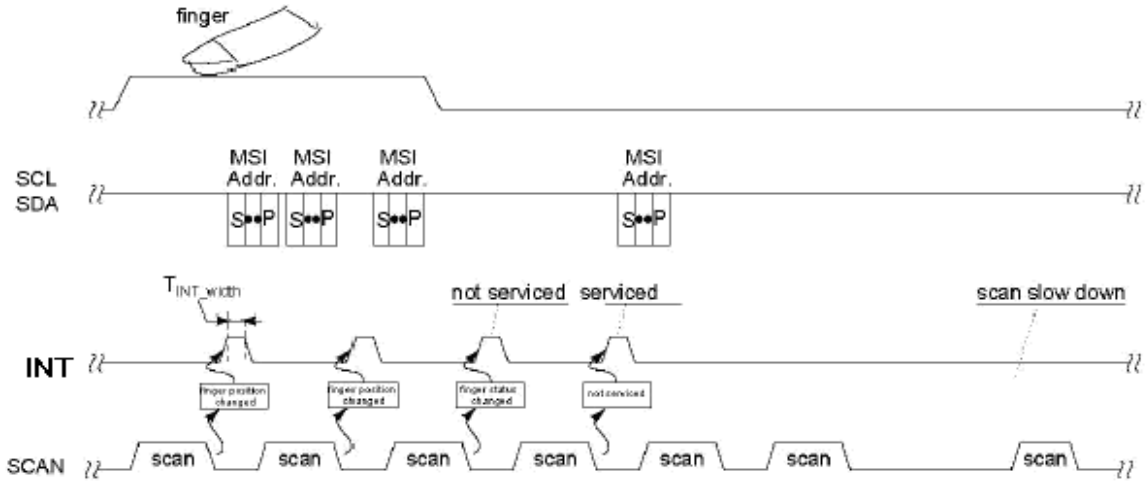
INT line pull down by slave (INT_POL=0, INT_MODE=00 in the INT mode register)

When INT_Mode=01 in the INT mode register and finger moving on the panel, the slave will set The INT line after each scan, as shown in below.



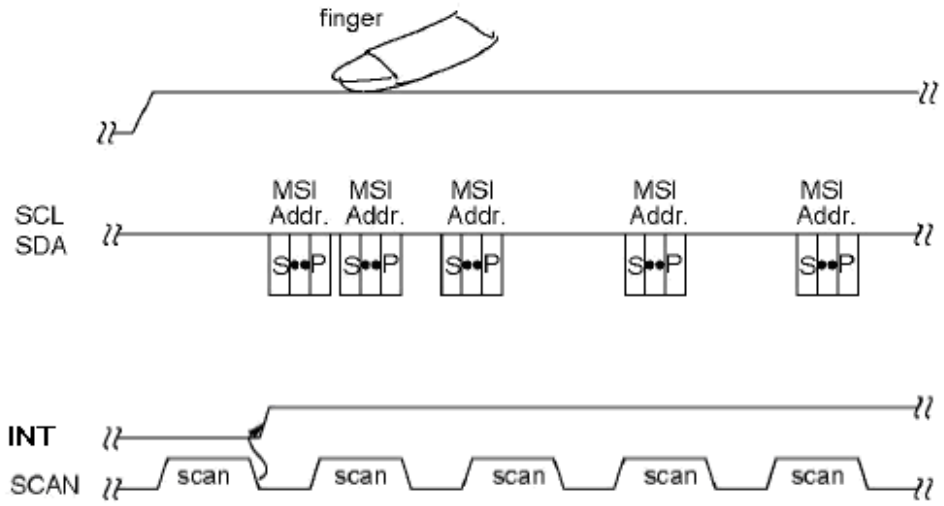
INT line pull up when finger moving (INT_POL=1, INT_MODE=01 in the INT mode register)

When fingers leaves the panel, the slave will continue to pulse INT line for each scan; but once the master has serviced this request and become now aware that there is no more finger touching, the slave will stop pulse the INT line, and will also gradually reduce the scan speed, as shown in below



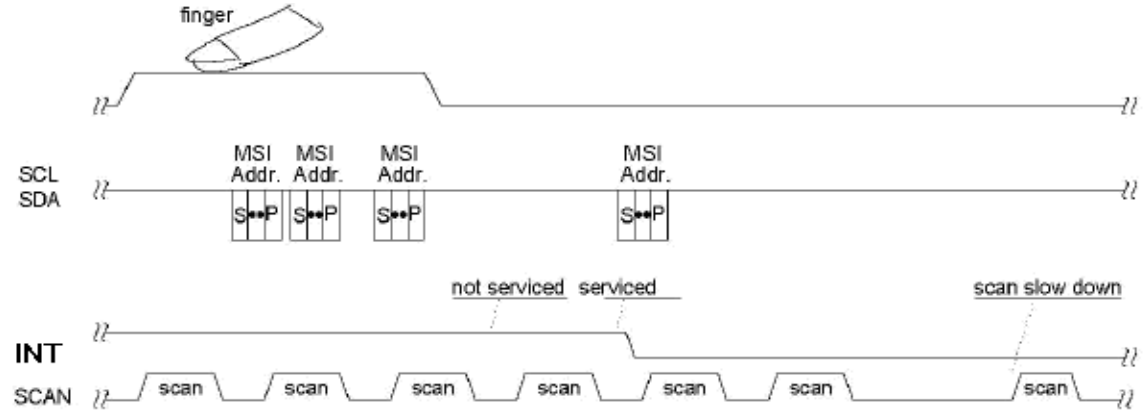
INT line will stop pulse when finger leaves and master has acknowledge the situation (INT_POL=1 in the INT mode register)

When INT_Mode=10 in the INT mode register and finger touch the panel, the slave will set The INT line after each scan as shown in below.



INT line pull up when finger touch (INT_POL=1, INT_MODE=10 in the INT mode register)

When fingers leaves the panel, the slave will continue keep INT line status for each scan; but once the master has serviced this request and become now aware that there is no more finger touching, the slave will release the INT line, and will also gradually reduce the scan speed, as shown in below

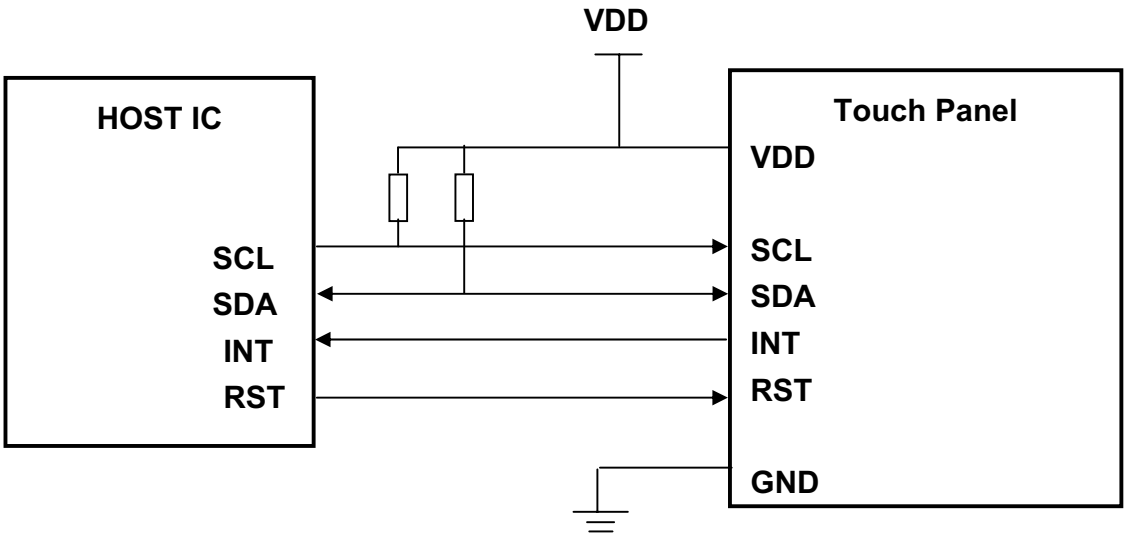


INT line will stop pulse when finger leaves and master has acknowledge the situation (INT_POL=1 in the INT mode register)

5. PIN CONNECTIONS

No.	Name	I/O	Description
1	VDD	P	Power; VDD=3.3V(typ.)
2	GND	P	Ground
3	RST	I	Reset
4	SCL	I	Clock; 100KHz
5	SDA	I/O	Serial data access
6	INT	O	Active low when data output from touch panel
7	NC	-	No Connect
8	NC	-	No Connect

6. BLOCK DIAGRAM



Note：1. USE APPROPRIATE RESISTOR VALUE DURING HIGH SPEED SCL CLOCK.
SUGGESTION : RESISTOR RECOMMENDATION：1K ohm.
2. To reduce the noise from the power, we suggest you use the independent power for the touch panel (VDD)

■ RELIABILITY TEST

No.	Test Item	Test Condition	Inspection after test
1	High Temperature Storage	80±2℃/240 hours	Note1,Note4
2	Low Temperature Storage	-30±2℃/240 hours	Note1,Note4
3	High Temperature Operating	70±2℃/240 hours	Note2,Note4
4	Low Temperature Operating	-20±2℃/240 hours	Note2,Note4
5	Temperature Cycle storage	-30±2℃~25~80±2℃×100cycles (30min.) (5min.) (30min.)	Note4
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours	Note4
7	Vibration Test	Frequency：10~55Hz Stroke:1.5mm Sweep: 10Hz~55Hz~10Hz 2hours for each direction of X.Y.Z (6 hours for total)	
8	Package drop test	Height:60 cm 1 corner,3 edges,6 surfaces	
9	ESD test	±2KV, Human body mode,100pF	
10	Mechanical shock	100G 6ms,±X, ±Y,±Z 3 times for each direction	
11	Package vibration test	Random vibration :0.15G*G/HZ from 5-200 HZ,-6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total)	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel’ s surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test,the product only guarantees operation, but don’ t guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature.

■ INSPECTION CRITERION

OUTGOING QUALITY STANDARD	PAGE 1 OF 8
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

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

1. Sample plan

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

Major defect: AQL 0.65

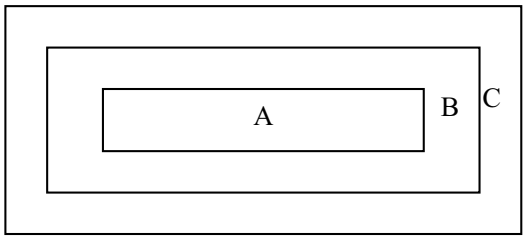
Minor defect: AQL 1.5

2. Inspection condition

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

3. Definition of Inspection Item.

3.1 Definition of inspection zone in LCD.



Zone A: character/Digit area

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

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

ZoneB+ZoneC= Around opaque edge area on TP.

Fig.1 Inspection zones in an LCD.

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

3.2 Definition of some visual defect

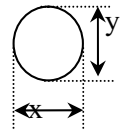
Bright dot.	Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Dark dot.	Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture, or pure whiter picture.
Dark / Bright Lines.	Lines on display which appear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

OUTGOING QUALITY STANDARD	PAGE 2 OF 8
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

4. Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Back-light no lighting, flickering and abnormal lighting.	Major
4.2	Missing	Missing component	
4.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
4.4	Crack	Creaks tend to break are not allowed.	

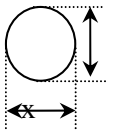
5. Minor Defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td>5.1</td><td>Bright dot. defect.
 

Φ=(x+y) /2</td><td>
<table>
<tr><th rowspan="2">Zone
Size(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.15</td><td colspan="2">Acceptable (clustering of spot not allowed)</td><td rowspan="3">Acceptable</td></tr>
<tr><td>0.15＜Φ≤0.25</td><td colspan="2">N≤6.</td></tr>
<tr><td>0.25＜Φ≤0.50</td><td colspan="2">N≤2</td></tr>
</table>
</td><td rowspan="3">Minor</td></tr>
<tr><td>5.2</td><td>Dark dot defect.</td><td>
<table>
<tr><th rowspan="2">Zone
Size(mm)</th><th colspan="3">Acceptable Q’ty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.15</td><td colspan="2">Acceptable</td><td rowspan="3">Acceptable</td></tr>
<tr><td>0.15＜Φ≤0.30</td><td colspan="2">N≤6</td></tr>
<tr><td>0.30＜Φ≤0.50</td><td colspan="2">N≤4</td></tr>
</table>
</td></tr>
<tr><td>5.3</td><td>Bright / Dark line.</td><td>0.01 ＜ W ≤ 0.10, 0.30 ＜ L ≤ 1.50, N≤1</td><td>Acceptable</td></tr>
</table>

Note: 1. Total defective dots shall not exceed 6 pcs.
2. Minimum distance between defective dots is more than 5mm.
3. 2 Adjacent dark sub pixel defect or bright sub pixel defect is not more than 1pair.
4. W: Width, L: Length, N: Count.

OUTGOING QUALITY STANDARD	PAGE 3 OF 8
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td>5.4</td><td>Linear defect
Foreign material under polarizer,</td><td>
<table>
<tr><td colspan="2">Size(m)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">Zone</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Ignore</td><td>W≤0.05</td><td colspan="2">Acceptable</td><td rowspan="3">Acceptable</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.15</td><td colspan="2">N≤5</td></tr>
<tr><td>5.0≤L</td><td>0.15≤W</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td></td><td>Circular Defect,
Foreign material under polarizer,
 
Φ=(x+y) /2</td><td>
<table>
<tr><td rowspan="2">Zone
Size(mm)</td><td colspan="3">Acceptable Q’ty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.25</td><td colspan="2">Acceptable</td><td rowspan="3">Acceptable</td></tr>
<tr><td>0.25＜Φ≤0.50</td><td colspan="2">N≤4</td></tr>
<tr><td>0.50≤Φ</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>5.5</td><td>Polarizer defect.</td><td>5.4.1 Polarizer Position
(i) Shifting in position should not exceed the glass outline dimension.
(ii) Incomplete covering of the viewing area due to shifting is not allowed.
5.4.2 Dirt on polarizer
Dirt which can be wiped easily should be accepted.
5.4.3 Polarizer Nick & Dent
<table>
<tr><td rowspan="3">Sizes(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">Zone</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ＜0.25</td><td colspan="2">Acceptable</td><td rowspan="3">Acceptable</td></tr>
<tr><td>0.25≤Φ≤0.5</td><td colspan="2">N≤4</td></tr>
<tr><td>Φ＞0.5</td><td colspan="2">0</td></tr>
</table>
</td><td>Minor</td></tr>
</table>

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5. Minor Defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="2">5.6</td><td rowspan="2">Polarizer defect</td><td>5.4.4Air bubbles between glass & polarizer:
<table>
<tr><td rowspan="3">Size(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td colspan="3">Zone</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.3</td><td colspan="2">Acceptable</td><td rowspan="4">Acceptable</td></tr>
<tr><td>0.3＜Φ≤1.0</td><td colspan="2">3</td></tr>
<tr><td>1.0＜Φ≤1.5</td><td colspan="2">1</td></tr>
<tr><td>Φ＞1.5</td><td colspan="2">0</td></tr>
</table></td><td>Minor</td></tr>
<tr><td>5.4.5 Polarizer scratch
(i) If the Polarizer scratch can be seen after cover assembling or in the operating condition, judge by the line defect of 5.4.
(ii) If the Polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following.
<table>
<tr><td colspan="2">Size(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">Zone</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Ignore</td><td>W≤0.02</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>1.0＜L≤5.0</td><td>0.02＜W≤0.2</td><td colspan="2">N≤4.</td></tr>
<tr><td>5.0＜L</td><td>0.2＜W</td><td colspan="2">0</td></tr>
</table></td><td>Minor</td></tr>
</table>

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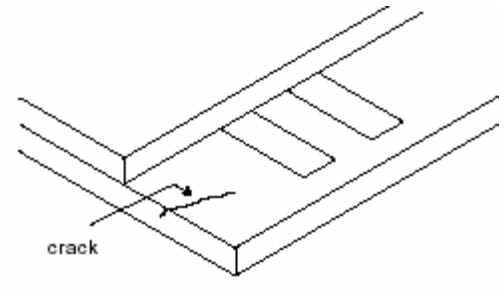
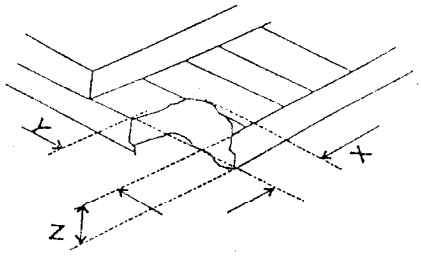
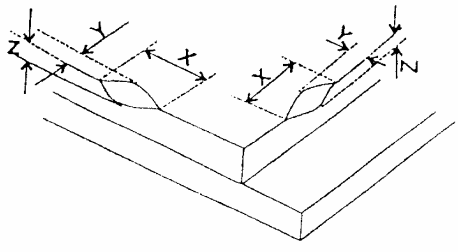
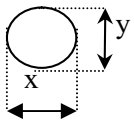
5. Minor Defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="3">5.7</td><td rowspan="3">Glass defect</td><td>(i) Crack
Cracks are not allowed.
 
</td><td>Minor</td></tr>
<tr><td>(ii) TFT chips on corner
 

<table><tr><th>X</th><th>Y</th><th>Z</th><th>Acceptable</th></tr><tr><td>≤3.0</td><td>≤3.0</td><td>Not more than the thickness of glass.</td><td>N≤3.</td></tr></table>Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.</td><td>Minor</td></tr>
<tr><td>(iii)Usual surface cracks
 

<table><tr><th>X</th><th>Y</th><th>Z</th><th>Acceptable</th></tr><tr><td>≤1.5</td><td>≤1.5</td><td>Not more than the thickness of glass.</td><td>N≤4.</td></tr></table>It is only applicable to the upper glass of LCD.</td><td>Minor</td></tr>
</table>

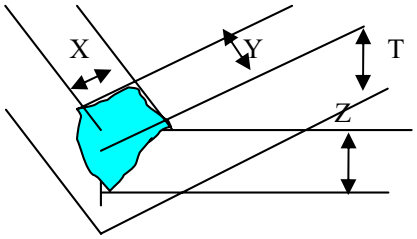
6. TP Cosmetic Defect.

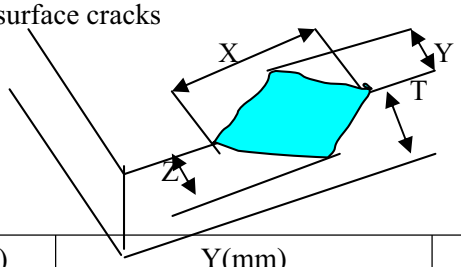
<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td>6.1</td><td>Black and white Spot defect Foreign Particle,</td><td>For dark/white spot, size Φ is defined as $\Phi = \frac{(x+y)}{2}$ 

<table>
<tr><th rowspan="2">Zone
Size(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B+C</th><th></th></tr>
<tr><td>Φ ≤0.15</td><td colspan="2">Ignore</td><td rowspan="4">distance 5mm over</td></tr>
<tr><td>0.15＜Φ ≤0.25</td><td colspan="2">6</td></tr>
<tr><td>0.25＜Φ ≤0.50</td><td colspan="2">4</td></tr>
<tr><td>Φ ＞0.5</td><td colspan="2">0</td></tr>
<tr><td colspan="4">Total defective dots shall not exceed 6 pcs on the same TP.</td></tr>
</table></td><td>Minor</td></tr>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td>6.2</td><td>Black line, White line, Scratch, Foreign material under film,</td><td>
<table>
<tr><th colspan="2">Size(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th rowspan="2">L(Length)</th><th rowspan="2">W(Width)</th><th colspan="3">Zone</th></tr>
<tr><th>A</th><th>B+C</th><th></th></tr>
<tr><td>Ignore</td><td>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="4">distance 5mm over</td></tr>
<tr><td>L≤5.0</td><td>0.03＜W≤0.05</td><td colspan="2">5</td></tr>
<tr><td>L≤5.0</td><td>0.05＜W≤0.1</td><td colspan="2">2</td></tr>
<tr><td></td><td>0.1＜W</td><td colspan="2">0</td></tr>
</table></td><td>Minor</td></tr>
</table>

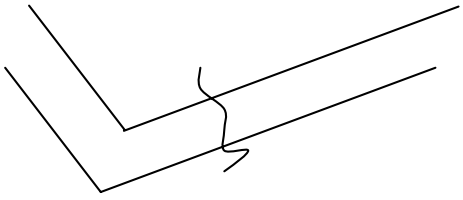
OUTGOING QUALITY STANDARD	PAGE 7 OF 8
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

6. TP Cosmetic Defect

<table>
<tr><th>Item No</th><th>Items to be inspected</th><th>Inspection Standard</th><th>Classification of defects</th></tr>
<tr><td rowspan="2">6.3</td><td rowspan="2">TP defect
,</td><td>(i) Chips on corner
 

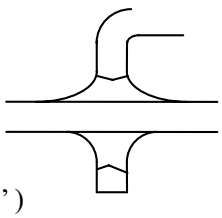
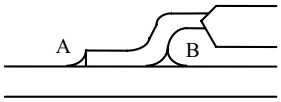
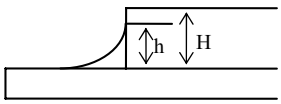
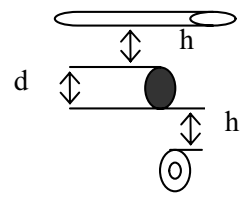
<table>
<tr><th>X(mm)</th><th>Y(mm)</th><th>Z(mm)</th></tr>
<tr><td>≤3.0</td><td>≤3.0</td><td>Z<T</td></tr>
</table>
(ii)Usual surface cracks
 

<table>
<tr><th>X(mm)</th><th>Y(mm)</th><th>Z(mm)</th></tr>
<tr><td>≤6.0</td><td><2.0</td><td>Z<T</td></tr>
</table></td><td>Minor

Minor</td></tr>
<tr><td>(iii) Crack
Cracks tending to break are not allowed.
  </td><td>Major</td></tr>
<tr><td>6.4</td><td>Total number of dots</td><td>The total number of luminous dots, dark dots, contamination particles, bubbles, scratch defects, pinholes must not exceed 10 /piece on the same TP.</td><td></td></tr>
</table>

OUTGOING QUALITY STANDARD	PAGE 8 OF 8
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

7. **Module Cosmetic Criteria**

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

■ 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

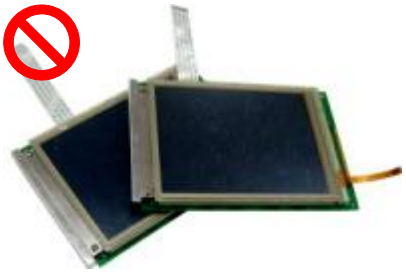
2.1 LCM is easy to be damaged. Please note below and be careful for handling.

2.2 Correct handling:

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

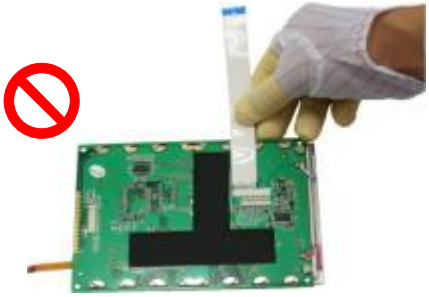
2.3 Incorrect handling:

Please don't touch IC directly.

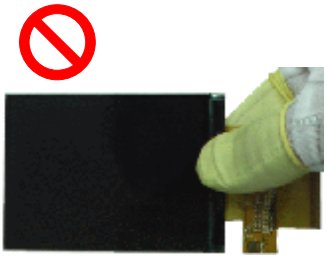


Please don't stack LCM.

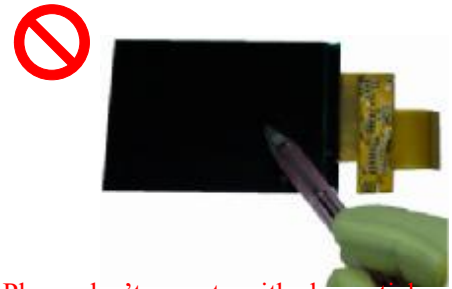
Please don't hold the surface of panel.



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 Transportation Precautions

3.2.1 During shipment, please handle with care. The packaging bag can not be broken, step on trap. Packaging Carton layer height can not be over two meters.

3.2.2 The transportation process should pay attention to the waterproof and moisture-proof measures. Product can not be watering. Ethylene sealed bags can not be unsealed.

3.3 Others

3.3.1 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.

3.3.2 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.

3.3.3 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.

3.3.3.1 - Exposed area of the printed circuit board.

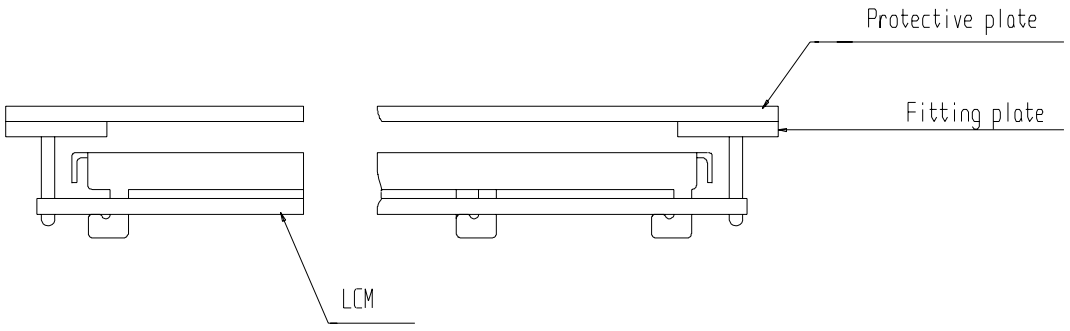
3.3.3.2 -Terminal electrode sections.

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.

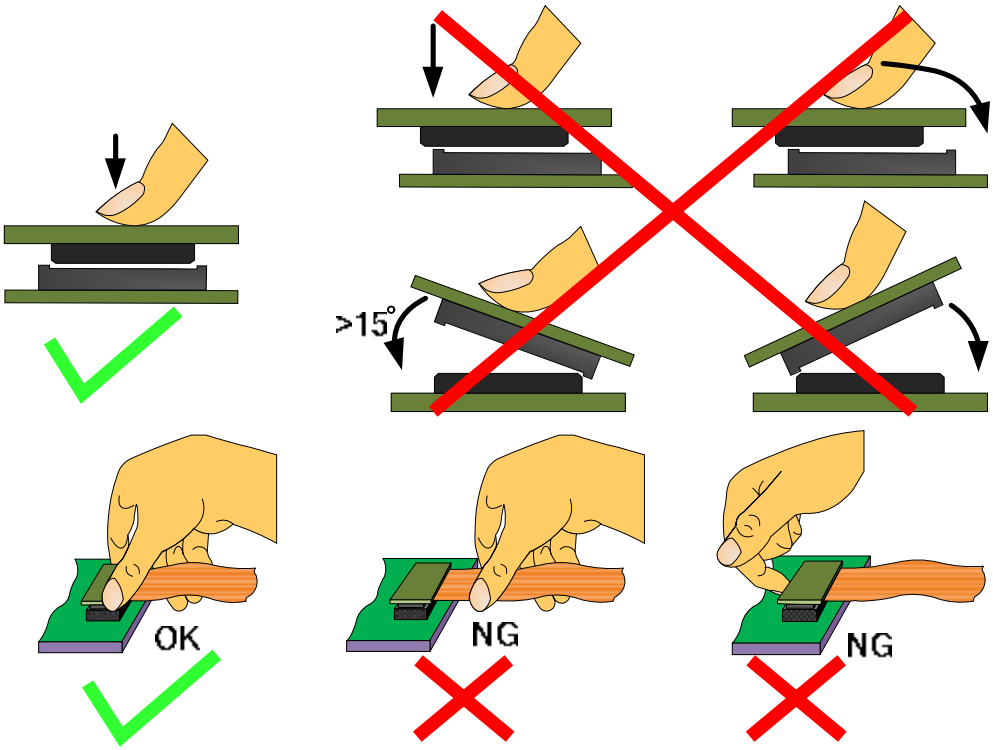
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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 : 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

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.