MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI0570ET-8

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	2013-11-20
	Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-11-20	Preliminary Specification Release	

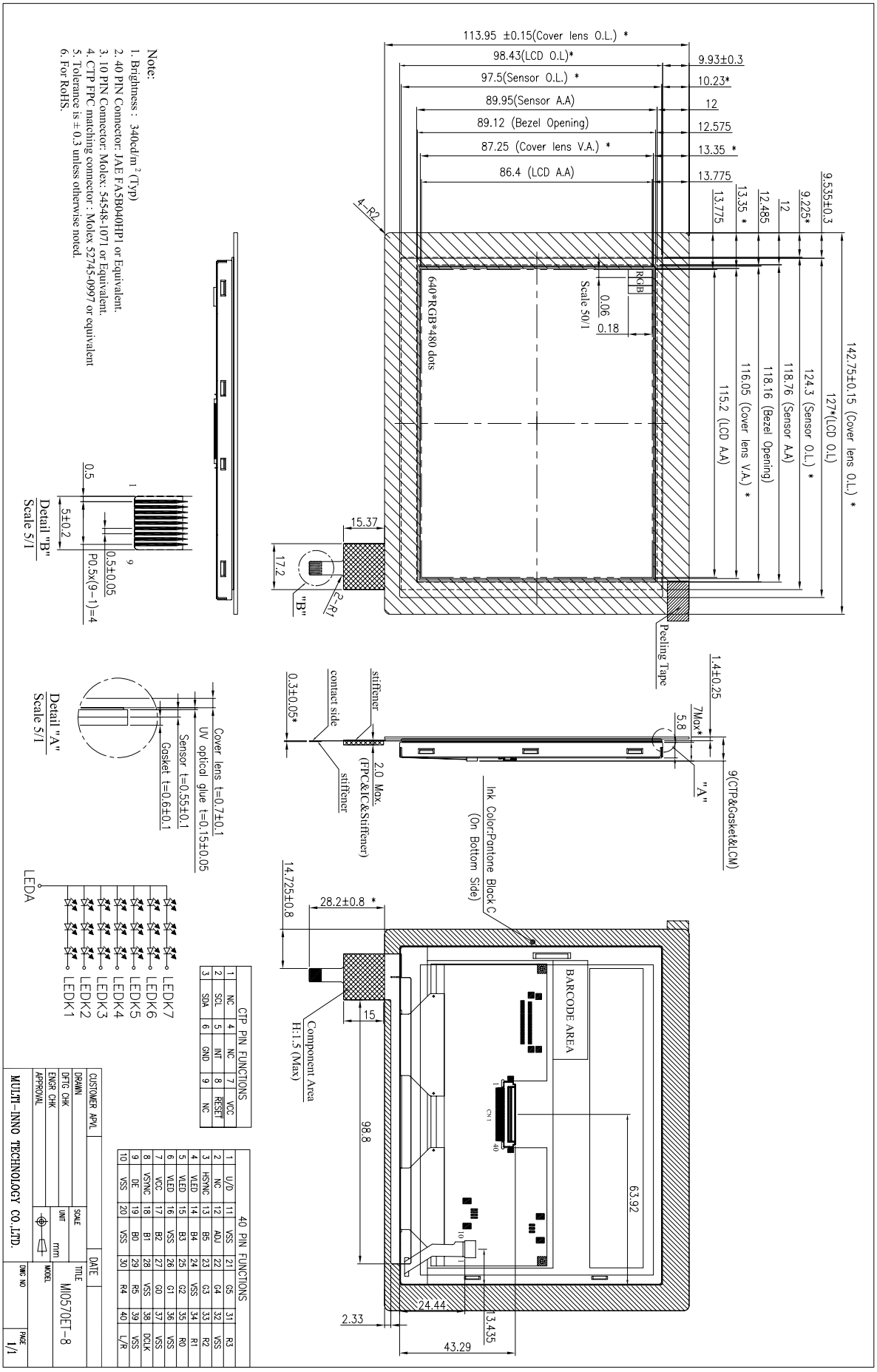
CONTENTS

■ GENERAL INFORMATION

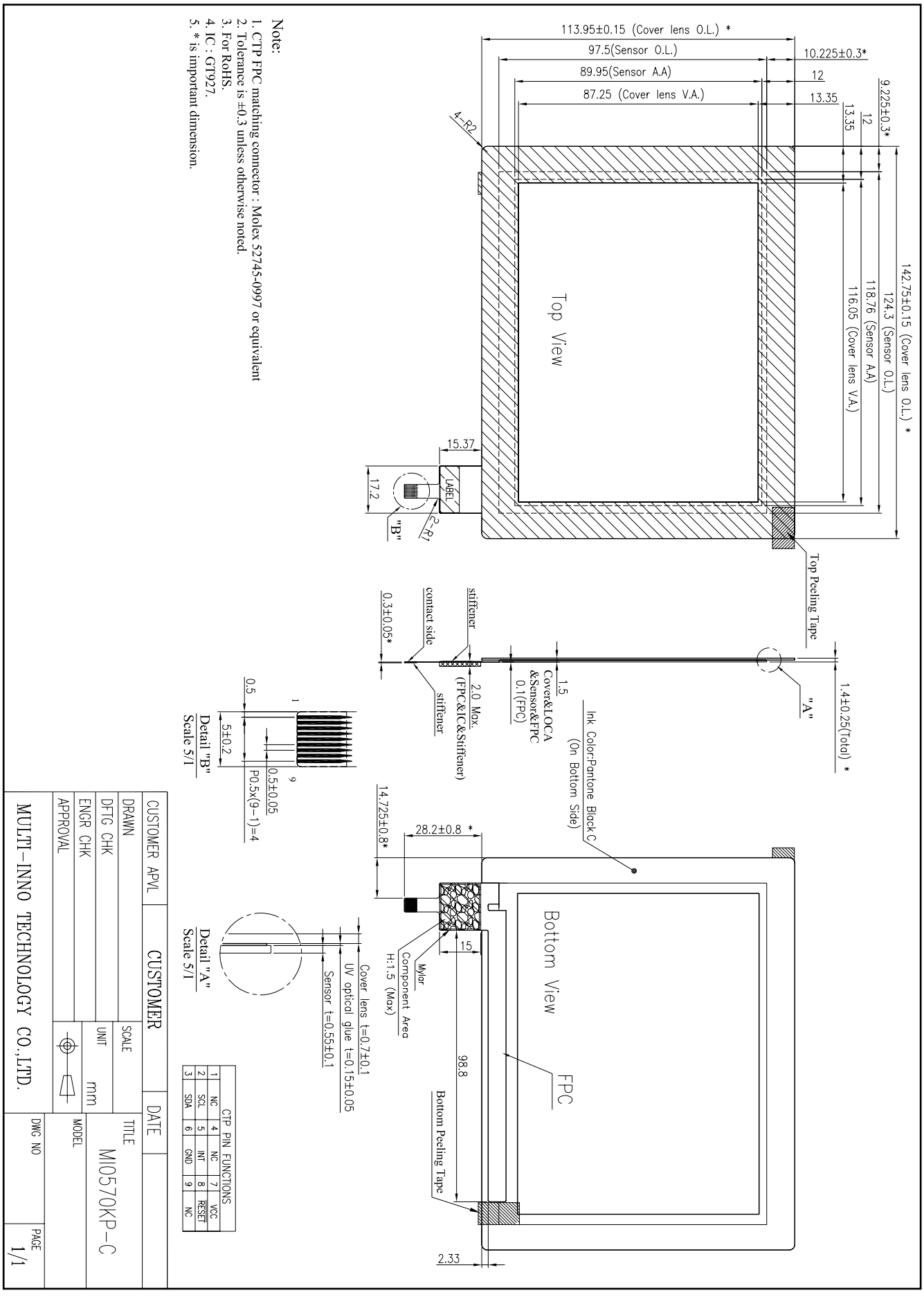
Item	Contents	Unit
LCD type	TFT	/
Size	5.7	Inch
Viewingdirection	6:00(without image inversion and least brightness change)	O' Clock
Gray scale inversion direction	12:00(contrast peak located at)	O'Clock
LCM (W × H × D)	142.75×113.95×9.00	mm^3
Active area (W×H)	115.20×86.40	mm^2
Dot pitch (W×H)	0.06×0.18	mm^2
Number of dots	640 (RGB) × 480	/
Backlight type	21 LEDs	/
Driver IC	Gate:HX8628A Source:HX8250-A	/
CTP IC	GT927	/
Interface type	RGB 18 bits	/
Color depth	262K	/
Color configuration	R.G.B stripe	/
Surface treatment	Clear	/
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



■ CTP OUTLINE DRAWING



■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Power supply voltage	VCC	-0.3	5.0	V
Logic input voltage	VI	-0.3	VCC+0.3	V
Operating temperature	TOP	-20	70	°C
Storage temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max60°C)	RH

■ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit
Power supply voltage for LCD	VCC	3.0	3.3	3.6	V
Power supply current for LCD	ICC	-	111	140	mA
Power supply voltage for LED	VLED	4.5	5	5.5	V
Power supply current for LCD	I LED	-	333	400	mA
Ripple voltage	VRF	-	-	100	mVp-p
Input voltage ' H ' level	VIH	0.7VCC	-	VCC	V
Input voltage ' L ' level	VIL	0	-	0.3VCC	V
ADJ frequency	-	19K	20K	21K	Hz
ADJ input voltage	VIH	3.0	-	3.3	V
	VIL	0	-	0.3	V
LED life time	-	-	50,000	-	Hr

Note 1: The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ and ADJ = 3.3V.

■ELECTRO-OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark	Note
Response time		Tr+Tf	θ=0° ∅=0° Ta=25℃	-	50	-	ms	FIG 1.	4
Contrast ratio		Cr		200	300	-	---	FIG 2.	1
Luminance uniformity		δ WHITE		70	80	-	%	FIG 2.	3
Surface Luminance		Lv		300	340	-	cd/m^2	FIG 2.	2
Viewing angle range		θ	∅ = 90°	50	60	-	deg	FIG 3.	6
			∅ = 270°	30	40	-	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℃	0.565	0.615	0.665		FIG 2.	5
		y		0.310	0.360	0.410			
	Green	x		0.295	0.345	0.395			
		y		0.490	0.540	0.590			
	Blue	x		0.098	0.148	0.198			
		y		0.056	0.106	0.156			
	White	x		0.259	0.309	0.359			
		y		0.270	0.320	0.370			
Image sticking	-	tis	2 hours	-	-	2	Sec	-	8

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

$$\textbf{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels } (P_1, P_2, P_3, P_4, P_5)}{\text{Average Surface Luminance with all black pixels } (P_1, P_2, P_3, P_4, P_5)}$$

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 **$(P_1, P_2, P_3, P_4, P_5)$**

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.

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

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.

Note7. For Viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments. For contrast ratio, Surface Luminance, Luminance uniformity,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".

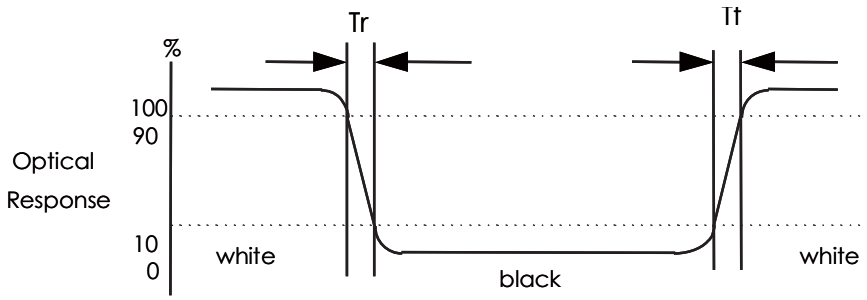
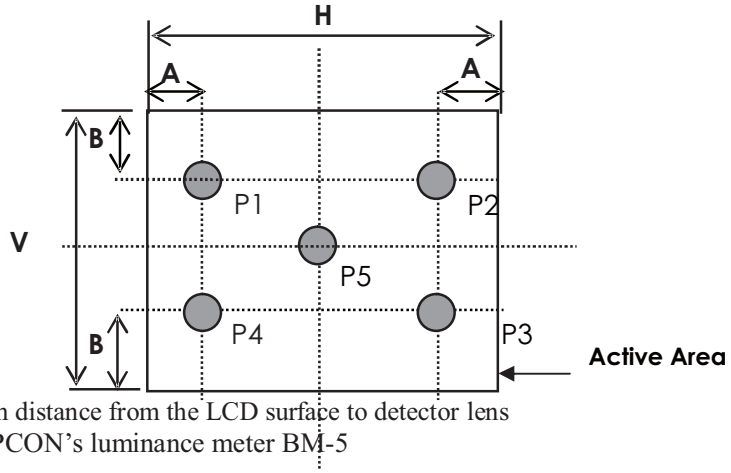
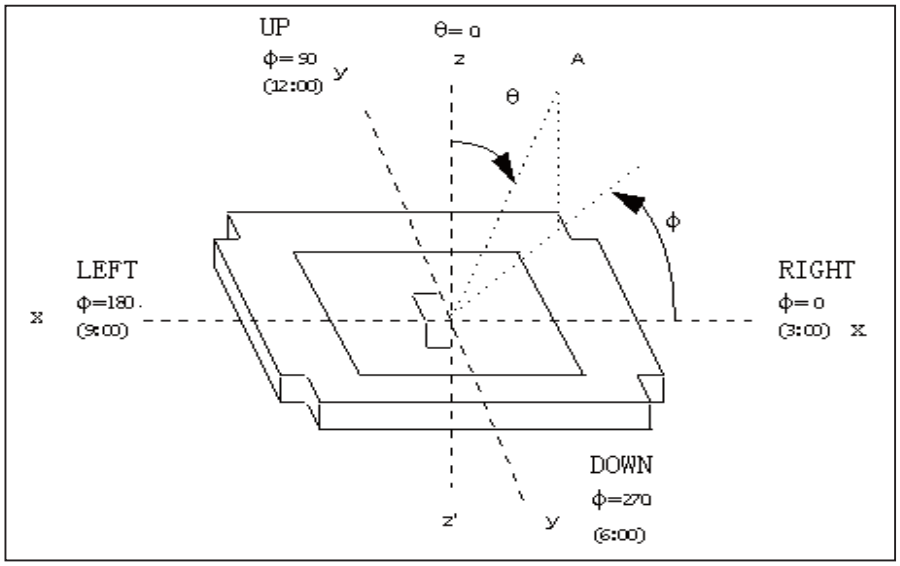


FIG. 2 Measuring method for Contrast ratio,surface luminance, Luminance uniformity , CIE (x, y) chromaticity



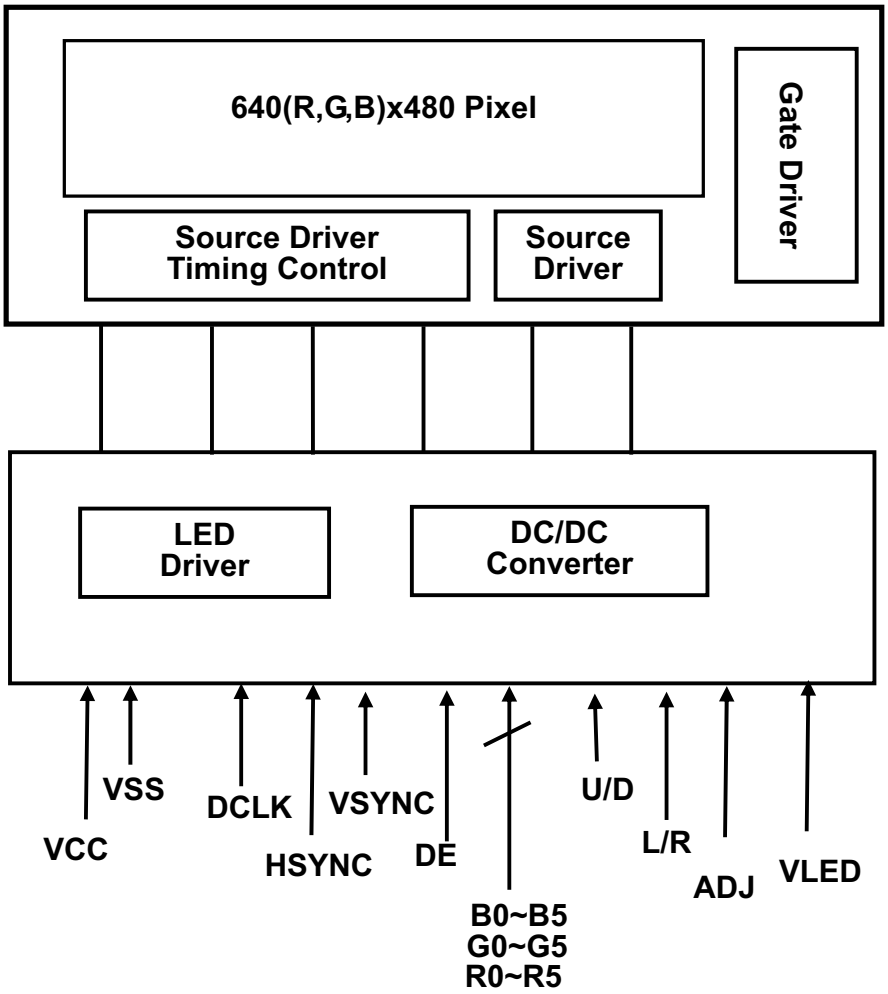
A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=7mm, 500mm distance from the LCD surface to detector lens measurement instrument is TOPCON's luminance meter BM-5

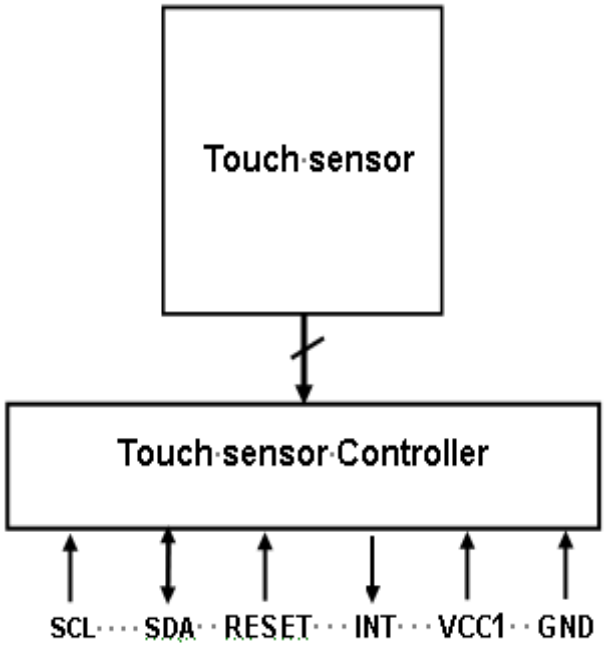
FIG. 3 The definition of viewing angle



■ INTERFACE DESCRIPTION

1. BLOCK DIAGRAM





2. PIN CONNECTIONS

Pin NO.	SYMBOL	DESCRIPTION
1	U/D	Up or Down Display Control
2	NC	No Connection
3	Hsync	Horizontal SYNC.
4	VLED	Power Supply for LED Driver circuit
5	VLED	Power Supply for LED Driver circuit
6	VLED	Power Supply for LED Driver circuit
7	Vcc	Power Supply for LCD
8	Vsync	Vertical SYNC.
9	DE	Data Enable
10	VSS	Power Ground
11	VSS	Power Ground
12	ADJ	Brightness control for LED B/L
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	Vss	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	Vss	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	Vss	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	Vss	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	Vss	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0
36	VSS	Power Ground
37	VSS	Power Ground
38	DCLK	Clock Signals ; Latch Data at the Falling Edge
39	Vss	Power Ground
40	L/R	Left or Right Display Control

Remarks：
1) ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
2) ADJ signal is 0~3.3V.Operation frequency is 20KHz
3) VSS PIN must be grounding, can not be floating.

4) U/D and L/R control Function

L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite，Up and Down opposite

5)If DE signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

8.1 Power Signal Sequence

Remarks:

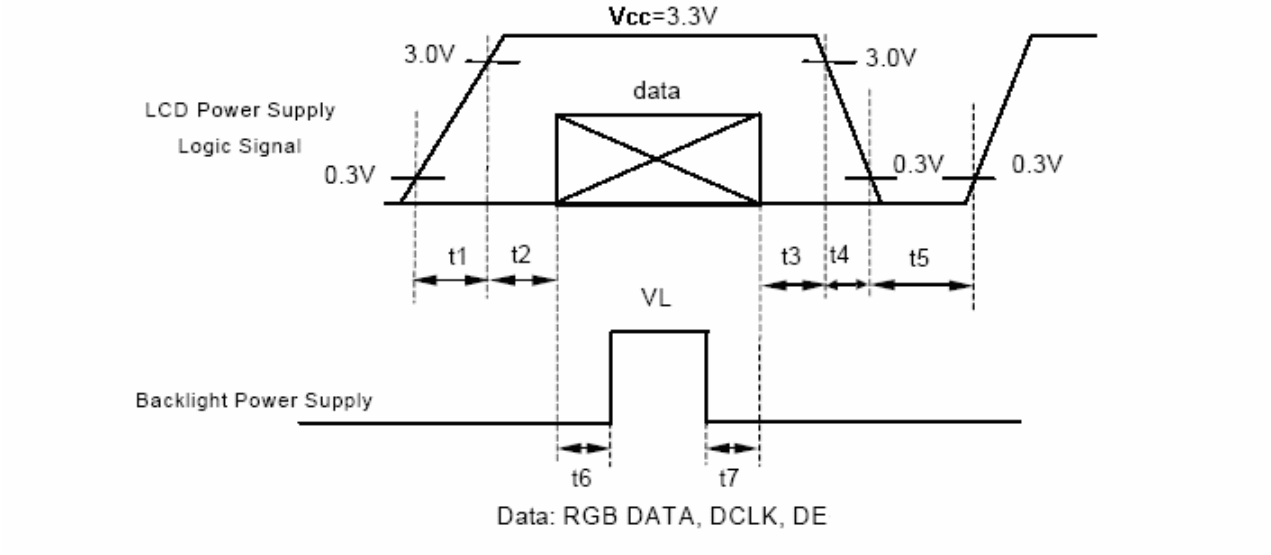
*1) Power Signal sequence:

t1 ≤10ms : 1 sec≤ t5

50ms≤ t2 : 200ms ≤t6

0<t3 ≤50ms: 200ms≤ t7

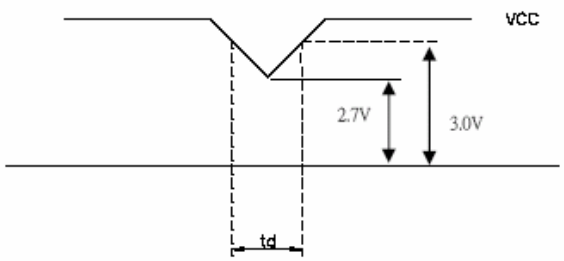
0<t4 ≤10ms



*2) VCC-dip condition:

(1) 2.7 V ≤VCC <3.0V,td ≤ 10 ms

(2) VCC＞3.0V,VCC-dip condition should be the same with VCC-turn-on condition。



■ APPLICATION NOTES

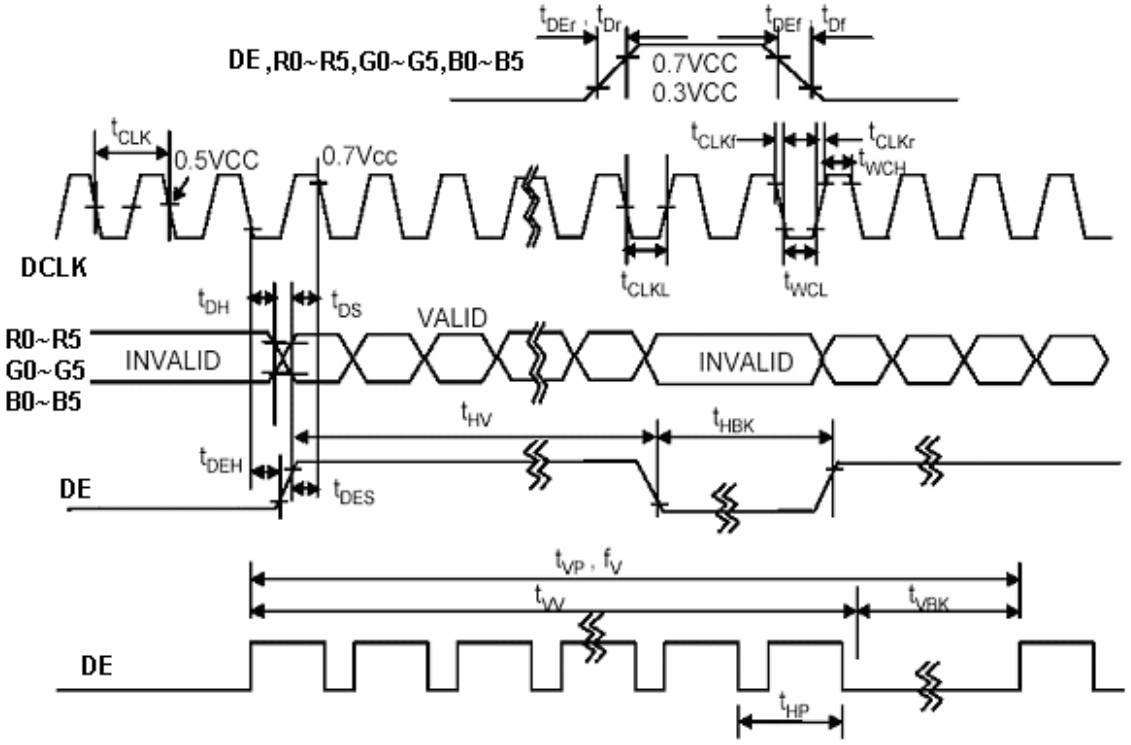
1. INTERFACE SPECIFICATIONS

1.1 DE mode Input signal characteristics

Signal	Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
DCLK	Period	t_{CLK}	33	40	43	ns	
	Frequency	f_{CLK}	23	25	30	MHz	
	Low Level Width	t_{WCL}	6	-	-	ns	
	High Level Width	t_{WCH}	6	-	-	ns	
	Rise, Fall Time	t_{CLKr}, t_{CLKf}	-	-	3	ns	
	Duty (1)	-	0.45	0.50	0.55	-	
DE (Data Enable)	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	10	-	-	ns	
	Rise, Fall Time	t_{DEr}, t_{DEf}	-	-	16	ns	
	Horizontal Period	t_{HP}	750	800	900	t_{CLK}	
	Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
	Horizontal Blank	t_{HBK}	110	160	260	t_{CLK}	
	Vertical Period	t_{VP}	515	525	560	t_{HP}	
	Vertical Valid	t_{W}	480	480	480	t_{HP}	
	Vertical Blank	t_{VBK}	35	45	80	t_{HP}	
	Vertical Frequency	f_{v}	55	60	65	Hz	
Data R,G,B	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	10	-	-	ns	
	Rise, Fall Time	t_{Dr}, t_{Df}	-	-	3	ns	

Note: (1) tCLKL / tCLK.

1.1 DE mode timing waveform



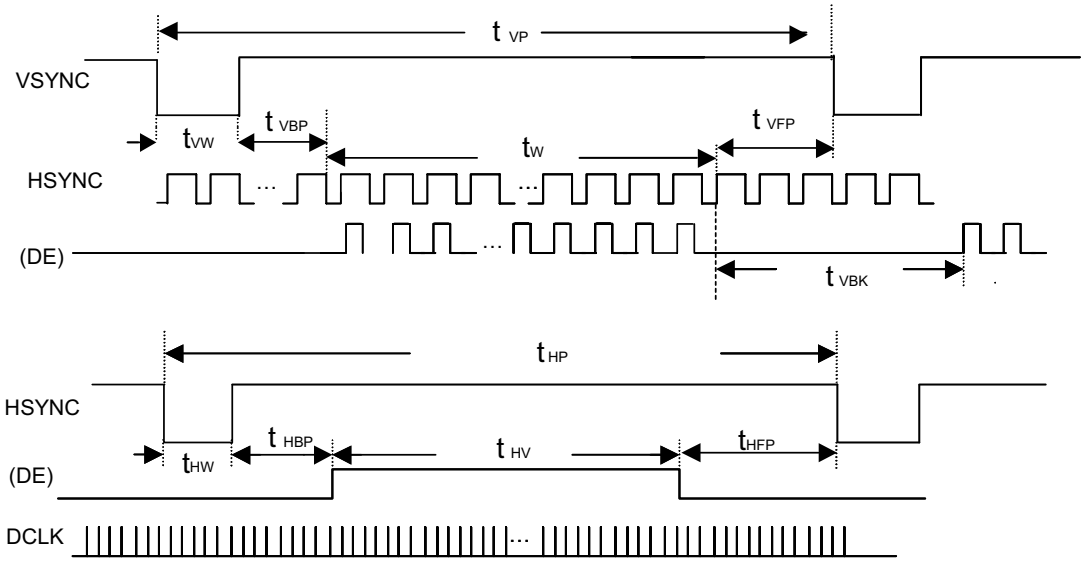
1.2 SYNC mode Input signal characteristics

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Clock Period	t_{CLK}	33	40	43	ns	
Clock Frequency	f_{CLK}	23	25	30	MHz	
Clock Low Level Width	t_{WCL}	6	-	-	ns	
Clock High Level Width	t_{WCH}	6	-	-	ns	
Clock Rise, Fall Time	t_{CLKr}, t_{CLKf}	-	-	3	ns	
HSYNC Period	t_{HP}	750	800	900	t_{CLK}	
HSYNC Pulse Width	t_{HW}	5	30	-	t_{CLK}	
HSYNC Front Porch	t_{HFP}	1	16	116	t_{CLK}	
HSYNC Back Porch	t_{HBP}	1	114	139	t_{CLK}	
HSYNC Width + Back Porch	t_{HW}+ t_{HBP}	144	144	144	t_{CLK}	
Horizontal Blank	t_{HBK}	1	160	260	t_{CLK}	
Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
VSYNC Period	t_{VP}	515	525	560	t_{HP}	
VSYNC Pulse Width	t_{VW}	1	3	5	t_{HP}	
VSYNC Front Porch	t_{VFP}	1	10	45	t_{HP}	
VSYNC Back Porch	t_{VBP}	30	32	34	t_{HP}	
VSYNC Width + Back Porch	t_{VW}+ t_{VBP}	35	35	35	t_{CLK}	
Vertical Blank	t_{VBK}	35	45	80	t_{HP}	
Vaild data Width	t_{W}	480	480	480	t_{HP}	
Data Setup Time	t_{DS}	5	-	-	ns	
Data Hold Time	t_{DH}	10	-	-	ns	

Note: (1) tHBK = tHFP + tHW + tHBP

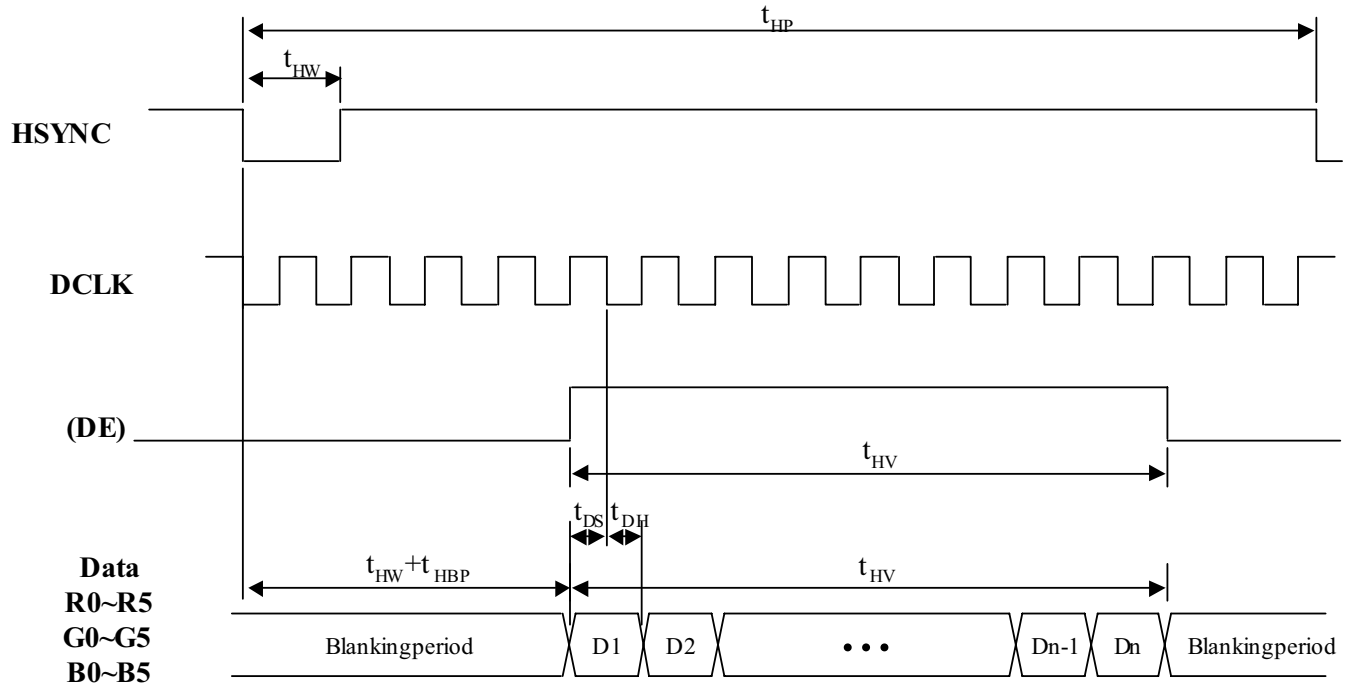
1.2.1 SYNC mode timing waveform

1.2.1.1 Input vertical timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

1.2.1.2 Input horizontal timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

1.3 Color Data Assignment

COLOR	INPUT	R DATA						G DATA						B DATA					
	DATA	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
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	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
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	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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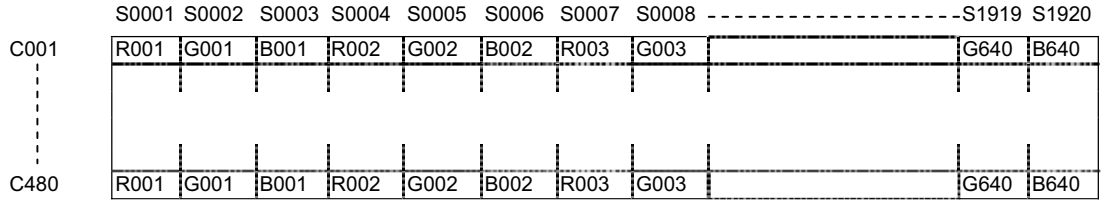
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Remarks:(1) Definition of Gray Scale
color(n):n is series of Gray Scale
The more n value is, the bright Gray Scale.
(2)Data:1-High,0-Low

Correspondence between Data and Display Position

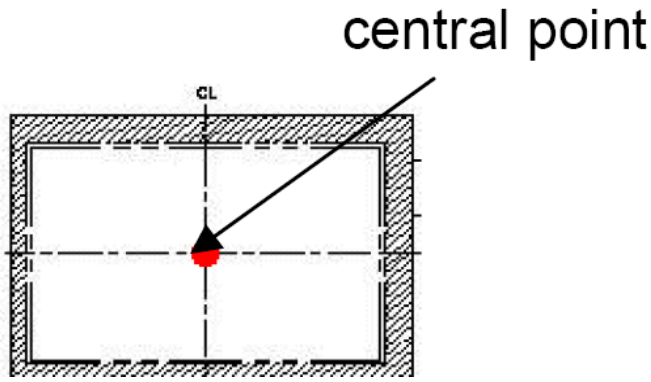


■ CTP GENERAL SPECIFICATIONS

1.1 CTP main feature

Item	Specification	Unit
Type	Transparent type projected capacitive touch panel	
Input mode	Human's finger	
Finger	10	
Sensor Active Area	118.76(W)(typ.) x89.95(H)(typ.)	mm
Transparency	≧85%	%
Haze	≦2.0%	%
Origin Point	The upper left corner	
Hardness	7H (typ.) [by JIS K5400]	Pencil hardness
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.



1.2 CTP Absolute Maximum Rating

Symbol	Description	Min	Typ.	Max	Unit	Notes
VCC1	Supply voltage	2.66	-	3.47	V	
VIO	DC input voltage	0	-	VCC1+0.3	V	

1.3 CTP Electrical Characteristics

Symbol	Description	Min	Typ	Max	Unit	Notes
VCC1	Supply voltage	2.8	-	3.3	V	
GND	Supply voltage	-	0	-	V	
I	Active mode	-	13	15	mA	
V_{IH}	Input H voltage	1.35	1.8	2.1	V	
V_{IL}	Input L voltage	-0.3	0	0.45	V	

1.4 CTP Pin Connections

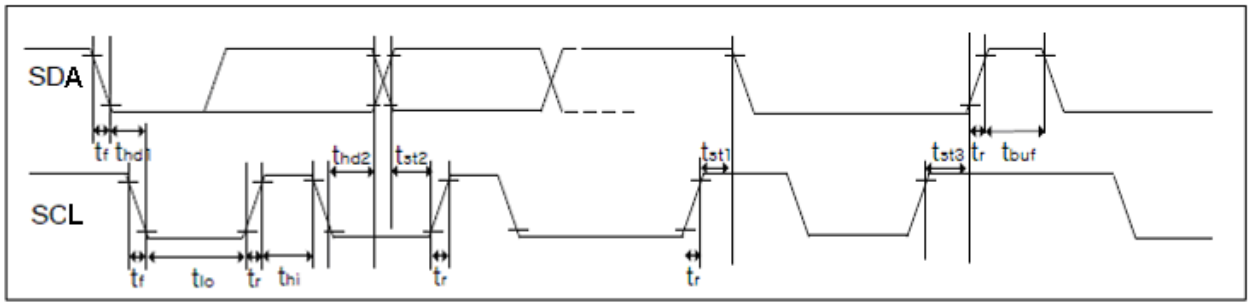
No.	Name	I/O	Description
1	NC	-	No connection
2	SCL	I	I^2C Clock
3	SDA	I/O	I^2C Data
4	NC	-	No connection
5	INT	O	Interrupt output
6	GND	P	Ground
7	VCC1	P	Power supply Voltage
8	/RESET	I	Reset active low
9	NC	-	No connection

1.5 CTP Interface and Data Format [Slave address is 0x5D(7 bit addressing)]

Communication protocol: I^2C

Clock frequency : 100Khz （400Khz Fast mode）

Below is timing of I2C hardware circuit:

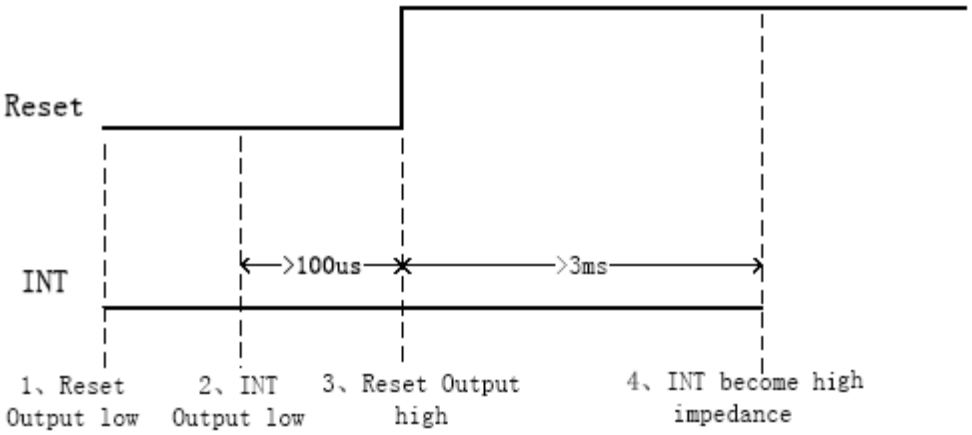


Test condition 1: 3.3V communication interface, 400Kbps, pull up resistor is 2K ohm

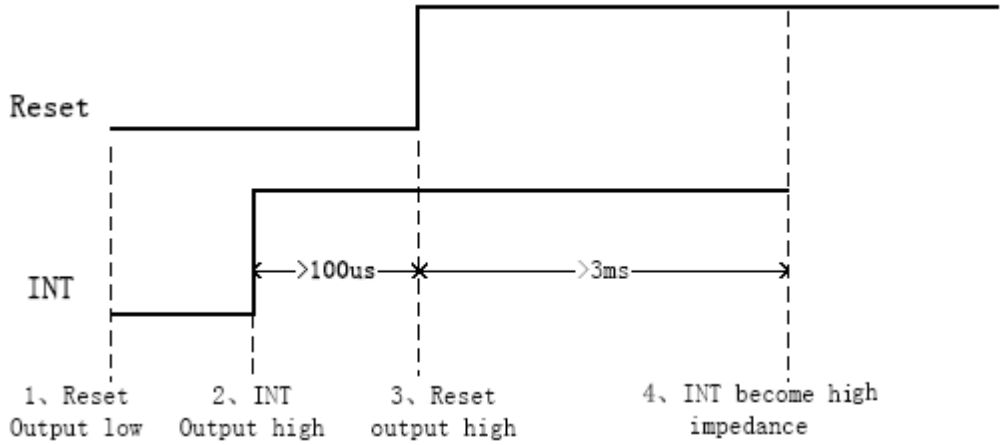
Parameter	Symbol	Min	Max	Unit
SCL low period	t_{lo}	0.9	0.9	us
SCL high period	t_{hi}	0.8	0.8	us
SCL setup time for START condition	t_{st1}	0.4	0.4	us
SCL setup time for STOP condition	t_{st3}	0.4	0.4	us
SCL hold time for START condition	t_{st1}	0.3	0.3	us
SDA setup time	t_{st2}	0.4	0.4	us
SDA hold time	t_{st2}	0.4	0.4	us

GT927 has 2 sets of slave address 0xBA/0xBB or 0x28/0x29. Master can control Reset & INT pin to configure the slave address the slave address in power on initial state like following:

1.5.1 Timing of setting slave address to 0xBA/0XBB:



1.5.2 Timing of setting slave address to 0x28/0X29:



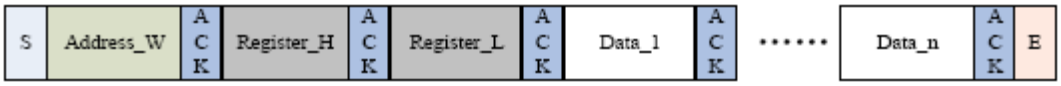
a) Data Transmission (ex: slave address is 0xBA/0xBB)
Communication is always initiated by master, A high-to-low transition of SDA with SCL high is a start condition.

All addresses words are serially transmitted to and from on bus in 8-bit words. GT927 sends a “0” to acknowledge when the address word is 0xBA/BB. This happens during the ninth clock cycle. If the slave address is not matched, GT927 will stay in idle state.

The data words are serially transmitted to and from in 9-bit words: 8-bit data + 1-bit ACK or NACK sent by GT927. Data changes during SCL high periods.

A low-to-high transition of SDA with SCL high is a stop condition.

b) Write Operations to GT927 (ex: slave address is 0xBA/0xBB)



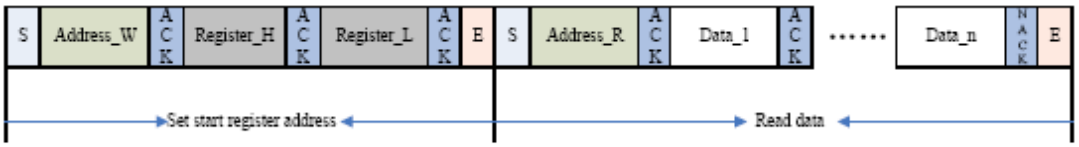
Write Operations

Please check above figure, master start the communication first, and then sends address words 0XBA for a write operation.

After receiving ACK from GT927, master sends out register address word in 16-bit, and then the data word in 8-bit, which is going to be wrote into GT927.

GT927's address pointer will be automatically added 1 after write operation, so master can sequential write in one operation. When operation finished, master stop the communication.

c) Read Operations to GT927 (ex: slave address is 0xBA/0xBB)



Read operation

Please check above figure, master start the communication first, and then sends address words 0xBA for a write operation.

After receiving ACK from GT927, master sends out register address word in 16-bit, to set GT927's address pointer. After receiving ACK, master sends out a start signal once again, start the read operation with command: 0xBB, and read data word from GT927 in 8-bit.

GT927 also supports sequential read operation, and the default setting is sequential read mode. Master shall send out ACK when receiving successfully in every data word, master sends NACK after getting all the data required, then sends stop signal to finish the communication.

1.5.3 Register Information of GT927

a) Real Time Order (Write Only)

Addr	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x8040	Command	0: read status of coordinate 1:D-value 2: software reset 3: benchmark update 4: benchmark calibration 5: screen off							
0x8041	LED_Control	Control word under control of touch key LED light							
0x8042	Proximity_En	Proximity switch							

b) Configuration Information (R/W)

Addr	Name	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
0x8047	Config_Version	Version number of configuration document							
0x8048	X Output Max_L	Max value of X axis							
0x8049	X Output Max_H								
0x804A	Y Output Max_L	Max value of Y axis							
0x804B	Y Output Max_H								
0x804C	Touch Number	Reserved				Touch number: 1~5			
0x804D	Module_Switch1	Reserved	Stretch_rank			X2Y	Sito	INT trigger method	
0x804E	Module_Switch2	Reserved						Touch_Key	
0x804F	Shake_Count	Reserved				Finger shake count			
0x8050	Filter	First_Filter		Normal_Filter(filtering value of original coordinate window, coefficiency is 1)					
0x8051	Large_Touch	Number of touch in large area							
0x8052	Noise_Reduction	Reserved				Value of noise elimination(coefficient is 1)			
0x8053	S_Touch_Level	Threshold of touch grow out of nothing							
0x8054	S_Leave_Level	Threshold of touch grow out of nothing							
0x8055	Low_Power_Control	Reserved				Time to low power consumption(0~15s)			
0x8056	Refresh_Rate	Reserved				Coordinate report rate(Cycle: 5+N ms)			
0x8057	x_threshold	Reserved							
0x8058	y_threshold								
0x8059	X_Speed_Limit	Parameter of speed limit							
0x805A	Y_Speed_Limit								
0x805B	Space	Blank area of boarder-top				Blank area of boarder-bottom			
0x805C		Blank area of boarder-left				Blank area of boarder-right			
0x805D	NC	Reserved							
0x805E	NC	Reserved							
0x805F	NC	Reserved							
0x8060	NC	Reserved							
0x8061	NC	Reserved							
0x8062	Drv_GroupA_Num	All_Driving	Reserved			Driver_Group_A_number			
0x8063	Drv_GroupB_Num	Reserved		D_Freq		Driver_Group_B_number			
0x8064	Sensor_Num	Sensor_Group_B_Number				Sensor_Group_A_Number			
0x8065	FreqA_factor	Driver frequency double frequency coefficient of Driver group A GroupA_Frequence =Multiplier factor *baseband							
0x8066	FreqB_factor	Driver frequency double frequency coefficient of Driver group B GroupB_Frequence =Multiplier factor *baseband							
0x8067	Pannel_BitFreqL	Baseband of Driver group A\B(1526Hz<baseband<14600Hz)							
0x8068	Pannel_BitFreqH								
0x8069	Pannel_Sensor_TimeL	Time interval of the neibouring two driving signal(Unit: us)							
0x806A	Pannel_Sensor_TimeH								

0x806B	Pannel_Tx_Gain	Reserved	Pannel_Drv_output_R, 4 gears	Pannel_DAC_Gain	
0x806C	Pannel_Rx_Gain	Pannel_PGA_C	Pannel_PGA_R	Pannel_Rx_Vcmi	Pannel_PGA_Gain
0x806D	Pannel_Dump_Shift	Reserved	Magnification coefficient of original value(The Nth power of 2)		
0x806E	Drv_Frame_Control	Reserved	SubFrame_Drv Num	Repeat_Num	
0x806F	NC	Reserved			
0x8070	NC	Reserved			
0x8071	NC	Reserved			
0x8072	Stylus_Tx_Gain	Undefined(invalid when stylus_priority=0)			
0x8073	Stylus_Rx_Gain	Undefined(invalid when stylus_priority=0)			
0x8074	Stylus_Dump_Shift	Undefined(invalid when stylus_priority=0)			
0x8075	Stylus_Touch_Level	Undefined(invalid when stylus_priority=0)			
0x8076	Stylus_Leave_Level	Undefined(invalid when stylus_priority=0)			
0x8077	Stylus_Control	Pen mode escape time out period(Unit: Sec)			
0x8078	NC	Reserved			
0x8079	NC	Reserved			
0x807A	Freq_Hopping_Start	Frequency hopping start frequency(Unit: 2KHz,50means 100KHz)			
0x807B	Freq_Hopping_End	Frequency hopping stop frequency(Unit: 2KHz,150means 300KHz)			
0x807C	Noise_Detect_Tims	Detect_Stay_Times	Detect_Confirm_Times		
0x807D	Hopping_Flag	Hop_En	Reserved	Detect_ Time_Out	
0x807E	Hopping_Threshold	Large_Noise_Threshold	Large_Hit_Threshold		
0x807F	Noise_Threshold	Threshold of noise level			
0x8080	NC	Reserved			
0x8081	NC	Reserved			
0x8082	Hopping_seg1_BitFreqL	Frequency hopping segment band 1 central frequency(for driver A/B)			
0x8083	Hopping_seg1_BitFreqH				
0x8084	Hopping_seg1_Factor	Frequency hopping segment 1 central frequency coefficient			
0x8085	Hopping_seg2_BitFreqL	Frequency hopping segment band 2 central frequency(for driver A/B)			
0x8086	Hopping_seg2_BitFreqH				
0x8087	Hopping_seg2_Factor	Frequency hopping segment 2 central frequency coefficient			
0x8088	Hopping_seg3_BitFreqL	Frequency hopping segment band 3 central frequency(for driver A/B)			
0x8089	Hopping_seg3_BitFreqH				
0x808A	Hopping_seg3_Factor	Frequency hopping segment 3 central frequency coefficient			
0x808B	Hopping_seg4_BitFreqL	Frequency hopping segment band 4 central frequency(for driver A/B)			
0x808C	Hopping_seg4_BitFreqH				
0x808D	Hopping_seg4_Factor	Frequency hopping segment 4 central frequency coefficient			
0x808E	Hopping_seg5_BitFreqL	Frequency hopping segment band 5 central frequency(for driver A/B)			
0x808F	Hopping_seg5_BitFreqH				
0x8090	Hopping_seg5_Factor	Frequency hopping segment 5 central frequency coefficient			
0x8091	NC	Reserved			
0x8092	NC	Reserved			
0x8093	Key1	Key 1 Position: 0~255 valid(0 means no touch, it means independent touch key when 4 of the keys are 8 multiples)			
0x8094	Key2	Key 2 position			
0x8095	Key3	Key 3 position			
0x8096	Key4	Key 4 position			
0x8097	Key_Area	Time limit for long press(1~16s)	Touch valid interval setting: 0~15 valid		
0x8098	Key_Touch_Level	Key threshold of touch key			

0x8099	Key_Leave_Level	Key threshold of touch key	
0x809A	Key_Sens	KeySens_1(sensitivity coefficient of key 1,same below)	KeySens_2
0x809B	Key_Sens	KeySens_3	KeySens_4
0x809C	Key_Restrain	Reserved	Reserved
0x809D	NC	Reserved	
0x809E	NC	Reserved	
0x809F	NC	Reserved	
0x80A0	NC	Reserved	
0x80A1	NC	Reserved	
0x80A2	Proximity_Drv_Select	Drv_Start_Ch(start channel of driving direction)	Drv_End_Ch(End channel)
0x80A3	Proximity_Sens_Select	Sens_Start_Ch(start channel of sensing direction)	Sens_End_Ch(End channel)
0x80A4	Proximity_Touch_Level	Proximity effective threshold value	
0x80A5	Proximity_Leave_Level	Proximity ineffective threshold value	
0x80A6	Proximity_Freq_Factor	Frequency mollification of proximity sensing channel	
0x80A7	Proximity_BitFreqL	Base frequency of proximity sensing channel	
0x80A8	Proximity_BitFreqH		
0x80A9	Proximity_Sensor_TimeL	Time interval between proximity adjacent driving signal	
0x80AA	Proximity_Sensor_TimeH		
0x80AB	Proximity_Tx_Gain	Driving gain of proximity	
0x80AC	Proximity_Rx_Gain	Driving gain of proximity	
0x80AD	Proximity_Dump_Shift	Reserved	Magnification coefficient of proximity original value(The Nth power of 2)
0x80AE	NC	Reserved	
0x80AF	NC	Reserved	
0x80B0	NC	Reserved	
0x80B1	NC	Reserved	
0x80B2	NC	Reserved	
0x80B3	NC	Reserved	
0x80B4	NC	Reserved	
0x80B5	NC	Reserved	
0x80B6	NC	Reserved	
0x80B7~ 0x80C4	Sensor_CH0~ Sensor_CH13	Corresponding channel no. of ITO Sensor	
0x80C5~ 0x80D4	NC	Reserved	
0x80D5~ 0x80EA	Driver_CH1~ Driver_CH21	Corresponding channel no. of ITO Driver0	
0x80EB~ 0x80FE	NC	Reserved	
0x80FF	Config_Chksum	Check of configuration information	
0x8100	Config_Fresh	Updated configuration(by master control)	

c) Coordinates Information

Addr	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0x8140	Product ID(Lowest Byte, ASCII code 6)							
0x8141	Product ID(Third Byte, ASCII code 0)							
0x8142	Product ID(Second Byte, ASCII code 0)							
0x8143	Product ID(Highest Byte, ASCII code 9)							
0x8144	Firmware version(byte1)(Low Byte)							
0x8145	Firmware version(byte2)(High Byte)							
0x8146	x coordinate resolution(low byte)(current output resolution)							
0x8147	x coordinate resolution(high byte)							
0x8148	y coordinate resolution(low byte)							
0x8149	y coordinate resolution(high byte)							
0x814A	Vendor_id(current module choice information)							
0x814B	Reserved							
0x814C	gesture type(Reserved)							
0x814D	gesture value(Reserved)							
0x814E	buffer status	Large detect	Proximity Valid		HaveKey		number of touch points	
0x814F	track id							
0x8150	point 1 x coordinate(low byte)							
0x8151	point 1 x coordinate(high byte)							
0x8152	point 1 y coordinate(low byte)							
0x8153	point 1 y coordinate(high byte)							
0x8154	point 1 size(low byte)							
0x8155	point 1 size(high byte)							
0x8156	Reserved							
0x8157	track id							
0x8158	point 2 x coordinate(low byte)							
0x8159	point 2 x coordinate(high byte)							
0x815A	point 2 y coordinate(low byte)							
0x815B	point 2 y coordinate(high byte)							
0x815C	point 2 size(low byte)							
0x815D	point 2 size(high byte)							
0x815E	Reserved							
0x815F	track id							
0x8160	point 3 x coordinate(low byte)							
0x8161	point 3 x coordinate(high byte)							
0x8162	point 3 y coordinate(low byte)							
0x8163	point 3 y coordinate(high byte)							
0x8164	point 3 size(low byte)							
0x8165	point 3 size(high byte)							
0x8166	Reserved							
0x8167	track id							
0x8168	point 4 x coordinate(low byte)							
0x8169	point 4 x coordinate(high byte)							
0x816A	point 4 y coordinate(low byte)							
0x816B	point 4 y coordinate(high byte)							
0x816C	point 4 size(low byte)							
0x816D	point 4 size(high byte)							
0x816E	Reserved							
0x816F	track id							
0x8170	point 5 x coordinate(low byte)							
0x8171	point 5 x coordinate(high byte)							
0x8172	point 5 y coordinate(low byte)							

0x8173	point 5 y coordinate(high byte)
0x8174	point 5 size(low byte)
0x8175	point 5 size(high byte)
0x8176	Reserved
0x8177	track id
0x8178	point 6 x coordinate(low byte)
0x8179	point 6 x coordinate(high byte)
0x817A	point 6 y coordinate(low byte)
0x817B	point 6 y coordinate(high byte)
0x817C	point 6 size(low byte)
0x817D	point 6 size(high byte)
0x817E	Reserved
0x817F	track id
0x8180	point 7 x coordinate(low byte)
0x8181	point 7 x coordinate(high byte)
0x8182	point 7 y coordinate(low byte)
0x8183	point 7 y coordinate(high byte)
0x8184	point 7 size(low byte)
0x8185	point 7 size(high byte)
0x8186	Reserved
0x8187	track id
0x8188	point 8 x coordinate(low byte)
0x8189	point 8 x coordinate(high byte)
0x818A	point 8 y coordinate(low byte)
0x818B	point 8 y coordinate(high byte)
0x818C	point 8 size(low byte)
0x818D	point 8 size(high byte)
0x818E	Reserved
0x818F	track id
0x8190	point 9 x coordinate(low byte)
0x8191	point 9 x coordinate(high byte)
0x8192	point 9 y coordinate(low byte)
0x8193	point 9 y coordinate(high byte)
0x8194	point 9 size(low byte)
0x8195	point 9 size(high byte)
0x8196	Reserved
0x8197	track id
0x8198	point 10 x coordinate(low byte)
0x8199	point 10 x coordinate(high byte)
0x819A	point 10 y coordinate(low byte)
0x819B	point 10 y coordinate(high byte)
0x819C	point 10 size(low byte)
0x819D	point 10 size(high byte)
0x819E	Reserved
0x819F	Keyvaule

■ RELIABILITY TEST

No.	Test Item	Test Condition
1	High Temperature Storage	80±2℃/240 hours
2	Low Temperature Storage	-30±2℃/240 hours
3	High Temperature Operating	70±2℃/240 hours
4	Low Temperature Operating	-20±2℃/240 hours
5	Temperature Cycle storage	-30±2℃~25~80±2℃×200cycles (30min.) (5min.) (30min.)
6	Damp proof Test operating	60℃±5℃×90%RH/240 hours
7	Vibration Test (no-operation)	Frequency：0~55Hz Amplitude:1.5mm Sweep time: 11min 6 cycles for each direction of X.Y.Z
8	ESD test (No operation)	150pF,330Ω Air:±12KV;Contact:±6KV 10 time/point;4 point/panel face

■ INSPECTION CRITERION

OUTGOING QUALITY STANDARD	PAGE 1 OF 3
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

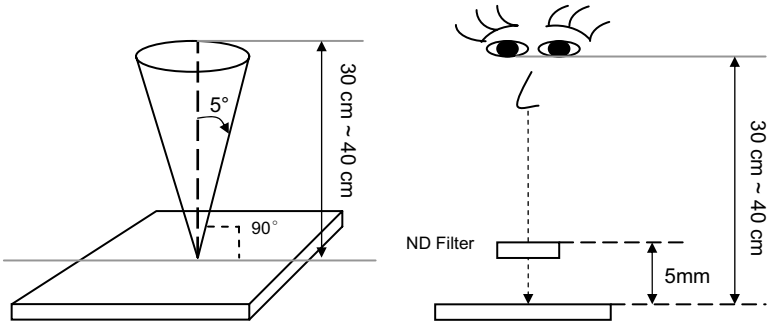
1.1 Inspection conditions

1.1.1 Inspection Distance : 35 ± 5cm

1.1.2 View Angle :

(1) Inspection under operating condition : ± 5 °

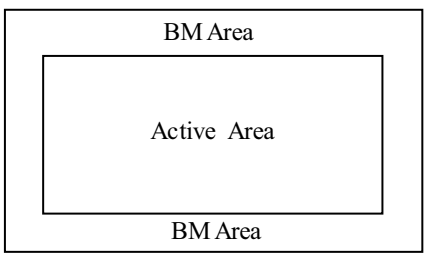
(2) Inspection under non-operating condition : ± 45°



1.1.3 Environment conditions :

Ambient Temperature :		25± 5℃
Ambient Humidity :		65± 5%
Ambient Illumination	Cosmetic Inspection	More than 600lux
	Functional Inspection	300 ~ 800lux

1.2 Definition of applicable Zones



OUTGOING QUALITY STANDARD	PAGE 2 OF 3
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

3. Inspection parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Operating</td><td>Display function: No Display malfunction (Major)</td></tr>
<tr><td>Contrast ratio (Black, White):
Does not meet specified range in the spec. (Major) (Note:3)</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">External Inspection
(non-operating)</td><td>Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)</td></tr>
<tr><td>Dimension: Outline (Major)</td></tr>
<tr><td></td><td></td><td>Bezel appearance: uneven (Minor)</td></tr>
</table>

Point Defect (Red, green, blue, dark): Active area ≤5dots (Minor)(Note:1)

Item	Acceptable number	Total	Class Of Defects	AQL Level
Bright	3	8	Minor	1.5
Dark	5			
Adjacent Bright	1	1		
Adjacent Dark	2	2		

Non-uniformity:
Visible through 6%ND filter white, RG, B and gray 50%pattern. (Minor)

Foreign material in Black or White spots shape (W>1/4L) (Note: 5)

Dimension	Acceptable number	Class Of Defects	AQL Level
D ≤ 0.3	*	Minor	1.5
0.3 < D ≤0.5	4		
D> 0.5	0		

D = (Long + Short) / 2 ∗ : Disregard

Foreign Material in Line or spiral shape (W≤1/4L) (Note: 4)

Dimension	Acceptable number	Class Of Defects	AQL Level
W>0.1mm,L>5mm	0	Minor	1.5
L≦5mm,0.05mm<W≦0.1mm	4		
L≦5mm,W<0.05mm	*		

L : Length W : Width ∗ : Disregard

Scratch on the polarize & TP: (Note:2)

Dimension	Acceptable number	Class Of Defects	AQL Level
W>0.1mm,L>10mm	0	Minor	1.5
L≦10mm,0.05mm<W≦0.1mm	4		
L≦10mm,W<0.05mm	*		

L : Length W : Width ∗ : Disregard

Dent and spots shape on the polarize & TP (Note:2): (Note: 5)

Dimension	Acceptable number	Class Of Defects	AQL Level
D ≤ 0.3	*	Minor	1.5
0.3 < D ≤0.8	4		
D> 0.8	0		

D = (Long + Short) / 2 ∗ : Disregard

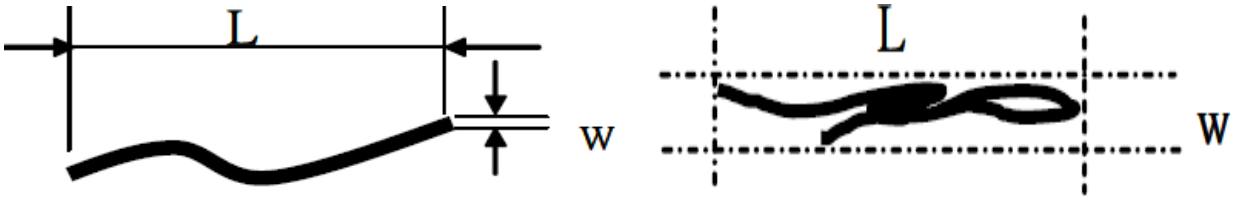
OUTGOING QUALITY STANDARD	PAGE 3 OF 3
TITLE:FUNCTIONAL TEST & INSPECTION CRITERIA	

Note:1.(a)Bright point defect is defined as point defect of R,G,B with area >1/2 pixel respectively
(b)Dark point defect is defined as visible in full white pattern.
(c)The point defect must under 2% ND Filter visible .

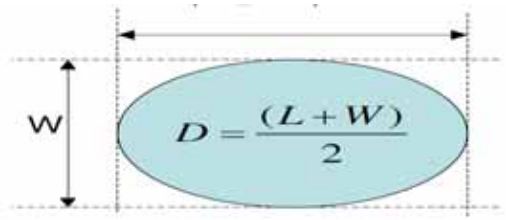
Note:2 The external inspection should be conducted at the distance 30± 5cm between the eyes of inspctor and thepanel .

Note:3 Luminance measurement for contrast ratio is at the distance 50± 5cm between the detective head and the panelwith ambient illuminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note:4 W-Width in mm , L-length of Max.(L1,L2) in mm.



Note:5 Spot Foreign Material (W≧L/4)



■PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

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

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

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

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

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

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

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

- Water
- Ketone
- Aromatic solvents

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

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

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

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

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

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

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

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

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

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

Handling precaution for LCM

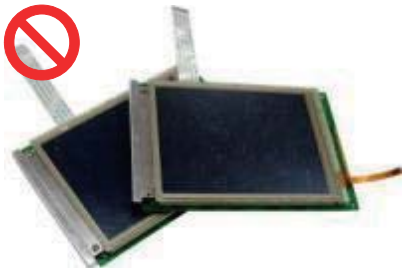
LCM is easy to be damaged. Please note below and be careful for handling.

Correct handling:

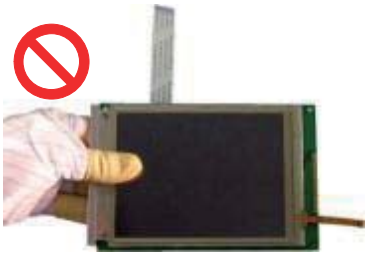
As above picture, please handle with anti-static gloves around LCM edges.

Incorrect handling:

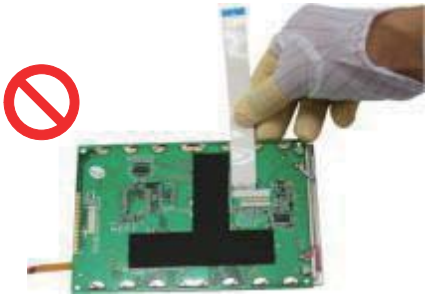
Please don't touch IC directly.



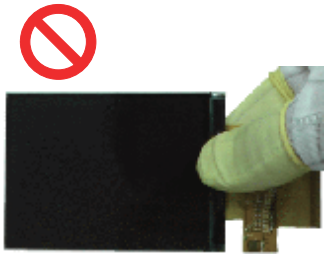
Please don't stack LCM.



Please don't hold the surface of panel.



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



Please don't hold the surface of IC.

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

Storage Precautions

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

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

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

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

Others

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

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

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

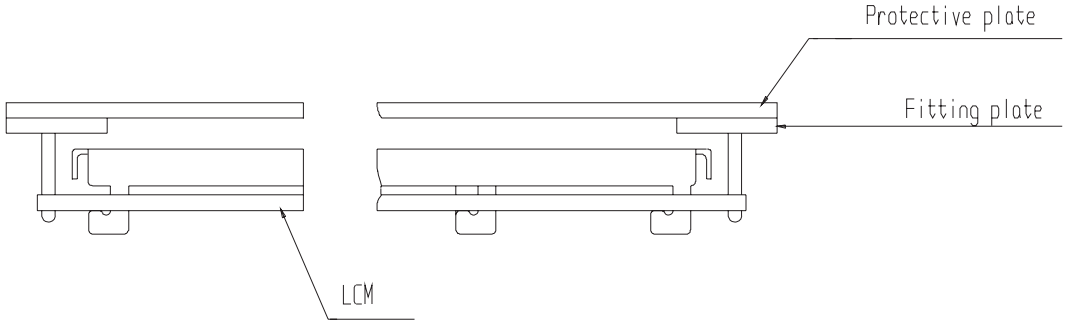
- Exposed area of the printed circuit board.
-Terminal electrode sections.

■ USING LCD MODULES

Installing LCD Modules

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

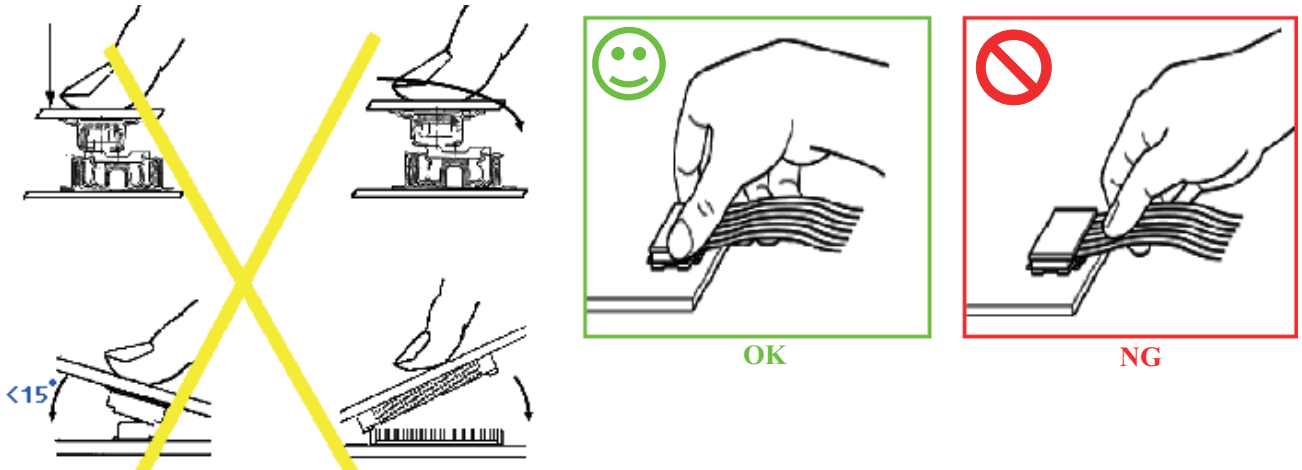
(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



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

Precaution for assemble the module with BTB connector:

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



Precaution for soldering 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

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

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

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

Precautions for Operation

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

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

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

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

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

(6) Input 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.

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

Safety

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

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

Limited Warranty

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

Return LCM under warranty

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

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

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

■ PRIOR CONSULT MATTER

1.①For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without notice on our customer.
②For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2.If you have special requirement about reliability condition, please let us know before you start the test on our samples.