ORIENT DISPLAY

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SPECIFICATION
FOR
LCD MODULE

MODULE NO: AFD1024600A0L-7.0N6WTM-C
VERSION NO: 01

Customer's Approval:

	SIGNATURE	DATE
PREPARED BY		
CHECKED BY		
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RECORD OF REVISION

Version	Revised Date	Page	Content
V1.0	2013/12/05	--	First Issued

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1. GENERAL DESCRIPTION

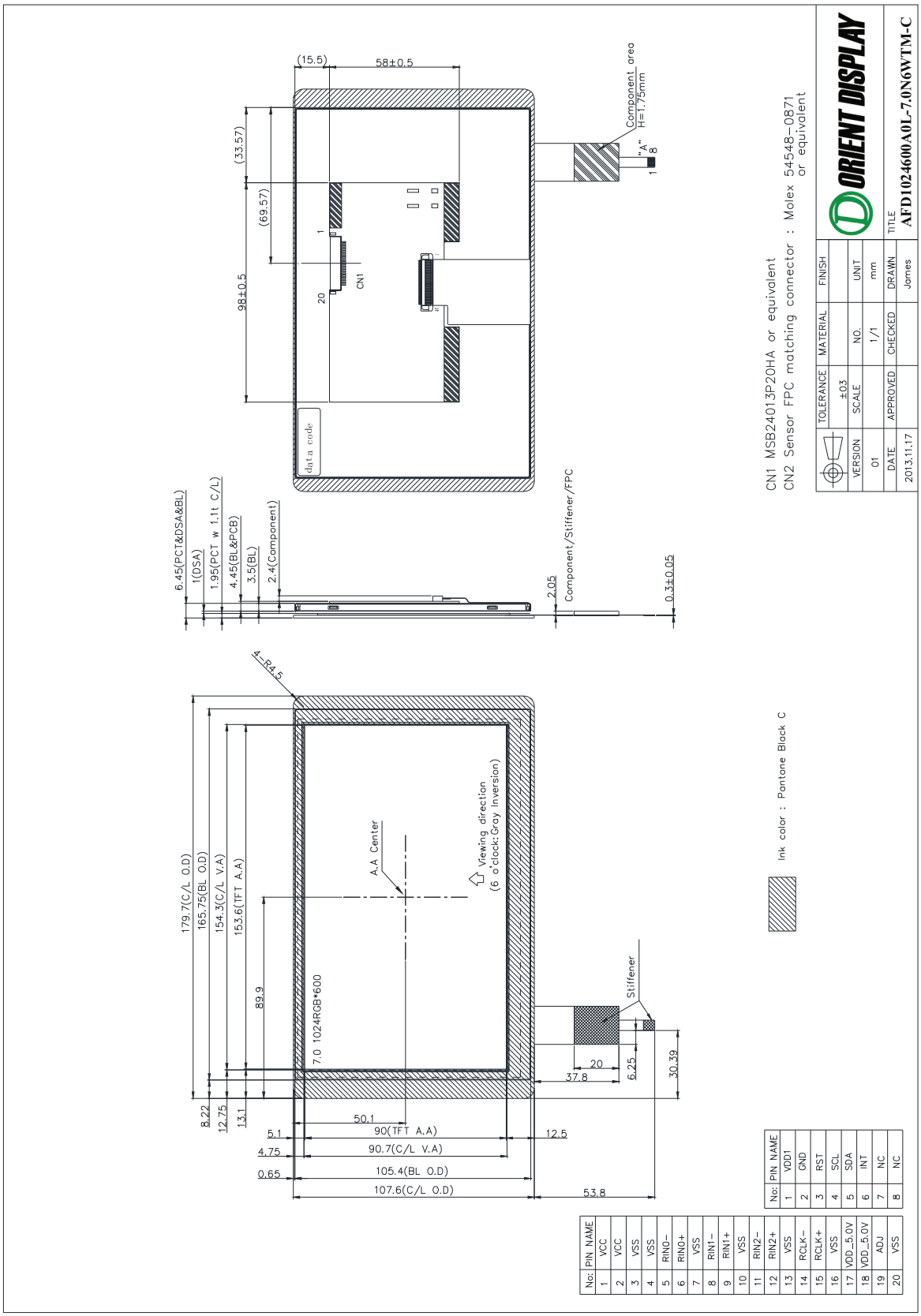
1.1 Description

The specifications is model AFD1024600A0L-7.0N6WTM-C is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, a back light system and projected capacitive touch panel. This TFT LCD has a 7.0 (16:9) inch diagonally measured active display area with WSGA (1024 horizontal by 600 vertical pixels) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	7.0”	Inch
2	Number of Pixels	1024 (W) x RGB x 600 (H)	Pixels
3	Active Area	153.6 (W) × 90 (H)	mm
4	Pixel Pitch	0.15 (W) x 0.15 (H)	mm
5	Outline Dimension	179.7 (W) × 107.6 (H) × 6.45 (T)	mm
6	Number of Colors	262K	- -
7	Display Mode	TN / Normally White / Transmissive	- -
8	Viewing Direction	12 o’clock (best view)	- -
		6 o’clock (gray inversion)	
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Clear	- -
11	Contrast Ratio	700 (Typ.)	- -
12	Luminance (cd/m^2)	450 (Typ.)	cd/m2
13	Interface	LVDS 6 bit Interface	- -
14	Backlight	White LED	- -
15	Driver IC	--	- -
16	Operation Temperature	-20 ~ 60	℃
17	Storage Temperature	-30 ~ 70	℃
18	Weight	TBD	g

2. MECHANICAL SPECIFICATION

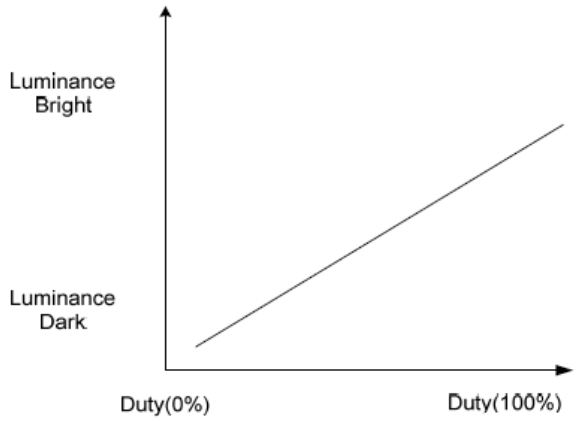


3. **PIN DESCRIPTION** (Connector Part No: MSB24013P20HA or equivalent)

Pin No.	Symbol	I/O	Function	Remark
1	VCC	P	Power Supply Logic voltage +3.3V	
2	VCC	P	Power Supply Logic voltage +3.3V	
3	VSS	P	Ground	
4	VSS	P	Ground	
5	RIN0-	I	Negative LVDS differential data input	
6	RIN0+	I	Positive LVDS differential data input	
7	VSS	P	Ground	
8	RIN1-	I	Negative LVDS differential data input	
9	RIN1+	I	Positive LVDS differential data input	
10	VSS	P	Ground	
11	RIN2-	I	Negative LVDS differential data input	
12	RIN2+	I	Positive LVDS differential data input	
13	VSS	P	Ground	
14	RCLK-	I	Negative LVDS differential clock input	
15	RCLK+	I	Positive LVDS differential clock input	
16	VSS	P	Ground	
17	VDD_5V	P	Power Supply LED voltage +5V	
18	VDD_5V	P	Power Supply LED voltage +5V	
19	ADJ	I	Back-light Dimming control	
20	VSS	P	Ground	

Notes:

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, cannot be floating.

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

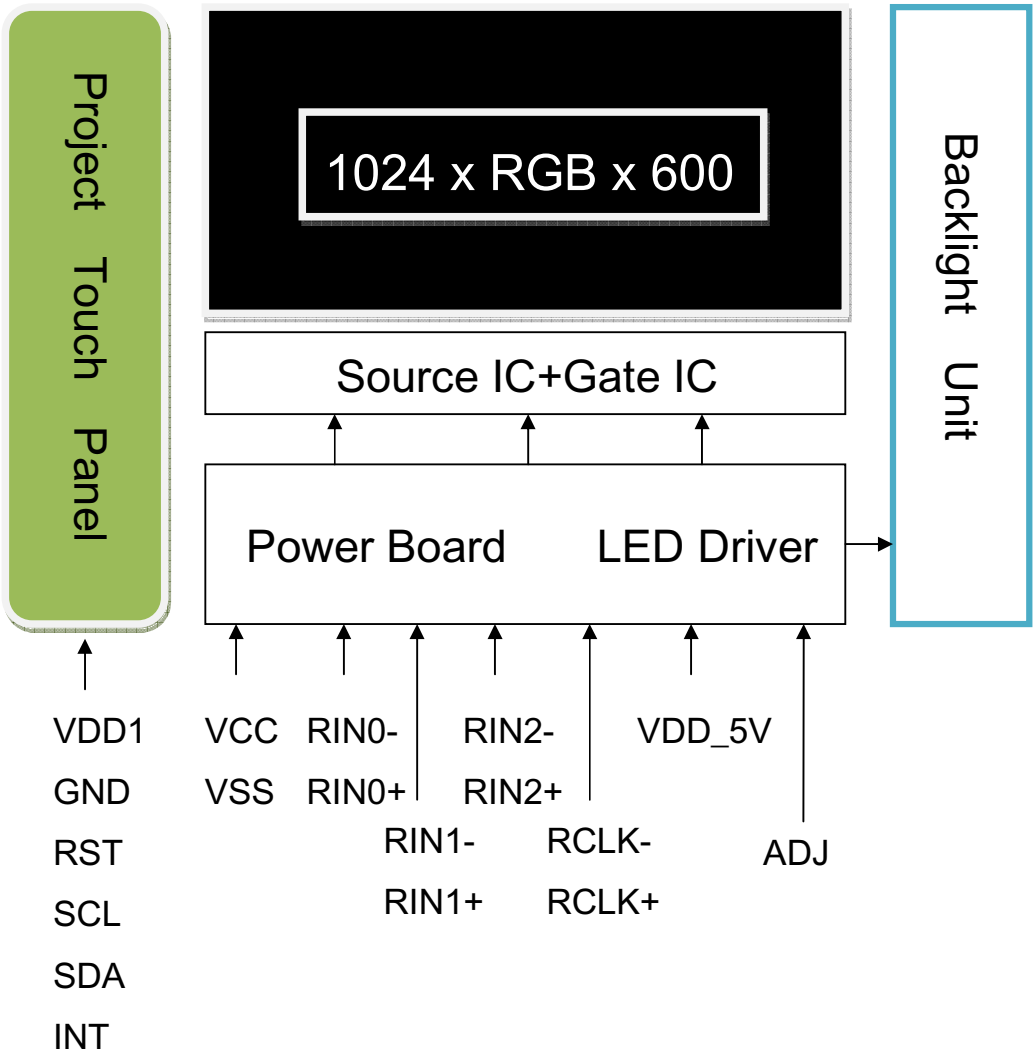
Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VCC	-0.3	4.0	V	
Power supply voltage	VDD_5V	0	6.0	V	

4.1.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-20		60	℃	Ambient temperature
Storage Temperature	Tstg	-30		70	℃	

5. BLOCK DIAGRAM

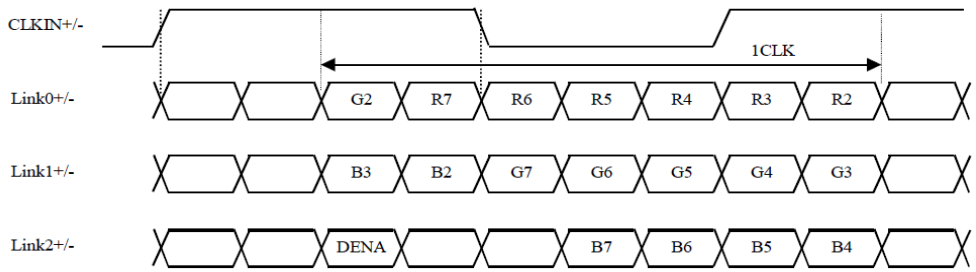
5.1 TFT LCD Module



6. Relationship Between Displayed Color and Input

6.1 6 bit

	Display	MSB LSB R5 R4 R3 R2 R1 R0	MSB LSB G5 G4 G3 G2 G1 G0	MSB LSB B5 B4 B3 B2 B1 B0	Gray scale level
Basic color	Black	L L L L L L	L L L L L L	L L L L L L	-
	Blue	L L L L L L	L L L L L L	H H H H H H	-
	Green	L L L L L L	H H H H H H	L L L L L L	-
	Light Blue	L L L L L L	H H H H H H	H H H H H H	-
	Red	H H H H H H	L L L L L L	L L L L L L	-
	Purple	H H H H H H	L L L L L L	H H H H H H	-
	Yellow	H H H H H H	H H H H H H	L L L L L L	-
	White	H H H H H H	H H H H H H	H H H H H H	-
Gray scale of Red	Black	L L L L L L	L L L L L L	L L L L L L	L0
	Dark ↑ ↓ Light	L L L L L H	L L L L L L	L L L L L L	L1
		L L L L H L	L L L L L L	L L L L L L	L2
		:	:	:	L3...L60
		H H H H L H	L L L L L L	L L L L L L	L61
		H H H H H L	L L L L L L	L L L L L L	L62
	Red	H H H H H H	L L L L L L	L L L L L L	Red L63
Gray scale of Green	Black	L L L L L L	L L L L L L	L L L L L L	L0
	Dark ↑ ↓ Light	L L L L L L	L L L L L H	L L L L L L	L1
		L L L L L L	L L L L H L	L L L L L L	L2
		:	: :	: :	L3...L60
		L L L L L L	H H H H L H	L L L L L L	L61
		L L L L L L	H H H H H L	L L L L L L	L62
	Green	L L L L L L	H H H H H H	L L L L L L	Green L63
Gray scale of Blue	Black	L L L L L L	L L L L L L	L L L L L L	L0
	Dark ↑ ↓ Light	L L L L L L	L L L L L L	L L L L L H	L1
		L L L L L L	L L L L L L	L L L L H L	L2
		:	:	:	L3...L60
		L L L L L L	L L L L L L	H H H H L H	L61
		L L L L L L	L L L L L L	H H H H H L	L62
	Blue	L L L L L L	L L L L L L	H H H H H H	Blue L63
Gray scale of White & Black	Black	L L L L L L	L L L L L L	L L L L L L	L0
	Dark ↑ ↓ Light	L L L L L H	L L L L L H	L L L L L H	L1
		L L L L H L	L L L L H L	L L L L H L	L2
		:	:	:	L3...L60
		H H H H L H	H H H H L H	H H H H L H	L61
		H H H H H L	H H H H H L	H H H H H L	L62
	White	H H H H H H	H H H H H H	H H H H H H	White L63



7. ELECTRICAL CHARACTERISTICS

7.1 TFT LCD Module

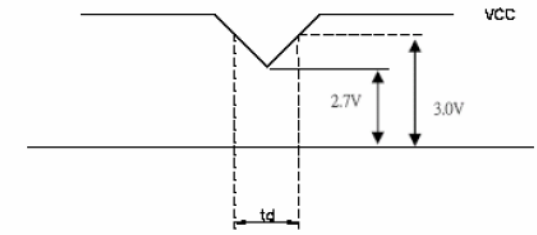
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Supply Voltage	VCC	3.0	3.3	3.6	V	
	VDD_5V	4.5	5.0	5.5	V	
	VRF	-	-	100	mV p-p	Ripple voltage
Differential Input High Threshold	VTH	-	-	+100	mV	Vcm=+1.2V
Differential Input Low Threshold	VTL	-100	-	-	mV	Vcm=+1.2V
Magnitude differential Input Voltage	[Vid]	100	-	600	mV	
Common Mode Voltage	Vcm	0.9	1.2	1.5	V	
Common Mode Voltage Offest	△Vcm	-	-	50	mV	Vcm=+1.2V
Supply Current	ICC	-	190	250	mA	VCC=3.3V
	IDD	-	(450)	(550)	mA	VDD_5V=5V
ADJ frequency		19K	20K	21K	Hz	
ADJ input voltage	VIH	3.0	-	3.3	V	
	VIL	0	-	0.3	V	
LED life time		30000	-	-	Hr	Note1

Note (1): The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ 60% RH.

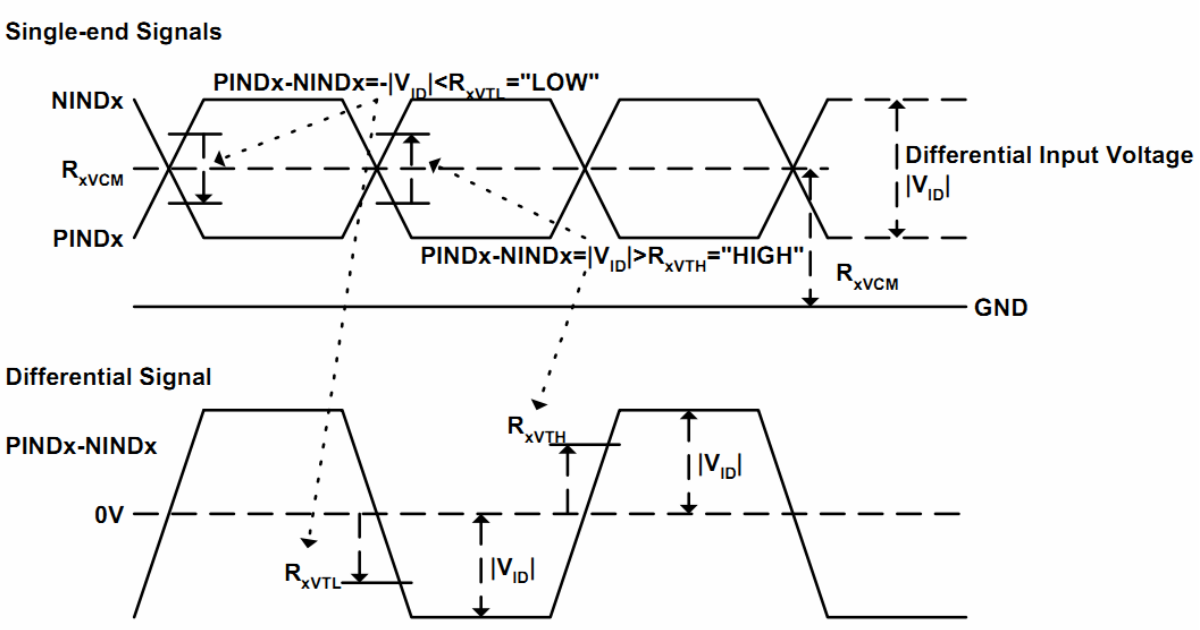
Note (2): VCC-dip condition

a. 2.7 V ≤VCC <3.0V, td ≤ 10 ms

b. VCC＞3.0V, VCC-dip condition should be the same with VCC-turn-on condition。



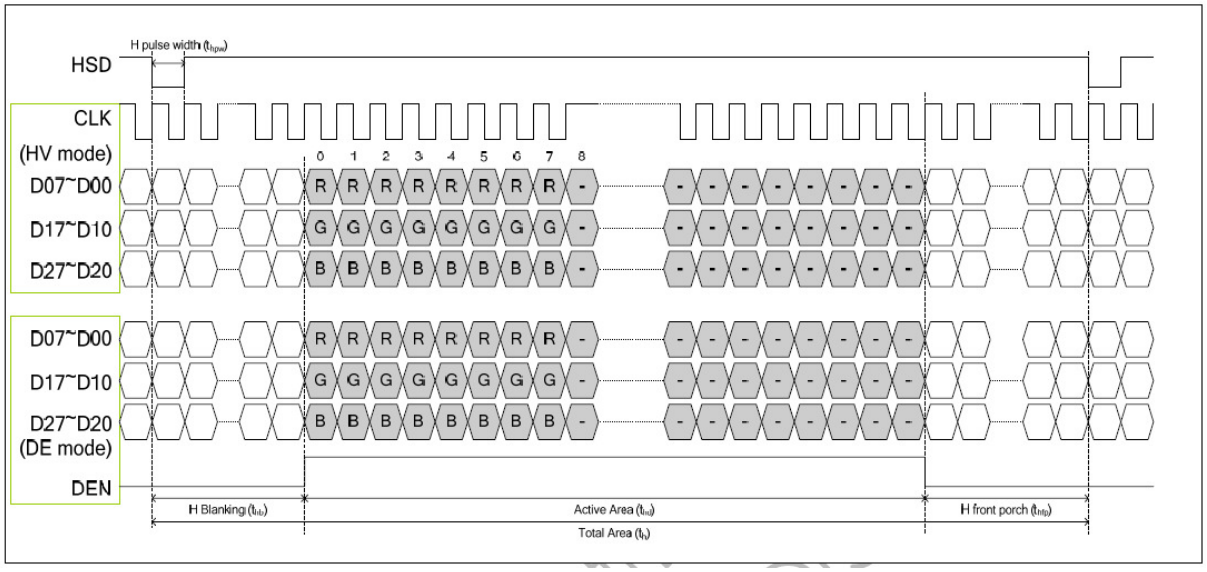
Note (3): The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

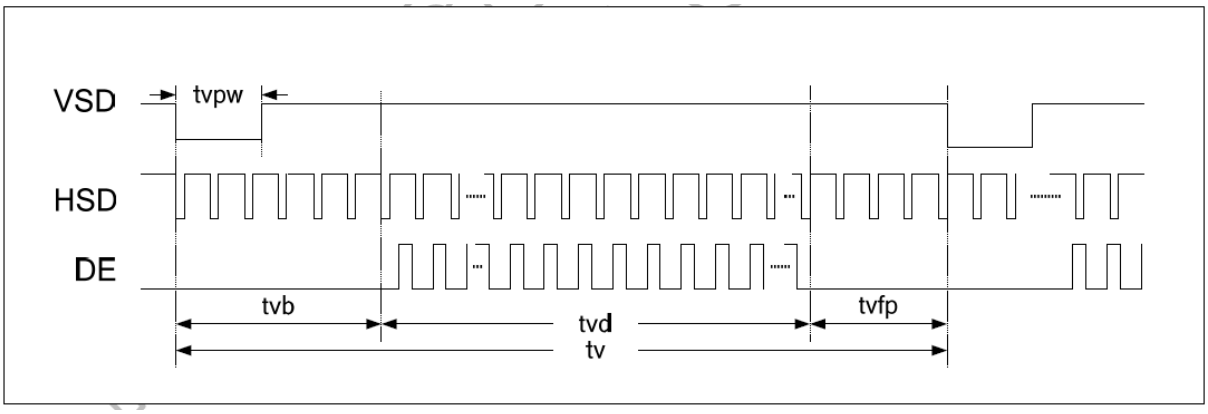

Single-end Signals
PINDx-NINDx=-|V_ID|<R_xVTL="LOW"
NINDx
R_xVCM
PINDx
Differential Input Voltage
|V_ID|
PINDx-NINDx=|V_ID|>R_xVTH="HIGH"
R_xVCM
GND
Differential Signal
PINDx-NINDx
R_xVTH
|V_ID|
0V
R_xVTL
|V_ID|

7.2 INTERFACE SPECIFICATIONS

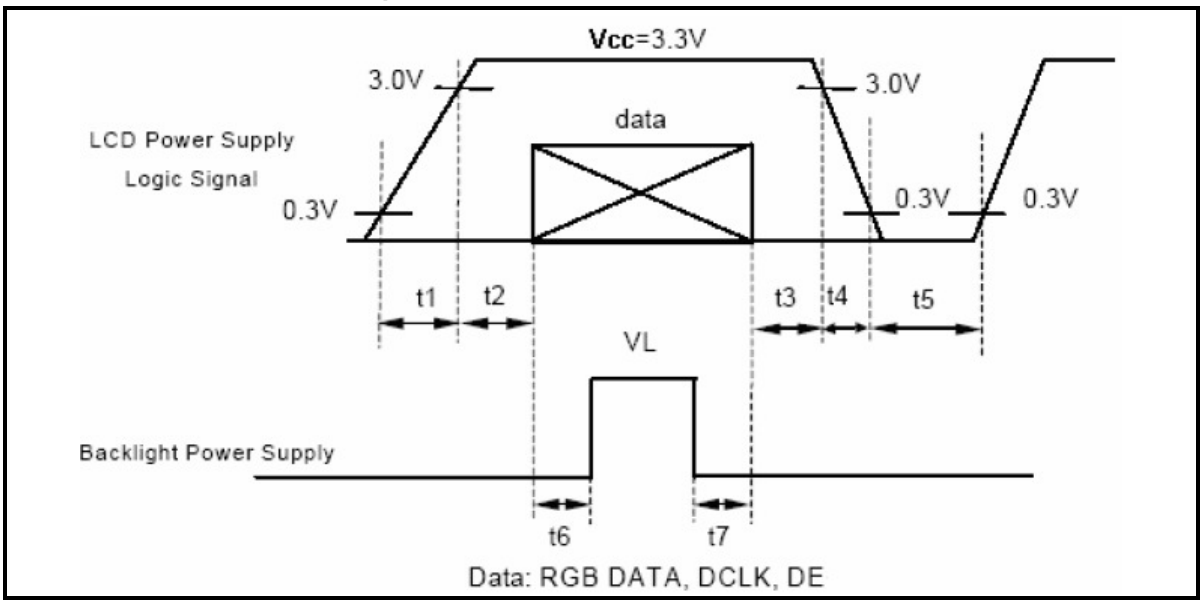
7.2.1 DE mode Input signal characteristics

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK	DCLK Frequency	fclk	40.8	51.2	67.2	MHz	
Horizontal	Horizontal display area	thd	-	1024	-	DCLK	
	HSD period time	th	1114	1344	1400	DCLK	
	HSD Blanking	thb+thfb	90	320	376	DCLK	
Vertical	Vertical display area	tvd	-	600	-	th	
	VSD period time	tv	610	635	800	th	
	VSD pulse width	tvb+tvfb	10	35	200	th	





7.3 Power On / Off Sequence



t1 ≤10ms : 1 sec≤ t5

50ms≤ t2 : 200ms ≤t6

0<t3 ≤50ms: 200ms≤ t7

0<t4 ≤10ms

8. PROJECTED CAPACITIVE TOUCH PANEL

8.1 Pin Assignments and Definitions

Item	Name	I/O	Unit
1	VDD1	P	Power;(VDD1=3.3V)
2	GND	P	Ground
3	RST	I	Reset, active high
4	SCL	I	I2C clock input
5	SDA	I/O	I2C data signal
6	INT	O	Interrupt output
7	NC	-	No connection
8	NC	-	No connection

8.2 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VDD1	-0.3	3.6	V	
Logic input voltage	VDD_5V	-0.3	VDD1+0.3	V	

8.3 ELECTRICAL CHARACTERISTICS

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Power supply voltage	VDD1	2.5	3.3	3.6	V	
	GND	-	0	-	V	
Input H voltage	VIH	0.8VDD1	-	VDD1	V	
Input L voltage	VIL	0	-	0.2VDD1	V	

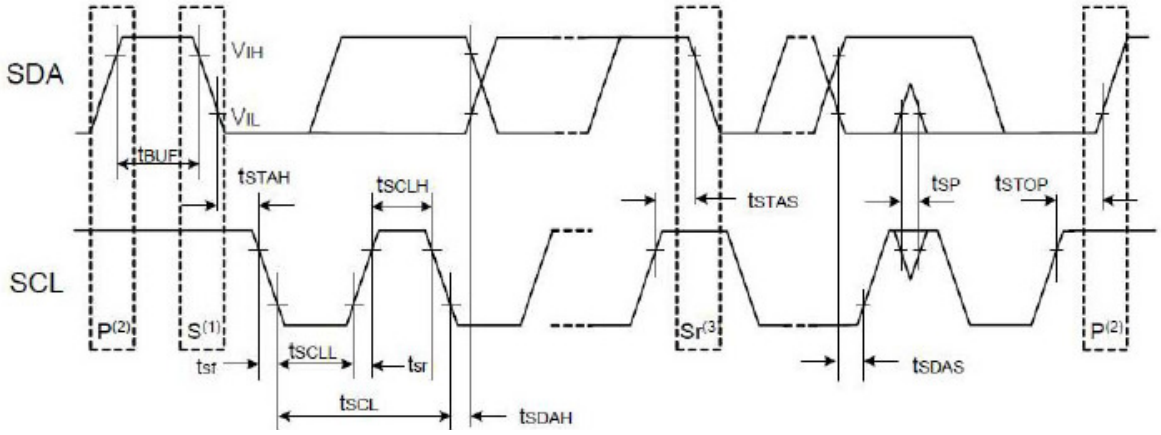
8.4 Power consumption

Item	Symbol	Fingers	Fscan (Hz)	Values			Unit
				Min.	Typ.	Max.	
Active mode	IVDD1	1	130	-	-	4	mA
		2	60	-	-	5	mA
		3	50	-	-	5.2	mA
		4	45	-	-	5.4	mA
		5	40	-	-	5.6	mA
Sleep mode	Isleep	0	10	-	-	0.11	mA
Deep sleep mode	Isleep	-	-	-	-	50	uA
Freeze mode	Ifreeze	-	-	-	-	2	uA
Boot load	-	-	-	-	-	6.2	mA
Calibration	-	-	-	-	-	6.2	mA

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

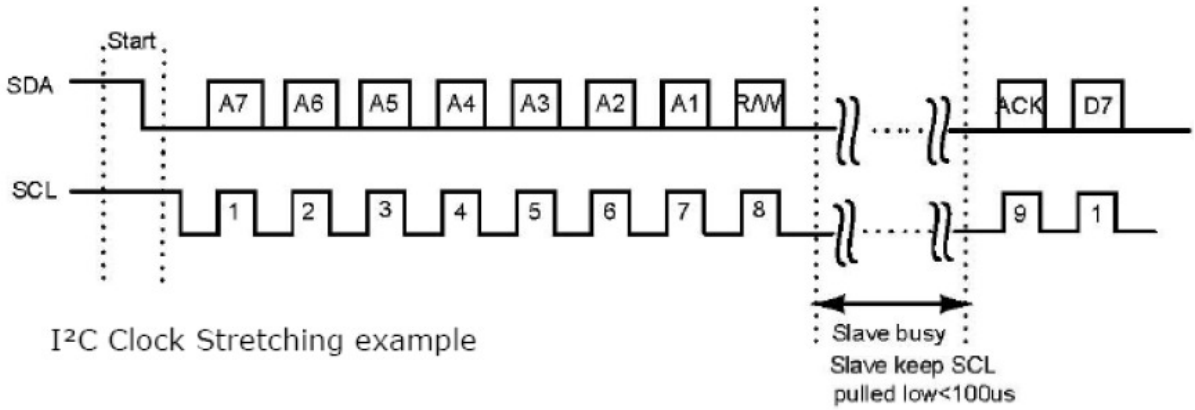
Communication protocol: I2C

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

8.6 Timing Characteristic

Read Operation

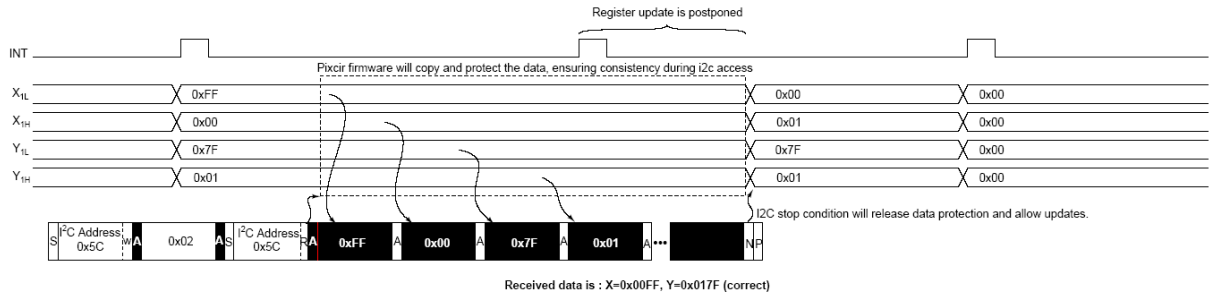
Read packets have variable content length, decided by the host. It is available to do a single read operation or a sequential read operation. Therefore, the beginning register address is needed to set before a read operation. And the data sent exactly follow the register table 9, table 11, table 12, 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

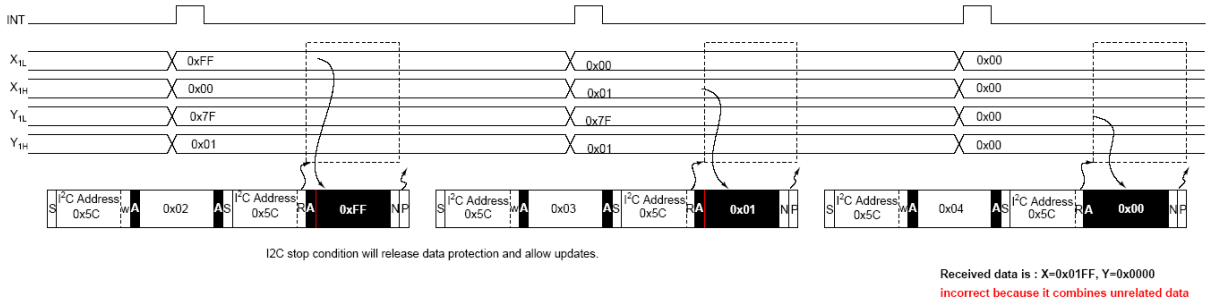
In a sequential read operation, the first data sent by the MSI device is therefore the touching register, and then the X and Y coordinates of the first finger, then 2nd finger, 3rd finger, 4th finger and then coordinates of the 5th finger, and so on. Refer in below:

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

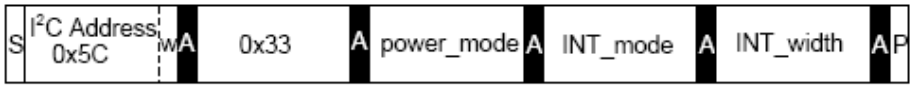


Coordinates read operation explanation

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 .

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	

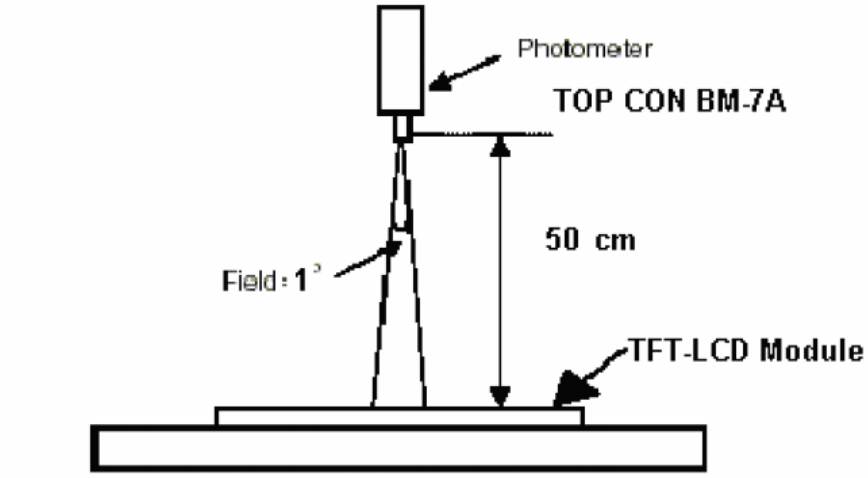
Address	Type	Name	Description	Category
32 (lsb) 33 (msb)	int	initial_distance	Distance separating fingers on the first time multitouch is detected	gesture
34 (lsb) 35 (msb)	int	distance	Distance separating fingers	
36 (lsb) 37 (msb)	int	ratio	100·distance / initial_distance	
38	char	water_level		
39	char	noise_level		
40	char	palm_level		monitor
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

9. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--	Note1, Note 3, ($\theta = 0^\circ$, Normal Viewing Angle)	360	450	--	cd/m2
Uniformity		B-uni		70	75	-	%
Contrast Ratio		CR		500	700	--	--
Response Time		Tr		--	10	20	ms
		Tf		--	15	30	ms
Color Chromaticity	White	Wx		0.260	0.310	0.360	--
		Wy		0.280	0.330	0.380	--
View angle	Horizontal	θ x+	Center CR≥10	60	70	--	
		θ x-		60	70	--	
	Vertical	θ Y+		40	50	--	
		θ Y-		50	60	--	
Image sticking		tis	2 hours	--	--	2	Sec

Note：The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C. The measurement method is shown in Note1.

Note1: The method of optical measurement:

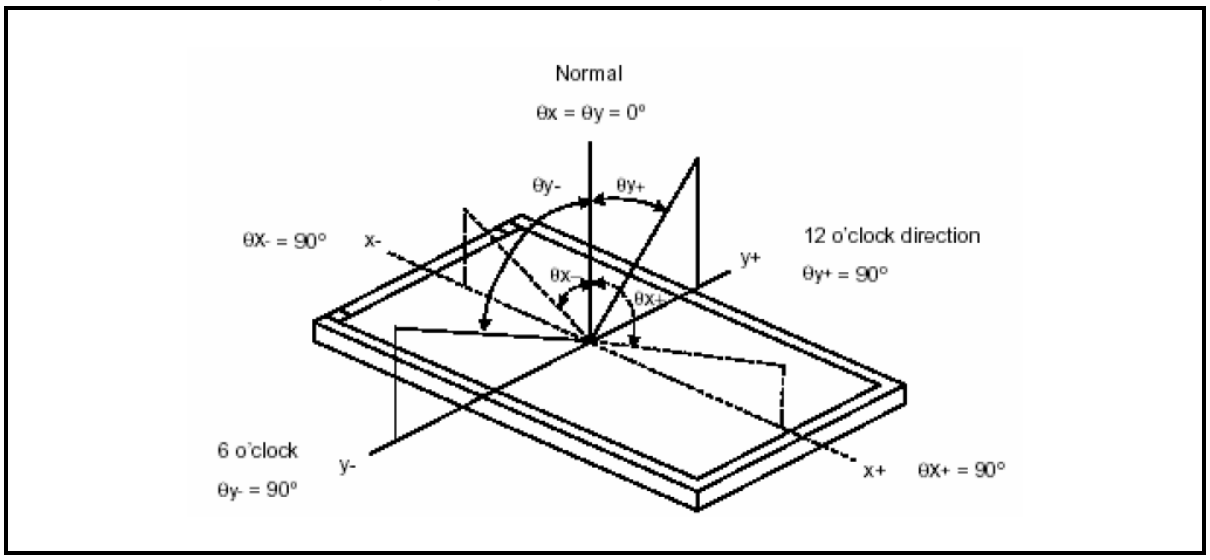


Note2: Measured at the center area of the panel and at the viewing angle of the θ x= θ y =0°

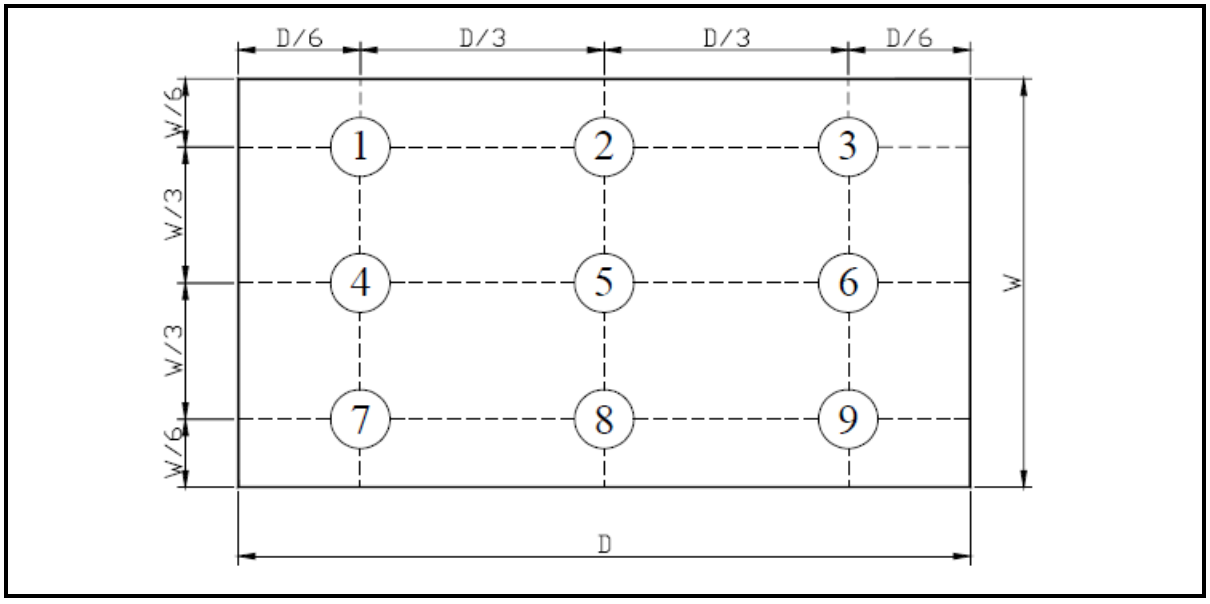
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state ÷ Luminance with all pixels in Black state

Note4: Definition of Viewing Angle:

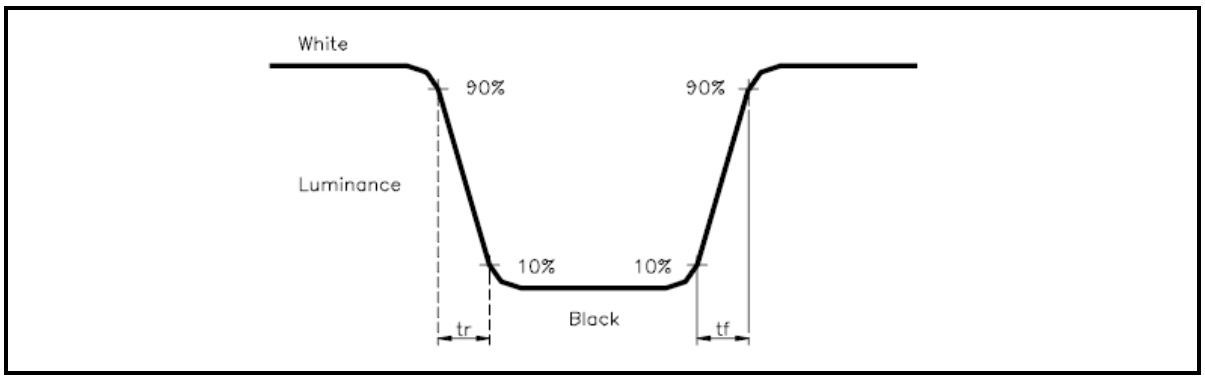


Note 5: Definition of Brightness Uniformity (B-uni):



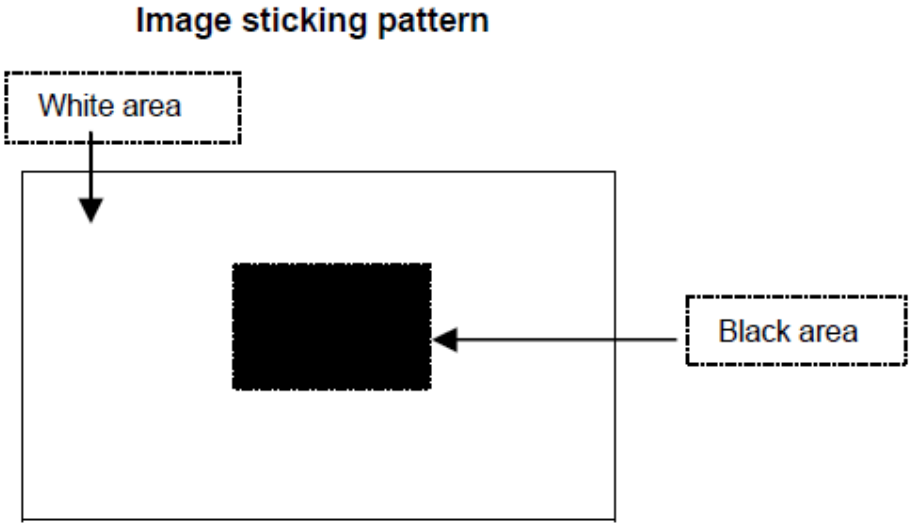
B-uni ＝(Minimum luminance of 9 points÷Maximum luminance of 9points)X100%

Note 6: Definition of Response Time:
The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure



Note 7: Definition of Chromaticity:
The color coordinates (Wx,Wy),(Rx,Ry),(Gx,Gy),and (Bx,By) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

Note 8: Definition of Image sticking (tis):
Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 ˚C



10. RELIABILITY

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C

Humidity : 65 ± 5%

10.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

10.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

10.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

10.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	70°C, 120 hrs
2	Low Temperature Storage	-30°C, 120 hrs
3	High Temperature Operating	60°C, 120 hrs
4	Low Temperature Operating	-20°C, 120 hrs
5	High Temperature/Humidity Non-Operating	40°C, 90%RH, 120 hrs
6	Temperature Shock Non-Operating	-30°C ←→ 70°C (0.5hr each), 25 cycles
7	Vibration Test Non-Operating	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
9	Electro-static Discharge Non-Operating	150pF,330Ω Air:± 8KV;Contact: ±4KV 10 times/point;4 points/panel face

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

10.3 JUDGMENT STANDARD

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

10.4 INCOMING INSPECTION STANDARDS

<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)
Contrast ratio (Black, White):
Does not meet specified range in the spec. (Major) (Note:3)
Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)
Point Defect : Active area ≤ 5 dots (Minor) (Note:1)
<table>
<tr><th rowspan="2">Item</th><th>Acceptable number</th><th rowspan="2">Total</th></tr>
<tr><th>Active Area</th></tr>
<tr><td>Bright</td><td>2</td><td rowspan="2">5</td></tr>
<tr><td>Dark</td><td>4</td></tr>
</table>
Non-uniformity: Visible through 5%ND filter. (Minor)
Foreign material in Black or White spots shape (W>1/4L)
<table>
<tr><th>Zone / Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D> 0.5</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.3 < D ≤ 0.5</td><td>5</td></tr>
<tr><td>D ≤ 0.3</td><td>*</td></tr>
</table>
D = (Long + Short) / 2 ＊ : Disregard
Foreign Material in Line or spiral shape (W≤1/4L) (Note: 4)
<table>
<tr><th>L (mm) / Zone W(mm)</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>L >5</td><td>W>0.1</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.5 < L ≤ 5</td><td>0.03 < W≤0.1</td><td>5</td></tr>
<tr><td>L ≤0.5</td><td>W≤0.03</td><td>*</td></tr>
</table>
L : Length W : Width ＊ : Disregard</td></tr>
<tr><td>2</td><td>External Inspection (non-operating)</td><td>Dimension: Outline (Major)
Bezel appearance: uneven (Minor)
Scratch on the polarize: (Note:2)
<table>
<tr><th>L (mm) / Zone W(mm)</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>--</td><td>W>0.1</td><td>0</td><td rowspan="2">Minor</td><td rowspan="2">1.5</td></tr>
<tr><td>L ≤ 3</td><td>W≤0.1</td><td>3</td></tr>
</table>
L : Length W : Width ＊ : Disregard
Dent or bubble on the polarize (Note:2)
<table>
<tr><th>Zone / Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D≤0.3</td><td>*</td><td rowspan="2">Minor</td><td rowspan="2">1.5</td></tr>
<tr><td>D≤0.5</td><td>3</td></tr>
</table>
D = (Long + Short) / 2 ＊ : Disregard</td></tr>
</table>

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

Note1:

(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)Definition of distribution of point defect is as follows:

-minimum separation between dark point defects should be larger than 5mm.

-minimum separation between bright point defects should be larger than 5mm.

(d)Definition of joined bright point defect and joined dark point defect are as follows:

-Two or more joined bright point defects must be nil.

-Three joined dark point defects must be nil.

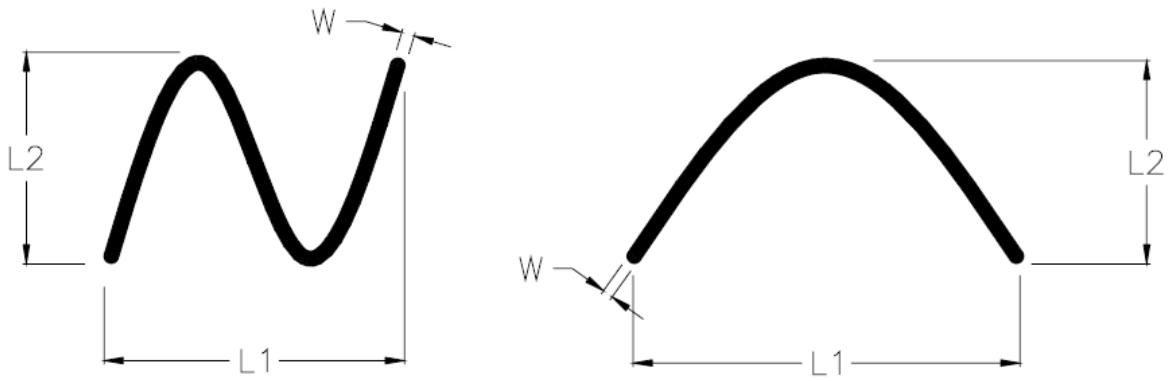
-Coupling of one dark and one bright point in junction is counted as one dark and bright spot with 1 pair maximum.

-Two Joined dark point is counted as two dark points with 2 pair maximum.

Note2: The external inspection should be conducted at the distance 30± 5cm between the eyes of inspector and the panel.

Note3: Luminance measurement for contrast ratio is at the distance 50± 5cm between the detective head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note4: W-Width in mm , L-length of Max.(L1,L2) in mm.



10.5 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

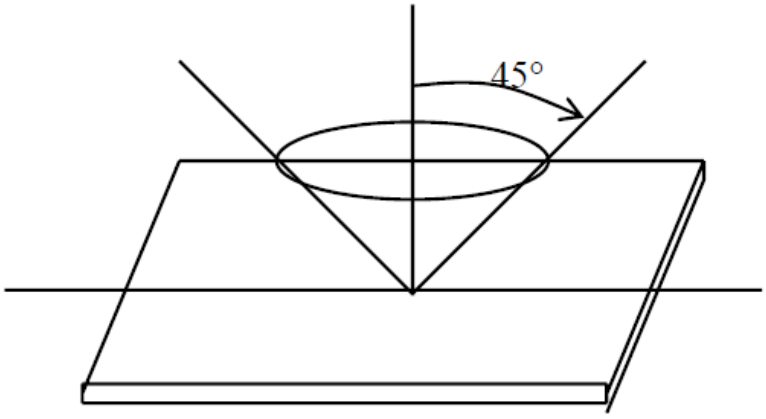
Inspection level: Level II

10.6 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

$\theta \leq 45^{\circ}$ inspection under non-operating condition.

$\theta \leq 5^{\circ}$ inspection under operating condition



11. PRECAUTION RELATING PRODUCT HANDLING

11.1 SAFETY

11.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

11.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

11.2 HANDLING

11.2.1 Avoid any strong mechanical shock which can break the glass.

11.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.

11.2.3 Do not remove the panel or frame from the module.

11.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

11.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

11.2.6 Do not touch the display area with bare hands , this will stain the display area.

11.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

11.2.8 To control temperature and time of soldering is 280 ± 10°C and 3-5 sec.

11.2.9 To avoid liquid (include organic solvent) stained on LCM.

11.3 STORAGE

11.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

11.3.2 Do not place the module near organics solvents or corrosive gases.

11.3.3 Do not crush, shake, or jolt the module.