

**Display Elektronik GmbH**

**DATA SHEET**

**TFT- MODULE**

**DEM 1024600L VMH-PW-N  
(C-TOUCH)**

**7" TFT**

**Product Specification**

**Ver.: 0**

**06.08.2018**

Revise Records

Rev.	Date	Contents	Written	Approved
0	06.08.2018	Preliminary Specification	R	MHI

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

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**1. General Description and Features**

DEM 1024600L VMH-PW-N(C-TOUCH) is 7.0" color TFT (Thin Film Transistor) liquid crystal display composed of a TFT-LCD module, a driver circuit, a touch Panel and a back-light unit. By applying 1024×600 images are displayed on the 7.0" diagonal screen. Display 16.7M colors by R.G.B signal input.

**1.1 Features**

- Back-light with 27 LEDs are available.
- IPS
- 7.0(16:9 diagonal) inch configuration
- ROHS Compliance

**1.2 LCD Module**

Item	Specification	Unit
Screen Size	7.0 Inches	Diagonal
Display Resolution	1024 x 600	Pixel
Active Area	154.214 x 85.92	mm
Outline Dimension	170.00 x 100.00 x 9.18	mm
Display Mode	Normally Black	--
Color Arrangement	RGB-vertical Stripe	--
Pixel Pitch	0.1506 x 0.1432	mm
Viewing Direction	All	--
Input Interface	LVDS	--

**2. Mechanical Information**

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	170.00	--	mm	
	Vertical (V)	--	100.00	--	mm	
	Thickness (T)	--	9.18	--	mm	(1)
Weight		--	(TBD)	--	g	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

**3. Electrical Specifications**

**3.1 Absolute Max. Ratings**

**3.1.1 Absolute Ratings of Environment**

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

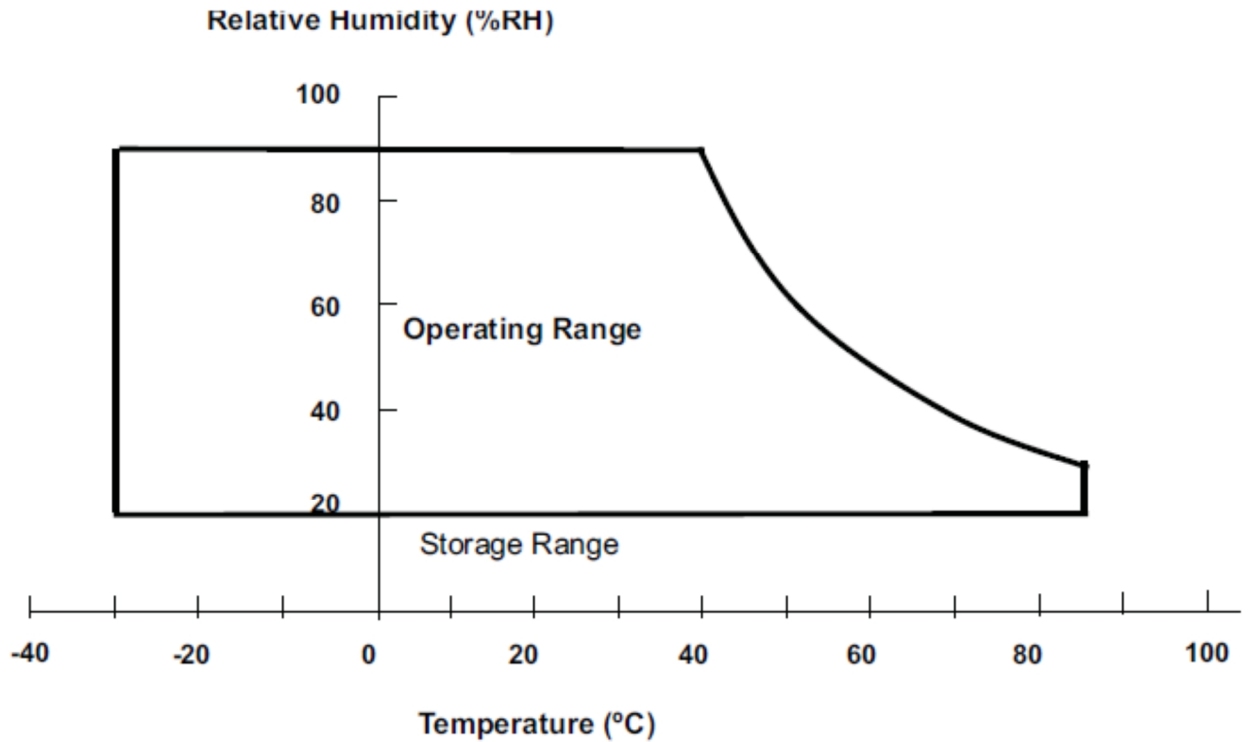
(Ta=25±2°C, Vss=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T <sub>STG</sub>	-30	80	°C	(1)
Operating Temperature	T <sub>OPR</sub>	-20	70	°C	(1,2,3)

Note (1) 90 % RH Max. ( 40 °C ≥ Ta ). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.

Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.



## 3.1.2 Electrical Absolute Maximum Ratings

(VCC=VCC\_IF=1.8V, AVDD=8V to 13.5V, GND=GND\_IF=AGND=0V, T<sub>A</sub>=-20°C to +85°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Digital supply voltage	VCC	-	1.71	1.8	1.89	V
MIPI/LVDS supply voltage	VCC_IF	-	1.71	1.8	1.89	V
Analog supply voltage	AVDD	-	8	-	13.5	V
Low level input voltage	V <sub>IL</sub>	For digital circuit	0	-	0.2VCC	V
High level input voltage	V <sub>IH</sub>	For digital circuit	0.8VCC	-	VCC	V
Output low voltage	V <sub>OL</sub>	I <sub>OL</sub> =400μA	-	-	GND+0.4	V
Output high voltage	V <sub>OH</sub>	I <sub>OH</sub> =-400μA	VCC-0.4	-	-	V
Pull low/high resistance	R	For the digital input pin @VCC=1.8V	150	400	600	kΩ
Input leakage current	I <sub>I</sub>	For digital circuit	-	-	±1	μA
Analog stand-by current	I <sub>st2</sub>	No load, clock & all functions are stopped	-	<1	100	μA
Input level of V1~V7	V <sub>ref1</sub>	Gamma correction voltage input	0.4AVDD	-	AVDD-0.1	V
Input level of V8~V14	V <sub>ref2</sub>	Gamma correction voltage input	0.1	-	0.6AVDD	V
Output voltage deviation	V <sub>od1</sub>	V <sub>o</sub> =AGND+0.2V~AGND+0.5V & V <sub>o</sub> =AGND-0.5V~AVDD-0.2V	-	±20	±35	mV
Output voltage deviation	V <sub>od2</sub>	V <sub>o</sub> =AGND+0.5V~AVDD-0.5V	-	±15	±20	mV
Output voltage offset between chips	V <sub>oc</sub>	V <sub>o</sub> =AGND+0.5V~AVDD-0.5V	-	-	±20	mV
Dynamic range of output	V <sub>dr</sub>	SO1~SO1536	0.1	-	AVDD-0.1	V
Sinking current of outputs	I <sub>OLy</sub>	SO1~SO1536; V <sub>o</sub> =0.1V vs. 1.0V, AVDD=13.5V	80	-	-	μA
Driving current of outputs	I <sub>OHy</sub>	SO1~SO1536; V <sub>o</sub> =0.1V vs. 12.5V, AVDD=13.5V	80	-	-	μA
Resistance of gamma Table	R <sub>g</sub>	R <sub>n</sub> : Internal gamma resistor	0.7·R <sub>n</sub>	1.0·R <sub>n</sub>	1.3·R <sub>n</sub>	Ω
Power reference voltage	FBH, FBL	-	1.1	1.2	1.3	V

## 3.1.2.1 TFT-LCD Module

(V<sub>SS</sub>=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Power supply voltage	V <sub>CC</sub> 3.3V	-0.3	4.3	V	

## 3.1.2.2 Backlight Unit

(V<sub>SS</sub>=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Current of Backlight Unit	I <sub>B</sub>	--	720	mA	
Voltage of Backlight Unit	V <sub>B</sub>	--	10.2	V	

## 3.1.3 DC Electrical Characteristics of the TFT LCD

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Power supply voltage 1	VCC	-0.3	-	+2	V
Power supply voltage 2	AVDD	-0.5	-	+14.85	V
Input voltage	V <sub>IN</sub>	-0.5	-	AVDD+0.5	V
Operation temperature	T <sub>OPR</sub>	-20	-	+85	°C
Storage temperature	T <sub>STG</sub>	-55	-	+125	°C

## 3.2 AC Timing Characteristic of The LCD

## 3.2.1 Timing Condition

## • DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fbk	26.2	29.2	54.6	MHz
Horizontal display area	thd		800		DCLK
HSD period	th	890	928	1300	DCLK
HSD blanking	thb+ thfp	90	128	500	DCLK
Vertical display area	tdv		480		T <sub>H</sub>
VSD period	tvbp	490	525	700	T <sub>H</sub>
VSD blanking	tvbp+ tvfp	10	45	220	T <sub>H</sub>

## • HV mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fbk	27.7	29.2	39.6	MHz
Horizontal display area	thd		800		DCLK
HSD period	th	900	928	1100	DCLK
HSD pulse Width	thpw	1	-	40	DCLK
HSD back porch	thbp		88		DCLK
HSD front porch	thfp	12	40	212	DCLK
Vertical display area	tdv		480		T <sub>H</sub>
VSD period	tv	513	525	600	T <sub>H</sub>
VSD pulse width	tvpw	1	-	3	T <sub>H</sub>
VSD back porch	tvbp		32		T <sub>H</sub>
VSD front porch	tvfp	1	13	88	T <sub>H</sub>

Parameter	Symbol	Conditions	Spec.			Unit
			Min.	Typ.	Max.	
Time from HSD to STV	Thstv	-	-	1	-	DCLK
STV pulse width	Twstv	-	-	1	-	H
Time from HSD to CKV	Thckv	-	-	45	-	DCLK
Time from HSD to OEV	Thoev	-	-	3	-	DCLK
Time from CKV to OEV	Twckvoe	-	-	105	-	DCLK
Time from HSD to LD	Thld	-	-	50	-	DCLK
OEV pulse width	Twoev	-	-	127	-	DCLK
LD pulse width	Twld	-	-	4	-	DCLK
Output stable time	T <sub>ss1</sub>	10% to 90% target voltage CL=90pF, R=10KΩ	-	-	5	μs

Timing Characteristic

3.2.1.1 DE and RGB Data Input Timing

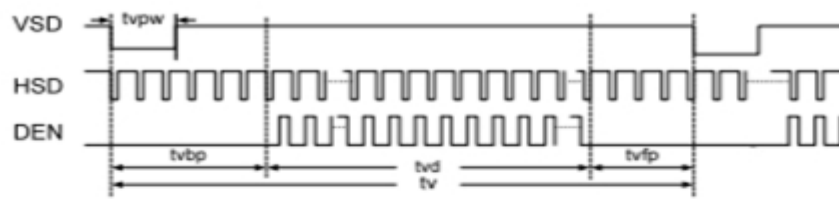
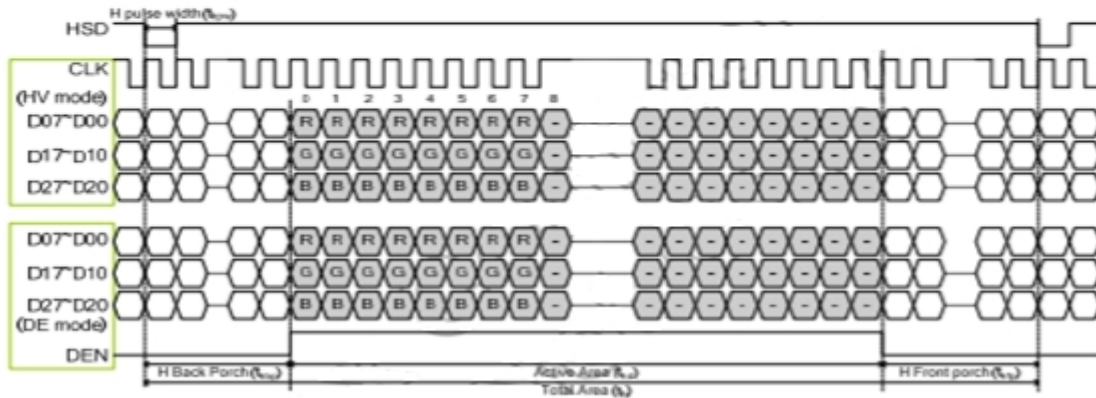
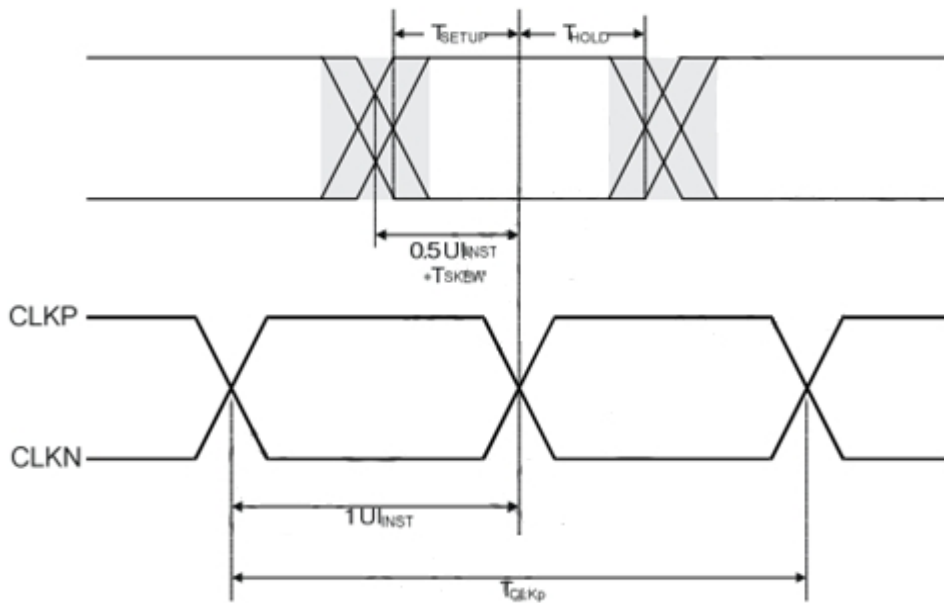


Figure 9.10: Vertical input timing diagram

Horizontal timing



3.2.1.2 Clock and Data input waveforms





### 3.3 Back-Light Unit

The Back-light system is an edge-lighting type with 27 white LED (Light Emitting Diode)s. The characteristics of 27 white LEDs are shown in the following tables.

(Ta= Room Temp)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Voltage	VB	7.8	9.6	10.2	V	
Forward Current	IB	-	630	-	mA	(1)
Power Consumption	P <sub>BL</sub>	-	6048	-	mW	(2)
LED Lifetime	-	35000	50000	-	hr	(3)

Note (1) LEDs in 3 series x 9 parallel type.

(2) Where  $IB = 630\text{mA}$ ,  $VB = 9.6$ ,  $P_{BL} = VB \times IB$

(3) The environmental conducted under ambient air flow, at  $Ta=25\pm 2^\circ\text{C}$ ,  $60\%RH\pm 5\%$

## 4. Optical Characteristics

### 4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

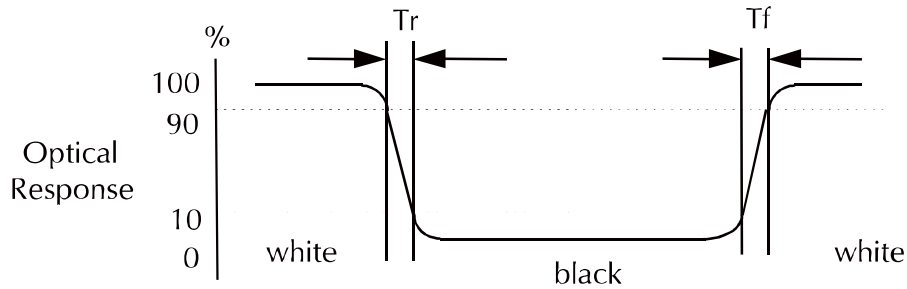
Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness	B		720	900	--	cd/m <sup>2</sup>		
Response Time	T <sub>r</sub>	$\theta=0^\circ$	-	13	20	ms	.	
	T <sub>f</sub>		--	15	25	ms		
Contrast Ratio	CR	At optimized viewing angle	600	800	--	--		
Luminance Uniformity	$\Delta L$		70	75		%		
Color Chromaticity (CIE 1931)	White	$\theta=0^\circ$ Normal Viewing Angle	W <sub>x</sub>	0.260	0.310	0.360	--	BM-7A
			W <sub>y</sub>	0.280	0.330	0.380		
Viewing Angle	Hor.	CR $\geq 10$	$\theta_R$	80	85	--	Degree	
			$\theta_L$	80	85	--		
	Ver.		$\theta_U$	80	85	--		
			$\theta_D$	80	85	--		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

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



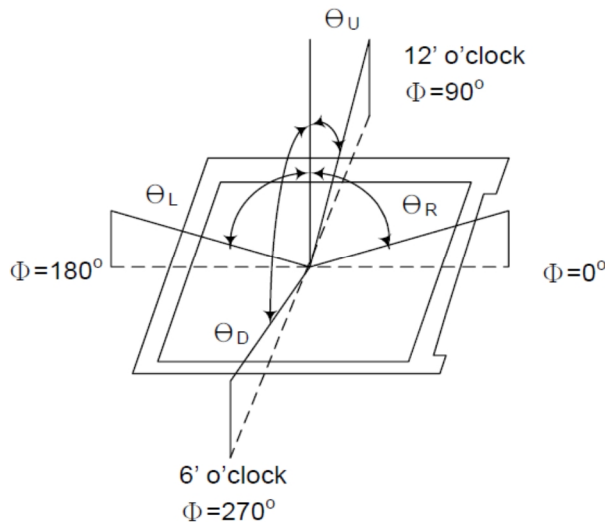
c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}$$

$$\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
---------------------------------	----------

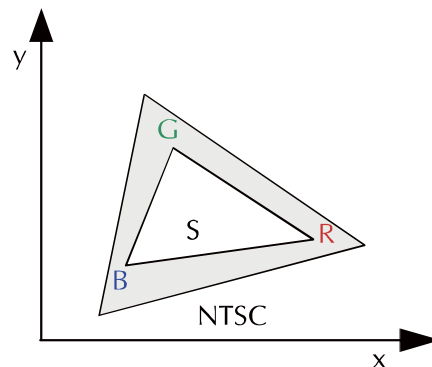
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = ( RGB Triangle Area / NTSC Triangle Area ) x 100



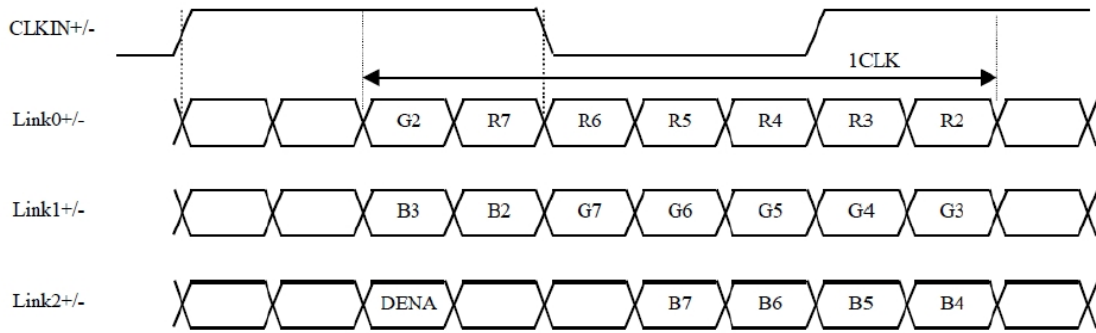
5. I/O Terminal

5.1 Pin Assignment

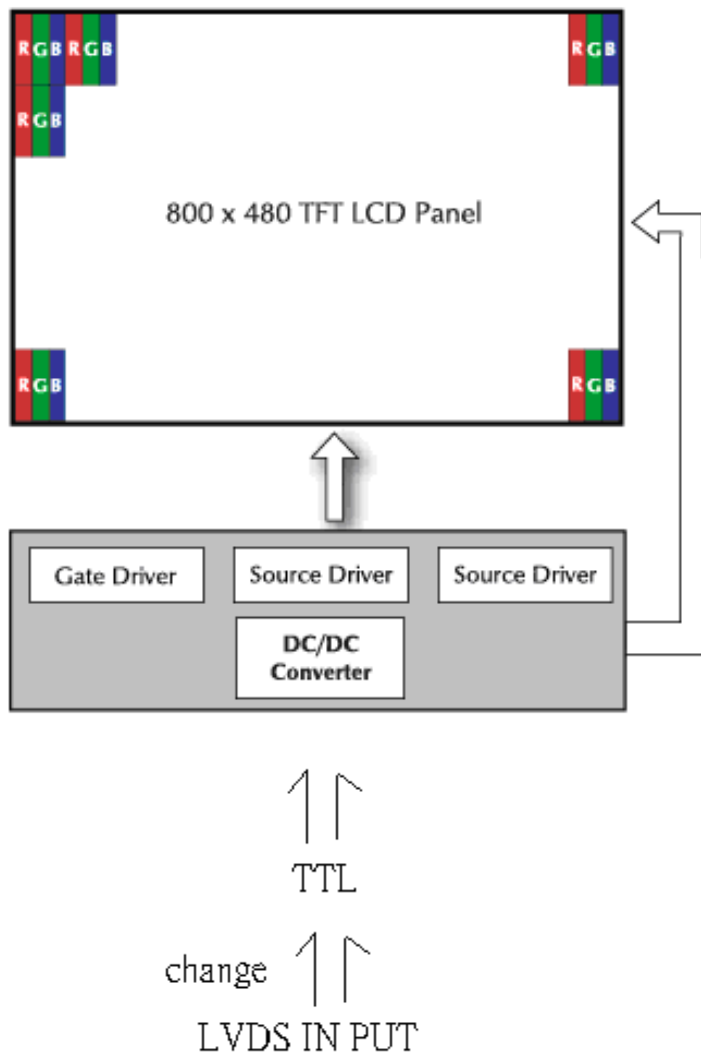
Pin No.	Symbol	I/O	Function	Remark
1	VCC	P	Power Supply for system 3.3V	
2	GND	P	Ground	
3	RxIN0-	I	LVDS Data Differential Pair 0 input	
4	RxIN0+	I	LVDS Data Differential Pair 0 input	
5	GND	P	Ground	
6	RxIN1-	I	LVDS Data Differential Pair 1 input	
7	RxIN1+	I	LVDS Data Differential Pair 1 input	
8	GND	P	Ground	
9	RxIN2-	I	LVDS Data Differential Pair 2 input	
10	RxIN2+	I	LVDS Data Differential Pair 2 input	
11	GND	P	Ground	
12	RxCLK-	I	Negative LVDS differential clock input	
13	RxCLK+	I	Positive LVDS differential clock input	
14	GND	P	Ground	
15	RxIN3-	I	LVDS Data Differential Pair 3 input	
16	RxIN3+	I	LVDS Data Differential Pair 3 input	
17	GND	P	Ground	
18	LED_A	P	Power for LED backlight anode	
19	LED_K	I	Power for LED backlight cathode	
20	GND	P	Ground	

I: Input, O: Output, P: Power

Notes: VSS Pin must ground contact, cannot be floating.



5.2 Block Diagram



6. Displayed Color and Input Data

	Color & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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	Black	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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	Black	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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	Black	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
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	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

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

## 7. Touch Screen Panel Specifications

## 7.1 Touch Panel

Item	Specification	Unit
Screen Size	7.0 Inches	Diagonal
Type	Transparent Type Projected Capacitive Touch Panel	--
Input Mode	Human's Finger/ Gloves	--
Point	5	--
Interface	I2C	--
Cover Glass Pencil-Handness	6H(min) by JIS K5400	--
IC Solution	IC : GT911	--

## 7.2 Electrical Characteristics

## 7.2.1 Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
Analog power AVDD28 (please refer to AGND)	2.66	3.47	V
VDDIO (please refer to DGND)	1.7	3.47	V
Voltage on digital I/O	-0.3	3.47	V
Voltage on analog I/O	-0.3	3.47	V
Range of operating temperature	-40	85	°C
Range of storage temperature	-60	125	°C
ESD susceptibility (HB Model)	—	±2	KV

## 7.2.2 Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
AVDD28	2.8	-	3.3	V
VDDIO	1.8	-	AVDD28	V
Operating temperature	-20	-	85	°C

7.2.3 AC Electrical Characteristics

(Ambient temperature:25°C, AVDD28=2.8V, VDDIO=1.8V)

Parameter	Min.	Typ.	Max.	Unit
OSC oscillation frequency	59	60	61	MHz
I/O output rise time, low to high	-	14	-	ns
I/O output fall time, high to low	-	14	-	ns

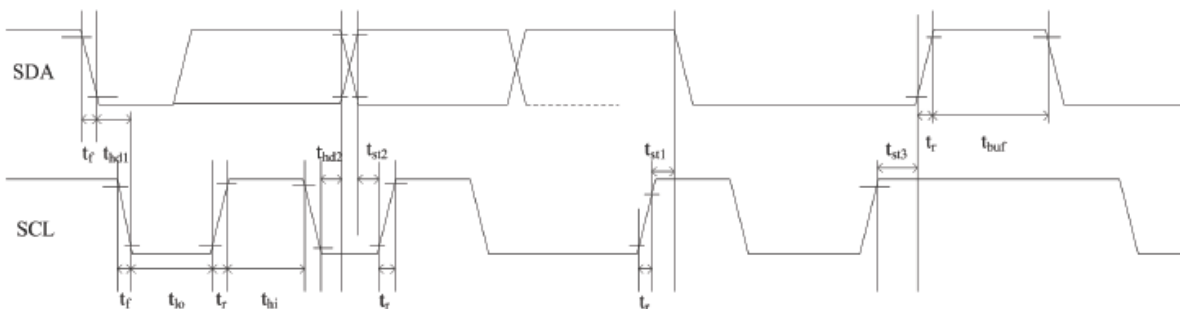
7.2.4 DC Electrical Characteristics

(Ambient temperature:25°C, AVDD28=2.8V)

Parameter	Min.	Typ.	Max.	Unit
Normal mode operating current	-	13	-	mA
Green mode operating current	-	4.5	-	mA
Sleep mode operating current	70	-	120	uA
Doze mode operating current	-	1.3	-	mA
Digital input low voltage/VIL	-0.3	-	0.25*VDDIO	V
Digital input high voltage/VIH	0.75*VDDIO	-	VDDIO+0.3	V
Digital output low voltage/VOL	-	-	0.15*VDDIO	V
Digital output high voltage/VOH	0.85*VDDIO	-	-	V

7.3 I2C Timing

GT9110 provides a standard I<sup>2</sup>C interface for SCL and SDA to communicate with the host. GT9110 always serves as slave device in the system with all communication being initialized by the host. It is strongly recommended that transmission rate be kept at or below 400Kbps. The I<sup>2</sup>C timing is shown below:



Test condition 1: 1.8V host interface voltage, 400Kbps transmission rate, 2K pull-up resistor

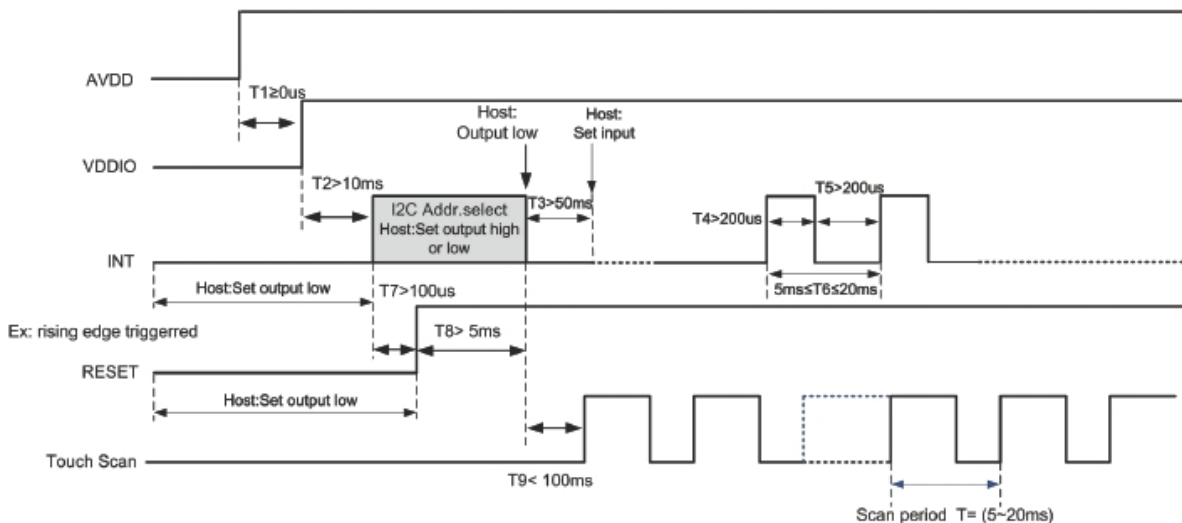
Parameter	Symbol	Min.	Max.	Unit
SCL low period	$t_{lo}$	1.3	-	us
SCL high period	$t_{hi}$	0.6	-	us
SCL setup time for Start condition	$t_{st1}$	0.6	-	us
SCL setup time for Stop condition	$t_{st3}$	0.6	-	us
SCL hold time for Start condition	$t_{hd1}$	0.6	-	us
SDA setup time	$t_{st2}$	0.1	-	us
SDA hold time	$t_{hd2}$	0	-	us

Test condition 2: 3.3V host interface voltage, 400Kbps transmission rate, 2K pull-up resistor

Parameter	Symbol	Min.	Max.	Unit
SCL low period	$t_{lo}$	1.3	-	us
SCL high period	$t_{hi}$	0.6	-	us
SCL setup time for Start condition	$t_{st1}$	0.6	-	us
SCL setup time for Stop condition	$t_{st3}$	0.6	-	us
SCL hold time for Start condition	$t_{hd1}$	0.6	-	us
SDA setup time	$t_{st2}$	0.1	-	us
SDA hold time	$t_{hd2}$	0	-	us

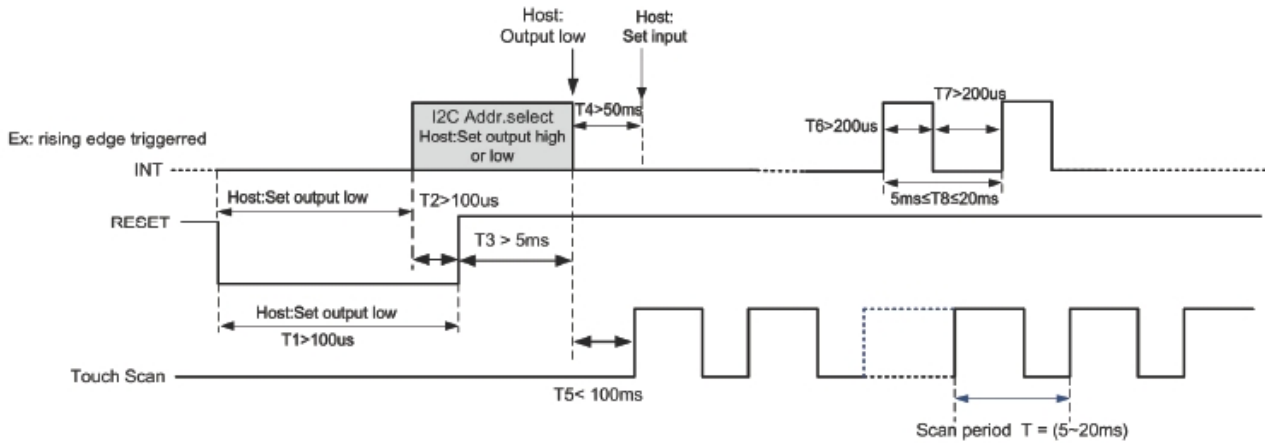
GT9110 supports two I2C slave addresses: 0xBA/0xBB and 0x28/0x29. The host can select the address by changing the status of Reset and INT pins during the power-on initialization phase. See the diagram below for configuration methods and timings:

**Power-on Timing:**

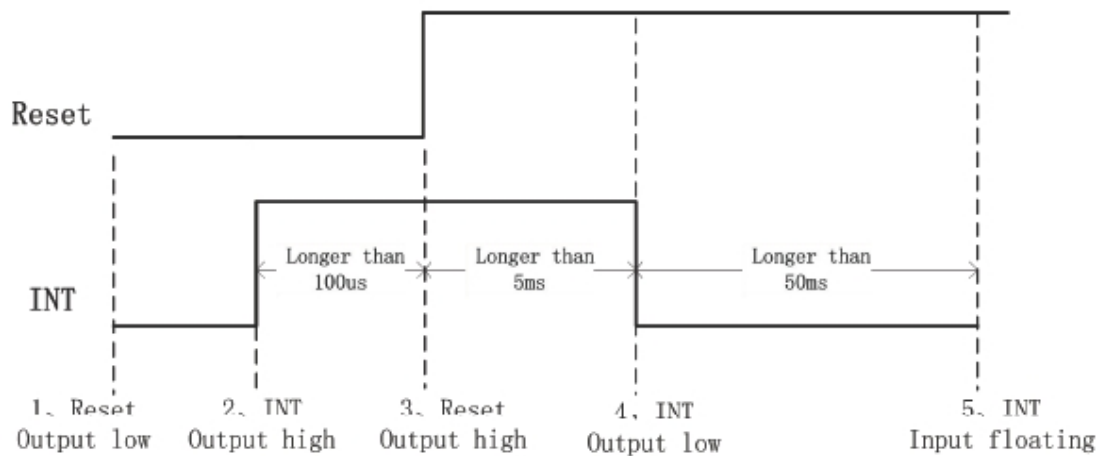




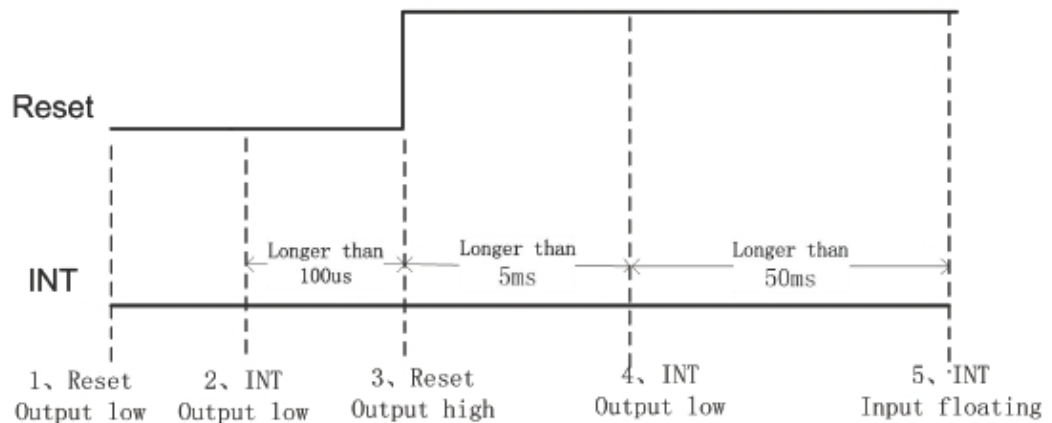
Timing for host resetting GT9110:



Timing for setting slave address to 0x28/0x29:



Timing for setting slave address to 0xBA/0xBB:



7.4 Pin Assignments and Definitions.

Item	Name	Function
1	VDD(3.3V)	Power supply 3.3V
2	GND	Ground
3	SCL	I2C Clock
4	SDA	I2C Data
5	INT	Interrupt request to the host
6	RST	External Reset, active low

8. Reliability Condition

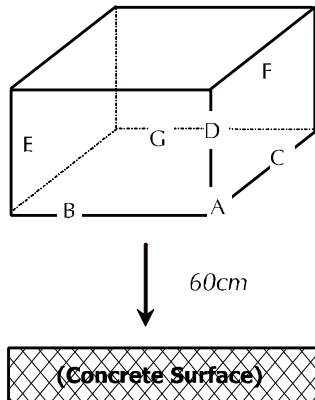
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20°C ± 5°C.

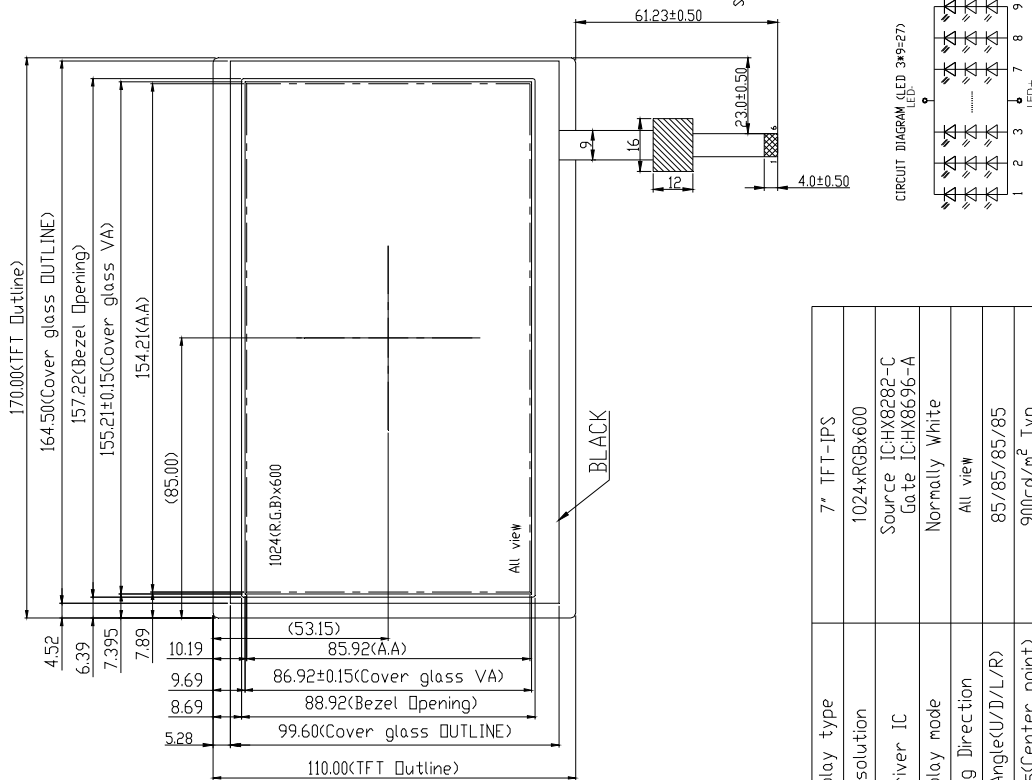
Humidity: 65% ± 5%RH.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs	
2	Low Temperature Operating	-20°C±2°C, 240hrs	1
3	High Temperature Storage	80°C±2°C, 240hrs.	2
4	Low Temperature Storage	-30°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	60°C±2°C , 90%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10–55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  <i>Dropping method corner dropping:</i> <i>A corner: Once edge dropping.</i> <i>B, C, D edge: Once face dropping.</i> <i>E, F, G face: Once.</i>	

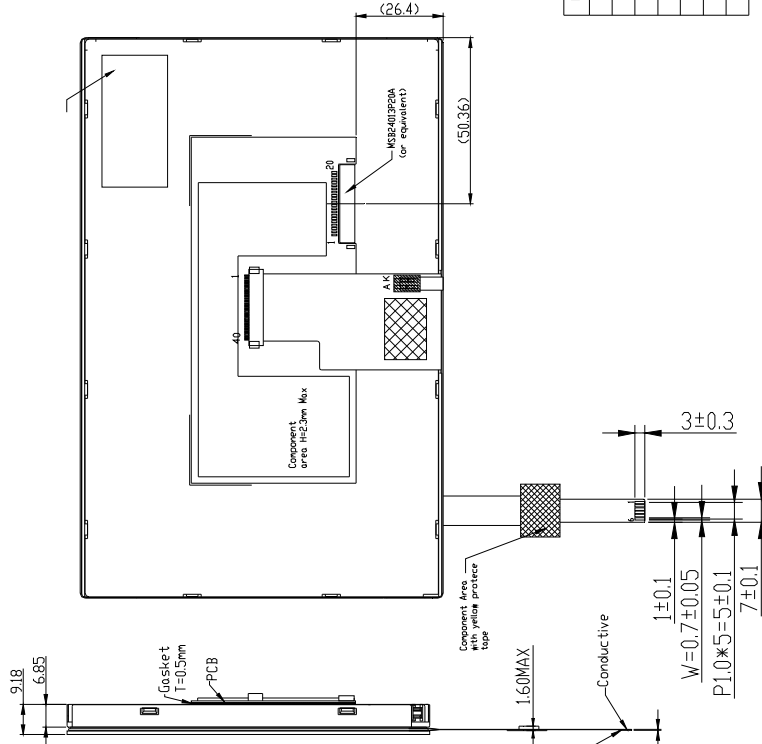
- Notes:
1. No dew condensation to be observed.
  2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
  3. Vibration test will be conducted to the product itself without putting I in a container.

9. Dimensional Outlines



No.	PIN NAME
1	VCC
2	GND
3	RIN0-
4	RIN0+
5	GND
6	RIN1-
7	RIN1+
8	GND
9	RIN2-
10	RIN2+
11	GND
12	RCLK-
13	RCLK+
14	GND
15	RIN3-
16	RIN3+
17	GND
18	LED_A
19	LED_K
20	GND

FUNCTION(P)	PIN	SYMBOL
1	VDDI3(3V)	
2	GND	
3	SCL	
4	SDA	
5	INT	
6	RESET	



CTP connector: Molex 52271-0619 or equivalent

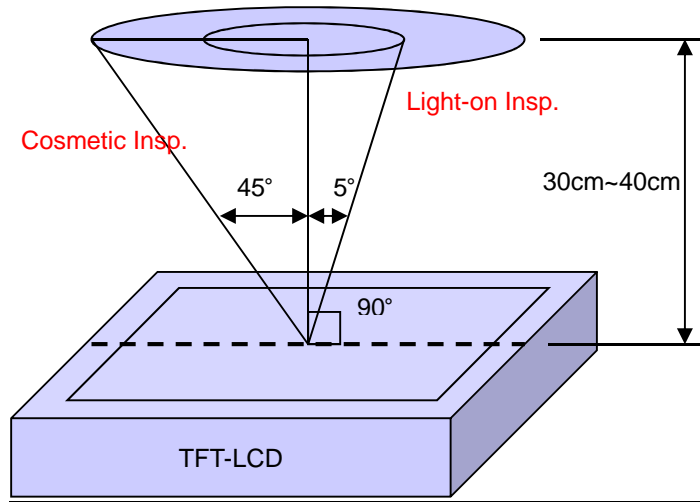
Display type	7" TFT-IPS
Resolution	1024xRGBx600
Driver IC	Source IC:HX8282-C Gate IC:HX8696-A
Display mode	Normally White
Viewing Direction	All view
Viewing Angle(U/D/L/R)	85/85/85/85
Brightness(Center point)	900cd/m <sup>2</sup> Typ.
Color Chromaticity	x=0.31±0.05, y=0.34±0.05
Backlight	LED 27pcs, 3S9P
Operating Temperature	-20~+70°C
Storage Temperature	-30~+80°C
Interface	LVDS

10. Incoming Inspection Standards

10.1 Inspection and Environment Conditions

10.1.1 Inspection Conditions:

- (1) Inspection Distance: 35 cm±5cm
- (2) View Angle : Light-on Inspection Angle : ±5°  
Cosmetic Inspection Angle : ±45°



( perpendicular to LCD panel surface)

10.1.2 Environment Conditions:

Ambient Temperature		23°C±5°C
Ambient Humidity		55±10%RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux

10.1.3 Sampling Conditions:

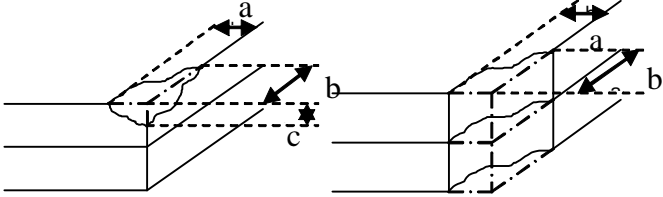
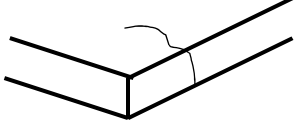
- (1) Lot Size: Quantity of shipment lot per model
- (2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

- (3) The classification of Major(MA) and Minor(MI) defects is shown as 3. Inspection Criteria.

10.1.4 Inspection Criteria

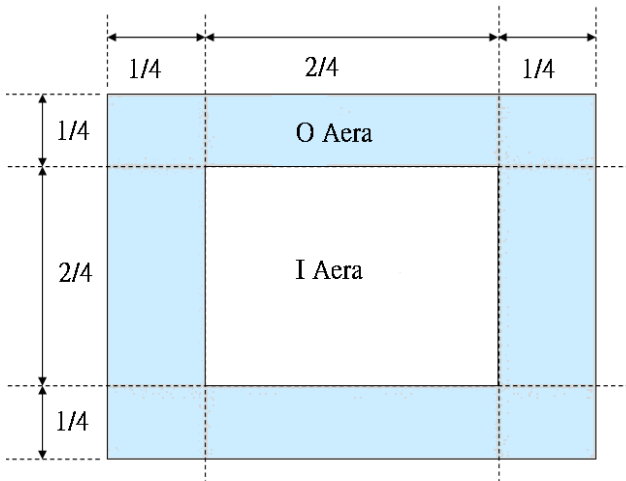
10.1.4.1 Cosmetic Inspection(Panel):

Item	Judgment Criteria	Classification
Chipping on Panel	 <p><math>a \leq 3.0\text{mm}</math>、<math>b \leq 3.0\text{mm}</math>、<math>c \leq t</math> ( Bottom glass thickness)</p>	MA
Scratch on Panel *Note-2	<p><math>W \leq 0.05\text{mm}</math> or <math>L &lt; 5\text{mm}</math>: Ignored  <math>0.05\text{mm} &lt; W \leq 0.1\text{mm}</math> and <math>L \leq 5\text{mm}</math>: <math>N \leq 5</math>  <math>W &gt; 0.1\text{mm}</math> or <math>L &gt; 5\text{mm}</math>: Not allowed</p>	MI
Bubble or Dent on Panel *Note-3	<p><math>D \leq 0.2\text{mm}</math>: Ignored  <math>0.2\text{mm} &lt; D \leq 0.3\text{mm}</math>: <math>N \leq 5</math>  <math>D &gt; 0.3\text{mm}</math>: Not allowed</p>	MI
Panel Crack	 <p>Not Allowed crack</p>	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	$L \leq 20\text{mm}$ , $W \leq 0.2$ , $N \leq 3$	MI
Metal Squash Dent /Flange(Front Side)	$D(W) \leq 1, L \leq 3, N \leq 3;$	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Must in Spec, refer to related product spec.	MI

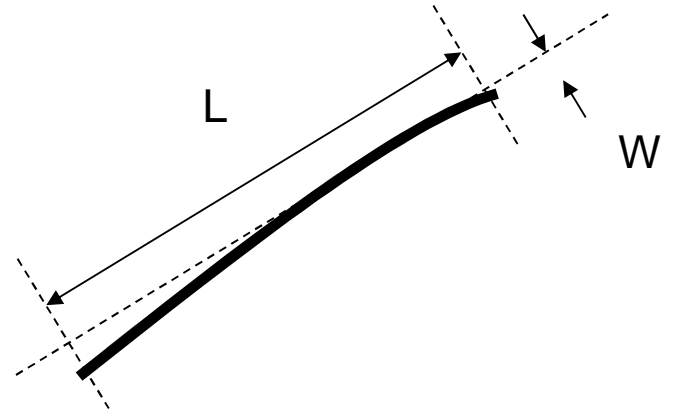
## 10.1.4.2 Functional Inspection:

Item	Judgment Criteria			Classification
	Area(Note1)	I	O	
Point Defect	Bright dot	Random	2	
		2 dots adjacent	0	0
		3 dots adjacent or more	0	0
	Dark dot	Random	3	
		2 dots adjacent	1	
		3 dots adjacent or more	0	0
	Total Dot Defect		5	
	Distance	Distance between Bright and Bright dot	$L \geq 5\text{mm}$	
		Distance between Bright and Dark dot	$L \geq 5\text{mm}$	
		Distance between Dark dot	$L \geq 5\text{mm}$	
(1) It is defined as Point Defect if defect area $> 0.5\text{dot}$ (2) It is ignored if defect area $\leq 0.5\text{dot}$ (3) Weak point defect will be defined as Bright Dot if it can be observed through ND filter 5% ( Full Screen Black Inspection)				MI
Line Defect	Obvious vertical or horizontal line defect is not allowed.			MA
Mura	Not allowed if it can be observed through ND Filter 5 %			MI
Foreign Material in spot shape *Note-3	$D \leq 0.2\text{mm}$ : Ignored $0.2\text{mm} < D \leq 0.5\text{mm}$ : $N \leq 8$ $D > 0.5\text{mm}$ : Not allowed			MI
Foreign Material in line or spiral shape *Note-4	$W \leq 0.05\text{mm}$ or $L \leq 5\text{mm}$ : Ignored $0.05\text{mm} < W \leq 0.2\text{mm}$ and $L 1.0\text{mm} \leq 5\text{mm}$ : $N \leq 8$ $W > 0.2\text{mm}$ or $L > 5\text{mm}$ : Not allowed			MI
Display Function Abnormal	No Malfunction can be allowed			MA

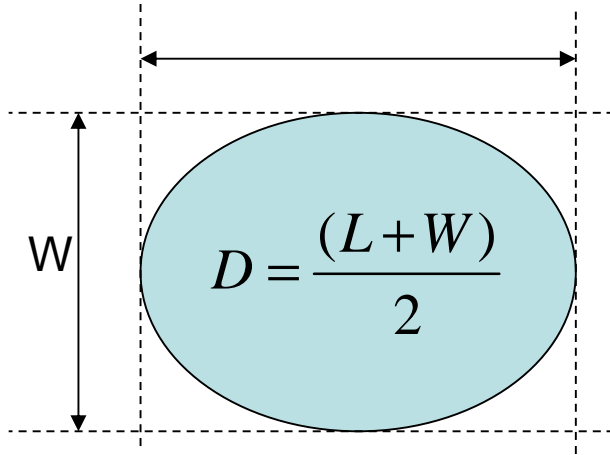
Note-1 : I/O Area Definition



Note-2 : Polarizer Scratch



Note-3 : Spot Foreign Material  
( $W \geq L / 4$ )



Note-4 : Line or Spiral Foreign Material  
( $W < L / 4$ )

