

Product Specification

Part Name: 5.46 inch TFT LCD With touch panel

Element Touch Part ID: ET-TLCM0546B1-CT-HD



1. Introduction

1.1 Scope of application

This specification applies to the LCD module that is supplied by Element Touch Shenzhen Yiheng Intelligent Innovation Co., Ltd.

LCD specification: Dots 1080xRGBx1920.

As to basic specification of the driver IC, refer to the IC (Himax:HX8399-C) specification and data book.

All material & processing of the LCD module should be Lead Free.

1.2 TFT features:

Structure: TFT PANNEL+IC +FPC+BL+CTP;

IPS Type LCD

1080 dot-segment and 1920 dot-common outputs;

16.7M Color can be selected by software;

White LED back light;

4Lane MIPI interface

1.3 Applications:

2. LCM General specification

ITEM	Standard value	Unit
LCD Type	Normally black	--
Drive element	TFT active matrix	--
Number of pixels	1080*3RGB(H)X1920(V)	Dots
Pixel arrangement	RGB stripe	--
Pixel Pitch (H*V)	63 (H) x63 (V)	um
Active area(H*V)	68.04(H) x 120.96(V)	mm
Viewing direction	ALL O'CLOCK	
TFT Driver IC	HX8399-C	
TFT interface	MIPI Interface	-
Approx. Weight	TBD	g
LCM Size(W*H*T)	70.04(W) x 128.29(H) x1.78(T)	mm
LCM+CTP Size(W*H*T)	75.80(W) x 139.90(H) x3.49(T)	mm
Touch structure	G+F+F	
Touch Driver IC	GT911	-
Touch Interface	I2C	

3. Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit
LCM Operating Temperature	T _{OPR}	-20	+60	°C
LCM Storage Temperature	T _{STG}	-30	+70	°C
TP Operating Temperature & Humidity(20% ~ 90%RH)	T _{OPR}	-20	+60	°C
TP SStorage Temperature & Humidity(20% ~ 90%RH)	T _{STG}	-30	+70	°C
Humidity	RH	-	90	%

4. Electrical Characteristics

4.1 TFT DC Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage for I/O	VDDIO	1.65	1.8	3.3	V	
External Input Voltage for(DC/DC)	VSP	4.8	--	6.0	V	
External Input Voltage for(DC/DC)	VSN	-4.8	--	-6.0	V	
TFT Gate ON Voltage	VGH	--	11	--	V	Note 2
TFT Gate OFF Voltage	VGL	--	-7	--	V	Note 2
TFT Common Voltage	Vcom	-2	TBD	0	V	Note 1

Note 1: VCOM value should be adjusted by different condition to optimize Flicker Value.

Note 2: VGH and VGL are the operating voltages of TFT gate.

4.2 Back-Light Unit Characteristics

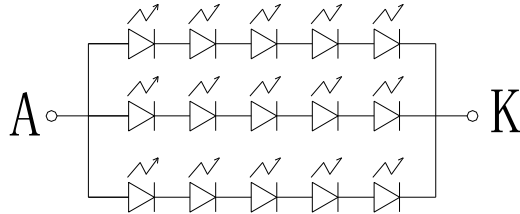
The back-light system is an edge-lighting type with 15 white LEDs. The characteristics of the back-light are shown in the following tables.

Characteristics	Symbol	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _F	28	--	32	V	-
Forward current	I _F	--	60	-	mA	-
Luminance(With LCD+CTP)	L _v	--	1000	--	cd/m ²	-
LED life time	N/A	----	30,000	--	Hr	Note 1

Note:

- (1) The “LED life time” is defined as the module brightness decrease to 50% of original brightness at $I_L=20\text{mA/LED}$. The LED life time could be decreased if operating I_L is larger than 25mA/LED .

Backlight circuit diagram shown in below:



5. Module Function Description

Pin No	Symbol	Description
1	GND	Power Ground
2	GND	Power Ground
3	CTP_RST 1.8V	Touch panel reset
4	RESET	Reset signal input terminal. Active at 'L'.
5	CTP_INT 1.8V	Touch panel interrupt output
6	TE	Tearing effect signal is used to synchronize MCU to frame memory
7	CTP_SDA 1.8V	Touch panel I2C data
8	LCD_ID	Not connected
9	CTP_SCL 1.8V	Touch panel I2C clock
10	GND	Power Ground
11	CTP_VCC	Touch panel Power supply 2.8~3.3V
12	DON	MIPI-DSI Data differential signal input pins.
13	GND	Power Ground
14	DOP	MIPI-DSI Data differential signal input pins.
15	LEDA	Power supply for backlight anode input terminal.
16	GND	Power Ground
17	LEDA	Power supply for backlight anode input terminal.
18	D1N	MIPI-DSI Data differential signal input pins.
19	GND	Power Ground

20	D1P	MIPI-DSI Data differential signal input pins.
21	LEDK	Power supply for backlight cathode input terminal.
22	GND	Power Ground
23	LEDK	Power supply for backlight cathode input terminal.
24	CLKN	MIPI-DSI CLOCK differential signal input pins.
25	LEDK	Power supply for backlight cathode input terminal.
26	CLKP	MIPI-DSI CLOCK differential signal input pins.
27	GND	Power Ground
28	GND	Power Ground
29	PWM	This pin is connecting with the external LED driver.
30	D2N	MIPI-DSI Data differential signal input pins.
31	IOVCC 1.8V	A power supply for the I/O circuit and logic power. IOVCC=1.65 to 3.3V
32	D2P	MIPI-DSI Data differential signal input pins.
33	GND	Power Ground
34	GND	Power Ground
35	VSP	External input voltage (4.8V~6V)
36	D3N	MIPI-DSI Data differential signal input pins.
37	VSN	External input voltage (-4.8V~-6V)
38	D3P	MIPI-DSI Data differential signal input pins.
39	GND	Power Ground
40	GND	Power Ground

6. Timing Characteristics

VSP/VSN/VDD1 input power (PCCS[2:0]=011)

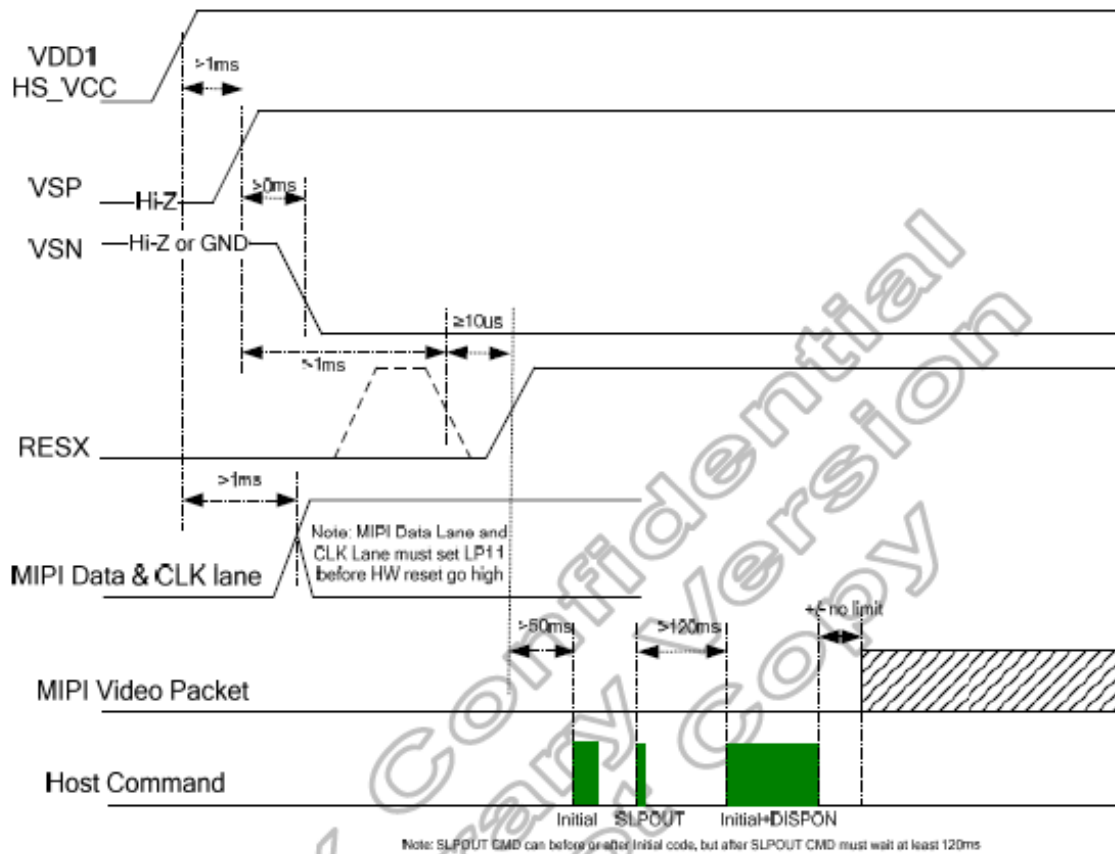


Figure 5.34: VSP/VSN/VDD1 input power on sequence (PCCS[2:0]=011)

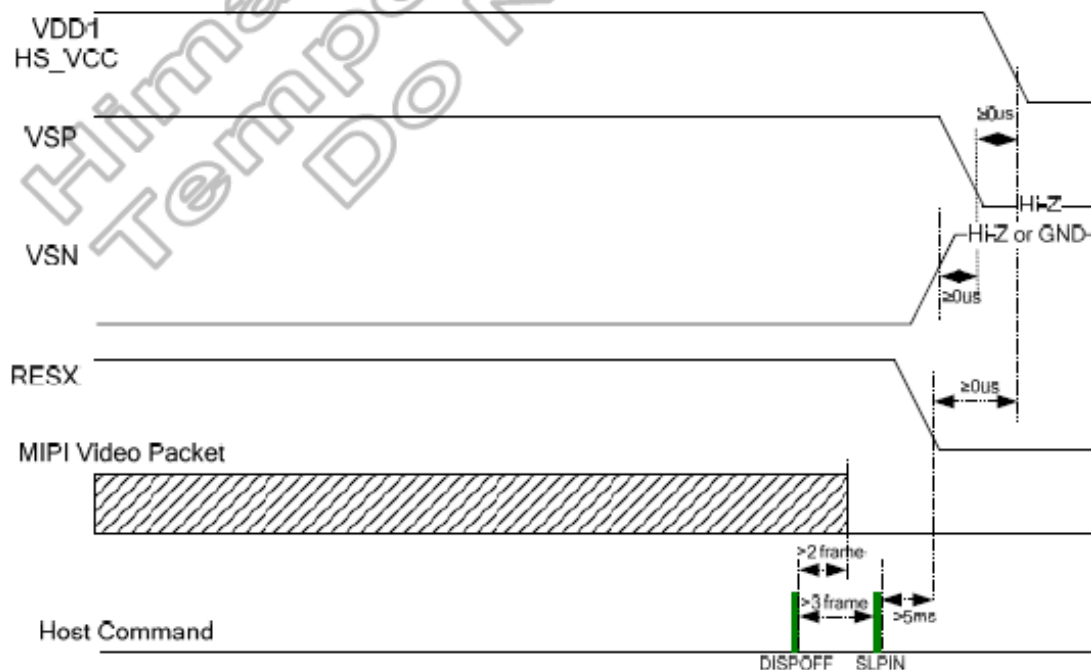


Figure 5.35: VSP/VSN/VDD1 input power off sequence (PCCS[2:0]=011)

Timings for DSI video mode

Vertical Timings

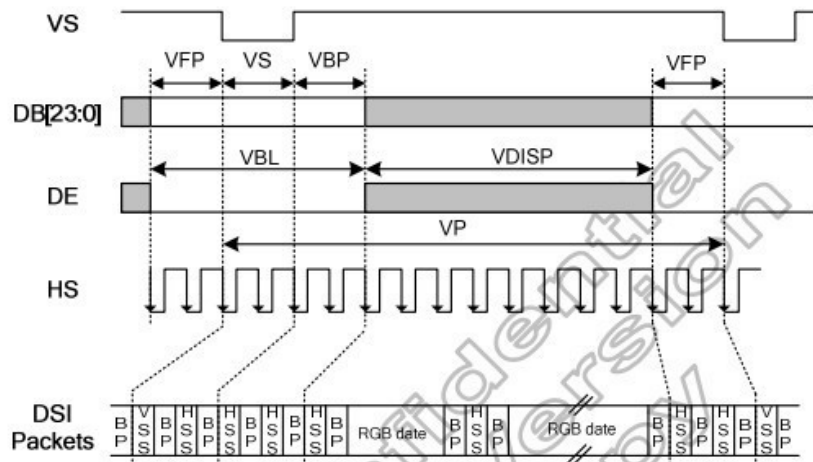


Figure 8.10: Vertical timings for DSI I/F

Vertical Resolution=528+8xNL (VSSA=0V, VDD1=1.8V, VDD3=2.8V, T_A=25 °C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	534+8xNL	-	-	Line
Vertical low pulse width	VS	-	2	-	Note ⁽¹⁾	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note ⁽¹⁾	Line
Vertical data start point	-	VS+VBP	4	-	Note ⁽¹⁾	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	528+8xNL	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

Table 8.14: Vertical timings for DSI I/F

Horizontal Timings

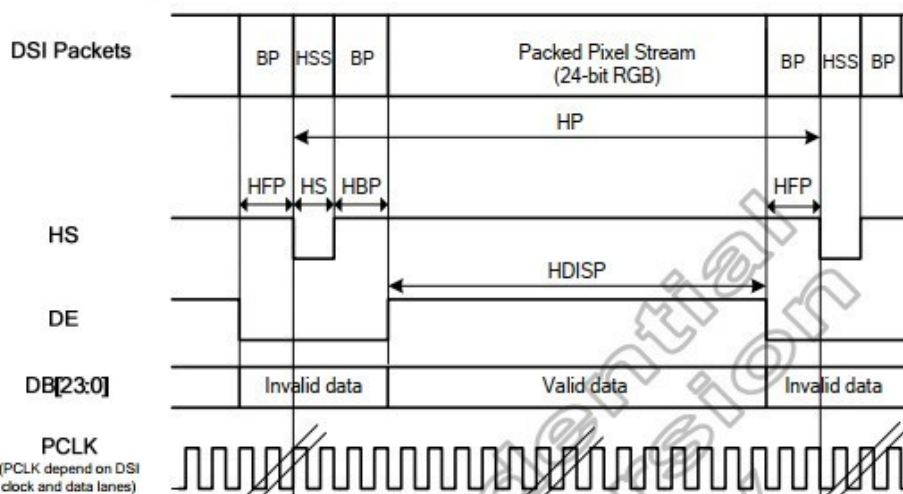


Figure 8.11: Horizontal timing for DSI video mode I/F

Horizontal Resolution=H_RES(1200/1080/1024/960/900/800/720) (VSSA=0V, VDD1=1.8V, VDD3 = HS_VCC =2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
HS cycle	HP	-	H_RES+15	-	-	DCK
HS low pulse width	HS	-	5	-	-	DCK
Horizontal back porch	HBP	-	5	-	-	DCK
Horizontal front porch	HFP	-	5	-	-	DCK
Horizontal data start point	-	HS+HBP	10	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	15	-	-	DCK
Horizontal active area	HDISP	-	-	H_RES	-	DCK

Table 8.15: Horizontal timings for DSI video mode I/F

Reset input timing

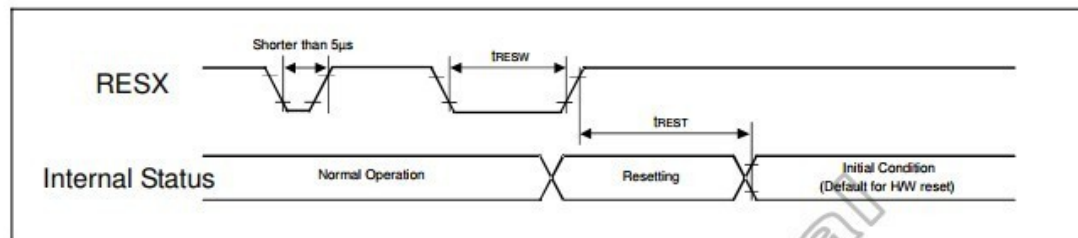


Figure 8.12: Reset input timing

Symbol	Parameter	Related pins	Spec.			Unit	Note
			Min.	Typ.	Max.		
t _{RESW}	Reset low pulse width ⁽¹⁾	RESX	10	-	-	µs	-
t _{REST}	Reset complete time ⁽²⁾	-	-	-	50	ms	-

Note: (1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 10µs	Reset
Between 5µs and 10µs	Reset Start

(2) During Reset Complete Time, OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (t_{REST}) within 5ms after a rising edge of RESX.

(3) Spike Rejection also applies during a valid reset pulse as shown below:

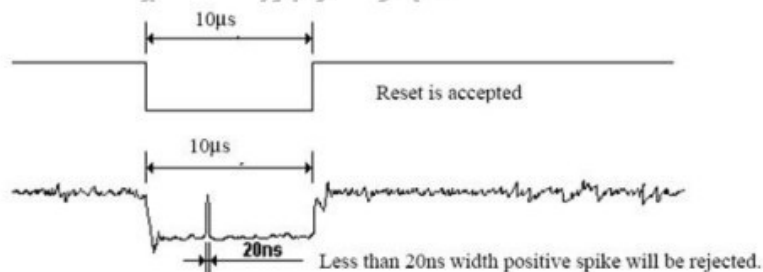


Table 8.16: Reset timing

7.Optical Characteristics

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance		T%	Viewing normal angle $\theta_x = \theta_y = 0^\circ$	3.6	4.2		%	1.POL without APCF 2.Transmittance with APCF & INX Yag BLU 3.Metrology : DMS900 4.wo TOD 5.VLC dark <0.2V, VLC white=5.3V
Contrast Ratio		CR		700	1000	--	--	
Response Time		T _{on} +T _{off}		--	35	45	ms	
Viewing Angle	Hor.	θ_{x+}	CR $\geq$ 10 at 25 °C	80	--	deg.		
		θ_{x-}		80	--			
	Ver.	θ_{y+}		80	--			
		θ_{y-}		80	--			
CF Only Color Chromaticity	Red	X _R	Viewing normal angle $\theta_x = \theta_y = 0^\circ$ at 25 °C	0.639	0.659	0.679	--	CF Only under C-light
		Y _R		0.299	0.319	0.339		
	Green	X _G		0.228	0.248	0.268		
		Y _G		0.557	0.577	0.597		
	Blue	X _B		0.119	0.139	0.159		
		Y _B		0.069	0.089	0.109		
	White	X _W		0.277	0.297	0.317		
		Y _W		0.297	0.317	0.337		
Color Gamut	CG			60	70	-	%	

*Note(1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

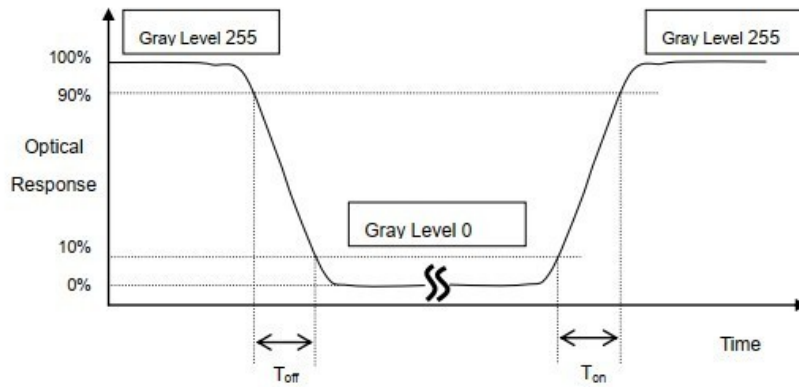
L255 : Luminance of gray level 255

L 0: Luminance of gray level 0

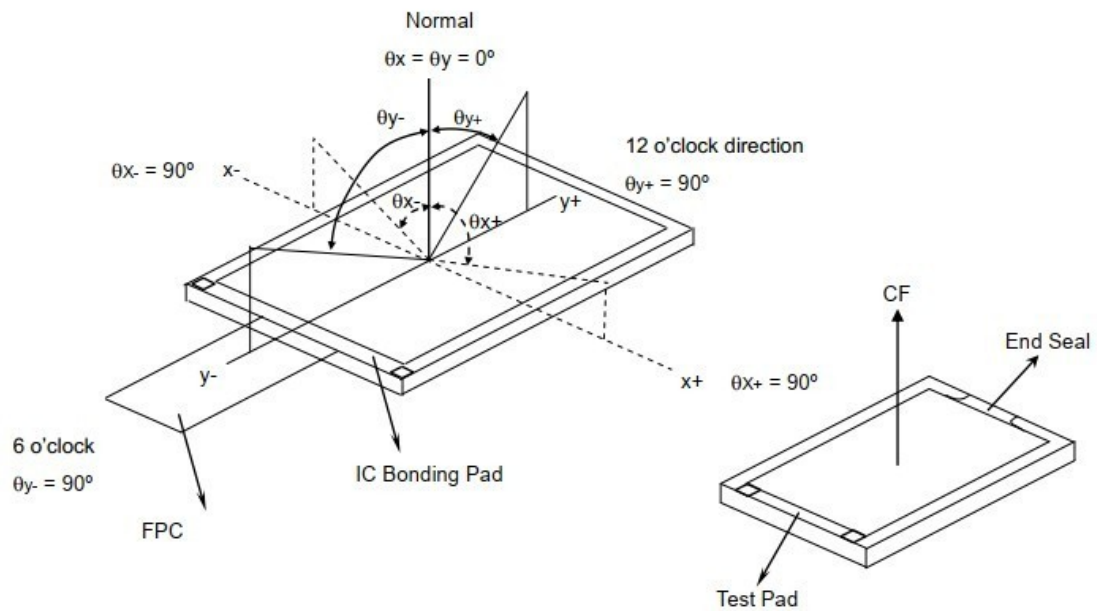
$$CR = CR(5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (T_{on} , T_{off}):

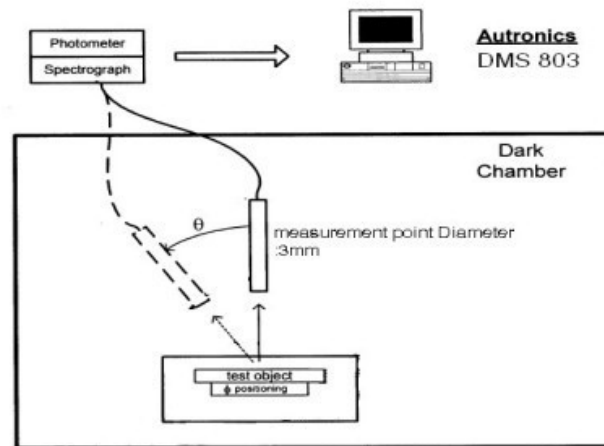


*Note(3) Definition of Viewing Angle

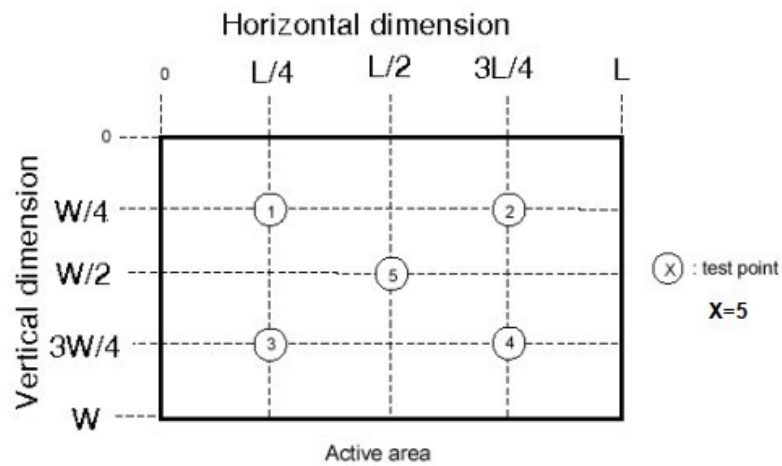


*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



*Note (5)



8. Reliability Test Item

No.	Test Item	Test Condition	Notes
1	High Temp. Storage	+70°C / 96H	1. Functional test is OK. Missing Segment, short, unclear segment non-display, display abnormally and liquid crystal leakage un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow.
2	Low Temp. Storage	-30°C / 96H	
3	High Temp. Operating	+60°C / 96H	
4	Low Temp. Operating	-20°C / 96H	
5	High Temperature / Humidity storage	50°C x 90%RH / 96H	
6	Thermal and cold shock	Static state, -20°C (30min) ~60°C (30min) , 50 cycles	

9. Packing Method----TBD

- END -