SPECIFICATION
FOR
APPROVAL

(◆) **Preliminary Specification**
( ) **Final Specification**

Title	9.4” WXGA TFT LCD

Customer	SONY
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LP094WX1
Suffix	SLA1

*When you obtain standard approval,
please use the above model name without suffix

APPROVED BY	SIGNATURE
/	
/	
/	

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	SIGNATURE
C. J. Jun / S. Manager	
REVIEWED BY	
S. W. Paeng / Manager	
PREPARED BY	
I. Y. Jung / Engineer	

Products Engineering Dept.
LG Display Co., Ltd

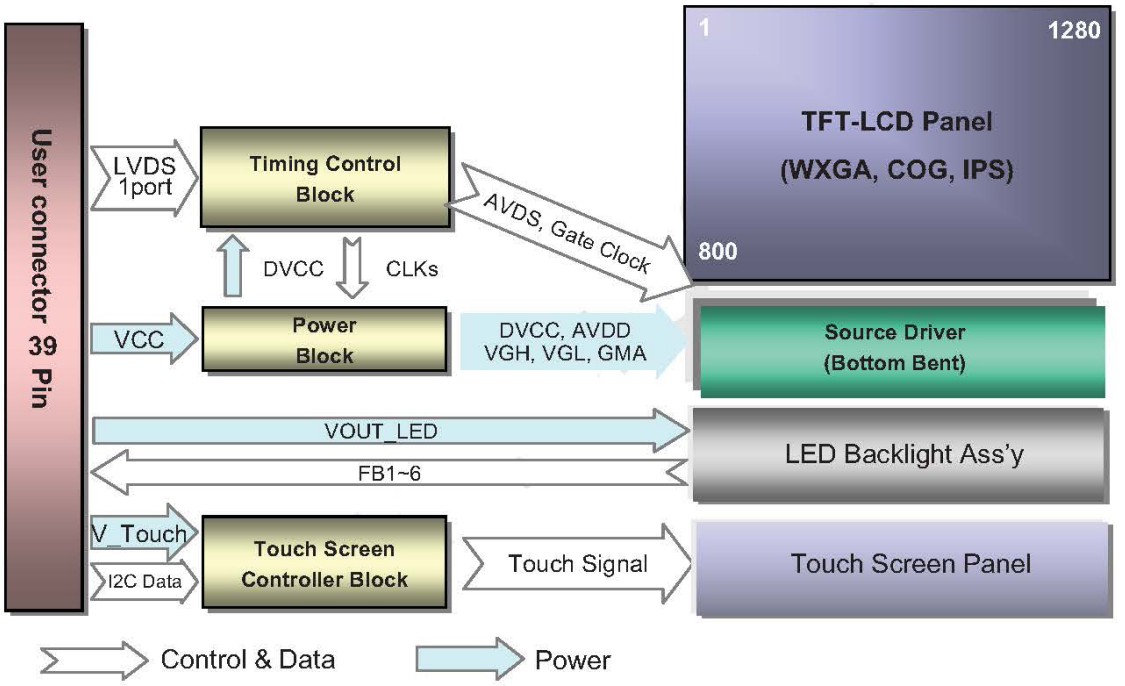
Contents

RECORD OF REVISIONS

Revision No	Revision Date	Page	Description
0.0	Nov. 25. 2010	-	First Draft
0.1	Feb. 17. 2011	4, 6	Changed & added electrical characteristics of the TSP
		4, 17	Changed Outline dimension, Surface treatment, wight
		17	Added Viewing angle item about the Touch
		(18)	Deleted LCM Drawing
		18	Changed TSP Module Drawing
		24	Changed Packing Information (Year Mark)
0.2	Apr. 12.2011	-	Changed Model name (LP094WX1-SLB1 → LP094WX1-SLA1)
		14	Changed Color coordinates
		4, 6	Changed LED Power & life time
0.3	May. 05. 2011	6	Changed Touch Power Consumption
		18	Changed Drawing (TSP BM)
		4, 17	Changed Weight
0.4	May. 17. 2011	14	Added Touch Specification
		15	Added Touch Inspection Process

1. General Description

The LP094WX1 is a Color Active Matrix Liquid Crystal Display with an integral LED backlight system and Touch Screen Panel. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. This TFT-LCD has 9.4 inches diagonally measured active display area with WSVGA resolution (1280 horizontal by 800 vertical pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 6-bit gray scale signal for each dot, thus, presenting a palette of more than 262,144 colors. The LP094WX1 has been designed to apply the interface method that enables low power, high speed, low EMI. The LP094WX1 is intended to support applications where thin thickness, low power are critical factors and graphic displays are important. In combination with the vertical arrangement of the sub-pixels, the LP094WX1 characteristics provide an excellent flat display.



General Features

Active Screen Size	9.4 inches diagonal
Outline Dimension	237.7(H, typ.)x161.45(V, typ.) x 6.5(D, max.) [mm] w/Touch & PCB
Pixel Pitch	0.1575mm × 0.1575mm
Pixel Format	1280 horiz. By 800 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Luminance, White	320cd/m^2 (Typ., 5point, w//Touch)
Power Consumption	Total 2.86W (Typ.) Logic : 0.9W (Typ.@ Mosaic), B/L : 1.74W (Typ.) Touch : 0.22W (Typ.)
Weight	235g(Max., w/Touch), 135g(Max., w/o Touch)
Display Operating Mode	Transmitting type, normally black
Surface Treatment	LCD : Hard Coating treatment (3H) of the front polarizer, TSP : Anti-Scatter Film
RoHS Comply	Yes

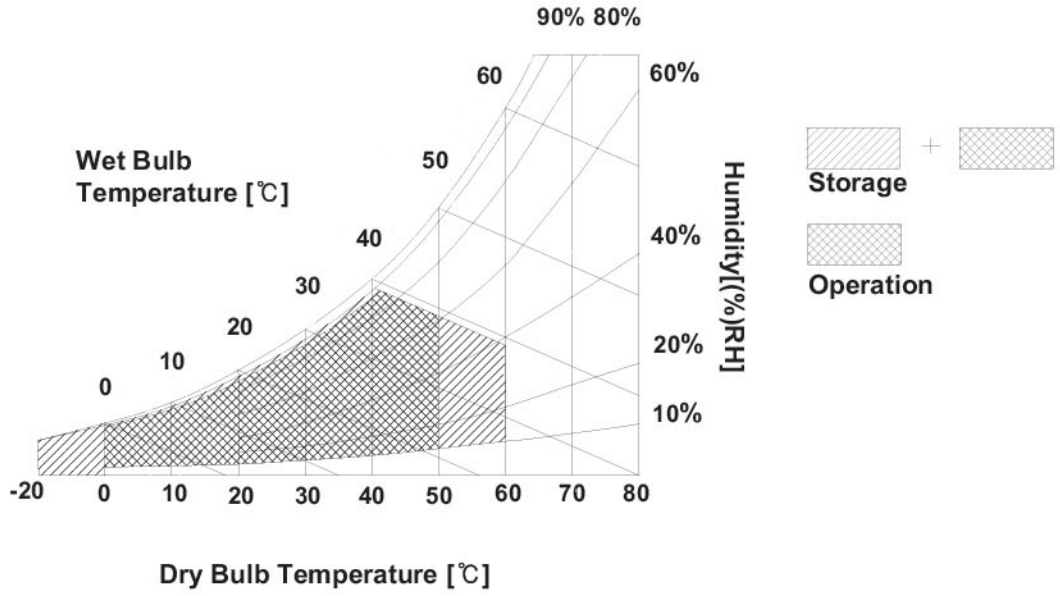
2. Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values		Units	Notes
		Min	Max		
Power Input Voltage	VCC	-0.3	4.0	Vdc	at 25 ± 5°C
Operating Temperature	TOP	0	50	°C	1
Storage Temperature	HST	-20	60	°C	1
Operating Ambient Humidity	HOP	10	90	%RH	1
Storage Humidity	HST	10	90	%RH	1

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39°C Max, and no condensation of water.



3. Electrical Specifications

3-1. Electrical Characteristics

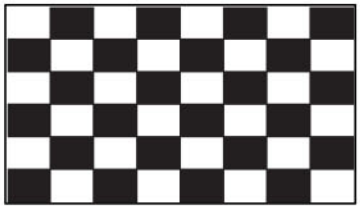
The LP094WX1 requires two power inputs. The first logic is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second backlight is the input about LED BL with LED Driver.

Table 2. ELECTRICAL CHARACTERISTICS

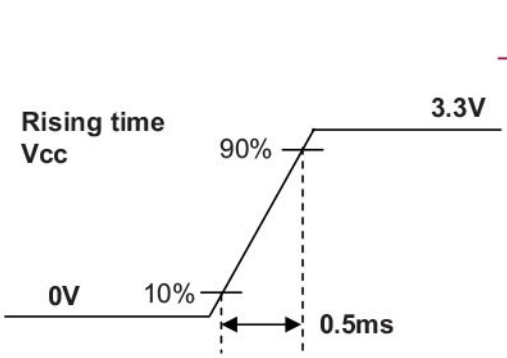
Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
LOGIC :						
Power Supply Input Voltage	V_{CC}	3.0	3.3	3.6	V	1
Power Supply Input Current	I_{CC}	-	273	315	mA	2
Power Consumption	P_{CC}	-	0.90	1.04	W	2
Power Supply Inrush Current	I_{CC_P}	-	-	1500	mA	3
LVDS Impedance	Z_{LVDS}	90	100	110	Ω	4
BACKLIGHT : (without LED Driver)						
LED Vf	V_f		2.9	3.0	V	
Operating Current per string	I_{LED}	-	20		mA	5
LED Power Consumption	P_{LED}	-	1.74	1.80	W	6
Life Time		10,000	-	-	Hrs	7

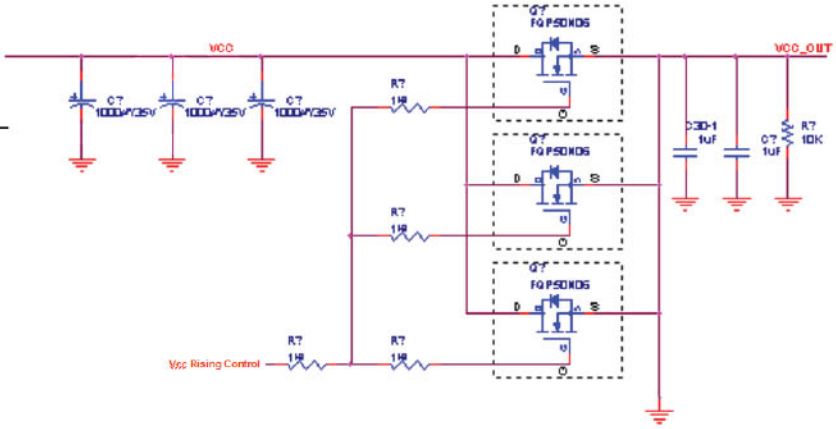
Note)

1. The measuring position is the connector of LCM and the test conditions are under 25℃, fv = 60Hz, White pattern.
2. The specified Icc current and power consumption are under the Vcc = 3.3V , 25℃, fv = 60Hz condition whereas Mosaic pattern is displayed and fv is the frame frequency.



3. The below figures are the measuring Vcc condition and the Vcc control block LGD used. The Vcc condition is same the minimum of T1 at Power on sequence.





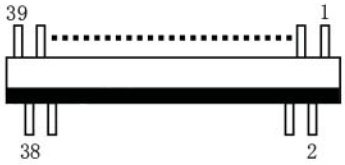
4. This impedance value is needed to proper display and measured form LVDS Tx to the mating connector.
5. The typical operating current is for the typical surface luminance (L_{WH}) in optical characteristics. I_{LED} is the current of each LEDs' string, LED backlight has strings on it.
6. The LED power consumption shown above does not include power of external LED driver circuit for typical current condition.
7. The life time is determined as the time at which the typical brightness of LCD is 50% compare to that of initial value at the typical LED current. These LED backlight has 6 strings on it and the typical current of LED's string is base on 20mA.

3-2. Interface Connection

This LCD employs two interface connections, a 39pin connector is used for the module electronics interface and the other connector is used for the integral backlight system.
The electronics interface connector is a model FH39-39S-0.3SH2(10) manufactured by Hirose.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

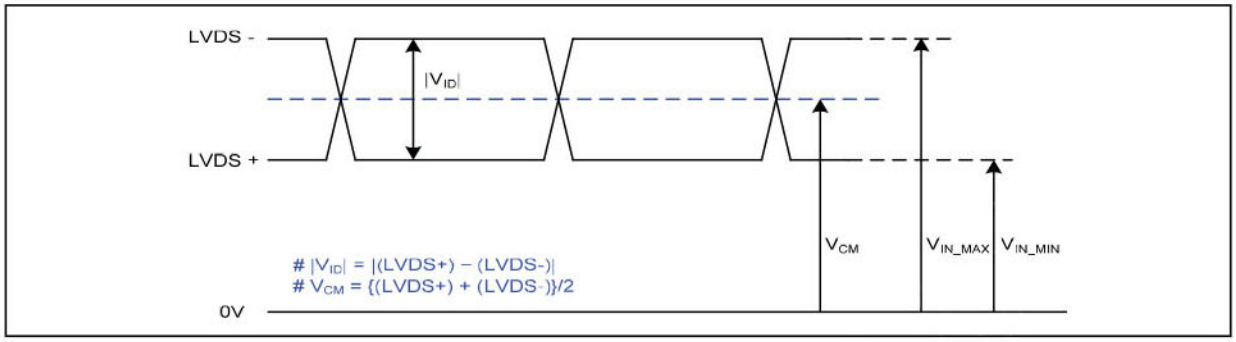
Pin	Symbol	Description	Notes
1	VCD1	LED Cathod	
2	VCD2	LED Cathod	**[Connector]** FH39-39S-0.3SH2(10)(Hirose), 39pin
3	VCD3	LED Cathod	
4	VCD4	LED Cathod	**[Connector pin arrangement]**
5	VCD5	LED Cathod	
6	VCD6	LED Cathod	
7	NC	No Connection	
8	NC	No Connection	
9	VLED	Power Supply for LED [Anode]	
10	VLED	Power Supply for LED [Anode]	
11	NC	No Connection [Reserved]	
12	NC	No Connection [Reserved]	
13	5V_TP	Analog Power for Touch	
14	NC	No Connection	
15	3.3V_TP	Logic Power for Touch	
16	3.3V_LCD	Power Supply for LCD Panel	
17	3.3V_LCD	Power Supply for LCD Panel	
18	3.3V_LCD	Power Supply for LCD Panel	
19	3.3V_LCD	Power Supply for LCD Panel	
20	NC	No Connection	
21	GND	Ground	
22	IN0-	Negative LVDS differential data input	
23	IN0+	Positive LVDS differential data input	
24	GND	Ground	
25	IN1-	Negative LVDS differential data input	
26	IN1+	Positive LVDS differential data input	
27	GND	Ground	
28	IN2-	Negative LVDS differential data input	
29	IN2+	Positive LVDS differential data input	
30	GND	Ground	
31	CLK-	Negative LVDS differential clock input	
32	CLK+	Positive LVDS differential clock input	
33	GND	Ground	
34	NC	No Connection	
35	GND	Ground	
36	Interupt	State change Interrupt	
37	I2C_CLK	I2C Clock for Touch	
38	I2C_DATA	I2C Data for Touch	
39	GND	Ground	



[LCD Module Rear View]

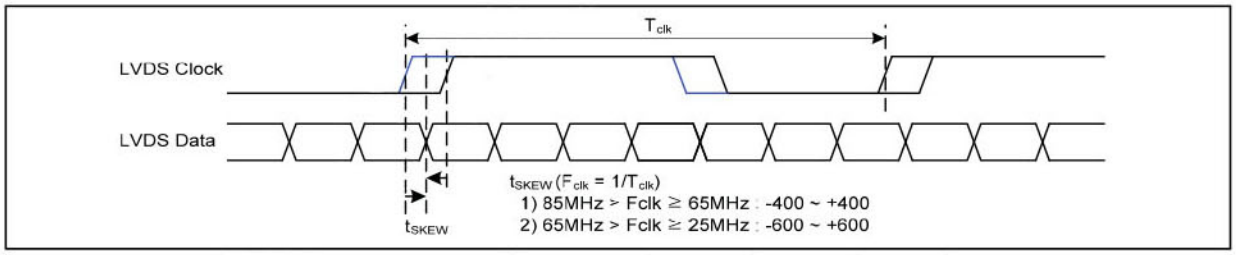
3-3. LVDS Signal Timing Specifications

3-3-1. DC Specification

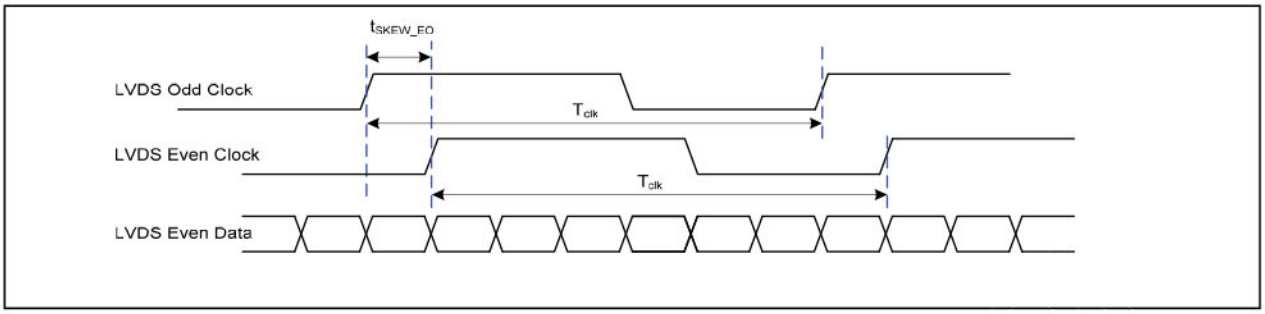


Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	$\|V_{ID}\|$	100	600	mV	-
LVDS Common mode Voltage	V_{CM}	0.6	1.8	V	-
LVDS Input Voltage Range	V_{IN}	0.3	2.1	V	-

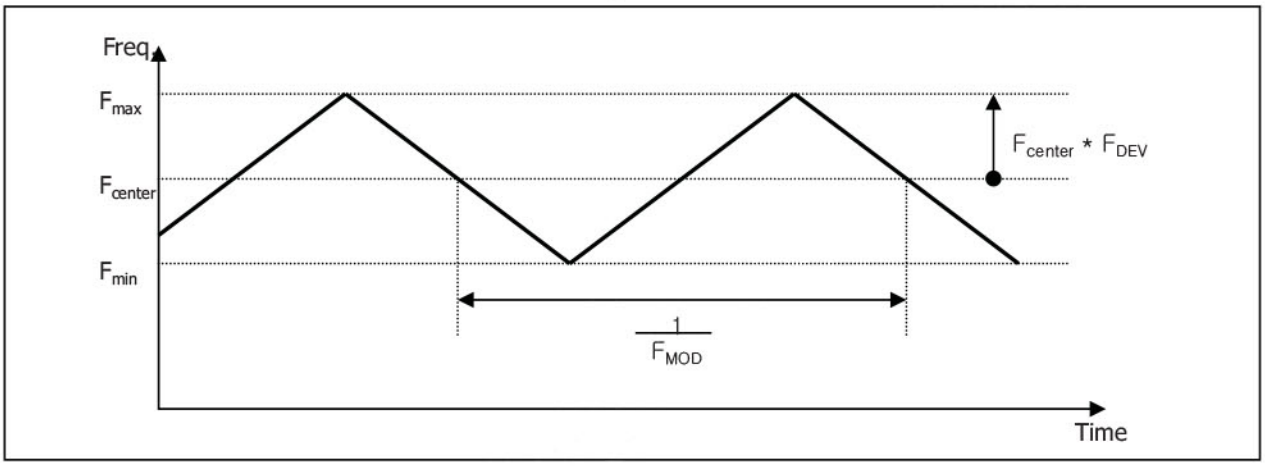
3-3-2. AC Specification



Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to Data Skew Margin	t_{SKEW}	- 400	+ 400	ps	85MHz > Fclk ≥ 65MHz
	t_{SKEW}	- 600	+ 600	ps	65MHz > Fclk ≥ 25MHz
LVDS Clock to Clock Skew Margin (Even to Odd)	t_{SKEW_EO}	- 1/7	+ 1/7	T_{clk}	-
Maximum deviation of input clock frequency during SSC	F_{DEV}	-	± 3	%	-
Maximum modulation frequency of input clock during SSC	F_{MOD}	-	200	KHz	-



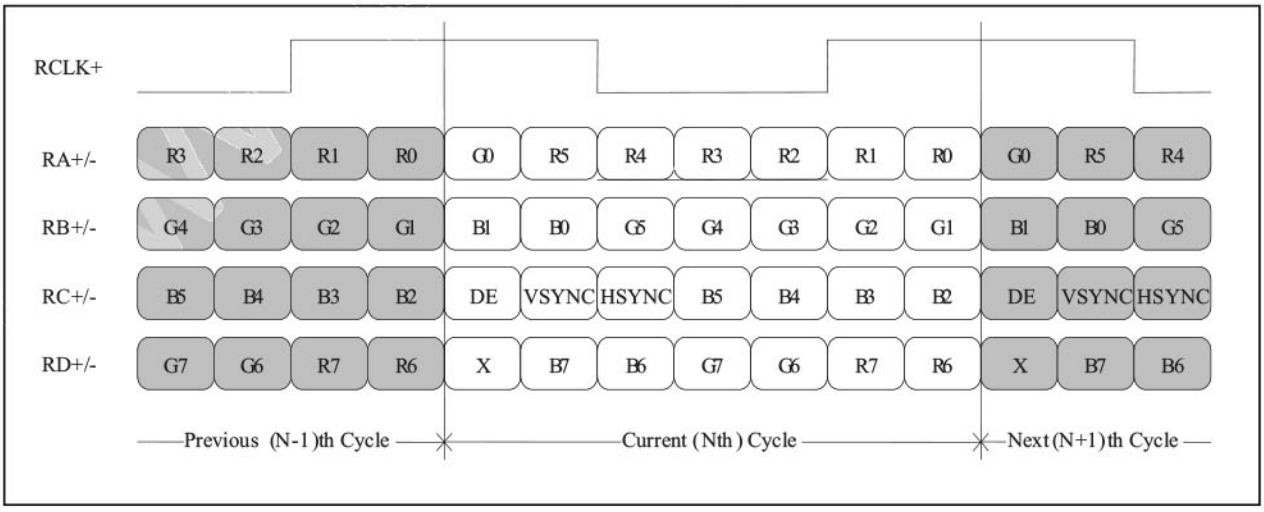
< Clock skew margin between channel >



< Spread Spectrum >

3-3-3. Data Format

- LVDS 1 Port



< LVDS Data Format >

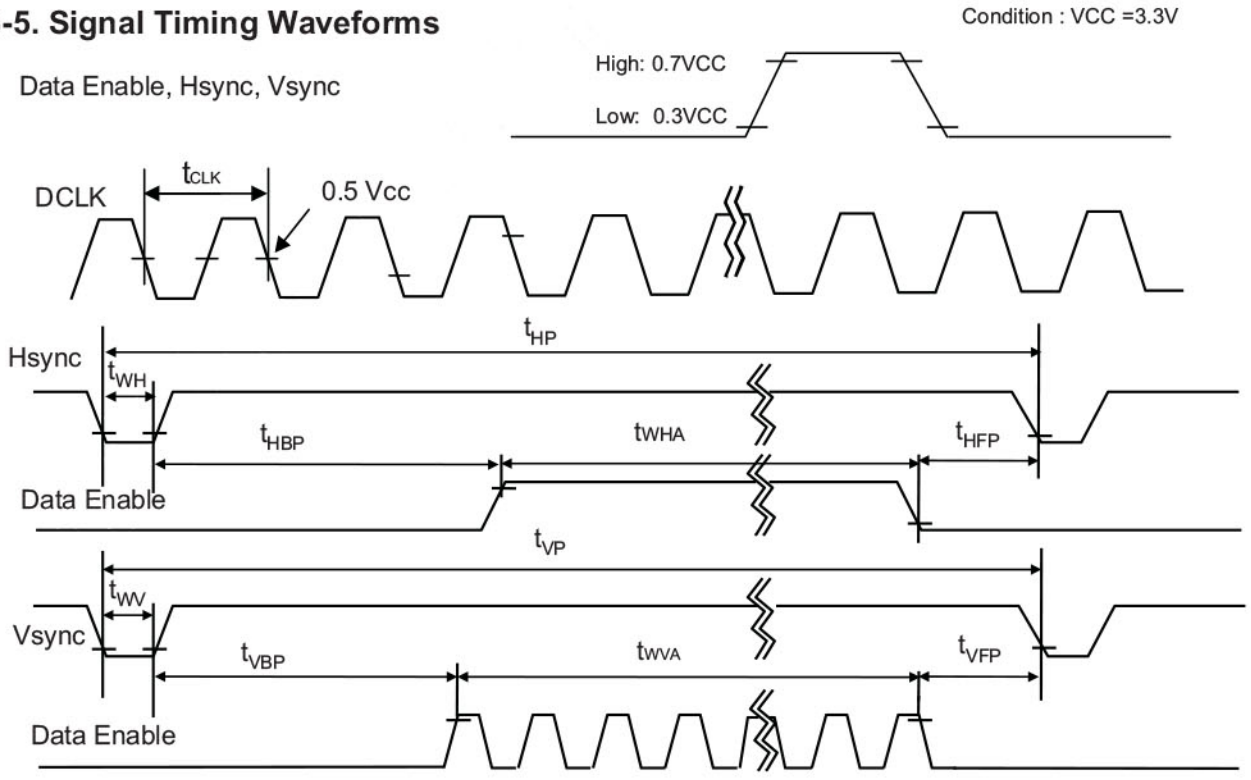
3-4. Signal Timing Specifications

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications and specifications of LVDS Tx/Rx for its proper operation.

Table 5. TIMING TABLE

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	67	71.0	80	MHz	
Hsync	Period	T_{hp}	1380	1440	1600	tCLK	
	Width	t_{WH}	28	32	80		
	Width-Active	t_{WHA}	1280	1280	1280		
Vsync	Period	t_{VP}	811	823	834	tHP	
	Width	t_{WV}	3	6	9		
	Width-Active	t_{WVA}	800	800	800		
Data Enable	Horizontal back porch	t_{HBP}	36	80	140	tCLK	
	Horizontal front porch	t_{HFP}	36	48	100		
	Vertical back porch	t_{VBP}	6	15	20	tHP	
	Vertical front porch	t_{VFP}	2	2	5		

3-5. Signal Timing Waveforms



3-6. Color Input Data Reference

The brightness of each primary color (red,green and blue) is based on the 6-bit gray scale data input for the color ; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 7. COLOR DATA REFERENCE

Color		Input Color Data																	
		RED						GREEN						BLUE					
		MSB					LSB	MSB					LSB	MSB					LSB
		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	RED (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (01)	0	0	0	0	0	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	GREEN (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (01)	0	0	0	0	0	0	0	0	0	0	0	1	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	BLUE (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	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

3-7. Power Sequence

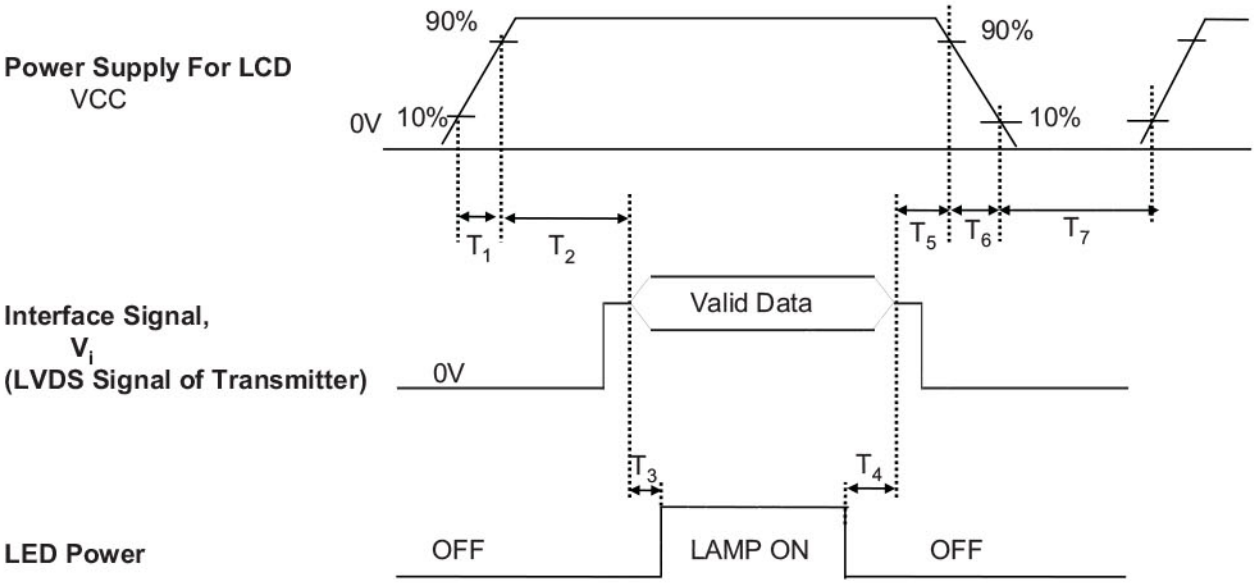


Table 7. POWER SEQUENCE TABLE

Parameter	Value			Units	Remark
	Min.	Typ.	Max.		
T_1	0.5	-	10	(ms)	-
T_2	0	-	50	(ms)	-
T_3	200	-	-	(ms)	-
T_4	200	-	-	(ms)	-
T_5	0	-	50	(ms)	-
T_6	0	-	10	(ms)	-
T_7	400	-	-	(ms)	-

Note)
1. Do not insert the mating cable when system turn on.
2. Valid Data have to meet "3-3. LVDS Signal Timing Specifications"
3. LVDS need to pull-down condition on invalid status.
4. LGD recommend the rising sequence of VLED after the Vcc and valid status of LVDS turn on.

4. Touch Specifications

4-1. General Specifications

The contents provide general characteristics for the model LP094WX1-SLA1.

	Item		Spec
General Specification	System		Projected, Capacitive type
	Multi touch points		10 points
	Active touch area		Same as LCD A/A
	Cover Lens	Outline	237.7x161.45mm
		Thickness	0.7mm
	Resolution		1280 x 800
	Interface		I2C
Other Feature	Finger ID tracking		Y
	Water Rejection		Y

4-2. Touch Performance

The contents provide general performance characteristics for the model LP094WX1-SLA1.

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Report Rate	-	-	60	-	Hz	@ All Point Touch
Point Accuracy	-	-	-	2.5	mm	

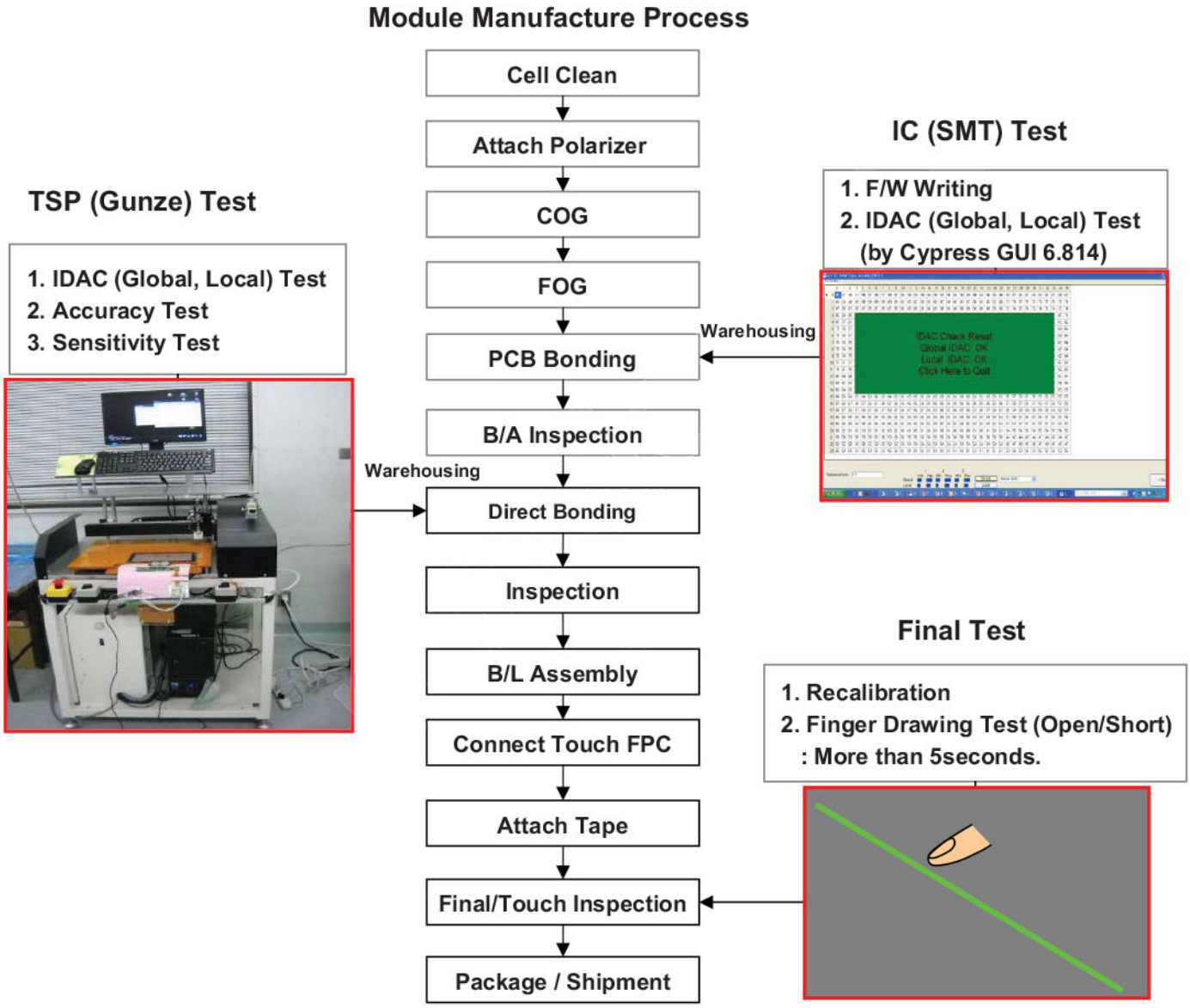
4-3. Touch Electrical Characteristics

The contents provide general Electrical characteristics for the model LP094WX1-SLA1.

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Digital Power Supply Input Voltage	V_{TSP}	3.0	3.3	3.6	V	
Digital Power Supply Input Current	I_{TSP}		47	54	mA	
Analog Power Supply Input Voltage	V_{TSP}	4.5	5.0	5.5	V	
Analog Power Supply Input Current	I_{TSP}		12	14	mA	
Power Consumption	P_{TSP}		0.22	0.25	W	@ All Point Touch

4-4. Touch Inspection Process

The Touch Inspection will follow the process below.



5. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and Θ equal to 0°.
FIG. 1 presents additional information concerning the measurement equipment and method.

FIG. 1 Optical Characteristic Measurement Equipment and Method

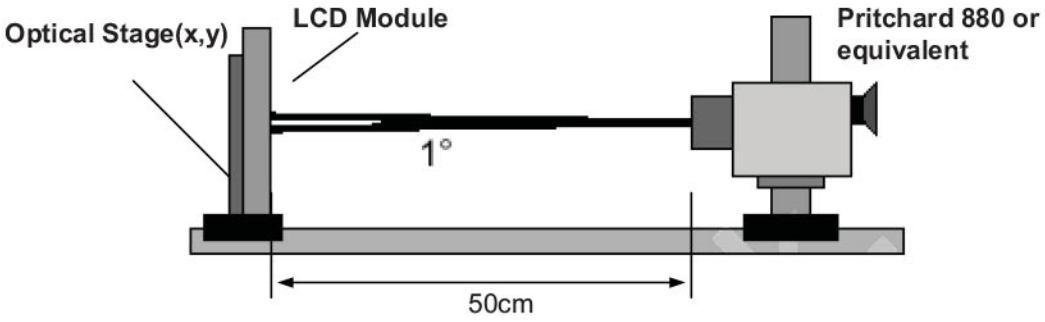


Table 8. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, fv=60Hz, I_{BL} = 20 mA

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
Contrast Ratio		CR	500	600	-		1
Surface Luminance (White)	w/Touch	L_{WH}	270	320	-	cd/m²	2
Luminance Variation		δ_{WHITE}	-	1.4	1.6		3
Response Time		$Tr_R + Tr_D$	-	35	40	ms	4
Color Coordinates							
	RED	RX	0.569	0.599	0.629		
		RY	0.326	0.356	0.386		
	GREEN	GX	0.311	0.341	0.371		
		GY	0.530	0.560	0.590		
	BLUE	BX	0.125	0.155	0.185		
		BY	0.091	0.121	0.151		
	WHITE	WX	0.289	0.319	0.349		0.313 (w/o Touch)
		WY	0.308	0.338	0.368		0.329 (w/o Touch)
Viewing Angle							5
	x axis, right(Φ=0°)	Θr	80			degree	3 o'clock
	x axis, left (Φ=180°)	Θl	80			degree	9 o'clock
	y axis, up (Φ=90°)	Θu	80			degree	12 o'clock
	y axis, down (Φ=270°)	Θd	80			degree	6 o'clock
Gray Scale				2.2			6

Note)

1. Contrast Ratio(CR) is defined mathematically as

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the average of 5 point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 1.

$$L_{WH} = \text{Average}(L_1, L_2, \ldots L_5)$$

3. The variation in surface luminance , The panel total variation (δ_{WHITE}) is determined by measuring L_N at each test position 1 through 13 and then defined as followed numerical formula.
For more information see FIG 2.

$$\delta_{WHITE} = \frac{\text{Maximum}(L_1, L_2, \ldots L_{13})}{\text{Minimum}(L_1, L_2, \ldots L_{13})}$$

4. Response time is the time required for the display to transition from white to black (rise time, Tr_R) and from black to white(Decay Time, Tr_D). For additional information see FIG 3.

5. Viewing angle is the angle at which the contrast 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 4.

6. Gray scale specification

* f_V = 60Hz

Gray Level	Luminance [%] (Typ)
L0	0.16
L7	0.97
L15	4.26
L23	10.5
L31	19.8
L39	33.6
L47	52.1
L55	74.8
L63	100

FIG. 2 Luminance

<measuring point for surface luminance & measuring point for luminance variation>

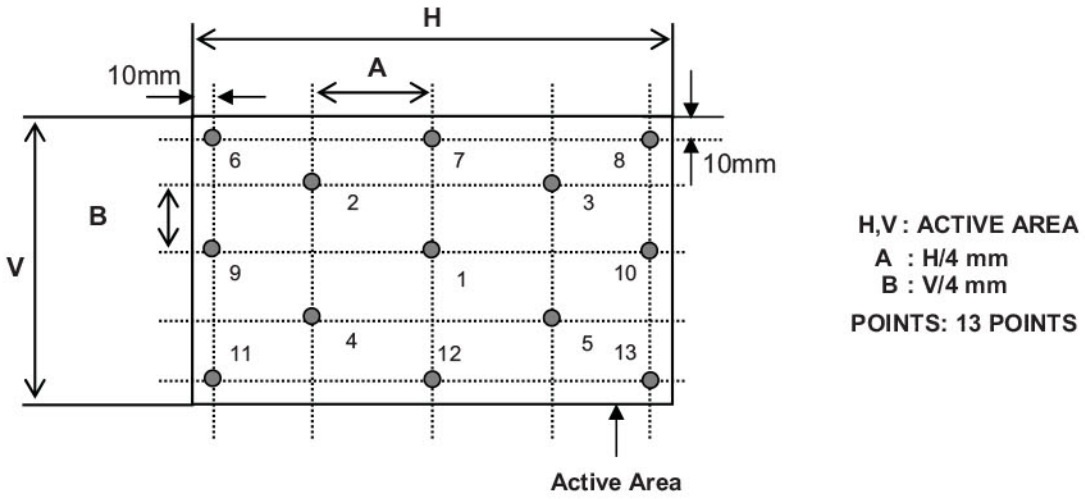


FIG. 3 Response Time

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

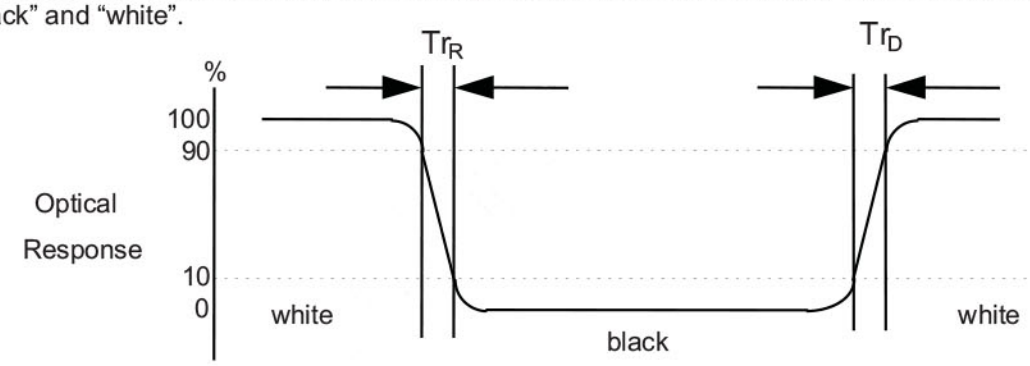
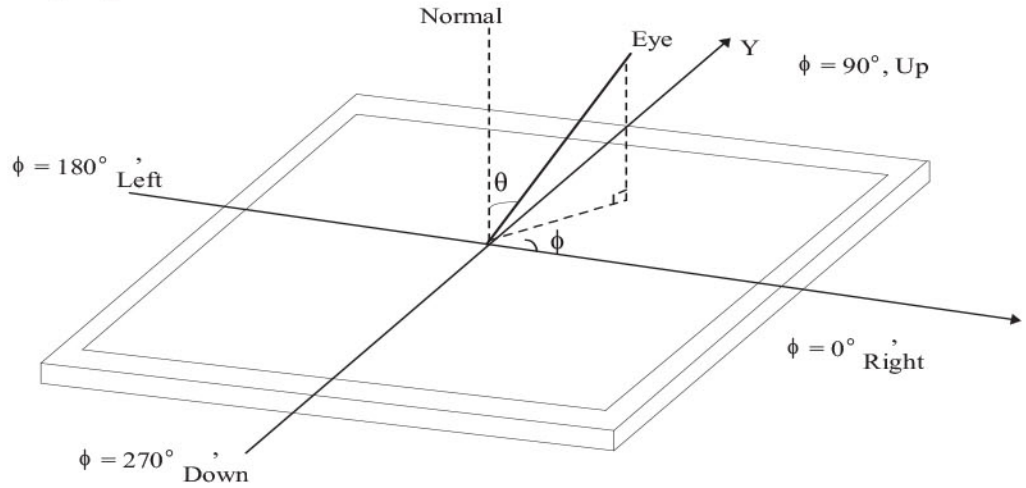


FIG. 4 Viewing angle



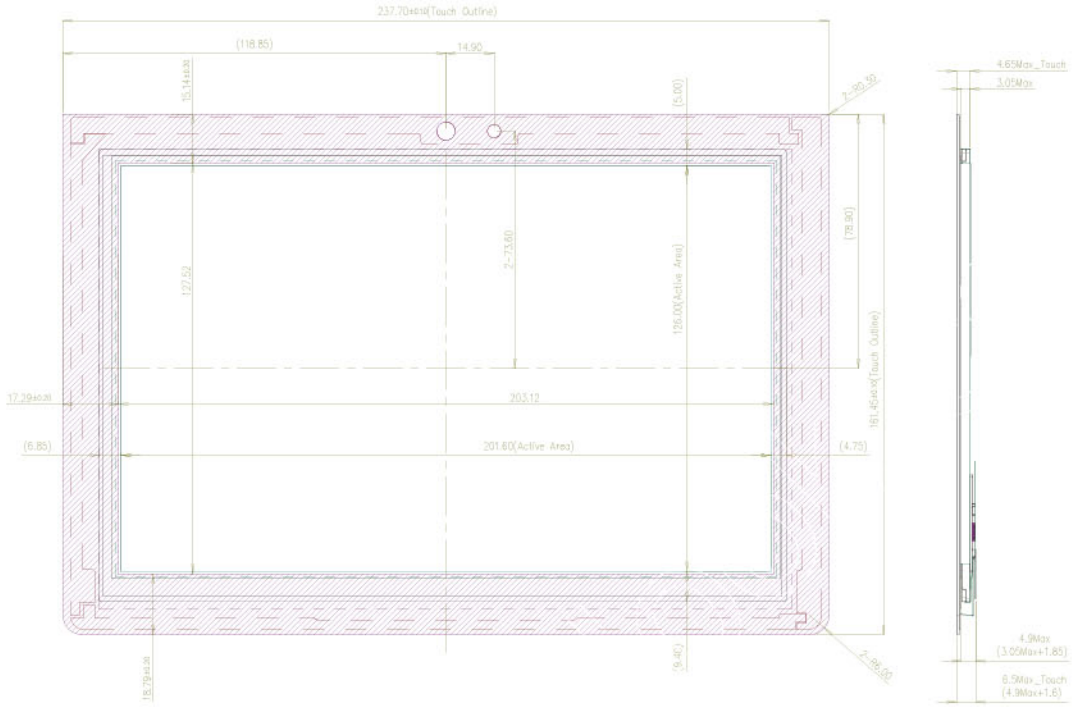
6. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP094WX1. In addition the figures in the next page are detailed mechanical drawing of the LCD.

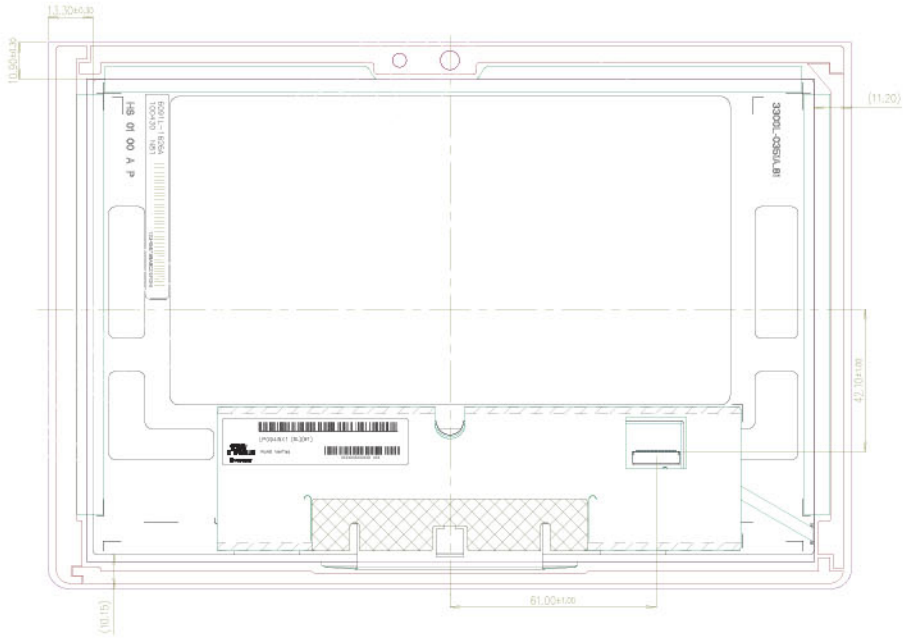
Outline Dimension	Horizontal	213.2 ± 0.5mm
	Vertical	140.4 ± 0.5mm
	Thickness	3.05mm (max), 4.9(w. PCB)
Active Display Area	Horizontal	201.6 mm
	Vertical	126.0 mm
Touch Screen Panel	Horizontal	237.7 ± 0.1mm
	Vertical	161.45 ± 0.1mm
	Thickness	1.6mm(max.)
Bezel Area	Horizontal	203.92 ± 0.5mm
	Vertical	128.32 ± 0.5mm
Weight	235g(Max) w/Touch, 135g(Max.) w/o Touch	
Surface Treatment	LCD : Hard Coating treatment (3H) of the front polarizer TSP : Anti-Scatter Film	
Viewing Angle	Viewing Angle(When Active area can be seen) ≤ 25°	

<FRONT VIEW_LCM+TSP Module>

Note) Unit:[mm], General tolerance: ± 0.5mm



<REAR VIEW_LCM+TSP Module>



7. Reliability

Environment test condition

No.	Test Item	Conditions
1	High temperature storage test	Ta= 60°C, 240h
2	Low temperature storage test	Ta= -20°C, 240h
3	High temperature operation test	Ta= 50°C, 50%RH, 240h
4	Low temperature operation test	Ta= 0°C, 240h
5	Vibration test (non-operating)	Random, 1.0Grms, X,Y,Z Direction Test time : each direction 1hour
6	Shock test (non-operating)	Half sine wave, 180G, 2ms one shock of each six faces(I.e. run 180G 6ms for all six faces)
7	Altitude operating storage / shipment	0 ~ 10,000 feet (3,048m) 24Hr 0 ~ 40,000 feet (12,192m) 24Hr

{ Result Evaluation Criteria }
There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

8. International Standards

8-1. Safety

a) UL 60950-1, Second Edition, Underwriters Laboratories Inc.
Information Technology Equipment - Safety - Part 1 : General Requirements.

b) CAN/CSA C22.2 No.60950-1-07, Second Edition, Canadian Standards Association.
Information Technology Equipment - Safety - Part 1 : General Requirements.

c) EN 60950-1:2006 + A11:2009, European Committee for Electrotechnical Standardization (CENELEC).
Information Technology Equipment - Safety - Part 1 : General Requirements.

d) IEC 60950-1:2005, Second Edition, The International Electrotechnical Commission (IEC).
Information Technology Equipment - Safety - Part 1 : General Requirements.

8-2. EMC

a) ANSI C63.4 “American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.” American National Standards Institute (ANSI), 2003.

b) CISPR 22 “Information technology equipment – Radio disturbance characteristics – Limit and methods of measurement." International Special Committee on Radio Interference (CISPR), 2005.

c) CISPR 13 “Sound and television broadcast receivers and associated equipment – Radio disturbance characteristics – Limits and method of measurement." International Special Committee on Radio Interference (CISPR), 2006.

8-3. Environment

a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003

9. Packing

9-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mark	A	B	C	D	E	F	G	H	J	K

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

9-2. Packing Form

a) Package quantity in one box : 20pcs

b) Box Size : 478 x 365 x 328

10. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

10-1. MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

10-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=± 200mV(Over and under shoot voltage)

(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

10-3. ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

10-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

10-5. STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

10-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.
(3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
(4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.