

SPECIFICATION FOR APPROVAL

11.6" HD TFT LCD

(<mark>→</mark>) Preliminary S	pecification
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) Final Specification

Title

Customer		SUPPLIER LG Display Co., Ltd. *MODEL LP116WH1
MODEL		*When you obtain standard approval, please use the above model name without suffix
APPROVED BY	SIGNATURE	APPROVED BY SIGNATURE
		C. J. Jun / Manager REVIEWED BY
		S. W. Paeng / Manager PREPARED BY
1		P. A. Choi / Engineer
		Products Engineering Dept. LG Display Co., Ltd
/er. 0.1		20, 2009 1 / 2



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RECORD OF REVISIONS

Dovision N.	Dovicion Data	Dese	Description	רטוס
Revision No	Revision Date	Page	Description	EDID ver
	F-h 00 0000	A !!	Final Dooft (Dooling on Occasification)	
0.0	Feb. 03. 2009	All	First Draft (Preliminary Specification)	-
0.1	Apr. 20. 2009	4	General Features	-
		17,18	Mechanical Dimension	-
Ver. 0.1			Apr. 20, 2009	3 / 27
			F = -, =	National printing

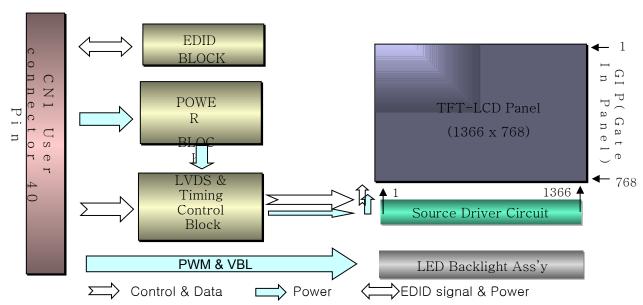


1. General Description

The LP11.6WH1 is a Color Active Matrix Liquid Crystal Display with an integral LED backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This TFT-LCD has 10.1inches diagonally measured active display area with WSVGA resolution(1366 horizontal by 768 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 LP101WH1 has been designed to apply the interface method that enables low power, high speed, low FMI.

The LP101WH1 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 LP101WH1 characteristics provide an excellent flat display for office automation products such as Notebook PC.



General Features

Active Screen Size	inches diagonal
Outline Dimension	268.5(H) × 162(V) × .5.2(D,Max.) [mm]
Pixel Pitch	0.1875mmx0.1875mm
Pixel Format	1366 horiz. By 768 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Luminance, White	200 cd/m²(Typ.5 point)
Power Consumption	Total 2.46 Watt(Typ.) @ LCM circuit 0.82 Watt(Typ.), B/L input 1.64 Watt(Typ.) (W.
Weight	255g (Max.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Glare treatment of the front polarizer
RoHS Comply	Yes



2. Absolute Maximum Ratings

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

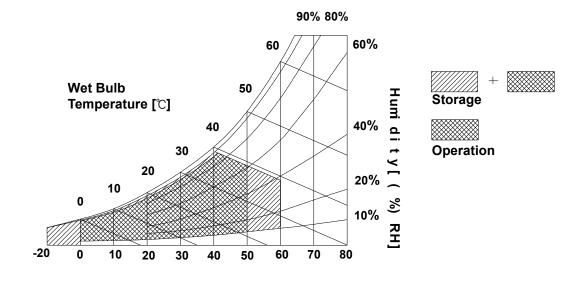
Table 1. ABSOLUTE MAXIMUM RATINGS

		Val	ues		
Parameter	Symbol			Units	Notes
	II.	Min	Max		
		-0.3	4.0		
Operating Temperature	Тор	0	50	°C	1
Storage Temperature	Нѕт	-20	60	°C	1
Operating Ambient Humidity	Нор	10	90	%RH	1
Storage Humidity Note: 1. Temperature and relativ	Hst e humidity ro	10 nge are show	90 n in the figure	%RH	1

The input data relative framing range are shown in the figure below.

Dry Bulb Temperature [℃]

Wet bulb temperature should be 39° C Max, and no condensation of water.





3. Electrical Specifications

3-1. Electrical Characteristics

The LP101WS1 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the LED BL.

Parameter Values Unit Symbol Notes Min Тур Max MODULE: VCC Power Supply Input Voltage 3.0 3.6 V_{DC} Power Supply Input Current 250 280 mΑ 1 I_{cc} Рс 0.82 0.93 Power Consumption Watt 1 100 110 Differential Impedance Zm 90 Ohm 2 _ED Backlight (With LED Driver): LED Driver (@12V) PDRIVER 0.12 0.14 Watt केन्द्रिक निर्माण्याहिर्<mark>श्रुण Input Range specification. 12.5%(Min.)~100%(Max.a)</mark> (PWM inpur Frequency specification:200Hz~1Khz) 30.6 V Operating Current per string 19 3 I_{LED} mΑ Note) 0Hz condition 1. The specified current and power consumption 1.74 Pow**a/h@neasn\/\bisa**ic pattern is displayed and fv is 1.64 Watt 10,000 Life Time Hrs 5

Table 2. ELECTRICAL CHARACTERISTICS

- 2. This impedance value is needed to proper display and measured form LVDS Tx to the mating connector.
- 3. The typical operating current is for the typical surface luminance (L_{WH}) in optical characteristics. I_{LED} is the current of each LED's string, LED backlight has 3 strings on it.
- The LED power consumption shown above does not include power of external LED driver circuit for typical current condition.
- 5. The life time is determined as the time at which brightness of LED is 50% compare to that of initial value at the typical LED current.



3-2. Interface Connection

This LCD employs one interface connection, a 40 pin connector is used for the module electronics interface.

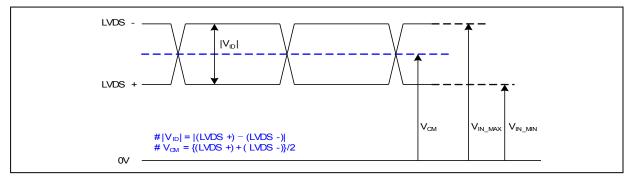
Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	CT1/NC	Connector Test/No Connection(Reserved)	
2	VDD	+3.3V Power Supply	-
3	VDD	+3.3V Power Supply	-
4	V_{EDID}	+3.3V EDID Power	1, Interface chips
5	NC	No Connection	1.1 LCD : SiW, 1port including
6	CLK _{EDID}	EDID Clock Input	LVDS Receiver
7	DATA _{EDID}	EDID Data Input	1.2 System : * Pin to Pin compatible with LVDS
8	RxIN0-	LVDS differential data input	T III to T III compatible with EV Bo
9	RxIN0+	LVDS differential data input	2. Connector
10	GND	Ground	2.1 LCD :I-PEX 20455-040E-0* (Locking type)
11	RxIN1-	LVDS differential data input	or equivalent
12	RxIN1+	LVDS differential data input	2.2 Mating .
13	GND	Ground	2.2 Mating : 2.3 Connector pin arrangement
14	RxIN2-	LVDS differential data input	-
15	RxIN2+	LVDS differential data input	40 1
16	GND	Ground	─ ┃ <u> </u>
17	RxCLKIN-	LVDS differential clock input	-
18	RxCLKIN+	LVDS differential clock input	[LCD Module Rear View]
19	GND	Ground	[LOD Module Real view]
20	NC	No Connection	-
21	NC	No Connection	┪
22	GND	Ground	┪
23	NC	No Connection	7
24	NC	No Connection	7
25	GND	Ground	7
26	NC	No Connection	7
27	NC	No Connection	7
28	GND	Ground	7
29	NC	No Connection	
30	NC	No Connection	
31	VLED_GND	LED Ground	
32	VLED_GND	LED Ground	
33	VLED_GND	LED Ground	
34	CT2/NC	Connector Test/No Connection(Reserved)	
35	S_PWMIN	System PWM signal input	
36	BL_ON	LED Enable[Note 1]	
37	NC	No Connection	
38	VLED	+5V~+21V LED Power Supply	[Note 1]
39	VLED	+5V~+21V LED Power Supply	On: 2.0V↑,Off:0~0.4V
40	VLED	+5V~+21V LED Power Supply	



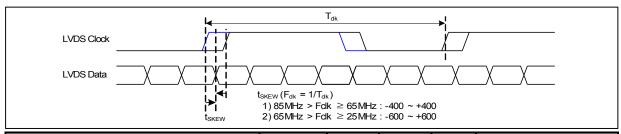
3-3. LVDS Signal Timing Specifications

3-3-1. DC Specification



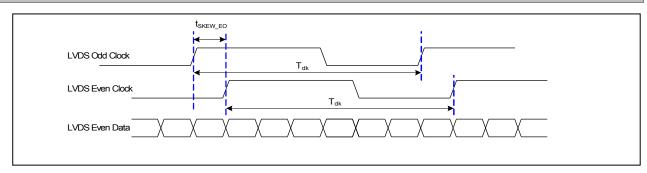
Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	V _{ID}	100	600	mV	-
LVDS Common mode Voltage	V_{CM}	0.6	1.8	V	-
LVDS Input Voltage Range	V _{IN}	0.3	2.1	V	-

3-3-2. AC Specification

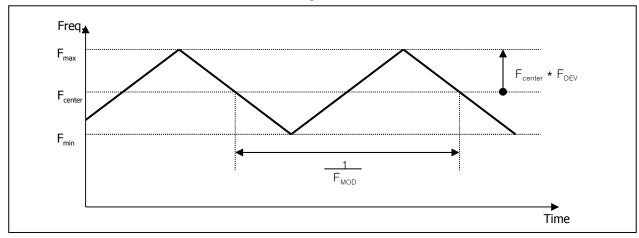


Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to Data Skew Margin	t _{skew}	- 400	+ 400	ps	85MHz > Fclk ≥ 65MHz
	t _{skew}	- 600	+ 600	ps	65MHz > Fclk ≥ 25MHz
LVDS Clock to Clock Skew Margin (Even to Odd)	t _{skew_eo}	- 1/7	+ 1/7	T _{clk}	-
Maximum deviation of input clock frequency during SSC	F_{DEV}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





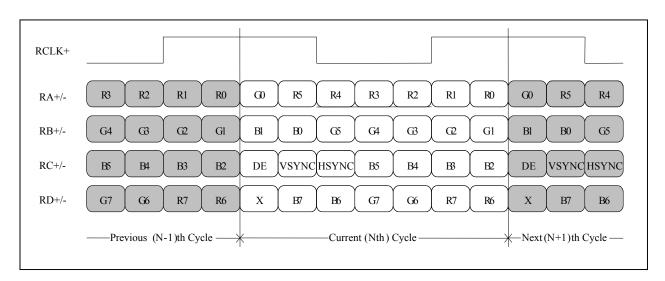
< Clock skew margin between channel >



< Spread Spectrum >

3-3-3. Data Format

- LVDS 1 Port

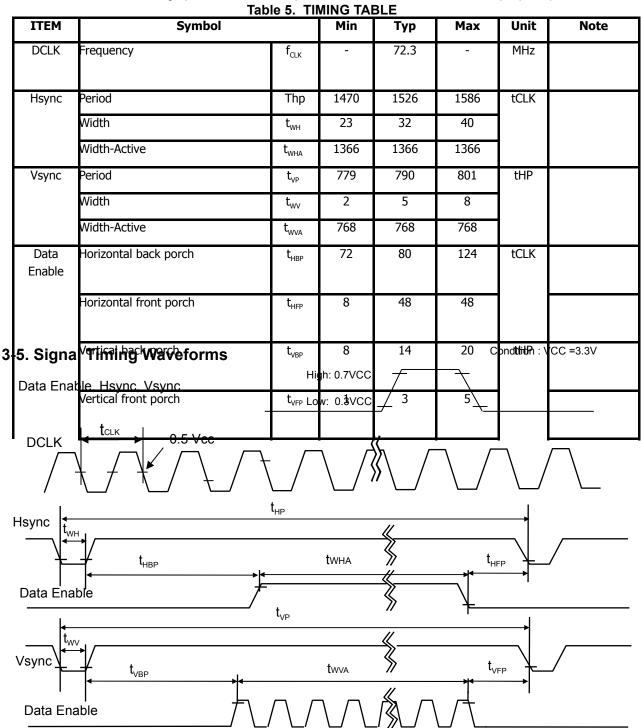


< LVDS Data Format >



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.





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 MSB LSB	GREEN MSB LSB	BLUE MSB LSB			
		R5 R4 R3 R2 R1 R0	G5 G4 G3 G2 G1 G0	B5 B4 B3 B2 B1 B0			
Basic	Black	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0			
Color	Red	1 1 1 1 1 1	00000	0 0 0 0 0			
	Green	00000	1 1 1 1 1 1	0 0 0 0 0			
	Blue	00000	00000	1 1 1 1 1 1			
	Cyan	00000	1 1 1 1 1 1	1 1 1 1 1 1			
	Magenta	1 1 1 1 1 1	00000	1 1 1 1 1 1			
	Yellow	1 1 1 1 1 1	1 1 1 1 1 1	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			
	RED (01)	000001	00000	00000			
	RED (62)	1 1 1 1 1 0	0 0 0 0 0	0 0 0 0 0			
	RED (63)	1 1 1 1 1 1	00000	00000			
GREEN	GREEN (00)	00000	0 0 0 0 0	00000			
	GREEN (01)	00000	0 0 0 0 0 1	0 0 0 0 0			
	GREEN (62)	00000	1 1 1 1 1 0	00000			
	GREEN (63)	00000	1 1 1 1 1 1	0 0 0 0 0			
BLUE	BLUE (00)	00000	0 0 0 0 0	00000			
	BLUE (01)	00000	00000	000001			
	BLUE (62)	00000	00000	1 1 1 1 1 0			
	BLUE (63)	00000	0 0 0 0 0	111111			



3-7. Power Sequence

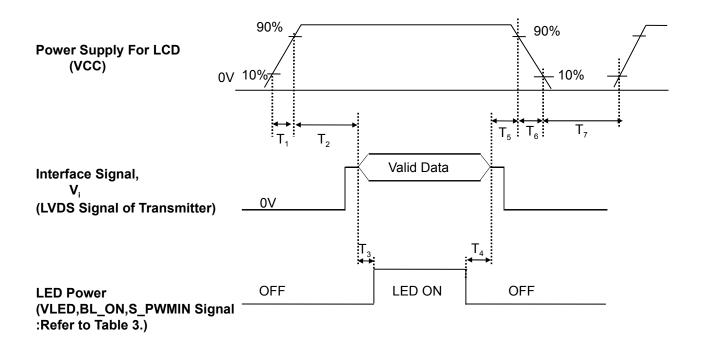


Table 7. POWER SEQUENCE TABLE

Parameter		Value	Units		
	Min.	Тур.	Max.		
T ₁	0.5	-	10	(ms)	
T ₂	0	-	50	(ms)	
Т ₃	200	-	-	(ms)	
T ₄	200	-	-	(ms)	
T ₅	0	-	50	(ms)	
T ₆	0	-	10	(ms)	
Т ₇	400	-	-	(ms)	

Note)

- 1. Valid Data is Data to meet "3-3. LVDS Signal Timing Specifications"
- 2. Please avoid floating state of interface signal at invalid period.
- 3. When the interface signal is invalid, be sure to pull down the power supply for LCD VCC to 0V.
- 4. LED power must be turn on after power supply for LCD and interface signal are valid.



4. 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 and Θ and Θ and Θ are the values of Φ and Φ are the values of Φ an

FIG. 1 presents additional information concerning the measurement equipment and method.

FIG. 1 Optical Characteristic Measurement Equipment and Method

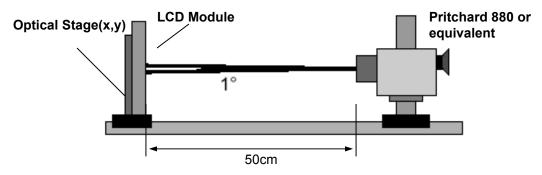


Table 8. OPTICAL CHARACTERISTICS

Ta=25° C, VCC=3.3V, f_V =60Hz, f_{CLK} =72.3MHz, I_{RL} = TBD mA

Parameter	Symbol		Values		Units	Notes
		Min	Тур	Max	1	
Contrast Ratio	CR	300	-	-		1
Surface Luminance, white	L _{wh}	170	200	-	cd/m²	2
Luminance Variation	δ _{WHITE}	-	1.4	1.6		3
Response Time	Tr _R + Tr _D	-	16	25	ms	4
Color Coordinates			TBD			
RED	RX	0.555	0.585	0.615	П	
	RY	0.319	0.349	0.379	Н	
GREEN	GX	0.306	0.336	0.366	П	
	GY	0.528	0.558	0.588	П	
BLUE	BX	0.128	0.158	0.188	\Box	
	BY	0.095	0.125	0.155		
Ver. 0.1						13 / 2
WHITE	WX	0.283	0.313	0.343		



Note)

1. Contrast Ratio(CR) is defined mathematically as

Contrast Ratio =

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.

$$L_{WH} = Average(L_1, L_2, ... L_5)$$

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.

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

- 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 = 60Hz

Gray Level	Luminance [%] (Typ) *
LO	0.2
L7	2.07
L15	6.93
L23	TBD
L31	Z3.Z
L39	36.4
L47	53.5
L55	75
L63	100



FIG. 2 Luminance

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

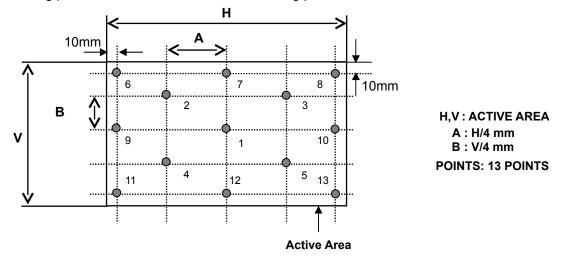


FIG. 3 Response Time

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

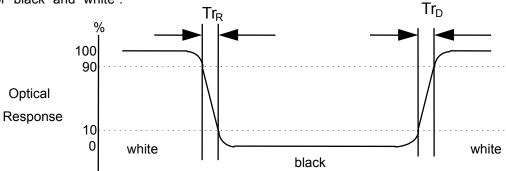
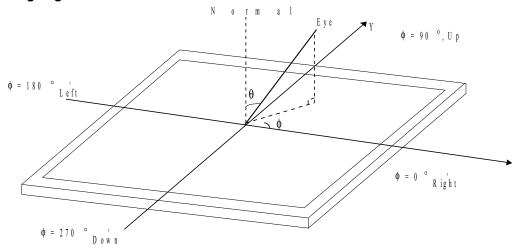


FIG. 4 Viewing angle





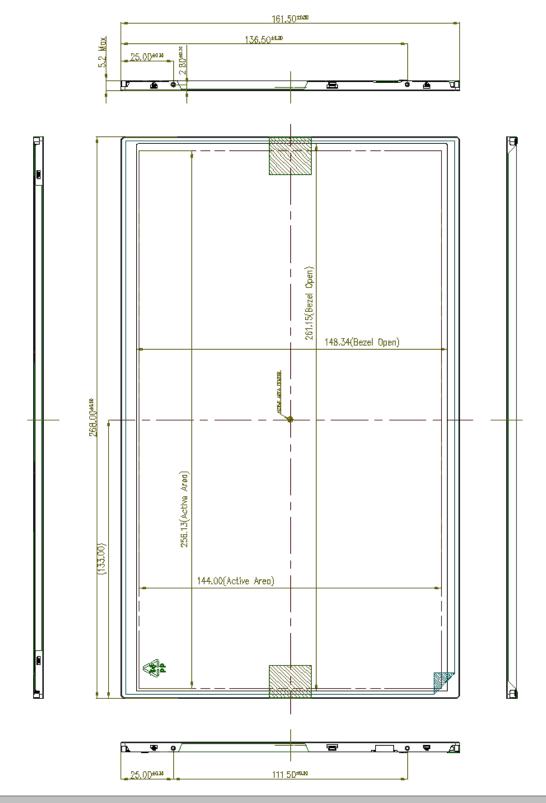
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP116WH1. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	268.0 ± 0.5 mm					
	Vertical	161.5 ± 0.5 mm					
	Thickness	5.2mm (max)					
Bezel Area	Horizontal	261.15 mm					
	Vertical	148.34 mm					
Active Display Area	Horizontal	256.13 mm					
	Vertical	144.00 mm					
Weight	255g (Max.)						
Surface Treatment	Glare treatment of the	Glare treatment of the front polarizer					

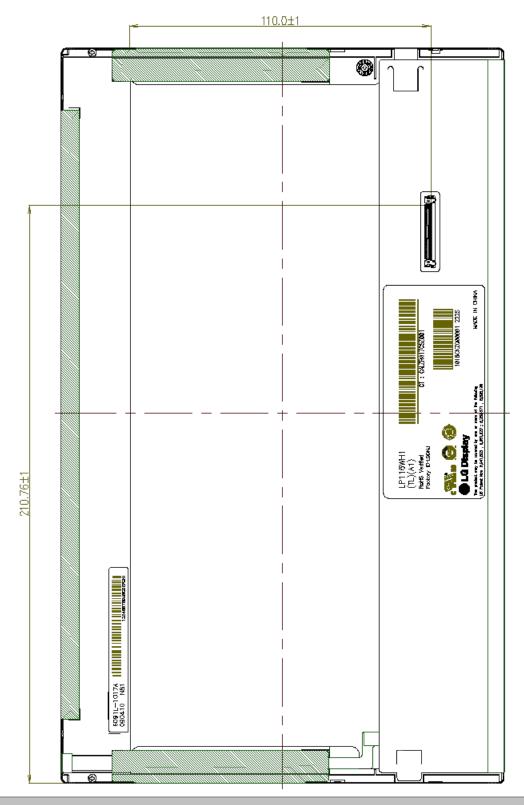


<FRONT VIEW>



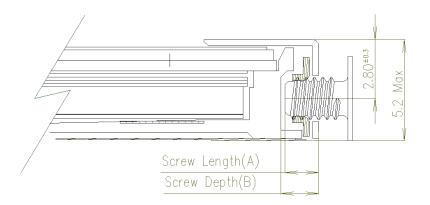


<REAR VIEW>





[DETAIL DESCRIPTION OF SIDE MOUNTING SCREW]



Section A-A

- * Mounting Screw Length (A) = 1.5(Min) /1.8(Max)
- * Mounting Screw Hole Depth (B) = 1.8(Min)
- * Mounting hole location : 2.8(typ.)
- * Torque : 2.0 kgf.cm(Max)

(Measurement gauge: torque meter)

Notes: 1. Screw plated through the method of non-electrolytic nickel plating is preferred to reduce possibility that results in vertical and/or horizontal line defect due to the conductive particles from screw surface.



6. 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)	Sine wave, 10 ~ 500 ~ 10Hz, 1.5G, 0.37oct/min 3 axis, 1hour/axis
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.



7. International Standards

7-1. Safety

a) UL 60950-1:2003, First Edition, Underwriters Laboratories, Inc.,

Standard for Safety of Information Technology Equipment.

b) CAN/CSA C22.2, No. 60950-1-03 1st Ed. April 1, 2003, Canadian Standards Association,

Standard for Safety of Information Technology Equipment.

c) EN 60950-1:2001, First Edition,

European Committee for Electrotechnical Standardization(CENELEC)

European Standard for Safety of Information Technology Equipment.

7-2. EMC

- a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. "American National Standards Institute(ANSI), 1992
- b) C.I.S.P.R "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." International Special Committee on Radio Interference.
- c) EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization.(CENELEC), 1998 (Including A1: 2000)



8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

Α	В	С	D	E	F	G	Н	I	J	K	L	М
---	---	---	---	---	---	---	---	---	---	---	---	---

A,B,C: SIZE(INCH)

E: MONTH $F \sim M$: SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

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	Α	В	С

D:YEAR

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.

8-2. Packing Form

a) Package quantity in one box: 40 pcs

b) Box Size: 395mm × 390mm × 309mm



9. PRECAUTIONS

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

9-1. 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.

9-2. 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.



9-3. 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.

9-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9-5. 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.

9-6. 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.



APPENDIX A. Enhanced Extended Display Identification Data (EEDID™) 1/3





APPENDIX A. Enhanced Extended Display Identification Data (EEDID™) 2/3





APPENDIX A. Enhanced Extended Display Identification Data (EEDID™) 3/3

