

SPECIFICATION FOR APPROVAL

(◆) Preliminary Specification

() Final Specification

Title	15.4" WXGA TFT LCD
-------	--------------------

Customer	Lenovo
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LP154WX7
Suffix	TLP2

*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
G. J. Kwon / G.Manager	
REVIEWED BY	
S. R. Kim / Manager	
PREPARED BY	
S. Y. Kim / Engineer	
D. J. Lee / Engineer	

Products Engineering Dept.
LG Display Co., Ltd

Product Specification

Contents

No	ITEM	Page
	COVER	1
	CONTENTS	2
	RECORD OF REVISIONS	3
1	GENERAL DESCRIPTION	4
2	ABSOLUTE MAXIMUM RATINGS	5
3	ELECTRICAL SPECIFICATIONS	
3-1	ELECTRICAL CHARACTERISTICS	6
3-2	INTERFACE CONNECTIONS	8
3-3	LVDS SIGNAL TIMING SPECIFICATIONS	9
3-4	SIGNAL TIMING SPECIFICATIONS	11
3-5	SIGNAL TIMING WAVEFORMS	11
3-6	COLOR INPUT DATA REFERENCE	12
3-7	POWER SEQUENCE	13
4	OPTICAL SPECIFICATIONS	14
5	MECHANICAL CHARACTERISTICS	18
6	RELIABILITY	25
7	INTERNATIONAL STANDARDS	
7-1	SAFETY	26
7-2	EMC	26
8	PACKING	
8-1	DESIGNATION OF LOT MARK	27
8-2	PACKING FORM	27
8-3	LABEL DESCRIPTION	28
9	PRECAUTIONS	29
A	APPENDIX. Enhanced Extended Display Identification Data	31

RECORD OF REVISIONS

[illegible]

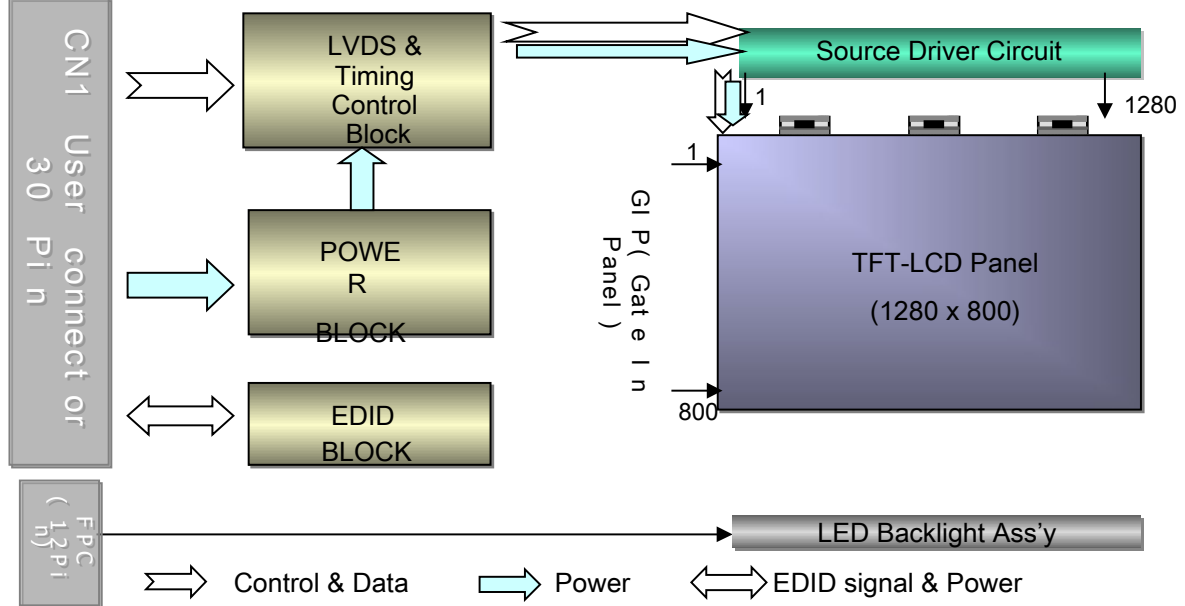
Product Specification

1. General Description

The LP154WX7 is a Color Active Matrix Liquid Crystal Display with an integral White 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 15.4 inches diagonally measured active display area with WXGA resolution(800 vertical by 1280 horizontal 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 LP154WX7 has been designed to apply the interface method that enables low power, high speed, low EMI.

The LP154WX7 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 LP154WX7 characteristics provide an excellent flat display for office automation products such as Notebook PC.



General Features

Active Screen Size	15.4 inches diagonal
Outline Dimension	344.0(H.) × 222.0(V) × 6.5(D,Max) [mm]
Pixel Pitch	0.2588mm × 0.2588 mm
Pixel Format	1280 horiz. By 800 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Luminance, White	220 cd/m ² (Typ.5 point)
Power Consumption	Total 3.9 Watt(Typ.) @ LCM circuit 1.2Watt(Typ.), B/L input 2.7Watt(Typ.)
Weight	570g(Max.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Anti-Glare treatment of the front polarizer
RoHS Comply	Yes

Product Specification

2. Absolute Maximum Ratings

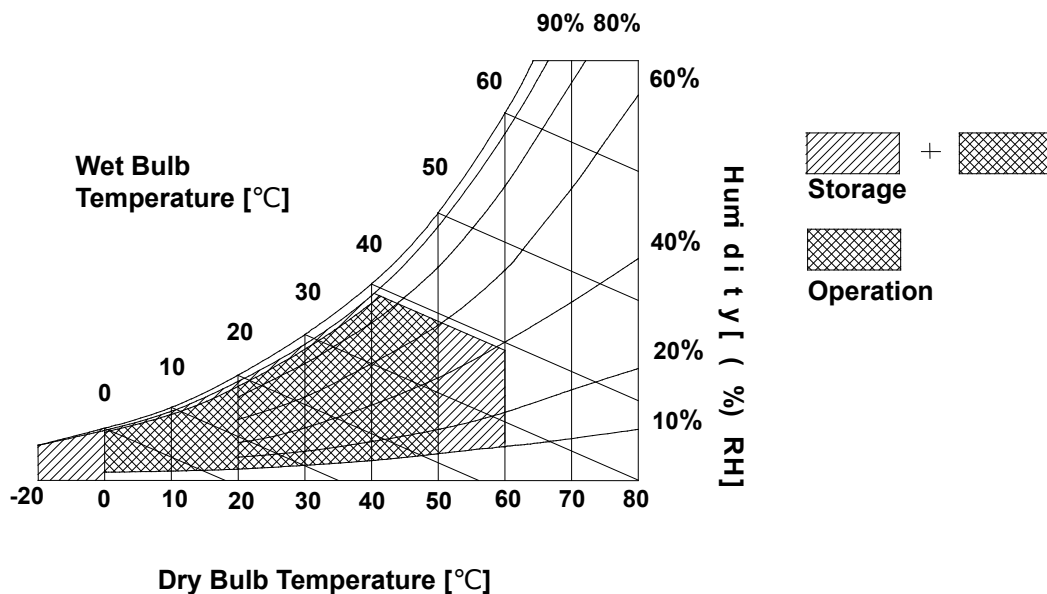
The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values		Units	Notes
		Min	Max		
Operating Temperature	TOP	-0.3	4.0	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.



Product Specification

3. Electrical Specifications

3-1. Electrical Characteristics

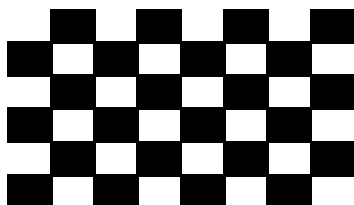
The LP154WX7 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the White LED, is typically generated by an LED Driver. The LED Driver is an external unit to the LCD.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	V _{CC}	3.0	3.3	3.6	V	
Power Supply Input Current (WinXP Desktop Pattern)	I _{CC}	305 (300)	360 (355)	415 (410)	mA	1
Power Consumption (WinXP Desktop Pattern)	P _{CC}	-	1.2 (1.2)	1.4 (1.4)	W	1
Power Supply Inrush Current	I _{CC_P}	-	-	1500	mA	
LVDS Impedance	Z _{LVDS}	90	100	110	Ω	2
LED :						
Operating Current	I _{BL}	5.0	20.0	21.0	mA	3
Operating Voltage per string	V _{LED}	20.3	22.4	23.8	V	
Power Consumption	P _{BL}	-	2.7	3.0	W	4
Life Time		12,000			Hrs	5

Note)

1. The specified current and power consumption are under the V_{CC} = 3.3V , 25°C, f_v = 60Hz condition whereas Mosaic pattern is displayed and f_v is the frame frequency.



2. This impedance value is needed to proper display and measured from 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 6 strings X 7 numbers on it.
4. The specified LED current and power consumption are under the V_{LED} = 12.0V , 25°C, Dimming of Max luminance whereas White pattern is displayed and f_v is the frame frequency.
5. The life time is determined as the time at which brightness of LCD is 50% compare to that of minimum value at Table 7. These LED backlight has 6 strings on it and the typical current of LED's string is base on typical current at Table 2.


Product Specification

3-2. Interface Connections

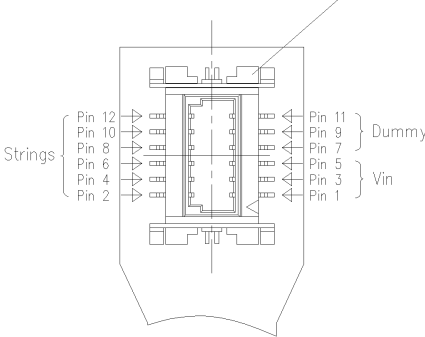
This LCD employs two interface connections, a 30 pin connector is used for the module electronics interface and the other connector is used for the integral backlight system.

The electronics interface connector is a model GT101-30S-HR11 manufactured by LSC.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	GND	Ground	<p>1, Interface chips 1.1 LCD : SW, SW0612B (LCD Controller) including LVDS Receiver 1.2 System : THC63LVD823A or equivalent * Pin to Pin compatible with LVDS</p> <p>2. Connector 2.1 LCD : GT101-30S-HR11, LSC IS100-C30R-C15 ,UJU Elec. it's compatible.</p> <p>2.2 Mating : FI-X30M or equivalent. 2.3 Connector pin arrangement</p> <div style="text-align: center;">  <p>[LCD Module Rear View]</p> </div>
2	VCC	Power Supply, 3.3V Typ.	
3	VCC	Power Supply, 3.3V Typ.	
4	V EEDID	DDC 3.3V power	
5	NC	Reserved for supplier test point	
6	CLK EEDID	DDC Clock	
7	DATA EEDID	DDC Data	
8	R _{IN} 0-	Negative LVDS differential data input	
9	R _{IN} 0+	Positive LVDS differential data input	
10	GND	Ground	
11	R _{IN} 1-	Negative LVDS differential data input	
12	R _{IN} 1+	Positive LVDS differential data input	
13	GND	Ground	
14	R _{IN} 2-	Negative LVDS differential data input	
15	R _{IN} 2+	Positive LVDS differential data input	
16	GND	Ground	
17	CLKIN-	Negative LVDS differential clock input	
18	CLKIN+	Positive LVDS differential clock input	
19	GND	Ground	
20	NC	No Connect	
21	NC	No Connect	
22	GND	Ground	
23	NC	No Connect	
24	NC	No Connect	
25	GND	Ground	
26	NC	No Connect	
27	NC	No Connect	
28	GND	Ground	
29	NC	No Connect	
30	NC	No Connect	

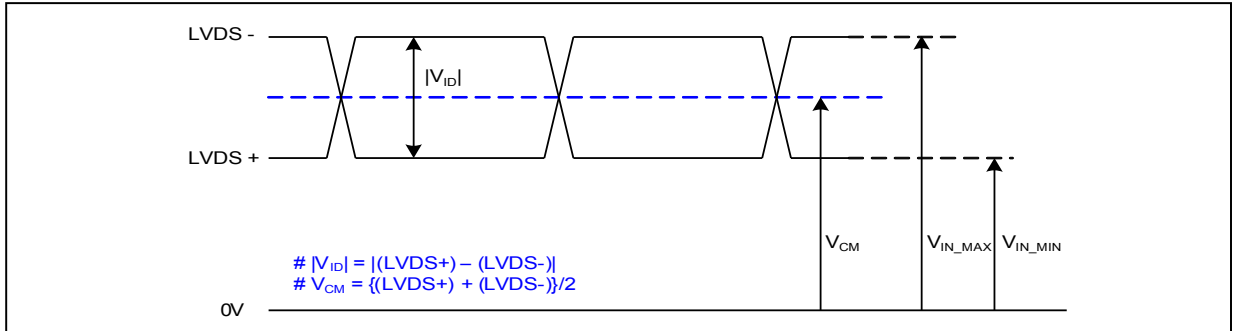
Product Specification
Table 4. LED FPC CONNECTOR PIN CONFIGURATION)

Pin	Symbol	Description	Notes
1	Vin	LED Power (LED Anode)	<p>Connector 1-179397-2, Tyco</p> <p>Tyco : 1-179397-2</p>  <p>[LCD Module Front View]</p>
2	FB1	LED Channel 1 Cathode	
3	Vin	LED Power (LED Anode)	
4	FB2	LED Chanel 2 Cathode	
5	Vin	LED Power (LED Anode)	
6	FB3	LED Chanel 3 Cathode	
7	NC	No Connect	
8	FB4	LED Chanel 4 Cathode	
9	NC	No Connect	
10	FB5	LED Chanel 5 Cathode	
11	NC	No Connect	
12	FB6	LED Chanel 6 Cathode	

Product Specification

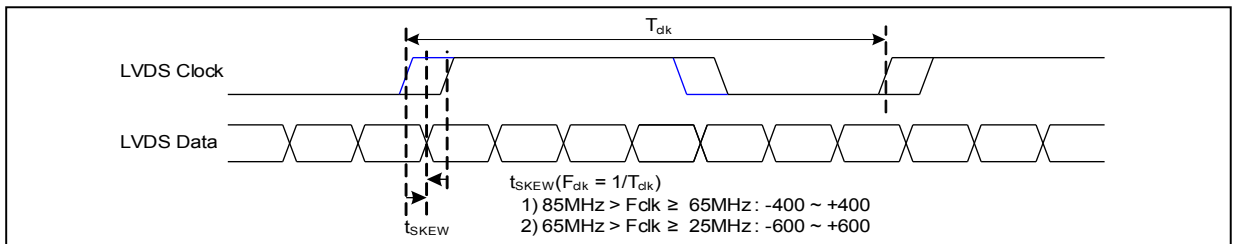
3-3. LVDS Signal Timing Specifications

3-3-1. DC Specification



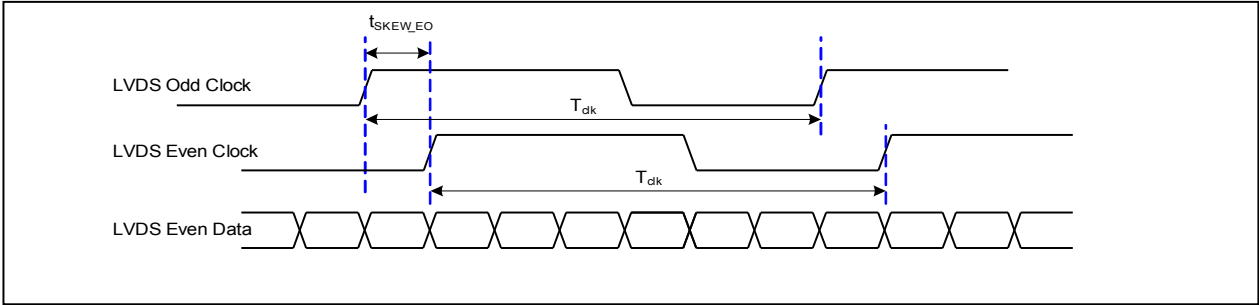
Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	$ V_{ID} $	100	600	mV	-
LVDS Common mode Voltage	V_{CM}	0.6	1.8	V	-
LVDS Input Voltage Range	V_{IN}	0.3	2.1	V	-

3-3-2. AC Specification

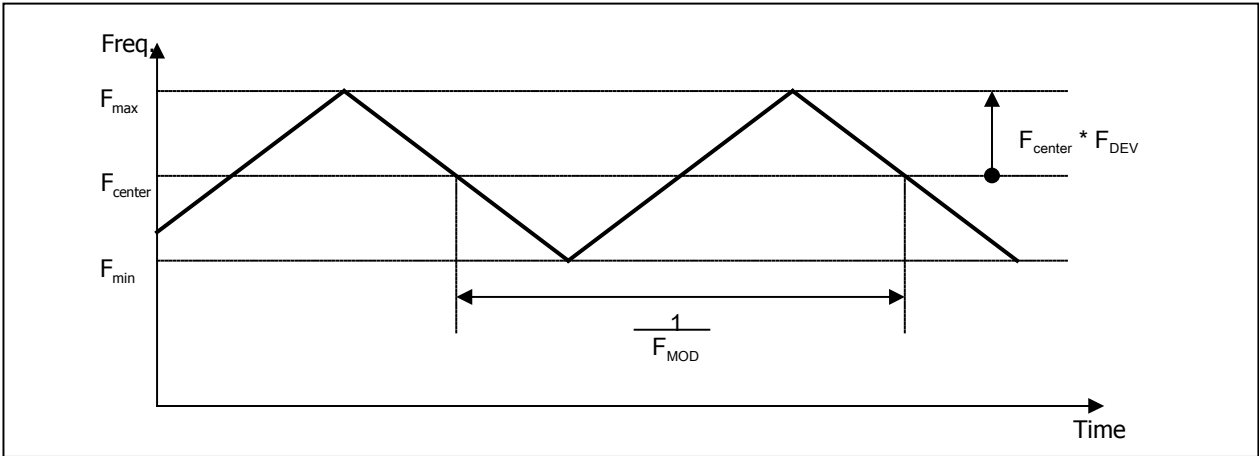


Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to Data Skew Margin	t_{SKEW}	- 400	+ 400	ps	$85\text{MHz} > F_{clk} \geq 65\text{MHz}$
	t_{SKEW}	- 600	+ 600	ps	$65\text{MHz} > F_{clk} \geq 25\text{MHz}$
LVDS Clock to Clock Skew Margin (Even to Odd)	t_{SKEW_EO}	- 1/7	+ 1/7	T_{clk}	-
Maximum deviation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

Product Specification



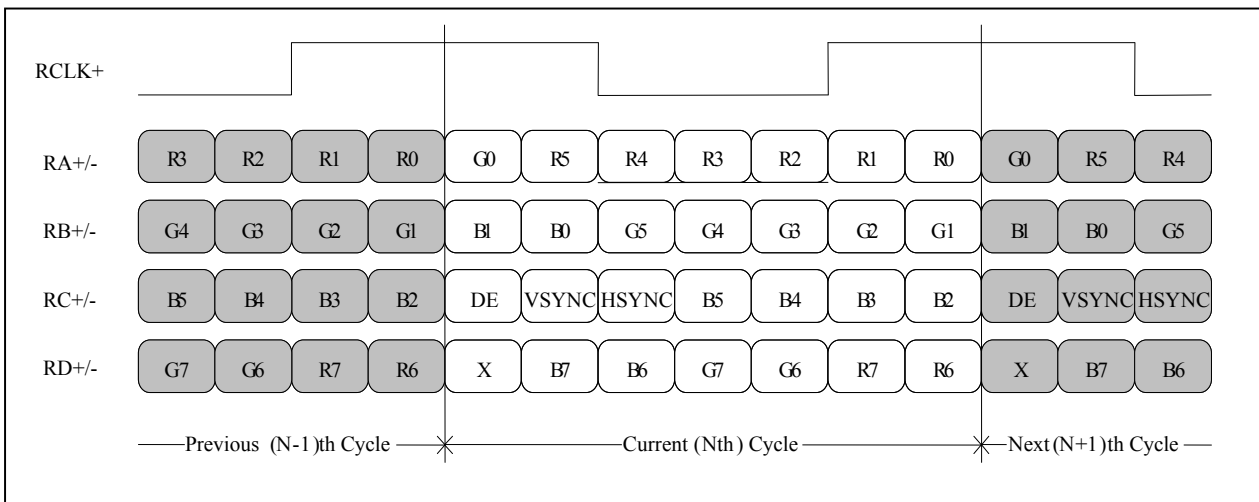
< Clock skew margin between channel >



< Spread Spectrum >

3-3-3. Data Format

1) LVDS 1 Port



< LVDS Data Format >

Product Specification

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.

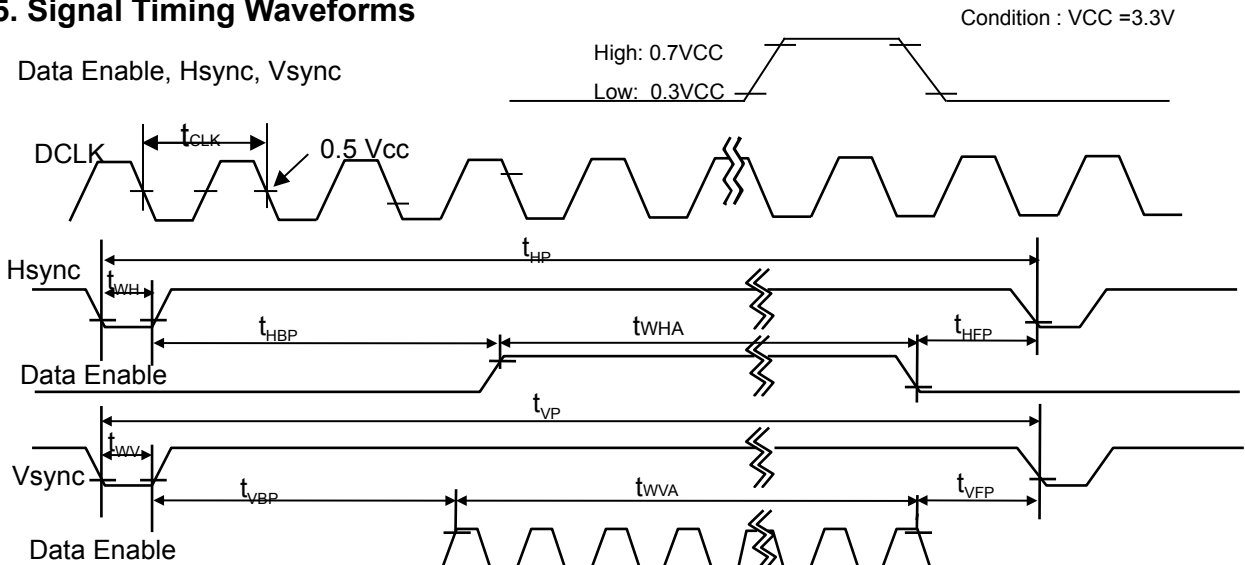
Table 6. TIMING TABLE

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	66.9	69.3	73.9	MHz	
Hsync	Period	t_{HP}	1376	1408	1480	tCLK	
	Width	t_{WH}	24	32	40		
	Width-Active	t_{WHA}	1280	1280	1280		
Vsync	Period	t_{VP}	810	820	832	tHP	
	Width	t_{WV}	2	4	6		
	Width-Active	t_{WVA}	800	800	800		
Data Enable	Horizontal back porch	t_{HBP}	56	72	96	tCLK	
	Horizontal front porch	t_{HFP}	16	24	64		
	Vertical back porch	t_{VBP}	6	12	18	tHP	
	Vertical front porch	t_{VFP}	2	4	8		

Note) Refresh Rate for Power Saving Mode

In this documentation, all reliabilities are specified for timing specification based on refresh rate of 60Hz. However, LP154WX7 has a good actual performance even at lower refresh rate (eg. 40Hz or 50Hz) for power saving mode, whereas LP154WX7 is secured only for function under lower refresh rate. 60Hz at Normal mode, 50Hz, 40Hz at Power save mode. Don't care Flicker level (power save mode).

3-5. Signal Timing Waveforms



Product Specification

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 6. 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	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	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	1	0	0

	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

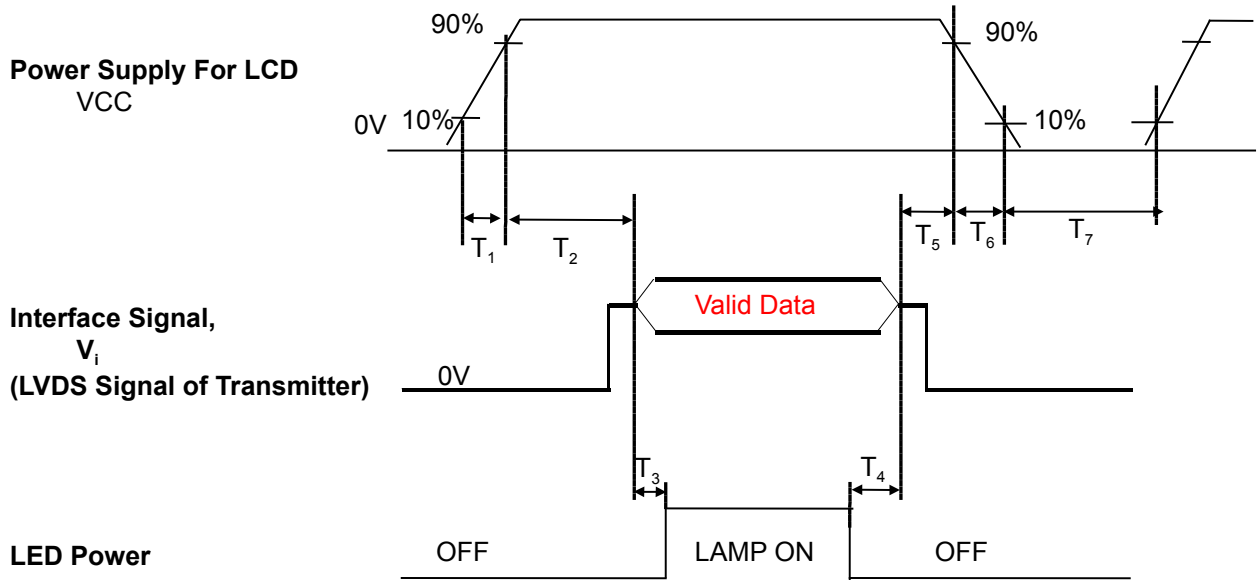


Table 7. POWER SEQUENCE TABLE

Parameter	Value			Units
	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	3	-	10	(ms)
T 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 θ_x and θ_y equal to 0°.

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

FIG. 1 Optical Characteristic Measurement Equipment and Method

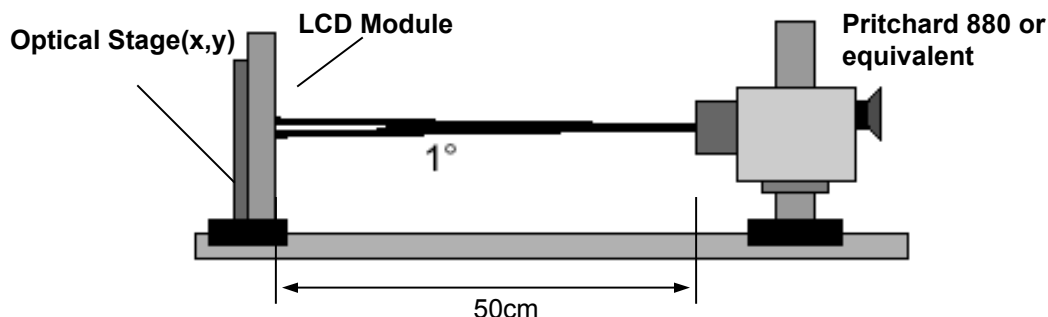


Table 8. OPTICAL CHARACTERISTICS

Ta=25 °C, VCC=3.3V, fv=60Hz, f_{CLK}= 69.3MHz, I_{LED}= 20.0mA

Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
Contrast Ratio	CR	-	500	-		1
Surface Luminance, white	L _{WH}	190	220	-	cd/m ²	2
Luminance Variation (13point)	WHITE	60	70	-	%	3
Luminance Variation (5point)	WHITE	70	80	-	%	
Response Time	Tr _R + Tr _D		16	25	ms	4
Color Coordinates						
RED	RX	0.562	0.592	0.622		
	RY	0.321	0.351	0.381		
	GREEN	GX	0.304	0.334	0.364	
	GY	0.527	0.557	0.587		
	BLUE	BX	0.124	0.154	0.184	
	BY	0.100	0.130	0.160		
	WHITE	WX	0.283	0.313	0.343	
	WY	0.299	0.329	0.359		
Viewing Angle						5
x axis, right($\theta_x=0^\circ$)	r	40	45	-	degree	
x axis, left ($\theta_x=180^\circ$)	l	40	45	-	degree	
y axis, up ($\theta_y=90^\circ$)	u	15	20	-	degree	
y axis, down ($\theta_y=270^\circ$)	d	35	40	-	degree	
Gray Scale			2.2			6
Color Gamut		-	45	-	%	

Product Specification

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.

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

3. The variation in surface luminance , The panel total variation (
- $_{WHITE}$
-) 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.

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

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.

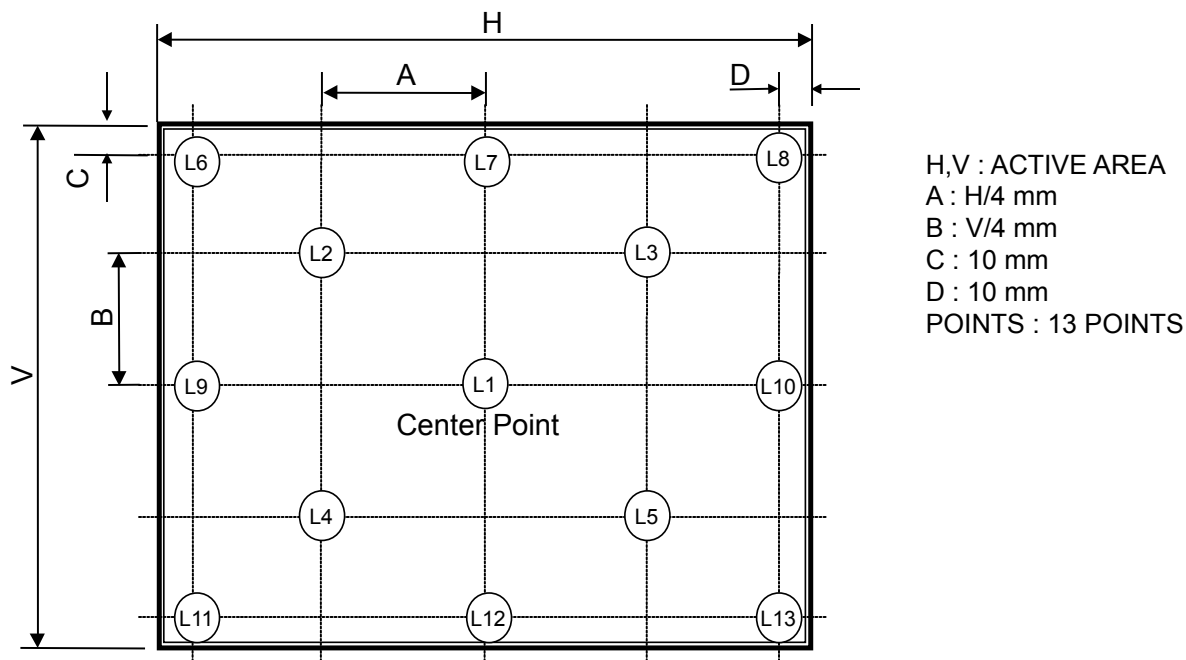
6. Gray scale specification

 * $f_v = 60\text{Hz}$

Gray Level	Luminance [%] (Typ)
L0	0.20
L7	1.86
L15	6.17
L23	12.7
L31	21.3
L39	35.6
L47	55.3
L55	78.5
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”.

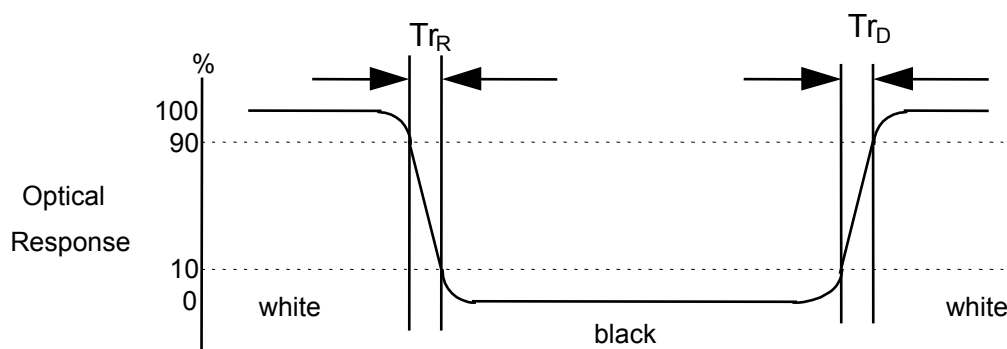
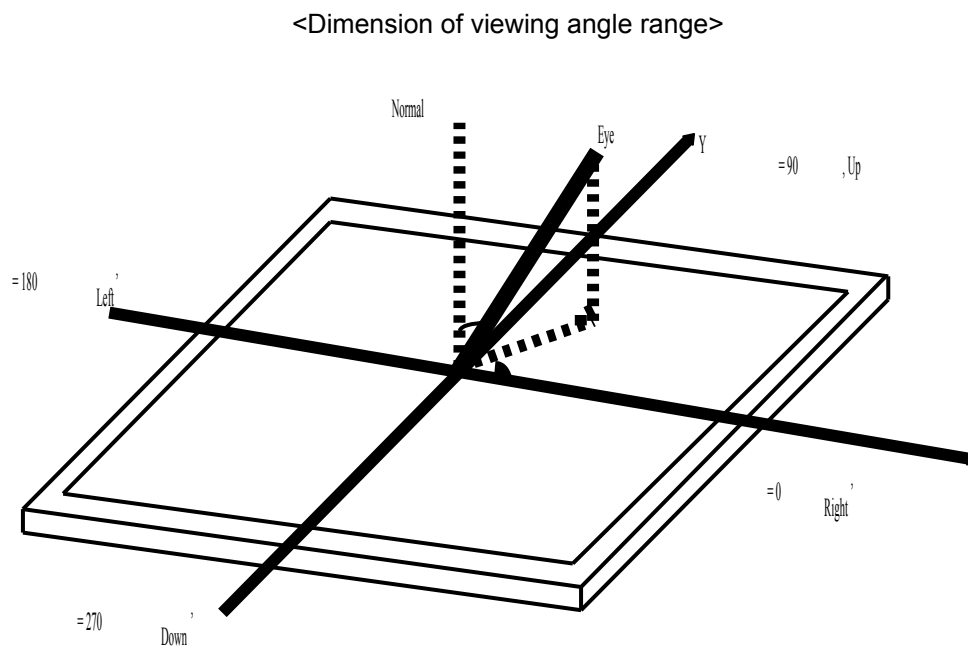


FIG. 4 Viewing angle



Product Specification

5. Mechanical Characteristics

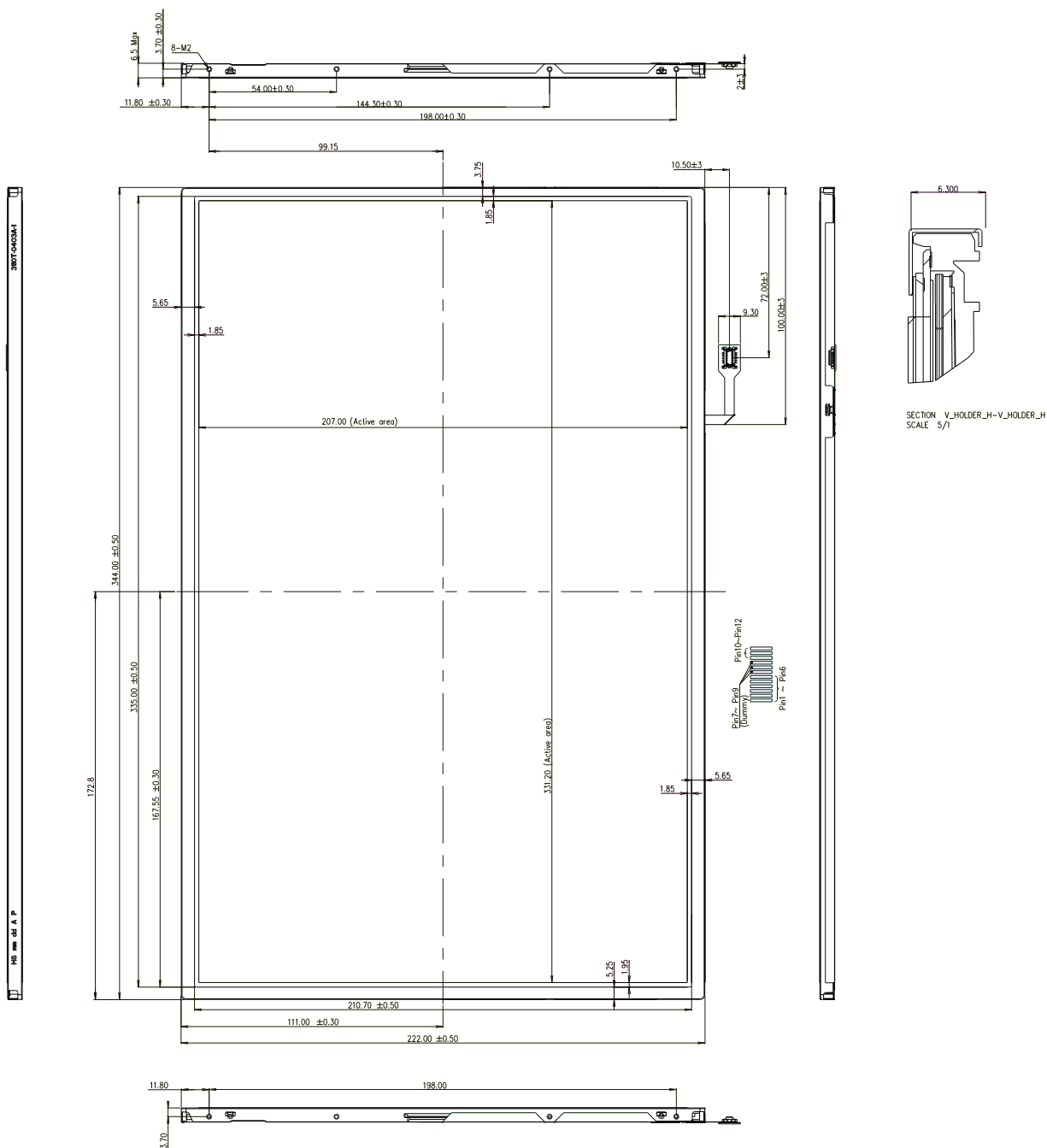
The contents provide general mechanical characteristics for the model LP154WX7. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	344.0 0.5mm
	Vertical	222.0 0.5mm
	Thickness	6.5mm (max)
Bezel Area	Horizontal	335.0 0.5mm
	Vertical	210.7 0.5mm
Active Display Area	Horizontal	331.2 mm
	Vertical	207.0 mm
Weight	570g(Max)	
Surface Treatment	Anti glare treatment of the front polarizer	

Product Specification

<FRONT VIEW>

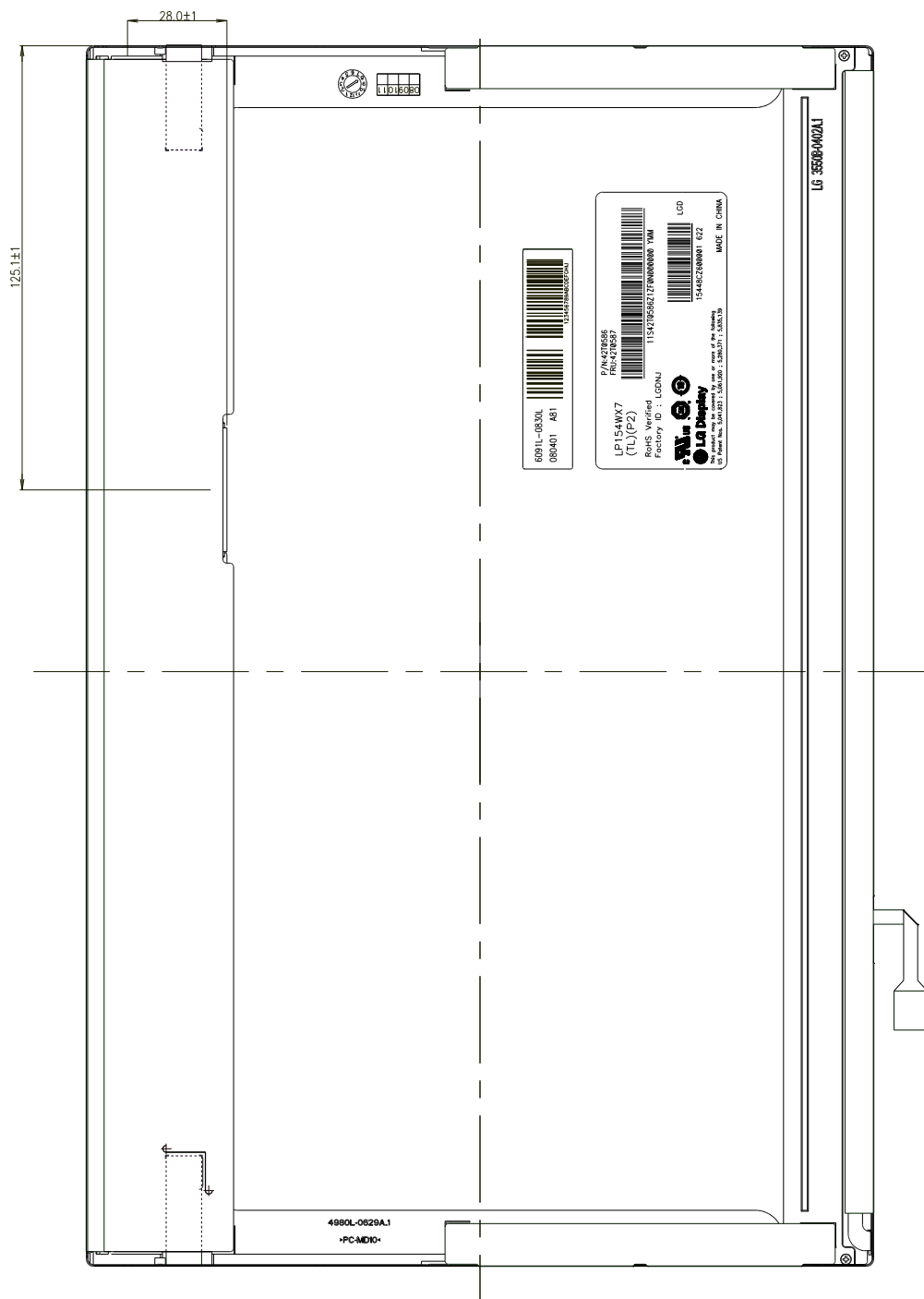
Note) Unit:[mm], General tolerance: 0.5mm



Product Specification

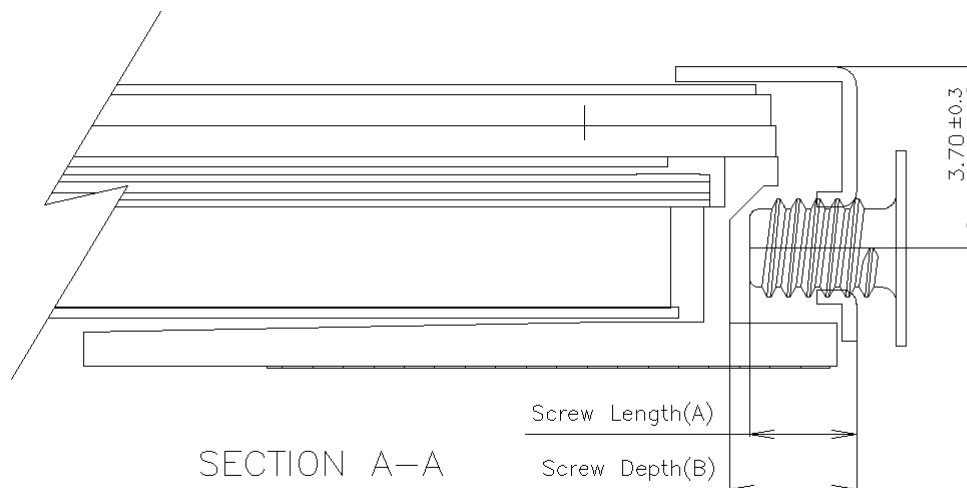
<REAR VIEW>

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



Product Specification

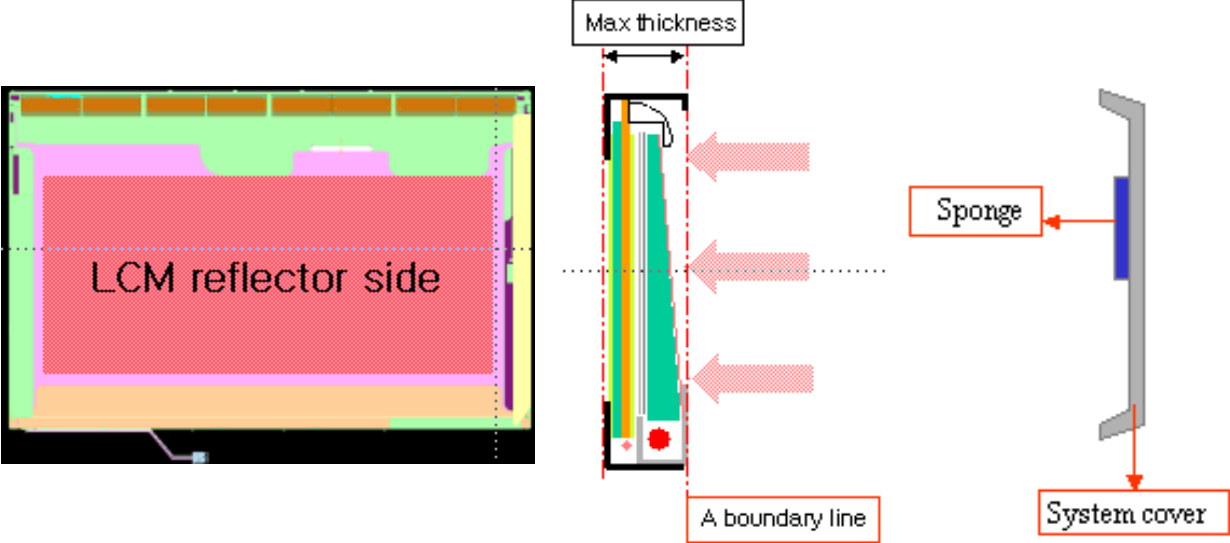
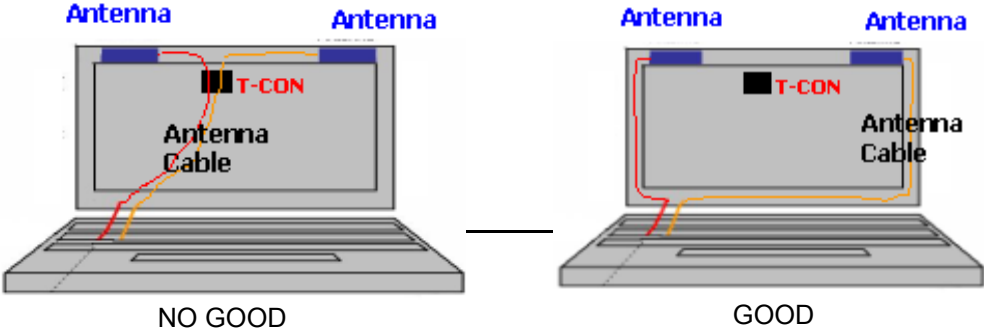
[DETAIL DESCRIPTION OF SIDE MOUNTING SCREW]



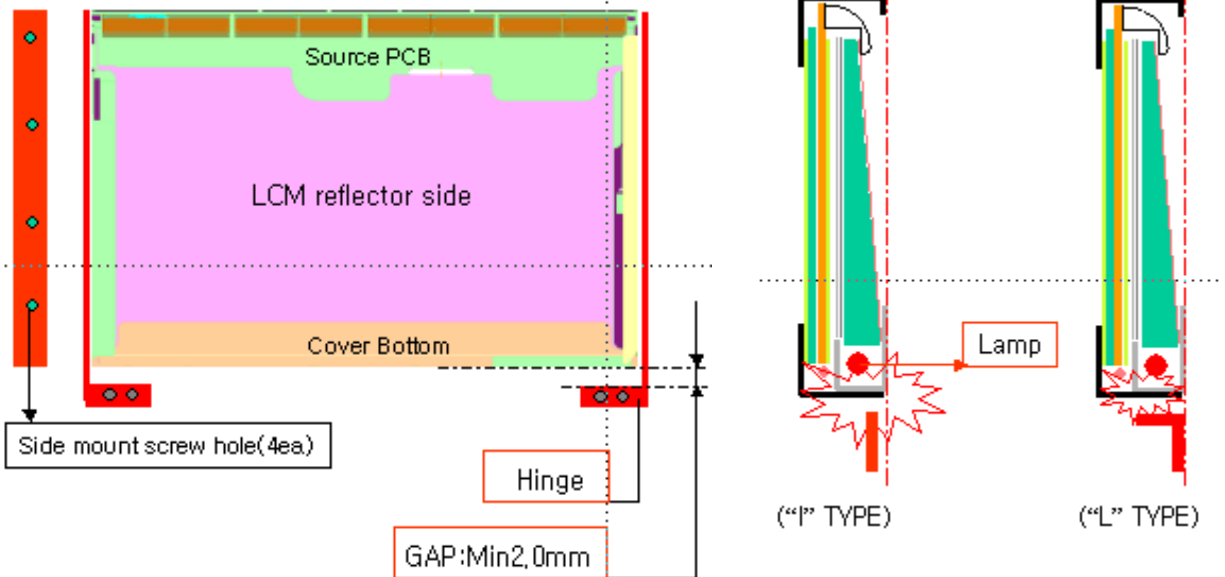
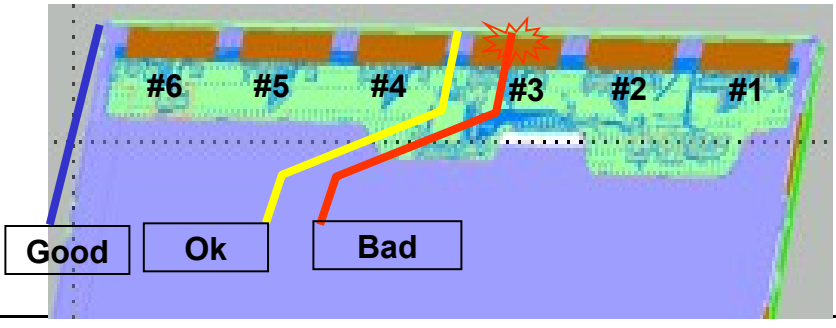
- * Mounting Screw Length (A)
= 2.0(Min) / 2.5(Max)
- * Mounting Screw Hole Depth (B)
= 2.5(Min)
- * Mounting hole location : 3.7(typ.)
- * Torque : 2.0 kgf.cm(Min) / 2.5 kgf.cm(Max)
(Measurement gauge : torque meter)

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.

LGD Proposal for system cover design.(Appendix)

1	Gap check for securing the enough gap between LCM and System cover.	
 <p>The diagram illustrates the gap check for the system cover design. On the left, a color-coded cross-section of the LCM reflector side is shown. In the center, a vertical cross-section of the system cover is shown with a red dashed line indicating 'Max thickness' and a red solid line indicating 'A boundary line'. To the right, a side view of the system cover is shown with a red arrow pointing to a 'Sponge' and another red arrow pointing to the 'System cover'.</p>		
Define	<p>1.Rear side of LCM is sensitive against external stress,and previous check about interference is highly needed.</p> <p>2.In case there is something from system cover comes into the boundary above,mechanical interference may cause the FOS defects. (Eg:Ripple,White spot..)</p>	
2	Check if antenna cable is sufficiently apart from T-CON of LCD Module.	
Define	 <p>The diagram shows two configurations of the antenna cable and T-CON. The left configuration, labeled 'NO GOOD', shows the antenna cable overlapping the T-CON. The right configuration, labeled 'GOOD', shows the antenna cable separated from the T-CON.</p>	
	1.If system antenna is overlapped with T-CON,it might be cause the noise.	

LGD Proposal for system cover design.

3	Gap check for securing the enough gap between LCM and System hinge.	
		
Define	1. At least 2.0mm of gap needs to be secured to prevent the shock related defects. 2. "L" type of hinge is recommended than "I" type under shock test.	
4	Checking the path of the System wire.	
		
Define	1. COF area needs to be handled with care. 2. GOOD → Wire path design to system side. OK → Wire path is located between COFs. BAD → Wire path overlapped with COF area.	

LGD Proposal for system cover design.

5	Using a bracket on the top of LCM is not recommended.	
	<div data-bbox="188 374 601 454" data-label="Image"> </div> <div data-bbox="342 469 458 502" data-label="Caption"> bracket </div> <div data-bbox="125 525 676 846" data-label="Image"> </div> <div data-bbox="312 869 499 904" data-label="Caption"> With bracket </div> <div data-bbox="755 525 1286 840" data-label="Image"> </div> <div data-bbox="922 869 1170 904" data-label="Caption"> Without bracket </div>	
Define	1.Condition without bracket is good for mechanical noise,and can minimize the light leakage from deformation of bracket. 2.The results shows that there is no difference between the condition with or without bracket.	
6	Securing additional gap on CNT area..	
	<div data-bbox="305 1232 1369 1676" data-label="Diagram"> </div>	
Define	1.CNT area is specially sensitive against external stress,and additional gap by cutting on system cover will be helpful on removing the Ripple. 2.Using a thinner CNT will be better. (eg: FPC type)	

Product Specification

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(l.e. run 180G, 2ms 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)

Product Specification

8. Packing

8-1. 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)

E : MONTH

D : YEAR

F ~ 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	A	B	C

b) Location of Lot Mark

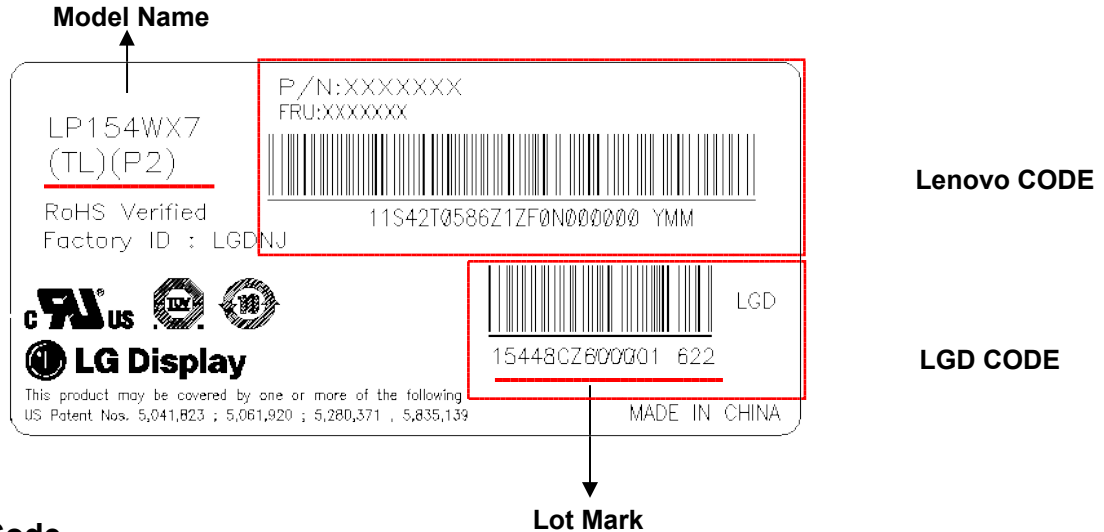
Serial No. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

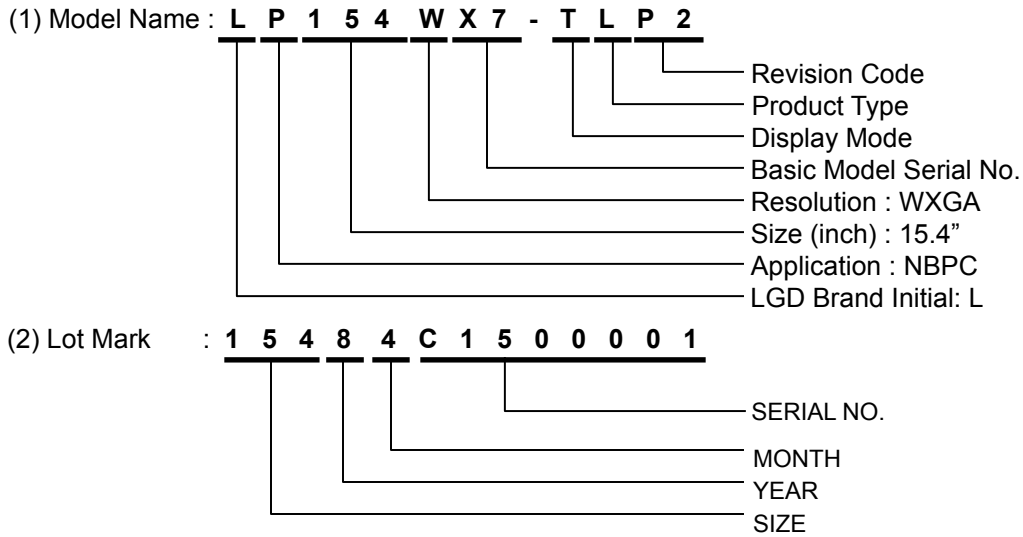
a) Package quantity in one box : 20 pcs

b) Box Size : 441mm × 373mm × 348mm

8-3. Label Description



LGD Code



Lenovo Code

1)P/N : 42T0796

2)FRU : 42T0797

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 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 :
 $V = \pm 200\text{mV}$ (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 minimize 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

Ver. 0.2

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

	Byte (Dec)	Byte (Hex)	Field Name and Comments	Value (Hex)	Value (Bin)
Timing Descriptor #1	54	36	Pixel Clock/10,000 (LSB) 69.5 MHz @ 60Hz	26	00100110
	55	37	Pixel Clock/10,000 (MSB)	1B	00011011
	56	38	Horizontal Active (lower 8 bits) 1280 Pixels	00	00000000
	57	39	Horizontal Blanking(Thp-HA) (lower 8 bits) 132 Pixels	84	10000100
	58	3A	Horizontal Active / Horizontal Blanking(Thp-HA) (upper 4:4bits)	50	01010000
	59	3B	Vertical Active 800 Lines	20	00100000
	60	3C	Vertical Blanking (Tvp-HA) (DE Blanking typ.for DE only panels) 20 Lines	14	00010100
	61	3D	Vertical Active : Vertical Blanking (Tvp-HA) (upper 4:4bits)	30	00110000
	62	3E	Horizontal Sync. Offset (Thfp) 24 Pixels	18	00011000
	63	3F	Horizontal Sync Pulse Width (HSPW) 32 Pixels	20	00100000
	64	40	Vertical Sync Offset(Tvfp) : Sync Width (VSPW) 4 Lines : 4 Lines	44	01000100
	65	41	Horizontal Vertical Sync Offset/Width (upper 2bits)	00	00000000
	66	42	Horizontal Image Size (mm) 331 mm	4B	01001011
	67	43	Vertical Image Size (mm) 207 mm	CF	11001111
	68	44	Horizontal Image Size / Vertical Image Size	10	00010000
	69	45	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
	70	46	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	71	47	Non-Interlace, Normal display, no stereo, Digital Separate (Vsync_NEG, Hsync_NEG), DE only note : LSB is set to '1' if panel is DE-timing only. H/V can be ignored.	19	00011001
Timing Descriptor #2	72	48	Pixel Clock/10,000 (LSB) 57.8 MHz @ 50.1Hz	94	10010100
	73	49	Pixel Clock/10,000 (MSB)	16	00010110
	74	4A	Horizontal Active (lower 8 bits) 1280 Pixels	00	00000000
	75	4B	Horizontal Blanking(Thp-HA) (lower 8 bits) 128 Pixels	80	10000000
	76	4C	Horizontal Active / Horizontal Blanking(Thp-HA) (upper 4:4bits)	50	01010000
	77	4D	Vertical Active 800 Lines	20	00100000
	78	4E	Vertical Blanking (Tvp-HA) (DE Blanking typ.for DE only panels) 20 Lines	14	00010100
	79	4F	Vertical Active : Vertical Blanking (Tvp-HA) (upper 4:4bits)	30	00110000
	80	50	Horizontal Sync. Offset (Thfp) 24 Pixels	18	00011000
	81	51	Horizontal Sync Pulse Width (HSPW) 32 Pixels	20	00100000
	82	52	Vertical Sync Offset(Tvfp) : Sync Width (VSPW) 4 Lines : 4 Lines	44	01000100
	83	53	Horizontal Vertical Sync Offset/Width (upper 2bits)	00	00000000
	84	54	Horizontal Image Size (mm) 331 mm	4B	01001011
	85	55	Vertical Image Size (mm) 207 mm	CF	11001111
	86	56	Horizontal Image Size / Vertical Image Size	10	00010000
	87	57	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
	88	58	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	89	59	Non-Interlace, Normal display, no stereo, Digital Separate (Vsync_NEG, Hsync_NEG), DE only note : LSB is set to '1' if panel is DE-timing only. H/V can be ignored.	19	00011001
Timing Descriptor #3	90	5A	Flag	00	00000000
	91	5B	Flag	00	00000000
	92	5C	Flag	00	00000000
	93	5D	Data Type Tag : Descriptor Defined by manufacturer	0F	00001111
	94	5E	Flag	00	00000000
	95	5F	(Horizontal active pixel/8)-31 129 (1280 pixels)	81	10000001
	96	60	Image Aspect Ratio(16:10) 16:10	0A	00001010
	97	61	Low Refresh Rate #1(50Hz) 50 Hz	32	00110010
	98	62	(Horizontal active pixel/8)-31 129 (1280 pixels)	81	10000001
	99	63	Image Aspect Ratio(16:10) 16:10	0A	00001010
	100	64	Low Refresh Rate #2(40Hz) 40 Hz	28	00101000
	101	65	Brightness(1/10nit) 210 nits	15	00010101
	102	66	Feature flag (TN Technology ,LED Backlight) No definition	09	00001001
	103	67	Reserved 00h	00	00000000
	104	68	EISA manufacturer code(3 Character ID) LGD	30	00110000
	105	69	Compressed ASCII	E4	11100100
	106	6A	Panel Supplier Reserved - Product code 0204	04	00000100
	107	6B	(Hex, LSB first)	02	00000010

Product Specification

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

	Byte (Dec)	Byte (Hex)	Field Name and Comments	Value (Hex)	Value (Bin)
Timing Descriptor #4	108	6C	Flag	00	00000000
	109	6D	Flag	00	00000000
	110	6E	Flag	00	00000000
	111	6F	Data Type Tag : Data String (ASCII String)	FE	11111110
	112	70	Flag	00	00000000
	113	71	Panel supplier P/N #1 = L	4C	01001100
	114	72	Panel supplier P/N #2 = P	50	01010000
	115	73	Panel supplier P/N #3 = 1	31	00110001
	116	74	Panel supplier P/N #4 = 5	35	00110101
	117	75	Panel supplier P/N #5 = 4	34	00110100
	118	76	Panel supplier P/N #6 = W	57	01010111
	119	77	Panel supplier P/N #7 = X	58	01011000
	120	78	Panel supplier P/N #8 = 7	37	00110111
	121	79	Panel supplier P/N #9 = -	2D	00101101
	122	7A	Panel supplier P/N #10 = T	54	01010100
	123	7B	Panel supplier P/N #11 = L	4C	01001100
Checksum	124	7C	Panel supplier P/N #12 = P	50	01010000
	125	7D	Panel supplier P/N #13 = 2	32	00110010
	126	7E	Extension flag (# of optional 128 panel ID extension block to follow, Typ = 0)	00	00000000
	127	7F	Check Sum (The 1-byte sum of all 128 bytes in this panel ID block shall = 0)	4F	01001111