

Product Specification

# SPECIFICATION FOR APPROVAL

- ( ● ) Preliminary Specification
- (   ) Final Specification

Title	17.3" FHD TFT LCD
-------	-------------------

BUYER	ASUS
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LP173WF1
Suffix	TLA1

\*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
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PREPARED BY	
S. W. Park / Engineer S. W. Kim / Engineer	_____

Product Engineering Dept.  
LG Display Co., Ltd

## Product Specification

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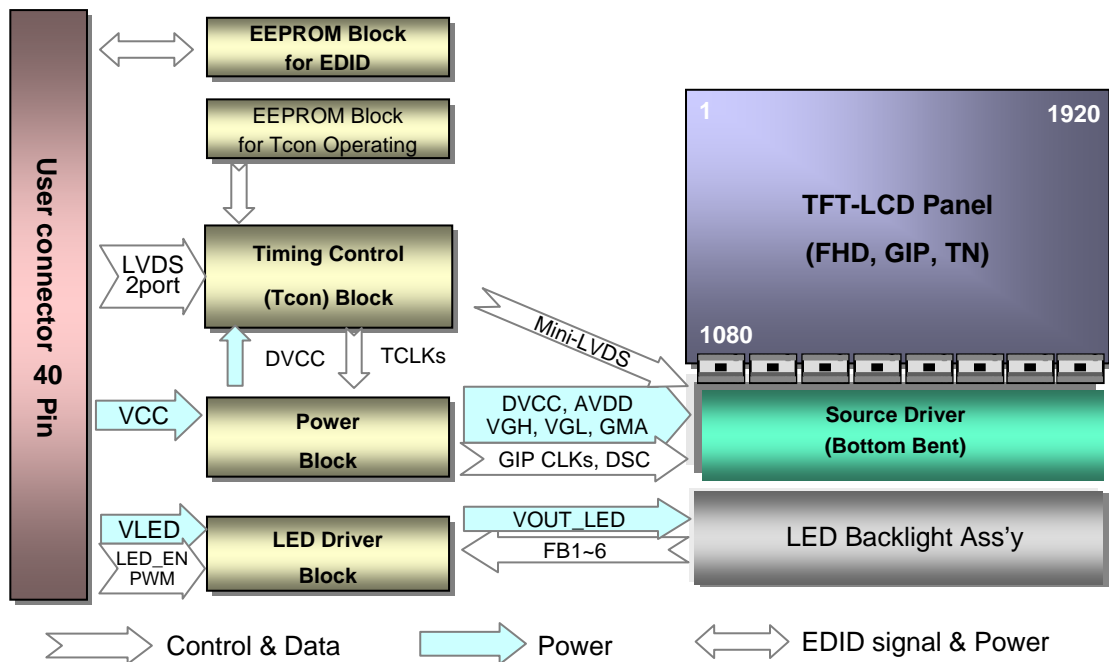
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### 1. General Description

The LP173WF1 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 17.3 inches diagonally measured active display area with FHD resolution (1920 horizontal by 1080 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 LP173WF1 has been designed to apply the interface method that enables low power, high speed, low EMI. The LP173WF1 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 LP173WF1 characteristics provide an excellent flat display for office automation products such as Notebook PC.



### General Features

Active Screen Size	17.3 inches diagonal
Outline Dimension	398.1(H, Typ.) × 232.8(V, Typ.) × 6.0(D, Max.) mm
Pixel Pitch	0.1989 X 0.1989 mm
Pixel Format	1920 horiz. by 1080 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Luminance, White	300 cd/m <sup>2</sup> (Typ., @ I <sub>LED</sub> =22mA)
Power Consumption	Total 8.5W(Typ.) Logic : 2.0W (Typ.@ Mosaic), B/L : 6.5W (Typ.@ VLED 12V )
Weight	580g (Max.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Glare treatment (4H) of the front Polarizer
RoHS Compliance	Yes
BFR / PVC / As Free	Yes for all



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### 3. Electrical Specifications

#### 3-1. Electrical Characteristics

The LP173WF1 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.

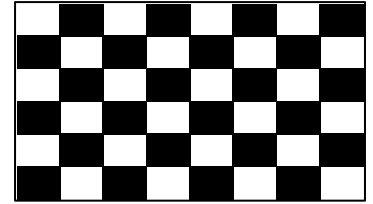
**Table 2. ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
LOGIC :						
Power Supply Input Voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	1
Power Supply Input Current	I <sub>CC</sub>	-	600	680	mA	2
Power Consumption	P <sub>CC</sub>	-	1.98	2.24	W	2
Power Supply Inrush Current	I <sub>CC_P</sub>	-	770	900	mA	4
LVDS Impedance	Z <sub>LVDS</sub>	90	100	110	Ω	5
BACKLIGHT : ( with LED Driver)						
LED Power Input Voltage	V <sub>LED</sub>	7.5	12.0	21.0	V	6
LED Power Input Current	I <sub>LED</sub>	-	TBD	TBD	mA	7
LED Power Consumption	P <sub>LED</sub>	-	TBD	TBD	W	7
LED Power Inrush Current	I <sub>LED_P</sub>	-	450	550	mA	8
PWM Duty Ratio		5	-	100	%	9
PWM Jitter	-	0	-	0.2	%	10
PWM Impedance	Z <sub>PWM</sub>	20	40	60	kΩ	
PWM Frequency	F <sub>PWM</sub>	200	-	1000	Hz	11
PWM High Level Voltage	V <sub>PWM_H</sub>	3.0	-	5.3	V	
PWM Low Level Voltage	V <sub>PWM_L</sub>	0	-	0.5	V	
LED_EN Impedance	Z <sub>PWM</sub>	20	40	60	kΩ	
LED_EN High Voltage	V <sub>LED_EN_H</sub>	3.0	-	5.3	V	
LED_EN Low Voltage	V <sub>LED_EN_L</sub>	0	-	0.5	V	
Life Time		12,000	-	-	Hrs	12

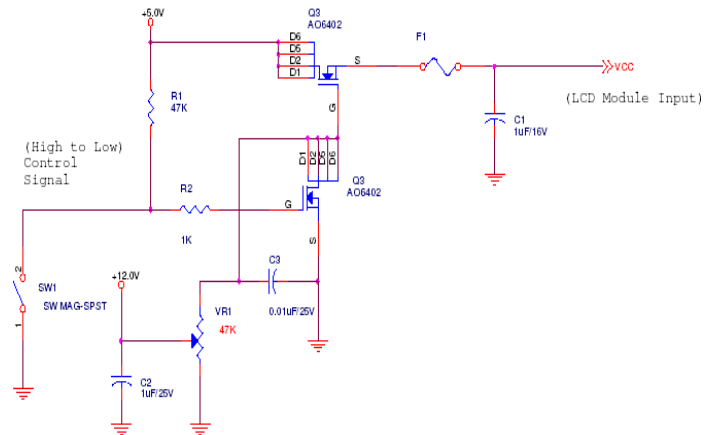
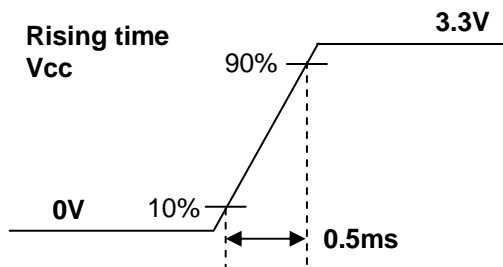
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Note)

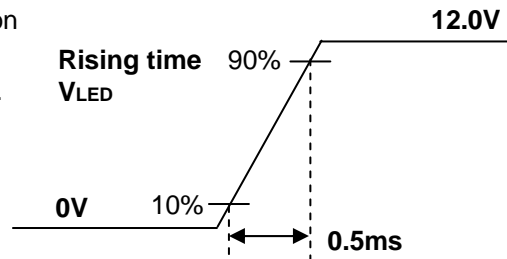
1. The measuring position is the connector of LCM and the test condition is under 25°C,  $f_v = 60\text{Hz}$ , Black pattern.
2. The specified  $I_{cc}$  current and power consumption are under the  $V_{cc} = 3.3\text{V}$ , 25°C,  $f_v = 60\text{Hz}$  condition whereas Mosaic pattern is displayed and  $f_v$  is the frame frequency.



3. The below figures are the measuring  $V_{cc}$  condition and the  $V_{cc}$  control block LGD used. The  $V_{cc}$  condition is same the minimum of T1 at Power on sequence.



4. This impedance value is needed to proper display and measured from LVDS Tx to the mating connector.
5. The measuring position is the connector of LCM and the test conditions are under 25°C.
6. The current and power consumption with LED Driver are under the  $V_{led} = 12.0\text{V}$ , 25°C, Dimming of Max luminance whereas White pattern is displayed and  $f_v$  is the frame frequency.
7. The below figures are the measuring  $V_{led}$  condition and the  $V_{led}$  control block LGD used.  $V_{LED}$  control block is same with  $V_{cc}$  control block.



8. The operation of LED Driver below minimum dimming ratio may cause flickering or reliability issue.
9. If Jitter of PWM is bigger than maximum. It may cause flickering.
10. This Spec. is not effective at 100% dimming ratio as an exception because it has DC level equivalent to 0Hz. In spite of acceptable range as defined, the PWM Frequency should be fixed and stable for more consistent brightness control at any specific level desired.
11. 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 22mA.

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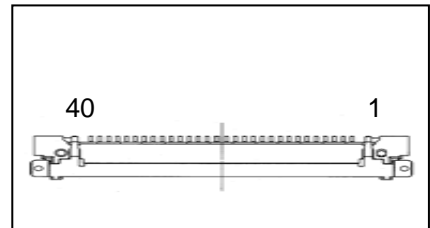
### 3-2. Interface Connections

This LCD employs two interface connections, a 40 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 20455-040E manufactured by UJU & LSMtron

**Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)**

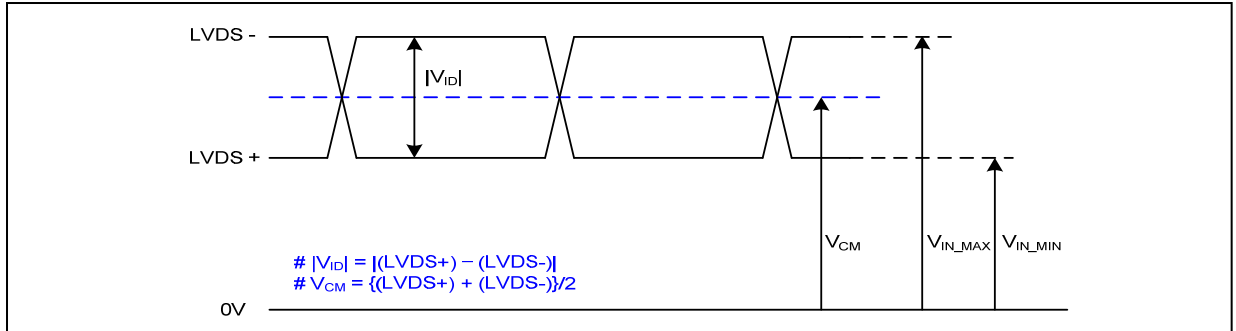
Pin	Symbol	Description	Notes
1	DIAG_LOOP	Buyer's Test loop to 34pin	<b>[Interface Chip]</b> 1. LCD : SW, SW0617(LCD Controller) Including LVDS Receiver. 2. System : SiWLVDSDRx or equivalent * Pin to Pin compatible with LVDS  <b>[Connector]</b> UJU IS050-L40B-C10 LSMtron GT05Q-40S-H10 or equivalent  <b>[Mating Connector]</b> 20345-#40E-## series or equivalent  <b>[Connector pin arrangement]</b>
2	VDD	Power Supply (3.3V typ.)	
3	VDD	Power Supply (3.3V typ.)	
4	V EEDID	DDC 3.3V power	
5	BIST	Panel Self Test	
6	CLK EEDID	DDC clock / SMBus clock	
7	DATA EEDLD	DDC data / SMBus data	
8	Odd_Rin0-	- LVDS differential data input (R0-R5,G0)	
9	Odd_Rin0+	+ LVDS differential data input (R0-R5,G0)	
10	GND	Ground	
11	Odd_Rin1-	- LVDS differential data input (G1-G5,B0-B1)	
12	Odd_Rin1+	+ LVDS differential data input (G1-G5,B0-B1)	
13	GND	Ground	
14	Odd_Rin2-	- LVDS differential data input (B2-B5,HS,VS,DE)	
15	Odd_Rin2+	+ LVDS differential data input (B2-B5,HS,VS,DE)	
16	GND	Ground	
17	Odd_ClkIN-	- LVDS differential clock input	
18	Odd_ClkIN+	+ LVDS differential clock input	
19	GND	No Connection	
20	Even Rin0-	- LVDS differential data input (R0-R5,G0)	
21	Even Rin0+	+ LVDS differential data input (R0-R5,G0)	
22	GND	Ground	
23	Even Rin1-	- LVDS differential data input (G1-G5,B0-B1)	
24	Even Rin1+	+ LVDS differential data input (G1-G5,B0-B1)	
25	GND	Ground	
26	Even Rin2-	- LVDS differential data input (B2-B5,HS,VS,DE)	
27	Even Rin2+	+ LVDS differential data input (B2-B5,HS,VS,DE)	
28	GND	Ground	
29	Even ClkIN-	- LVDS differential clock input	
30	Even ClkIN+	+ LVDS differential clock input	
31	GND	LED power return	
32	GND	LED power return	
33	GND	LED power return	
34	DIAG_LOOP	Buyer's Test loop to 1pin	
35	PWM	PWM for luminance control	
36	LED_EN	BL On/Off	
37	NC	No Connection.	
38	VLED	7V-21V LED power	
39	VLED	7V-21V LED power	
40	VLED	7V-21V LED power	



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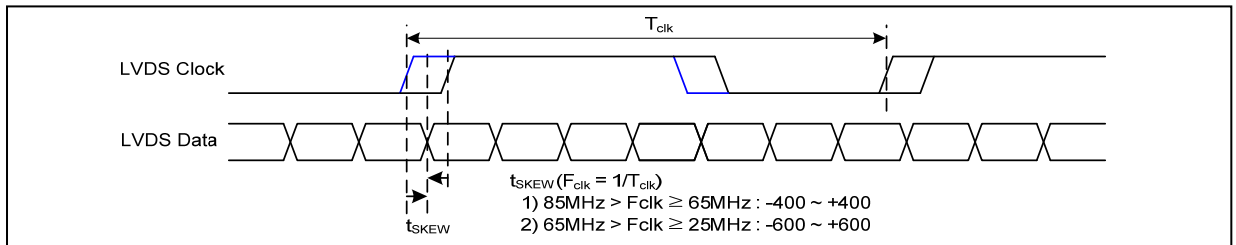
### 3-3. LVDS Signal Timing Specifications

#### 3-3-1. DC Specification



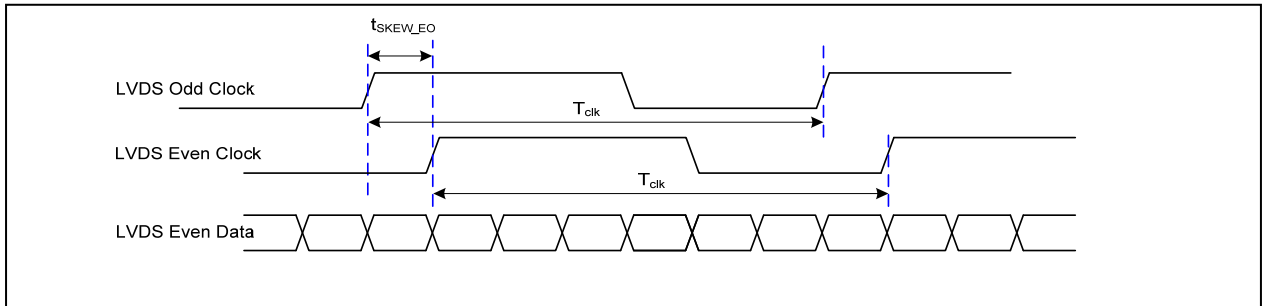
Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	$ V_{ID} $	100	600	mV	-
LVDS Common mode Voltage	$V_{CM}$	0.6	1.8	V	-
LVDS Input Voltage Range	$V_{IN}$	0.3	2.1	V	-

#### 3-3-2. AC Specification

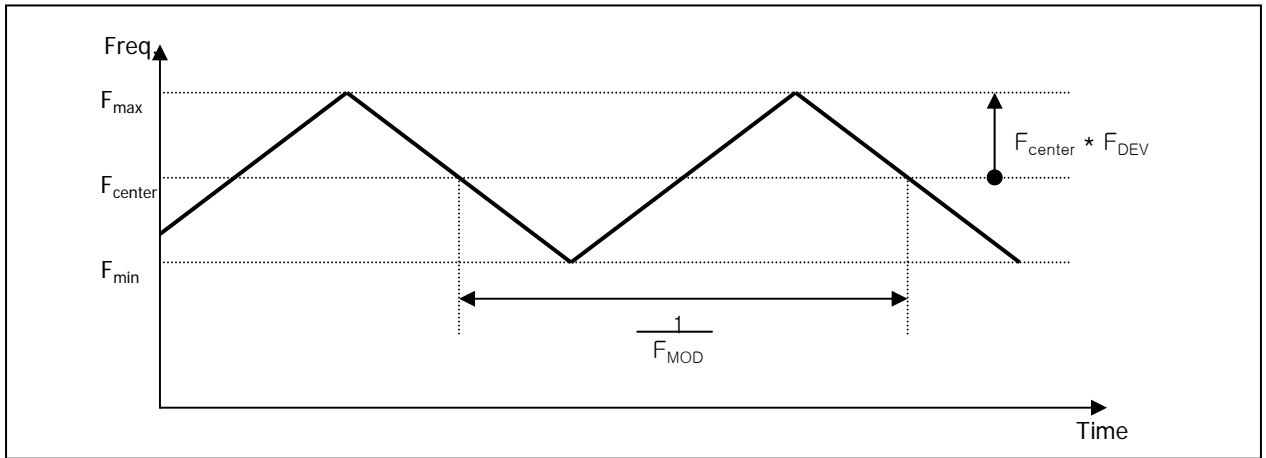


Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to Data Skew Margin	$t_{SKEW}$	- 400	+ 400	ps	$85MHz > F_{clk} \geq 65MHz$
	$t_{SKEW}$	- 600	+ 600	ps	$65MHz > F_{clk} \geq 25MHz$
LVDS Clock to Clock Skew Margin (Even to Odd)	$t_{SKEW\_EO}$	- 1/7	+ 1/7	$T_{clk}$	-
Maximum deviation of input clock frequency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

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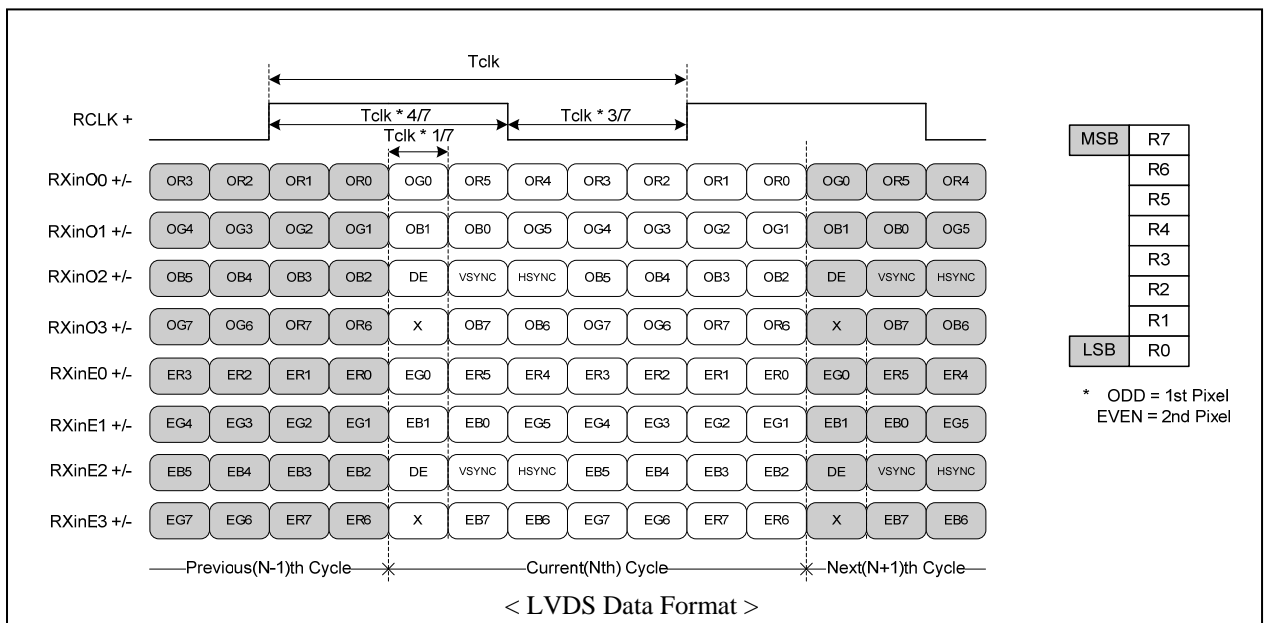
< Clock skew margin between channel >



< Spread Spectrum >

3-3-3. Data Format

1) LVDS 2 Port



< LVDS Data Format >

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### 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**

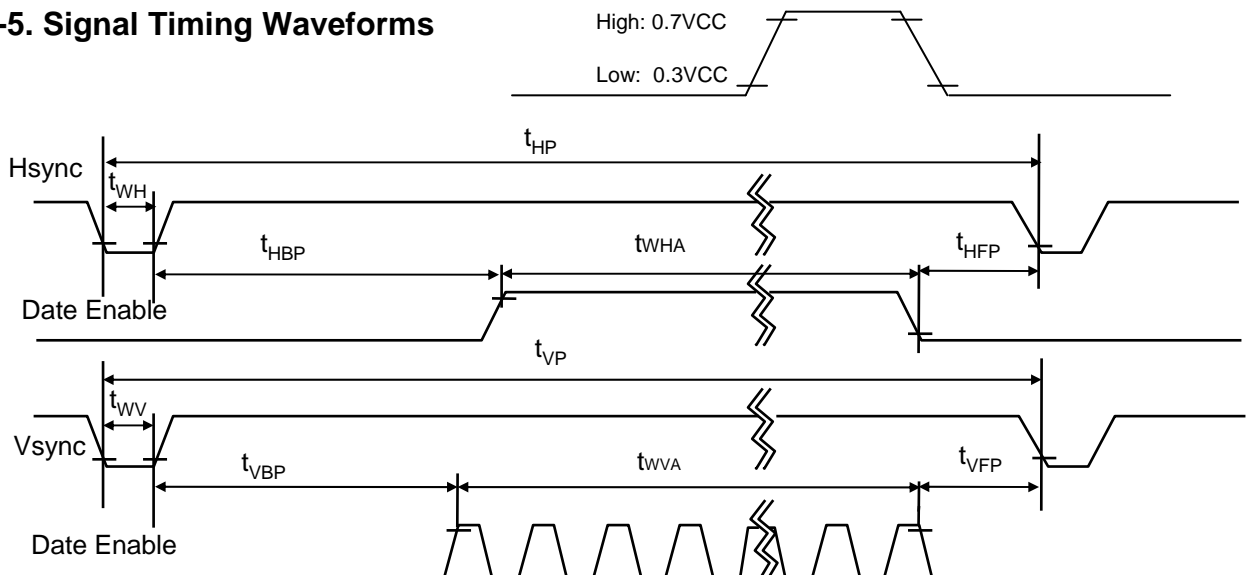
ITEM	Symbol	Min	Typ	Max	Unit	Note	
DCLK	Frequency	$f_{CLK}$	-	74.9	-	MHz	2port
Hsync	Period	$t_{HP}$	1086	1138	1190	tCLK	2port
	Width	$t_{WH}$	32	48	56		
	Width-Active	$t_{WHA}$	960	960	960		
Vsync	Period	$t_{VP}$	1093	1097	1101	tHP	
	Width	$t_{WV}$	2	3	4		
	Width-Active	$t_{WVA}$	1080	1080	1080		
Data Enable	Horizontal back porch	$t_{HBP}$	68	98	134	tCLK	2port
	Horizontal front porch	$t_{HFP}$	26	32	40		
	Vertical back porch	$t_{VBP}$	10	12	14	tHP	
	Vertical front porch	$t_{VFP}$	1	2	3		

Note)

- In this documentation, all reliabilities are specified for timing specification based on refresh rate of 60Hz. However, LP173WF1 has a good actual performance even at lower refresh rate( eg. 40Hz or 50Hz) for power saving mode, whereas LP173WF1 is secured only for function under lower refresh rate. 60Hz at Normal mode, 50Hz ,40 Hz at Power save mode. Don't care Flicker level (power save mode).

Condition :  $V_{CC} = 3.3V$

### 3-5. Signal Timing Waveforms



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### 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	
		R 5	R 4	R 3	R 2	R 1	R 0	G 5	G 4	G 3	G 2	G 1	G 0	B 5	B 4	B 3	B 2	B 1	B 0
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

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## 3-7. Power Sequence

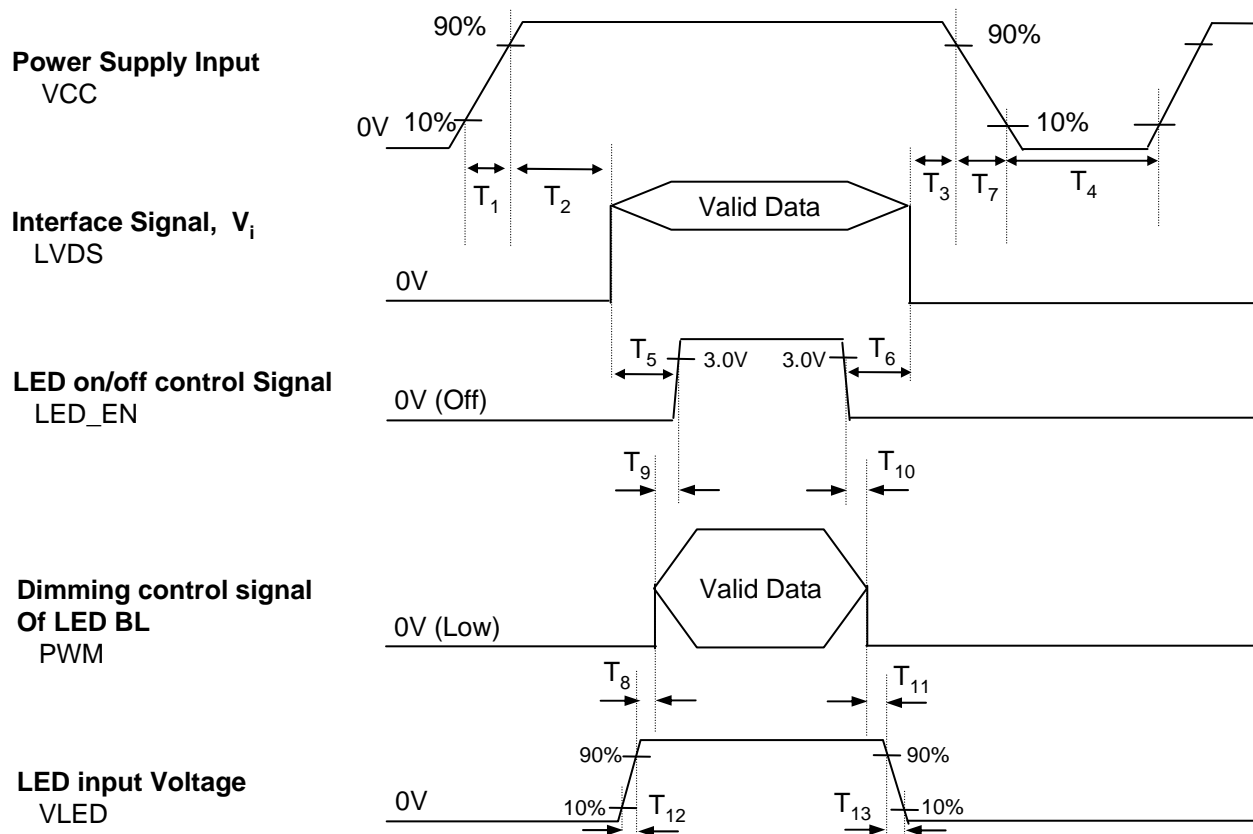


Table 6. POWER SEQUENCE TABLE

Logic Parameter	Value			Units	LED Parameter	Value			Units
	Min.	Typ.	Max.			Min.	Typ.	Max.	
T <sub>1</sub>	0.5	-	10	ms	T <sub>8</sub>	10	-	-	ms
T <sub>2</sub>	0	-	50	ms	T <sub>9</sub>	0	-	-	ms
T <sub>3</sub>	0	-	50	ms	T <sub>10</sub>	0	-	-	ms
T <sub>4</sub>	400	-	-	ms	T <sub>11</sub>	10	-	-	ms
T <sub>5</sub>	200	-	-	ms	T <sub>12</sub>	0.5	-	-	ms
T <sub>6</sub>	200	-	-	ms	T <sub>13</sub>	0	-	5000	ms
T <sub>7</sub>	3	-	10	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, LED\_EN and PWM 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.

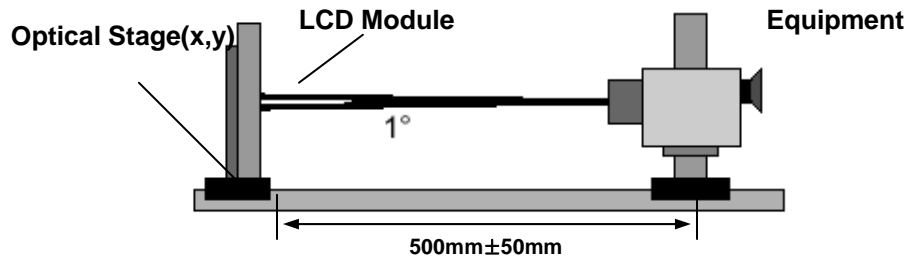
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## 4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 20 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  $\Phi$  and  $\Theta$  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**

$T_a=25^\circ\text{C}$ ,  $V_{CC}=3.3\text{V}$ ,  $f_v=60\text{Hz}$ ,  $f_{CLK}=97.75\text{MHz}$ ,  $I_{LED}=\text{TBD mA}$

Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
Contrast Ratio	CR	500	600	-		1
Surface Luminance, white	$L_{WH}$	270	300	-	cd/m <sup>2</sup>	2
Luminance Variation	$\delta_{WHITE}$		-	35%		3
Response Time	$T_{r,R} + T_{r,D}$	-	8	16	ms	4
Color Coordinates						
RED	RX	0.610	0.640	0.670		
	RY	0.305	0.335	0.365		
GREEN	GX	0.290	0.320	0.350		
	GY	0.580	0.630	0.660		
BLUE	BX	0.120	0.150	0.180		
	BY	0.030	0.060	0.090		
WHITE	WX	0.283	0.313	0.343		
	WY	0.299	0.329	0.359		
Viewing Angle						5
x axis, right( $\Phi=0^\circ$ )	$\Theta_r$	60	-	-	degree	
x axis, left ( $\Phi=180^\circ$ )	$\Theta_l$	60	-	-	degree	
y axis, up ( $\Phi=90^\circ$ )	$\Theta_u$	50	-	-	degree	
y axis, down ( $\Phi=270^\circ$ )	$\Theta_d$	50	-	-	degree	
Gray Scale						6
Color Gamut	C/G	67	72	-	%	

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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.

$$\text{LWH} = \text{Average}(\text{L1}, \text{L2}, \dots \text{L5})$$

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

$$\delta \text{ WHITE} (= \frac{\text{Maximum}(\text{L1}, \text{L2}, \dots \text{L13}) - \text{Minimum}(\text{L1}, \text{L2}, \dots \text{L13})}{\text{Maximum}(\text{L1}, \text{L2}, \dots \text{L13})} * 100(\%))$$

4. Response time is the time required for the display to transition from white to black (rise time, TrR) and from black to white(Decay Time, TrD). 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

\* fV = 60Hz

Gray Level	Luminance [%] (Typ)
L0	0.11
L7	1.20
L15	5.23
L23	11.8
L31	20.6
L39	34.6
L47	53.3
L55	74.8
L63	100

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FIG. 2 Luminance

<Measuring point for Average Luminance & measuring point for Luminance variation>

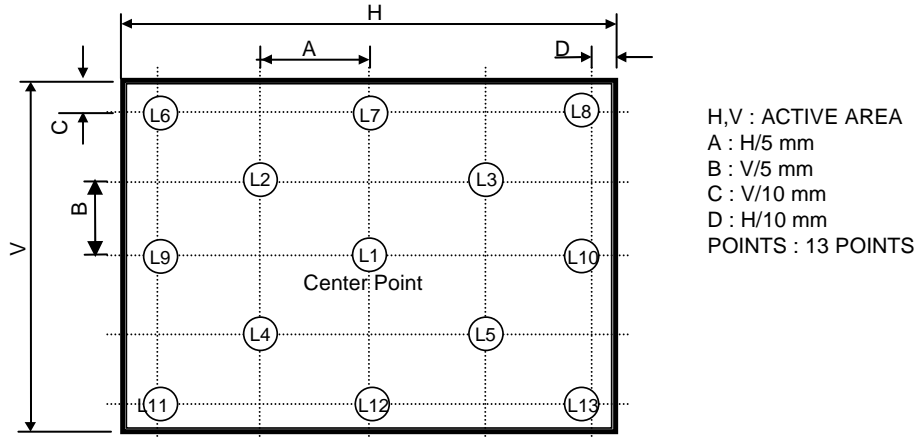


FIG. 3 Response Time

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

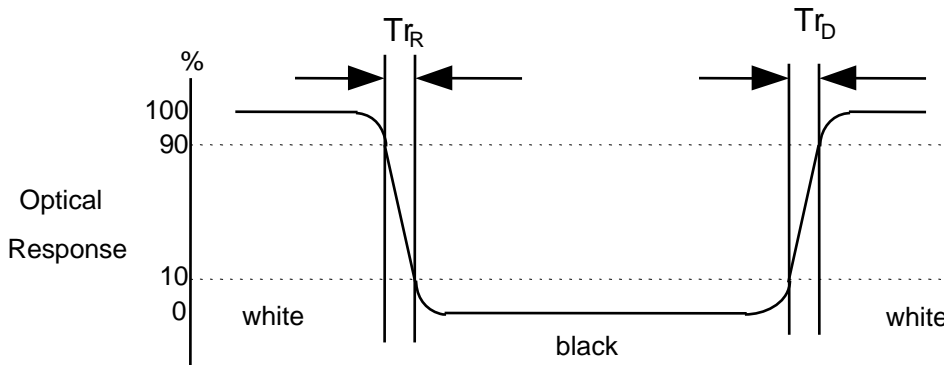
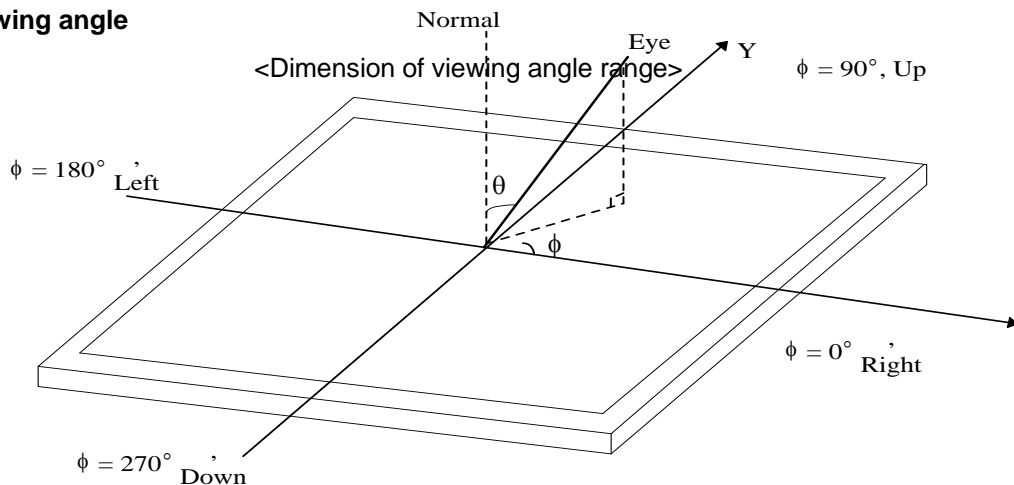


FIG. 4 Viewing angle



## Product Specification

## 5. Mechanical Characteristics

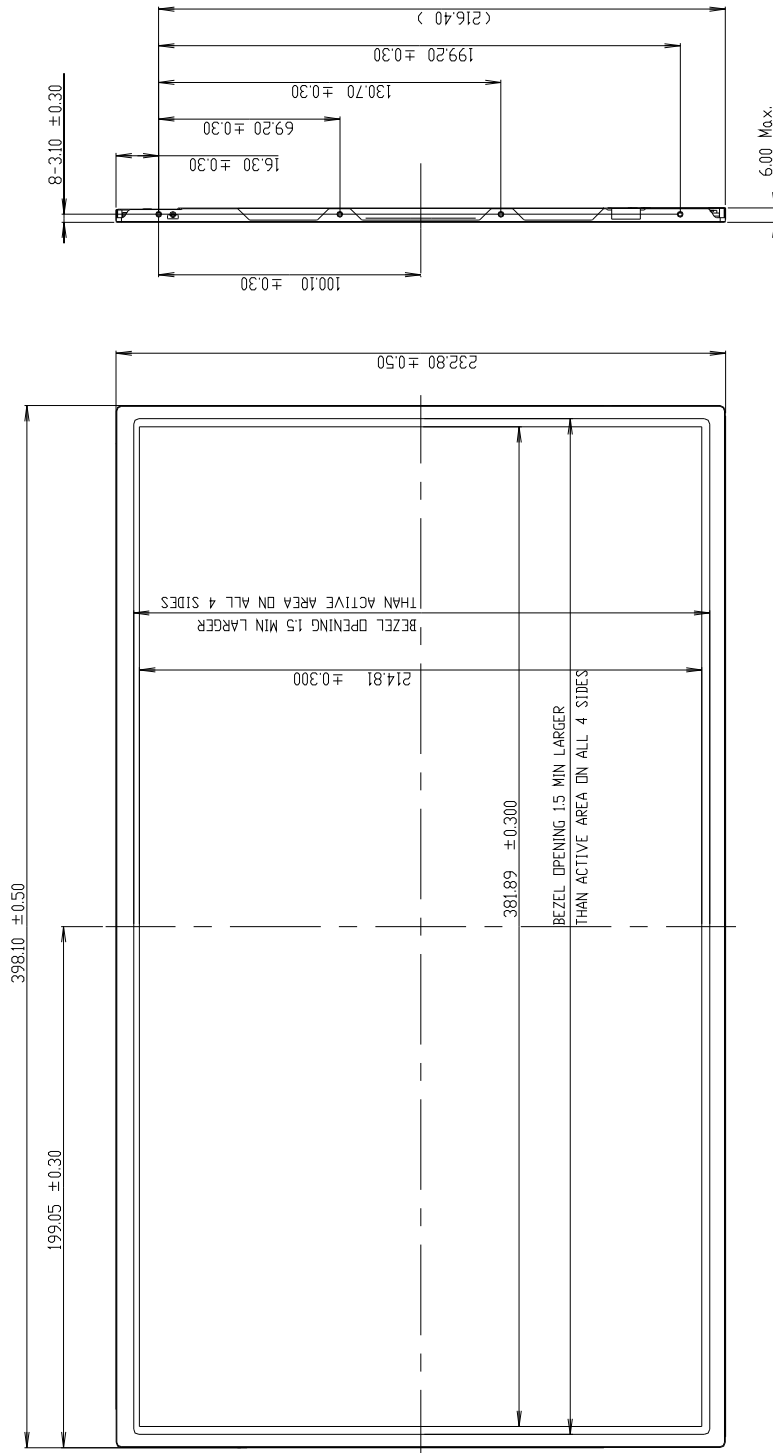
The contents provide general mechanical characteristics for the model LP173WF1. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	398.1 ± 0.50mm
	Vertical	232.8 ± 0.50mm
	Depth	6.0mm(Max.)
Bezel Area	Horizontal	1.5mm Min.( Larger than Active Display Area )
	Vertical	1.5mm Min.( Larger than Active Display Area )
Active Display Area	Horizontal	381.888mm
	Vertical	214.812 mm
Weight	580g (Max.)	
Surface Treatment	4H Glare treatment of the front Polarizer (Haze 0%)	
Mother Glass Thickness	Upper Glass (C/F Glass)	0.50 + 0.05 / -0.03 mm
	Lower Glass (TFT Glass)	0.50 + 0.05 / -0.03 mm

**Product Specification**

<FRONT VIEW>

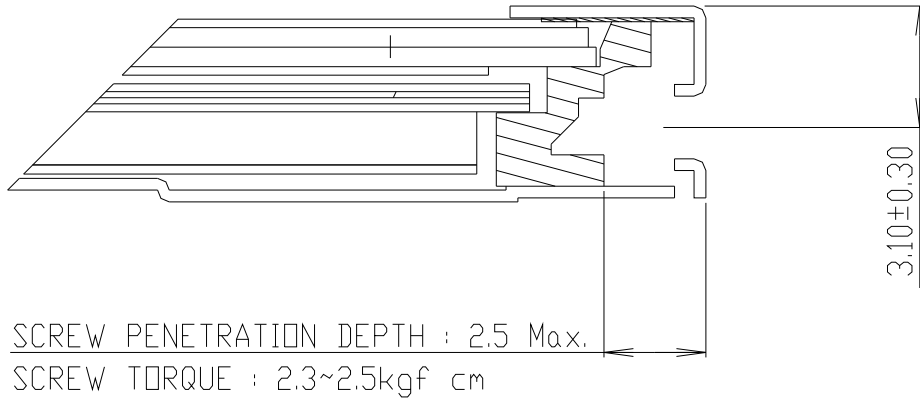
Note) Unit:[mm], General tolerance:  $\pm 0.5\text{mm}$



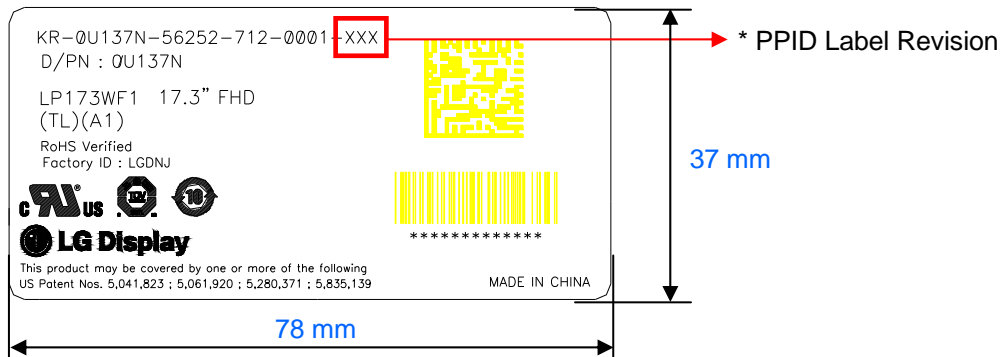


**Product Specification**

[ DETAIL DESCRIPTION OF SIDE MOUNTING SCREW ]



[ DETAIL INFORMATION OF PPID LABEL AND REVISION CODE ]



\* PPID Label Revision :

It is subject to change with Dell event. Please refer to the below table for detail.

Classification	No Change	1st Revision	2nd Revision	...	9th Revision	...
SST(WS)	X00	X01	X02	...	A09	...
PT(ES)	X10	X11	X12	...	A19	...
ST(CS)	X20	X21	X22	...	A29	...
XB(MP)	A00	A01	A02	...	A09	...




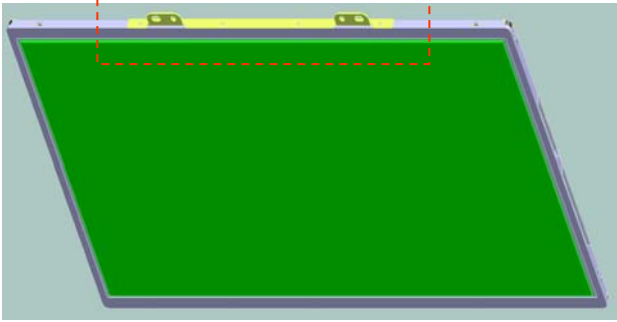
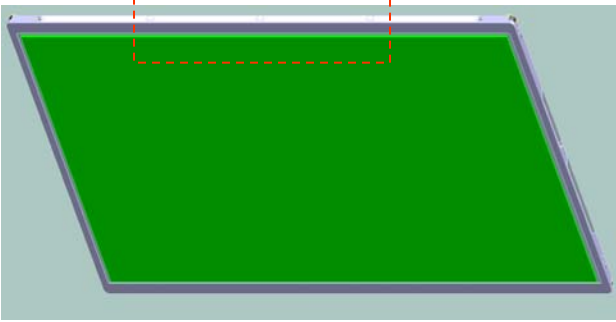
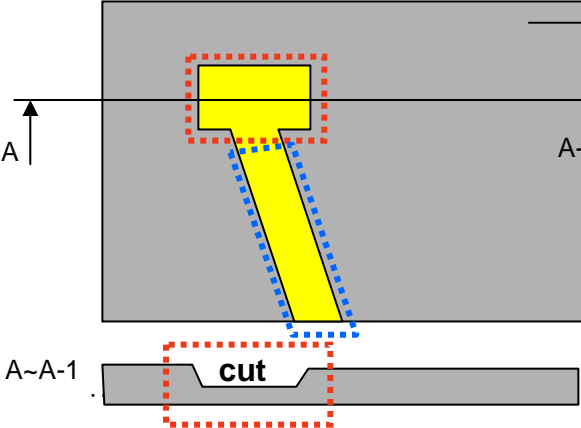


**LGD Proposal for system cover design.(Appendix)**

1	Gap check for securing the enough gap between LCM and System cover.	
<p>The diagram illustrates the assembly of the LCM (Liquid Crystal Module) and the system cover. On the left, a top-down view of the 'LCM Reflector Side' is shown. On the right, a cross-sectional view shows the LCM, a boundary line, and the system cover. The system cover includes a sponge. Labels include 'Max Thickness' with a double-headed arrow, 'A Boundary Line' with a dashed line, 'Sponge', and 'System Cover'.</p>		
Notes	<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.	
<p>The diagrams show two scenarios for antenna cable placement relative to the T-CON (Timing Control) on the LCD module. The left diagram, labeled 'NO GOOD', shows the antenna cable overlapping the T-CON. The right diagram, labeled 'GOOD', shows the antenna cable separated from the T-CON. Labels include 'Antenna', 'T-CON', and 'Antenna Cable'.</p>		
Notes	1.If system antenna is overlapped with T-CON,it might be cause the noise.	

**LGD Proposal for system cover design.**

<p>3</p>	<p>Gap check for securing enough gap between LCM and System hinge.</p>	
<p>The diagram illustrates the LCM Reflector Side assembly. It shows a top-down view of the LCM with a red frame and a hinge mechanism. A side mount screw hole is indicated with four locations. A gap of at least 2.0mm is specified between the LCM and the hinge. Two cross-sectional views are provided: the 'I' TYPE hinge, which shows a larger gap, and the 'L' TYPE hinge, which shows a smaller gap. The COF (D-IC) area is also labeled.</p>		
<p>Notes</p>	<ol style="list-style-type: none"> <li>1. At least 2.0mm gap is required to secure from any damage during shock test.</li> <li>2. "L" type hinge is more recommended than "I" type to get better performance for shock test.</li> </ol>	
<p>4</p>	<p>Checking the path of the System wire.</p>	
<p>The diagram shows three wire paths labeled #1, #2, and #3. Path #1 is labeled 'Good' and does not overlap with the COF area. Path #2 is labeled 'Bad' and overlaps with the COF area. Path #3 is labeled 'Ok' and is located between the COFs.</p>		
<p>Notes</p>	<ol style="list-style-type: none"> <li>1. It is required to handle COF area carefully .</li> <li>2. Good : Wire path does not overlap with LCM                      OK : Wire path is located between COFs.                      BAD : Wire path overlapped with COF area.</li> </ol> <p>Flat type cable is highly recommended if cable should be located on bad case</p>	

**LGD Proposal for system cover design.**

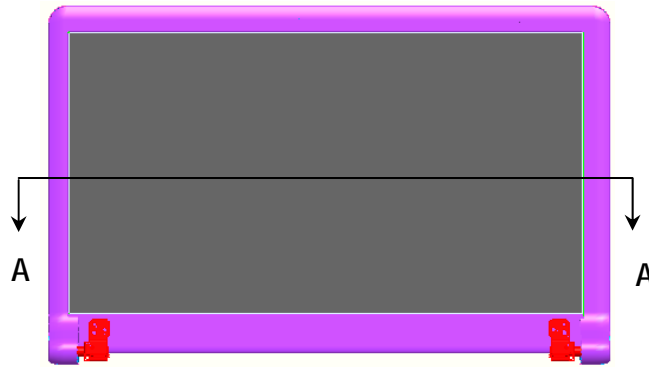
5	Using a bracket on the top of LCM is not recommended.	
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>bracket</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;">  <p>With bracket</p> </div> <div style="text-align: center;">  <p>Without bracket</p> </div> </div>		
Notes	<p>1.Condition without bracket is good for mechanical noise,and can minimize the light leakage from deformation of bracket.</p> <p>2.The results shows that there is no difference between the condition with or without bracket.</p>	
6	Securing additional gap on CNT area..	
<div style="display: flex; align-items: center;"> <div style="flex: 1;">  </div> <div style="flex: 1; padding-left: 20px;"> <p>System cover inner side.</p> <p> User connector area.</p> <p> User connector Cable pathway.</p> <p>FPC:Flexible Printed Circuit.</p> </div> </div>		
Notes	<p>1.CNT area is specially sensitive against external stress,and additional gap by cutting on system cover will be helpful on removing the Ripple.</p> <p>2.Using a thinner CNT will be better. (eg: FPC type)</p>	



Product Specification

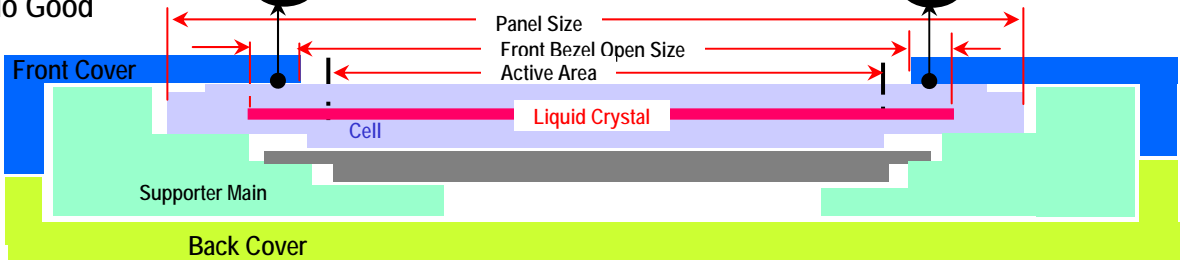
LGD Proposal for system cover design.

8	Securing additional gap between front cover & LCD at edge of front cover.
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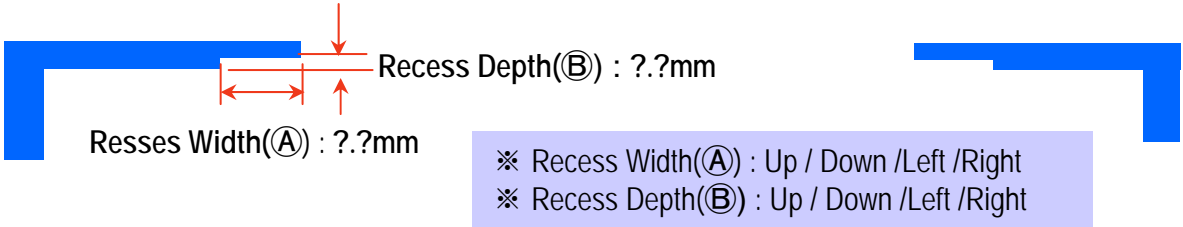


"A" : Overlap between Front Cover & Liquid Crystal area

No Good



Good



Notes	<p>1.Active area which is filled with Liquid Crystal is sensitive against external stress, so additional gap to make recess area on the edge of front cover will be helpful to prevent mechanical Ripple. (Dimension of Recess depends on each model design)</p>
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## 7. International Standards

### 7-1. 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.
  
- d) IEC 60950-1:2005, Second Edition, The International Electrotechnical Commission (IEC).  
Information Technology Equipment - Safety - Part 1 : General Requirements.

### 7-2. 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.

### 7-3. Environment

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

## 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 : 20pcs

b) Box Size :490X390X298

## 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 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.

## Product Specification

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

	Byte	Field Name and Comments	Value	Value
	(hex)		(hex)	(binary)
Header	0	Header	00	00000000
	1	Header	FF	11111111
	2	Header	FF	11111111
	3	Header	FF	11111111
	4	Header	FF	11111111
	5	Header	FF	11111111
	6	Header	FF	11111111
Vendor / Product EDID Version	7	Header	00	00000000
	8	EISA manufacture code = 3 Character ID = LGD	30	00110000
	9	EISA manufacture code (Compressed ASCII)	E4	11100100
	0A	Panel Supplier Reserved - Product Code - 0284	84	10000100
	0B	Panel Supplier Reserved - Product Code	02	00000010
	0C	LCD module Serial No - Preferred but Optional ("0" if not used)	00	00000000
	0D	LCD module Serial No - Preferred but Optional ("0" if not used)	00	00000000
	0E	LCD module Serial No - Preferred but Optional ("0" if not used)	00	00000000
	0F	LCD module Serial No - Preferred but Optional ("0" if not used)	00	00000000
	10	Week of manufacture	00	00000000
	11	Year of manufacture - 2009	13	00010011
	12	EDID structure version # = 1	01	00000001
	13	EDID revision # = 3	03	00000011
Display Parameters	14	Video I/P definition = Digital I/P, 6bit (90h), 8bit (80h)	90	10010000
	15	Max H image size = 38.219cm(38)	26	00100110
	16	Max V image size = 21.511cm(22)	16	00010110
	17	Display gamma = $(2.2 \times 100) - 100 = 120$	78	01111000
	18	Feature support ( no DPMS, Active off, RGB, timing BLK 1)	0A	00001010
Panel Color Coordinates	19	Red/Green Low bit (RxRy/GxGy)	00	00000000
	1A	Blue/White Low bit (BxBY/WxWy)	05	00000101
	1B	Red X Rx = TBD	00	00000000
	1C	Red Y Ry = TBD	00	00000000
	1D	Green X Gx = TBD	00	00000000
	1E	Green Y Gy = TBD	00	00000000
	1F	Blue X Bx = TBD	00	00000000
	20	Blue Y By = TBD	00	00000000
	21	White X Wx = 0.313	50	01010000
	22	White Y Wy = 0.329	54	01010100
Established Timings	23	Established timings 1 (00h if not used)	00	00000000
	24	Established timings 2 (00h if not used)	00	00000000
	25	Manufacturer's timings (00h if not used)	00	00000000
Standard Timing ID	26	Standard timing ID1 (01h if not used)	01	00000001
	27	Standard timing ID1 (01h if not used)	01	00000001
	28	Standard timing ID2 (01h if not used)	01	00000001
	29	Standard timing ID2 (01h if not used)	01	00000001
	2A	Standard timing ID3 (01h if not used)	01	00000001
	2B	Standard timing ID3 (01h if not used)	01	00000001
	2C	Standard timing ID4 (01h if not used)	01	00000001
	2D	Standard timing ID4 (01h if not used)	01	00000001
	2E	Standard timing ID5 (01h if not used)	01	00000001
	2F	Standard timing ID5 (01h if not used)	01	00000001
	30	Standard timing ID6 (01h if not used)	01	00000001
	31	Standard timing ID6 (01h if not used)	01	00000001
	32	Standard timing ID7 (01h if not used)	01	00000001
33	Standard timing ID7 (01h if not used)	01	00000001	
34	Standard timing ID8 (01h if not used)	01	00000001	
35	Standard timing ID8 (01h if not used)	01	00000001	

## Product Specification

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

	Byte	Field Name and Comments		Value	Value
	(hex)			(hex)	(binary)
Timing Descriptor #1	36	Pixel Clock/10,000	149.8Mhz (LSB)	84	10000100
	37	Pixel Clock/10,000	149.8Mhz (MSB)	3A	00111010
	38	Horizontal Active = 1920 pixels	(lower 8 bits)	80	10000000
	39	Horizontal Blanking (Thbp) = 356 pixels	(lower 8 bits)	64	01100100
	3A	Horizontal Active/Horizontal blanking (Thbp)	1920/356 (upper4:4 bits)	71	01110001
	3B	Vertical Active = 1080 lines		38	00111000
	3C	Vertical Blanking (Tvbp) = 17 lines (DE Blanking typ. for DE only panels)		11	00010001
	3D	Vertical Active : Vertical Blanking (Tvbp) = 1080:5	(upper4:4 bits)	40	01000000
	3E	Horizontal Sync, Offset (Thfp) = 64 pixels		40	01000000
	3F	Horizontal Sync, Pulse Width = 96 pixels		60	01100000
	40	Vertical Sync, Offset (Tvfp) = 2 lines	Sync Width = 3 lines	23	00100011
	41	Horizontal Vertical Sync Offset/Width upper 2 bits		00	00000000
	42	Horizontal Image Size = 38.219 cm		7F	01111111
	43	Vertical image Size = 21.511 cm		D7	11010111
	44	Horizontal Image Size / Vertical image size		10	00010000
	45	Horizontal Border = 0 (Zero for Notebook LCD)		00	00000000
	46	Vertical Border = 0 (Zero for Notebook LCD)		00	00000000
47	Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives, DE only note: LSB is set to "1" if panel is DE-timing only. H/V can be ignored.		19	00011001	
Timing Descriptor #2	48	Detailed Timing Descriptor #2		00	00000000
	49			00	00000000
	4A			00	00000000
	4B			00	00000000
	4C			00	00000000
	4D			00	00000000
	4E			00	00000000
	4F			00	00000000
	50			00	00000000
	51			00	00000000
	52			00	00000000
	53			00	00000000
	54			00	00000000
Timing Descriptor #3 Dell specific information	5A	Flag		00	00000000
	5B	Flag		00	00000000
	5C	Flag		00	00000000
	5D	Data Type Tag ( ASCII String )		FE	11111110
	5E	Flag		00	00000000
	5F	ASCII String	L	4C	01001100
	60	ASCII String	G	47	01000111
	61	ASCII String		20	00100000
	62	ASCII String	D	44	01000100
	63	ASCII String	i	69	01101001
	64	ASCII String	s	73	01110011
	65	ASCII String	p	70	01110000
	66	ASCII String	l	6C	01101100
	67	ASCII String	a	61	01100001
68	ASCII String	y	79	01111001	
69	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASC II code 0Ah,set remaining char = 20h)		0A	00001010	
6A	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASC II code 0Ah,set remaining char = 20h)		20	00100000	
6B	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASC II code 0Ah,set remaining char = 20h)		20	00100000	

## Product Specification

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

	Byte	Field Name and Comments	Value	Value
	(hex)		(hex)	(binary)
Timing Descriptor #4	6C	Flag	00	00000000
	6D	Flag	00	00000000
	6E	Flag	00	00000000
	6F	Data Type Tag ( ASCII String )	FE	11111110
	70	Flag	00	00000000
	71	ASCII String L	4C	01001100
	72	ASCII String P	50	01010000
	73	ASCII String 1	31	00110001
	74	ASCII String 7	37	00110111
	75	ASCII String 3	33	00110011
	76	ASCII String W	57	01010111
	77	ASCII String F	46	01000110
	78	ASCII String 1	31	00110001
	79	ASCII String -	2D	00101101
	7A	ASCII String T	54	01010100
7B	ASCII String L	4C	01001100	
7C	ASCII String A	41	01000001	
7D	ASCII String 1	31	00110001	
Checksum	7E	Extension flag (# of optional 128 EDID extension blocks to follow, Typ = 0)	00	00000000
	7F	Check Sum	5D	01011101