SPECIFICATION
FOR
APPROVAL

(●) **Preliminary Specification**
( ) **Final Specification**

Title	13.3” WHD TFT LCD

BUYER	HP
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LP133WH1
Suffix	TLA2

*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
K. J. Kwon / S.Manager	
REVIEWED BY	
M. J. Lee / Manager	
PREPARED BY	
B. R. Seo / Engineer	

Product Engineering Dept.
LG Display Co., Ltd

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RECORD OF REVISIONS

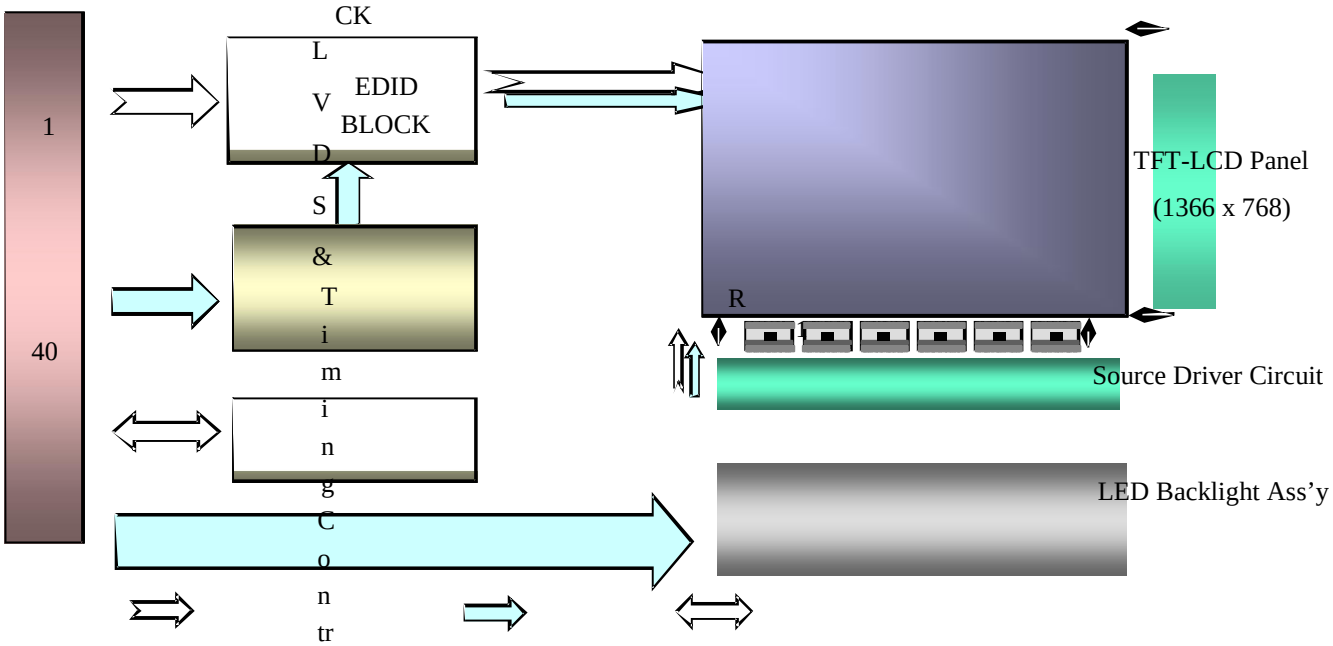
Revision No	Revision Date	Page	Description	EDID ver
0.0	29. Apr. 2009	-	First Draft (Preliminary Specification)	0.0

1. General Description

The LP133WH1 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 13.3 inches diagonally measured active display area with WHD 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 LP133WH1 has been designed to apply the interface method that enables low power, high speed, low EMI.

The LP133WH1 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 LP133WH1 characteristics provide an excellent flat display for office automation products such as Notebook PC.



P
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1

1366 768

VBL+ & PWM

42ea

Control & Data Power EDID signal & Power

General Features

Active Screen Size	13.3 inches diagonal
Outline Dimension	308.1 (H) Ч 183.6 (V) Ч 5.5(D, max.) mm
Pixel Pitch	0.2148 mm Ч 0.2148 mm
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 points)
Power Consumption	Total 4.5 Watt(Max.) @ LCM circuit 1.2 Watt(Max.), B/L input 3.3Watt(Max. with Driver)
Weight	350g(Max.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Hard Coating(3H), Glare treatment of the front polarizer
RoHS Comply &Halogen Free	Yes

CN User connector Pin

Gate In Panel

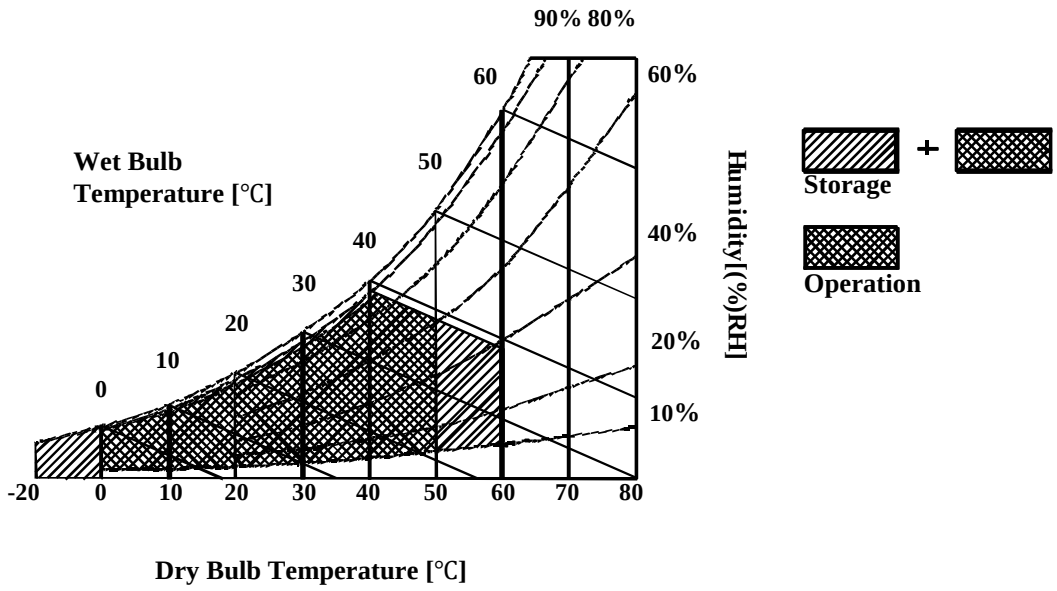
2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

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

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



3. Electrical Specifications

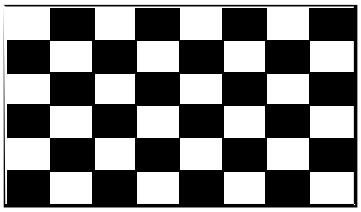
3-1. Electrical Characteristics

The LP133WH1 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 Backlight.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol		Values			Unit	Notes
			Min	Typ	Max		
LOGIC :							
Power Supply Input Voltage	V_{CC}		3.0	3.3	3.6	V	
Power Supply Input Current	I_{CC}	Mosaic	-	315	365	mA	1
		Black		360	410	mA	
Power Consumption	P_{CC}		-	1.0	1.2	W	1
Power Supply Inrush Current	I_{CC_P}		-	-	1500	mA	
LVDS Impedance	Z_{LVDS}		90	100	110		2
BACKLIGHT : (with LED Driver)							
LED Power Input Voltage	V_{LED}		7.0	12.0	20.0	V	
LED Power Input Current	I_{LED}		-	260	-	mA	3
LED Power Consumption	P_{LED}		-	3.1	3.3	W	3
LED Power Inrush Current	I_{LED_P}		-	-	-	mA	
PWM Dimming Ratio	-		6	-	100	%	4
PWM Impedance	Z_{PWM}		20	40	60	k	
PWM Frequency	F_{PWM}		200	-	1000	Hz	5
PWM High Level Voltage	V_{PWM_H}		2.1	3.3	5	V	
PWM Low Level Voltage	V_{PWM_L}		0	-	0.8	V	
LED_EN High Voltage	$V_{LED_EN_H}$		2.1	3.3	5	V	
LED_EN Low Voltage	$V_{LED_EN_L}$		0	-	0.8	V	
Life Time			12,000	-	-	Hrs	6

Note)

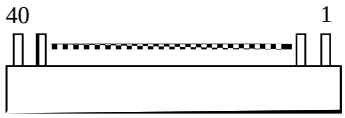


1. The specified Icc current and power consumption are under the Vcc = 3.3V , 25℃, fv = 60Hz condition whereas Mosaic pattern is displayed and fv is the frame frequency.
2. This impedance value is needed to proper display and measured form LVDS Tx to the mating connector.
3. The specified LED current and power consumption are under the Vled = 12.0V , 25℃, Dimming of Max luminance whereas White pattern is displayed and fv is the frame frequency.
4. There may be a flickering or some reliability issues when LED driver is operated by under condition of minimum.
5. The PWM Frequency has 0Hz, DC level for dimming ratio 100%. The PWM Frequency should be fixed and continue for stable luminance levels what you want.
6. The life time is determined as the time at which brightness of LCD is 50% compare to that of initial value at the typical LED current. These LED backlight has 6 strings on it and the typical current of LED's string is base on 20mA.

3-2. Interface Connections

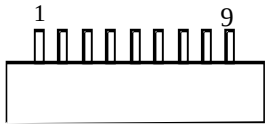
This LCD employs one interface connections, a 40 pin connector is used for the module electronics interface and LED Driver.
The electronics interface connector is a model 20455-040E-0x manufactured by I-PEX.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	NC	No connection	1, Interface chips 1.1 LCD : SW, SW0624 (LCD Controller) including LVDS Receiver 1.2 System : THC63LVDF823A or equivalent * Pin to Pin compatible with LVDS 2. Connector 2.1 LCD :20455-040E-0x, I-PEX or its compatibles 2.2 Mating : 20453-040T-0x, I-PEX or equivalent. 2.3 Connector pin arrangement  [LCD Module Rear View]
2	VCC	Power Supply, 3.3V Typ.	
3	VCC	Power Supply, 3.3V Typ.	
4	V EEDID	DDC 3.3V power	
5	NC	No Connection	
6	Clk EEDID	DDC Clock	
7	DATA EEDID	DDC Data	
8	Odd_R_{IN}0-	Negative LVDS differential data input	
9	Odd_R_{IN}0+	Positive LVDS differential data input	
10	GND	Ground	
11	Odd_R_{IN}1-	Negative LVDS differential data input	
12	Odd_R_{IN}1+	Positive LVDS differential data input	
13	GND	Ground	
14	Odd_R_{IN}2-	Negative LVDS differential data input	
15	Odd_R_{IN}2+	Positive LVDS differential data input	
16	GND	Ground	
17	Odd_CLKIN-	Negative LVDS differential clock input	
18	Odd_CLKIN+	Positive LVDS differential clock input	
19	GND	Ground	
20	NC	No Connection	
21	NC	No Connection	
22	NC	No Connection	
23	NC	No Connection	
24	NC	No Connection	
25	NC	No Connection	
26	NC	No Connection	
27	NC	No Connection	
28	NC	No Connection	
29	NC	No Connection	
30	NC	No Connection	
31	VLED_GND	LED Ground	
32	VLED_GND	LED Ground	
33	VLED_GND	LED Ground	
34	NC	No Connection	
35	BLIM	PWM for Luminance control	
36	BL_On	Backlight On/Off Control	
37	NC	No Connection	
38	VLED	LED Power Supply (7V-20V)	
39	VLED	LED Power Supply (7V-20V)	
40	VLED	LED Power Supply (7V-20V)	

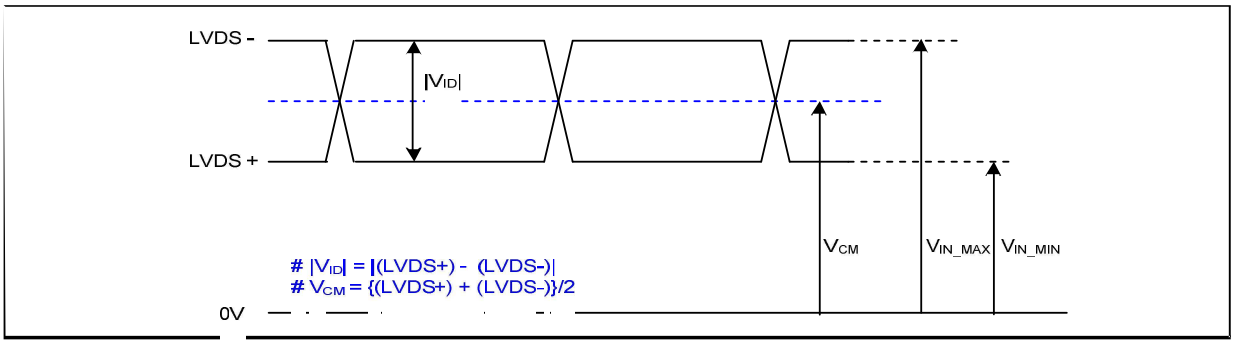
The LED backlight connector is a model TF12-9S-0.5H, manufactured by Hirose or equivalent.

Table 4. BACKLIGHT CONNECTOR PIN CONFIGURATION (CN2)

Pin	Symbol	Description	Notes
1	Vdc(1,2,3,4,5,6)	LED Anode(Positive)	
2	Vdc(1,2,3,4,5,6)	LED Anode(Positive)	
3	NC	No Connection	
4	Vdc1	LED Cathode (Negative)	
5	Vdc2	LED Cathode (Negative)	
6	Vdc3	LED Cathode (Negative)	
7	Vdc4	LED Cathode (Negative)	
8	Vdc5	LED Cathode (Negative)	
9	Vdc6	LED Cathode (Negative)	

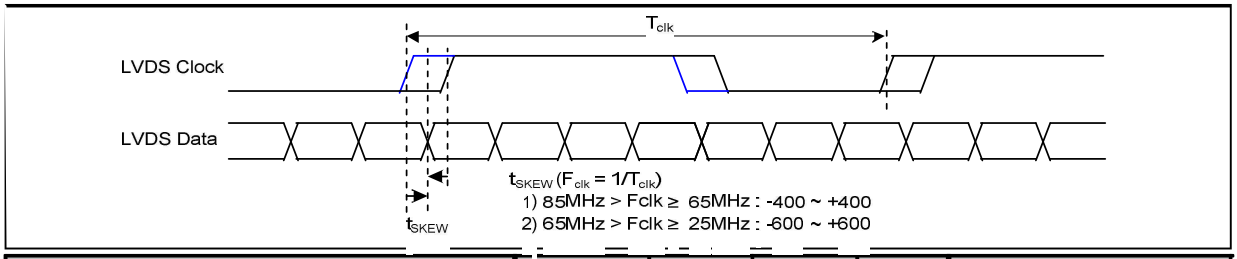
3-3. LVDS Signal Timing Specifications

3-3-1. DC Specification

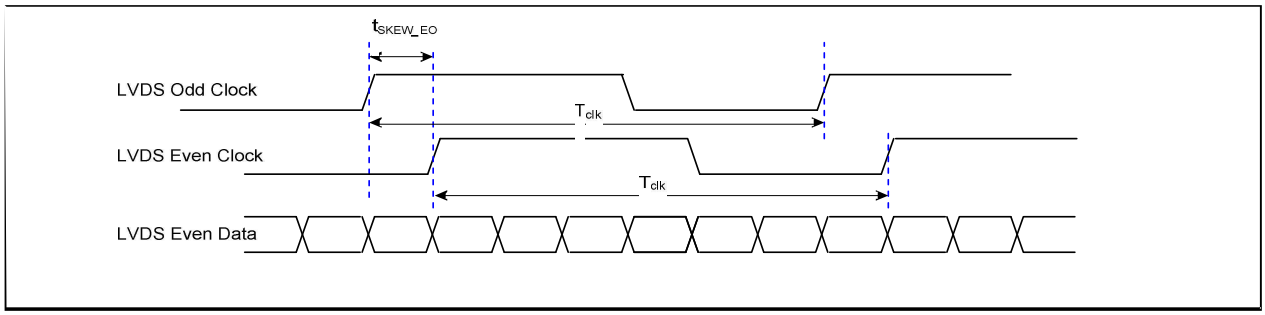


Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	$\|V_{ID}\|$	100	600	mV	-
LVDS Common mode Voltage	V_{CM}	0.6	1.8	V	-
LVDS Input Voltage Range	V_{IN}	0.3	2.1	V	-

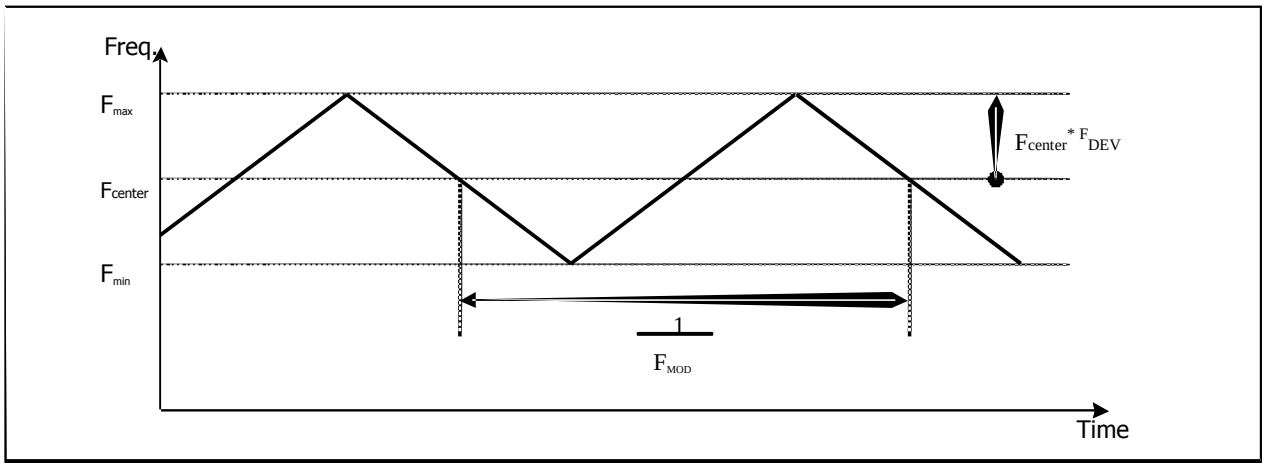
3-3-2. AC Specification



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	-



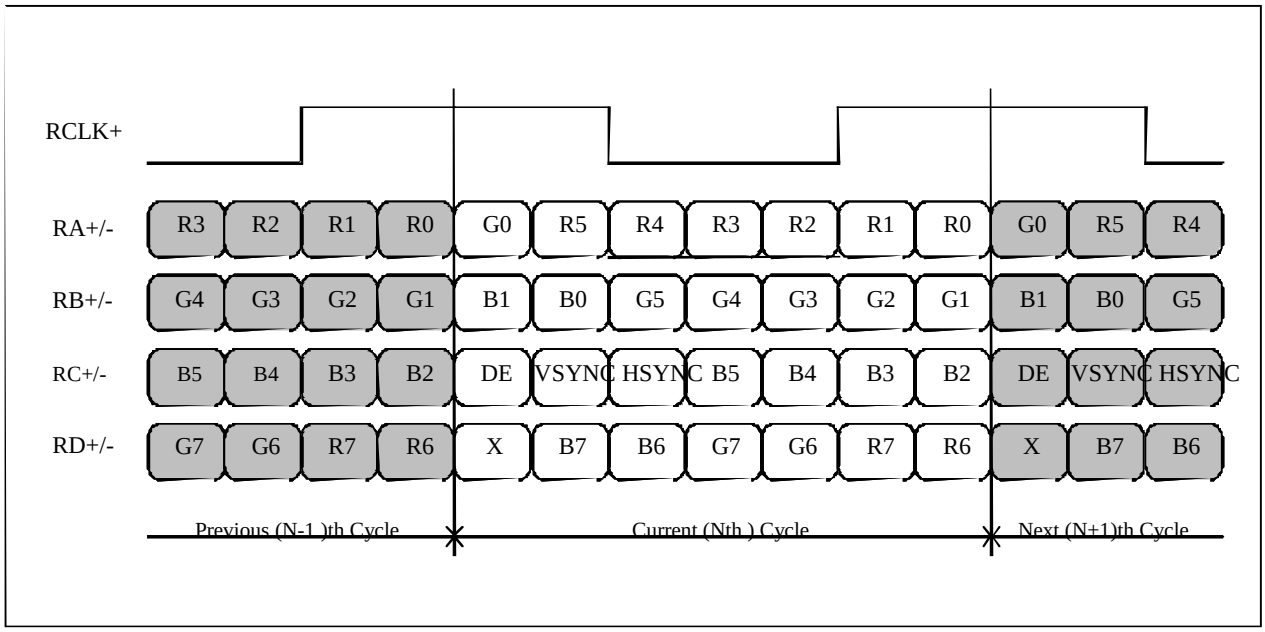
< Clock skew margin between channel >



< Spread Spectrum >

3-3-3. Data Format

1) LVDS 1 Port



< LVDS Data Format >

3-4. Signal Timing Specifications

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

Table 5. TIMING TABLE

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	-	69.3	-	MHz	
Hsync	Period	Thp	1406	1462	1518	tCLK	
	Width	t_{WH}	8	16	24		
	Width-Active	t_{WHA}	1366	1366	1366		
Vsync	Period	t_{VP}	780	790	800	tHP	
	Width	t_{WV}	3	6	9		
	Width-Active	t_{WVA}	768	768	768		
Data Enable	Horizontal back porch	t_{HBP}	24	48	72	tCLK	
	Horizontal front porch	t_{HFP}	8	32	56		
	Vertical back porch	t_{VBP}	8	13	18	tHP	
	Vertical front porch	t_{VFP}	1	3	5		

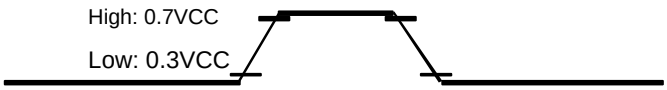
Note)

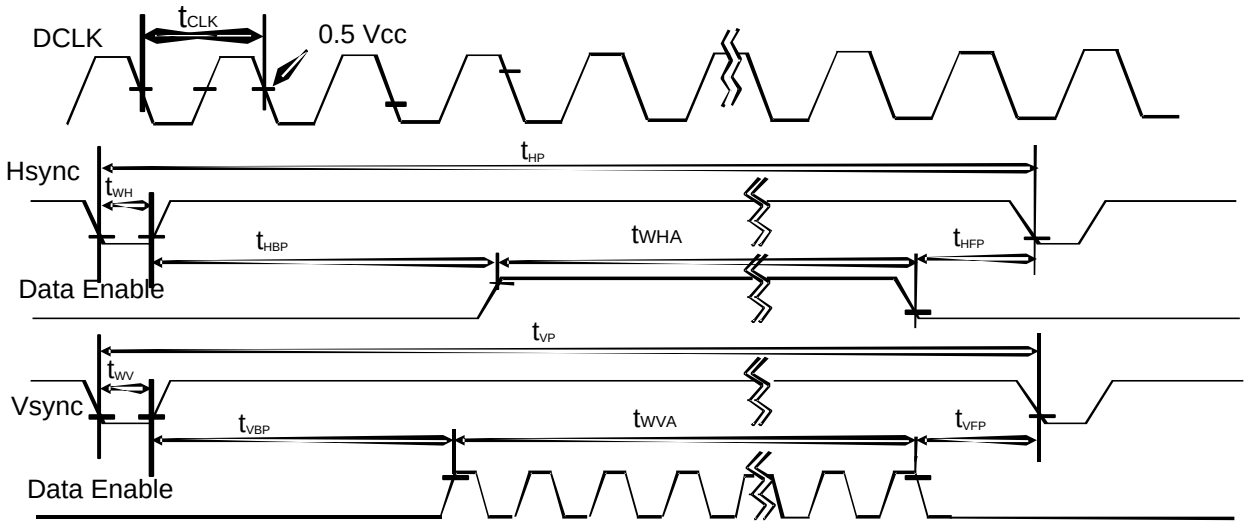
1. In this documentation, all reliabilities are specified for timing specification based on refresh rate of 60Hz. However, LP133WH1 has a good actual performance even at lower refresh rate(eg. 40Hz or 50Hz) for power saving mode, whereas LP133WH1 is secured only for function under lower refresh rate. 60Hz at Normal mode, 50Hz ,40 Hz at Power save mode. Don't care Flicker level (power save mode).

3-5. Signal Timing Waveforms

Condition : VCC =2.5V

Data Enable, Hsync, Vsync





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

3-7. Power Sequence

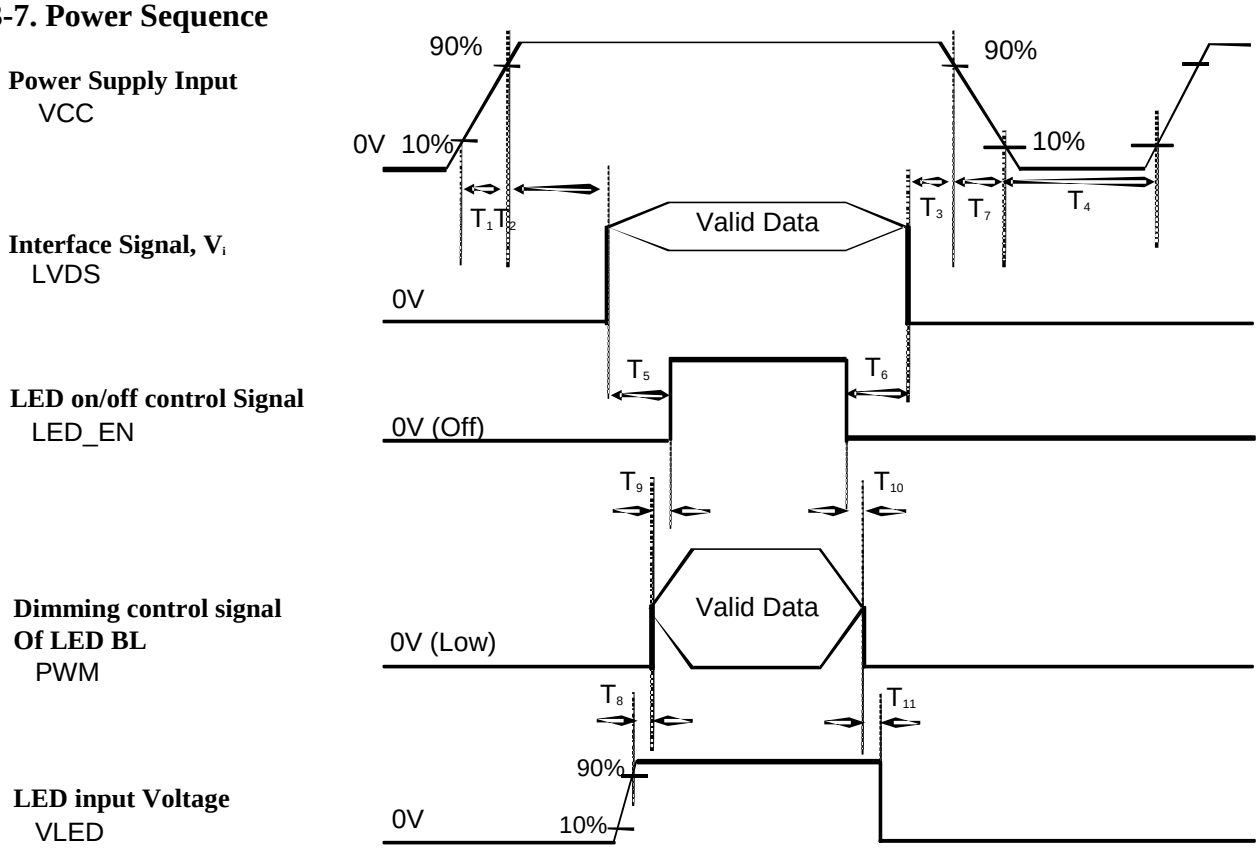


Table 6. POWER SEQUENCE TABLE

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
T_8	10	-	100	ms
T_9	0	-	100	ms
T_{10}	0	-	100	ms
T_{11}	10	-	100	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 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 √ and ∪ equal to 0°.
FIG. 1 presents additional information concerning the measurement equipment and method.

FIG. 1 Optical Characteristic Measurement Equipment and Method

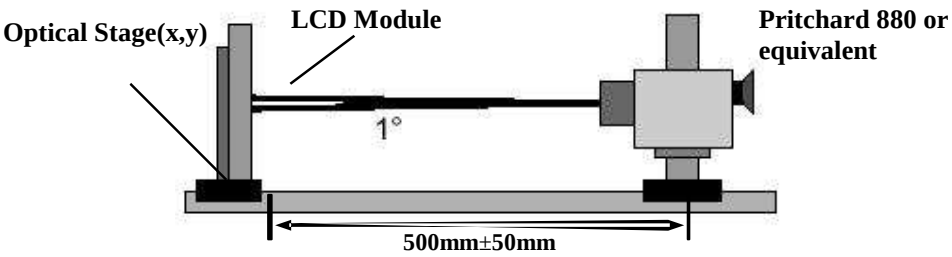


Table 8. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, fv=60Hz, f_{CLK}= 69.3 MHz, I_{LED}= 20 mA

Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
Contrast Ratio	CR	300	-	-		1
Surface Luminance, white	L_{WH}	170	200	-	cd/m2	2
Luminance Variation(13points)	™ WHITE		1.4	1.6		3
Response Time	Tr_R+ Tr_D		16	25	ms	4
Color Coordinates						
RED	RX	0.559	0.589	0.619		
	RY	0.319	0.349	0.379		
GREEN	GX	0.307	0.337	0.367		
	GY	0.518	0.548	0.578		
BLUE	BX	0.125	0.155	0.185		
	BY	0.092	0.122	0.152		
WHITE	WX	0.283	0.313	0.343		
	WY	0.299	0.329	0.359		
Viewing Angle						5
x axis, right(√=0°)	∪r	40	-	-	degree	
x axis, left (√=180°)	∪l	40	-	-	degree	
y axis, up (√=90°)	∪u	10	-	-	degree	
y axis, down (√=270°)	∪d	30	-	-	degree	
Gray Scale						6

Notes)

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 5point (1~5)average across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 2.
When I_{LED}= TBD mA, L_{WH}=200cd/m2(Typ.)

3. The variation in surface luminance , The panel total variation (TM_{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.

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

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

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

6. Gray scale specification *

f_v=60Hz

Gray Level	Luminance [%] (Typ)
L0	0.16
L7	1.45
L15	5.36
L23	12.21
L31	21.01
L39	34.82
L47	52.49
L55	74.17
L63	100

FIG. 2 Luminance

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

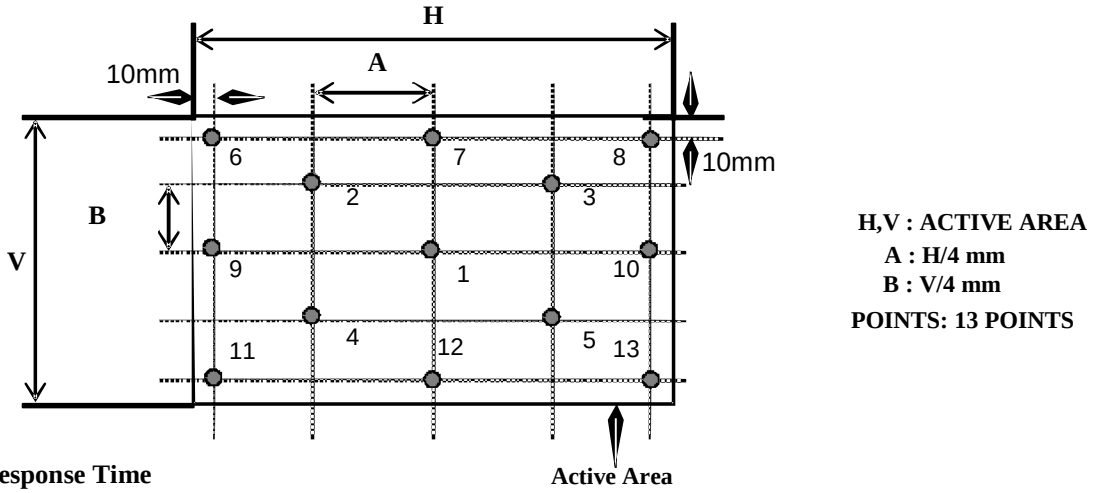


FIG. 3 Response Time

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

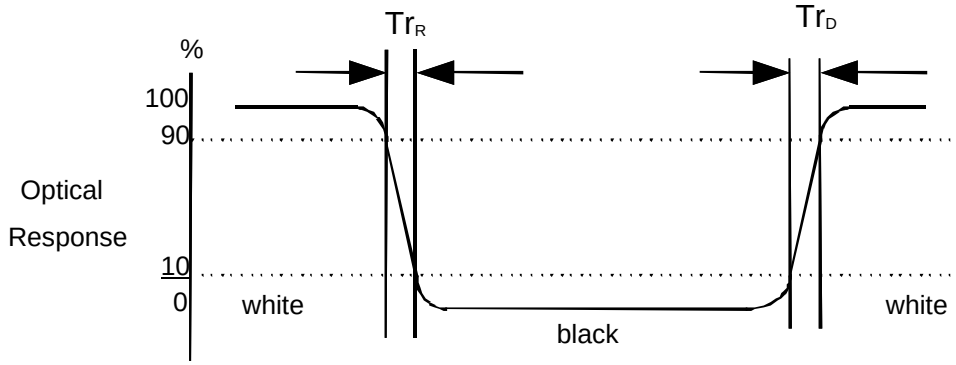
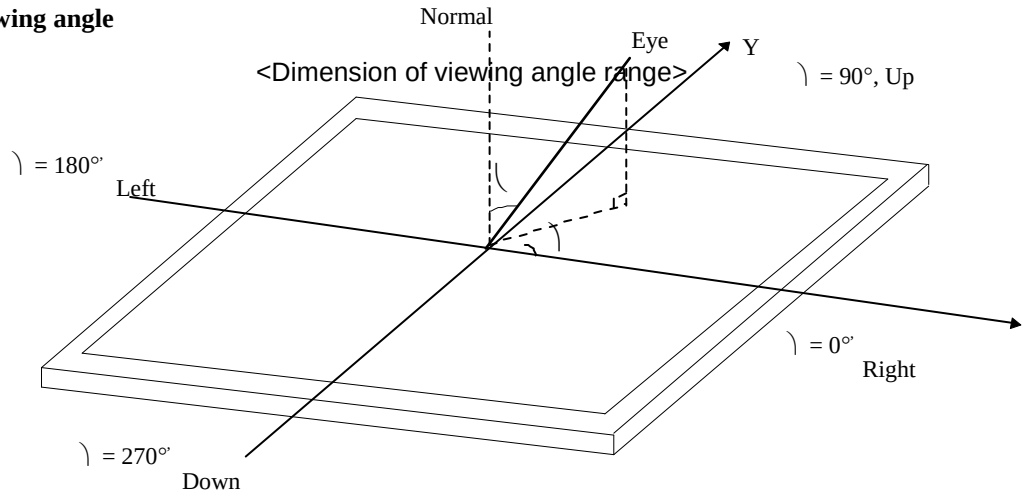


FIG. 4 Viewing angle



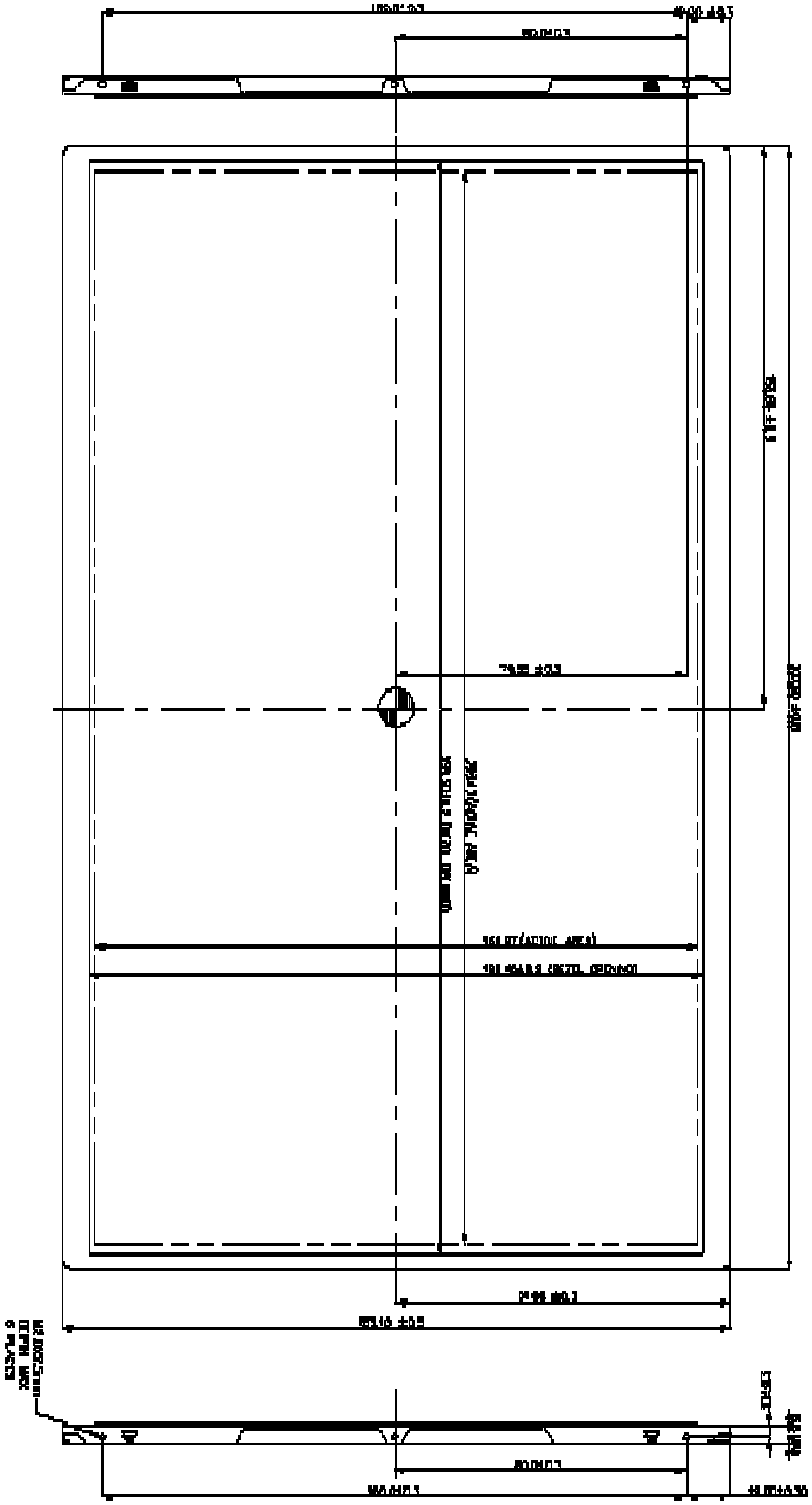
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP133WH1.
In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	307.6 ± 0.50mm
	Vertical	183.1 ± 0.50mm
	Depth	5.5mm(Max.)
Bezel Area	Horizontal	299.5 mm
	Vertical	168.4 mm
Active Display Area	Horizontal	293.42mm
	Vertical	164.97mm
Weight	350g (Max.)	
Surface Treatment	Hard Coating(3H), Glare treatment of the front polarizer	

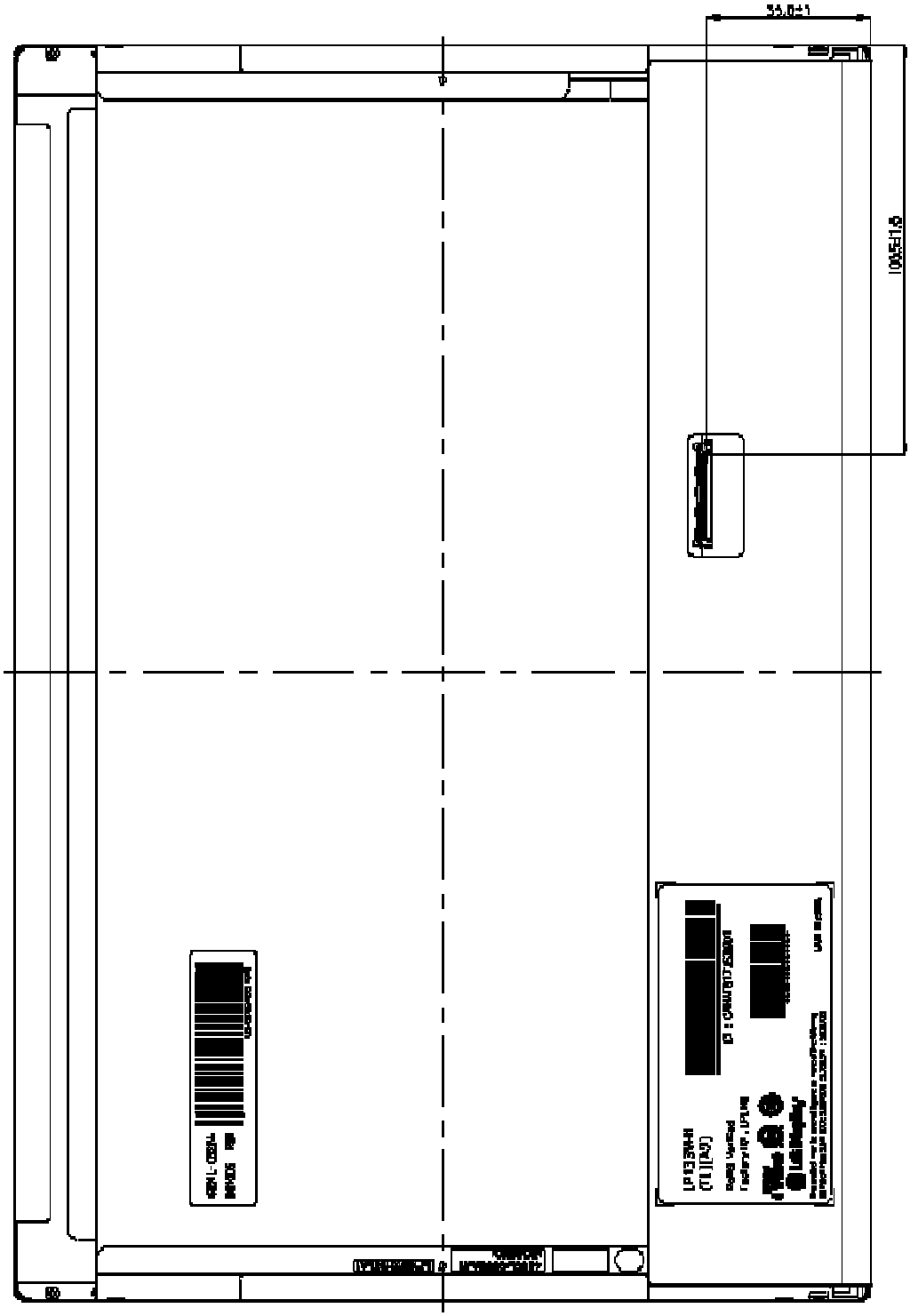
<FRONT VIEW>

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

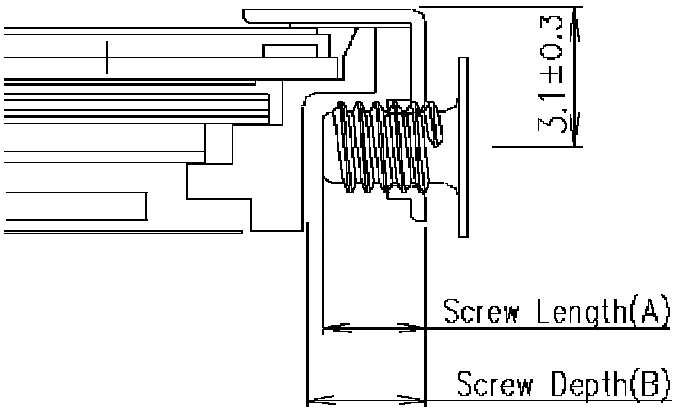


<REAR VIEW>

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



[DETAIL DESCRIPTION OF SIDE MOUNTING SCREW]

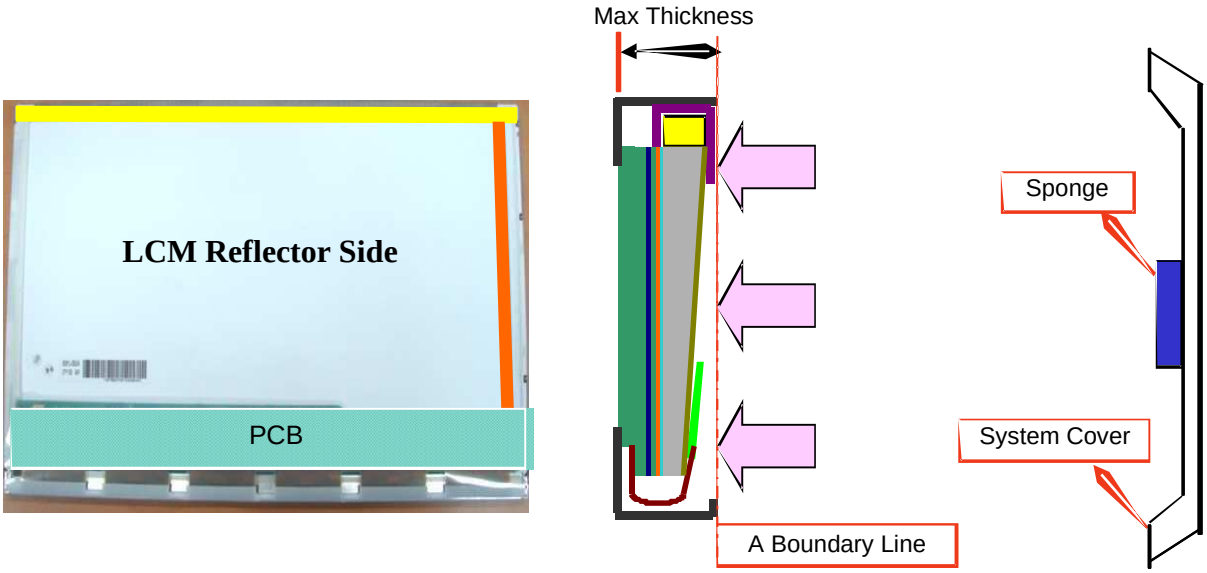


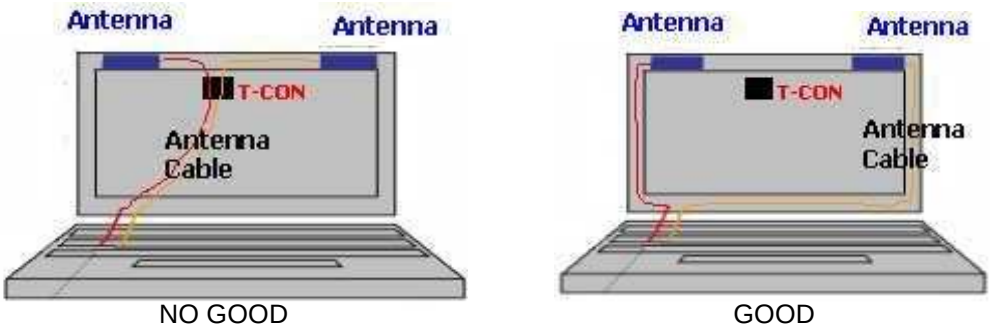
Screw Length (A) : Max: 2.5mm / Min: 2.0mm
Screw Depth (B) : Min 2.5mm
Screw Torque : Max 2.5kgf.cm (Measurement Gauge: Torque meter)

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)

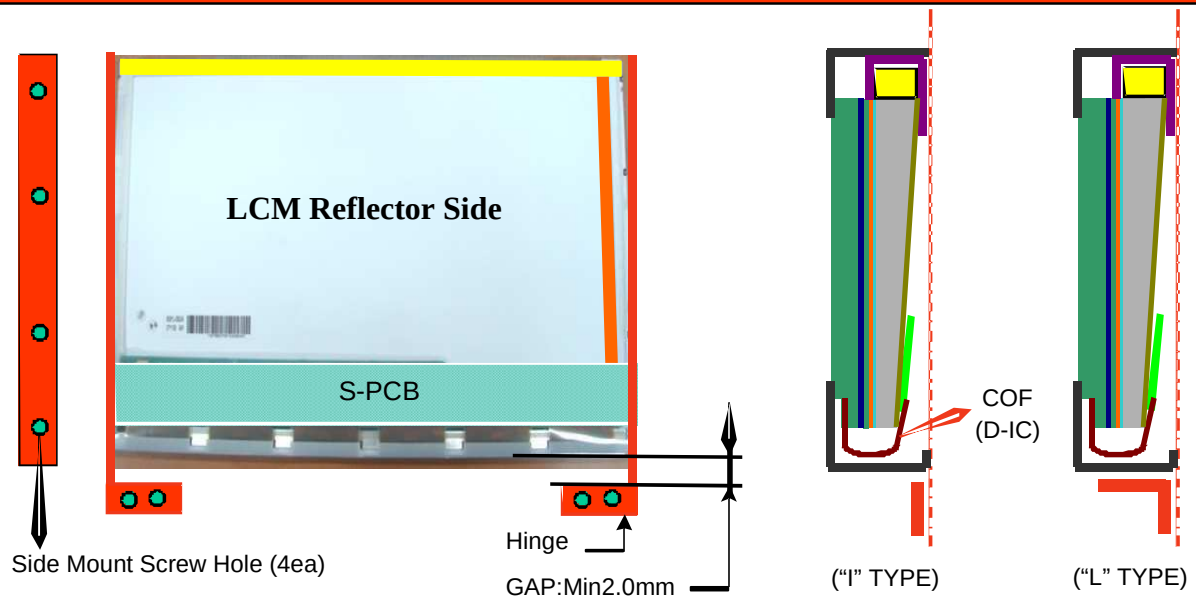
1	Gap check for securing the enough gap between LCM and System cover.	

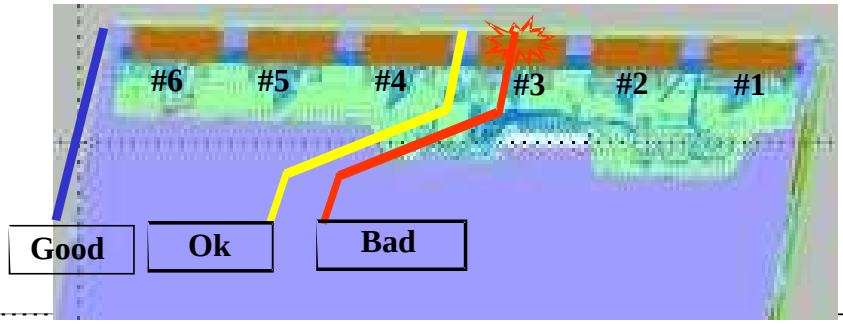


Define	1.Rear side of LCM is sensitive against external stress,and previous check about interference is highly needed. 2.In case there is something from system cover comes into the boundary above,mechanical interference may cause the FOS defects. (Eg: Ripple, White spot..)
2	Check if antenna cable is sufficiently apart from T-CON of LCD Module.
Define	
	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.	

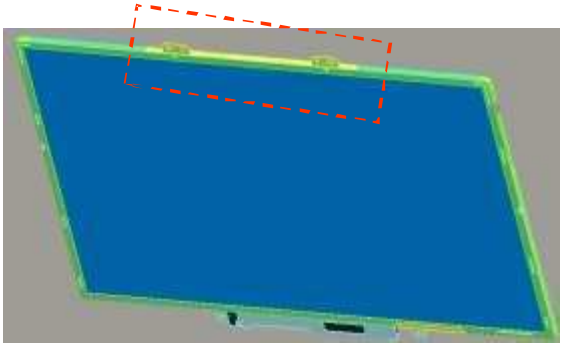


Define	1.At least 2.0mm of gap needs to be secured to prevent the shock related defects. 2."L" type of hinge is recommended than "I" type under shock test.
4	Checking the path of the System wire.
	
Define	1.COF area needs to be handled with care. 2.GOOD Wire path design to system side. OK Wire path is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

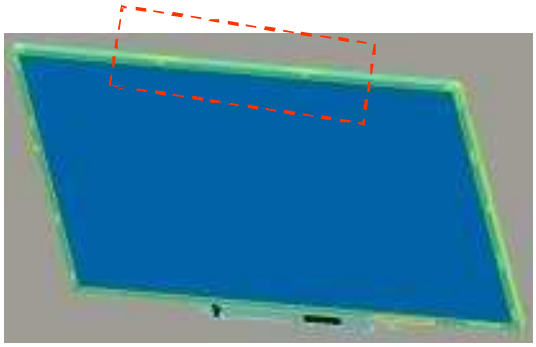
LPL Proposal for system cover design.

5	Using a bracket on the top of LCM is not recommended.	

bracket

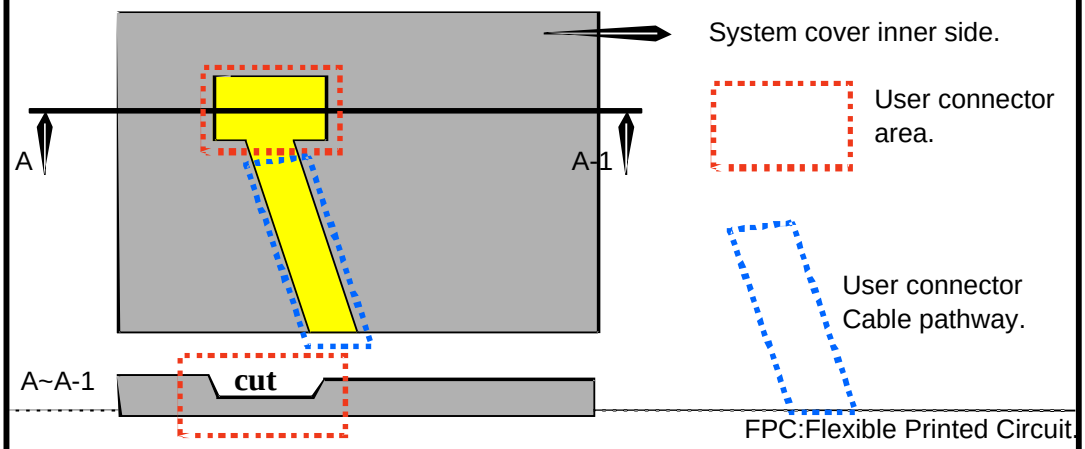


With bracket



Without bracket

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..



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)

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 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)

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)

D :

YEAR

E : MONTH

F ~ M : SERIAL NO.

Note

1. YEAR

										2010
Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	
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 : 30 pcs

b) Box Size : 430X378X268mm

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

	Byte (Dec)	Byte (Hex)	Field Name and Comments	Value (Hex)	Value (Bin)
Header	0	00	Header	00	00000000
	1	01	Header	FF	11111111
	2	02	Header	FF	11111111
	3	03	Header	FF	11111111
	4	04	Header	FF	11111111
	5	05	Header	FF	11111111
	6	06	Header	FF	11111111
	7	07	Header	00	00000000
Vendor/Product EDID Version	8	08	EISA manufacture code (3 Character ID) LGD	30	00110000
	9	09	EISA manufacture code (Compressed ASCII)	E4	11100100
	10	0A	Panel Supplier Reserved - Product Code 022Ch	2C	00101100
	11	0B	(Hex. LSB first)	02	00000010
	12	0C	LCD Module Serial No - Preferred but Optional ("0" If not used)	00	00000000
	13	0D	LCD Module Serial No - Preferred but Optional ("0" If not used)	00	00000000
	14	0E	LCD Module Serial No - Preferred but Optional ("0" If not used)	00	00000000
	15	0F	LCD Module Serial No - Preferred but Optional ("0" If not used)	00	00000000
	16	10	Week of Manufacture 0	00	00000000
	17	weeks		13	00010011
	18	11	Year of Manufacture 2009years	01	00000001
	19	12	EDID structure version # = 1	03	00000011
Display Parameters	20	13	EDID revision # = 3	80	10000000
	21	14	Video input Definition = Digital signal	1D	00011101
	22	15	Max H image size (Rounded cm) = 29 cm	11	00010001
	23	16	Max V image size (Rounded cm) = 17 cm	78	01111000
	24	17	Display gamma = (gamma*100)-100 = Example:(2.2*100)-100=120 = 2.2 Gamma Feature Support (no_DPMS, no_Active Off/Very Low Power, RGB color display, Timing BLK	0A	00001010
Panel Color Coordinates	25	18	1,no_GTF)	D5	11010101
	26	19	Red/Green Low Bits (RxRy/GxGy)	D5	11010101
	27	1A	Blue/White Low Bits (BxBy/WxWy)	96	10010110
	28	1B	Red X Rx = 0.589	59	01011001
	29	1C	Red Y Ry =0.349	56	01010110
	30	1D	Green X Gx = 0.337	8C	10001100
	31	1E	Green Y Gy =0.548	27	00100111
	32	1F	Blue X Bx = 0.155	1F	00011111
	33	20	Blue Y By = 0.122	50	01010000
	34	21	White X Wx =0.313	54	01010100
Established Timings	35	22	White Y Wy =0.329	00	00000000
	36	23	Established timing 1 (00h if not used)	00	00000000
	37	24	Established timing 2 (00h if not used)	00	00000000
Standard Timing ID	38	25	Manufacturer's timings (00h if not used)	01	00000001
	39	26	Standard timing ID1 (01h if not used)	01	00000001
	40	27	Standard timing ID1 (01h if not used)	01	00000001
	41	28	Standard timing ID2 (01h if not used)	01	00000001
	42	29	Standard timing ID2 (01h if not used)	01	00000001
	43	2A	Standard timing ID3 (01h if not used)	01	00000001
	44	2B	Standard timing ID3 (01h if not used)	01	00000001
	45	2C	Standard timing ID4 (01h if not used)	01	00000001
	46	2D	Standard timing ID4 (01h if not used)	01	00000001
	47	2E	Standard timing ID5 (01h if not used)	01	00000001
	48	2F	Standard timing ID5 (01h if not used)	01	00000001
	49	30	Standard timing ID6 (01h if not used)	01	00000001
	50	31	Standard timing ID6 (01h if not used)	01	00000001
	51	32	Standard timing ID7 (01h if not used)	01	00000001
	52	33	Standard timing ID7 (01h if not used)	01	00000001
	53	34	Standard timing ID8 (01h if not used)	01	00000001
		35	Standard timing ID8 (01h if not used)		

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

	Byte (Dec)	Byte (Hex)	Field Name and Comments	Value (Hex)	Value (Bin)
Timing Descripto #1	54	36	Pixel Clock/10,000 (LSB) 69.3 MHz @ 60Hz	12	00010010
	55	37	Pixel Clock/10,000 (MSB)	1B	00011011
	56	38	Horizontal Active (lower 8 bits) 1366 Pixels	56	01010110
	57	39	Horizontal Blanking(Thp-HA) (lower 8 bits) 96 Pixels	60	01100000
	58	3A	Horizontal Active / Horizontal Blanking(Thp-HA) (upper 4:4bits)	50	01010000
	59	3B	Vertical Avtive 768	00	00000000
	60	Lines		16	00010110
	61	3C	Vertical Blanking (Tvp-HA) (DE Blanking typ.for DE only panels) 22 Lines	30	00110000
	62	3D	Vertical Active : Vertical Blanking (Tvp-HA) (upper 4:4bits)	20	00100000
	63	3E	Horizontal Sync. Offset (Thfp) 32 Pixels	30	00110000
	64	3F	Horizontal Sync Pulse Width (HSPW) 48	36	00110110
	65	Pixels		00	00000000
	66	40	Vertical Sync Offset(Tvfp) : Sync Width (VSPW) 3 Lines : 6 Lines	26	00100110
	67	41	Horizontal Vertical Sync Offset/Width (upper 2bits)	A6	10100110
	68	42	Horizontal Image Size (mm) 294 mm	10	00010000
	69	43	Vertical Image Size (mm) 166 mm	00	00000000
	70	44	Horizontal Image Size / Vertical Image Size	00	00000000
	71	45	Horizontal Border = 0 (Zero for Notebook LCD)	19	00011001
Timing Descripto #2	72	46	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
	73	47	Non-Interlace, Normal display, no stereo, Digital Separate (Vsync_NEG, Hsync_NEG), DE only	00	00000000
	74	48	note : LSB is set to '1' if panel is DE-timing only. H/V can be ignored. Flag	00	00000000
	75	49	Flag	00	00000000
	76	4A	Flag	00	00000000
	77	4B	Data Type Tag (Descriptor Defined by manufacturer)	00	00000000
	78	4C	Flag	00	00000000
	79	4D	Descriptor Defined by manufacturer	00	00000000
	80	4E	Descriptor Defined by manufacturer	00	00000000
	81	4F	Descriptor Defined by manufacturer	00	00000000
	82	50	Descriptor Defined by manufacturer	00	00000000
	83	51	Descriptor Defined by manufacturer	00	00000000
	84	52	Descriptor Defined by manufacturer	00	00000000
	85	53	Descriptor Defined by manufacturer	00	00000000
	86	54	Descriptor Defined by manufacturer	00	00000000
	87	55	Descriptor Defined by manufacturer	00	00000000
	88	56	Descriptor Defined by manufacturer	00	00000000
	89	57	Descriptor Defined by manufacturer	00	00000000
Timing Descripto #3	90	58	Descriptor Defined by manufacturer	00	00000000
	91	59	Descriptor Defined by manufacturer	00	00000000
	92	5A	Flag	00	00000000
	93	5B	Flag	FE	11111110
	94	5C	Flag	00	00000000
	95	5D	Data Type Tag (ASCII String)	4C	01001100
	96	5E	Flag	47	01000111
	97	5F	ASCII String L	20	00100000
	98	60	ASCII String	44	01000100
	99	G		69	01101001
	100	61	ASCII String	73	01110011
	101	62	ASCII String D	70	01110000
	102	63	ASCII String i	6C	01101100
	103	64	ASCII String s	61	01100001
	104	65	ASCII String p	79	01111001
	105	66	ASCII String l	0A	00001010
	106	67	ASCII String a	20	00100000
		68	ASCII String y		
		69	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCⅡ		
		6A	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCⅡ		
	107	6B	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCⅡ code 0Ah,set remaining char = 20h)	20	00100000

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 (ASCII String)	FE	11111110
	112	70	Flag	00	00000000
	113	71	ASCII String L	4C	01001100
	114	72	ASCII String P	50	01010000
	115	73	ASCII String 1	31	00110001
	116	74	ASCII String 3	33	00110011
	117	75	ASCII String 3	33	00110011
	118	76	ASCII String W	57	01010111
	119	77	ASCII String H	48	01001000
	120	78	ASCII String 1	31	00110001
	121	79	ASCII String -	2D	00101101
	122	7A	ASCII String T	54	01010100
	123	7B	ASCII String L	4C	01001100
	124	7C	ASCII String A	41	01000001
	125	7D	ASCII String 2	32	00110010
Checksum	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)	02	00000010