SPECIFICATION
FOR
APPROVAL

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

Title	17.1” WUXGA TFT LCD

BUYER	HP
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LP171WU5
Suffix	TLB1

*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 / S.Manager	
REVIEWED BY	
C. J. Jun / Manager	
PREPARED BY	
H. S. Shin / Engineer	

Products Engineering Dept.
LG Display Co., Ltd

Contents

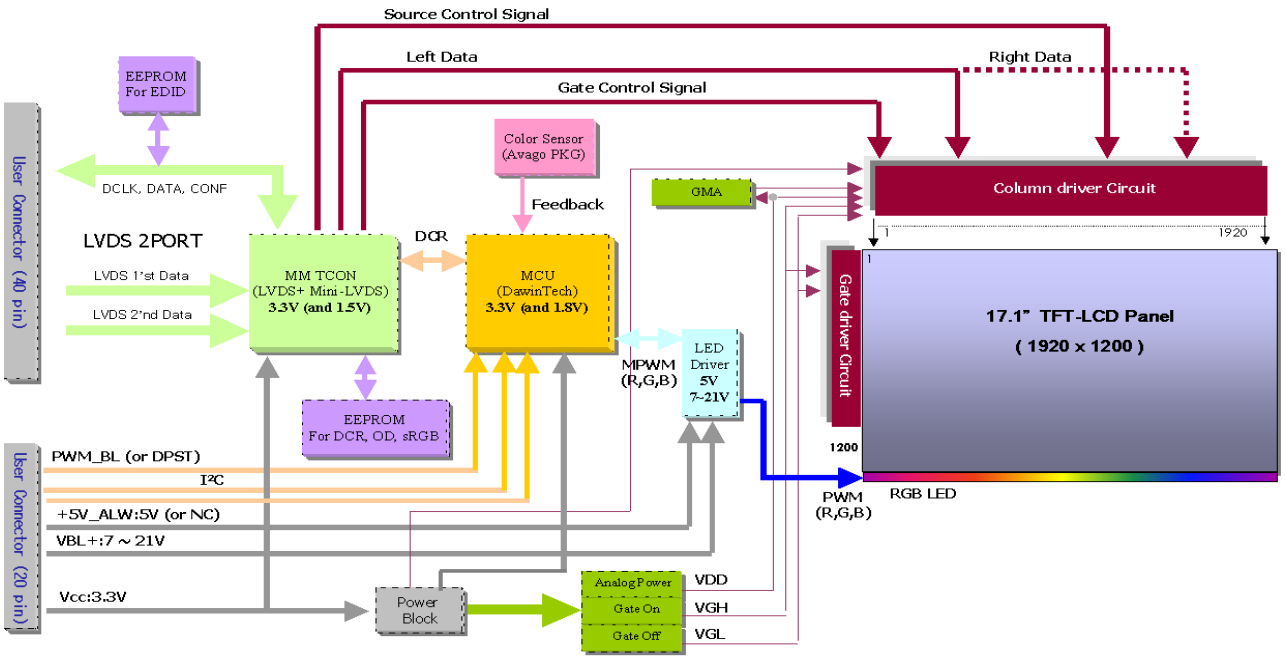
RECORD OF REVISIONS

Revision No	Revision Date	Page	Description	Note
0.0	16.Oct.2007	-	First draft	-
0.1	29. Feb. 2008	4,6,7	4,6 page: Power Consumption update. 7page: Interface Connections update.	
0.2	10. Apr. 2008	14,15	Changed the optical specification	
0.3	1. May. 2008	31,32,33	Update EDID table	
0.4	22. May. 2008	31,32,33	Update EDID table (ver 1.3 → ver 1.4)	
	22. May. 2008	10	Pin assign change (ADD ALS function)	
0.5	17. Jun. 2008	20, 21	Mechanical drawing (Front / Rear view) update	

1. General Description

The LP171WU5 is a Color Active Matrix Liquid Crystal Display with an integral RGB 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 17.1 inches diagonally measured active display area with WUXGA resolution(1920 horizontal by 1200 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 8-bit gray scale signal for each dot, thus, presenting a palette of more than 16.7M(True) colors.

The LP171WU5 has been designed to apply the interface method that enables low power, high speed, low EMI. The LP171WU5 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 LP171WU5(TLB1) characteristics provide an excellent flat display for office automation products such as Notebook PC.



General Features

Active Screen Size	17.1 inches diagonal
Outline Dimension(max)	382.7 (H) × 248.0 (V) × 7.0(D) mm
Pixel Pitch	0.191 mm × 0. 191 mm
Pixel Format	1920 horiz. by 1200 vert. Pixels RGB strip arrangement
Color Depth	8-bit, 16.7M colors
Luminance, White	300 cd/m^2(Typ.), 5 point
Power Consumption	15W(Typ.) [3.3W(Logic, Typ.) + 11.7W(B/L, Typ.)]
Weight (Max)	800g
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Hard coating(3H) Anti-Glare treatment of the front polarizer

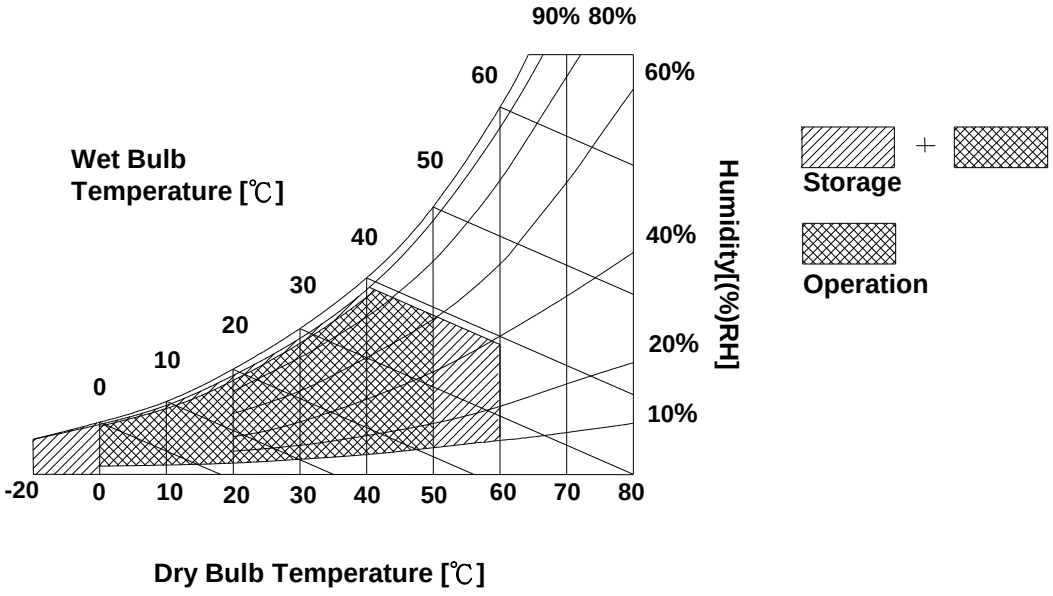
2. Absolute Maximum Ratings

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

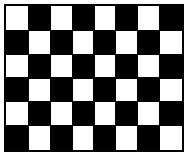
The LP171WU5(TLB1)requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the LED, is typically generated by an LED Driver. The LED Driver is an internal unit to the LCD.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	VCC	3.0	3.3	3.6	V_{DC}	
Power Supply Input Current	I_{CC}	850	1000	1150	mA	1
Power Consumption	Pc	-	3.3	3.8	Watt	1
Differential Impedance	Zm	90	100	110	Ohm	2
LED Backlight :						
Power Supply Input Voltage	V_{BL+}	7.5	14.4	21	V_{DC}	
Operating Voltage	$V_{LED\ (R,G,B)}$	-	-	42.4	V	3
Operating Current per string	$I_{LED\ (R,G,B)}$	-	-	50	mA	3
Power Consumption	P_{BL}		11.7	15.5	Watt	4
Life Time		15,000	-	-	Hrs	5

Note)

1. The specified current and power consumption are under the Vcc = 3.3V , 25℃, fv = 60Hz condition whereas Mosaic pattern (32x32) is displayed and fv is the frame frequency.

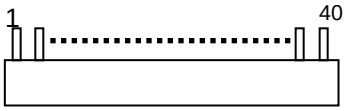


2. This impedance value is needed to proper display and measured form LVDS Tx to the mating connector.
3. RGB LED Operating Voltage and Operating Current per string should be within Max. SPEC.
4. The LED power consumption (Typ) shown above does include power of internal LED driver circuit for typical current condition. (Luminance = 300nit condition)
   The power consumption (Max) condition is R,G,B LED 100% Dimming.
5. The life time is determined as the time at which brightness of LED is 50% compare to that of initial value at the typical LED current.

3-2. Interface Connections

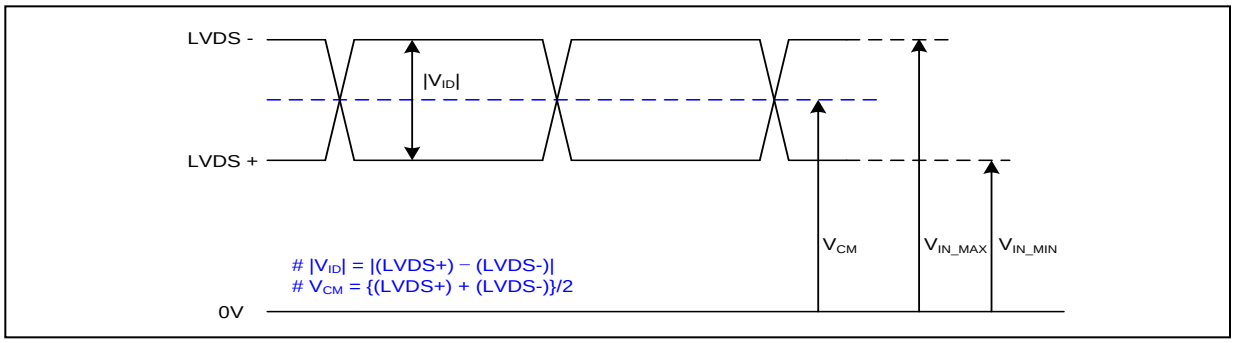
This LCD employs two interface connections, a 40 pin connector is used for the module electronics interface and the other connector is used for the integral backlight system.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	GND	Ground	1, Interface chips 1.1 LCD : Renesas (MM-TCON) including LVDS Receiver 1.2 System : * Pin to Pin compatible with LVDS 2.Connector 2.1 LCD :JAE FI-NXB40SL-HF10 or equivalent (1.0 mm thickness, lock-in type, pin 1 starts from left on the front) 2.2 Mating: JAE or equivalent 2.3 Connector pin arrangement LCD rear view  [LCD Module Rear View]
2	GND	Ground	
3	AVDD	Power Supply, 3.3V Typ.	
4	AVDD	Power Supply, 3.3V Typ.	
5	AVDD	Power Supply, 3.3V Typ.	
6	DVDD	Digital Power supply (3.3V Typ)	
7	DVDD	Digital Power supply (3.3V Typ)	
8	Clk EEDID	Two wire serial interface clock	
9	DATA EEDID	Two wire serial interface data	
10	RXinO0-	- LVDS differential data input, Chan 0-Odd	
11	RXinO0+	+ LVDS differential data input, Chan 0-Odd	
12	GND	Ground	
13	RXinO1	- LVDS differential data input, Chan 1-Odd	
14	RXinO1+	+ LVDS differential data input, Chan 1-Odd	
15	GND	Ground	
16	RXinO2-	- LVDS differential data input, Chan 2-Odd	
17	RXinO2+	+ LVDS differential data input, Chan 2-Odd	
18	GND	Ground	
19	RXOC-	- LVDS Differential Clock input (Odd)	
20	RXOC+	+ LVDS Differential Clock input (Odd)	
21	GND	Ground	
22	RXinO3-	- LVDS differential data input, Chan 3-Odd	
23	RXinO3+	+ LVDS differential data input, Chan 3-Odd	
24	GND	Ground	
25	RXinE0-	- LVDS differential data input, Chan 0-Even	
26	RXinE0+	+ LVDS differential data input, Chan 0-Even	
27	GND	Ground	
28	RXinE1-	- LVDS differential data input, Chan 1-Even	
29	RXinE1+	+ LVDS differential data input, Chan 1-Even	
30	GND	Ground	
31	RXinE2-	- LVDS differential data input, Chan 2-Even	
32	RXinE2+	+ LVDS differential data input, Chan 2-Even	
33	GND	Ground	
34	RXEC-	- LVDS Differential Clock input (Even)	
35	RXEC+	+ LVDS Differential Clock input (Even)	
36	GND	Ground	
37	RXinE3-	- LVDS differential data input, Chan 3-Even	
38	RXinE3+	+ LVDS differential data input, Chan 3-Even	
39	GND	Ground	
40	NC	No connection	

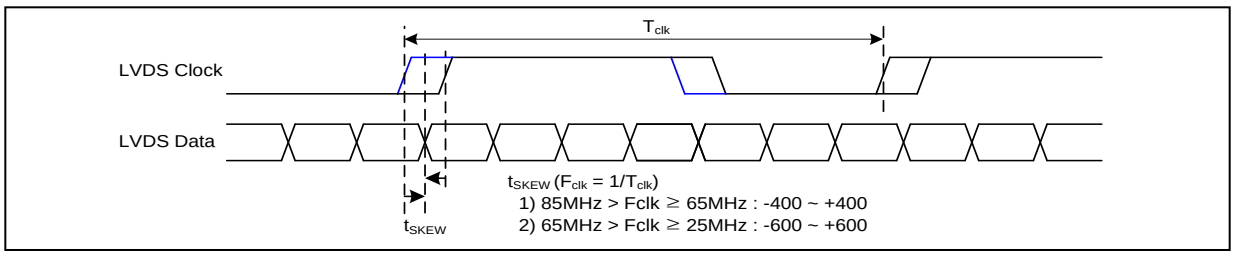
3-3. LVDS Signal Timing Specifications

3-3-1. DC Specification

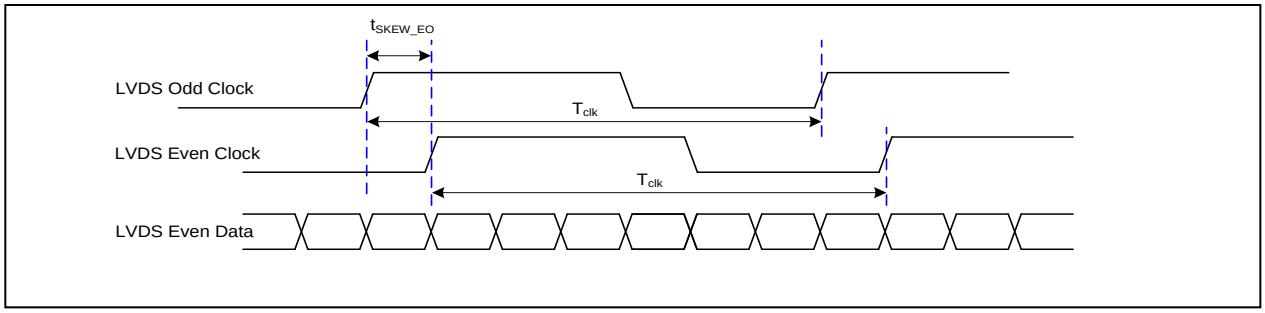


Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	$\|V_{ID}\|$	100	600	mV	-
LVDS Common mode Voltage	V_{CM}	0.6	1.8	V	-
LVDS Input Voltage Range	V_{IN}	0.3	2.1	V	-

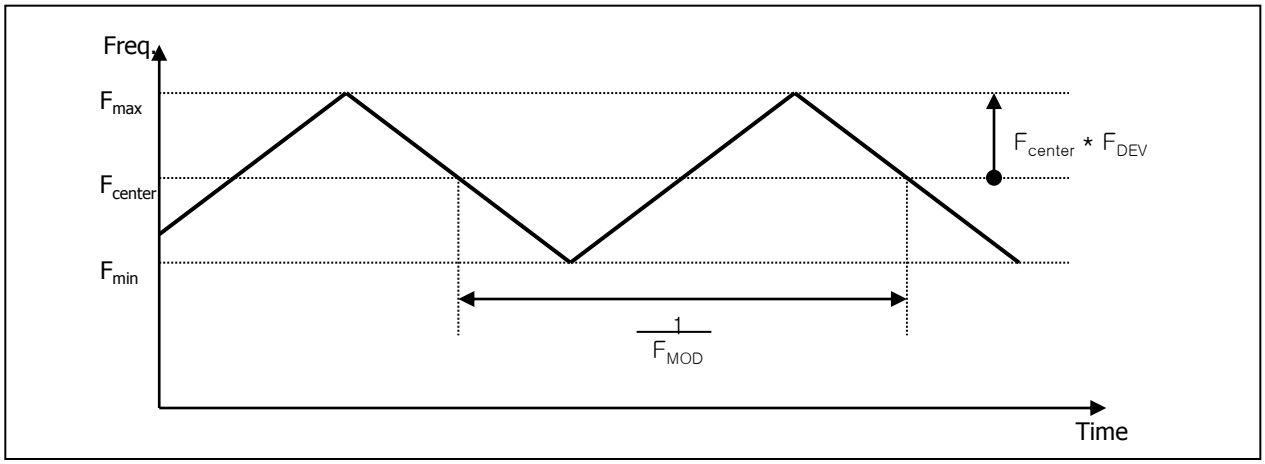
3-3-2. AC Specification



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	-



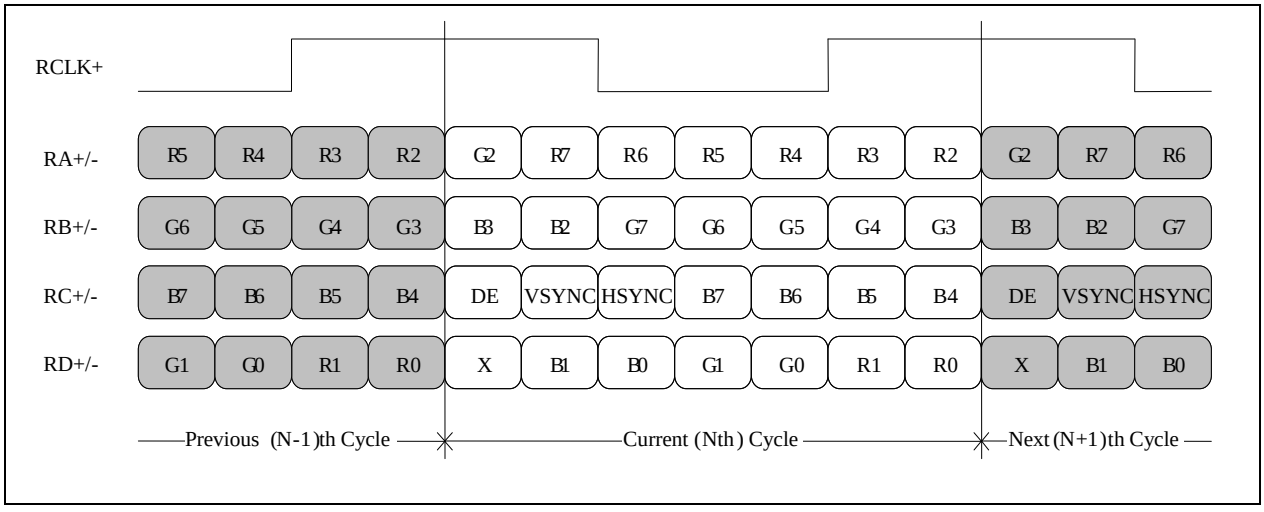
< Clock skew margin between channel >



< Spread Spectrum >

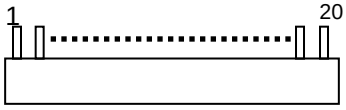
3-3-3. Data Format

1) LVDS Data Port



< LVDS Data Format >

Table 4. BACKLIGHT CONNECTOR PIN CONFIGURATION (CN2)

Pin	Symbol	Description	Notes
1	GND	Ground	1. Connector 1.1 LCD : JAE FI-XB20S-HF10 or equivalent 1.2 Mating : JAE equivalent. 1.3 Connector pin arrangement  [LCD Module Rear View]
2	VBL+	7V - 20V LED Power	
3	VBL+	7V - 20V LED Power	
4	VBL+	7V - 20V LED Power	
5	VBL+	7V - 20V LED Power	
6	VBL+	7V - 20V LED Power	
7	NC	No Connection	
8	VBL-	Ground	
9	VBL-	Ground	
10	VBL-	Ground	
11	VBL-	Ground	
12	VBL-	Ground	
13	NC	No Connection	
14	GND	Ground	
15	I2C_DATA	DATA for RGB control	
16	I2C_CLK	CLK for RGB control	
17	GND	Ground	
18	ALS	Note1)	
19	Reserved	Reserved	
20	GND	Ground	

Note)
1. Do not use ALS : 3.3V DC input
   Use ALS : PWM or DC(0V~3.3V) input

3-3. Signal Timing Specifications

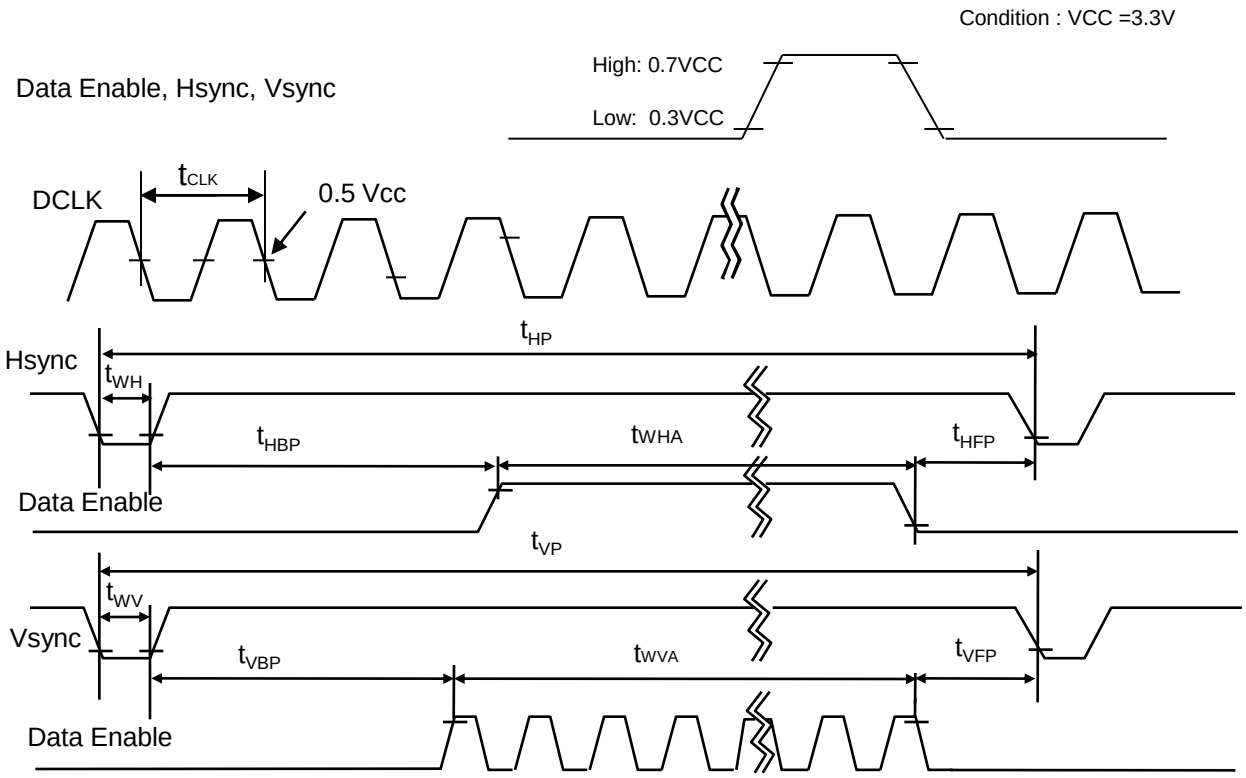
This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications and specifications of LVDS Tx/Rx for its proper operation.

Table 5. TIMING TABLE

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	147	154	164	MHz	$t_{CLK} = 1 / f_{CLK}$
Hsync	Period	t_{HP}	2016	2080	2144	t_{CLK}	
	Width	t_{WH}	32	32	32		
	Active	t_{WHA}	1920	1920	1920		
Vsync	Period	t_{VP}	1213	1235	1278	t_{HP}	
	Width	t_{WV}	6	6	6		
	Active	t_{WVA}	1200	1200	1200		
Data Enable	Horizontal back porch	t_{HBP}	48	80	112	t_{CLK}	
	Horizontal front porch	t_{HFP}	16	48	80		
	Vertical back porch	t_{VBP}	6	26	48	t_{HP}	
	Vertical front porch	t_{VFP}	1	3	24		

3-4. Signal Timing Waveforms (Normal status)

Condition : VCC =3.3V



3-5. Color Input Data Reference

The brightness of each primary color (red,green and blue) is based on the 8-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
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	F11	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	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	1	1	1	1	1	1
RED	RED (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	...					...								...								...			
	RED (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	...					...								...								...			
	GREEN (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	...					...								...								...			
	BLUE (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

3-6. Power Sequence

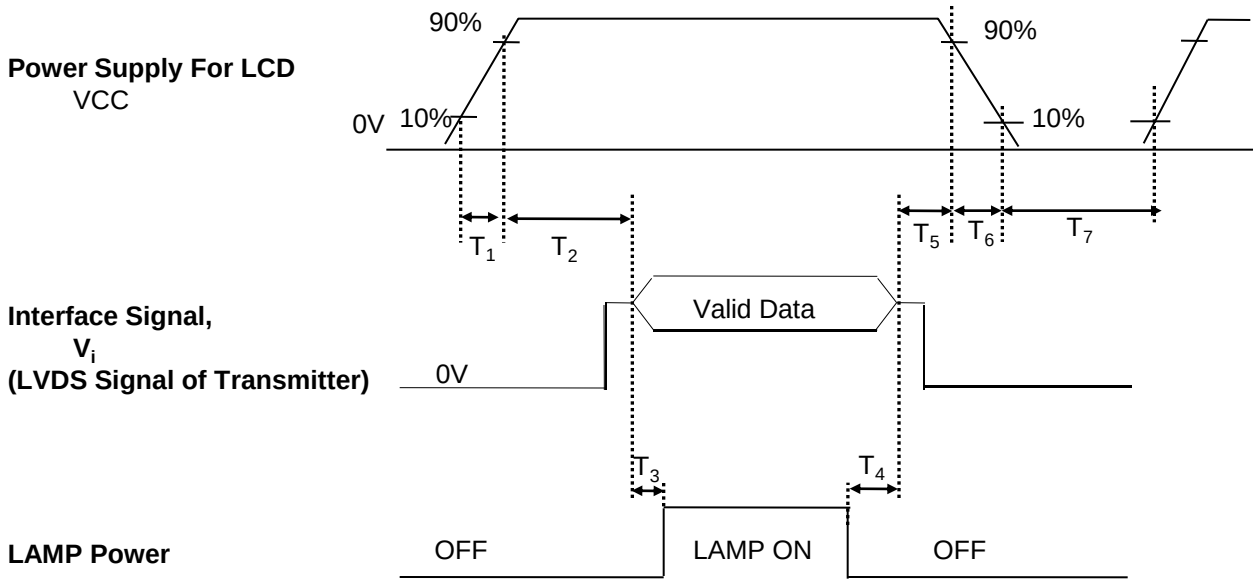


Table 7. POWER SEQUENCE TABLE

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

Note)
1. 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. Lamp power must be turn on after power supply for LCD and interface signal are valid.

4. Optical Specification

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

FIG. 1 Optical Characteristic Measurement Equipment and Method

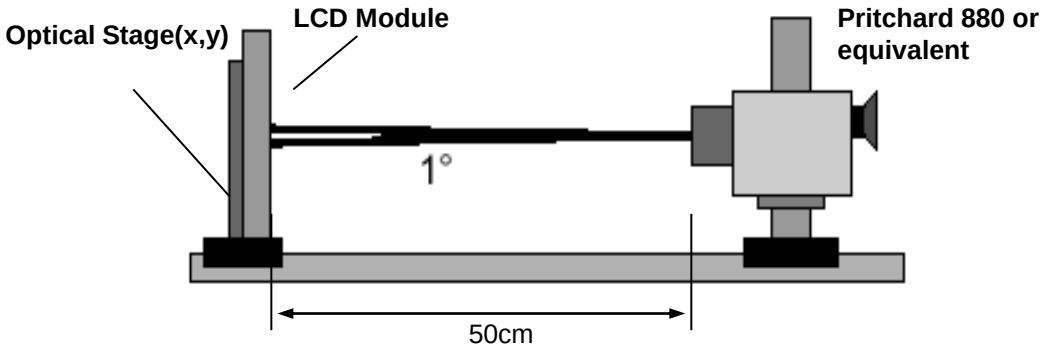


Table 8. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, fv=60Hz, f_{CLK}= 154MHz, Finished Color Calibration

Parameter	Symbol	Values			Units	Notes
		Min	Typ	Max		
Contrast Ratio	CR	600	800	-		1
Dynamic CR		-	3000	-		
Surface Luminance, white	L_{WH}	255	300	-	cd/m²	2
Luminance Variation	δ_{WHITE}	-	1.4	1.6		3
Response Time						4
Rise Time+Decay Time (W to B)	Tr_R+Tr_D	-	16	20	ms	
Rise Time+Decay Time (G to G)	Tr_R+Tr_D	-	8	16	ms	
Viewing Angle						5
x axis, right(Φ=0°)	Θr	75	80	-	degree	
x axis, left (Φ=180°)	Θl	75	80	-	degree	
y axis, up (Φ=90°)	Θu	55	60	-	degree	
y axis, down (Φ=270°)	Θd	65	70	-	degree	
Color Shift (@Native Mode ±15°)	△E			10		
Gray Scale (@Gamma 2.2)	△L			8		6

Table 8. OPTICAL CHARACTERISTICS

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
Color Coordinates (Temperature)							CIE1976
	@ 5000ºK	Wu'		0.2092	0.008<△u'v'		
		Wv'		0.4881			
	@ 6500ºK	Wu'		0.1978	0.008<△u'v'		
		Wv'		0.4683			
	@ 9300ºK	Wu'		0.1888	0.008<△u'v'		
		Wv'		0.4459			
Color Coordinates (Color Mode)							
@ Native Mode	RED	Ru'		0.5200	0.02<△u'v'		
		Rv'		0.5200			
	GREEN	Gu'		0.0721	0.01<△u'v'		
		Gv'		0.5762			
	BLUE	Bu'		0.1733	0.04<△u'v'		
		Bv'		0.1381			
	WHITE	Wu'		0.1978	0.008<△u'v'		
		Wv'		0.4683			
@ Adobe Mode	RED	Ru'		0.4507	0.02<△u'v'		
		Rv'		0.5229			
	GREEN	Gu'		0.0757	0.01<△u'v'		
		Gv'		0.5757			
	BLUE	Bu'		0.1754	0.04<△u'v'		
		Bv'		0.1579			
	WHITE	Wu'		0.1978	0.008<△u'v'		
		Wv'		0.4683			
@ sRGB Mode	RED	Ru'		0.4507	0.02<△u'v'		
		Rv'		0.5229			
	GREEN	Gu'		0.1250	0.01<△u'v'		
		Gv'		0.5625			
	BLUE	Bu'		0.1754	0.04<△u'v'		
		Bv'		0.1579			
	WHITE	Wu'		0.1978	0.008<△u'v'		
		Wv'		0.4683			

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 5point (1~5)average across the LCD surface 50cm from the surface with all pixels displaying white Luminance (300nit). For more information see FIG 2.

3. Luminance % uniformity is measured for 13 point For more information see FIG 2.
   δ WHITE = Maximum(LN1,LN2, ….. LN13) ÷ Minimum(LN1,LN2, ….. LN13)

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.

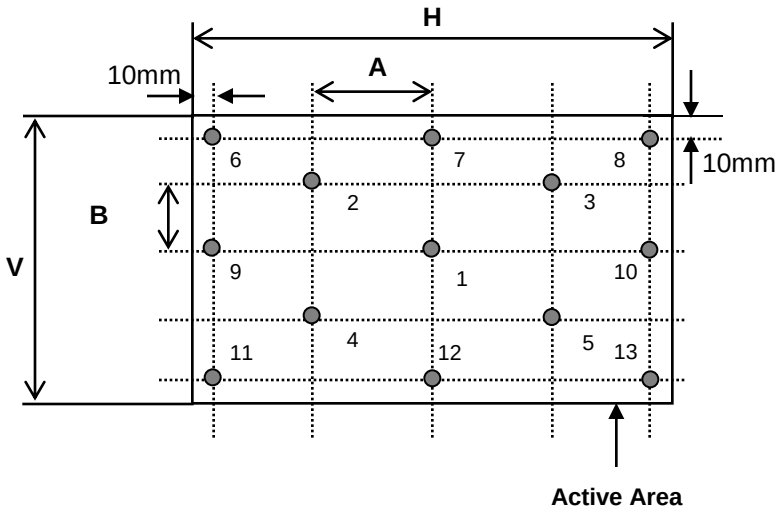
6. Gray scale specification * f_V=60Hz

Gray Level	Luminance [%] (Typ)
L0	0.00
L15	0.20
L31	0.97
L47	2.42
L63	4.61
L79	7.59
L95	11.39
L111	16.04
L127	21.58
L143	28.01
L159	35.37
L175	43.68
L191	52.95
L207	63.20
L223	74.45
L239	86.71
L255	100

-. △L Reference Level : 16 steps from gray 0 to gray 255

FIG. 2 Luminance

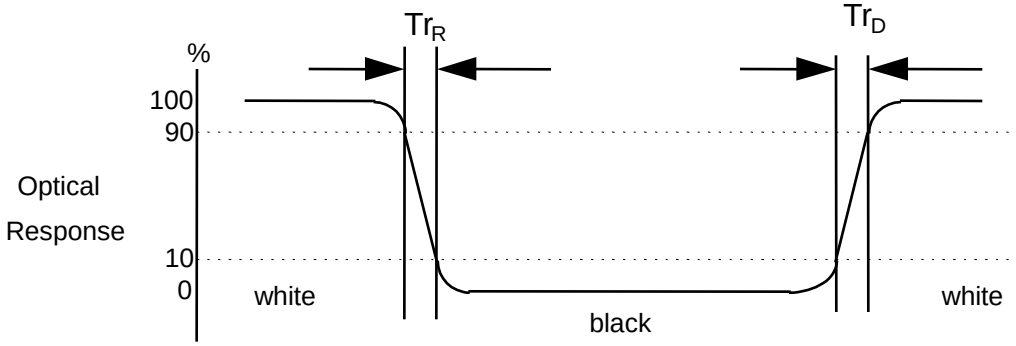
<measuring point for surface luminance & measuring point for luminance variation>



H,V : ACTIVE AREA
A : H/4 mm
B : V/4 mm
POINTS: 13 POINTS

FIG. 3 Response Time

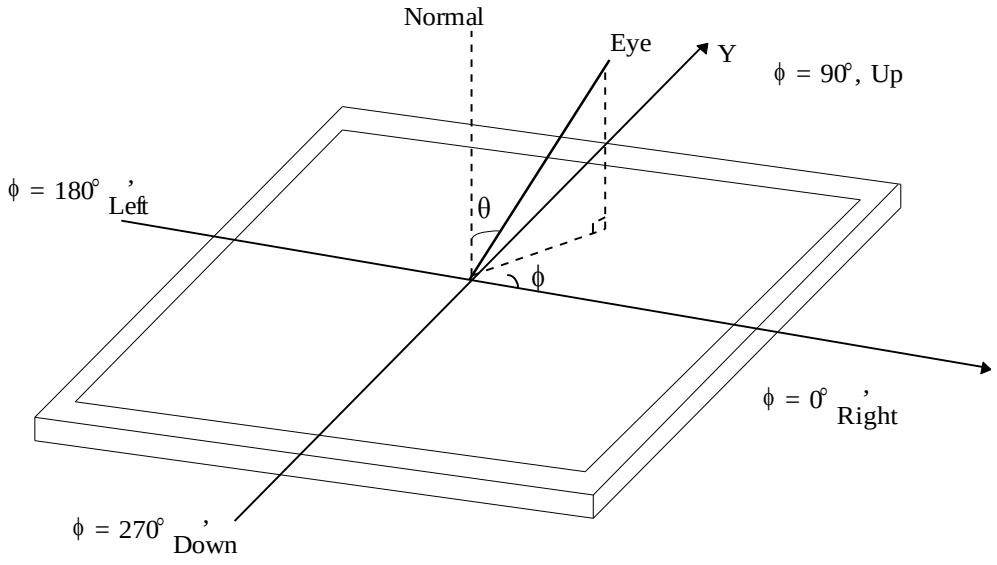
The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white” In condition of RGB LED Duty 100%



In other condition (For example, RGB LED Duty 80%), The response time defined as measurement data which is not lack

FIG. 4 Viewing angle

<Dimension of viewing angle range>



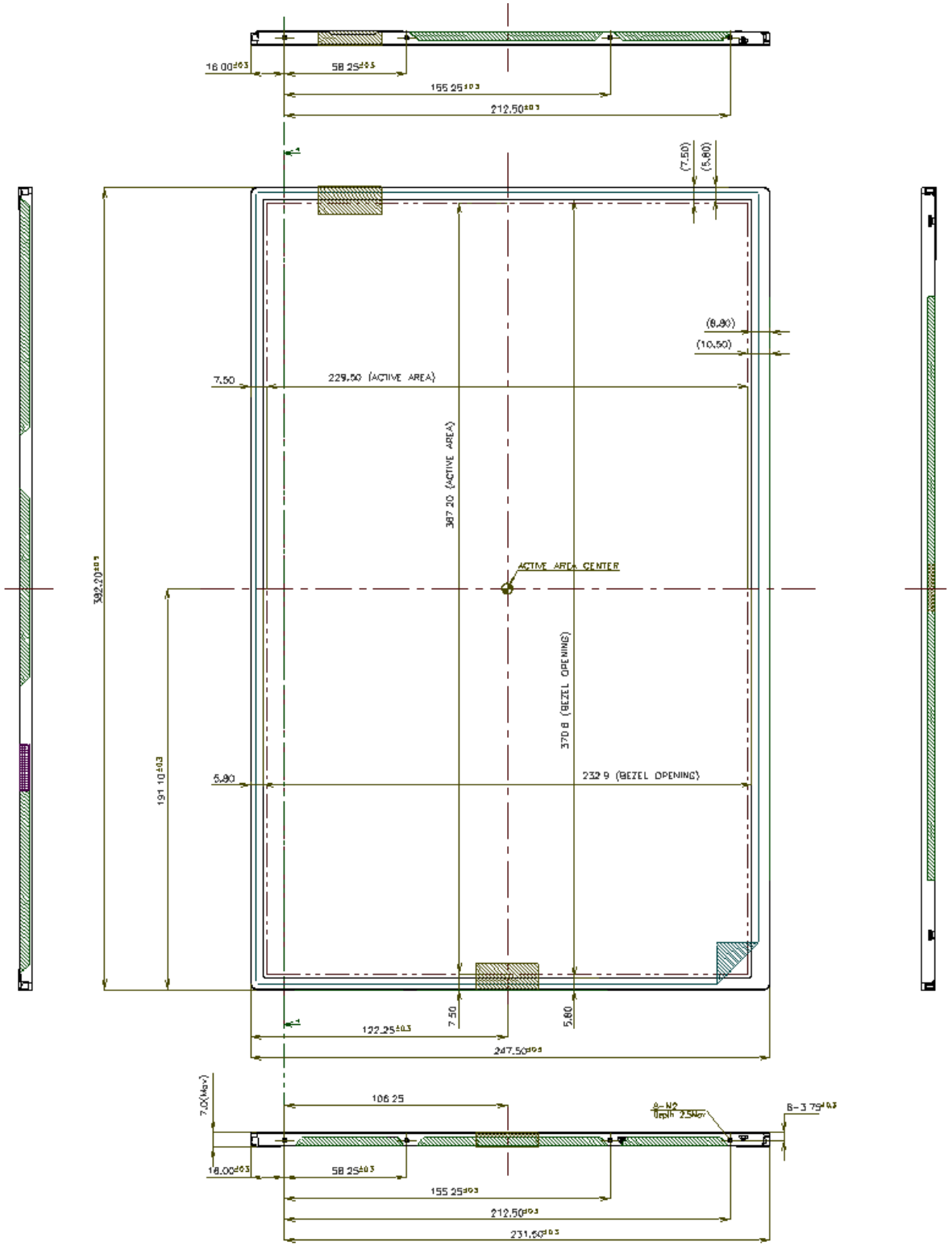
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP171WU5(TLB1). In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	382.2 ± 0.5 mm
	Vertical	247.5 ± 0.5 mm
	Depth (Max)	7.0 mm
Bezel Area	Horizontal	370.6(H)
	Vertical	232.9(V)
Active Display Area	Horizontal	367.2 mm
	Vertical	229.5 mm
Weight	800 g (MAX)	
Surface Treatment	Hard coating(3H) Anti-Glare treatment of the front polarizer	

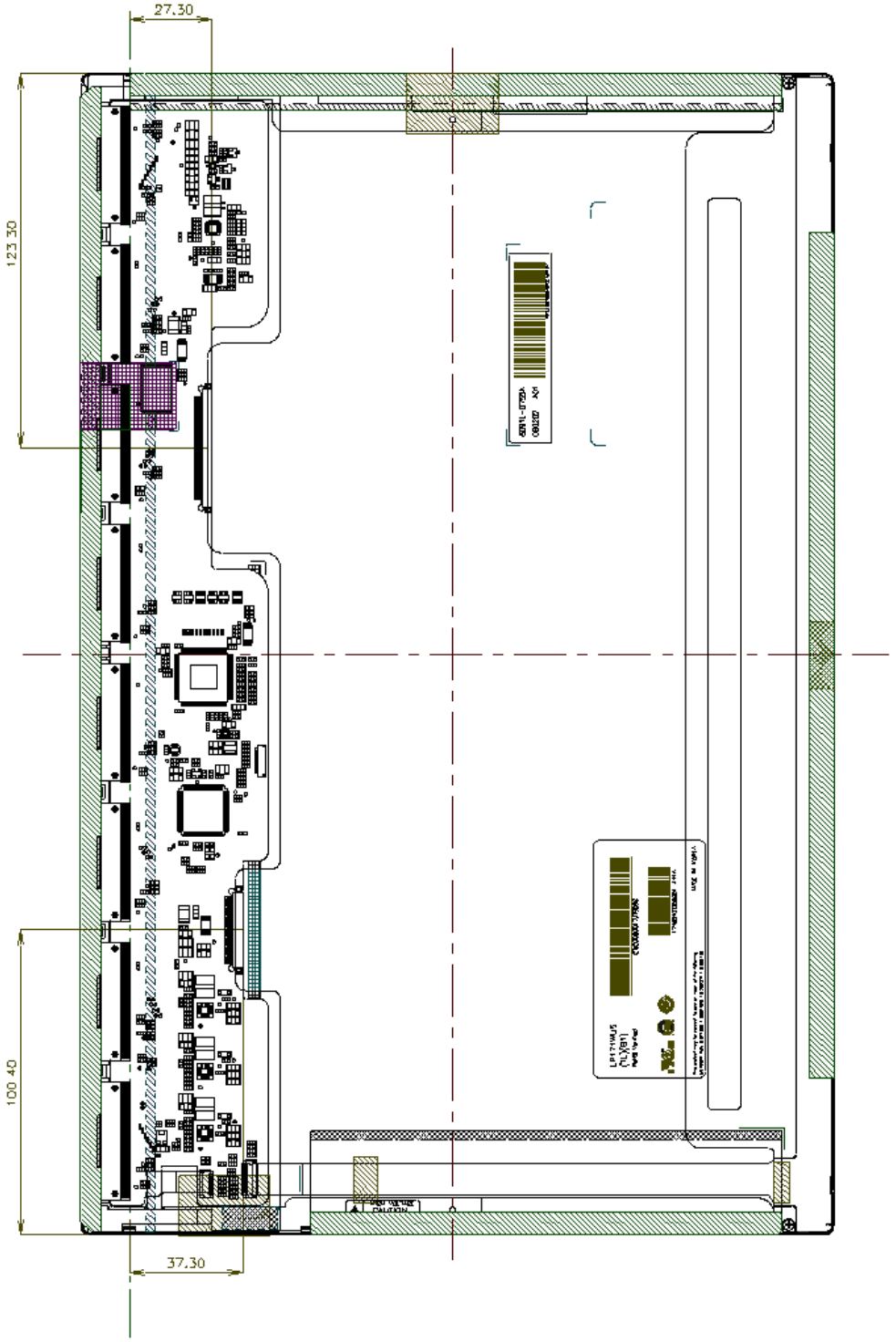
<FRONT VIEW>

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

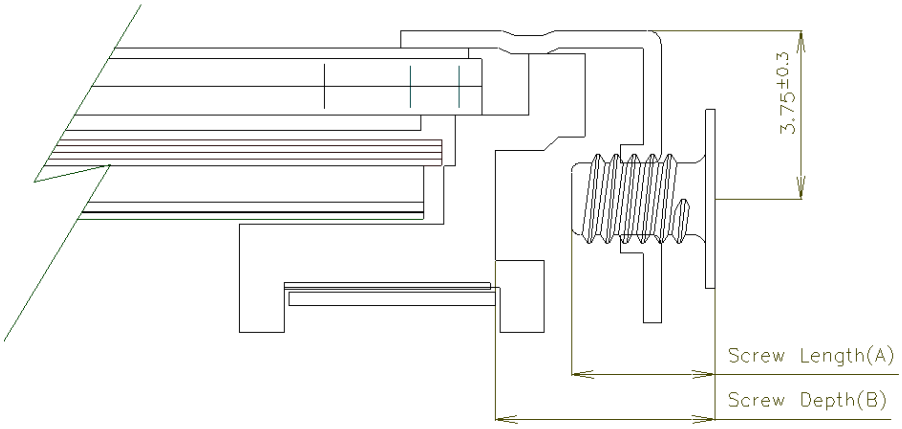


<REAR VIEW>

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



[DETAIL DESCRIPTION OF SIDE MOUNTING SCREW]



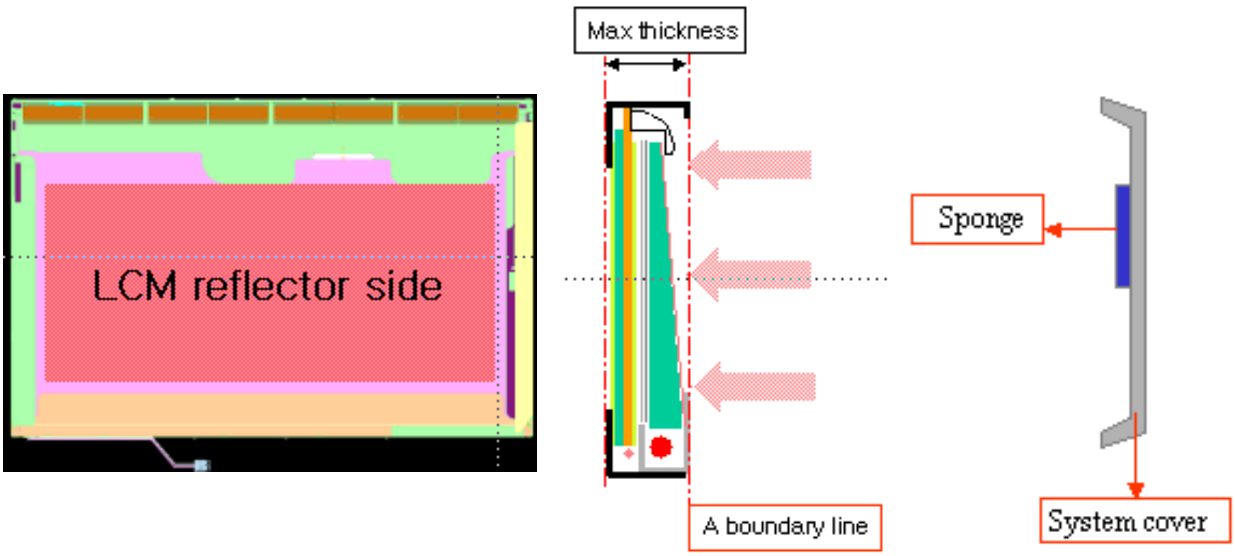
* Mounting Screw Length (A)
  = 2.0(Min) / 2.5(Max)
* Mounting Screw Hole Depth (B)
  = 2.5(Min)
* Mounting hole location : 3.75(typ.)
* Torque : 2.0 kgf.cm(Max)
  (Measurement gauge : torque meter)

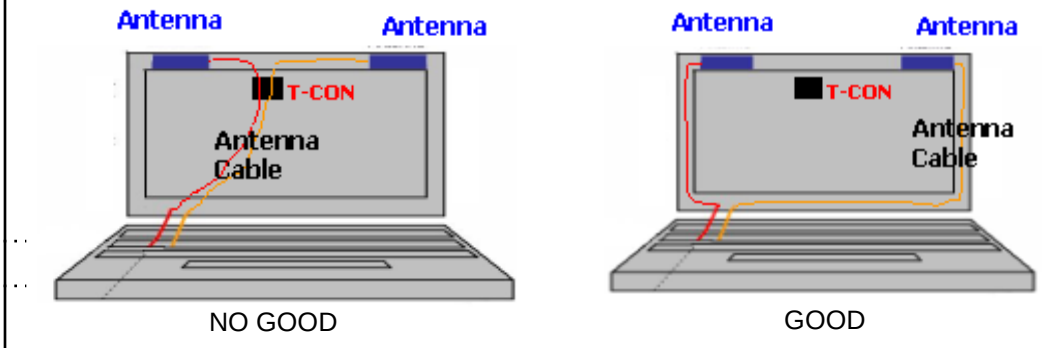
Notes : 1. Screw plated through the method of non-electrolytic nickel plating is preferred to reduce possibility that results in vertical and/or horizontal line defect due to the conductive particles from screw surface.

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

LGD Proposal for system cover design.(Appendix)

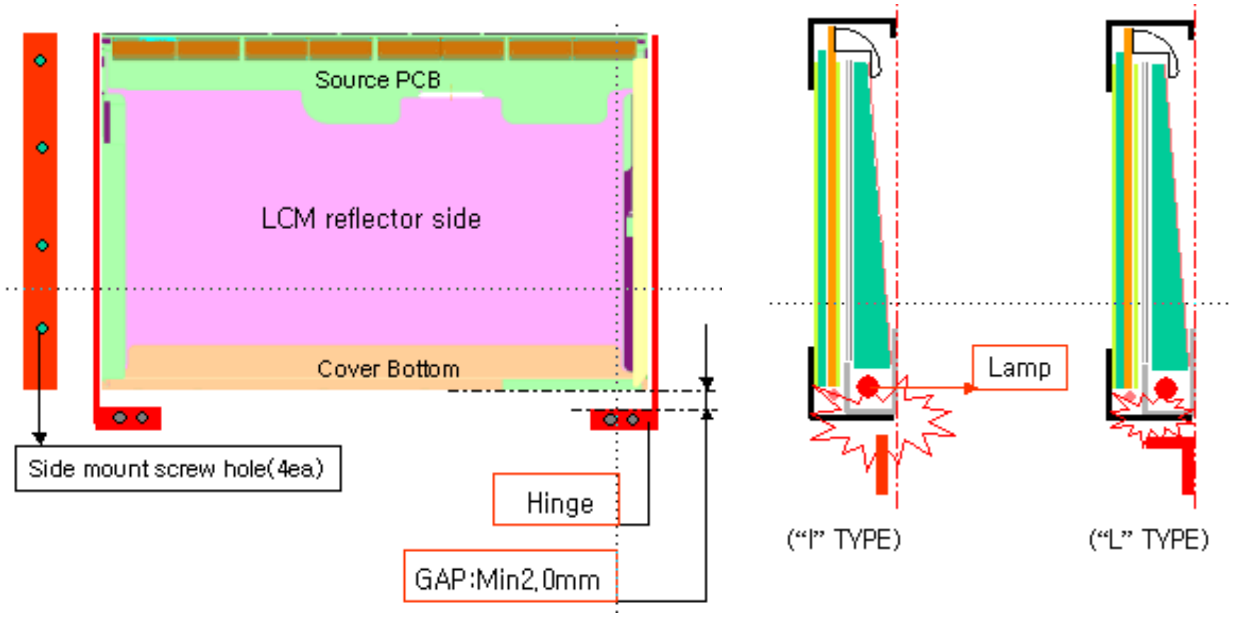
1	Gap check for securing the enough gap between LCM and System cover.	



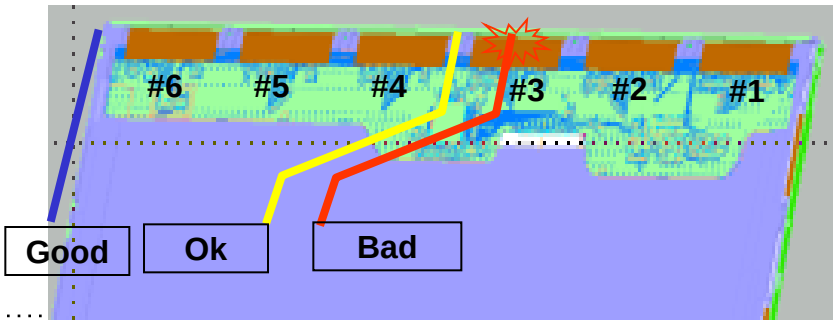
Define	1.Rear side of LCM is sensitive against external stress,and previous check about interference is highly needed. 2.In case there is something from system cover comes into the boundary above,mechanical interference may cause the FOS defects. (Eg:Ripple,White spot..)
2	Check if antenna cable is sufficiently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

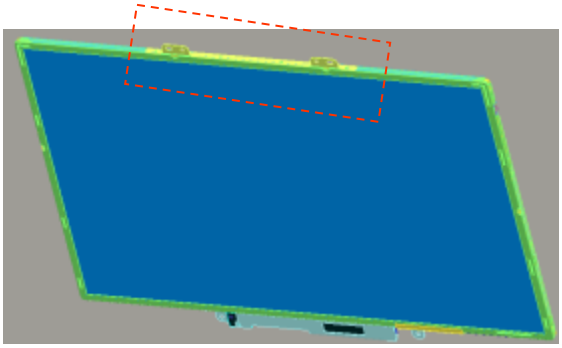


Define	1.COF area needs to be handled with care. 2.GOOD ➔Wire path design to system side. OK➔ Wire path is located between COFs. BAD➔Wire path overlapped with COF area.

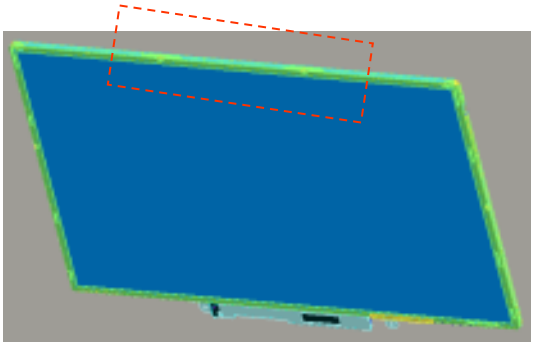
LGD Proposal for system cover design.

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

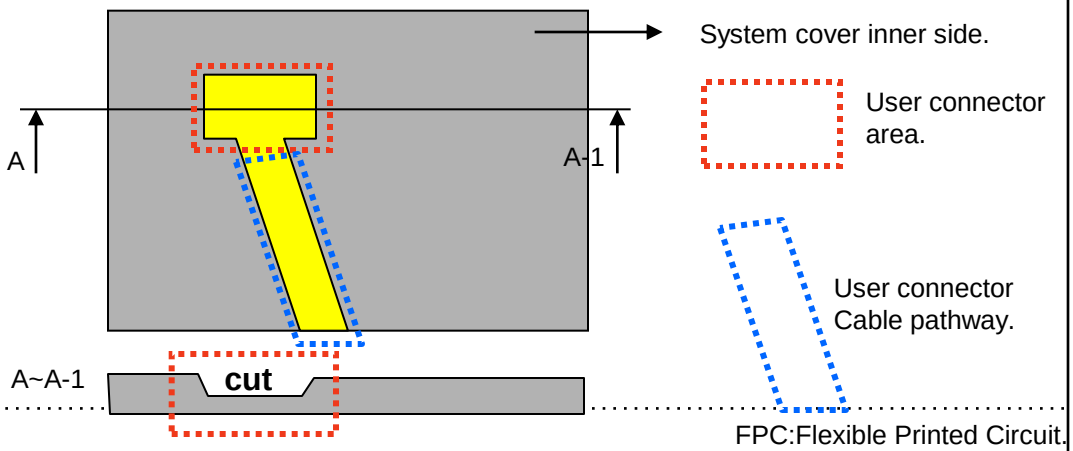
bracket



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, 5 ~ 150Hz, 1.5G, 0.37oct/min 3 axis, 30min/axis
6	Shock test (non-operating)	- No functional or cosmetic defects following a shock to all 6 sides delivering at least 200 G in a half sine pulse no longer than 2 ms to the display module - No functional defects following a shock delivering at least 260 g in a half sine pulse no longer than 2 ms to each of 6 sides. Each of the 6 sides will be shock tested with one each display, for a total of 6 displays
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)
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

b) Box Size : 490mmX393mmX327mm

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
EDID Vendor / Product Version	8	08	ID Manufacture Name LGD	30	00110000
	9	09	ID Manufacture Name	E4	11100100
	10	0A	ID Product Code 0169h	69	01101001
	11	0B	(Hex. LSB first)	01	00000001
	12	0C	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	13	0D	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	14	0E	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	15	0F	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	16	10	Week of Manufacture - Optinal May 3th week : 21	15	00010101
	17	11	Year of Manufacture 2008 years	12	00010010
	18	12	EDID structure version # = 1	01	00000001
	19	13	EDID revision # = 4	04	00000100
Display Parameters	20	14	Video input Definition = Input is a Digital Video signal Interface , Colo Bit Depth : 8 Bits per Primary Color , Digital Video Interface Standard Supported: Digital Interface is not defined	A0	10100000
	21	15	Horizontal Screen Size (Rounded cm) = 37 cm	25	00100101
	22	16	Vertical Screen Size (Rounded cm) = 23 cm	17	00010111
	23	17	Display Transfer Characteristic (Gamma) = (gamma*100)-100 = Example:(2.2*100)-100=120	78	01111000
	24	18	Feature Support [Display Power Management(DPM) : No_stanby,No_suspend, No_Active Off/Very Low Power., Display Color Type : RGB color display. ,Other Feature Support Flags : No_sRGB, Preferred Timing Mode, No_Display is continuous frequency (Multi-mode_Base EDID and Extension Block).]	0A	00001010
Panel Color Coordinates	25	19	Red/Green Low Bits (RxRy/GxGy)	EF	11101111
	26	1A	Blue/White Low Bits (BxBy/WxWy)	95	10010101
	27	1B	Red X Rx = 0.640	A3	10100011
	28	1C	Red Y Ry = 0.330	54	01010100
	29	1D	Green X Gx = 0.210	35	00110101
	30	1E	Green Y Gy = 0.710	B5	10110101
	31	1F	Blue X Bx = 0.150	26	00100110
	32	20	Blue Y By = 0.060	0F	00001111
	33	21	White X Wx = 0.313	50	01010000
	34	22	White Y Wy = 0.329	54	01010100
Established Timings	35	23	Established timing 1 (Optional_00h if not used)	00	00000000
	36	24	Established timing 2 (Optional_00h if not used)	00	00000000
	37	25	Manufacturer's timings (Optional_00h if not used)	00	00000000
Standard Timing ID	38	26	Standard timing ID1 (Optional_01h if not used)	01	00000001
	39	27	Standard timing ID1 (Optional_01h if not used)	01	00000001
	40	28	Standard timing ID2 (Optional_01h if not used)	01	00000001
	41	29	Standard timing ID2 (Optional_01h if not used)	01	00000001
	42	2A	Standard timing ID3 (Optional_01h if not used)	01	00000001
	43	2B	Standard timing ID3 (Optional_01h if not used)	01	00000001
	44	2C	Standard timing ID4 (Optional_01h if not used)	01	00000001
	45	2D	Standard timing ID4 (Optional_01h if not used)	01	00000001
	46	2E	Standard timing ID5 (Optional_01h if not used)	01	00000001
	47	2F	Standard timing ID5 (Optional_01h if not used)	01	00000001
	48	30	Standard timing ID6 (Optional_01h if not used)	01	00000001
	49	31	Standard timing ID6 (Optional_01h if not used)	01	00000001
	50	32	Standard timing ID7 (Optional_01h if not used)	01	00000001
	51	33	Standard timing ID7 (Optional_01h if not used)	01	00000001
	52	34	Standard timing ID8 (Optional_01h if not used)	01	00000001
	53	35	Standard timing ID8 (Optional_01h if not used)	01	00000001

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) 154 MHz	**28**	00101000
	55	**37**	Pixel Clock/10,000 (MSB)	**3C**	00111100
	56	**38**	Horizontal Active (HA) (lower 8 bits) 1920 Pix	**80**	10000000
	57	**39**	Horizontal Blanking (HB) (lower 8 bits) 160 Pi	**A0**	10100000
	58	**3A**	Horizontal Active / Horizontal Blanking(HA HB) (upper 4:4bits)	**70**	01110000
	59	**3B**	Vertical Avtive (VA) 1200	**B0**	10110000
	60	**3C**	Vertical Blanking (VB) (DE Blanking typ.for DE only panels) 35 Lin	**23**	00100011
	61	**3D**	Vertical Active / Vertical Blanking (VA VB) (upper 4:4bits)	**40**	01000000
	62	**3E**	Horizontal Front Porch in pixels (HF) (lower 8 bits)48 Pixels	**30**	00110000
	63	**3F**	Horizontal Sync Pulse Width in pixels (HS) (lower 8 bits) 32 Pixel	**20**	00100000
	64	**40**	Vertical Front Porch in lines (VF) (lower 4 bits) : Vertical Sync Pluse Width in lines (VS) (l	**36**	00110110
	65	**41**	Horizontal Front Porch/ Sync Pulse Width/ Vertical Front Porch/ Sync Pulse Width (up	**00**	00000000
	66	**42**	Horizontal Vedio Image Size (mm) (lower 8 bits) 367 m	**6F**	01101111
	67	**43**	Vertical Vedio Image Size (mm) (lower 8 bits) 230 n	**E6**	11100110
	68	**44**	Horizontal Image Size / Vertical Image Size (upper 4 bits)	**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 (outside of V-sync)]See the EDID Format	**19**	00011001
Timing Descriptor #2	72	**48**	Flag	**00**	00000000
	73	**49**	Flag	**00**	00000000
	74	**4A**	Flag	**00**	00000000
	75	**4B**	Data Type Tag (Descriptor Defined by manufacturer)	**00**	00000000
	76	**4C**	Flag	**00**	00000000
	77	**4D**	Descriptor Defined by manufacturer	**00**	00000000
	78	**4E**	Descriptor Defined by manufacturer	**00**	00000000
	79	**4F**	Descriptor Defined by manufacturer	**00**	00000000
	80	**50**	Descriptor Defined by manufacturer	**00**	00000000
	81	**51**	Descriptor Defined by manufacturer	**00**	00000000
	82	**52**	Descriptor Defined by manufacturer	**00**	00000000
	83	**53**	Descriptor Defined by manufacturer	**00**	00000000
	84	**54**	Descriptor Defined by manufacturer	**00**	00000000
	85	**55**	Descriptor Defined by manufacturer	**00**	00000000
	86	**56**	Descriptor Defined by manufacturer	**00**	00000000
	87	**57**	Descriptor Defined by manufacturer	**00**	00000000
	88	**58**	Descriptor Defined by manufacturer	**00**	00000000
	89	**59**	Descriptor Defined by manufacturer	**00**	00000000
Timing Descriptor #3	90	**5A**	Flag	**00**	00000000
	91	**5B**	Flag	**00**	00000000
	92	**5C**	Flag	**00**	00000000
	93	**5D**	Data Type Tag (Alphanumeric Data String (ASCII String))	**FE**	11111110
	94	**5E**	Flag	**00**	00000000
	95	**5F**	Alphanumeric Data String (ASCII String)	**4C**	01001100
	96	**60**	Alphanumeric Data String (ASCII String)	**47**	01000111
	97	**61**	Alphanumeric Data String (ASCII String)	**20**	00100000
	98	**62**	Alphanumeric Data String (ASCII String)	**44**	01000100
	99	**63**	Alphanumeric Data String (ASCII String)	**69**	01101001
	100	**64**	Alphanumeric Data String (ASCII String)	**73**	01110011
	101	**65**	Alphanumeric Data String (ASCII String)	**70**	01110000
	102	**66**	Alphanumeric Data String (ASCII String)	**6C**	01101100
	103	**67**	Alphanumeric Data String (ASCII String)	**61**	01100001
	104	**68**	Alphanumeric Data String (ASCII String)	**79**	01111001
	105	**69**	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCⅡ code 0Ah,set remaining cha	**0A**	00001010
	106	**6A**	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCⅡ code 0Ah,set remaining cha	**20**	00100000
	107	**6B**	Manufacturer P/N(If<13 char--> 0Ah, then terminate with ASCⅡ code 0Ah,set remaining cha	**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 (Display Product Name, stored as ASCII)		FC	11111100
	112	70	Flag		00	00000000
	113	71	Display Product Name, stored as ASCII	L	4C	01001100
	114	72	Display Product Name, stored as ASCII	P	50	01010000
	115	73	Display Product Name, stored as ASCII	1	31	00110001
	116	74	Display Product Name, stored as ASCII	7	37	00110111
	117	75	Display Product Name, stored as ASCII	1	31	00110001
	118	76	Display Product Name, stored as ASCII	W	57	01010111
	119	77	Display Product Name, stored as ASCII	U	55	01010101
	120	78	Display Product Name, stored as ASCII	5	35	00110101
	121	79	Display Product Name, stored as ASCII	-	2D	00101101
	122	7A	Display Product Name, stored as ASCII	T	54	01010100
	123	7B	Display Product Name, stored as ASCII	L	4C	01001100
	124	7C	Display Product Name, stored as ASCII	B	42	01000010
	125	7D	Display Product Name, stored as ASCII	1	31	00110001
Chec	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)		82	10000010