SPECIFICATION
FOR
APPROVAL

(   ) Preliminary Specification
(◆) Final Specification

Title	15.4" WSXGA+ TFT LCD

BUYER	DELL
MODEL	

SUPPLIER	LG.Philips LCD CO., Ltd.
*MODEL	LP154W02
SUFFIX	B1K7

*When you obtain standard approval,
 please use the above model name without suffix

SIGNATURE	DATE
_____ / _____	_____
_____ / _____	_____
_____ / _____	_____

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	Signature
J. H. Lee / S.Manager	_____
REVIEWED BY	
K. K. Jang / Manager	_____
PREPARED BY	
Y.S. Ha / Engineer	_____

Product Engineering Dept.
LG. Philips LCD Co., Ltd

Product Specification

RECORDS OF REVISIONS

| Revision No	Revision Date	Page	Description	EDID ver
0.0	Sep.09. 2005	-	First Draft	0.0
1.0	Jan.12. 2006	-	EDID Change (Luminance of SMBUS Step : E4→FF)	0.1

LG.PHILIPS LCD

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1. General Description

 The LP154W02(B1K7) is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element.
It is a transmissive type display operating in the normally white mode. This TFT-LCD has 15.4 inches diagonally measured active display area with WSXGA+ resolution(1680 vertical by 1050 horizontal pixel array) Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 6-bit gray scale signal for each dot, thus, presenting a palette of more than 262,144 colors.
 The LP154W02(B1K7) has been designed to apply the interface method that enables low power, high speed, low EMI. Flat Link must be used as a LVDS(Low Voltage Differential Signaling) chip.
 The LP154W02(B1K7) is intended to support applications where thin thickness, low power are critical factors and graphic display are important. In combination with the vertical arrangement of the sub-pixels, the LP154W02(B1K7) characteristics provide an excellent flat display for office automation products such as Notebook PC.
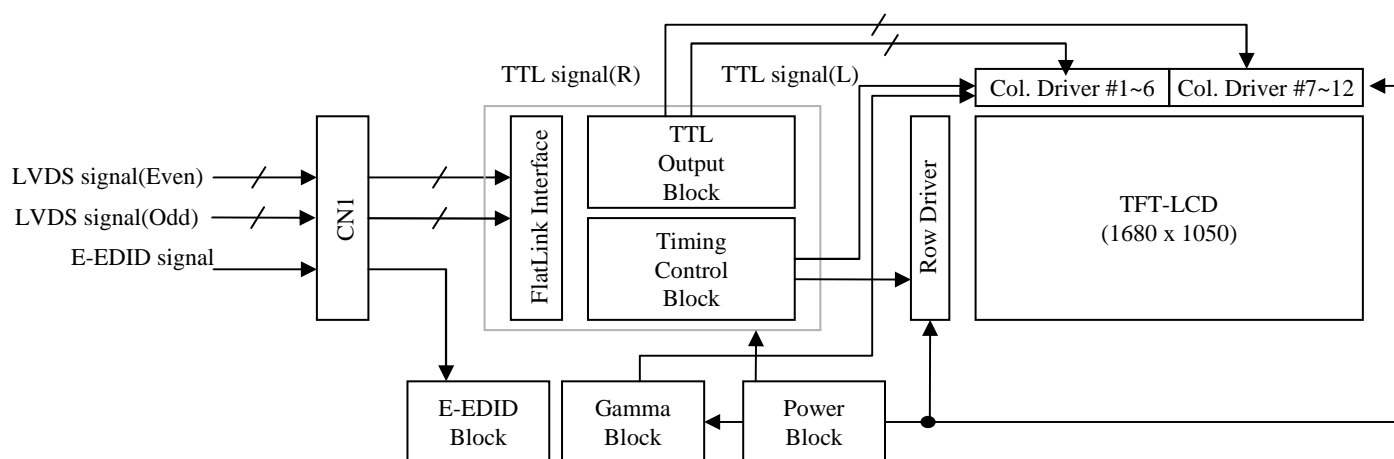
General Features

|	
Active screen size	15.4 inches diagonal
Outline Dimension	344.0(H)[typ.] x 222.0(V)[typ.] x 6.5(D) mm[Max.]
Pixel Pitch	0.19725 mm x 0.19725mm
Pixel format	1680 horiz. By 1050 vert. Pixels RGB stripes arrangement
Color depth	6-bit, 262,144 colors
Luminance, white	185 cd/m^2(typ.), 5p average
Power Consumption	6.06 Watt (Typ.)
Weight	575 (Max.) With inverter
Display operating mode	Transmissive mode, normally white
Surface treatments	Glare treatment of the front polarizer

2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	symbol	Values		Units	Notes
		Min.	Max.		
Power Input Voltage	V_{CC}	-0.3	4.0	Vdc	At $25 \pm 5°C$
Operating Temperature	T_{OP}	0	50	°C	1
Storage Temperature	T_{ST}	-20	60	°C	1
Operating Ambient Humidity	H_{OP}	10	90	%RH	1
Storage Humidity	H_{ST}	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.
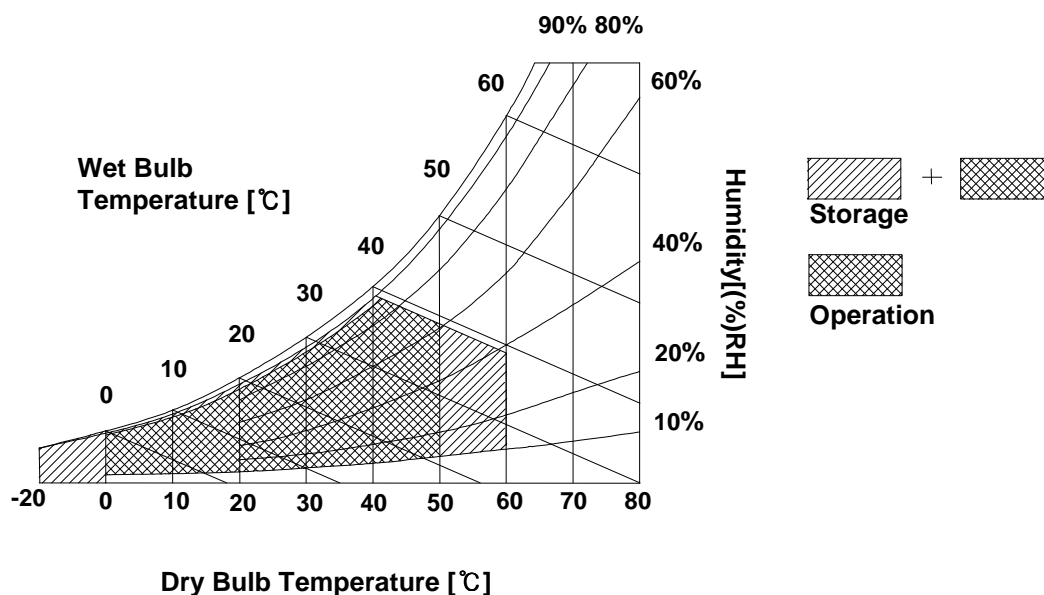
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3. Electrical Specifications

3-1. Electrical Characteristics

The LP154W02(B1K7) 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 CCFL, is typically generated by an inverter. The inverter is an external 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}	-	510	590	mA	1
Power Consumption	Pc	-	1.68	1.95	Watt	1
Differential Impedance	Zm	90	100	110	Ohm	2
LAMP :						
Operating Voltage	V_{BL}	880 (2mA)	675 (6.5mA)	660 (7mA)	V_{RMS}	3
Operating Current	I_{BL}	2	6.5	7	mA_{RMS}	4
Power Consumption	P_{BL}	-	4.38	4.62		9
Operating Frequency	f_{BL}	40	60	80	kHz	7
Discharge Stabilization Time	Ts	-	-	3	Min	5
Life Time		10,000	-	-	Hrs	6
Established Starting Voltage at 25℃ at 0 ℃	Vs			1200 1500	V_{RMS} V_{RMS}	8

Note)
1. The specified 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 variance of the voltage is ± 10%.
4. The typical operating current is for the typical surface luminance (L_{WH}) in optical characteristics.
5. Define the brightness of the lamp after being lighted for 5 minutes as 100%, Ts is the time required for the brightness of the center of the lamp to be not less than 95%.
6. The life time is determined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current.
7. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform.(Asymmetrical ratio is less than 10%) Please do not use the inverter which has asymmetrical voltage and asymmetrical current and spike wave.
   Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
8. The voltage above VS should be applied to the lamps for more than 1 second for start-up. Otherwise, the lamps may not be turned on. The used lamp current is the lamp typical current.
9. The lamp power consumption shown above does not include loss of external inverter.
   The applied lamp current is a typical one.

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Note)
10. Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp, are following.
It shall help increase the lamp lifetime and reduce leakage current.
    a. The asymmetry rate of the inverter waveform should be less than 10%.
    b. The distortion rate of the waveform should be within √2 ±10%.
      * Inverter output waveform had better be more similar to ideal sine wave.
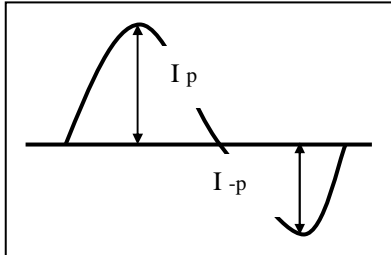
* Asymmetry rate:

$$| I_p - I_{-p} | / I_{rms} * 100\%$$

* Distortion rate

$$I_p \text{ (or } I_{-p}) / I_{rms}$$

※ Do not attach a conducting tape to lamp connecting wire.
If the lamp wire attach to a conducting tape, TFT-LCD Module has a low luminance and the inverter has abnormal action. Because leakage current is occurred between lamp wire and conducting tape.

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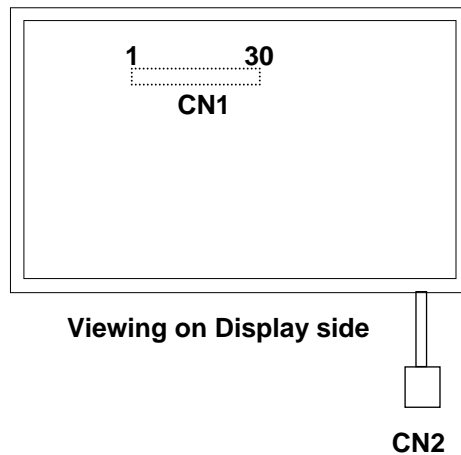
3-2. Interface Connections

Interface chip must be used FlatLink, part No. THC63LVDF823A(Transmitter made by Thine Inc or equivalence.

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

The electronics interface connector is a model FI-XB30SRL-HF11 manufactured by JAE or equivalent.

The pin configuration for the connector is shown in the table below.

Table 3. MODULE CONNECTOR PIN CONFIGURATION(LVDS)

Pin	Symbol	Description	Notes
1	GND	Ground	1. Interface chips
2	Vcc	Power(3.3V)	1.1 LCD : KZ4E053G11(LCD Controller)
3	Vcc	Power(3.3V)	including LVDS Receiver
4	VEDID	DDC 3.3V Power	1.2 System : THC63LVD823 or equivalent
5	NC	No connect	*Pin to Pin compatible with TI LVDS
6	CLKEDID	DDC clock	
7	DATAEDID	DDC data	2. Connector
8	Odd_A1M	Differential Signal	2.1 LCD : FI-XB30SRL-HF11,JAE or equivalent
9	Odd_A1P	Differential Signal	2.2 Mating : FI-X30M or equivalent.
10	GND	Ground	2.3 Connector pin arrangement
11	Odd_A2M	Differential Signal	
12	Odd_A2P	Differential Signal	
13	GND	Ground	
14	Odd_A3M	Differential Signal	
15	Odd_A3P	Differential Signal	
16	GND	Ground	
17	Odd_CLKM	Differential Signal	
18	Odd_CLKP	Differential Signal	
19	GND	Ground	
20	Even_A1M	Differential Signal	
21	Even_A1P	Differential Signal	
22	GND	Ground	
23	Even_A2M	Differential Signal	
24	Even_A2P	Differential Signal	
25	GND	Ground	
26	Even_A3M	Differential Signal	
27	Even_A3P	Differential Signal	
28	GND	Ground	
29	Even_CLKM	Differential Signal	
30	Even_CLKP	Differential Signal	

1   30

CN1

Viewing on Display side

CN2

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The backlight interface connector is a model BHSR-02VS-1, manufactured by JST. The mating connector part number is SM02B-BHSS-1 or equivalent.

The pin configuration for the connector is shown in the table below.

Table 4. BACKLIGHT CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Notes
1	HV	Power supply for lamp (High voltage side)	1
2	LV	Power supply for lamp (Low voltage side)	1

Notes : 1. The high voltage side terminal is colored pink. The low voltage side terminal is Green.

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3-3. Signal Timing Specifications

This is the signal timing required at the input of the LVDS Transmitter. All of the interface signal timing should be satisfied with the following specifications for its proper operation.

Table 6. Timing Table

ITEM		SYMBOL	MIN	TYP.	MAX.	UNIT	NOTES
Dclk	Frequency	f_{CLK}	55	61	69	MHz	
	Width-Low	t_{WCL}	3	-	-	ns	
	Width-High	t_{WCH}	3	-	-	ns	
	Duty	D	0.4	0.5	0.6		$D= t_{CLKH}/t_{CLK}$
Hsync	Period	t_{HP}	864	952	1288	t_{HP}	
	Width	t_{WH}	8	-	-		
Vsync	Period	t_{VP}	1057	1066	1082	t_{HP}	
	Width active	t_{WV}	1		-	t_{HP}	
DE	Set up Time	t_{SI}	3	-	-	ns	For Dclk
	Hold Time	t_{HI}	3	-	-		
	Horizontal Back Porch	t_{HBP}	8	-	-	t_{CLK}	
	Horizontal Front Porch	t_{HFP}	8	-	-		
	Vertical Back Porch	t_{VBP}	5	-	-	t_{HP}	
	Vertical Front Porch	t_{VFP}	1	-	-		
DATA	Set up Time	t_{SD}	3	-	-	ns	For Dclk
	Hold Time	t_{HD}	3	-	-		
Input Voltage	High	t_{rH}	0.7Vcc				
	Low	t_{rL}			0.3Vcc		

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3-4. Signal Timing Waveforms

Dclk, Hsync, Vsync, DE, DATA

0.7Vcc

0.3Vcc
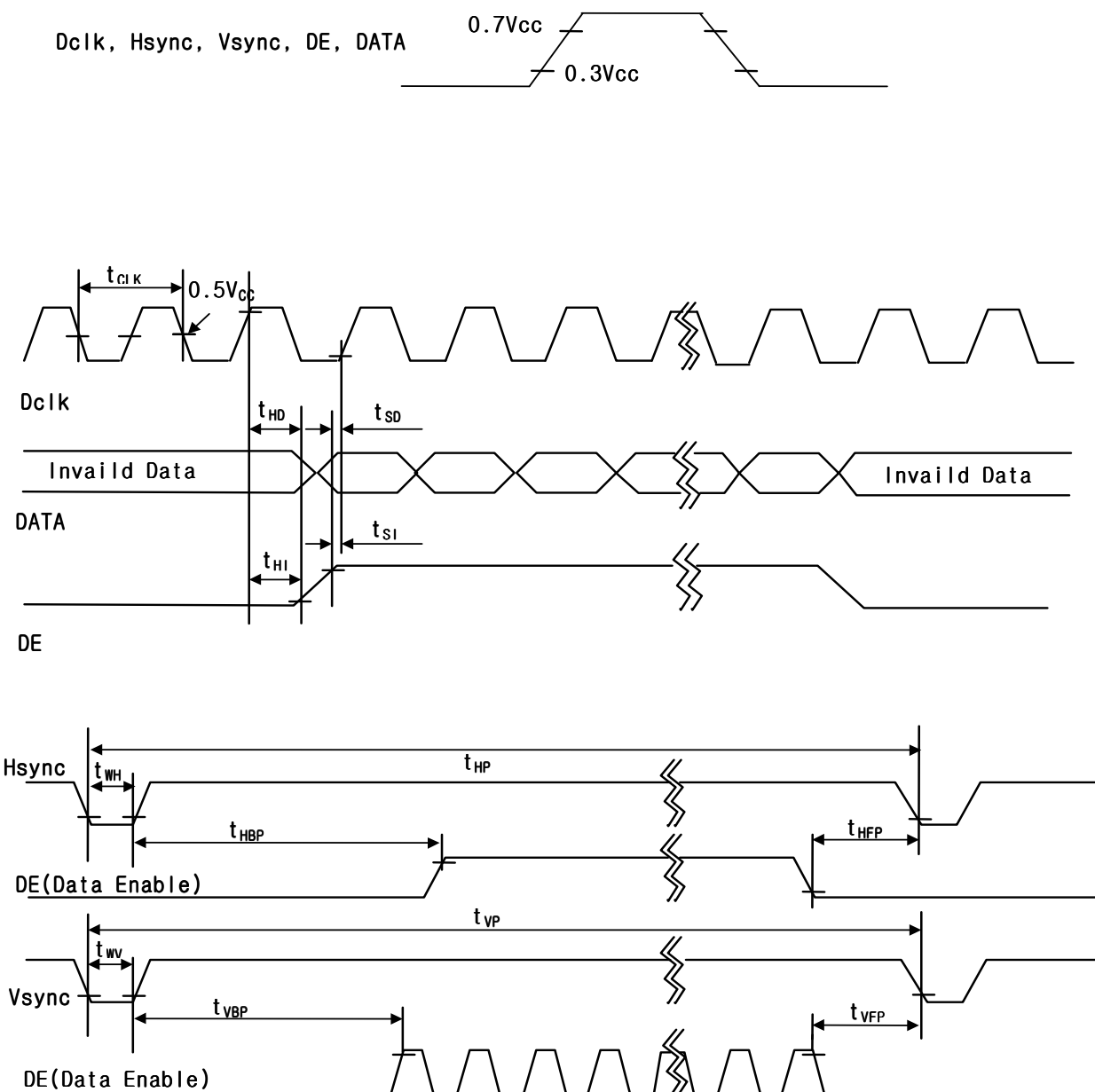
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3-5. Color Input Data Reference

The brightness of each primary color(red,green and blue) is based on the 6-bit gray scale data input for the color ; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 7. COLOR DATA REFERENCE

Color		Red MSB					LSB	Green MSB					LSB	Blue MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	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(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	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) Dark	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(02)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	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) Bright	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(00)Dark	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(02)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	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)Bright	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue(00) Dark	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(02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63) Bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

3-6. Power Sequence
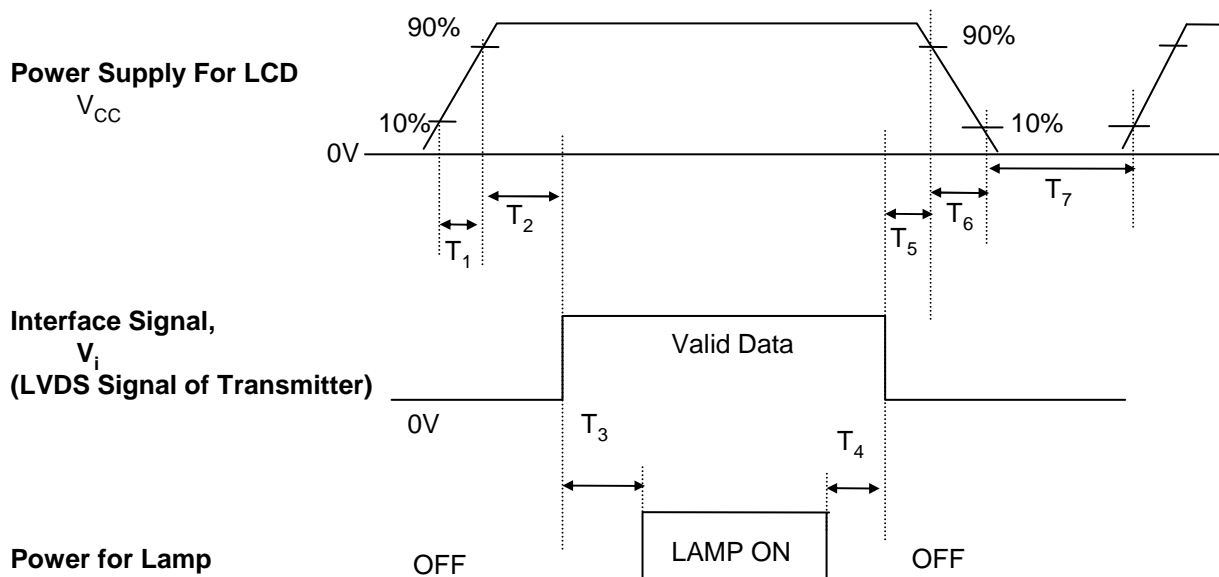
Parameter	Values			Units
	Min.	Typ.	Max.	
T_1	-	-	10	ms
T_2	0	-	50	ms
T_3	200	-	-	ms
T_4	200	-	-	ms
T_5	0	-	50	ms
T_6	-	-	10	ms
T_7	400	-	-	ms

Notes : 1. **Please avoid floating state of interface signal at invalid period.**
　　　　　2. **When the interface signal is invalid, be sure to pull down the power supply for LCD V$_{CC}$ to 0V.**
　　　　　3. **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

Optical Stage(x,y)

LCD Module

Field = 1 °

Pritchard 880 or equivalent

500mm
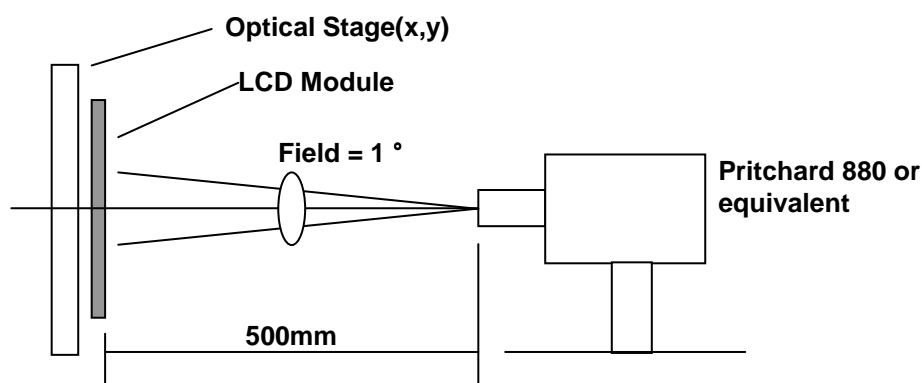
(Ta=25 °C, V_{CC}=3.3V, f_V=60Hz
Dclk=60.9MHz, I_{BL}=6.0mA)

Table 8. OPTICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	300	-	-		1
Surface Luminance, white	L_{WH}	170	185		cd/m^2	2
Luminance % uniformity	δ_{WHITE}	-	1.8	2.0		3
Response Time	Tr					4
Rise Time + Decay Time	$Tr_R + Tr_D$	-	25	35	ms	
CIE Color Coordinates						
Red	XR	0.554	0.584	0.614		±0.03
	YR	0.301	0.331	0.361		
Green	XG	0.293	0.323	0.353		
	YG	0.517	0.547	0.577		
Blue	XB	0.124	0.154	0.184		
	YB	0.109	0.139	0.169		
White	XW	0.283	0.313	0.343		
	YW	0.299	0.329	0.359		
Viewing Angle						5
x axis, right(φ=0°)	θr	65				
x axis, left (φ=180°)	θl	65				
y axis, up (φ=90°)	θu	50			degree	
y axis, down (φ=270°)	θd	50				
Gray Scale	-	-	2.2	-		6

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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_{BL}= 6.5mA, $L_{WH=}$185cd/m^2(typ.)

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   * fV=60Hz

Gray Level	Luminance(%) (Typ.)
L0	0.12
L7	0.60
L15	3.85
L23	10.0
L31	19.0
L39	32.0
L47	50.3
L55	74.0
L63	100

FIG. 2 Luminance

<measuring point for luminance variation/surface luminance>

A : H/4 mm
B : V/4 mm
H : 331.38 mm
V : 207.11 mm
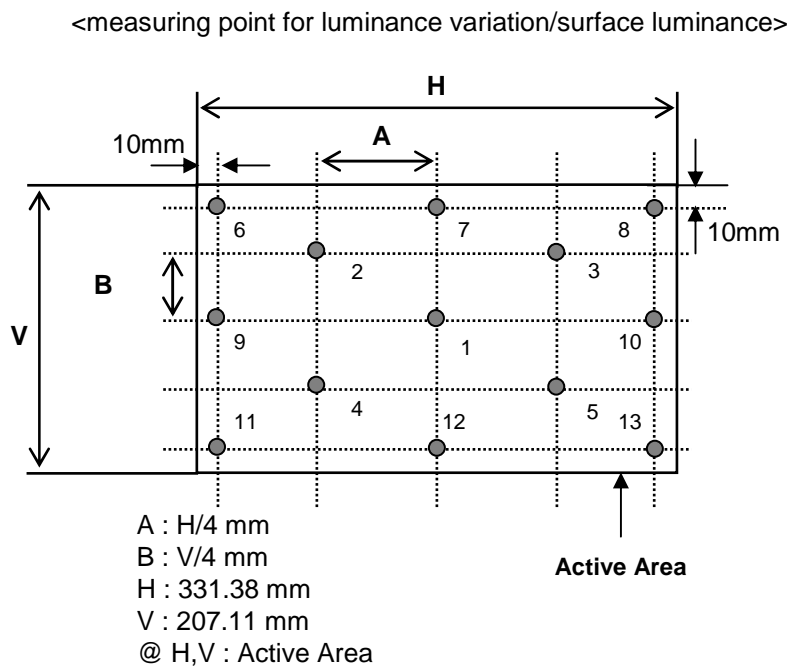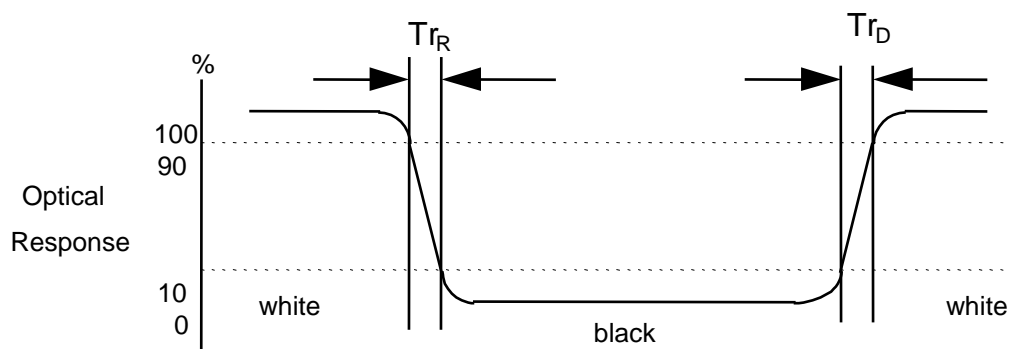@ H,V : Active Area

Active Area

FIG. 3 Response Time
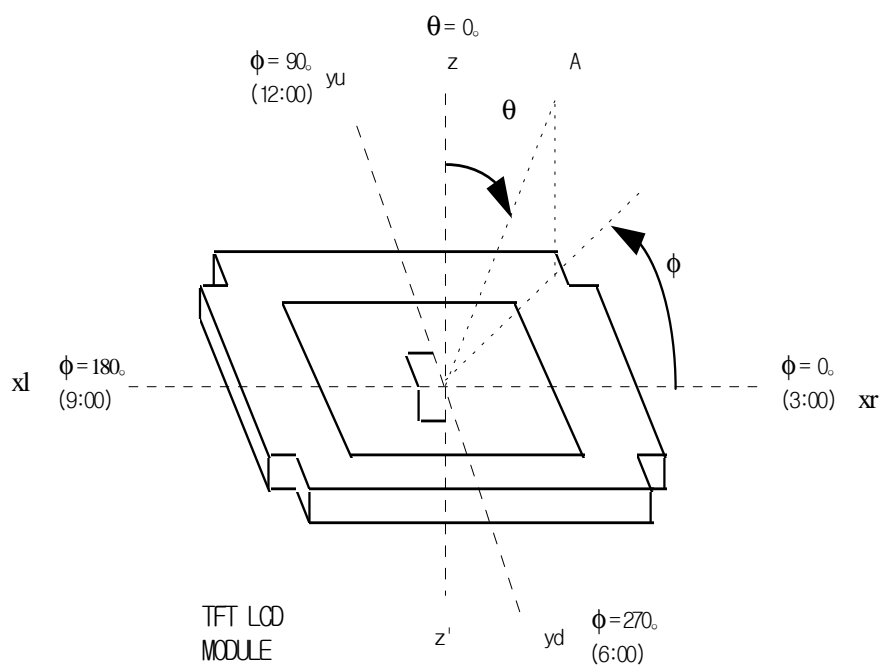
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

Tr_R

Tr_D

%

100
90

Optical

Response

10
0

white

black

white

FIG. 4 Viewing angle

<dimension of viewing angle range>

A : Eye of Observer

5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP154W02(B1K7). In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outside dimensions	Horizontal	344.0 ± 0.5mm
	Vertical	222.0 ± 0.5mm
	Depth	6.2㎜(Typ), 6.5㎜(Max)
Bezel area	Horizontal	335.0± 0.5mm
	Vertical	210.7 ± 0.5mm
Active display area	Horizontal	331.38mm
	Vertical	207.11mm
Weight(approximate)	575(Max),With inverter	
Surface Treatment	Glare treatment of the front polarizer	

Product Specification
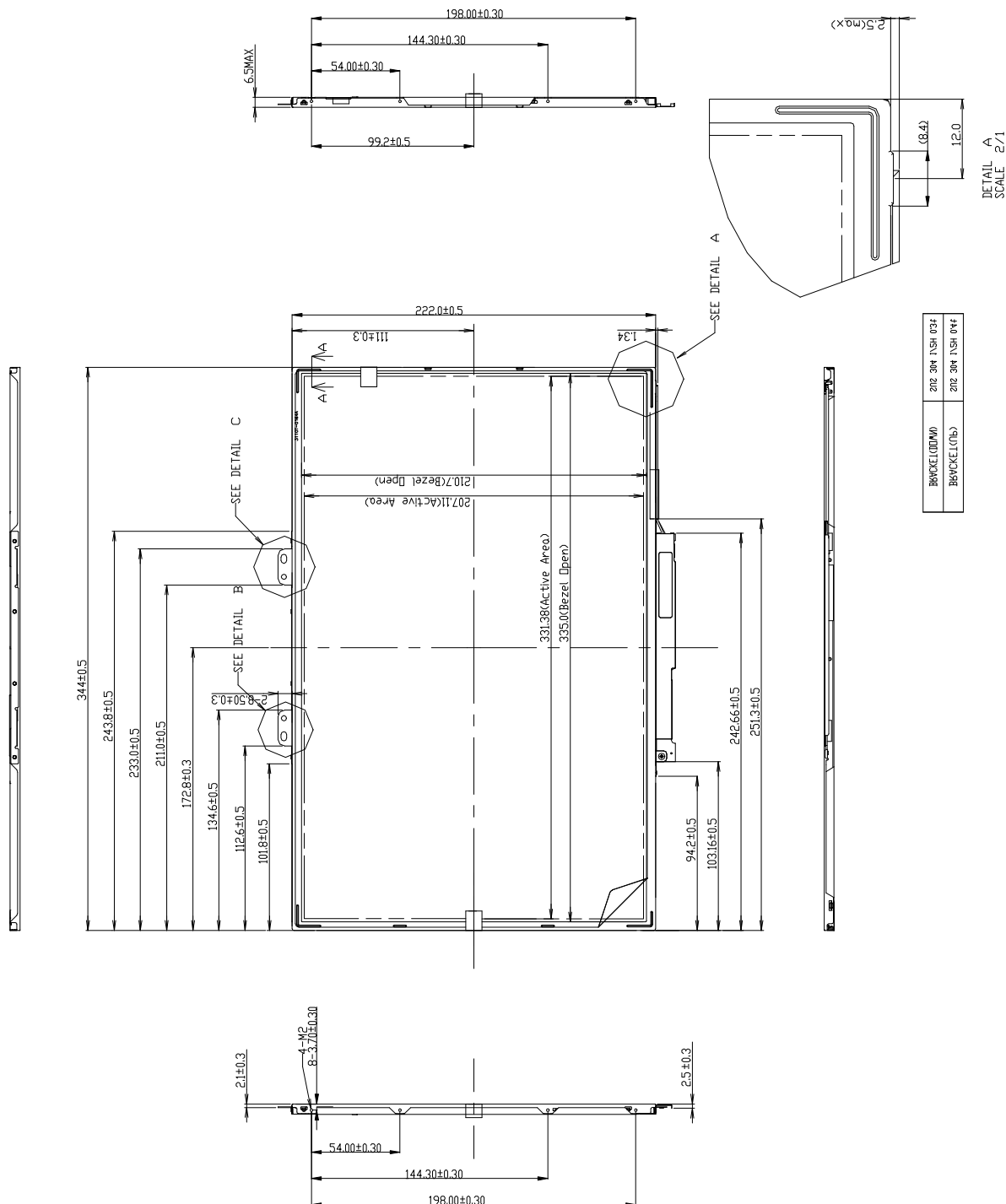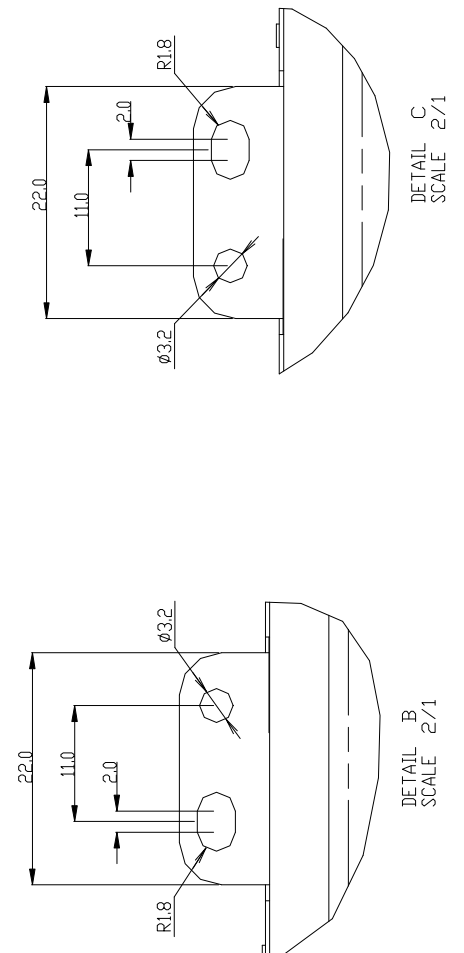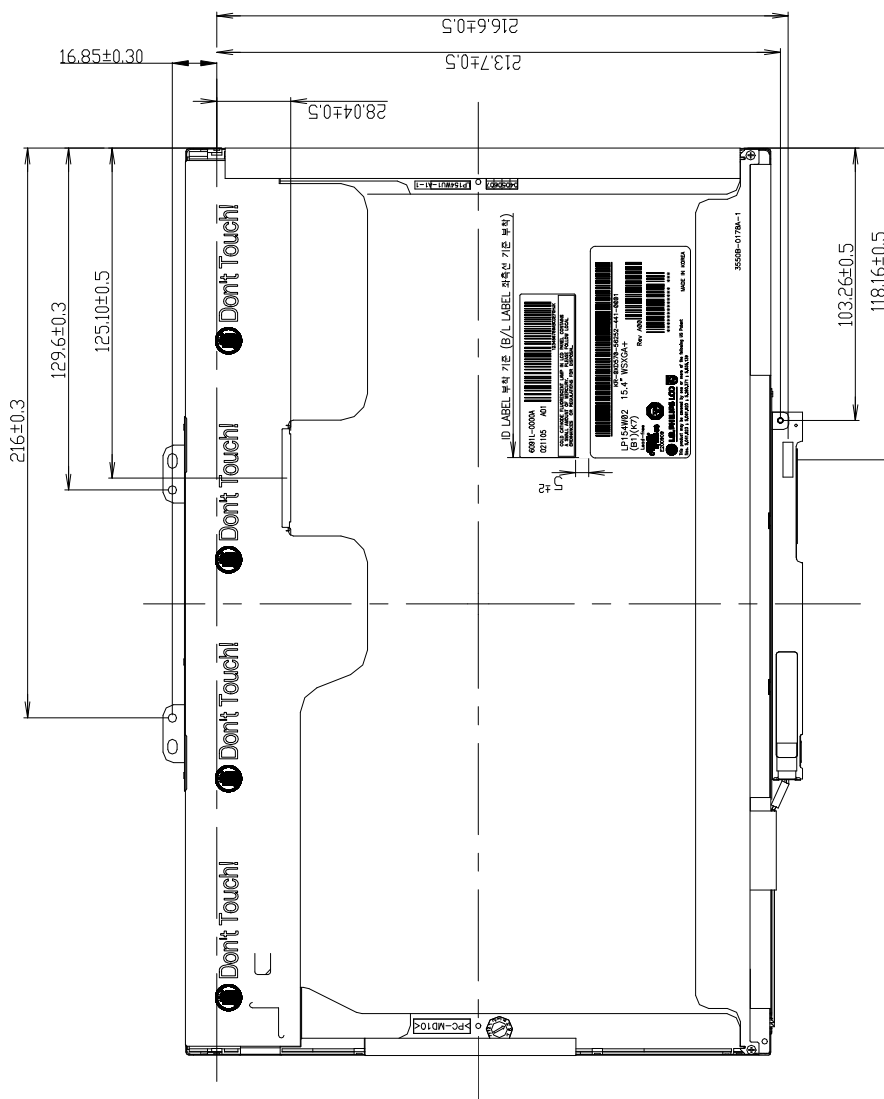
<FRONT VIEW>

Note. unspecified dimensional tolerance are +/-0.5mm

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<REAR VIEW>
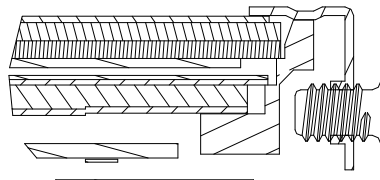

Note. unspecified dimensional tolerance are +/-0.5mm

<DETAIL DESCRIPTION OF SIDE MOUNTING SCREW>

SECTION E-E
SCALE 5/1

*SCREW(8ea) TORQUE : 2kgf.cm max
*Mounting SCREW Depth : 2.5mm max

Note. unspecified dimensional tolerance are +/-0.5mm

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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 face (i.e. run 180G 2ms for all six faces)
7	Altitude operating storage / shipment	 0 - 10,000 feet(3,048m) 0 - 40,000 feet(12,192m)

{ 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.

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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)

8-1. 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 : FACTORY CODE
G : ASSEMBLY CODE   H ~ 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

3. FACTORY CODE

Factory Code	LPL Gumi	LPL Nanjing	HEESUNG
Mark	K	C	D

4. SERIAL NO.

| Mark | 100001~199999, 200001~299999, 300001~399999, …., A00001~A99999, ….., Z00001~Z99999 |

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 : 10 pcs

Box Size : 441mm ×373mm × 348mm

Product Specification

9. PRECAUTIONS

Please pay attention to the following 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 a 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 describe 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 determined 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 :
   $V=\pm200mV$(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 (hex)	Field Name and Comments	Value (hex)	Value (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
	7	Header	00	00000000
Vendor / Product EDID Version	8	EISA manufacture code = 3 Character ID=LPL	32	00110010
	9	EISA manufacture code (Compressed ASCII)	0C	00001100
	0A	Panel Supplier Reserved – Product Code	00	00000000
	0B	Panel Supplier Reserved – Product Code	00	00000000
	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 =2005	0F	00001111
	12	EDID structure version # = 1	01	00000001
	13	EDID revision # = 3	03	00000011
Display Parameters	14	Video I/P definition = Digital I/P (80h)	80	10000000
	15	Max H image size =33.138cm (Rounded to cm) (33)	21	00100001
	16	Max V image size =20.711 (Rounded to cm) (21)	15	00010101
	17	Display gamma = (gamma ×100)-100 = Example: (2.2 × 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)	BC	10111100
	1A	Blue/White Low bit (BxBy/WxWy)	A5	10100101
	1B	Red X Rx = 0.584	95	10010101
	1C	Red Y Ry = 0.331	54	01010100
	1D	Green X Gx = 0.323	52	01010010
	1E	Green Y Gy = 0.547	8C	10001100
	1F	Blue X Bx = 0.154	27	00100111
	20	Blue Y By = 0.139	23	00100011
	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 (hex)	Field Name and Comments	Value (hex)	Value (binary)
	Timing Descripter #1		
36	Pixel Clock/10,000 122MHz (LSB)	A8	10101000
37	Pixel Clock/10,000 122MHz (MSB)	2F	00101111
38	Horizontal Active = 1680 pixels (lower 8 bits)	90	10010000
39	Horizontal Blanking (Thbp) = 224 pixels (lower 8 bits)	E0	11100000
3A	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	60	01100000
3B	Vertical Active = 1050lines	1A	00011010
3C	Vertical Blanking (Tvbp) = 16 lines (DE Blanking typ. for DE only panels)	10	00010000
3D	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	40	01000000
3E	Horizontal Sync, Offset (Thfp) = 32 pixels	20	00100000
3F	Horizontal Sync, Pulse Width = 64 pixels	40	01000000
40	Vertical Sync, Offset (Tvfp) = 1 lines Sync Width =3 lines	13	00010011
41	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000
42	Horizontal Image Size =331.38 mm(331)	4B	01001011
43	Vertical image Size = 207.11 mm(207)	CF	11001111
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 Descripter #2		
48	Pixel Clock/10,000 122MHz (LSB)	A8	10101000
49	Pixel Clock/10,000 122MHz (MSB)	2F	00101111
4A	Horizontal Active = 1680 pixels (lower 8 bits)	90	10010000
4B	Horizontal Blanking (Thbp) = 224 pixels (lower 8 bits)	E0	11100000
4C	Horizontal Active/Horizontal blanking (Thbp) (upper4:4 bits)	60	01100000
4D	Vertical Active = 1050lines	1A	00011010
4E	Vertical Blanking (Tvbp) = 16 lines (DE Blanking typ. for DE only panels)	10	00010000
4F	Vertical Active : Vertical Blanking (Tvbp) (upper4:4 bits)	40	01000000
50	Horizontal Sync, Offset (Thfp) = 32 pixels	20	00100000
51	Horizontal Sync, Pulse Width = 64 pixels	40	01000000
52	Vertical Sync, Offset (Tvfp) = 1 lines Sync Width =3 lines	13	00010011
53	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000
54	Horizontal Image Size =331.38 mm(331)	4B	01001011
55	Vertical image Size = 207.11 mm(207)	CF	11001111
56	Horizontal Image Size / Vertical image size	10	00010000
57	Horizontal Border = 0 (Zero for Notebook LCD)	00	00000000
58	Vertical Border = 0 (Zero for Notebook LCD)	00	00000000
59	Module "A" Revision = Example: 00, 01, 02, 03, etc.	00	00000000
	Timing Descripter #3 Dell specific information		
5A	Flag	00	00000000
5B	Flag	00	00000000
5C	Flag	00	00000000
5D	Dummy Descriptor	FE	11111110
5E	Flag	00	00000000
5F	Dell P/N 1st Character =X	58	01011000
60	Dell P/N 2nd Character=D	44	01000100
61	Dell P/N 3rd Character=5	35	00110101
62	Dell P/N 4th Character=7	37	00110111
63	Dell P/N 5th Character=0	30	00110000
64	LCD Supplier EEDID Revision # =VER 0.1	01	00000001
65	Manufacturer P/N=1	31	00110001
66	Manufacturer P/N=5	35	00110101
67	Manufacturer P/N=4	34	00110100
68	Manufacturer P/N=W	57	01010111
69	Manufacturer P/N=0	30	00110000
6A	Manufacturer P/N=2	32	00110010
6B	Manufacturer P/N (If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010

Product Specification

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

	Byte (hex)	Field Name and Comments	Value (hex)	Value (binary)
Timing Descripter #4	6C	Flag	00	00000000
	6D	Flag	00	00000000
	6E	Flag	00	00000000
	6F	Data Type Tag:	FE	11111110
	70	Flag	00	00000000
	71	SMBUS Value = 10 nits +/- 10% (5 - point average)	28	00101000
	72	SMBUS Value = 17 nits +/- 10% (5 - point average)	3F	00111111
	73	SMBUS Value = 24 nits +/- 10% (5 - point average)	4E	01001110
	74	SMBUS Value = 30 nits +/- 10% (5 - point average)	58	01011000
	75	SMBUS Value = 60 nits +/- 10% (5 - point average)	80	10000000
	76	SMBUS Value = 110 nits +/- 10% (5 - point average)	AF	10101111
	77	SMBUS Value = 150 nits +/- 10% (5 - point average)	D2	11010010
	78	SMBUS Value = MAX nits (Typically = FFh, XXX nits)	F6	11110110
	79	Number of LVDS receiver chips = '01' or '02'	02	00000010
	7A	BIST Enable: Yes = '01' No = '00'	01	00000001
	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
Checksum	7E	Extension flag (# of optional 128 EDID extension blocks to follow, Typ = 0)	00	00000000
	7F	Checksum (The 1-byte sum of all 128 bytes in this EDID block shall = 0)	FF	11111111