LG.PHILIPS LCD

Product Specification

SPECIFICATION
FOR
APPROVAL

(●) **Preliminary Specification**

(   ) **Final Specification**

Title	4.8"WVGA TFT LCD

Customer	Acer
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LP048WV1
Suffix	TLD1

*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.S.Baek / S.Manager	
REVIEWED BY	
Y.C.Jung / S.Manager	
PREPARED BY	
S.J.Nam / Engineer	
J.H.Kim / Engineer	
Y.S.Kim / Engineer	
J.S.Oh / Engineer	

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

LG.PHILIPS LCD

Product Specification

Contents

Ver. 0.1.	Jan, 26, 2007	2 / 23

LG.PHILIPS LCD

Product Specification

RECORD OF REVISIONS

| Revision No	Revision Date	Page	Description	
0.1	Jan. 26. 2007	-	Final Specification	

Product Specification

1. General Description

The LP048WV1 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 4.8 inches diagonally measured active display area with WVGA resolution(800 horizontal by 480 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 LP048WV1 has been designed to apply the interface method that enables low power, high speed, low EMI.

The LP048WV1 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 LP048WV1 characteristics provide an excellent flat display for office automation products such as UMPC.
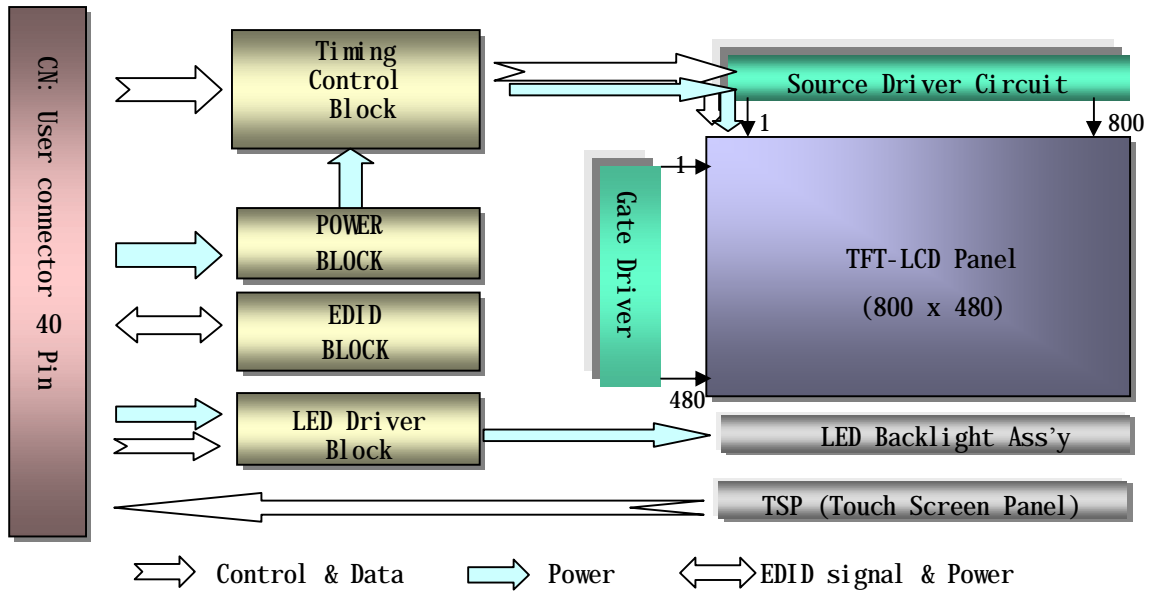
General Features

|	
Active Screen Size	4.8 inches diagonal
Outline Dimension (Typ)	114.65 (H) × 74.7 (V) × 2.9(D) mm w/o TSP, w/o Comp 114.65 (H) × 74.7 (V) × 4.7(D) mm w/o TSP, w Comp 114.65 (H) × 74.7 (V) × 5.85(D) mm w TSP, w Comp
Pixel Pitch	0.12975mmx0.12975mm
Pixel Format	800 horiz. by 480 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Luminance, White	300 cd/m^2(Typ.) , 1 point
Power Consumption	Total 1.3 Watt(Typ.) @ LCM circuit 0.5 Watt(Typ.), B/L input 0. 8 Watt(Typ.)
Weight (Typ)	60g w/o TSP, w Component TBD w TSP, w Component.
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Hard coating(3H) Anti-glare 12% treatment of the front polarizer

LG.PHILIPS LCD

Product Specification

2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values		Units	Notes
		Min	Max		
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.

Dry Bulb Temperature [°C]

LG.PHILIPS LCD
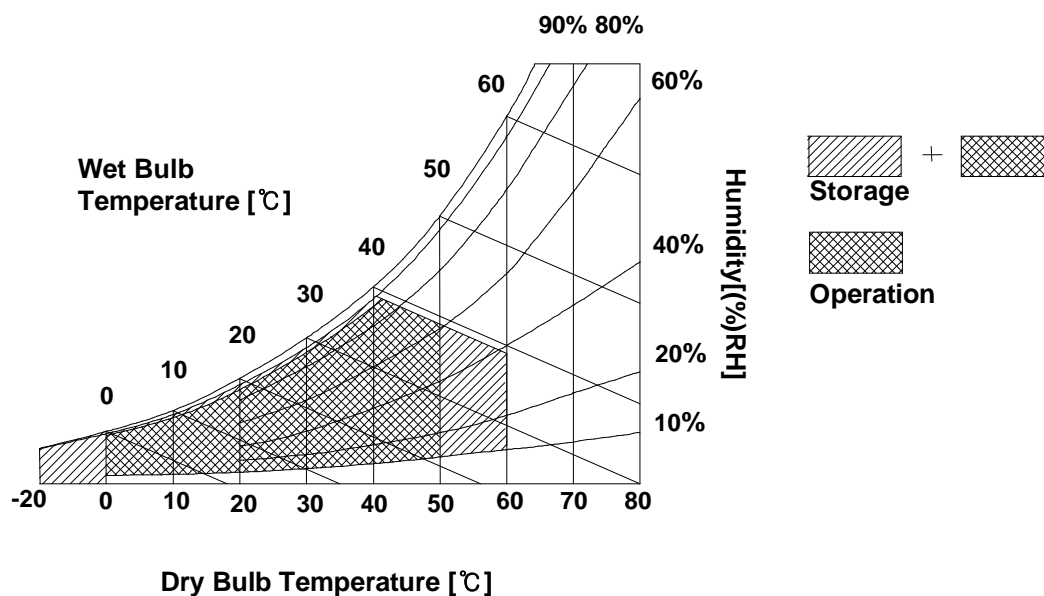
Product Specification

3. Electrical Specifications

3-1. Electrical Characteristics

The LP048WV1 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 a 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}		150	TBD	mA	1
Power Consumption	Pc	-	0.5	TBD	Watt	1
Differential Impedance	Zm	90	100	110	Ohm	2

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.

3-2. Back Light Unit

The edge-lighting type of back light unit consists of 12 LEDs which is connected in parallel.

Table 3 Electrical Characteristics Of Back Light Unit

$(T_a = 25^\circ C)$

Parameter	Symbol	Values			Units	Notes
		Min	Typ.	Max		
LED Current	I_{LED}	-	20	25	mA	1
Power Consumption	P_{LED}	-	770	840	mW	2

Note)
1. The permissible forward current of LED vary with environmental temperature.
2. I_{LED} is 20mA / "1 LED"
3. The LED power consumption shown above does not include loss of LED Driver Block.

Product Specification

3-3. Interface Connections

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

The electronics interface connector is a model FI-JH-40S manufactured by JAE.

Table 4. MODULE CONNECTOR PIN CONFIGURATION (CN)

| Pin	Symbol	Description	Notes
1	GND	Ground	
2	VCC	Power Supply, 3.3V Typ.	
3	VCC	Power Supply, 3.3V Typ.	
4	NC	No Connection	1. Connector
5	R0	Red data (LSB)	2.1 LCD : FI-JH-40S, JAE
6	R1	Red data	2.2 Mating : FI-JH-40C or equivalent.
7	R2	Red data	2.3 Connector pin arrangement
8	R3	Red data	
9	R4	Red data	
10	R5	Red data (MSB)	
11	GND	Ground	
12	G0	Green Data (LSB)	
13	G1	Green Data	
14	G2	Green Data	
15	G3	Green Data	
16	G4	Green Data	[LCD Module Rear View]
17	G5	Green Data (MSB)	
18	GND	Ground	
19	B0	Blue Data (LSB)	
20	B1	Blue Data	
21	B2	Blue Data	
22	B3	Blue Data	
23	B4	Blue Data	
24	B5	Blue Data (MSB)	
25	GND	Ground	
26	HSYNC	Horizontal Sync Signal	
27	VSYNC	Vertical Sync Signal	
28	GND	Ground	
29	CLK	Dot Clock	
30	GND	Ground	
31	VLED	LED Driving circuit power Supply, 3.3V Typ.	
32	VLED	LED Driving circuit power Supply, 3.3V Typ.	
33	GND	Ground	
34	GND	Ground	
35	PWMDimming	LED Brightness Dimming	
36	GND	Ground	
37	X1	X Right Touch Panel	
38	Y1	Y Bottom Touch Panel	
39	X2	X Left Touch Panel	
40	Y2	Y Top Touch Panel	

Product Specification

3-4. Signal Timing Specifications

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

Table 5. TIMING TABLE

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	28.0	29.5	31.0	MHz	
DE (Data Enable)	Active Data	t_{DE}	800	800	800	t_{CLK}	
Blank (Blank Period)	Blank	t_{BLK}	24	192	400	t_{CLK}	

3-5. Signal Timing Waveforms

LG.PHILIPS LCD
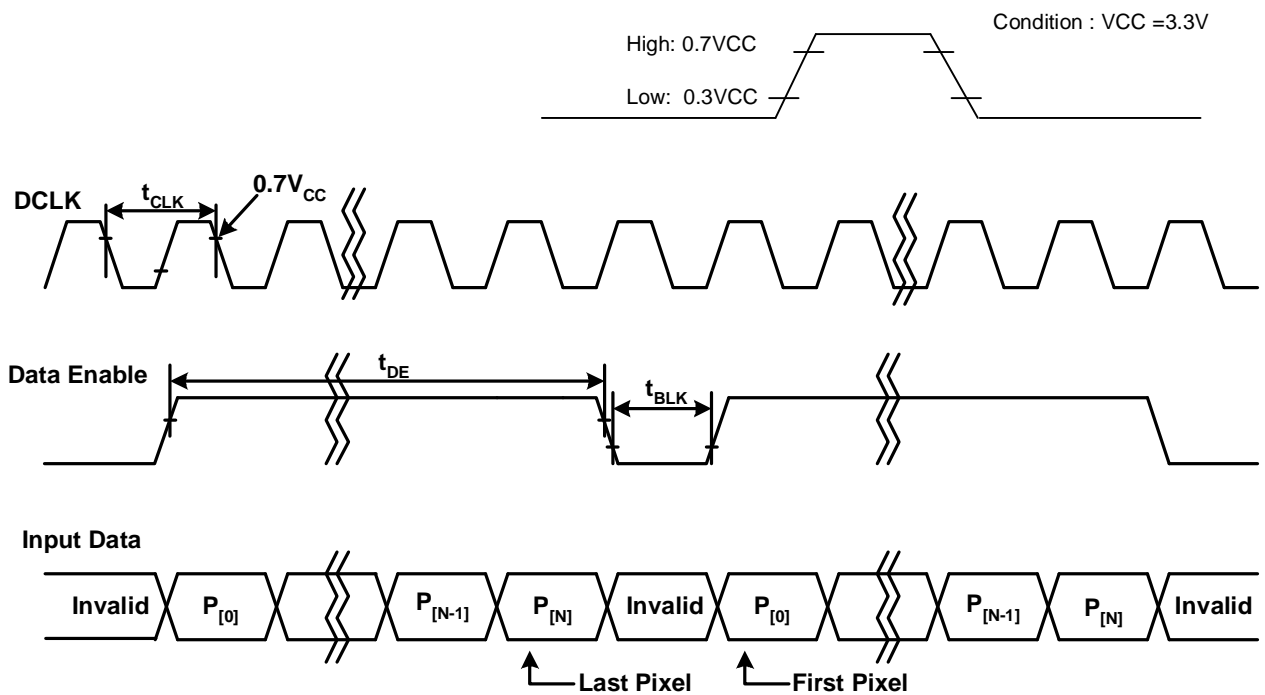
Product Specification

3-6. Color Input Data Reference

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

Table 6. COLOR DATA REFERENCE

Color		Input Color Data																			
		RED						GREEN						BLUE						
		MSB					LSB	MSB					LSB	MSB					LSB
		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

Product Specification

3-7. Power Sequence
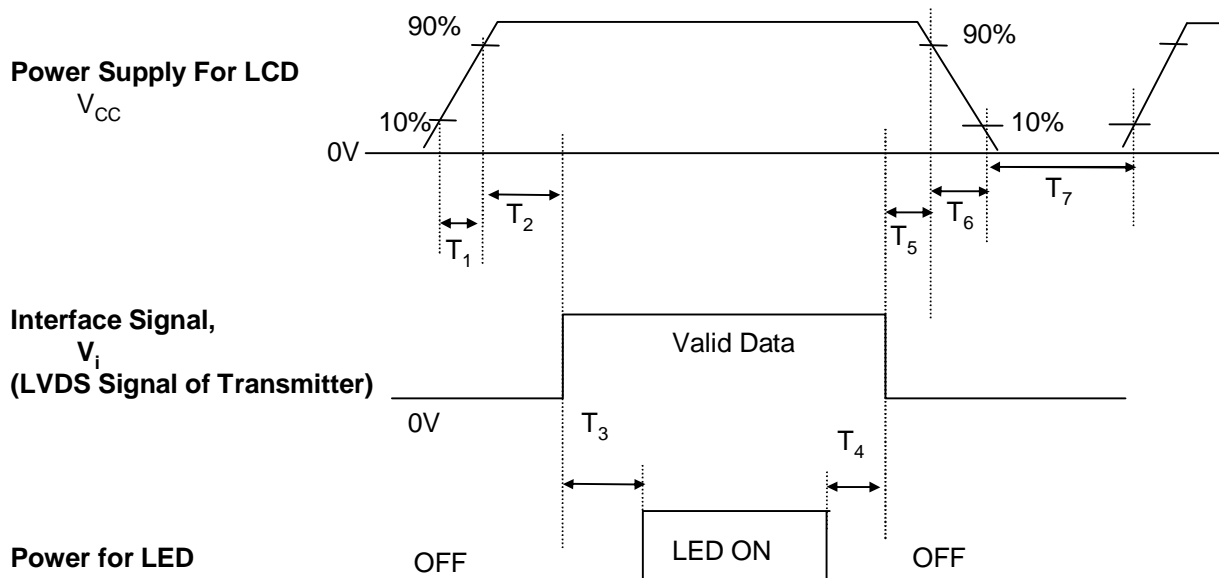
Table 7. POWER SEQUENCE TABLE

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. 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 VCC to 0V.
3. LED power must be turn on after power supply for LCD and interface signal are valid.

4. Touch Screen Panel Specifications

4-1. Electrical Characteristics : TBD

4-2. Mechanical & Reliability Characteristics : TBD

Product Specification

5. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 5 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.

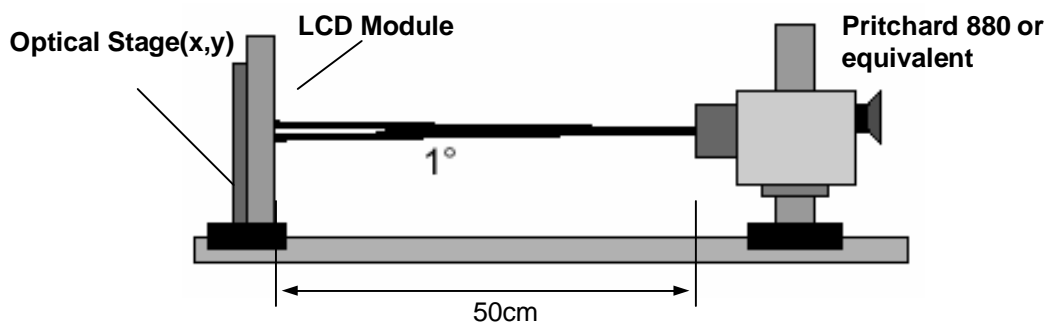### FIG. 1 Optical Characteristic Measurement Equipment and Method

Optical Stage(x,y)   **LCD Module**   **Pritchard 880 or equivalent**

1°

50cm

Table 8. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, fv=60Hz, f_{CLK}= 88.75MHz, Iout = 6.5mA

Parameter	Symbol	Values			Units	Notes
		Min	Typ	MAx		
Contrast Ratio	CR	300	TBD			1
Surface Luminance, white (w/o TSP)	L_{WH}	TBD	300		cd/m²	2
(w TSP)	L_{WH}		TBD			2
Luminance Uniformity	U	-	1.2	1.4		3
Response Time						4
Rise Time+Decay Time	$Tr_R + Tr_D$		16	25	ms	
Color Coordinates						±0.05
RED	RX		TBD			
	RY		TBD			
GREEN	GX		TBD			
	GY		TBD			
BLUE	BX		TBD			
	BY		TBD			
WHITE	WX	0.263	0.313	0.363		
	WY	0.279	0.329	0.379		
Viewing Angle						5
x axis, right(Φ=0°)	Θr		65		degree	
x axis, left (Φ=180°)	Θl		65		degree	
y axis, up (Φ=90°)	Θu		50		degree	
y axis, down (Φ=270°)	Θd		50		degree	
Gray Scale						6

Product Specification

Note)
1. Contrast Ratio(CR) is defined mathematically as

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the 1point across the LCD surface 50cm from the surface
   with all pixels displaying white. For more information see FIG 2.
   When I_{LED}= 20mA, L_{WH}=300cd/m^2(Typ.)

3. Luminance uniformity is measured for 9 point For more information see FIG 2.
   Luminance Uniformity= Maximum of 9points (①~⑨) / Minimum of 9points (①~⑨)

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	TBD
L7	TBD
L15	TBD
L23	TBD
L31	TBD
L39	TBD
L47	TBD
L55	TBD
L63	TBD

LG.PHILIPS LCD

Product Specification

FIG. 2 Luminance

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

A : H/4 mm
B : V/4 mm
H : 103.8 mm
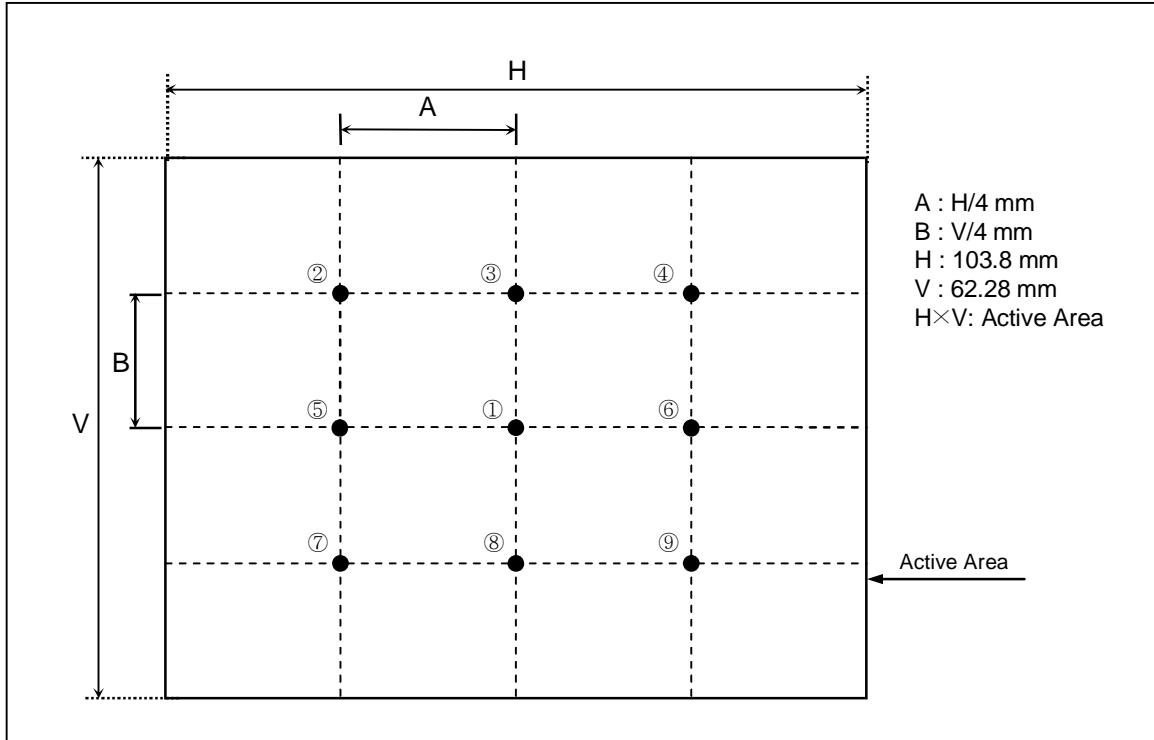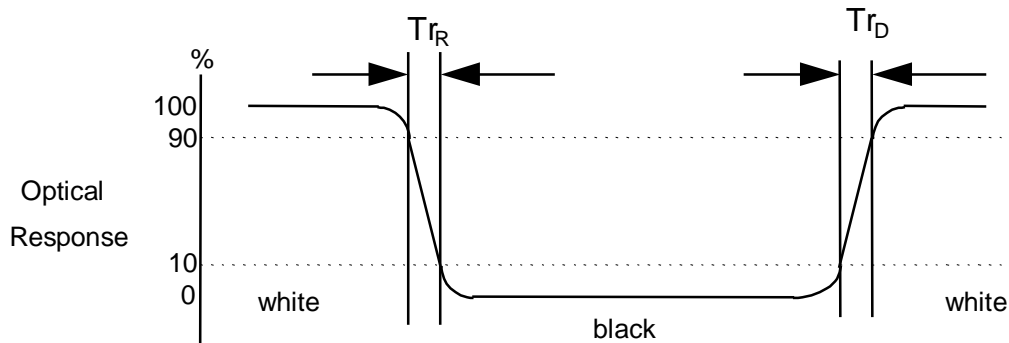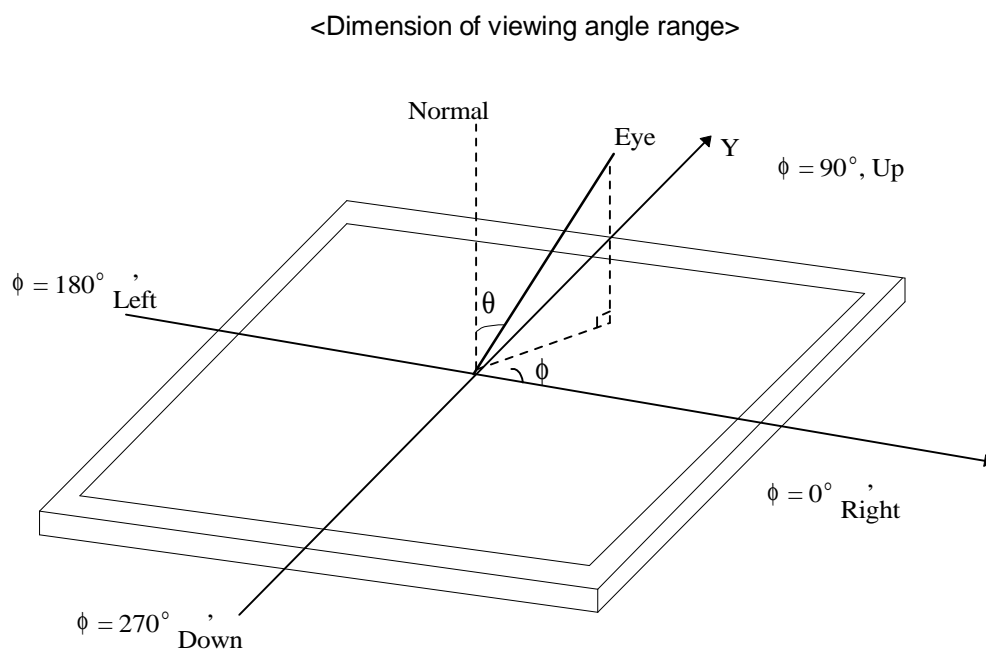V : 62.28 mm
H×V: Active Area

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".

LG.PHILIPS LCD

Product Specification

FIG. 4 Viewing angle

<Dimension of viewing angle range>

Normal

Eye   Y

$\phi = 90°$, Up

$\phi = 180°$, Left

θ

ϕ

$\phi = 0°$, Right

$\phi = 270°$, Down

LG.PHILIPS LCD

Product Specification
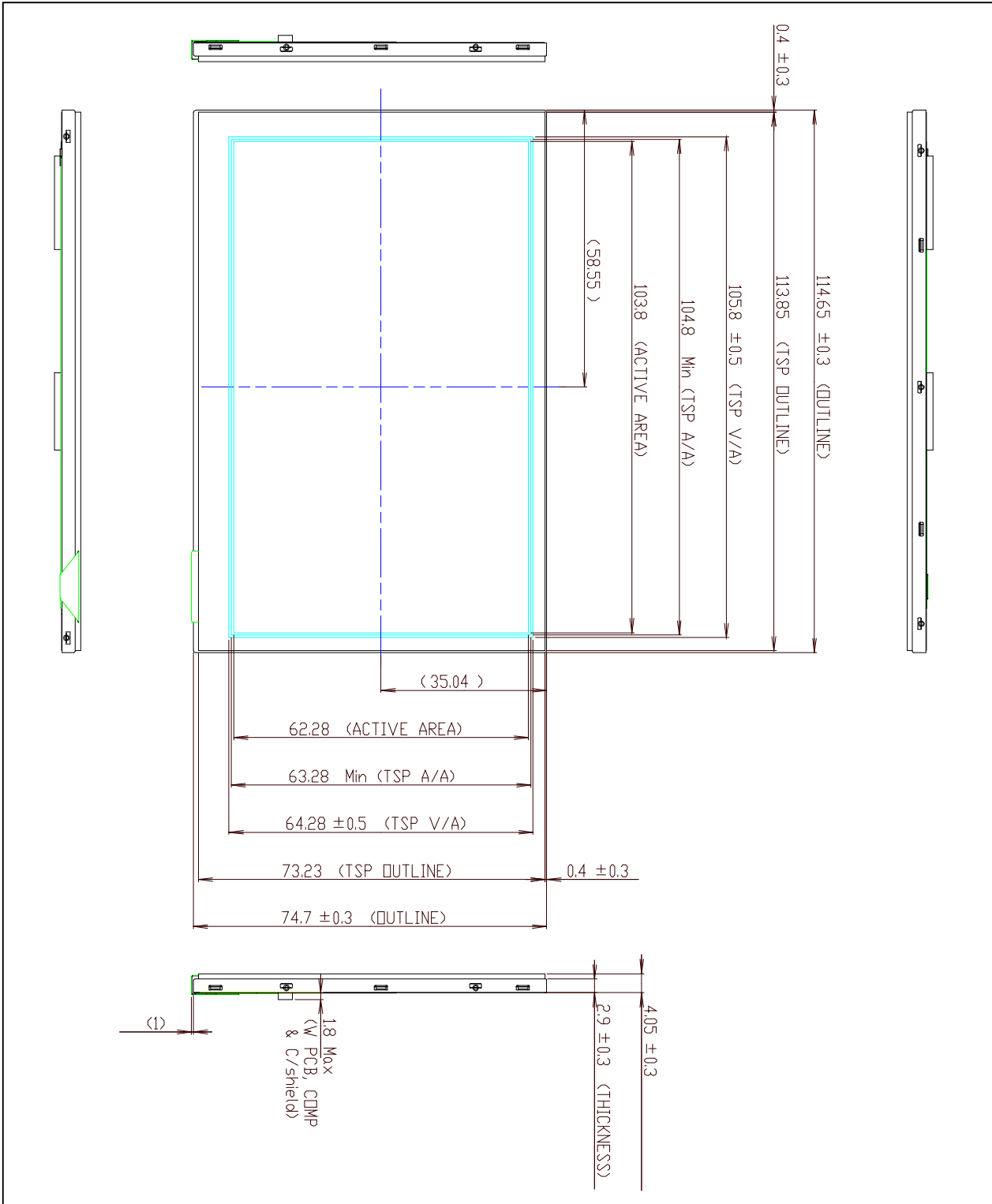
6. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP048WV1.
In addition the figures in the next page are detailed mechanical drawing of the LCD.

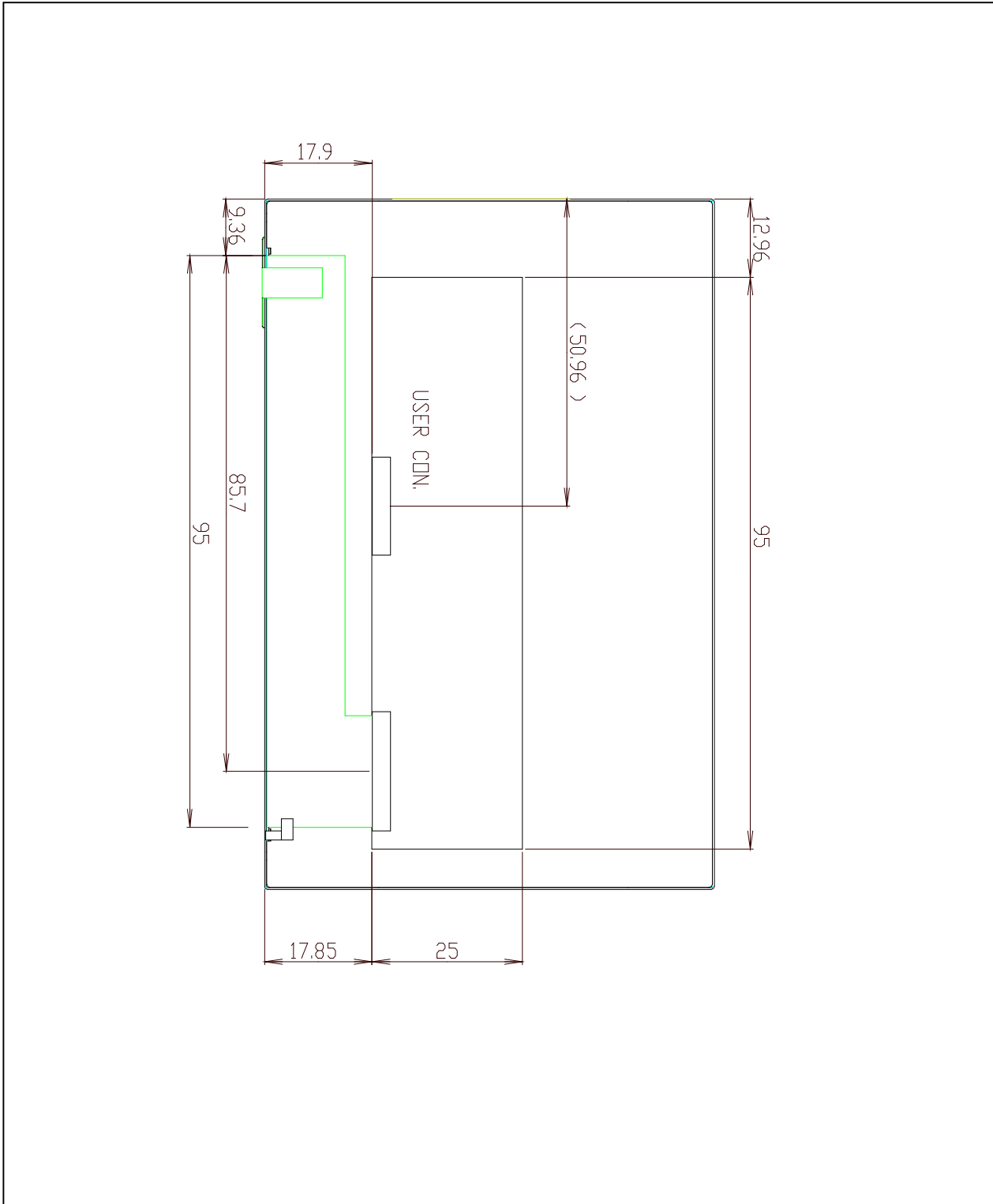|		
Outline Dimension	Horizontal	114.65 ± 0.3mm
	Vertical	74.7 ± 0.3mm
	Depth	2.9 ± 0.3mm (w/o TSP, w/o Comp) 4.7± 0.3mm (w/o TSP, w Comp) 5.85± 0.3mm (w TSP, w Comp)
Bezel Area	Horizontal	106.8 ± 0.3mm
	Vertical	65.28 ± 0.3mm
Active Display Area	Horizontal	103.8 mm
	Vertical	62.28 mm
Weight	60g ± 5g w/o TSP TBD w TSP	
Surface Treatment	Hard coating(3H) Anti-glare 12% treatment of the front polarizer	

LG.PHILIPS LCD

Product Specification

<FRONT VIEW>   Note) Unit:[mm], General tolerance: ± 0.5mm

0.4 ±0.3

(58.55)

103.8 (ACTIVE AREA)

104.8 Min (TSP A/A)

105.8 ±0.5 (TSP V/A)

113.85 (TSP OUTLINE)

114.65 ±0.3 (OUTLINE)

(35.04)

62.28 (ACTIVE AREA)

63.28 Min (TSP A/A)

64.28 ±0.5 (TSP V/A)

73.23 (TSP OUTLINE)   0.4 ±0.3

74.7 ±0.3 (OUTLINE)

(1)

1.8 Max (W PCB, COMP & C/shield)

2.9 ±0.3 (THICKNESS)

4.05 ±0.3

Ver. 0.1.	Jan, 26, 2007	17 / 23

LG.PHILIPS LCD

Product Specification

<REAR VIEW>

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

17.9

9.36

12.96

85.7

95

(50.96)

USER CON.

95

17.85

25

Product Specification

7. 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)	-180G, 2msec, Half sine - ±X, ±Y, ±Z. Per 1time
7	Thermal Shock test	-30 °C (0.5h) ~ 70 °C (0.5h) , 100cycles

{ 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.

8. International Standards

8-1. Safety

a) UL 1950 Third Edition, Underwriters Laboratories, Inc. Jan. 28, 1995.
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
b) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995.
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
c) EN 60950 : 1992+A1: 1993+A2: 1993+A3: 1995+A1: 1997+A11: 1997
IEC 950 : 1991+A1: 1992+A2: 1993+A3: 1995+A1: 1996
European Committee for Electrotechnical Standardization(CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

8-2. 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

Product Specification

9. Packing

9-1. 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, I, J, K, L, 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.

9-2. Packing Form

a) Package quantity in one box : TBD

b) Box Size : TBD

10. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

10-1. 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.

10-2. 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.

10-3. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

10-4. 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.

10-5. 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.