# SPECIFICATION
# FOR
# APPROVAL

( ) Preliminary Specification
( ● ) Final Specification

| Title | 7.0”W (480 X RGB X 234) TFT-LCD |
|---|---|

| | |
|---|---|
| BUYER | |
| MODEL | |

| | |
|---|---|
| SUPPLIER | LG Display Co., Ltd. |
| MODEL | LB070WQ4 |
| SUFFIX | * TM01 |

*Without Tcon

| SIGNATURE | DATE |
|---|---|
| / | |
| / | |
| / | |

| APPROVED BY | DATE |
|---|---|
| J.D. KIM / Chief Engineer | May. 16 |
| **REVIEWED BY** | |
| S.G.KIM / Senior Engineer | May. 16 |
| **PREPARED BY** | |
| Y.B. PARK / Engineer | May. 16 |

**Product Engineering Dept.**
**LG Display Co., Ltd**

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## RECORD OF REVISIONS

| Revision No. | Revision Date | Page | Summary |
|---|---|---|---|
| 0.0 | Dec.25.2005 | - | Preliminary |
| 0.1 | Mar.07.2006 | 10 | Backlight Driving Section [correction] |
| | | | Lamp Voltage:<br>550(Min), 580(Typ), 730(Max) → 520(Min), 550(Typ), 700(Max) |
| | | | Lamp Power Consumption:<br>3.48(Typ), 385(Max) → 3.3(Typ), 3.64(Max) |
| | | | Kick-Off Voltage:<br>1480Vrms (Ta = +25℃) → 1250Vrms(Ta = +25℃)<br>1780Vrms (Ta = -30℃) → 1500Vrms(Ta = -30℃) |
| | | 18 | Bezel Area [correction] |
| | | | Horizontal: 158.0(± 0.3)mm → 158.3(± 0.3)mm |
| | | | Vertical: 84.6 (± 0.3)mm → 84.5(± 0.3)mm |
| | | 19 | Drawing [correction] |
| 1.0 | Aug.23.2006 | - | Final |
| | | 5 | 1.Summary [correction]<br>aspect ratio: 16:9 → 17:9 |
| | | 5 | 2.Features [correction]<br>aspect ratio: 16:9 → 17:9<br>Block diagram: connection from VSS to Source driver circuit |
| | | 7 | 4-2. Backlight Fluorescent Tube Driving Part<br>[correction & delete] |
| | | | Backlight interface connector model:<br>BHR-02VS-1 by JST → BHR-03VS-1 by JST [correction]<br>1674817-1 by AMP [delete] |
| | | 8 | Operating and storage temperature chart [addition] |
| | | 9 | 6-1-1. TFT-LCD Panel Driving Section [correction]<br>$VCOM_{DC}$: (1.4) → (1.7) |
| | | 10 | 6-1-2. Power sequence [correction] |
| | | 11 | 6-1-3. Backlight Driving Section [correction] |
| | | | Lamp Current Typical: 6.0 → 6.5 |
| | | | Lamp Voltage Typical:<br>550 (6.0㎃rms) → 535 (6.5㎃rms) |
| | | | Lamp Power Consumption:<br>Typical: 3.3 → 3.48, Maximum: 3.64 → 3.83 |
| | | 14 | 6-2-1. Timing for a Source Driver [correction & addition]<br>Last sentence: rising edge → falling edge [correction]<br>“For Twoe period, shift register in source driver are reset internally.”<br>[addition] |

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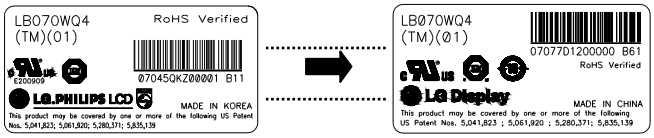
| | | 15 | 6-2-2. Timing for a Gate Driver [addition]<br>Oex , Xn timing chart |
| | | 16 | 7. Electro-optical Characteristics [correction] |
| | | | Luminance condition:<br>6mArms → 6.5mArms |
| | | | White Color Chromaticity condition:<br>6mArms → 6.5mArms |
| | | 22 | 9. Reliability Test [correction & addition] |
| | | | Thermal Shock Test:<br>-30℃(0.5h) ~ 80℃(0.5h) → -40℃(0.5h) ~ 85℃(0.5h) |
| | | | Thermal Cycle: 5 cycles [addition] |
| | | 24 | 11-1. Designation of Lot Mark [correction] |
| | | 25 | 11-2. Packing Form [correction] |
| | | | Packing, Bottom: EPS → EPP |
| | | | Packing, Top: EPS → EPP |
| 1.1 | Oct.26.2006 | 7 | 4.3. Backlight Fluorescent Tube Structure [addition]<br>Lamp position, Lamp Maker, Metal Oxide treatment |
| | | 9 | 6-1-1. TFT-LCD Panel Driving Section [addition] |
| | | | Typical value of current<br>$I_{DD1}$: 1, $I_{DD2}$ : 6.5 , $I_{GH}$ : 0.07 , $I_{GL}$ : 0.3 |
| | | 11 | Life Time of Backlight [correction]<br>(15,000) → - |
| | | 13 | Driver IC Maker [addition]<br>NOVATEK MICROELECTRONICS CORP. (Last sentence) |
| | | 16 | Contrast Ratio [correction]<br>(400) → 400 |
| | | 21 | Backlight Label [correction & addition]<br>Japanese, Warning Mark |
| | | 25 | 11-2. Packing Form [correction] |
| | | | Box size : 475x348x150 → 475x335x150 |
| | | | Quantity in a carton box : 44pcs → 40pcs |
| 1.2 | Oct.30.2006 | 7 | 4-2. Backlight Fluorescent Tube Driving Part [correction]<br>Backlight interface connector model:<br>BHS-03VS-1 by JST → BHR-03VS-1 by JST |
| | | 20 | Front view drawing [addition]<br>The size of the square holes<br>The length between metal frame and active area |
| | | 21 | Rear view drawing [addition]<br>The length between metal frame and FPC center |

## Product Specification

| Revision No. | Revision Date | Page | Summary |
|---|---|---|---|
| 1.3 | Nov.20.2006 | 22 | Rear view drawing [ addition & delete & correction]<br>The detailed dimension of FPC connector [addition]<br>The FPC folding Drawing [delete]<br>LCM Label: Lead free → RoHS Verified [correction] |
| 1.4 | May.16.2008 | 22 |  |
| | | | - LCM label : Changing the company logo<br>(LG PHILIPS LCD → LG Display) [Change] |
| | | 26 | Changing the company logo in the box.<br>(LG PHILIPS LCD → LG Display) [Change] |
| | | | Change to the environmental-friendly glass<br>(As, Sb free) [Change] |

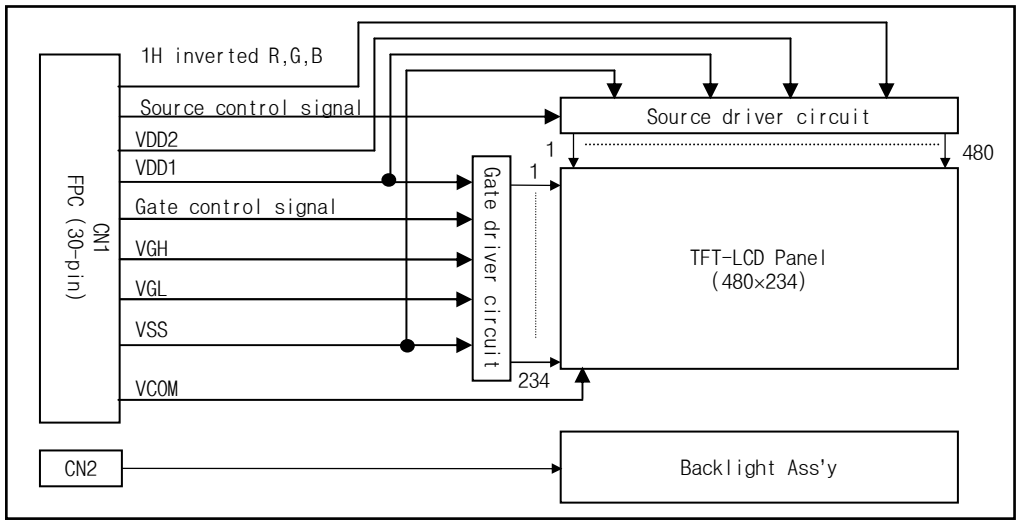
## Product Specification

## 1. Summary

This module utilizes amorphous silicon thin film transistors and a 17:9 aspect ratio. A 7” active matrix liquid crystal display allows full color to be displayed.
The applications are Car Navigation & Display Devices, and other AV Systems.

## 2. Features

•Utilizes a panel with a 17:9 aspect ratio, which makes the module suitable for use in wide-screen systems.
•The 7.0” screen produces a high resolution image that is composed of 112,320 pixel elements in a stripe arrangement.
•Wide viewing angle technology is employed.
[The most suitable viewing direction is in the 6 o’clock direction.]
•By adopting an active matrix drive, a picture with high contrast is realized.
•A thin, light and compact module is accomplished through the use of COG mounting technology.
•By adopting a high aperture panel, high transmittance color filter and high transmission polarizing plates, high transmittance ratio is realized.




## 3. General Specification

| CHARACTERISTIC ITEM | SPECIFICATION |
|---|---|
| Display Technology | a-Si TFT active matrix |
| Display Mode | TN Type Full Color / Transmitting Type/ Normally White |
| Screen Size (Diagonal) | 7.0” (17.66㎝) |
| Outline Dimension | 167mm (W) X 93mm (H) X 6.8mm (D) |
| Active Area | 156.24mm (W) X 82.368mm (H) |
| Number Of dots | 480(H) X 3(R,G,B) X 234(V) |
| Dot Pitch | 0.1085mm (W) X 0. 352mm (H) |
| Color Filter Array | RGB vertical stripes |
| Weight | 160 g (Max.) |
| Backlight | CCFL with 3 wave-length spectrum (L Type) |
| Surface Treatment | Anti-Glare Treatment |

## 4. Interface (Input terminal)

### 4-1. TFT-LCD Panel Driving Part (CN1)

| Pin No. | SYMBOL | FUNCTION | REMARK |
|---|---|---|---|
| 1 | VSS | Ground For Logic Circuit | |
| 2 | NC | Open | |
| 3 | VGL | Gate Driver Negative Voltage | |
| 4 | STV1 | Gate Start Signal1 | |
| 5 | U/D | Up/Down Scanning Selection | See 6-3> P.13 |
| 6 | CPV | Gate Driver Scanning Clock Pulse | |
| 7 | OE1 | Gate Driver Output Enable1 | |
| 8 | OE2 | Gate Driver Output Enable2 | |
| 9 | OE3 | Gate Driver Output Enable3 | |
| 10 | STV2 | Gate Start Signal2 | |
| 11 | VDD1 | Power Line For Logic | |
| 12 | NC | Open | |
| 13 | VGH | Gate Driver Positive Voltage | |
| 14 | NC | Open | |
| 15 | VCOM | Voltage Applied To Color Filter Substrate | |
| 16 | STH2 | Source Start Signal2 | |
| 17 | VDD2 | Power Line For Source Driver IC | |
| 18 | VR | Red Analog Video Signal | |
| 19 | VG | Green Analog Video Signal | |
| 20 | VB | Blue Analog Video Signal | |
| 21 | VSS | Ground For Analog Circuit | |
| 22 | CPH1 | Source Driver Clock Signal1 | |
| 23 | CPH2 | Source Driver Clock Signal2 | |
| 24 | CPH3 | Source Driver Clock Signal3 | |
| 25 | VSS | Ground For Logic Circuit | |
| 26 | MODE | Sampling Mode Change | See 6-4> P.13 |
| 27 | L/R | Source Scanning Direction Change | See 6-3> P.13 |
| 28 | SOE | Source Output Enable | |
| 29 | STH1 | Source Start Signal1 | |
| 30 | VSS | Ground For Logic Circuit | |

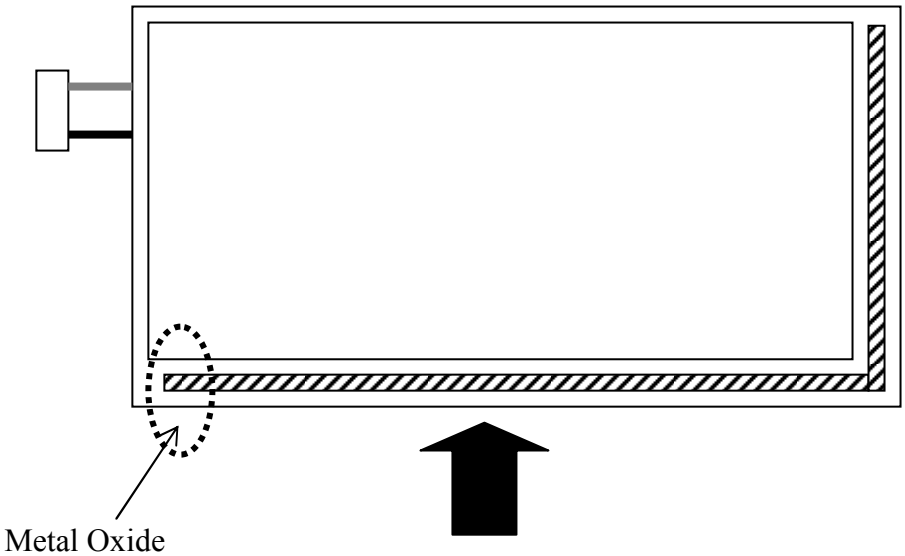
**The matching connector part number is **GF053-30S-LSS(Bottom Contact Type) or GF055-30S-LSS (Top Contact Type)** manufactured by LG Cable Ltd. or equivalent.

### 4-2. Backlight Fluorescent Tube Driving Part (CN2)

| Pin No. | SYMBOL | FUCTION | REMARK |
|---|---|---|---|
| 1 | HV | Power Supply For Lamp [High Voltage Side] | [Note 4-1] |
| - | - | - | - |
| 3 | LV | Power Supply For Lamp [Low Voltage Side] | [Note 4-2] |

The backlight interface connector is a model **BHR-03VS-1** manufactured by JST .
[Note 4-1] The wire color of high voltage side is pink.
[Note 4-2] The wire color of low voltage side is white. Connect the low voltage side of the DC/AC inverter used to drive the fluorescent tube to GND of the inverter circuit.

### 4- 3. Backlight Fluorescent Tube Structure

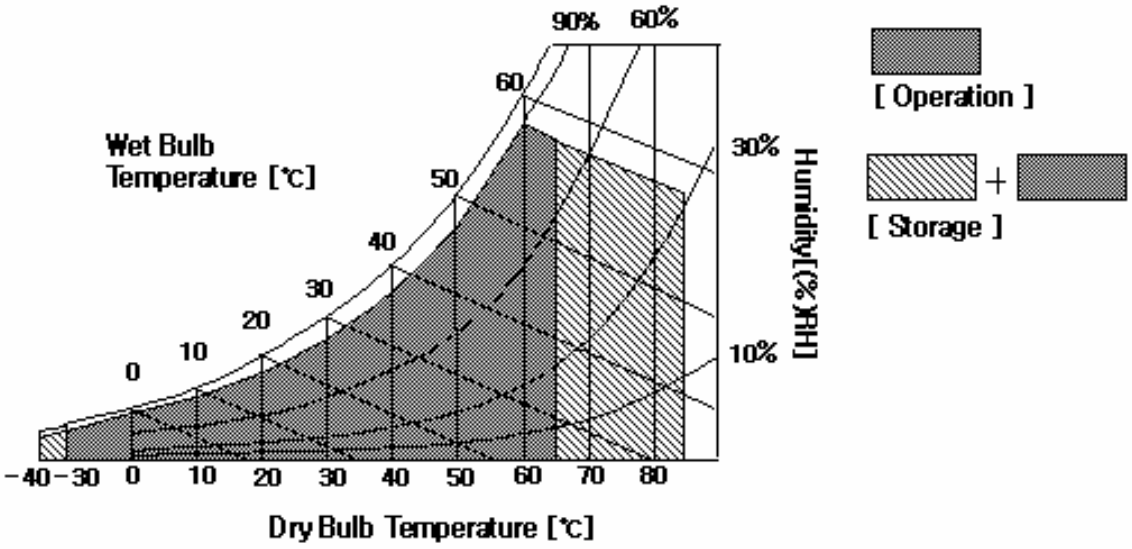



Main Viewing Angle : 6 O'clock
Lamp position : Oblique line part in above drawing.
(L-shape lamp, 1 piece)
Lamp Maker : Harison Toshiba Lighting Corp.

## 5. Absolute Maximum Ratings

| PARAMETER | SYMBOL | CONDITION | MIN. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|
| Power Voltage | VDD1 | $T_a$=25℃ | -0.3 | 6.0 | V | |
| | VDD2 | $T_a$=25℃ | -0.3 | 7.0 | V | |
| | VGH | $T_a$=25℃ | -0.3 | 40 | V | |
| | VGL | $T_a$=25℃ | -20 | 0.3 | V | |
| | VGH-VGL | $T_a$=25℃ | 17 | 40 | V | |
| Input Signal | $V_{DI}$ | $T_a$=25℃ | -0.3 | VDD1+0.3 | V | [Note 5-1] |
| | $V_{AI}$ | $T_a$=25℃ | -0.2 | VDD2+0.2 | V | [Note 5-2] |
| Voltage Applied To Color Filter Substrate | Vcom | $T_a$=25℃ | -10 | 13 | V | |
| Storage Temperature | $T_{st}$ | - | -40 | 85 | ℃ | [Note 5-3,4] |
| Operating Temperature (Panel Surface) | $T_P$ | - | -30 | 85 | ℃ | [Note 5-3,4,5,6] |
| Operating Temperature (Ambient Temperature) | $T_a$ | - | -30 | 65 | ℃ | |

[Note 5-1] CPV, U/D, STV1,STV2, OE1.OE2,OE3,L/R, MODE, L/R, SOE, CPH1, CPH2, CPH3, STH1,STH2
[Note 5-2] VR, VG, VB
[Note 5-3] This rating applies to all parts of the module and should not be exceeded.
[Note 5-4] Maximum wet-bulb temperature is 58℃. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.
[Note 5-5] The operating temperature only guarantees operation of the circuit and doesn't guarantee all the contents of Electro-optical specification
[Note 5-6] Ambient temperature when the backlight is lit (reference value).



# 6. Electrical Characteristics

## 6-1. Recommended Operating Conditions

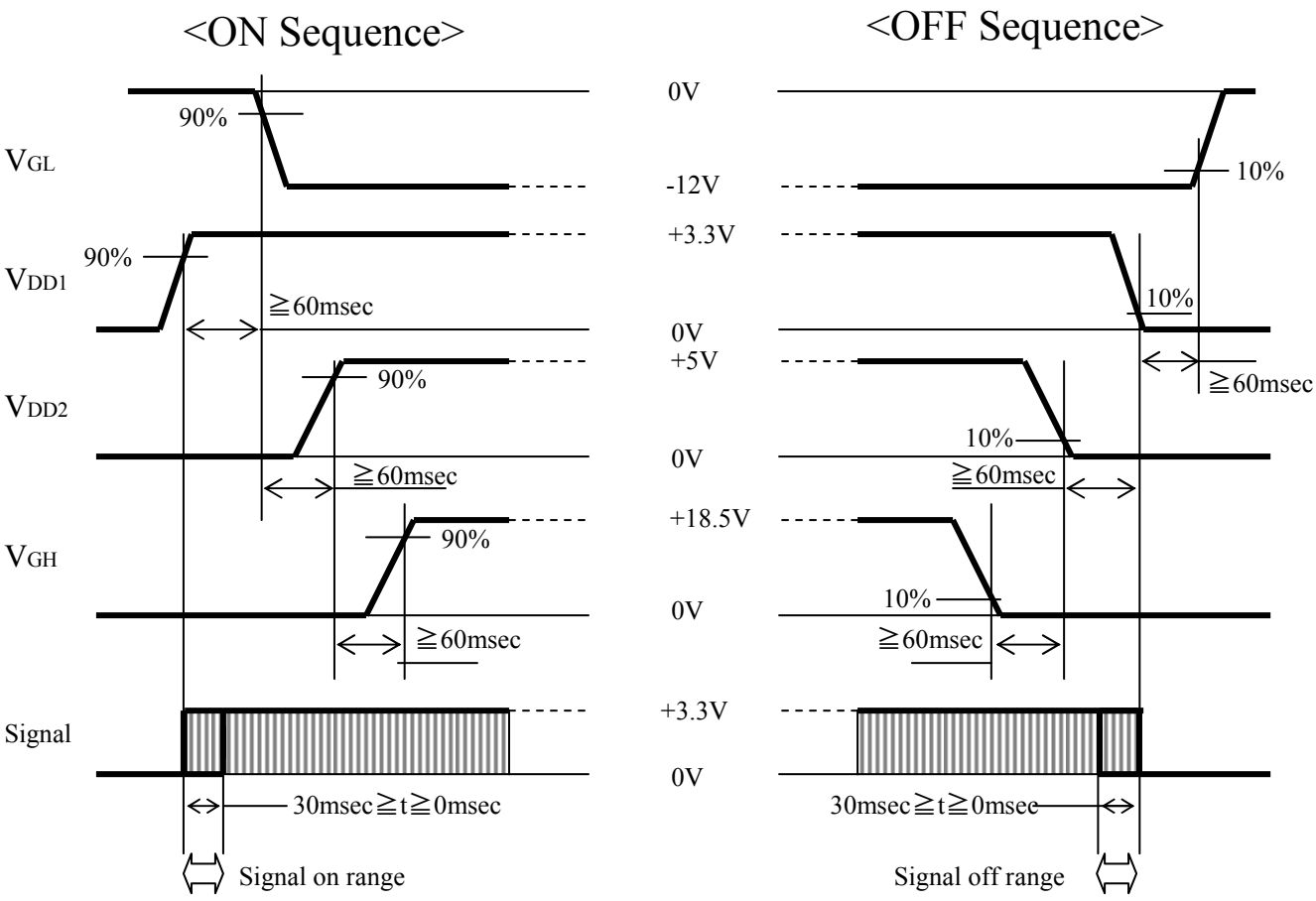
### 6-1-1. TFT-LCD Panel Driving Section

$T_a$=25℃

| PARAMETER | | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|---|
| Logic Supply Voltage | | VDD1 | 3.0 | 3.3 | 3.6 | V | |
| Source Driver Supply Voltage | | VDD2 | 4.5 | 5.0 | 5.5 | V | |
| Digital Input Signal | High Level | $V_{IH}$ | 0.8VDD1 | - | VDD1 | V | |
| | Low Level | $V_{IL}$ | 0 | - | 0.2VDD1 | V | |
| Gate Driver | High Supply Voltage | VGH | 17.5 | 18.5 | 19.5 | V | |
| | Low Supply Voltage | VGL | -11.0 | -12.0 | -13.0 | V | |
| Analog Video Signal Input Voltage | | $V_{VI}$ | VSS+0.2 | - | VDD2-0.2 | V | |
| Color Filter Substrate Voltage | AC Component | $VCOM_{AC}$ | 3.5 | 4.5 | 5.5 | $V_{P-P}$ | |
| | DC Component | $VCOM_{DC}$ | - | (1.7) | - | V | [Note 1] |
| Logic Supply Current | | $I_{DD1}$ | - | 1 | 3 | mA | |
| Source Driver Supply Current | | $I_{DD2}$ | - | 6.5 | 25 | mA | [Note 2] |
| Gate Driver High Supply Current | | $I_{GH}$ | - | 0.07 | 0.5 | mA | |
| Gate Driver Low Supply Current | | $I_{GL}$ | - | 0.3 | 1 | mA | |

[Note 1] This value should be tuned for optimal display quality of each panel.
[Note 2] The test pattern of this current is the full black pattern.

### 6-1-2. Power sequence



### 6-1-3. Backlight Driving Section

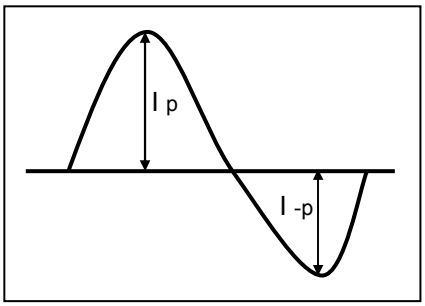
$T_a$=25℃

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Lamp Current | $I_{BL}$ | 3.0 | 6.5 | 7.0 | mArms | |
| Lamp Voltage | $V_{BL}$ | 520 (7.0㎃rms) | 535 (6.5㎃rms) | 700 (3.0㎃rms) | Vrms | ±10[%] |
| Lamp Power Consumption | $P_{BL}$ | - | 3.48 | 3.83 | Wrms | $I_{BL}$=6.5㎃ |
| Lamp Frequency | $f_{BL}$ | 40 | - | 60 | kHz | *1 |
| | | 40 | - | 80 | | *2 |
| Kick-Off Voltage (*3) | $V_S$ | - | - | 1250 | Vrms | $T_a$=25℃ |
| | | - | - | 1500 | Vrms | $T_a$=-30℃ |
| Discharge Stabilization Time | $T_S$ | - | - | 3 | Minutes | *4 |
| Life Time | - | 12,000 | - | - | Hour | *5 |

* 1 : This frequency range means the range to keep within ± 10% change of electrical and optical characteristics.
* 2 : This frequency range means not affecting to lamp life and reliability characteristics.
(The lamp frequency should be selected as different as possible from display horizontal synchronous signal (Including harmonic frequency of this scanning frequency) to avoid “Beat” interference which may be observed on the screen as horizontal stripes like moving wave. This phenomenon is caused by interference between lamp (CCFL) lighting frequency and the harmonics of LCD horizontal synchronous signal.
* 3 : The “MAX” of “Kick-Off Voltage” means the minimum voltage for inverter to turn on the CCFL normally in the LCD module. However this isn’t the values that we can assure stability of starting lamp on condition that the module is installed in your set.
It should be careful that “Kick-Off Voltage” is changed by an increase of stray capacitance in your set, inverter method, value of ballast capacitor in your inverter and so on.
Especially, the value of “Kick-Off Voltage” is higher in low temperature condition than in normal temperature condition, because impedance of CCFL is increased.
"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"
* 4 : The time needed to achieve not less than 95%brightness of the center part of lamp.
The brightness of the lamp after lighted for 5 minutes is defined as 100%.
* 5 : “Life time” is defined as the lamp brightness decrease to 50% original brightness at $I_{BL}$=TYP; continuous lighting, $T_a$=25℃.

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. Inverter should be designed to be subject to the conditions below

A. The asymmetry rate of the inverter waveform should be less than 10%.
B. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$.
* Inverter output waveform had better be more similar to ideal sine wave.




* Asymmetry rate:

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

•Distortion rate:

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

C. There should not be any spikes in the waveform.
D. Lamp current should not exceed the “MAX” value under the “Operating Temperature” (it is prohibited to exceed the “MAX.” value even if it is operated in the guaranteed temperature). When lamp current exceed the maximum value for a long time, it may cause a smoking and ignition.
Therefore, it is recommended that the inverter have the current limited circuit that is used as a protection circuit and/or the lamp current-controlled inverter.

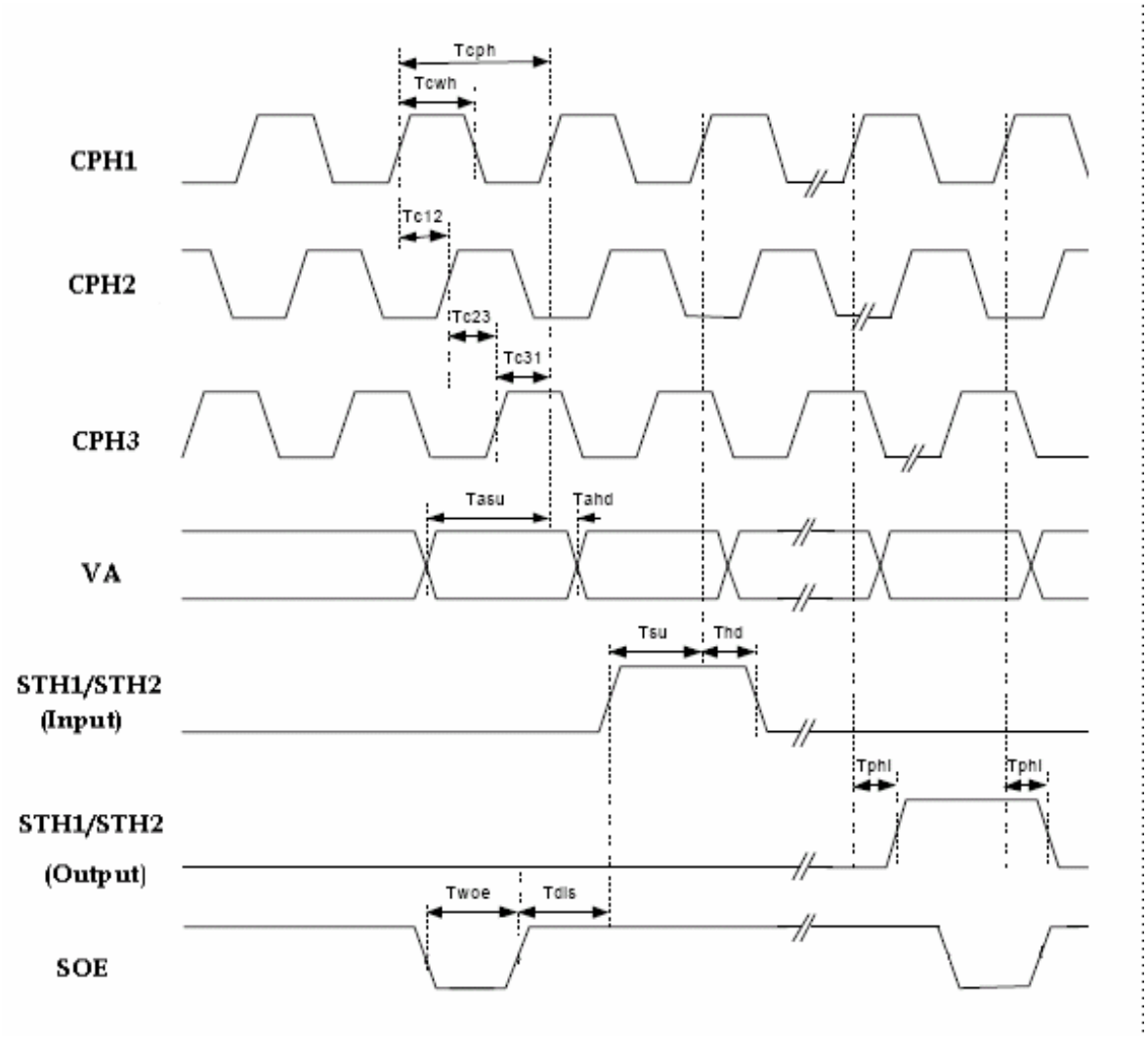
∗ Do not attach a conducting tape to lamp connecting wire.
If the lamp wire attach to a conducting tape, TFT-LCD Module has a low luminance and the inverter has abnormal action. Because leakage current is occurred between lamp wire and conducting tape.

## 6-2. Timing Characteristics of input siganl

| | PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|---|
| SOURCE | Clock cycle time | Tcph | 45 | - | 2000 | ns | CPHn |
| | CPHn pulse duty | Tcwh | 40 | - | 60 | % | CPHn |
| | CPHn phase delay | Tc12<br>Tc23<br>Tc31 | 20 | - | Tcph/2 | ns | CPH1-CPH2<br>CPH2-CPH3<br>CPH3-CPH1 |
| | Set-up time of analog signals | Tasu | 20 | - | - | ns | VA,VB,VC-CPHn |
| | Hold time of analog signals | Tahd | 20 | - | - | ns | CPHn-VA,VB,VC |
| | STHn set-up time | Tsu | 20 | - | - | ns | STHn-CPHn |
| | STHn hold time | Thd | 10 | - | - | ns | CPHn-STHn |
| | Propagation delay of STHn | Tphl | 10 | 35 | 50 | ns | CL=25pF |
| | Sample and hold disable time | Tdis | 1 | - | - | Tcph | SOE-STHn |
| | SOE pulse width | Twoe | 1 | - | - | Tcph | |
| GATE | STVD/STVU Delay Time | Tdt | - | - | 500 | ns | |
| | Driver Output Delay Time | Tdo | - | - | 900 | ns | |
| | Output Falling Time | Tthl | - | 400 | 800 | ns | |
| | Output Rising Time | Ttlh | - | 500 | 1000 | ns | |
| | OEx to Driver Output Delay Time | Toe | - | - | 900 | ns | |
| | Clock Frequency | Fclk | - | - | 200 | KHz | |
| | Clock Rise Time | Trck | - | - | 100 | ns | |
| | Clock Falling Time | Tfck | - | - | 100 | ns | |
| | Clock Pulse Width (High & Low) | PWCLK | 500 | - | - | ns | |
| | STVD/STVU Set-up Time | Tsu | 200 | - | - | ns | |
| | STVD/STVU Hold Time | Thd | 300 | - | - | ns | |
| | Output Enabled pulse | Twcl | 1 | - | - | ns | |

***** Source and Gate Driver IC Maker: NOVATEK MICROELECTRONICS CORP.

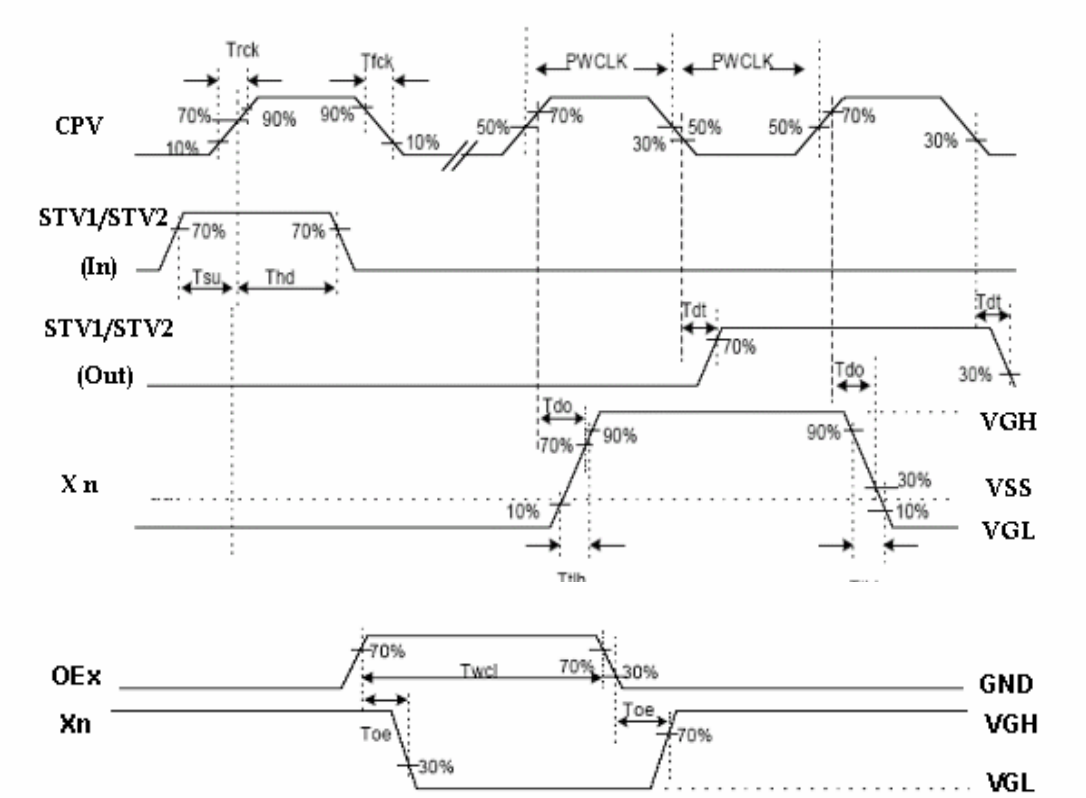
### 6-2-1. Timing for a Source Driver




• Remark : The sample-and-hold circuits are switched and the outputs are started with new data at the falling edge of SOE.

" For Twoe period, shift register in source driver are reset internally."

### 6-2-2. Timing for a Gate Driver




### 6.3. Scanning Mode Selection ( Reference position : @ Input terminal )

| MODE | L/R | U/D | STH1 | STH2 | STV1 | STV2 |
|---|---|---|---|---|---|---|
| Normal Mode | H | L | Input | Output | Input | Output |
| Up/Down Reverse Mode | H | H | Input | Output | Output | Input |
| Left/Right Reverse Mode | L | L | Output | Input | Input | Output |
| Left/Right & Up/Down Reverse Mode | L | H | Output | Input | Output | Input |

***** H(High Level) =VDD1 , L(Low Level)=VSS

### 6.4. Source Sampling Mode

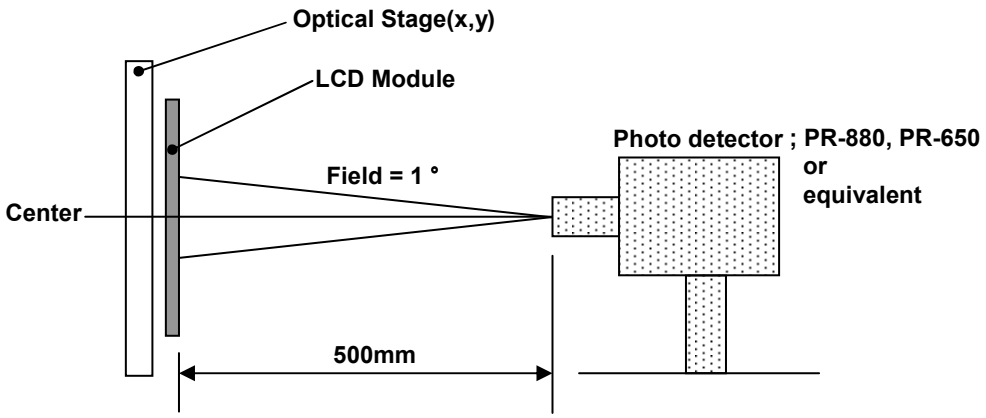
| MODE | MODE | CPH1 | CPH2 | CPH3 |
|---|---|---|---|---|
| Sequential Sampling Mode | L | Input | Input | Input |
| Simultaneous Sampling Mode | H | Input | L | L |

***** H(High Level) =VDD1 , L(Low Level)=VSS

## 7. Electro-optical Characteristics

$T_a$=25℃

| PARAMETER | | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|---|---|
| Luminance | | Y | $I_{BL}$=6.5mArms | 360 | 450 | - | cd/m$^2$ | [Note 7-1] |
| Contrast Ratio | | CR | Optimal | 300 | 400 | - | - | [Note 7-2] |
| White Color Chromaticity | | $W_x$ | $I_{BL}$=6.5mArms | 0.270 | 0.300 | 0.330 | - | [Note 7-1] |
| | | $W_y$ | | 0.290 | 0.320 | 0.350 | - | |
| Viewing Angle | ϕ=180° | Θl | CR≥10 | 55 | 60 | - | ° | [Note 7-2] [Note 7-3] |
| | ϕ=0° | Θr | | 55 | 60 | - | ° | |
| | ϕ=90° | Θu | | 45 | 50 | - | ° | |
| | ϕ=270° | Θd | | 55 | 60 | - | ° | |
| Response Time | Rise | $\tau_r$ | Θ=0° | - | - | 50 | ms | [Note 7-4] |
| | Fall | $\tau_d$ | | - | - | 75 | ms | |




Measuring Condition ;
-Measuring surroundings : Dark Room
-Measuring temperature : $T_a$=25℃
-Adjust operating voltage to get optimum contrast at the center of the display.
-Measured value at the center point of LCD panel after more than 30 minutes while backlight turning on.

[Note 7-1]

Measured on the center area of the panel by PHOTO RESEARCH photometer PR-880 and PR-650 or equivalent. ( Vlc = 0V )

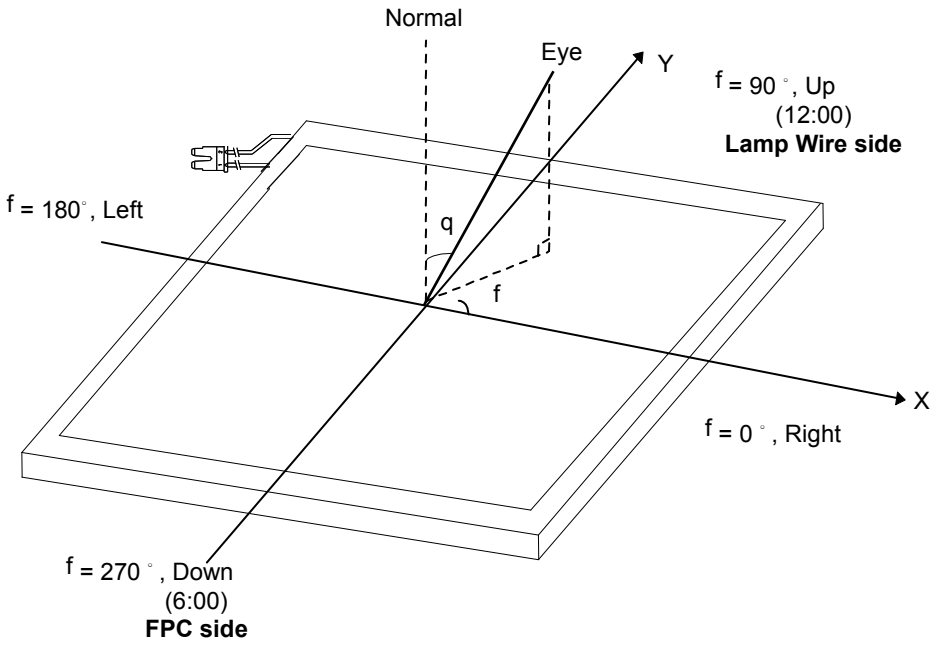
[Note 7-2]

Contrast ratio is defined as follows ;

$$\text{Contrast Ratio(CR)} = \frac{\text{Photo detector output with LCD being “white” ( Vlc = 0V )}}{\text{Photo detector output with LCD being “black” ( Vlc = 4V )}}$$

[Note 7-3]

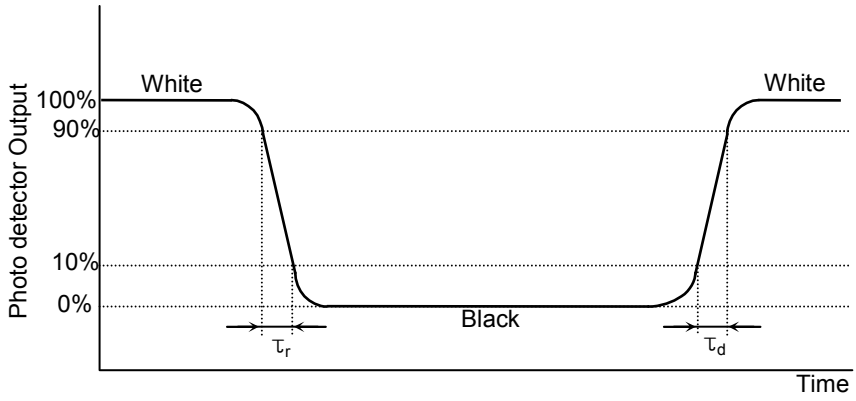
Viewing angle range is defined as follows;




[ Normal scanning Mode view ]

[Note 7-4]

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area “black” to and from “white”.



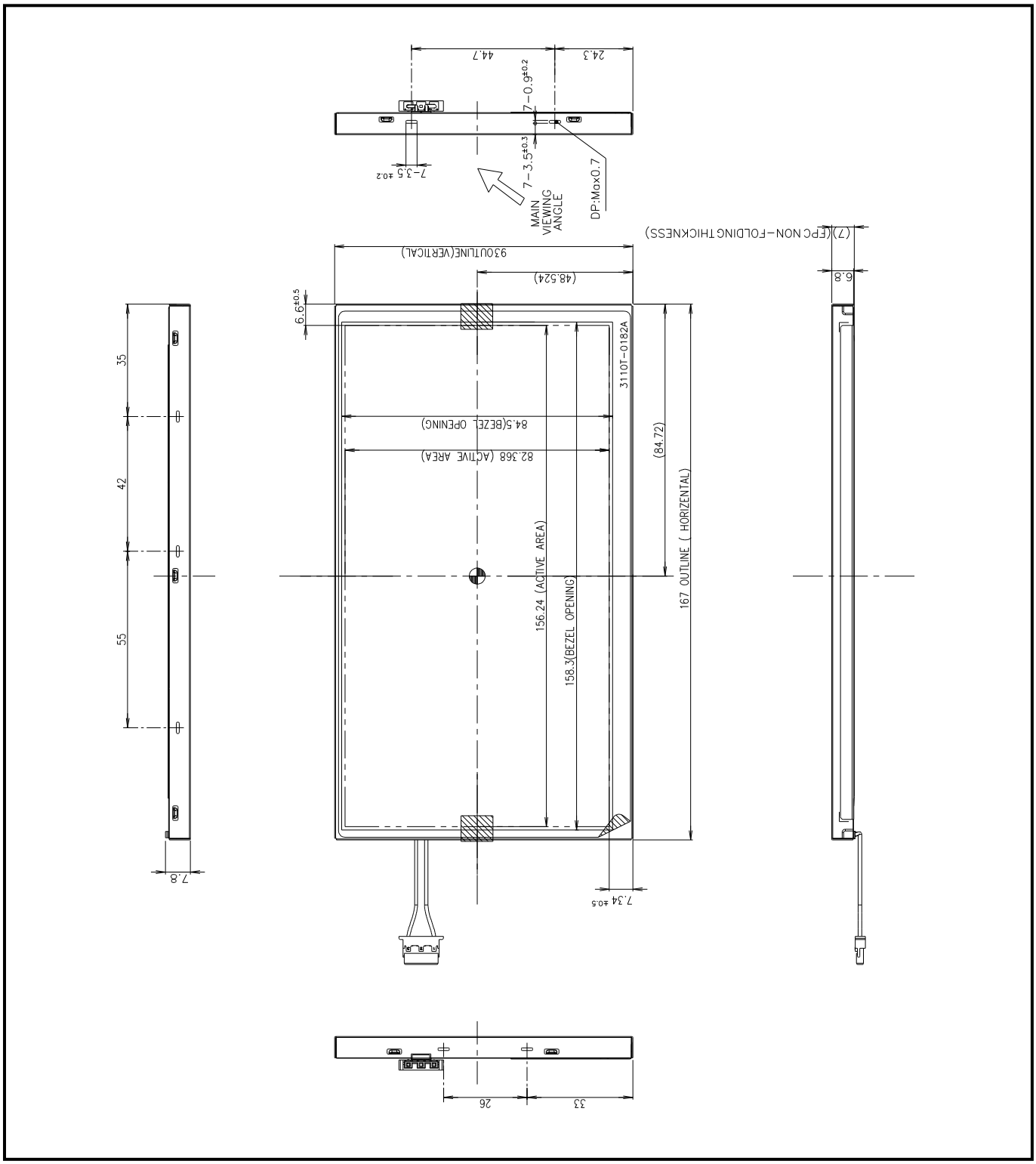

Measuring Condition ;
-White : Vlc = 0V
-Black : Vlc = 4V

## 8. Mechanical Characteristics

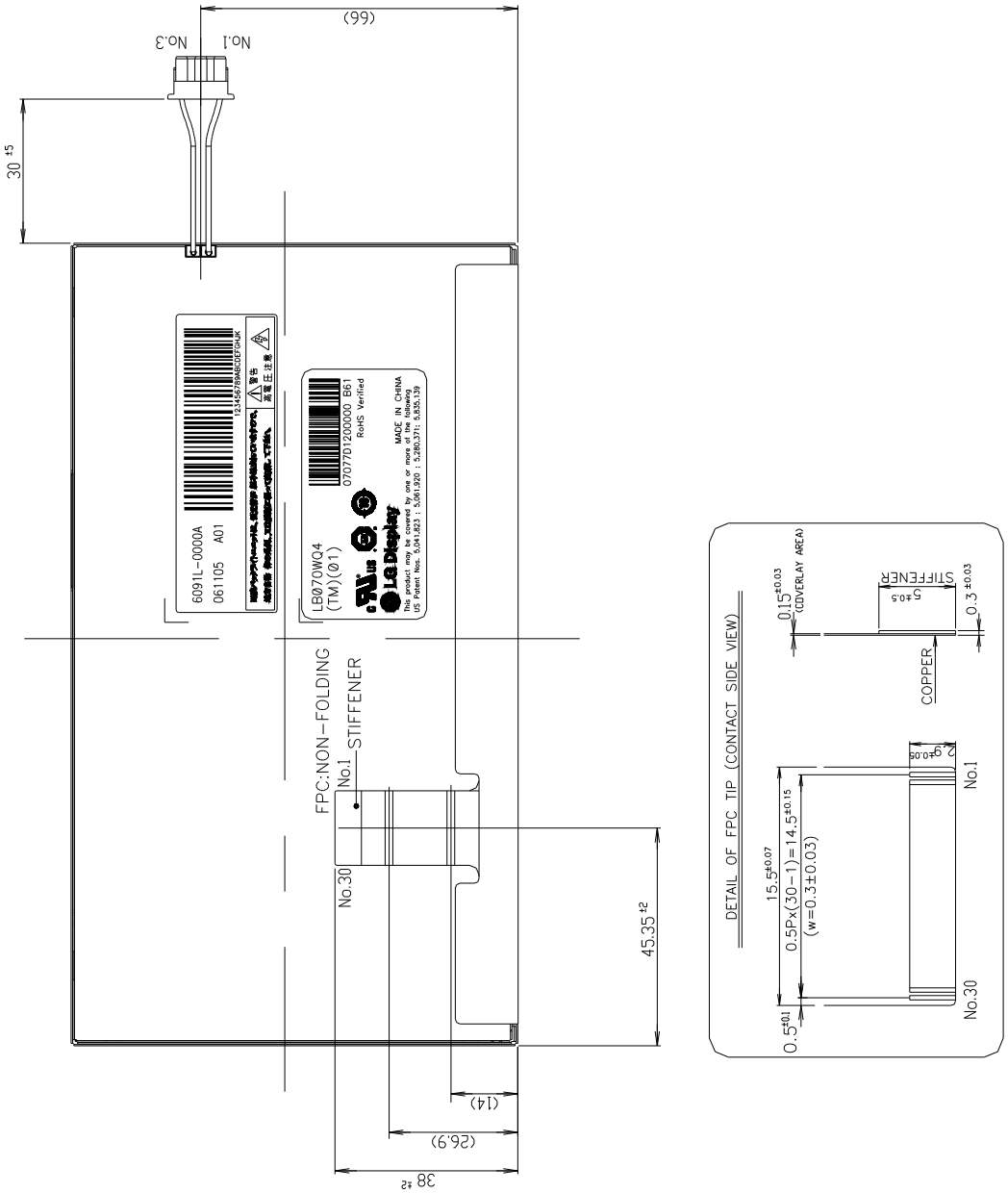
The contents provide general mechanical characteristics for the model LB070WQ4-TM01. In addition, the figures in the next page are detailed mechanical drawing of the LCD.

| | | |
|---|---|---|
| Outline Dimension | Horizontal | 167.0(± 0.3)mm |
| | Vertical | 93.0(± 0.3)mm |
| | Depth | 6.8(± 0.3)mm |
| Bezel Area | Horizontal | 158.3(± 0.3)mm |
| | Vertical | 84.5(± 0.3)mm |
| Active Display Area | Horizontal | 156.24 mm |
| | Vertical | 82.368mm |
| Weight | 150(Typ)/160(Max) | |

<Front View>


44.7
24.3
7-0.9±0.2
7-3.5±0.3
7-3.5±0.2
MAIN VIEWING ANGLE
DP:Max0.7
93.OUTLINE(VERTICAL)
(48.524)
(7)(EPC NON-FOLDING THICKNESS)
6.8
6.6±0.5
3110T-0182A
84.5(BEZEL OPENING)
82.368 (ACTIVE AREA)
(84.72)
156.24 (ACTIVE AREA)
158.3(BEZEL OPENING)
167 OUTLINE ( HORIZENTAL)
35
42
55
7.8
7.34±0.5
26
33

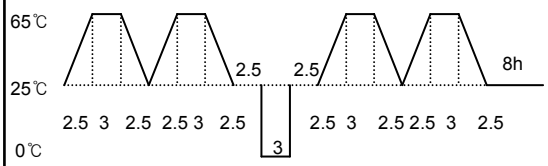
<Rear View>




- UNSPECIFIED TOLERANCE IS ±0.3mm
- B/L CONNECTOR:BHR-03VS-1(JST)
- B/L WIRE COLOR & CN PIN ARRAY

| PIN NO. | COLOR | VOLTAGE |
|---|---|---|
| 1 | PINK | HIGH |
| 3 | WHITE | LOW |

## 9. Reliability Test

| No. | Test Items | Test Condition | REMARK |
|---|---|---|---|
| 1 | High Temperature Storage Test | $T_a$ =85℃ 240h | [Note 9-1,2,3] |
| 2 | Low Temperature Storage Test | $T_a$ =-40℃ 240h | [Note 9-1,2,3] |
| 3 | High Temperature Operation Test | $T_P$ =85℃ 240h | [Note 9-1,2,3] |
| 4 | Low Temperature Operation Test | $T_a$ =-30℃ 240h | [Note 9-1,2,3] |
| 5 | High Temperature and High Humidity Operation Test | $T_a$ =65℃ 90%RH 240h | [Note 9-1,2,3] |
| 6 | Light-proof | UV Exposure, Ta=65<br>225.6kJ/m$^2$@ 340nm 144h | |
| 7 | Thermal Shock Test<br>(non-operating) | -40℃(0.5h) ~ 85℃(0.5h) / 300 cycles | |
| 8 | Dew Condensation | -30℃(0.5h,non-operation)<br>⇔ 25℃ 95%RH(10m operation)<br>10 cycles | |
| 9 | Thermal Cycle<br>(non-operating) | 1Cycle = 48h, 5 cycles 90~95%RH<br>  | |
| 10 | Electro Static Discharge Test | -Panel Surface/Top_case<br>: 150pF ±15kV 150Ω<br>(Direct Discharge, Five Times)<br>-FPC Input Terminal : 200pF ±200V 0Ω | |
| 11 | Shock Test<br>(non-operating) | 980m/s$^2$ , t=6ms<br>X,Y,Z direction 2 Times | |
| 12 | Vibration Test<br>(non-operating) | 5~10 Hz Amplitude 25mm<br>10~30 Hz 3.7 × 9.8 m/s$^2$<br>30~50 Hz 1.6 × 9.8 m/s$^2$<br>50~80 Hz 0.7 × 9.8 m/s$^2$<br>80~100 Hz 0.3 × 9.8 m/s$^2$<br>X,Y,Z direction 8min × 2 sweep<br>Each direction 96h | |
| 13 | Terminal Intensity<br>(non-operating) | Loading 500g, ± 90 degree from outside of terminal | |
| 14 | Push Test<br>(non-operating) | Using push and pull gage on the center point with diameter 12.7mm bar, pressure 5 × 9.8N | |
| 15 | Withstand pressure<br>(non-operating) | 5 × 10$^4$ Pa , 2h | |

[Note 9-1] $T_a$ = Ambient Temperature, $T_P$ = Panel Surface Temperature
[Note 9-2] In the Reliability Test, performance is confirmed after leaving in room temp.
[Note 9-3] In the standard condition, there shall be no practical problems that may affect the display function.

## 10. International Standards

### 10-1. Safety

a) UL 60950, Third Edition, Underwriters Laboratories, Inc., Dated Dec. 11, 2000.
Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.
b) CAN/CSA C22.2, No. 60950, Third Edition, Canadian Standards Association, Dec. 1, 2000.
Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.
c) EN 60950 : 2000, Third Edition
IEC 60950 : 1999, Third Edition
European Committee for Electrotechnical Standardization(CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

## 11. Packing

### 11-1. 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 |

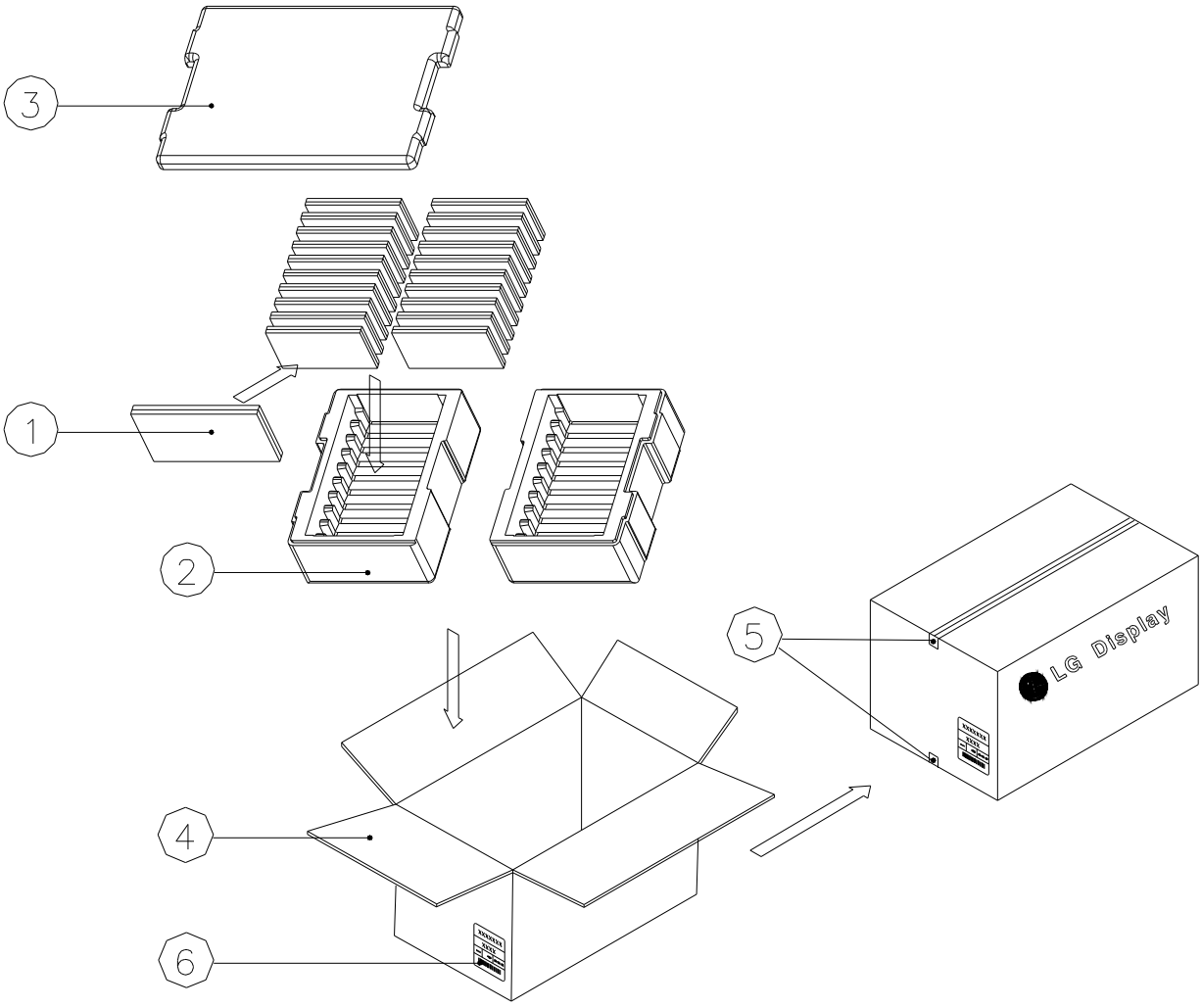
b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.

## 11-2. Packing Form

a) Package quantity in one box :40 pcs
b) Box Size : 475×335×150 (mm)

| NO. | Description | Material |
|---|---|---|
| 1 | Module | |
| 2 | Packing, Bottom | EPP |
| 3 | Packing, Top | EPP |
| 4 | Carton Box | SWR4 |
| 5 | Tape | OPP 70MMx300m |
| 6 | Label | Art Paper 100x100 |



## 12. PRECAUTIONS

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

### 12-1. MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged in four corners or three 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 resist external force.
(4) You should adopt heat 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 with bare hand or greasy cloth.(Some cosmetics deteriorate the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. 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.
(10) The metal case of a module should be contacted to electrical ground of your system.

### 12-2. 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, stable 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 minimize the interference.

## 12-3. 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.

## 12-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

## 12-5. 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.

## 12-6. 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.