

Product Specification

SPECIFICATION FOR APPROVAL

- () Preliminary Specification
 () Final Specification

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

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

| | |
|----------|--------------------------|
| SUPPLIER | LG.Philips LCD Co., Ltd. |
| MODEL | LT070W02 |
| SUFFIX | * TME1 |

***Without Tcon**

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

| APPROVED BY | DATE |
|---------------------------------|-------|
| C.S. KYEONG /G.Manager _____ | _____ |
| REVIEWED BY | |
| S.D. JUNG /Manager _____ | _____ |
| PREPARED BY | |
| J.Y. KIM /Engineer _____ | _____ |

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

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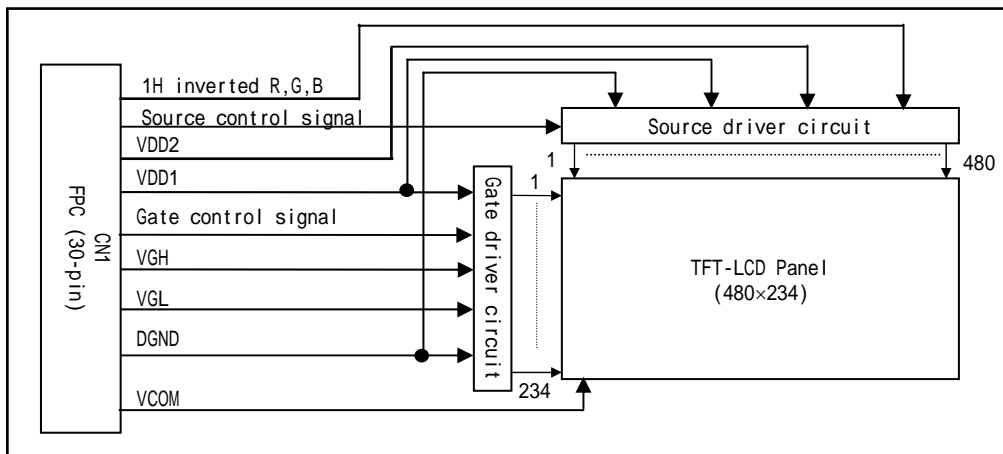
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Product Specification
1. Summary

The LT070W02-TME1 is a **Board Assembly Product** of TFT LCD without any extra system. This Board Assembly utilizes amorphous silicon thin film transistors and a 16:9 aspect ratio. A 7.0" active matrix liquid crystal display allows full color to be displayed. The applications are Portable DVD, Multimedia applications and others AV system.

2. Features

- Utilizes a panel with a 16:9 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.
- This Board Assembly is accomplished through the use of COG mounting technology.
- By adopting a high aperture panel, high transmittance color filter and high transmission polarizing plates, transmittance ratio is realized.


3. General Specification

| CHARACTERISTIC ITEM | SPECIFICATION |
|------------------------|---|
| Video Signal Interface | Analog Video Interface |
| Display Technology | a-Si TFT active matrix |
| Display Mode | TN Type Full Color / Transmitting Type / Normally White |
| Screen Size (Diagonal) | 7.0" (17.78cm) |
| Outline Dimension | 162.7mm (W) X 149.4mm (H) X 1.75mm (D) |
| Active Area | 154.08mm (W) X 86.58mm (H) |
| Number Of dots | 480(H) X 3(R,G,B) X 234(V) |
| Dot Pitch | 0.107mm (W) X 0.370mm (H) |
| Color Filter Array | RGB vertical stripes |
| Weight | 60 g (Max.) |
| Surface Treatment | Anti-Glare Treatment |

Product Specification
4. Interface (Input terminal)

1> TFT-LCD Panel Driving Part

| Pin No. | SYMBOL | FUNCTION | REMARK |
|---------|---------|---|-----------------------------------|
| 1 | VDD1 | Power Line For Logic | |
| 2 | VDD1 | Power Line For Logic | |
| 3 | DS | Gate Driver Double Scan Control | See P.11 |
| 4 | U/D | Up/Down Scanning Change | See 6-3> P.9 |
| 5 | STV | Gate Scanning Start Signal (GSP) | |
| 6 | CLK | Gate Driver Scanning Clock Pulse (GSC) | |
| 7 | OE | Gate Driver Output Enable (GOE) | H: enable / L:disable |
| 8 | DSOE | Gate Driver Double Scan Pulse Width Control | See P.11 |
| 9 | DGND | Ground For Logic Circuit | |
| 10 | VGL | Gate Driver Negative Voltage | |
| 11 | VGH | Gate Driver Positive Voltage | |
| 12 | AGND | Ground For Analog Circuit | |
| 13 | AGND | Ground For Analog Circuit | |
| 14 | VDD2 | Power Line For Source Driver IC | |
| 15 | VDD2 | Power Line For Source Driver IC | |
| 16 | VB | Blue Analog Video Signal | |
| 17 | VG | Green Analog Video Signal | |
| 18 | VR | Red Analog Video Signal | |
| 19 | DGND | Ground For Logic Circuit | |
| 20 | STH2 | Source Scanning Left Start Signal (STHL) | |
| 21 | SEQ/SIM | Sampling Mode Change | Forced Simultaneous Sampling Mode |
| 22 | L/R | Left/Right Scanning Change | See 6-3> P.9 |
| 23 | RESET | Source Driver Reset | No use |
| 24 | SOE | Source Driver Output Enable (INH) | H: disable / L: enable |
| 25 | CPH1 | Source Driver Clock Signal 1(SSC_1) | |
| 26 | CPH2 | Source Driver Clock Signal 2 (SSC_2) | |
| 27 | CPH3 | Source Driver Clock Signal 3 (SSC_3) | |
| 28 | STH1 | Source Scanning Right Start Signal (STHR) | |
| 29 | VEE | Gate Driver Negative Voltage For Internal Operation | |
| 30 | VCOM | Voltage Applied To Color Filter Substrate | |

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.

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5. Absolute Maximum Ratings

| PARAMETER | SYMBOL | CONDITION | MIN. | MAX. | UNIT | REMARK |
|--|-----------------|--------------------|---------|----------|------|------------------|
| Logic Voltage | VDD1 | T _a =25 | -0.5 | 6.0 | V | |
| Source Driver Voltage | VDD2 | T _a =25 | -0.5 | 6.0 | V | |
| Digital Input Signals | V _{DI} | T _a =25 | -0.5 | VDD1+0.5 | V | [Note 5-1] |
| Analog Input Signals | V _{AI} | T _a =25 | -0.5 | VDD2+0.5 | V | [Note 5-2] |
| Gate Driver High Supply Voltage | VGH | T _a =25 | -0.5 | 28 | V | |
| Gate Driver Internal Negative Supply Voltage | VEE | T _a =25 | -16 | 0.5 | V | |
| Gate Driver Low Supply Voltage | VGL | T _a =25 | VEE-0.3 | VEE+7.0 | V | |
| Storage Temperature | T _{st} | - | -20 | 70 | | [Note 5-3,4] |
| Operating Temperature (Ambient Temperature) | T _a | - | -10 | 60 | | [Note 5-3,4,5,6] |

[Note 5-1] DS, U/D, STV, CLK, OE, DSOE, STH1, STH2, L/R, SOE, CPH1, CPH2, CPH3

[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 60 . 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. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature, T_a 25 .

[Note 5-6] Ambient temperature when the backlight is lit (reference value).

Product Specification

6. Electrical Characteristics

1> Recommended Operating Conditions

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 | | |
| Digital Input Signal | High Level | V_{IH} | 0.8VDD1 | - | VDD1 | V | | |
| | Low Level | V_{IL} | 0 | - | 0.2VDD1 | V | | |
| Source Driver Supply Voltage | | VDD2 | 4.5 | 5.0 | 5.5 | V | | |
| Gate Driver | High Supply Voltage | VGH | 16.0 | 16.5 | 17.0 | V | | |
| | Low Supply Voltage | AC | VGL_{AC} | 4.0 | 5.0 | 6.0 | V_{P-P} | |
| | | DC | VGL_{DC} | -12.0 | -11.5 | -11.0 | V | |
| Internal Negative Supply Voltage | | VEE | -15.0 | -14.5 | -14.0 | V | | |
| Analog Video Signal Input Voltage | | V_{VI} | AGND+1.0 | - | VDD2-1.0 | V | | |
| Color Filter Substrate Voltage | AC Component | $VCOM_{AC}$ | 4.0 | 5.0 | 6.0 | V_{P-P} | | |
| | DC Component | $VCOM_{DC}$ | 1.5 | 1.75 | 2.0 | V | [Note 1] | |

[Note 1] This value should be tuned for optimal display quality of each panel.

***** Cautionary Matter : When applying or disconnecting power, please be sure that such action is sequentially carried out for all power supplies. In addition, apply input signals only after power has been turned on.

-Source Driver :

Turn on power to VDD1 and VDD2 in this order.
Turn off power in the reverse order.

-Gate Driver :

Turn on power to VDD1, VEE, VGL and VGH in this order.
Turn off power in the reverse order.

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| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|--|-----------|------|------|------|-------|--|
| Logic Supply Current | I_{DD1} | - | - | 5.0 | mA | VDD1 = 3.3V |
| Source Driver Supply Current | I_{DD2} | - | - | 50 | mA | VDD2 = 5.0V |
| Gate Driver Internal Negative Supply Current | I_{EE} | - | - | 1.5 | mA | VEE=-14.5V |
| Gate Driver High Supply Current | I_{GH} | - | - | 0.5 | mA | VGH=16.5V |
| Gate Driver Low Supply Current | I_{GL} | - | - | 15 | mArms | VGL _{DC} =-11.5V VGL _{AC} =5.0V |

Product Specification
2> Timing Characteristics of input signals

| | PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|----------------------------|-------------------------------|----------------------|------|------|--------|------|-------------------------------------|
| S O U R C E | Clock cycle time | Tcph | 100 | - | 2000 | ns | CPHn |
| | CPHn pulse duty | Tcwh | 40 | - | 60 | % | CPHn |
| | CPHn phase delay | Tc12 Tc23 Tc31 | 20 | - | Tcph/2 | ns | CPH1-CPH2 CPH2-CPH3 CPH3-CPH1 |
| | Set-up time of analog signals | Tasu | 60 | - | - | ns | VA,VB,VC-CPHn |
| | Hold time of analog signals | Tahd | 40 | - | - | 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 | 8 | - | - | us | OE-STHn |
| | SOE pulse width | Twoe | 1 | - | - | Tcph | |
| G A T E | Clock Pulse High Width | PW _{CLK(H)} | 500 | - | | ns | |
| | Clock Pulse Low Width | PW _{CLK(L)} | 500 | - | | ns | |
| | Enable Pulse Width | PW _{OE} | 1000 | - | | ns | |
| | Start Pulse Setup Time | t _{SETUP1} | 200 | - | | ns | |
| | Start Pulse Hold Time | t _{HOLD1} | 200 | - | | ns | |
| | Double Scan Setup Time | t _{SETUP2} | 200 | - | | ns | |
| | Double Scan Hold Time | t _{HOLD2} | 200 | - | | ns | |

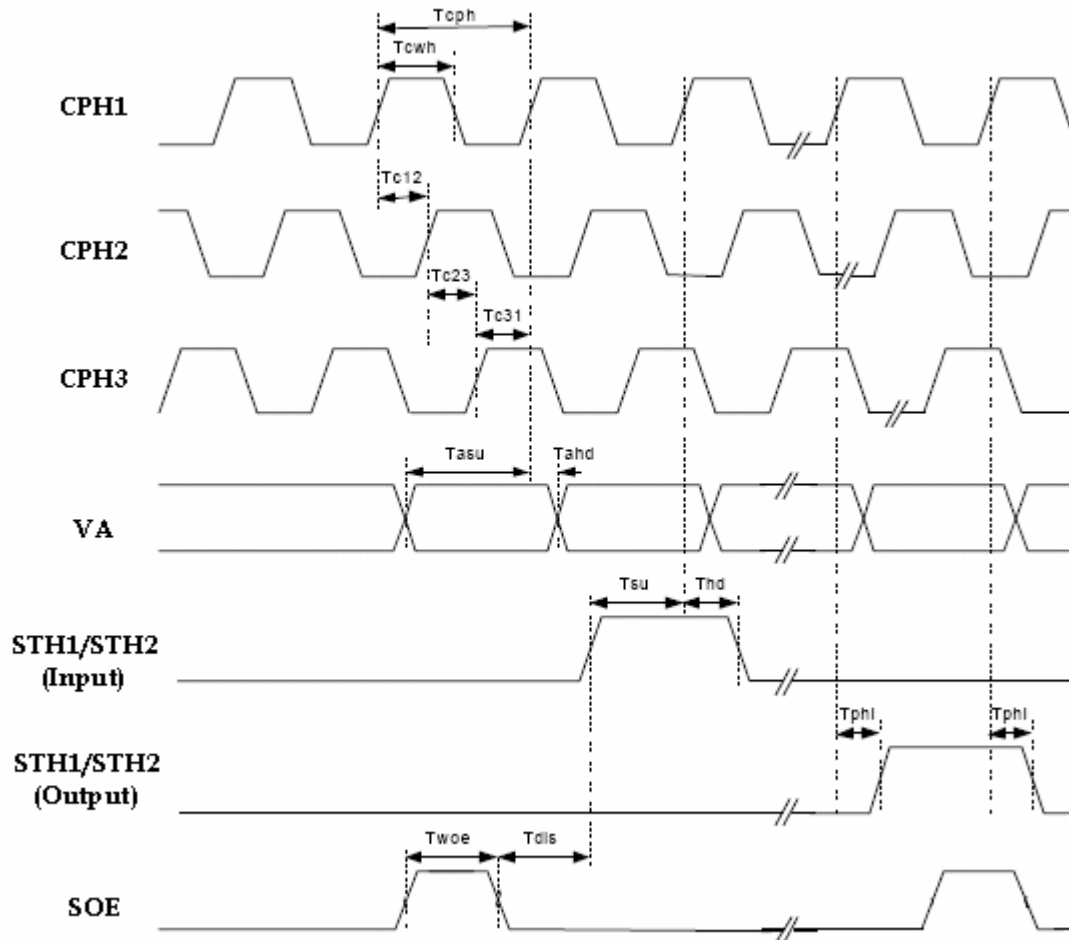
3> Scanning Mode Selection (Reference position : @ Input terminal)

| MODE | L/R | U/D | STHL | STHR | STV | REMARK |
|-----------------------------------|-----|-----|---------------|---------------|-------|---|
| Normal Mode | H | H | Signal Output | Signal Input | Input | See P.13 (the figure of [Note 7-3]) |
| Left/Right Reverse Mode | L | H | Signal Input | Signal Output | Input | |
| Up/Down Reverse Mode | H | L | Signal Output | Signal Input | Input | |
| Left/Right & Up/Down Reverse Mode | L | L | Signal Input | Signal Output | Input | |

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

Product Specification

Timing for a Source Driver

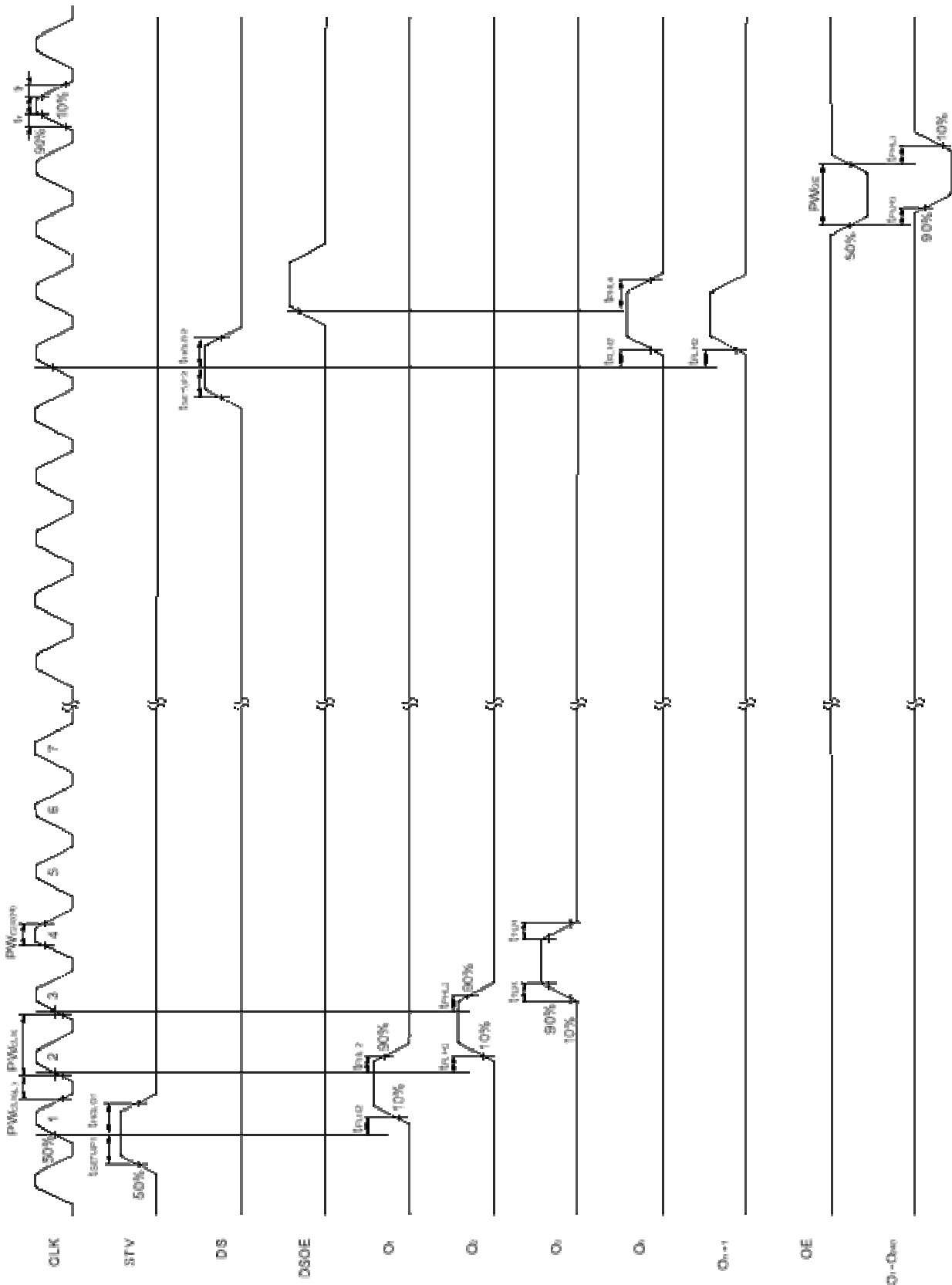


• Remark : The sample-and-hold circuits are switched and the outputs are started with new data at the rising edge of SOE.

“ For T_{twoe} period, shift register in source driver are reset internally.”

Product Specification

Switching Characteristics Waveform for Gate Driver (U/D =H)



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7. Electro-optical Characteristics
 $T_a=25$

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | REMARK |
|--------------------------|------------------|------------|-------|-------|-------|------|--------------------------|
| Transmittance | T | - | 7.2 | 8.5 | - | % | |
| Contrast Ratio | CR | Optimal | 300 | 400 | - | - | [Note 7-2] |
| White Color Chromaticity | W_x | - | 0.270 | 0.300 | 0.330 | - | [Note 7-1] |
| | W_y | | 0.304 | 0.334 | 0.364 | - | |
| Viewing Angle | $\phi=180^\circ$ | CR 10 | 60 | 65 | - | ° | [Note 7-2] [Note 7-3] |
| | $\phi=0^\circ$ | | 60 | 65 | - | ° | |
| | $\phi=90^\circ$ | | 40 | 45 | - | ° | |
| | $\phi=270^\circ$ | | 50 | 55 | - | ° | |
| Response Time | Rise | $=0^\circ$ | - | 10 | 20 | ms | [Note 7-4] |
| | Fall | | - | 20 | 30 | ms | |

** All transmissive mode optical characteristics are measured under back light condition.
but, following conditions are just "Internal Conditions for Quality Test" of LG.Philips LCD.

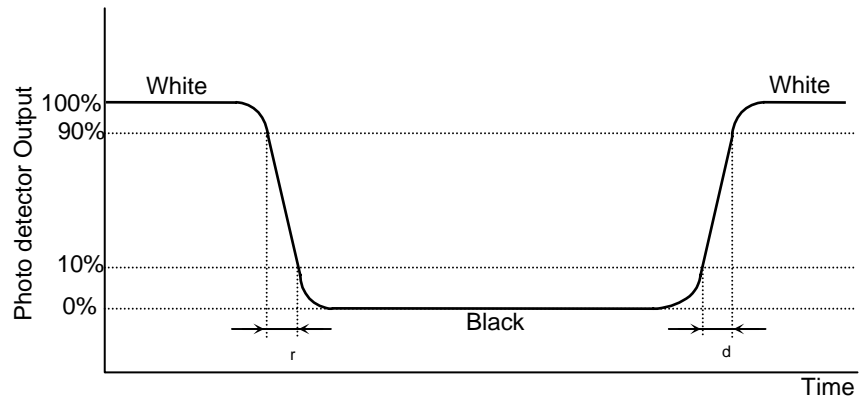
< Reference Backlight Unit >

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|--------------------------|--------|------|-------|------|-------------------|--------------|
| Luminance | B_1 | - | 4750 | - | cd/m ² | Center Point |
| White Color Chromaticity | X | - | 0.291 | - | - | Center Point |
| | Y | - | 0.297 | - | | Center Point |

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[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".

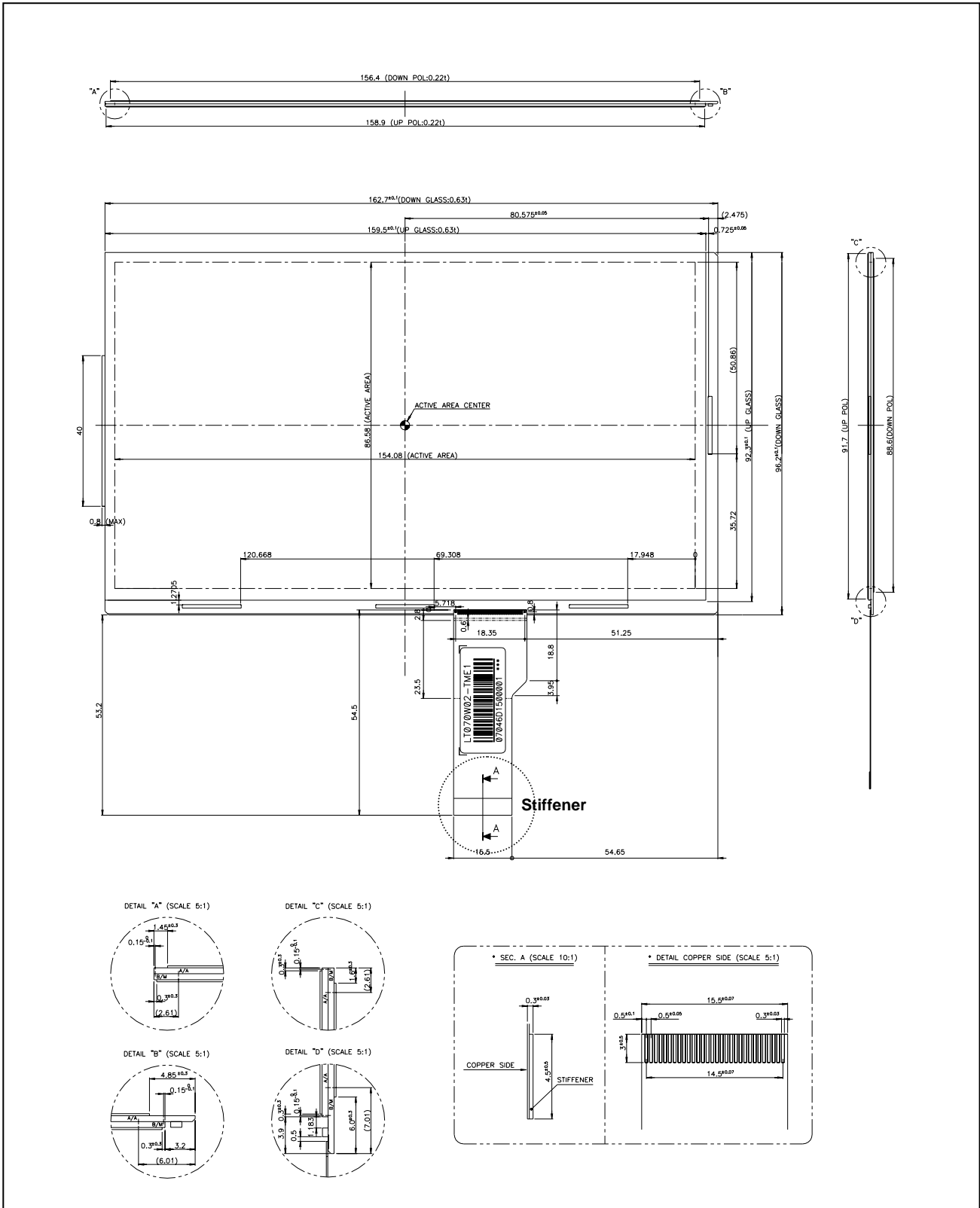


Product Specification
8. Mechanical Characteristics

| PARAMETER | SPECIFICATION | | UNIT | REMARK |
|---------------------|----------------------|------------|------|--------|
| Outline Dimension | Width | 162.7 | mm | |
| | Height | 149.4 | mm | |
| | Depth | 1.75 (TYP) | mm | |
| Active Display Area | Width | 154.08 | mm | |
| | Height | 86.58 | mm | |
| Weight | 60 (Max.) | | g | |
| Surface Treatment | Anti-Glare Treatment | | - | |

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[Outline Dimension]



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9. Reliability Test

| No. | Test Items | Test Condition | REMARK |
|-----|---|-------------------------------------|----------------|
| 1 | High Temperature Storage Test | T _a =60 240h | [Note 9-1,2,3] |
| 2 | Low Temperature Storage Test | T _a =-10 240h | [Note 9-1,2,3] |
| 3 | High Temperature Operation Test | T _a =70 240h | [Note 9-1,2,3] |
| 4 | Low Temperature Operation Test | T _a =-20 240h | [Note 9-1,2,3] |
| 5 | High Temperature and High Humidity Operation Test | T _a =50 80%RH 240h | [Note 9-1,2,3] |
| 6 | Thermal Shock Test | -10 (0.5h) ~ 60 (0.5h) / 100 cycles | |

[Note 9-1] T_a = Ambient Temperature

[Note 9-2] In the Reliability Test, Confirm performance after leaving in room temp.

[Note 9-3] In the standard condition, there shall be no practical problems that may affect the display function.

Product Specification
10. Packing
10-1. 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

G : ASSEMBLY CODE

D : YEAR

F : FACTORY 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.

10-2. Packing Form

a) Package quantity in one box : 80 pcs

b) Box Size(mm) : 384(L)×334(W)×191(H)

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11. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD COG Assembly(Board Ass'y).

11-1. MOUNTING PRECAUTIONS

- (1) You must mount a Board Ass'y using packing trays arranged.
- (2) You should consider the mounting structure so that uneven force(ex. Twisted stress) is not applied to the Board Ass'y.
And the case on which a Board Ass'y is mounted should have sufficient strength so that external force is not transmitted directly to the Board Ass'y.
- (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 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.

11-2. OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
 $V = \pm 200\text{mV}$ (Over and under shoot voltage)
- (2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
- (3) 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.
- (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (5) Sufficient suppression to the electromagnetic interference shall be done by system manufacturers.
Grounding and shielding methods may be important to minimize the interference.

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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.