

Product Specification**CONTENTS**

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Product Specification

1. Summary

This module 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 12 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, 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" (17.67 ^{cm}) |
| Outline Dimension | 166mm (W) X 100mm (H) X 7.0mm (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 | 155 g (Max) |
| Backlight | CCFL with 3 wave-length spectrum (L Type) |
| Surface Treatment | Anti-Glare Treatment |

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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.13 |
| 4 | U/D | Up/Down Scanning Change | See 6-3> P.11 |
| 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.13 |
| 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 | STHL | Source Scanning Left Start Signal (SSP_L) | |
| 21 | SEQ/SIM | Sampling Mode Change | Forced Simultaneous Sampling Mode |
| 22 | L/R | Left/Right Scanning Change | See 6-3> P.11 |
| 23 | RESET | Source Driver Reset | No use |
| 24 | INH | Source Driver Output Enable (SOE) | H: disable / L: enable |
| 25 | CLI1 | Source Driver Clock Input 1(SSC_1) | |
| 26 | CLI2 | Source Driver Clock Input 2 (SSC_2) | |
| 27 | CLI3 | Source Driver Clock Input 3 (SSC_3) | |
| 28 | STHR | Source Scanning Right Start Signal (SSP_R) | |
| 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} | - | -10 | 60 | ℃ | [Note 5-3,4] |
| Operating Temperature (Ambient Temperature) | T _a | - | 0 | 60 | ℃ | [Note 5-3,4,5,6] |

[Note 5-1] DS, U/D, STV, CLK, OE, DSOE, STHL, SEQ/SIM, L/R, RESET, INH, CLI1, CLI2, CLI3, STHR

[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).

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6. Electrical Characteristics

1> Recommended Operating Conditions

◆ TFT-LCD Panel Driving Section

 $T_a=25^{\circ}\text{C}$

| 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 | V_{GL_AC} | 4.0 | 5.0 | 6.0 | V_{P-P} | |
| | | DC | V_{GL_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 | V_{COM_AC} | 4.0 | 5.0 | 6.0 | V_{P-P} | | |
| | DC Component | V_{COM_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, logic input, VDD2, and video signal input in this order.
 Turn off power in the reverse order.

-Gate Driver :

Turn on power to VDD1, VEE, VGL, VGH, and logic input 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 |

◆ Backlight Driving Section

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | REMARK |
|------------------------------|----------|----------------|----------------|----------------|---------|---------------------|
| Lamp Current | I_{BL} | 3.0 | 6.0 | 6.5 | mArms | |
| Lamp Voltage | V_{BL} | 542 (6.5mA) | 555 (6.0mA) | 670 (3.0mA) | Vrms | ±10[%] |
| Lamp Power Consumption | P_{BL} | 2.01 | 3.33 | 3.53 | Wrms | |
| Lamp Frequency | f_{BL} | 40 | - | 60 | kHz | *1 |
| | | 40 | - | 80 | | *2 |
| Kick-Off Voltage (*3) | V_S | - | - | 1080 | Vrms | T _a =25℃ |
| | | - | - | 1390 | Vrms | T _a =0℃ |
| Discharge Stabilization Time | T_S | - | - | 3 | Minutes | *4 |
| Life Time | - | 20,000 | - | - | Hour | *5 |

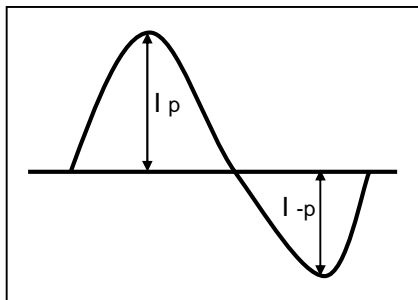
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- * 1 : This frequency range means the range to keep within $\pm 10\%$ change of electrical and optical characteristics.
- * 2 : This frequency range means not affecting to lamp life and reliability characteristics.
(The lamp frequency should be selected 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 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.
- * 4 : The time needed to achieve not less than 95% brightness of the center part of lamp.
The brightness of the lamp after being lighted for 5 minutes is defined as 100%.
- * 5 : "Life time" is defined as the time the lamp brightness decreases to 50% from original brightness at $I_{BL}=TYP$; continuous lighting, $T_a=25^\circ C$.

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:

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

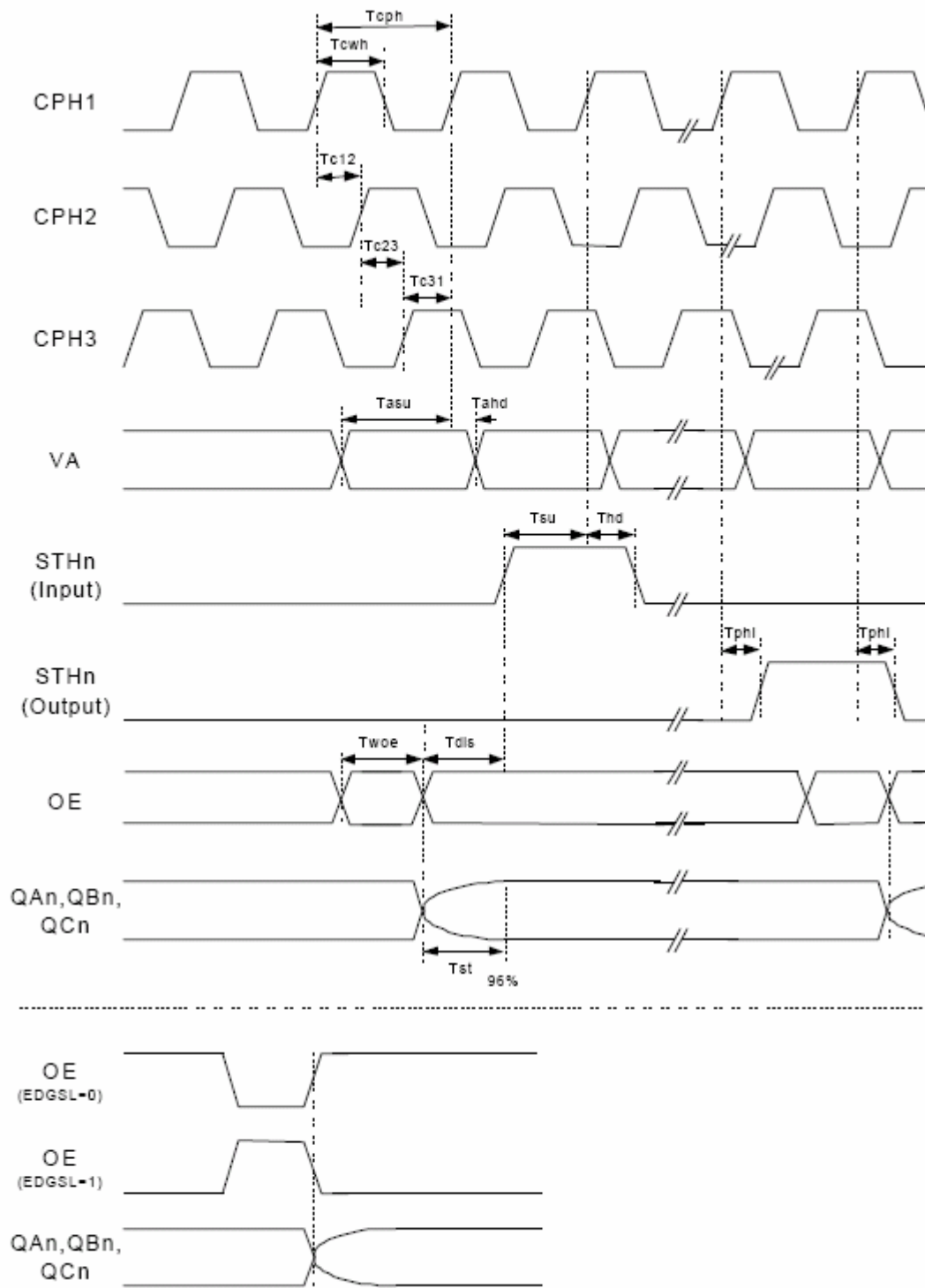
- C. There should not be any spikes in the waveform.
- D. Lamp current should not exceed the "MAX" value under the "Operating Temperature" (it is prohibited to exceed the "MAX." value even if it is operated in the guaranteed temperature).
When lamp current exceed the maximum value for a long time, it 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 attaches 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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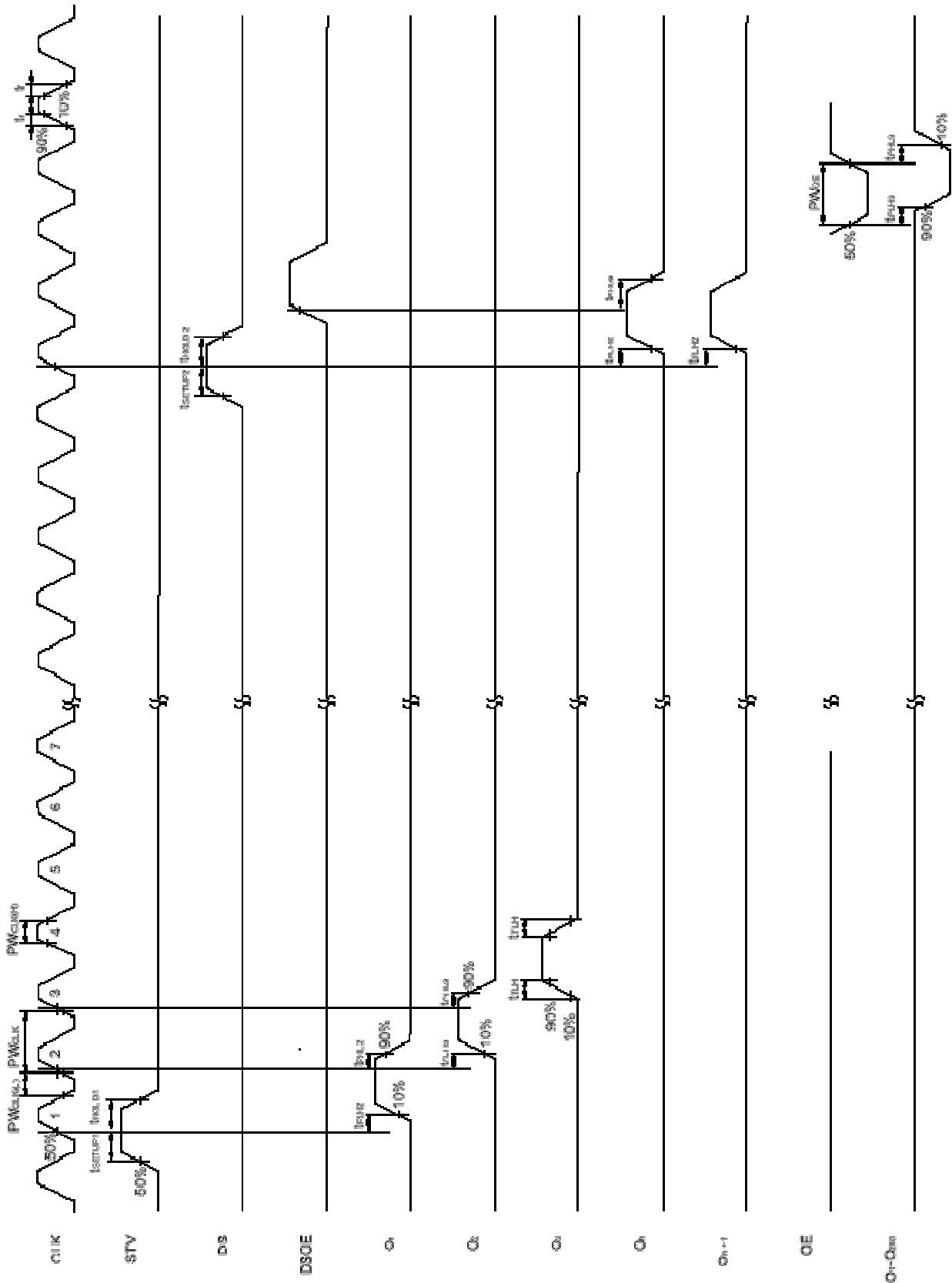
Timing for a Source Driver



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

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

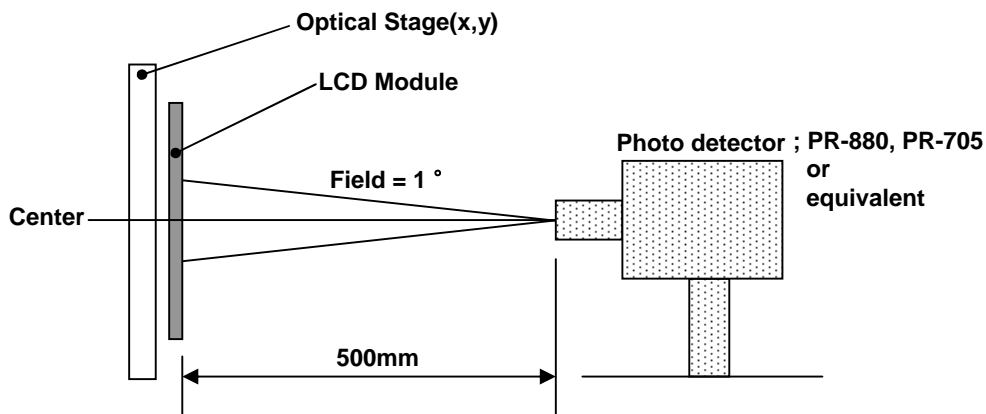


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7. Electro-optical Characteristics

$T_a=25^\circ\text{C}$

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | REMARK | |
|--------------------------|------------------|------------------------|------------|-------|-------|-------------------|--------------------------|----|
| Luminance | Y | $I_{BL}=6\text{mArms}$ | 300 | 400 | - | cd/m ² | [Note 7-1] | |
| Contrast Ratio | CR | Optimal | 300 | 400 | - | - | [Note 7-2] | |
| White Color Chromaticity | W_x | $I_{BL}=6\text{mArms}$ | 0.270 | 0.300 | 0.330 | - | [Note 7-1] | |
| | W_y | | 0.304 | 0.334 | 0.364 | - | | |
| Viewing Angle | $\phi=180^\circ$ | $\text{CR} \geq 5$ | 60 | 65 | - | ° | [Note 7-2] [Note 7-3] | |
| | $\phi=0^\circ$ | | Θ_r | 60 | 65 | - | | ° |
| | $\phi=90^\circ$ | | Θ_u | 60 | 65 | - | | ° |
| | $\phi=270^\circ$ | | Θ_d | 45 | 50 | - | | ° |
| Response Time | Rise | $\Theta=0^\circ$ | - | 10 | 20 | ms | [Note 7-4] | |
| | Fall | | τ_d | - | 30 | 45 | | ms |



- Measuring Condition ;
- Measuring surroundings : Dark Room
 - Measuring temperature : $T_a=25^\circ\text{C}$
 - 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.

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[Note 7-1]

Measured on the center area of the panel by PHOTO RESEARCH photometer PR-880 and PR-705 or equivalent.

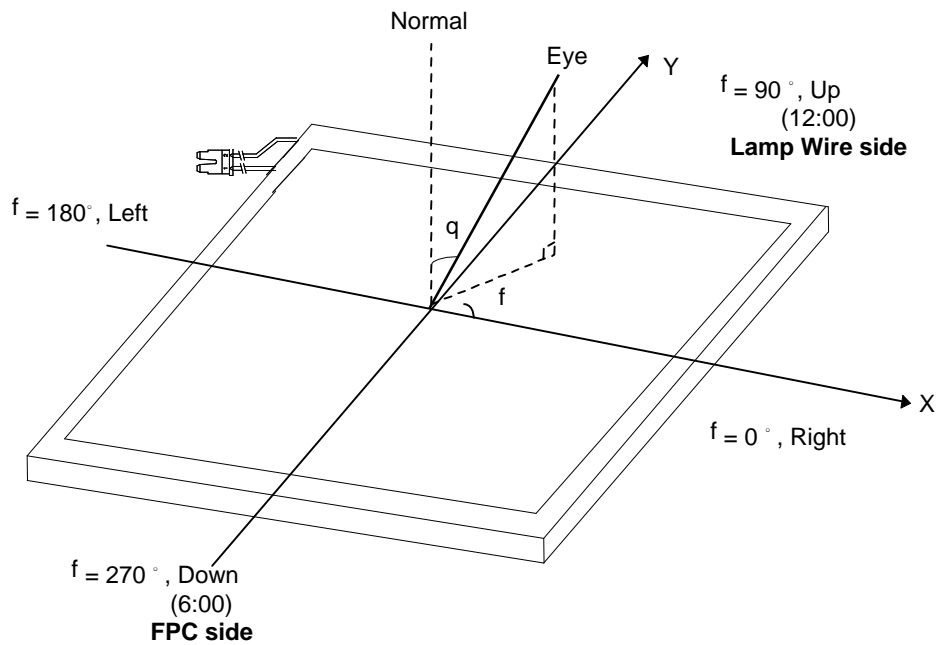
[Note 7-2]

Contrast ratio is defined as follows ;

$$\text{Contrast Ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"}}{\text{Photo detector output with LCD being "black"}}$$

[Note 7-3]

Viewing angle range is defined as follows;

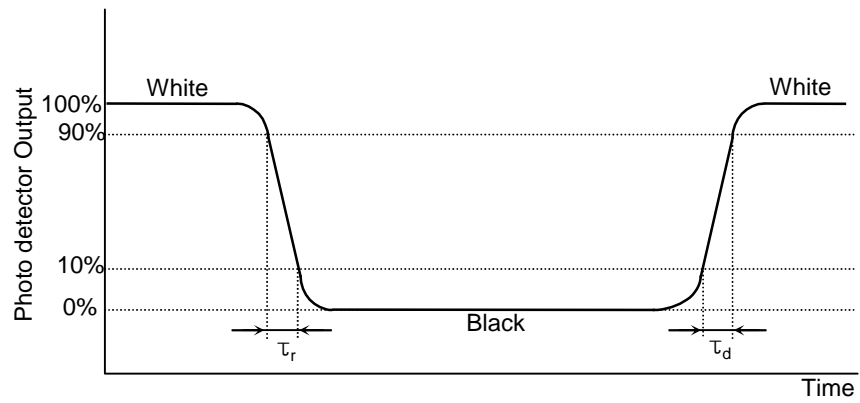


[Normal scanning Mode view]

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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".



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8. Mechanical Characteristics

| PARAMETER | SPECIFICATION | | UNIT | REMARK |
|---------------------|----------------------|-----------|------|--------|
| Outline Dimension | Width | 166 | mm | |
| | Height | 100 | mm | |
| | Depth | 7.0 (TYP) | mm | |
| Bezel Area | Width | 157.2 | mm | |
| | Height | 89.6 | mm | |
| Active Display Area | Width | 154.08 | mm | |
| | Height | 86.58 | mm | |
| Weight | 155 (Max.) | | g | |
| Surface Treatment | Anti-Glare Treatment | | - | |

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9. Reliability Test

| No. | Test Items | Test Condition | REMARK |
|-----|---|---|----------------|
| 1 | High Temperature Storage Test | Ta=60℃ 240h | [Note 9-1,2,3] |
| 2 | Low Temperature Storage Test | Ta=-10℃ 240h | [Note 9-1,2,3] |
| 3 | High Temperature Operation Test | Ta=60℃ 240h | [Note 9-1,2,3] |
| 4 | Low Temperature Operation Test | Ta=0℃ 240h | [Note 9-1,2,3] |
| 5 | High Temperature and High Humidity Operation Test | Ta=50℃ 80%RH 240h | [Note 9-1,2,3] |
| 6 | Electro Static Discharge Test | -Panel Surface/Top_Case : 150pF, 150Ω (Air : ±15kV , Contact : ±8kV) -FPC input terminal : 100pF ±200V 0Ω | |
| 7 | Shock Test (non-operating) | Half sine wave, 80G, 11ms 3 times shock of each six faces | |
| 8 | Vibration Test (non-operating) | Sine wave, 10 ~ 500 ~ 10Hz, 1.5G, 0.37oct/min 3 axis, 1hour/axis | |
| 9 | 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.

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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.

10-2. 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)

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11. Packing

11-1. Designation of Lot Mark

a) Lot Mark



A,B,C : SIZE(INCH)

D : YEAR

F : PANEL CODE

H : ASSEMBLY CODE

E : MONTH

G : FACTORY CODE

I,J,K,L,M : SERIAL NO.

Note

1. YEAR

| | | | | | | | | | | | |
|------|----|----|----|------|------|------|------|------|------|------|------|
| Year | 97 | 98 | 99 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Mark | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

2. MONTH

| | | | | | | | | | | | | |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Mark | 1 | 2 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

3. PANEL CODE

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-------------|
| Panel Code | P1 Factory | P2 Factory | P3 Factory | P4 Factory | P5 Factory | Hydis Panel |
| Mark | 1 | 2 | 3 | 4 | 5 | H |

4. FACTORY CODE

| | | |
|--------------|----------|-------------|
| Factory Code | LPL Gumi | LPL Nanjing |
| Mark | K | C |

5. SERIAL NO.

| | | |
|------|---------------|------------------------------|
| Year | 1 ~ 99999 | 100000 ~ |
| Mark | 00001 ~ 99999 | A0001 ~ A9999, , Z9999 |

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.

11-2. Packing Form

a) Package quantity in one box : 40 pcs

b) Box Size(mm) : 492(L)×402(W)×136(H)

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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 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 resist external force.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics 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 :
 $V = \pm 200\text{mV}$ (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 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.