



RAYSTAR

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RFT46AA-AIW-DNN

SPECIFICATION

CUSTOMER:

| | |
|-------------|--|
| APPROVED BY | |
| PCB VERSION | |
| DATE | |

FOR CUSTOMER USE ONLY

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|----------|-------------|------------|-------------|
| | | | |

Release DATE:

Revision History

| VERSION | DATE | REVISED PAGE NO. | Note |
|---------|------------|------------------|-------------|
| 0 | 2016/09/06 | | First issue |

RAYSTAR OPTRONICS

Contents

1. Module Classification Information
2. Summary
3. General Specification
4. Interface
5. Contour Drawing
6. Block Diagram
7. Absolute Maximum Ratings
8. Electrical Characteristics
9. Interface Timing Characteristics
10. Optical Characteristics
11. Reliability
12. Other

2.Summary

This technical specification applies to 4.6' color TFT-LCD panel. The 4.6' color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays. This module follows RoHS.

RAYSTAR OPTRONICS

3.General Specifications

- Size: 4.6 inch
- Dot Matrix: 800 x RGBx320(TFT) dots
- Module dimension: 120.7(W) x 56.16(H) x 3.1(D) mm
- Active area: 108 x 43.2 mm
- Dot pitch: 0.045(W)x 0.135(H) mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Surface: Anti-Glare

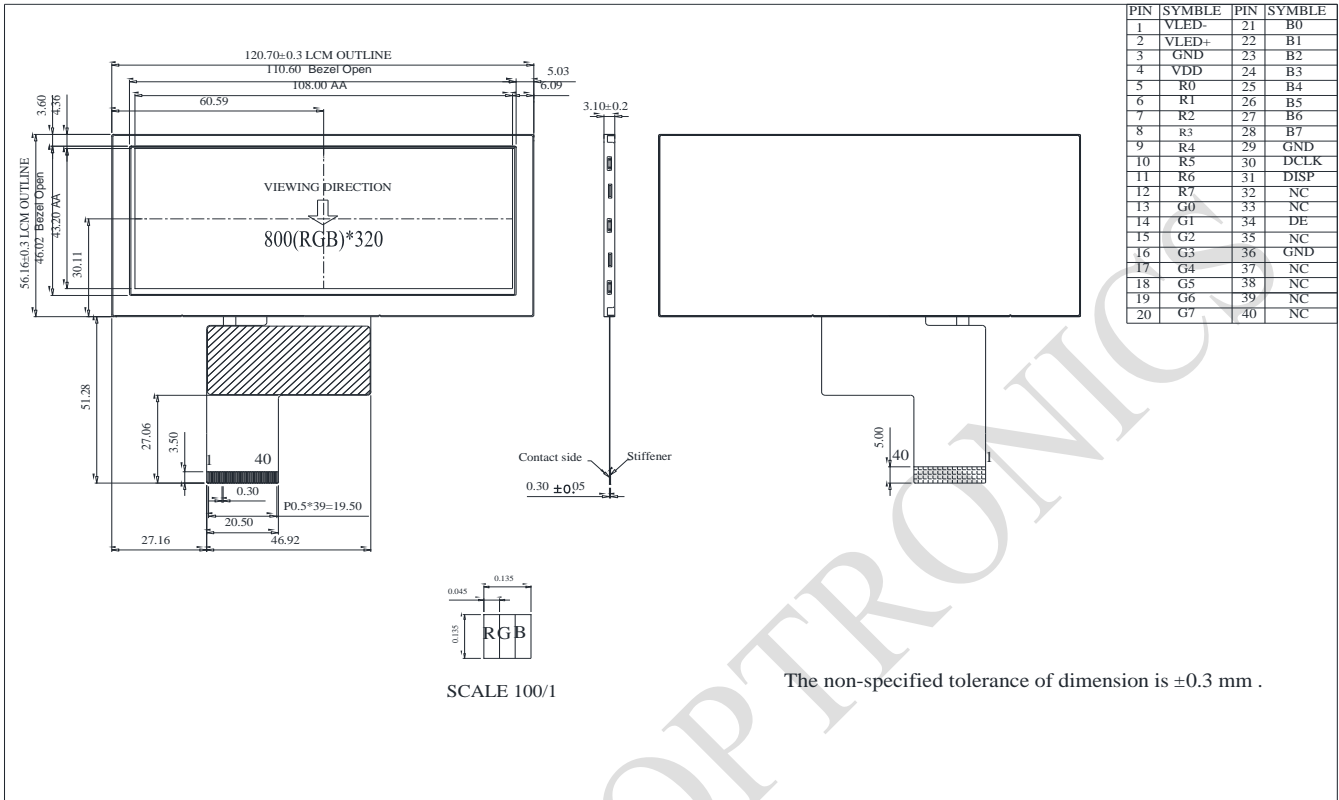
*Color tone slight changed by temperature and driving voltage.

4.Interface

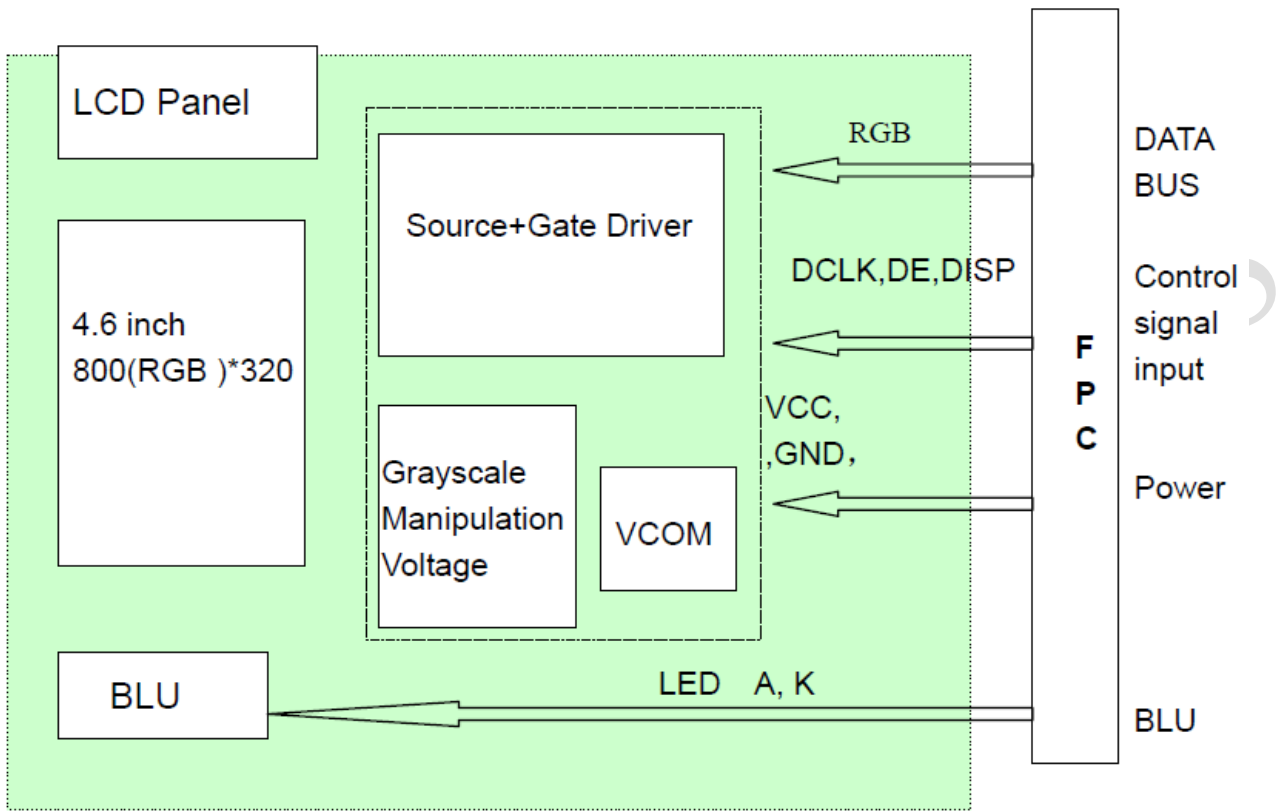
4.1. LCM PIN Definition

| No. | Symbol | Description |
|-------|--------|----------------------------------|
| 1 | VLED- | Backlight LED Cathode |
| 2 | VLED+ | Backlight LED Anode. |
| 3 | GND | System Ground |
| 4 | VDD | Power supply for logic operation |
| 5~12 | R0~R7 | Data bus |
| 13~20 | G0~G7 | Data bus |
| 21~28 | B0~B7 | Data bus |
| 29 | GND | System Ground |
| 30 | DCLK | Pixel clock signal |
| 31 | DISP | Display on/off control |
| 32 | NC | No connect |
| 33 | NC | No connect |
| 34 | DE | Data Enable |
| 35 | NC | No connect |
| 36 | GND | System Ground |
| 37 | NC | No connect |
| 38 | NC | No connect |
| 39 | NC | No connect |
| 40 | NC | No connect |

5. Contour Drawing



6. Block Diagram



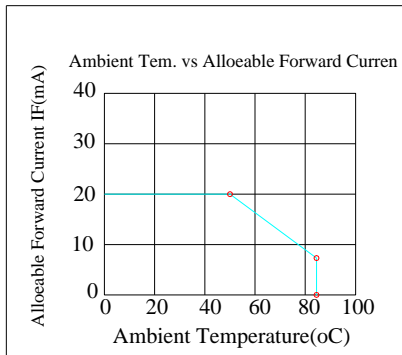
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7. Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP | -20 | — | +70 | °C |
| Storage Temperature | TST | -30 | — | +80 | °C |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

- Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C



8. Electrical Characteristics

8.1. Operating conditions:

| Item | Symbol | Values | | | Unit | Remark |
|--------------------------|--------|---------|------|---------|------|--------|
| | | MIN | TYP | MAX | | |
| Power Voltage | DVDD | 3.0 | 3.3 | 3.6 | V | Note 2 |
| | AVDD | 10.2 | 10.4 | 10.6 | V | |
| | VGH | 15.3 | 16.0 | 16.7 | V | |
| | VGL | -6.7 | -6.0 | -5.3 | V | |
| Input signal voltage | VCOM | 3.09 | 4.09 | 5.09 | V | Note 4 |
| Input logic high voltage | VIH | 0.7DVDD | | DVDD | V | Note 3 |
| Input logic low voltage | VIL | 0 | | 0.7DVDD | V | |

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output (refer to note3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D,L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB

Note 4: Typical VCOM is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.

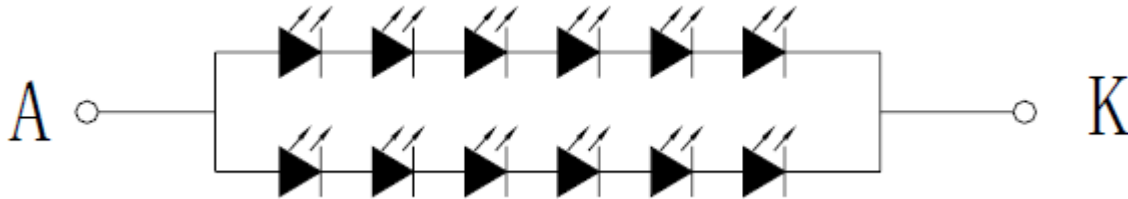
8.2. Current Consumption

| Item | Symbol | Values | | | Unit | Remark |
|--------------------|--------|--------|------|-----|------|------------|
| | | MIN | TYP | MAX | | |
| Current for driver | IGH | - | 0.50 | 1 | mA | VGH=16.0V |
| | IGL | - | 0.54 | 1 | mA | VGL=-6.0V |
| | IDVDD | - | 4.2 | 10 | mA | DVDD=3.3V |
| | IAVDD | - | 19 | 50 | mA | AVDD=10.4V |

8.3. LED driving conditions

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------------------|--------|-----|-------|-------|------|--------|
| Forward Current | IF | - | 40 | 50 | mA | |
| Forward Voltage | VF | | 19.6 | 21 | V | |
| Backlight Power consumption | WBL | - | 0.784 | -1.05 | W | |
| LED Lifetime | | - | 25000 | - | Hrs | |

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25 °C

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

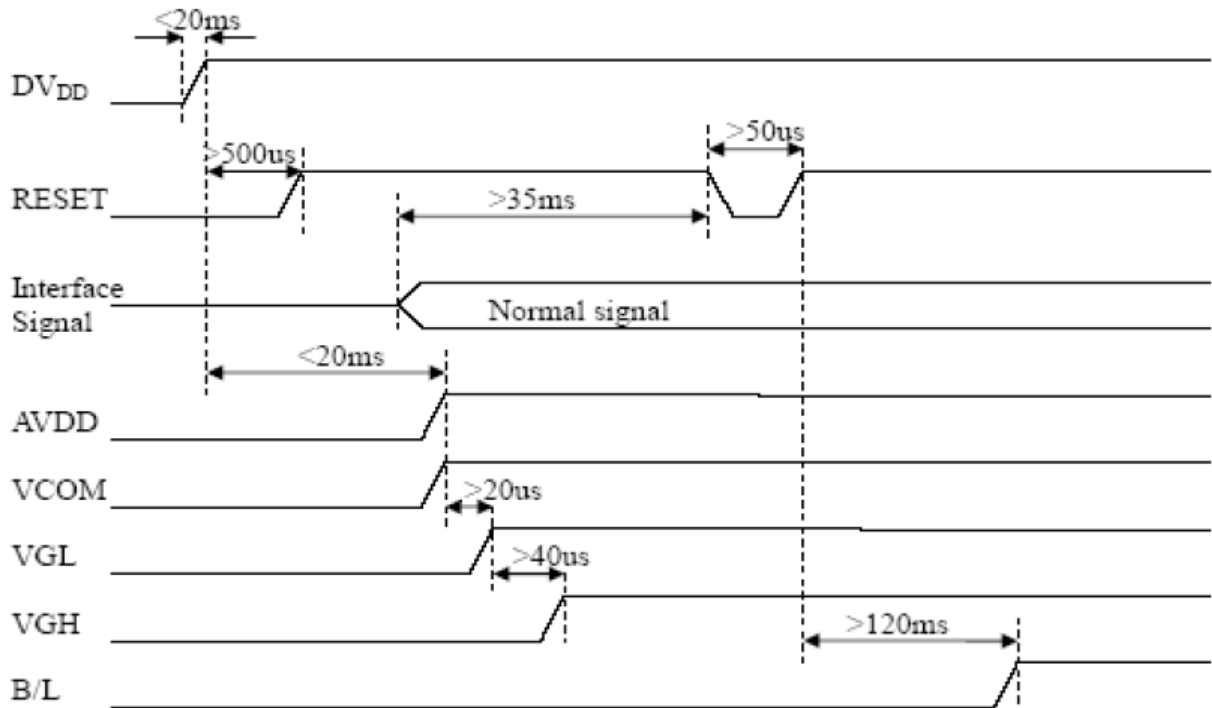
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9. Interface Timing

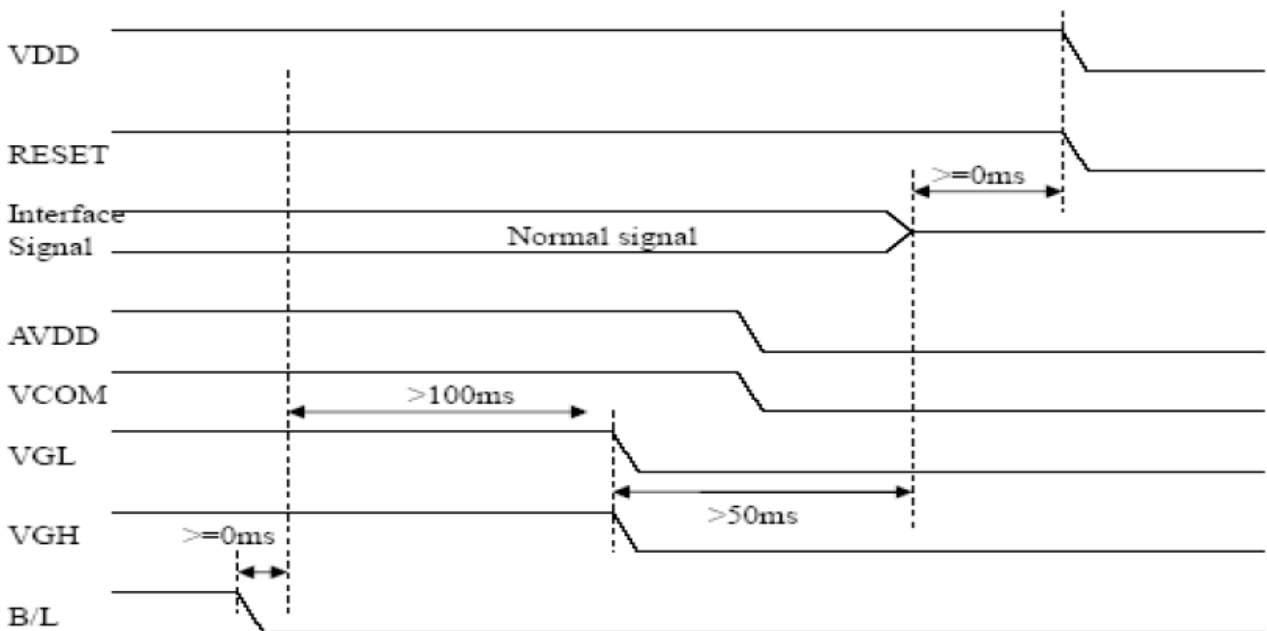
9.1. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.

a. Power on sequence:

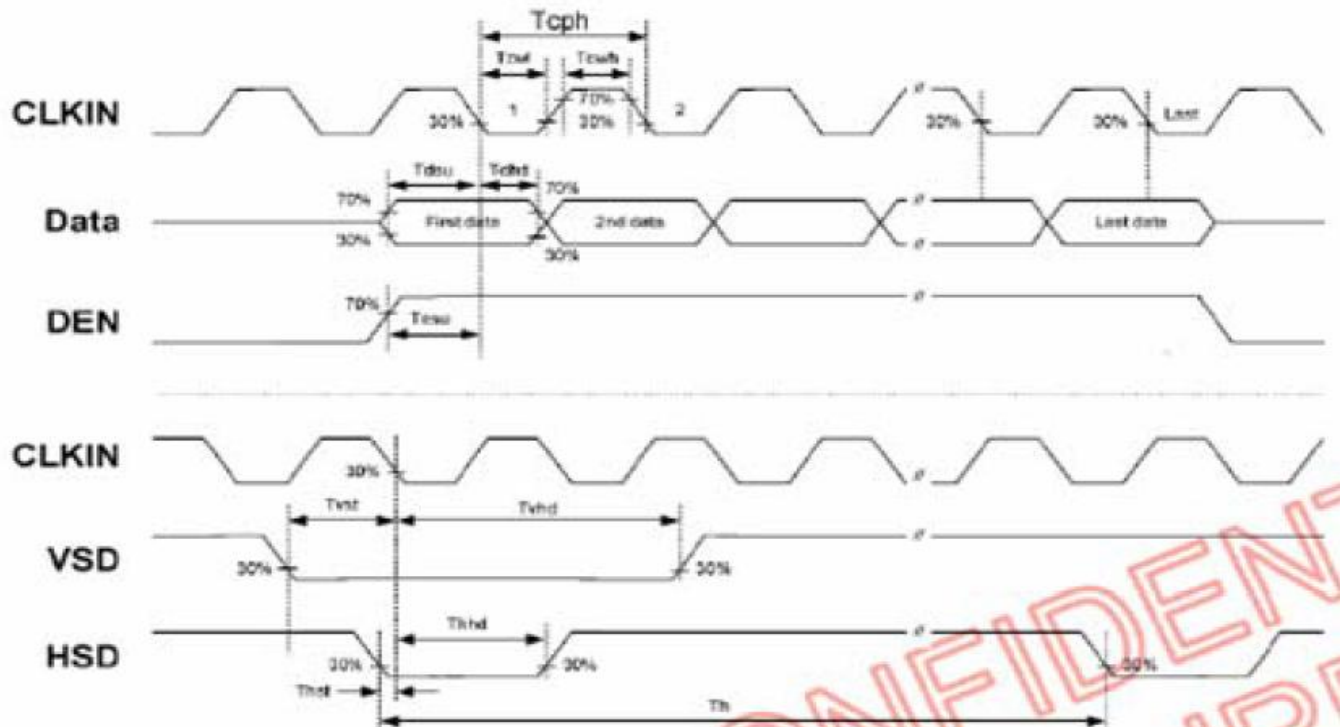


b. Power off sequence:



9.2. Timing Conditions

| Item | Symbol | Values | | | Unit | Remark |
|-------------------------|--------|--------|-----|-----|------|--------------------|
| | | MIN | TYP | MAX | | |
| HS setup time | Thst | 8 | - | - | ns | |
| HS hold time | Thhd | 8 | - | - | ns | |
| VS setup time | Tvst | 8 | - | - | ns | |
| VS hold time | Tvhd | 8 | - | - | ns | |
| Data setup time | Tdsu | 8 | - | - | ns | |
| Data hold time | Tdhd | 8 | - | - | ns | |
| DE setup time | Tesu | 8 | - | - | ns | |
| DE hold time | Tehd | 8 | - | - | ns | |
| DVDD power on slew rate | Tpor | - | - | 20 | ms | From 0 to 90% DVDD |
| RESET pulse width | Trst | 1 | - | - | ms | |
| DCLK cycle time | Tcoh | 20 | - | - | ns | |
| DCLK pulse duty | Tcwh | 40 | 50 | 60 | % | |

9.3. Timing Diagram


9.4. Timing

| Item | Symbol | Values | | | Unit | Remark |
|-------------------------|--------|--------|------|------|-------|--------|
| | | MIN | TYP | MAX | | |
| Horizontal Display Area | thd | - | 800 | - | DCLK. | |
| DCLK Frequency | fclk | 26.4 | 33.3 | 46.8 | MHz | |
| One Horizontal Line | th | 862 | 1056 | 1200 | DCLK | |
| HS pulse width | thpw | 1 | - | 40 | OCLK | |
| HS Blanking | thb | 46 | 46 | 46 | DCLK | |
| HS Front Porch | lfp | 16 | 210 | 354 | OCLK. | |

| Item | Symbol | Values | | | Unit | Remark |
|-----------------------|--------|--------|-----|-----|------|--------|
| | | MIN | TYP | MAX | | |
| Vertical Display Area | tvd | - | 480 | - | TH | |
| VS period time | tv | 510 | 525 | 650 | TH | |
| VS pulse width | tvpw | 1 | - | 20 | TH | |
| VS Blanking | tvb | 23 | 23 | 23 | TH | |
| VS Front Porch | tvfp | 7 | 22 | 147 | TH | |

9.5. Data Input Format



Figure 1 Horizontal input timing diagram.

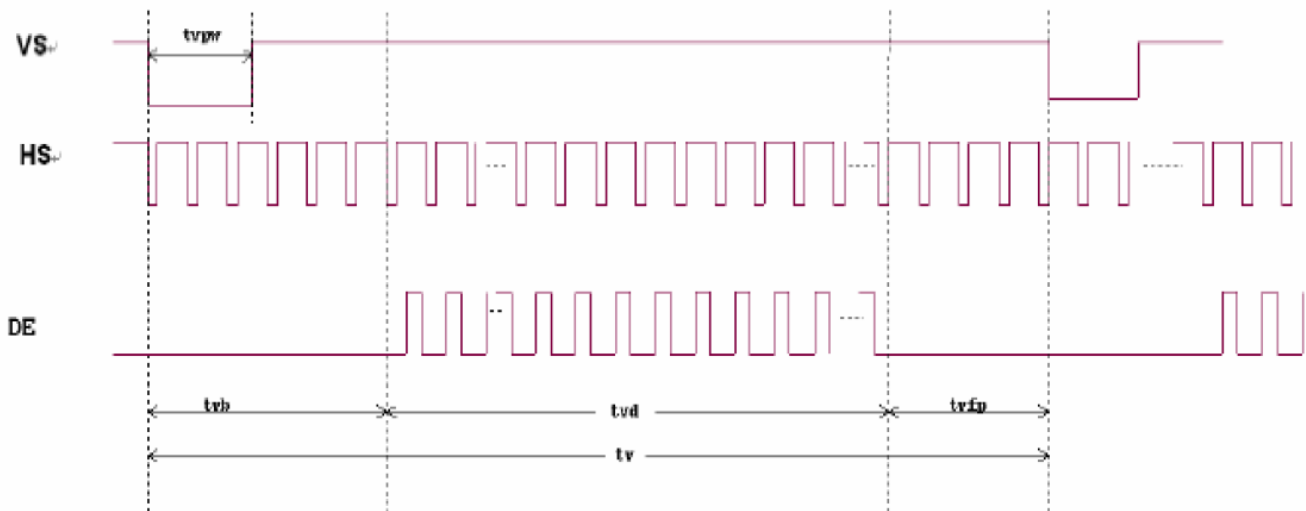


Figure 2 Vertical input timing diagram.

10. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|--|--------|-----------------------------------|------------|-------|-------|-------------------|-------------------|----------|
| Response time | Tr | $\theta=0^\circ$ 、 $\phi=0^\circ$ | - | 20 | 30 | ms | Note 3 | |
| | Tf | | - | 20 | 30 | | | |
| Contrast ratio | CR | At optimized viewing angle | 500 | 600 | - | - | Note 4 | |
| Color Chromaticity | White | $\theta=0^\circ$ 、 $\phi=0$ | Wx | 0.324 | 0.326 | 0.328 | - | Note 2,5 |
| | | | Wy | 0.364 | 0.366 | 0.368 | - | |
| Viewing angle (Gray Scale Inversion Direction) | Hor. | $CR \geq 10$ | θ_R | 60 | 70 | - | Deg | Note 1 |
| | | | θ_L | 60 | 70 | - | | |
| | Ver. | | ϕ_T | 40 | 50 | - | | |
| | | | ϕ_B | 60 | 70 | - | | |
| Brightness | - | - | 350 | 400 | - | cd/m ² | Center of display | |

Ta=25±2°C,

Note 1: Definition of viewing angle range

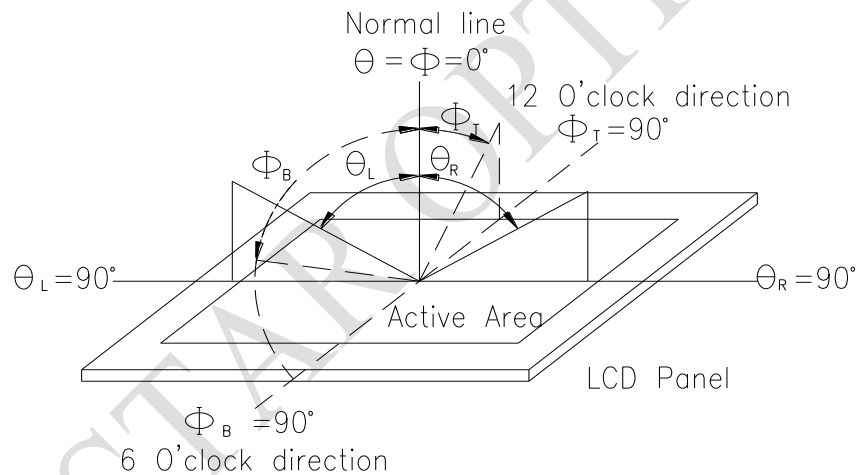


Fig. 10.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

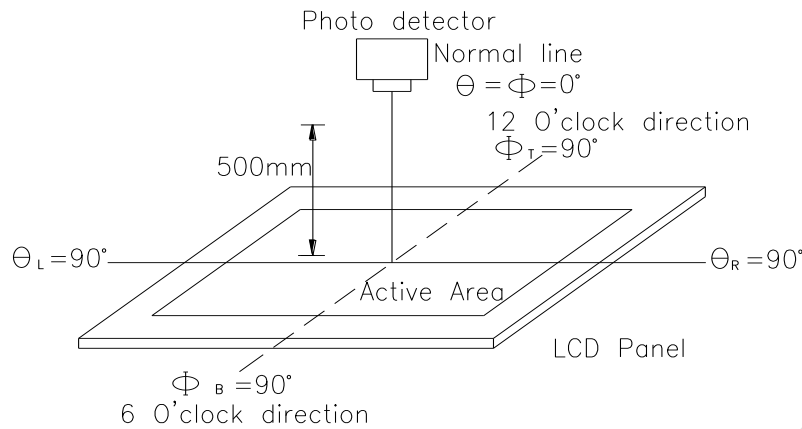
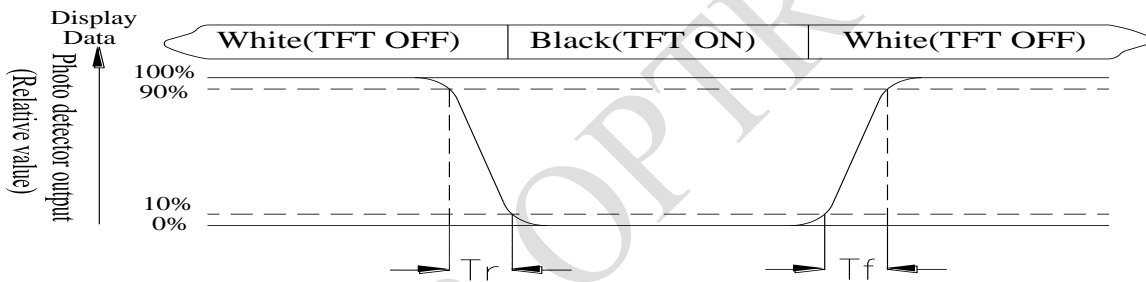


Fig. 10.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

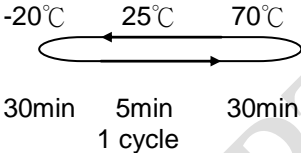
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

11. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

| Environmental Test | | | |
|--------------------------------------|---|--|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80°C 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 70°C 200hrs | — |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20°C 200hrs | 1 |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60°C,90%RH max | 60°C,90%RH 96hrs | 1,2 |
| Thermal shock resistance | The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;">  <p>-20°C 25°C 70°C</p> <p>30min 5min 30min</p> <p>1 cycle</p> </div> | -20°C/70°C 10 cycles | — |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 3 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes | 3 |
| Static electricity test | Endurance test applying the electric stress to the terminal. | VS=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times | — |

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

LCM Sample Estimate Feedback Sheet

Module Number : _____

1 、 Panel Specification :

| | | |
|----------------------------|-------------------------------|-------------------------------------|
| 1. Panel Type : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. View Direction : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Numbers of Dots : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. View Area : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Active Area : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Operating Temperature : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Storage Temperature : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. Others : | _____ | |

2 、 Mechanical Specification :

| | | |
|-----------------------------|-------------------------------|-------------------------------------|
| 1. PCB Size : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Frame Size : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Material of Frame : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Connector Position : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Fix Hole Position : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Backlight Position : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Thickness of PCB : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. Height of Frame to PCB : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. Height of Module : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

3 、 Relative Hole Size :

| | | |
|-----------------------------|-------------------------------|-------------------------------------|
| 1. Pitch of Connector : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Hole size of Connector : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Mounting Hole size : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Mounting Hole Type : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

4 、 Backlight Specification :

| | | |
|---|-------------------------------|-------------------------------------|
| 1. B/L Type : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. B/L Color : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. B/L Driving Voltage (Reference for LED Type) : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. B/L Driving Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Brightness of B/L : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. B/L Solder Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

>> **Go to page 2** <<

Module Number : _____

5 · Electronic Characteristics of Module :

| | | |
|-----------------------------|-------------------------------|-------------------------------------|
| 1.Input Voltage : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2.Supply Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3.Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4.Contrast for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5.B/L Driving Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6.Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7.Interface Function : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8.LCD Uniformity : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9.ESD test : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10.Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

6 · Summary :

Sales signature : _____

Customer Signature : _____

Date : / / _____