



RAYSTAR

曜凌光電股份有限公司

住址: 42878 台中市大雅区科雅路 25 號 5F WEB: <http://www.Raystar-Optronics.com>
5F., No.25, Keya Rd., Daya Dist., Taichung E-mail: sales@raystar-optronics.com
City 428, Taiwan Tel:886-4-2565-0761 Fax : 886-4-2565-0760

RFC350Y-AIW-DNS

SPECIFICATION

CUSTOMER:

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

FOR CUSTOMER USE ONLY

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

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

Revision History

| VERSION | DATE | REVISED PAGE NO. | Note |
|---------|------------|------------------|--------------------------------|
| 0 | 2015/11/19 | | First issue |
| A | 2016/01/21 | | Modify Static electricity test |
| B | 2016/08/11 | | Modify Vibration test |
| C | 2016/10/17 | | Modify Summary |
| D | 2017/03/31 | | Add Aspect Ratio |
| E | 2019/01/14 | | Add Uniformity. |

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. DC Characteristics
10. AC Characteristics
11. Optical Characteristics
12. Reliability
13. Touch Panel Information
14. Other

1. Module Classification Information

| | | | | | | | | | | | | |
|----------|----------|----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| R | F | C | 35 | 0Y | - | A | I | W | - | D | N | S |
| 1 | 2 | 3 | 4 | 5 | - | 6 | 7 | 8 | - | 9 | 10 | 11 |

| Item | Description | | | | | |
|--|---|--|--|---------------------------|-----------------|--|
| 1 | R : Raystar Optronics Inc. | | | | | |
| 2 | Display Type : F→TFT Type, J→ Custom TFT | | | | | |
| 3 | Solution: A: 128x160 B:320x234 C:320x240 D:480x234 E:480x272 F:800x480 G:640x480 H:1024x600 I:320x480 J:240x320 K:1280x800 L:240x400 M:1024x768 N:128x128 O:480x800 P:640x320 Q:800x600 S:480x128 T:800x320 | | | | | |
| 4 | Display Size : 3.5" TFT | | | | | |
| 5 | Version Code. | | | | | |
| 6 | <table border="0"> <tr> <td>Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD</td> <td>6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD</td> </tr> </table> | Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD | 6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD | | | |
| Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD | 6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD | | | | | |
| 7 | <table border="0"> <tr> <td>Polarizer Type, Temperature range, View direction</td> <td>I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT</td> </tr> </table> | Polarizer Type, Temperature range, View direction | I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT | | | |
| Polarizer Type, Temperature range, View direction | I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT | | | | | |
| 8 | <table border="0"> <tr> <td rowspan="2">Backlight</td> <td>W : LED, White</td> <td>H : LED, High Light White</td> </tr> <tr> <td>F : CCFL, White</td> <td></td> </tr> </table> | Backlight | W : LED, White | H : LED, High Light White | F : CCFL, White | |
| Backlight | W : LED, White | | H : LED, High Light White | | | |
| | F : CCFL, White | | | | | |
| 9 | Driver Method D: Digital A: Analog L : LVDS M:MIPI | | | | | |
| 10 | Interface N : without control board A : 8Bit B : 16Bit S:SPI Interface R: RS232 U:USB I: I2C | | | | | |
| 11 | TS N : Without TS S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G) | | | | | |

RAYSTAR OPTRONICS

2.Summary

TFT 3.5" is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is composed of a TFT_LCD module, it is usually designed for industrial application and this module follows RoHs,

RAYSTAR OPTRONICS

3.General Specifications

- Size: 3.5 inch
- Dot Matrix: 320 x RGBx240(TFT) dots
- Module dimension: 76.9x 63.9x 4.36 mm
- Active area: 70.08 x 52.56 mm
- Dot pitch: 0.073 x 0.219 mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Aspect Ratio: 4:3
- Backlight Type: LED ,Normally White
- With /Without TP: With RTP
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

| Pin | Symbol | Function | Remark |
|-----|--------|---|--------------|
| 1 | VLED- | Power for LED backlight cathode | |
| 2 | VLED+ | Power for LED backlight anode | |
| 3 | DGND | System ground pin of the IC. Connect to system ground. | |
| 4 | VCC | Power Supply | |
| 5 | R0 | Red Data bit(LSB) | |
| 6 | R1 | Red Data bit | |
| 7 | R2 | Red Data bit | |
| 8 | R3 | Red Data bit | |
| 9 | R4 | Red Data bit | |
| 10 | R5 | Red Data bit | |
| 11 | R6 | Red Data bit | |
| 12 | R7 | Red Data bit (MSB) | |
| 13 | G0 | Green Data bit(LSB) | |
| 14 | G1 | Green Data bit | |
| 15 | G2 | Green Data bit | |
| 16 | G3 | Green Data bit | |
| 17 | G4 | Green Data bit | |
| 18 | G5 | Green Data bit | |
| 19 | G6 | Green Data bit | |
| 20 | G7 | Green Data bit (MSB) | |
| 21 | B0 | Blue Data bit(LSB) | |
| 22 | B1 | Blue Data bit | |
| 23 | B2 | Blue Data bit | |
| 24 | B3 | Blue Data bit | |
| 25 | B4 | Blue Data bit | |
| 26 | B5 | Blue Data bit | |
| 27 | B6 | Blue Data bit | |
| 28 | B7 | Blue Data bit (MSB) | |
| 29 | AVSS | Grounding for analog circuit Connect to system ground | |
| 30 | CLK | Dot-clock signal and oscillator source | |
| 31 | NC | No connect | |
| 32 | HSYNC | Horizontal sync signal | Note1 |
| 33 | VSYNC | Vertical sync signal | Note1 |
| 34 | DE | Data Enable signal | Note1 |
| 35 | NC | No connect | |
| 36 | RESET | Hardware reset | |
| 37 | XR | Right electrode | |
| 38 | YD | Bottom electrode | |
| 39 | XL | Left electrode | |
| 40 | YU | Top electrode | |

Note1:

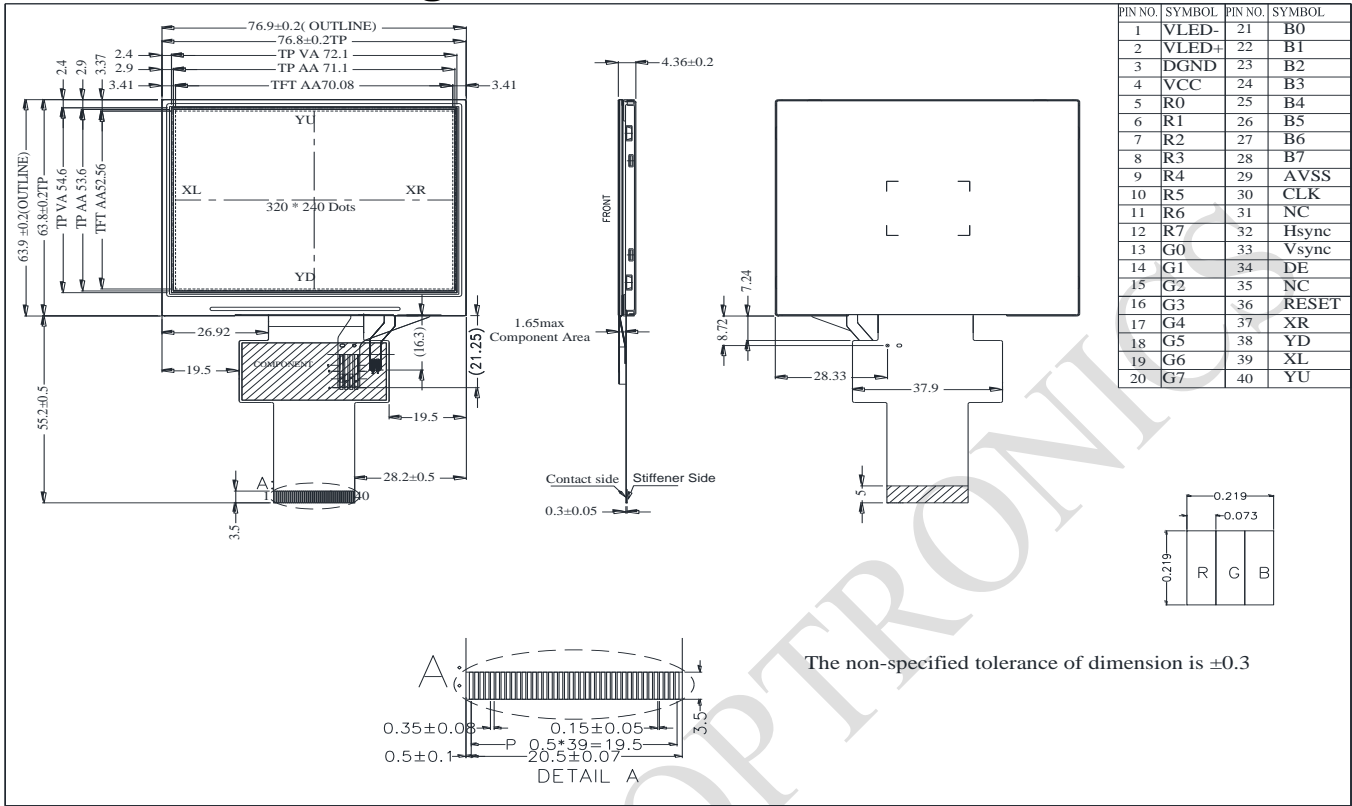
For digital 24Bit RGB input data format, both SYNC mode and DE mode are supported. If DE signal is fixed low, SYNC mode is used. Otherwise, DE mode is used. Suggest used SYNC mode!!

| Mode | D[23:16] | D[15:8] | D[7:0] | IHS | IVS | DEN |
|------------|----------|---------|--------|----------------------|----------------------|--------------------------------------|
| 24 bit RGB | R[7:0] | G[7:0] | B[7:0] | HSYNC | VSYNC | DE signal is fixed low for SYNC mode |
| | | | | Floating if not used | Floating if not used | DE for DE Mode |

4.2. Basic Display Color and Gray Scale

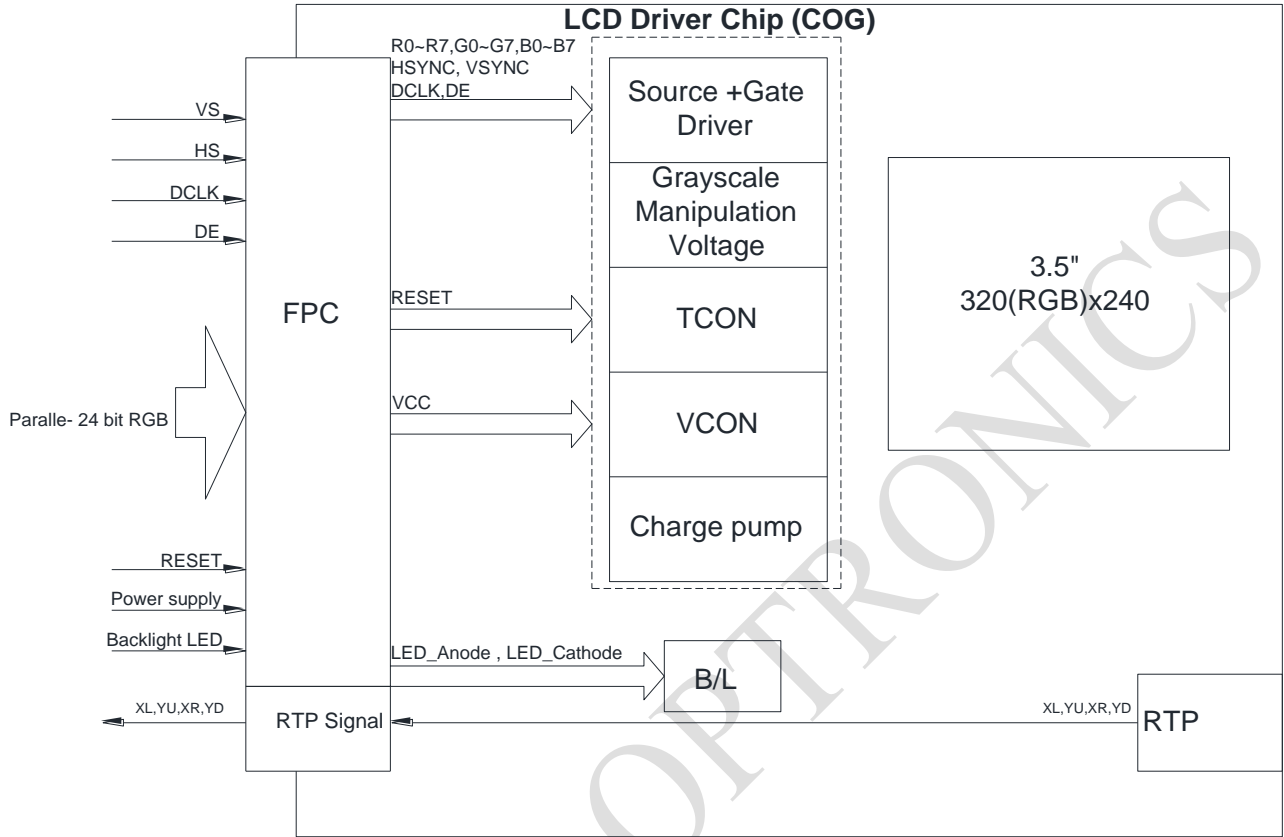
| Color | | Input Color Data | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|-------------------|------------------|----|----|----|-----|----|----|----|-------|----|----|----|-----|----|----|----|------|----|----|----|-----|----|----|----|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | MSB | | | | LSB | | | | MSB | | | | LSB | | | | MSB | | | | LSB | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Red | Red(0) Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) Bright | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Green(0) Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) Bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Blue(0) Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) Bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

5. Contour Drawing



RAYSTAR OPTRONICS

6. Block Diagram



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

RAYSTAR OPTRONICS

8. Electrical Characteristics

8.1. Operating conditions:

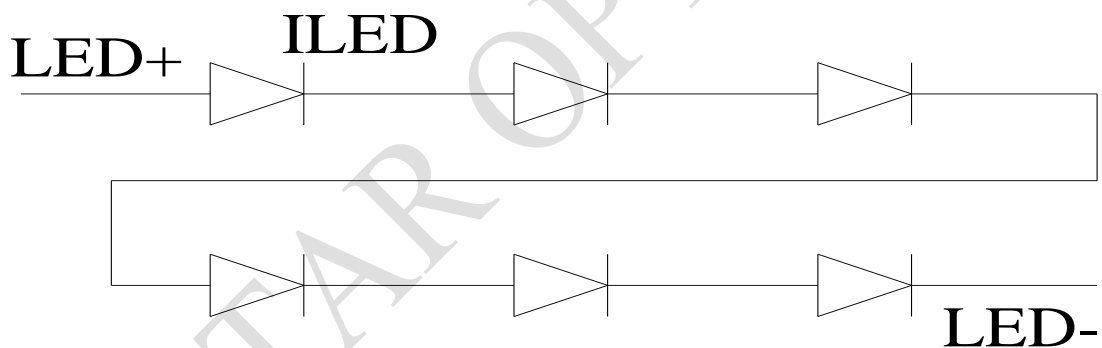
| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|------------------------|--------|-----------|-----|-----|-----|------|--------|
| Supply Voltage For LCM | VCC | — | 3.0 | 3.3 | 3.6 | V | |
| Supply Current For LCM | ICC | — | — | 12 | 18 | mA | Note 1 |

Note 1 : This value is test for VCC =3.3V , Ta=25 °C only

8.2. LED driving conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-------------------|--------|------|--------|------|------|------------|
| LED current | | - | 20 | - | mA | |
| Power Consumption | | 348 | 384 | 408 | mW | |
| LED voltage | LED+ | 17.4 | 19.2 | 20.4 | V | Note 1 |
| LED Life Time | | - | 50,000 | - | Hr | Note 2,3,4 |

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

9.DC CHARATERISTICS

| Parameter | Symbol | Rating | | | Unit | Condition |
|--------------------------|----------|--------|-----|--------|------|-----------|
| | | Min | Typ | Max | | |
| Low level input voltage | V_{IL} | 0 | - | 0.3VCC | V | |
| High level input voltage | V_{IH} | 0.7VCC | - | VCC | V | |

RAYSTAR OPTRONICS

10.AC Characteristics

Digital Parallel RGB interface

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|--------|----------------|--------|-----|-----|-----|------|
| Dclk | Frequency | Tosc | - | 6.5 | 10 | MHz |
| | High Time | Tch | - | 77 | - | ns |
| | Low Time | Tcl | - | 77 | - | ns |
| Data | Setup Time | Tsu | 12 | - | - | ns |
| | Hold Time | Thd | 12 | - | - | ns |
| Hsync | Period | TH | - | 408 | - | Tosc |
| | Pulse Width | THS | 5 | 30 | - | Tosc |
| | Back-Porch | Thb | - | 38 | - | Tosc |
| | Display Period | TEP | - | 320 | - | Tosc |
| | Hsync-den time | THE | 36 | 68 | 88 | - |
| | Front-Porch | Thf | - | 20 | - | Tosc |
| Vsync | Period | Tv | - | 262 | - | TH |
| | Pulse Width | Tvs | 1 | 3 | 5 | TH |
| | Back-Porch | Tvb | - | 15 | - | TH |
| | Display Period | Tvd | - | 240 | - | TH |
| | Front-Porch | Tvf | 2 | 4 | - | TH |

Note:

1. $Thp + Thb = 68$, the user is make up by yourself.
2. $Tv = Tvs + Tvb + Tvd + Tvf$, the user is make up by yourself.
3. When SYNC mode is used, 1st data start from 68th Dclk after Hsync falling

10.1. Waveform

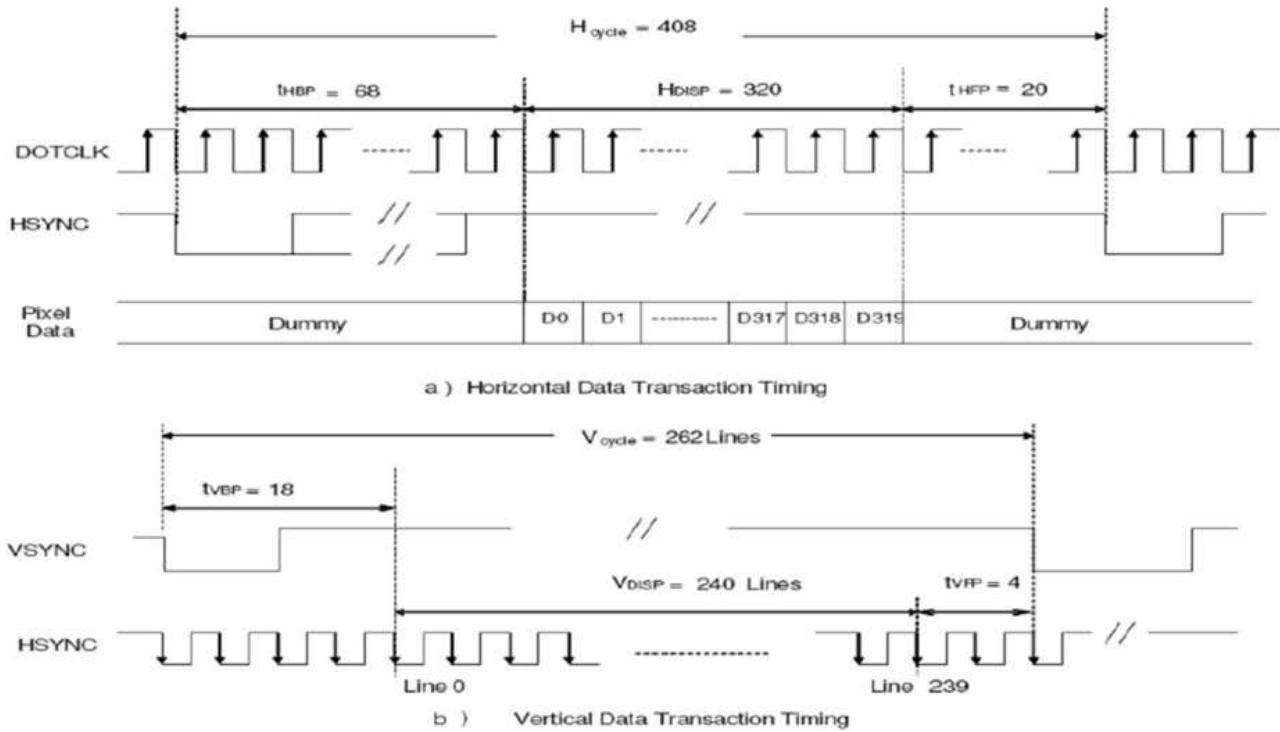


Figure 7.1.1 Data Transaction Timing in Parallel RGB (24 bit) Interface (SYNC Mode)

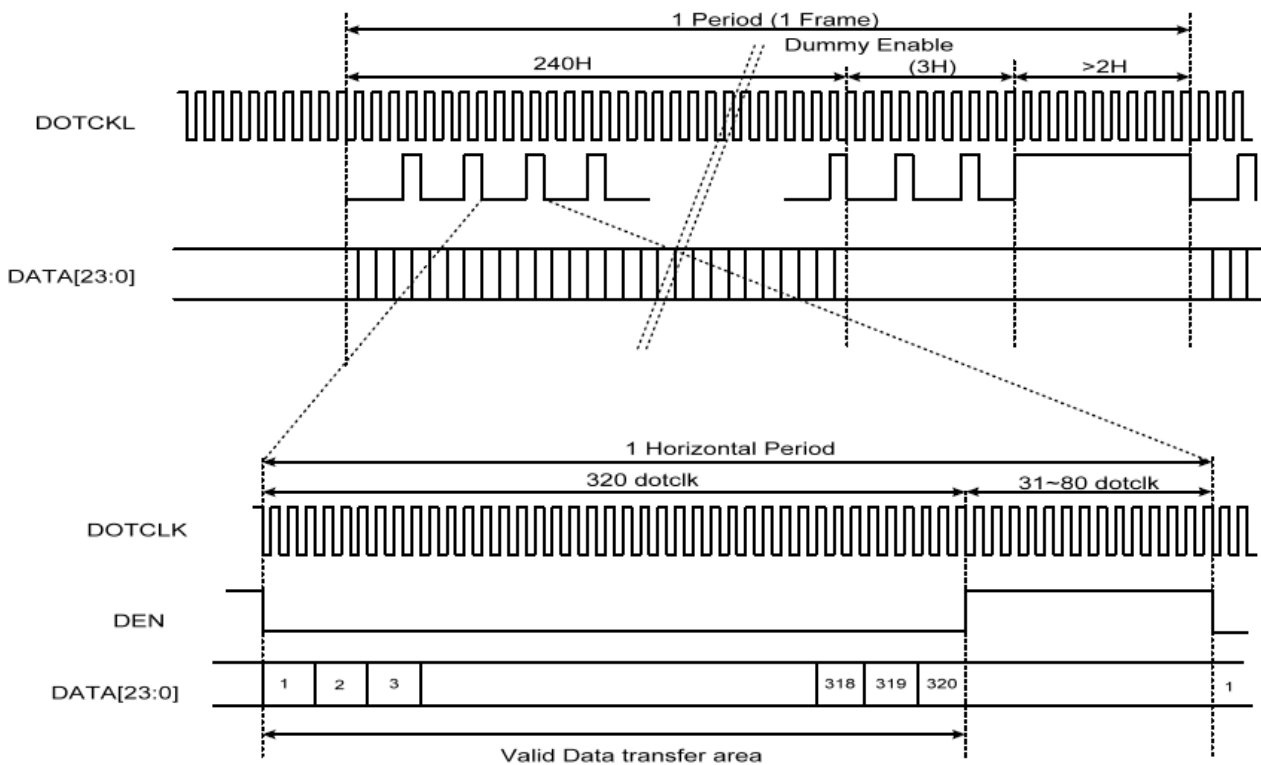


Figure 7.1.2 Data Transaction Timing in Parallel RGB (24 bit) Interface (DE Mode)

10.2. Clock and Sync waveforms

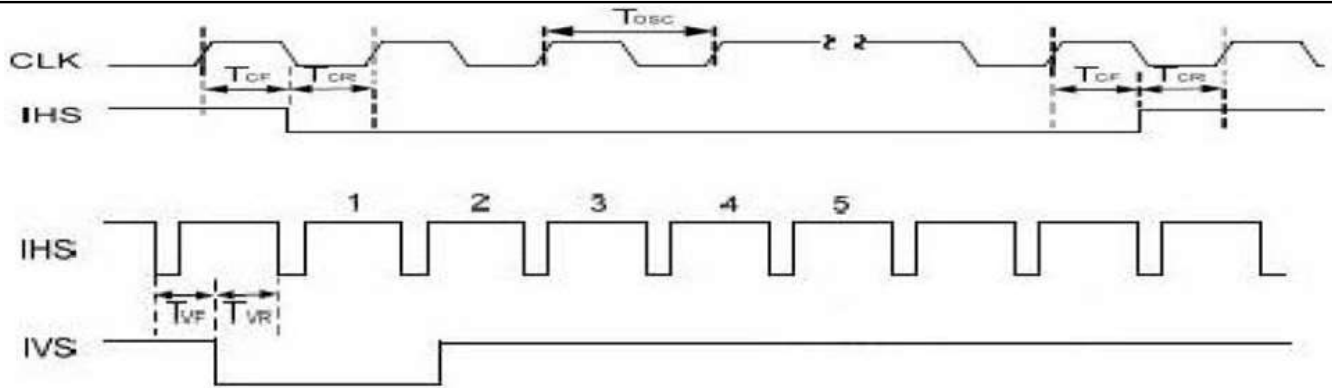


Figure 7.2.1 IHS and IVS timing waveforms

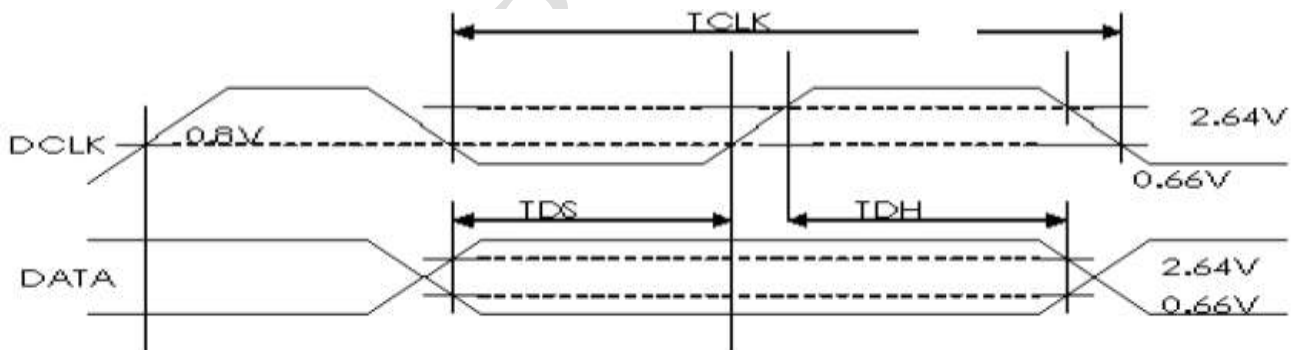
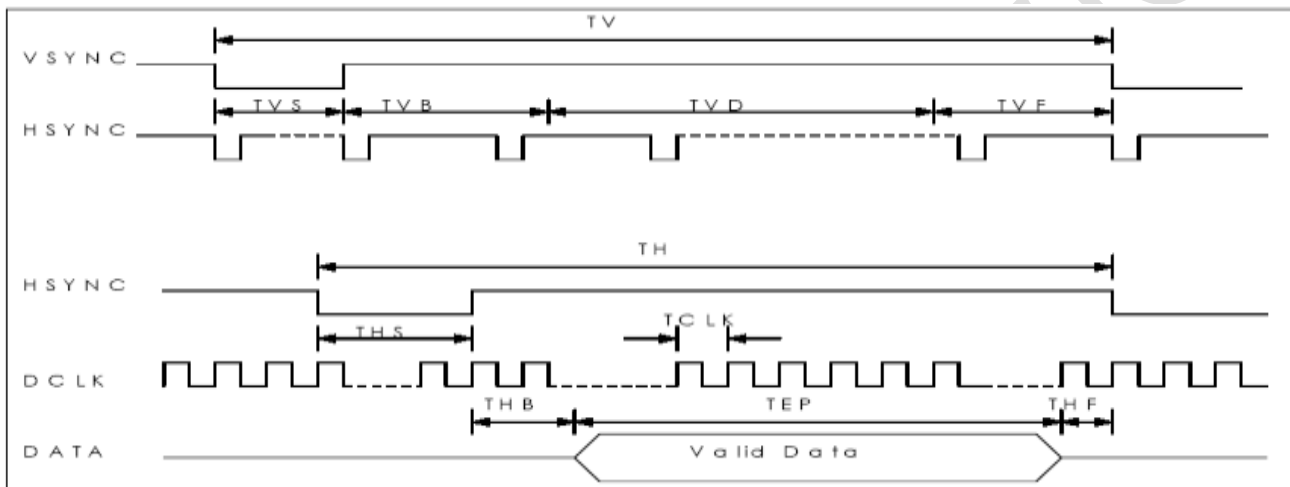
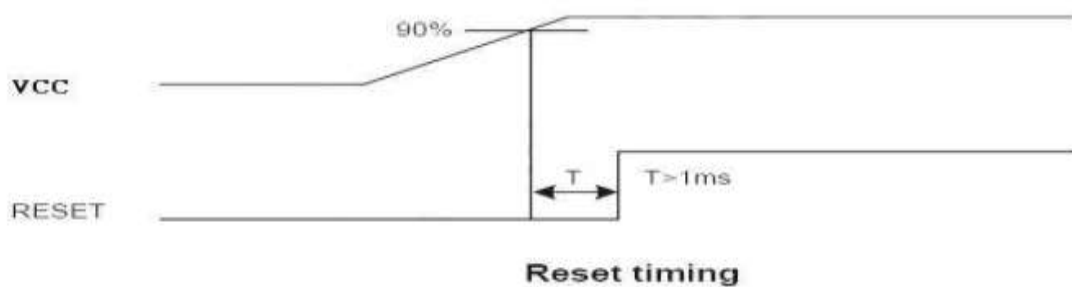


Figure 7.2.2 TV and TH timing waveforms

10.3. Reset Timing Chart

The RESET input must be held at least 1ms after power is stable



Reset timing

11. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark |
|--|--------|-----------------------------------|------|------|------|-------------------|-------------------|
| Response time | Tr | $\theta=0^\circ$ 、 $\Phi=0^\circ$ | - | 10 | - | ms | Note 3 |
| | Tf | | - | 15 | - | ms | |
| Contrast ratio | CR | At optimized viewing angle | 300 | 350 | - | - | Note 4 |
| Color Chromaticity | White | $\theta=0^\circ$ 、 $\Phi=0^\circ$ | 0.26 | 0.31 | 0.36 | - | Note 2,6,7 |
| | | | Wy | 0.28 | 0.33 | 0.38 | - |
| Viewing angle (Gray Scale Inversion Direction) | Hor. | Θ_R | - | 55 | - | Deg. | Note 1 |
| | | Θ_L | - | 55 | - | | |
| | Ver. | Φ_T | - | 45 | - | | |
| | | Φ_B | - | 50 | - | | |
| Brightness | - | - | 250 | 300 | - | cd/m ² | Center of display |
| Uniformity | (U) | - | 75 | - | - | % | Note 5 |

Ta=25±2°C, IL=20mA

Note 1: Definition of viewing angle range

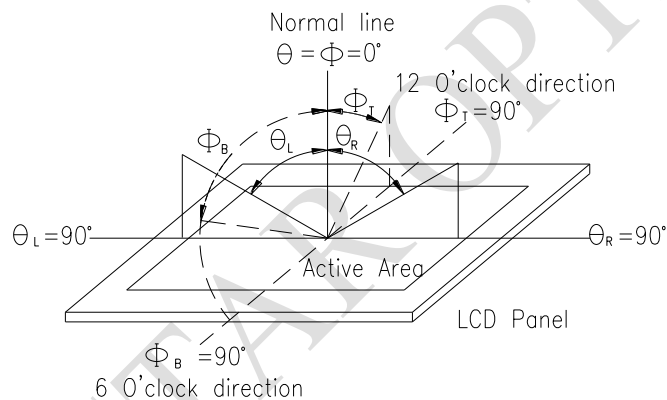


Fig. 11.1. Definition of viewing angle

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.

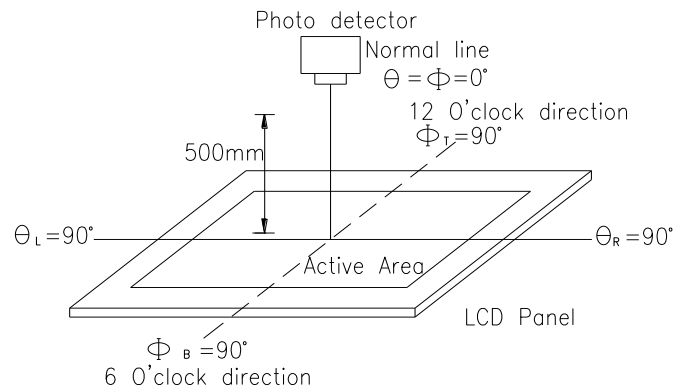
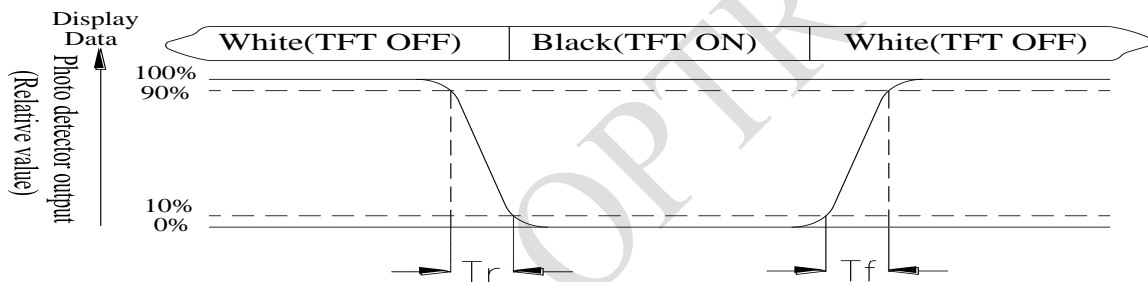


Fig. 11.2. Optical measurement system setup

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: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

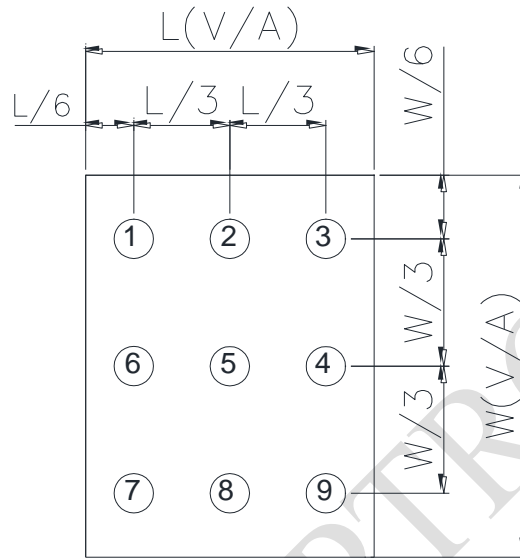


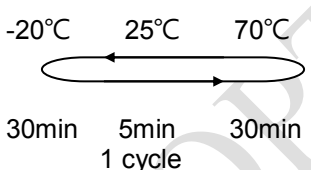
Fig11.3. Definition of uniformity

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.

12. Reliability

| 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 : 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 | — |

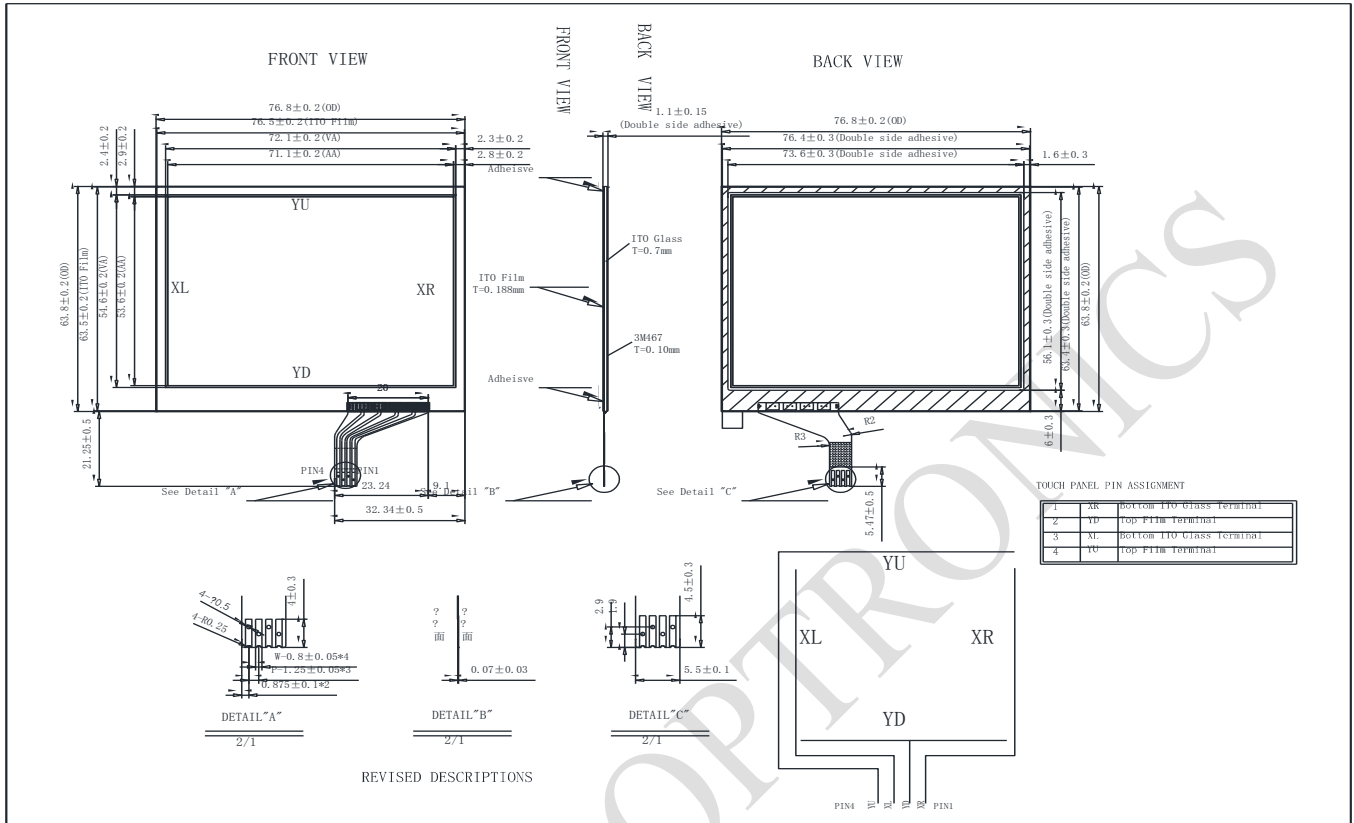
Content of Reliability Test (Wide temperature, -20°C~70°C)

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.

13.Touch Panel Information



13.1. Resistance Touch Panel General Specifications

| Item | Description |
|---|-----------------------------|
| Driving condition | DC5V |
| Operating force | 60~150g |
| Linearity max | $\leq \pm 1.5\%$ |
| Insulating resistance | $> 20M\Omega \cdot 25V(DC)$ |
| Light transparence | 70% |
| Structure type | ITO Film/ITO Glass(F/G) |
| Surface Hardness | 3H typ |
| Pen Hitting Durability (with the silicon rubber) | $> 1000,000$ times |
| X resistance | 200~1100 Ω |
| Y resistance | 200~1100 Ω |

RAYSTAR OPTRONICS

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 : / /