



RAYSTAR

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RFC350Y-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 | 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 |

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.Other

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 a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs,

3.General Specifications

Size: 3.5 inch

Dot Matrix: 320 x RGBx240(TFT) dots

Module dimension: 76.9x 63.9x 3.26 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: Without TP

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 NC No connect
38 NC No connect
39 NC No connect
40 NC No connect

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

5. Contour Drawing

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

1. 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 | 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 CHARACTERISTICS

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

10.AC Characteristics

Digital Parallel RGB interface

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|-----------------|----------------|--------|-----|-----|-----|------|
| DclkFrequency | 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

11. Optical Characteristics

| Item Symbol | Condition. | Min | Typ. | Max. | Unit | Remark |
|--------------------|---------------------------------------|--------------|---------------------------------|------|-------------------|--------------------|
| Response time | $\theta = 0^\circ$ 、 $\Phi = 0^\circ$ | - | 10 | - | ms | Note 3,5 |
| Tf | - | 15 | - | - | ms | |
| Contrast ratio | CR | At optimized | | | | |
| viewing angle | 300 350 | - | - | - | - | Note 4,5 |
| Color Chromaticity | White | W_x | $\theta = 0^\circ$ 、 $\Phi = 0$ | 0.26 | 0.31 | 0.36 - Note 2,6,7 |
| | W_y | 0.28 | 0.33 | 0.38 | - | - |
| Viewing angle | (Gray Scale Inversion Direction) | Hor. | Θ | R | $CR \geq 10$ | - 55 - Deg. Note 1 |
| | ΘL | - | 55 | - | - | |
| | Ver. ΦT | - | 45 | - | - | |
| | ΦB | - | 50 | - | - | |
| Brightness | - | 350 | 420 | - | cd/m ² | Center of display |

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-7 or BM-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, Tr, is the time between photo detector output intensity changed from 90% to 10%. And fall time, Tf, 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.

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.

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

-20°C 25°C 70°C

30min 5min 30min

1 cycle -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.

Page: 1

LCM Sample Estimate Feedback Sheet

Module Number :

1、Panel Specification :

1. Panel Type : Pass NG ,
2. View Direction : Pass NG ,
3. Numbers of Dots : Pass NG ,
4. View Area : Pass NG ,
5. Active Area : Pass NG ,
6. Operating Temperature : Pass NG ,
7. Storage Temperature : Pass NG ,
8. Others :

2、Mechanical Specification :

1. PCB Size : Pass NG ,
2. Frame Size : Pass NG ,
3. Material of Frame : Pass NG ,
4. Connector Position : Pass NG ,
5. Fix Hole Position : Pass NG ,
6. Backlight Position : Pass NG ,
7. Thickness of PCB : Pass NG ,
8. Height of Frame to PCB : Pass NG ,
9. Height of Module : Pass NG ,
10. Others : Pass NG ,

3、Relative Hole Size :

1. Pitch of Connector : Pass NG ,
2. Hole size of Connector : Pass NG ,
3. Mounting Hole size : Pass NG ,
4. Mounting Hole Type : Pass NG ,
5. Others : Pass NG ,

4、Backlight Specification :

1. B/L Type : Pass NG ,
2. B/L Color : Pass NG ,
3. B/L Driving Voltage (Reference for LED Type) : Pass NG ,
4. B/L Driving Current : Pass NG ,
5. Brightness of B/L : Pass NG ,
6. B/L Solder Method : Pass NG ,
7. Others : Pass NG ,

>> Go to page 2 <<

Page: 2

Module Number :

5、Electronic Characteristics of Module :

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

6、Summary :

Sales signature :

Customer Signature :

Date : / /