



**RAYSTAR**

# 曜凌光電股份有限公司

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## RFE430V-AZW-DNN

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### SPECIFICATION

CUSTOMER:

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

FOR CUSTOMER USE ONLY

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

Release DATE:

This TFT Display item is for Economical Version TFT LCM Inspection Specification:

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>

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## Revision History

| VERSION | DATE                     | REVISED PAGE NO. | Note                                            |
|---------|--------------------------|------------------|-------------------------------------------------|
| 0<br>A  | 2019/03/12<br>2019/07/11 |                  | First issue<br>Add O-Film Remark<br>description |

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.Other

# 1.Module Classification Information

|          |          |          |           |           |          |          |          |          |          |          |          |          |
|----------|----------|----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>R</b> | <b>F</b> | <b>E</b> | <b>43</b> | <b>0V</b> | <b>-</b> | <b>A</b> | <b>Z</b> | <b>W</b> | <b>-</b> | <b>D</b> | <b>N</b> | <b>N</b> |
| 1        | 2        | 3        | 4         | 5         | -        | 6        | 7        | 8        | -        | 9        | 10       | 11       |

| Item | Description                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | R : Raystar Optonics Inc.                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                        |
| 2    | Display Type : F→TFT Type, J→ Custom TFT                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                        |
| 3    | Solution: A: 128x160    B:320x234    C:320x240    D:480x234    E:480x272<br>F:800x480    G:640x480    H:1024x600    I:320x480    J:240x320<br>K:1280x800    L:240x400    M:1024x768    N:128x128    O:480x800<br>P:640x320    Q:800x600    S:480x128    T:800x320 |                                                                                                                                                                                                                                                                                                                                                                        |
| 4    | Display Size : 4.3" TFT                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                        |
| 5    | Version Code.                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                        |
| 6    | Model Type:<br>A : TFT LCD<br>E : TFT+FR+CONTROL BOARD<br>J : TFT+FR+A/D BOARD<br>N : TFT+FR+A/D BOARD+CONTROL BOARD<br>S : TFT+FR+POWER BOARD (DC TO DC)<br>1 : TFT+CONTROL BOARD                                                                                | 6 : TFT+FR<br>H : TFT+D/V BOARD<br>I : TFT+FR+D/V BOARD<br>B : TFT+POWER BD                                                                                                                                                                                                                                                                                            |
| 7    | Polarizer Type,<br>Temperature range,<br>View direction                                                                                                                                                                                                           | I→Transmissive, W. T, 6:00 ;    C→Transmissive, N. T, 6:00<br>L→Transmissive, W.T,12:00 ;    F→Transmissive, N.T,12:00<br>Y→Transmissive,W.T, IPS TFT ;<br>A→Transmissive, N.T, IPS TFT<br>Z→Transmissive, W.T, O-TFT<br>R→Transmissive, Super W.T, O-TFT<br>N→Transmissive, Super W.T, 6:00;<br>Q→Transmissive, Super W.T, 12:00<br>V→Transmissive, Super W.T, VA TFT |
| 8    | Backlight                                                                                                                                                                                                                                                         | W : LED, White                      H : LED, High Light White<br>F : CCFL, White                                                                                                                                                                                                                                                                                       |
| 9    | Driver Method                                                                                                                                                                                                                                                     | D: Digital    A: Analog    L : LVDS    M:MIPI                                                                                                                                                                                                                                                                                                                          |
| 10   | Interface                                                                                                                                                                                                                                                         | N : without control board    A : 8Bit    B : 16Bit<br>S:SPI Interface    R: RS232    U:USB    I: I2C                                                                                                                                                                                                                                                                   |
| 11   | TS                                                                                                                                                                                                                                                                | N : Without TS    S : resistive touch panel<br>C : capacitive touch panel capacitive touch panel (G-F-F)<br>G : capacitive touch panel(G-G)                                                                                                                                                                                                                            |

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## 2.Summary

TFT 4.3" 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,

RAYSTAR OPTRONICS

### 3.General Specifications

- Size: 4.3 inch
- Dot Matrix: 480 x RGBx272(TFT) dots
- Module dimension: 105.5(W) x 67.2(H) x 2.95(D) mm
- Active area: 95.04 x 53.856 mm
- Dot pitch: 0.066 x 0.198 mm
- LCD type: TFT, Normally White, Transmissive
- Aspect Ratio: 16:9
- TFT Driver IC: ST7282-G4-1L
- Interface: 24-bit RGB
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Surface: Anti-Glare

\*Color tone slight changed by temperature and driving voltage.

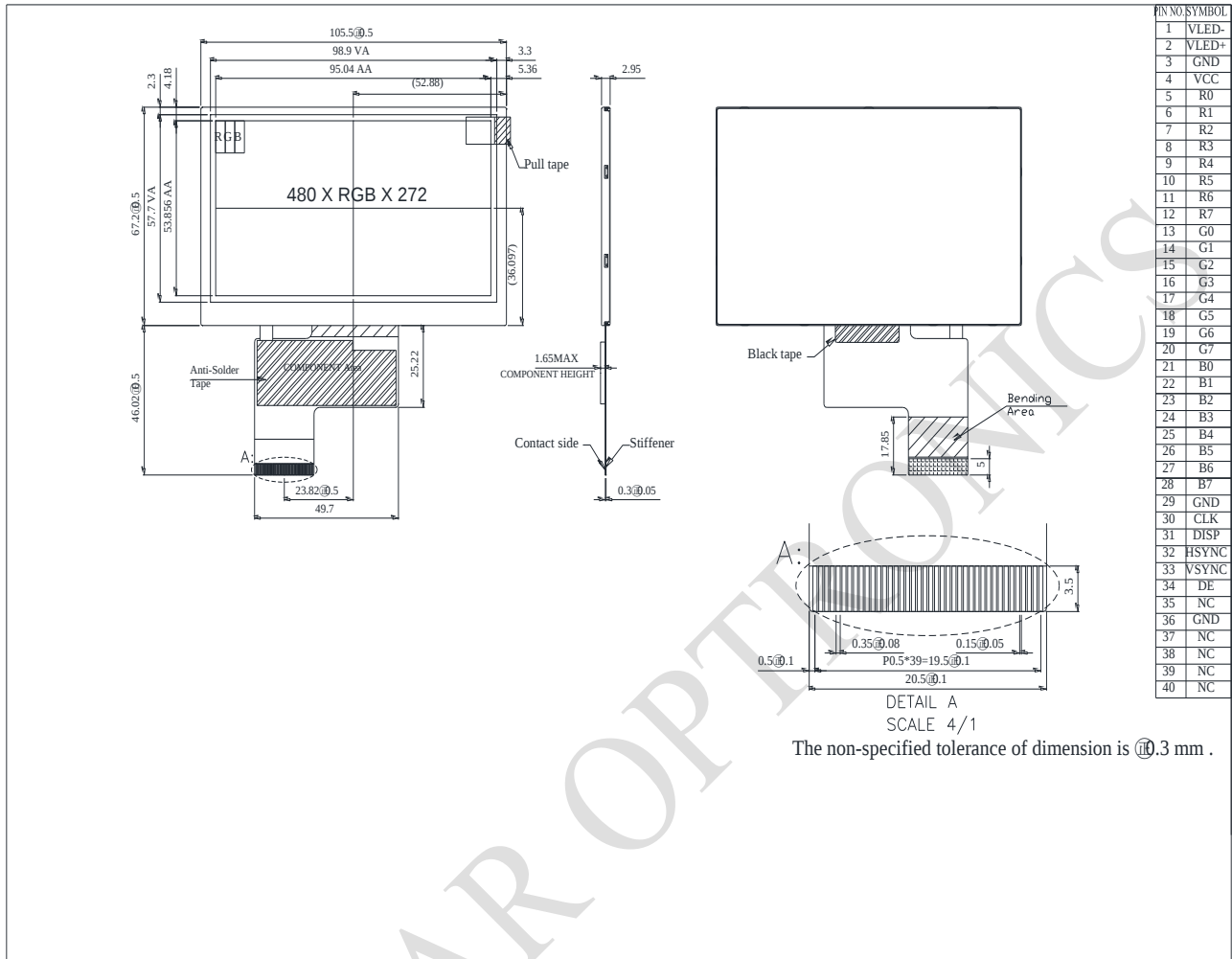
## 4.Interface

### 4.1. LCM PIN Definition

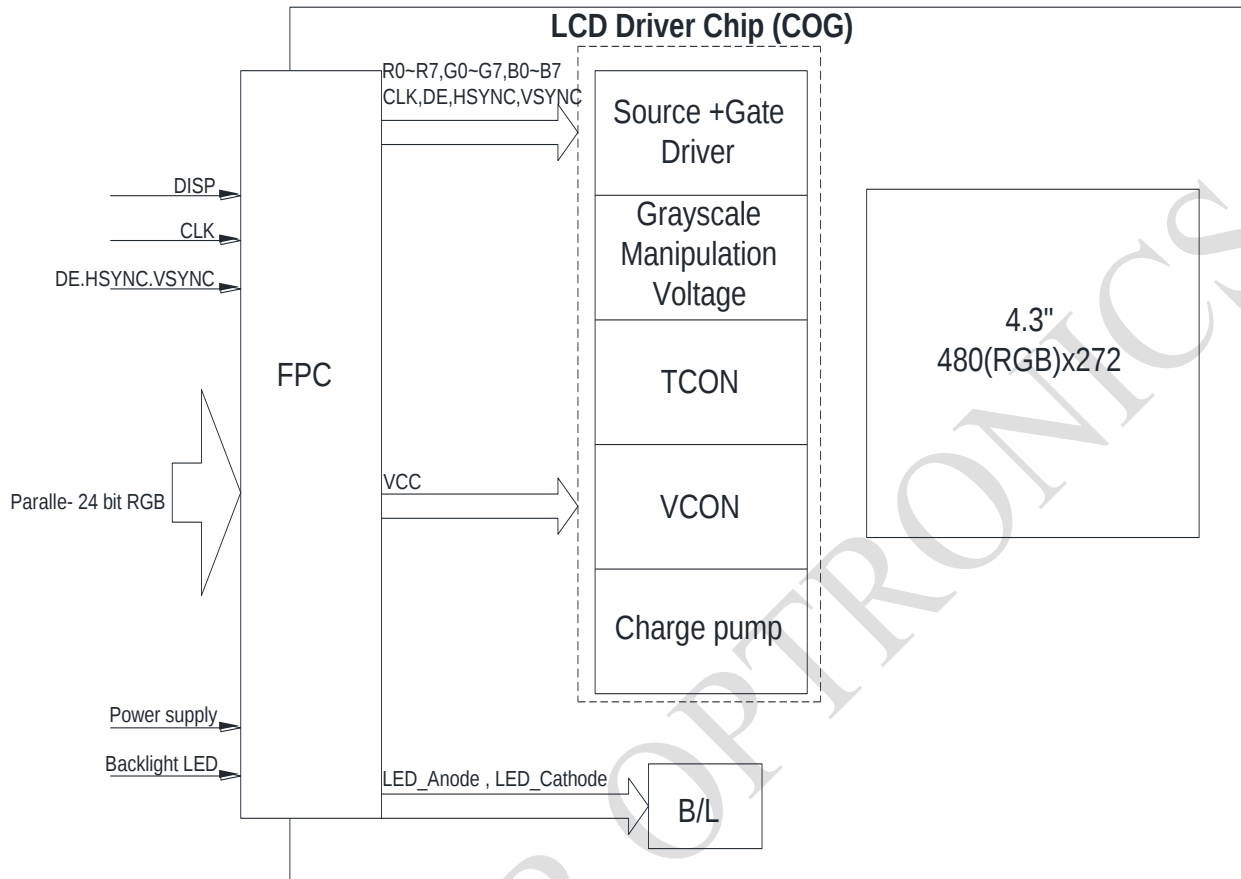
| Pin | Symbol | Function                        | Remark |
|-----|--------|---------------------------------|--------|
| 1   | VLED-  | Power for LED backlight cathode |        |
| 2   | VLED+  | Power for LED backlight anode   |        |
| 3   | GND    | Power ground                    |        |
| 4   | VCC    | Power voltage                   |        |
| 5   | R0     | Red data (LSB)                  |        |
| 6   | R1     | Red data                        |        |
| 7   | R2     | Red data                        |        |
| 8   | R3     | Red data                        |        |
| 9   | R4     | Red data                        |        |
| 10  | R5     | Red data                        |        |
| 11  | R6     | Red data                        |        |
| 12  | R7     | Red data (MSB)                  |        |
| 13  | G0     | Green data (LSB)                |        |
| 14  | G1     | Green data                      |        |
| 15  | G2     | Green data                      |        |
| 16  | G3     | Green data                      |        |
| 17  | G4     | Green data                      |        |
| 18  | G5     | Green data                      |        |
| 19  | G6     | Green data                      |        |
| 20  | G7     | Green data (MSB)                |        |
| 21  | B0     | Blue data (LSB)                 |        |
| 22  | B1     | Blue data                       |        |
| 23  | B2     | Blue data                       |        |
| 24  | B3     | Blue data                       |        |
| 25  | B4     | Blue data                       |        |
| 26  | B5     | Blue data                       |        |
| 27  | B6     | Blue data                       |        |
| 28  | B7     | Blue data (MSB)                 |        |
| 29  | GND    | Power ground                    |        |

|    |       |                                           |  |
|----|-------|-------------------------------------------|--|
| 30 | CLK   | Pixel clock                               |  |
| 31 | DISP  | Display on/off                            |  |
| 32 | HSYNC | Horizontal sync signal; negative polarity |  |
| 33 | VSYNC | Vertical sync signal; negative polarity   |  |
| 34 | DE    | Data Enable                               |  |
| 35 | NC    | No connection                             |  |
| 36 | GND   | Power ground                              |  |
| 37 | NC    | No connection                             |  |
| 38 | NC    | No connection                             |  |
| 39 | NC    | No connection                             |  |
| 40 | NC    | No connection                             |  |

## 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  $60^{\circ}\text{C}$

## 8. Electrical Characteristics

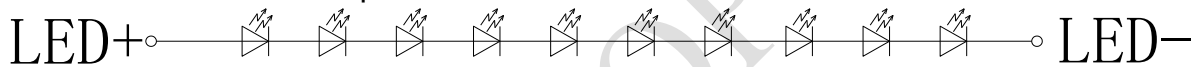
### 8.1. Operating conditions:

| Item                      | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------|--------|-----------|-----|-----|-----|------|
| Supply Voltage For Logic  | VCC    | —         | 3.1 | 3.3 | 3.5 | V    |
| Digital operation current | Icc    | —         | —   | 22  | 33  | mA   |

### 8.2. LED driving conditions

| Item              | Symbol | Min | Typ    | Max | Unit | Remark     |
|-------------------|--------|-----|--------|-----|------|------------|
| LED current       | —      | —   | 20     | —   | mA   |            |
| Power Consumption | —      | —   | 640    | 680 | mW   |            |
| LED voltage       | LED+   | 29  | 32     | 35  | 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    |           |

## 10.AC CHARATERISTICS

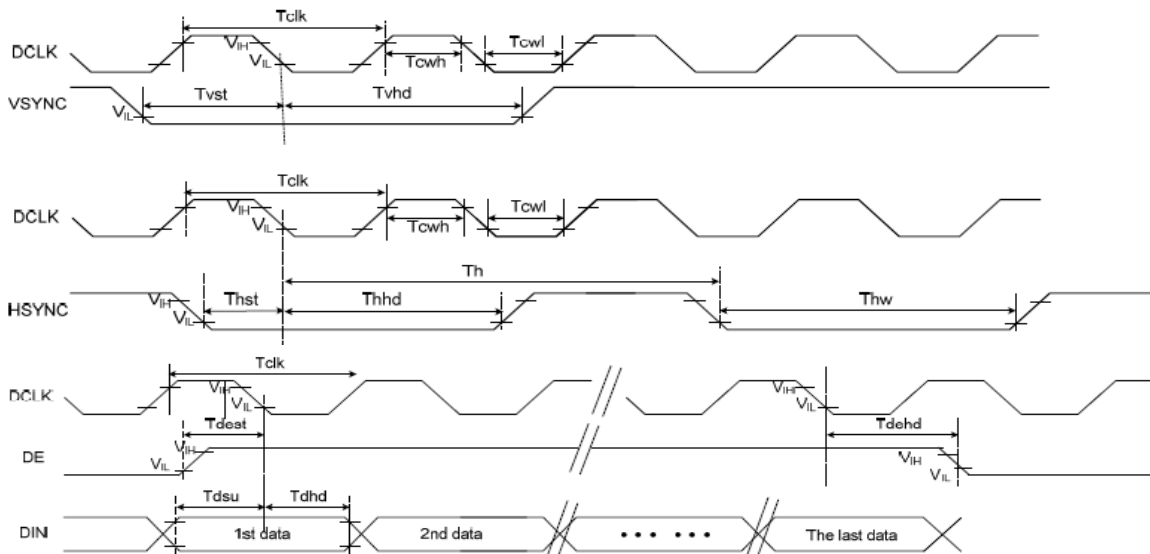
### 10.1. AC Characteristics

AC Electrical Characteristics (VCC= 3.3V, GND= 0V, TA=25°C)

| Item                       | Symbol | Min. | Typ. | Max. | Unit | Conditions         |
|----------------------------|--------|------|------|------|------|--------------------|
| System operation timing    |        |      |      |      |      |                    |
| VCC power source slew time | TPOR   | -    | -    | 20   | Ms   | From 0V to 99% VCC |
| GRB pulse width            | tRSTW  | 10   | 50   | -    | us   | R=10Kohm, C=1uF    |
| Input/ Output timing       |        |      |      |      |      |                    |
| CLK pulse duty             | Tcw    | 40   | 50   | 60   | %    |                    |
| Hsync width                | Thw    | 2    | -    | -    | DCLK |                    |
| Hsync period               | Th     | 55   | 60   | 65   | us   |                    |
| Vsync setup time           | Tvst   | 12   | -    | -    | ns   |                    |
| Vsync hold time            | Tvhd   | 12   | -    | -    | ns   |                    |
| Hsync setup time           | Thst   | 12   | -    | -    | ns   |                    |
| Hsync hold time            | Thhd   | 12   | -    | -    | ns   |                    |
| Data setup time            | Tdsu   | 12   | -    | -    | ns   |                    |
| Data hold time             | Tdhd   | 12   | -    | -    | ns   |                    |
| DE setup time              | Tdest  | 10   | -    | -    | ns   |                    |
| DE setup time              | Tdehd  | 10   | -    | -    | ns   |                    |

### 10.2. AC Timing Diagram

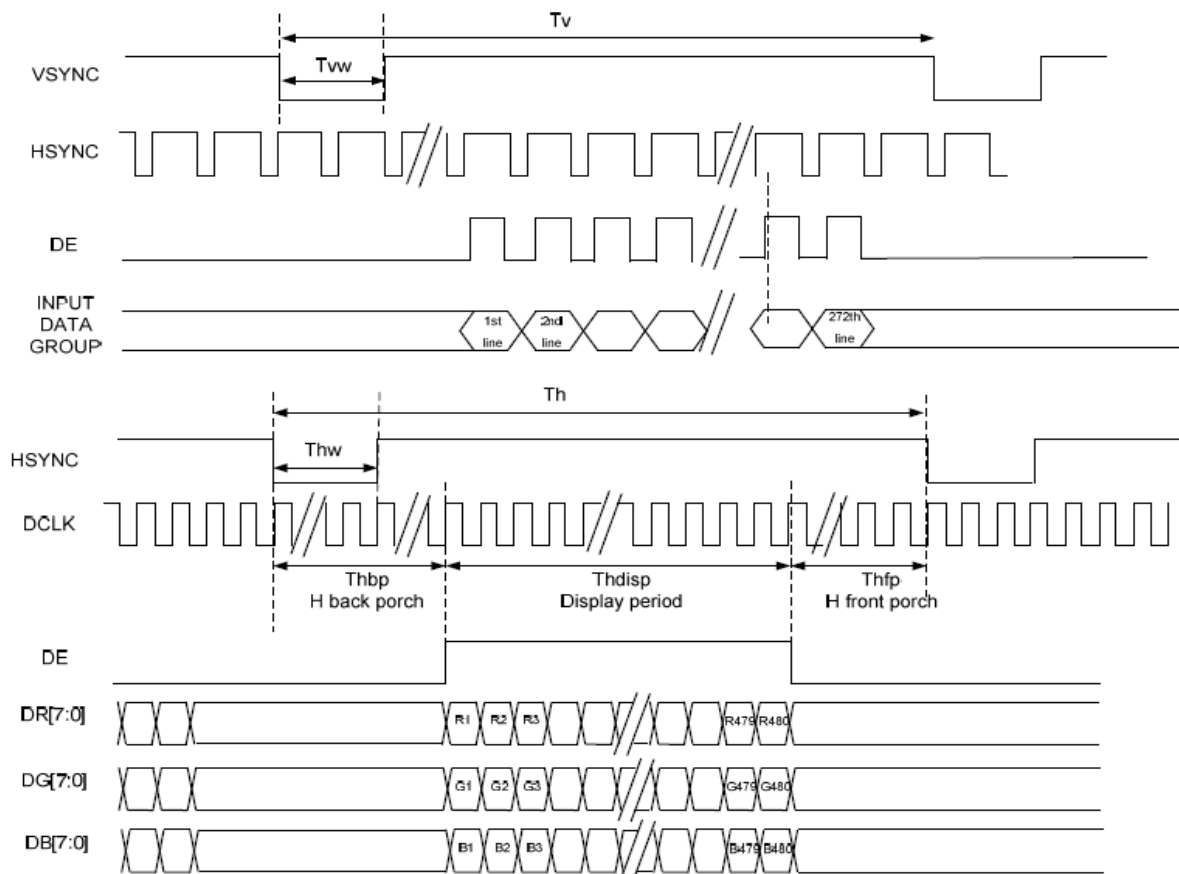
#### Clock and Data Input Timing Diagram



### 10.3. Parallel 24-bit RGB Timing Table

| Item          |                | Symbol | Min | Typ | Max | Unit | Remark                |
|---------------|----------------|--------|-----|-----|-----|------|-----------------------|
| CLK frequency |                | Fclk   | 8   | 9   | 12  | MHz  |                       |
| DCLK Period   |                | Tclk   | 83  | 111 | 125 | ns   |                       |
| HSYNC         | Period Time    | Th     | 485 | 531 | 598 | DCLK |                       |
|               | Display Period | Thdisp |     | 480 |     | DCLK |                       |
|               | Back Porch     | Thbp   | 3   | 43  | 43  | DCLK | By H_Blanking setting |
|               | Front Porch    | Thfp   | 2   | 8   | 75  | DCLK |                       |
|               | Pulse Width    | Thw    | 2   | 4   | 75  | DCLK |                       |
| VSYNC         | Period Time    | Tv     | 276 | 292 | 321 | H    |                       |
|               | Display Period | Tvdisp |     | 272 |     | H    |                       |
|               | Back Porch     | Tvbp   | 2   | 12  | 12  | H    | By V_Blanking setting |
|               | Front Porch    | Tvfp   | 2   | 8   | 37  | H    |                       |
|               | Pulse Width    | Tvw    | 2   | 4   | 37  | H    |                       |

### 10.4. SYNC-DE Mode Timing Diagram



## 11. Optical Characteristics

| Item               |       | Symbol     | Condition.                            | Min  | Typ. | Max. | Unit              | Remark            |
|--------------------|-------|------------|---------------------------------------|------|------|------|-------------------|-------------------|
| Response time      |       | Tr         | $\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$ | -    | 25   | 30   | ms                | Note 3            |
|                    |       | Tf         |                                       |      |      |      |                   |                   |
| Contrast ratio     |       | CR         | At optimized viewing angle            | 300  | 500  | -    | -                 | Note 4            |
| Color Chromaticity | White | Wx         | $\theta=0^{\circ}$ 、 $\Phi=0$         | 0.26 | 0.31 | 0.36 | -                 | Note 2,6,7        |
|                    |       | Wy         |                                       | 0.28 | 0.33 | 0.38 | -                 |                   |
| Viewing angle      | Hor.  | $\Theta R$ | $CR \geq 10$                          | -    | 75   | -    | Deg.              | Note 1            |
|                    |       | $\Theta L$ |                                       | -    | 75   | -    |                   |                   |
|                    | Ver.  | $\Phi T$   |                                       | -    | 75   | -    |                   |                   |
|                    |       | $\Phi B$   |                                       | -    | 75   | -    |                   |                   |
| Brightness         |       | -          | -                                     | 300  | 400  | -    | cd/m <sup>2</sup> | Center of display |
| Uniformity         |       | (U)        | -                                     | 75   | -    | -    | %                 | Note5             |

Ta=25±2℃

**Note: After adding a polarized O-film, its viewing angle is enlarged, but its still have gray scale appearance.**

Note 1: Definition of viewing angle range

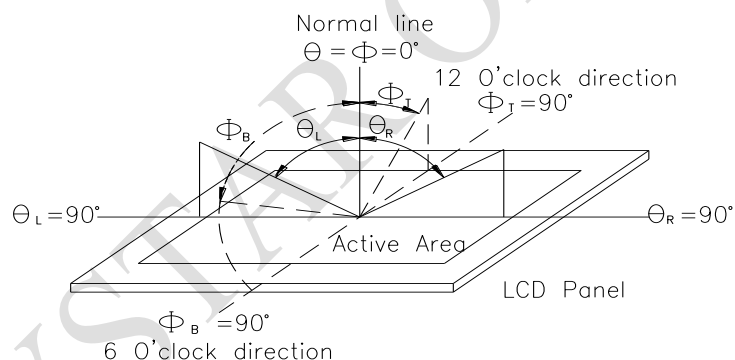
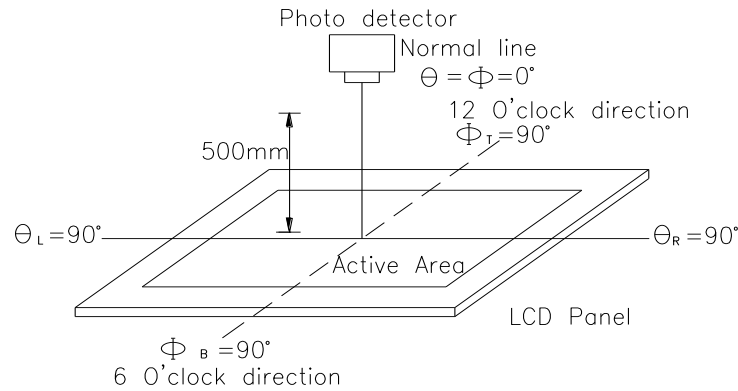


Fig. 11.1. Definition of viewing angle

Note 2: Test equipment setup:

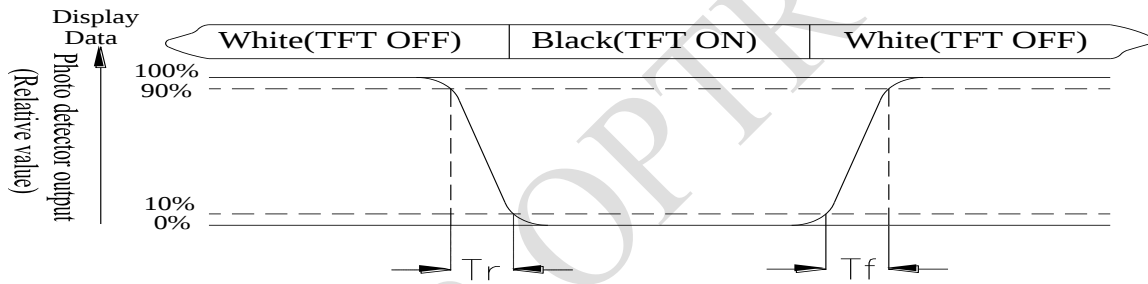
After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm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

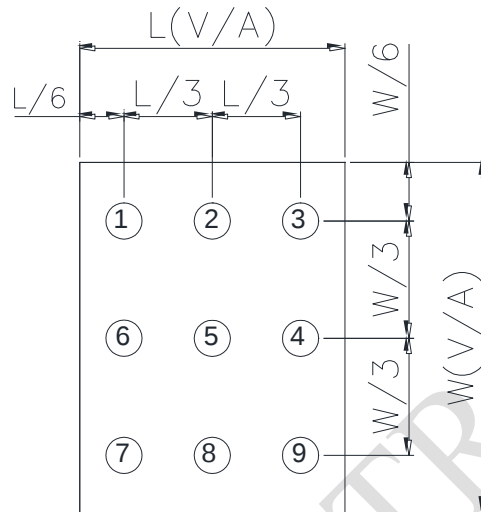


Fig.11.3. Definition of uniformity

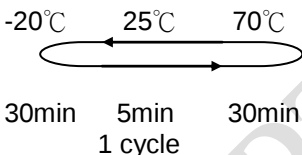
**Note 6: Definition of color chromaticity (CIE 1931)**

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

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

| <b>LCM Sample Estimate Feedback Sheet</b>                                                                           |                               |                                     |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------|
| <b>Module Number :</b> _____                                                                                        |                               |                                     |
| <b>1 、 <u>Panel Specification</u> :</b>                                                                             |                               |                                     |
| 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 : _____                                                                                                   |                               |                                     |
| <b>2 、 <u>Mechanical Specification</u> :</b>                                                                        |                               |                                     |
| 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 , _____ |
| <b>3 、 <u>Relative Hole Size</u> :</b>                                                                              |                               |                                     |
| 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 , _____ |
| <b>4 、 <u>Backlight Specification</u> :</b>                                                                         |                               |                                     |
| 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 , _____ |

&gt;&gt; Go to page 2 &lt;&lt;

**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 :**    /    /