



**RAYSTAR**

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### RFE43DM-EIW-DRN

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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:

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  | 2019/03/04<br>2019/04/17 |                  | First issue<br>Modify Optical<br>Characteristics |

# Contents

1.Module Classification Information

2.Summary

3.General Specification

4.Interface

5.Contour Drawing

6.Absolute Maximum Ratings

7.Electrical Characteristics

8.DC Characteristics

9.AC Characteristics

10. Waveform

11.Optical Characteristics

12.Reliability

13.Other

# 1.Module Classification Information

|          |          |          |           |           |          |          |          |          |          |          |          |          |
|----------|----------|----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>R</b> | <b>F</b> | <b>E</b> | <b>43</b> | <b>DM</b> | <b>-</b> | <b>E</b> | <b>I</b> | <b>W</b> | <b>-</b> | <b>D</b> | <b>R</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-4 ( preservation)    R:Uart    U:USB    I: I2C                                                                                                                                                                                                                                                            |
| 11   | TS                                                                                                                                                                                                                                                                | N : Without TS    S : RTP (preservation)<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,

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### 3.General Specifications

- Size: 4.3 inch
- Dot Matrix: 480 x RGBx272(TFT) dots
- Module dimension: 125.5(W) x 67.2(H) x 7.7 (D) mm
- Active area: 95.04 x 53.86 mm
- Dot pitch: 0.066 x 0.198 mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Aspect Ratio: 16:9
- Backlight Type: LED, Normally White
- Interface: Uart 19200 Baud rate/SPI
- With /Without TP: Without TP
- Surface: Glare

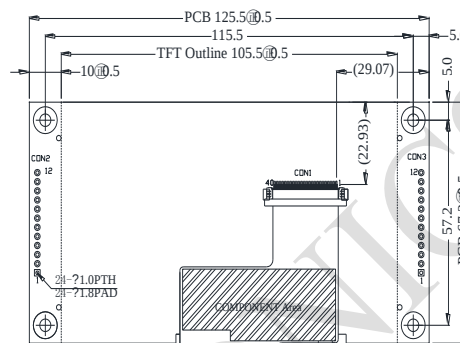
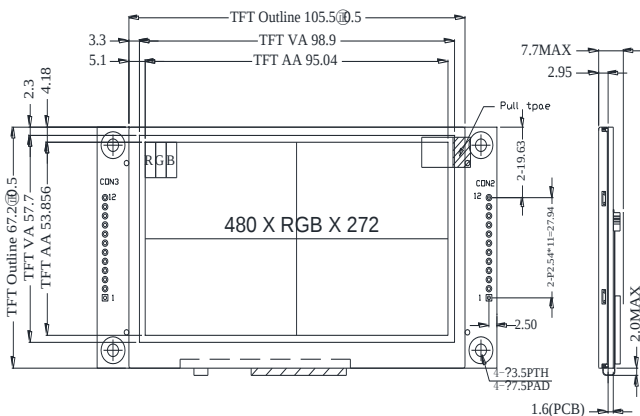
\*Color tone slight changed by temperature and driving voltage

## 4.Interface

| CON 2 |        |              |                        |
|-------|--------|--------------|------------------------|
| Pin   | Symbol | I/O          | Function               |
| 1     | GND    | Power Supply | Power Ground           |
| 2     | TX     | O            | Uart Transmit pin      |
| 3     | RX     | I            | Uart Receive pin       |
| 4     | VBUS   | Power Supply | Power supply : 5V      |
| 5     | D+     | I/O          | USB Data +             |
| 6     | D-     | I/O          | USB Data -             |
| 7     | GND    | Power Supply | Power Ground           |
| 8     | /RST   | I            | Reset (active Low)     |
| 9     | GND    | Power Supply | Power Ground           |
| 10    | PWM    | O            | Pulse width modulation |
| 11    | GND    | Power Supply | Power Ground           |
| 12    | VBUS   | Power Supply | Power supply : 5V      |

| CON 3 |         |              |                                  |
|-------|---------|--------------|----------------------------------|
| Pin   | Symbol  | I/O          | Function                         |
| 1     | GND     | Power Supply | Power Ground                     |
| 2     | SW1     | I            | Switch ( active low)             |
| 3     | SW2     | I            | Switch ( active low)             |
| 4     | SW3     | I            | Switch ( active low)             |
| 5     | SW4     | I            | Switch ( active low)             |
| 6     | GND     | Power Supply | Power Ground                     |
| 7     | SDI     | O            | Master Input Slave Output (MISO) |
| 8     | SDO     | I            | Master Output Slave Input (MOSI) |
| 9     | SCK     | I            | Serial Clock                     |
| 10    | SCS     | I            | Serial Chip selection            |
| 11    | SPI_INT | O            | Serial Interrupt                 |
| 12    | VBUS    | Power Supply | Power supply : 5V                |

## 5. Contour Drawing



| CON2 |        | CON3 |        |
|------|--------|------|--------|
| PIN  | SYMBOL | PIN  | SYMBOL |
| 1    | GND    | 1    | GND    |
| 2    | TX     | 2    | SW1    |
| 3    | RX     | 3    | SW2    |
| 4    | VBUS   | 4    | SW3    |
| 5    | D+     | 5    | SW4    |
| 6    | D-     | 6    | GND    |
| 7    | GND    | 7    | SDI    |
| 8    | RST    | 8    | SDO    |
| 9    | GND    | 9    | SCK    |
| 10   | PWM    | 10   | SCS    |
| 11   | GND    | 11   | SPLIN  |
| 12   | VBUS   | 12   | VBUS   |

VLED+  VLED-  
CIRCUIT DIAGRAM(10dice)

The non-specified tolerance of dimension is  $\pm 0.3\text{mm}$ .

## 6. 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  $60^{\circ}\text{C}$

## 7. Electrical Characteristics

### 7.1. Operating conditions:

| Item                   | Symbol | Condition | Min | Typ  | Max  | Unit | Remark            |
|------------------------|--------|-----------|-----|------|------|------|-------------------|
| Supply Voltage For LCM | VBUS   | —         | 4.5 | 5    | 5.5  | V    | —                 |
| Supply Current For LCM | IBUS   | —         | —   | 220  | 240  | mA   | Note1             |
| Power Consumption      | —      | VBUS=5V   | —   | 1100 | 1320 | mW   | VBUS=5V<br>Note 2 |

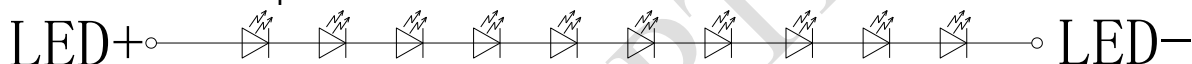
Note 1 : This value is test for VBUS=5V , Ta=25 °C only

Note 2 : Power consumption is include Backlight driver system

### 7.2. LED driving conditions (LED Driver system build in )

| Parameter         | Symbol | Min. | Typ.   | Max. | Unit | Remark     |
|-------------------|--------|------|--------|------|------|------------|
| LED current       | -      | -    | 20     | -    | mA   | -          |
| Power Consumption | -      | -    | 640    | 680  | mW   | -          |
| LED voltage       | VBL+   | 30   | 32     | 34   | 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

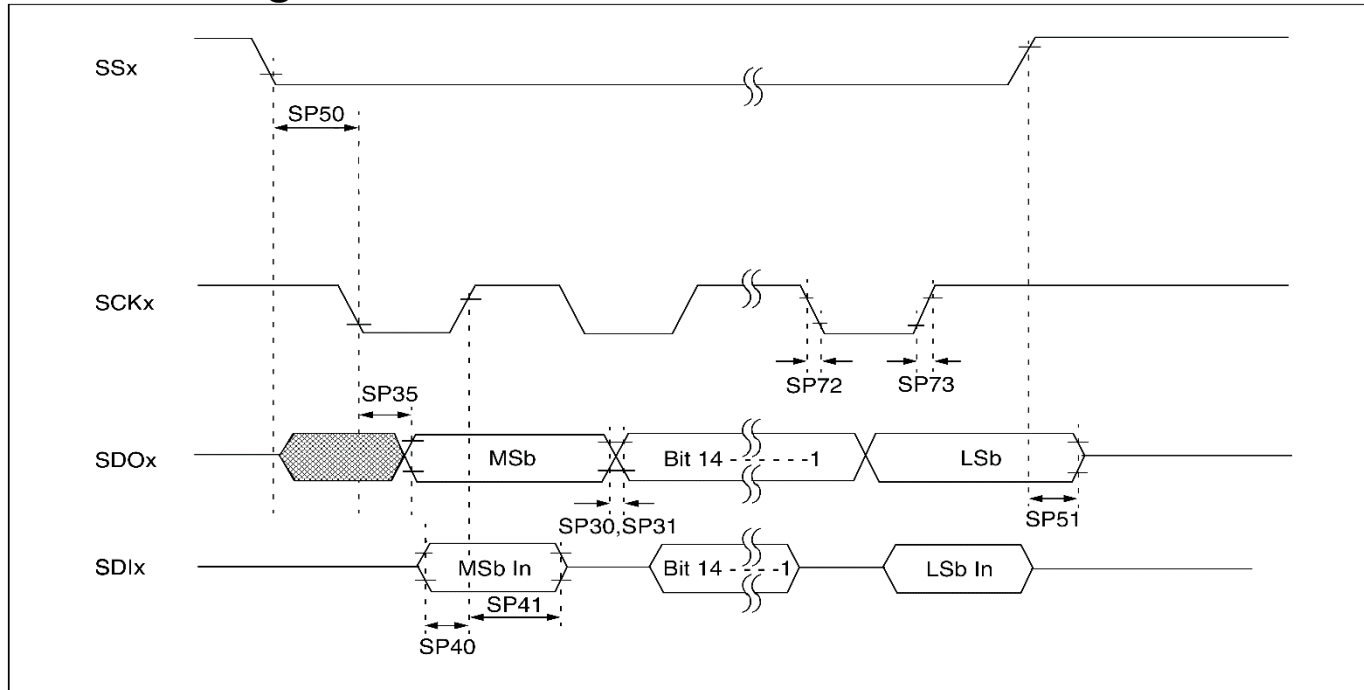
Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

## 8.DC CHARATERISTICS

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

## 9.SPI Timing Characteristics



| AC CHARACTERISTICS |                       |                                                                                 | Standard Operating Conditions: 2.0V to 3.6V<br>(unless otherwise stated)<br>Operating temperature $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for Industrial |                    |     |       |            |
|--------------------|-----------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----|-------|------------|
| Param No.          | Symbol                | Characteristic                                                                  | Min                                                                                                                                                                      | Typ <sup>(1)</sup> | Max | Units | Conditions |
| SP70               | TscL                  | SCKx Input Low Time                                                             | 250                                                                                                                                                                      | —                  | —   | ns    |            |
| SP71               | TscH                  | SCKx Input High Time                                                            | 250                                                                                                                                                                      | —                  | —   | ns    |            |
| SP72               | TscF                  | SCKx Input Fall Time <sup>(2)</sup>                                             | —                                                                                                                                                                        | 10                 | 25  | ns    |            |
| SP73               | TscR                  | SCKx Input Rise Time <sup>(2)</sup>                                             | —                                                                                                                                                                        | 10                 | 25  | ns    |            |
| SP30               | TdoF                  | SDOx Data Output Fall Time <sup>(2)</sup>                                       | —                                                                                                                                                                        | 10                 | 25  | ns    |            |
| SP31               | TdoR                  | SDOx Data Output Rise Time <sup>(2)</sup>                                       | —                                                                                                                                                                        | 10                 | 25  | ns    |            |
| SP35               | Tsch2doV,<br>TscL2doV | SDOx Data Output Valid after SCKx Edge                                          | —                                                                                                                                                                        | —                  | 30  | ns    |            |
| SP40               | TdiV2scH,<br>TdiV2scL | Setup Time of SDIx Data Input to SCKx Edge                                      | 20                                                                                                                                                                       | —                  | —   | ns    |            |
| SP41               | Tsch2diL,<br>TscL2diL | Hold Time of SDIx Data Input to SCKx Edge                                       | 20                                                                                                                                                                       | —                  | —   | ns    |            |
| SP50               | TssL2scH,<br>TssL2scL | $\overline{\text{SSx}}$ to SCKx $\uparrow$ or SCKx Input                        | 120                                                                                                                                                                      | —                  | —   | ns    |            |
| SP51               | TssH2doZ              | $\overline{\text{SSx}}$ $\uparrow$ to SDOx Output High-Impedance <sup>(3)</sup> | 10                                                                                                                                                                       | —                  | 50  | ns    |            |
| SP52               | Tsch2ssH<br>TscL2ssH  | $\overline{\text{SSx}}$ after SCKx Edge                                         | 50                                                                                                                                                                       | —                  | —   | ns    |            |

## 10. Instructions Table

### 10.1. UART Mode

#### Text Mode

Instruction of text mode

|         |    |         |         |        |        |    |        |    |        |    |        |        |    |        |        |        |           |         |         |         |
|---------|----|---------|---------|--------|--------|----|--------|----|--------|----|--------|--------|----|--------|--------|--------|-----------|---------|---------|---------|
| 1       | 2  | 3       | 4       | 5      | 6      | 7  | 8      | 9  | 10     | 11 | 12     | 13     | 14 | 15     | 16     | 17     | 18        | 19      | 20      | 21      |
| SB<br>1 | PL | SB<br>2 | SB<br>3 | M<br>D | W<br>R | TR | X<br>H | XL | Y<br>H | YL | S<br>R | S<br>G | SB | B<br>R | B<br>G | B<br>B | TA<br>SDA | EB<br>1 | EB<br>2 | EB<br>3 |

#### Graphic Mode

Instruction of Graphic mode:

|     |    |     |     |    |    |    |    |    |    |    |    |     |     |     |     |
|-----|----|-----|-----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|
| 1   | 2  | 3   | 4   | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13  | 14  | 15  | 16  |
| SB1 | PL | SB2 | SB3 | MD | RR | XH | XL | YH | YL | PH | PL | EB1 | EB2 | EB3 | SB1 |

#### Pixel Mode

Instruction of Pixel mode

|     |    |     |     |    |    |    |    |    |    |    |    |    |     |     |     |
|-----|----|-----|-----|----|----|----|----|----|----|----|----|----|-----|-----|-----|
| 1   | 2  | 3   | 4   | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14  | 15  | 16  |
| SB1 | PL | SB2 | SB3 | MD | RR | XH | XL | YH | YL | PR | PG | PB | EB1 | EB2 | EB3 |

#### Geometry Mode

Instruction of geometry mode

|         |    |         |         |        |        |         |         |         |         |         |         |         |         |    |    |    |    |         |         |         |
|---------|----|---------|---------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|----|----|----|----|---------|---------|---------|
| 1       | 2  | 3       | 4       | 5      | 6      | 7       | 8       | 9       | 10      | 11      | 12      | 13      | 14      | 15 | 16 | 17 | 18 | 19      | 20      | 21      |
| SB<br>1 | PL | SB<br>2 | SB<br>3 | M<br>D | R<br>R | XS<br>H | XS<br>L | YS<br>H | YS<br>L | XE<br>H | XE<br>L | YE<br>H | YE<br>L | LS | LR | LG | LB | EB<br>1 | EB<br>2 | EB<br>3 |

#### Clean Mode

Instruction of Clean Mode

|     |    |         |         |    |     |     |     |     |     |     |     |     |     |     |     |
|-----|----|---------|---------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2  | 3       | 4       | 5  | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  |
| SB1 | PL | SB<br>2 | SB<br>3 | MD | XSH | XSL | YSH | YSL | XEH | XEL | YEH | YEL | EB1 | EB2 | EB3 |

#### PWM Mode

Instruction of Pixel mode

|     |    |     |     |    |    |     |     |     |     |     |     |     |
|-----|----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|
| 1   | 2  | 3   | 4   | 5  | 6  | 7   | 8   | 9   | 10  | 11  | 12  | 13  |
| SB1 | PL | SB2 | SB3 | MD | PS | PFH | PFL | PDH | PDL | EB1 | EB2 | EB3 |

#### Backlight Mode

Instruction of Clean Mode

|     |    |     |     |    |    |    |    |    |    |    |    |    |     |     |     |
|-----|----|-----|-----|----|----|----|----|----|----|----|----|----|-----|-----|-----|
| 1   | 2  | 3   | 4   | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14  | 15  | 16  |
| SB1 | PL | SB2 | SB3 | MD | RR | XH | XL | YH | YL | PR | PG | PB | EB1 | EB2 | EB3 |

## 10.2. SPI Mode

### Text Mode

Instruction of text mode

| 1    | 2               | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15             | 16     |
|------|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----------------|--------|
| 0x31 | SB <sub>3</sub> | MD | WR | TR | XH | XL | YH | YL | SR | SG | SB | BR | BG | B <sub>B</sub> | TA SDA |

### Graphic Mode

Instruction of Graphic mode:

| 1    | 2   | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|------|-----|----|----|----|----|----|----|----|----|
| 0x31 | SB3 | MD | RR | XH | XL | YH | YL | PH | PL |

### Pixel Mode

Instruction of Pixel mode

| 1    | 2   | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |
|------|-----|----|----|----|----|----|----|----|----|----|
| 0x31 | SB3 | MD | RR | XH | XL | YH | YL | PR | PG | PB |

### Geometry Mode

Instruction of geometry mode

| 1    | 2               | 3  | 4  | 5               | 6   | 7               | 8   | 9               | 10  | 11              | 12  | 13 | 14 | 15 | 16 |
|------|-----------------|----|----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|----|----|----|----|
| 0x31 | SB <sub>3</sub> | MD | RR | XS <sub>H</sub> | XSL | YS <sub>H</sub> | YSL | XE <sub>H</sub> | XEL | YE <sub>H</sub> | YEL | LS | LR | LG | LB |

### Clean Mode

Instruction of Clean Mode

| 1    | 2   | 3  | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
|------|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0x31 | SB3 | MD | XSH | XSL | YSH | YSL | XEH | XEL | YEH | YEL |

### PWM Mode

Instruction of Pixel mode

| 1    | 2   | 3  | 4  | 5   | 6   | 7   | 8   |
|------|-----|----|----|-----|-----|-----|-----|
| 0x31 | SB3 | MD | PS | PFH | PFL | PDH | PDL |

### Backlight Mode

Instruction of Clean Mode

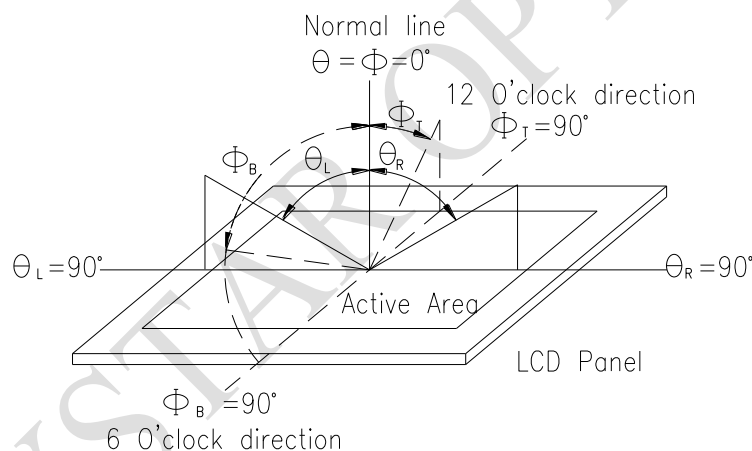
| 1    | 2   | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |
|------|-----|----|----|----|----|----|----|----|----|----|
| 0x31 | SB3 | MD | RR | XH | XL | YH | YL | PR | PG | PB |

## 11. Optical Characteristics

| Item                                              | Symbol | Condition.                        | Min  | Typ. | Max. | Unit              | Remark            |
|---------------------------------------------------|--------|-----------------------------------|------|------|------|-------------------|-------------------|
| Response time                                     | Tr+ Tf | $\theta=0^\circ$ 、 $\Phi=0^\circ$ | -    | 25   | 30   | .ms               | Note 3            |
| Contrast ratio                                    | CR     | At optimized viewing angle        | 300  | 500  | -    | -                 | Note 4            |
| Color Chromaticity                                | White  | Wx                                | 0.26 | 0.31 | 0.36 |                   | Note 2,6,7        |
|                                                   |        | Wy                                | 0.28 | 0.33 | 0.38 |                   |                   |
| Viewing angle<br>(Gray Scale Inversion Direction) | Hor.   | $\Theta_R$                        | -    | 70   | -    | Deg.              | Note 1            |
|                                                   |        | $\Theta_L$                        | -    | 70   | -    |                   |                   |
|                                                   | Ver.   | $\Phi_T$                          | -    | 50   | -    |                   |                   |
|                                                   |        | $\Phi_B$                          | -    | 60   | -    |                   |                   |
| Brightness                                        | -      | -                                 | 400  | 500  | -    | cd/m <sup>2</sup> | Center of display |
| Uniformity                                        | (U)    | -                                 | 75   | -    | -    | %                 | Note5             |

Ta=25±2℃

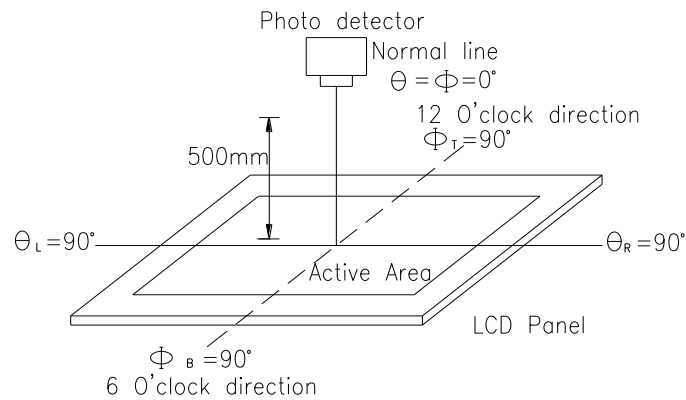
Note 1: Definition of viewing angle range



**Fig. 11.1. Definition of viewing angle**

Note 2: Test equipment setup:

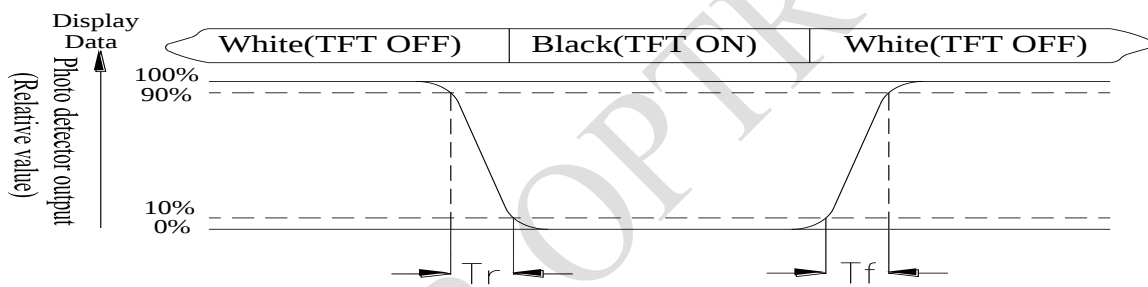
After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of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

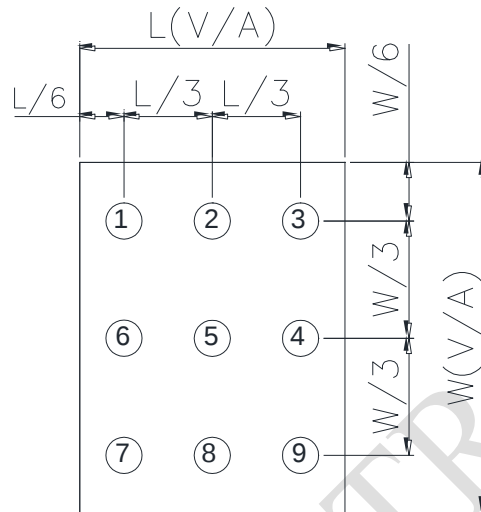


Fig.11.3. Definition of uniformity.

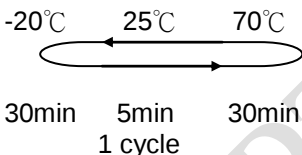
**Note 6: Definition of color chromaticity (CIE 1931)**

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.

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