



RAYSTAR

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RFE430M-EIW-DRS

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 | 2014/11/03 | | First issue |
| A | 2015/07/08 | | Modify Reliability |

RAYSTAR OPTRONICS

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2.Summary

This technical specification applies to 4.3' color TFT-LCD panel. The 4.3' color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays. This module follows RoHS.

RAYSTAR OPTRONICS

3. General Specifications

- Size: 4.3 inch
- Dot Matrix: 480 x RGBx272(TFT) dots
- Module dimension: 125.5(W) x 67.2(H) x 8.8 (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
- Backlight Type: LED, Normally White
- Interface: RS232 19200 Baud rate/SPI
- With /Without TP: With RTP
- Surface: Anti-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 | RS232 Transmit pin |
| 3 | RX | I | RS232 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 | /REST | 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 |

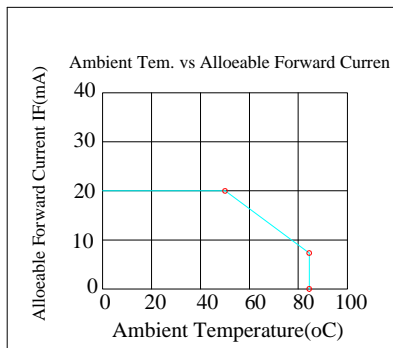
| CON 3 | | | |
|-------|---------|--------------|-----------------------|
| Pin | Symbol | I/O | Function |
| 1 | GND | Power Supply | Power Ground |
| 2 | SW1 | I | Switch (active low) |
| 3 | SW2 | I | Switch (active low) |
| 4 | SW3 | I | Switch (active low) |
| 5 | SW4 | I | Switch (active low)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

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°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 | Note 1 |
| Power Consumption | — | VBUS=5V | — | 1100 | 1320 | mW | VBUS=5V Note 2 |

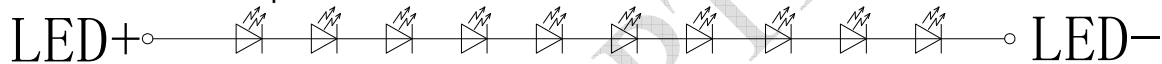
Note 1 : This value is test for VBUS=5V , Ta=25 °C only

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

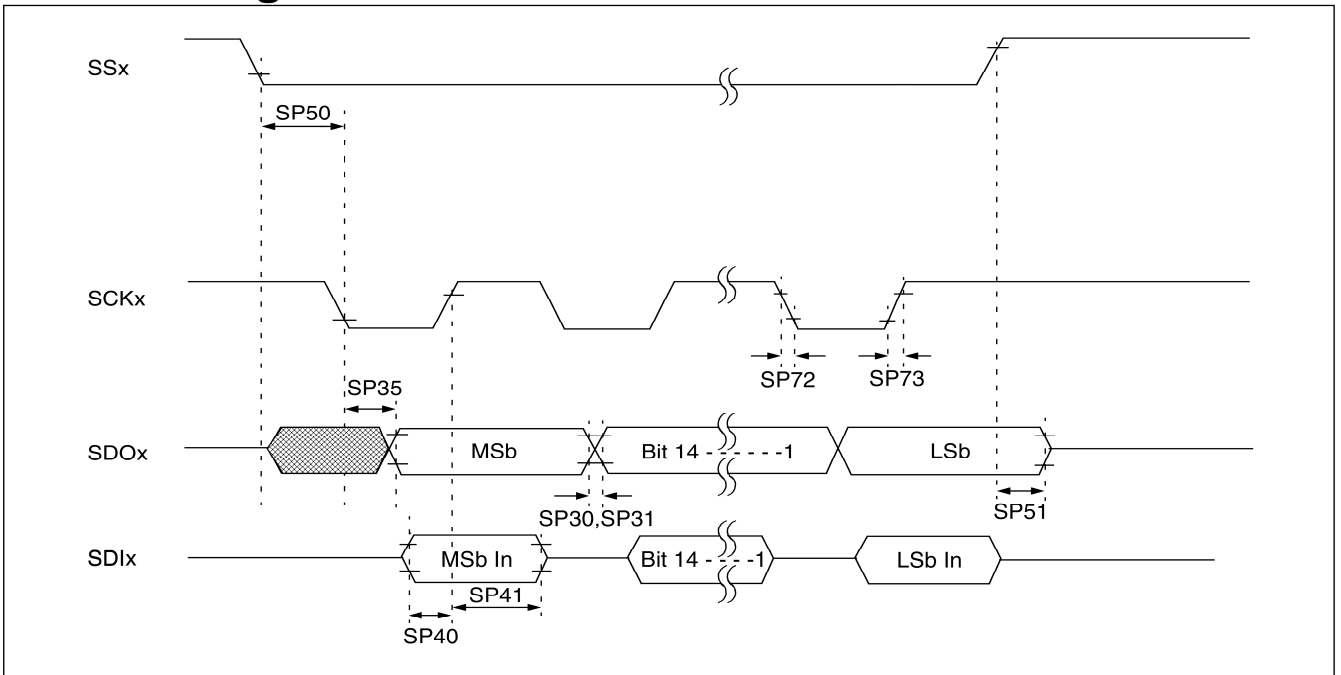
Note 4 : The single LED lamp case

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 | |

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9.SPI Timing Characteristics



| AC CHARACTERISTICS | | | Standard Operating Conditions: 2.0V to 3.6V (unless otherwise stated) Operating temperature $-40^{\circ}\text{C} \leq T_A \leq +85^{\circ}\text{C}$ for Industrial | | | | |
|--------------------|-----------------------|---|--|--------------------|-----|-------|------------|
| Param No. | Symbol | Characteristic | Min | Typ ⁽¹⁾ | Max | Units | Conditions |
| SP70 | TscL | SCKx Input Low Time | 250 | — | — | ns | |
| SP71 | TschH | SCKx Input High Time | 250 | — | — | ns | |
| SP72 | TscF | SCKx Input Fall Time ⁽²⁾ | — | 10 | 25 | ns | |
| SP73 | TscR | SCKx Input Rise Time ⁽²⁾ | — | 10 | 25 | ns | |
| SP30 | TdoF | SDOx Data Output Fall Time ⁽²⁾ | — | 10 | 25 | ns | |
| SP31 | TdoR | SDOx Data Output Rise Time ⁽²⁾ | — | 10 | 25 | ns | |
| SP35 | Tsch2doV, TscL2doV | SDOx Data Output Valid after SCKx Edge | — | — | 30 | ns | |
| SP40 | TdiV2sch, TdiV2scL | Setup Time of SDIx Data Input to SCKx Edge | 20 | — | — | ns | |
| SP41 | Tsch2diL, TscL2diL | Hold Time of SDIx Data Input to SCKx Edge | 20 | — | — | ns | |
| SP50 | Tssl2sch, Tssl2scL | $\overline{\text{SSx}}$ to SCKx \uparrow or SCKx Input | 120 | — | — | ns | |
| SP51 | TssH2doZ | $\overline{\text{SSx}}$ \uparrow to SDOx Output High-Impedance ⁽³⁾ | 10 | — | 50 | ns | |
| SP52 | Tsch2ssH 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 1 | PL | SB 2 | SB 3 | M D | W R | TR | X H | XL | Y H | YL | S R | S G | SB | B R | B G | B B | TA SDA | EB 1 | EB 2 | EB 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 1 | PL | SB 2 | SB 3 | M D | R R | X S H | X S L | Y S H | Y S L | X E H | X E L | Y E H | Y E L | LS | LR | LG | LB | EB 1 | EB 2 | EB 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 2 | SB 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 3 | MD | WR | TR | XH | XL | YH | YL | SR | SG | SB | BR | BG | B B | 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 3 | MD | RR | XS H | XSL | YS H | YSL | XE H | XEL | YE H | 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 | $\theta=0^\circ$ 、 $\Phi=0^\circ$ | - | 30 | 45 | .ms | Note 3 |
| Contrast ratio | CR | At optimized viewing angle | 250 | 350 | - | - | Note 4 |
| Color Chromaticity | White | Wx | 0.28 | 0.30 | 0.33 | | Note 2,5 |
| | | Wy | 0.31 | 0.33 | 0.36 | | |
| Viewing angle | Hor. | Θ_R | 55 | 65 | - | Deg. | Note 1 |
| | | Θ_L | 55 | 65 | - | | |
| | Ver. | Φ_T | 45 | 55 | - | | |
| | | Φ_B | 45 | 55 | - | | |
| Brightness | - | - | 280 | 350 | - | cd/m ² | Center of display |

Ta=25±2°C

Note 1: Definition of viewing angle range

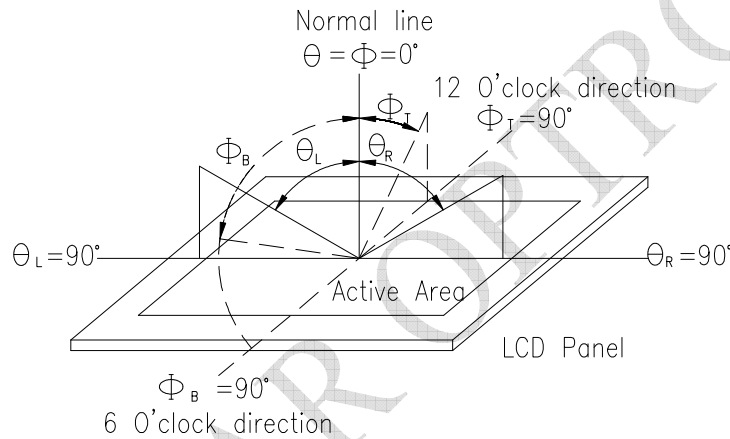


Fig. 11.1. Definition of viewing angle

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.

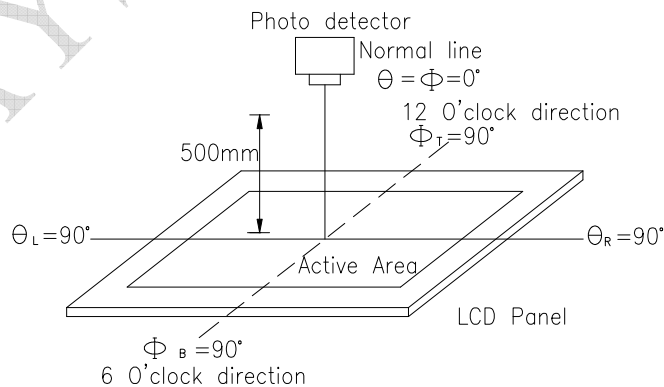
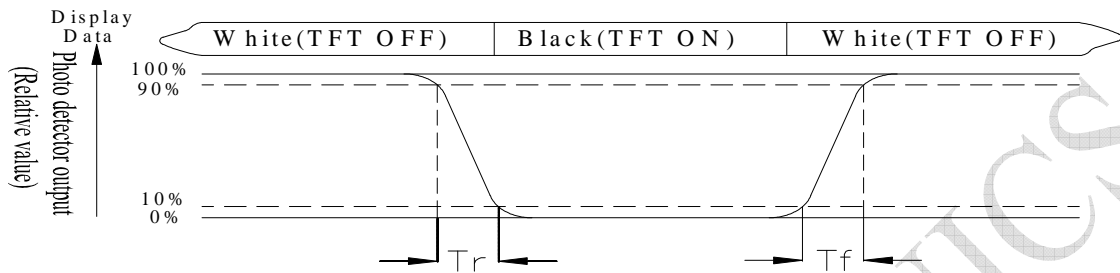


Fig. 11.2. Optical measurement system setup

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: 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.

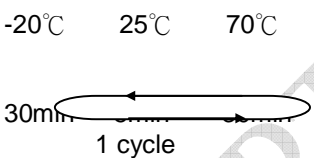
Note 6: Definition of color chromaticity (CIE 1931)

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

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

| Environmental Test | | | |
|--------------------------------------|---|---|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80°C 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30°C 200hrs | 1,2 |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 70°C 200hrs | — |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20°C 200hrs | 1 |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60°C,90%RH max | 60°C,90%RH 96hrs | 1,2 |
| Thermal shock resistance | The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;">  <p>-20°C 25°C 70°C</p> <p>30min</p> <p>1 cycle</p> </div> | -20°C/70°C 10 cycles | — |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 3 15mm 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=800V, RS=1.5kΩ CS=100pF 1 time | — |

Note1: No dew condensation to be observed.

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

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

LCM Sample Estimate Feedback Sheet

Module Number : _____

1 、 Panel Specification :

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

2 、 Mechanical Specification :

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

3 、 Relative Hole Size :

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

4 、 Backlight Specification :

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

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

| | | |
|--|-------------------------------|-------------------------------------|
| Module Number : _____ | | |
| 5 · <u>Electronic Characteristics of Module :</u> | | |
| 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 · <u>Summary :</u> | | |
| <p style="text-align: right;"> Sales signature : _____ Customer Signature : _____ Date : / / _____ </p> | | |