



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



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華凌光電股份有限公司

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SPECIFICATION

CUSTOMER : _____

MODULE NO.: WF88BTYA8MNNO#

| | |
|--|---|
| <p>APPROVED BY: (FOR CUSTOMER USE ONLY)</p> | <p>PCB VERSION: _____ DATA: _____</p> |
|--|---|

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|--------------------------------|-------------|------------|-------------|
| | | | 葉虹蘭 |
| ISSUED DATE: 2018/03/15 | | | |



RECORDS OF REVISION

DOC. FIRST ISSUE

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1.Module Classification Information

W F 88 B T Y A 8 M N N 0 #
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

| | | | | | | | | | | | | | | | | | | |
|---|---|------------------------------------|---|--|---|---------|---|---------|------------------------------------|---------|---|--------------------------------|--|----------|--|--|--|--|
| ① | Brand : WINSTAR DISPLAY CORPORATION | | | | | | | | | | | | | | | | | |
| ② | Display Type : F→TFT Type, J→Custom TFT | | | | | | | | | | | | | | | | | |
| ③ | Display Size : 8.8" TFT | | | | | | | | | | | | | | | | | |
| ④ | Model serials no. | | | | | | | | | | | | | | | | | |
| ⑤ | Backlight Type : | | | | | | F→CCFL, White S→LED, High Light White | | | | | | T→LED, White Z→Nichia LED, White | | | | | |
| ⑥ | LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction | | | | | | A→Transmissive, N.T, IPS TFT C→Transmissive, N. T, 6:00 ; F→Transmissive, N.T,12:00 ; I→Transmissive, W. T, 6:00 K→Transflective, W.T,12:00 L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00 | | | | | | Q→Transmissive, Super W.T, 12:00 R→Transmissive, Super W.T, O-TFT V→Transmissive, Super W.T, VA TFT W→Transmissive, Super W.T, IPS TFT X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-TFT | | | | | |
| ⑦ | A : TFT LCD B : TFT+SCREW HOLES+CONTROL BOARD C : TFT+ SCREW HOLES +A/D BOARD D : TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD E : TFT+ SCREW HOLES +POWER BOARD | | | | | | F : TFT+CONTROL BOARD G : TFT+ SCREW HOLES H : TFT+D/V BOARD I : TFT+ SCREW HOLES +D/V BOARD J : TFT+POWER BD | | | | | | | | | | | |
| ⑧ | Resolution: | | | | | | | | | | | | | | | | | |
| | A | 128160 | B | 320234 | C | 320240 | D | 480234 | E | 480272 | F | 640480 | G | 800480 | | | | |
| | H | 1024600 | I | 320480 | J | 240320 | K | 800600 | L | 240400 | M | 1024768 | N | 128128 | | | | |
| | P | 1280800 | Q | 480800 | R | 640320 | S | 480128 | T | 800320 | U | 8001280 | V | 176220 | | | | |
| | W | 1280398 | X | 1024250 | Y | 1920720 | Z | 800200 | 2 | 1024324 | 3 | 7201280 | 4 | 19201200 | | | | |
| | 5 | 1366768 | 6 | 1280320 | 7 | 1280480 | 8 | 4801920 | | | | | | | | | | |
| ⑨ | D: Digital L : LVDS M:MIPI | | | | | | | | | | | | | | | | | |
| ⑩ | Interface: | | | | | | | | | | | | | | | | | |
| | N | Without control board | | | A | 8Bit | | B | 16Bit | | | H | HDMI | | | | | |
| | I | I2C Interface | | | R | RS232 | | S | SPI Interface | | | U | USB | | | | | |
| ⑪ | TS: | | | | | | | | | | | | | | | | | |
| | N | Without TS | | | | T | Resistive touch panel | | | | C | Capacitive touch panel (G-F-F) | | | | | | |
| | G | Capacitive touch panel (G-G) | | | | | | C1 | Capacitive touch panel (G-F-F)+OCA | | | | | | | | | |
| | C2 | Capacitive touch panel (G-F-F)+OCR | | | | | | G1 | Capacitive touch panel (G-G)+OCA | | | | | | | | | |
| | G2 | Capacitive touch panel (G-G)+OCR | | | | | | B | CTP+GG+USB | | | | | | | | | |
| ⑫ | Version: X:Raspberry pi | | | | | | | | | | | | | | | | | |
| ⑬ | Special Code | | | #:Fit in with ROHS directive regulations | | | | | | | | | | | | | | |

2.Summary

WF88 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 8.8 (1:4) inch diagonally measured active display area with (480 horizontal by 1920 vertical pixel) resolution.

3. General Specifications

| Item | Dimension | Unit |
|------------------|-----------------------------------|-------------|
| Size | 8.8 | inch |
| Dot Matrix | 480 x R.G.B. x 1920 | dots |
| Module dimension | 231.3*64.3*4.8 | mm |
| Active area | 218.88 *54.72 | mm |
| Dot pitch | 0.114 x 0.114 | mm |
| LCD type | TFT, Normally black, Transmissive | |
| Viewing angle | 85/85/85/85 | |
| Backlight Type | LED ,Normally White | |
| Interface | mipi | |
| With /Without TP | Without TP | |
| Surface | Glare | |

*Color tone slight changed by temperature and driving voltage.

4. Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP | -20 | — | +70 | °C |
| Storage Temperature | TST | -30 | — | +80 | °C |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

5. Electrical Characteristics

5.1. TFT LCD Module

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------|--------|---------|------|---------|------|-------------|
| Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| | VGH | 17.0 | 18.0 | 19.0 | V | |
| | VGL | -11 | -10 | -9 | V | |
| | AVDD | 11.8 | 12 | 12.2 | V | |
| VCOM | VCOM | 4.5 | 4.88 | 5.2 | V | Note (1) |
| Input signal voltage | ViH | 0.7 VDD | - | VDD | V | Note (2) |
| | ViL | 0 | - | 0.3 VDD | V | |
| Current of power supply | IDD | - | - | 35 | mA | VDD =3.3V |
| | IADD | - | - | 30 | mA | AVDD=12V |
| | IGH | - | - | 5 | mA | VGH=18V |
| | IGL | - | - | -5 | mA | VGL= -10V |
| | Ivcom | - | - | 0.1 | mA | Vcom= 4.88V |

Note (1): Please adjust VCOM to make the flicker level minimum.

Note (2) :RESET, STBYB, TP_Sync

5.2. MIPI DC Characteristics
HS Receiver DC Specification

| Parameter | Symbol | Rating | | | Unit | Note |
|---|-----------|---------|------|---------|------|---|
| | | Min. | Typ. | Max. | | |
| Operation voltage | VDD | 1.5-10% | 1.5 | 1.5+10% | mV | |
| Differential Input Voltage | VID | 70 | 200 | 260 | mV | |
| Common Mode Voltage | VCMRX(DC) | 70 | - | 330 | mV | |
| Differential Input High Threshold Voltage | VTH | - | - | 70 | mV | |
| Differential Input Low Threshold Voltage | VTL | -70 | - | - | mV | |
| Singled-ended input high voltage | VIHHS | - | - | 460 | mV | |
| Singled-ended input low voltage | VILHS | -40 | - | - | mV | |
| Singled-ended Threshold for HS termination enable | VTERM-EN | - | - | 450 | mV | |
| Differential Input impedance | ZID | 80 | 100 | 125 | ohm | |
| Pin leakage current | ILEAK | -10 | - | 10 | uA | |
| Common-mode interference beyond 450MHZ | VCMRX(HF) | - | - | 100 | mV | |
| Common-mode interference 50MHz-450MHZ | VCMRX(LF) | -50 | - | 50 | mV | |
| Common-mode termination | CCM | - | - | 60 | pF | |
| Embedded Termination | RT | 90 | 100 | 110 | ohm | 2bits RT_SEL[1:0] for termination resistor selection 00→200ohm 10,01→150 ohm 11→100 ohm(default) 1bit ERMR_EN for termination resistor enable TERM_EN=0, termr disable R=(OPEN) TERM_EN=1, termr enable |

Note:

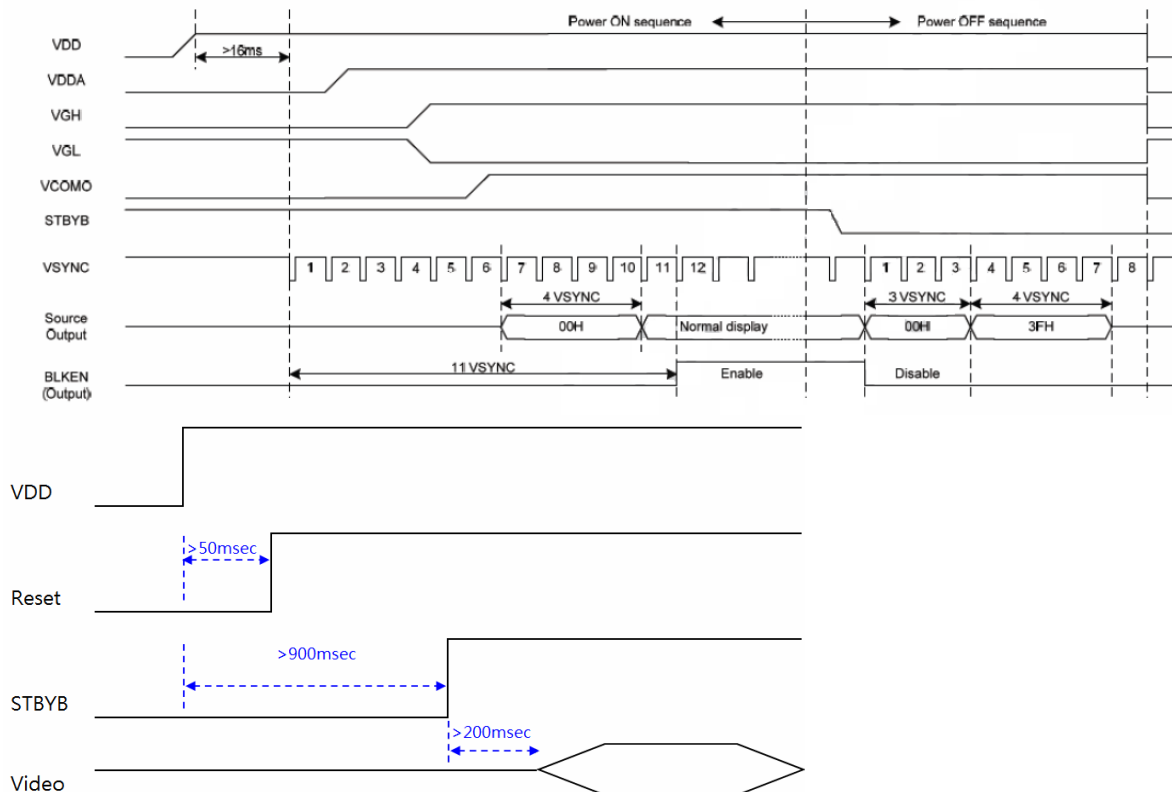
Excluding possible additional RF interference of 100mV peak sine wave beyond 450Mhz.
This table value includes a ground difference of 50mV between the transmitter and the receiver,the static common-mode level tolerance and variations below 450MHz.

5.3. Interface Timing

| Item | Symbol | Min. | Typ. | Max. | Unit |
|----------------------------------|--------|------|-------|------|------|
| MIPI Video data rate(4 lane) | - | - | 397.7 | - | Mbps |
| PCLK Frequency | FPCLK | - | 66.3 | - | MHz |
| Horizontal Synchronization | Hsync | - | 30 | - | PCLK |
| Horizontal Back Porch | HBP | - | 30 | - | PCLK |
| Horizontal Front Porch | HFP | - | 30 | - | PCLK |
| Hsync+HBP+HFP | - | 75 | 90 | - | PCLK |
| HorizontalAddress (Display Area) | Hadr | - | 480 | - | PCLK |
| Horizontal cycle | - | 555 | 570 | - | PCLK |
| Vertical Synchronization | Vsync | - | 6 | - | Line |
| Vertical Back Porch | VBP | - | 6 | - | Line |
| Vertical Front Porch | VFP | - | 6 | - | Line |
| Vsync+VBP+VFP | - | 15 | 18 | - | Line |
| Vertical Address(Display Area) | Vadr | - | 1920 | - | Line |
| Vertical cycle | - | 1935 | 1938 | - | Line |
| Frame Rate | - | - | 60 | - | Hz |

5.4. Power On / Off Sequence

Power-On/Off Timing Sequence:



5.5. Backlight Unit

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---------------|--------|------|--------|------|------|---------------------------|
| LED Current | IF | - | 160 | - | mA | Ta=25°C |
| LED Voltage | VF | - | - | 17.5 | Volt | Ta=25°C |
| LED Life-Time | N/A | | 30,000 | - | Hour | Ta=25°C IF=160Ma Note (2) |

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 oC, typical IL value indicated in the above table until the brightness becomes less than 50%

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C , and IL=160mA. The LED lifetime could be decreased if operating IL is larger than 160mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit

6. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|--------------------|--------|-----------------------------------|-----------------------------|-------|-------|-------------------|-------------------|--------|
| Response time | Tr | $\theta=0^\circ$ 、 $\phi=0^\circ$ | - | 30 | 40 | .ms | Note 3,5 | |
| | Tf | | | | | | | |
| Contrast ratio | CR | At optimized viewing angle | 600 | 800 | - | - | Note 4,5 | |
| Color Chromaticity | White | Wx | $\theta=0^\circ$ 、 $\phi=0$ | 0.250 | 0.300 | 0.350 | Note 2,6,7 | |
| | | Wy | | 0.272 | 0.322 | 0.372 | | |
| Viewing angle | Hor. | Θ_R | $CR \geq 10$ | 75 | 85 | - | Deg. | Note 1 |
| | | Θ_L | | 75 | 85 | - | | |
| | Ver. | Φ_T | | 75 | 85 | - | | |
| | | Φ_B | | 75 | 85 | - | | |
| Brightness | - | - | 480 | 600 | - | cd/m ² | Center of display | |

Ta=25±2°C,

Note 1: Definition of viewing angle range

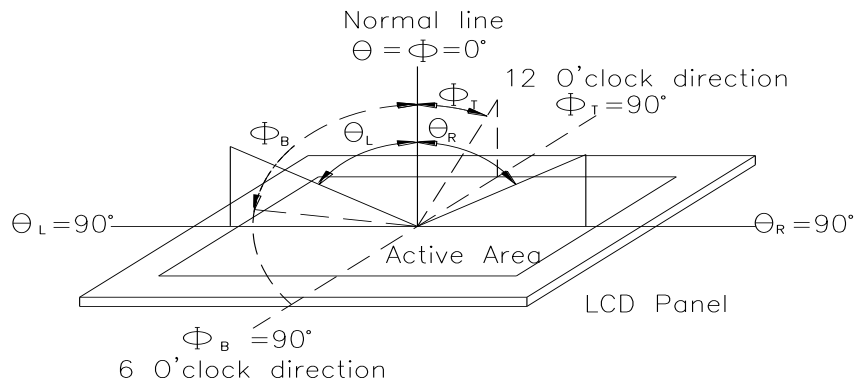


Fig.6.1. Definition of viewing angle

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.

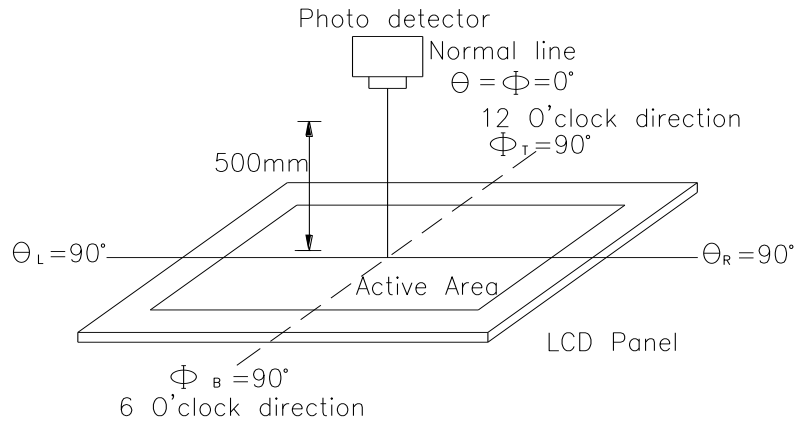
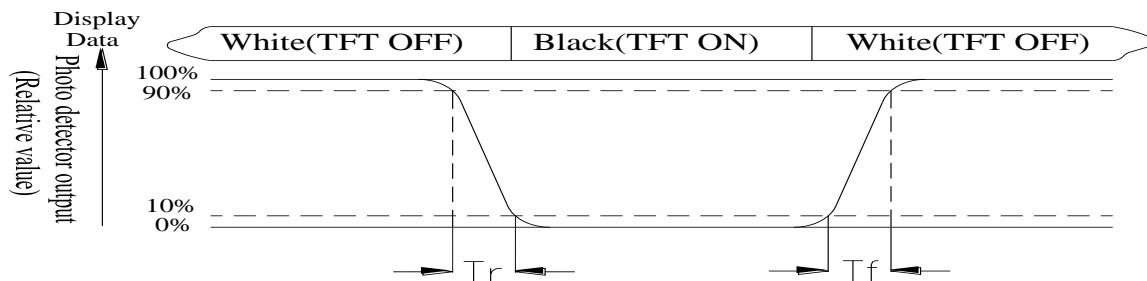


Fig. 6.2. Optical measurement system setup

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.

7.Interface

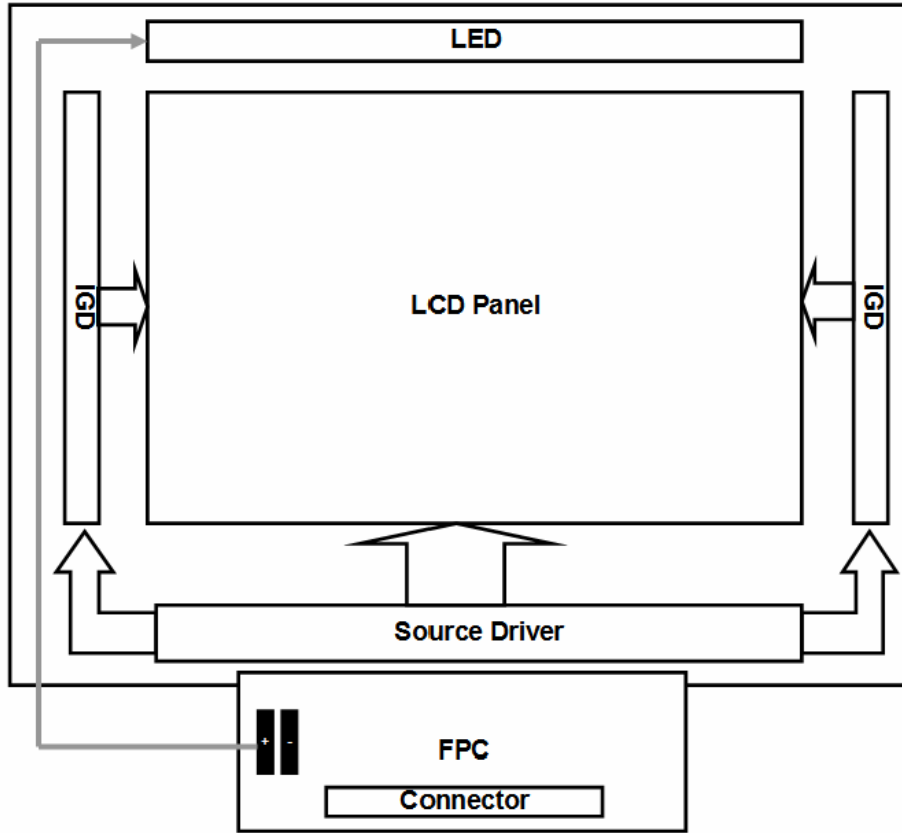
FPC connector is used for electronics interface. The recommended model is Hirose FH34SRJ-40S-0.5SH(50)

| Pin No. | Symbol | I/O | Function |
|---------|---------|-----|------------------------------------|
| 1 | GND | P | Ground |
| 2 | NC | --- | No connection |
| 3 | LED+ | P | LED Anode |
| 4 | LED+ | P | LED Anode |
| 5 | NC | --- | No connection |
| 6 | LED- | P | LED Cathode |
| 7 | LED- | P | LED Cathode |
| 8 | NC | --- | No connection |
| 9 | GND | P | Ground |
| 10 | NC | --- | No connection |
| 11 | AVDD | P | Power supply for analog circuit |
| 12 | NC | --- | No connection |
| 13 | VGH | P | Power supply for analog circuit |
| 14 | NC | --- | No connection |
| 15 | VGL | P | Power supply for analog circuit |
| 16 | NC | --- | No connection |
| 17 | GND | P | Ground |
| 18 | VCOM | P | Power supply for common voltage |
| 19 | GND | P | Ground |
| 20 | GND | P | Ground |
| 21 | RESET | I | Global reset |
| 22 | VDD | P | Power supply for digital circuits |
| 23 | STBYB | I | Standby mode |
| 24 | TP_Sync | O | Sync signal for touch panel |
| 25 | GND | P | Ground |
| 26 | D0P | I | MIPI Data Input Lane0 positive-end |
| 27 | D0N | I | MIPI Data Input Lane0 negative-end |
| 28 | GND | P | Ground |
| 29 | D1P | I | MIPI Data Input Lane1 positive-end |
| 30 | D1N | I | MIPI Data Input Lane1 negative-end |
| 31 | GND | P | Ground |

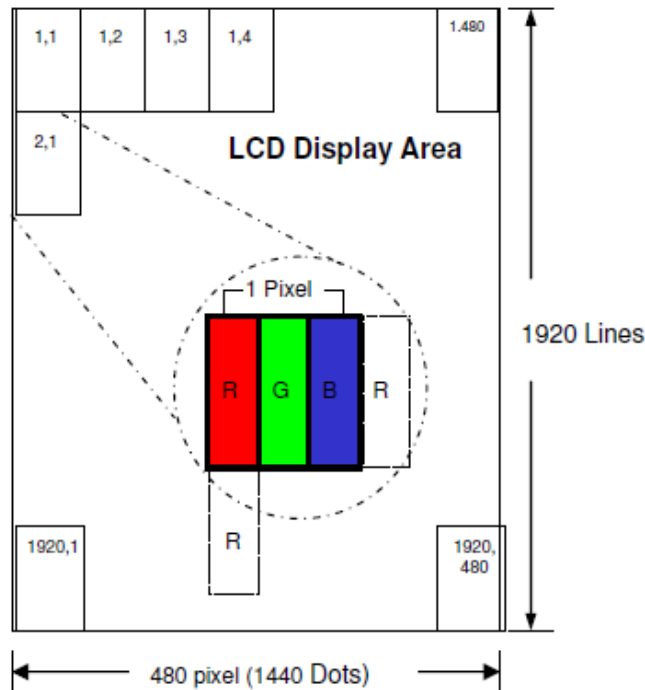
| | | | |
|----|------|---|------------------------------------|
| 32 | CLKP | I | MIPI Clock Input positive-end |
| 33 | CLKN | I | MIPI Clock Input negtive-end |
| 34 | GND | P | Ground |
| 35 | D2P | I | MIPI Data Input Lane2 positive-end |
| 36 | D2N | I | MIPI Data Input Lane2 negtive-end |
| 37 | GND | P | Ground |
| 38 | D3P | I | MIPI Data Input Lane3 positive-end |
| 39 | D3N | I | MIPI Data Input Lane3 negtive-end |
| 40 | GND | P | Ground |

8. Block Diagram

8.1. TFT LCD Module

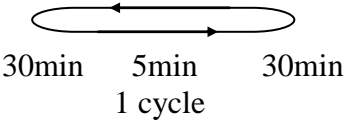


8.2. Pixel Format



9. Reliability

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

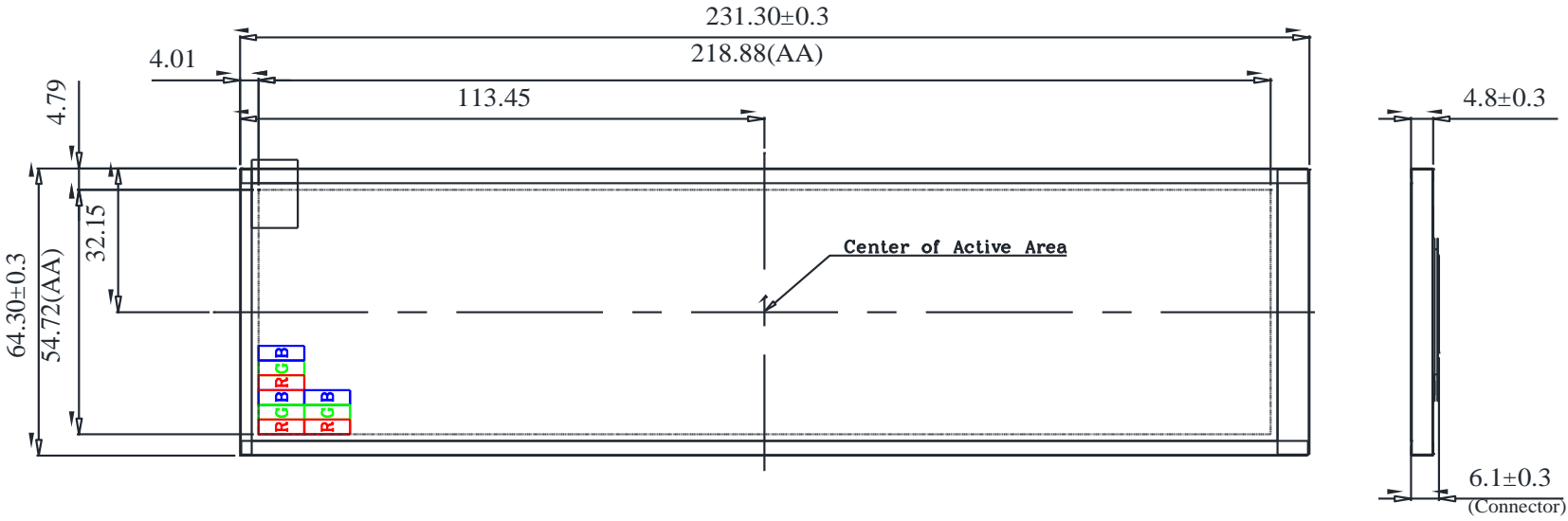
| Environmental Test | | | |
|--------------------------------------|--|---|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80°C 200hrs | 2 |
| Low Temperature storage | Endurance test 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 | <p>The sample should be allowed stand the following 10 cycles of operation</p> <p style="text-align: center;">-20°C 25°C 70°C</p>  <p style="text-align: center;">30min 5min 30min 1 cycle</p> | -20°C /70°C 10 cycles | — |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes | 3 |
| Static electricity test | Endurance test applying the electric stress to the terminal. | VS=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times | — |

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.

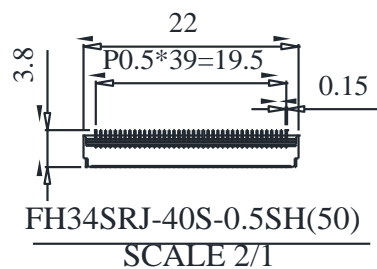
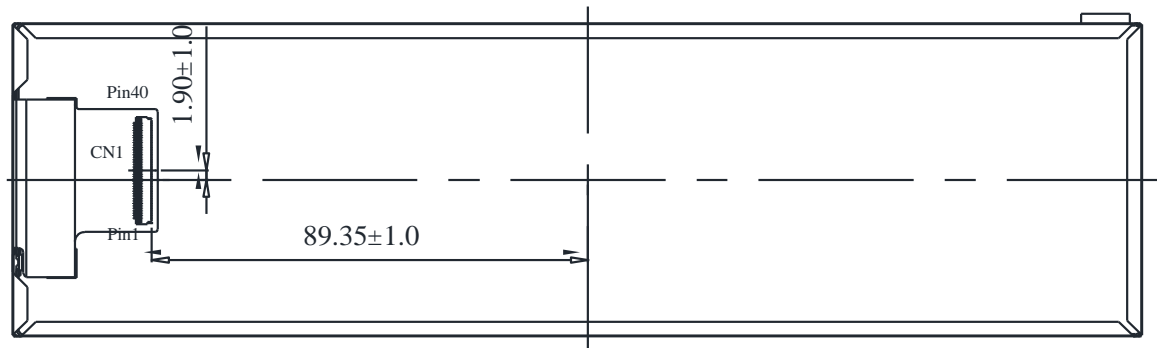
10. Contour Drawing



The non-specified tolerance of dimension is ± 0.3 mm .

CN1-FH34SRJ-40S-0.5SH(50)

| PIN NO | SYMBOL | PIN NO | SYMBOL |
|--------|--------|--------|---------|
| 1 | GND | 21 | RESET |
| 2 | NC | 22 | VDD |
| 3 | LED+ | 23 | STBYB |
| 4 | LED+ | 24 | TP_Sync |
| 5 | NC | 25 | GND |
| 6 | LED- | 26 | D0P |
| 7 | LED- | 27 | D0N |
| 8 | NC | 28 | GND |
| 9 | GND | 29 | D1P |
| 10 | NC | 30 | D1N |
| 11 | AVDD | 31 | GND |
| 12 | NC | 32 | CLKP |
| 13 | VGH | 33 | CLKN |
| 14 | NC | 34 | GND |
| 15 | VGL | 35 | D2P |
| 16 | NC | 36 | D2N |
| 17 | GND | 37 | GND |
| 18 | VCOM | 38 | D3P |
| 19 | GND | 39 | D3N |
| 20 | GND | 40 | GND |



The non-specified tolerance of dimension is ±0.3 mm .



1、Panel Specification :

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

2、Mechanical Specification :

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

3、Relative Hole Size :

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

4、Backlight Specification :

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

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



Winstar Module Number : _____

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5、Electronic Characteristics of Module :

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

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : / / _____