



RAYSTAR

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RFC570S-AIW-DNS

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>

Revision History

| VERSION | DATE | REVISED PAGE NO. | Note |
|---------|------------|------------------|--|
| 0 | 2014/04/02 | | First issue |
| A | 2015/10/19 | | Add size, Surface & Resistance Touch Panel General Specification.. |
| | | | Modify Pixel Data Format & Block Diagram |
| | | | Remove the description of TFT color part |
| B | 2015/11/04 | | Modify Reliability. |
| C | 2016/01/21 | | Modify Initial Code |
| | | | Modify Static electricity test |
| D | 2016/08/11 | | Modify Vibration test |
| E | 2017/08/24 | | Remove Package Specification |

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1. Module Classification Information
2. Summary
3. General Specification
4. Interface
5. Contour Drawing
6. Block Diagram
7. Absolute Maximum Ratings
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11. Optical Characteristics
12. Reliability
13. Touch Panel Information
14. Initial Code For Reference
15. Other

2.Summary

This technical specification applies to 5.7' Mono TFT-LCD panel. The 5.7' Mono 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.

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3.General Specifications

- Size: 5.7 inch
- Dot Matrix: 320 x 240 dots
- Module dimension: 160.0 x 109.0 x 8.5 mm
- Active area: 115.2 x 86.4 mm
- Dot pitch: 0.36 x 0.36 mm
- LCD type: TFT, Positive, Transmissive
- View Direction: 12 o'clock
- Gray Scale Inversion Direction: 6 o'clock
- Gray Scale: 16 Gray scale (4BPP)/ 4 Gray scale (2BPP)/ 2 Gray scale (1BPP)
- Driver IC: ST7511U
- Backlight Type: LED, Normally White
- With /Without TP: With RTP
- Surface: Anti-Glare

* Mono tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

| Pin | Symbol | Function | Remark |
|-----|--------------|----------------------|--------|
| 1 | GND | System ground | |
| 2 | VDD | Power Supply : +3.3V | |
| 3 | NC | No connect | |
| 4 | A0 | Data/Command select | |
| 5 | /WR(R/W) | Write strobe signal | |
| 6 | /RD(E) | Read strobe signal | |
| 7 | DB0 | Data bus | |
| 8 | DB1 | Data bus | |
| 9 | DB2 | Data bus | |
| 10 | DB3 | Data bus | |
| 11 | DB4 | Data bus | |
| 12 | DB5 | Data bus | |
| 13 | DB6 | Data bus | |
| 14 | DB7 | Data bus | |
| 15 | /CS | Chip select | |
| 16 | /RESET(RSTB) | Hardware reset | |
| 17 | IF0 | Mode select | Note1 |
| 18 | IF1 | | |
| 19 | NC | No connect | |
| 20 | NC | No connect | |
| 21 | NC | No connect | |
| 22 | NC | No connect | |

Note1:

| Setting | | MCU Type | Interface Pin Function | | | | |
|---------|-----|--------------------------|------------------------|----|-----|-----|-------------------------------------|
| IF1 | IF0 | | CSB | A0 | RWR | ERD | D[7:0] |
| L | L | Parallel 8080 series MCU | CSB | A0 | /WR | /RD | D[7:0] |
| L | H | Parallel 6800 series MCU | | | R/W | E | D[7:0] |
| H | H | Serial 4-Line series MCU | | | - | - | D7=SCL, D0=SDA, D[6:1] are not used |
| H | L | Serial 3-Line series MCU | | | - | - | |

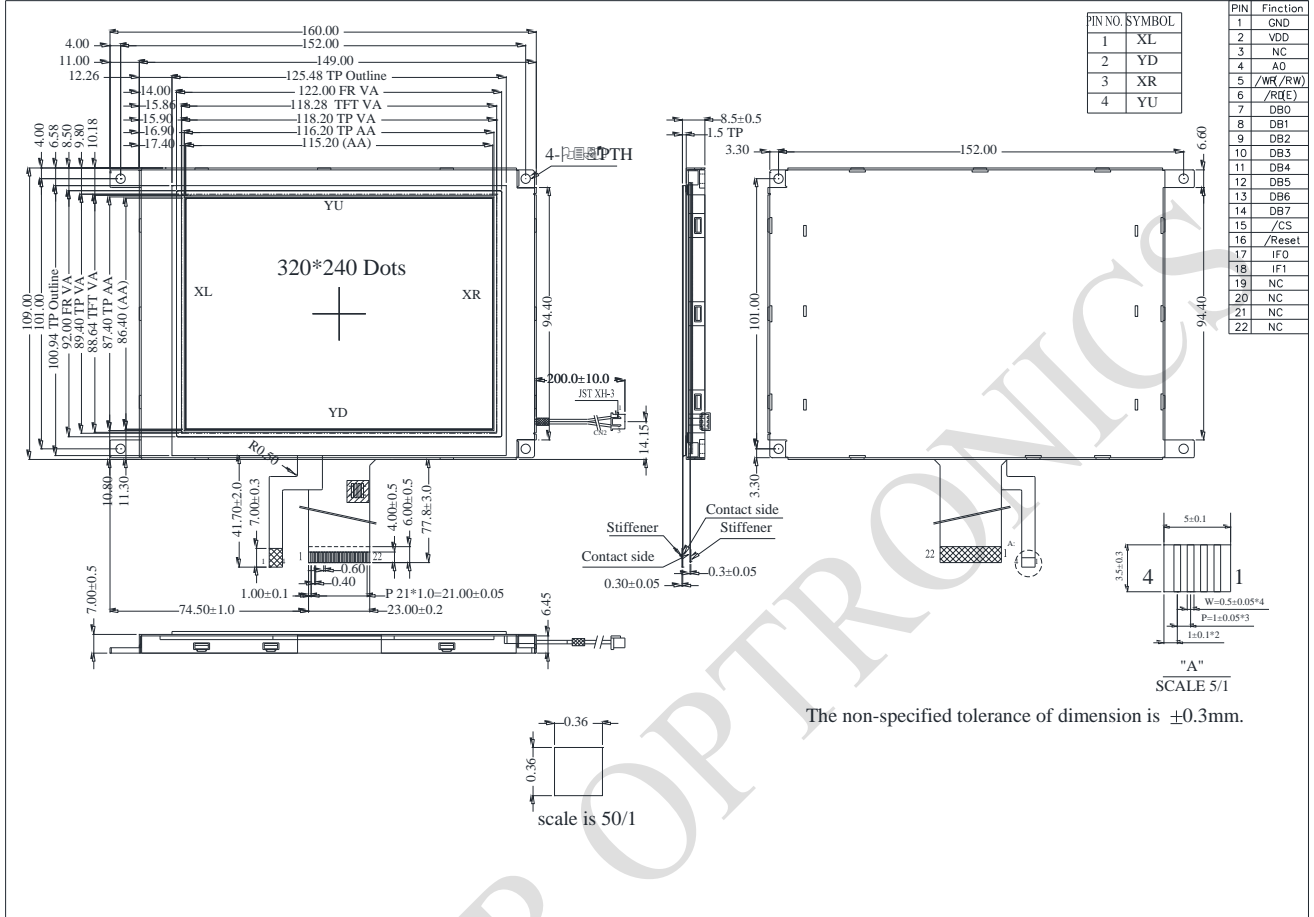
The un-used pins are marked as “-” and should be connected to “H” by VDDI.

4.2. Backlight Unit Section(CN2)

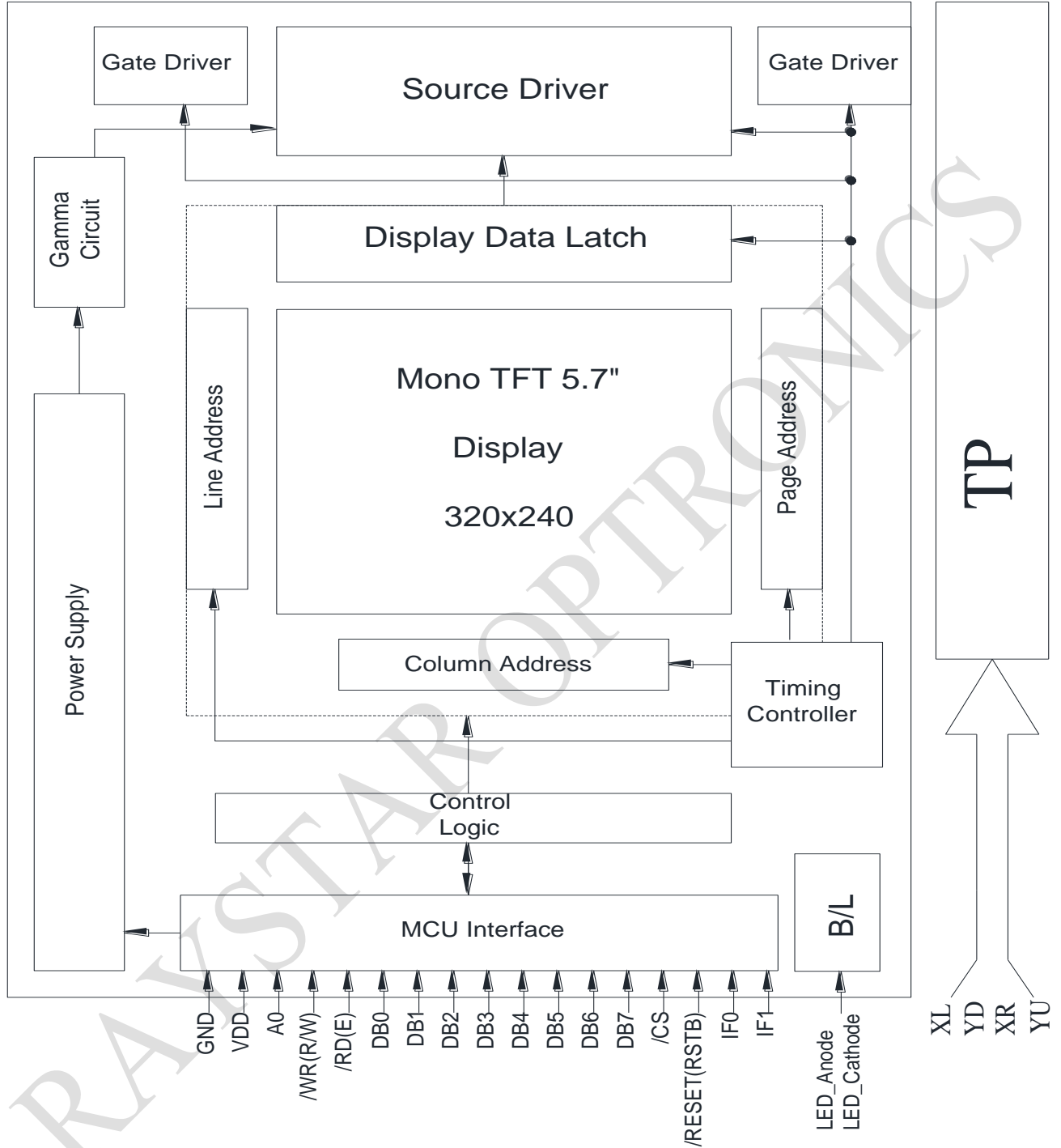
LED Light Bar connector is used for the the integral backlight system. The recommended model is “JST XH-3” manufactured by JST.

| Pin No. | Symbol | I/O | Function | Remark |
|---------|-------------------|-----|-------------------------------------|--------|
| 1 | V _{LED+} | P | Power for LED backlight anode (A) | Red |
| 3 | V _{LED-} | P | Power for LED backlight cathode (K) | White |

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

- 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

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8. Electrical Characteristics

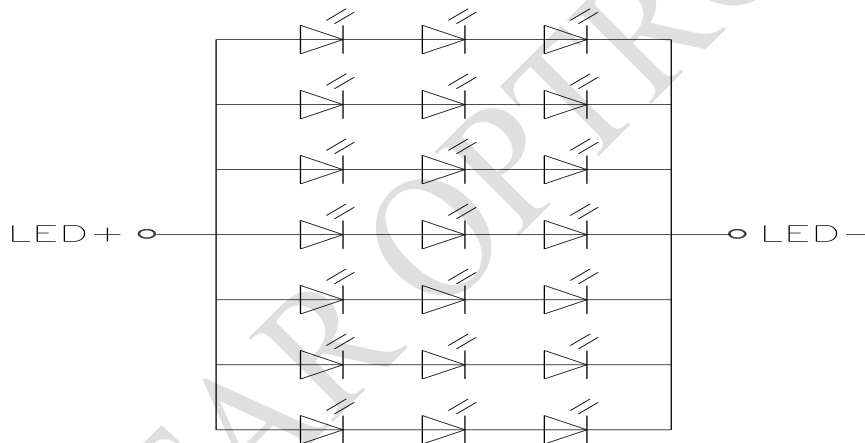
8.1. Operating conditions:

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|------------------------|--------|-----------|-----|-----|-----|------|--------|
| Supply Voltage For LCM | VDD | — | 3.0 | 3.3 | 3.6 | V | |
| Supply Current For LCM | IDD | — | — | 20 | 30 | mA | Note1 |
| Power Consumption | — | — | — | 66 | 108 | mW | |

Note1: This value is test for VDD=3.3V only

8.2. LED driving conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-------------------|--------|------|--------|------|------|------------|
| LED current | | - | 140 | - | mA | |
| Power Consumption | | 1120 | - | 1386 | mW | |
| LED voltage | VLED+ | 8.0 | 9.0 | 9.9 | V | Note 1 |
| LED Life Time | | - | 50,000 | - | Hr | Note 2,3,4 |



Note 1 : Power supply the back light specification

Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

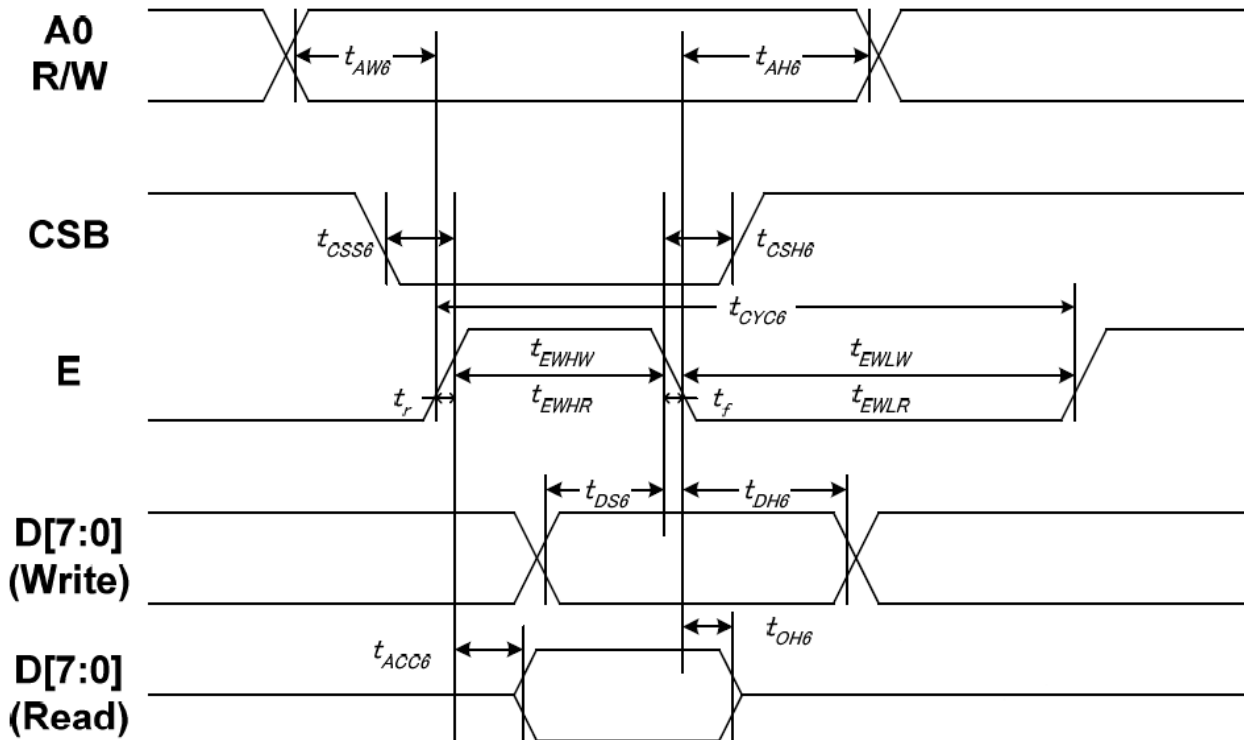
9.DC CHARATERISTICS

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

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10.AC Characteristics

10.1. System Bus Timing for 6800 Series MPU

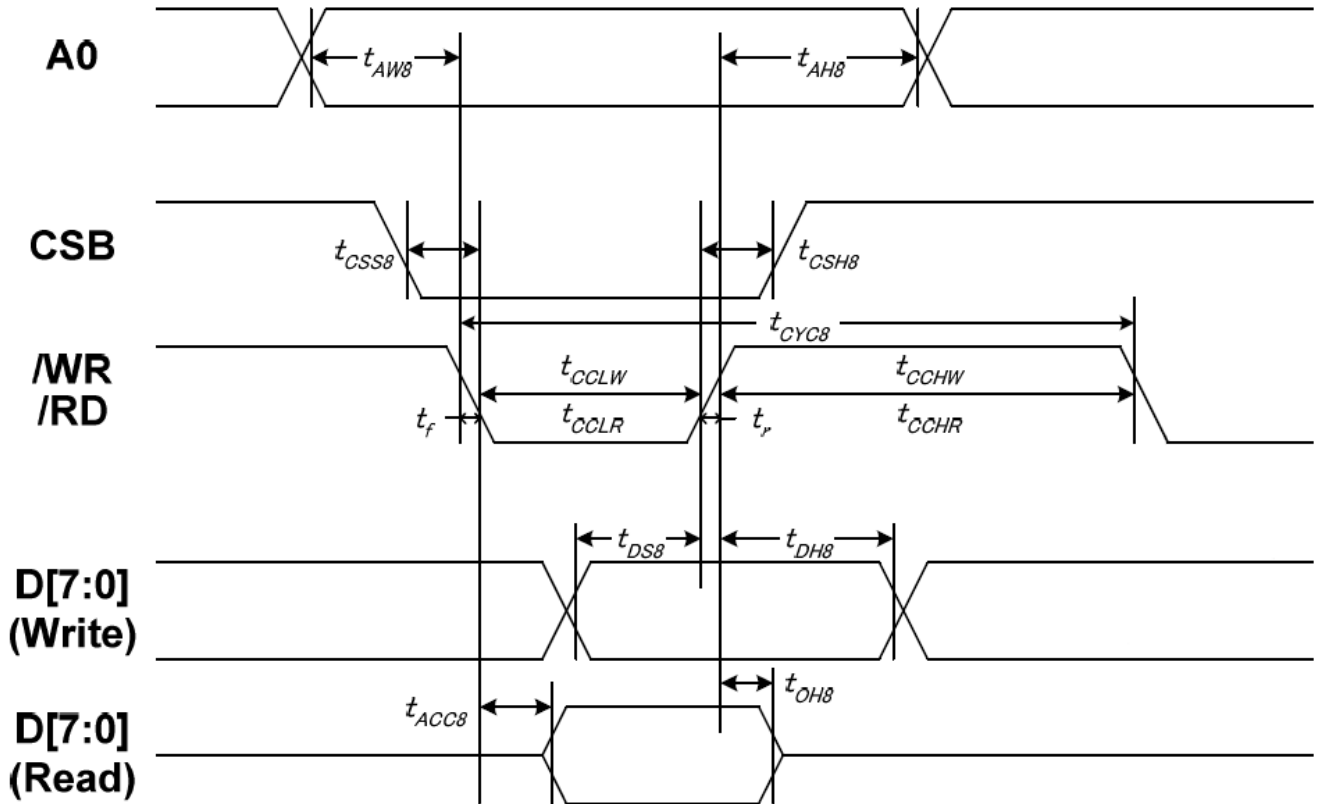


| Item | Signal | Symbol | Condition | Min | Max | Unit | |
|-------------------------------|------------|-------------|-------------|-----|-----|------|---|
| Address setup time | A0 | t_{AW6} | - | 10 | - | ns | |
| Address hold time | | t_{AH6} | - | 0 | - | | |
| System cycle time | E | t_{CYC6} | - | 200 | - | | |
| Enable L pulse width (WRITE) | | t_{EHLW} | - | 100 | - | | |
| Enable H pulse width (WRITE) | | t_{EHWLW} | - | 100 | - | | |
| Enable L pulse width (READ) | | t_{EHLR} | - | 130 | - | | |
| Enable H pulse width (READ) | | t_{EHWLR} | - | 130 | - | | |
| CSB setup time | | CSB | t_{CSS6} | - | 100 | | - |
| CSB hold time | | | t_{CSH6} | - | 100 | | - |
| Write data setup time | | D[7:0] | t_{DS6} | - | 70 | | - |
| Write data hold time | t_{DH6} | | - | 20 | - | | |
| Read data access time | t_{ACC6} | | CL = 100 pF | - | 80 | | |
| Read data output disable time | t_{OH6} | | CL = 100 pF | 15 | 80 | | |

Note:

1. The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC6} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC6} - t_{CCLR} - t_{CCHR})$ are specified.
2. All timing is specified using 20% and 80% of VDDI as the reference.
3. t_{CCLW} and t_{CCLR} are specified as the overlap between CSB being "L" and /WR and /RD being at the "L" level. CSB and /WR (or /RD) cannot act at the same time and CSB should be 100ns wider than /WR (or /RD).

10.2. System Bus Timing for 8080 Series MPU

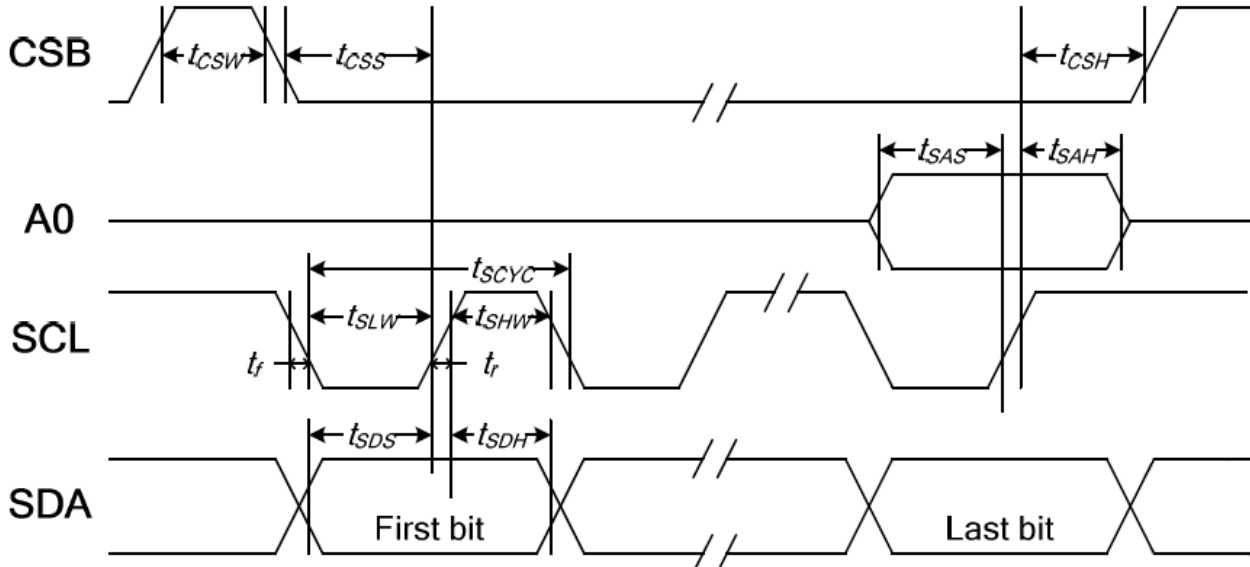


| Item | Signal | Symbol | Condition | Min | Max | Unit |
|-------------------------------|--------|-------------------|-------------|-----|-----|------|
| Address setup time | A0 | t _{AW8} | - | 10 | - | ns |
| Address hold time | | t _{AH8} | - | 0 | - | |
| System cycle time | | t _{CYC8} | - | 200 | - | |
| /WR L pulse width (WRITE) | /WR | t _{CCLW} | - | 100 | - | |
| /WR H pulse width (WRITE) | | t _{CCHW} | - | 100 | - | |
| /RD L pulse width (READ) | /RD | t _{CCLR} | - | 120 | - | |
| /RD H pulse width (READ) | | t _{CCHR} | - | 120 | - | |
| CSB setup time | CSB | t _{CSS8} | - | 100 | - | |
| CSB hold time | | t _{CSH8} | - | 100 | - | |
| Write data setup time | D[7:0] | t _{DS8} | - | 70 | - | |
| Write data hold time | | t _{DH8} | - | 20 | - | |
| Read data access time | D[7:0] | t _{ACC8} | CL = 100 pF | - | 80 | |
| Read data output disable time | | t _{OH8} | CL = 100 pF | 15 | 80 | |

Note:

- The input signal rise time and fall time (t_r, t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, (t_r + t_f) ≤ (t_{CYC8} – t_{CCLW} – t_{CCHW}) for (t_r + t_f) ≤ (t_{CYC8} – t_{CCLR} – t_{CCHR}) are specified.
- All timing is specified using 20% and 80% of VDDI as the reference.
- t_{CCLW} and t_{CCLR} are specified as the overlap between CSB being “L” and /WR and /RD being at the “L” level. CSB and /WR (or /RD) cannot act at the same time and CSB should be 100ns wider than /WR (or /RD).

10.3. System Bus Timing for 4-Line Serial Interface

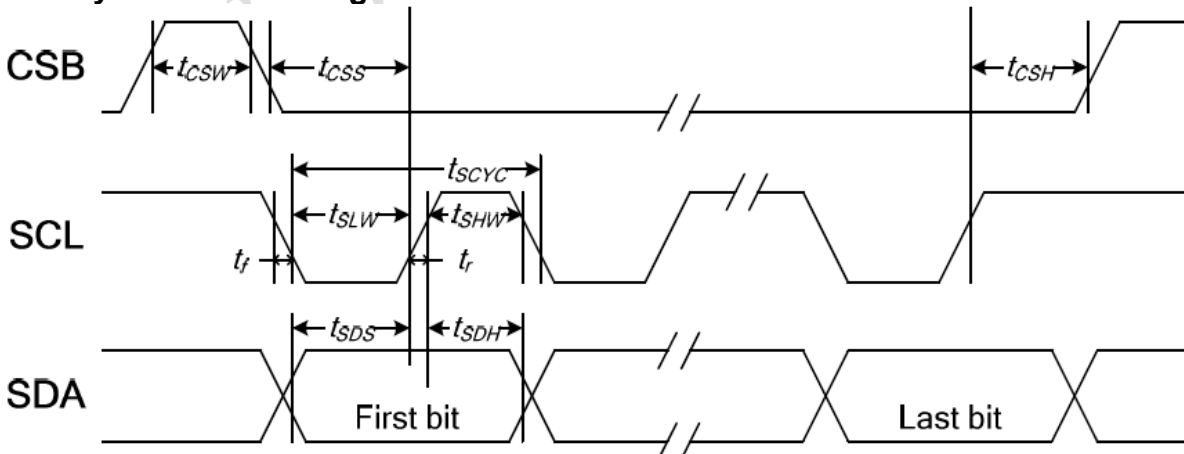


| Item | Signal | Symbol | Condition | Min | Max | Unit |
|---------------------|--------|--------|-----------|-----|-----|------|
| Serial clock period | SCL | tSCYC | - | 80 | - | ns |
| SCL "H" pulse width | | tSHW | - | 40 | - | |
| SCL "L" pulse width | | tSLW | - | 40 | - | |
| Address setup time | A0 | tSAS | - | 40 | - | |
| Address hold time | | tSAH | - | 40 | - | |
| Data setup time | SDA | tSDS | - | 15 | - | |
| Data hold time | | tSDH | - | 20 | - | |
| CSB-SCL time | CSB | tCSS | - | 40 | - | |
| CSB-SCL time | | tCSH | - | 40 | - | |
| CSB "H" pulse width | | tCSW | - | 15 | - | |

Note:

1. The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDDI as the standard.

10.4. System Bus Timing for 3-Line Serial Interface



| Item | Signal | Symbol | Condition | Min | Max | Unit |
|---------------------|--------|--------|-----------|-----|-----|------|
| Serial clock period | SCL | tSCYC | - | 80 | - | ns |
| SCL "H" pulse width | | tSHW | - | 40 | - | |
| SCL "L" pulse width | | tSLW | - | 40 | - | |
| Data setup time | SDA | tSDS | - | 15 | - | |
| Data hold time | | tSDH | - | 20 | - | |
| CSB-SCL time | CSB | tCSS | - | 40 | - | |
| CSB-SCL time | | tCSH | - | 40 | - | |
| CSB "H" pulse width | | tCSW | - | 15 | - | |

Note:

1. The input signal rise and fall time (t_r , t_f) are specified at 15 ns or less.
2. All timing is specified using 20% and 80% of VDDI as the standard.

11. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark |
|----------------|--------|-----------------------------------|-----|------|------|-------------------|-------------------|
| Response time | Tr | $\theta=0^\circ$ 、 $\phi=0^\circ$ | - | 20 | 30 | .ms | Note 3,5 |
| | Tf | | - | 10 | 15 | .ms | |
| Contrast ratio | CR | At optimized viewing angle | - | 800 | - | - | Note 4,5 |
| Viewing angle | Hor. | Θ_R | 60 | | | Deg. | Note 1 |
| | | Θ_L | 60 | | | | |
| | Ver. | Φ_T | 60 | | | | |
| | | Φ_B | 50 | | | | |
| Brightness | - | - | 630 | 700 | - | cd/m ² | Center of display |

Ta=25±2°C, IL=140mA

Note 1: Definition of viewing angle

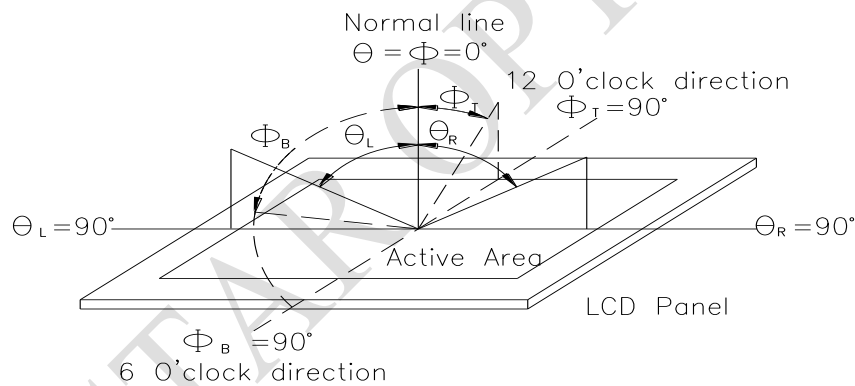


Fig.11.1. Definition of viewing angle

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.

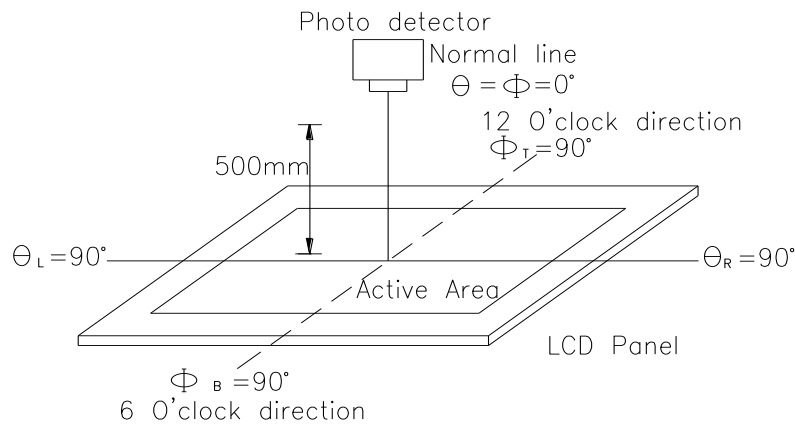
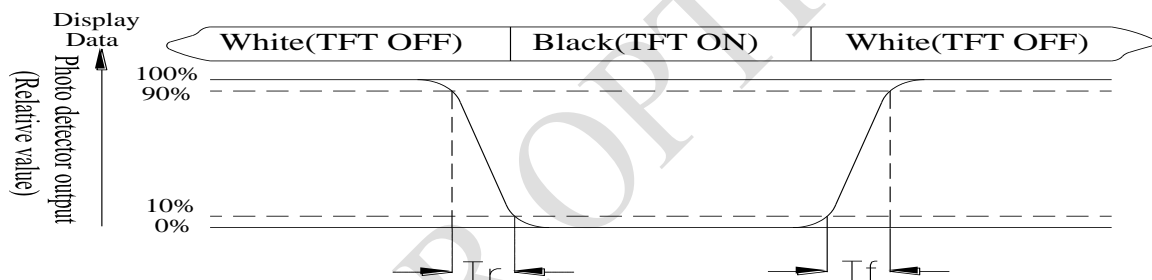


Fig. 11.2. Optical measurement system setup

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.

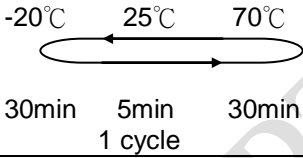
“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: 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)

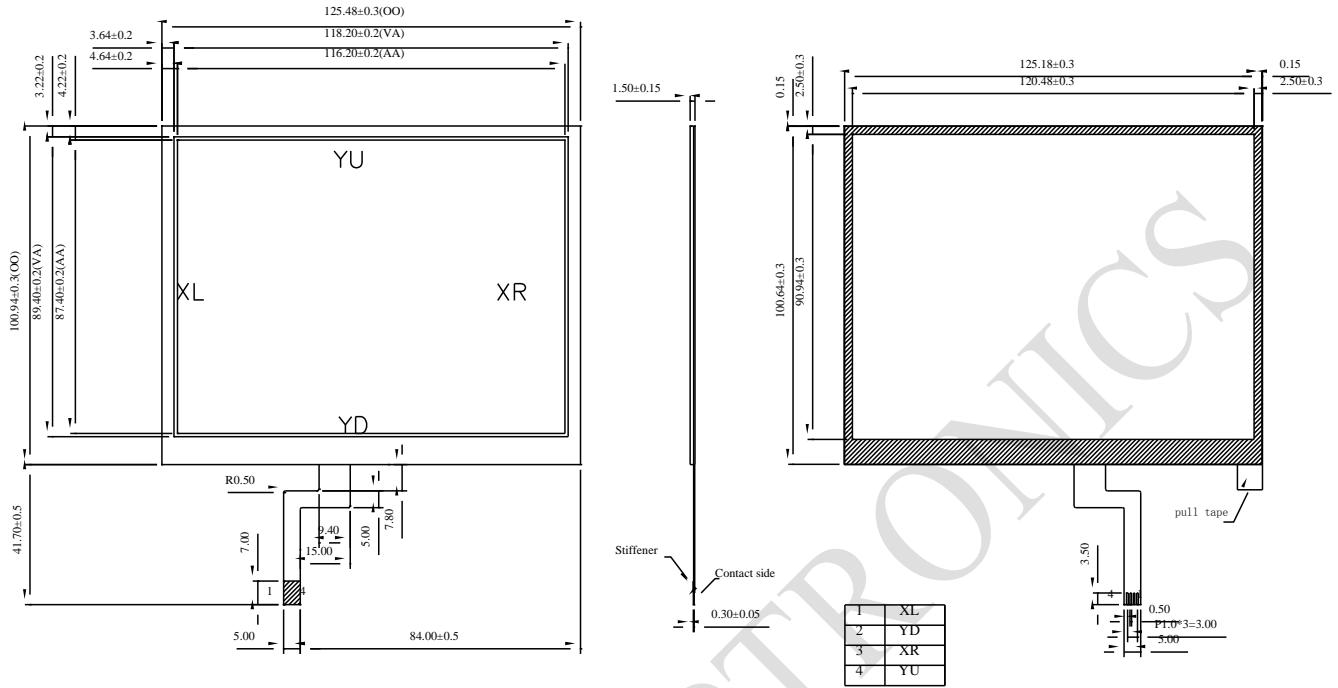
| Environmental Test | | | |
|--------------------------------------|--|---|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80°C 200hrs | 2 |
| Low Temperature storage | Endurance test 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 5min 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 : 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.

13.Touch Panel Information



14. Initial Code For Reference

```
void Initial_code()
{
    Write_Command(0xae);
    Write_Data(0xa5);

    Write_Command(0x61);
    Write_Data(0x8f);
    Write_Data(0x04);
    Write_Data(0xa5);
    Write_Data(0xa5);

    Write_Command(0x62);
    Write_Data(0x36);
    Write_Data(0x0b);
    Write_Data(0x0b);
    Write_Data(0xa5);

    Write_Command(0x33);
    Write_Data(0x07);
    Write_Data(0x2c);
    Write_Data(0x09);
    Write_Data(0x2a);

    Write_Command(0x63);
    Write_Data(0x09);
    Write_Data(0x17);
    Write_Data(0xa5);
    Write_Data(0xa5);

    Write_Command(0x91);
    Write_Data(0x00);
    Write_Data(0x16);
    Write_Data(0x1B);
    Write_Data(0x1C);
    Write_Command(0x92);
    Write_Data(0x1E);
    Write_Data(0x1F);
    Write_Data(0x20);
    Write_Data(0x21);
    Write_Command(0x93);
    Write_Data(0x23);
    Write_Data(0x24);
    Write_Data(0x26);
    Write_Data(0x28);
    Write_Command(0x94);
    Write_Data(0x2B);
    Write_Data(0x2F);
}
```

```
Write_Data(0x34);  
Write_Data(0x3f);  
Write_Command(0x99);  
Write_Data(0x00);  
Write_Data(0x16);  
Write_Data(0x1B);  
Write_Data(0x1C);  
Write_Command(0x9a);  
Write_Data(0x1E);  
Write_Data(0x1F);  
Write_Data(0x20);  
Write_Data(0x21);  
Write_Command(0x9b);  
Write_Data(0x23);  
Write_Data(0x24);  
Write_Data(0x26);  
Write_Data(0x28);  
Write_Command(0x9c);  
Write_Data(0x2B);  
Write_Data(0x2F);  
Write_Data(0x34);  
Write_Data(0x3F);
```

```
Write_Command(0x12);  
Write_Data(0xa5);
```

```
Write_Command(0x24);  
Write_Data(0x01);  
Write_Data(0xa5);  
Write_Data(0xa5);  
Write_Data(0xa5);
```

```
Write_Command(0x22);  
Write_Data(0x00);  
Write_Data(0xa5);  
Write_Data(0xa5);  
Write_Data(0xa5);
```

```
Write_Command(0x15);  
Write_Data(0xa5);
```

```
_nop_();
```

```
}
```

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> | | |

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