



RAYSTAR

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RFY1230A-6WH-LNG

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 | 2017/04/01 | | First issue |

RAYSTAR OPTRONICS

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2.Summary

TFT 12.3" (24 : 9) is a IPS(In-Plane Switching) 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: 12.3 inch
- Pixel Number: 1920 x R.G.B. x 720 pixel
- Module dimension: 313.4 x 135.86 x10.15 mm
- Active Area: 292.32 (H) x 109.62 (V) mm
- Pixel Pitch: 0.1523(H) x 0.1523(V) mm
- LCD type: TFT, Normally Black, Transmissive
- Gray Scale Inversion Direction: ALL
- Backlight Type: LED ,Normally White
- With /Without TP: With CTP
- Surface: Glare

*Color tone slight changed by temperature and driving voltage.

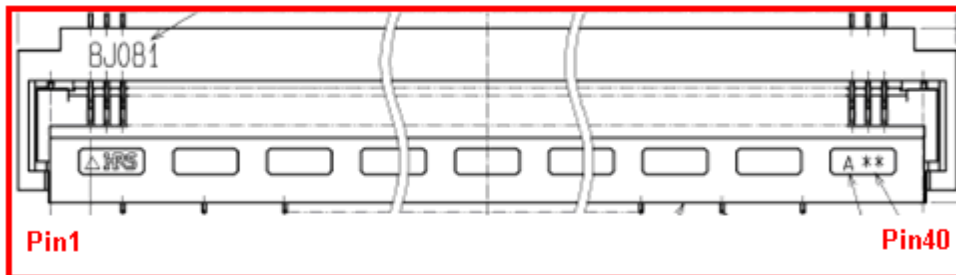
4.Interface

4.1. TFT LCD MODULE

| No | Symbol | Description |
|----|---------|--|
| 1 | GND | Power ground |
| 2 | GND | Power ground |
| 3 | Rxoin0 | -LVDS differential data input (Odd data) |
| 4 | Rxoin0+ | +LVDS differential data input (Odd data) |
| 5 | GND | Power ground |
| 6 | Rxoin1- | -LVDS differential data input (Odd data) |
| 7 | Rxoin1+ | +LVDS differential data input (Odd data) |
| 8 | GND | Power ground |
| 9 | Rxoin2- | -LVDS differential data input (Odd data) |
| 10 | Rxoin2+ | +LVDS differential data input (Odd data) |
| 11 | GND | Power ground |
| 12 | RxoCLK- | -LVDS differential clock input (Odd clock) |
| 13 | RxoCLK+ | +LVDS differential clock input (Odd clock) |
| 14 | GND | Power ground |
| 15 | Rxoin3- | -LVDS differential data input (Odd data) |
| 16 | Rxoin3+ | +LVDS differential data input (Odd data) |
| 17 | GND | Power ground |
| 18 | Rxein0- | -LVDS differential data input (Even data) |
| 19 | Rxein0+ | +LVDS differential data input (Even data) |
| 20 | GND | Power ground |
| 21 | Rxein1- | -LVDS differential data input (Even data) |
| 22 | Rxein1+ | +LVDS differential data input (Even data) |
| 23 | GND | Power ground |
| 24 | Rxein2- | -LVDS differential data input (Even data) |
| 25 | Rxein2+ | +LVDS differential data input (Even data) |
| 26 | GND | Power ground |
| 27 | Rxein3- | -LVDS differential data input (Even data) |
| 28 | Rxein3+ | +LVDS differential data input (Even data) |
| 29 | GND | Power ground |
| 30 | STVD | Feedback signal |
| 31 | GND | Power ground |
| 32 | RESET | Global reset pin |
| 33 | GND | Power ground |
| 34 | VDD | Power input |
| 35 | VDD | Power input |

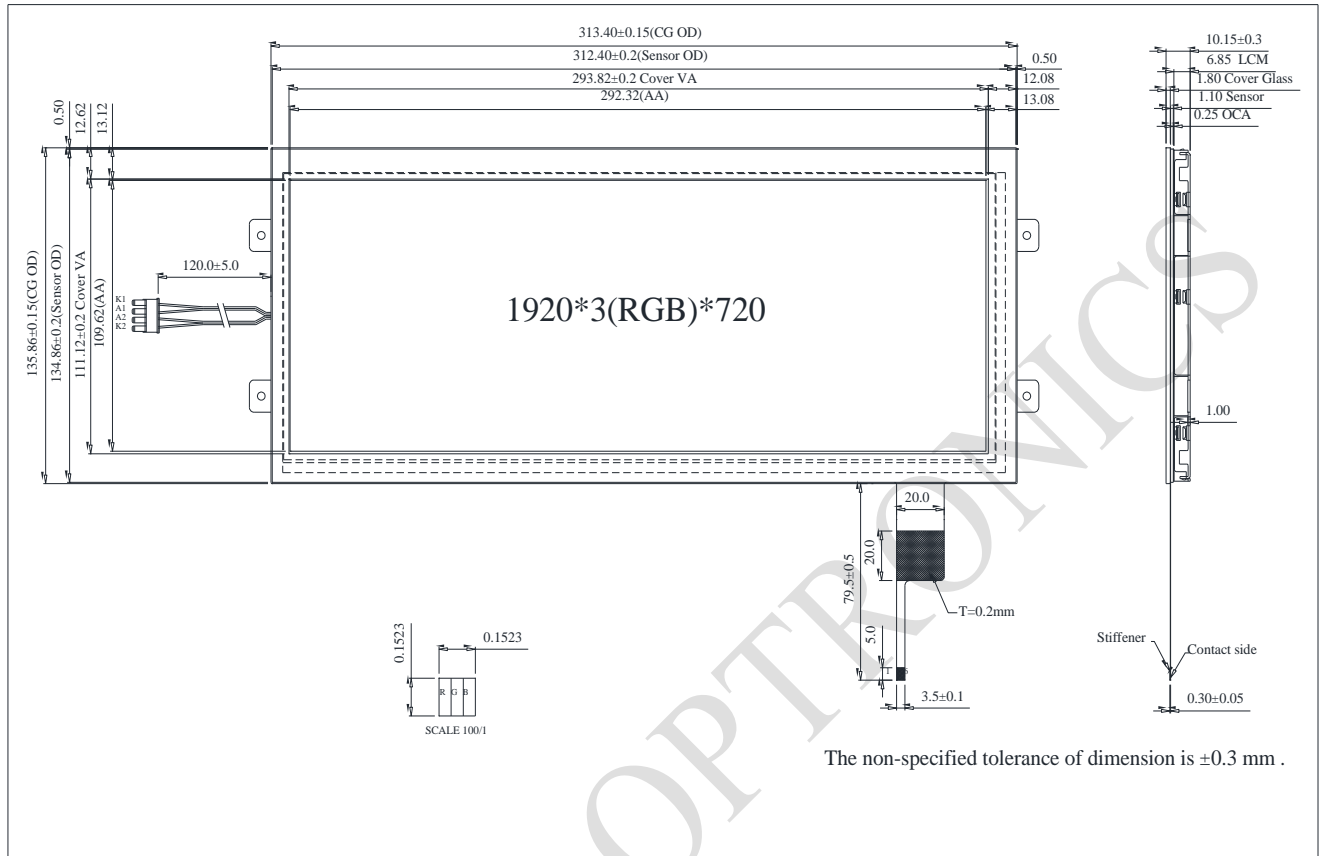
| | | |
|----|-----|--------------|
| 36 | VDD | Power input |
| 37 | VDD | Power input |
| 38 | VDD | Power input |
| 39 | GND | Power ground |
| 40 | GND | Power ground |

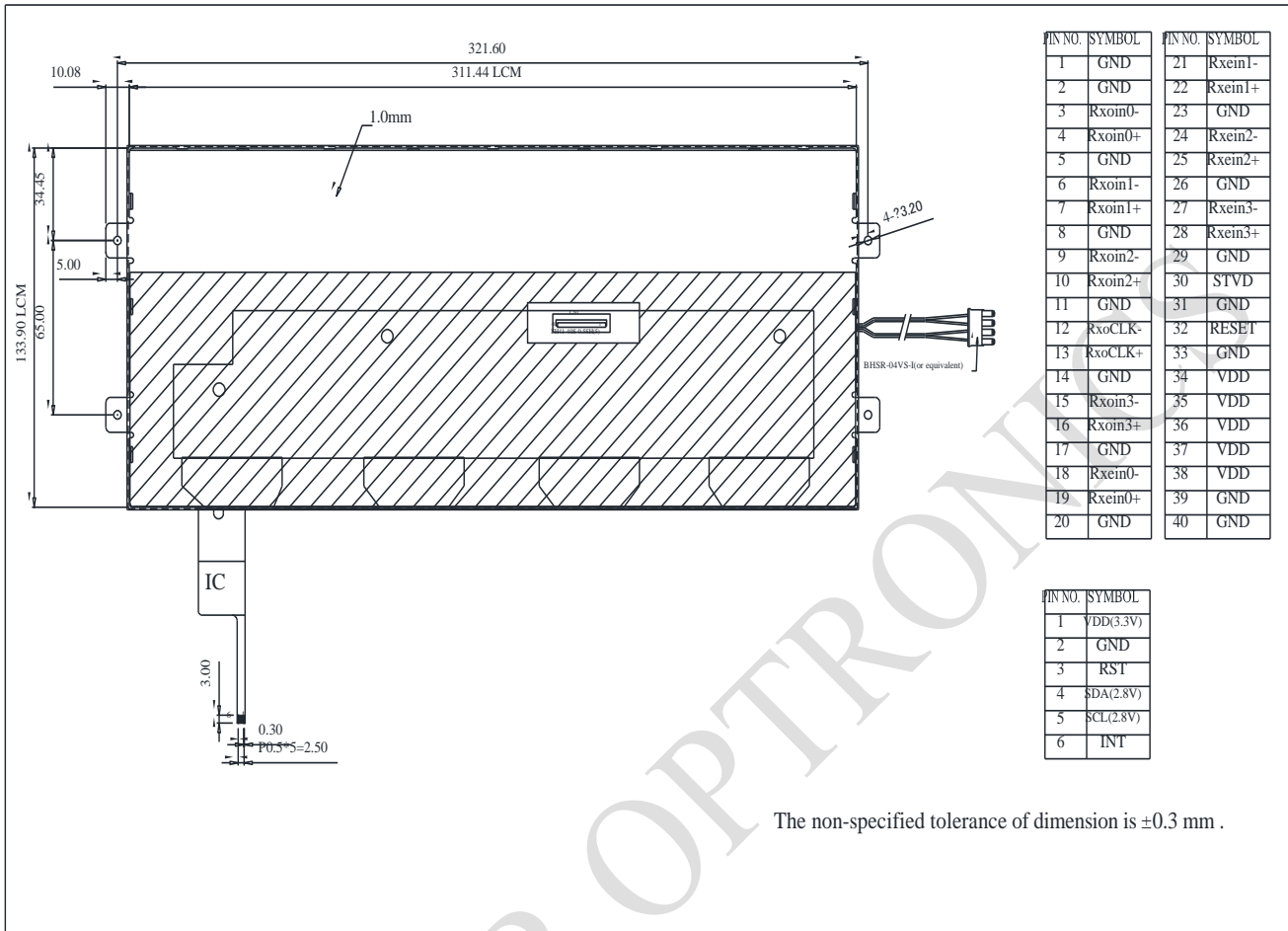
I: Digital signal input, G:GND, P:Power input ,O: Digital output
 Connector Pin 1 position



Note: B Pin1 and B Pin42 are connected metal of connector surface, please fixed to ground.

5. Contour Drawing





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

6. Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP | -30 | — | +85 | °C |
| Storage Temperature | TST | -40 | — | +95 | °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

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7. Electrical Characteristics

7.1. Driving TFT LCD Panel

| Item | Symbol | MIN | TYP | MAX | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Power voltage | VD | 3 | 3.3 | 3.6 | V |
| | IVDD | - | 1.1 | 1.4 | A |
| Operating Temperature | TOP | -30 | 85 | °C | - |
| Storage Temperature | TST | -40 | 95 | °C | - |

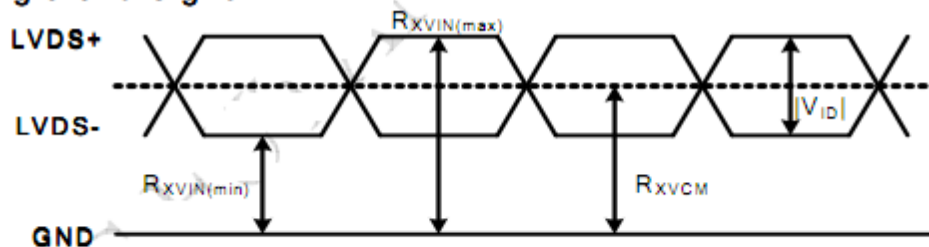
Note 1 : Test pattern is the following picture (white pattern)



7.2. Signal DC Electrical Characteristics

| Parameter | Symbol | MIN | TYP | MAX | Unit | Notes |
|--|------------|------|-----|-----|------|-----------------|
| Differential input high threshold | R_{XVTH} | - | - | 200 | mV | $R_{XVCM}=1.2V$ |
| Differential input low threshold | R_{XVTL} | -200 | - | - | mV | $R_{XVCM}=1.2V$ |
| Input voltage range (singled-end) | R_{XVIN} | 0.7 | - | 1.6 | V | |
| Input differential voltage | $ V_{ID} $ | 200 | - | 600 | mV | |
| Differential input Common Mode voltage | R_{XVCM} | 1.0 | 1.2 | 1.3 | V | |

Single-end Signal



Differential Signal

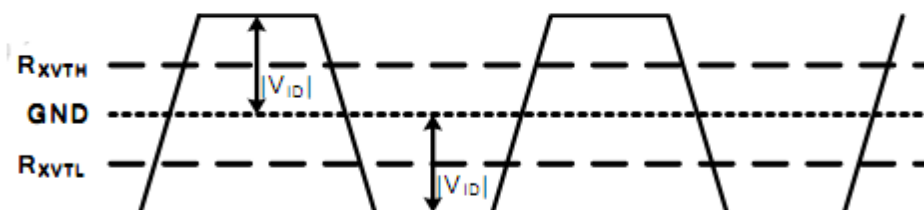


Fig. 1 LVDS DC characteristics diagram

BACKLIGHT UNIT

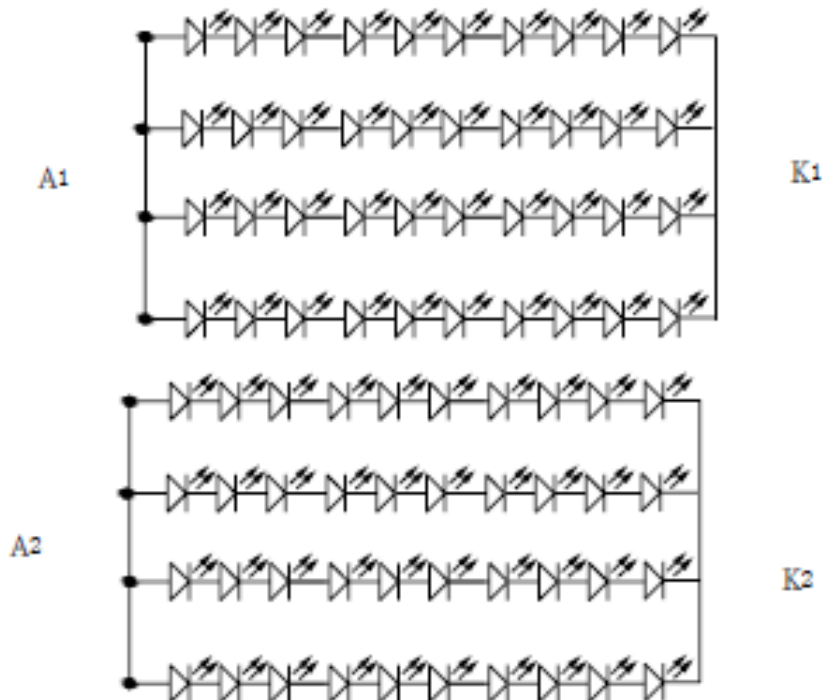
| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------------------|--------|-------|-------|-------|------|--------|
| Forward Current | IF | - | 480 | 520 | mA | |
| Forward Voltage | VF | - | 32 | 33 | V | |
| Backlight Power consumption | WBL | - | 15.36 | 17.16 | W | |
| LED Lifetime | - | 70000 | - | - | Hrs | |

Note 1: Each LED: IF =60 mA, VF =3.2V.

Note 2: Optical performance should be evaluated at Ta=25°C only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness.

Typical operating life time is estimated data.

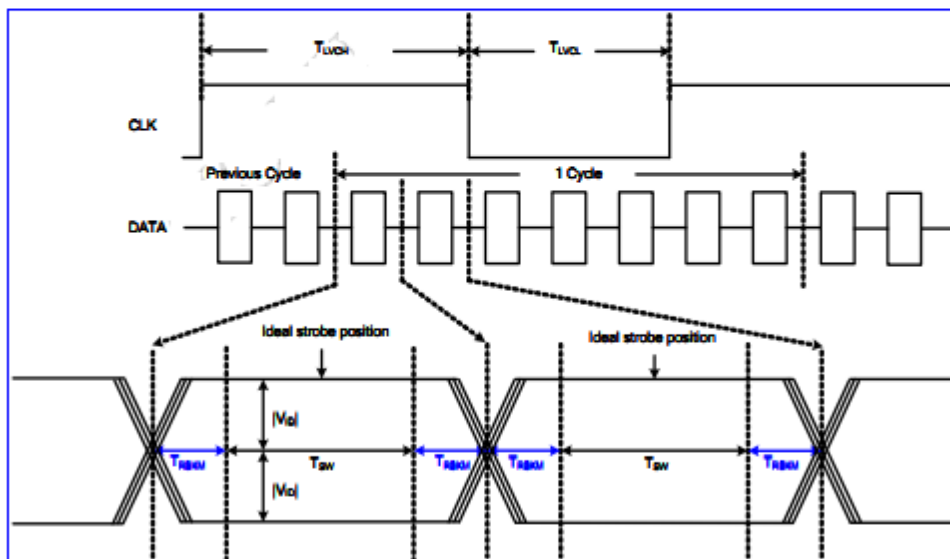
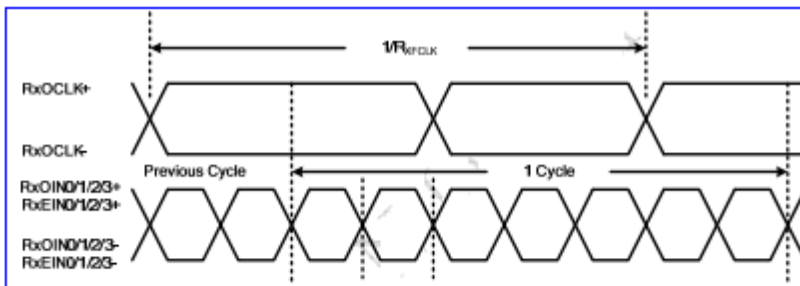


8.AC Electrical Characteristics

8.1. Differential signal AC characteristics

| Parameter | Symbol | MIN | TYP | MAX | Unit | Notes |
|------------------------|--------|------|-------------------------|-----|------|----------------------------------|
| Clock frequency | RXVTH | 44.7 | 47.5 | 61 | MHz | |
| Input data skew margin | RXVTL | - | - | 200 | ps | Vid=200mV Rxvcm=1.2v Note1 |
| Clock strobe width | RXVIN | 1200 | - | - | ps | |
| Clock high time | VID | - | $4/(7 \cdot R_{XFCLK})$ | - | ns | |
| Clock low time | RXVCM | - | $3/(7 \cdot R_{XFCLK})$ | - | ns | |

Note1. For the Data Skew Margin, "Input Signal Skew + Input Signal Jitter" must be smaller than TRSKM.



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Fig.1 Data skew margin Differential Input Data Format

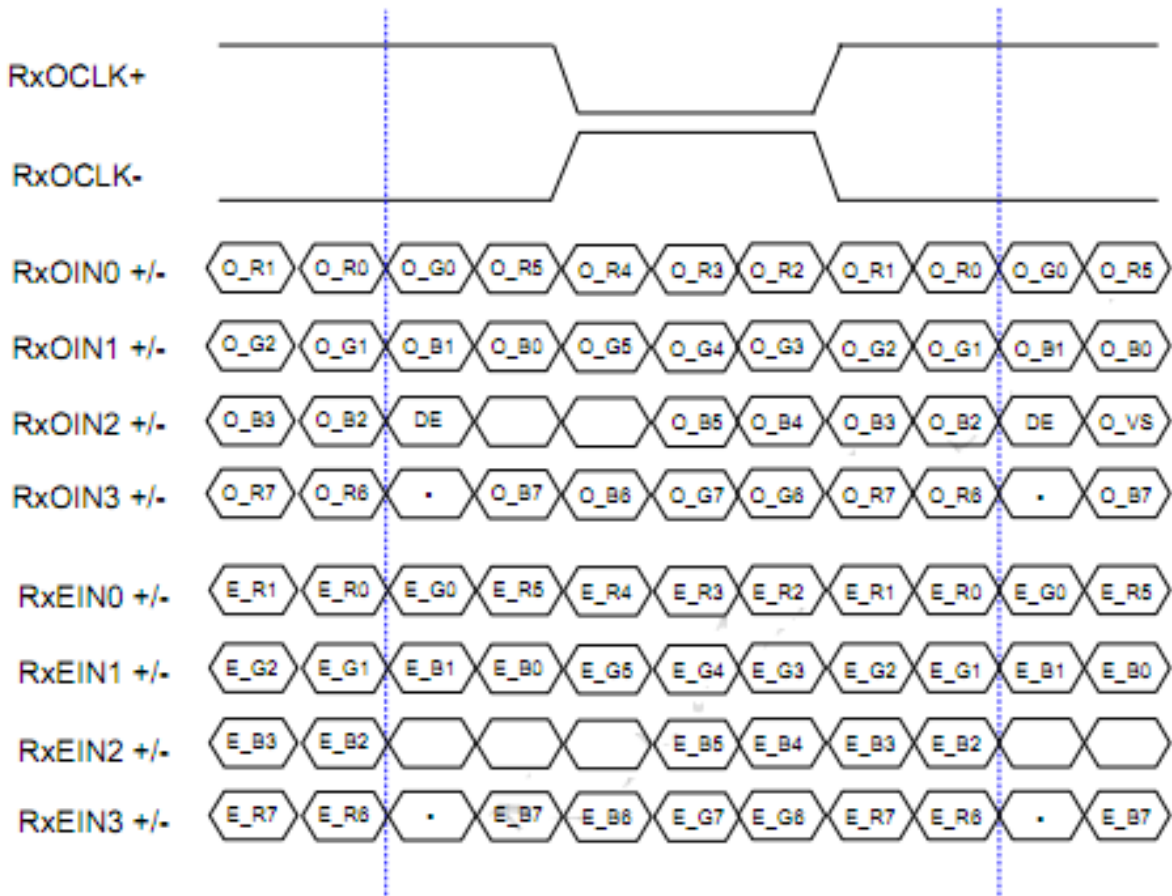


Fig . 1 LVDS input data VESA format

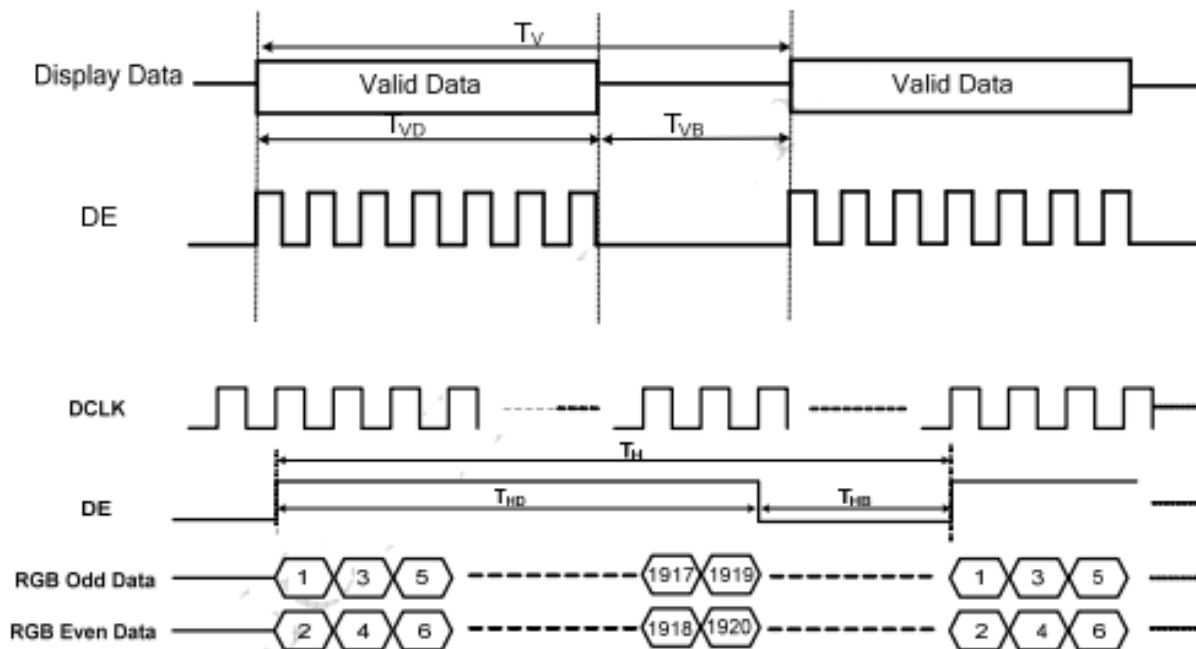
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8.2. Timing Condition

a. DE Mode

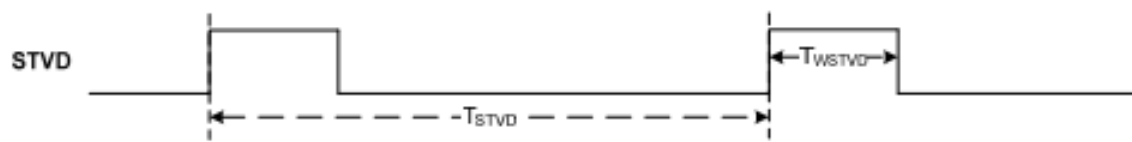
| Item | Symbol | Min | Typ. | Max | Unit | Remark |
|--------------------------|------------|------|------|------|-------|--------|
| Clock frequency | F_{DCLK} | 44.7 | 47.5 | 61 | MHz | |
| Horizontal period area | T_H | 1020 | 1040 | 1200 | DCLK | |
| Horizontal display area | T_{HD} | 960 | 960 | 960 | DCLK | |
| Horizontal blanking area | T_{HB} | 60 | 80 | 240 | DCLK | |
| Vertical period area | T_V | 730 | 760 | 840 | T_H | |
| Vertical display area | T_{VD} | 720 | 720 | 720 | T_H | |
| Vertical blanking area | T_{VB} | 10 | 40 | 120 | T_H | |
| Frame rate | F_R | 55 | 60 | 65 | Hz | |

b. Timing Diagram



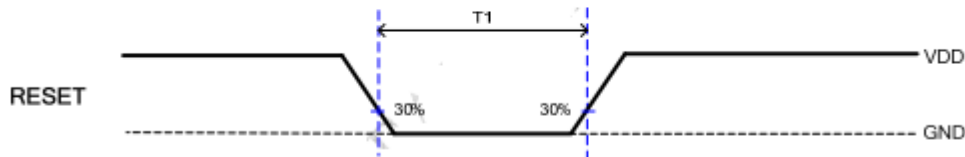
8.3. Feedback Signal Timing for Detected Function

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|------------------|--------------|---------|------|---------|------|--------------------------|
| STVD | V_{STVD-H} | VDD-0.3 | -- | VDD | V | $I_{STVD-H} = 200\mu A$ |
| | V_{STVD-L} | GND | -- | GND+0.3 | V | $I_{STVD-L} = -200\mu A$ |
| STVD frequency | F_{STVD} | 55 | 60 | 65 | HZ | |
| STVD period | T_{STVD} | 15.4 | 16.6 | 18.2 | ms | |
| STVD pulse width | T_{WSTVD} | 19 | 21 | 23 | us | |



8.4. RESET Function

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-------|--------|-----|-----|-----|------|--------|
| RESET | T1 | 1 | -- | 20 | ms | |



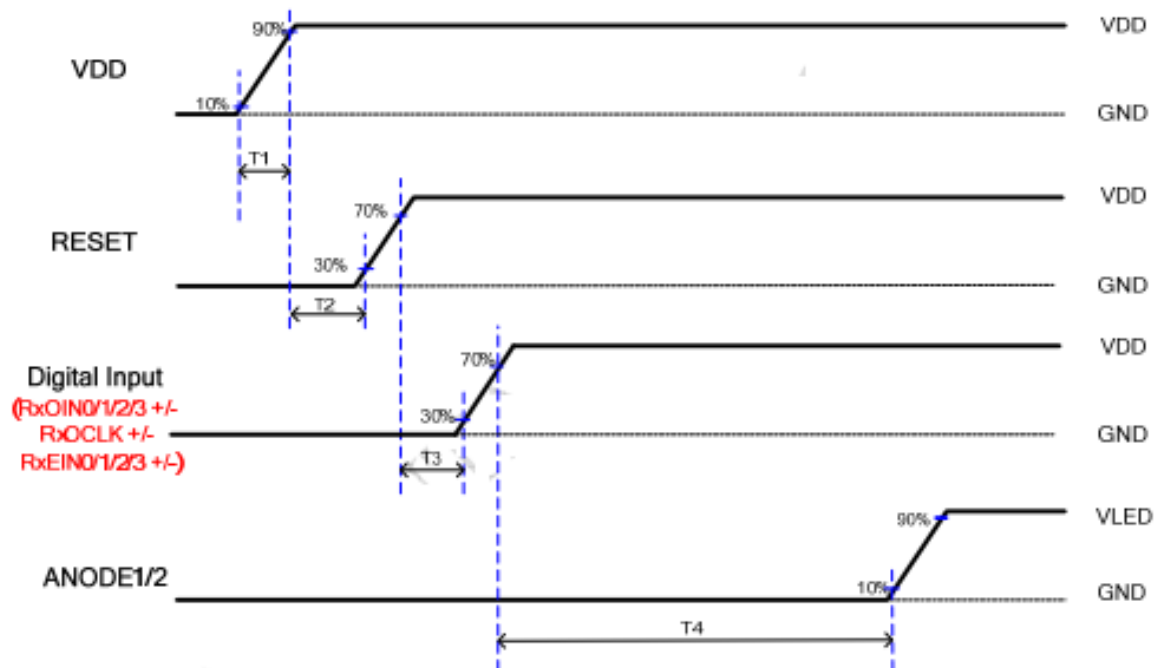
8.5. Power ON / OFF timing

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

a. Power on sequence

| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | -- | 15 | ms |
| T2 | 1 | -- | 20 | ms |
| T3 | 0 | -- | 20 | ms |
| T4 | 500 | -- | -- | ms |

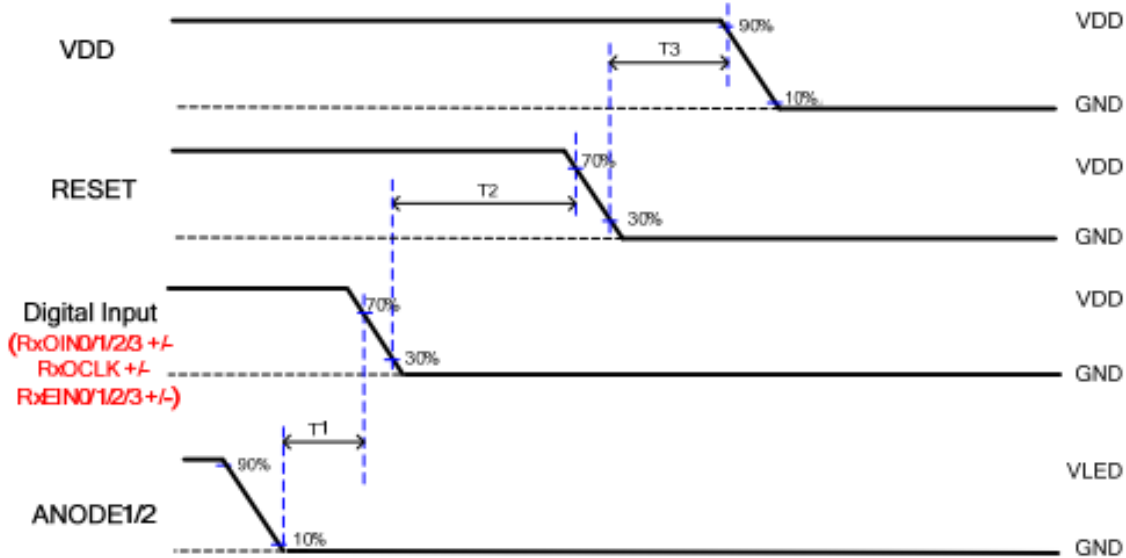
Power on sequence



b. Power OFF sequence

| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 200 | -- | -- | ms |
| T2 | 0 | -- | 20 | ms |
| T3 | 1 | -- | 20 | ms |

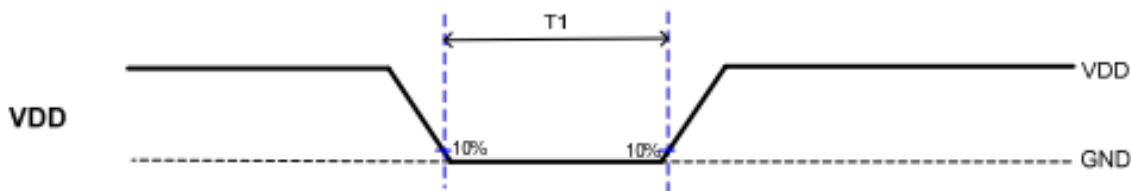
Power off sequence



c. VDD ON/OFF

| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 1000 | -- | - | ms |

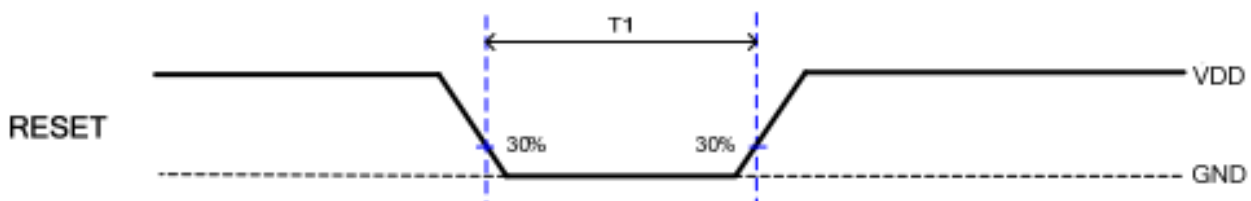
VDD ON / OFF



d. RESET ON/OFF

| Parameter | Value | | | Unit |
|-----------|-------|------|------|------|
| | Min. | Typ. | Max. | |
| T1 | 1000 | -- | - | ms |

RESET ON / OFF



9. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|---|--------|-----------------------------------|-----------------------------------|------|------|-------------------|-------------------|--------|
| Response time | Tr | $\theta=0^\circ$ 、 $\phi=0^\circ$ | - | 12 | - | .ms | Note 3,5 | |
| | Tf | | - | 13 | - | .ms | | |
| Contrast ratio | CR | At optimized viewing angle | 800 | 1000 | - | - | Note 4,5 | |
| Color Chromaticity | White | Wx | $\theta=0^\circ$ 、 $\phi=0^\circ$ | 0.26 | 0.31 | 0.36 | Note 2,6,7 | |
| | | Wy | | 0.28 | 0.33 | 0.38 | | |
| Viewing angle (Gray Scale Inversion Direction) | Hor. | θ_R | $CR \geq 10$ | - | 85 | - | Deg. | Note 1 |
| | | θ_L | | - | 85 | - | | |
| | Ver. | ϕ_T | | - | 85 | - | | |
| | | ϕ_B | | - | 85 | - | | |
| Brightness | - | - | 750 | 800 | - | cd/m ² | Center of display | |

Note 1: Definition of viewing angle range

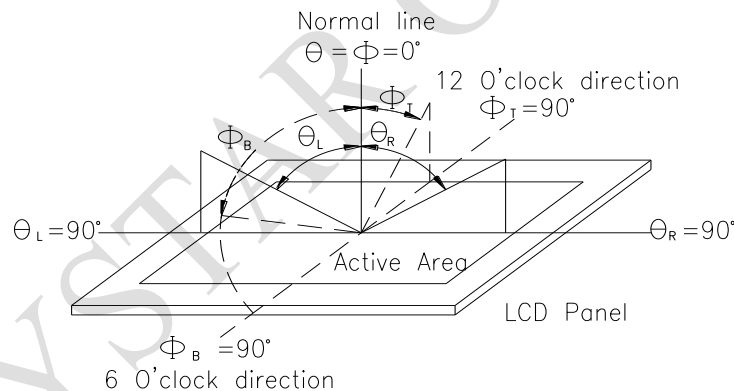


Fig.9.1. Definition of viewing angle

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.

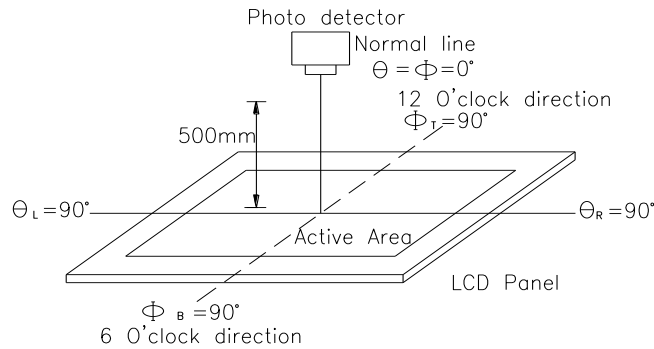
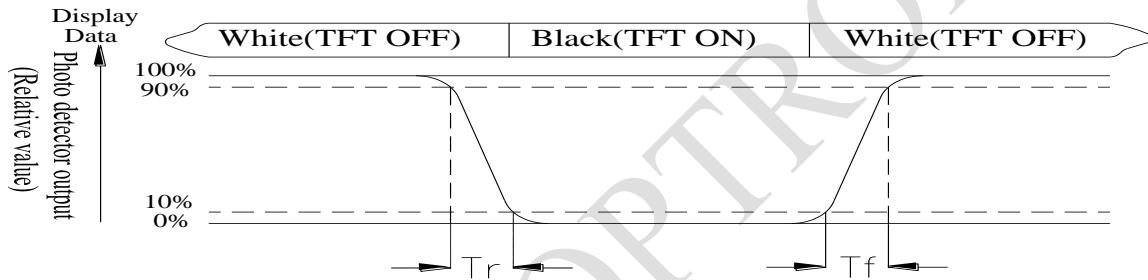


Fig. 9.2. Optical measurement system setup

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.

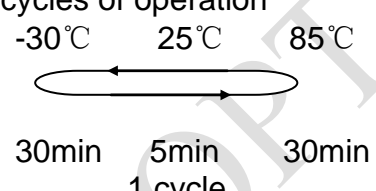
Note 6: Definition of color chromaticity (CIE 1931)

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.

10. Reliability

Content of Reliability Test (Super Wide temperature, -30°C~85°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. | 95°C 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -40°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. | 85°C 200hrs | — |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -30°C 200hrs | 1 |
| High Temperature/ Humidity storage | 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>-30°C 25°C 85°C</p> <p>30min 5min 30min</p> <p>1 cycle</p> </div> | -30°C/85°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.

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 : _____</p> <p style="text-align: right;">Customer Signature : _____ <u>Date</u> : / / _____</p> | | |