Tailorpixels

A Professional Manufacturer of Display

# PRODUCT SPECIFICATIONS

For Customer: _____ ☐ : APPROVAL FOR SPECIFICATION

Customer Model No. _____ ☐ : APPROVAL FOR SAMPLE

Module No.: *TBD-T101BHH-01C* *Date : 2022.07.13*

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**For Customer's Acceptance:**

| Approved By | Comment |
|---|---|
| | |

| PREPARED | CHECKED | VERIFIED BY QA DEPT | VERIFIED BY R&D DEPT |
|---|---|---|---|
| NIKOLA | | | |

# 2. Revision Record

| Date | Rev.No. | Page | Revision Items | Prepared |
|---|---|---|---|---|
| 2022.07.13 | V0 | | The first release | NIKOLA |
| | | | | |

## 3. General Specifications

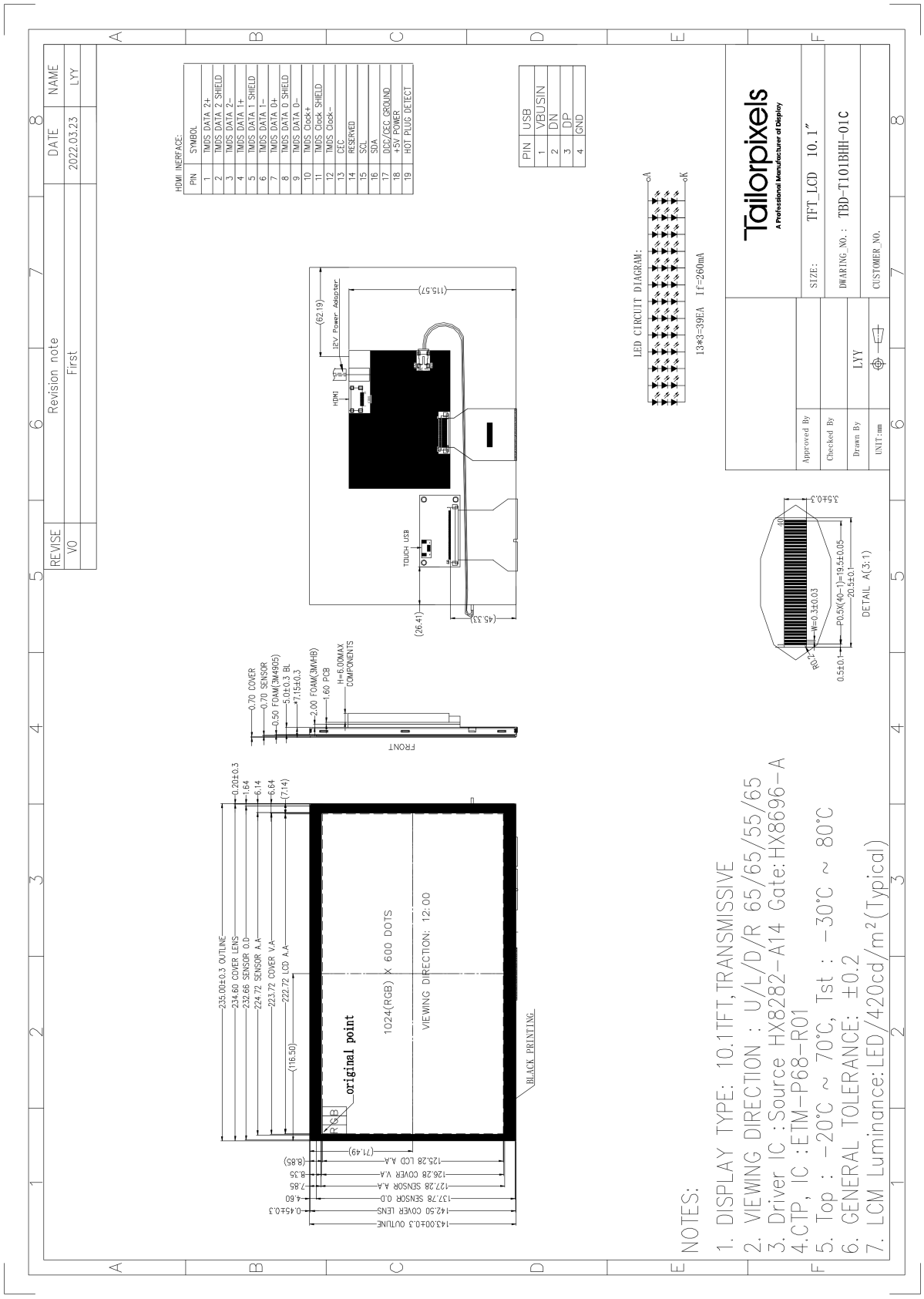
*TBD-T101BHH-0C is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light ,PCB,CTP unit. The 10.1'' display area contains* 1024 x (RGB) x 600 *pixels and can display up to 16.7M colors. This product accords with ROHS environmental criterion..*

| Item | Contents | Unit | Note |
|---|---|---|---|
| LCD Type | TFT | - | |
| Display color | 16.7M | | 1 |
| Viewing Direction | 12 | O'Clock | |
| Operating temperature | -20~+70 | ℃ | |
| Storage temperature | -30~+80 | ℃ | |
| Module size | 235.00X143.0X7.15 | mm | 2 |
| Active Area(W×H) | 222.72 X 125.28 | mm | |
| Number of Dots | 1024 X 600 | dots | |
| CTP interface | USB | - | |
| Power Supply Voltage | 12(PCBA) | V | |
| Backlight | 3S13P-LEDs (white) | pcs | |
| Weight | --- | g | |
| Interface | HDMI | - | |

*Note 1: Color tune is slightly changed by temperature and driving voltage.*

*Note 2: Without FOAM and Solder,PCBA.With CTP*

# 4.Outline.Drawing



# 5. Absolute Maximum Ratings(Ta=25℃)

## 5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

| Item | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|
| USB Power Supply Voltage | VBUSIN | -0.3 | 6.0 | V | 1，2 |
| Power Supply Voltage | VCC | -0.3 | 13.0 | V | 1，2 |

*Notes:*

*1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.*

*2. $V_{DD}$ >$V_{SS}$ must be maintained.*

*3. Please be sure users are grounded when handing LCD Module.*

## 5.2 Environmental Absolute Maximum Ratings.

| Item | Storage | | Operating | | Note |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature | -30℃ | 80℃ | -20℃ | 70℃ | 1,2 |
| Humidity | - | - | - | - | 3 |

*1. The response time will become lower when operated at low temperature.*

*2. Background color changes slightly depending on ambient temperature.*

*The phenomenon is reversible.*

*3. Ta<=40℃:85%RH MAX.*

*Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.*

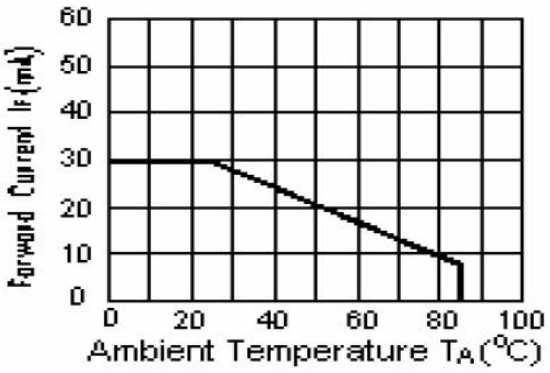
# 6. Electrical Specifications

## 6.1 Electrical characteristics for LCD(Vss=0V ,Ta=25℃)

| Parameter | | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Power supply | | $VDD_{(HDMI)}$ | Ta=25℃ | 4.5 | 5.0 | 5.5 | V | |
| Power supply | | VCC(PCBA) | Ta=25℃ | 11.5 | 12 | 12.5 | V | |
| Current for LCM | | Icc | Ta=25℃ VCC=12V | | TBD | - | mA | |
| Input voltage | 'H' | $V_{IH}$ | $V_{DD(HDMI)}$=5.0 V | $0.8V_{DD}$ | - | $V_{DD}$ | V | |
| | 'L' | $V_{IL}$ | $V_{DD(HDMI)}$=5.0 V | 0 | - | $0.2V_{DD}$ | V | |

## 6.2.LED backlight specification(VSS=0V ,Ta=25℃)

| Item | Symbol | Condition | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|---|
| Supply voltage | Vf | If=260mA | 8.1 | 9.0 | 9.9 | V | |
| Uniformity | ∆ Bp | If=260mA | 75 | 80 | - | % | |
| Life Time | time | If=260mA | 20K | - | | hours | 1 |




ILED VS TEMP

*Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25 ℃*

### 6.3 *Interface signals*

| Pin No | Symbol | I/O | Function |
|---|---|---|---|
| 1 | TMDS DATA 2+ | I | TMDS DATA 2+. |
| 2 | MDS DATA 2 SHIELD | P | TMDS Data 2 Shield. |
| 3 | TMDS DATA 2- | I | TMDS DATA 2-. |
| 4 | TMDS DATA 1+ | I | TMDS DATA 1+. |
| 5 | MDS DATA 1 SHIELD | P | TMDS Data 1 Shield. |
| 6 | TMDS DATA 1- | I | TMDS DATA 1-. |
| 7 | TMDS DATA 0+ | I | TMDS DATA 0+. |
| 8 | TMDS DATA 0 SHIELD | P | TMDS Data 0 Shield. |
| 9 | TMDS DATA 0- | I | TMDS DATA 0-. |
| 10 | TMDS Clock+ | I | TMDS Clock+. |
| 11 | TMDS Clock SHIELD | P | TMDS Clock Shield. |
| 12 | TMDS Clock- | I | TMDS Clock- |
| 13 | CEC | I | Consumer Electronics Control. |
| 14 | RESERVED | - | Reserved for AUO internal test. Please treat it as NC. |
| 15 | SCL | I | Serial interface clock pin. |
| 16 | SDA | I | Serial in/out signal pin. |
| 17 | DCC/CEC GROUND | P | DDC/CEC Ground. |
| 18 | +5V POWER | P | Power Supply +5V. |
| 19 | HOT PLUG DETECT | I | Hot plug detect. |

**USB interface**

| Pin No | Symbol | I/O | Function |
|---|---|---|---|
| 1 | VBUSIN | p | Power supply. |
| 2 | DN | P | USB data-. |
| 3 | DP | P | USB data+. |
| 4 | GND | I | Ground. |

## 7. *Optical Characteristics*

| Item | Symbol | | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Brightness | Bp | | θ=0° Φ=0° | - | 420 | - | Cd/m² | 1 |
| Uniformity | ⊿Bp | | | 75 | 80 | - | % | 1,2 |
| Viewing Angle | 3:00 | | Cr≥10 | - | 65 | - | Deg | 3 |
| | 6:00 | | | - | 55 | - | | |
| | 9:00 | | | - | 65 | - | | |
| | 12:00 | | | - | 65 | - | | |
| Contrast Ratio | Cr | | Ta=25℃ Φ=0° | - | 600 | | - | 4 |
| Response Time | $T_{r+}T_f$ | | | - | 25 | 40 | ms | 5 |
| Color of CIE Coordinate | W | x | θ=0° Φ=0° | TYP -0.05 | 0.310 | TYP +0.05 | - | 1,6 |
| | | y | | | 0.344 | | - | |
| | R | x | | | 0.605 | | - | |
| | | y | | | 0.327 | | - | |
| | G | x | | | 0.297 | | - | |
| | | y | | | 0.563 | | - | |
| | B | x | | | 0.144 | | - | |
| | | y | | | 0.169 | | - | |
| NTSC Ratio | S | | | - | 50 | - | % | |

*Note： The parameter is slightly changed by temperature, driving voltage and materiel*

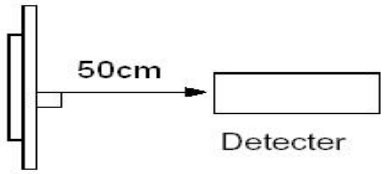
*Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 (Φ5mm)*

*Measuring condition:*

- *Measuring surroundings: Dark room.*
- *Measuring temperature: Ta=25 ℃.*
- *Adjust operating voltage to get optimum contrast at the center of the display.*

*Measured value at the center point of LCD panel after more than 5 minutes while backlight*

*turning on.*

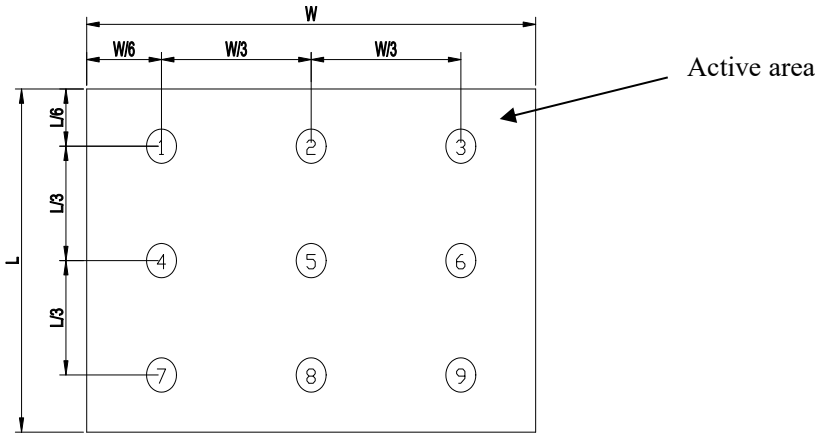



*Note 2: The luminance uniformity is calculated by using following formula.*

*⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)*

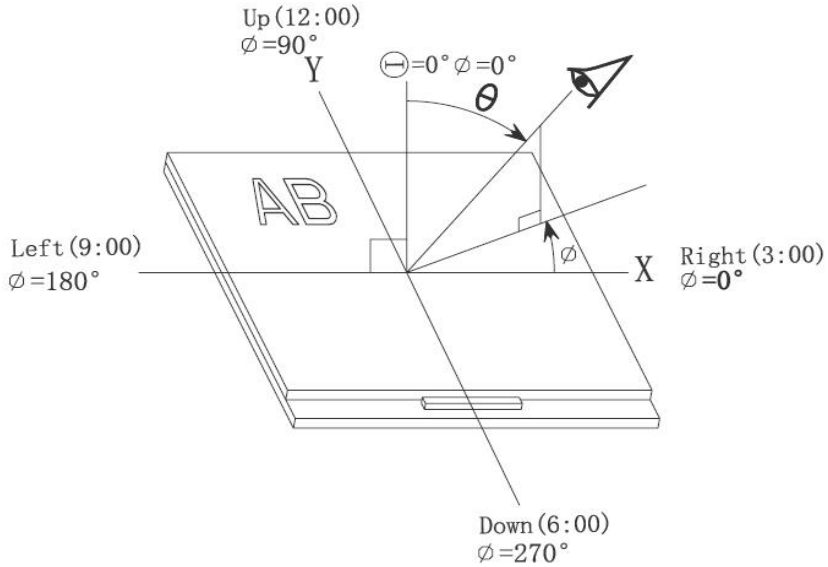
*Bp (Max.) = Maximum brightness in 9 measured spots*

*Bp (Min.) = Minimum brightness in 9 measured spots.*

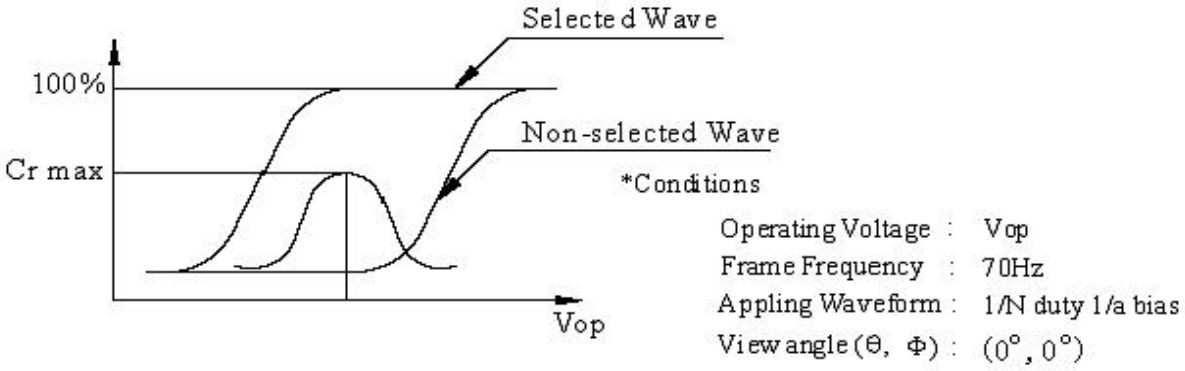



*Note 3: The definition of viewing angle:*

*Refer to the graph below marked by ϑ and Φ*



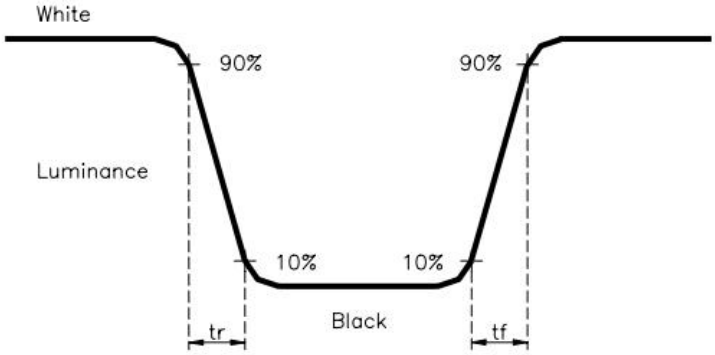

*Note 4: Definition of contrast ratio.( Test LCD using DMS501)*




$$Contrast\ ratio(Cr) = \frac{Brightness\ of\ selected\ dots}{Brightness\ of\ non-selected\ dots}$$

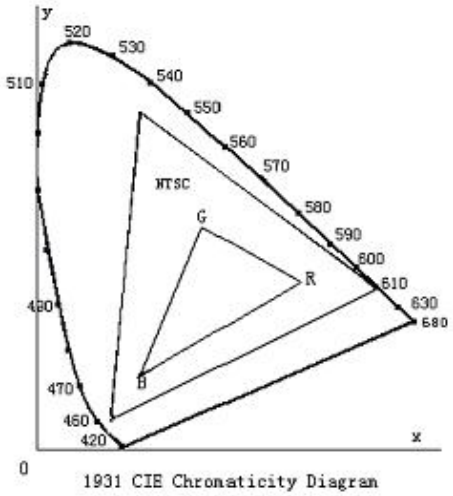
*Note 5: Definition of Response time. (Test LCD using DMS501):*

*The output signals of photo detector are measured when the input signals are changed from"white"to"black"(rising time) and from"black"to "white"(falling time) , respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.*




*The definition of response time*

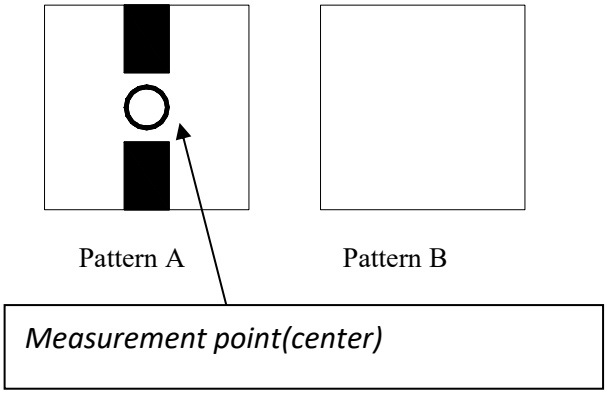
*Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.*




**Color gamut:**

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

*Note 7: Definition of cross talk.*
*Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100*




*Electric volume value=3F+/-3Hex*

## 8. Reliability Test Items and Criteria

| No | Test Item | Test condition | Criterion |
|---|---|---|---|
| 1 | High Temperature Storage | 80℃±2℃ 96H<br>Restore 2H at 25℃<br>Power off | 1. After testing, cosmetic and electrical defects should not happen.<br>2. Total current consumption should not be more than twice of initial value. |
| 2 | Low Temperature Storage | -30℃±2℃ 96H<br>Restore 2H at 25℃<br>Power off | |
| 3 | High Temperature Operation | 70℃±2℃ 96H<br>Restore 2H at 25℃<br>Power on | |
| 4 | Low Temperature Operation | -20℃±2℃ 96H<br>Restore 4H at 25℃<br>Power on | |
| 5 | High Temperature/Humidity Operation | 60℃±2℃ 90%RH 96H<br>Power on | |
| 6 | Temperature Cycle | -20℃←————→70℃<br>30min 5min 30min<br>after 5 cycle, Restore 2H at 25℃<br>Power off | |

Note: Operation: Supply 3.3V for logic system.

The inspection terms after reliability test, as below

| ITEM | Inspection |
|---|---|
| Contrast | CR>50% |
| IDD | IDD<200% |
| Brightness | Brightness>60% |
| Color Tone | Color Tone+/-0,05 |

# 9. *Precautions for Use of LCD Modules*

## *9.1 Handling Precautions*

*9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.*

*9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.*

*9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.*

*9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.*

*9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:*

*— Isopropyl alcohol — Ethyl alcohol*

*Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:*

*— Water — Ketone — Aromatic solvents*

*9.1.6 Do not attempt to disassemble the LCD Module.*

*9.1.7 If the logic circuit power is off, do not apply the input signals.*

*9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.*

*a. Be sure to ground the body when handling the LCD Modules.*

*b. Tools required for assembly, such as soldering irons, must be properly ground.*

*c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.*

*d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.*

## *9.2 Storage precautions*

*9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.*

*9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:*

*Temperature : 0℃ ～ 40℃*

*Relatively humidity: ≤80%*

*9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.*

**9.3** ***The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.***

***END***