# TFT DISPLAY SPECIFICATION




WINSTAR Display Co.,Ltd.

華凌光電股份有限公司

**Winstar Display Co., LTD**
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# SPECIFICATION

**CUSTOMER :** _____

**MODULE NO.: WF70B4TIAGDNN0#**

| | |
|---|---|
| **APPROVED BY:**<br>**( FOR CUSTOMER USE ONLY )** | **PCB VERSION: DATA:** |

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|---|---|---|---|
| | | | 葉虹蘭 |
| **ISSUED DATE: 2025/02/04** | | | |

TFT Display Inspection Specification: https://www.winstar.com.tw/technology/download.html
Precaution in use of TFT module: https://www.winstar.com.tw/technology/download/declaration.html

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MODLE NO：

## RECORDS OF REVISION

**DOC. FIRST ISSUE**

| VERSION | DATE | REVISED PAGE NO. | **SUMMARY** |
|---|---|---|---|
| 0 | 2021/01/25 | | First issue |
| A | 2021/07/27 | | Added the AVDD in min. and max. value |
| B | 2025/02/04 | | Modify LED Life Time & Reliability |

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# 1.Module Classification Information

| W | F | 70 | B4 | T | I | A | G | D | 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：7.0” TFT | | |
| ④ | Model serials no. | | |
| ⑤ | Backlight Type： | F→CCFL, White<br>S→LED, High Light White | T→LED, White<br>Z→Nichia LED, White |
| ⑥ | LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction | A→Transmissive, N.T, IPS TFT<br>C→Transmissive, N. T, 6:00 ;<br>F→Transmissive, N.T,12:00 ;<br>I→Transmissive, W. T, 6:00<br>K→Transflective, W.T,12:00<br>L→Transmissive, W.T,12:00<br>N→Transmissive, Super W.T, 6:00 | Q→Transmissive, Super W.T, 12:00<br>R→Transmissive, Super W.T, O-TFT<br>V→Transmissive, Super W.T, VA TFT<br>W→Transmissive, Super W.T, IPS TFT<br>X→Transmissive, W.T, VA TFT<br>Y→Transmissive, W.T, IPS TFT<br>Z→Transmissive, W.T, O-TFT |
| ⑦ | A：TFT LCD<br>B：TFT+SCREW HOLES+CONTROL BOARD<br>C：TFT+ SCREW HOLES +A/D BOARD<br>D：TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD<br>E：TFT+ SCREW HOLES +POWER BOARD | | F：TFT+CONTROL BOARD<br>G：TFT+ SCREW HOLES<br>H：TFT+D/V BOARD<br>I：TFT+ SCREW HOLES +D/V BOARD<br>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 |

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 |

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| | | |
|---|---|---|
| | | |

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# 2.Summary

TFT 7.0”is a TN transmissive type 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

| Item | Dimension | Unit |
|---|---|---|
| Size | 7.0 | inch |
| Dot Matrix | 800 x RGB x 480 (TFT) | dots |
| Module dimension | 165 x 100.0x 5.7 | mm |
| Active area | 154.08 x 85.92 | mm |
| Pixel Pitch | 0.1926 X 0.179 | mm |
| LCD type | TFT, Normally White, Transmissive | |
| View Direction | 12 o'clock | |
| Gray Scale Inversion Direction | 6 o'clock | |
| Aspect Ratio | 16:9 | |
| Backlight Type | LED ,Normally White | |
| Color arrangement | RGB-STRIPE | |
| TFT Driver IC | HX8264 & HX8664 or Equivalent | |
| TFT interface | 24-bit RGB | |
| With /Without TP | Without TP | |
| Surface | Anti-Glare | |

*Color tone slight changed by temperature and driving voltage.

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# 4.Absolute Maximum Ratings

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

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

1. Temp. ≦ 60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

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# 5.Electrical Characteristics

### 5.1. Operating conditions:

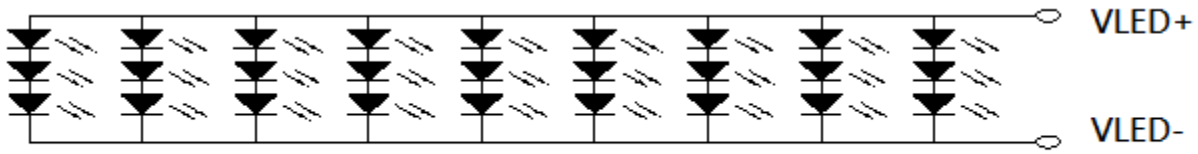
| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| Supply Voltage For Logic | VCC | 3.0 | 3.3 | 3.6 | V | Note 2 |
| Power voltage | AVDD | 10.2 | 10.4 | 10.6 | V | |
| Power Supply For Current | VCC =3.3V | - | 4.3 | - | mA | - |
| Power voltage | VGH | 14.5 | 15.0 | 15.5 | V | - |
| Power voltage | VGL | -10.5 | -10 | -9.5 | V | - |
| Input signal voltage | VCOM | 3.54 | 4.04 | 4.54 | V | Note 4 |

Note 1: Be sure to apply VCC and VGL to the LCD first, and then apply VGH.
Note 2: VCC setting should match the signals output voltage (refer to Note 3) of customer's system board.
Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.
Note 4: Typical VCOM is only a reference value. It must be optimized according to each LCM

### 5.2. LED driving conditions

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| LED current | - | - | 180 | - | mA | - |
| LED voltage | VLED+ | 8.4 | 9.8 | 11.0 | V | Note 1 |
| LED Life Time | - | 50,000 | - | - | Hr | Note 2,3,4 |

Note 1 : There are 1 Groups LED




Backlight LED Circuit

Note 2 : Ta = 25℃
Note 3 : Brightness to be decreased to 50% of the initial value
Note 4 : The single LED lamp case

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# 6.DC CHARATERISTICS

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

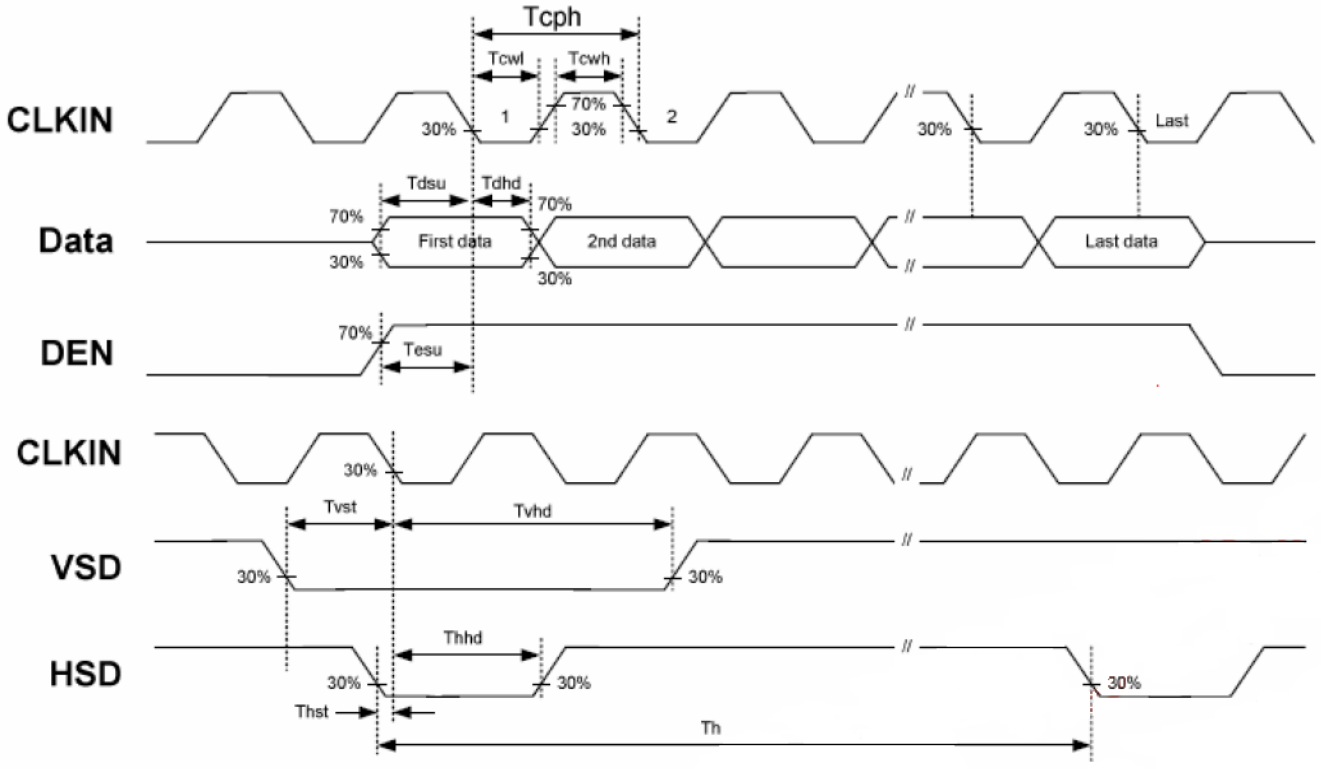
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# 7.AC Characteristics

## 7.1. AC Electrical Characteristics

| Signal | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| HS setup time | Thst | 8 | - | - | ns |
| HS hold time | Thhd | 8 | - | - | ns |
| VS setup time | Tvst | 8 | - | - | ns |
| VS hold time | Tvhd | 8 | - | - | ns |
| Data setup time | Tdsu | 8 | - | - | ns |
| Data hole time | Tdhd | 8 | - | - | ns |
| DE setup time | Tesu | 8 | - | - | ns |
| DE hole time | Tehd | 8 | - | - | ns |
| VCC Power On Slew rate | TPOR | - | - | 20 | ms |
| RESET pulse width | TRst | 1 | - | - | ms |
| DCLK cycle time | Tcoh | 20 | - | - | ns |
| DCLK pulse duty | Tcwh | 40 | 50 | 60 | % |

## 7.2. Input Clock and Data Timing Diagram




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### 7.3. Timing

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Horizontal Display Area | thd | - | 800 | - | DCLK | |
| DCLK Frequency | fclk | 26.4 | 33.3 | 46.8 | MHz | |
| One Horizontal Line | th | 862 | 1056 | 1200 | DCLK | |
| HS pulse width | thpw | 1 | - | 40 | DCLK | |
| HS Blanking | thb | - | 46 | - | DCLK | |
| HS Front Porch | thfp | 16 | 210 | 354 | DCLK | |

| Item | Symbol | Values | | | Unit | Remark |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Vertical Display Area | tvd | - | 480 | - | TH | |
| VS period time | tv | 510 | 525 | 650 | TH | |
| VS pulse width | tvpw | 1 | - | 20 | TH | |
| VS Blanking | tvb | - | 23 | - | TH | |
| VS Front Porch | tvfp | 7 | 22 | 147 | TH | |

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## 7.4. Data Input Format




Fig. Horizontal input timing diagram

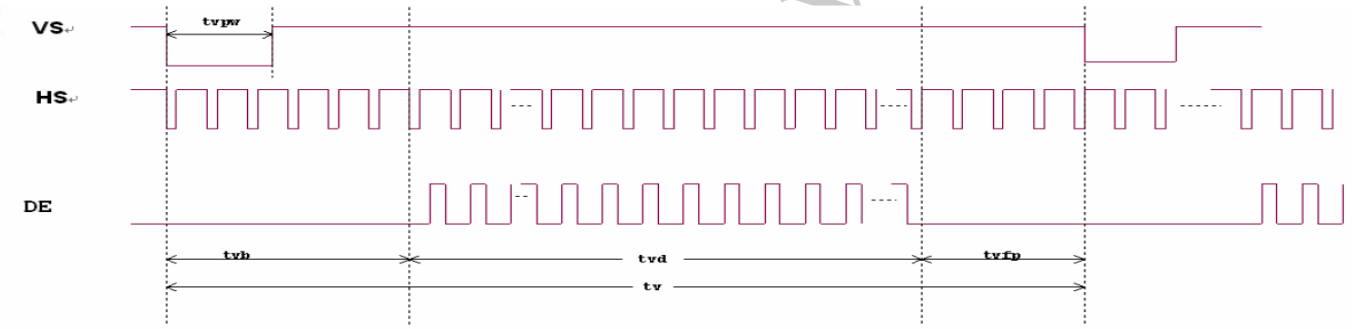



Fig. Vertical input timing diagram

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# 8.Optical Characteristics

| Item | | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Response time | | Tr+ Tf | θ=0°、Φ=0° | - | 25 | 50 | .ms | Note 3 |
| Contrast ratio | | CR | At optimized viewing angle | 500 | 800 | - | - | Note 4 |
| Color Chromaticity | White | Wx | θ=0°、Φ=0 | 0.26 | 0.31 | 0.36 | - | Note 2,5,6 |
| | | Wy | | 0.28 | 0.33 | 0.38 | - | |
| Viewing angle (Gray Scale Inversion Direction) | Hor. | ΘR | CR≧10 | 60 | 70 | - | Deg. | Note 1 |
| | | ΘL | | 60 | 70 | - | | |
| | Ver. | ΦT | | 50 | 60 | - | | |
| | | ΦB | | 60 | 70 | - | | |
| Brightness | | - | - | 320 | 400 | - | cd/m² | Center of display |
| Uniformity | | (U) | - | 70 | - | - | % | Note 5 |

Ta=25±2℃, IL=180mA

Note 1: Definition of viewing angle range

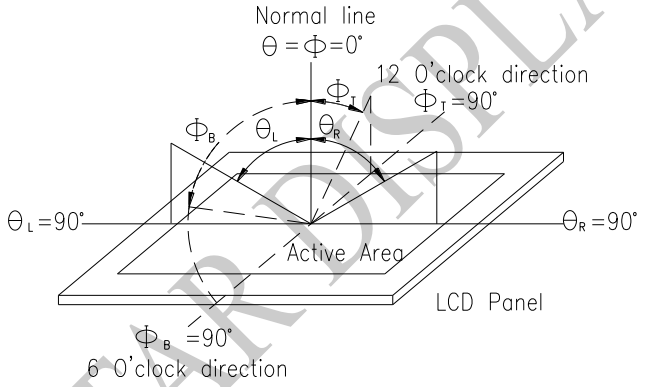
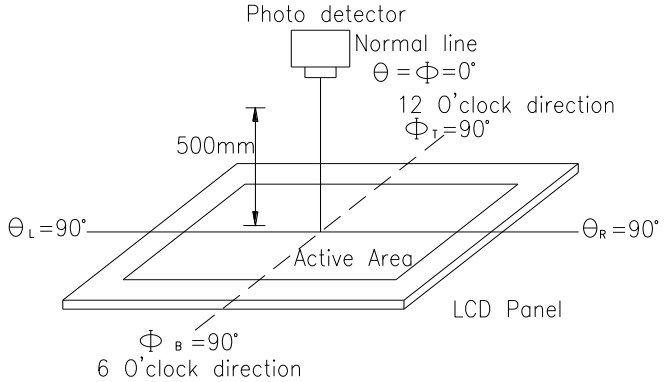



Fig. 8.1. Definition of viewing angle

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.

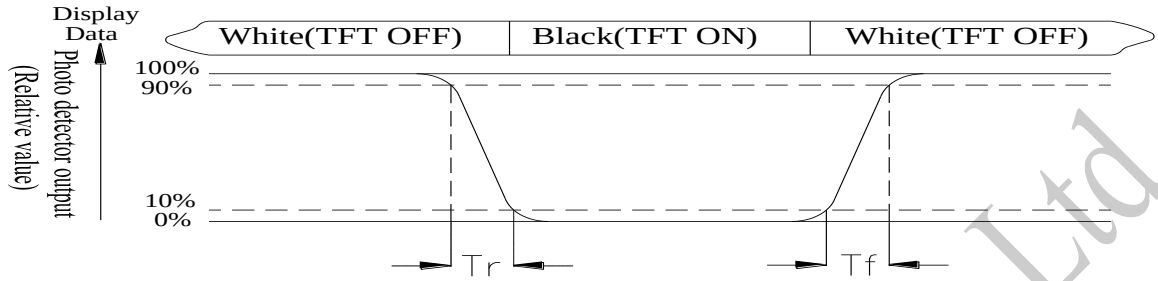



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Fig. 8.2. Optical measurement system setup

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, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, 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: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/Lmax x100%

L = Active area length

W = Active area width

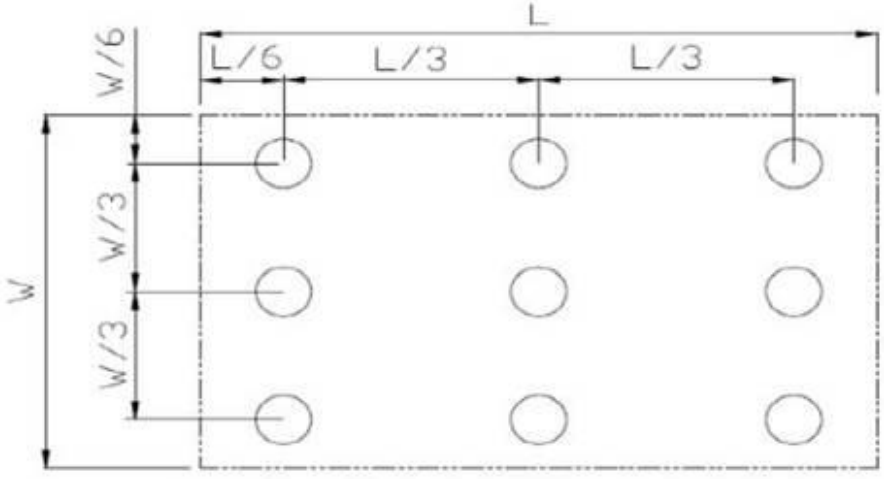



Fig8.3. Definition of uniformity

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.

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# 9.Interface

### 9.1. LCM PIN Definition

| Pin | Symbol | Function | Remark |
|---|---|---|---|
| 1 | VLED+ | Power supply for backlight | |
| 2 | VLED+ | Power supply for backlight | |
| 3 | VLED- | Backlight ground | |
| 4 | VLED- | Backlight ground | |
| 5 | GND | Power ground | |
| 6 | VCOM | Common voltage | |
| 7 | VCC | Power for Digital Circuit | |
| 8 | MODE | DE/SYNC mode select | Note 1 |
| 9 | DE | Data Input Enable (DEN) | |
| 10 | VS | Vertical Sync Input (VSD) | |
| 11 | HS | Horizontal Sync Input (HSD) | |
| 12 | B7 | Blue data(MSB) | |
| 13 | B6 | Blue data | |
| 14 | B5 | Blue data | |
| 15 | B4 | Blue data | |
| 16 | B3 | Blue data | |
| 17 | B2 | Blue data | |
| 18 | B1 | Blue data | Note 2 |
| 19 | B0 | Blue data(LSB) | Note 2 |
| 20 | G7 | Green data(MSB) | |
| 21 | G6 | Green data | |
| 22 | G5 | Green data | |
| 23 | G4 | Green data | |
| 24 | G3 | Green data | |
| 25 | G2 | Green data | |
| 26 | G1 | Green data | Note 2 |
| 27 | G0 | Green data(LSB) | Note 2 |
| 28 | R7 | Red data(MSB) | |
| 29 | R6 | Red data | |
| 30 | R5 | Red data | |
| 31 | R4 | Red data | |

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| | | | |
|---|---|---|---|
| 32 | R3 | Red data | |
| 33 | R2 | Red data | |
| 34 | R1 | Red data | Note 2 |
| 35 | R0 | Red data(LSB) | Note 2 |
| 36 | GND | Power Ground | |
| 37 | DCLK | Sample clock (CLKIN) | Note 3 |
| 38 | GND | Power Ground | |
| 39 | L/R | Left / right selection | Note 4 |
| 40 | U/D | Up/down selection | Note 5 |
| 41 | VGH | Gate ON Voltage | |
| 42 | VGL | Gate OFF Voltage | |
| 43 | AVDD | Power for Analog Circuit | |
| 44 | RESET | Global reset pin. | Note 6 |
| 45 | NC | No connection | |
| 46 | VCOM | Common Voltage | |
| 47 | DITHB | Dithering function | Note 7 |
| 48 | GND | Power Ground | |
| 49 | NC | No connection | |
| 50 | NC | No connection | |

I: input, O: output, P: Power

Note 1: When select DE mode, MODE=”1”, VS and HS must pull high.
When select SYNC mode, MODE= ”0”, DE must be grounded.

Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

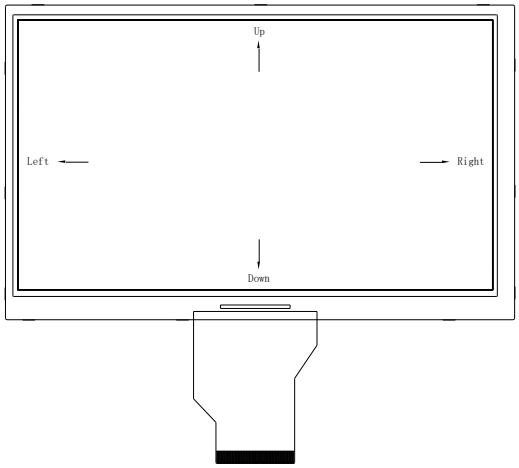
Note 4: Selection of scanning mode

| **Setting of scan control input** | | **Scanning direction** |
|---|---|---|
| **U/D** | **L/R** | |
| L | H | Up to down, left to right |
| H | L | Down to up, right to left |
| L | L | Up to down, right to left |
| H | H | Down to up, left to right |

Note 5: Definition of scanning direction.

Refer to the figure as below:

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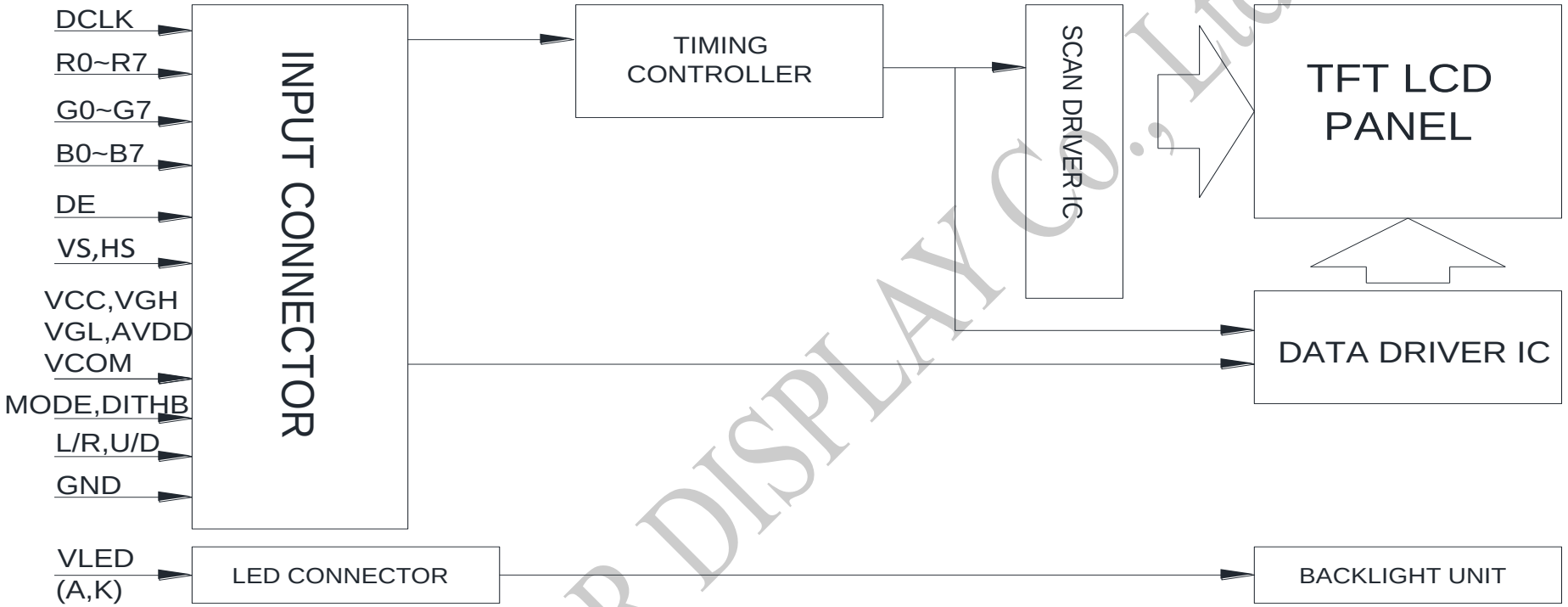



Note 6: Global reset pin. Active low to enter reset state . Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB=”1”, Disable internal dithering function,
When DITHB=”0”, Enable internal dithering function,

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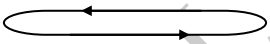
# 10.Block Diagram




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# 11.Reliability

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

| **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℃<br>200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -30℃<br>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℃<br>200hrs | 2 |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20℃<br>200hrs | 1,2 |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60℃,90%RH max | 60℃,90%RH<br>96hrs | 1,2 |
| Thermal shock resistance | The sample should be allowed stand the following 10 cycles of operation<br>-20℃ 25℃ 70℃<br><br>30min 5min 30min<br>1 cycle | -20℃/70℃<br>10 cycles | 2 |
| Vibration test | Endurance test applying the vibration during transportation and using. | Total fixed amplitude : 1.5mm<br>Vibration Frequency : 10~55Hz<br>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=±6KV(contact), ±8KV(air),<br>RS=330Ω<br>CS=150pF<br>10 times | 4 |

Note1: No dew condensation to be observed.

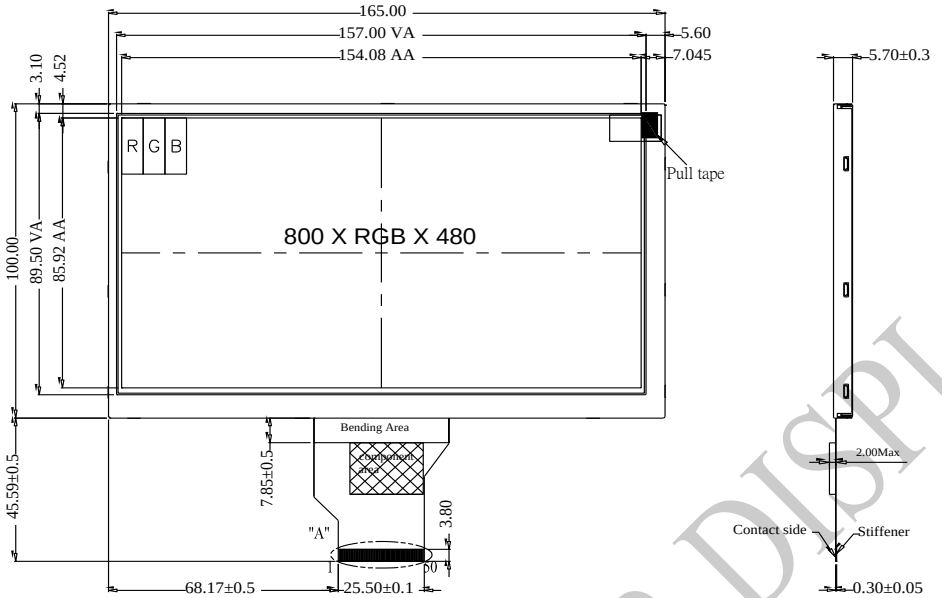
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

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

Note4: Endurance test applying the electric stress to the finished product housing

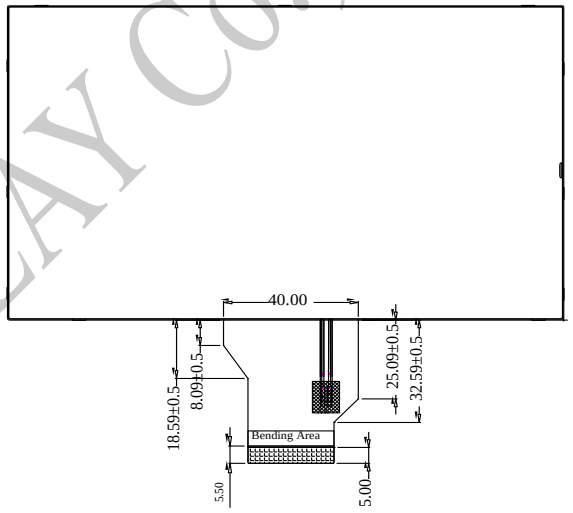
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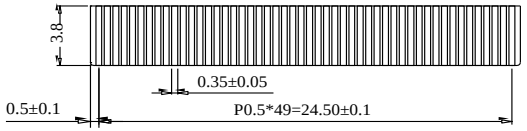
# 12.Contour Drawing










DETAIL "A"
SCALE:5X

| PIN NO. | SYMBOL |
|---|---|
| 1 | VLED+ |
| 2 | VLED+ |
| 3 | VLED− |
| 4 | VLED− |
| 5 | GND |
| 6 | VCOM |
| 7 | VCC |
| 8 | MODE |
| 9 | DE |
| 10 | VS |
| 11 | HS |
| 12 | B7 |
| 13 | B6 |
| 14 | B5 |
| 15 | B4 |
| 16 | B3 |
| 17 | B2 |
| 18 | B1 |
| 19 | B0 |
| 20 | G7 |
| 21 | G6 |
| 22 | G5 |
| 23 | G4 |
| 24 | G3 |
| 25 | G2 |
| 26 | G1 |
| 27 | G0 |
| 28 | R7 |
| 29 | R6 |
| 30 | R5 |
| 31 | R4 |
| 32 | R3 |
| 33 | R2 |
| 34 | R1 |
| 35 | R0 |
| 36 | GND |
| 37 | DCLK |
| 38 | GND |
| 39 | L/R |
| 40 | U/D |
| 41 | VGH |
| 42 | VGL |
| 43 | AVDD |
| 44 | RESET |
| 45 | NC |
| 46 | VCOM |
| 47 | DITHB |
| 48 | GND |
| 49 | NC |
| 50 | NC |

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

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# LCM Sample Estimate Feedback Sheet

**Module Number：** _____ **Page: 1**

## 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

| | | | |
|---|---|---|---|
| 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 ,_____ |

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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：** / /

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