



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



Winstar Display Co., LTD

華凌光電股份有限公司



WEB: <https://www.winstar.com.tw> E-mail: sales@winstar.com.tw

SPECIFICATION

CUSTOMER : _____

MODULE NO.: WF70A8SYAHDNNO#

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

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|--------------------------------|-------------|------------|-------------|
| | | | 葉虹蘭 |
| ISSUED DATE: 2024/05/17 | | | |

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>



RECORDS OF REVISION

DOC. FIRST ISSUE

| VERSION | DATE | REVISED PAGE NO. | SUMMARY |
|---------|------------|---------------------|-------------|
| 0 | 2024/05/17 | | First issue |

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1.Module Classification Information

W F 70 A8 S Y A H 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 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 |
| 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 IPS 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 | 1024 x RGBx600(TFT) | dots |
| Module dimension | 169.9(W) x 103.4(H) x 5.6(D) | mm |
| Active area | 154.2144 x 85.92 | mm |
| Pixel pitch | 0.1506 x 0.1432 | mm |
| LCD type | TFT, Normally Black, Transmissive | |
| Viewing Angle | 85/85/85/85 | |
| Aspect Ratio | 16:9 | |
| Driver IC | EK79001HK-S + EK73215BCGA or equivalent | |
| Interface | 24bit RGB | |
| Backlight Type | LED, Normally White | |
| With /Without TP | Without TP | |
| Surface | Anti-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

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5. Electrical Characteristics

5.1. Typical Operation Conditions

| Item | Symbol | Values | | | Unit | Remark |
|----------------------|--------|--------|------|------|------|------------|
| | | Min. | Typ. | Max. | | |
| Power voltage | VCC | 3.0 | 3.3 | 3.6 | V | |
| Analog Power | AVDD | 8.9 | 9.0 | 9.1 | V | |
| TFT Gate ON Voltage | VGH | 17 | 18 | 19 | V | Note1 |
| TFT Gate OFF Voltage | VGL | -6.5 | -6.0 | -5.5 | V | Note2 |
| TFT Common Voltage | Vcom | 3.0 | 3.15 | 3.3 | V | Note3 |
| Current for Driver | IDD | - | 85 | 130 | mA | VDD=3.3V |
| Power Current | IAVDD | - | 20 | - | mA | AVDD=9V |
| TFT Gate ON Current | IVGH | - | 1 | - | mA | VGH=18V |
| TFT Gate OFF Current | IVGL | - | 1 | - | mA | VGL=6V |
| TFT Common Current | IVCOM | - | 1 | - | mA | VCOM=3.15V |

Note:

Note 1. VGH is TFT Gate operating Voltage.

Note 2. VGL is TFT Gate operating Voltage.

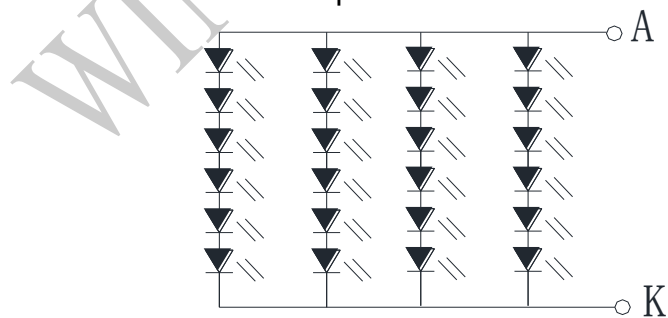
The storage structure of this model is CST (Storage on Common)

Note 3. Vcom must be adjusted to optimize display quality Crosstalk, Contrast Ratio and etc.

5.2. Backlight Driving Conditions

| Item | Symbol | Values | | | Unit | Remark |
|---------------------------|--------|--------|--------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Voltage for LED backlight | VL | 16.8 | 19.2 | 21.0 | V | Note 1 |
| Current for LED backlight | IL | -- | 290 | -- | mA | |
| LED life time | - | - | 50,000 | - | Hr | Note 2 |

Note 1 : There are 1 Groups LED



Backlight 24LED Circuit

Note 2 : $T_a = 25\text{ }^\circ\text{C}$

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

Note 4 : The single LED lamp case

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6. Electrical Specification

6.1. AC Characteristics

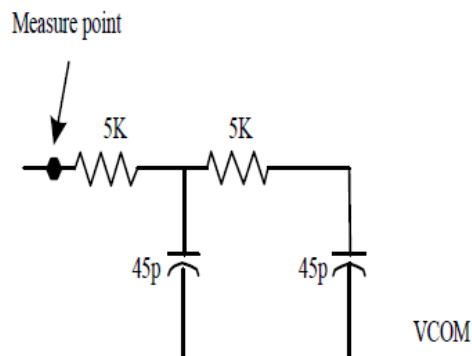
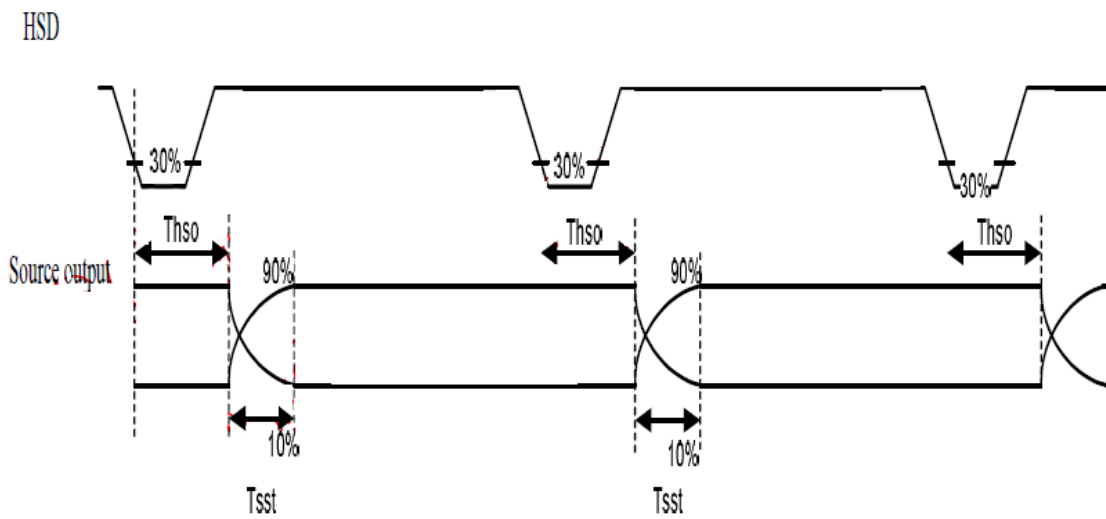
(TA = -30 to 85°C, VDD = 2.3 to 3.6V, AVDD = 8 to 13.5V, GND = AGND = 0V)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit |
|------------------------|--------|-----------------------------------|------|------|------|------|
| VDD Power On Slew rate | TPOR | From 0V to 90% VDD | 1 | - | 20 | ms |
| RST pulse width | TRST | DCLK = 65MHz | 50 | - | - | us |
| DCLK cycle time | Tcph | - | 14 | - | - | ns |
| DCLK pulse duty | Tcwh | - | 40 | 50 | 60 | % |
| VSD setup time | Tvst | - | 5 | - | - | ns |
| VSD hold time | Tvhd | - | 5 | - | - | ns |
| HSD setup time | Thst | - | 5 | - | - | ns |
| HSD hold time | Thhd | - | 5 | - | - | ns |
| Data set-up time | Tdsu | D0[7:0], D1[7:0], D2[7:0] to DCLK | 5 | - | - | ns |
| Data hold time | Tdhd | D0[7:0], D1[7:0], D2[7:0] to DCLK | 5 | - | - | ns |
| DE setup time | Tesu | - | 5 | - | - | ns |
| DE hold time | Tehd | - | 5 | - | - | ns |
| Output stable time | Tsst | Dual gate | - | - | 3 | us |

6.2. Output Timing Table

Output Timing Table

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Condition |
|--------------------------------|--------|------|------|------|------|---------------|
| DCLK frequency | Fclk | - | 65 | 71 | MHz | VDD =2.3~3.6V |
| DCLK cycle time | Tclk | 14.1 | 15.4 | | ns | |
| DCLK pulse duty | Tcwh | 40 | 50 | 60 | % | Tclk |
| Time from HSD to Source Output | Thso | - | 64 | - | DCLK | |
| Time from HSD to LD | Thld | - | 64 | - | DCLK | |
| Time from HSD to STV | Thstv | - | 2 | - | DCLK | |
| Time from HSD to CKV | Thckv | - | 20 | - | DCLK | |
| Time from HSD to OEV | Thoev | - | 4 | - | DCLK | |
| LD pulse width | Twld | - | 10 | - | DCLK | |
| CKV pulse width | Twckv | - | 66 | - | DCLK | |
| OEV pulse width | Twoev | - | 74 | - | DCLK | |



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For 1024RGB x 600 panel

DE mode

| DE mode | | | | | |
|---------------------------------|----------|-------|------|------|------|
| Parameter | Symbol | Value | | | Unit |
| | | Min. | Typ. | Max. | |
| DCLK frequency @Frame rate=60hz | fclk | 40.8 | 51.2 | 67.2 | Mhz |
| Horizontal display area | thd | 1024 | | | DCLK |
| HSYNC period time | th | 1114 | 1344 | 1400 | DCLK |
| HSYNC blanking | thb+thfp | 90 | 320 | 376 | DCLK |
| Vertical display area | tvd | 600 | | | H |
| VSYNC period time | tv | 610 | 635 | 800 | H |
| VSYNC blanking | tvb+tvfp | 10 | 35 | 200 | H |

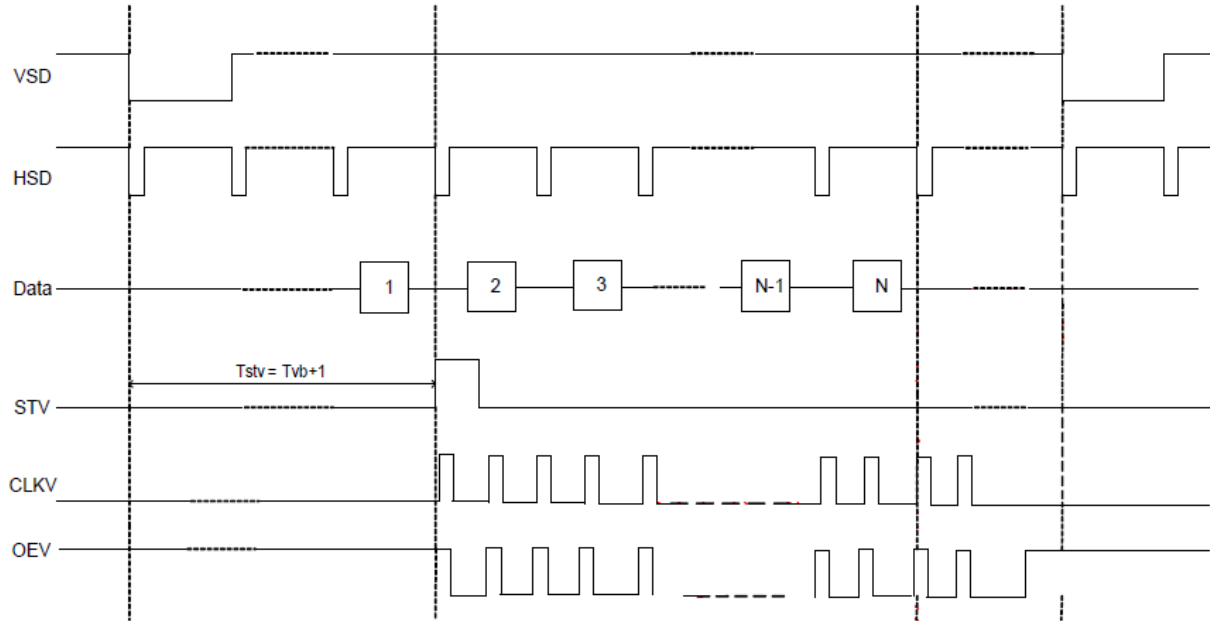
HV mode(1)

| HV mode | | | | | |
|---------------------------------|--------|-------|------|------|------|
| Horizontal input timing | | | | | |
| Parameter | Symbol | Value | | | Unit |
| Horizontal display area | thd | 1024 | | | DCLK |
| DCLK frequency@ Frame rate=60hz | fclk | Min. | Typ. | Max. | Mhz |
| | | 44.9 | 51.2 | 63 | |
| 1 Horizontal Line | th | 1200 | 1344 | 1400 | DCLK |
| HSYNC pulse width | thpw | Min. | 1 | | |
| | | Typ. | - | | |
| | | Max. | 140 | | |
| HSYNC back porch | thbp | 160 | 160 | 160 | |
| HSYNC front porch | thfp | 16 | 160 | 216 | |

HV mode(2)

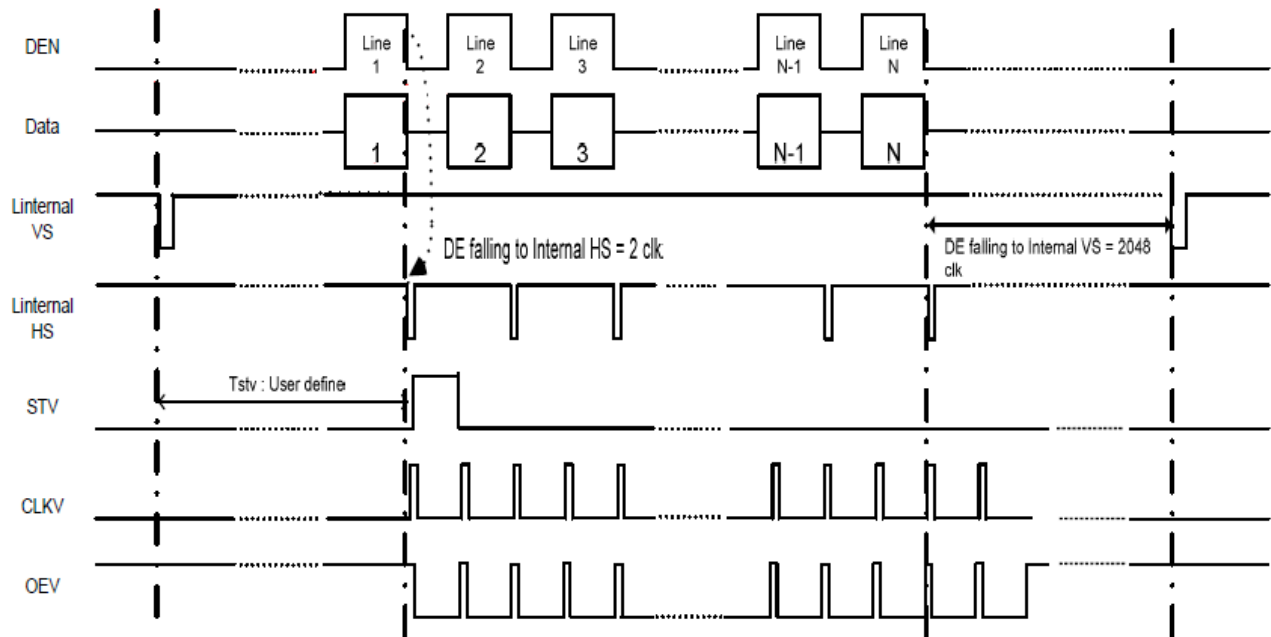
| Vertical input timing | | | | | |
|-----------------------|--------|-------|------|------|------|
| Parameter | Symbol | Value | | | Unit |
| | | Min. | Typ. | Max. | |
| Vertical display area | tvd | 600 | | | H |
| VSYNC period time | tv | 624 | 635 | 750 | H |
| VSYNC pulse width | tvpw | 1 | - | 20 | H |
| VSYNC back porch | tvb | 23 | 23 | 23 | H |
| VSYNC front porch | tvfp | 1 | 12 | 127 | H |

1. Vertical Timing Diagram HV mode



Vertical Timing Diagram HV mode

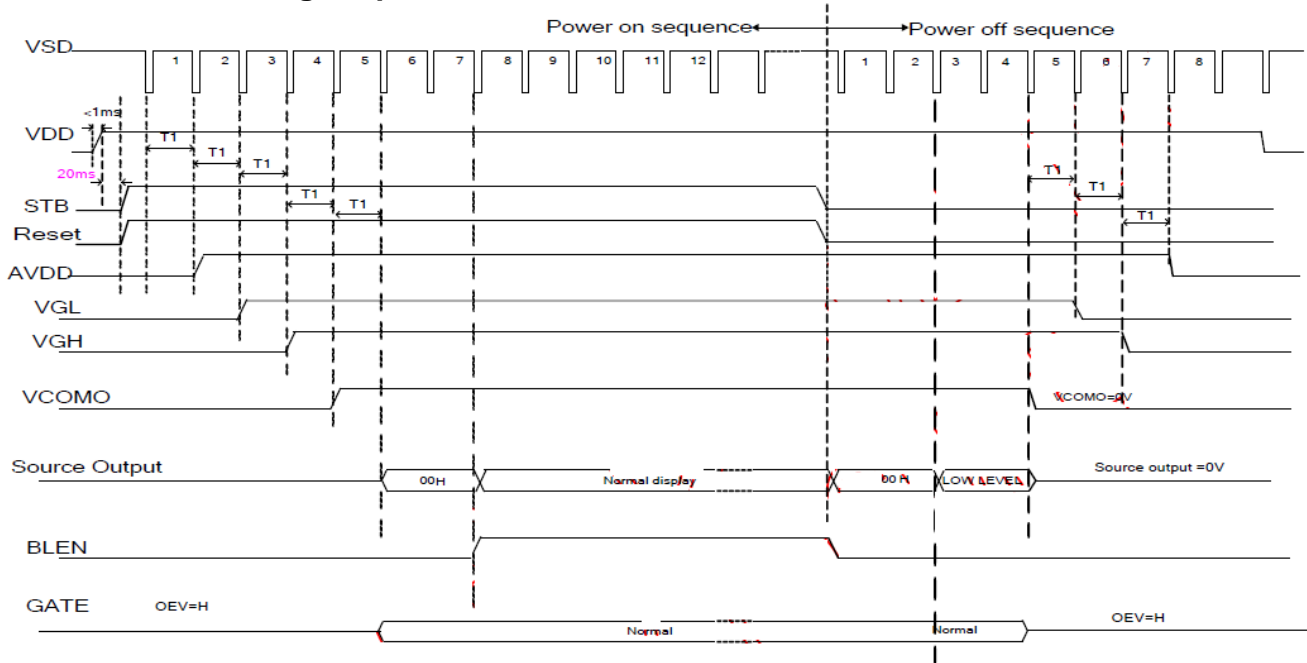
2. Vertical Timing Diagram DE mode



7. Power On/Off Sequence

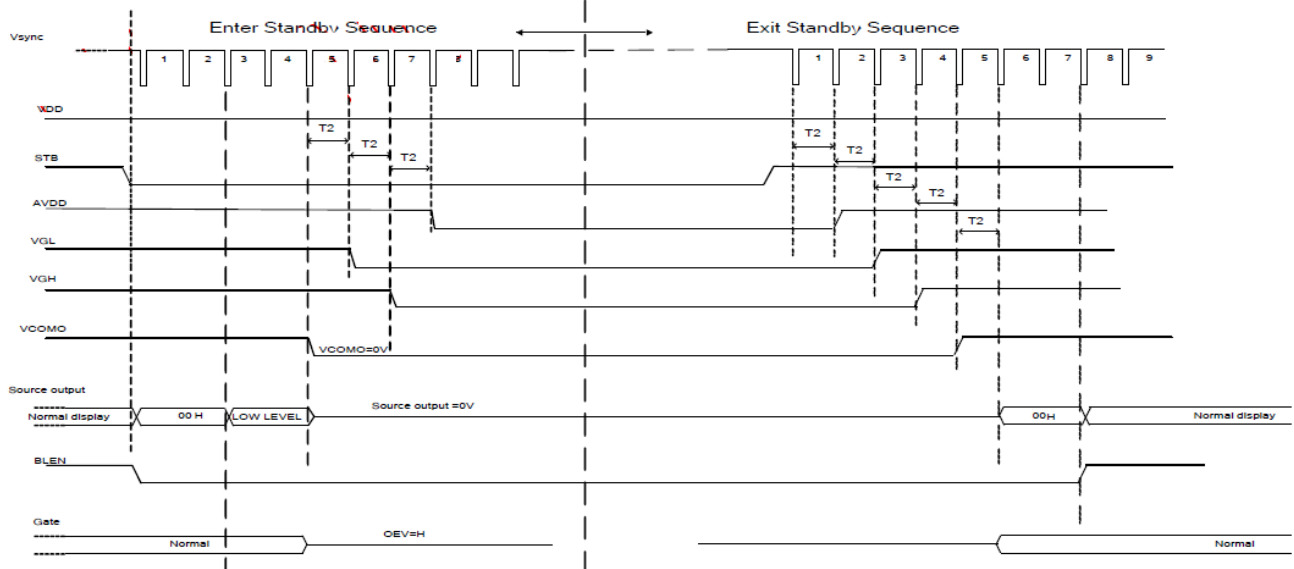
In order to prevent IC from power on reset fail, the rising time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “AC Characteristics” for more detail on timing.

Power-On/Off Timing Sequence



Note : 1Frame $\geq T1 \geq 2ms$.

Power On/Off timing chart



Note : 1Frame $\geq T2 \geq 2ms$.

Enter and Exit Standby Mode timing chart

Note: Low level=3Fh, when NBW=L(Normally white)

Low level=00h, when NBW=H(Normally black)

8. Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|--------------------|--------|-----------------------------------|-----------------------------------|-------|-------|-------------------|-------------------|------------|
| Response time | Tr | $\theta=0^\circ$ 、 $\phi=0^\circ$ | - | 13 | 20 | .ms | Note 3 | |
| | Tf | | - | 15 | 25 | | | |
| Contrast ratio | CR | At optimized viewing angle | 600 | 800 | - | - | Note 4 | |
| Color Chromaticity | White | Wx | $\theta=0^\circ$ 、 $\phi=0^\circ$ | 0.269 | 0.319 | 0.369 | - | Note 2,5,6 |
| | | Wy | | 0.291 | 0.341 | 0.391 | - | |
| Viewing angle | Hor. | Θ_R | $CR \geq 10$ | 80 | 85 | - | Deg. | Note 1 |
| | | Θ_L | | 80 | 85 | - | | |
| | Ver. | Φ_T | | 80 | 85 | - | | |
| | | Φ_B | | 80 | 85 | - | | |
| Brightness | - | - | 1000 | 1100 | - | cd/m ² | Center of display | |
| Uniformity | (U) | - | 75 | - | - | % | Note 5 | |

Ta=25±2°C,

Note 1: Definition of viewing angle

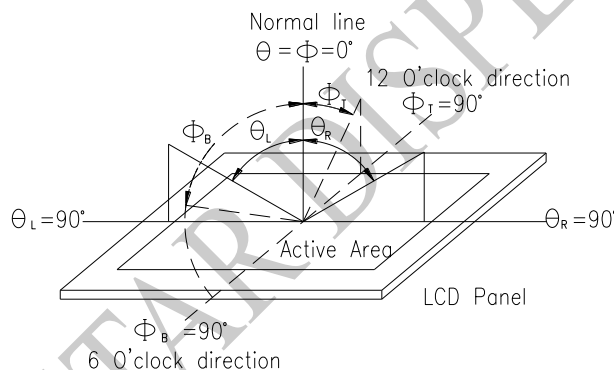


Fig. 8.1. Definition of viewing angle

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-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

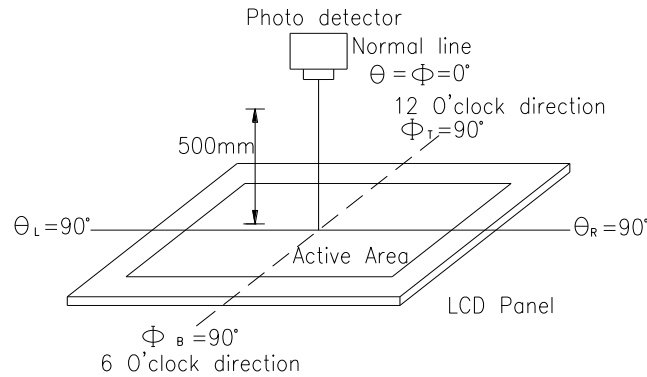
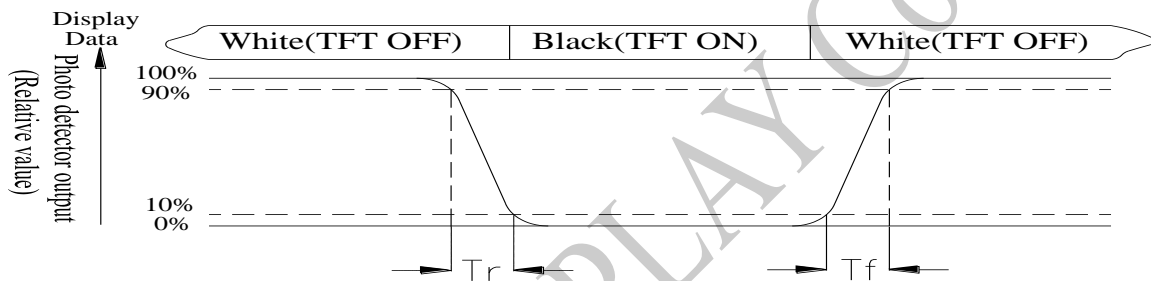


Fig. 8.2. Optical measurement system setup

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, 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: 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.

$$\text{Luminance Uniformity (U)} = \text{Lmin/Lmax} \times 100\%$$

L = Active area length

W = Active area width

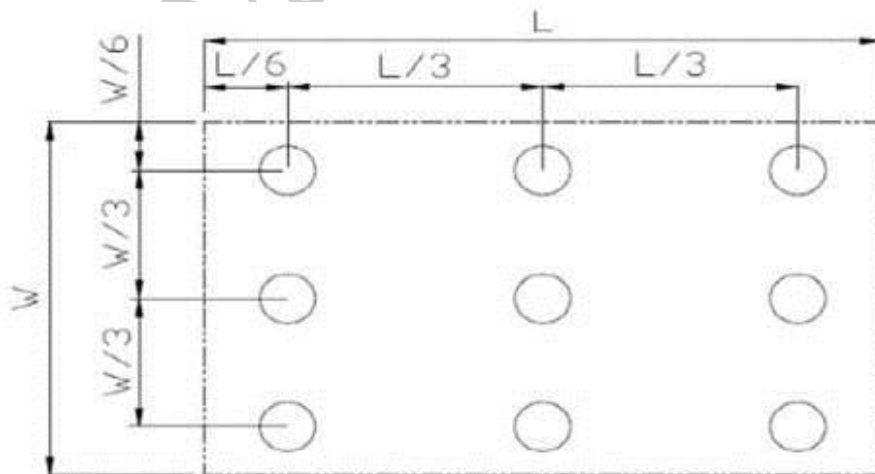


Fig 8.3. Definition of uniformity

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 No. | Symbol | Function | Remark |
|---------|--------|-----------------------------|--------|
| 1 | VLED+ | LED Anode | |
| 2 | VLED+ | LED Anode | |
| 3 | VLED- | LED Cathode | |
| 4 | VLED- | LED Cathode | |
| 5 | GND | 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 | |

| | | | |
|----|-------|--------------------------|----------|
| 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 (CLK) | Note 3 |
| 38 | GND | Power Ground | |
| 39 | L/R | Left / right selection | Note 4,5 |
| 40 | U/D | Up/down selection | Note 4,5 |
| 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 | |

Note 1: When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

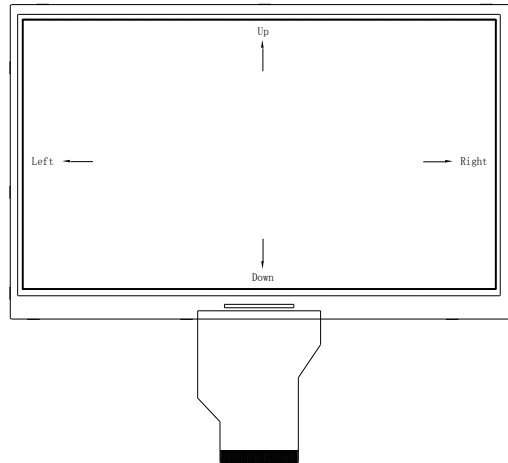
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

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 | |
| Low | High | Up to down, left to right |
| High | Low | Down to up, right to left |
| Low | Low | Up to down, right to left |
| High | High | Down to up, left to right |

Note 5: Definition of scanning direction.
Refer to the figure as below:



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 low.
When DITHB="0", Disable internal dithering function,
When DITHB="1", Enable internal dithering function,

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10. Reliability

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

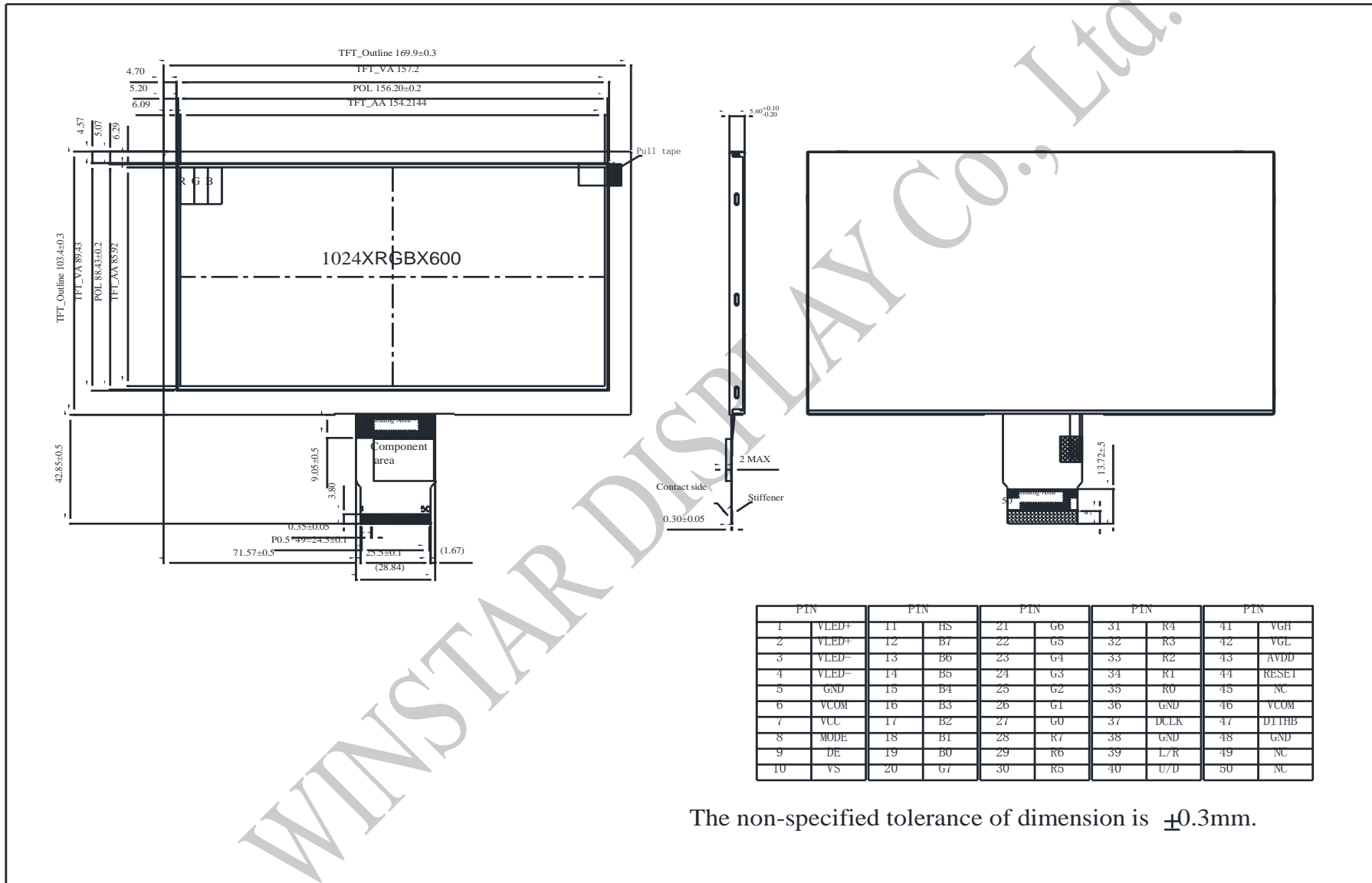
| Environmental Test | | | |
|---|--|--|------|
| Test Item | Content of Test | Test Condition | Note |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80°C 200hrs | 2 |
| Low Temperature storage | Endurance test applying the low storage temperature 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 style="margin: 0;">-20°C 25°C 70°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">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=±7KV(contact), ±8KV(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.

11. Contour Drawing



The non-specified tolerance of dimension is $\pm 0.3\text{mm}$.



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 : 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) : 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 , _____



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 : / / _____

