


| | | | |
|----------------------|------------|-----------------------------------|------------|
| MDT0390A3SH-RGB | 480 x 128 | RGB Interface | TFT Module |
| Specification | | | |
| Version: 2 | | Date: 02/06/2018 | |
| Revision | | | |
| 1 | 05/03/2018 | First issue | |
| 2 | 31/05/2018 | Add TFT Driver IC & TFT Interface | |

| Display Features | |  | |
|-----------------------|-------------------------|---|------------------|
| Display Size | 3.9" | | |
| Resolution | 480 x 128 | | |
| Orientation | Landscape | | |
| Appearance | RGB | | |
| Logic Voltage | 3.3V | | |
| Interface | RGB | | |
| Brightness | 1000 cd/m ² | | |
| Touchscreen | --- | | |
| Module Size | 105.50 x 37.00 x 3.05mm | | |
| Operating Temperature | -30°C ~ +80°C | | |
| Pinout | 40 way FFC | | Box Quantity |
| Pitch | 0.5mm | | Weight / Display |
| | | --- | --- |

DESIGN • MANUFACTURE • SUPPLY

* - For full design functionality, please use this specification in conjunction with the HX8278-A specification.(Provided Separately)

| Display Accessories | |
|---------------------|-------------|
| Part Number | Description |
| | |
| | |
| | |

| Optional Variants | |
|-------------------|---------|
| Appearances | Voltage |
| | |
| | |
| | |



Summary

TFT 3.9" 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.

General Specifications

- Size: 3.9 inch
- Dot Matrix: 480 x 128 x RGB (TFT) dots
- Module dimension: 105.5(W) x 37.0(H) x 3.05(D) mm
- Active area: 95.04 x 25.34 mm
- Dot pitch: 0.066(W)x 0.198(H) mm
- LCD type: TFT, Normally White, Transmissive
- View Direction: 6 o'clock
- Gray Scale Inversion Direction: 12 o'clock
- Aspect Ratio: Bar Type
- Backlight Type: LED, Normally White
- TFT Driver IC: HX8278-A Or Equal
- TFT Interface: RGB-24BIT (SYNC mode)
- With /Without TP: Without TP
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.



Interface

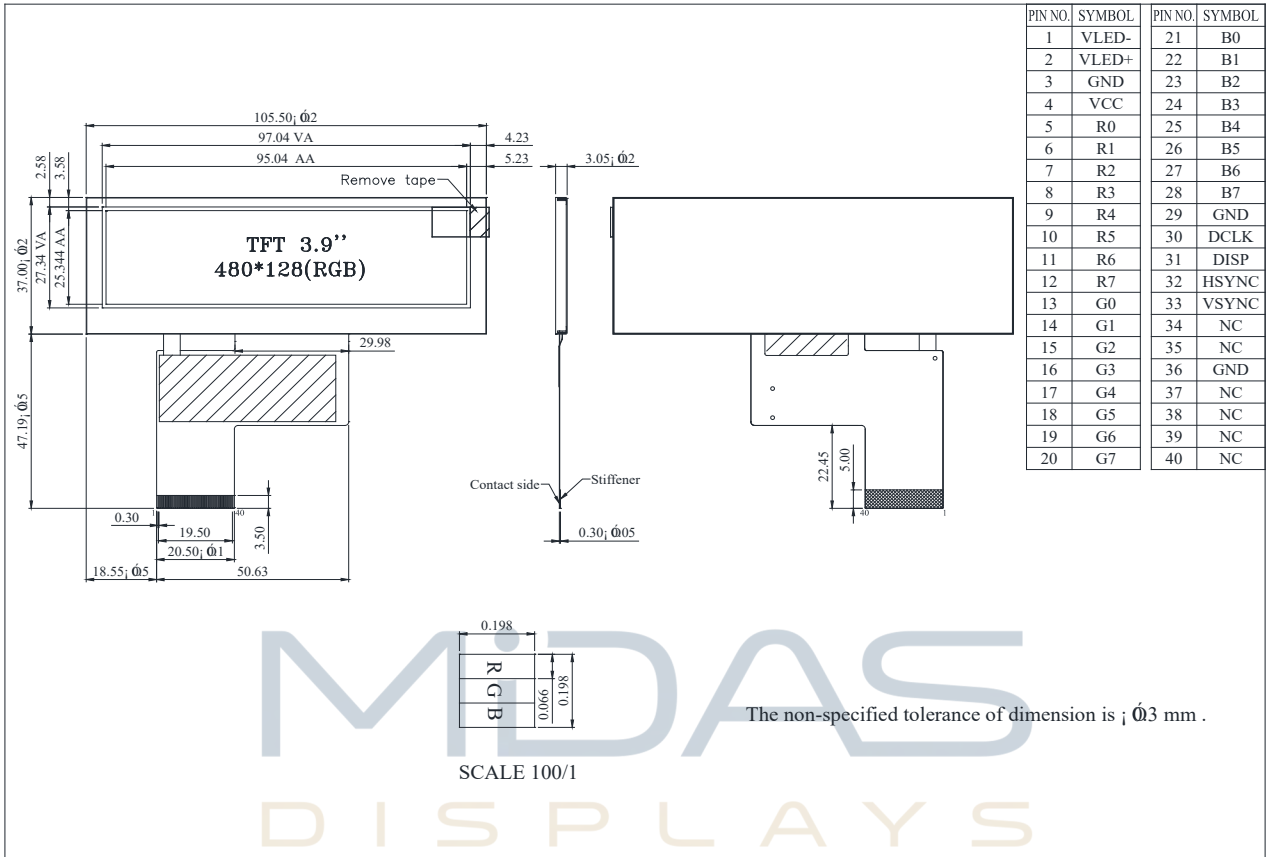
1. LCM PIN Definition

| No. | Symbol | Description | Remark |
|-------|--------|-----------------------------------|--------|
| 1 | VLED- | Backlight LED Cathode | |
| 2 | VLED+ | Backlight LED Anode. | |
| 3 | GND | System Ground | |
| 4 | VCC | Power supply for logic operation | |
| 5~12 | R0~R7 | Data bus | |
| 13~20 | G0~G7 | Data bus | |
| 21~28 | B0~B7 | Data bus | |
| 29 | GND | System Ground | |
| 30 | DCLK | Pixel clock signal | |
| 31 | DISP | Display on/off control | |
| 32 | HSYNC | Horizontal Sync signal | Note1 |
| 33 | VSYNC | Vrtical Sync signal | Note1 |
| 34 | NC | No connection (Option DE) | Note1 |
| 35 | NC | No connection | |
| 36 | GND | System Ground | |
| 37 | NC | No connection (Option XR for RTP) | |
| 38 | NC | No connection (Option YD for RTP) | |
| 39 | NC | No connection (Option XL for RTP) | |
| 40 | NC | No connection (Option YU for RTP) | |

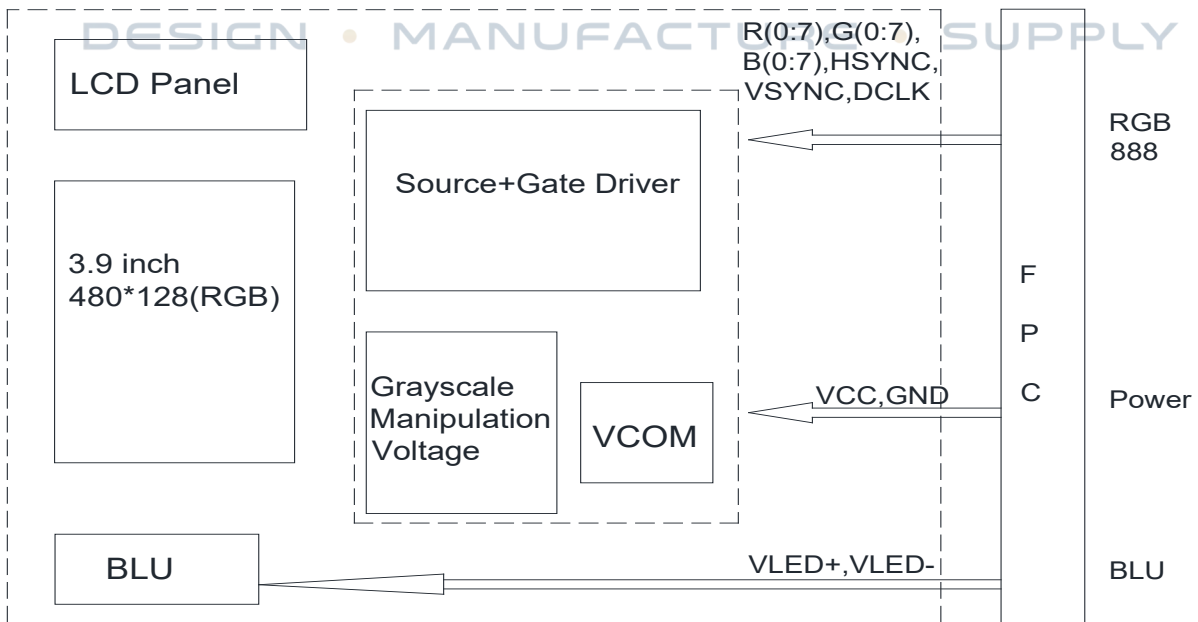
Note1: This module default function is for SYNC mode, if this module want change to use DE mode , the FPC have to modify resistive jumper



Contour Drawing



Block Diagram



Absolute Maximum Ratings

| Item | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP | -30 | — | +80 | °C |
| Storage Temperature | TST | -40 | — | +90 | °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

Electrical Characteristics

1. Operating conditions

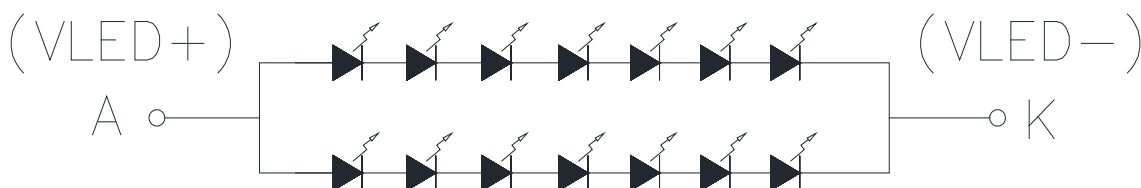
| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|------------------------|--------|-----------|-----|-----|-----|------|--------|
| Supply Voltage For LCM | VCC | — | 3.0 | 3.3 | 3.6 | V | |
| Supply Current For LCM | ICC | — | — | 15 | 25 | mA | Note 1 |

Note 1 : This value is test for VCC =3.3V , Ta=25 °C only

2. LED driving conditions

| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|---------------------|-------------------|------|-------|------|------|--------------|
| Forward Current | I _{LED} | — | 40 | — | mA | |
| Forward Voltage | V _{LED+} | 19.6 | 21 | 23.8 | V | Note 1,2,3,4 |
| Backlight life time | — | — | 50000 | — | hr | |

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM

Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

DC CHARACTERISTICS

| 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 | |

Interface Timing

1. Parallel RGB in SYNC mode

1.1 Horizontal

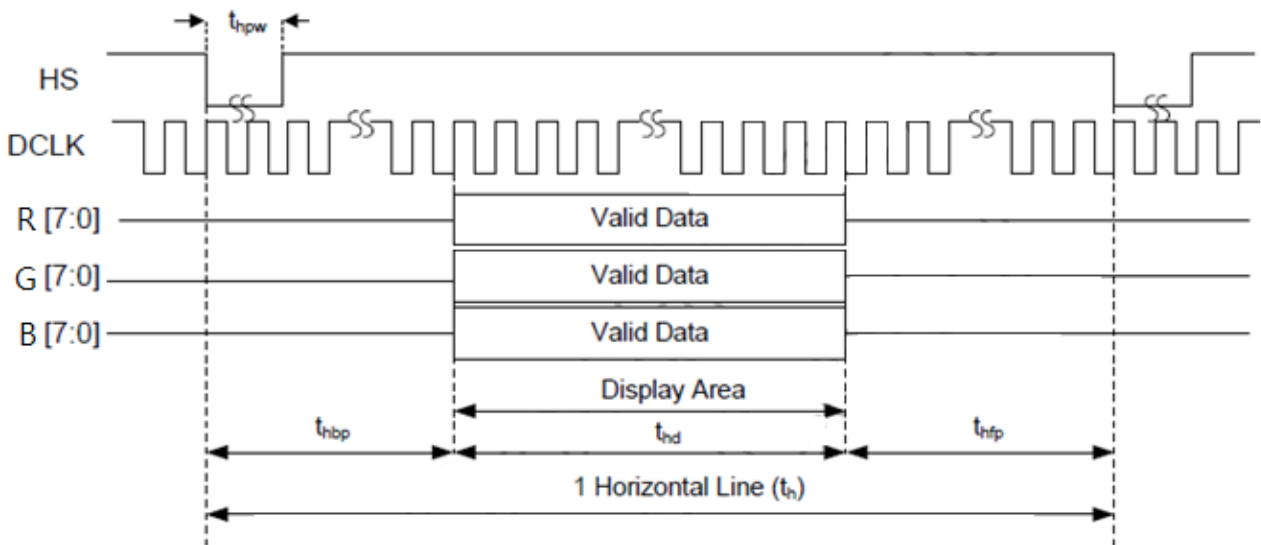


Figure 7.1: Horizontal input timing in Sync mode

1.2 Horizontal

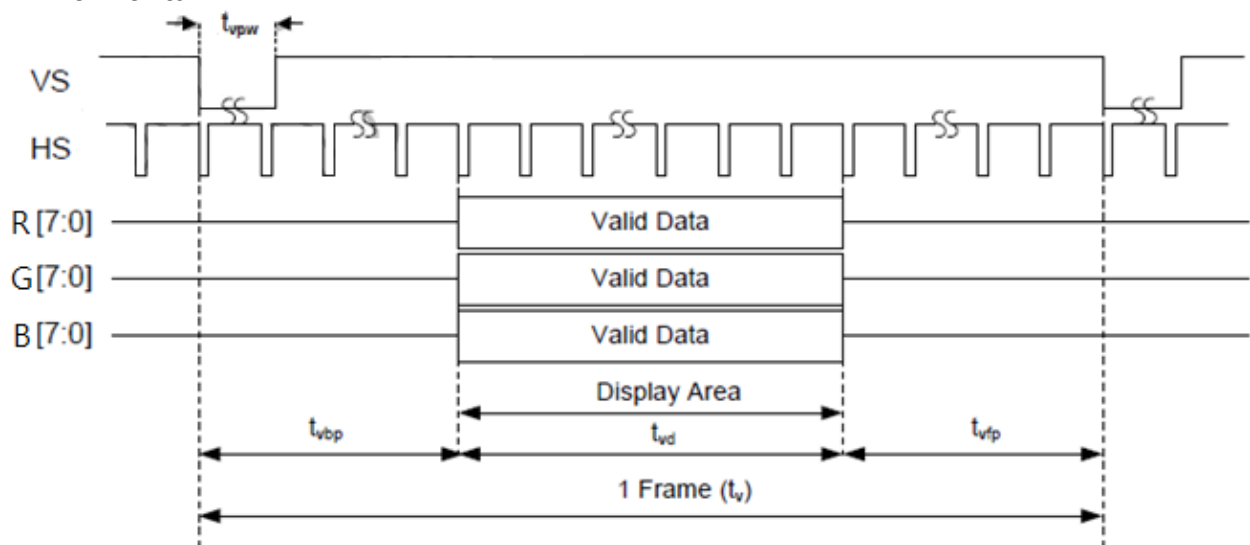


Figure 7.2: Vertical input timing in Sync mode



2. Parallel RGB input timing table

| Item | Symbol | Min | Typ | Max | Unit | |
|---------------|----------------|--------|------|-----|------|------|
| CLK frequency | Fclk | - | 9.05 | - | MHz | |
| DCLK Period | Tclk | - | 111 | - | ns | |
| HSYNC | Period Time | Th | 510 | 524 | 862 | DCLK |
| | Display Period | Thdisp | - | 480 | - | DCLK |
| | Back Porch | Thbp | 6 | 16 | 127 | DCLK |
| | Front Porch | Thfp | 24 | 28 | 255- | DCLK |
| | Pulse Width | Thw | 11 | 16 | 127 | DCLK |
| VSYNC | Period Time | Tv | 280 | 288 | 526 | H |
| | Display Period | Tvdisp | - | 272 | - | H |
| | Back Porch | Tvbp | 4 | 8 | 127 | H |
| | Front Porch | Tvfp | 4 | 8 | 127 | H |
| | Pulse Width | Tvw | 1 | 3 | 20 | H |

Optical Characteristics

| Item | Symbol | Condition. | Min | Typ. | Max. | Unit | Remark | |
|---|--------|-----------------------------------|------------|-------|-------|-------------------|-------------------|----------|
| Response time | Tr | $\theta=0^\circ$ 、 $\Phi=0^\circ$ | - | 10 | - | ms | Note 3 | |
| | Tf | | - | 15 | - | | | |
| Contrast ratio | CR | At optimized viewing angle | - | 500 | - | - | Note 4 | |
| Color Chromaticity | White | $\theta=0^\circ$ 、 $\Phi=0$ | Wx | 0.269 | 0.319 | 0.369 | - | Note 2,5 |
| | | | Wy | 0.273 | 0.323 | 0.373 | - | |
| Viewing angle (Gray Scale Inversion Direction) | Hor. | CR \geq 10 | Θ R | - | 65 | - | Deg. | Note 1 |
| | | | Θ L | - | 65 | - | | |
| | Ver. | | Φ T | - | 65 | - | | |
| | | | Φ B | - | 50 | - | | |
| Brightness | - | - | 900 | 1000 | - | cd/m ² | Center of display | |
| Uniformity | (U) | - | 75 | - | - | % | Note 5 | |

Ta=25±2°C, ILED=40mA

Note 1: Definition of viewing angle range



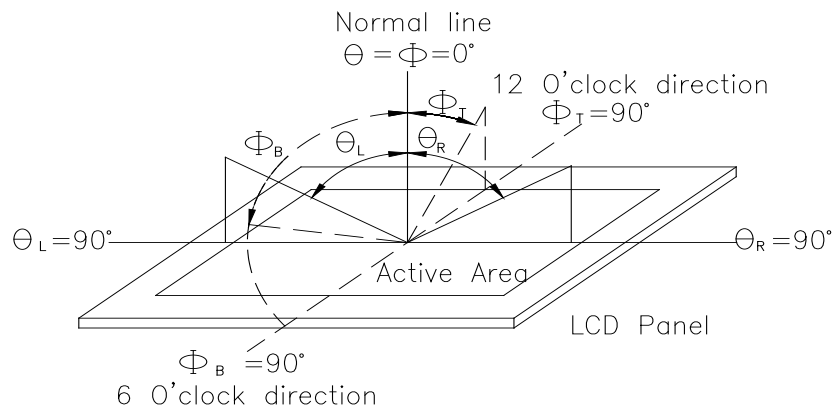


Fig. 11.1. Definition of viewing angle

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

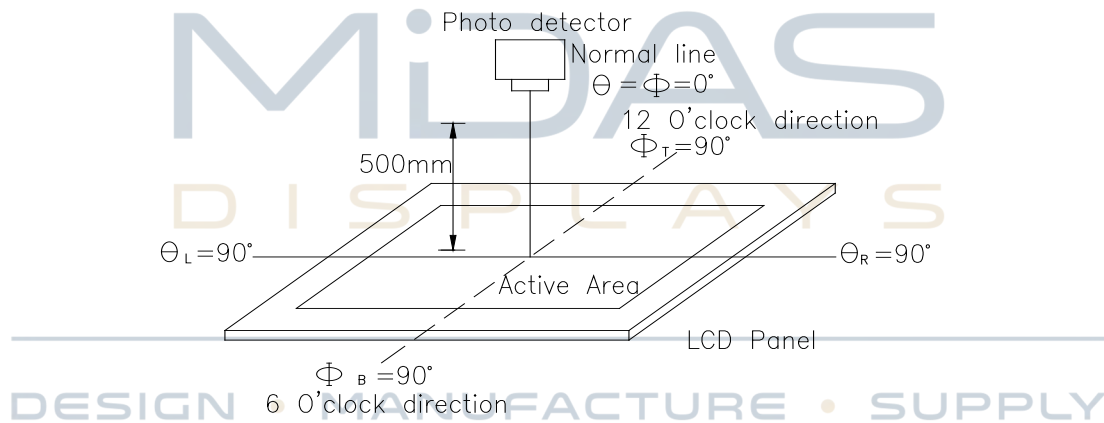
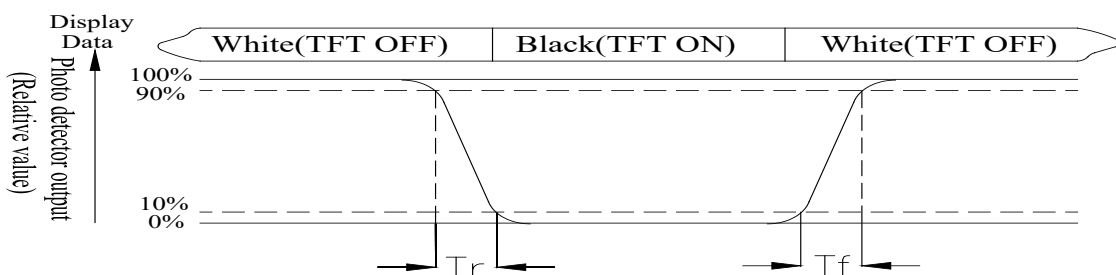


Fig. 11.2. Optical measurement system setup

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: 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.

$$\text{Luminance Uniformity (U)} = L_{\min}/L_{\max} \times 100\%$$

L = Active area length

W = Active area width

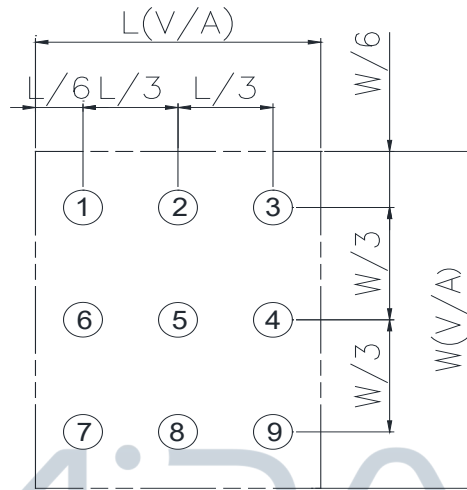


Fig11.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

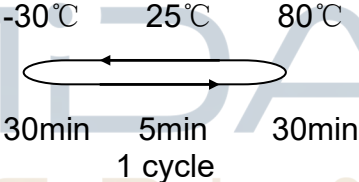
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

DESIGN • MANUFACTURE • SUPPLY



Reliability

Content of Reliability Test (Super Wide temperature, -30°C~80°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. | 90°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. | 80°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  | -30°C/80°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.

