**MODEL NO : TM043NDHG12**

**MODEL VERSION: 00**

**SPEC VERSION : V1.1**

**ISSUED DATE: 2016.02.05**

■**Preliminary Specification**
□**Final Product Specification**

**Customer :**

| Approved by | Notes |
|---|---|
| | |

**TIANMA Confirmed :**

| Prepared by | Checked by | Approved by |
|---|---|---|
| Lynn.Fu<br>2016.02.05 | Felix.Tan<br>2016.02.05 | **Feng.Qin**<br>2016.02.05 |



This technical specification is subjected to change without notice

# Table of Contents

# Record of Revision

| Rev | Issued Date | Description | Editor |
|---|---|---|---|
| 1.0 | 2016.01.21 | First version released | Lynn |
| 1.1 | 2016.02.05 | Update BLU forward current and voltage | Lynn |
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# 1 General Specifications

| Feature | | Spec |
|---|---|---|
| **Display Spec.** | Size | 4.3inch |
| | Resolution | 480(RGB)*272 |
| | Technology Type | a-Si TFT |
| | Pixel Configuration | R.G.B vertical Stripe |
| | Pixel pitch(mm) | 0.198×0.198 |
| | Display Mode | TN |
| | Surface Treatment | Ag |
| | Viewing Direction | 12 o'clock |
| | Gray Scale Inversion Direction | 6 o'clock |
| **Mechanical Characteristics** | LCM (W x H x D) (mm) | 105.5× 67.2× 2.9 (mm) |
| | Active Area(mm) | 95.04× 53.86 |
| | With /Without TSP | Without TSP |
| | Matching Connection Type | ZIF |
| | LED Numbers | 10pcs |
| | Weight (g) | TBD |
| **Electrical Characteristics** | Interface | RGB 24 bit |
| | Color Depth | 16.7M |
| | Driver IC | ST7282T2 |

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: Q/S0002

Note 3: LCM weight tolerance: ± 5%

## 2 Input/Output Terminals

| Pin No. | Symbol | I/O | Function | Remark |
|---|---|---|---|---|
| 1 | VLED- | P | Power for LED backlight(anode) | |
| 2 | VLED+ | P | Power for LED backlight(anode) | |
| 3 | GND | P | Power Ground | |
| 4 | VDD | P | POWER | |
| 5 | R0 | P | Data Bus | |
| 6 | R1 | I | Data Bus | |
| 7 | R2 | I | Data Bus | |
| 8 | R3 | I | Data Bus | |
| 9 | R4 | I | Data Bus | |
| 10 | R5 | I | Data Bus | |
| 11 | R6 | I | Data Bus | |
| 12 | R7 | I | Data Bus | |
| 13 | G0 | I | Data Bus | |
| 14 | G1 | I | Data Bus | |
| 15 | G2 | I | Data Bus | |
| 16 | G3 | I | Data Bus | |
| 17 | G4 | I | Data Bus | |
| 18 | G5 | I | Data Bus | |
| 19 | G6 | I | Data Bus | |
| 20 | G7 | I | Data Bus | |
| 21 | B0 | I | Data Bus | |
| 22 | B1 | I | Data Bus | |
| 23 | B2 | I | Data Bus | |
| 24 | B3 | I | Data Bus | |
| 25 | B4 | I | Data Bus | |
| 26 | B5 | I | Data Bus | |
| 27 | B6 | I | Data Bus | |
| 28 | B7 | I | Data Bus | |
| 29 | GND | I | Data Bus | |
| 30 | DCLK | I | Pixel clock signal in RGB mode | |

| | | | | |
|---|---|---|---|---|
| 31 | DISP | I | Data Bus | |
| 32 | HSYNC | I | Horizontal Sync input | |
| 33 | VSYNC | I | VERTICAL SYNC INPUT | |
| 34 | DE | I | Data enable signal in RGB mode | |
| 35 | NC | I | | |
| 36 | GND | P | Power Ground | |
| 37 | X_R | O | XR | |
| 38 | Y_B | O | YD | |
| 39 | X_L | O | XL | |
| 40 | Y_T | O | YU | |

Note1：Matched Connector:FH12A-40S-0.5SH

## 3 Absolute Maximum Ratings

GND=0V

| Item | Symbol | MIN | MAX | Unit | Remark |
|---|---|---|---|---|---|
| Power Voltage | VDD | -0.3 | 4,6 | V | Note1 |
| Input voltage | $V_{IN}$ | -0.3 | VDDI+0.3 | V | |
| Operating Temperature | Top | -20 | +80 | ℃ | |
| Storage Temperature | Tst | -30 | +80 | ℃ | |
| Relative Humidity Note2 | RH | -- | ≤95 | % | Ta≤40℃ |
| | | -- | ≤85 | % | 40℃＜Ta≤50℃ |
| | | -- | ≤55 | % | 50℃＜Ta≤60℃ |
| | | -- | ≤36 | % | 60℃＜Ta≤70℃ |
| | | -- | ≤24 | % | 70℃＜Ta≤80℃ |
| Absolute Humidity | AH | -- | ≤70 | g/m³ | Ta＞70℃ |

**Table 3 Absolute Maximum Ratings**

Note1: Input voltage include R0~R7, G0~G7, B0~B7, Dotclk, Hsync, Vsync, DE, X_R/X_L, Y_B/Y_T.(For your reference)

Note2: Ta means the ambient temperature.
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed.

# 4 Electrical Characteristics

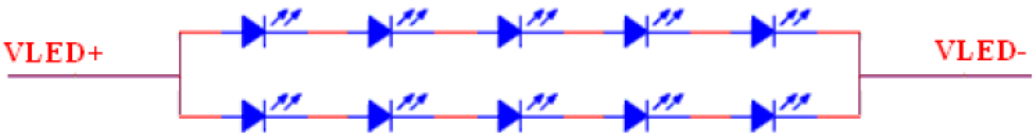
## 4.1 Driving TFT LCD Panel

| Item | | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Supply Voltage | | VDD | 3.0 | 3.3 | 3.6 | V | |
| NVW Supply Voltage | | VPP | 7.4 | 7.5 | 7.6 | V | |
| Input Signal Voltage | Low Level | $V_{IL}$ | DGND | — | 0.3×VDD | V | |
| | High Level | $V_{IH}$ | 0.7×VDD | — | VDD | V | |
| Output Signal Voltage | Low Level | $V_{OL}$ | DGND | — | DGND+0.4 | V | |
| | High Level | $V_{OH}$ | VDD-0.4 | — | VDD | V | |
| （Panel + LSI）Power Consumption | | Black Mode (60Hz) | | TBD | | | |
| | | Standby Mode | | TBD | | | |

## 4.2 Backlight Unit

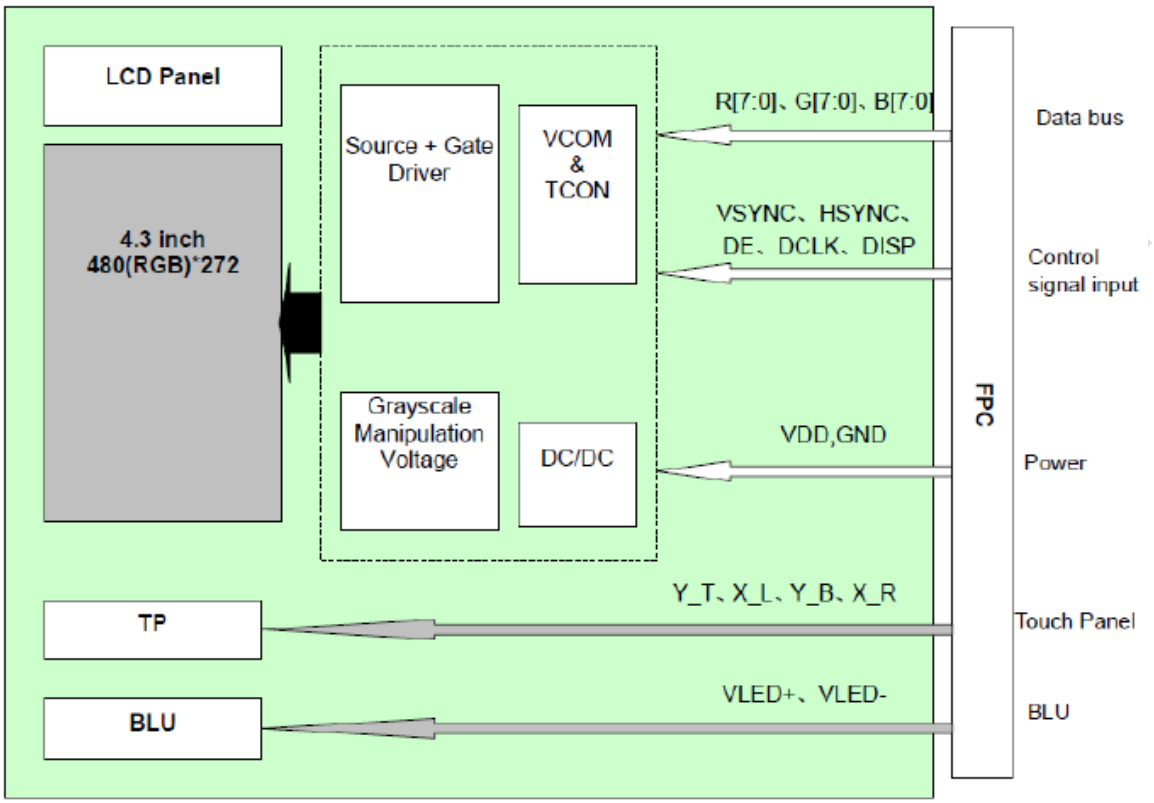
| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| Forward Current | $I_F$ | -- | 20 | | mA | 10 LEDs (2 LED Serial,5 LED Parallel) |
| Forward Current Voltage | $V_F$ | 13.85 | 14.35 | 14.85 | V | |
| Backlight Power Consumption | $W_{BL}$ | -- | 287 | — | mW | |
| LED life time | -- | -- | 50000 | - | Hrs | |

Note1: The LED driving condition is defied for each LED module (5 LED Serial,2 LED Parallel).
Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.
Note3: $I_F$ is defined for one channel LED. Optical performance should be evaluated at Ta=25℃ only 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.
Note4: The LED driving condition is defined for each LED module.



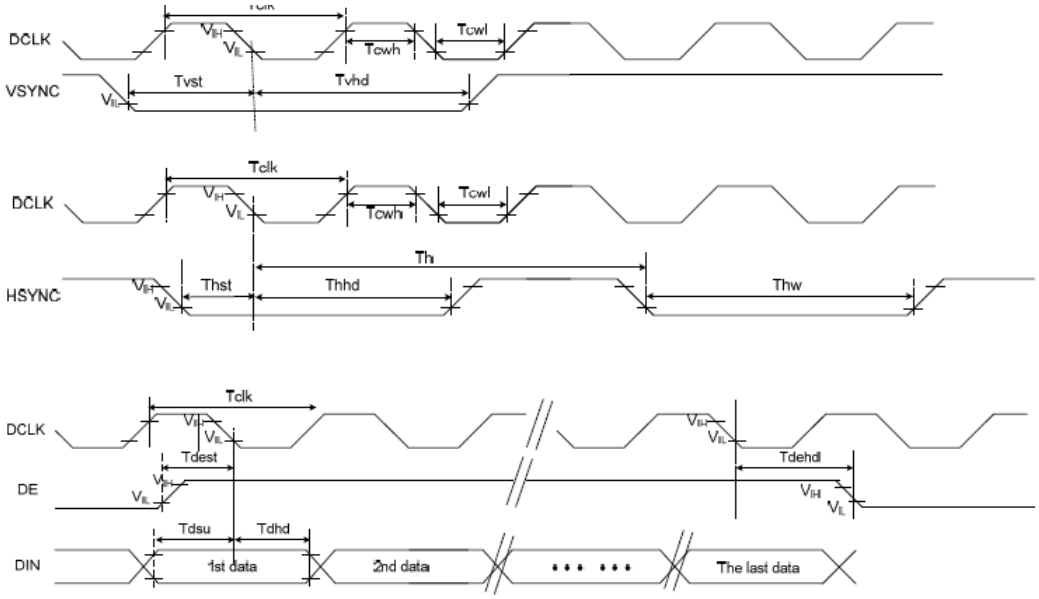
## 4.3 Block Diagram

**LCD Module diagram**

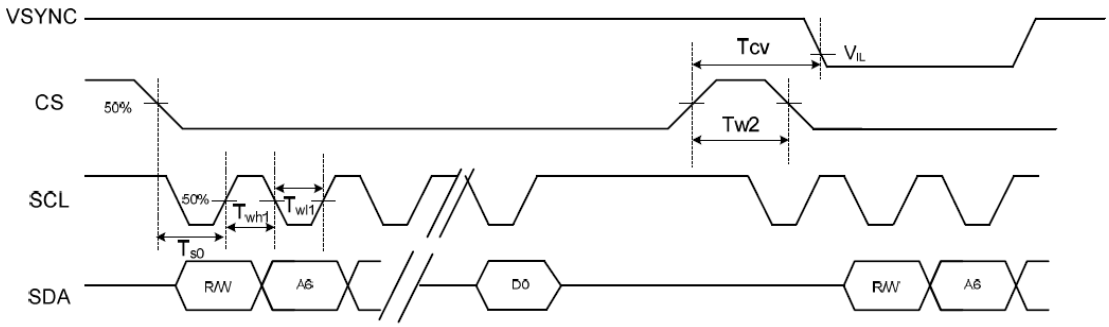


# 5 Timing Chart

## 5.1 Clock and Data Input Timing Diagram




## 5.2 3-Wire Communication Timing Diagram

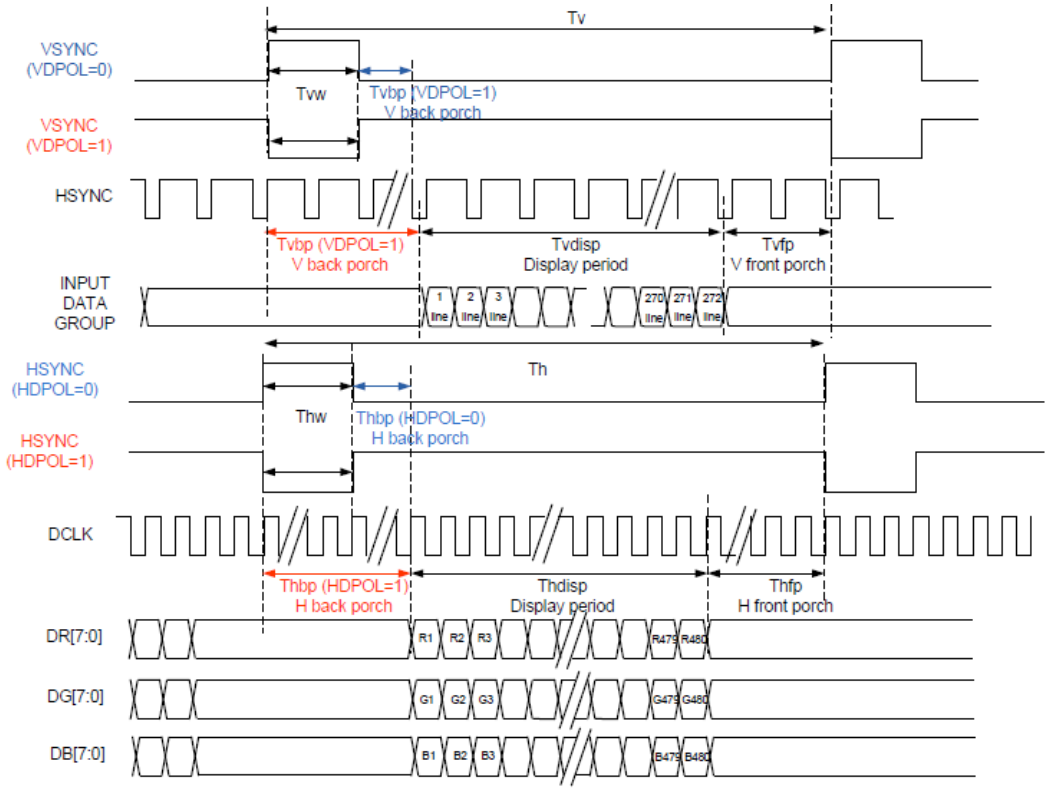


## 5.3 AC Characteristics

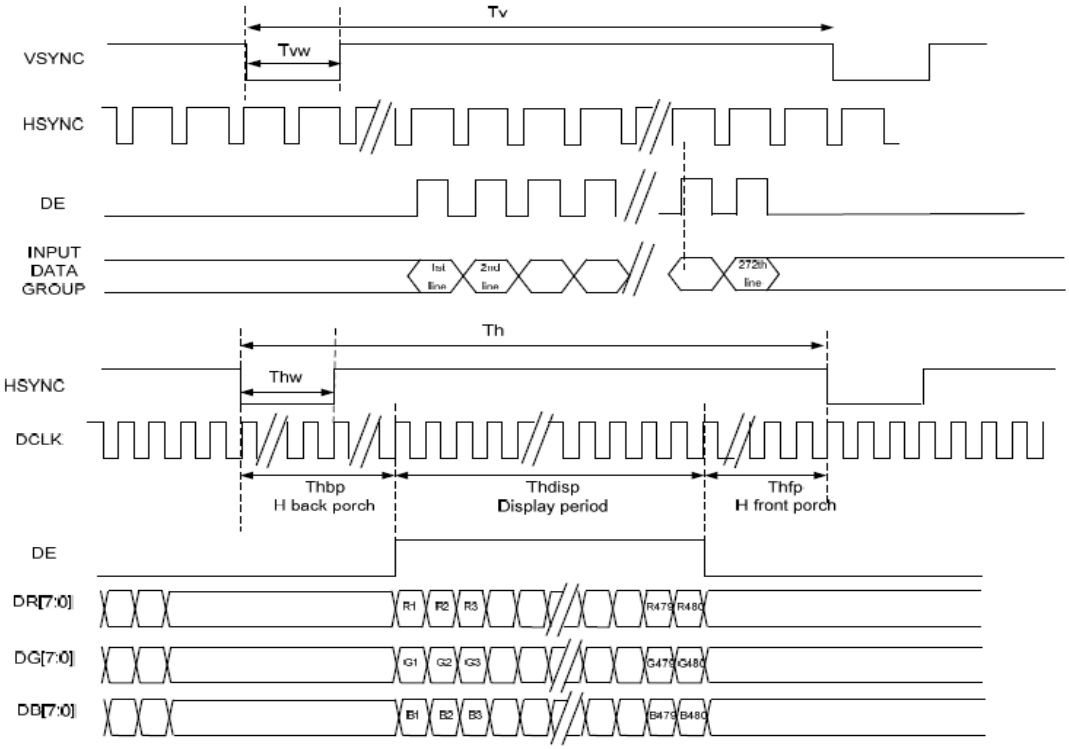
VDDI= 3.3V, VDD= 3.3V, AGND= 0V

| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| System operation timing | | | | | | |
| VDD power source slew time | TPOR | - | - | 20 | ms | From 0V to 99% VDD |
| GRB pulse width | tRSTW | 10 | 50 | - | us | R=10Kohm, C=1uF |
| Input/ Output timing | | | | | | |
| CLK pulse duty | Tcw | 40 | 50 | 60 | % | |
| Hsync width | Thw | 1 | - | - | DCLK | |
| Hsync period | Th | 55 | 60 | 65 | us | |
| Vsync setup time | Tvst | 12 | - | - | ns | |
| Vsync hold time | Tvhd | 12 | - | - | ns | |
| Hsync setup time | Thst | 12 | - | - | ns | |
| Hsync hold time | Thhd | 12 | - | - | ns | |
| Data setup time | Tdsu | 12 | - | - | ns | |
| Data hold time | Tdhd | 12 | - | - | ns | |
| DE setup time | Tdest | 10 | - | - | ns | |
| DE hold time | Tdehd | 10 | - | - | ns | |
| SD output stable time | Tst | - | - | 12 | us | Output settled within +20mV Loading = 6.8k+28.2pF. |
| GD output rise and fall time | Tgst | - | - | 6 | us | Output settled (5%~95%), Loading = 4.7k+29.8pF |
| 3-wire serial communication | | | | | | |
| Delay between CSB and Vsync | Tcv | 1 | | | us | |
| CS input setup time | Ts0 | 50 | | | ns | |
| Serial data input setup time | Ts1 | 50 | | | ns | |
| CS input hold time | Th0 | 50 | | | ns | |
| Serial data input hold time | Th1 | 50 | | | ns | |
| SCL pulse high width | Twh1 | 50 | | | ns | |
| SCL pulse low width | Twl1 | 50 | | | ns | |
| CS pulse high width | Tw2 | 400 | | | ns | |

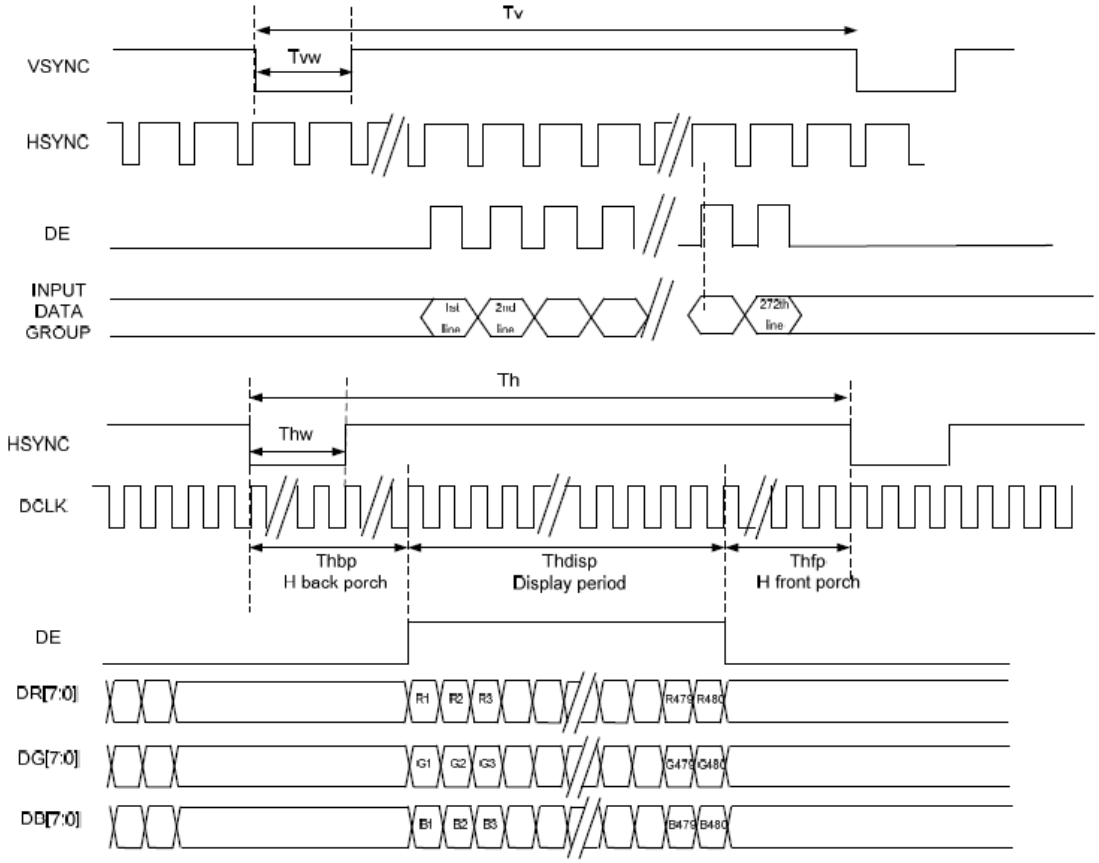
## 5.4 SYNC Mode Timing Diagram




## 5.5 SYNC-DE Mode Timing Diagram



## 5.6 DE Mode Timing Diagram



# 6 Optical Characteristics

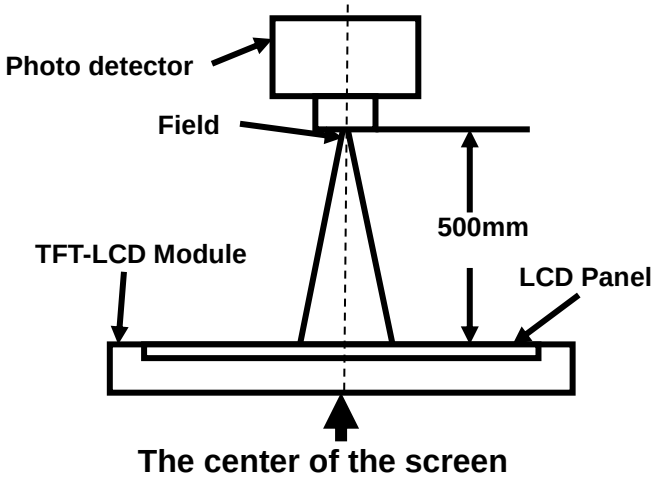
| Item | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| **View Angles** | | θT | CR≧10 | 40 | 50 | | Degree | Note2,3 |
| | | θB | | 60 | 70 | | | |
| | | θL | | 60 | 70 | | | |
| | | θR | | 60 | 70 | | | |
| **Contrast Ratio** | | CR | θ=0° | 400 | 500 | | | Note 3 |
| **Response Time** | | $T_{ON}$ | 25℃ | | 20 | 30 | ms | Note 4 |
| | | $T_{OFF}$ | | | | | | |
| **Chromaticity** | **White** | x | Backlight is on | 0.260 | 0.310 | 0.360 | | Note 1,5 |
| | | y | | 0.280 | 0.330 | 0.380 | | |
| | **Red** | x | | 0.540 | 0.590 | 0.640 | | Note 1,5 |
| | | y | | 0.307 | 0.357 | 0.407 | | |
| | **Green** | x | | 0.295 | 0.345 | 0.395 | | Note 1,5 |
| | | y | | 0.539 | 0.589 | 0.639 | | |
| | **Blue** | x | | 0.100 | 0.15 | 0.200 | | Note 1,5 |
| | | y | | 0.045 | 0.095 | 0.145 | | |
| **Uniformity** | | U | | 75 | 80 | | % | Note 6 |
| **NTSC** | | | | 45 | 50 | | % | Note 5 |
| **Luminance** | | L | | 250 | 270 | | $cd/m^2$ | Note 7 |

Test Conditions:

1. $I_F$= **16** mA(total), and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

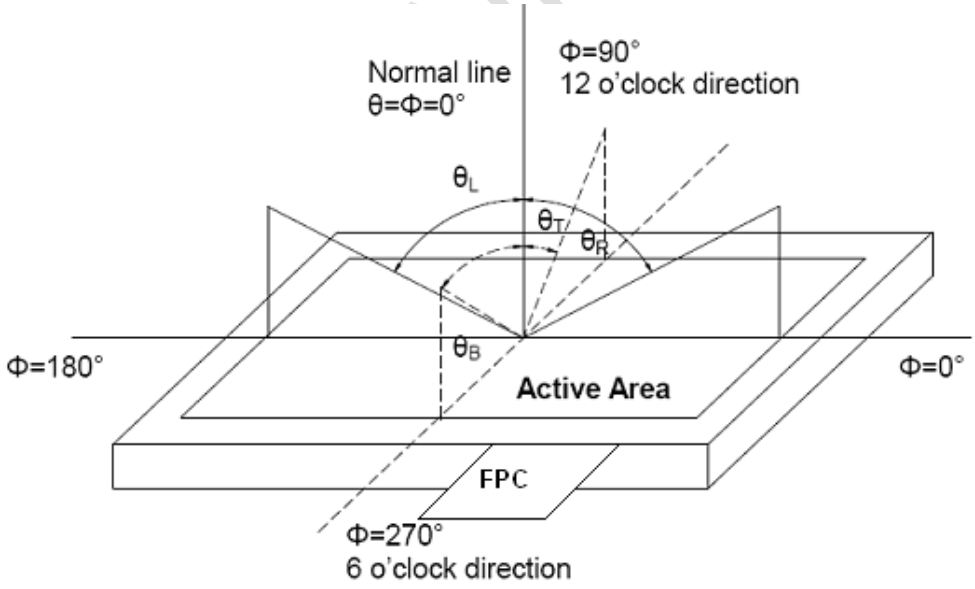
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.




| Item | Photo detector | Field |
|---|---|---|
| Contrast Ratio | SR-3A | 1° |
| Luminance | | |
| Chromaticity | | |
| Lum Uniformity | | |
| Response Time | BM-7A | 2° |

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。




Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

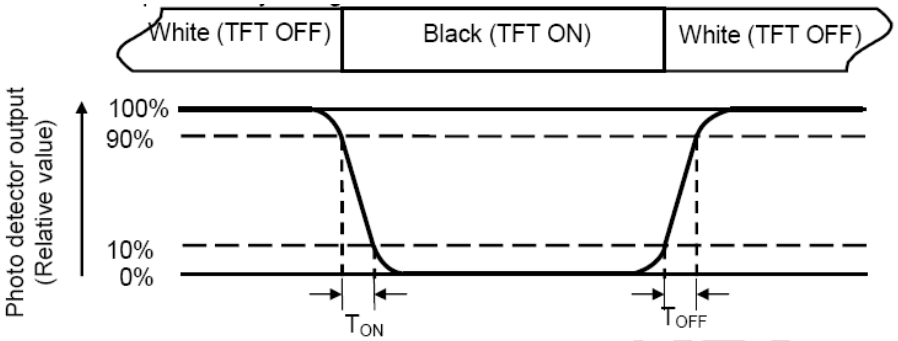
"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ($T_{ON}$) is the time between photo detector output intensity changed from 90% to 10%. And fall time ($T_{OFF}$) is the time between photo detector output intensity changed from 10% to 90%.




Note 5: Definition of color chromaticity (CIE1931)

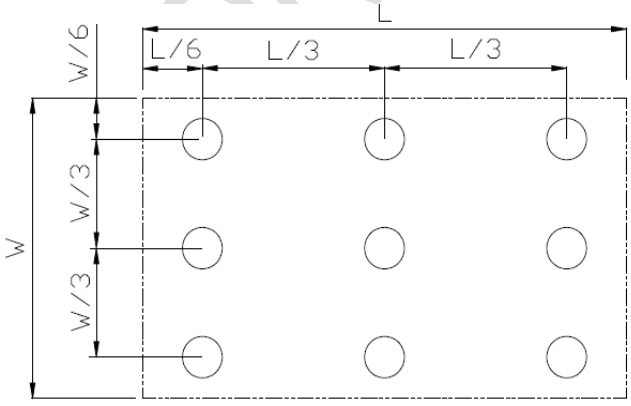
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-------Active area length W----- Active area width




Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

# 7 Environmental / Reliability Test

| No | Test Item | Condition | Remarks |
|---|---|---|---|
| 1 | High Temperature Operation | Ts = +80℃, 240 hours (Note1) | IEC60068-2-1:2007<br>GB2423.2-2008 |
| 2 | Low Temperature Operation | Ta = -20℃, 240 hours (Note2) | IEC60068-2-1:2007<br>GB2423.1-2008 |
| 3 | High Temperature Storage | Ta = +80℃, 240 hours | IEC60068-2-1:2007<br>GB2423.2-2008 |
| 4 | Low Temperature Storage | Ta = -30℃, 240 hours | IEC60068-2-1:2007<br>GB2423.1-2008 |
| 5 | Storage at High Temperature and Humidity | Ta = +60℃, 90% RH max, 240hours | IEC60068-2-78 :2001<br>GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -30℃ 30 min ~ +80℃ 30 min,<br>Change time:5min, 20 Cycle | Start with cold temperature,<br>End with high temperature,<br>IEC60068-2-14:1984,GB2423.22-2002 |
| 7 | ESD | C=150pF, R=330Ω, 5point/panel<br>Air: ±8Kv, 5times;<br>Contact: ±4Kv, 5times<br>(Environment: 15℃~35℃, 30%~60%. 86Kpa~106Kpa) | IEC61000-4-2:2001<br>GB/T17626.2-2006 |
| 8 | Vibration Test | Frequency range: 10~55Hz<br>Stroke: 1.5mm<br>Sweep: 10Hz~55Hz~10Hz<br>2 hours for each direction of X.Y.Z.<br>(6 hours for total) | IEC60068-2-6:1982<br>GB/T2423.10—1995 |
| 9 | Mechanical Shock (Non OP) | 60G 6ms, ±X, ±Y, ±Z<br>3times for each direction | IEC60068-2-27:1987<br>GB/T2423.5—1995 |
| 10 | Package Drop Test | Height: 80cm,<br>1corner, 3edges, 6surfaces | IEC60068-2-32:1990<br>GB/T2423.8—1995 |

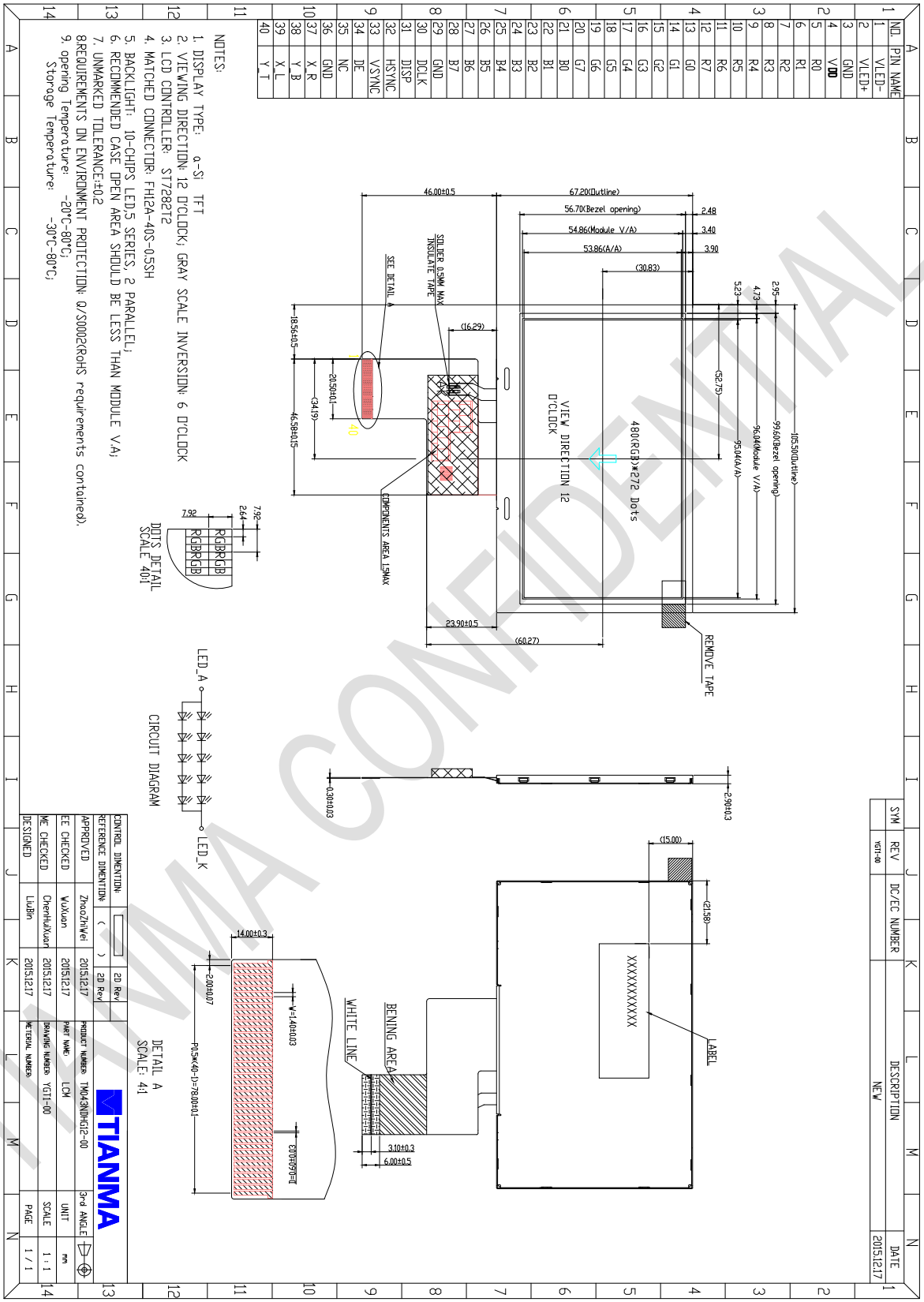
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

# 8 Mechanical Drawing



# 9 Packing Drawing

**Per Carton**

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark |
|---|---|---|---|---|---|---|
| 1 | LCM module | TM043NDHG12-00 | 105.5X67.2X2.9 | TBD | 112 | |
| 2 | Partition_1 | Corrugated Paper | 513x333x106 | 0.7 | 2 | |
| 3 | Anti-Static Bag | PE | 175.8X125X0.05 | 0.0007 | 112 | Anti-static |
| 4 | Dust-Proof Bag | PE | 700X545 | 0.06 | 1 | |
| 5 | Partition_2 | Corrugated Paper | 505×332x4 | 0.09 | 3 | |
| 6 | Corrugated Bar | Corrugated Paper | 513x117x3 | 0.04 | 8 | |
| 7 | Carton | Corrugated Paper | 530X350X250 | 0.726 | 1 | |
| 8 | Total weight | TBD ±5% | | | | |

TBD

# 10 Precautions for Use of LCD Modules

10.5 Handling Precautions

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

10.5.2 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.

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

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

10.5.5 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

10.5.6 Do not attempt to disassemble the LCD Module.

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

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

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

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

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

10.1.8.4 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.

10.6 Storage precautions

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

10.6.2 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%

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

10.7 Transportation Precautions

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