

MODEL NO. : TM043NBH02ISSUED DATE: 2010-9-30VERSION : Ver 1.2

☒ Preliminary Specification
☐ Final Product Specification

Customer : _____

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

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Table of Contents

| | |
|---|----|
| Table of Contents..... | 2 |
| Record of Revision | 3 |
| 1 General Specifications | 4 |
| 2 Input/Output Terminals..... | 5 |
| 3 Absolute Maximum Ratings | 7 |
| 4 Electrical Characteristics | 8 |
| 5 Timing Chart | 10 |
| 6 Optical Characteristics..... | 15 |
| 7 Environmental / Reliability Tests | 18 |
| 8 Mechanical Drawing | 19 |
| 9 Packing Drawing..... | 20 |
| 10 Precautions for Use of LCD Modules | 21 |

Record of Revision

[illegible]



1 General Specifications

| Feature | | Spec |
|----------------------------|--------------------------------|-----------------------|
| Display Spec. | Size | 4.3 inch |
| | Resolution | 480(RGB)x272 |
| | Interface | RGB 24 bits |
| | Color Depth | 16.7M |
| | Technology Type | a-Si |
| | Pixel Configuration | R.G.B Vertical Stripe |
| | Display Mode | TN,NW |
| | Surface Treatment | AG |
| | Viewing Direction | 6 o'clock |
| | Gray Scale Inversion Direction | 12 o'clock |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 105.50x67.20x4.10 |
| | Active Area(mm) | 95.04x53.856 |
| | With /Without TSP | With TSP |
| | Weight (g) | TBD |
| | LED Numbers | 10 LEDs |

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: $\pm 5\%$



2 Input/Output Terminals

2.1 TFT LCD Panel

| No | Symbol | I/O | Description | Comment |
|----|--------|-----|--|---------|
| 1 | VLED- | P | Back light cathode | |
| 2 | VLED+ | P | Back light anode | |
| 3 | GND | P | Ground | |
| 4 | VDD | P | Power supply | |
| 5 | R0 | I | Data input | |
| 6 | R1 | I | Data input | |
| 7 | R2 | I | Data input | |
| 8 | R3 | I | Data input | |
| 9 | R4 | I | Data input | |
| 10 | R5 | I | Data input | |
| 11 | R6 | I | Data input | |
| 12 | R7 | I | Data input | |
| 13 | G0 | I | Data input | |
| 14 | G1 | I | Data input | |
| 15 | G2 | I | Data input | |
| 16 | G3 | I | Data input | |
| 17 | G4 | I | Data input | |
| 18 | G5 | I | Data input | |
| 19 | G6 | I | Data input | |
| 20 | G7 | I | Data input | |
| 21 | B0 | I | Data input | |
| 22 | B1 | I | Data input | |
| 23 | B2 | I | Data input | |
| 24 | B3 | I | Data input | |
| 25 | B4 | I | Data input | |
| 26 | B5 | I | Data input | |
| 27 | B6 | I | Data input | |
| 28 | B7 | I | Data input | |
| 29 | GND | P | Ground | |
| 30 | DCLK | I | Clock for input data. Data latched at rising edge of this signal. | |
| 31 | DISP | I | Standby mode. DISP =“1”: Normally operation. DISP =“0”: Standby mode. | |
| 32 | HSYNC | I | Horizontal sync input with negative polarity. If unused, please pull high level. | |



| | | | | |
|----|-------|---|--|--|
| 33 | VSYNC | I | Vertical sync input with negative polarity. If unused, please pull high level. | |
| 34 | DE | I | Data input enable. If unused, please pull low level. | |
| 35 | NC | — | No connection | |
| 36 | GND | P | Ground. | |
| 37 | X_R | O | XR | |
| 38 | Y_B | O | YD | |
| 39 | X_L | O | XL | |
| 40 | Y_T | O | YU | |

Note 1: I——Input, O——Output, P——Power/Ground



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta =25℃

| Item | Symbol | MIN | MAX | Unit | Remark |
|----------------------------|------------------|------|-----|------|--------------|
| Supply Voltage | VDD | -0.3 | 4.0 | V | |
| Back Light Forward Current | I _{LED} | | 25 | mA | For each LED |
| Operating Temperature | T _{OPR} | -20 | 60 | ℃ | |
| Storage Temperature | T _{STG} | -30 | 70 | ℃ | |



4 Electrical Characteristics

4.1 Driving TFT LCD Panel

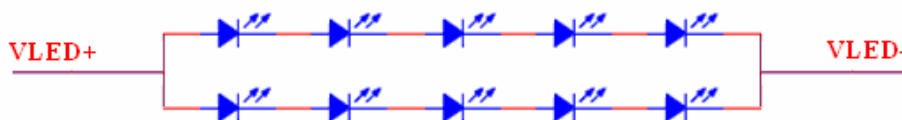
GND=0V, Ta=25°C

| Item | | Symbol | MIN | TYP | MAX | Unit | Remark |
|----------------------------------|------------|----------------------|------------------|-----|------------------|------|--------|
| Supply Voltage | | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input Signal Voltage | Low Level | V_{IL} | 0 | — | $0.3 \times VDD$ | V | |
| | High Level | V_{IH} | $0.7 \times VDD$ | — | VDD | V | |
| Output Signal Voltage | Low Level | V_{OL} | — | — | $0.3 \times VDD$ | V | |
| | High Level | V_{OH} | $0.7 \times VDD$ | — | VDD | V | |
| (Panel+LSI) Power Consumption | | Black Mode (60Hz) | | TBD | | mW | |
| | | Standby Mode | | TBD | | mW | |

4.2 Backlight Unit

Ta=25°C

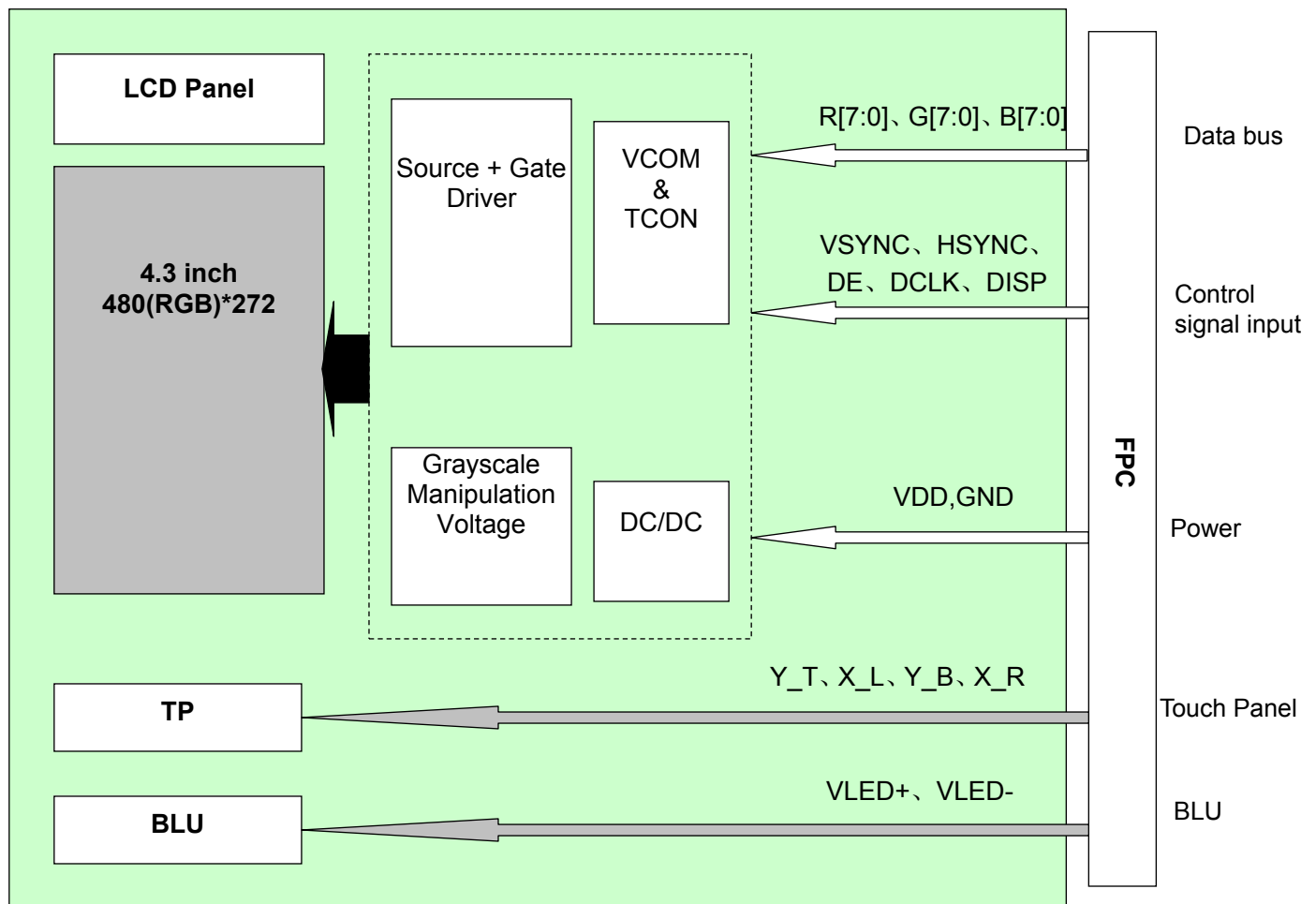
| Item | Symbol | MIN | TYP | MAX | Unit | Remark |
|-----------------------------|----------|-----|-----|-----|------|----------------|
| Forward Current | I_F | -- | 20 | 25 | mA | For each LED |
| Forward Current Voltage | V_F | -- | 3.2 | — | V | For each LED |
| Backlight Power Consumption | W_{BL} | -- | 640 | — | mW | For total LEDs |





4.3 Block Diagram

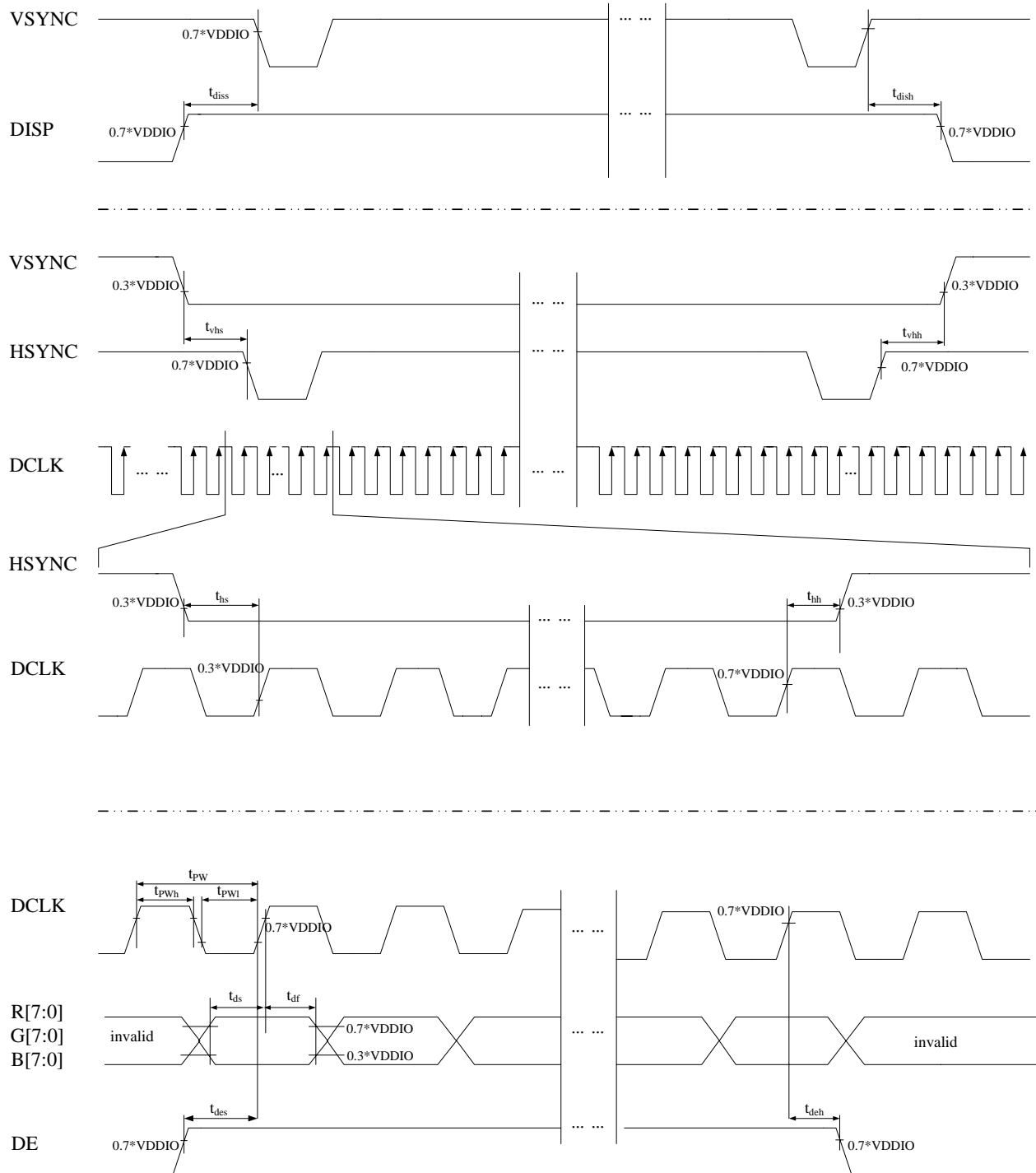
LCD module diagram





5 Timing Chart

5.1 Input Setup Timing





5.2 Input Setup Timing Parameter Setting

VDD=3.3V Ta=25°C

| Parameter | Symb ol | Min | Typ | Max | Unit | Remark |
|-----------------------|------------|------|-----|-----|------|--------|
| DCLK Cycle Time | T_{pw} | 66.7 | - | - | ns | |
| DCLK Pulse High Width | T_{pwh} | 26.7 | - | - | ns | |
| DCLK Pulse Low Width | T_{pwl} | 26.7 | - | - | ns | |
| DE Setup Time | T_{des} | 10 | - | - | ns | |
| DE Hold Time | T_{deh} | 10 | - | - | ns | |
| HSYNC Setup Time | T_{hs} | 10 | - | - | ns | |
| HSYNC Hold Time | T_{hh} | 10 | - | - | ns | |
| VSYNC Setup Time | T_{vhs} | 10 | - | - | ns | |
| VSYNC Hold Time | T_{vhh} | 10 | - | - | ns | |
| Data Setup Time | T_{ds} | 10 | - | - | ns | |
| Data Hold Time | T_{dh} | 10 | - | - | ns | |
| DISP Setup Time | T_{diss} | 10 | - | - | us | |
| DISP Hold Time | T_{dish} | 10 | - | - | ms | |

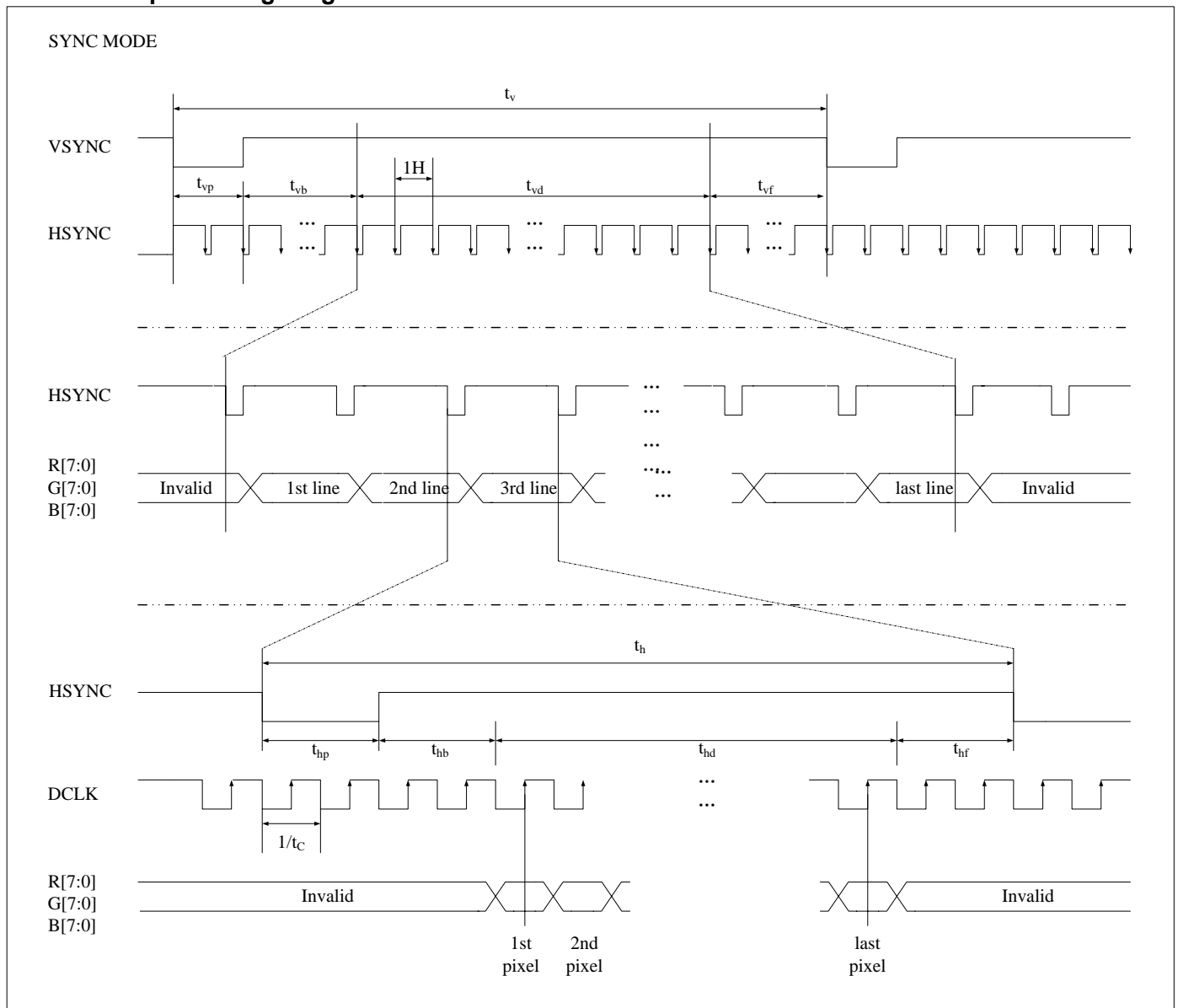
Note 1: $t_r=t_f=2ns$. t_r , t_f is defined 10% to 90% of signal amplitude.

Note 2: For parallel interface, maximum clock frequency is 15MHz.



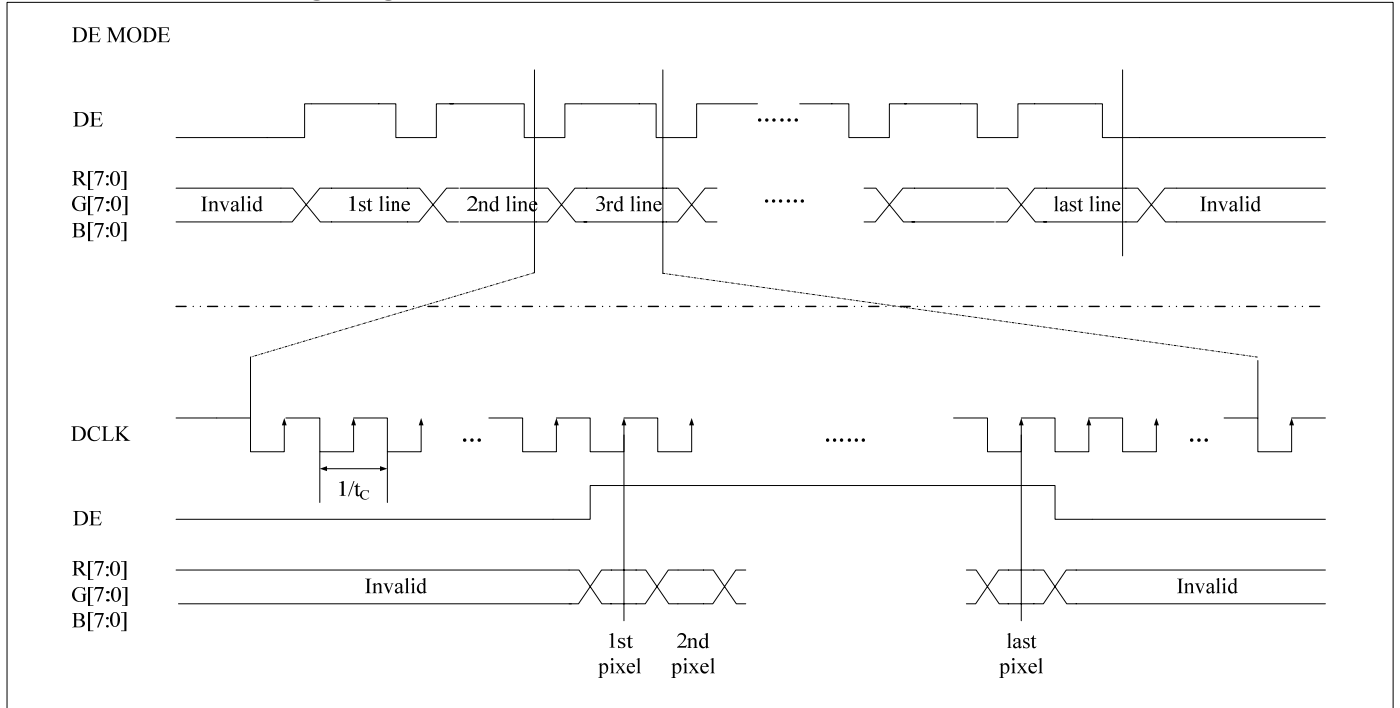
5.3 Data Input Format

5.3.1 Data Input Timing Diagram under SYNC Mode





5.3.2 Data Input Timing Diagram under DE Mode



5.4 Data Input Timing Parameter Setting

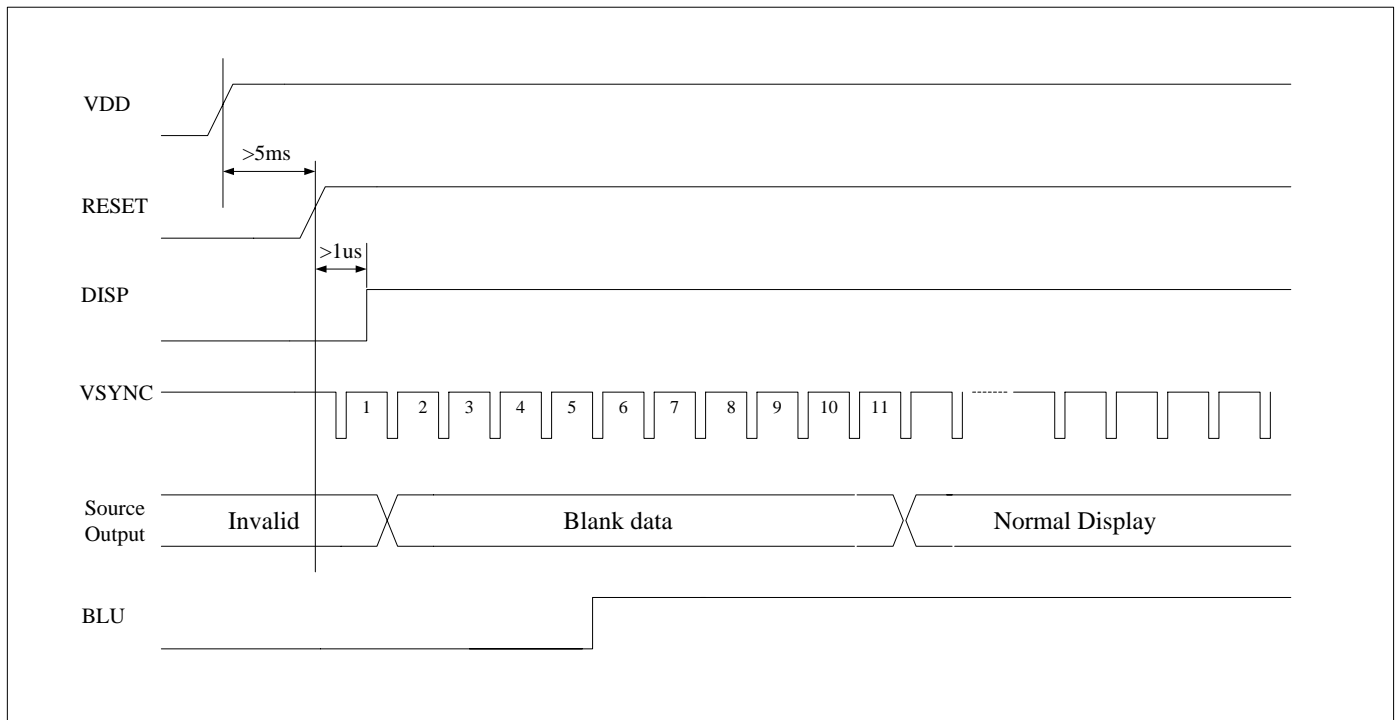
| Parameter | Symbol | Spec. | | | Unit |
|---------------------------|-----------|-------|-------|------|-------|
| | | Min. | Typ. | Max. | |
| DCLK frequency | f_{clk} | - | 9 | 15 | MHZ |
| HSYNC frequency | $1/t_h$ | - | 17.14 | - | KHz |
| VSNC frequency | $1/t_v$ | - | 59.94 | - | Hz |
| Horizontal cycle | t_h | 525 | 525 | 605 | DCLK |
| Horizontal display period | t_{hd} | 480 | | | DCLK |
| Horizontal pulse width | t_{hp} | 2 | 41 | 41 | DCLK |
| Horizontal back porch | t_{hb} | 2 | 2 | 41 | DCLK |
| Horizontal front porch | t_{hf} | 2 | 2 | 82 | DCLK |
| Vertical cycle | t_v | 285 | 286 | 399 | HSYNC |
| Vertical display period | t_{vd} | 272 | | | HSYNC |
| Vertical pulse width | t_{vp} | 1 | 10 | 11 | HSYNC |
| Vertical back porch | t_{vb} | 1 | 2 | 11 | HSYNC |
| Vertical front porch | t_{vf} | 1 | 2 | 227 | HSYNC |

Note 1: Unit: CLK= $1/f_{CLK}$, H= t_h ,

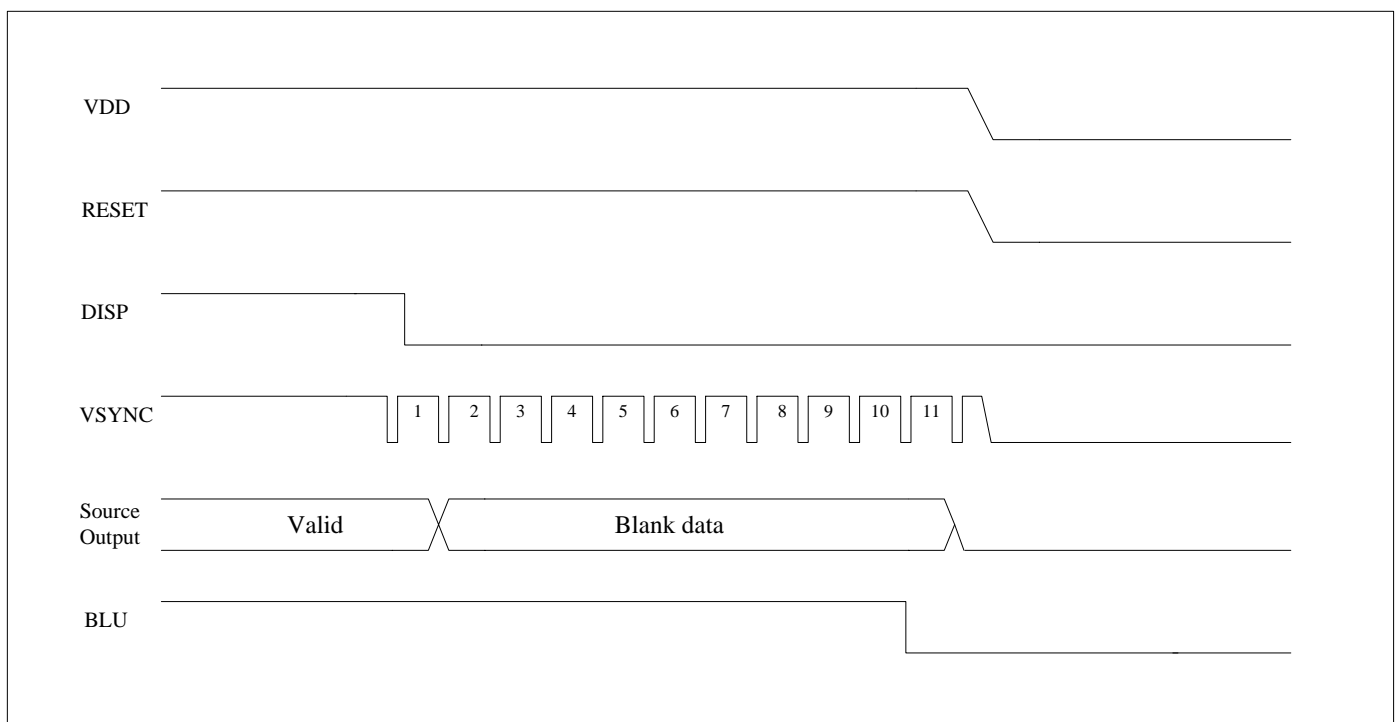
Note 2: It is necessary to keep $t_{vp}+t_{vb}=12$ and $t_{hp}+t_{hb}=43$ in sync mode. DE mode is unnecessary to keep it.



5.5 Power ON Sequence



5.6 Power Off Sequence





6 Optical Characteristics

Ta=25°C

| Item | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|----------------|-------|------------------|-----------------|-------|-------|-------|-------------------|----------|
| View Angles | | θT | CR≧10 | 60 | 70 | - | Degree | Note2,3 |
| | | θB | | 40 | 50 | - | | |
| | | θL | | 60 | 70 | - | | |
| | | θR | | 60 | 70 | - | | |
| Contrast Ratio | | CR | θ=0° | 400 | 450 | - | | Note 3 |
| Response Time | | T _{ON} | 25℃ | - | 20 | 30 | ms | Note 4 |
| | | T _{OFF} | | | | | | |
| Chromaticity | White | x | Backlight is on | 0.265 | 0.315 | 0.365 | | Note 1,5 |
| | | y | | 0.278 | 0.328 | 0.378 | | |
| | Red | x | | 0.540 | 0.590 | 0.640 | | Note 1,5 |
| | | y | | 0.300 | 0.350 | 0.400 | | |
| | Green | x | | 0.290 | 0.340 | 0.390 | | Note 1,5 |
| | | y | | 0.500 | 0.550 | 0.600 | | |
| | Blue | x | | 0.094 | 0.144 | 0.194 | | Note 1,5 |
| | | y | | 0.050 | 0.100 | 0.150 | | |
| Uniformity | | U | | | 75 | - | % | Note 6 |
| NTSC | | | | - | 50 | - | % | Note 5 |
| Luminance | | L | | 230 | 280 | - | cd/m ² | Note 7 |

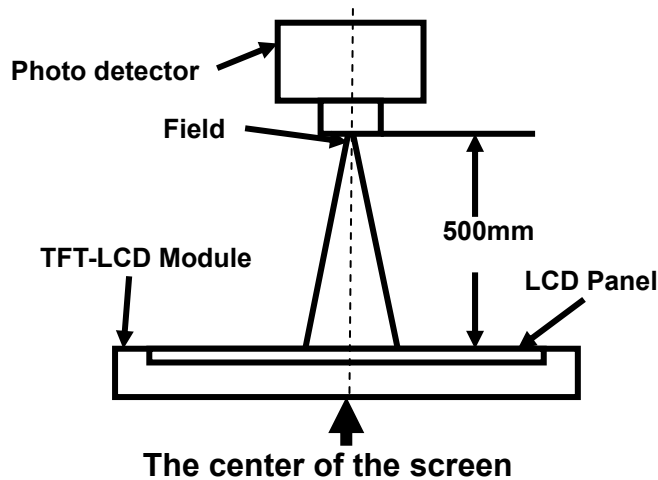
Test Conditions:

1. $I_F = 22$ mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

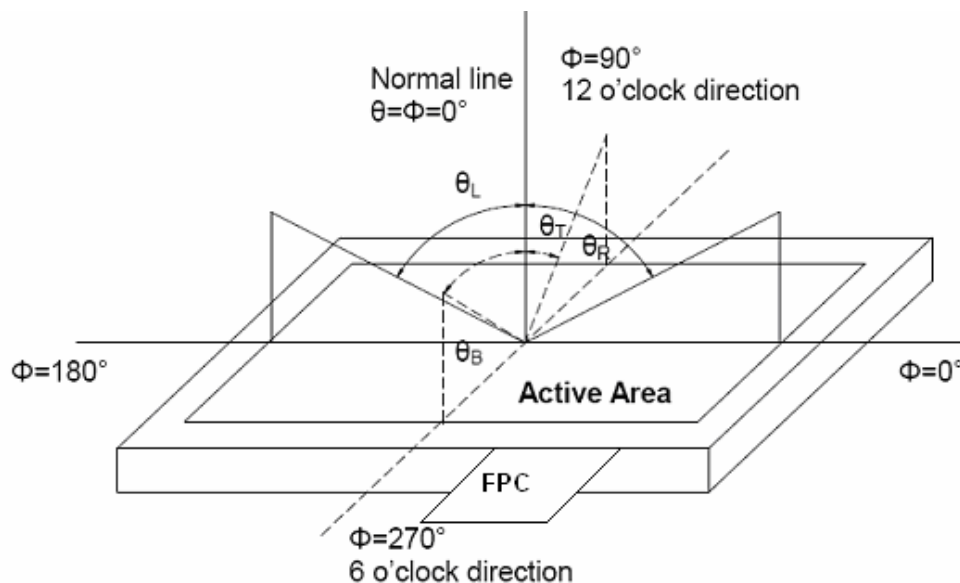
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



| 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 V_{white} .

“Black state”: The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

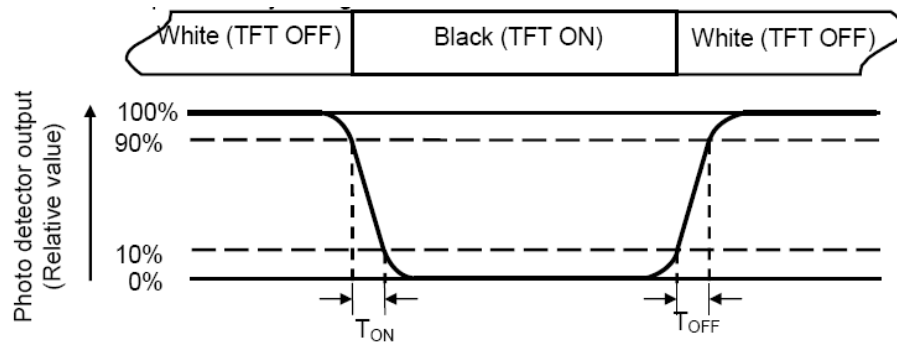
Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and

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"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)

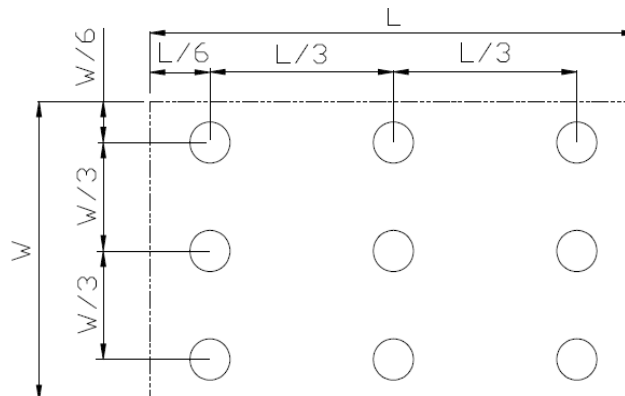
Color coordinates measured at center point of LCD.

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.

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

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



L_{\max} : The measured Maximum luminance of all measurement position.

L_{\min} : 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 Tests**

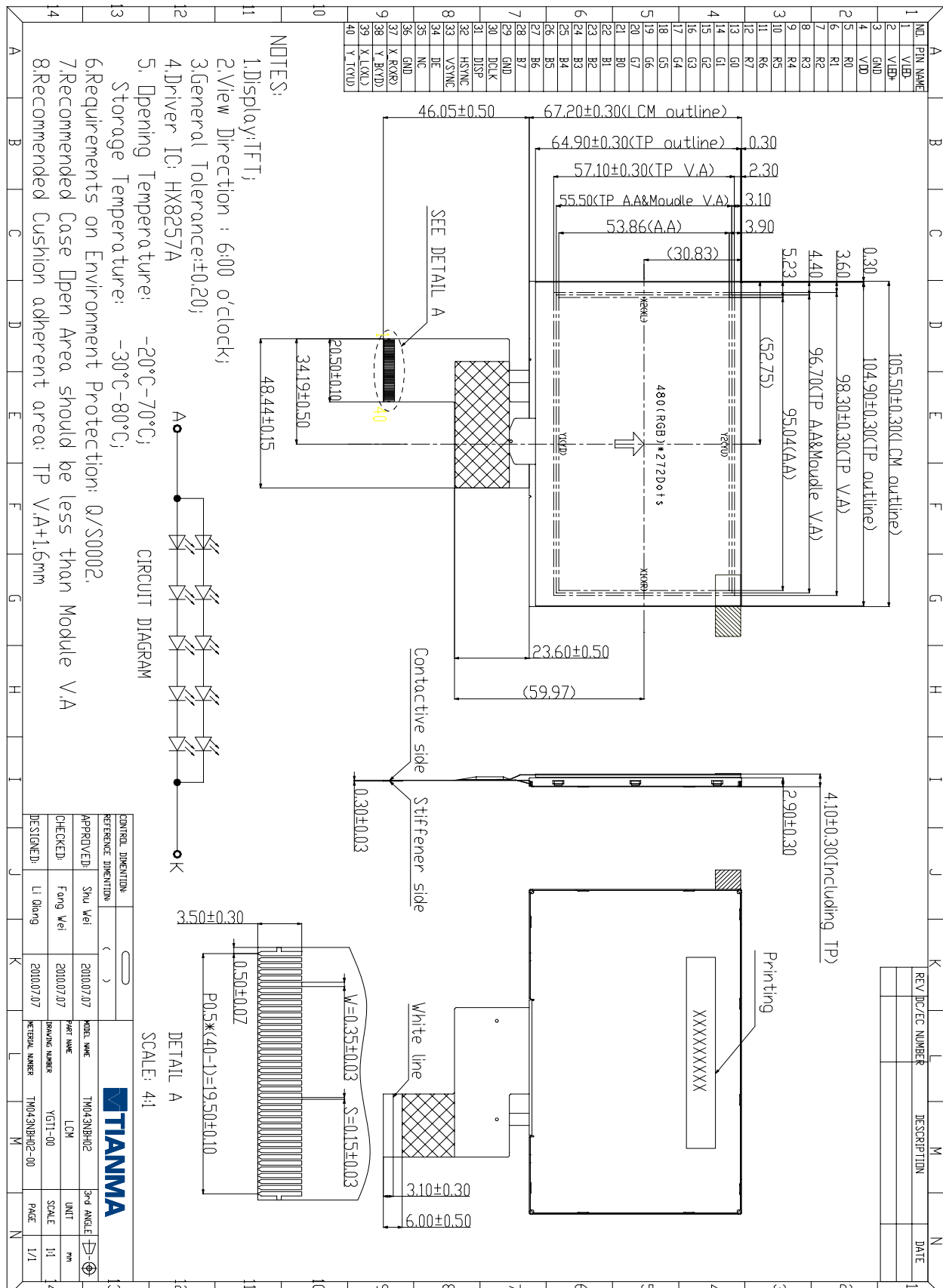
| No | Test Item | Condition | Remarks |
|----|--|---|---|
| 1 | High Temperature Operation | Ts=+60℃, 240hrs | Note1 IEC60068-2-1,GB2423.2 |
| 2 | Low Temperature Operation | Ta=-20℃, 240hrs | IEC60068-2-1 GB2423.1 |
| 3 | High Temperature Storage | Ta=+70℃, 240hrs | IEC60068-2-1 GB2423.2 |
| 4 | Low Temperature Storage | Ta=-30℃, 240hrs | IEC60068-2-1 GB2423.1 |
| 5 | High Temperature & High Humidity Storage | Ta=+60℃, 90% RH 240 hours | Note2 IEC60068-2-78 GB/T2423.3 |
| 6 | Thermal Shock (Non-operation) | -30℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycles | Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22 |
| 7 | Electro Static Discharge (Operation) | C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; (Environment: 15℃~35℃, 30%~60%, 86Kpa~106Kpa) | IEC61000-4-2 GB/T17626.2 |
| 8 | Vibration (Non-operation) | Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)(Package condition) | IEC60068-2-6 GB/T2423.10 |
| 9 | Shock (Non-operation) | 60G 6ms, ±X,±Y,±Z 3times, for each direction | IEC60068-2-27 GB/T2423.5 |
| 10 | Package Drop Test | Height:80 cm, 1 corner, 3 edges, 6 surfaces | IEC60068-2-32 GB/T2423.8 |
| 11 | Package Vibration Test | Random Vibration: 0.015GxG/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total) | IEC60068-2-34 GB/T2423.11 |

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

Note2: Ta is the ambient temperature of sample.



8 Mechanical Drawing

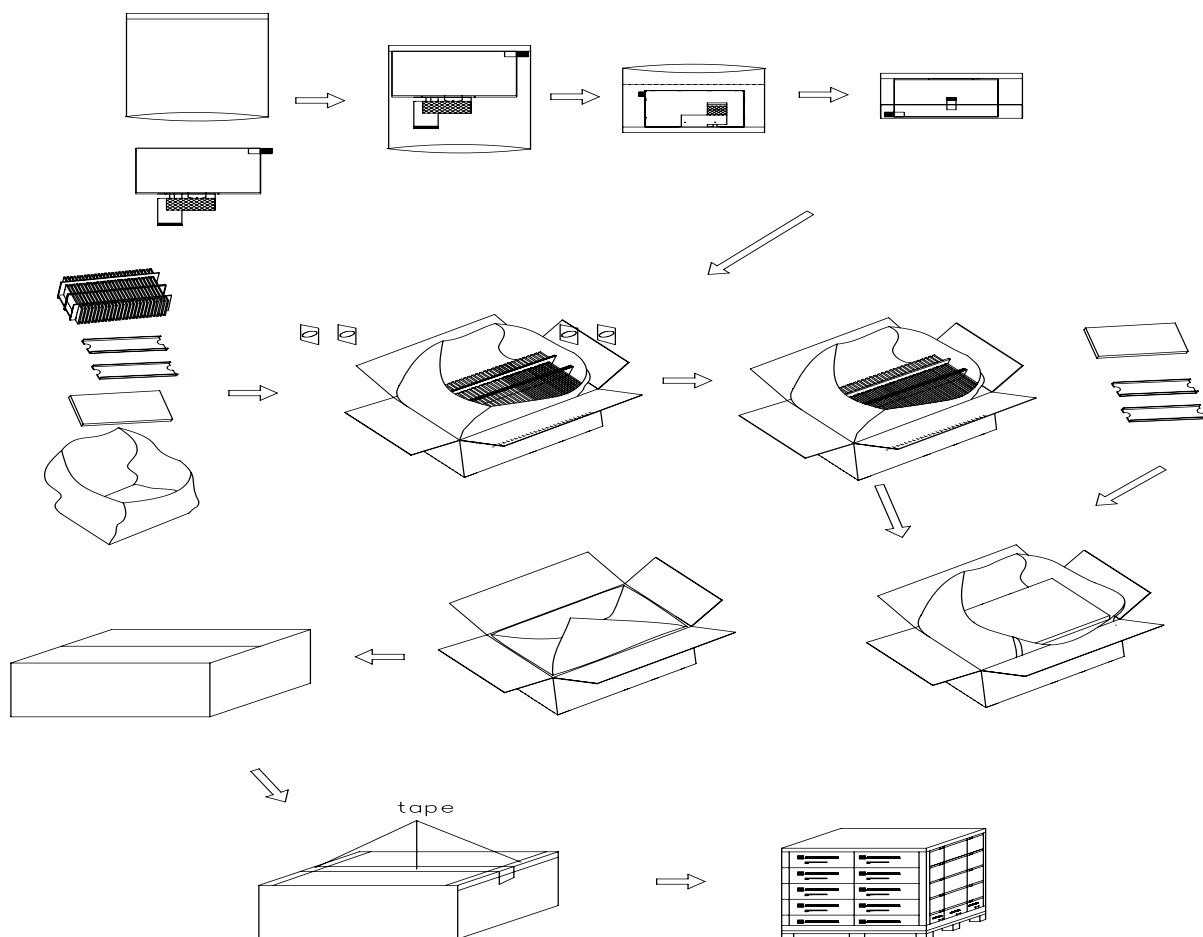


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9 Packing Drawing

| No | Item | Model (Material) | Dimensions(mm) | Unit Weight(Kg) | Quantity | Remark |
|----|-----------------|------------------|----------------|-----------------|----------|-------------|
| 1 | LCM module | TM043NBH02 | 105.5x67.2x4.1 | 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 | 700x530 | 0.0600 | 1 | |
| 5 | Partition_2 | Corrugated Paper | 505x332x4.00 | 0.09 | 3 | |
| 6 | Corrugated Bar | Corrugated Paper | 513x117x3 | 0.04 | 8 | |
| 7 | Carton | Corrugated Paper | 530x350x250 | 1.1000 | 1 | |
| 8 | Total weight | TBD Kg | | | | |





10 Precautions for Use of LCD Modules

10.1 Handling Precautions

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

10.1.2 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.

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

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

10.1.5 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

10.1.6 Do not attempt to disassemble the LCD Module.

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

10.1.8 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.

10.2 Storage precautions

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

10.2.2 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°C ~ 40°C Relatively humidity: ≤80%

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

10.3 Transportation Precautions

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