



SPECIFICATION



TM050RDZG03-00

5.0" – 800 x 480 - RGB

Version: 5.0

Date: 20.05.2020

Note: This specification is subject to change without prior notice

MODEL NO : TM050RDZG03-00

SPEC VERSION : 5.0

ISSUED DATE: 2020-05-20

- Preliminary Specification
 Final Product Specification

Customer : _____

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

TIANMA Confirmed :

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1 General Specifications

| Feature | | Spec | |
|-----------------------------------|--------------------------------|------------------------|------------------------|
| Display Spec. | Size | 5.0 inch | |
| | Resolution | 800(RGB) x 480 | |
| | Technology Type | a-Si | |
| | Pixel Configuration | R.G.B. Vertical Stripe | |
| | Pixel pitch(mm) | 0.135*0.135 | |
| | Display Mode | Normally White (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) | 120.70x77.80x5.7 | |
| | Active Area(mm) | 108.00x64.80 | |
| | With /Without TSP | Without TSP | |
| | Matching Connection Type | FH52E-40S-0.5SH | |
| | LED Numbers | 18 LEDs | |
| | Weight (g) | TBD | |
| Electrical Characteristics | Interface | RGB 24bits | |
| | Color Depth | 16.7M | |
| | Driver IC | Gate IC | HX8664-B00APD400-LT |
| | | Source IC | HX8264-D03DPD400-A-LTP |

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

Matching Connector : FH52E-40S-0.5SH

| No | Symbol | I/O | Description | Comment |
|----|--------|-----|--|---------|
| 1 | NC | -- | No connection | |
| 2 | NC | -- | No connection | |
| 3 | GND | P | Ground | |
| 4 | VDD | P | Power supply voltage | |
| 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 | CLKIN | I | Clock for input data. Data latched at falling edge of this signal. | |
| 31 | STBYB | I | Standby mode. STBYB="1": Normally operation. STBYB="0": Standby mode .Timing controller, source driver will turn off, all output are High-Z. | |
| 32 | HSD | I | Horizontal sync input. | |
| 33 | VSD | I | Vertical sync input | |
| 34 | DEN | I | Data input enable. Active high to enable the data input bus under "DE Mode ". | |
| 35 | NC | -- | No connection | |
| 36 | GND | P | Ground | |
| 37 | LED_A | P | Back light anode | |
| 38 | LED_K1 | P | Back light cathode | |
| 39 | LED_K2 | P | Back light cathode | |
| 40 | LED_K3 | P | Back light cathode | |

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Note1: Please add the FPC connector type and matched one if necessary.

Note2: I—Input, O—Output, P—Power/Ground

3 Absolute Maximum Ratings

GND=0V

| Item | Symbol | MIN | MAX | Unit | Remark |
|-----------------------|--------|------|-----|------|--------|
| Power Voltage | VDD | -0.5 | 4.5 | V | Note1 |
| Operating Temperature | Top | -30 | 85 | °C | |
| Storage Temperature | Tst | -40 | 90 | °C | |

Table 3 Absolute Maximum Ratings

Note1: Input voltage include R0~R5, G0~G5, B0~B5, Dotclk, Hsync, Vsync, Enable, R/L, U/D

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4 Electrical Characteristics

4.1 Driving TFT LCD Panel

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|----------------------------------|-------------------|----------|------------------|-----|------------------|--------|
| Supply Voltage | VDD | 3.2 | 3.3 | 3.4 | 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} | -- | -- | GND+0.4 | V |
| | High Level | V_{OH} | $VDD-0.4$ | -- | -- | V |
| (Panel+LSI) Power Consumption | Black Mode (60Hz) | | 320 | | | mW |
| | Standby Mode | | 110 | | | mW |

Note1: For different LCM, the value may have a bit of difference.

Note2: To test the current dissipation, use "all Black Pattern".

4.2 Backlight Unit

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|-----------------------------|----------|-----|----------|-----|------|--------|
| Forward Current | I_F | - | 175 | - | mA | Note 1 |
| Forward Voltage | V_F | 8.7 | 9.3 | 9.9 | V | |
| Backlight Power Consumption | W_{BL} | - | 1627.5 | - | mW | |
| Life Time | - | - | (50,000) | - | Hrs | Note 3 |

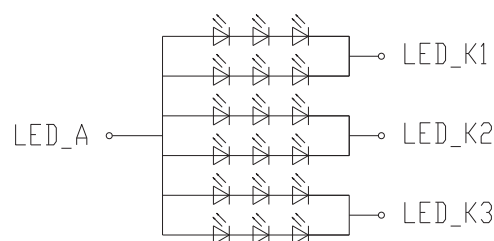
Table 4.2 LED backlight characteristics

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 6LED 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 $T_a=25^\circ\text{C}$ 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.

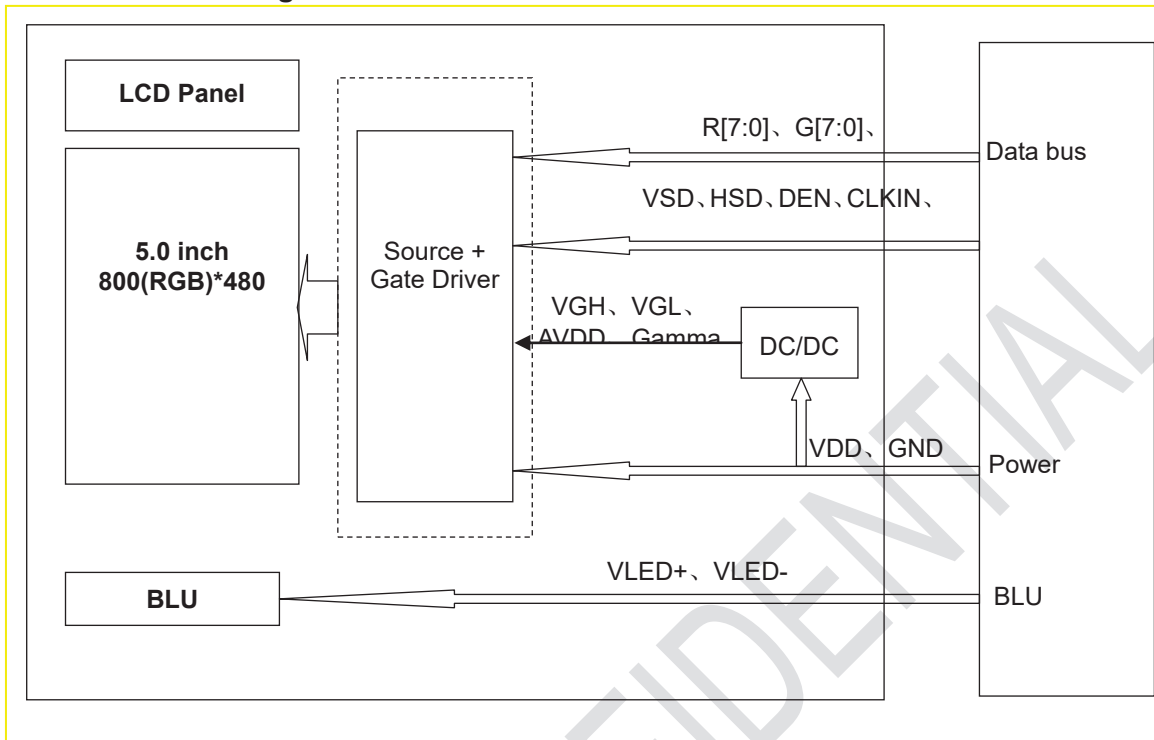
Note4: The LED driving condition is defined for each LED module.



LED circuit

Figure 4.2 LED connection of backlight

**4.3 Block Diagram
LCD Module diagram**



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5 Timing Chart

5.1 Input Clock and Data Timing

| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|------------------------|-----------|-----|-----|-----|------|--------|
| HSD Setup Time | T_{hst} | 8 | | | ns | |
| HSD Hold Time | T_{hhd} | 8 | - | - | ns | |
| VSD Setup Time | T_{vst} | 8 | | | ns | |
| VSD Hold Time | T_{vhd} | 8 | - | - | ns | |
| Data Setup Time | T_{dsu} | 8 | | | ns | |
| Data Hold Time | T_{dhd} | 8 | - | - | ns | |
| DE Setup Time | T_{esu} | 8 | | | ns | |
| DE Hold Time | T_{ehd} | 8 | - | - | ns | |
| CLKIN Cycle Time | T_{cph} | 20 | - | - | ns | |
| CLKIN Pulse Width | T_{cwh} | 40 | 50 | 60 | % | |
| Output stable time | T_{sst} | - | - | 6 | us | |
| VDD Power ON Slew rate | T_{por} | | | 20 | ms | |
| RSTB pulse width | TR_{st} | 10 | - | - | us | |

Table 5.1 Input Clock and Data Timing

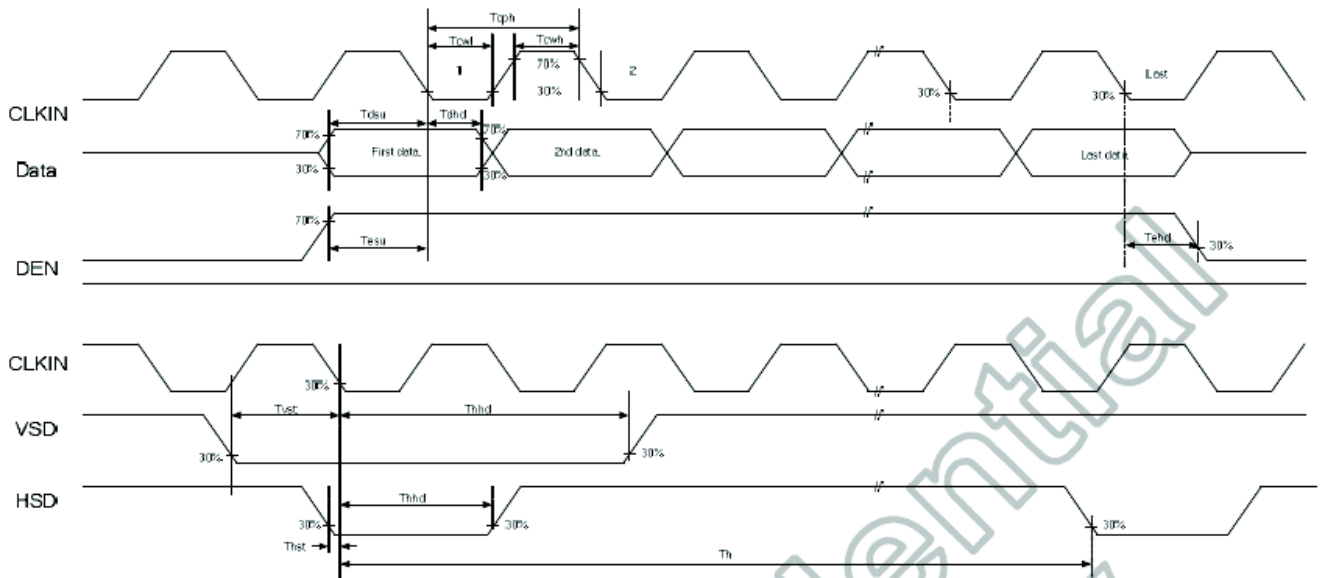


Figure 5.1 Input Clock and Data Timing Diagram

5.2 Data Input Format

5.2.1 Parameter Setting Of Timing

| Parameter | Symbol | Spec | | | Unit |
|-------------------------------------|-----------|------|-----|------|-------|
| | | Min | Typ | Max | |
| Horizontal display area | t_{hd} | 800 | | | CLKIN |
| CLKIN frequency (60Hz) | f_{clk} | - | 30 | 50 | MHZ |
| One Horizontal Line | t_h | 889 | 928 | 1143 | CLKIN |
| HSD pulse width | t_{hpw} | 1 | 48 | 255 | CLKIN |
| HSD blanking | t_{hb} | 88 | | | CLKIN |
| HSD front porch | t_{hfp} | 1 | 40 | 255 | CLKIN |
| Vertical display area | t_{vd} | 480 | | | T_H |
| VSD period time | t_v | 513 | 525 | 767 | T_H |
| VSD pulse width | t_{vpw} | 3 | 3 | 255 | T_H |
| VSD Blanking(tv _b) | t_{vb} | 32 | | | T_H |
| VSD Front porch (tv _{fp}) | t_{vfp} | 1 | 13 | 255 | T_H |

Table 5.2 Parameter Setting Of Timing

5.2.2 Horizontal Input Timing Diagram

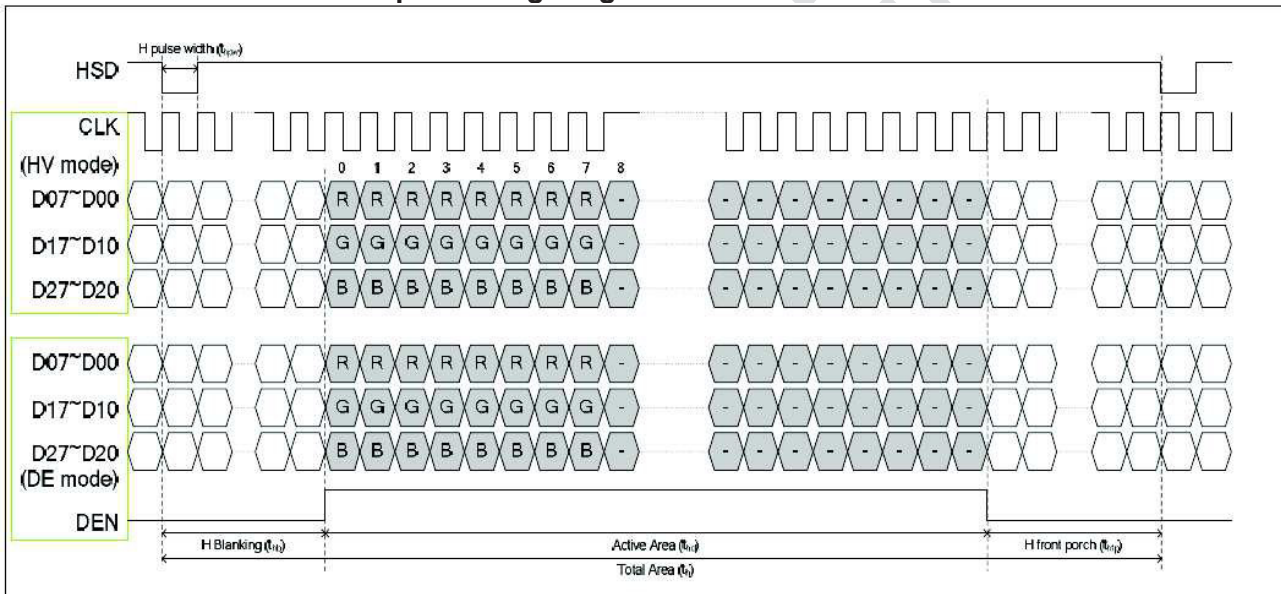


Figure 5.2 Horizontal Input Timing Diagram

5.2.3 Vertical Input Timing Diagram

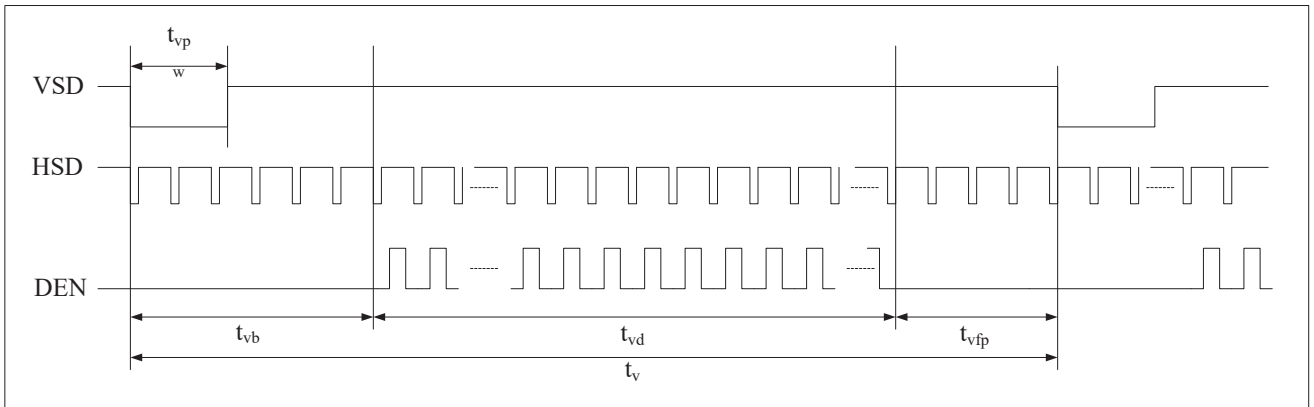


Figure 5.2.3 Vertical Input Timing Diagram

5.3 Power ON/OFF Sequence

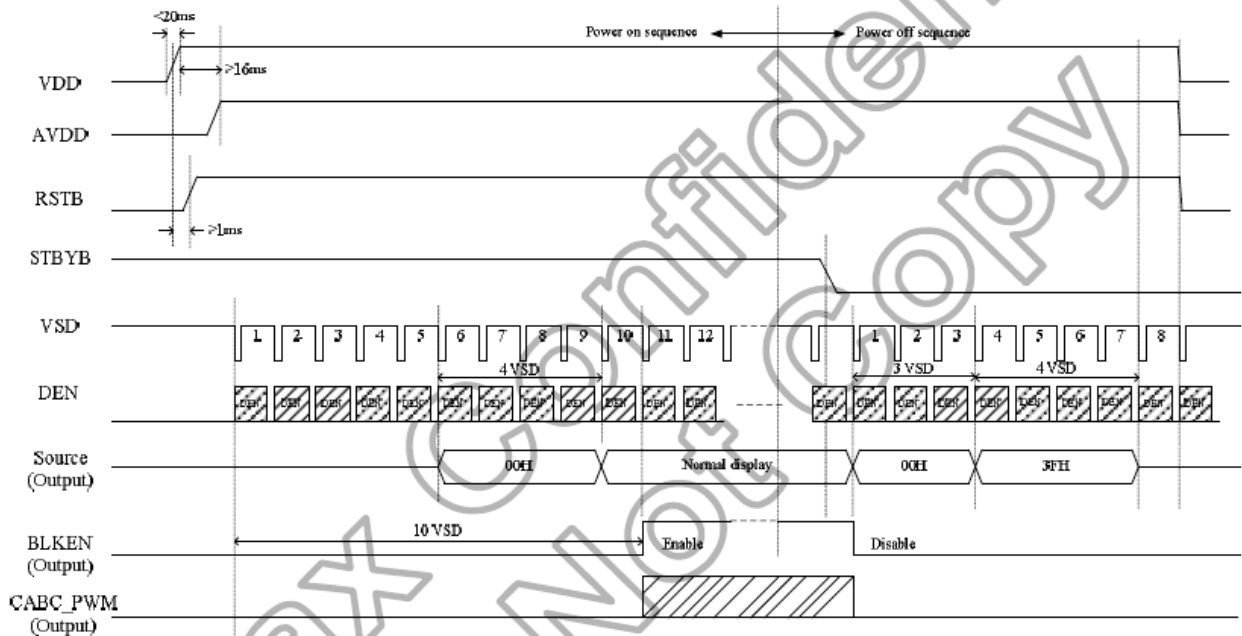


Figure 5.3.1 Power On/Off Sequence

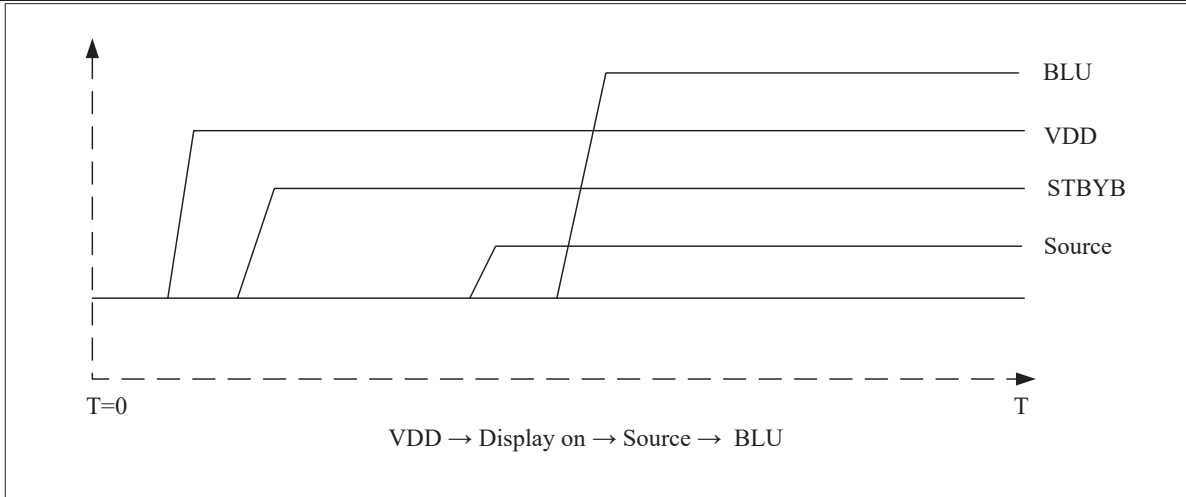


Figure 5.3.2 Power On Sequence

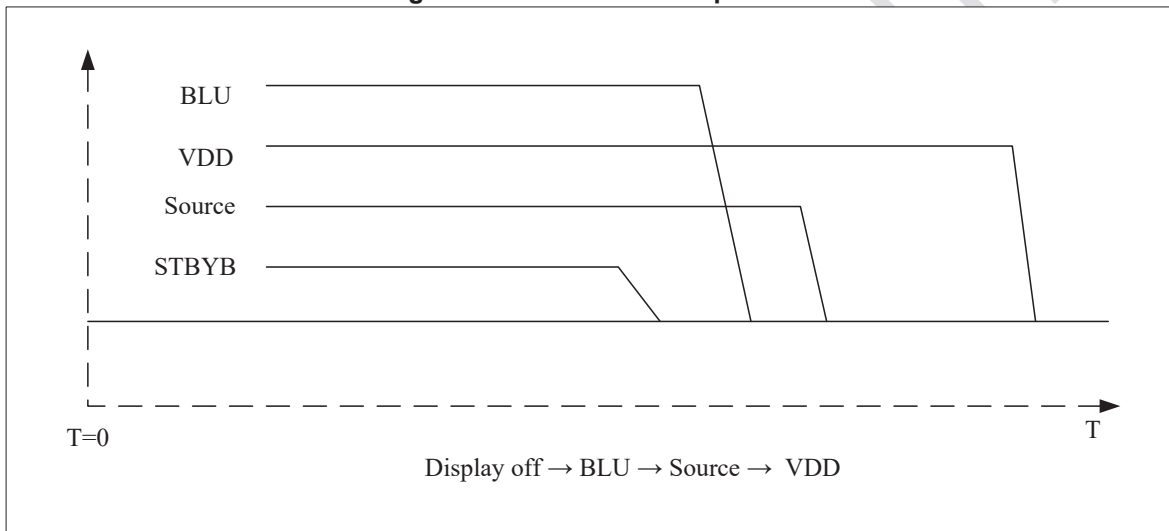


Figure 5.3.3 Power Off Sequence

6 Optical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|----------------|------------|------------------|-----------------|-------|-------|-------------------|----------|
| View Angles | θT | $CR \geq 10$ | 60 | 70 | - | Degree | Note2,3 |
| | θB | | 70 | 80 | - | | |
| | θL | | 70 | 80 | - | | |
| | θR | | 70 | 80 | - | | |
| Contrast Ratio | CR | $\theta=0^\circ$ | 600 | 750 | - | | Note 3 |
| Response Time | T_{ON} | 25°C | - | 20 | 30 | ms | Note 4 |
| | T_{OFF} | | | | | | |
| Chromaticity | White | x | Backlight is on | 0.268 | 0.318 | 0.368 | Note 1,5 |
| | | y | | 0.302 | 0.352 | 0.402 | |
| | Red | x | | 0.547 | 0.597 | 0.647 | Note 1,5 |
| | | y | | 0.298 | 0.348 | 0.398 | |
| | Green | x | | 0.279 | 0.329 | 0.379 | Note 1,5 |
| | | y | | 0.553 | 0.603 | 0.653 | |
| | Blue | x | | 0.101 | 0.151 | 0.201 | Note 1,5 |
| | | y | | 0.065 | 0.115 | 0.165 | |
| Uniformity | U | | 75 | 80 | -- | % | Note 6 |
| NTSC | | | -- | 50 | -- | % | Note 5 |
| Luminance | L | | 800 | 1000 | -- | cd/m ² | Note 7 |

Test Conditions:

1. IF= 30 mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.
3. Flicker pattern: 128 Grayscale

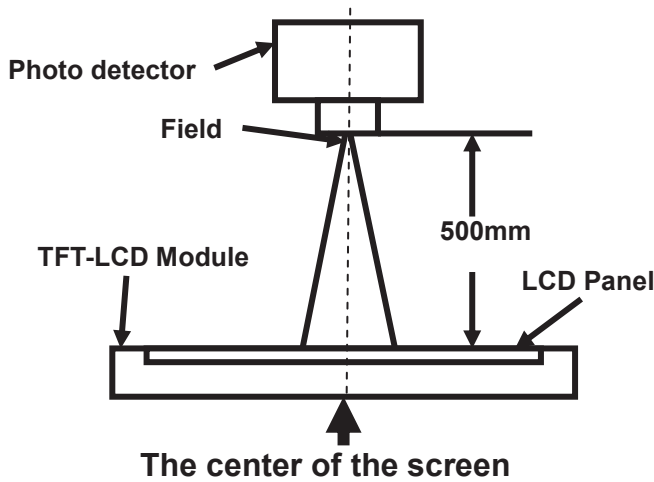
| 1V2H/1+2dot(2) | | | | | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|----|----|----|
| R+ | G- | B- | R+ | G+ | B- | R- | G+ | B+ | R- | G- | B+ |
| R- | G+ | B+ | R- | G- | B+ | R+ | G- | B- | R+ | G+ | B- |
| R+ | G- | B- | R+ | G+ | B- | R- | G+ | B+ | R- | G- | B+ |
| R- | G+ | B+ | R- | G- | B+ | R+ | G- | B- | R+ | G+ | B- |
| R+ | G- | B- | R+ | G+ | B- | R- | G+ | B+ | R- | G- | B+ |
| R- | G+ | B+ | R- | G- | B+ | R+ | G- | B- | R+ | G+ | B- |

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

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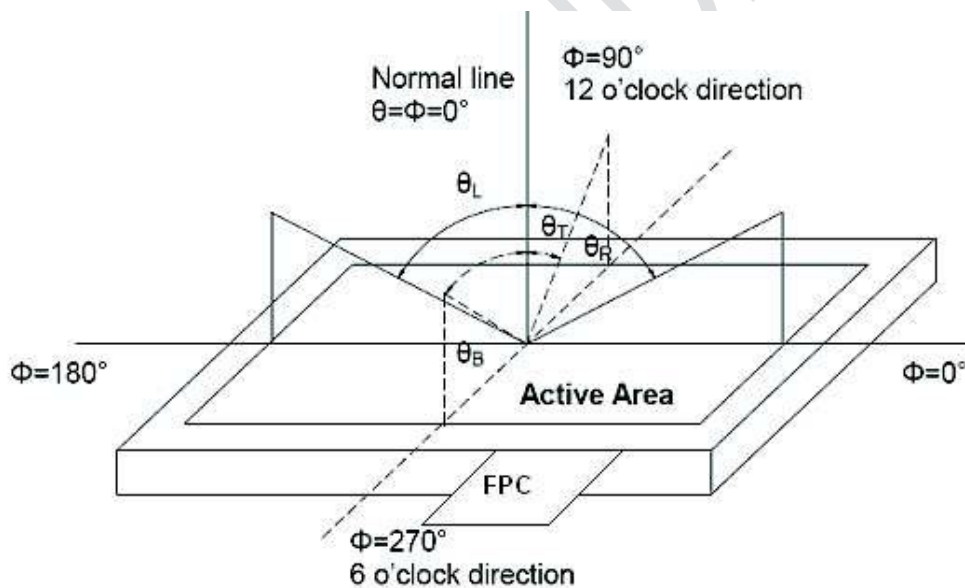
be ground when measuring the center area of the panel.



| 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

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

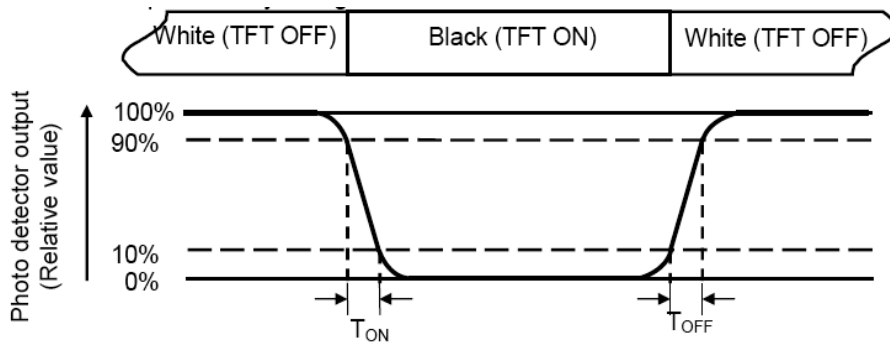
“White state “: The state is that the LCD should drive by V_{white}.

“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 “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)

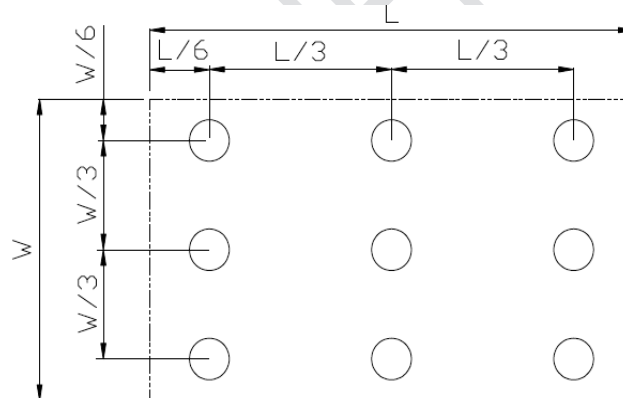
Color coordinates measured at center point of LCD.

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 Test

| No | Test Item | Condition | Remarks |
|----|-------------------------------------|--|---|
| 1 | High Temperature Operation | Ta = +85℃,500hrs | IEC60068-2-1:2007 GB2423.2-2008 |
| 2 | Low Temperature Operation | Ta= -30℃,500hrs | IEC60068-2-1:2007 GB2423.1-2008 |
| 3 | High Temperature Storage | Ta = +90℃,500hrs | IEC60068-2-1:2007 GB2423.2-2008 |
| 4 | Low Temperature Storage | Ta = -40℃,500 hrs | IEC60068-2-1:2007 GB2423.1-2008 |
| 5 | High Temperature & Humidity Storage | Ta=+60℃, 90% RH 500 hours | IEC60068-2-78 :2001 GB/T2423.3—2006 |
| 6 | Thermal Shock (non-operation) | -35℃ 30 min~+80℃ 30 min, Change time:5min, 100 Cycles | Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002 |
| 7 | ESD | C=150pF, R=330Ω · 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; (Environment: 15℃~35℃, 30%~60%, 86Kpa~106Kpa) | IEC61000-4-2:2001 GB/T17626.2-2006 |
| 8 | Vibration Test | Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2H for each direction of X.Y.Z.(6 hours for total) | IEC60068-2-6:1982 GB/T2423.10—1995 |
| 9 | Mechanical Shock (Non OP) | 60G 6ms, ± X,± Y,± Z 3times, for each direction | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 10 | Package Vibration | 频率 (Hz) 5~20-200Hz,PSD:0.01-0.01-0.001 Total:0.781g2/Hz, 时间 : X/Y/Z 各轴 30min | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 11 | Package Drop | Height:80cm;1corner,3edges,6surfaces | IEC60068-2-27:1987 GB/T2423.5—1995 |
| 12 | Image sticking test | 40℃ (Oven real temperature) Times: fixed 6hours Checkboard image (total Number:6X8)Criteria: 25℃, 50% gray scale ,disappear in 15 minutes or have no | Criteria: 25℃, 50% gray scale ,disappear in 15 minutes or have no |

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.

Note4: 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.

Note5: Image sticking test is as below.

9 Packing Drawing

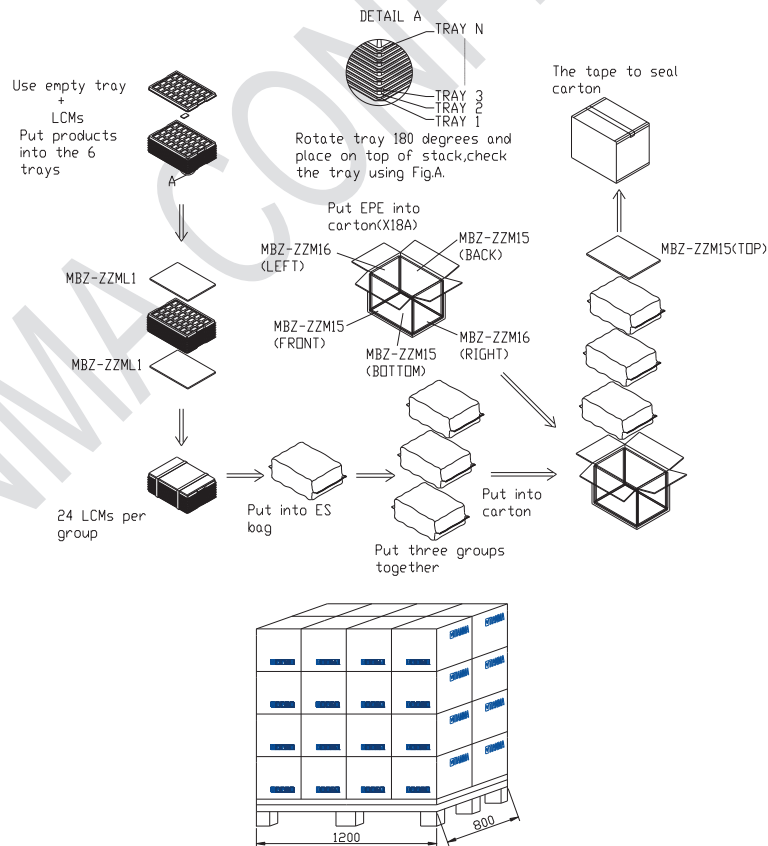
9.1 Packaging Material

| No | Item | Model(Material) | Dimensions (mm) | Unit Weight (Kg) | Quantity | Remark |
|----|-------------------|-------------------------|-----------------|------------------|----------|-------------|
| 1 | LCM Module | TM050RDZG03-00 | 120.7*77.8*5.7 | 0.076 | 72 | |
| 2 | Tray | TM050RDZG03-00-YBZ 1-00 | 356*256*15.6 | 0.12 | 21 | |
| 3 | EPE (珍珠棉1) | MBZ-ZZML1 | 336*246*6 | 0.01 | 6 | Anti-static |
| 4 | EPE (珍珠棉2) | MBZ-ZZM15 | 375*275*10 | 0.014 | 4 | |
| 5 | EPE (珍珠棉3) | MBZ-ZZM16 | 250*280*12 | 0.015 | 2 | |
| 6 | Carton | X18A | 395*290*315 | 0.58 | 1 | |
| 7 | Es bag (防静电真空包装袋) | JD13 | 400*520 | 0.042 | 3 | |
| 10 | Total weight | | | 8.84 \pm 5% | | |

Note: Packaging Specification and Quantity

Module quantity in a carton: 2pcs (per row) x 2 (per column) x 6 x3= 72pcs

9.2 Packing Instruction



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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.



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