# 5” WVGA

# High brightness color TFT-LCD module

**Model: VM05B1 V6**

**Date: Sep 16th, 2021**

**Note: This specification is subject to change without notice**

| |
|---|
| **Customer：_____** <br><br> **Date：_____** |

| **Approved** | **Prepared** |
|---|---|
| **Date:** | **Date:** |

# Contents

# RECORD OF REVISION

| Version and Date | Page | Old description | New description | Remark |
|---|---|---|---|---|
| 0.1 2018/12/24 | All | First Edition for customer | | |
| 0.2 2021/09/16 | 6,13 | Brightness: 600nits | Brightness: 1000nits<br>Backlight power: 2.88W | |

## 1. HANDLING PRECAUTIONS

1) Since front polarizer is easily damaged, pay attention not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7) Do not open or modify the Module Assembly.
8) Do not press the reflector sheet at the back of the module to any directions.
9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of TFTLCD panel.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

# 2. General Description

## 2.1, Overview

VM05B1 V6 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The display supports the WVGA+ (800(H) x 480(V)) screen format and 16.7M colors (RGB 8-bits).All input signals are 1 Channel TTL interface compatible.

## 2.2 Features

- 1000nits high brightness
- LED backlight
- Wide operation temperature
- RoHS Compliance

## 2.3 Application

Industrial Application.

2.4 Display Specifications

| Items | Unit | Specification |
|---|---|---|
| Screen Diagonal | inch | 5” |
| Active Area | mm | 108 (H) × 64.8 (V) |
| Pixels H x V | pixels | 800 × 3(RGB) × 480 |
| Pixels Pitch | um | 0.135 × 0.135 |
| Pixel Arrangement | | RGB Vertical stripe |
| Display mode | | Normally white |
| White luminance (center) | $Cd/m^2$ | 1000 (Typ.) |
| Contrast ratio | | 600 : 1 (Typ.) |
| Optical Response Time | msec | 30 ms (Typ. on/off) |
| Normal Input Voltage VDD | Volt | 3.3 |
| Power Consumption<br>(VDD Line + LED L Line) | Watt | 3.18 (Typ.)<br>TFT = 0.3W, Backlight = 2.88W |
| Weight | Grams | 57 (Typ.) |
| Physical size | mm | 120.7 (H) x 75.8 (V) x 3.10 (D, TBD) (Typ) |
| Electrical Interface | | 1 Chanel TTL |
| Support Colors | | 16.7M colors (RGB 8-bits) |
| Driver IC | | Gate IC HX8664-B00BPD400-B<br>Source IC HX8264-D02DPD400-A |
| Surface Treatment | | Anti-Glare, 3H |
| Temperature range<br>Operating<br>Storage (Shipping) | <br>$^0C$<br>$^0C$ | <br>-20 ~ 70 (LCD surface temperature)<br>-30 ~ 80 |
| RoHS Compliance | | RoHS Compliance |

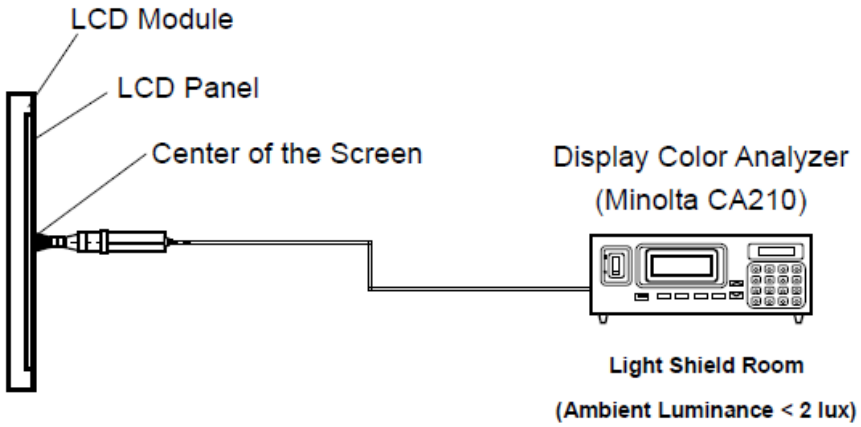
2.5 Optical Characteristics

The following optical characteristics are measured under stable condition at 25 $^0$C

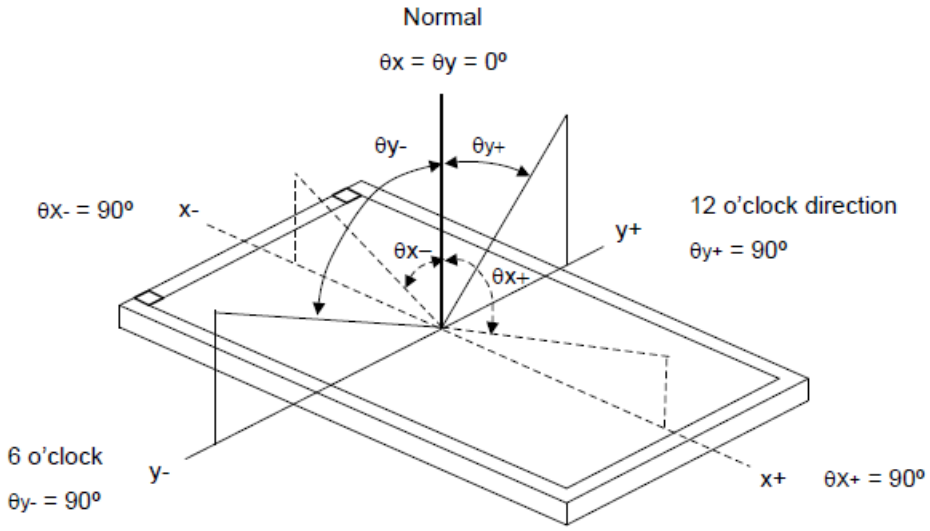
| Items | Unit | Conditions | Min. | Typ. | Max. | Note |
|---|---|---|---|---|---|---|
| Viewing angle | Deg. | Horizontal (Right) | 60 | 70 | | 2 |
| | | CR=10 (Left) | 60 | 70 | | |
| | | Vertical (Up) | 60 | 70 | | |
| | | CR=10 (Down) | 40 | 50 | | |
| Contrast Ratio | | Normal Direction | 500 | 600 | | 3 |
| Response Time | msec | Raising + Falling | | 20 | | 4 |
| Color coordinates (CIE) White | | Red x | -0.05 | 0.590 | +0.05 | 5 |
| | | Red y | | 0.350 | | |
| | | Green x | | 0.348 | | |
| | | Green y | | 0.570 | | |
| | | Blue x | | 0.145 | | |
| | | Blue y | | 0.110 | | |
| | | White x | | 0.310 | | |
| | | White y | | 0.330 | | |
| Center Luminance | Cd/m$^2$ | | 800 | 1000 | | 6 |
| Luminance Uniformity | % | | | 70 | | 7 |
| Crosstalk (in 60 Hz) | % | | | | 1 | |
| Flicker | dB | | | | -20 | |

Note 1: Measurement method

The LCD module should be stabilized at given temperature for 0.5 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



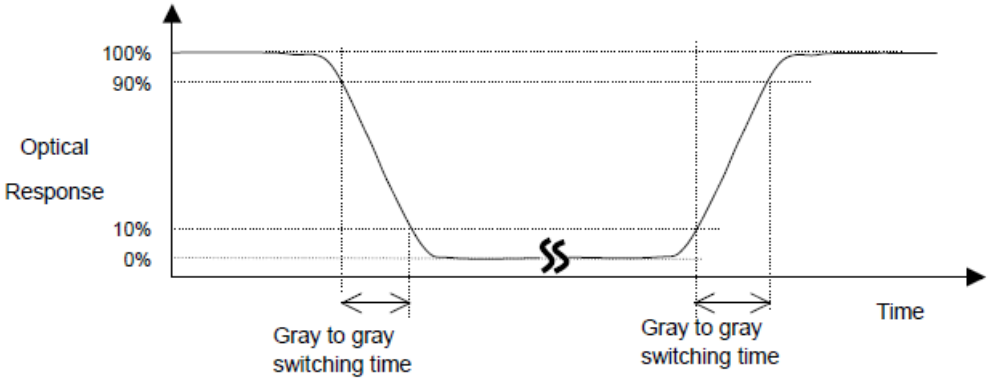

Note 2: Definition of viewing angle




Note 3: Contrast ratio is measured by Minolta CA-210

Note 4: Definition of Response time

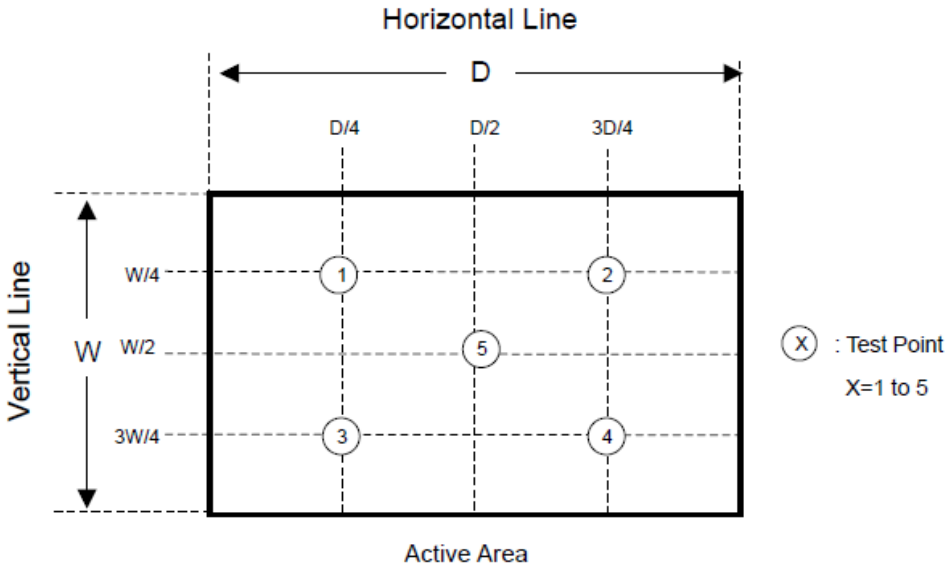
The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time), and from “Full White” to “Full Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.




Note 5: Color chromaticity and coordinates (CIE) is measured by Minolta CA-210

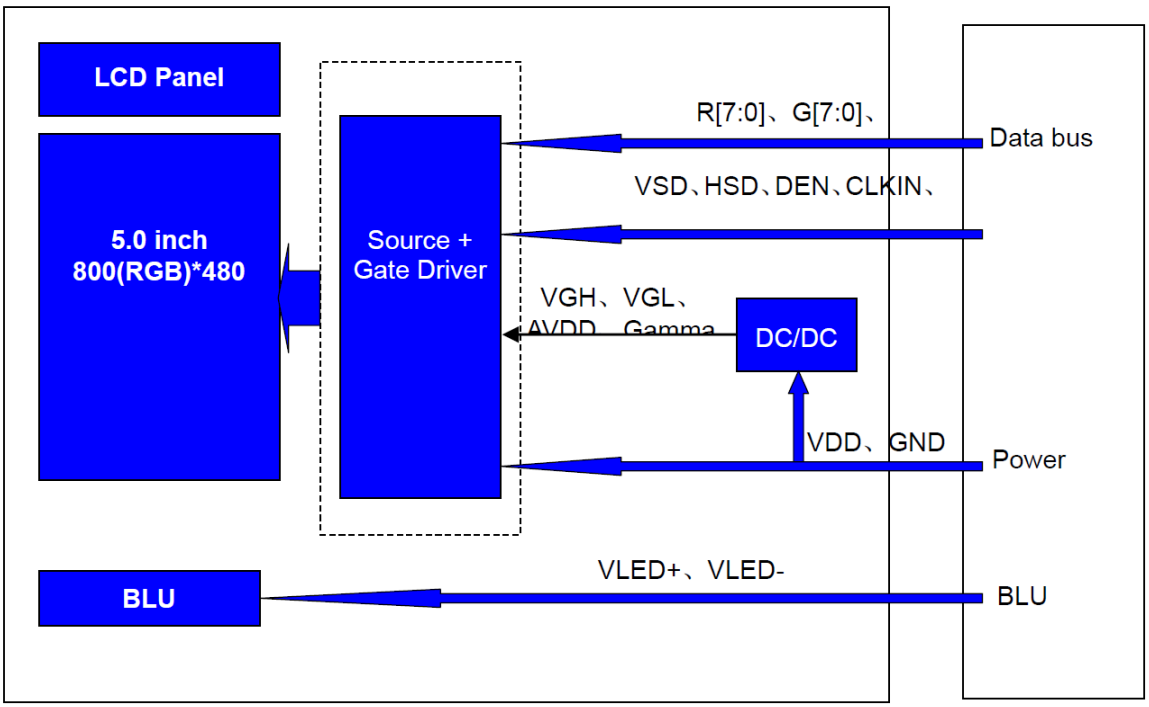
Note 6: Center luminance is measured by Minolta CA-210

Note 7: Luminance uniformity of these 5 points is defined as below and measured by Minolta CA-210




Uniformity = (Min. Luminance of 5 points) / (Max. Luminance of 5 points)

## 3. Functional Block Diagram



## 4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

| Items | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Power supply voltage | $V_{CC}$ | -0.5 | 5.0 | V | |
| | $V_{IN}$ | -0.5 | 5.0 | V | |

4.2 Backlight unit

| Items | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| LED Current | I LED | | 180 | mA | Note 1, 2 |

4.3 Environment

| Items | Symbol | Values | | | Unit | Conditions |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Operation temperature | $T_{OP}$ | -20 | - | 70 | $^0$C | Note 3 |
| Operation Humidity | $H_{OP}$ | 8 | | 90 | % | |
| Storage temperature | $T_{ST}$ | -30 | | 80 | $^0$C | |
| Storage Humidity | $H_{ST}$ | 8 | | 90 | % | |

Note 1: With in Ta= 25℃

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: For quality performance, please refer to IIS (Incoming Inspection Standard).

## 5. Electrical characteristics

### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

Input power specifications are as follows

| 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 | -- | 0.3xVDD | V | |
| | High Level | $V_{IH}$ | 0.7xVDD | -- | 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) | | 297 | | mW | |
| | | Standby Mode | | 101 | | mW | |

Note 1: Fore different LCM, the value may have a bit of difference.

Note 2: To test the current dissipation, use “all black pattern”.

## 5.2 Backlight Unit

Parameter guideline is under stable conditions at 25℃ (Room Temperature):

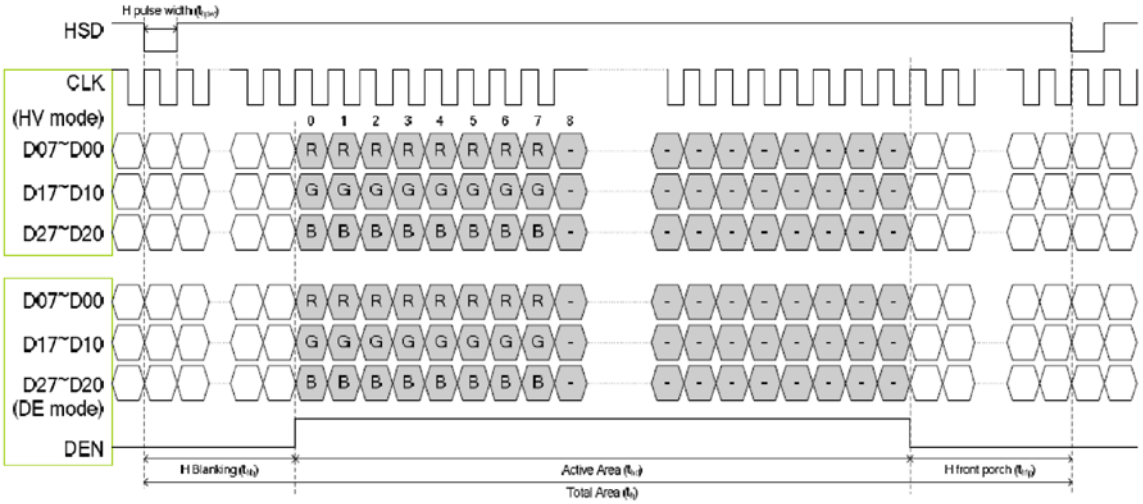
| Parameter | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|
| LED voltage (VL) | | 18 | | [V] | 2 |
| LED current (IL) | | 160 | | [mA] | 2, |
| Power consumption | | 2.88 | | W | |
| LED Life Time(LTLED) | | 50,000 | | [Hour] | 1 |

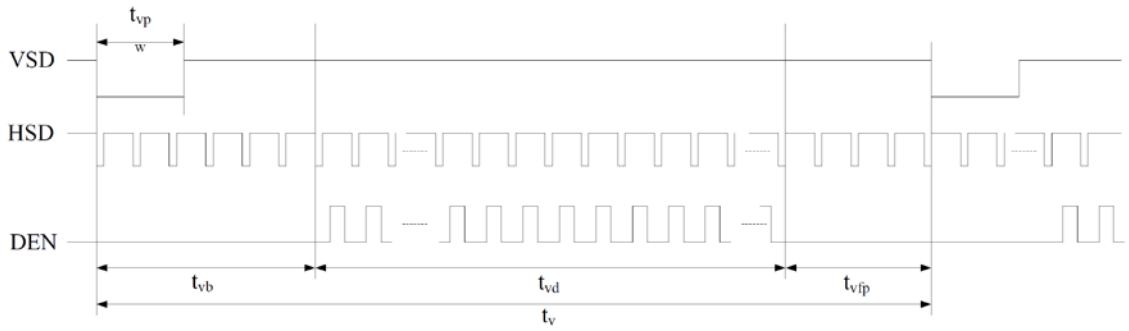
Note 1: The “LED lift time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃.

Note 2: Power consumption is VL x IL

## 6. Signal Characteristic

### 6.1 The Input Data Format



## 6.2 Signal Description

Matching Connector FH19SC-40S-0.5SH(HRS)

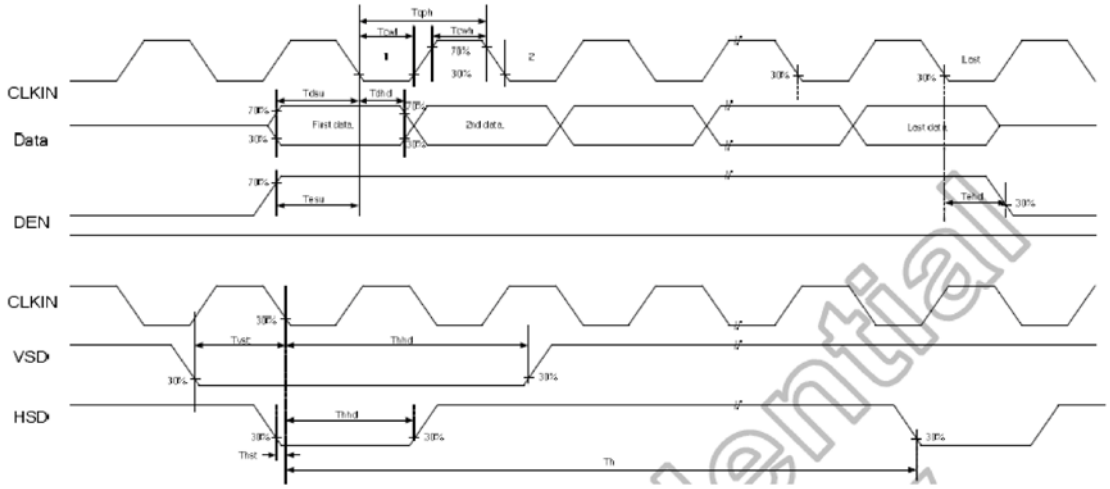
| No | Symbol | I/O | Description | Comment |
|---|---|---|---|---|
| 1 | VLED- | P | Back light cathode | |
| 2 | VLED+ | P | Back light anode | |
| 3 | GND | P | Ground | |
| 4 | VDD | P | Power supply | |
| 5 | R0 | I | Data input | |
| 6 | R1 | I | Data input | |
| 7 | R2 | I | Data input | |
| 8 | 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 | 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 | XR | -- | NC | |
| 38 | YD | -- | NC | |
| 39 | XL | -- | NC | |
| 40 | YU | -- | NC | |

## 6.3 Interface Timing

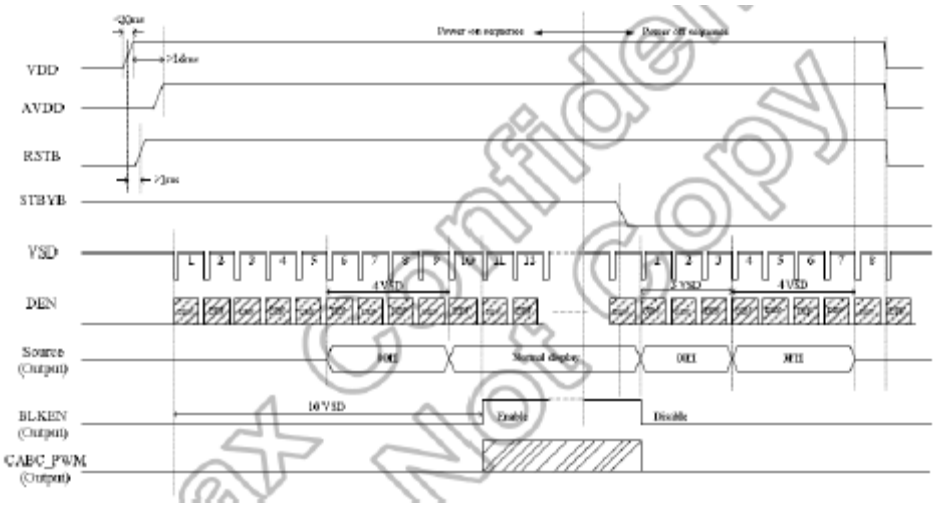
### 6.3.1 AC Characteristics

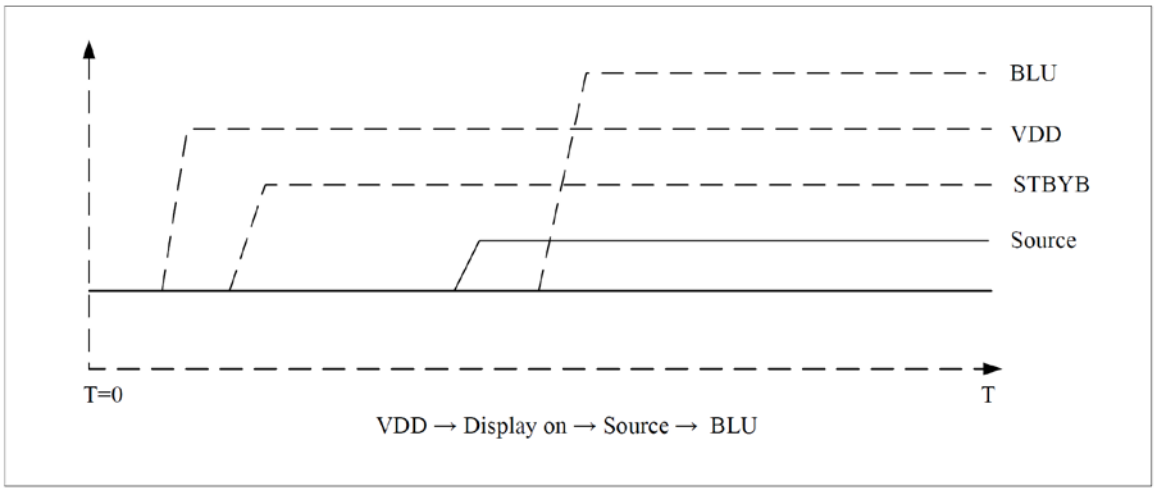
| Parameter | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| HSD Setup Time | $T_{hst}$ | 8 | | | ns | |
| HSD Hold Time | $T_{hhd}$ | 8 | - | - | ns | |
| VSD Setup Time | $T_{vst}$ | 8 | | | ns | |
| VSD Hold Time | $T_{vhd}$ | 8 | - | - | ns | |
| Data Setup Time | $T_{dsu}$ | 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 | Tsst | - | - | 6 | us | |
| VDD Power ON Slew rate | Tpor | | | 20 | ms | |
| RSTB pulse width | TRst | 10 | - | - | us | |

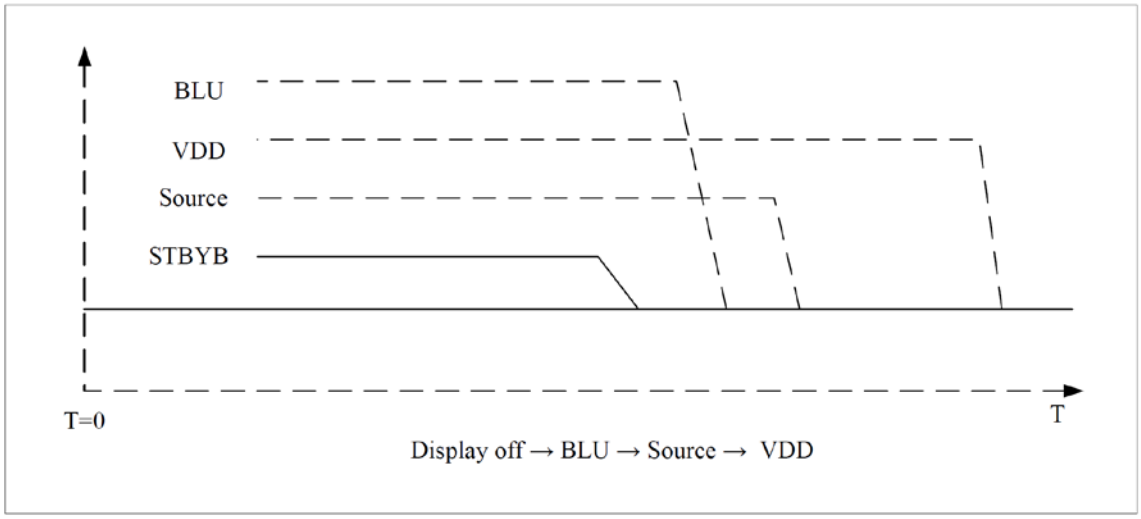
### 6.3.2 Timing Diagram



## 6.4 Power ON/OFF Sequence



## 7. Reliability Test

Environment test conditions are listed as following table.

| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias (THB) | Ta= 50℃, 80%RH, 240hours | |
| High Temperature Operation (HTO) | Ta= 70℃, 50%RH, 240hours | 2 |
| Low Temperature Operation (LTO) | Ta= -20℃, 240hours | |
| High Temperature Storage (HTS) | Ta= 80℃, 240hours | |
| Low Temperature Storage (LTS) | Ta= -30℃, 240hours | |
| Thermal Shock Test (TST) | -20℃/30min, 50℃/30min, 100 cycles | 1 |
| On/Off Test | On/10sec, Off/10sec, 30,000 cycles | |
| ESD (ElectroStatic Discharge) | Air Discharge: ± 8KV, 150pF(330Ω ) 1sec 9 points, 25 times/ point. | |

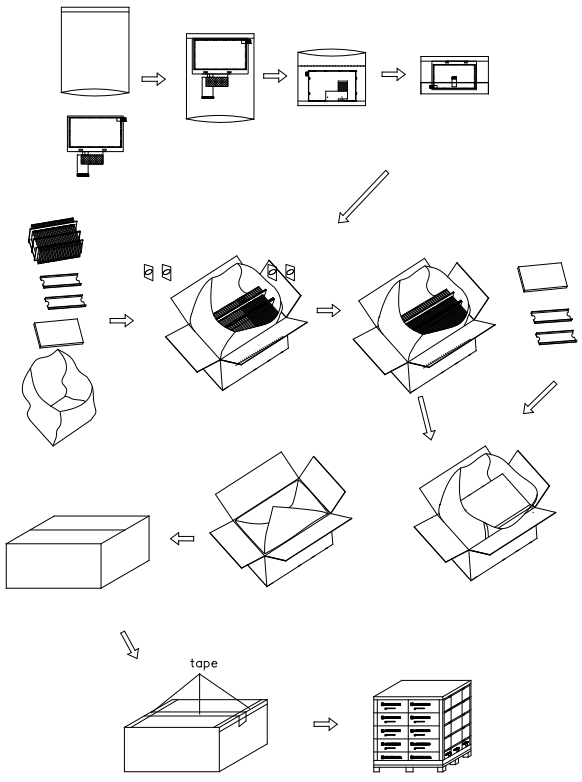
Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20℃ to 60℃, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: The test items are tested by open frame type chassis.

## 8. Shipping Label & Package

| No | Item | Model(Material) | Dimensions (mm) | Unit Weigt (Kg) | Quantity | Remark |
|---|---|---|---|---|---|---|
| 1 | LCM module | VM05B1 V6 | 120.7x75.8x3.1 | 0.057 | 112 | 6.384 |
| 2 | Partition_1 | Corrugated paper | 513X333X106 | 0.7 | 2 | 1.4 |
| 3 | Anti-static Bag | PE | 136X140X0.05 | 0.0007 | 112 | Anti-static |
| 4 | Dust-Proof Bag | PE | - | 0.06 | 1 | 0.06+0.08 |
| 5 | Partition_2 | Corrugated Paper | 505X332X4.0 | 0.09 | 3 | 0.18 |
| 6 | Corrugated Bar | Corrugated paper | 513X110×31 | 0.048 | 4 | 0.192 |
| 7 | Beauty-grain | Beauty-grain | 30x10 | -- | 112 | |
| 8 | Desiccant | Desiccant | 45x35 | 0.002 | 24 | 0.048 |
| 9 | Carton | Corrugated paper | 530X350X250 | 1.10 | 1 | 1.1 |
| 10 | Total weight | 9.45±5% | | | | |

Note: Packaging Specification and Quantity
Module quantity in a carton：28pcs(per row)x2(per column)x2= 112pcs



## 9 Mechanical Characteristic