



晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

| | |
|--------------------------|----------------------------|
| CUSTOMER | |
| CUSTOMER PART NO. | |
| AMPIRE PART NO. | AM-1024768RTNQW-00H |
| APPROVED BY | |
| DATE | |

Approved For Specifications

Approved For Specifications & Sample

AMPIRE CO., LTD.

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| | | |

RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---------------|------|---|--------|
| 2013/09/25 | -- | New Release | Rober |
| 2014/1/23 | 5 | Correct the Absolute Maximum Ratings | Rober |
| 2014/4/10 | 3 | Correct the General Descriptions | Rober |
| 2014/12/3 | 3 | Add Viewing Direction: 6 o'clock (Gray Inversion) | Mark |
| 2015/11/04 | 12 | Add REV Pin detail | Mark |
| 2018/8/10 | 11 | Mention the backlight control parameters. | Emil |

1.0 General Descriptions

1.1 Introduction

The LCM is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a backlight system, column driver and row driver circuit. This TFT LCD has a 12.1-inch diagonally measured active display area with resolution (1024 horizontal by 768 vertical pixels array).

1.2 Features

- 12.1" TFT LCD Panel
- LED Backlight System
- Supported 1024x768 pixels resolution
- Compatible with RoHS Standard
- Viewing Direction: 6 o'clock (Gray Inversion)

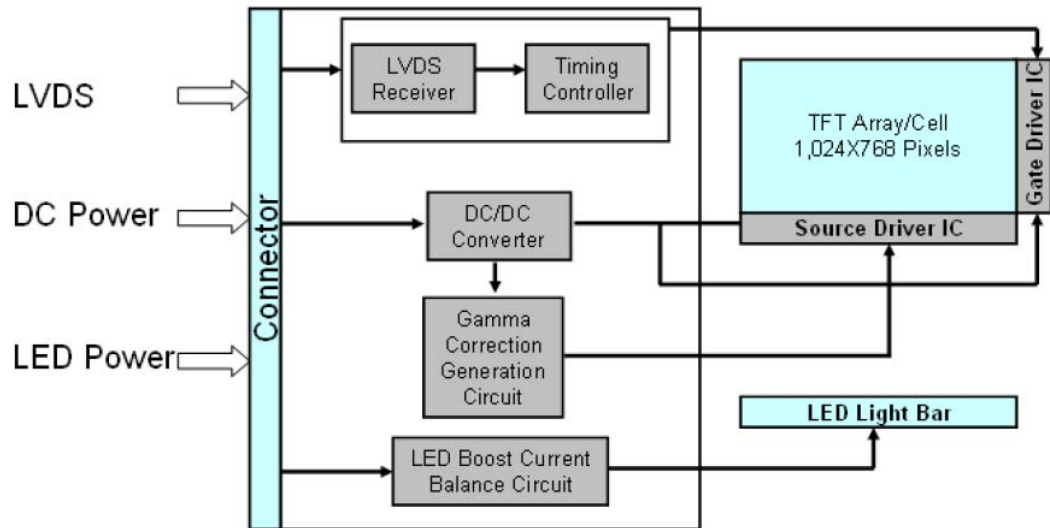
1.3 Product Summary

| Items | Specifications | Unit |
|------------------------------|----------------------------------|--------------------|
| Screen Diagonal | 12.1 | Inch |
| Active Area | 245.76(H) x 184.32(V) | mm |
| Pixel Format | 1024(RGB) x768 | - |
| Pixel Pitch | 0.24(H) x 0.24(V) | mm |
| Pixel Arrangement | R.G.B. Vertical Stripe | - |
| Display Mode | Normally White | - |
| White Luminance | 300(Typ) | cd /m ² |
| Contrast Ratio | 800 : 1 (Typ) | - |
| Response Time | 16(TYP) | msec |
| Input Voltage | 3.3 | V |
| Weight | 545(Max) | g |
| Outline Dimensions | 279.0(H) x 209.0(V) x9.0(D) Typ. | mm |
| Electrical Interface (Logic) | LVDS | - |
| Support Color | 16.7M | - |
| Surface Treatment | Anti-glare & hardness 3H | - |

1.4 Functional Block Diagram

Shows the functional block diagram of the LCD module.

Figure 1 Block Diagram



2.0 Absolute Maximum Ratings

Table 1 Absolute Ratings of Environment

| Item | Symbol | Min | Max | Unit | Conditons |
|-----------------------|--------|------|-----|------|-----------|
| Supply Voltage | VDD | -0.5 | 5 | V | - |
| Operating Temperature | TOP | -20 | 70 | °C | Note |
| Operating Humidity | HOP | 10 | 85 | %RH | Note |
| Storage Temperature | TST | -30 | 80 | °C | Note |
| Storage Humidity | HST | 10 | 95 | %RH | Note |

Note (1): Humidity: 85%RH Max. ($T \leq 40^\circ\text{C}$) Note static electricity.

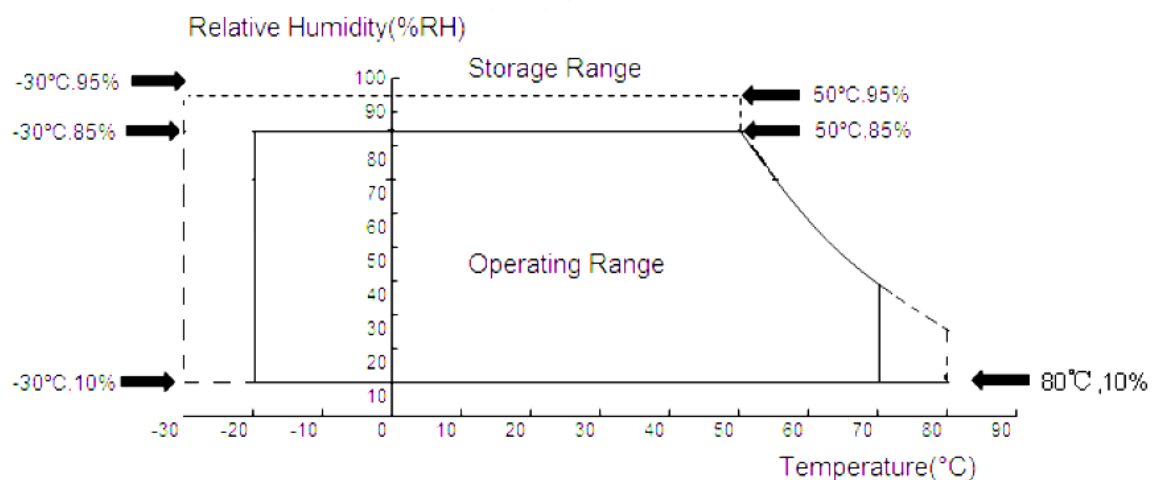
Maximum wet bulb temperature at 39°C or less. ($T > 40^\circ\text{C}$) No condensation.

Note (2): There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at $80 \sim 85^\circ\text{C}$ or -20°C .

Note (3): There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60% or more).

Note (4): In the operating temperature item, the low temperature side is the ambient temperature regulations. The high temperature side is the panel surface temperature regulations.

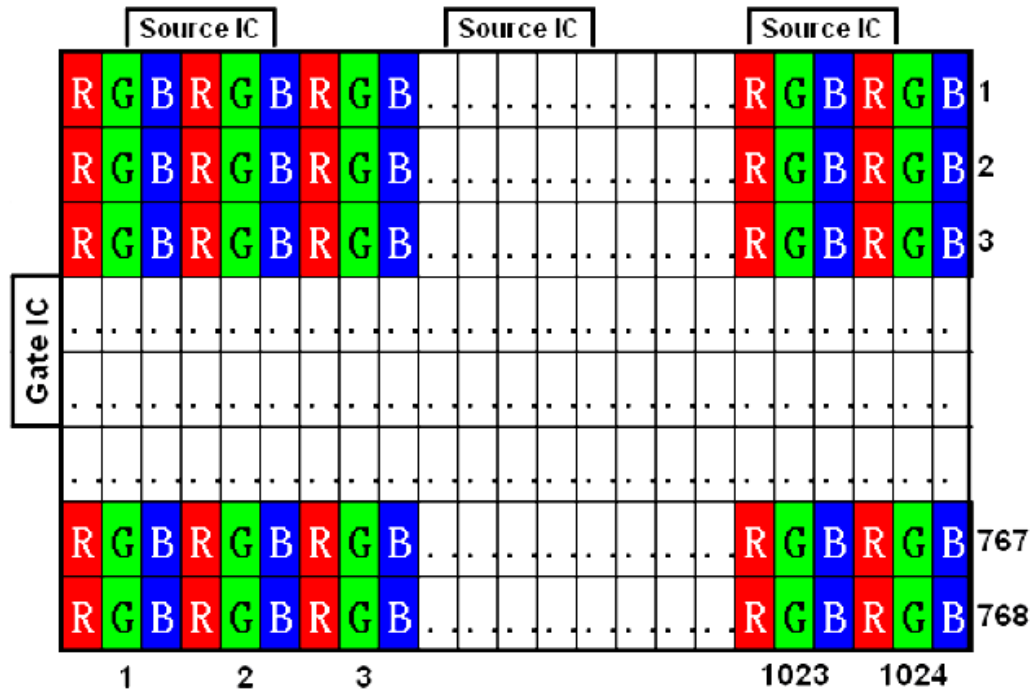
Note (5): Storage Range&Operating Range Picture:



3.0 Pixel Format Image

Figure 2 shows the relationship of the input signals and LCD pixel format image.

Figure 2 Pixel Format



4.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes

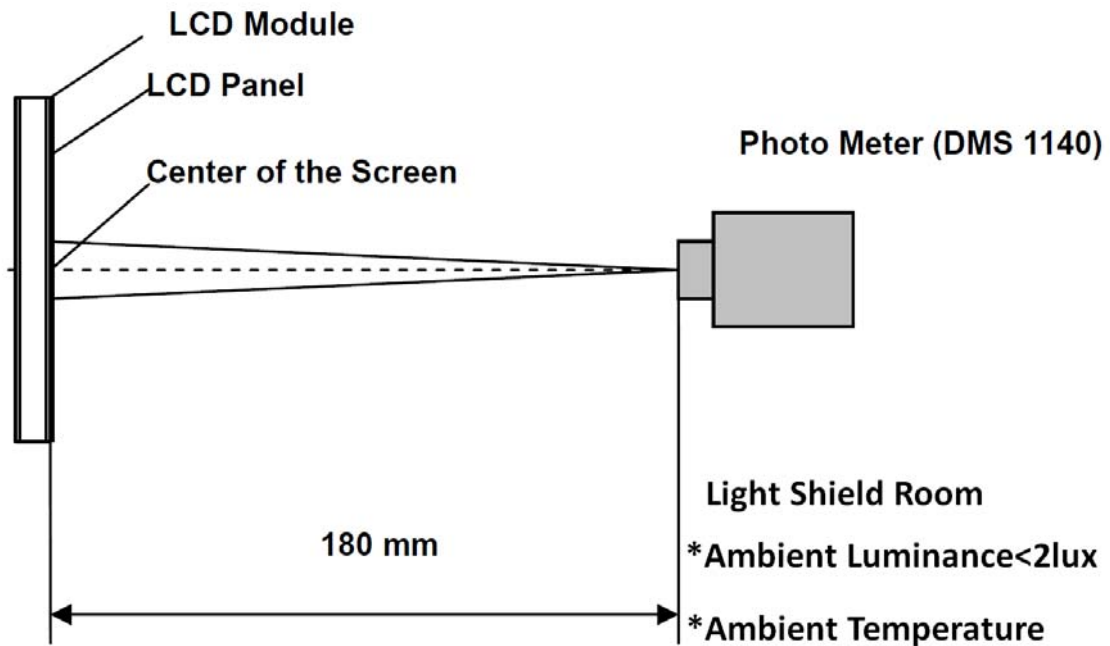
Table 2 Optical Characteristics

| Item | Conditions | | Min. | Typ. | Max. | Unit | Note | | |
|--------------------------|------------------|------------|---------------|-------|---------------|-------------------|-------------|-------|---|
| Viewing Angle (CR>10) | Horizontal | θ_L | 70 | 80 | - | degree | (1),(2),(3) | | |
| | | θ_R | 70 | 80 | - | | | | |
| | Vertical | θ_T | 70 | 80 | - | | | | |
| | | θ_B | 70 | 80 | - | | | | |
| Contrast Ratio | Center | | 720 | 800 | - | - | (1),(2),(4) | | |
| Response Time | Rising + Falling | | - | 16 | TBD | ms | (1),(2),(5) | | |
| Color Chromaticity | Red | x | Typ. -0.03 | TBD | Typ. +0.03 | - | (1),(2) | | |
| | Red | y | | TBD | | - | | | |
| | Green | x | | TBD | | - | | | |
| | Green | y | | TBD | | - | | | |
| | Blue | x | | TBD | | - | | | |
| | Blue | y | | TBD | | - | | | |
| | White | x | | 0.255 | | 0.305 | | 0.355 | - |
| | White | y | | 0.275 | | 0.325 | | 0.375 | - |
| White Luminance | Center | | 315 | 350 | - | cd/m ² | (1),(2),(6) | | |
| Luminance Uniformity | 9Points | | 75 | 80 | - | % | (1),(2),(6) | | |

Note (1) Measurement Setup:

The LCD module should be stabilized at given temperature(25 °C) for 15 minutes to Avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

Figure 3 Measurement Setup



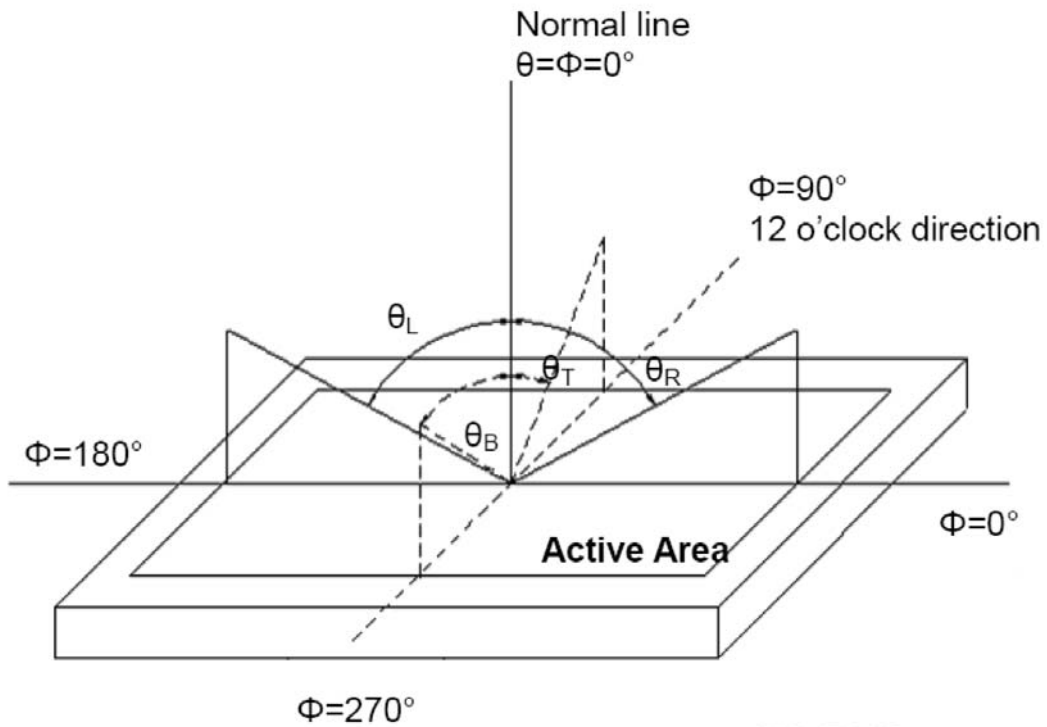
Note (2) The LED input parameter setting as:

VLED: 12V;

PWM_LED: Duty 100 %

Note (3) Definition of Viewing Angle

Figure 4 Definition of Viewing Angle



Note (4) Definition Of Contrast Ratio (CR)

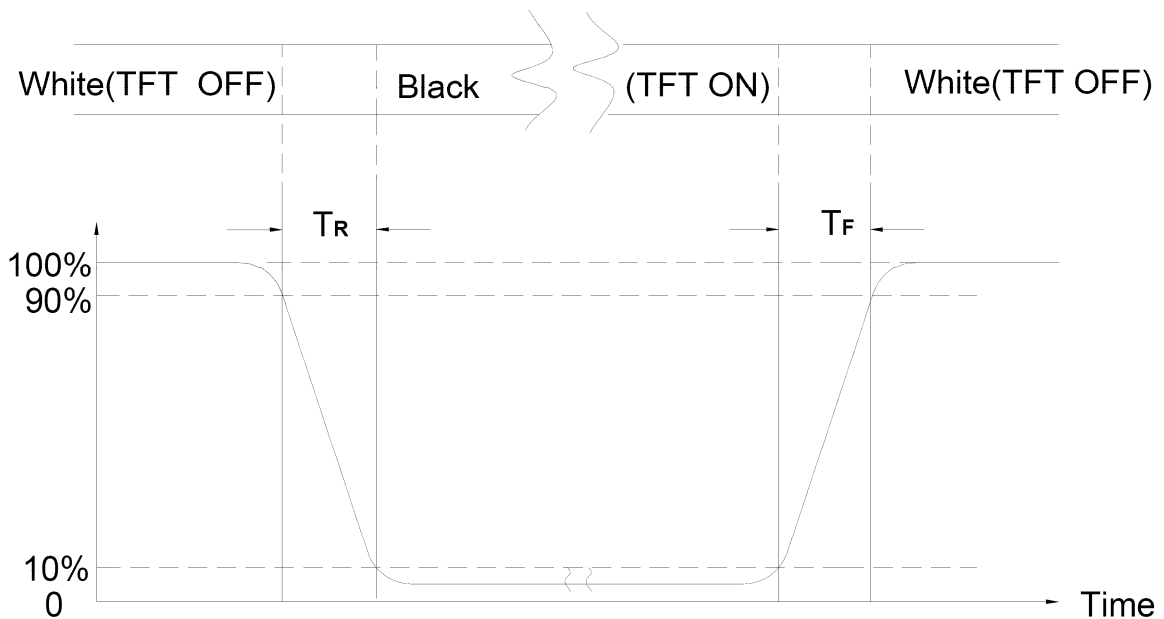
The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255, L0: Luminance of gray level 0

Note (5) Definition Of Response Time (TR, TF)

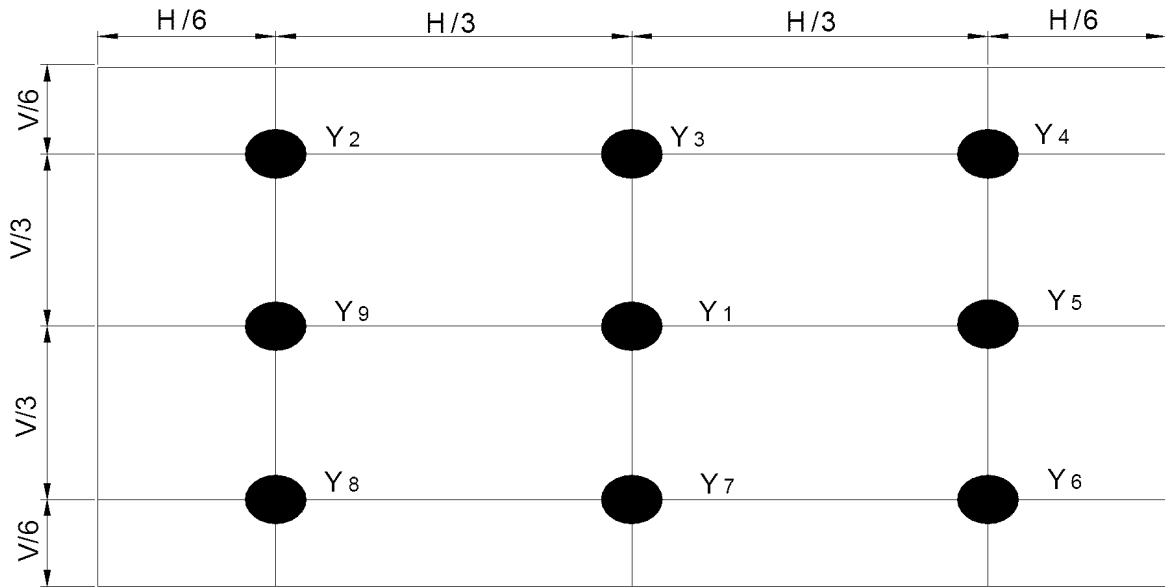
Figure 5 Definition of Response Time



Note (6) Definition Of Brightness Luminance

$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 5 points})}{(\text{Max Luminance of 5 points})} \times 100\%$$

Figure 6 Measurement Locations



5.0 Backlight Characteristics

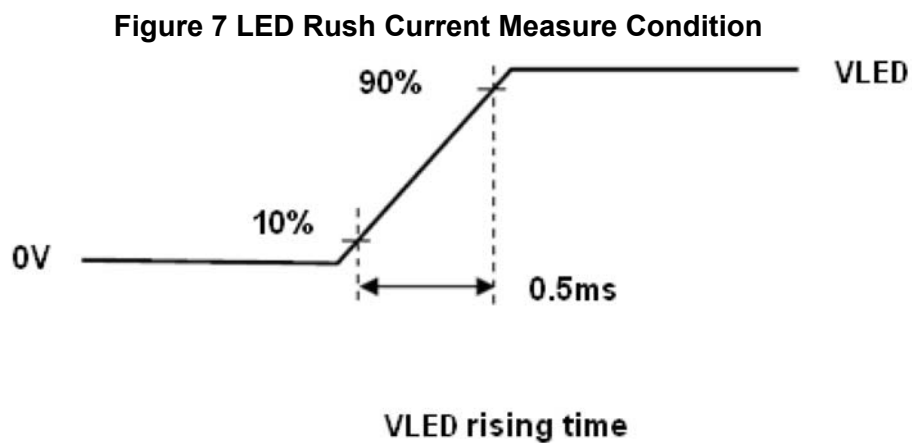
5.1 Parameter Guideline Of LED Backlight

Table 3 Parameter Guideline for LED Backlight

| Symbol | Parameter | | Min. | Typ. | Max. | Units | Condition |
|---------------------|----------------------|------|--------|------|------|-------|-------------------|
| VLED | LED Input | | 10.8 | 12 | 12.6 | [V] | Ta=25°C |
| ILED | LED Current | | - | 240 | - | mA | Ta=25°C |
| VF | LED Forward Voltage | | 2.8 | 3.3 | 3.6 | V | Ta=25°C |
| IF | LED Forward Current | | - | 60 | - | mA | Ta=25°C |
| PL | BL Power Consumption | | - | - | 6.1 | W | Ta=25°C |
| V _{PWM} | PWM Signal Voltage | High | 2.5 | 3.3 | 5.5 | V | Ta=25°C |
| | | low | - | 0 | 0.5 | | Ta=25°C |
| V _{LED_EN} | LED Enable Voltage | High | 2 | 3.3 | 5.5 | V | Ta=25°C |
| | | low | - | 0 | 0.5 | | Ta=25°C |
| FPWM | Input PWM Frequency | | 2 | - | 2000 | Hz | Ta=25°C |
| LT | LED Life Time | | 30,000 | - | - | Hours | Ta=25°C Note A |

Note A: The LED life time define as the estimated time to 50% degradation of initial luminous.

Note B: A higher LED power supply voltage will result in better power efficiency.
Keep the VLED between 12V and 12.6V is strongly recommended.



6.0 Electrical Characteristics

6.1 TFT LCD Module Interface Connector

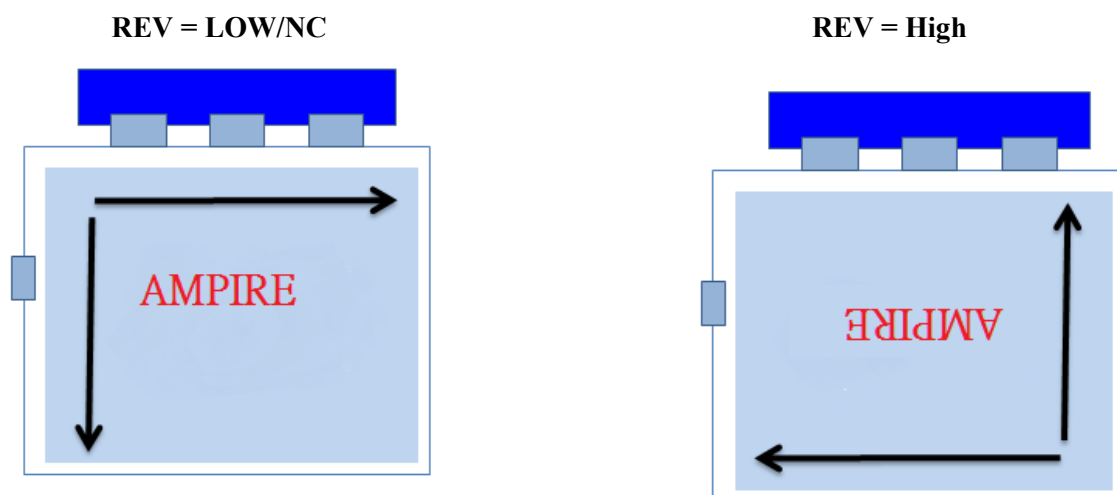
Table 4 Connector Name / Designation

| Item | Description |
|--------------------|-------------|
| Type / Part Number | MSB240420HE |

Table 5 Signal Pin Assignment

| Pin # | Signal Name | Description | Remarks |
|-------|-------------|--|---------|
| 1 | VDD | Power Supply, 3.3V (typical) | - |
| 2 | VDD | Power Supply, 3.3V (typical) | - |
| 3 | VSS | GND | - |
| 4 | REV | Reverse Scan selection | 1* |
| 5 | Rin1- | -LVDS differential data input | |
| 6 | Rin1+ | +LVDS differential data input | |
| 7 | VSS | GND | |
| 8 | Rin2- | -LVDS differential data input | |
| 9 | Rin2+ | +LVDS differential data input | |
| 10 | VSS | GND | |
| 11 | Rin3- | -LVDS differential data input | |
| 12 | Rin3+ | +LVDS differential data input | |
| 13 | VSS | GND | |
| 14 | CIkIN- | -LVDS differential data input | |
| 15 | CIkIN+ | +LVDS differential data input | |
| 16 | GND | GND | |
| 17 | Rin4- | -LVDS differential data input | |
| 18 | Rin4+ | +LVDS differential data input | |
| 19 | SEL68 | 6/8 bits LVDS data input selection(H:8bit L/NC:6bit) | |
| 20 | Bist | Internal use | |

Note1: About REV Please refer ;



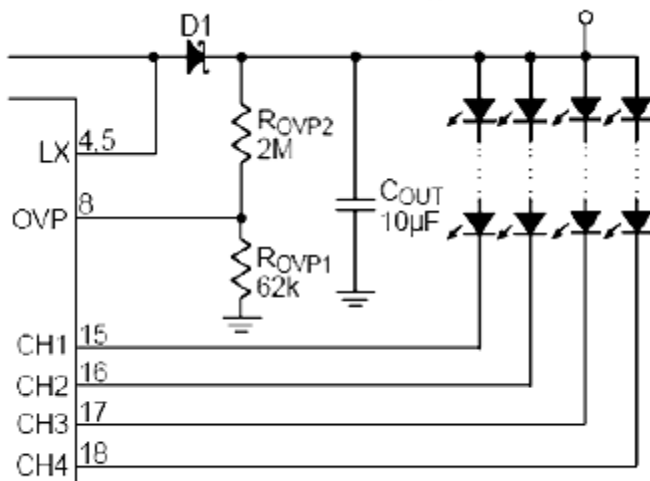
Note2: All input signals shall be low or Hi-resistance state when VDD is off.

6.2 TFT Backlight Interface Connector

Table 6 Connector Name / Designation

| Item | Description |
|--------------------|-------------|
| Type / Part Number | MSB24038P5A |

| Pin # | Function |
|-------|----------------------|
| 1 | VCC(12V input) |
| 2 | GND |
| 3 | On/Off(5V-ON,0V-OFF) |
| 4 | Dimming(PWM) |
| 5 | NC |



7.0 Interface Timings

7.1 Timing Characteristics

Table 6 Interface Timings

| Parameter | Symbol | Unit | Min. | Typ. | Max. |
|----------------------|--------|--------|------|------|------|
| LVDS Clock Frequency | Fclk | MHz | 50 | 65 | 80 |
| H Total Time | HT | Clocks | 1100 | 1344 | 2047 |
| H Active Time | HA | Clocks | 1024 | 1024 | 1024 |
| H Blanking Time | HBL | Clocks | 76 | 320 | 1023 |
| V Total Time | VT | Lines | 776 | 806 | 1023 |
| V Active Time | VA | Lines | 768 | 768 | 768 |
| V Blanking Time | VBL | Lines | 8 | 38 | 255 |
| Frame Rate | Vsync | Hz | - | 60 | - |

Synchronization Method: DE only

Note: H Blank area and V Blank area can not be changed at every frame

7.2 Timing Diagram of Interface Signal

Figure 8 Timing Characteristics

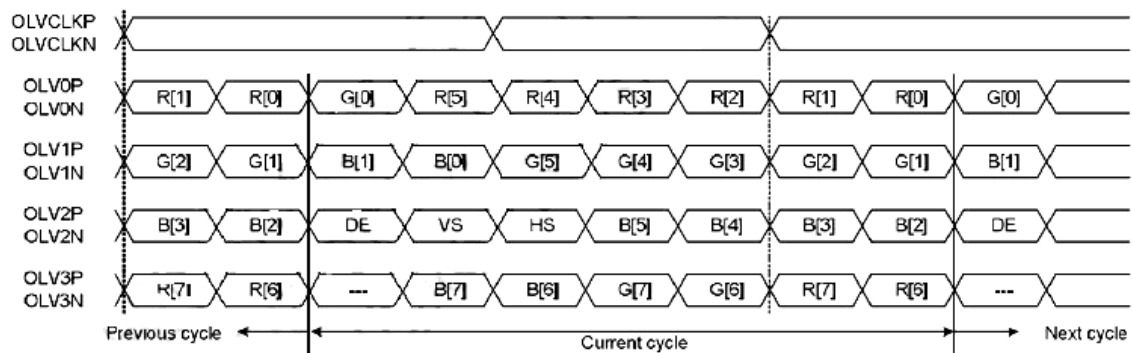
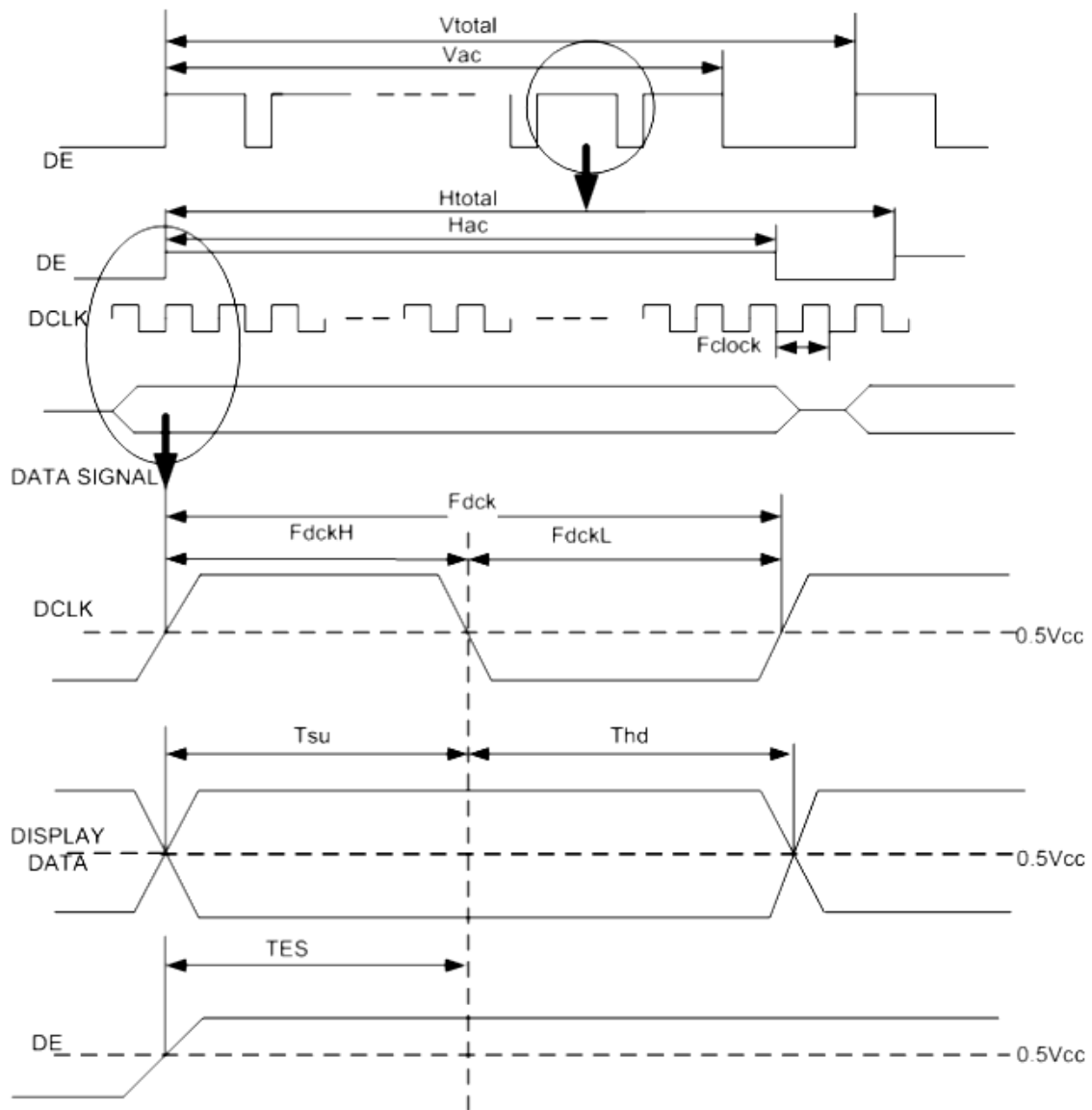


Figure 9 Timing Characteristics



8.0 Power Consumption

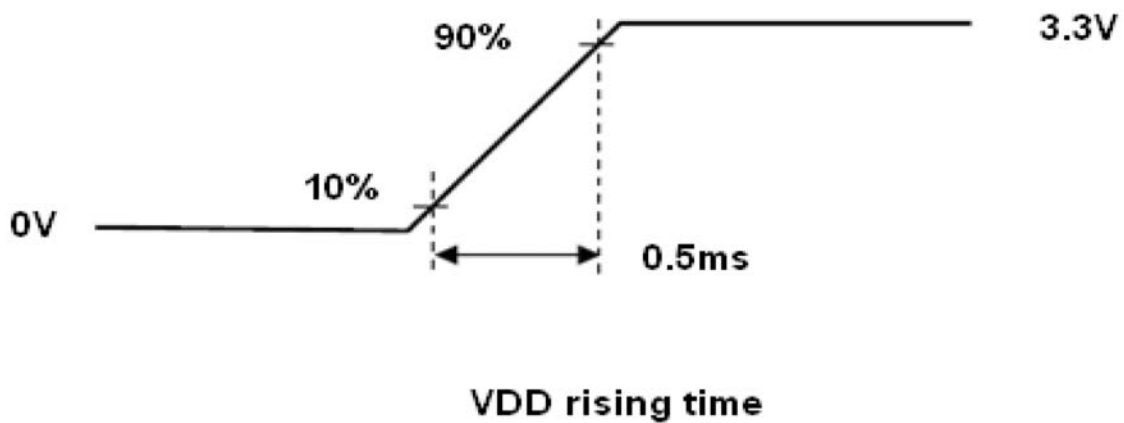
Input power specifications are as follows.

Table 8 Power Consumption

| Item | Symbol | Min. | Typ. | Max. | Units | Note | |
|--|---------------|------|------|------|-------|-------------|-------------|
| LCD Drive Voltage (Logic) | VDD | 3.0 | 3.3 | 3.6 | V | (2), (4) | |
| VDD Current | Black Pattern | IDD | - | - | 250 | mA | (3),(4),(6) |
| VDD Power Consumption | Black Pattern | PDD | - | - | 0.825 | W | |
| Rush Current | Irush | - | - | 3 | A | (1),(4),(5) | |
| Allowable Logic/LCD Drive Ripple Voltage | VDDrp | - | - | 200 | mV | (4) | |

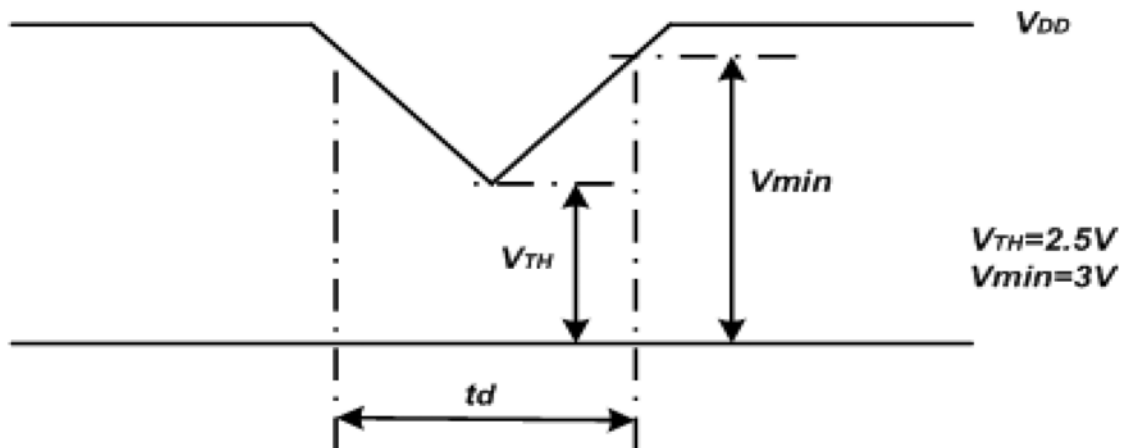
Note 1. Measure Condition

Figure 9 VDD rising time



Note 2. VDD Power Dip Condition

Figure 10 VDD Power Dip



If $V_{TH} < V_{DD} \leq V_{min}$, then $t_d \leq 10ms$; When the voltage return to normal our panel must revive automatically.

9.0 Power ON/OFF Sequence

VDD power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.

Figure 11 Power Sequence

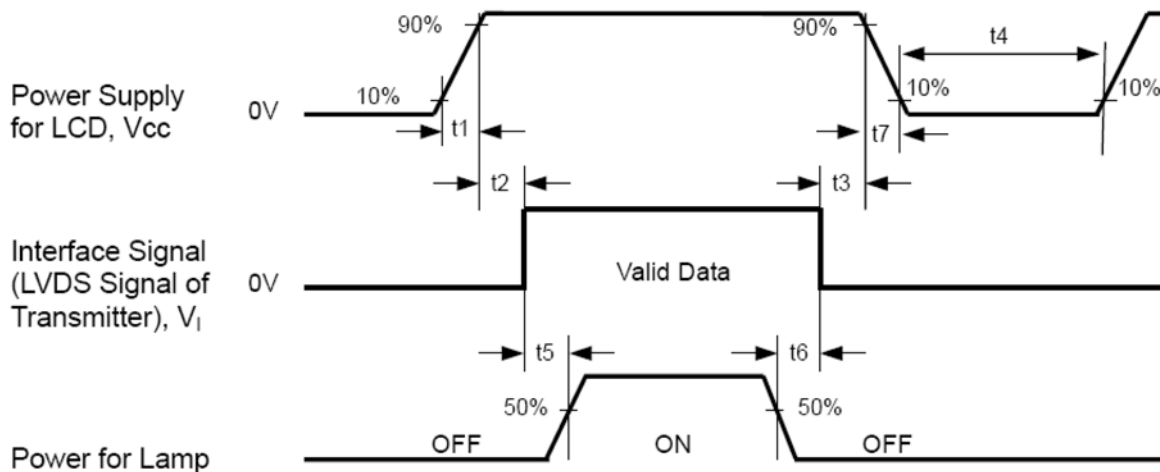


Table 9 Power Sequencing Requirements

| Parameter | Value | | | Units |
|-----------|-------|------|------|-------|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | [ms] |
| T2 | 30 | 40 | 50 | [ms] |
| T3 | 200 | - | - | [ms] |
| T4 | 10 | - | - | [ms] |
| T5 | 10 | - | - | [ms] |
| T6 | 0 | - | - | [ms] |
| T7 | 10 | - | - | [ms] |
| T8 | 100 | - | - | [ms] |
| T9 | 0 | 16 | 50 | [ms] |
| T10 | - | - | 10 | [ms] |
| T11 | 1000 | - | - | [ms] |

10 USE PRECAUTIONS

10.1 Handling precautions

- 1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
- 2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
- 3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
- 4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

10.2 Installing precautions

- 1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. $1M\Omega$ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
- 2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
- 3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
- 4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

10.3 Storage precautions

- 1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
- 2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
- 3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

10.4 Operating precautions

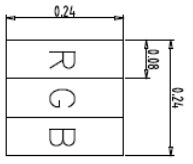
- 1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
- 2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
- 3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC drive voltage.
- 4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
- 5) Make certain that each signal noise level is within the standard (L level: 0.2V_{dd} or less and H level: 0.8V_{dd} or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
- 6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.

- 7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
- 8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

10. Other

- 1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- 2) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.
- 3) AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

| REV | REVISION RECORD | DATE | NAME |
|-----|-----------------|----------|-------|
| 0 | NEW RELEASE | 09-03-13 | EMILY |



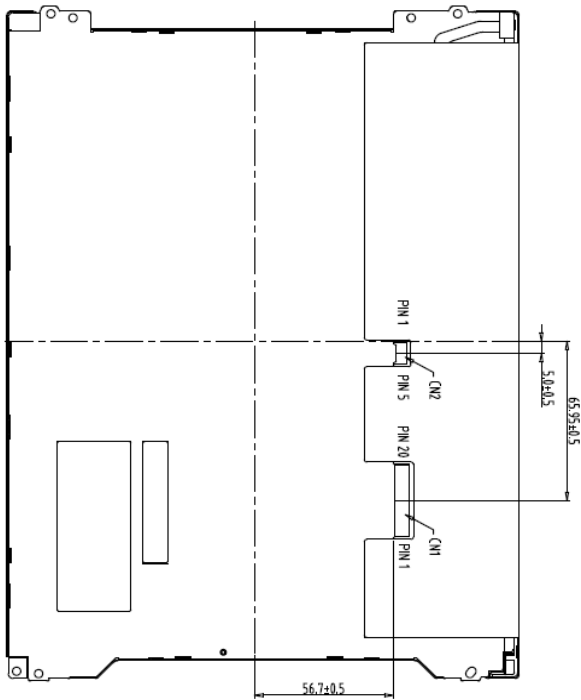
A Block

| | |
|---|---------|
| 1 | VCC |
| 2 | GND |
| 3 | On/Off |
| 4 | Dimming |
| 5 | NC |

CN2

| | | | |
|----|-------|----|--------|
| 1 | VDD | 11 | Rin3- |
| 2 | VDD | 12 | Rin3+ |
| 3 | VSS | 13 | VSS |
| 4 | REV | 14 | CLKIN- |
| 5 | Rin1- | 15 | CLKIN+ |
| 6 | Rin1+ | 16 | GND |
| 7 | VSS | 17 | Rin4- |
| 8 | Rin2- | 18 | Rin4+ |
| 9 | Rin2+ | 19 | SEL68 |
| 10 | VSS | 20 | Bist |

CN1



Back View

Note:
 1. Unless indicated, Tolerance "±0.5"
 2. UV Glue For OLB Protection.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | TOLERANCE GRAD(E) | A | B | DIM. | MM | DWN. | EMILY | DATE | 09-03-13 | TITLE | 1024768R | DWG. NO. | *130908MA | SHEET | 1 OF 1 |
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