



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-800480SHMQW-00 |
| Approved by | |
| Date | |

- Preliminary Specification
 Formal Specification

AMPIRE CO., LTD.

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| Approved by | Checked by | Organized by |
|-------------|------------|--------------|
| Patrick | Kakai | Jessica |

This Specification is subject to change without notice.

RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---------------|------|--|---------|
| 2021/12/27 | -- | New Release | Jessica |
| 2022/02/07 | 5,7 | Update timing table and LED driving conditions | Jessica |

1. Introduction

It's a 7 inches Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 7" TFT-LCD panel, LED backlight.

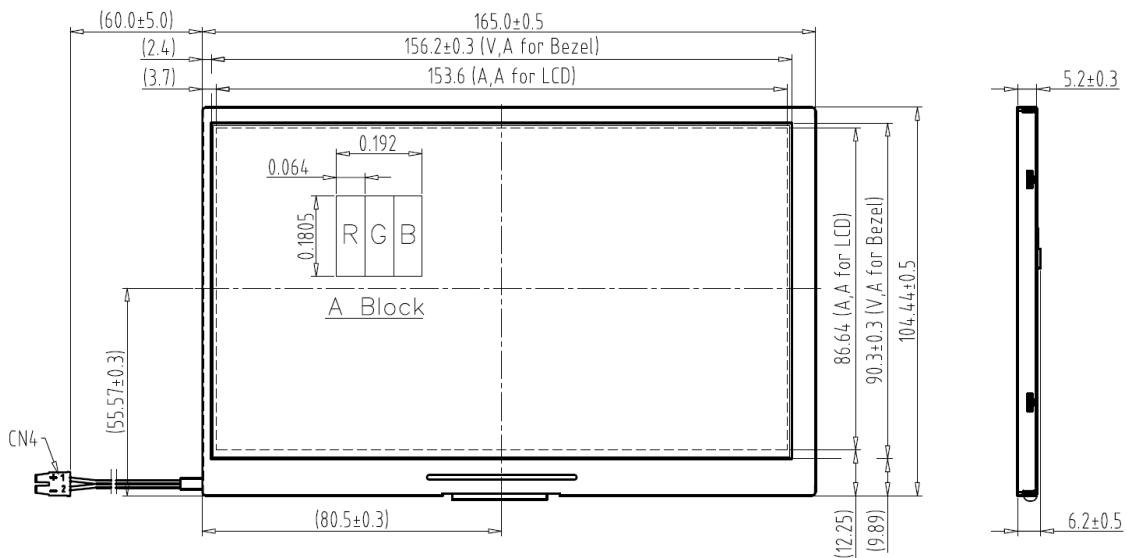
- (1) Construction: 7" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 800(R.G.B) X480
- (3) Number of the Colors: 262,144 colors (R, G, and B 6 bit digital each)
- (4) LCD type: Transmissive, normally White
- (5) Interface: TTL
- (6) Viewing Direction: 6 o'clock (Gray inversion)

1.1 Features

- (1) Input interface voltage: 3.3V

2. Physical Specifications

| Item | Specifications | unit |
|-------------------|----------------------|------|
| LCD size | 7 inch (Diagonal) | |
| Resolution | 800 x (RGB) x 480 | dot |
| Pixel pitch | 0.192(W) x 0.1805(H) | mm |
| Color arrangement | RGB-stripe | |
| interface | Digital | |



3. Absolute Max. Ratings

| Item | Symbol | Values | | | Unit | Remark |
|-----------------------|--------|--------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Power Voltage | VCC | -0.5 | -- | 5 | V | |
| Operation Temperature | TOP | -20 | - | 70 | °C | |
| Storage Temperature | TST | -30 | - | 80 | °C | |

Note(1) The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

4. Electrical Characteristics

4.1 DC Characteristics

| Item | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------------------|---------|------|---------|------|---------|--------|
| Power supply | VCC | 3.0 | 3.3 | 3.6 | V | |
| Input Voltage for logic | H Level | VIH | 0.7 VCC | -- | VCC | V |
| | L Level | VIL | 0 | -- | 0.3 VCC | V |
| Power Supply current | ICC | | 100 | | mA | Note1 |

Note(1) TFT power supply current. VCC=3.0V, fV =60Hz, Ta=25°C, Display pattern: All Black

4.2 AC Characteristics

TTL

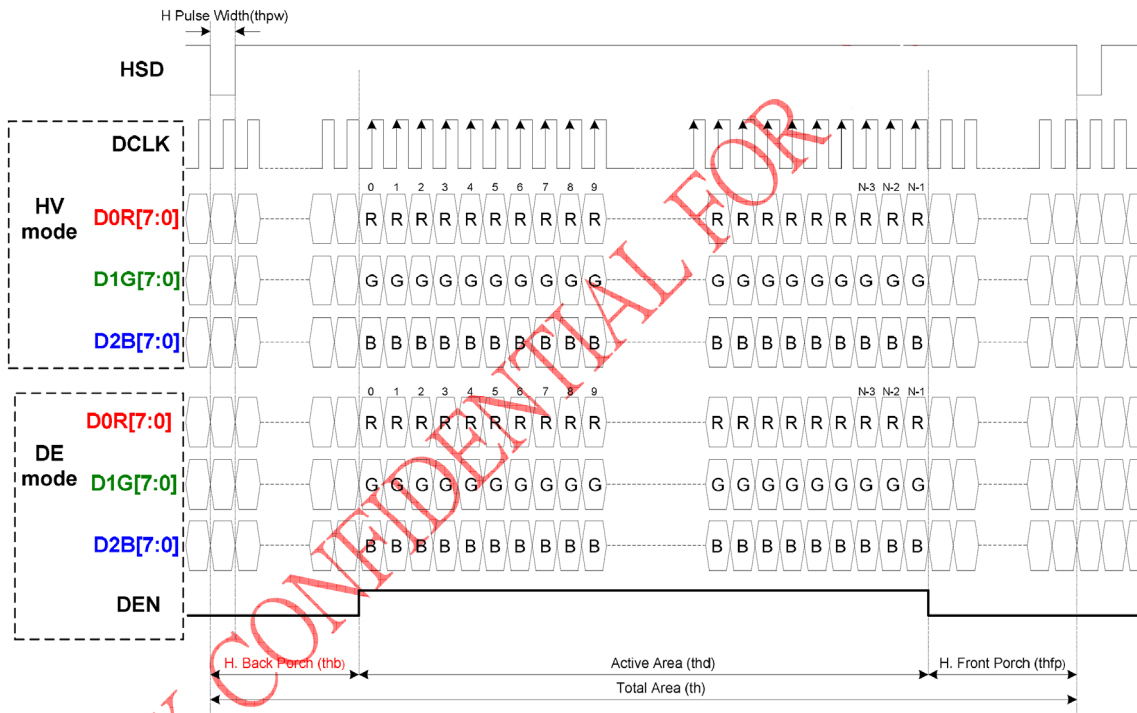
- Horizontal timing

| Parameter | Symbol | Spec. | | | Unit |
|--------------------------|--------|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| Horizontal Display Area | thd | | 800 | | DCLK |
| DCLK frequency | fclk | - | 30 | 50 | MHz |
| One Horizontal Line | th | 889 | 928 | 1143 | DCLK |
| HS pulse width | thpw | 1 | 48 | 255 | DCLK |
| HS Back Porch (Blanking) | thb | | 88 | | DCLK |
| HS Front Porch | thfp | 1 | 40 | 255 | DCLK |
| DE mode Blanking | th-thd | 85 | 128 | 512 | DCLK |

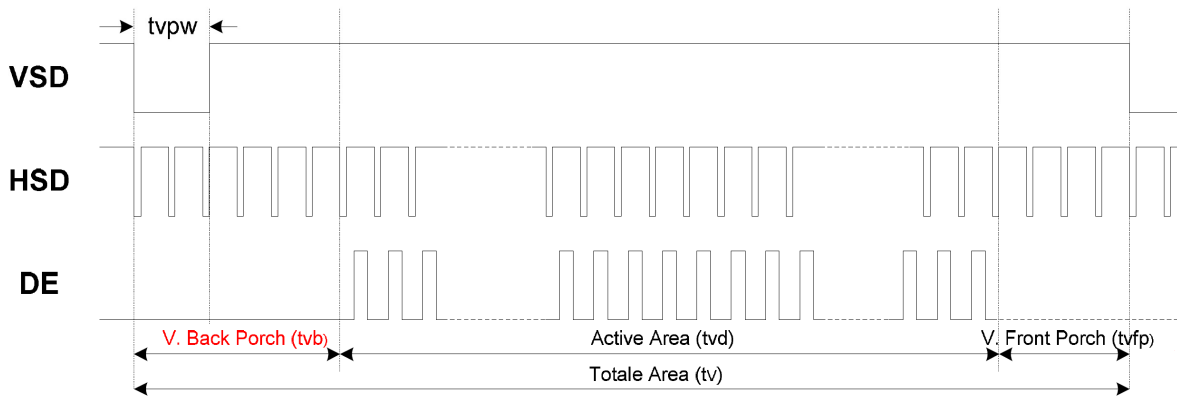
- Vertical timing

| Parameter | Symbol | Spec. | | | Unit |
|--------------------------|--------|-------|------|------|----------------|
| | | Min. | Typ. | Max. | |
| Vertical Display Area | tvd | | 480 | | T _H |
| VS period time | tv | 513 | 525 | 767 | T _H |
| VS pulse width | tvpw | 3 | 3 | 255 | T _H |
| VS Back Porch (Blanking) | tvb | | 32 | | T _H |
| VS Front Porch | tvfp | 1 | 13 | 255 | T _H |
| DE mode Blanking | tv-tvd | 4 | 45 | 255 | T _H |

.2. Horizontal Input Timing



Vertical Input Timing

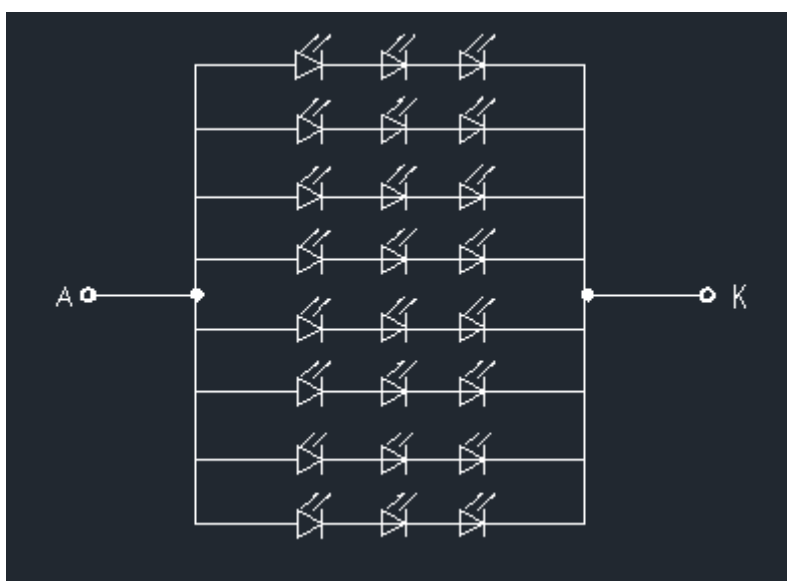


5. LED Driving Conditions

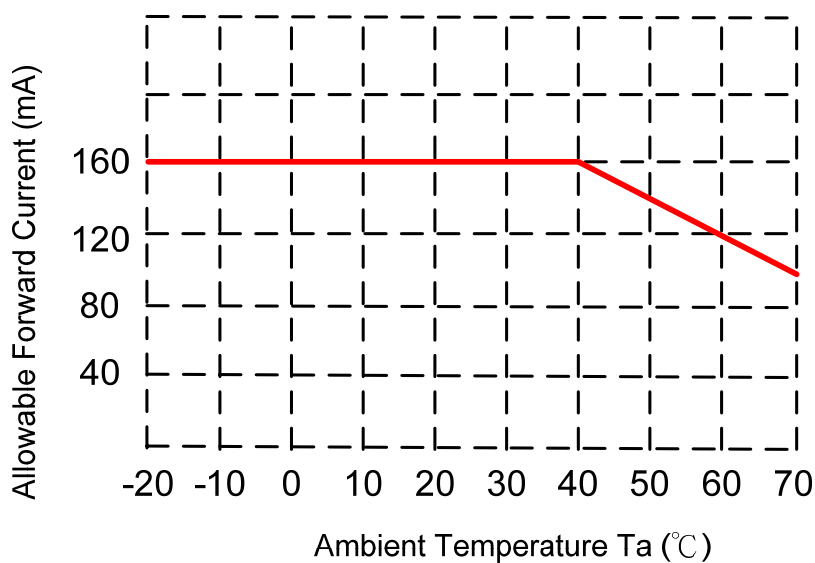
| Item | Symbol | Min. | Typ. | Max. | Unit | Condition |
|-----------------------|--------|------|------|------|------|------------------------|
| LED Backlight Voltage | VBL | - | 9.9 | - | V | Note(1) IBL = 160mA |
| LED Backlight Current | IBL | - | 160 | - | mA | |
| LED Life Time | - | -- | 30K | -- | Hr | Note(2) |

Note(1) The backlight must be driven by constant current source.

Note(2) Brightness to be decreased to 50% of the initial value.



Note(3) When LCM is operated over 40°C ambient temperature, the IBL should be follow :



6. Interface

| Pin no | Symbol | Function |
|--------|--------|--|
| 1 | GND | Ground |
| 2 | GND | Ground |
| 3 | NC | No connection |
| 4 | VCC | Power supply for Digital Circuit |
| 5 | VCC | Power supply for Digital Circuit |
| 6 | VCC | Power supply for Digital Circuit |
| 7 | VCC | Power supply for Digital Circuit |
| 8 | NC | No connection |
| 9 | DE | Data Enable Timing Signal |
| 10 | GND | Ground |
| 11 | GND | Ground |
| 12 | GND | Ground |
| 13 | B5 | Blue data (MSB) |
| 14 | B4 | Blue data |
| 15 | B3 | Blue data |
| 16 | GND | Ground |
| 17 | B2 | Blue data |
| 18 | B1 | Blue data |
| 19 | B0 | Blue data (LSB) |
| 20 | GND | Ground |
| 21 | G5 | Green data (MSB) |
| 22 | G4 | Green data |
| 23 | G3 | Green data |
| 24 | GND | Ground |
| 25 | G2 | Green data |
| 26 | G1 | Green data |
| 27 | G0 | Green data (LSB) |
| 28 | GND | Ground |
| 29 | R5 | Red data (MSB) |
| 30 | R4 | Red data |
| 31 | R3 | Red data |
| 32 | GND | Ground |
| 33 | R2 | Red data |
| 34 | R1 | Red data |
| 35 | R0 | Red data (LSB) |
| 36 | GND | Ground |
| 37 | GND | Ground |
| 38 | DCLK | Data Clock :Latch Data at Falling Edge |
| 39 | GND | Ground |
| 40 | GND | Ground |

Note: User's connector part number is **PF050-40ZSG-F09-S** manufactured by UJU or equivalent.

7. Optical Characteristics

| Item | Symbol | Condition | Values | | | Unit | Note | |
|------------------------------|--------|-------------------------|------------------|---------------|------|-------------------|-------|----------------|
| | | | Min. | Typ. | Max. | | | |
| Viewing angle (CR ≥ 10) | θL | Φ = 180° (9 o'clock) | 60 | 70 | -- | degree | Note1 | |
| | θR | Φ = 0° (3 o'clock) | 60 | 70 | -- | | | |
| | θT | Φ = 90° (12 o'clock) | 40 | 50 | -- | | | |
| | θB | Φ = 270° (6 o'clock) | 50 | 60 | -- | | | |
| Response time | TON | Normal θ=Φ=0° | -- | 5 | 7 | msec | Note3 | |
| | TOFF | | -- | 20 | 28 | msec | | |
| Contrast ratio | CR | | 400 | 500 | -- | -- | Note4 | |
| Color chromaticity | WX | | Normal θ=Φ=0° | Typ. -0.05 | TBD | Typ. +0.05 | -- | Note5 Note6 |
| | WY | | | | TBD | | -- | |
| | RX | | | | TBD | | | |
| | RY | | | | TBD | | | |
| | GX | | | | TBD | | | |
| | GY | TBD | | | | | | |
| | BX | TBD | | | | | | |
| | BY | TBD | | | | | | |
| Luminance (central point) | L | | 300 | 350 | -- | cd/m ² | Note6 | |
| Luminance uniformity | YU | | 70 | 75 | -- | % | Note6 | |

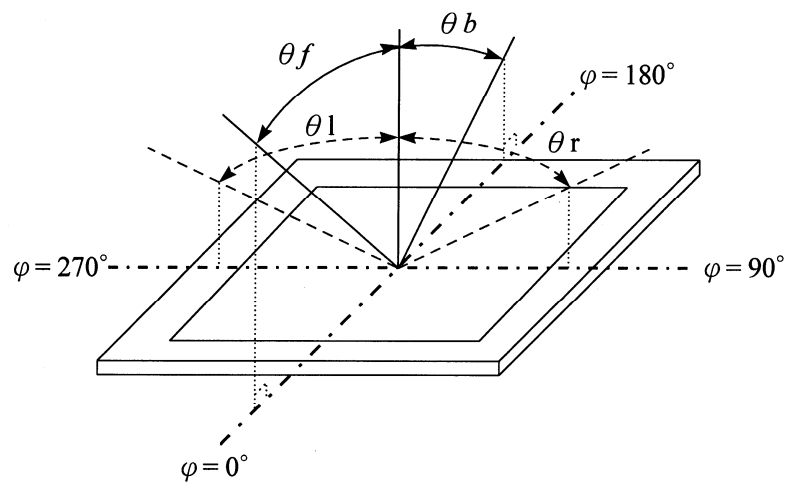
Test Conditions:

VCC = 3.3V, IBL = 160mA (Backlight current), the ambient temperature is 25°C.

The test systems refer to Note 2.

Note(1) $T_a=25^{\circ}\text{C}$. To be measured on the center area of panel after 10 minutes operation.

Note(2) Definition of Viewing Angle



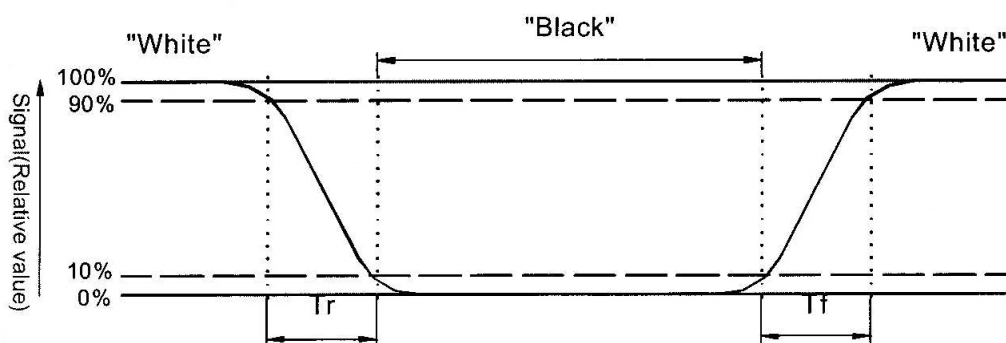
Note(3) Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

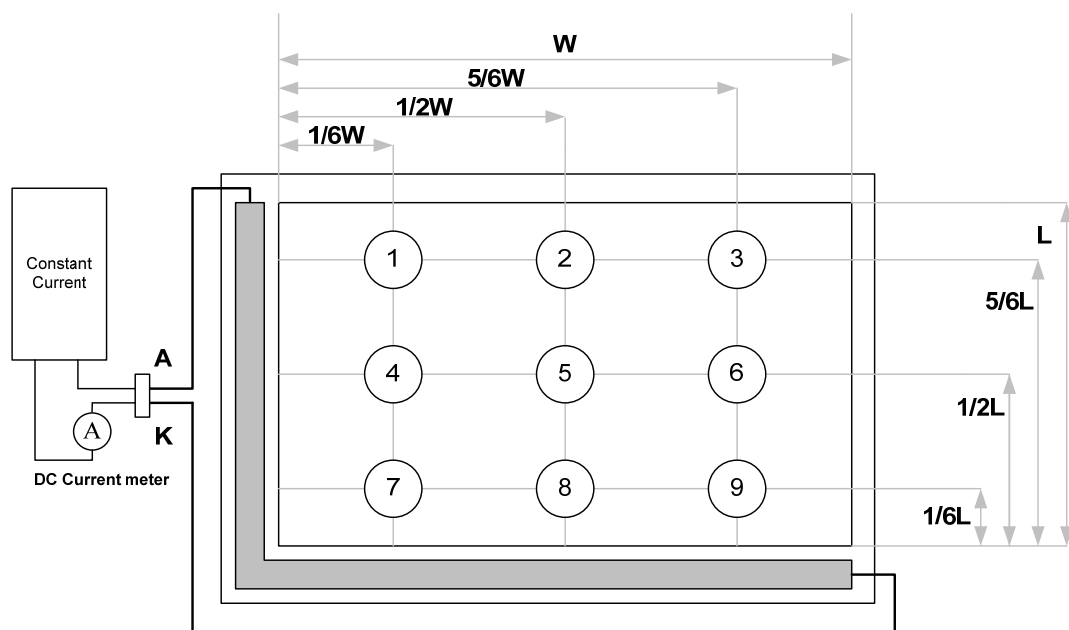
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

Note(4) Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time) respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



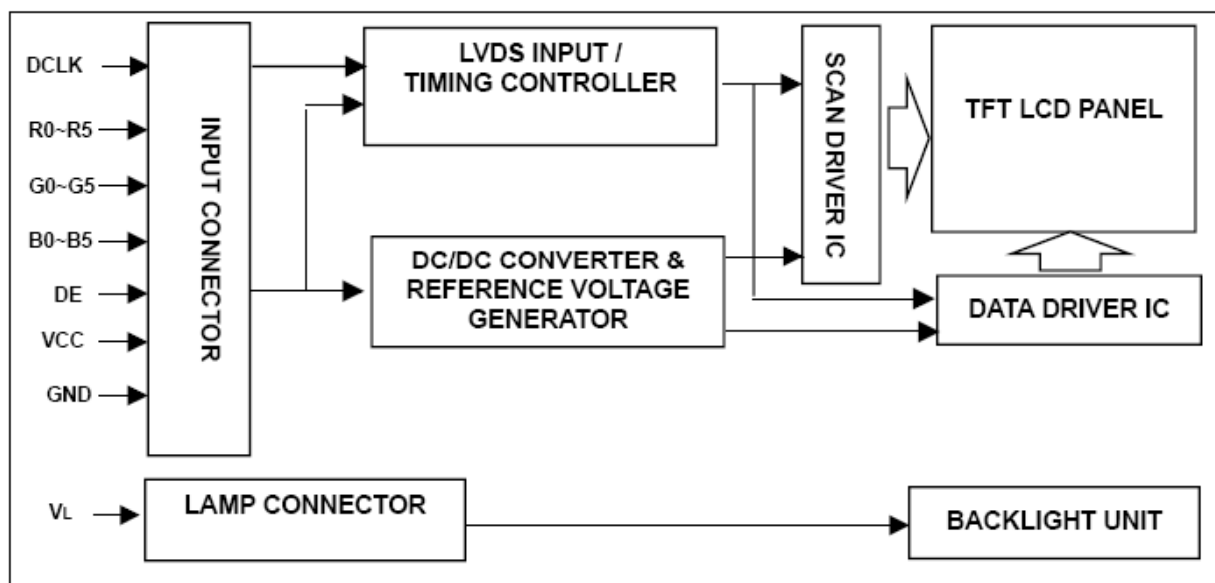
Note(5) Luminance is measured at point 5 of the display.



Note(6) Definition of Luminance Uniformity

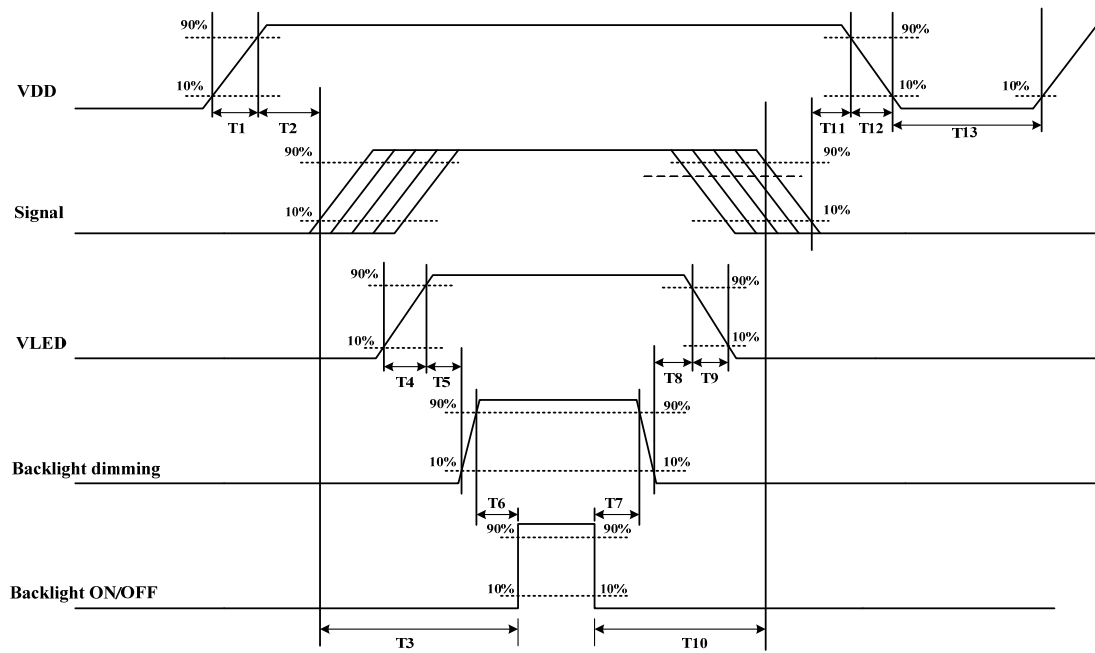
$$\Delta L = [L (\text{min.}) \text{ of 9 points} / L (\text{max.}) \text{ of 9 points}] \times 100\%$$

8. Block Diagram



9. Power ON/OFF sequence

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



| Parameter | Value | | | Units |
|-----------|-------|------|------|-------|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | [ms] |
| T2 | 0 | 40 | 50 | [ms] |
| T3 | 200 | - | - | [ms] |
| T4 | 0.5 | - | 10 | [ms] |
| T5 | 10 | - | - | [ms] |
| T6 | 10 | - | - | [ms] |
| T7 | 0 | - | - | [ms] |
| T8 | 10 | - | - | [ms] |
| T9 | - | - | 10 | [ms] |
| T10 | 110 | - | - | [ms] |
| T11 | 0.5 | 16 | 50 | [ms] |
| T12 | - | - | 100 | [ms] |
| T13 | 1000 | - | - | [ms] |

10. Reliability Test Conditions

| Test Item | Test Conditions | Note |
|----------------------------|---|------|
| High Temperature Operation | 70±3°C ,Dry t=240 hrs | |
| Low Temperature Operation | -20±3°C, Dry t=240 hrs | |
| High Temperature Storage | 80±3°C , Dry t=240 hrs | 1,2 |
| Low Temperature Storage | -30±3°C ,Dry t=240 hrs | 1,2 |
| Thermal Shock Test | -20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 100 cycle(Dry) | 1,2 |
| Humidity Test | 40 °C, Humidity 90%, 240 hrs | 1,2 |
| Vibration Test (Packing) | Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis | 2 |

Note(1) Condensation of water is not permitted on the module.

Note(2) The module should be inspired after 1 hour storage in normal conditions (15~35°C, 45~65%RH).

Note(3) The module shouldn't be tested over one condition, and all the tests are independent.

Note(4) All reliability tests should be done without the protective film.

Definitions of life end point:

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of initial value.

11. Use Precautions

11.1 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.

11.2 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

11.3 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.

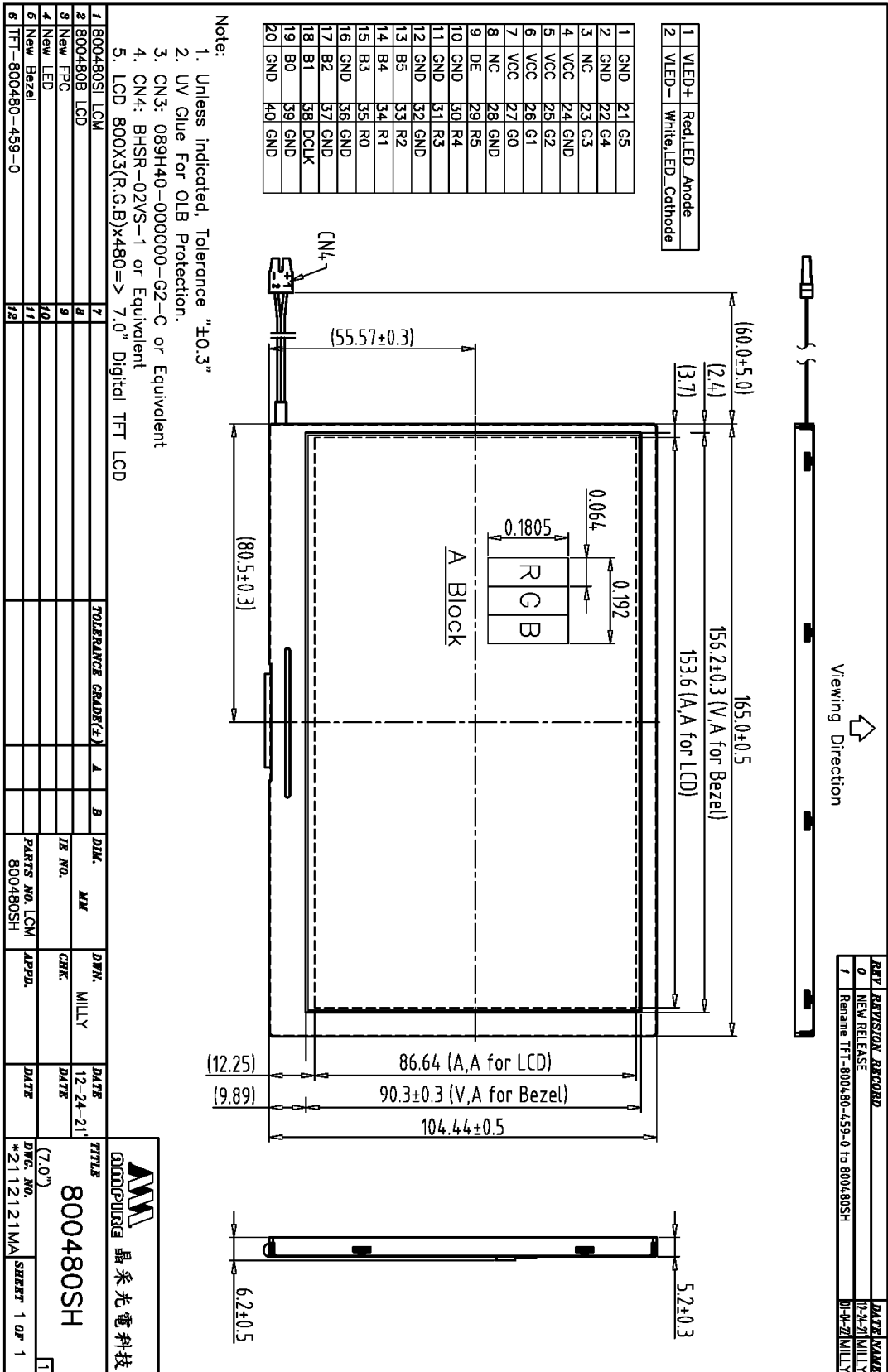
11.4 Operating precautions

- (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: 0.2VCC or less and H level: 0.8VCC 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.

11.5 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) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
- (3) AMIPRE will provide one year warranty for all products and three months warranty for all repairing products.
- (4) 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.

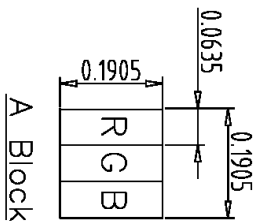
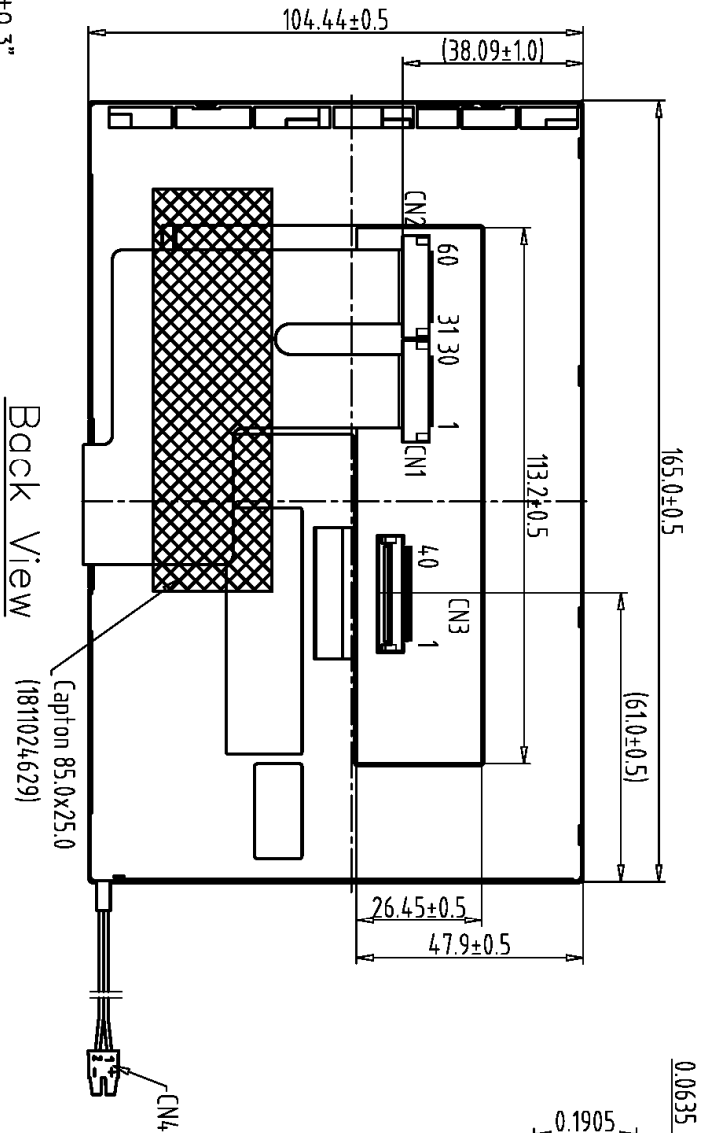
12. Outline Dimension



| REV | REVISION RECORD | DATE NAME |
|-----|-------------------------------------|----------------|
| 0 | NEW RELEASE | 12-24-21 MILLY |
| 1 | Rename TFT-800480-459-0 to 800480SH | 01-14-22 MILLY |

| | | |
|---|-------|-------------------|
| 1 | VLED+ | Red LED_Anode |
| 2 | VLED- | White_LED_Cathode |

| | | | |
|----|-----|----|------|
| 1 | GND | 21 | G5 |
| 2 | GND | 22 | G4 |
| 3 | NC | 23 | G3 |
| 4 | VCC | 24 | GND |
| 5 | VCC | 25 | G2 |
| 6 | VCC | 26 | G1 |
| 7 | VCC | 27 | G0 |
| 8 | NC | 28 | GND |
| 9 | DE | 29 | R5 |
| 10 | GND | 30 | R4 |
| 11 | GND | 31 | R3 |
| 12 | GND | 32 | GND |
| 13 | B5 | 33 | R2 |
| 14 | B4 | 34 | R1 |
| 15 | B3 | 35 | R0 |
| 16 | GND | 36 | GND |
| 17 | B2 | 37 | GND |
| 18 | B1 | 38 | DCLK |
| 19 | B0 | 39 | GND |
| 20 | GND | 40 | GND |



- Note:
1. Unless indicated, Tolerance “±0.3”
 2. UV Glue For OLB Protection.
 3. CN3: 089H40-000000-G2-C or Equivalent
 4. CN4: BHSR-02VS-1 or Equivalent
 5. LCD 800X3(R,G,B)x480=> 7.0” Digital TFT LCD

| | | | | | | | | | |
|---|------------------|----|--------------------|---|---|---------|------------|----------|--------------|
| 1 | 800480SH LCM | 7 | TOLERANCE GRADE(F) | A | B | DIM. MM | DWN. MILLY | DATE | TITLE |
| 2 | 800480B LCD | 8 | | | | | | 12-24-21 | 800480SH |
| 3 | New FPC | 9 | | | | | | | (7.0”) |
| 4 | New LED | 10 | | | | | | | DWG. NO |
| 5 | New Bezel | 11 | | | | | | | *2112122MA |
| 6 | TFT-800480-459-0 | 12 | | | | | | | SHEET 1 OF 1 |

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13. Package
TBD