



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

|                          |                            |
|--------------------------|----------------------------|
| <b>CUSTOMER</b>          |                            |
| <b>CUSTOMER PART NO.</b> |                            |
| <b>AMPIRE PART NO.</b>   | <b>AM-800480ANTMQW-A1H</b> |
| <b>APPROVED BY</b>       |                            |
| <b>DATE</b>              |                            |

- Approved For Specifications  
 Approved For Specifications & Sample

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|-------------|------------|--------------|
|             |            |              |

## RECORD OF REVISION

| Revision Date           | Page | Contents   | Editor          |
|-------------------------|------|--|-----------------|
| 2014/08/18<br>2014/10/6 |      | New Release<br>Modify LED driver Data according the real design. | Sharon<br>Kokai |

AMPIRE CONFIDENTIAL

## 1. Features

9 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module.  
This module is composed of a TFT-LCD panel , a driving circuit and LED backlight.

- (1) Construction: 9" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 800(R.G.B) X480
- (3) Number of the Colors : 256K colors ( R , G , B 6 bit digital each)
- (4) LCD type : Transmissive, normally White
- (5) Interface: LVDS interface 20 pin
- (6) Built-in LED Driver. (PWM Dimming).**
- (7) Power Supply Voltage: 3.3V for logic voltage.
- (8) Viewing Direction: 6 O'clock (Gray Inversion The direction it's hard to be discolored)

## 2. PHYSICAL SPECIFICATIONS

| Item              | Specifications                 | unit |
|-------------------|--------------------------------|------|
| LCD size          | 9 inch (Diagonal)              |      |
| Resolution        | 800 x (RGB) x 480              | dot  |
| Dot pitch         | 0.0825(W) x 0.2327(H)          | mm   |
| Active area       | 198.0(W) x 111.696(H)          | mm   |
| Module size       | 211.1(W) x 126.5(H) x 10.85(D) | mm   |
| Color arrangement | RGB-stripe                     |      |
| interface         | Digital                        |      |

### 3. ABSOLUTE MAX. RATINGS

| Item                     | Symbol           | Values |      | UNIT | Note  |
|--------------------------|------------------|--------|------|------|-------|
|                          |                  | Min.   | Max. |      |       |
| LED Power Supply Voltage | V <sub>LED</sub> | -0.3   | 13.0 | V    | GND=0 |
| Logic Supply Voltage     | V <sub>DD</sub>  | -0.3   | 5.0  | V    |       |
| Operation temperature    | T <sub>OP</sub>  | -20    | 70   | °C   |       |
| Storage temperature      | T <sub>ST</sub>  | -30    | 80   | °C   |       |

Note 1: The product is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

Signals include : DCLK, DE, HS, VS, R0~R5, G0~G5, B0~B5.

## 4. ELECTRICAL CHARACTERISTICS

### 4.1 TFT LCD Module

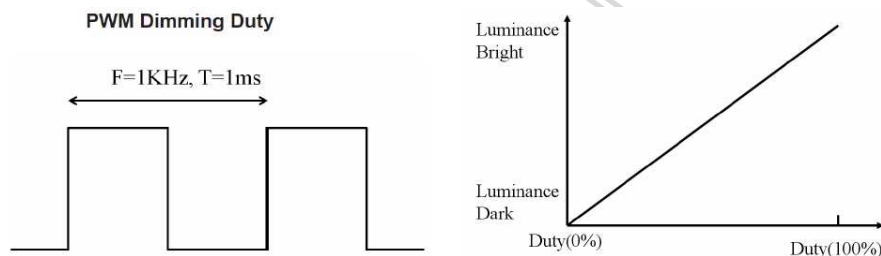
| Item                               | Symbol           | Values |      |      | UNIT | Note                      |
|------------------------------------|------------------|--------|------|------|------|---------------------------|
|                                    |                  | Min.   | Typ. | Max. |      |                           |
| Power voltage                      | VCC              | 3.0    | 3.3  | 3.6  | V    | Note1                     |
| Current of power supply            | ICC              | -      | 0.3  | -    | A    | VDD=3.3V<br>Black pattern |
| Power voltage for LED driver       | VLED             | 10     | 12   | 15   | V    |                           |
| LED driver current of power supply | ILED             | -      | 190  | --   | mA   | VLED=12<br>ADJ=100%       |
| LED Driver PWM dimming voltage     | ADJ              | 1.4    |      | 5    | VPP  | Note 2                    |
| LED Driver PWM dimming frequency   | F <sub>ADJ</sub> | 100    | 300  | 1000 | Hz   | Note2                     |

Note 1: VCC-dip condition :

when  $2.7V \leq VCC < 3.0V$  ,  $t_d \leq 10ms$ .

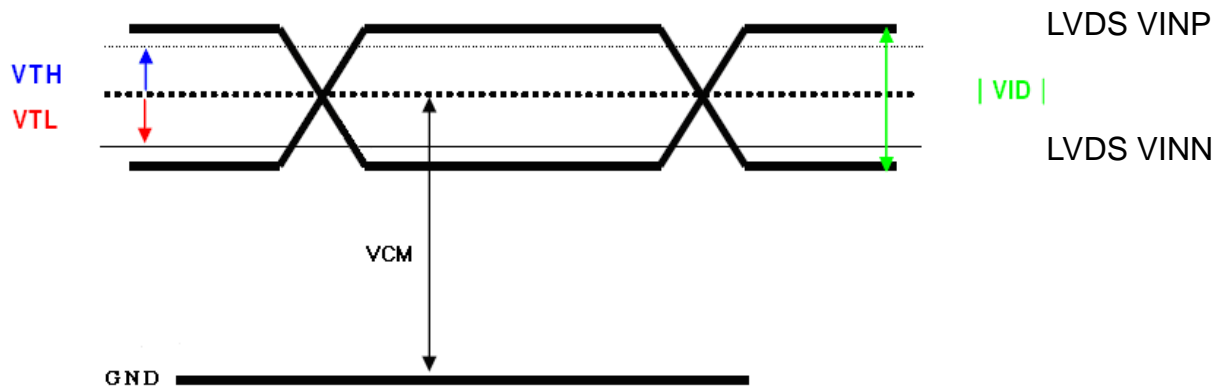
$VCC > 3.0V$  , VCC-dip condition should be same as VCC-turn-con condition.

Note 2 : PWM dimming : ADJ signal Vp-p = 1.4~5.0V, operation frequency: 100Hz ~ 1 kHz



### 4.2 Switching Characteristics of LVDS Receiver

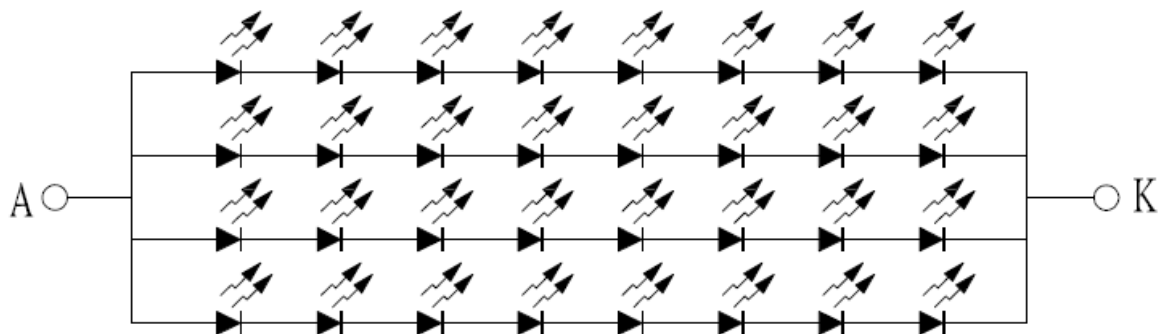
| Item                              | Symbol | Min.              | Typ. | Max.                        | Unit | Condition |
|-----------------------------------|--------|-------------------|------|-----------------------------|------|-----------|
| Differential Input High Threshold | VTH    | --                | --   | 100                         | mV   | VCM=1.2V  |
| Differential Input Low Threshold  | VTL    | -100              | --   | --                          | mV   |           |
| Input current                     | IIN    | -10               | --   | +10                         | uA   |           |
| Differential input Voltage        | VID    | 0.2               | --   | 0.6                         | V    |           |
| Common Mode Voltage Offset        | VCM    | $\frac{ VID }{2}$ | 1.25 | $2.4 \cdot \frac{ VID }{2}$ | V    |           |



### 4.3 Backlight Driving Conditions

(For reference only, The module is built-in LED driver. The LED driver output current is setting to **90 mA** for optimum the power consumption, brightness and LED lifetime)

| Item                                      | Symbol | Values        |        |      | Unit          | Note |
|---|--------|---------------|--------|------|---------------|------|
|   |        | Min.          | Typ.   | Max. |               |      |
| LED voltage                               | VAK    | --            | 25.2   | --   | LED voltage   | VAK  |
| LED current                               | IL     | --            | 260    | --   | LED current   | IL   |
| LED life time<br>(normal use 260mA)       | --     | 30,000        | 40,000 | --   | LED life time | --   |
| LED life time<br><b>(LED Driver 90mA)</b> | --     | <b>50,000</b> |        |      | LED life time | --   |

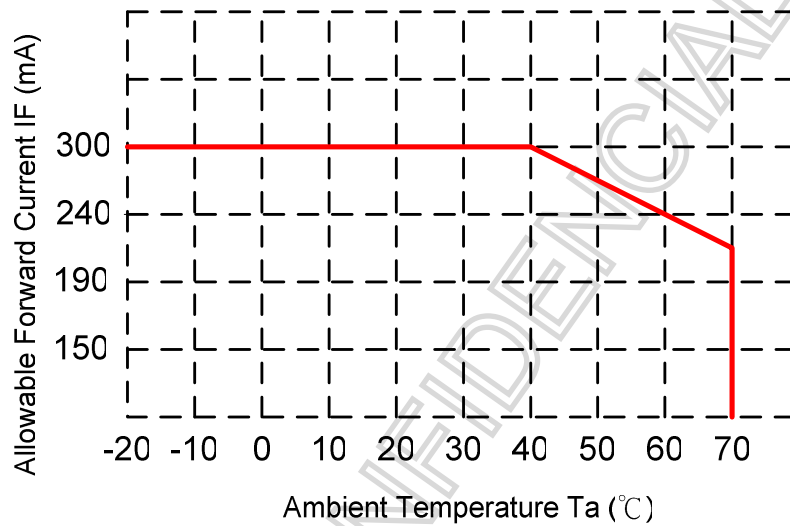


Note 1 : The LED Supply Voltage is defined by the number of LED at Ta=25°C

and  $I_L=260\text{mA}$ .

Note 2 : The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^\circ\text{C}$  and  $I_L=260\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 260mA.

Note 3 : When LCM is operated over  $40^\circ\text{C}$  ambient temperature, the  $I_L$  should be follow :



## 5. Optical Specifications

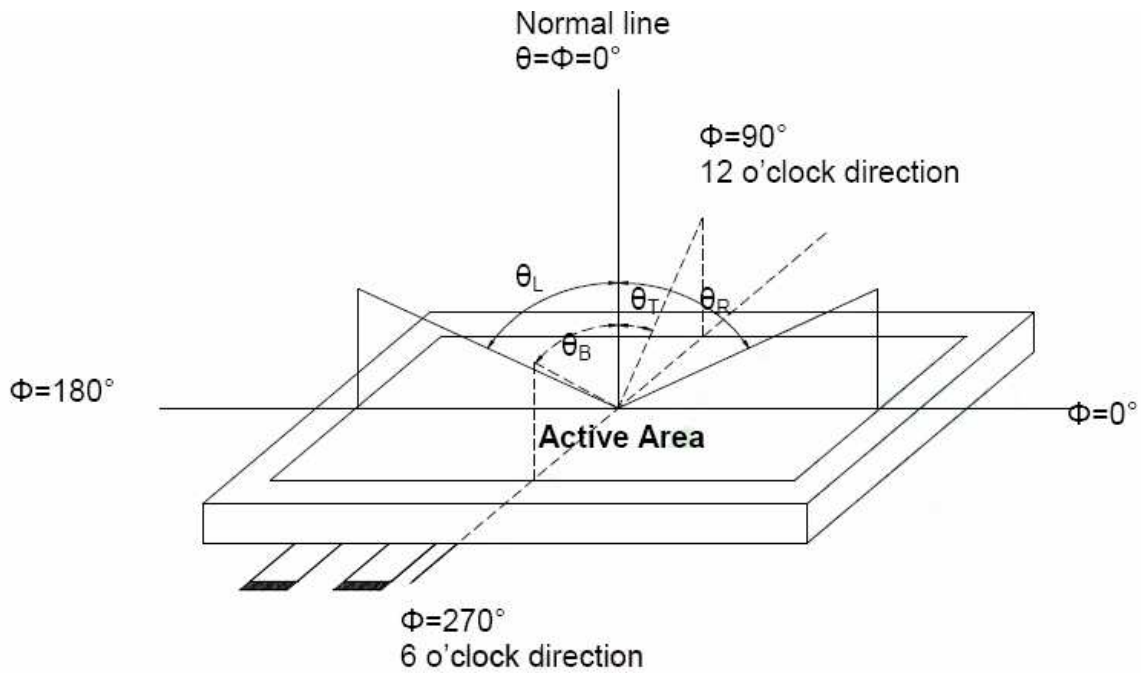
| Item                            | Symbol     | Condition                           | Values |      |      | Unit              | Note  |
|---------------------------------|------------|-------------------------------------|--------|------|------|-------------------|-------|
|                                 |            |                                     | Min.   | Typ. | Max. |                   |       |
| Viewing angle<br>(CR $\geq$ 10) | $\theta$ L | $\Phi = 180^\circ$<br>(9 o'clock)   | 60     | 70   | --   | degree            | Note1 |
|                                 | $\theta$ R | $\Phi = 0^\circ$<br>(3 o'clock)     | 60     | 70   | --   |                   |       |
|                                 | $\theta$ T | $\Phi = 90^\circ$<br>(12 o'clock)   | 40     | 50   | --   |                   |       |
|                                 | $\theta$ B | $\Phi = 270^\circ$<br>(6 o'clock)   | 70     | 70   | --   |                   |       |
| Response time                   | TON        | Normal<br>$\theta = \Phi = 0^\circ$ | --     | 10   | 20   | msec              | Note3 |
|                                 | TOFF       |                                     | --     | 15   | 30   | msec              |       |
| Contrast ratio                  | CR         |                                     | --     | 300  | --   | --                | Note4 |
| Color chromaticity              | WX         |                                     | 0.26   | 0.31 | 0.36 | --                | Note5 |
|                                 | WY         |                                     | 0.28   | 0.33 | 0.38 | --                | Note6 |
| Luminance                       | L          |                                     | 400    | 500  | --   | cd/m <sup>2</sup> | Note6 |
| Luminance uniformity            | YU         |                                     | 70     | 75   | --   | %                 | Note7 |

Test Conditions :

1.  $I_L = 300\text{mA}$  (Backlight current), the ambient temperature is  $25^\circ\text{C}$ .
2. The test systems refer to Note 2.

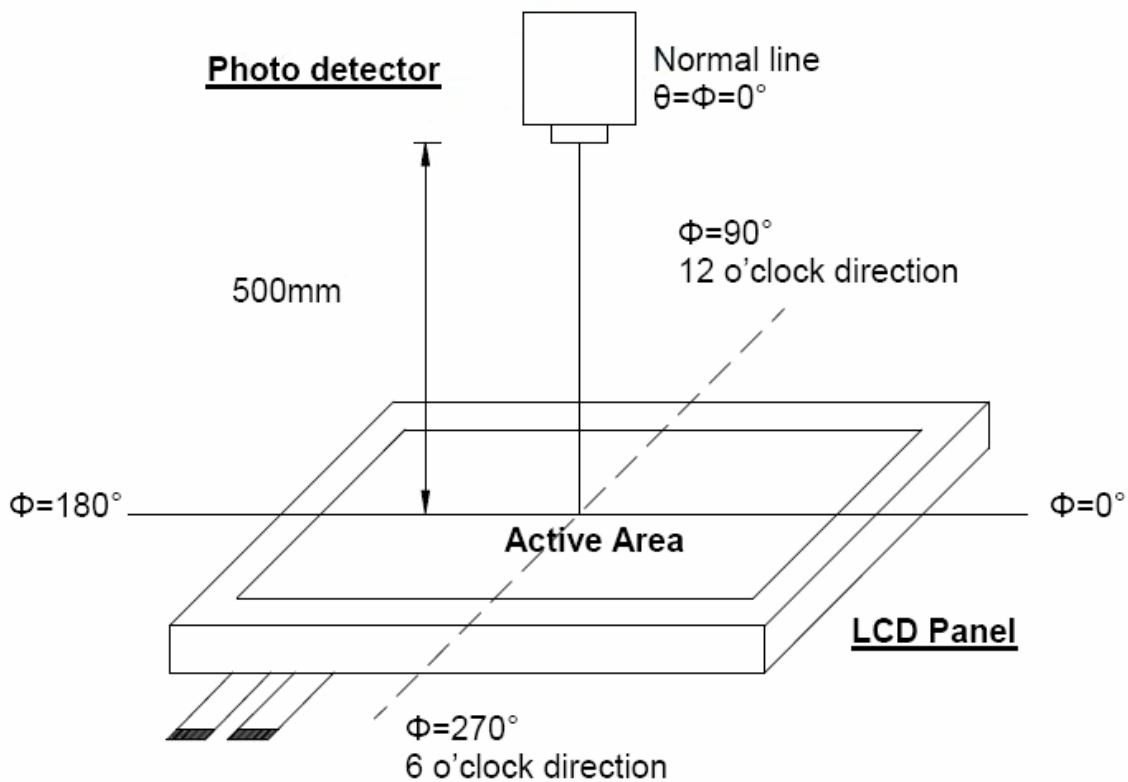
Note 1 : Definition of viewing angle range





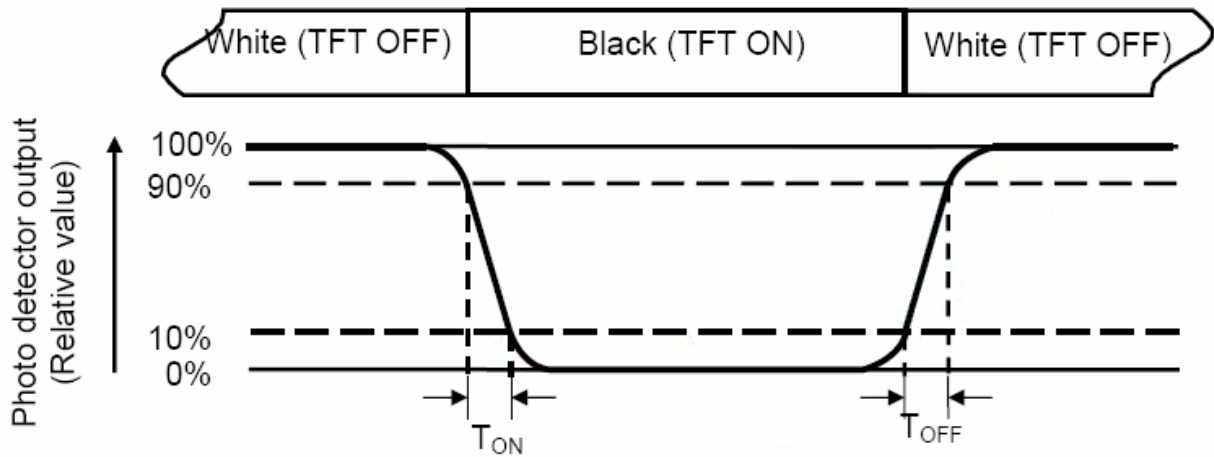
Note 2 : Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view :  $1^\circ$  / Height : 500 mm.)



Note 3 : 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 4 : Definition of contrast ratio

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

Note 5 : Definition of color chromaticity (CIE1931)

Color coordinated measured at center point of LCD.

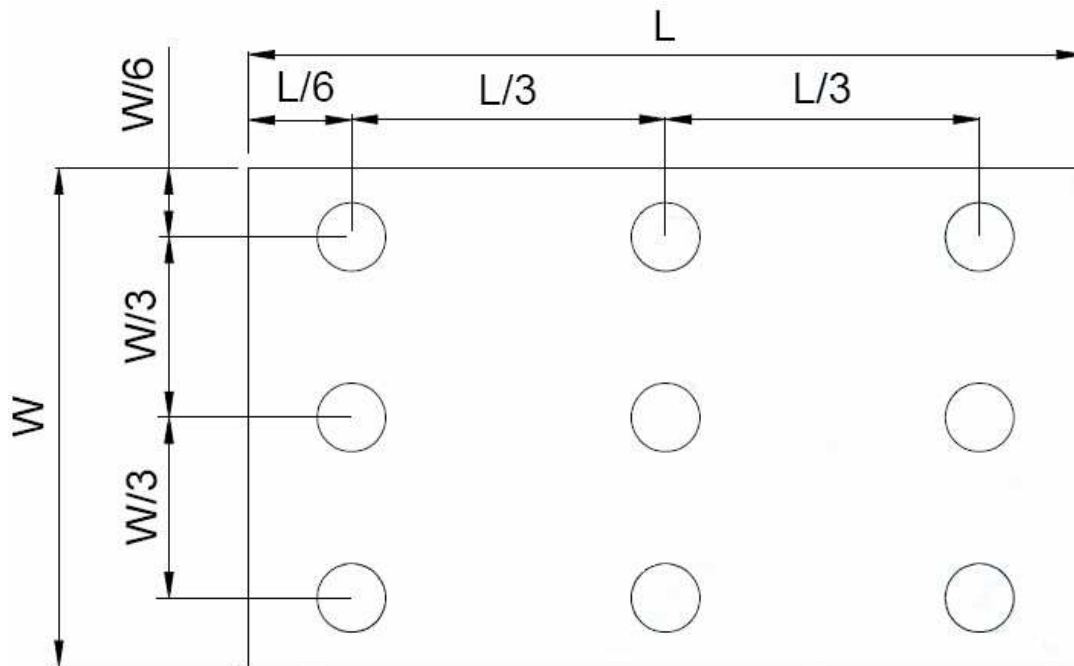
Note 6 : All input terminals LCD panel must be ground when measuring the center area of the panel.

Note 7 : Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to bellow figure). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$

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



$B_{\max}$  : The measured maximum luminance of all measurement position.

$B_{\min}$  : The measured minimum luminance of all measurement position.

## 6. INTERFACE

### Electrical Interface Connection

CN1(Input signal):

| Pin No. | Symbol | Description               | Note |
|---------|--------|---------------------------|------|
| 1       | VCC    | 3.3V Power                |      |
| 2       | VCC    | 3.3V Power                |      |
| 3       | GND    | Ground                    |      |
| 4       | GND    | Ground                    |      |
| 5       | RXIN0- | LVDS Signal - channel0-   |      |
| 6       | RXIN0+ | LVDS Signal+ channel0+    |      |
| 7       | GND    | Ground                    |      |
| 8       | RXIN1- | Data Input channel1-      |      |
| 9       | RXIN1+ | Data Input channel1+      |      |
| 10      | GND    | Ground                    |      |
| 11      | RXIN2- | Data Input channel2-      |      |
| 12      | RXIN2+ | Data Input channel2+      |      |
| 13      | GND    | Ground                    |      |
| 14      | CLKIN- | Data Input CLK-           |      |
| 15      | CLKIN+ | Data Input CLK+           |      |
| 16      | GND    | Ground                    |      |
| 17      | VLED   | VLED Power +12V           |      |
| 18      | VLED   | VLED Power +12V           |      |
| 19      | GND    | Ground                    |      |
| 20      | ADJ    | Adjust for LED brightness |      |

## 7. INPUT SIGNAL :

### 7-1 AC Electrical Characteristics

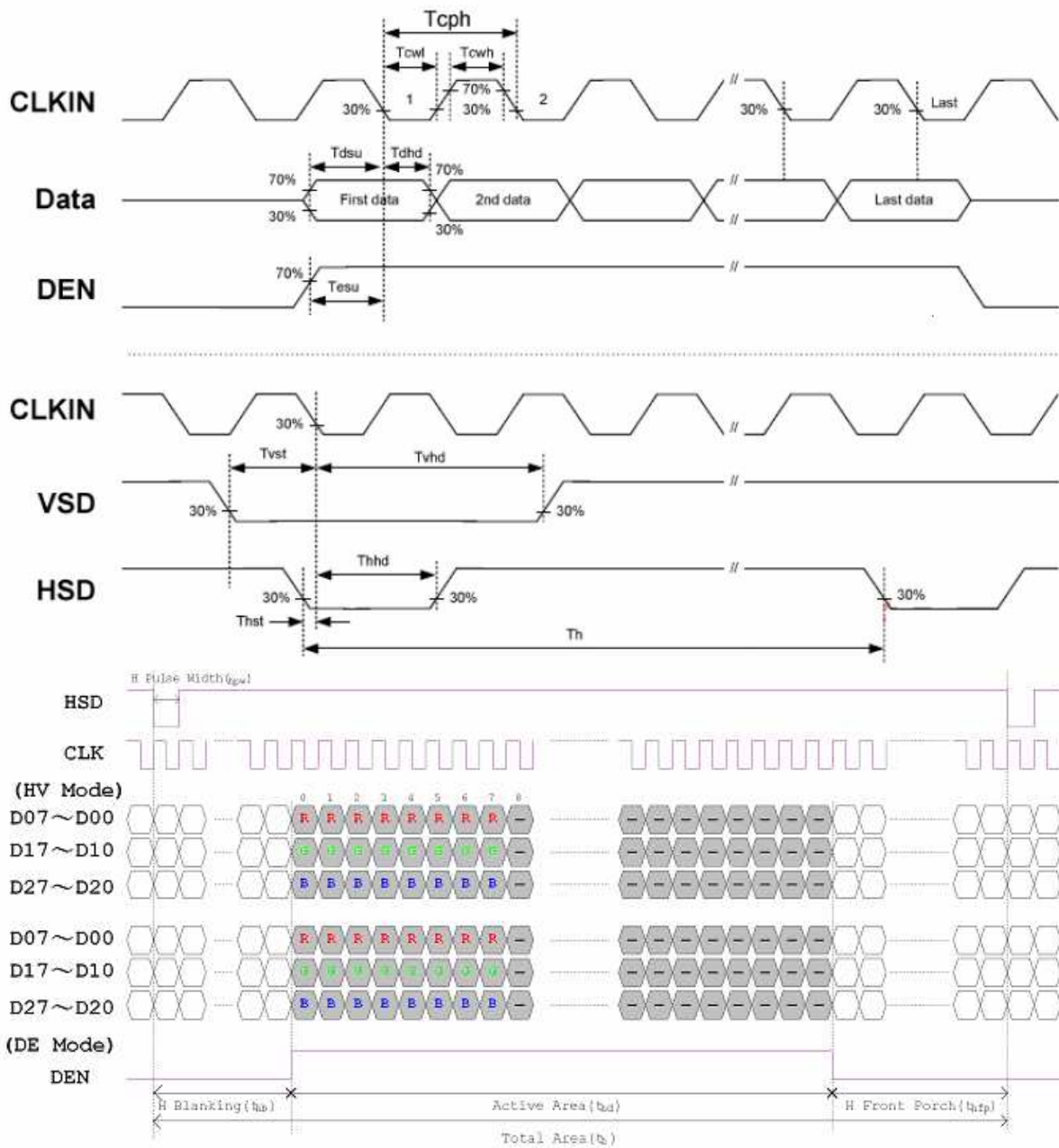
| Item                    | Symbol | Value |      |      | Unit | Remark      |
|-------------------------|--------|-------|------|------|------|-------------|
|                         |        | Min.  | Typ. | Max. |      |             |
| HS setup time           | Thst   | 8     | -    | -    | ns   |             |
| HS hold time            | Thhd   | 8     | -    | -    | ns   |             |
| VS setup time           | Tvst   | 8     | -    | -    | ns   |             |
| VS hold time            | Tvhd   | 8     | -    | -    | ns   |             |
| Data setup time         | Tdsu   | 8     | -    | -    | ns   |             |
| Data hole time          | Tdhd   | 8     | -    | -    | ns   |             |
| DE setup time           | Tesu   | 8     | -    | -    | ns   |             |
| DE hold time            | Tehd   | 8     | -    | -    | ns   |             |
| DVDD Power On Slew rate | TPOR   | -     | -    | 20   | ms   | From 0%~90% |
| RESET pulse width       | TRST   | 1     | -    | -    | ms   |             |
| DCLK cycle time         | Tcoh   | 20    | -    | -    | ns   |             |
| DCLK pulse duty         | Tcwh   | 40    | 50   | 60   | %    |             |

### 7-2 Timing

| Item                    | Symbol | Value |      |      | Unit | Remark |
|-------------------------|--------|-------|------|------|------|--------|
|                         |        | Min.  | Typ. | Max. |      |        |
| Horizontal Display Area | Thd    | -     | 800  | -    | DCLK |        |
| DCLK Frequency          | fclk   | 26.4  | 33.3 | 46.8 | MHz  |        |
| One Horizontal Line     | th     | 862   | 1056 | 1200 | DCLK |        |
| HS pulse width          | thpw   | 1     | -    | 40   | DCLK |        |
| HS Blanking             | Thb    | 46    | 46   | 46   | DCLK |        |
| HS Front Porch          | Thfp   | 16    | 210  | 354  | DCLK |        |

| Item                  | Symbol | Value |      |      | Unit | Remark |
|-----------------------|--------|-------|------|------|------|--------|
|                       |        | Min.  | Typ. | Max. |      |        |
| Vertical Display Area | Thd    | -     | 480  | -    | TH   |        |
| VS period time        | Tv     | 510   | 525  | 650  | TH   |        |
| VS pulse width        | tvpw   | 1     | -    | 20   | TH   |        |
| VS Blanking           | Tvb    | 23    | 23   | 23   | TH   |        |
| VS Front Porch        | Tvfp   | 7     | 22   | 147  | TH   |        |

### 7-3 Input Clock and Data Timing Diagram



## 8. RELIABILITY TEST CONDITIONS

| Test Item                  | Test Conditions   | Note |
|----------------------------|---|------|
| High Temperature Operation | 70±3°C , t=240 hrs  |      |
| Low Temperature Operation  | -20±3°C , t=240 hrs   |      |
| High Temperature Storage   | 80±3°C , t=240 hrs  | 1,2  |
| Low Temperature Storage    | -30±3°C , t=240 hrs   | 1,2  |
| Thermal Shock Test         | -20°C ~ 25°C ~ 70°C<br>30 m in. 5 min. 30 min. ( 1 cycle )<br>Total 5 cycle   | 1,2  |
| Storage Humidity Test      | 60 °C, Humidity 90%, 96 hrs   | 1,2  |
| Vibration Test (Packing)   | Sweep frequency : 10 ~ 55 ~ 10 Hz/1min<br>Amplitude : 0.75mm<br>Test direction : X.Y.Z/3 axis<br>Duration : 30min/each axis | 2    |

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

Note 2 : The module should be inspected after 1 hour storage in normal conditions

(15-35°C , 45-65%RH).

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 the initial value.

## 9. General Precautions

### 9-1 Safety

Liquid crystal is poisonous. Do not put it your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

### 9-2 Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

### 9-3 Static Electricity

1. Be sure to ground module before turning on power or operation module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

### 9-4 Storage

1. Store the module in a dark room where must keep at  $+25\pm 10^{\circ}\text{C}$  and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

### 9-5 Cleaning

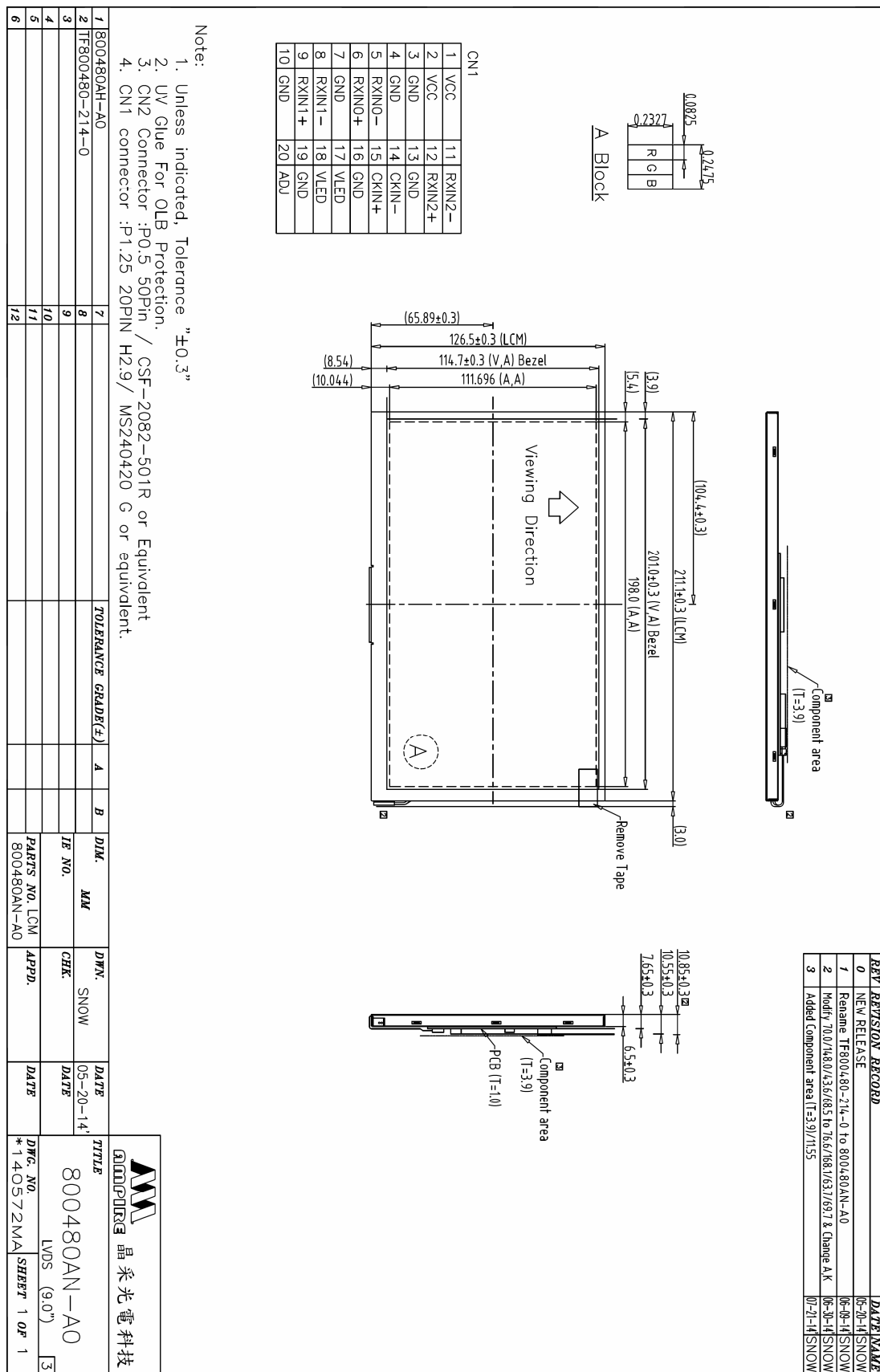
1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

### 9-5 Others

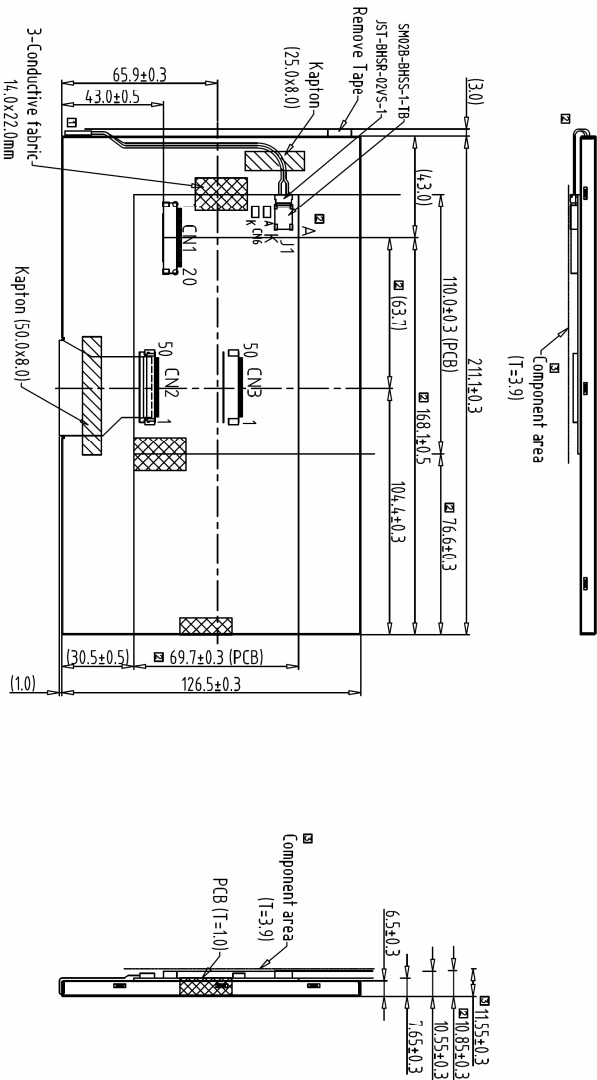
1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.



# 10. OUTLINE DIMENSION



| REV. | REVISION RECORD  | DATE NAME     |
|------|--|---------------|
| 0    | NEW RELEASE  | 05-20-14 SNOW |
| 1    | Rename TF800480-214-0 to 800480AN-A0                           | 06-04-14 SNOW |
| 2    | Modify 70.0/148.0/3.6/68.5 to 76.6/168.1/63.7/69.7 & Change AK | 06-20-14 SNOW |
| 3    | Added Component area (I=3.9)/71.55                             | 07-21-14 SNOW |



| CN1 |        |
|-----|--------|
| 1   | VCC    |
| 2   | VCC    |
| 3   | GND    |
| 4   | GND    |
| 5   | RXIN0- |
| 6   | RXIN0+ |
| 7   | GND    |
| 8   | RXIN1- |
| 9   | RXIN1+ |
| 10  | GND    |
| 11  | RXIN2- |
| 12  | RXIN2+ |
| 13  | GND    |
| 14  | CKIN-  |
| 15  | CKIN+  |
| 16  | GND    |
| 17  | VLED   |
| 18  | VLED   |
| 19  | GND    |
| 20  | ADJ    |

Back View

- Note:
1. Unless indicated, Tolerance "±0.3"
  2. UV Glue For OLB Protection.
  3. CN2 Connector : P0.5 50Pin / CSF-2082-501R or Equivalent
  4. CN1 connector : P1.25 20PIN H2.9 / MS240420 G or equivalent.

| 1 | 800480AH       | 7  | 7  | TOLERANCE GRADE(F) | A | B | DIM.            | MM | DWN.  | SNOW | DATE     | TITLE       |
|---|----------------|----|----|--------------------|---|---|-----------------|----|-------|------|----------|-------------|
| 2 | TF800480-214-0 | 8  | 8  |                    |   |   | IE NO.          |    | CHEK. |      | 05-20-14 | 800480AN-A0 |
| 3 |                | 9  | 9  |                    |   |   | PARTS NO. LCM-1 |    | APPD. |      | DATE     | 晶采光电科技      |
| 4 |                | 10 | 10 |                    |   |   | 800480AN-A0     |    |       |      |          | AMPIRE      |
| 5 |                | 11 | 11 |                    |   |   |                 |    |       |      |          | 晶采光电科技      |
| 6 |                | 12 | 12 |                    |   |   |                 |    |       |      |          | 晶采光电科技      |