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-19201080FTZQW-00 |
| APPROVED BY | |
| DATE | |

☐Approved For Specifications
☐Approved For Specifications & Sample

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

# RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---|---|---|---|
| 2017/03/20 | -- | New Release | Mark |
| 2017/03/23 | | Correct the Temperature parameters | Mark |
| | | | |

# 1.0 General Descriptions

## 1.1 Introduction

The LCM is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 15.6 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is a low reflection and higher color type.

## 1.2 Features

- 3.3 V Logic Power
- 2 lane eDP Interface with 2.7Gbps Link Rates
- 16.7M Colors (6bit + HFRC)
- On board LED Driving circuit
- Green Product (RoHS)

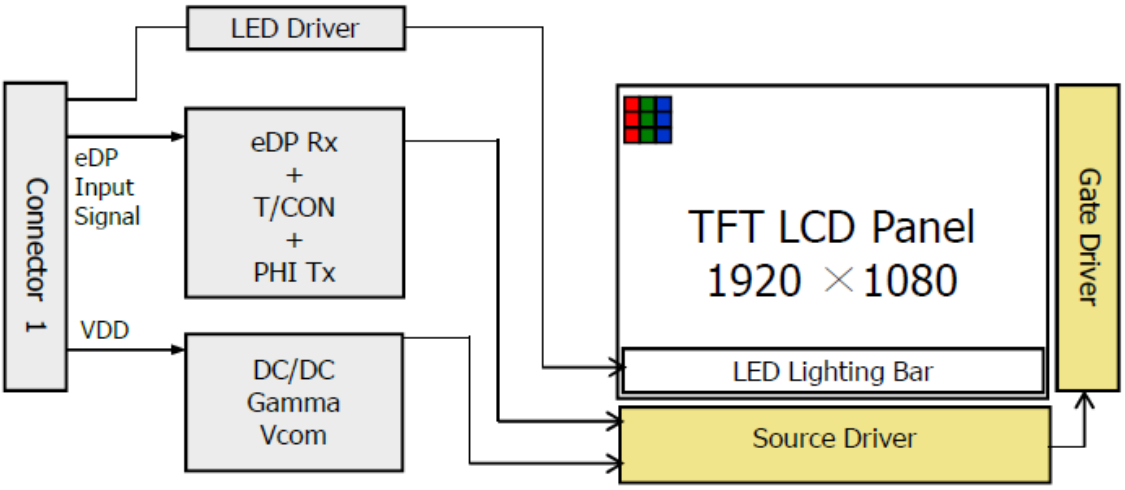
## 1.3 Product Summary

| Items | Specifications | Unit |
|---|---|---|
| Screen Diagonal | 15.6 | Inch |
| Active Area | 344.16 (H) ×193.59 (V) | mm |
| Pixel Format | 1920 (H) x RGB x 1080 (V) | - |
| Pixel Pitch | 0.17925 (H) X 0.17925 (V) | mm |
| Pixel Arrangement | R.G.B. Vertical Stripe | - |
| Display Mode | Normally Black | - |
| White Luminance | 500 (Typ) | cd /m2 |
| Contrast Ratio | 800 : 1 (Typ) | - |
| Input Voltage | 3.3 | V |
| Outline Dimensions | 363.8(H)(Typ)*215.9V)<br>(Typ)(W/PCB)*9.9(Max) | mm |
| Support Color | 16.7M (6bit + HFRC) | - |

### 1.4 Functional Block Diagram

Shows the functional block diagram of the LCD module.

**Figure 1 Block Diagram**



**2.0 Absolute Maximum Ratings**

| ITEM | SYMBOL | VALUES | | UNIT | REMARK |
|---|---|---|---|---|---|
| | | MIN | MAX | | |
| Power Supply Voltage | VDD | -0.3 | +4.0 | V | |
| Logic Supply Voltage | Vin | Vss-0.3 | $V_{DD}$+0.3 | V | |
| Operation Temperature | $T_{op}$ | -30 | 75 | ℃ | |
| Storage Temperature | $T_{st}$ | -30 | 80 | ℃ | |

Notes : 1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

2. Temperature and relative humidity range are shown in the figure below.

95 % RH Max. ( 40 OC ≥ Ta)

Maximum wet - bulb temperature at 39 OC or less. (Ta > 40 OC) No condensation.

3.0 Electrical Specifications

## 3.0 ELECTRICAL SPECIFICATIONS

**Table 3 Electrical Specifications**

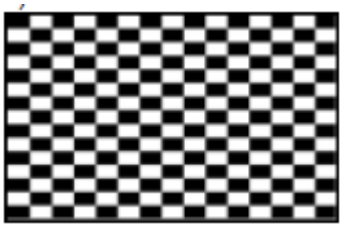
| Parameter | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Power Supply Voltage | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | Note 1 |
| Permissible Input Ripple Voltage | $V_{RF}$ | - | - | 100 | mV | At $V_{DD}$ = 3.3V |
| Power Supply Current | $I_{DD}$ | - | 300 | - | mA | Note 1 |
| Differential Input Voltage | $V_{ID}$ | 200 | - | 600 | mV | |
| Power Consumption | $P_D$ | - | 1.0 | 2.3 | W | Note 1 |
| | $P_{BL}$ | - | - | 5.7 | W | Note 2 |
| | $P_{total}$ | - | - | 8.0 | W | |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for 3.3V at 25℃.

a) Typ : Mosaic Pattern

b) Max : R/G/B Pattern



2. Calculated value for reference (VLED× ILED)

# 4. Interface Timings

### 4.1 Timing Characteristics

| Item | | Symbols | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Clock | Frequency | 1/Tc | 100 | 141.4 | 160 | MHz |
| | High Time | Tch | - | *4/7* | - | Tc |
| | Low Time | Tcl | - | *3/7* | - | Tc |
| Frame Period | | Tv | *1090* | *1100* | *1238* | lines |
| | | | - | *60* | - | Hz |
| | | | - | *16.7* | - | ms |
| Vertical Display Period | | Tvd | - | *1080* | - | lines |
| One line Scanning Period | | Th | *2080* | *2142* | *2400* | clocks |
| Horizontal Display Period | | Thd | - | *1920* | - | clocks |

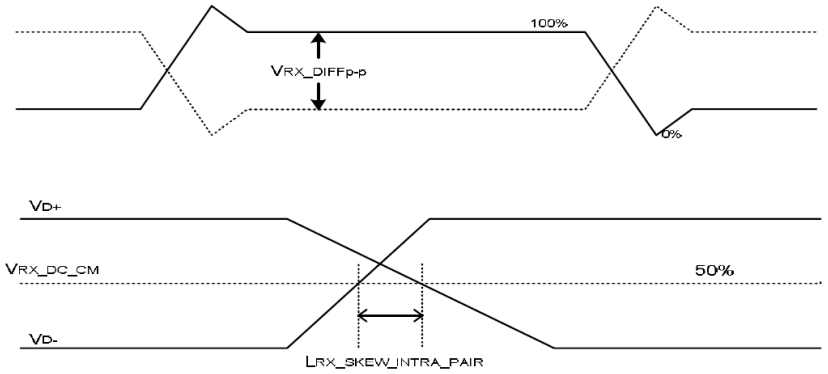
Note※: This Module can support low frame refresh rate 50Hz & 40Hz.

### 4.2 Timing diagram

The specification of the eDP Rx interface timing parameter is shown in Table 8.

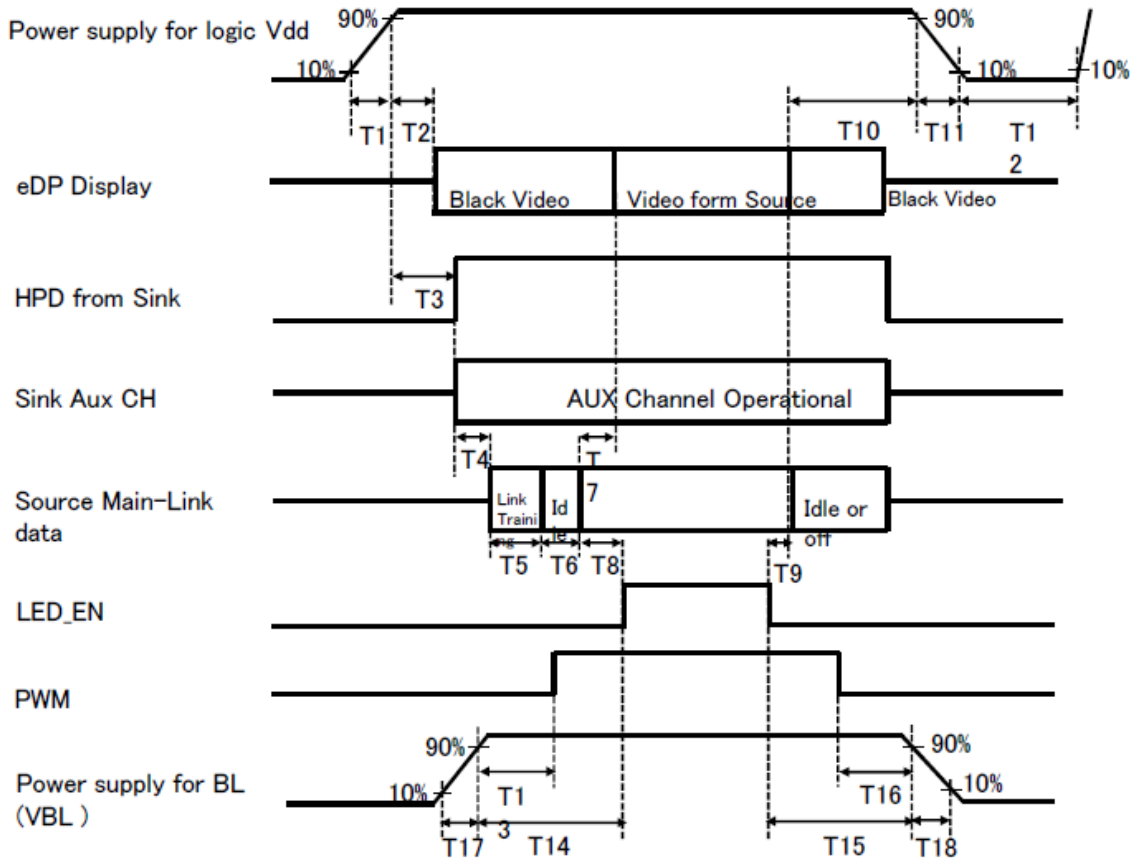
<Table 8. eDP Rx Interface Timing Specification>

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| Spread spectrum clock | ssc | | 0.5 | | % | |
| Differential peak-to-peak input voltage at package pins | $V_{RX-DIFFp-p}$ | 100 | 0 | 1320 | mV | |
| Rx input DC common mode voltage | $V_{RX\_DC\_CM}$ | - | GND | - | V | |
| Differential termination resistance | $R_{RX-DIFF}$ | 80 | - | 100 | Ω | |
| Single-ended termination resistance | $R_{RX-SE}$ | 40 | - | 60 | Ω | |
| Rx short circuit current limit | $I_{RX\_SHORT}$ | - | - | 20 | mA | |
| Intra-pair skew at Rx package pins (HBR)<br>RX intra-pair skew tolerance at HBR | $L_{RX\_SKEW\_INTRA\_PAIR}$ | - | - | 150 | ps | |



**4.3 Power Sequence**

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown below.




- 0.5ms ≤ T1 ≤ 10 ms
- 0ms ≤ T2 ≤ 200 ms
- 0ms ≤ T3 ≤ 200 ms
- 0ms ≤ T13
- 0ms ≤ T14
- 0ms ≤ T17
- 0ms ≤ T7 ≤ 50ms
- 0ms ≤ T10 ≤ 500 ms
- 0 ms ≤ T11 ≤ 10 ms
- 150ms ≤ T12
- 0ms ≤ T15
- 0ms ≤ T16
- 0ms ≤ T18

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

## 5.0 Optical Specifications

The optical characteristics are measured under stable conditions as following notes

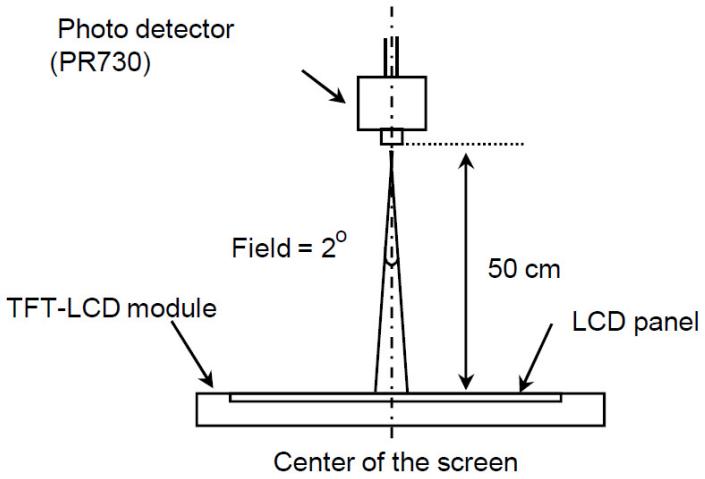
| Item | Conditions | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Viewing Angle （CR>10） | Horizontal | $\theta_L$ | 80 | 85 | - | degree | Note1 |
| | | $\theta_R$ | 80 | 85 | - | | |
| | Vertical | $\theta_T$ | 80 | 85 | - | | |
| | | $\theta_B$ | 80 | 85 | - | | |
| Contrast Ratio | Center | | - | 800 | - | - | Note2 |
| Response Time | Rising + Falling | | - | 30 | 35 | ms | Note5 |
| Color Chromaticity (CIE1931) | Red | x | Typ. -0.05 | 0.616 | Typ. +0.05 | - | Note3 |
| | Red | y | | 0.339 | | - | |
| | Green | x | | 0.313 | | - | |
| | Green | y | | 0.582 | | - | |
| | Blue | x | | 0.156 | | - | |
| | Blue | y | | 0.134 | | - | |
| | White | x | | 0.313 | | - | |
| | White | y | | 0.329 | | - | |
| White Luminance | Center | | 420 | 500 | - | cd/m^2 | Note4 |
| Luminance Uniformity | 9Points | | 75 | - | - | % | Note4 |
| Cross Talk | CT | Θ=0 | - | - | 2.0 | % | Note6 |

Notes 1：Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface(see Figure1).

Notes 2：Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state (see Figure1). Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / Luminance when displaying a black raster.

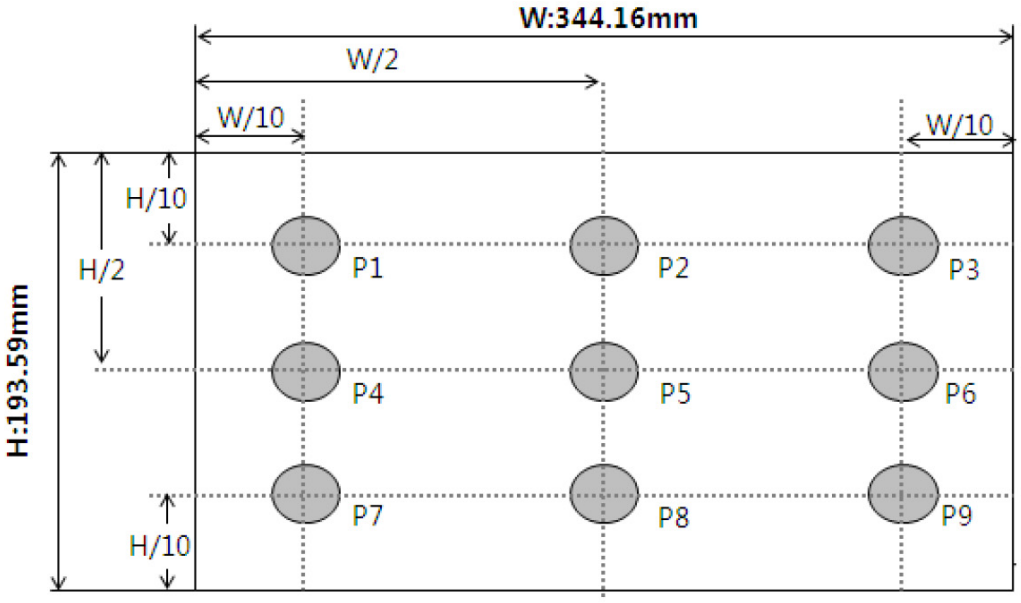
Notes 3：Reference only / Standard Front Surface Treatment Measured with green cover glass. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

**Figure 1. Measurement Set Up**



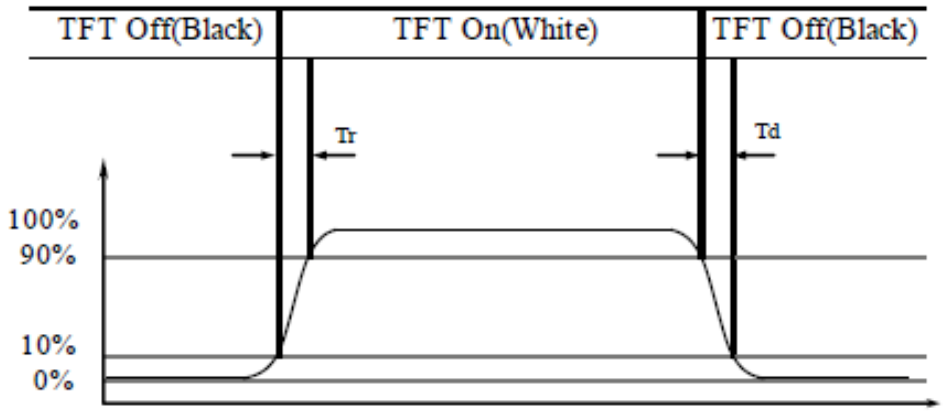

Optical characteristics measurement setup

**Figure 2. White Luminance and Uniformity Measurement Locations (9 points)**




Center Luminance of white is defined as luminance values of center 9 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

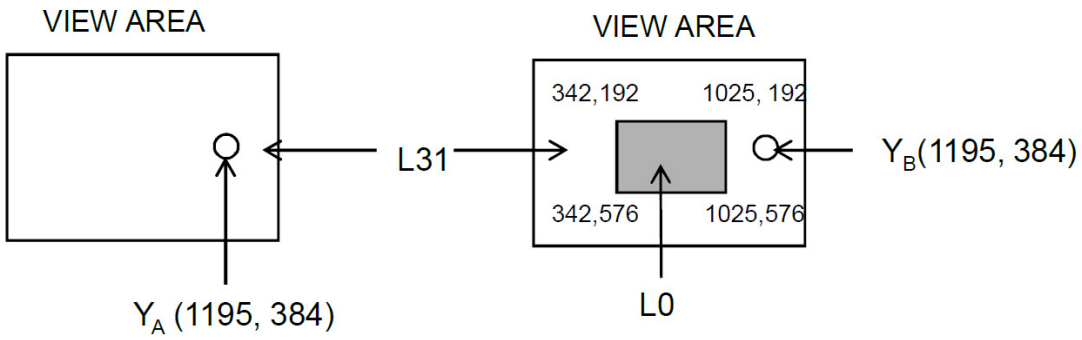
Figure 3. Response Time Testing




Note 5.
The electro-optical response time measurements shall be made as Figure 4 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

Note 6.
Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark (Refer to Figure 4).

**Figure 4. Cross Modulation Test Description**




$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

$Y_A$ = Initial luminance of measured area (cd/m$^2$)

$Y_B$ = Subsequent luminance of measured area (cd/m$^2$)

The location measured will be exactly the same in both patterns

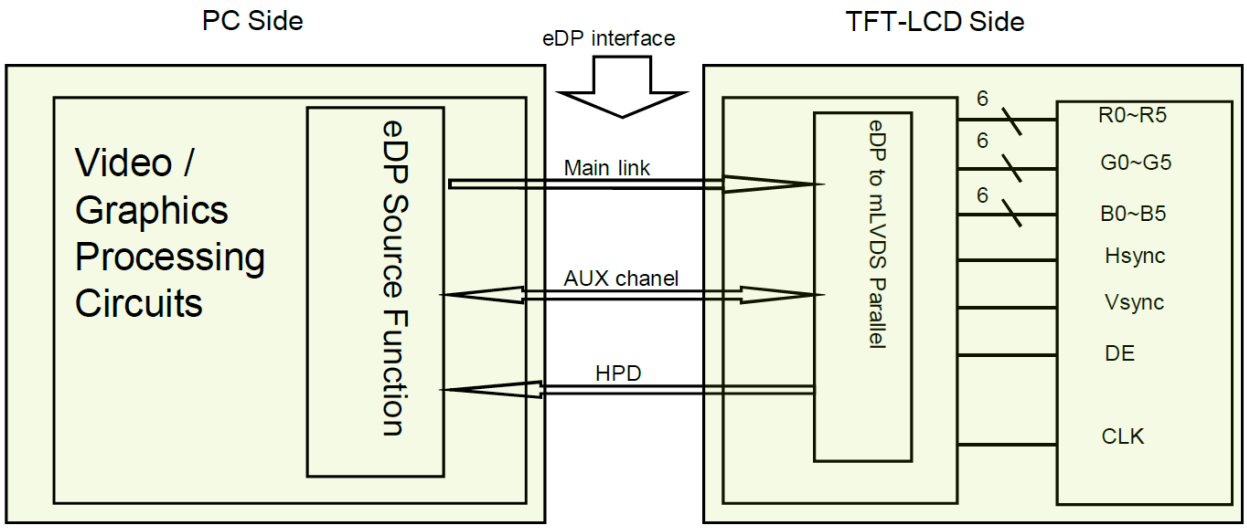
Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark (Refer to FIGURE 4).

# 6. Interface Connections

## 6.1 Electrical Interface Connector:STMMSAK24025P30

| Terminal | Symbol | Functions |
|---|---|---|
| Pin No. | Symbol | Description |
| 1 | NC | No Connection |
| 2 | H_GND | Ground |
| 3 | LANE1_N | eDP RX channel 1 negative |
| 4 | LANE1_P | eDP RX channel 1 positive |
| 5 | H_GND | Ground |
| 6 | LANE0_N | eDP RX channel 0 negative |
| 7 | LANE0_P | eDP RX channel 0 positive |
| 8 | H_GND | Ground |
| 9 | AUX_CH_P | eDP AUX CH positive |
| 10 | AUX_CH_N | eDP AUX CH negative |
| 11 | H_GND | Ground |
| 12 | LCD_VCC | Power Supply, 3.3V (typ.) |
| 13 | LCD_VCC | Power Supply, 3.3V (typ.) |
| 14 | LCD_Self_Test | Panel self test enable |
| 15 | H_GND | Ground |
| 16 | H_GND | Ground |
| 17 | HPD | Hot plug detect output |
| 18 | BL_GND | LED Ground |
| 19 | BL_GND | LED Ground |
| 20 | BL_GND | LED Ground |
| 21 | BL_GND | LED Ground |
| 22 | BL_ENABLE | LED enable pin(+3.3V Input) |
| 23 | BL_PWM | System PWM Signal Input |
| 24 | NC | No Connection |
| 25 | NC | No Connection |
| 26 | BL_POWER | LED Power Supply 12V |
| 27 | BL_POWER | LED Power Supply 12V |
| 28 | BL_POWER | LED Power Supply 12V |
| 29 | BL_POWER | LED Power Supply 12V |
| 30 | NC | No Connection |

### 6.2 eDP Interface




Note. Transmitter : HX8876-G04 or equivalent.

Transmitter is not contained in Module.

**eDP Input signal**

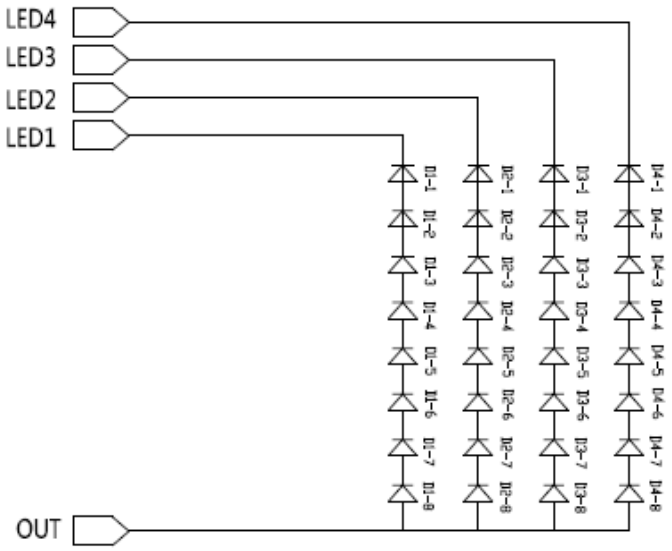
| Lane 0 | Lane 1 |
|---|---|
| R0-5:0\|G0-5:4 | R1-5:0\|G1-5:4 |
| G0-3:0\|B0-5:2 | G1-3:0\|B1-5:2 |
| B0-1:0\|R2-5:0 | B1-1:0\|R3-5:0 |
| G2-5:0\|B2-5:4 | G3-5:0\|B3-5:4 |
| B2-3:0\|R4-5:2 | B3-3:0\|R5-5:2 |
| R4-1:0\|G4-5:0 | R5-1:0\|G5-5:0 |
| B4-5:0\|R6-5:4 | B5-5:0\|R7-5:4 |
| R6-3:0\|G6-5:2 | R7-3:0\|G7-5:2 |
| R6-1:0\|G6-5:0 | R7-1:0\|G7-5:0 |

# 7. LED Driving Conditions

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

| Parameter | | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| LED Forward Voltage | | $V_F$ | - | 3.0 | 3.2 | V | - |
| LED Forward Current | | $I_F$ | - | 50 | - | mA | - |
| LED Power Consumption | | $P_{LED}$ | | - | 5.7 | W | Note 1 |
| LED Life-Time | | N/A | 50,000 | - | - | Hour | Note2 |
| Power supply voltage for LED Driver | | $V_{LED}$ | 10.8 | 12 | 13.2 | V | |
| EN Control Level | Backlight on | | 2.5 | | 5.0 | V | |
| | Backlight off | | 0 | | 0.8 | V | |
| PWM Control Level | PWM High Level | | 2.5 | | 5.0 | V | |
| | PWM Low Level | | 0 | | 0.8 | V | |
| PWM Control Frequency | | $F_{PWM}$ | 120 | - | 1,000 | Hz | |
| Duty Ratio | | - | 10 | - | 100 | % | |

Notes : 1. Power supply voltage12V for LED Driver
Calculator Value for reference $I_F \times V_F \times 32$ / efficiency = $P_{LED}$
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous@25℃。


LED4
LED3
LED2
LED1
OUT

## 8. Reliability Test

The reliability test items and its conditions are shown below.

| Test Item | Test Conditions | Note |
|---|---|---|
| High Temperature Operation | 75±3°C , t=240 hrs | |
| Low Temperature Operation | -30±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 |
| Storage at High Temperature and Humidity | 40°C, 90% RH , 240 hrs | 1,2 |
| Thermal Shock Test | -30°C (30min) ~ 60°C (30min) , 27 cycles | 1,2 |
| Vibration Test (Packing) | Sweep frequency : 10~55~10 Hz/1min<br>Amplitude : 0.75mm<br>Test direction : X.Y.Z/3 axes<br>Duration : 30 min/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).

# 9 . GENERAL PRECAUTION

### 9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

### 9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AMPIRE does not warrant the module, if customers disassemble or modify the module.

### 9.3 Breakage of LCD Panel

(1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
(2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
(3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
(4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

### 9.4 Electric Shock

(1) Disconnect power supply before handling LCD module.
(2) Do not pull or fold the LED cable.
(3) Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

### 9.5 Absolute Maximum Ratings and Power Protection Circuit

(1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
(2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
(3) It's recommended to employ protection circuit for power supply.

**9.6 Operation**

(1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
(2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
(3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
(4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
(5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

**9.7 Mechanism**

Please mount LCD module by using mounting holes arranged in four corners tightly.

**9.8 Static Electricity**

(1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
(2) Because LCD modules use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

**9.9 Strong Light Exposure**

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

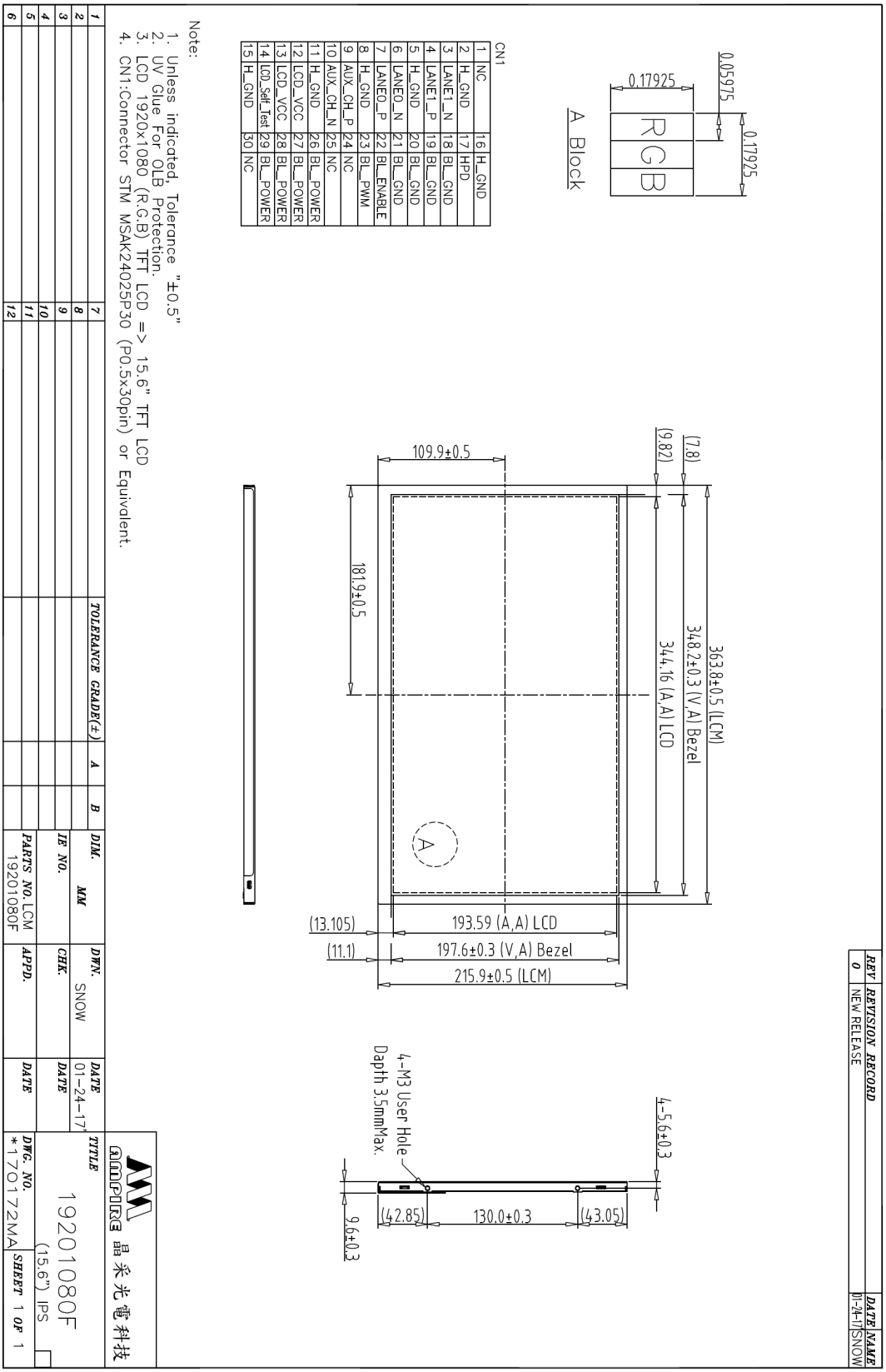
**9.10 Disposal**

When disposing LCD module, obey the local environmental regulations.

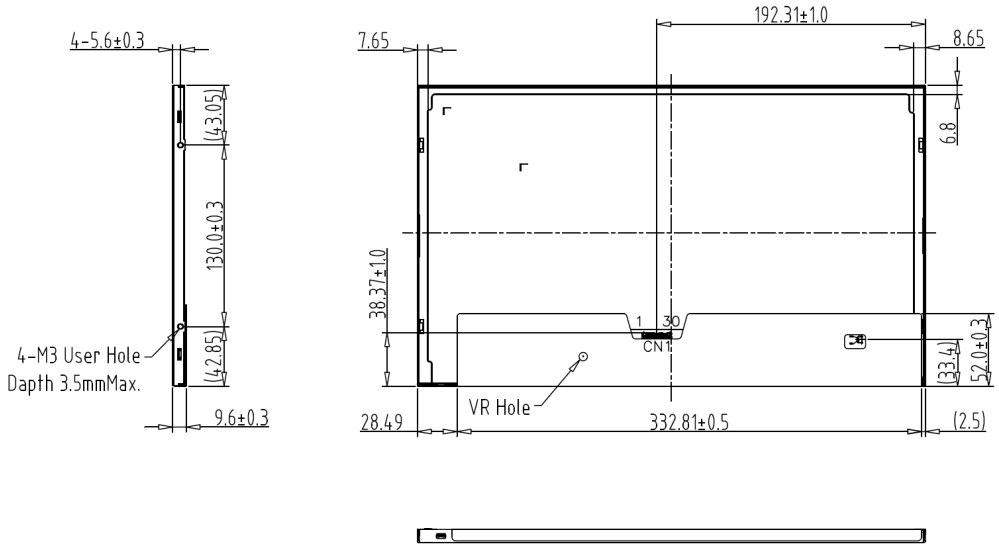
**9.11 Others**

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.

# 10.0 Outline Dimension



| REV | REVISION RECORD | DATE | NAME |
|---|---|---|---|
| 0 | NEW RELEASE | 01-24-17 | SNOW |




Back view

CN1

| | | | |
|---|---|---|---|
| 1 | NC | 16 | H_GND |
| 2 | H_GND | 17 | HPD |
| 3 | LANE1_N | 18 | BL_GND |
| 4 | LANE1_P | 19 | BL_GND |
| 5 | H_GND | 20 | BL_GND |
| 6 | LANE0_N | 21 | BL_GND |
| 7 | LANE0_P | 22 | BL_ENABLE |
| 8 | H_GND | 23 | BL_PWM |
| 9 | AUX_CH_P | 24 | NC |
| 10 | AUX_CH_N | 25 | NC |
| 11 | H_GND | 26 | BL_POWER |
| 12 | LCD_VCC | 27 | BL_POWER |
| 13 | LCD_VCC | 28 | BL_POWER |
| 14 | LCD_Self_Test | 29 | BL_POWER |
| 15 | H_GND | 30 | NC |

Note:

1. Unless indicated, Tolerance "±0.5"
2. UV Glue For OLB Protection.
3. LCD 1920x1080 (R.G.B) TFT LCD => 15.6" TFT LCD
4. CN1:Connector STM MSAK24025P30 (P0.5x30pin) or Equivalent.

晶采光電科技

| | | | | TOLERANCE GRADE(±) | A | B | DIM. MM | DWN. SNOW | DATE 01-24-17 | TITLE 19201080F (15.6") IPS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 7 | | | | | | | | |
| 2 | | 8 | | | | | | | | |
| 3 | | 9 | | | | | IE NO. | CHK. | DATE | |
| 4 | | 10 | | | | | | | | |
| 5 | | 11 | | | | | PARTS NO. LCM-1 19201080F | APPD. | DATE | DWG. NO. *170173MA |
| 6 | | 12 | | | | | | | | SHEET 1 OF 1 |



AMPIRE CO., LTD.

Date : 2017/03/23