(✓) Preliminary Specifications
( ) Final Specifications

| | |
|---|---|
| Module | 32 Inch Color TFT-LCD |
| Model Name | G320ZAN02.2 |

| Customer | Date | Approved by | Date |
|---|---|---|---|
| | | Jason Pan | 2021/07/16 |
| Checked & Approved by | Date | Prepared by | Date |
| | | Buffy Chen | 2021/07/16 |
| Customer's sign back page | | General Display Business Unit / AU Optronics corporation | |

# Contents

## Record of Revision

| Version | Date | Page | Old description | New Description |
|---|---|---|---|---|
| 0.1 | 2021/03/10 | All | First draft specification | |
| 0.2 | 2021/06/17 | P25/P26 | | 2D Drawing Updated |
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# 1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and 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 soft cloth.
5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
6) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.
7) Do not open nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED light bar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.
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) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
14) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

## 2. General Description

This specification applies to the Color Active Matrix Liquid Crystal Display G320ZAN02.2 composed of a TFT-LCD display, a driver and power supply circuit, and a LED backlight system. The screen format is intended to support the UHD (3840(H)x2160(V)) screen and 1.07B colors. All input signals are eDP interface compatible. LED driving board for backlight unit is included in G320ZAN02.2.

## 2.1 Display Characteristics

The following items are characteristics summary on the table under 25℃ condition:

| Items | Unit | Specifications |
|---|---|---|
| Screen Diagonal | [inch] | 32.0" ( 812.8mm) |
| Active Area | [mm] | 708.48 (H) x 398.52 (V) |
| Resolution | | 3840(x3) x 2160 |
| Pixel Pitch | [mm] | 0.1845 (per one triad) x 0.1845 |
| Pixel Arrangement | | R.G.B. Vertical Stripe |
| Display Mode | | Normally Black, AHVA |
| Nominal Input Voltage VDD | [Volt] | +12.0 V |
| Power Consumption | [Watt] | Max.133W<br>(Logi.c: max. 34W + BL power: max.99W) |
| Weight | [Grams] | 4630 (Typ) |
| Physical Size | [mm] | 727.3 (H) x 424.5 (V) x 20.48 (D) (Typ) |
| Electrical Interface | | eDP(4lane) |
| Surface Treatment | | Anti-Glare treatment |
| Support Color | | 10bit(True 10) |
| Temperature Range<br>Operating<br>Storage (Non-Operating) | <br>[℃]<br>[℃] | <br>0 to +50<br>-20 to +60 |
| RoHS Compliance | | Yes |

## 2.2 Optical Characteristics

The optical characteristics are measured under stable conditions(warm up 30 mins) at 25°C(Room Temperature), VDD 12V , Frame rate:60Hz:

| Item | Unit | Conditions | | Min. | Typ. | Max. | Note |
|---|---|---|---|---|---|---|---|
| White Luminance | cd/m$^2$ | ILED=95mA(center point) | | 680 | 850 | --- | 1 |
| Uniformity | % | 9 points | | --- | --- | 20 | 2,3 |
| Contrast Ratio | -- | | | 1260 | 1800 | | 4 |
| Response Time | msec | Rising | | --- | TBD | TBD | 5 |
| | | Falling | | --- | TBD | TBD | |
| | | Rising + Falling | | --- | (22) | TBD | |
| Viewing Angle | degree | Horizontal CR >= 10 | (Right) | 75 | 89 | --- | 6 |
| | | | (Left) | 75 | 89 | --- | |
| | | Vertical CR >= 10 | (Upper) | 75 | 89 | --- | |
| | | | (Lower) | 75 | 89 | --- | |
| Color / Chromaticity Coordinates (CIE 1931) | -- | Red x | | TBD | (0.687) | TBD | |
| | | Red y | | TBD | (0.308) | TBD | |
| | | Green x | | TBD | (0.211) | TBD | |
| | | Green y | | TBD | (0.730) | TBD | |
| | | Blue x | | TBD | (0.149) | TBD | |
| | | Blue y | | TBD | (0.051) | TBD | |
| | | White x | | 0.283 | 0.313 | 0.343 | |
| | | White y | | 0.299 | 0.329 | 0.359 | |
| Adobe RGB coverage ratio | %(typ) | | | DCI：98% / Adobe RGB：100% | | | |

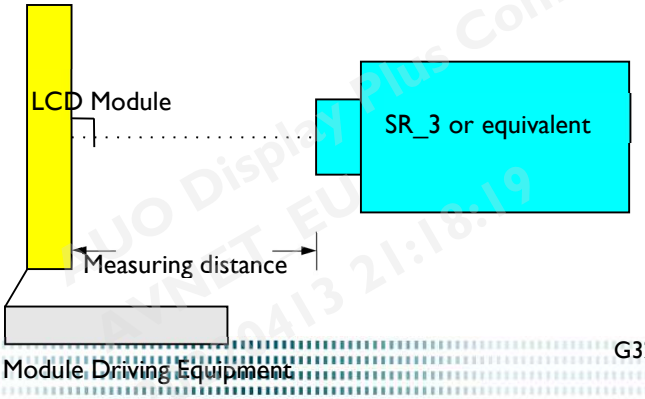
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

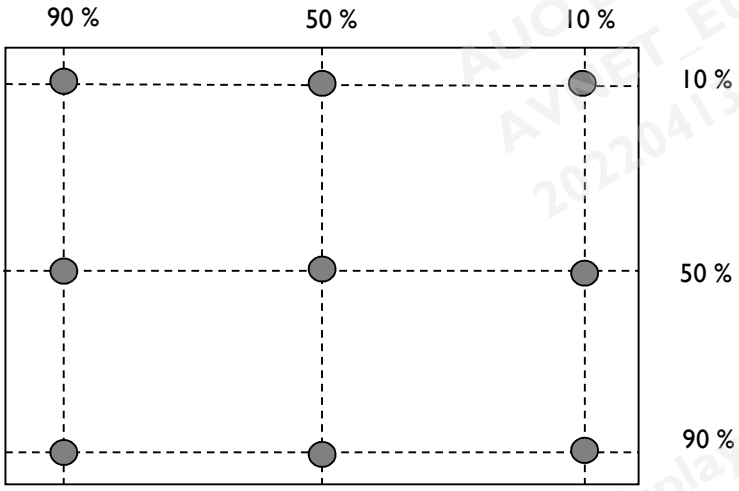
Aperture 1◦with 50cm viewing distance

Test Point Center

Environment < 1 *lux*



Note 2: Definition of 9 points position




Note 3: Definition of luminance uniformity of 9 points.

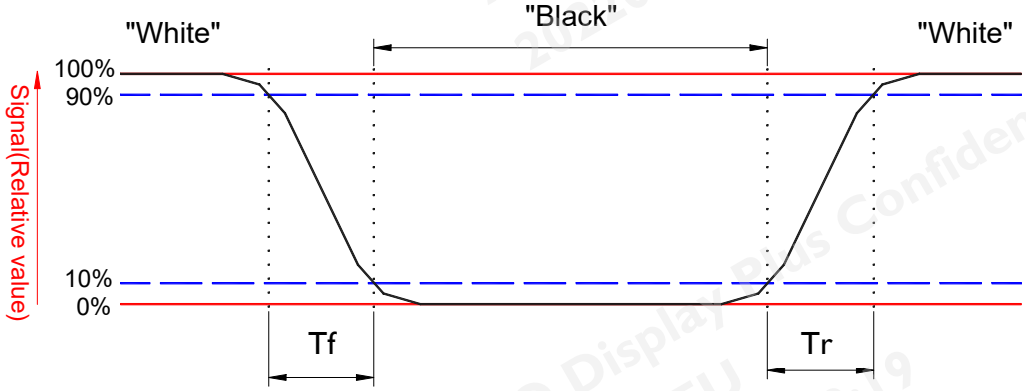
$$\delta_{w9} = \frac{\left|B_{max} \text{ or } B_{min} - B_{avg}\right|}{B_{avg}} \times 100\%$$

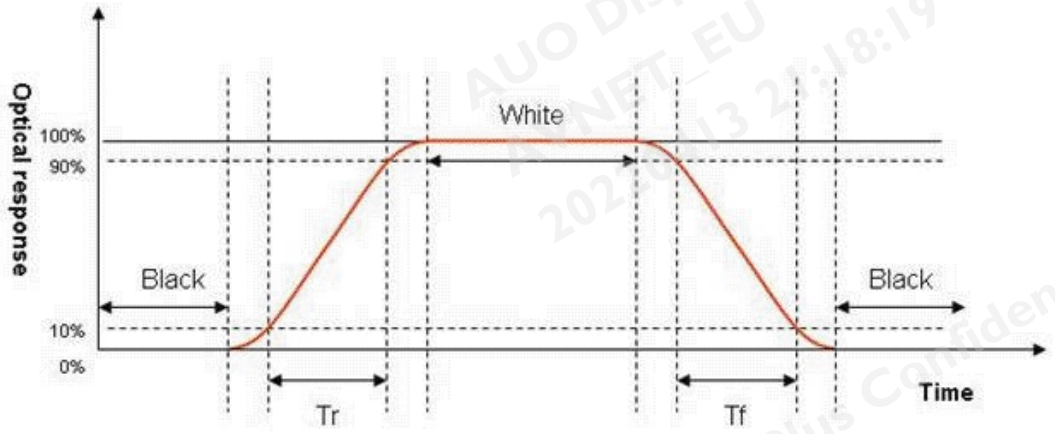
Note 4: Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 5: Definition of response time:

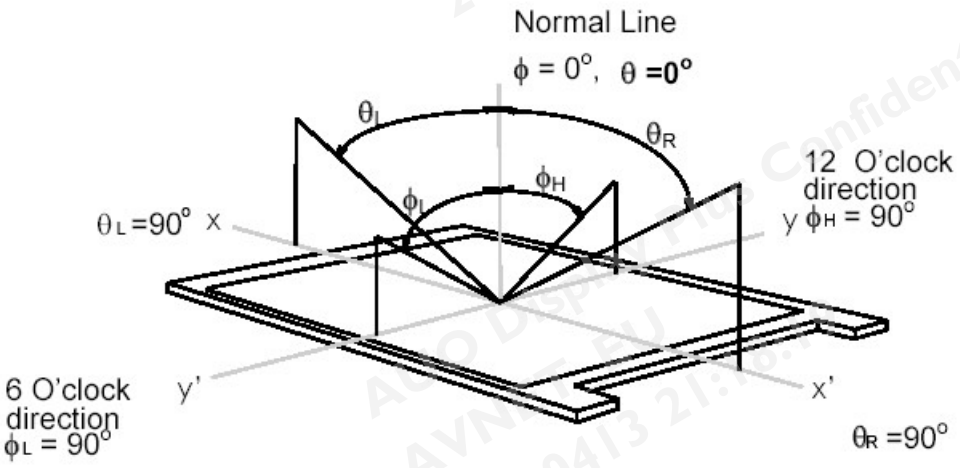
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.





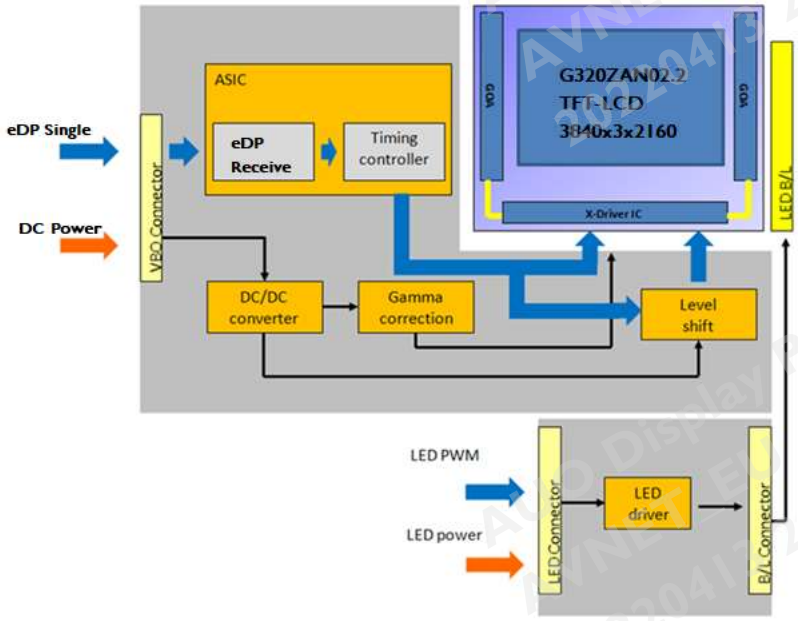

Note 6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



## 3. Functional Block Diagram

The following diagram shows the functional block of the 32 inch color TFT/LCD module:




## 3.1 Interface Connection：

| Connector Name / Designation | Signal Connector |
|---|---|
| Manufacturer | JAE |
| Connector Model Number | FI-RE51S-HF |
| Adaptable Plug | FI-RE51CL |

# 4. Absolute Maximum Ratings

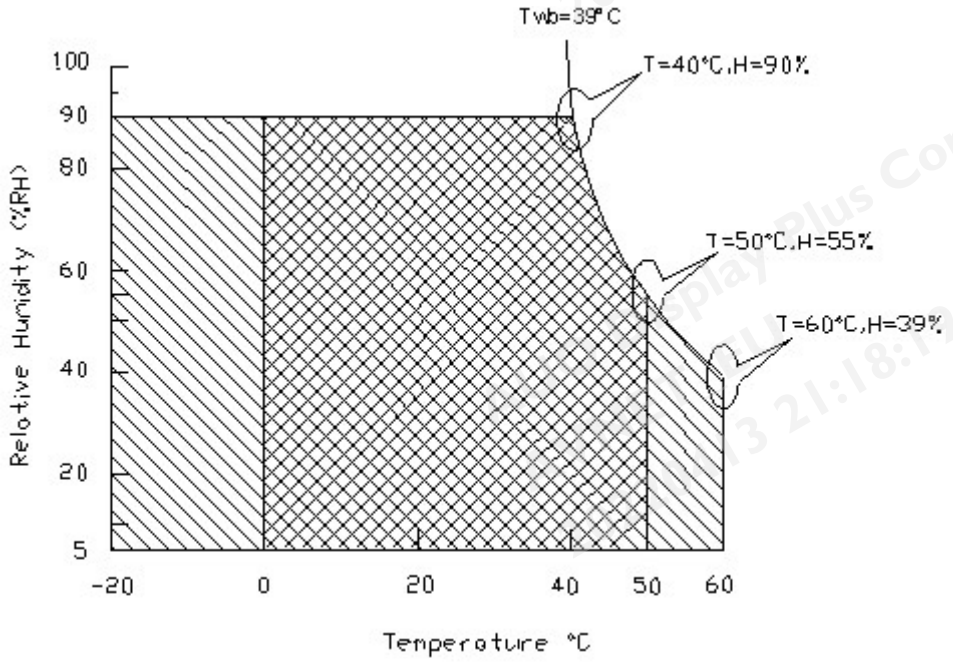
## 4.1 Absolute Ratings of TFT LCD Module

| Item | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Logic/LCD drive Voltage | Vin | -0.3 | +13.5 | [Volt] |

## 4.2 Absolute Ratings of Environment

| Item | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Operating Temperature | TOP | 0 | +50 | [°C] |
| Operation Humidity | HOP | 5 | 90 | [%RH] |
| Storage Temperature | TST | -20 | +60 | [°C] |
| Storage Humidity | HST | 5 | 90 | [%RH] |

Note: Maximum Wet-Bulb should be 39°C and no condensation.




Operating Range Storage Range

# 5. Electrical Characteristics

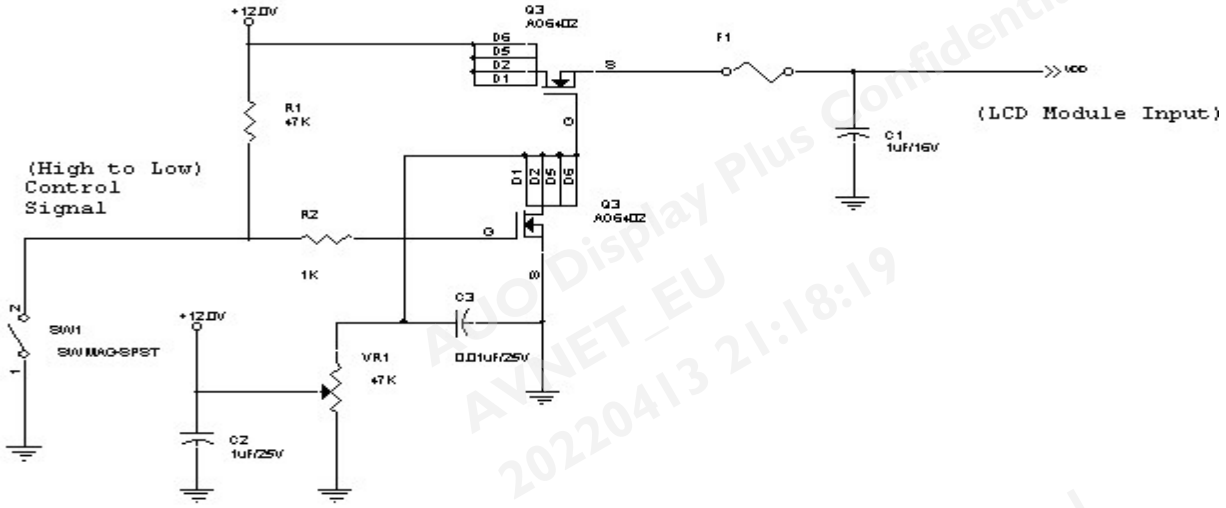
## 5.1 TFT LCD Module

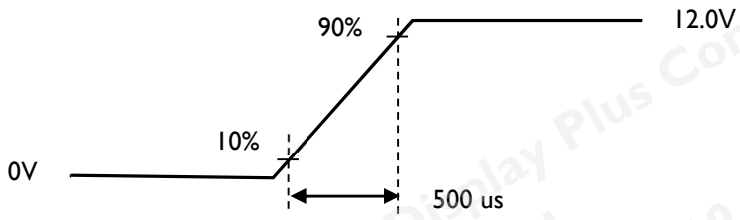
### 5.1.1 Power Specification

Input power specifications are shown as follows;

| Symbol | Parameter | Min | Typ | Max | Units | Remark |
|---|---|---|---|---|---|---|
| VDD | Logic/LCD Drive Voltage | 10.8 | 12.0 | 13.2 | [Volt] | ±10% |
| IDD | VDD Current | - | (2.3) | (2.83) | [A] | White Pattern (VDD=12V, at 60Hz) |
| Irush | LCD Inrush Current | - | - | 4 | [A] | *Note 1* |
| PDD | VDD Power | - | 27.6 | 34 | [Watt] | White Pattern (VDD=12V, at 60Hz) |
| VDDrp | Allowable Logic/LCD Drive Ripple Voltage | - | - | VDD* 5% | [mV] | VDD= 12.0V, White pattern, Fv=60Hz |

Note 1: Measurement condition:




VDD rising time

## 5.2 Backlight Unit

### 5.2.1 LED Backlight Unit: Driver Connector

| Connector Name / Designation | Lamp Connector |
|---|---|
| Manufacturer | JST |
| Connector Model Number | S14B-PH-SM6-K-TB(HF) |
| Mating Model Number | PHR-14 |

| Pin # | Symbol | Pin Description |
|---|---|---|
| 1 | VBL | +24V |
| 2 | VBL | +24V |
| 3 | VBL | +24V |
| 4 | VBL | +24V |
| 5 | VBL | +24V |
| 6 | GND | GND |
| 7 | GND | GND |
| 8 | GND | GND |
| 9 | GND | GND |
| 10 | GND | GND |
| 11 | BL_DIM_A | Analog Dimming |
| 12 | BL_EN | BL enable (3.3V-On / 0V-Off) |
| 13 | NC | N/A |
| 14 | BL_DIM_P | PWM Dimming |

Note 1: Use the PWM mode. The pin.11 must be NC.

Note 2: Use the Analog mode. The pin.14 must be NC.

### 5.2.2 Parameter guideline for LED

Following characteristics are measured under a stable condition using an inverter at 25°C(Room Temperature):

### LED characteristics

| Symbol | Parameter | Min | Typ | Max | Units | Condition |
|---|---|---|---|---|---|---|
| PLED | Backlight Power Consumption | --- | (72.96) | (82.69) | [Watt] | LED only |
| LTLED | LED Life-Time | 30,000 | --- | --- | Hour | LED only |

**Note 1:** Calculator value for reference $P_{LED}$ = $V_F$ (Normal Distribution) * $I_F$ (Normal Distribution)

**Note 2:** The LED life-time define as the estimated time to 50% degradation of initial luminous.

### Backlight input signal characteristics

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| VDD | Input Voltage | 21.6 | 24.0 | 26.4 | [Volt] | |
| $I_{VDD}$ | Input Current | --- | 3.63 | --- | [A] | 100% PWM Duty |
| $P_{VDD}$ | Power Consumption | --- | (87.3) | (99.0) | [Watt] | 100% PWM Duty |
| Backlight on/off | On control Voltage | 2 | 3.3 | 5 | [Volt] | |
| | Off control Voltage | | --- | 0.8 | [Volt] | |
| Backlight Dimming (Analog Mode) | Dimming Voltage | 0 | --- | 3 | [Volt] | Adjustable Dimming Range |
| Backlight Dimming (PWM Mode) | Dimming Frequency | 0.2 | | 15 | [kHz] | |
| | Swing Voltage | 3 | --- | 3.6 | V | Note3 |
| | Dimming Duty Cycle | 10 | - | 100 | % | |
| $I_{F\ (one\ channel)}$ | LED Forward Current | --- | (95) | --- | mA | Ta = 25°C |

Note 1: Ta means ambient temperature of TFT-LCD module.

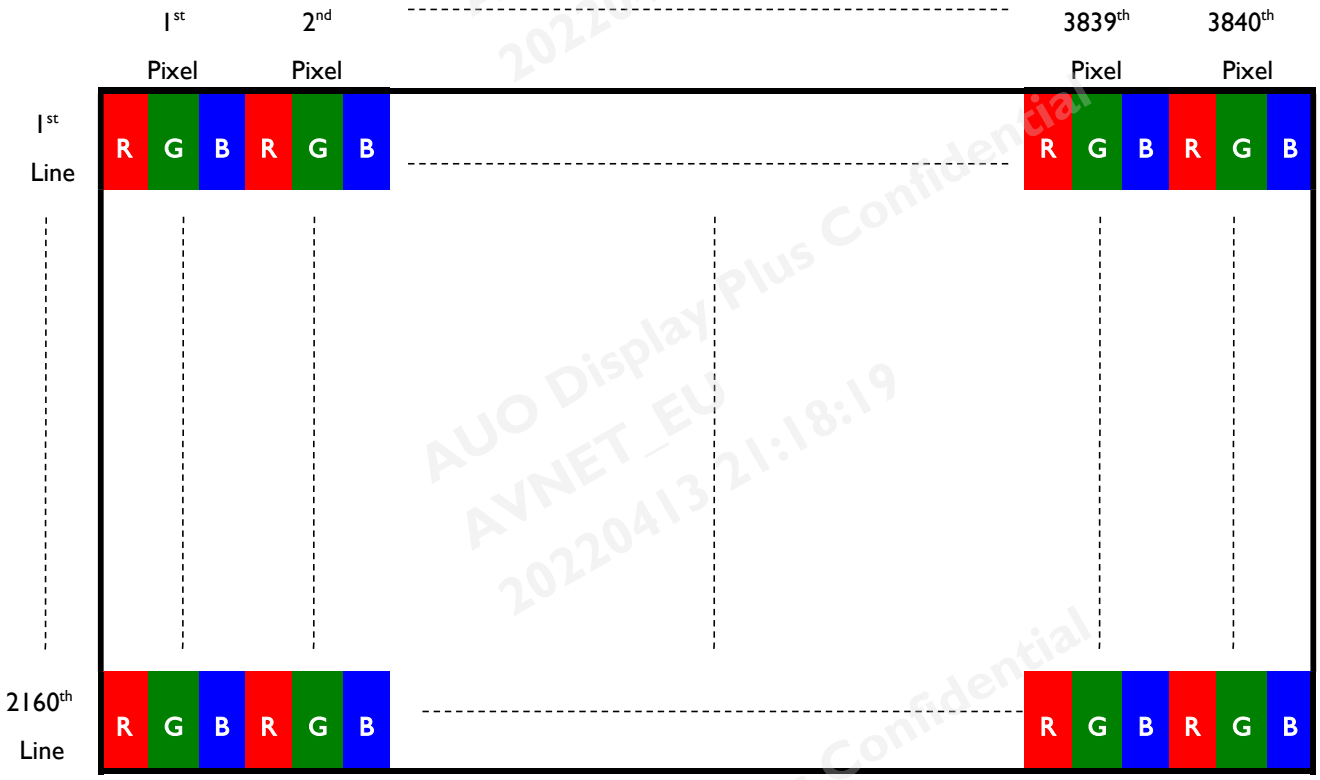
Note 2: VDD, IVDD, PVDD , Irush LED are defined for LED B/L.(100% duty of PWM dimming).

Note 3: Swing voltage 3V is best linear of PWM mode.

# 6. Signal Characteristic

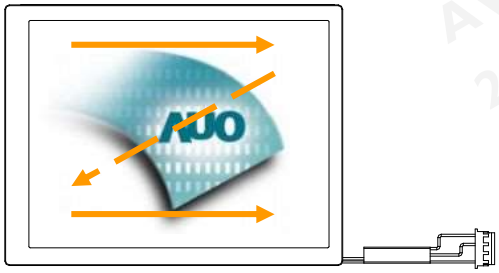
## 6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.




## 6.2 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.



## 6.3 Signal Description

The module uses a V By One receiver embedded in AUO's ASIC. eDP is a differential signal technology for LCD interface and a high-speed data transfer device.

### 6.3.1 TFT LCD Module: LCD Connector

| Connector Name / Designation | Signal Connector |
|---|---|
| Manufacturer | JAE |
| Connector Model Number | FI-RE51S-HF |
| Adaptable Plug | FI-RE51CL |

| PIN # | Symbol | Description |
|---|---|---|
| 1 | VDD | Power +12V |
| 2 | VDD | Power +12V |
| 3 | VDD | Power +12V |
| 4 | VDD | Power +12V |
| 5 | VDD | Power +12V |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | GND | Ground |
| 9 | NC | No connection (for AUO test only. Do not connect) |
| 10 | NC | No connection (for AUO test only. Do not connect) |
| 11 | NC | No connection (for AUO test only. Do not connect) |
| 12 | NC | No connection (for AUO test only. Do not connect) |
| 13 | NC | No connection (for AUO test only. Do not connect) |
| 14 | NC | No connection (for AUO test only. Do not connect) |
| 15 | NC | No connection (for AUO test only. Do not connect) |
| 16 | NC | No connection (for AUO test only. Do not connect) |
| 17 | GND | Ground |
| 18 | 1st Lane3_N | Negative eDP differential data input |
| 19 | 1st Lane3_P | Positive eDP differential data input |
| 20 | GND | Ground |
| 21 | 1st Lane2_N | Negative eDP differential data input |
| 22 | 1st Lane2_P | Positive eDP differential data input |
| 23 | GND | Ground |
| 24 | 1st Lane1_N | Negative eDP differential data input |
| 25 | 1st Lane1_P | Positive eDP differential data input |
| 26 | GND | Ground |
| 27 | 1st Lane0_N | Negative eDP differential data input |
| 28 | 1st Lane0_P | Positive eDP differential data input |
| 29 | GND | Ground |

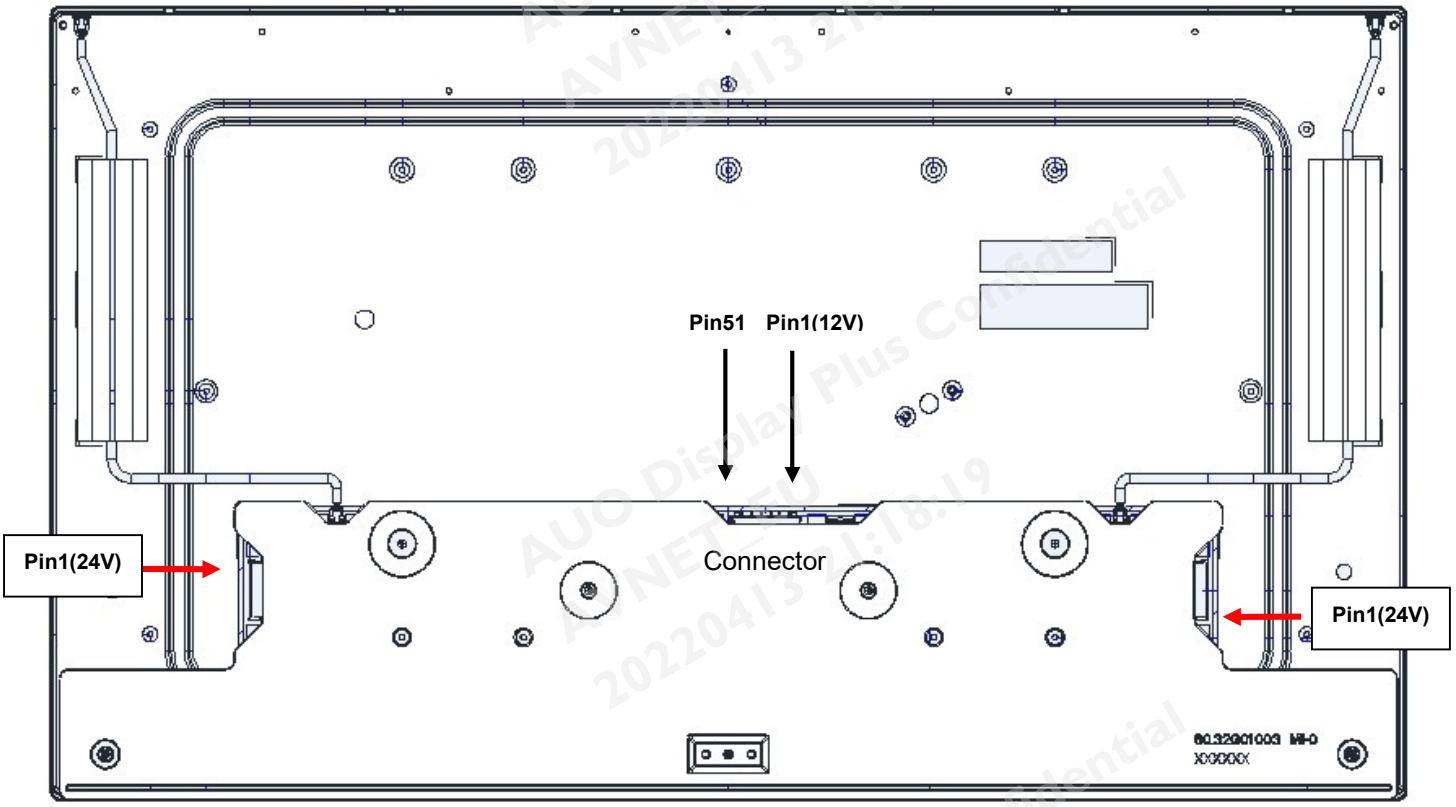
| | | |
|---|---|---|
| 30 | 1st AUX_CH_P | Positive AUX Channel differential data input |
| 31 | 1st AUX_CH_N | Negative AUX Channel differential data input |
| 32 | GND | Ground |
| 33 | NC | No connection (for AUO test only. Do not connect) |
| 34 | GND | Ground |
| 35 | NC | No connection (for AUO test only. Do not connect) |
| 36 | NC | No connection (for AUO test only. Do not connect) |
| 37 | GND | Ground |
| 38 | NC | No connection (for AUO test only. Do not connect) |
| 39 | NC | No connection (for AUO test only. Do not connect) |
| 40 | GND | Ground |
| 41 | NC | No connection (for AUO test only. Do not connect) |
| 42 | NC | No connection (for AUO test only. Do not connect) |
| 43 | GND | Ground |
| 44 | NC | No connection (for AUO test only. Do not connect) |
| 45 | NC | No connection (for AUO test only. Do not connect) |
| 46 | GND | Ground |
| 47 | NC | No connection (for AUO test only. Do not connect) |
| 48 | NC | No connection (for AUO test only. Do not connect) |
| 49 | GND | Ground |
| 50 | HPD | Hot plug detection |
| 51 | GND | Ground |

*Note 1:* Input Signals shall be in low status when VDD is off.

*Note 2:* High stands for "3.3V", Low stands for "0V", NC means "No Connection".

*Note 3:* RSV means "Reserved".

Note1: Pin1 start position



## 6.4 The Input Data Format

### 6.4.1 eDP Data Format

**The brightness of each primary color is based on the 10bit gray scale data input for the color; the higher the ninary input, the brighter the color. The table below provides a reference for color versus data input.**

| Lane 0 | Lane 1 | Lane 2 | Lane 3 |
|---|---|---|---|
| R0-9:2 | R1-9:2 | R2-9:2 | R3-9:2 |
| R0-1:0\|G0-9:4 | R1-1:0\|G1-9:4 | R2-1:0\|G2-9:4 | R3-1:0\|G3-9:4 |
| G0-3:0\|B0-9:6 | G1-3:0\|B1-9:6 | G2-3:0\|B2-9:6 | G3-3:0\|B3-9:6 |
| B0-5:0\|R4-9:8 | B1-5:0\|R5-9:8 | B2-5:0\|R6-9:8 | B3-5:0\|R7-9:8 |
| R4-7:0 | R5-7:0 | R6-7:0 | R7-7:0 |
| G4-9:2 | G5-9:2 | G6-9:2 | G7-9:2 |
| G4-1:0\|B4-9:4 | G5-1:0\|B5-9:4 | G6-1:0\|B6-9:4 | G7-1:0\|B7-9:4 |
| B4-3:0\|R8-9:6 | B5-3:0\|R9-9:6 | B6-3:0\|R10-9:6 | B7-3:0\|R11-9:6 |
| R8-5:0\|G8-9:8 | R9-5:0\|G9-9:8 | R10-5:0\|G10-9:8 | R11-5:0\|G11-9:8 |
| G8-7:0 | G9-7:0 | G10-7:0 | G11-7:0 |
| B8-9:2 | B9-9:2 | B10-9:2 | B11-9:2 |
| B8-1:0\|R12-9:4 | B9-1:0\|R13-9:4 | B10-1:0\|R14-9:4 | B11-1:0\|R15-9:4 |
| R12-3:0\|G12-9:6 | R13-3:0\|G13-9:6 | R14-3:0\|G14-9:6 | R15-3:0\|G15-9:6 |
| G12-5:0\|B12-9:8 | G13-5:0\|B13-9:8 | G14-5:0\|B14-9:8 | G15-5:0\|B15-9:8 |
| B12-7:0 | B13-7:0 | B14-7:0 | B15-7:0 |

10bit RGB to a 4-Lane Main-Link Mapping

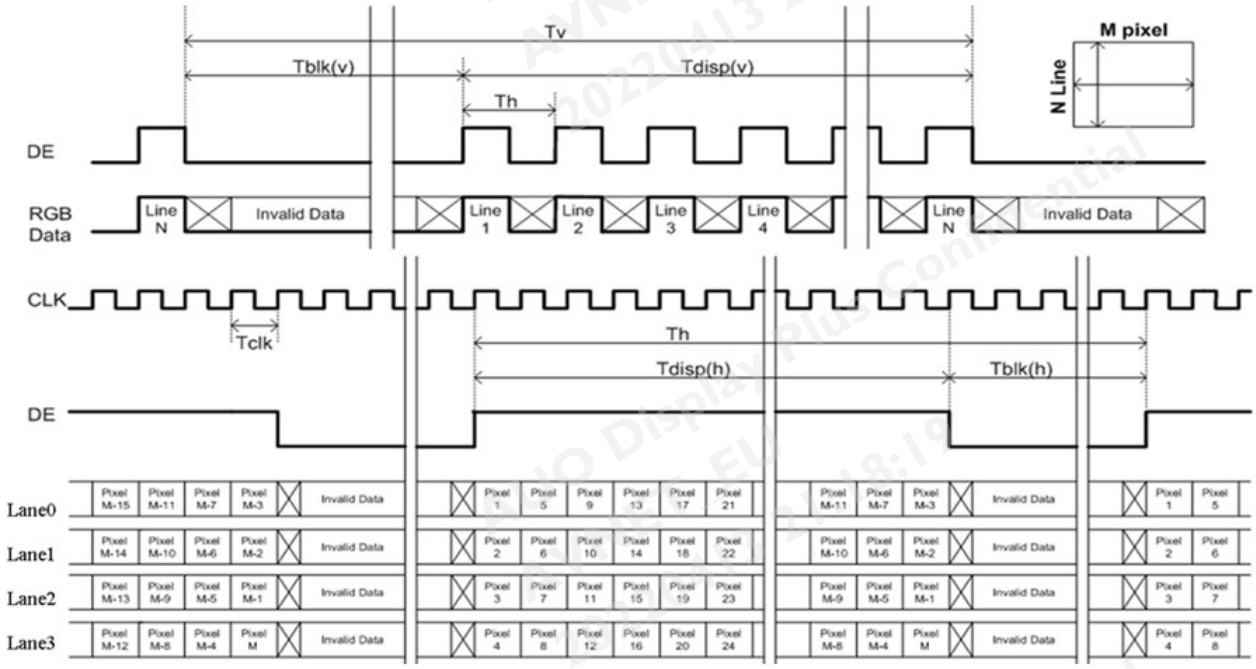
### 6.4.2 The Input Data Format(eDP)

**The following table is for color versus input data (10bit). The higher the gray level, the brighter the color.**

| Color | Gary Level | Color Input Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RED data (MSB:R9,LSB:R0) | | | | | | | | | | GREEN data (MSB:G9,LSB:G0) | | | | | | | | | | BLUE data (MSB:B9,LSB:B0) | | | | | | | | | |
| | | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G9 | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 | |
| Black | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| White | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| L511 | - | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Red | L0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Black |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | L1023 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Green | L0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Black |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | L1023 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Blue | L0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Black |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | L1023 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |

### 6.4.3 Timing Diagram

**(Lane0~3 eDP data:1, 2, 3, 4, …,3837,3838,3839,3840)**




## 6.5 eDP Specification (Follow VESA Display Port Standard Version 1.2)

### 6.5.1 DisplayPort Main Link Signal:

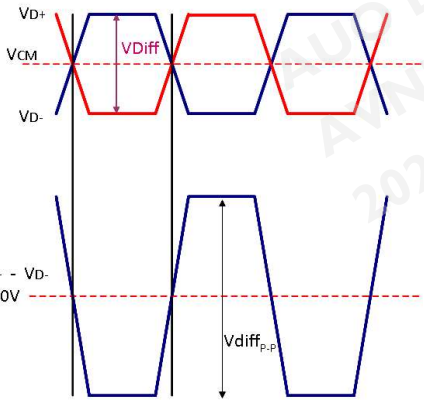
| DisplayPort Main Link | | | | | |
|---|---|---|---|---|---|
| | | Min | Typ | Max | unit |
| Frequency | Main Link Frequency | - | 5.4 | - | Gbps |
| UI | Unit Interval | - | 185 | - | ps |
| VCM | RX input DC Common Mode Voltage | - | 0 | - | [Volt] |
| $VDiff_{P-P}$ | Peak-to-peak Voltage at a receiving Device | 70 | - | - | [mVolt] |
| Down_Spread_Freq | Link clock down spread frequency | 30 | - | 33 | KHz |
| Down_Spread_Amplitude | Link clock down spread amplitude | - | - | 0.5 | % |

| Point | Time(UI) | Voltage (V) |
|---|---|---|
| 1 | 0.310 | 0 |
| 2 | 0.375~0.625 | 35mV |
| 3 | 0.310 | 0 |
| 4 | 0.375~0.625 | -35mV |

**Downstream Device EYE Mask at Receiver Connector for HBR2**

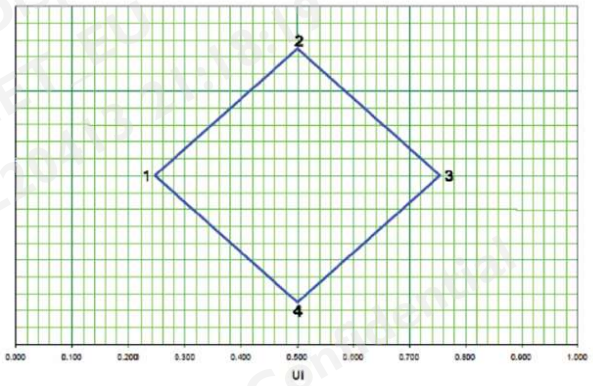
Differential pair VD+ , VD-
Which is one Display port
Main link

VCM of Display port
Main link

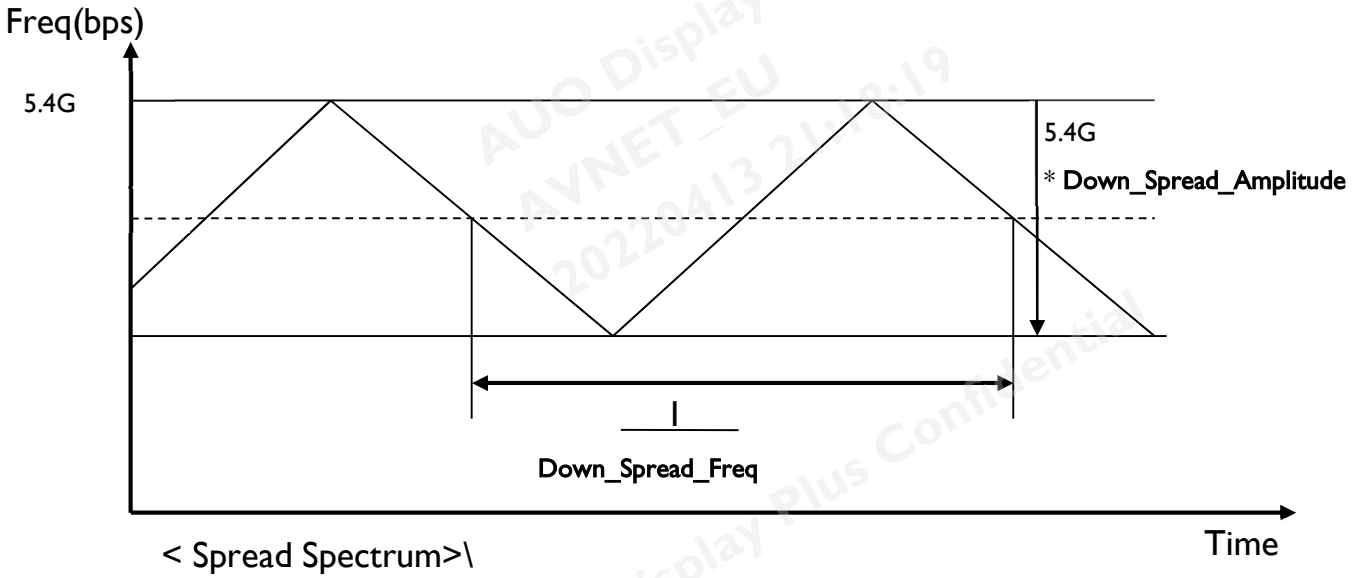



$Vdiff_{P-P} = [(VD+) - (VD-)] \times 2$



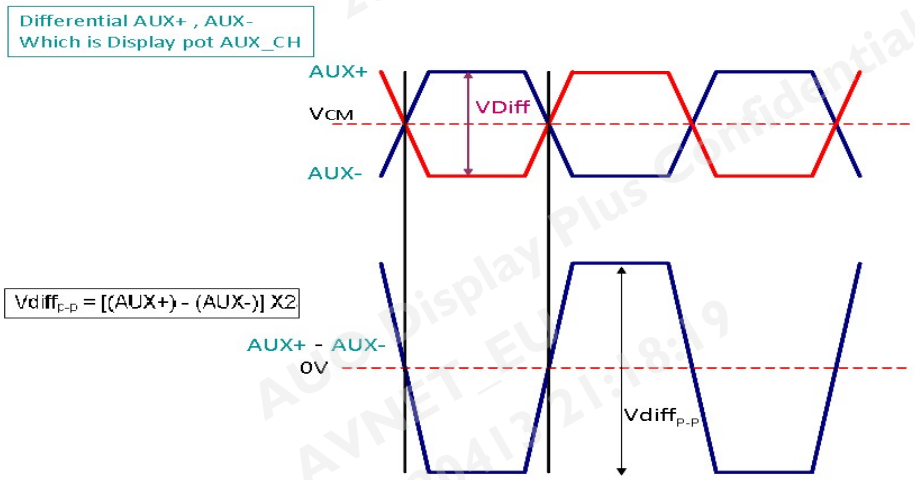

Downstream Device EYE Mask at Receiver Connector Pins




< Spread Spectrum>\

### 6.5.2 DisplayPort AUX_CH Signal:

| DisplayPort AUX_CH | | | | | |
|---|---|---|---|---|---|
| | | Min | Typ | Max | unit |
| VCM | AUX DC Common Mode Voltage | - | 0 | - | [Volt] |
| $VDiff_{P-P}$ | AUX Peak-to-peak voltage at a receiving device | 70 | - | - | [mVolt] |




### 6.5.3 DisplayPort VHPD Signal:

| Display Port VHPD | | | | | |
|---|---|---|---|---|---|
| | | Min | Typ | Max | unit |
| VHPD | HPD Voltage | 2.25 | - | 3.6 | [Volt] |

### 6.5.3 Intra-Pair Skew:

| LRX-SKEW-INTRA_PAIR | | | | | |
|---|---|---|---|---|---|
| | | Min | Typ | Max | unit |
| LRX-SKEW-INTRA_PAIR | Lane Intra-pair Skew Tolerance | - | - | 50 | [ps] |

### 6.5.4 Inter-Pair Skew

| LRX-SKEW-INTER_PAIR | | | | | |
|---|---|---|---|---|---|
| | | Min | Typ | Max | unit |
| LRX-SKEW-INTER_PAIR | Lane-to-Lane Skew at RX package pins | - | - | 5700 | [ps] |

## 6.6 Interface Timing

### 6.6.1 Timing Characteristics

The input timing is shown as the following table.

| Symbol | Description | | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Tv | Vertical Section | Period | (2190) | 2200 | (2760) | Th | |
| Tdisp (v) | | Active | (2160) | 2160 | (2160) | Th | |
| Tblk (v) | | Blanking | (30) | 40 | (600) | Th | |
| Fv | | Frequency | (50) | 60 | (63) | Hz | *Note 6-6* |
| Th | Horizontal Section | Period | (4000) | 4120 | (4240) | Tclk | |
| Tdisp (h) | | Active | (3840) | 3840 | (3840) | Tclk | |
| Tblk (h) | | Blanking | (160) | 280 | (400) | Tclk | |
| Fh | | Frequency | (109.5) | 132 | (147.3) | kHz | *Note 6-4* |
| Tclk | Pixel Clock | Period | (1.7) | 1.84 | (2.3) | ns | 1/Fclk |
| Fclk | | Frequency | (438) | 543.8 | (589.2) | MHz | *Note 6-5* |
| Link Rate per Lane | | | | 5.4 | | Gbps | 5.4 |

***Note 6-4:*** The equation is listed as following. Please don't exceed the above recommended value.

Fh (Min.) = Fclk (Min.) / Th (Min.)
Fh (Typ.) = Fclk (Typ.) / Th (Typ.)
Fh (Max.)= Fclk (Max.) / Th (Min.)

***Note 6-5:*** The equation is listed as following. Please don't exceed the above recommended value.

1st Lane N & 2nd Lane N skew < 200ns

Fclk (Typ.) = Fv (Typ.) x Th (Typ.) x Tv (Typ.)

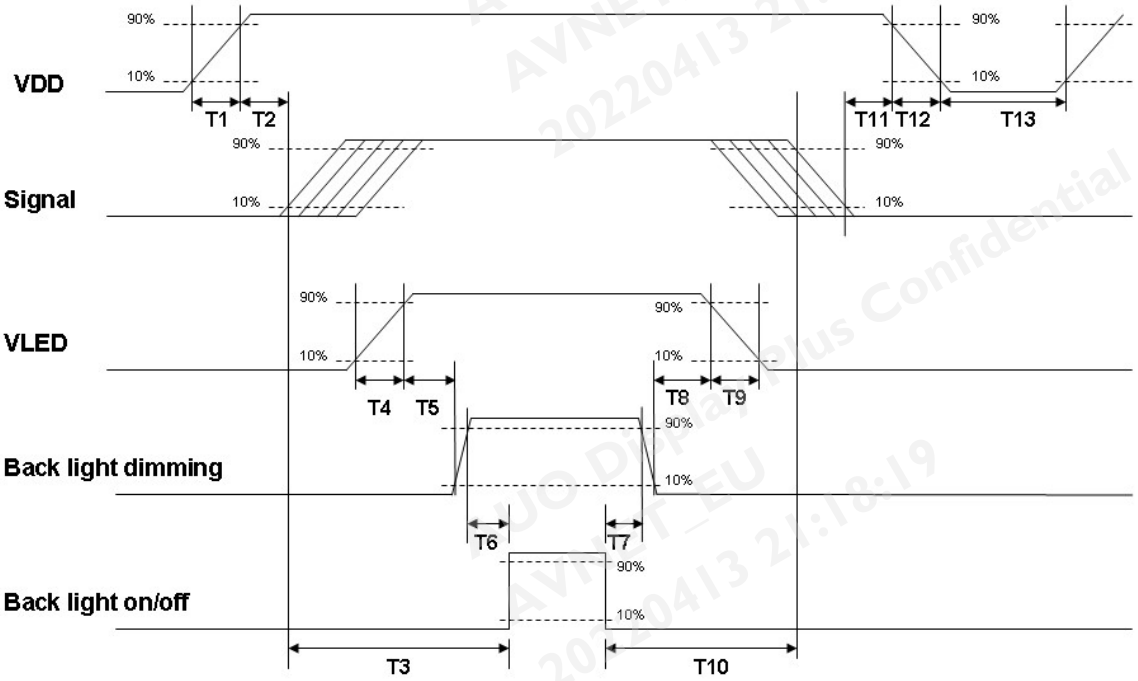
Fclk (Min.)≦Fv x Th x Tv ≦ Fclk (Max.)

***Note 6-6:*** The equation is listed as following. Please don't exceed the above recommended value.

Fv =Fclk(Typ.) / (Tv x Th)

## 6.7 Power ON/OFF Sequence

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




### Power sequence timing

| Parameter | Value | | | Units |
|---|---|---|---|---|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | ms |
| T2 | 40 | - | -*1 | |
| T3 | 200 | - | - | |
| T4 | 0.5 | - | 10 | |
| T5 | 10 | - | - | |
| T6 | 10 | - | -*2 | |
| T7 | 0 | - | - | |
| T8 | 10 | - | - | |
| T9 | - | - | 10 | |
| T10 | 110 | - | - | |
| T11 | 0 | 16 | 50 | |
| T12 | 0 | - | 10 | |
| T13 | 1000 | - | - | |

*Note 1* (T2) : The maximum timing of VDD rising(90%) to HTPDN falling edge decided by customer system.

*Note 2* (T6) : voftage of VDD must decay smoothly after power-off.(customer system decide this value)

## 7. Reliability Test Criteria

All testing under following setting: VDD 12V, Frame rate: 60Hz

| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias (Ta) | 50°C/80%,300Hr | |
| High Temperature Operation (Ta) | 50°C, 300Hr (center point of panel surface) | |
| Low Temperature Operation (Ta) | 0°C, 300Hr | |
| Hot Storage | 60°C, 300 hours | |
| Cold Storage | -20°C, 300 hours | |
| Thermal Shock Test (Ta) | -20°C /30 min ,60 °C /30 min ,100cycles, 40°C minimun ramp rate | |
| Shock Test (Non-Operating) | 50G,20ms,Half-sine wave,(+-X,+-Y,+-Z) | |
| Vibration Test (Non-Operating) | 1.0G, 10~300Hz, Random wave<br>10mins/axis, 3 direction (X, Y, Z) | |
| Altitude Test | Operation : 10,000ft<br>Non-Operation : 30,000ft | |
| ESD | Contact : ± 8KV/ operation, Class B<br>Air : ± 15KV / operation, Class B | Note 1 |

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

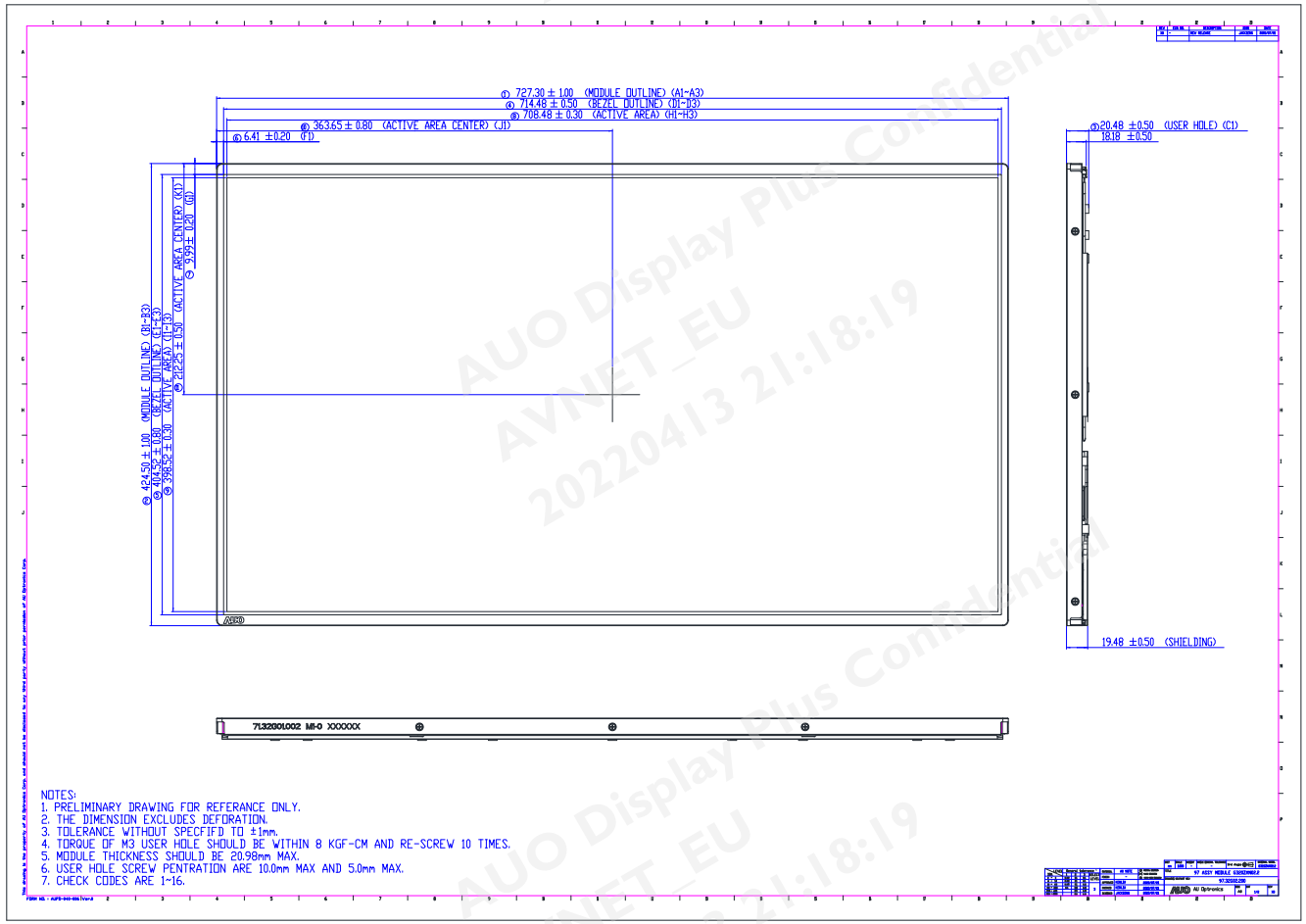
. Self-recoverable. No hardware failures.

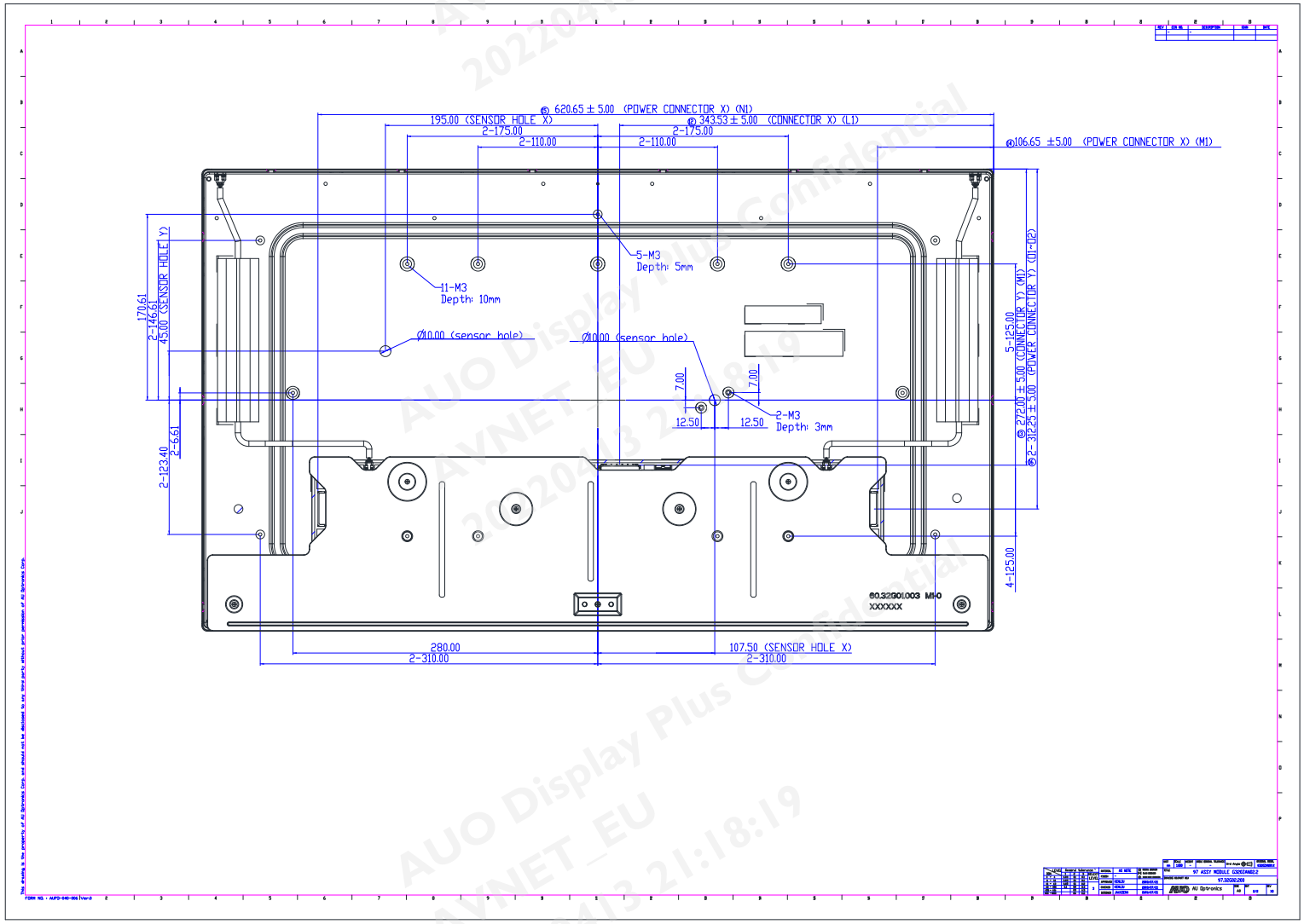
Note2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.
- No function failure occurs.

# 8. Mechanical Characteristics

## 8.1 LCM Outline Dimension

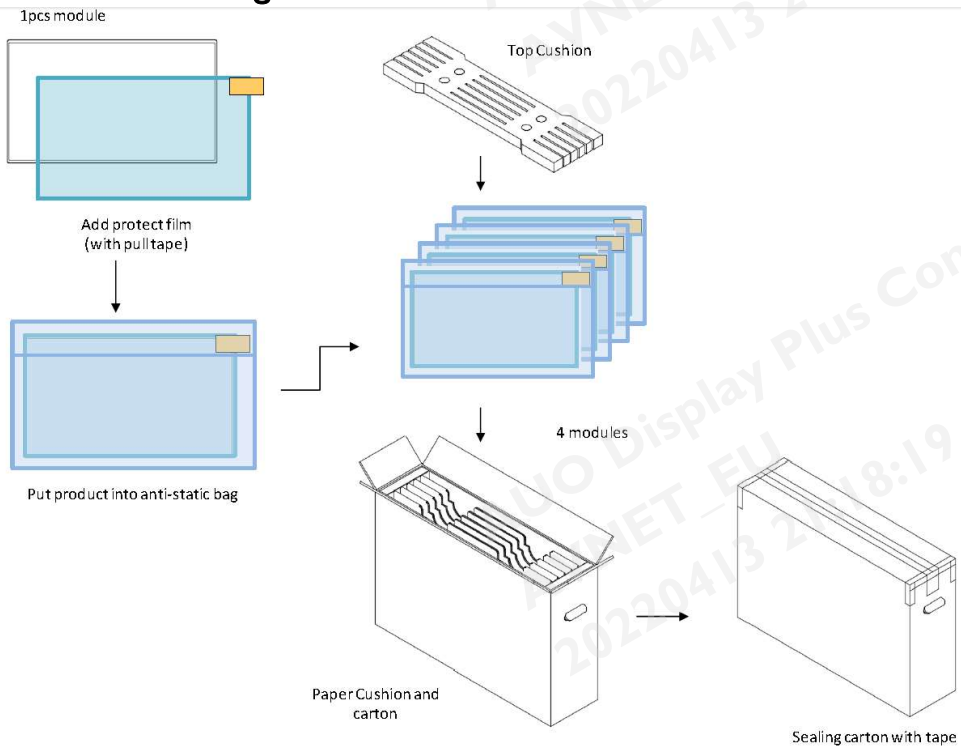



620.65 ± 5.00 (POWER CONNECTOR X) (N1)
195.00 (SENSOR HOLE X)
343.53 ± 5.00 (CONNECTOR X) (L1)
2-175.00
2-175.00
2-110.00
2-110.00
106.65 ±5.00 (POWER CONNECTOR X) (M1)
5-M3
Depth: 5mm
11-M3
Depth: 10mm
170.61
2-146.61
45.00 (SENSOR HOLE Y)
Ø10.00 (sensor hole)
Ø10.00 (sensor hole)
7.00
7.00
12.50
12.50
2-M3
Depth: 3mm
2-123.40
2-6.61
5-125.00
272.00 ± 5.00 (CONNECTOR Y) (M1)
2-312.25 ± 5.00 (POWER CONNECTOR Y) (D1-D2)
4-125.00
80.32901.003 M1.0
XXXXXX
280.00
2-310.00
107.50 (SENSOR HOLE X)
2-310.00

# 9. Label and Packaging

## 9.1 Shipping Label (on the rear side of TFT-LCD display)


## 9.2 Carton Package




Capacity: 4 modules /carton

Weight: 21.5±0.5 kg

Carton Dim.: 820(L)mm* 220(W)mm* 535(H)mm

Pallet Dim.: 1150(L)mm* 840(W)mm* 132(H)mm

Module by air: (1*5)*2 layers, one pallet put 10 boxes, total 40pcs module.

Module by sea: One pallet (1*5)*2 layers + One pallet (1*5)*1 layer, total 60pcs module.

Module by sea (HQ): One pallet (1*5)*2 layers + One pallet (1*5)*2 layers, total 80pcs module

# 10 Safety

## 10.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

## 10.2 Materials

### 10.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

### 10.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

## 10.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

## 10.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

| | |
|---|---|
| UL 60950-1 second edition | U.S.A. Information Technology Equipment |