



( v ) Preliminary Specifications

( ) Final Specifications

|                   |                       |
|-------------------|-----------------------|
| <b>Module</b>     | 32 Inch Color TFT-LCD |
| <b>Model Name</b> | G320ZAN01.0           |

|                                  |             |
|----------------------------------|-------------|
| <b>Customer</b>                  | <b>Date</b> |
| _____                            | _____       |
| <b>Checked &amp; Approved by</b> | <b>Date</b> |
| _____                            | _____       |
| Customer's sign back page        |             |

|   |                   |
|---|-------------------|
| <b>Approved by</b>  | <b>Date</b>       |
| <u><i>Crystal Hsieh</i></u>                                 | <u>2017/09/01</u> |
| <b>Prepared by</b>  | <b>Date</b>       |
| <u><i>Wennie Lee</i></u>                                    | <u>2017/09/01</u> |
| General Display Business Unit /<br>AU Optronics corporation |                   |



## 2. General Description

This specification applies to the Color Active Matrix Liquid Crystal Display G320ZAN01.0 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 V by one interface compatible. LED driving board for backlight unit is included in G320ZAN01.0.

### 2.1 Display Characteristics

The following items are characteristics summary on the table under 25 °C 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]  | Logic: max. 17.28 W@ white pattern<br>BL power: max. 110.08 W |
| Weight                        | [Grams] | 4630g +/- 10%   |
| Physical Size                 | [mm]    | 727.3 (H) x 424.5 (V) x 20.48 (D) (Typ)                       |
| Electrical Interface          |         | V by one  |
| Surface Treatment             |         | Anti-Glare treatment  |
| Support Color                 |         | 10bit(8bit+FRC)   |
| Temperature Range (T surface) |         |   |
| Operating                     | [°C]    | 0 to +50  |
| Storage (Non-Operating)       | [°C]    | -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):

| Item  | Unit              | Conditions                 | Min.    | Typ.  | Max.  | Note |
|---|-------------------|----------------------------|---------|-------|-------|------|
| White Luminance                             | cd/m <sup>2</sup> | ILED=107.5mA(center point) | (600)   | 700   | ---   | 1    |
| Uniformity                                  | %                 | 9 points                   | 80      | ---   | ---   | 2,3  |
| Contrast Ratio                              | --                |                            | 800     | 1350  |       | 4    |
| Response Time                               | msec              | Rising                     | -       | 8     | 20    | 5    |
|   |                   | Falling                    |         | 10    | 20    |      |
|   |                   | Rising + Falling           |         | 18    | 40    |      |
| Viewing Angle                               | degree            | Horizontal<br>CR >= 10     | (Right) | 75    | 89    | 6    |
|   |                   |                            | (Left)  | 75    | 89    |      |
|   |                   | Vertical<br>CR >= 10       | (Upper) | 75    | 89    |      |
|   |                   |                            | (Lower) | 75    | 89    |      |
| Color / Chromaticity Coordinates (CIE 1931) | --                | Red x                      | 0.655   | 0.685 | 0.715 |      |
|   |                   | Red y                      | 0.279   | 0.309 | 0.339 |      |
|   |                   | Green x                    | 0.180   | 0.210 | 0.240 |      |
|   |                   | Green y                    | 0.680   | 0.710 | 0.740 |      |
|   |                   | Blue x                     | 0.120   | 0.150 | 0.180 |      |
|   |                   | Blue y                     | 0.030   | 0.060 | 0.090 |      |
|   |                   | White x                    | 0.283   | 0.313 | 0.343 |      |
|   |                   | White y                    | 0.299   | 0.329 | 0.359 |      |
| Adobe RGB coverage ratio                    | %                 |                            | ---     | 100   | ---   |      |

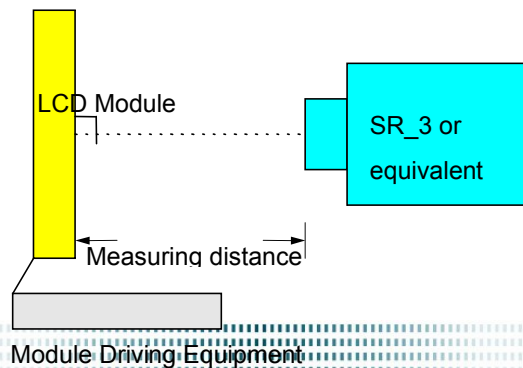
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR\_3 or equivalent)

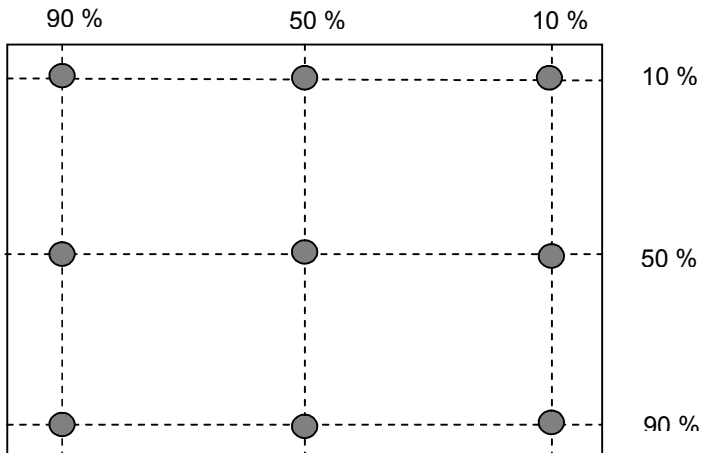
Aperture 1° with 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 9 points position



Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

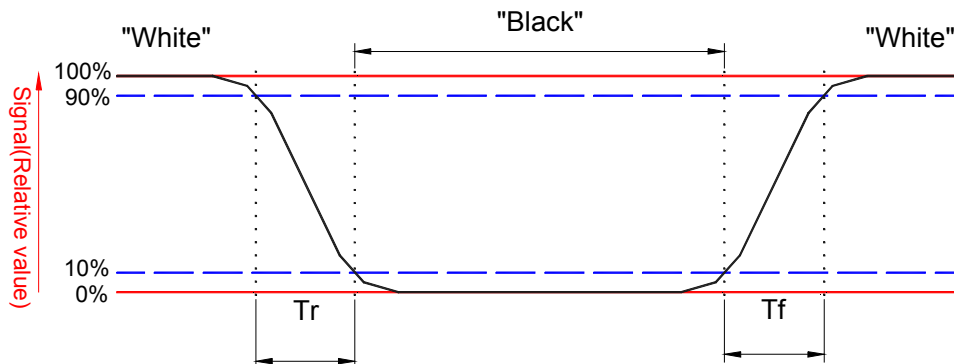
$$\delta_{w9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

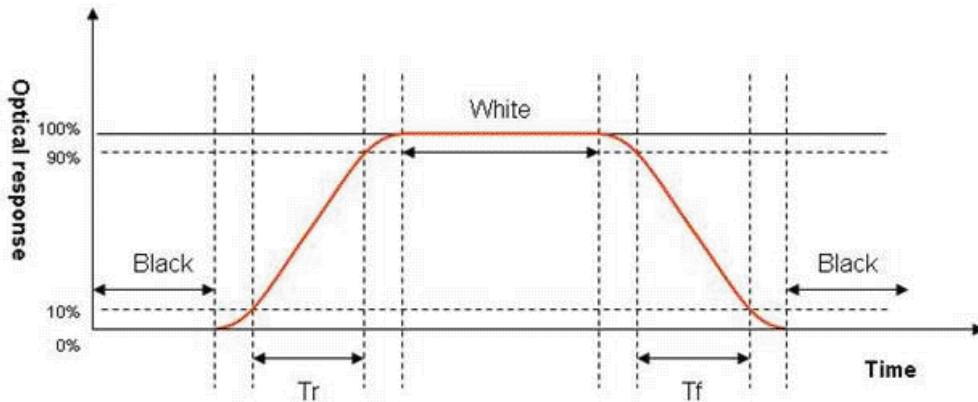
Note 4: Definition of contrast ratio (CR):

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

Note 5: Definition of response time:

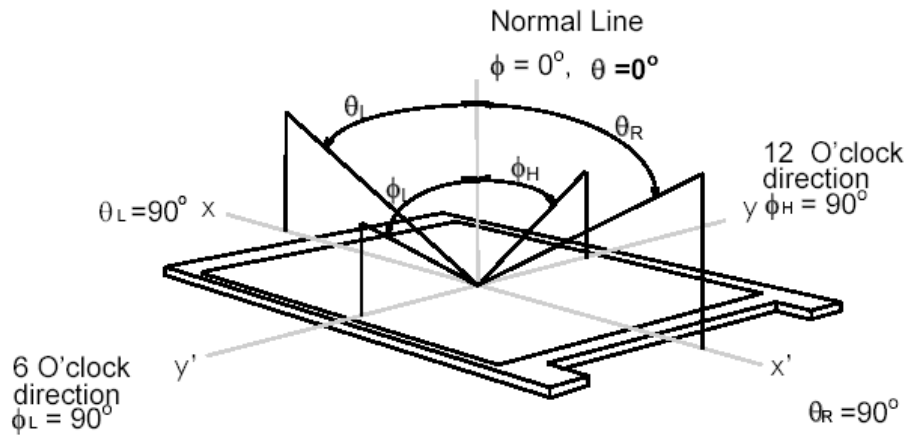
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.





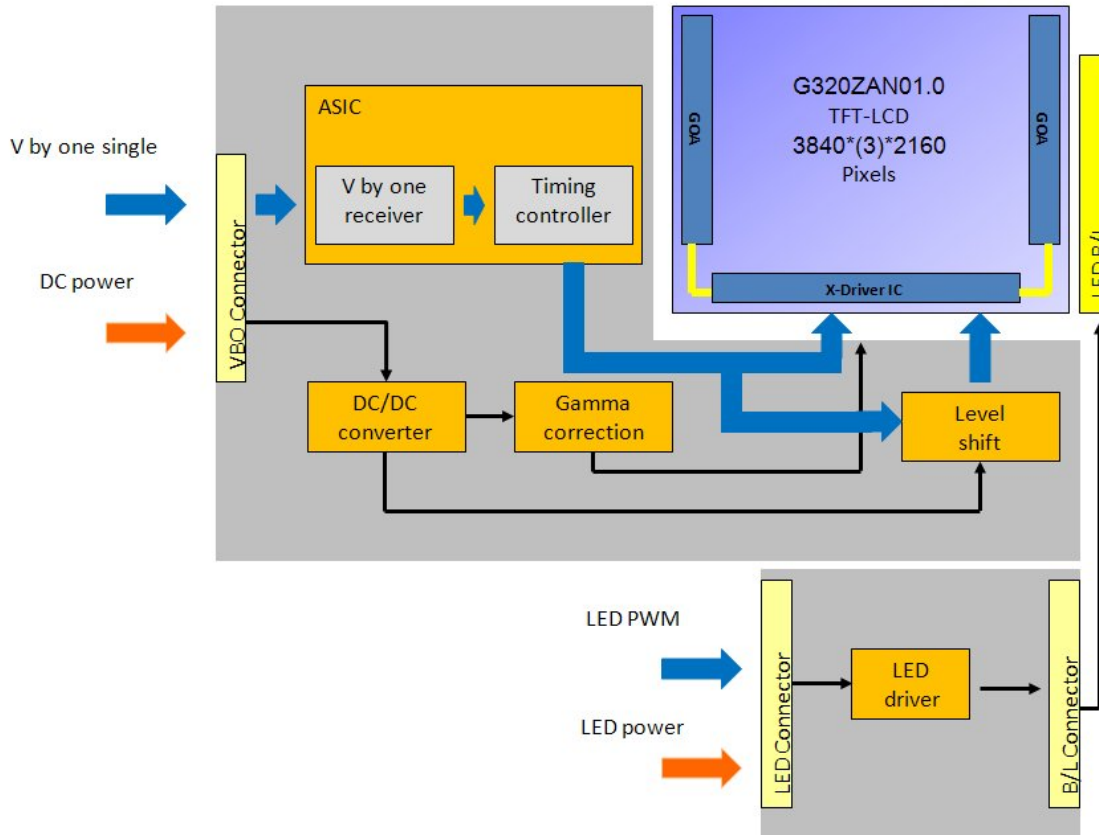
**Note 6: Definition of viewing angle**

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a  $180^\circ$  horizontal and  $180^\circ$  vertical range (off-normal viewing angles). The  $180^\circ$  viewing angle range is broken down as below:  $90^\circ$  ( $\theta$ ) horizontal left and right, and  $90^\circ$  ( $\phi$ ) 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:



### I/F PCB Interface:

FI-RE51S-HF

### Mating Type:

FI-RE51HL

## 4. Absolute Maximum Ratings

### 4.1 Absolute Ratings of TFT LCD Module

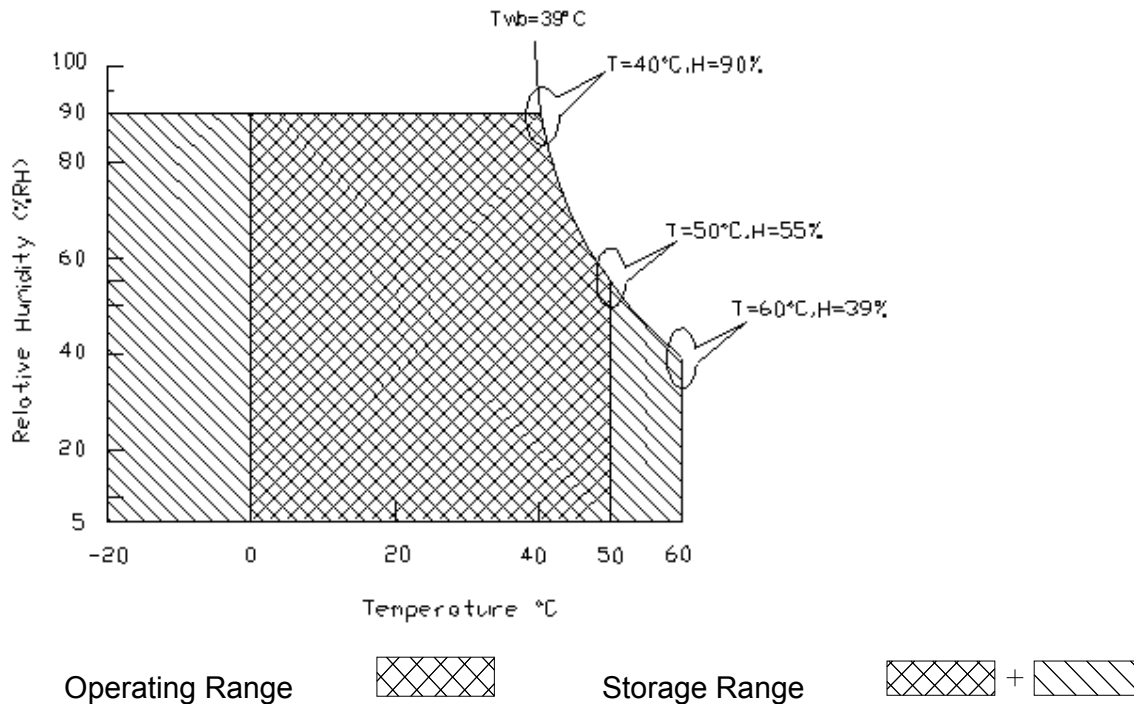
| Item                    | Symbol | Min  | Max   | Unit   |
|-------------------------|--------|------|-------|--------|
| Logic/LCD drive Voltage | Vin    | -0.3 | +16.5 | [Volt] |

### 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: temperature is defined as surface temperature

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



## 5. Electrical Characteristics

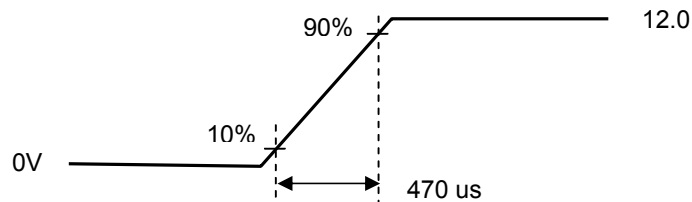
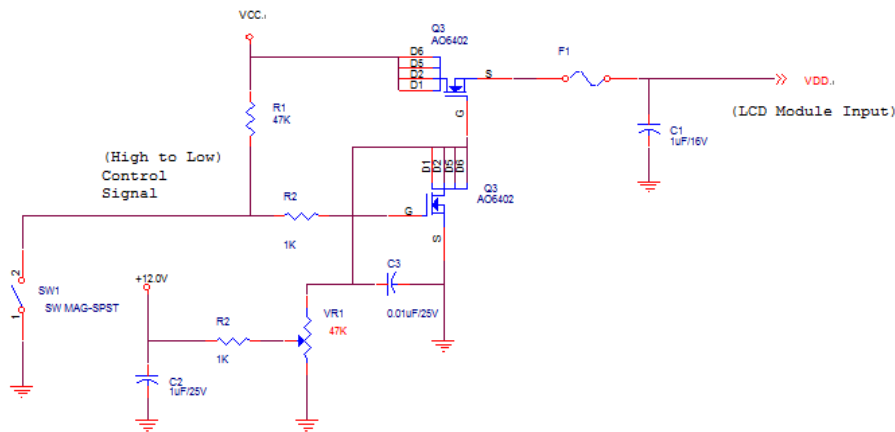
### 5.1 TFT LCD Module

#### 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                              | -    | 1.2  | 1.44       | [mA]   | White Pattern<br>(VDD=12V, at 60Hz) |
| Irush  | LCD Inrush Current                       | -    |      | 4          | [A]    | Note 1<br>(VDD=12V, at 60Hz)        |
| PDD    | VDD Power                                | -    | 14.4 | 17.28      | [Watt] | White Pattern<br>(VDD=12V, at 60Hz) |
| VDDrp  | Allowable Logic/LCD Drive Ripple Voltage | -    | -    | VDD*<br>5% | [mV]   | White Pattern<br>(VDD=12V, at 60Hz) |

Note 1: Measurement condition:



VDD rising time

## 5.2 Backlight Unit

### 5.2.1 LED Backlight Unit: Driver Connector

|                                     |                       |
|-------------------------------------|-----------------------|
| <b>Connector Name / Designation</b> | <b>Lamp Connector</b> |
| 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    | DC_Dimming | DC Dimming (Hi: 3VDC, Lo:0VDC)                       |
| 12    | BLON       | BL ON/OFF (ON:3.3V, OFF:0V)                          |
| 13    | NC         | N/A  |
| 14    | E_PWM      | External PWM Control<br>(Hi Level: 3V, Lo Level: 0V) |

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

Note 2: Use the DC 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 | -      | 82.56 | 93.57 | [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) / Efficiency

**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       | 23.5 | 24.0  | 24.5   | [Volt] |               |
| I <sub>VDD</sub>             | Input Current       |      | 4.05  | 4.59   | [A]    | 100% PWM Duty |
| P <sub>VDD</sub>             | Power Consumption   |      | 97.13 | 110.08 | [Watt] | 100% PWM Duty |
| Backlight<br>on/off          | On control Voltage  | 2    | 3.3   | 5      | [Volt] |               |
|                              | Off control Voltage |      |       | 0.8    | [Volt] |               |
| SEL                          | SEL High level      | 2    | 3.3   | 5      | [Volt] |               |
|                              | SEL Low level       |      |       | 0.8    | [Volt] |               |
| DC                           | DC Dimming          | 0    |       | 3      | [Volt] |               |
| F <sub>PWM</sub>             | Dimming Frequency   | 0.2  |       | 15     | [kHz]  |               |
|                              | Swing Voltage       |      | 3     |        | V      |               |
|                              | Dimming Duty Cycle  | 10   | -     | 100    | %      |               |
| I <sub>F (one channel)</sub> | LED Forward Current |      | 107.5 |        | mA     | Ta = 25°C     |

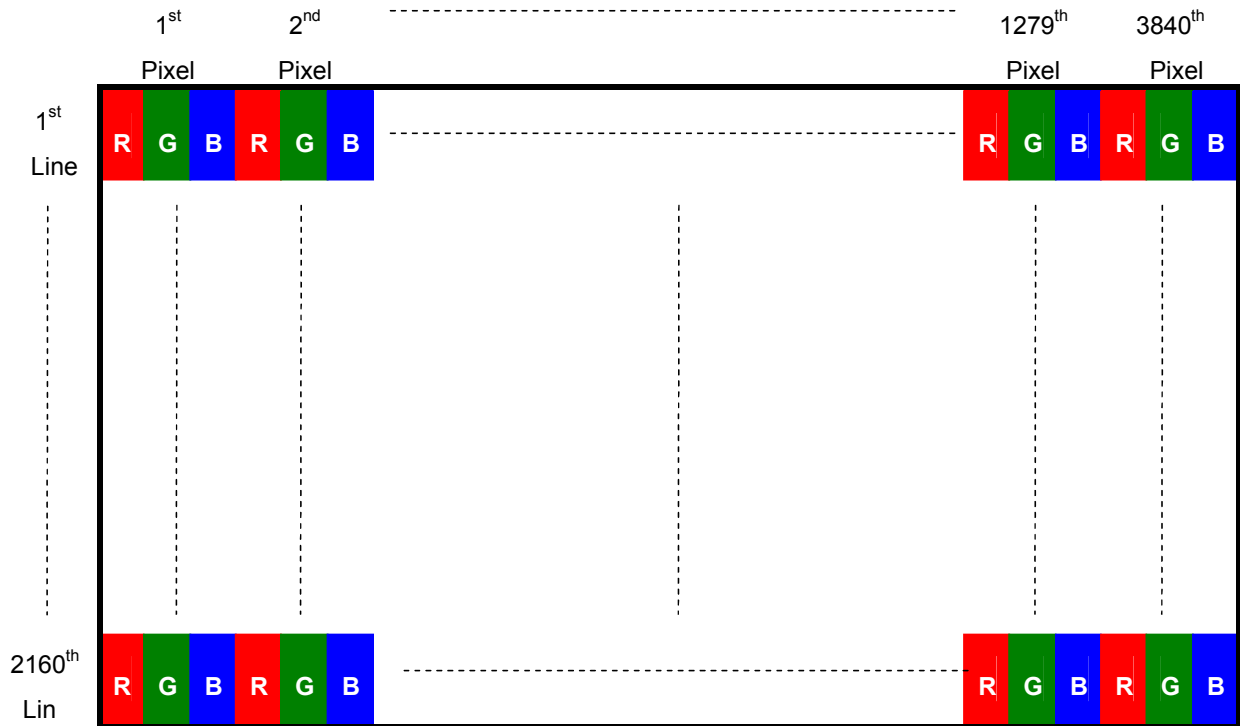
Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: VDD, I<sub>VDD</sub>, P<sub>VDD</sub>, I<sub>rush</sub> LED are defined for LED B/L.(100% duty of PWM dimming)

## 6. Signal Characteristic

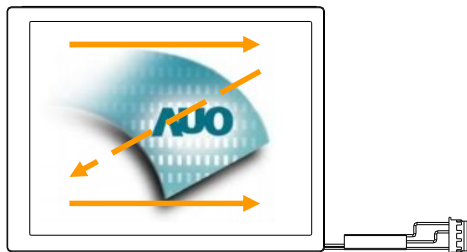
### 6.1 Pixel Format Image

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

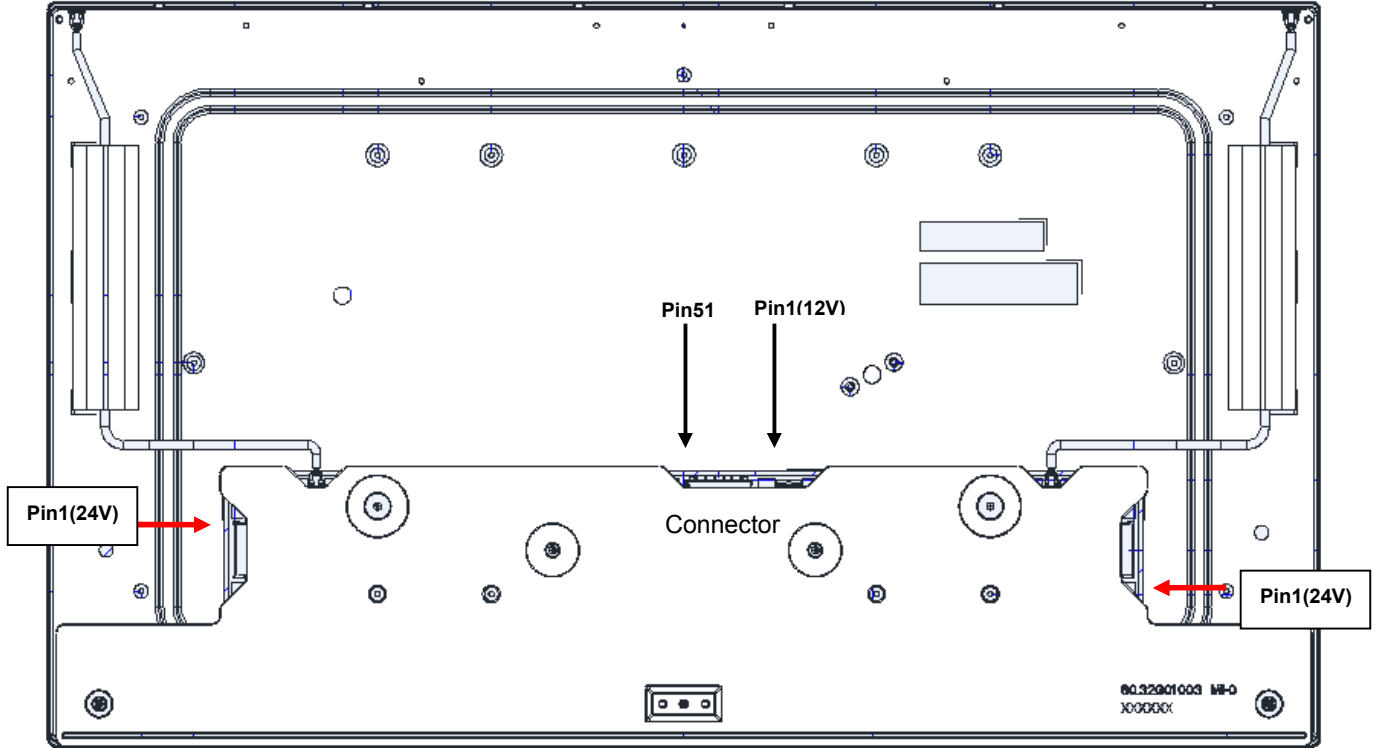
The module uses a LVDS receiver embedded in AUO's ASIC. LVDS is a differential signal technology for LCD interface and a high-speed data transfer device.

### 6.3.1 TFT LCD Module: LVDS Connector

| Connector Name / Designation | Signal Connector |
|------------------------------|------------------|
| Manufacturer                 | JAE              |
| Connector Model Number       | FI-RE51S-HF      |
| Adaptable Plug               | FI-RE51HL        |

| Pin No. | Function                            | Pin No. | Function   |
|---------|-------------------------------------|---------|--|
| 1       | Power input (+12V)                  | 26      | Lock detect output, Open drain.                                    |
| 2       | Power input (+12V)                  | 27      | Ground   |
| 3       | Power input (+12V)                  | 28      | 1st Pixel Negative VbyOne differential data input in area A. Lan 0 |
| 4       | Power input (+12V)                  | 29      | 1st Pixel Positive VbyOne differential data input in area A. Lan 0 |
| 5       | Power input (+12V)                  | 30      | Ground   |
| 6       | Power input (+12V)                  | 31      | 2nd Pixel Negative VbyOne differential data input in area A. Lan 1 |
| 7       | Power input (+12V)                  | 32      | 2nd Pixel Positive VbyOne differential data input in area A. Lan 1 |
| 8       | Power input (+12V)                  | 33      | Ground   |
| 9       | No Connection                       | 34      | 3rd Pixel Negative VbyOne differential data input in area A. Lan 2 |
| 10      | Ground                              | 35      | 3rd Pixel Positive VbyOne differential data input in area A. Lan 2 |
| 11      | Ground                              | 36      | Ground   |
| 12      | Ground                              | 37      | 4th Pixel Negative VbyOne differential data input in area A. Lan 3 |
| 13      | Ground                              | 38      | 4th Pixel Positive VbyOne differential data input in area A. Lan 3 |
| 14      | Ground                              | 39      | Ground   |
| 15      | No Connection                       | 40      | 5th Pixel Negative VbyOne differential data input in area A. Lan 4 |
| 16      | No Connection                       | 41      | 5th Pixel Positive VbyOne differential data input in area A. Lan 4 |
| 17      | No Connection                       | 42      | Ground   |
| 18      | For internal use, no connection     | 43      | 6th Pixel Negative VbyOne differential data input in area A. Lan 5 |
| 19      | For internal use, no connection     | 44      | 6th Pixel Positive VbyOne differential data input in area A. Lan 5 |
| 20      | No Connection                       | 45      | Ground   |
| 21      | No Connection                       | 46      | 7th Pixel Negative VbyOne differential data input in area A. Lan 6 |
| 22      | No Connection                       | 47      | 7th Pixel Positive VbyOne differential data input in area A. Lan 6 |
| 23      | No Connection                       | 48      | Ground   |
| 24      | No Connection                       | 49      | 8th Pixel Negative VbyOne differential data input in area A. Lan 7 |
| 25      | Hot plug detect output, Open drain. | 50      | 8th Pixel Positive VbyOne differential data input in area A. Lan 7 |
|         |                                     | 51      | Ground   |

Note1: Pin1 start position





## 6.4 The Input Data Format

### 6.4.1 Color data input reference

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

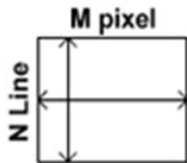
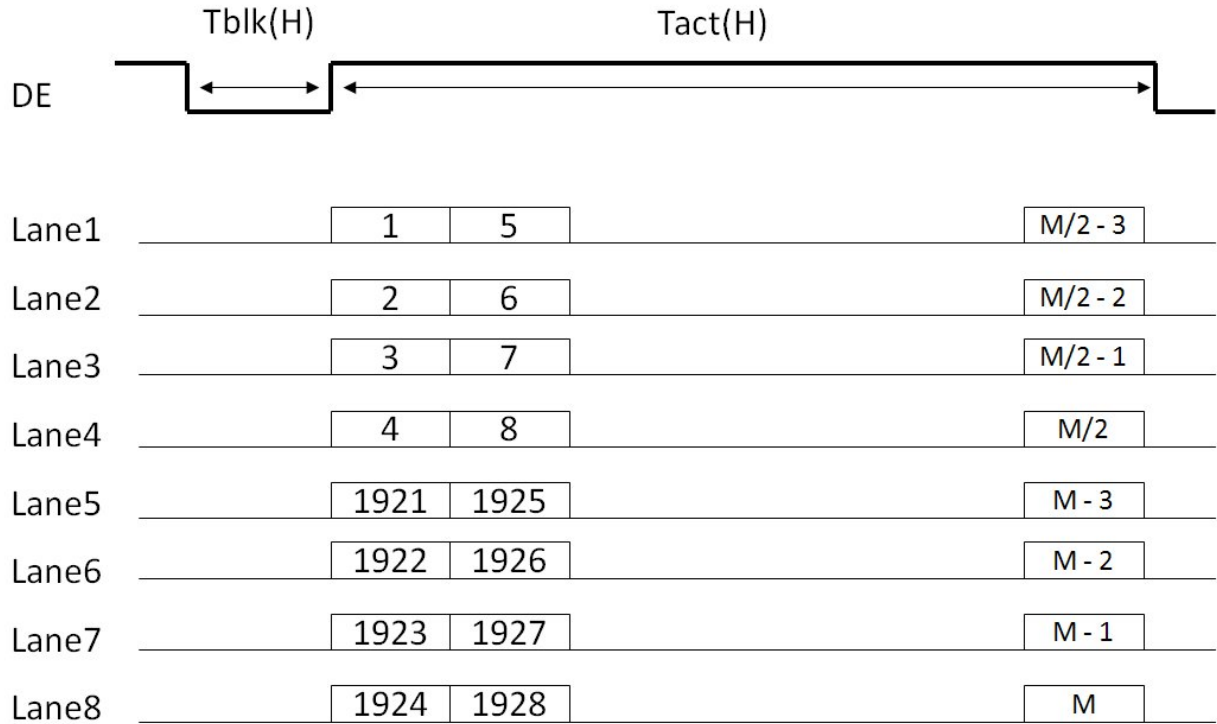
| Color       | Input color data |    |    |    |    |     |    |    |    |    |       |    |    |    |    |     |    |    |    |    |      |    |    |    |    |     |    |    |    |    |
|-------------|------------------|----|----|----|----|-----|----|----|----|----|-------|----|----|----|----|-----|----|----|----|----|------|----|----|----|----|-----|----|----|----|----|
|             | RED              |    |    |    |    |     |    |    |    |    | GREEN |    |    |    |    |     |    |    |    |    | BLUE |    |    |    |    |     |    |    |    |    |
|             | MSB              |    |    |    |    | LSB |    |    |    |    | MSB   |    |    |    |    | LSB |    |    |    |    | MSB  |    |    |    |    | LSB |    |    |    |    |
|             | 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 |
| Basic Color | 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  |
|             | Red(0123)        | 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(1023)      | 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(1023)       | 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  |
|             | Cyan             | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 1     | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 1    | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  |
|             | Magenta          | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 0     | 0  | 0  | 0  | 0  | 0   | 0  | 0  | 0  | 0  | 1    | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  |
|             | Yellow           | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 1     | 1  | 1  | 1  | 1  | 1   | 1  | 1  | 1  | 1  | 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  |
| R           | RED(000)         | 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  |    |
|             | RED(001)         | 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  |    |
|             | ....             |    |    |    |    |     |    |    |    |    |       |    |    |    |    |     |    |    |    |    |      |    |    |    |    |     |    |    |    |    |
|             | RED(1022)        | 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  |    |
| RED(1023)   | 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  |    |    |
| G           | Green(000)       | 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  |    |
|             | Green(001)       | 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  |    |
|             | ....             |    |    |    |    |     |    |    |    |    |       |    |    |    |    |     |    |    |    |    |      |    |    |    |    |     |    |    |    |    |
|             | Green(1022)      | 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  |    |
| Green(1023) | 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  |    |    |
| B           | Blue(000)        | 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  |    |
|             | Blue(001)        | 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  |    |
|             | ....             |    |    |    |    |     |    |    |    |    |       |    |    |    |    |     |    |    |    |    |      |    |    |    |    |     |    |    |    |    |
|             | Blue(1022)       | 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  | 0  |    |
| Blue(1023)  | 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  |    |    |

## 6.4.2 The Input Data Format

| Mode       | Packer input & Unpacker output | 30bpp RGB / YCbCr444 (10bit) |         |
|------------|--------------------------------|------------------------------|---------|
| 4byte mode | Byte0                          | D[0]                         | R/Cr[2] |
|            |                                | D[1]                         | R/Cr[3] |
|            |                                | D[2]                         | R/Cr[4] |
|            |                                | D[3]                         | R/Cr[5] |
|            |                                | D[4]                         | R/Cr[6] |
|            |                                | D[5]                         | R/Cr[7] |
|            |                                | D[6]                         | R/Cr[8] |
|            | Byte1                          | D[7]                         | R/Cr[9] |
|            |                                | D[8]                         | G/Y[2]  |
|            |                                | D[9]                         | G/Y[3]  |
|            |                                | D[10]                        | G/Y[4]  |
|            |                                | D[11]                        | G/Y[5]  |
|            |                                | D[12]                        | G/Y[6]  |
|            |                                | D[13]                        | G/Y[7]  |
|            | Byte2                          | D[14]                        | G/Y[8]  |
|            |                                | D[15]                        | G/Y[9]  |
|            |                                | D[16]                        | B/Cb[2] |
|            |                                | D[17]                        | B/Cb[3] |
|            |                                | D[18]                        | B/Cb[4] |
|            |                                | D[19]                        | B/Cb[5] |
|            |                                | D[20]                        | B/Cb[6] |
|            | Byte3                          | D[21]                        | B/Cb[7] |
|            |                                | D[22]                        | B/Cb[8] |
|            |                                | D[23]                        | B/Cb[9] |
|            |                                | D[24]                        | --      |
|            |                                | D[25]                        | --      |
|            |                                | D[26]                        | B/Cb[0] |
|            |                                | D[27]                        | B/Cb[1] |
|            |                                | D[28]                        | G/Y[0]  |
|            |                                | D[29]                        | G/Y[1]  |
|            |                                | D[30]                        | R/Cr[0] |
| D[31]      |                                | R/Cr[1]                      |         |

## 6.4.3 Timing Diagram

(Lane1~8 V By One data:1, 2, 3, 4, 1921, 1922, 1923, 1924)



## 6.5 Interface Timing

### 6.5.1 Timing Characteristics

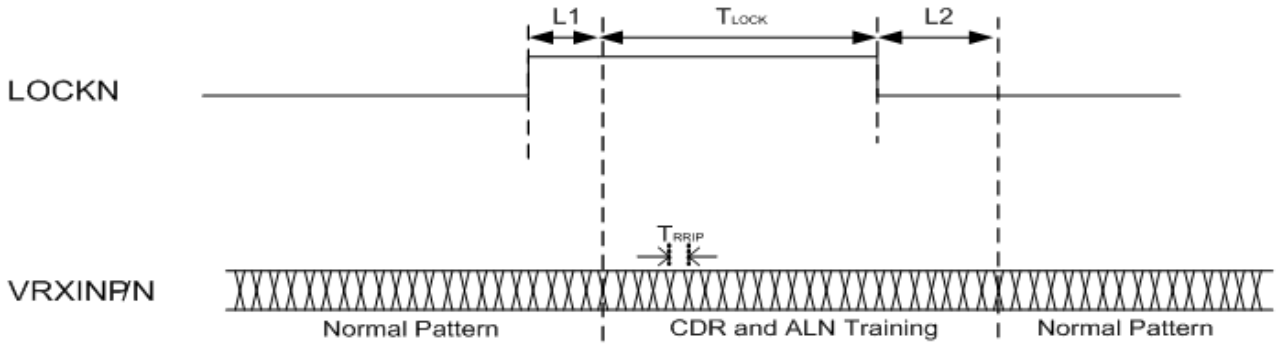
| Signal             | Item      | Symbol                        | Min   | Typ   | Max   | Unit |
|--------------------|-----------|-------------------------------|-------|-------|-------|------|
| Vertical Section   | Period    | $T_v$                         | 2200  | 2250  | 2660  | Th   |
|                    | Active    | $T_{disp(v)}$                 | -     | 2160  | -     | Th   |
|                    | Blanking  | $T_{bp(v)}+T_{fp(v)}+PW_{vs}$ | 40    | 90    | 500   | Th   |
| Horizontal Section | Period    | $T_h$                         | 530   | 550   | 600   | Tclk |
|                    | Active    | $T_{disp(h)}$                 | -     | 480   | -     | Tclk |
|                    | Blanking  | $T_{bp(h)}+T_{fp(h)}+PW_{hs}$ | 50    | 70    | 120   | Tclk |
| Clock              | Period    | Tclk                          | 15.15 | 13    | 12.98 | ns   |
|                    | Frequency | Freq.                         | 66    | 74.25 | 77    | MHz  |
| Frame Rate         | Frequency | $1/T_v$                       | 45    | 60    | 63    | Hz   |

Note : DE mode only

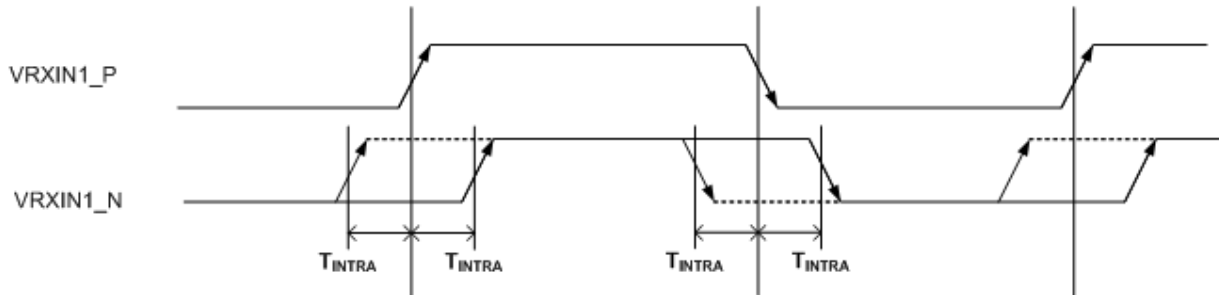
### 6.5.2 V-By-One SPEC

| Item               | Symbol  | Min.        | Typ. | Max | Unit | Note             |   |
|--------------------|---|-------------|------|-----|------|------------------|---|
| V-by-one Interface | VRXINP/N input each bit Period                      | TRRIP       | 310  | --  | 379  | ps               | 1 |
|                    | CDR training pattern time                           | TLOCK       | --   | 500 | --   | us               | 1 |
|                    | Latency from LOCKN 'HIGH' to clock training pattern | L1          | 0    | --  | --   | us               | 1 |
|                    | Latency from LOCKN 'LOW' to normal 8b10b data       | L2          | --   | --  | 70   | us               | 1 |
|                    | CML Differential Input High Threshold               | $V_{RTH}$   | +50  |     |      | mV <sub>DC</sub> |   |
|                    | CML Differential Input Low Threshold                | $V_{RTL}$   |      |     | -50  | mV <sub>DC</sub> |   |
|                    | CML Common mode Bias Voltage                        | $V_{RCT}$   | 0.8  | 0.9 | 1.0  | mV <sub>DC</sub> |   |
|                    | Intra-pair skew                                     | $T_{INTRA}$ | --   | --  | 0.3  | UI               | 2 |
|                    | Inter-pair skew                                     | $T_{INTER}$ | --   | --  | 5    | UI               | 3 |

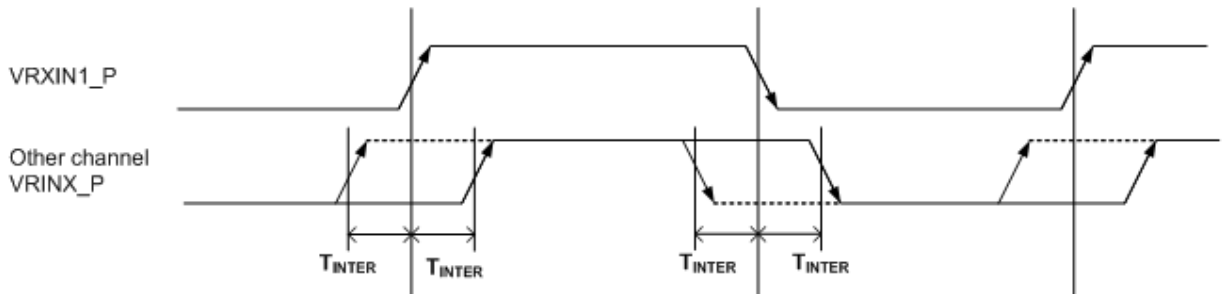
## 1. V-By-One Signal diagram



## 2. V-By-One intra-pair Skew



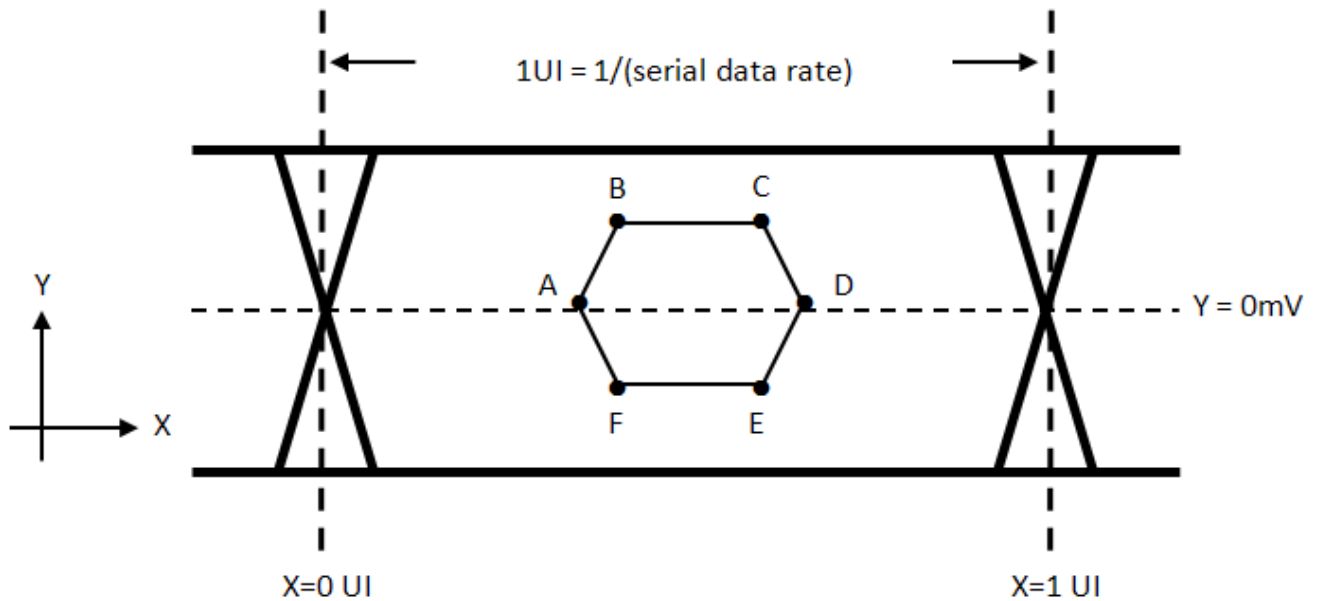
## 3. V-By-One intra-pair Skew



## 6.5.3 V-By-One Eye diagram at receiver

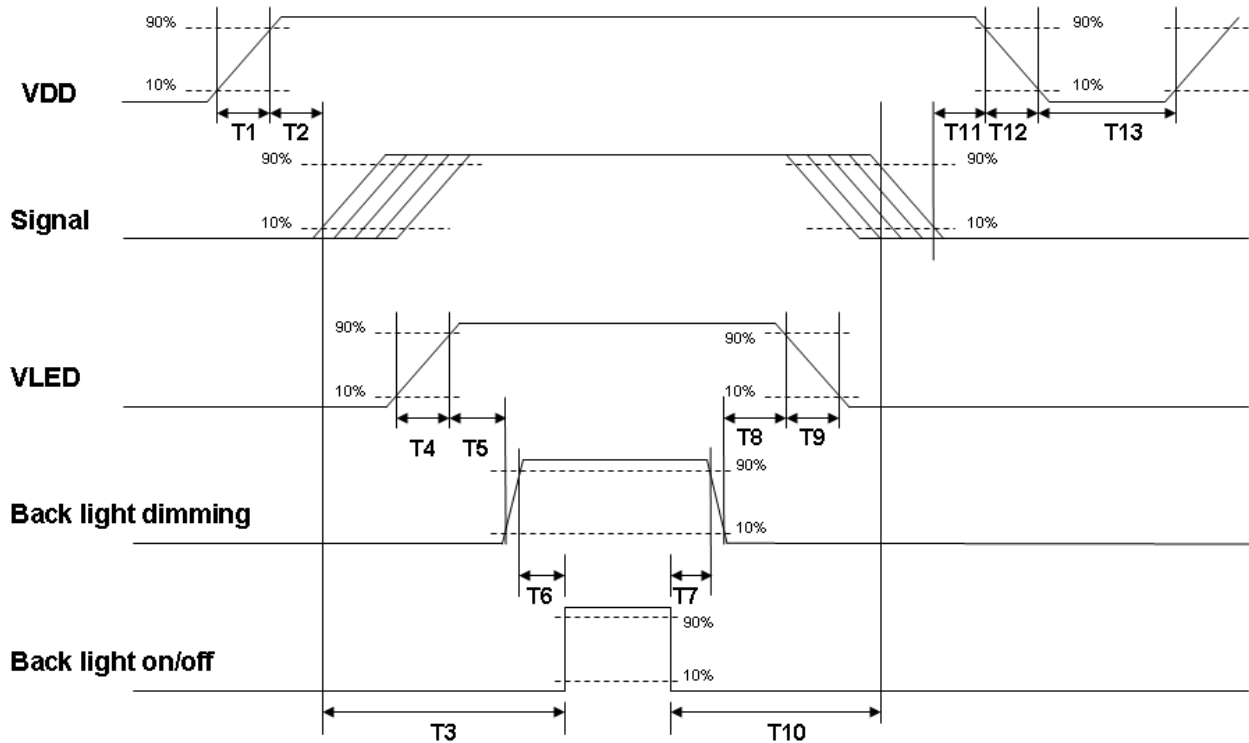
| Item               | Symbol                  | Min. | Typ. | Max  | Unit | Note |    |
|--------------------|-------------------------|------|------|------|------|------|----|
| V-by-one Interface | Eye diagram at receiver | A_X  | --   | 0.25 | --   | UI   | 1. |
|                    |                         | A_Y  | --   | 0    | --   | mV   |    |
|                    |                         | B_X  | --   | 0.3  | --   | UI   |    |
|                    |                         | B_Y  | --   | 50   | --   | mV   |    |
|                    |                         | C_X  | --   | 0.7  | --   | UI   |    |
|                    |                         | C_Y  | --   | 50   | --   | mV   |    |
|                    |                         | D_X  | --   | 0.75 | --   | UI   |    |
|                    |                         | D_Y  | --   | 0    | --   | mV   |    |
|                    |                         | E_X  | --   | 0.7  | --   | UI   |    |
|                    |                         | E_Y  | --   | -50  | --   | mV   |    |
|                    |                         | F_X  | --   | 0.3  | --   | UI   |    |
|                    |                         | F_Y  | --   | -50  | --   | mV   |    |

Note1. Eye Mask



## 6.6 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        | 30    | 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     | 16   | 50   | [ms]  |
| T12       | 0     | -    | 10   | [ms]  |
| T13       | 1000  | -    | -    | [ms]  |

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

## 7. Reliability Test Criteria

| Items                           | Required Condition   | Note   |
|---------------------------------|--|--------|
| Temperature Humidity Bias (Ts)  | 50 °C /80%,300Hr   |        |
| High Temperature Operation (Ts) | 50 °C, 300Hr (center point of panel surface)                             |        |
| Low Temperature Operation (Ts)  | 0 °C, 300Hr  |        |
| Hot Storage                     | 60 °C, 300 hours   |        |
| Cold Storage                    | -20 °C, 300 hours  |        |
| Thermal Shock Test (Ts)         | -20 °C /30 min ,60 °C /30 min ,100cycles, 40 °C minimum 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)        |        |
| ESD                             | Contact : ± 8KV/ operation, Class B<br>Air : ± 15KV / operation, Class B | Note 1 |

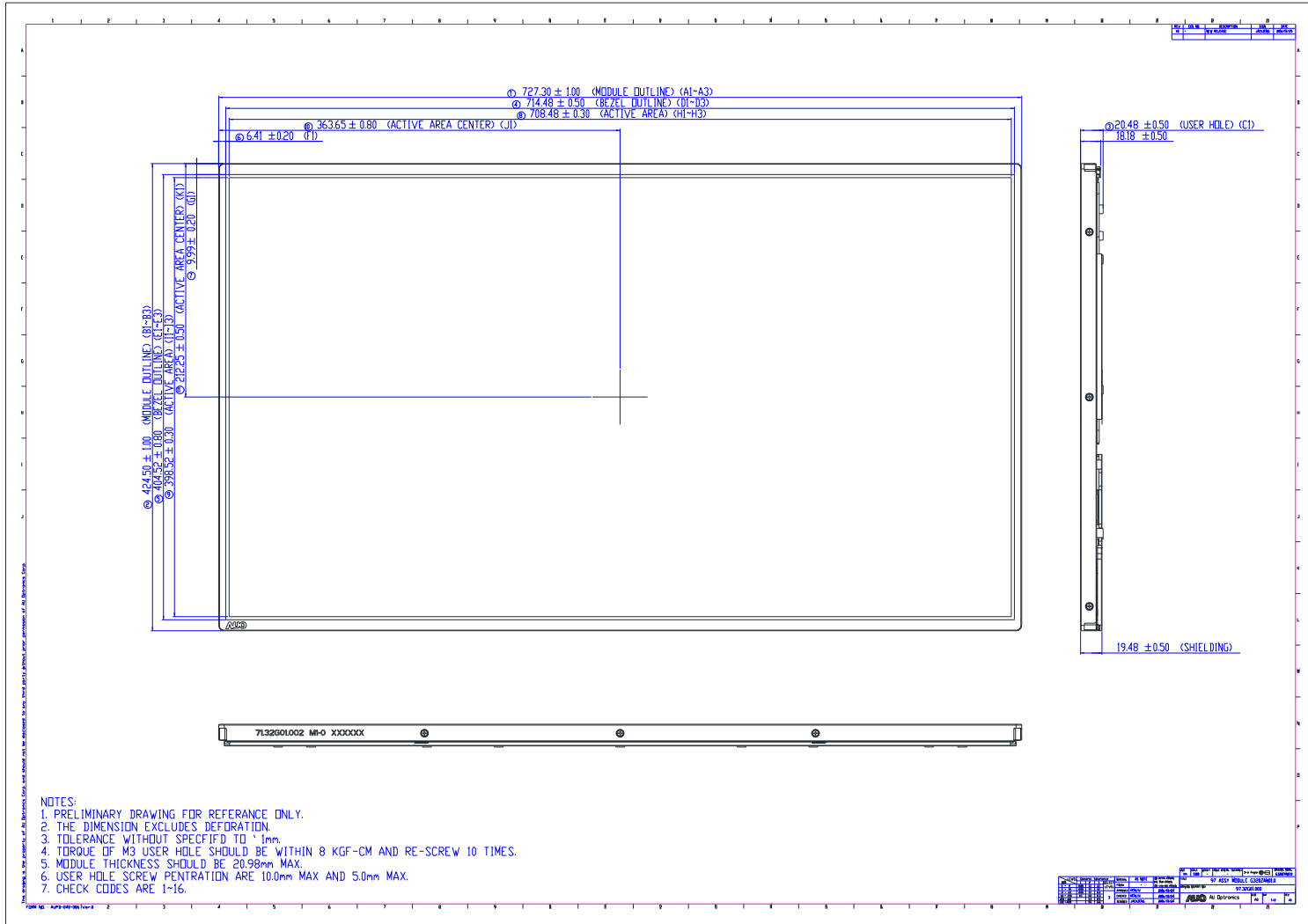
Note1: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost  
 . Self-recoverable. No hardware failures.

Note2:

- Ts is defined as panel surface temperature
- 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

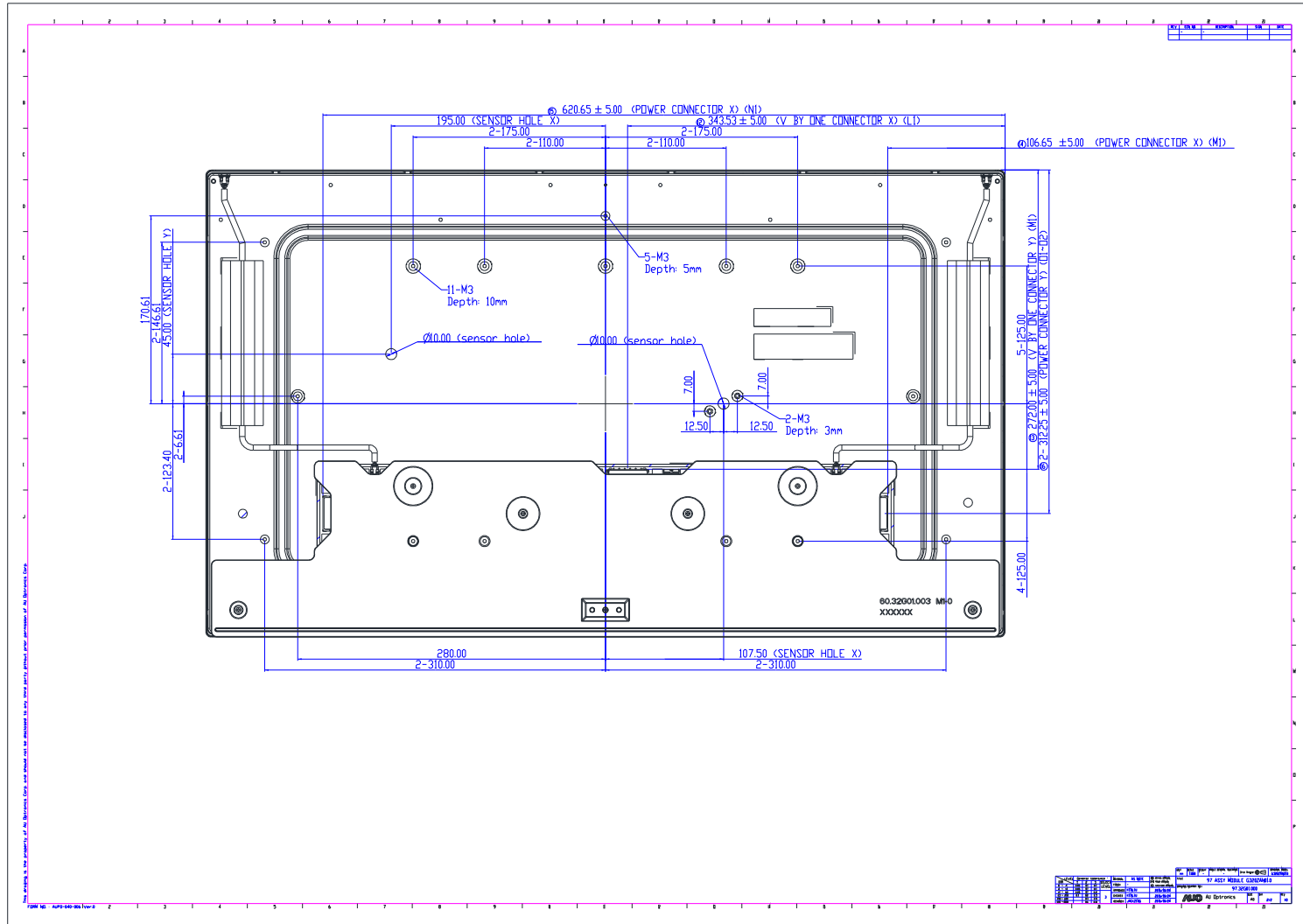




# Product Specification

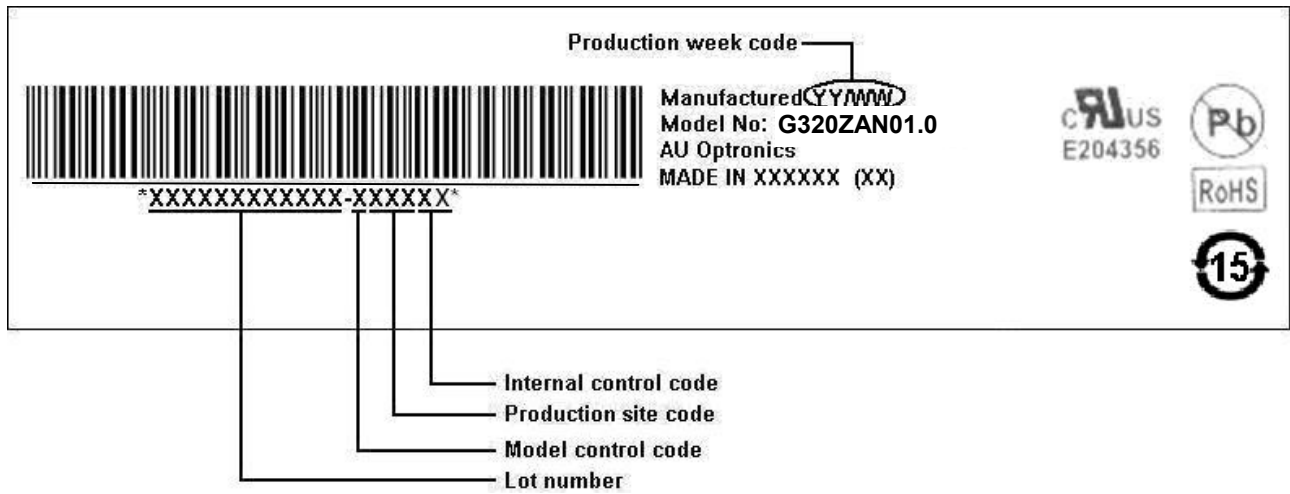
AU OPTRONICS CORPORATION

G320ZAN01.0

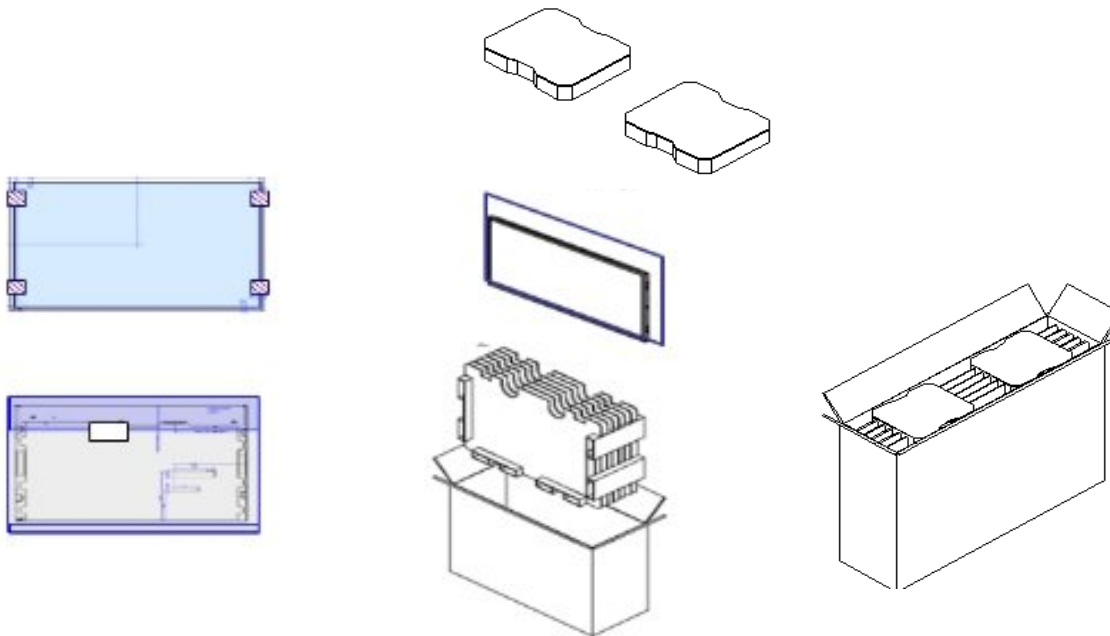


## 9. Label and Packaging

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



### 9.2 Carton Package



Max capacity : 4 PCS TFT-LCD module per carton

Max weight: 27kg per carton

Outside dimension of carton: 820mm(L)\* 220mm(W)\* 535mm(H)

Pallet size : 1150mm \* 840mm \* 133mm

Box stacked

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

Module by sea\_Max : (1 \* 5) \* 2 layers + (1 \* 5) \* 1 layers , two pallet put 15boxes , total 60pcs module

Module by sea\_HQ\_Max : (1 \* 5) \* 2 layers+( 1 \* 5) \* 2 layers, two pallet put 20 boxes, 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