



# Product Specification

AU OPTRONICS CORPORATION

G270ZAN01.2

( ) Preliminary Specifications

(v ) Final Specifications

|            |                         |
|------------|-------------------------|
| Module     | 27.0 Inch Color TFT-LCD |
| Model Name | G270ZAN01.2             |

|                                                                                                                                                                                          |                                                                 |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|------|-------|-------|-----------------------|------|-------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|----------------------|---------------------|-------------|------|--------------------|---------------------|
| <table><tr><td>Customer</td><td>Date</td></tr><tr><td><hr/></td><td><hr/></td></tr><tr><td>Checked &amp; Approved by</td><td>Date</td></tr><tr><td><hr/></td><td><hr/></td></tr></table> | Customer                                                        | Date | <hr/> | <hr/> | Checked & Approved by | Date | <hr/> | <hr/> | <table><tr><td>Approved by</td><td>Date</td></tr><tr><td><i>Jason.C.L.Pan</i></td><td><u>2021. 02. 24</u></td></tr><tr><td>Prepared by</td><td>Date</td></tr><tr><td><i>Livia Huang</i></td><td><u>2021. 02. 24</u></td></tr></table> | Approved by | Date | <i>Jason.C.L.Pan</i> | <u>2021. 02. 24</u> | Prepared by | Date | <i>Livia Huang</i> | <u>2021. 02. 24</u> |
| Customer                                                                                                                                                                                 | Date                                                            |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| <hr/>                                                                                                                                                                                    | <hr/>                                                           |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| Checked & Approved by                                                                                                                                                                    | Date                                                            |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| <hr/>                                                                                                                                                                                    | <hr/>                                                           |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| Approved by                                                                                                                                                                              | Date                                                            |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| <i>Jason.C.L.Pan</i>                                                                                                                                                                     | <u>2021. 02. 24</u>                                             |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| Prepared by                                                                                                                                                                              | Date                                                            |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| <i>Livia Huang</i>                                                                                                                                                                       | <u>2021. 02. 24</u>                                             |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |
| Customer's sign back page                                                                                                                                                                | General Display Business Division /<br>AU Optronics corporation |      |       |       |                       |      |       |       |                                                                                                                                                                                                                                       |             |      |                      |                     |             |      |                    |                     |

## Contents

|                                                                |           |
|----------------------------------------------------------------|-----------|
| <b>1. Operating Precautions .....</b>                          | <b>4</b>  |
| <b>2. General Description .....</b>                            | <b>5</b>  |
| 2.1 Display Characteristics.....                               | 5         |
| 2.2 Optical Characteristics .....                              | 6         |
| <b>3. Functional Block Diagram.....</b>                        | <b>9</b>  |
| <b>4. Absolute Maximum Ratings .....</b>                       | <b>10</b> |
| 4.1 Absolute Ratings of TFT LCD Module.....                    | 10        |
| 4.2 Absolute Ratings of Environment .....                      | 10        |
| <b>5. Electrical Characteristics .....</b>                     | <b>11</b> |
| 5.1 TFT LCD Module.....                                        | 11        |
| 5.2 Backlight Unit .....                                       | 13        |
| <b>6. Signal Characteristic .....</b>                          | <b>15</b> |
| 6.1 Pixel Format Image .....                                   | 15        |
| 6.2 Scanning Direction .....                                   | 16        |
| 6.3 Signal Description .....                                   | 17        |
| 6.4 The Input Data Format .....                                | 20        |
| 6.5 Interface Timing .....                                     | 22        |
| 6.6 Power ON/OFF Sequence .....                                | 24        |
| <b>7. Reliability Test Criteria .....</b>                      | <b>25</b> |
| <b>8. Mechanical Characteristics .....</b>                     | <b>26</b> |
| 8.1 LCM Outline Dimension .....                                | 26        |
| <b>9. Label and Packaging .....</b>                            | <b>28</b> |
| 9.1 Shipping Label (on the rear side of TFT-LCD display) ..... | 28        |
| 9.2 Carton Package .....                                       | 28        |
| <b>10 Safety .....</b>                                         | <b>29</b> |
| 10.1 Sharp Edge Requirements .....                             | 29        |
| 10.2 Materials .....                                           | 29        |
| 10.3 Capacitors .....                                          | 29        |
| 10.4 National Test Lab Requirement.....                        | 29        |



## Record of Revision

| Version | Date<br>(yyyy/m/d) | Page | Old description            | New Description |
|---------|--------------------|------|----------------------------|-----------------|
| 1.0     | 2021/02/24         | All  | First Edition for Customer |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |
|         |                    |      |                            |                 |

## 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 Discharge) 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 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 G270ZAN01.2 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) x 2160(V)) screen and 16.7M colors.

LED driving board for backlight unit is included. All input signals are 8 lanes eDP interface compatible.

## 2.1 Display Characteristics

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

| Items                     | Unit    | Specifications                                                    |
|---------------------------|---------|-------------------------------------------------------------------|
| Screen Diagonal           | [inch]  | 26.93" (684mm)                                                    |
| Active Area               | [mm]    | 596.16 (H) x 335.34 (V)                                           |
| Resolution                |         | 3840(x3) x 2160                                                   |
| Pixel Pitch               | [mm]    | 0.15525 (per one triad) x 0.15525                                 |
| Pixel Arrangement         |         | R.G.B. Vertical Stripe                                            |
| Display Mode              |         | AHVA mode, Normally Black                                         |
| Nominal Input Voltage VDD | [Volt]  | +12V (Typ)                                                        |
| Power Consumption         | [Watt]  | Total = 65.21W (Typ)<br>LCD =8.57W @ white pattern<br>BLU =56.64W |
| Weight                    | [Grams] | 3400 (Typ)                                                        |
| Physical Size             | [mm]    | 630.0 (H) x 368.2 (V) x 22.9 (D) (Typ)                            |
| Electrical Interface      |         | 8-lanes eDP , 8bits RGB data input                                |
| Surface Treatment         |         | Anti-Glare treatment                                              |
| Support Color             |         | 16.7M colors (true 8bit)                                          |
| Temperature Range         |         |                                                                   |
| Operating                 | [°C]    | 0 to +50                                                          |
| Storage (Non-Operating)   | [°C]    | -20 to +60                                                        |
| RoHS Compliance           |         |                                                                   |

## 2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25 °C (Room Temperature):

| Item                                        | Unit              | Conditions                           |         | Min.  | Typ.  | Max.  | Note |
|---------------------------------------------|-------------------|--------------------------------------|---------|-------|-------|-------|------|
| White Luminance                             | cd/m <sup>2</sup> | I <sub>LED</sub> =80mA(center point) |         | 715   | 850   |       | 1    |
| Luminance Uniformity @ white pattern        | %                 | 9 points                             |         | 80    | 85    |       | 2,3  |
| Luminance Uniformity @ black pattern        | %                 | 9 points                             |         | 60    |       |       | 2,3  |
| Contrast Ratio                              | --                |                                      |         | 700   | 1000  |       | 4    |
| Response Time                               | msec              | Rising                               |         |       |       |       | 5    |
|                                             |                   | Falling                              |         |       |       |       |      |
|                                             |                   | Rising + Falling                     |         |       | 16    | 25    |      |
| Viewing Angle                               | degree            | Horizontal<br>CR >= 10               | (Right) | 85    | 89    |       | 6    |
|                                             |                   |                                      | (Left)  | 85    | 89    |       |      |
|                                             |                   | Vertical<br>CR >= 10                 | (Upper) | 85    | 89    |       |      |
|                                             |                   |                                      | (Lower) | 85    | 89    |       |      |
| Color / Chromaticity Coordinates (CIE 1931) | --                | Red x                                |         | 0.636 | 0.666 | 0.696 |      |
|                                             |                   | Red y                                |         | 0.282 | 0.312 | 0.342 |      |
|                                             |                   | Green x                              |         | 0.237 | 0.267 | 0.297 |      |
|                                             |                   | Green y                              |         | 0.637 | 0.667 | 0.697 |      |
|                                             |                   | Blue x                               |         | 0.124 | 0.154 | 0.184 |      |
|                                             |                   | Blue y                               |         | 0.012 | 0.042 | 0.072 |      |
|                                             |                   | White x                              |         | 0.279 | 0.309 | 0.339 |      |
|                                             |                   | White y                              |         | 0.287 | 0.317 | 0.347 |      |

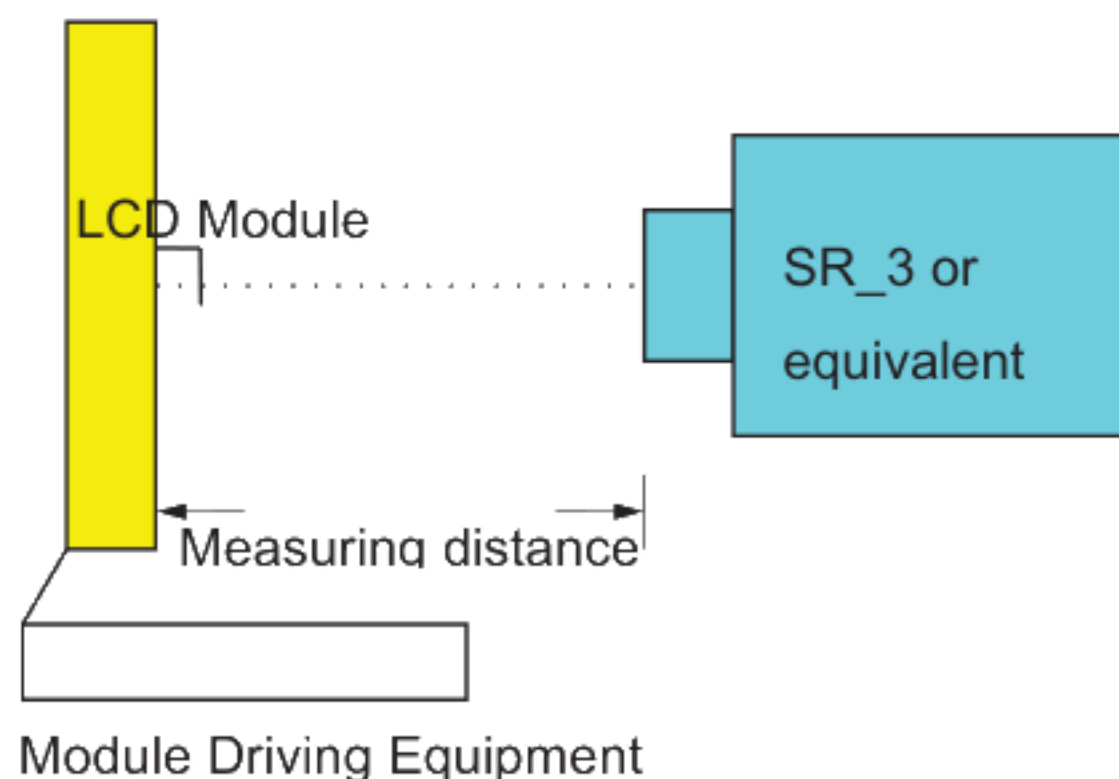
Note 1: Measurement method

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

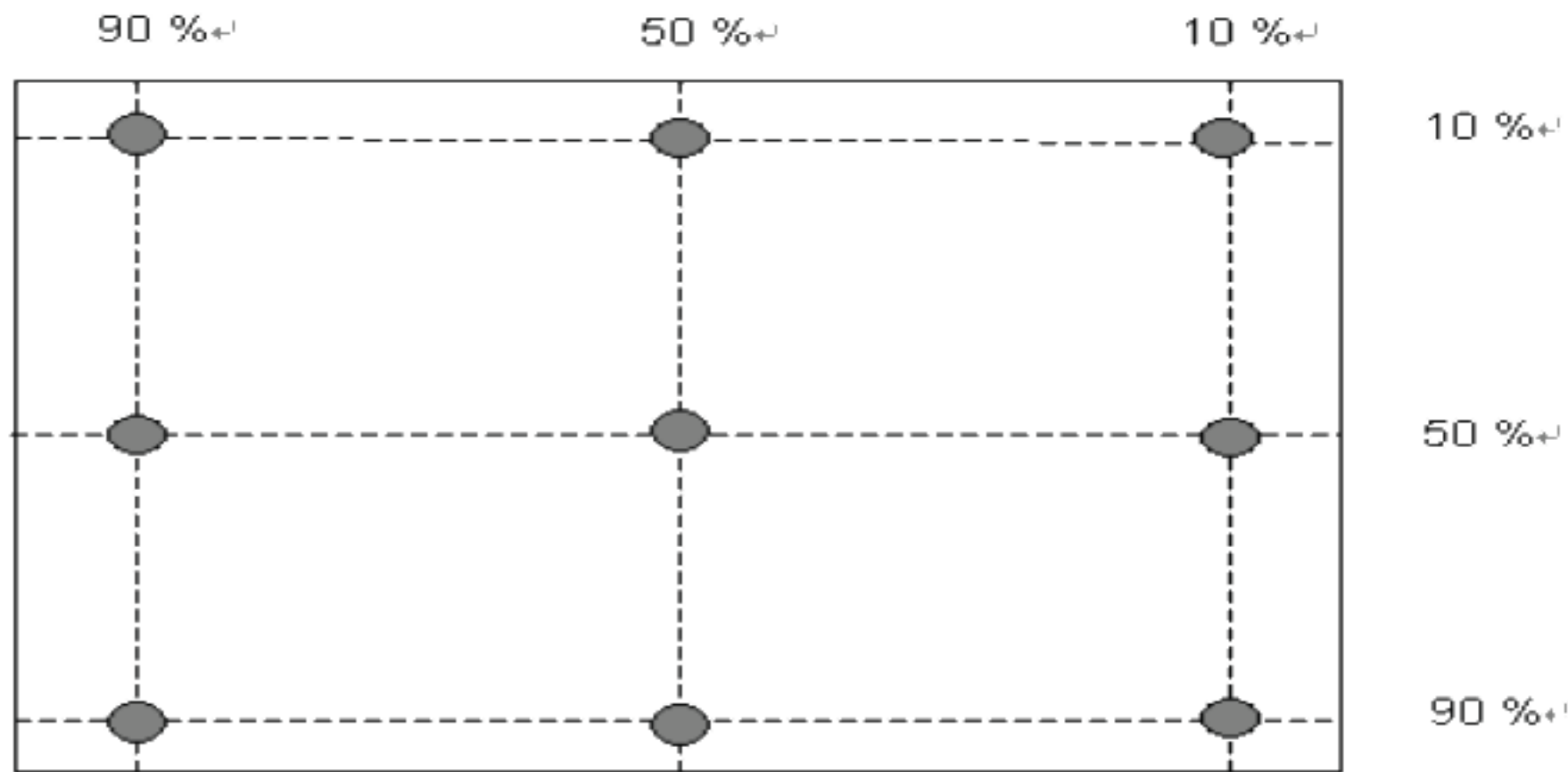
Aperture 1" with 50cm viewing distance

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

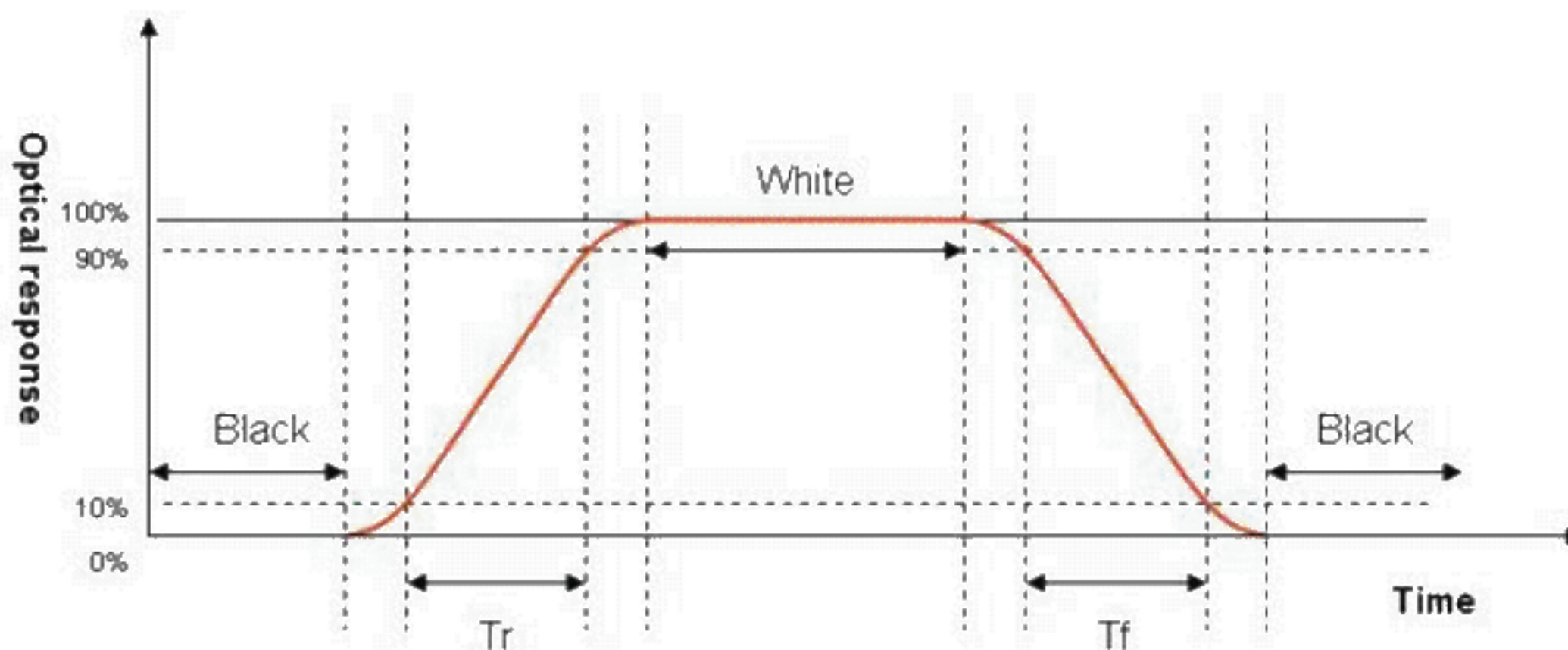
$$\delta_{w9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

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:

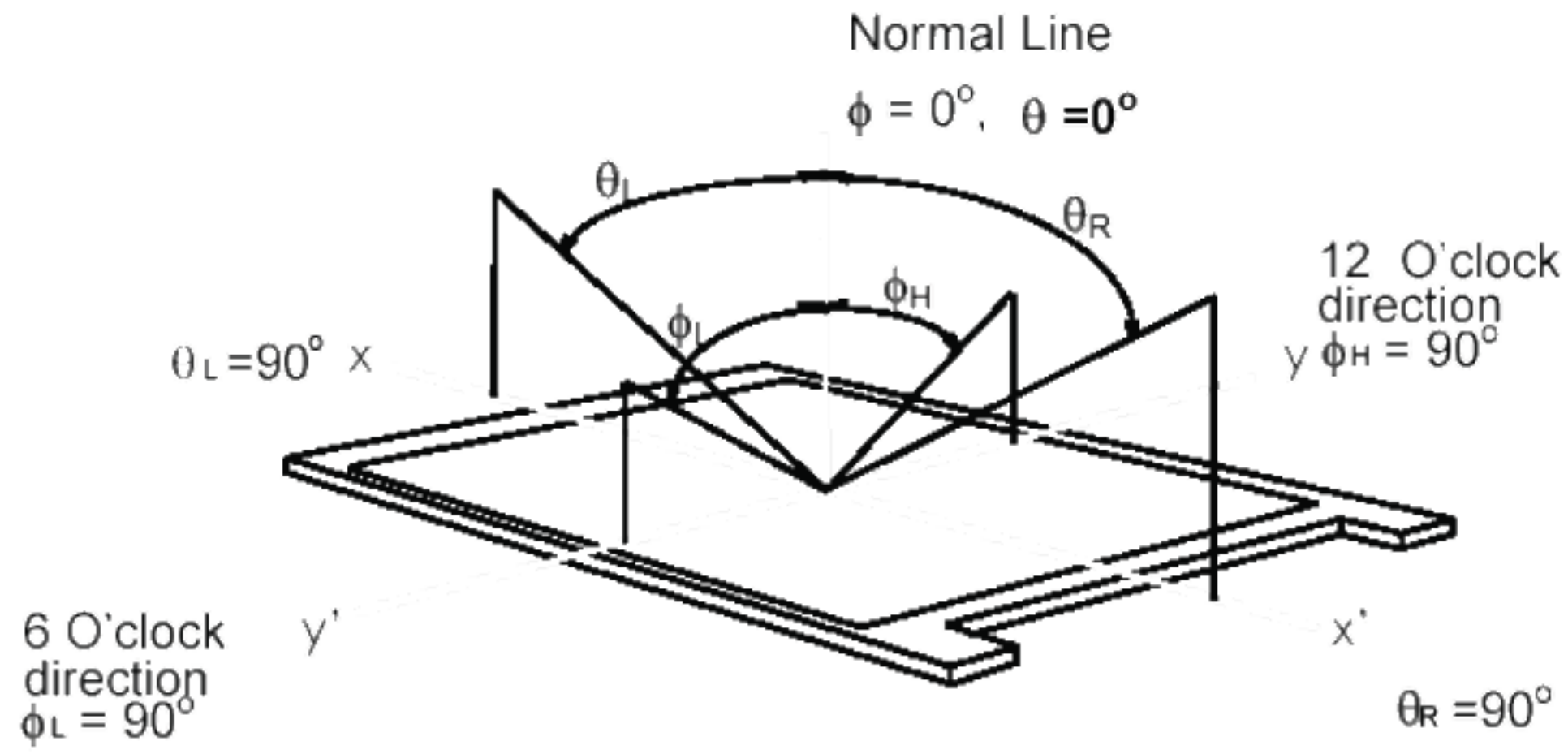
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



Note 6: Definition of viewing angle

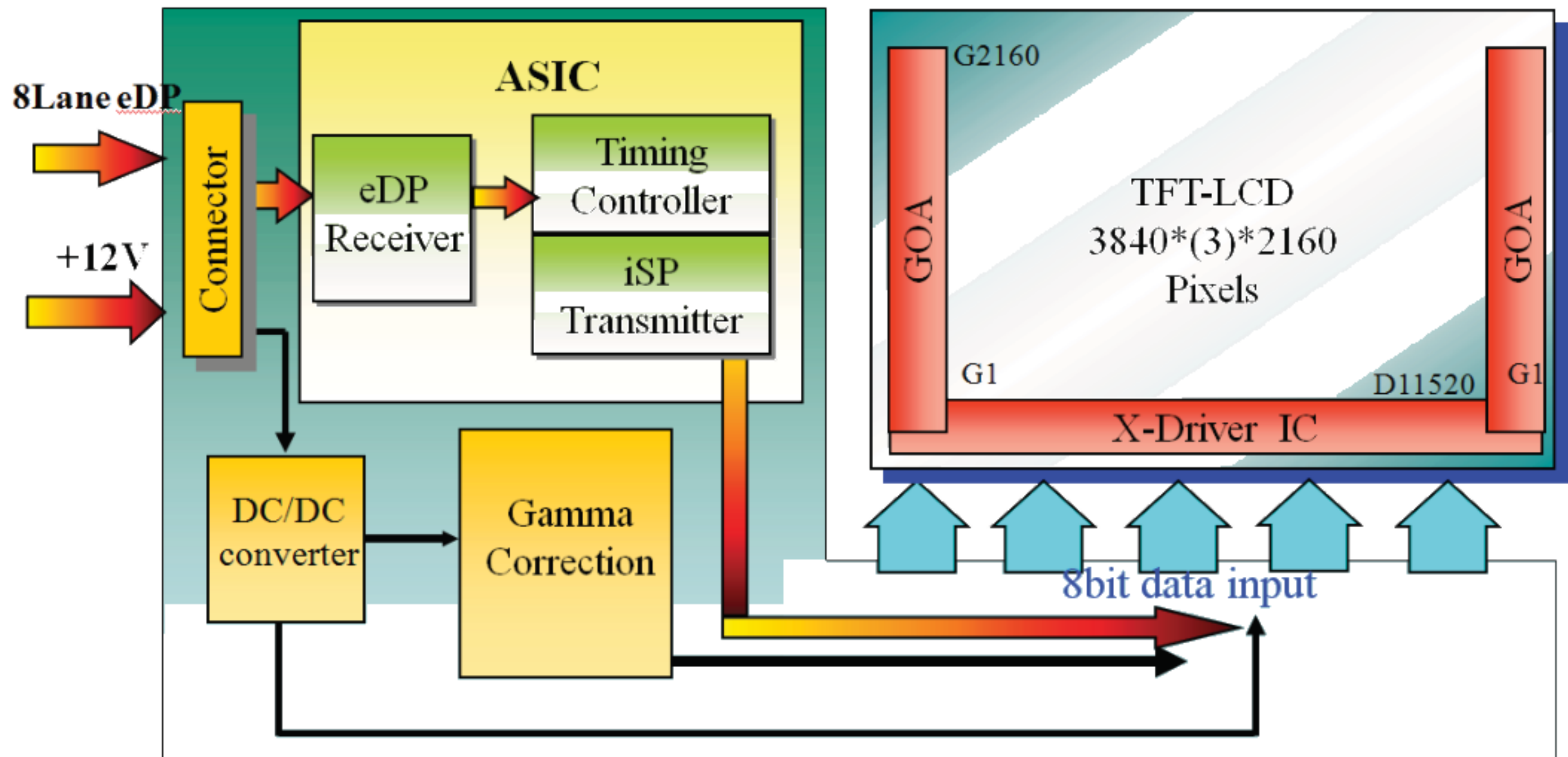
Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° ( $\theta$ ) horizontal left and right, and 90° ( $\Phi$ ) vertical high (up) and 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 27.0 inch color TFT/LCD module:



X PCB

## 4. Absolute Maximum Ratings

### 4.1 Absolute Ratings of TFT LCD Module

| Item                    | Symbol | Min     | Max | Unit   |
|-------------------------|--------|---------|-----|--------|
| Logic/LCD drive Voltage | Vin    | GND-0.3 | 14  | [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.

## 5. Electrical Characteristics

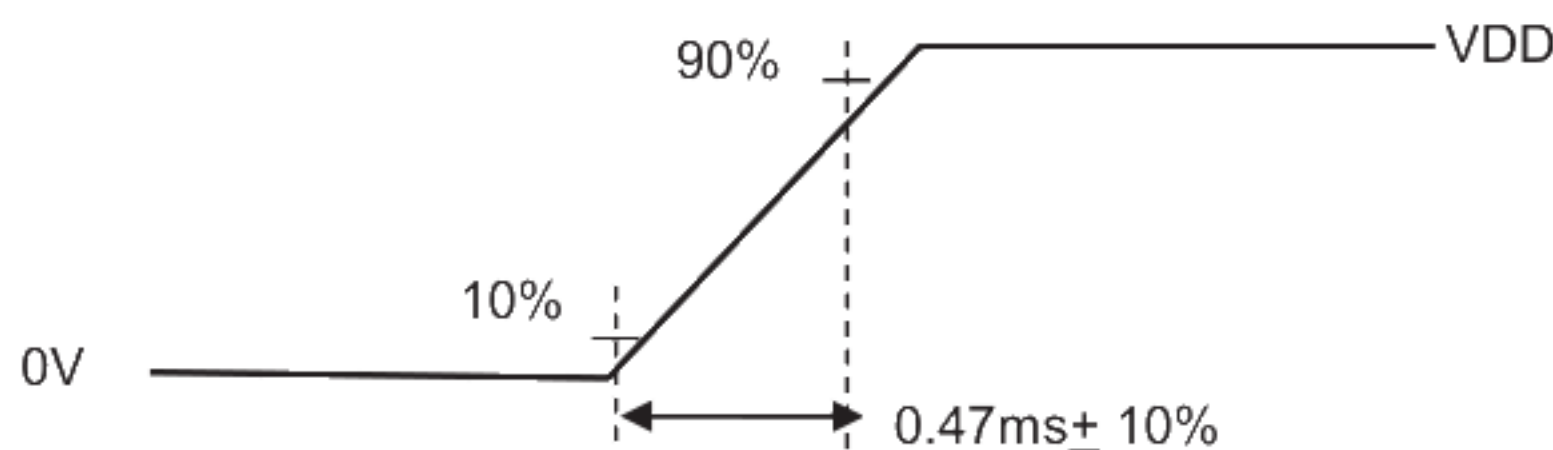
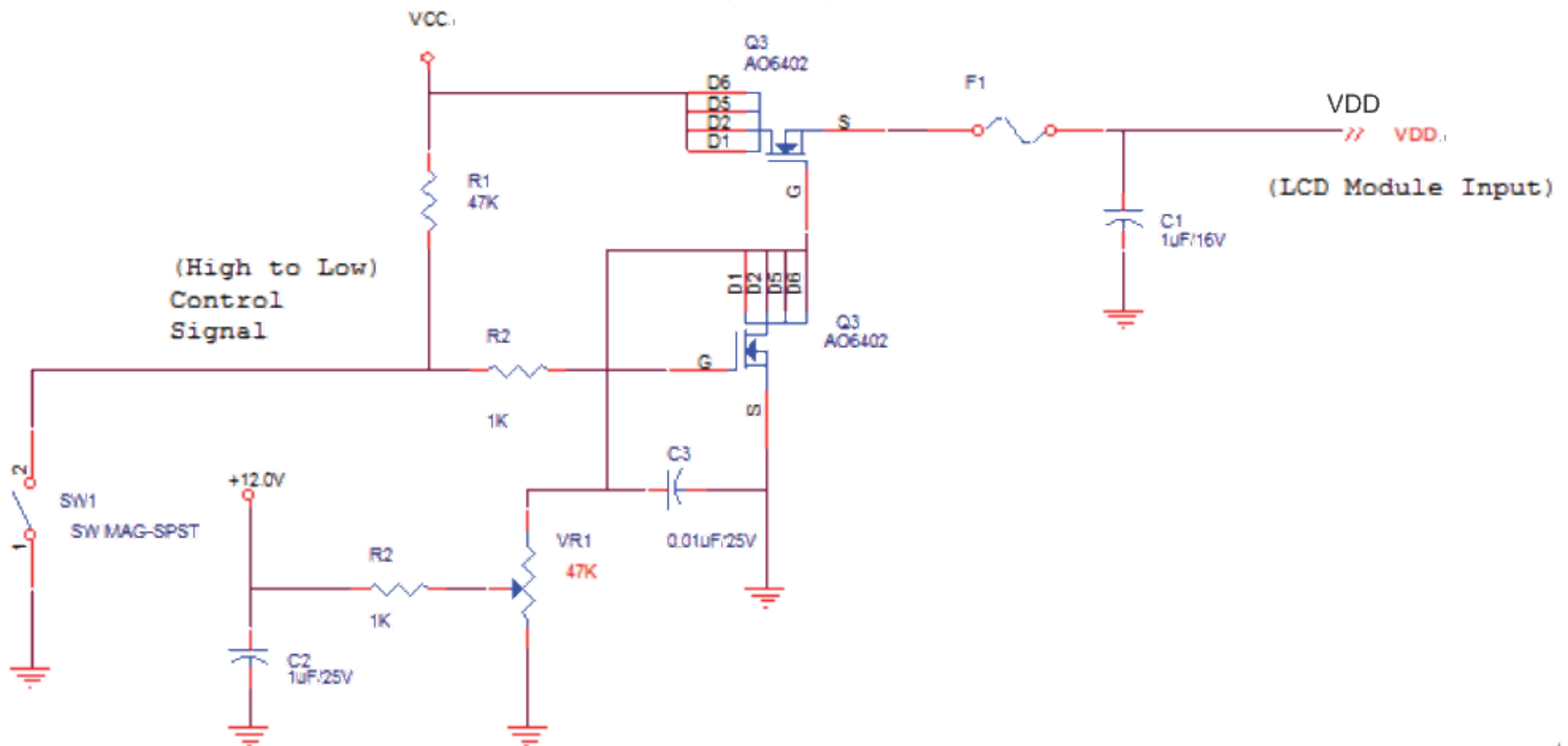
### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

Input power specifications are shown as follows:

| Symbol | Parameter                           | Min  | Typ  | Max        | Units  | Remark                                  |
|--------|-------------------------------------|------|------|------------|--------|-----------------------------------------|
| VDD    | Power supply<br>Input voltage       | 10.8 | 12.0 | 13.2       | [Volt] |                                         |
| IDD    | Power supply<br>Input Current (RMS) | -    | 0.71 | 0.85       | [A]    | VDD= 12.0V, White<br>pattern, Fv=144Hz  |
|        |                                     |      | 0.65 | 0.78       |        | VDD= 12.0V, White<br>pattern, Fv=120Hz  |
| IRush  | Inrush Current                      | -    | -    | 3.0        | [A]    | <b>Note 1</b>                           |
| PDD    | VDD Power<br>Consumption            | -    | 8.57 | 10.2       | [Watt] | VDD= 12.0V , White<br>pattern, Fv=144Hz |
|        |                                     |      | 7.80 | 9.36       |        | VDD= 12.0V, White<br>pattern, Fv=120Hz  |
| VDDrp  | Allowable VDD Ripple<br>Voltage     | -    | -    | VDD*<br>5% | [mV]   | VDD= 12.0V, White<br>pattern, Fv=60Hz   |

Note 1: Measurement condition:

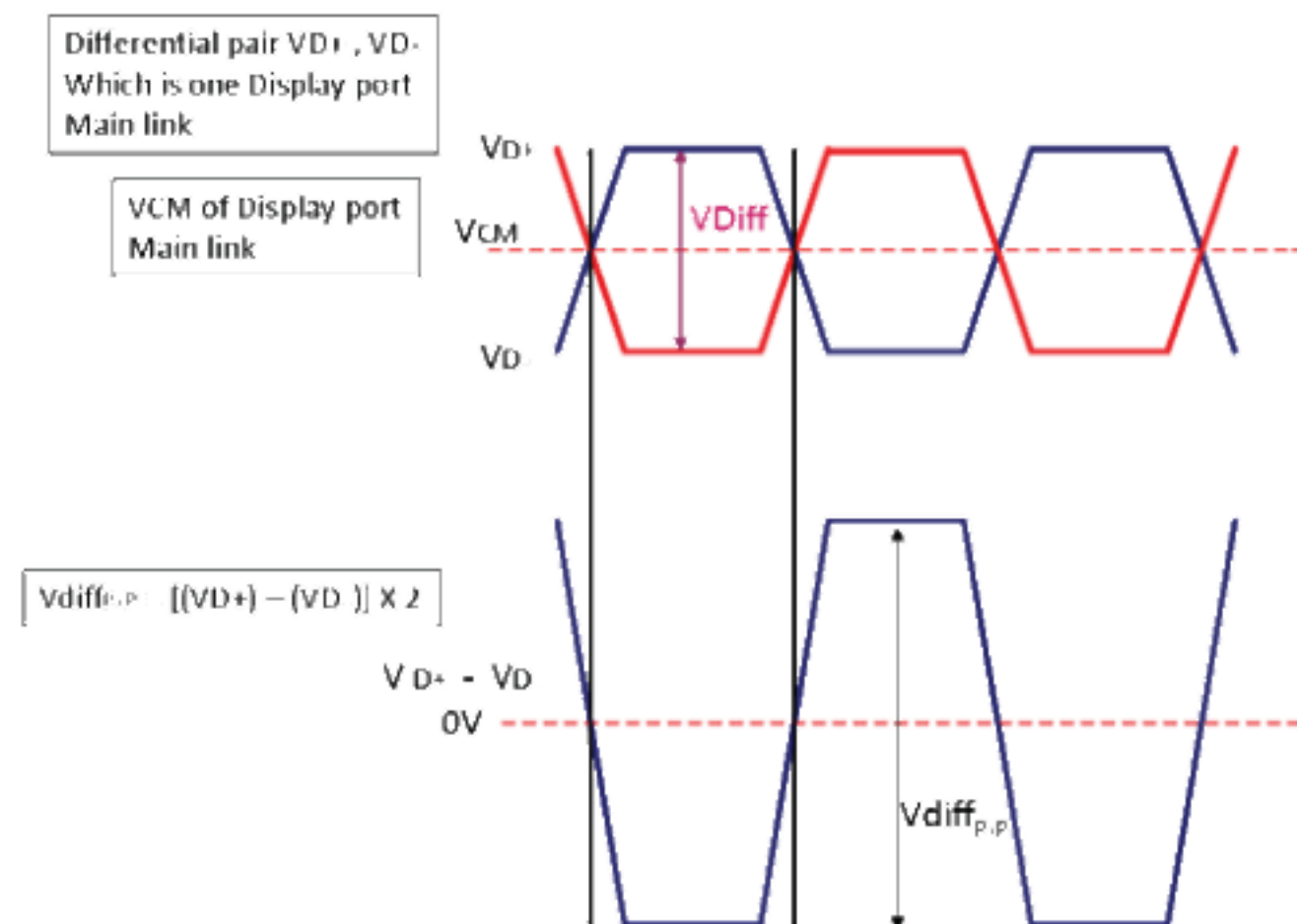


## 5.1.2 eDP Electrical Characteristics

Follow as VESA DisplayPort Standard Version 1.2

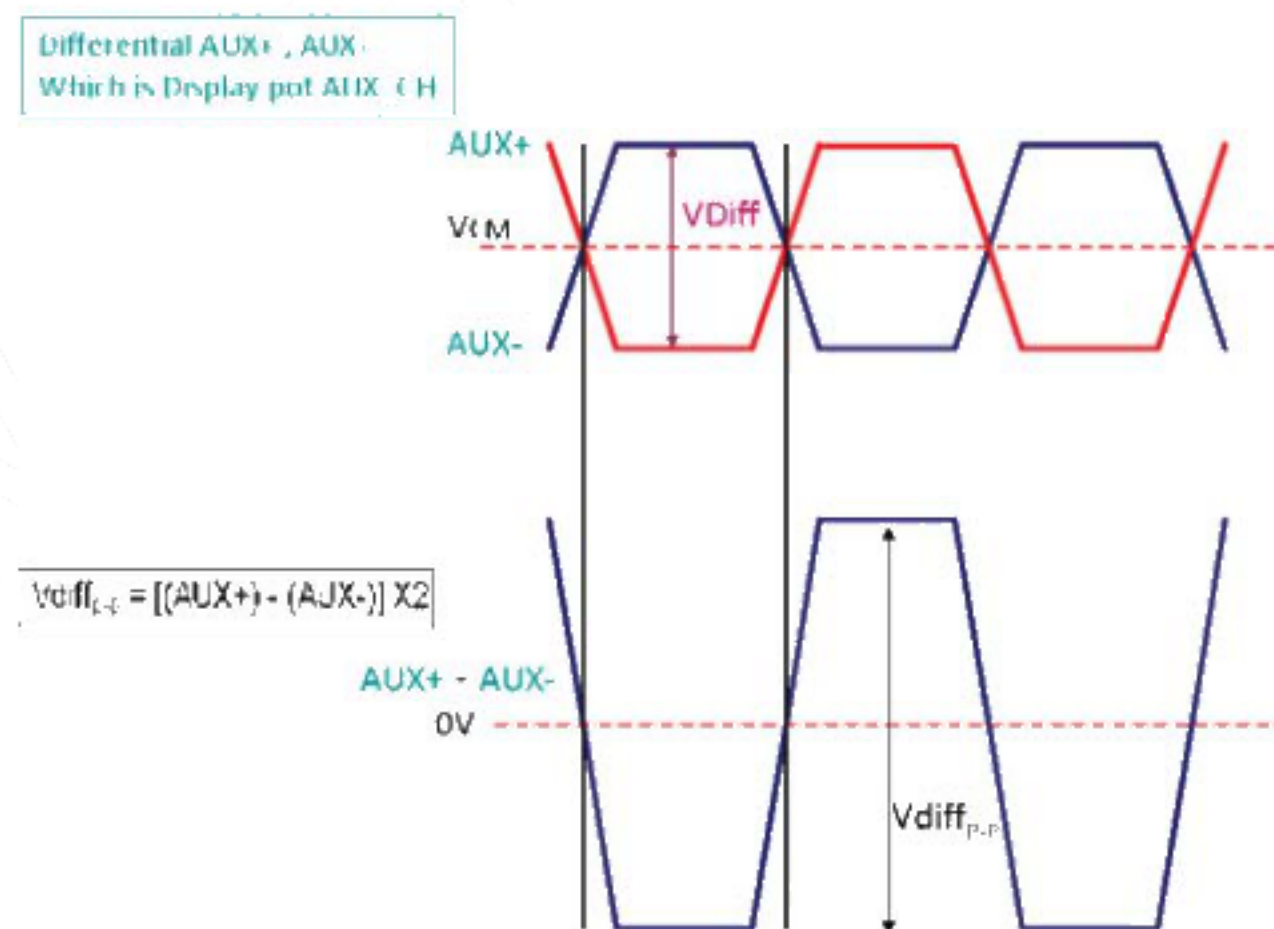
a. DisplayPort main link signal:

| DisplayPort main link |                                            |     |     |     |      |
|-----------------------|--------------------------------------------|-----|-----|-----|------|
|                       |                                            | Min | Typ | Max | unit |
| VCM                   | RX input DC Common Mode Voltage            | -   | 0   | -   | V    |
| VDiff <sub>P-P</sub>  | Peak-to-peak Voltage at a receiving Device | 70  | -   | -   | mV   |



b. DisplayPort AUX\_CH signal:

| DisplayPort AUX_CH   |                                                |      |     |      |      |
|----------------------|------------------------------------------------|------|-----|------|------|
|                      |                                                | Min  | Typ | Max  | unit |
| VCM                  | AUX DC Common Mode Voltage                     | 0    | -   | 2.0  | V    |
| VDiff <sub>P-P</sub> | AUX Peak-to-peak voltage at a receiving device | 0.27 | -   | 1.36 | V    |



c. DisplayPort VHPD signal:

| DisplayPort VHPD |             |      |     |     |      |
|------------------|-------------|------|-----|-----|------|
|                  |             | Min  | Typ | Max | unit |
| VHPD             | HPD Voltage | 2.25 | -   | 3.6 | V    |

## 5.2 Backlight Unit

### 5.2.1 LED Backlight Unit : Driver Connector

|           |              |                      |
|-----------|--------------|----------------------|
| Backlight | manufacturer | JST                  |
|           | part number  | S14B-PH-SM6-K-TB(HF) |
| Mating    | manufacturer | JST                  |
|           | part number  | PHR-14               |

### 5.2.2 Signal for LED connector

| Pin # | Symbol  | Pin Description                   |
|-------|---------|-----------------------------------|
| 1     | NC      | Do not connect                    |
| 2     | Dimming | PWM; duty 10%~ 100%               |
| 3     | EN      | Enable(0V:disable, 2.5~5V:Enable) |
| 4     | NC      | Do not connect                    |
| 5     | GND     | GND                               |
| 6     | GND     | GND                               |
| 7     | GND     | GND                               |
| 8     | GND     | GND                               |
| 9     | GND     | GND                               |
| 10    | VDD     | Power +24V                        |
| 11    | VDD     | Power +24V                        |
| 12    | VDD     | Power +24V                        |
| 13    | VDD     | Power +24V                        |
| 14    | VDD     | Power +24V                        |

## 5.2.3 Backlight input signal characteristics

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

| Symbol                             | Parameter             | Min.   | Typ.  | Max.  | Unit   | Remark                                                            |
|------------------------------------|-----------------------|--------|-------|-------|--------|-------------------------------------------------------------------|
| <b>VDD</b>                         | Input Voltage         | 21.6   | 24.0  | 26.4  | [Volt] |                                                                   |
| <b>I<sub>VDD</sub></b>             | Input Current         |        | 2.36  | 2.83  | [A]    | 100% PWM Duty                                                     |
| <b>P<sub>VDD</sub></b>             | Power Consumption     |        | 56.64 | 67.92 | [Watt] | 100% PWM Duty                                                     |
| <b>I<sub>rush LED</sub></b>        | Inrush Current        | -      | -     | 6     | [A]    | at rising time=470us                                              |
| <b>F<sub>PWM</sub></b>             | Dimming Frequency     |        | 0.2   | 20    | [kHz]  |                                                                   |
|                                    | Swing Voltage         | 3      | 3.3   | 5     | V      |                                                                   |
|                                    | Dimming Duty Cycle    | 10     | -     | 100   | %      |                                                                   |
| <b>I<sub>F</sub> (one channel)</b> | LED Forward Current   |        | 80    |       | mA     | Ta = 25°C                                                         |
| <b>V<sub>F</sub> (one channel)</b> | LED Forward Voltage   | -      | -     | -     | Volt   |                                                                   |
|                                    |                       | -      | 33.0  | 37.4  | Volt   | I <sub>F</sub> =80 mA, Ta = 25°C<br>10 channel/LB &<br>2 LB/Panel |
|                                    |                       | -      | 3.0   | 3.4   |        |                                                                   |
| <b>P<sub>LED</sub> (One LB)</b>    | LED Power Consumption | -      | 26.40 | 29.92 | Watt   | I <sub>F</sub> =80 mA, Ta = 25°C<br>LBx2 : 29.92x2=59.84(Max)     |
| <b>LED Lifetime</b>                |                       | 30,000 |       |       | Hrs    | I <sub>F</sub> =80 mA, Ta= 25°C                                   |

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

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

Note 3: I<sub>F</sub>, V<sub>F</sub> are defined for one channel LED. There are ten LED channels in one light bar. P<sub>LED</sub> is defined for one light bar. For G270ZAN01.2, there are two light bars in back light unit.

Note 4: If G270ZAN01.2 module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

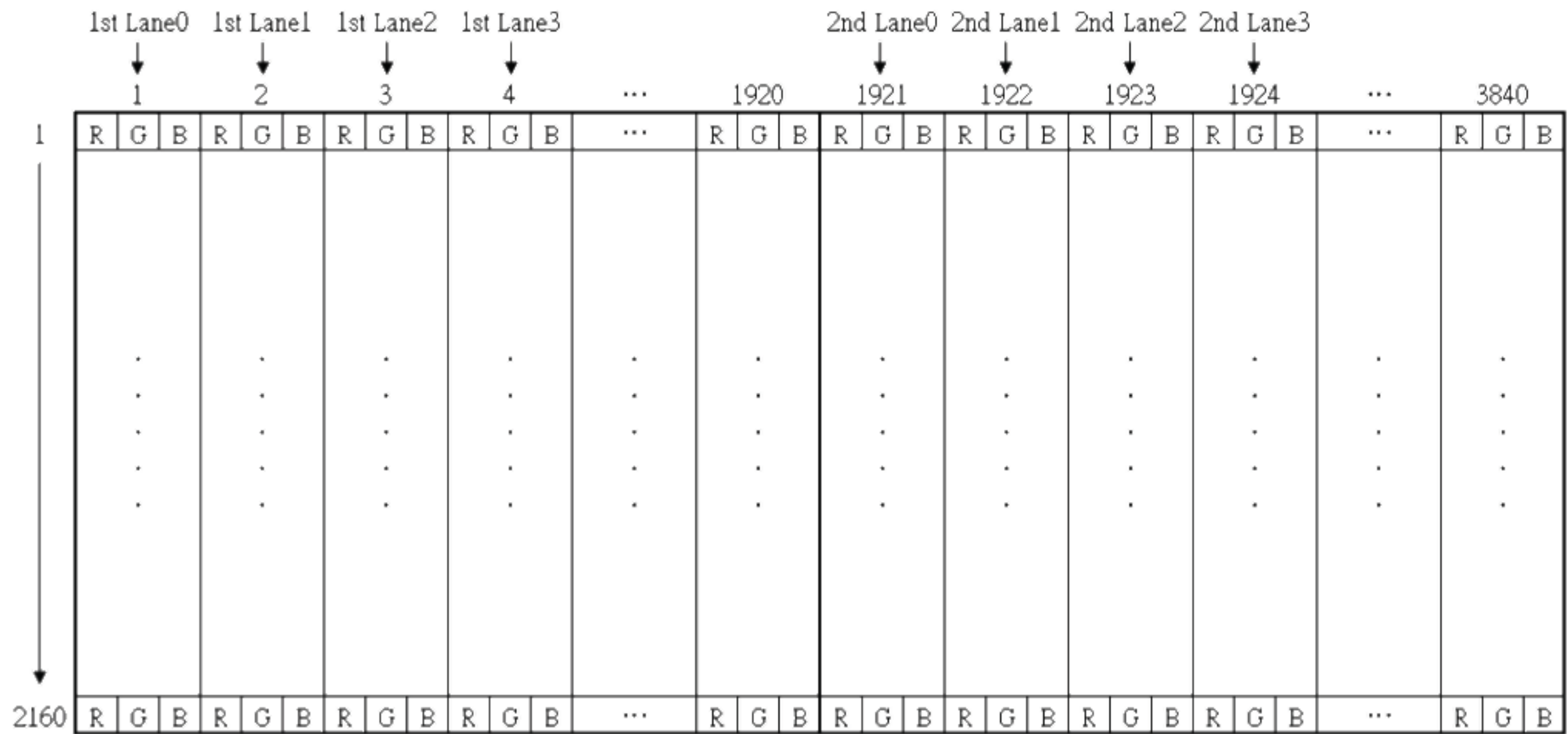
Note 5: LED life means brightness goes down to 50% initial brightness.

Note 6: Only one kind types for adjusting brightness: PWM .

## 6. Signal Characteristic

### 6.1 Pixel Format Image

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



**Note:** The module use 8-Lanes eDP interface.

1<sup>st</sup> port:

1<sup>st</sup> Lane0 : 1+4n pixel

1<sup>st</sup> Lane1 : 2+4n pixel

1<sup>st</sup> Lane2 : 3+4n pixel

1<sup>st</sup> Lane3 : 4+4n pixel

2<sup>nd</sup> port:

2<sup>nd</sup> Lane0 : 1921+4n pixel

2<sup>nd</sup> Lane1 : 1922+4n pixel

2<sup>nd</sup> Lane2 : 1923+4n pixel

2<sup>nd</sup> Lane3 : 1924+4n pixel

n=0~479

## 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-RTE51SZ-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              |



# Product Specification

AU OPTRONICS CORPORATION

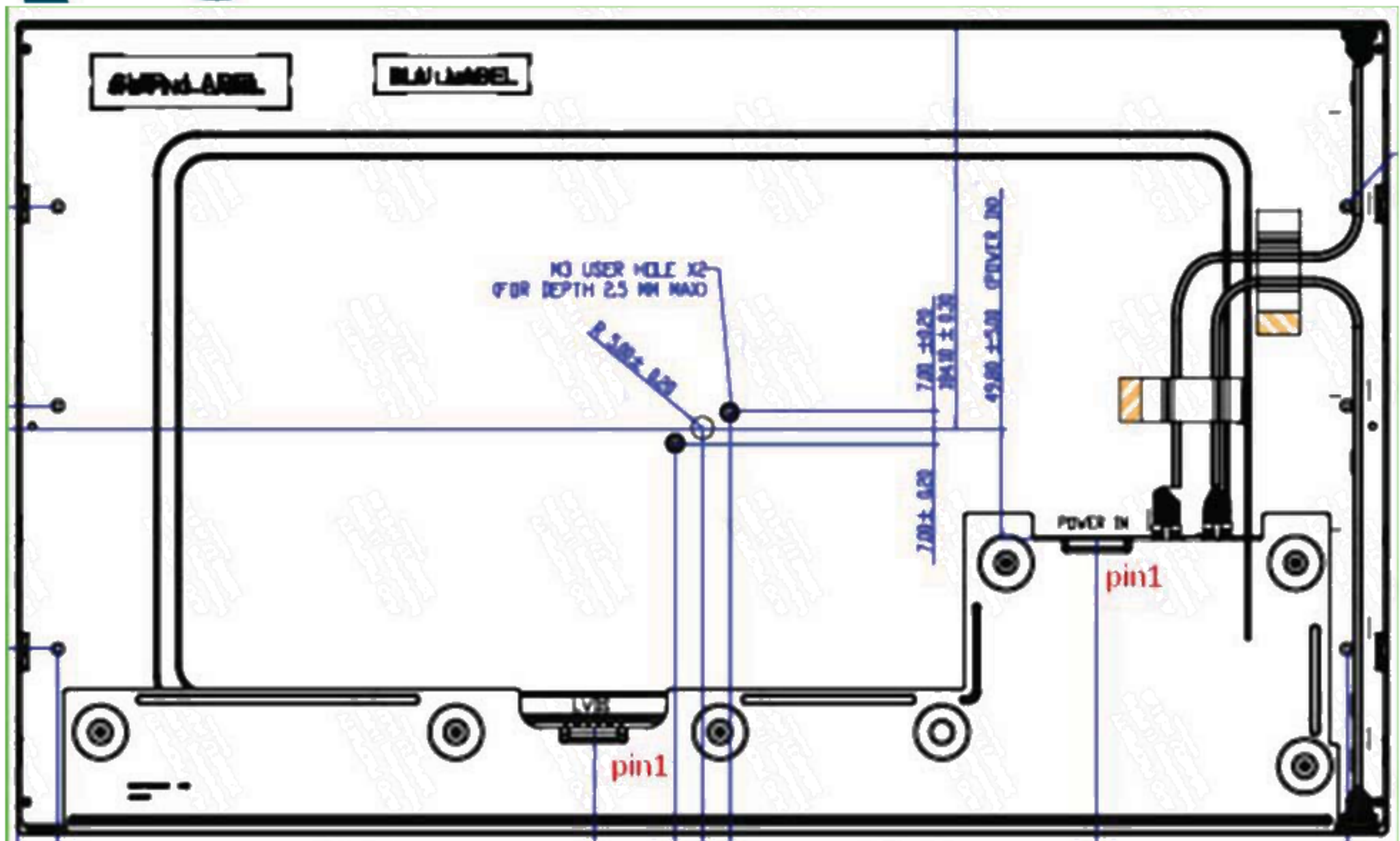
G270ZAN01.2

|    |              |                                                   |
|----|--------------|---------------------------------------------------|
| 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 | 2nd Lane3_N  | Negative eDP differential data input              |
| 36 | 2nd Lane3_P  | Positive eDP differential data input              |
| 37 | GND          | Ground                                            |
| 38 | 2nd Lane2_N  | Negative eDP differential data input              |
| 39 | 2nd Lane2_P  | Positive eDP differential data input              |
| 40 | GND          | Ground                                            |
| 41 | 2nd Lane1_N  | Negative eDP differential data input              |
| 42 | 2nd Lane1_P  | Positive eDP differential data input              |
| 43 | GND          | Ground                                            |
| 44 | 2nd Lane0_N  | Negative eDP differential data input              |
| 45 | 2nd Lane0_P  | Positive eDP differential data input              |
| 46 | GND          | Ground                                            |
| 47 | 2nd AUX_CH_P | Positive AUX Channel differential data input      |
| 48 | 2nd AUX_CH_N | Negative AUX Channel differential data input      |
| 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".



## 6.4 The Input Data Format

### 6.4.1 eDP Data Format

| 1st Lane0       | 1st Lane1       | 1st Lane2       | 1st Lane3       | 2nd Lane0           | 2nd Lane1           | 2nd Lane2           | 2nd Lane3           |
|-----------------|-----------------|-----------------|-----------------|---------------------|---------------------|---------------------|---------------------|
| R1-9:2          | R2-9:2          | R3-9:2          | R4-9:2          | R1921-9:2           | R1922-9:2           | R1923-9:2           | R1924-9:2           |
| R1-1:0IG1-9:4   | R2-1:0IG2-9:4   | R3-1:0IG3-9:4   | R4-1:0IG4-9:4   | R1921-1:0IG1921-9:4 | R1922-1:0IG1922-9:4 | R1923-1:0IG1923-9:4 | R1924-1:0IG1924-9:4 |
| G1-3:0IB1-9:6   | G2-3:0IB2-9:6   | G3-3:0IB3-9:6   | G4-3:0IB4-9:6   | G1921-3:0IB1921-9:6 | G1922-3:0IB1922-9:6 | G1923-3:0IB1923-9:6 | G1924-3:0IB1924-9:6 |
| B1-5:0IR5-9:8   | B2-5:0IR6-9:8   | B3-5:0IR7-9:8   | B4-5:0IR8-9:8   | B1921-5:0IR1921-9:8 | B1922-5:0IR1922-9:8 | B1923-5:0IR1923-9:8 | B1924-5:0IR1924-9:8 |
| R5-7:0          | R6-7:0          | R7-7:0          | R8-7:0          | R1925-7:0           | R1926-7:0           | R1927-7:0           | R1928-7:0           |
| G5-9:2          | G6-9:2          | G7-9:2          | G8-9:2          | G1925-9:2           | G1926-9:2           | G1927-9:2           | G1928-9:2           |
| G5-1:0IB5-9:4   | G6-1:0IB6-9:4   | G7-1:0IB7-9:4   | G8-1:0IB8-9:4   | G1925-1:0IB1925-9:4 | G1926-1:0IB1926-9:4 | G1927-1:0IB1927-9:4 | G1928-1:0IB1928-9:4 |
| B5-3:0IR9-9:6   | B6-3:0IR10-9:6  | B7-3:0IR11-9:6  | B8-3:0IR12-9:6  | B1925-3:0IR1925-9:6 | B1926-3:0IR1926-9:6 | B1927-3:0IR1927-9:6 | B1928-3:0IR1928-9:6 |
| R9-5:0IG9-9:8   | R10-5:0IG10-9:8 | R11-5:0IG11-9:8 | R12-5:0IG12-9:8 | R1929-5:0IG1929-9:8 | R1930-5:0IG1930-9:8 | R1931-5:0IG1931-9:8 | R1932-5:0IG1932-9:8 |
| G9-7:0          | G10-7:0         | G11-7:0         | G12-7:0         | G1929-7:0           | G1930-7:0           | G1931-7:0           | G1932-7:0           |
| B9-9:2          | B10-9:2         | B11-9:2         | B12-9:2         | B1929-9:2           | B1930-9:2           | B1931-9:2           | B1932-9:2           |
| B9-1:0IR13-9:4  | B10-1:0IR14-9:4 | B11-1:0IR15-9:4 | B12-1:0IR16-9:4 | B1929-1:0IR1929-9:4 | B1930-1:0IR1930-9:4 | B1931-1:0IR1931-9:4 | B1932-1:0IR1932-9:4 |
| R13-3:0IG13-9:6 | R14-3:0IG14-9:6 | R15-3:0IG15-9:6 | R16-3:0IG16-9:6 | R1933-3:0IG1933-9:6 | R1934-3:0IG1934-9:6 | R1935-3:0IG1935-9:6 | R1936-3:0IG1936-9:6 |
| G13-5:0IB13-9:8 | G14-5:0IB14-9:8 | G15-5:0IB15-9:8 | G16-5:0IB16-9:8 | G1933-5:0IB1933-9:8 | G1934-5:0IB1934-9:8 | G1935-5:0IB1935-9:8 | G1936-5:0IB1936-9:8 |
| B13-7:0         | B14-7:0         | B15-7:0         | B16-7:0         | B1933-7:0           | B1934-7:0           | B1935-7:0           | B1936-7:0           |
| .               | .               | .               | .               | .                   | .                   | .                   | .                   |
| .               | .               | .               | .               | .                   | .                   | .                   | .                   |
| .               | .               | .               | .               | .                   | .                   | .                   | .                   |
| .               | .               | .               | .               | .                   | .                   | .                   | .                   |
| .               | .               | .               | .               | .                   | .                   | .                   | .                   |

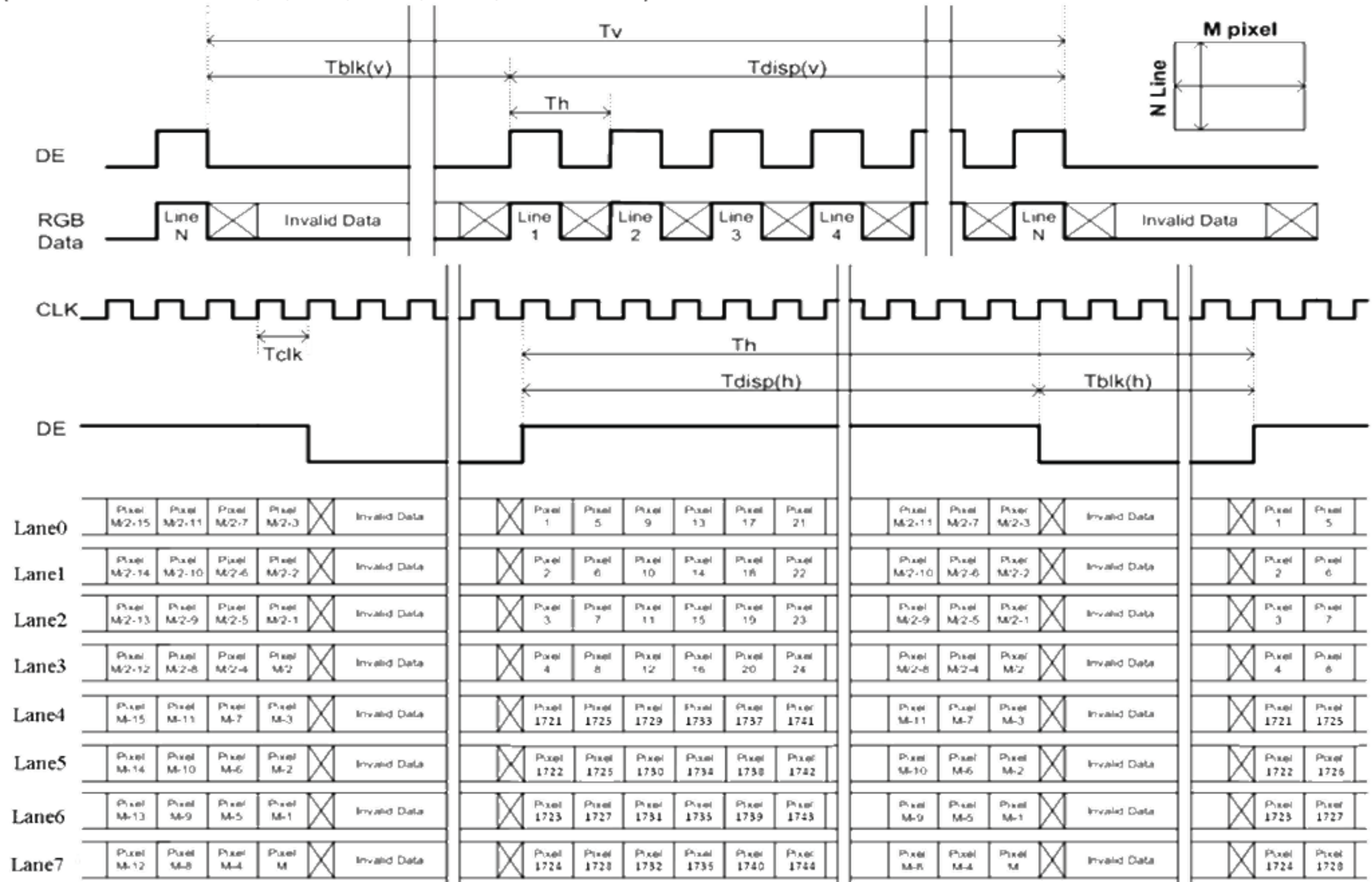
### 6.4.2 Color versus Input Data

The following table is for color versus input data (8bit). The higher the gray level, the brighter the color.

| color    | Gray Level | Color Input Data                              |    |    |    |    |    |    |    |                                                 |    |    |    |    |    |    |    |                                                |    |    |    |    |    |    |    | Remark |
|----------|------------|-----------------------------------------------|----|----|----|----|----|----|----|-------------------------------------------------|----|----|----|----|----|----|----|------------------------------------------------|----|----|----|----|----|----|----|--------|
|          |            | RED data<br>( <b>MSB</b> :R7, <b>LSB</b> :R0) |    |    |    |    |    |    |    | GREEN data<br>( <b>MSB</b> :G7, <b>LSB</b> :G0) |    |    |    |    |    |    |    | BLUE data<br>( <b>MSB</b> :B7, <b>LSB</b> :B0) |    |    |    |    |    |    |    |        |
|          |            | R7                                            | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7                                              | G6 | G5 | G4 | G3 | G2 | G1 | G0 | 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  |        |
| 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  |        |
| Gray 127 | -          | 0                                             | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0                                               | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0                                              | 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  | Black  |
|          | :          | :                                             | :  | :  | :  | :  | :  | :  | :  | :                                               | :  | :  | :  | :  | :  | :  | :  | :                                              | :  | :  | :  | :  | :  | :  | :  |        |
|          | L255       | 1                                             | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 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  | Black  |
|          | :          | :                                             | :  | :  | :  | :  | :  | :  | :  | :                                               | :  | :  | :  | :  | :  | :  | :  | :                                              | :  | :  | :  | :  | :  | :  | :  |        |
|          | L255       | 0                                             | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1                                               | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 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  | Black  |
|          | :          | :                                             | :  | :  | :  | :  | :  | :  | :  | :                                               | :  | :  | :  | :  | :  | :  | :  | :                                              | :  | :  | :  | :  | :  | :  | :  |        |
|          | L255       | 0                                             | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0                                               | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1                                              | 1  | 1  | 1  | 1  | 1  | 1  | 1  |        |

## 6.4.3 Input Timing Diagram

(Lane0~7 eDP data:1, 2, 3, 4, 1921, 1922, 1923, 1924)



## 6.5 Interface Timing

### 6.5.1 Timing Characteristics

The input timing is shown as the following table.

| Symbol             | Description        |           | Min.  | Typ.  | Max.  | Unit | Remark          |
|--------------------|--------------------|-----------|-------|-------|-------|------|-----------------|
| Tv                 | Vertical Section   | Period    | 2180  | 2200  | 5450  | Th   |                 |
| Tdisp (v)          |                    | Active    | 2160  | 2160  | 2160  | Th   |                 |
| Tblk (v)           |                    | Blanking  | 20    | 40    | 3290  | Th   |                 |
| Fv                 |                    | Frequency | 57    | 120   | 144   | Hz   | <b>Note 6-6</b> |
| Th                 | Horizontal Section | Period    | 2000  | 2100  | 3520  | Tclk |                 |
| Tdisp (h)          |                    | Active    | 1920  | 1920  | 1920  | Tclk |                 |
| Tblk (h)           |                    | Blanking  | 80    | 180   | 1600  | Tclk |                 |
| Fh                 |                    | Frequency | 180   | 264   | 314   | kHz  | <b>Note 6-4</b> |
| Tclk               | Pixel Clock        | Period    | 1.592 | 1.804 | 2.778 | ns   | 1/Fclk          |
| Fclk               |                    | Frequency | 360   | 554   | 628   | MHz  | <b>Note 6-5</b> |
| Link Rate per Lane |                    |           | 5.4   |       |       | Gbps |                 |

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

$$\begin{aligned} Fh (\text{Min.}) &= Fclk (\text{Min.}) / Th (\text{Min.}) \\ Fh (\text{Typ.}) &= Fclk (\text{Typ.}) / Th (\text{Typ.}) \\ Fh (\text{Max.}) &= Fclk (\text{Max.}) / Th (\text{Min.}) \end{aligned}$$

**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

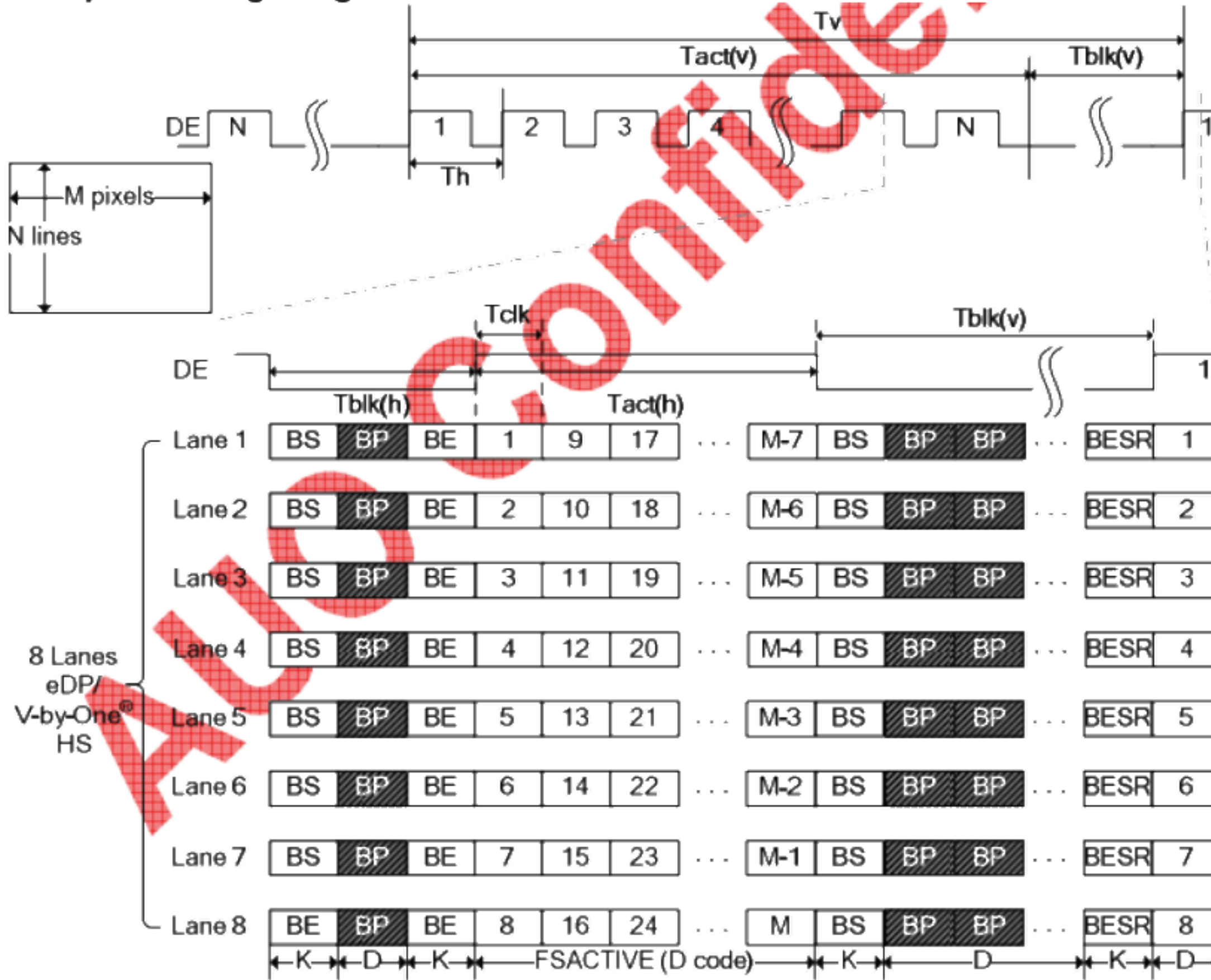
$$Fclk (\text{Typ.}) = Fv (\text{Typ.}) \times Th (\text{Typ.}) \times Tv (\text{Typ.})$$

$$Fclk (\text{Min.}) \leq Fv \times Th \times Tv \leq Fclk (\text{Max.})$$

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

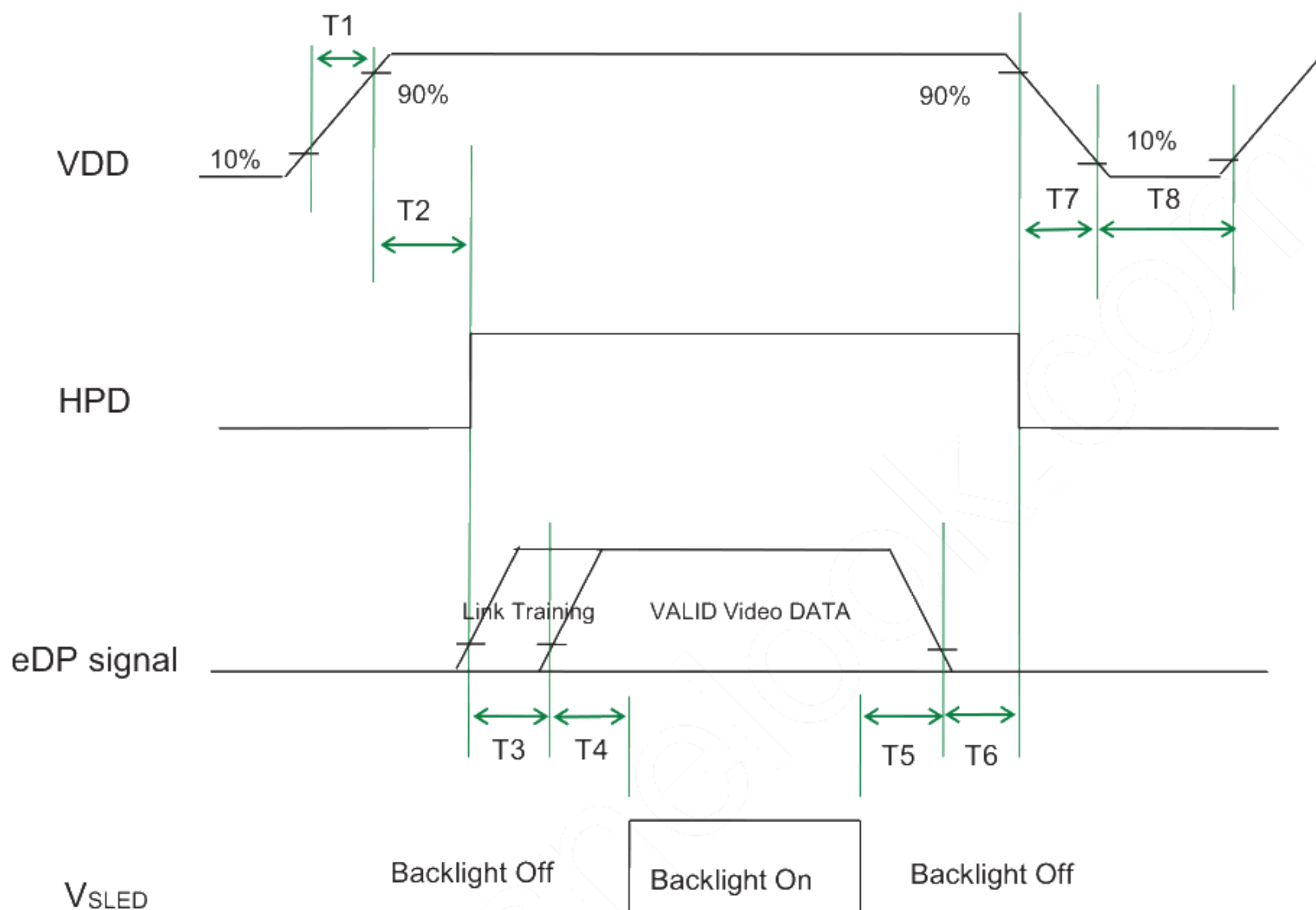
$$Fv = Fclk(\text{Typ.}) / (Tv \times Th)$$

## 6.5.2 Input Timing Diagram



## 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 ON/OFF sequence timing

| Symbol | Value |      |      | Unit | Remark |
|--------|-------|------|------|------|--------|
|        | Min.  | Typ. | Max. |      |        |
| T1     | 0.5   | -    | 10   | [ms] |        |
| T2     | 0     | -    | 200  | [ms] |        |
| T3     | 0     | -    | -    | [ms] |        |
| T4     | 500   | -    | -    | [ms] |        |
| T5     | 100   | -    | -    | [ms] |        |
| T6     | 0     | -    | 50   | [ms] |        |
| T7     | 0     | -    | 200  | [ms] |        |
| T8     | 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 (THB)   | Ta= 50℃ , 80%RH, 300hours                                                                                     |          |
| High Temperature Operation (HTO)  | Ta= 50℃ , 300hours                                                                                            |          |
| Low Temperature Operation (LTO)   | Ta= 0℃ , 300hours                                                                                             |          |
| High Temperature Storage (HTS)    | Ta= 60℃ , 300hours                                                                                            |          |
| Low Temperature Storage (LTS)     | Ta= -20℃ , 300hours                                                                                           |          |
| Vibration Test<br>(Non-operation) | Acceleration: 1.5 G<br>Wave: Random<br>Frequency: 10 - 200Hz<br>Sweep: 30 Minutes each Axis (X, Y, Z)         |          |
| Shock Test<br>(Non-operation)     | Acceleration: 50 G<br>Wave: Half-sine<br>Active Time: 20 ms<br>Direction: ±X, ±Y, ±Z (one time for each Axis) |          |
| Drop Test                         | Height: 45.7 cm, package test                                                                                 |          |
| Thermal Shock Test (TST)          | -20℃ /30min, 60℃ /30min, 100 cycles                                                                           | <b>1</b> |
| On/Off Test                       | On/10sec, Off/10sec, 30,000 cycles                                                                            |          |
| ESD (Electrostatic Discharge)     | Contact Discharge: ± 8KV, 150pF(330Ω ) 1sec,<br>8 points, 25 times/ point.                                    | <b>2</b> |
|                                   | Air Discharge: ± 15KV, 150pF(330Ω ) 1sec<br>8 points, 25 times/ point.                                        |          |
| Altitude Test                     | Operation:10,000 ft<br>Non-Operation:30,000 ft                                                                |          |

**Note 1:** The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change.

- A cycle of rapid temperature change consists of varying the temperature from -20oC to 60oC, and back again. Power is not applied during the test.
- After finish temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

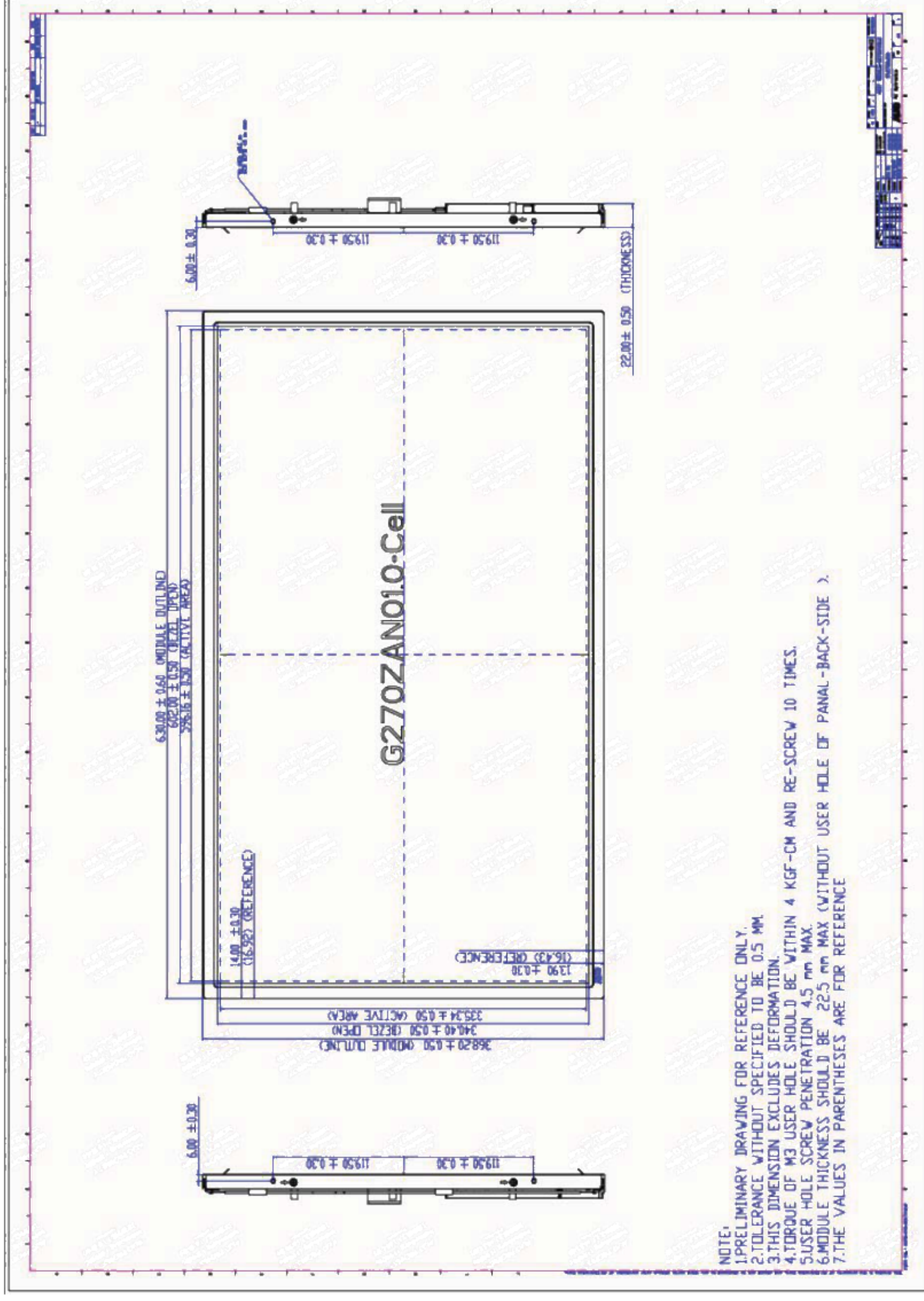
**Note 2:** According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost.  
Self-recoverable. No hardware failures.

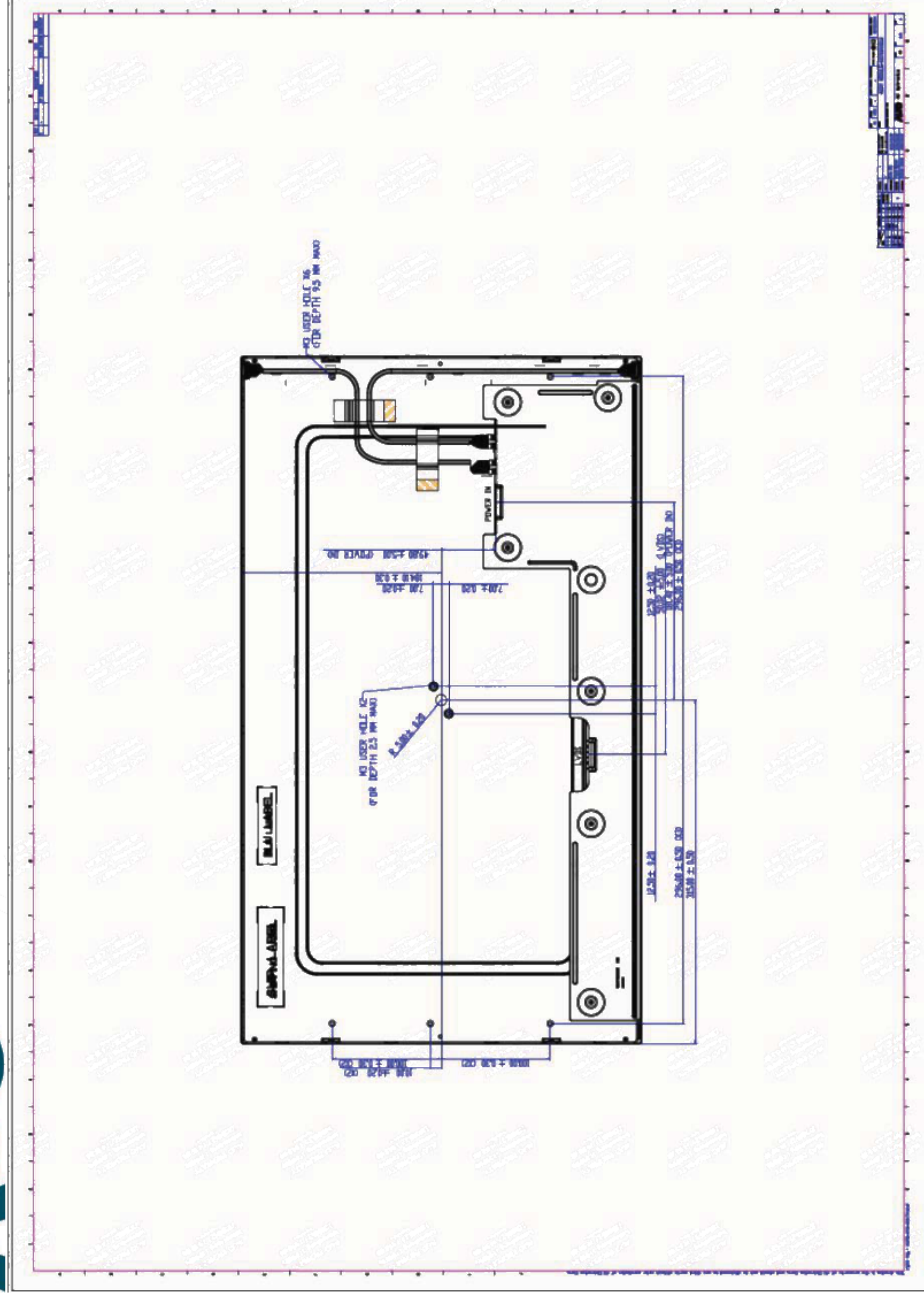
**Note 3:**

- 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.

## 8. Mechanical Characteristics

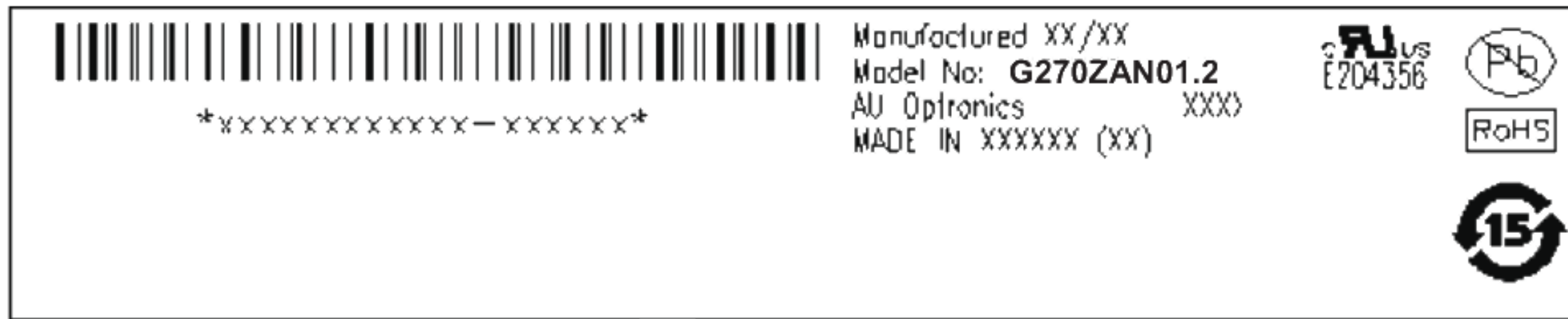
### 8.1 LCM Outline Dimension





## 9. Label and Packaging

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



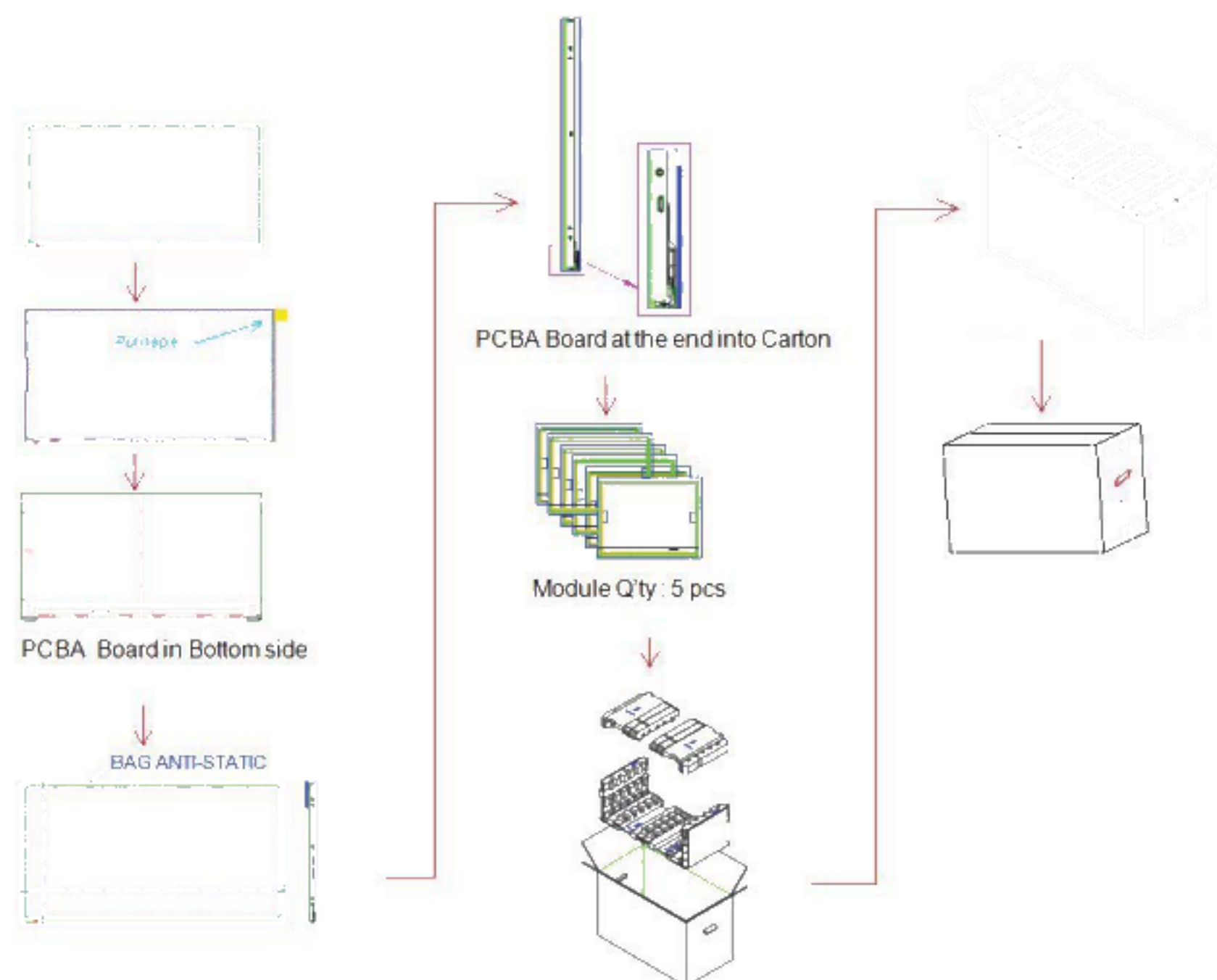
Note 1: For Pb Free products, AUO will add  for identification.

Note 2: For RoHS compatible products, AUO will add  for identification.

Note 3: For China RoHS compatible products, AUO will add  for identification.

Note 4: The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

### 9.2 Carton Package



- Max capacity : 5pcs TFT-LCD module per carton
- Max weight : 20 kg per carton
- Outside dimension of carton : 718mm(L) \* 375mm(W) \* 468mm(H)
- Pallet size : 1200 mm \* 800 mm \* 144mm
- Box stacked :

Module by air\_Max : (1 \*3) \*2 layers, one pallet put 6 boxes, total 30pcs module

Module by sea\_Max : (1\*3) \*2 layers + (1 \*3) \*2 layers, two pallet put 12 boxes, total 60pcs module

Module by sea\_HQ\_Max : (1\*3) \*2 layers+(1\*3) \*2 layers, two pallet put 12 boxes, total 60pcs 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