



# Product Specification

AU OPTRONICS CORPORATION

G240HW01 V1

☐ Preliminary Specification

☒ Final Specification

|            |                     |
|------------|---------------------|
| Module     | 24.0" Color TFT-LCD |
| Model Name | G240HW01 V1         |

|                                                                                                                                                                                      |                                                              |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------|-------|-------|-----------------------|--|-------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------|-------|-------|---------------|------------|-------------|--|-------|-------|------------|------------|
| <table><tr><td>Customer</td><td>Date</td></tr><tr><td>_____</td><td>_____</td></tr><tr><td>Checked &amp; Approved by</td><td></td></tr><tr><td>_____</td><td>_____</td></tr></table> | Customer                                                     | Date | _____ | _____ | Checked & Approved by |  | _____ | _____ | <table><tr><td>Approved by</td><td>Date</td></tr><tr><td>_____</td><td>_____</td></tr><tr><td>Crystal Hsieh</td><td>2017/04/07</td></tr><tr><td>Prepared by</td><td></td></tr><tr><td>_____</td><td>_____</td></tr><tr><td>Jimmy Tsai</td><td>2017/04/07</td></tr></table> | Approved by | Date | _____ | _____ | Crystal Hsieh | 2017/04/07 | Prepared by |  | _____ | _____ | Jimmy Tsai | 2017/04/07 |
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| _____                                                                                                                                                                                | _____                                                        |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| Checked & Approved by                                                                                                                                                                |                                                              |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| _____                                                                                                                                                                                | _____                                                        |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| Approved by                                                                                                                                                                          | Date                                                         |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| _____                                                                                                                                                                                | _____                                                        |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| Crystal Hsieh                                                                                                                                                                        | 2017/04/07                                                   |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| Prepared by                                                                                                                                                                          |                                                              |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| _____                                                                                                                                                                                | _____                                                        |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| Jimmy Tsai                                                                                                                                                                           | 2017/04/07                                                   |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |
| Note: This Specification is subject to change without notice.                                                                                                                        | General Display Business Division / AU Optronics corporation |      |       |       |                       |  |       |       |                                                                                                                                                                                                                                                                            |             |      |       |       |               |            |             |  |       |       |            |            |



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## 1. Operating Precautions

- 1) Since front polarizer is easily damaged, pay attention 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 other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, take it easily, or the TFT Module may be damaged.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 11) 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.
- 12) Severe temperature condition may result in different luminance, response time and LED life time.
- 13) The data on this specification sheet is applicable when LCD module is placed in landscape position.
- 14) Continuous displaying fixed pattern may induce image sticking. It is 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 24 inch-wide Color TFT-LCD Module G240HW01 V1. The display supports the Full HD - 1920(H) x 1080(V) screen format and 16.7M colors (RGB 8-bits data). All input signals are dual channel LVDS interface.

LED driver board is included. G240HW01 V1 is designed for industrial display applications.

### 2.1 Display Characteristics

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

| ITEMS                                                | Unit                 | SPECIFICATIONS                   |
|------------------------------------------------------|----------------------|----------------------------------|
| Screen Diagonal                                      | [mm]                 | 609.7(24.0")                     |
| Active Area                                          | [mm]                 | 531.36 (H) x 298.89 (V)          |
| Pixels H x V                                         |                      | 1920(x3) x 1080                  |
| Pixel Pitch                                          | [um]                 | 276.75 (per one triad) ×276.75   |
| Pixel Arrangement                                    |                      | R.G.B. Vertical Stripe           |
| Display Mode                                         |                      | VA Mode, Normally Black          |
| White Luminance ( Center )                           | [cd/m <sup>2</sup> ] | 300                              |
| Contrast Ratio                                       |                      | 5000: 1                          |
| Optical Response Time                                | [msec]               | 25                               |
| Nominal Input Voltage VDD                            | [Volt]               | +5.0 V                           |
| Power Consumption                                    | [Watt]               | 23.3 (max) (Cell: 6 + BL: 17.3)  |
| Weight                                               | [g]                  | 2,130 (Typ.)±213 g               |
| Physical Size                                        | [mm]                 | 556.0 (W) x 323.2 (H) x 17.0 (D) |
| Electrical Interface                                 |                      | Dual channel LVDS                |
| Support Color                                        |                      | 16.7M colors (true 8-bit)        |
| Surface Treatment                                    |                      | Anti-Glare, 3H                   |
| Temperature Range<br>Operating<br>Storage (Shipping) | [°C]<br>[°C]         | -20 to +70<br>-30 to +80         |
| RoHS Compliance                                      |                      | RoHS Compliance                  |



## 2.2 Optical Characteristics

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

| Item                                        | Unit                 | Conditions                           | Min.  | Typ.  | Max.  | Note    |
|---------------------------------------------|----------------------|--------------------------------------|-------|-------|-------|---------|
| White Luminance                             | [cd/m <sup>2</sup> ] | I <sub>F</sub> = 45 mA               | 240   | 300   | -     | 1       |
| Uniformity                                  | %                    | 9 Points                             | 75    | 80    | -     | 1, 2, 3 |
| Contrast Ratio                              |                      |                                      | 3000  | 5000  | -     | 4       |
| Cross talk                                  | %                    |                                      | -     | -     | 1.5   | 5       |
| Response Time                               | [msec]               | Rising                               | -     | 16    | -     | 6       |
|                                             |                      | Falling                              | -     | 9     | -     |         |
|                                             |                      | Rising + Falling                     | -     | 25    | 50    |         |
| Viewing Angle                               | [degree]             | Horizontal (Right)<br>CR = 10 (Left) | 75    | 89    | -     | 7       |
|                                             | [degree]             |                                      | 75    | 89    | -     |         |
|                                             | [degree]             | Vertical (Upper)<br>CR = 10 (Lower)  | 75    | 89    | -     |         |
|                                             | [degree]             |                                      | 75    | 89    | -     |         |
| Color / Chromaticity Coordinates (CIE 1931) |                      | Red x                                | 0.593 | 0.643 | 0.693 |         |
|                                             |                      | Red y                                | 0.289 | 0.339 | 0.389 |         |
|                                             |                      | Green x                              | 0.279 | 0.329 | 0.379 |         |
|                                             |                      | Green y                              | 0.574 | 0.624 | 0.674 |         |
|                                             |                      | Blue x                               | 0.105 | 0.155 | 0.205 |         |
|                                             |                      | Blue y                               | 0.000 | 0.048 | 0.098 |         |
|                                             |                      | White x                              | 0.263 | 0.313 | 0.363 |         |
|                                             |                      | White y                              | 0.279 | 0.329 | 0.379 |         |
| Color Gamut                                 | %                    |                                      |       | 72    | -     |         |

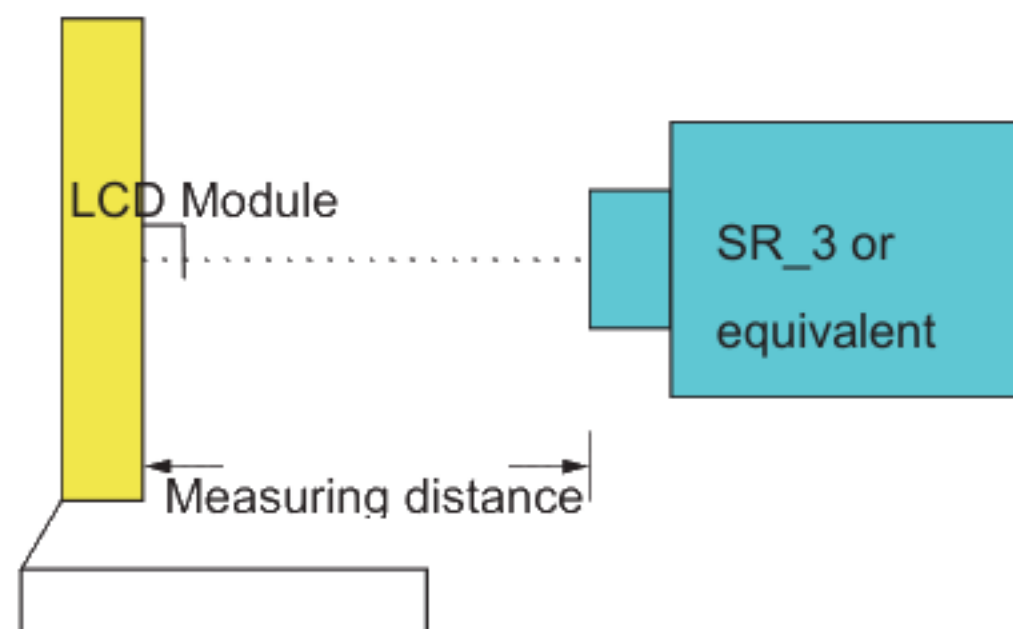
Note 1: Measurement method

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

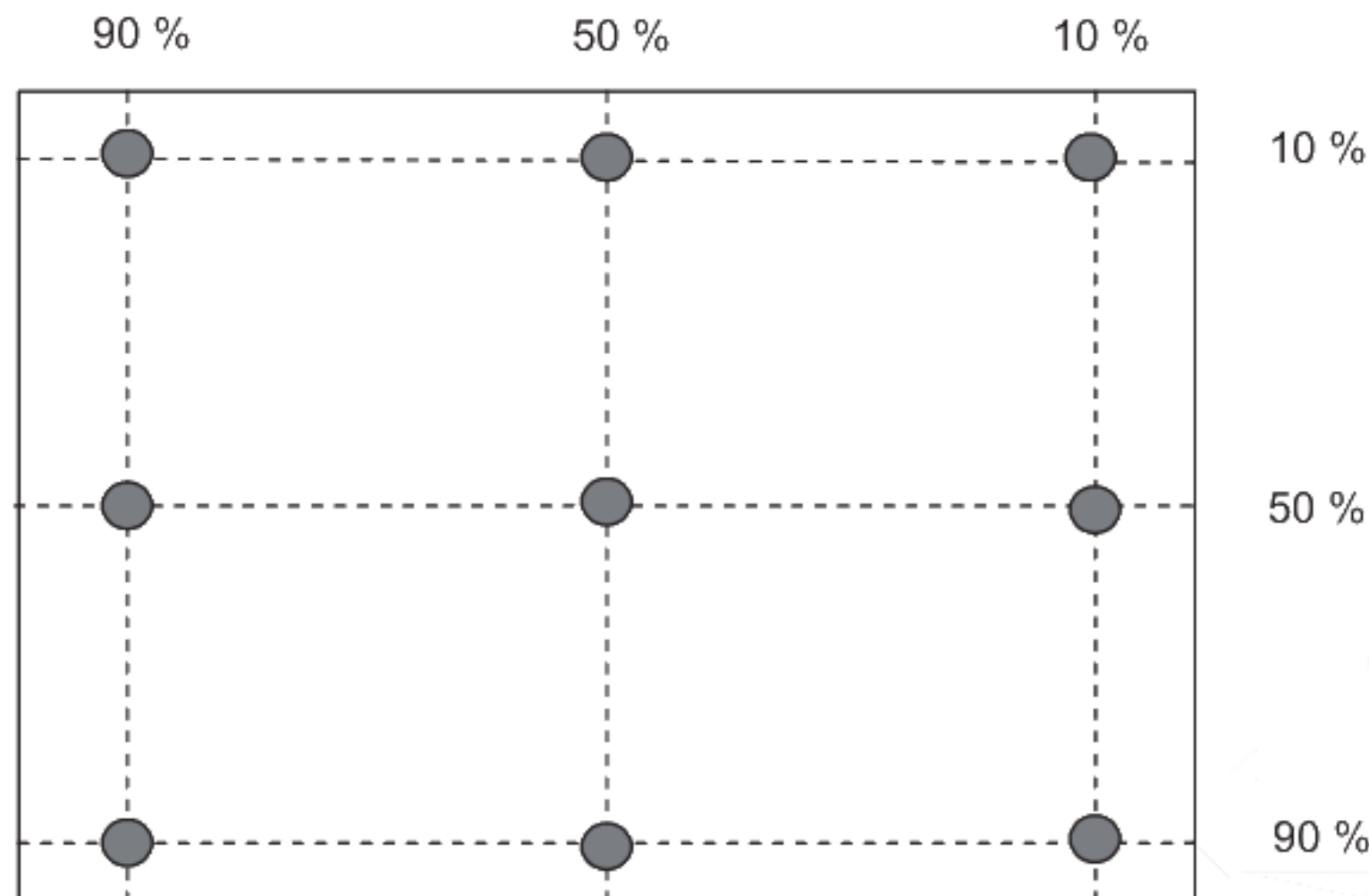
Aperture 1□with 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 9 points position. Display active area:



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):

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

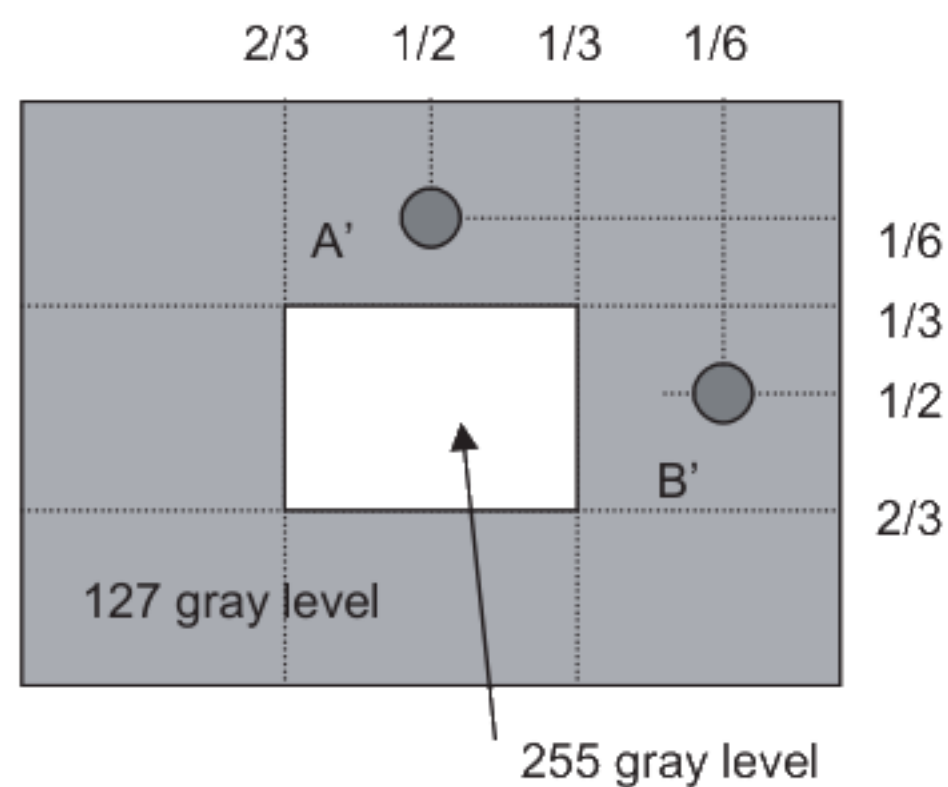
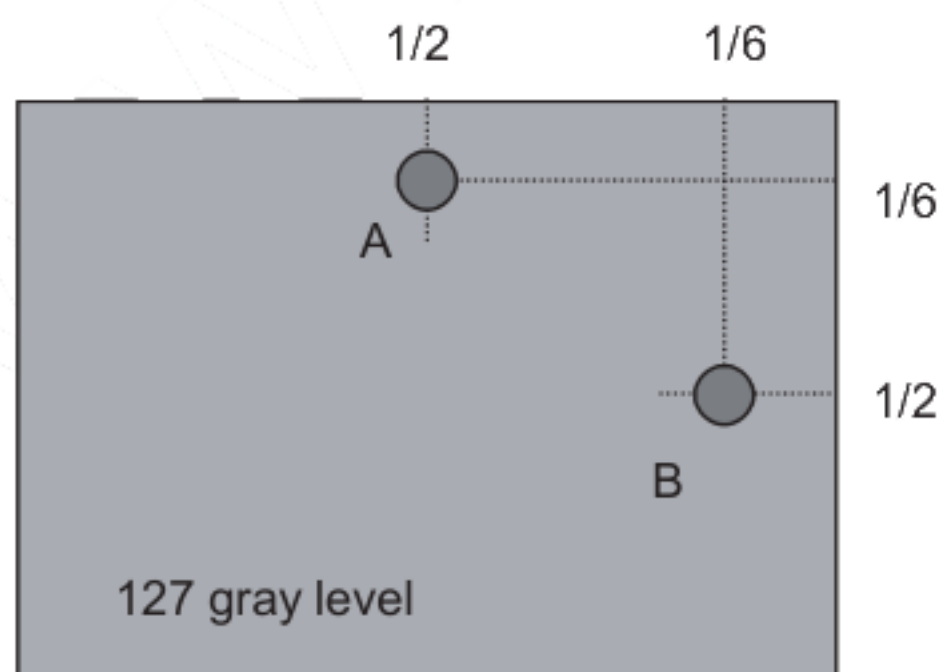
Note 5 : Definition of cross talk (CT)

$$CT = |YB - YA| / YA \times 100 (\%)$$

Where

YA = Luminance of measured location without gray level 255 pattern (cd/m2)

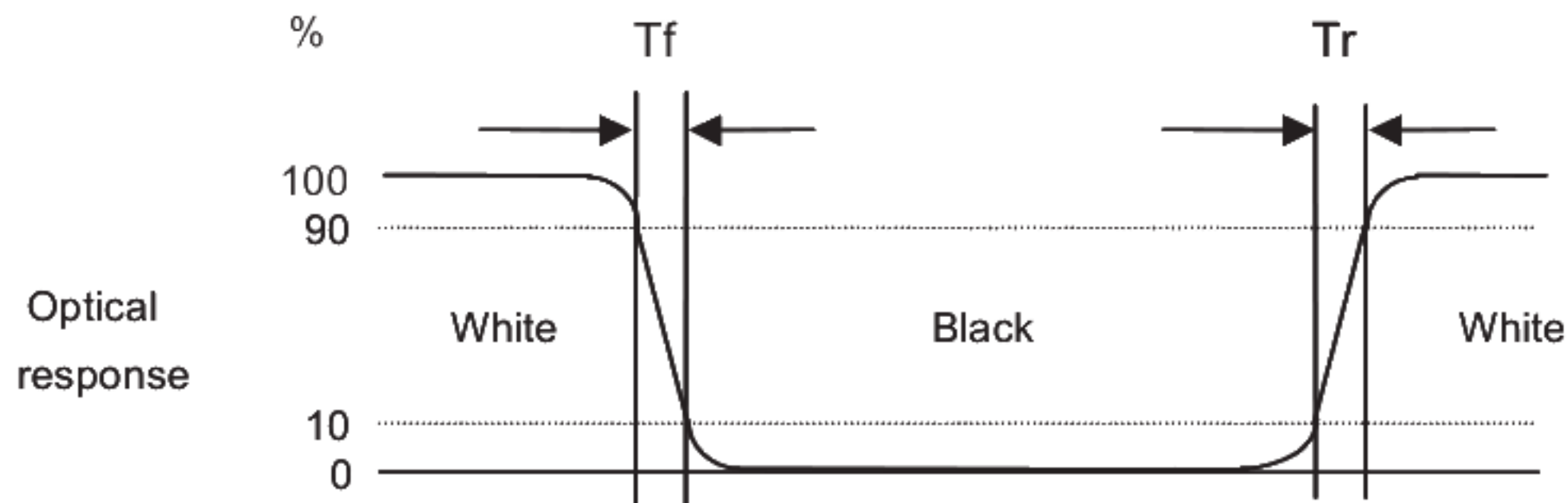
YB = Luminance of measured location with gray level 255 pattern (cd/m2)





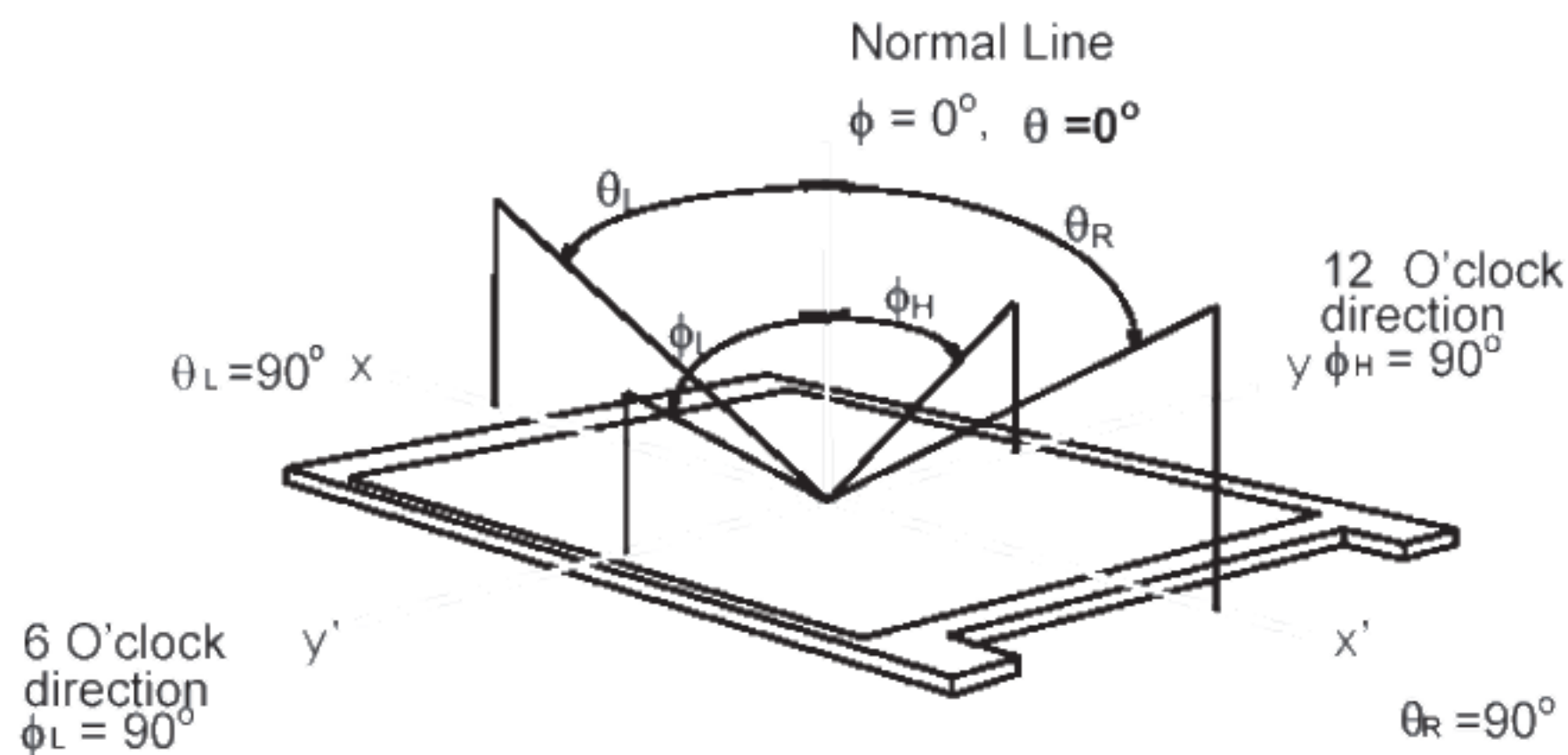
Note 6: Definition of response time:

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 7: Definition of viewing angle

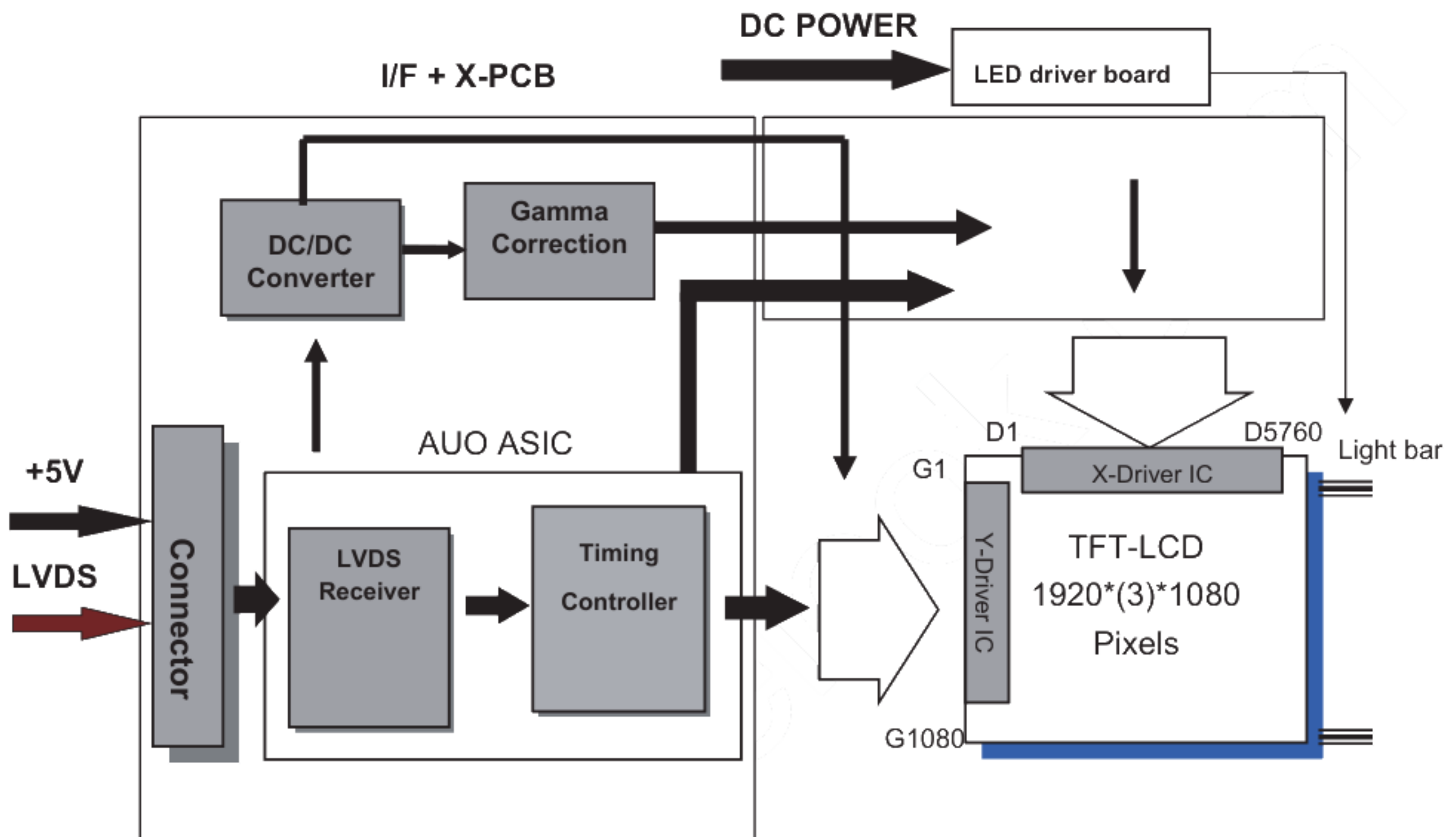
Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a  $180^\circ$  horizontal and  $180^\circ$  vertical range (off-normal viewing angles). The  $180^\circ$  viewing angle range is broken down as below:  $90^\circ$  ( $\theta$ ) horizontal left and right, and  $90^\circ$  ( $\phi$ ) 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 24 inches wide Color TFT-LCD Module:



LVDS Connector: JAE (FI-XB30SRL-HF11) or equivalent.  
LED Connector: Sin Sheng (MS24049HJ) or equivalent.



## 4. Absolute Maximum Ratings

### 4.1 TFT LCD Module

| Item                    | Symbol | Min | Max | Unit   | Conditions      |
|-------------------------|--------|-----|-----|--------|-----------------|
| Logic/LCD Drive Voltage | VDD    | 0   | 5.5 | [Volt] | <b>Note 1,2</b> |

### 4.2 Backlight Unit

| Item              | Symbol | Min  | Max  | Unit   | Conditions      |
|-------------------|--------|------|------|--------|-----------------|
| LED Input Voltage | Vcc    | 10.8 | 13.2 | [Volt] | <b>Note 1,2</b> |

### 4.3 Absolute Ratings of Environment

| Item                  | Symbol | Min. | Max. | Unit  | Conditions    |
|-----------------------|--------|------|------|-------|---------------|
| Operating Temperature | TOP    | -20  | 70   | [°C]  | <b>Note 3</b> |
| Operation Humidity    | HOP    | 5    | 90   | [%RH] |               |
| Storage Temperature   | TST    | -30  | 80   | [°C]  |               |
| Storage Humidity      | HST    | 5    | 90   | [%RH] |               |

**Note 1:** With in Ta (25°C)

**Note 2:** Permanent damage to the device may occur if exceeding maximum values

**Note 3:** For quality performance, please refer to AUO IIS(Incoming Inspection Standard).



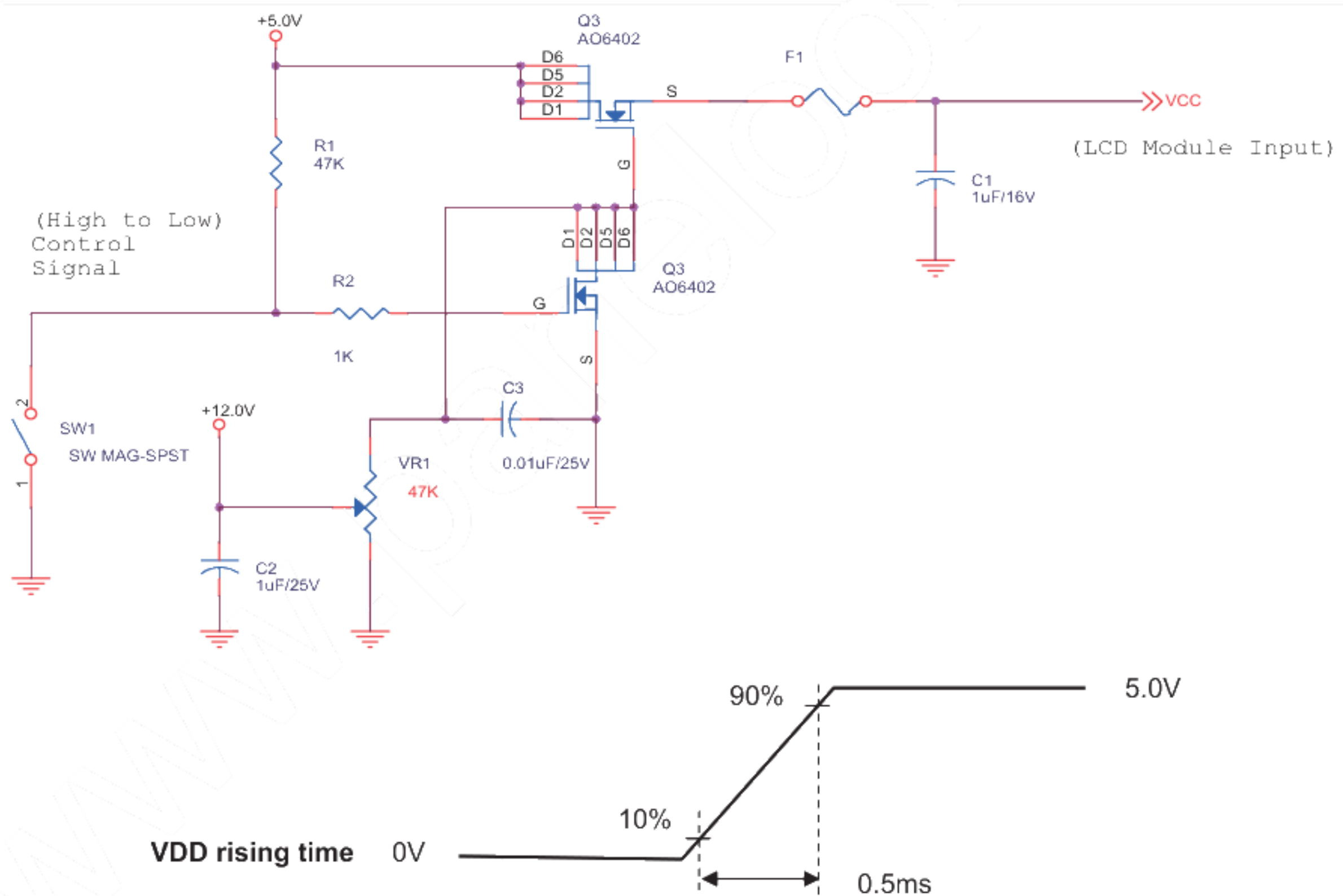
## 5. Electrical Characteristics

### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

| Symbol | Parameter               | Min | Typ | Max  | Units  | Remark                                  |
|--------|-------------------------|-----|-----|------|--------|-----------------------------------------|
| VDD    | Logic/LCD Drive Voltage | 4.5 | 5.0 | 5.5  | [Volt] | ± 10%                                   |
| IDD    | VDD Current             | -   | 900 | 1200 | [mA]   | VDD= 5.0V, All White Pattern<br>At 60Hz |
| Irush  | LCD Inrush Current      | -   | -   | 3    | [A]    | Note 1                                  |
| PDD    | VDD Power               | -   | 4.5 | 6    | [Watt] | VDD= 5.0V, All White Pattern<br>At 60Hz |

Note 1: Measurement condition:

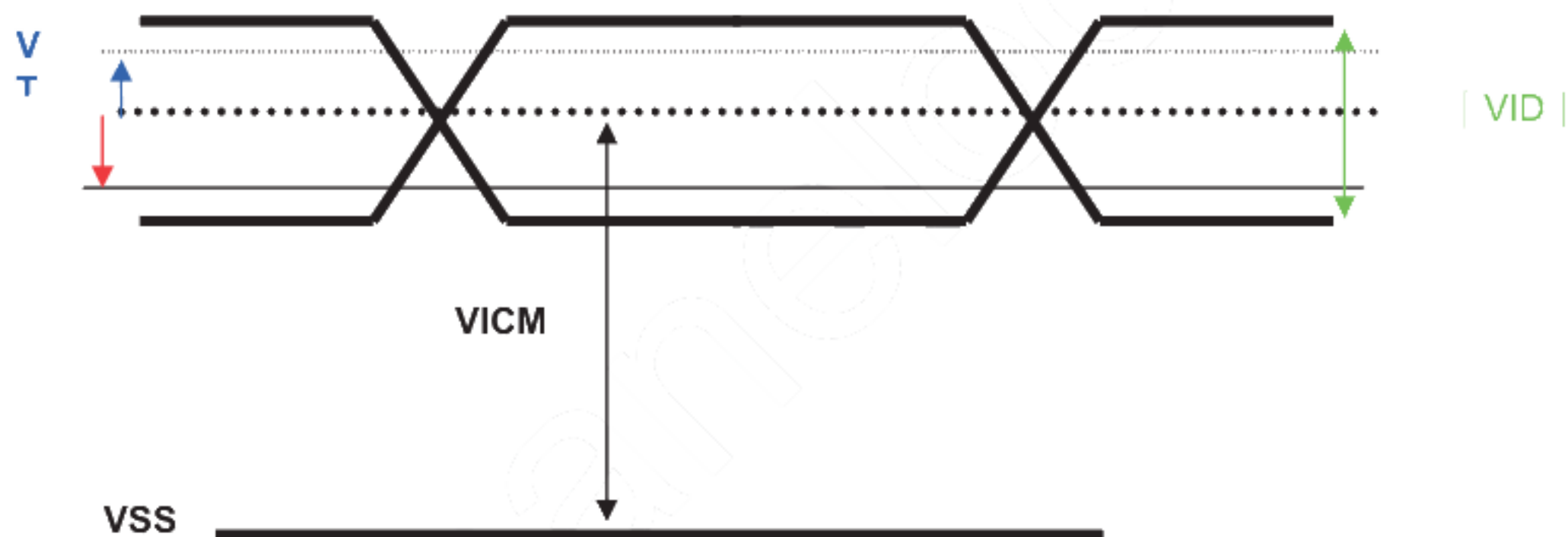


## 5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

| Symbol           | Item                                   | Min. | Typ. | Max. | Unit | Remark                                   |
|------------------|----------------------------------------|------|------|------|------|------------------------------------------|
| V <sub>TH</sub>  | Differential Input High Threshold      | -    | -    | 100  | [mV] | V <sub>CM</sub> =1.2V                    |
| V <sub>TL</sub>  | Differential Input Low Threshold       | -100 | -    | -    | [mV] | V <sub>CM</sub> =1.2V                    |
| V <sub>ID</sub>  | Input Differential Voltage             | 100  | 400  | 600  | [mV] |                                          |
| V <sub>ICM</sub> | Differential Input Common Mode Voltage | 0.3  | -    | 1.25 | [V]  | V <sub>TH</sub> /V <sub>TL</sub> =±100mV |

Note: LVDS Signal Waveform.





## 5.2 Backlight Unit

### 5.2.1 LED Driver

Following characteristics are measured under stable condition at 25. . (Room Temperature).

| Symbol         | Parameter             | Min    | Typ  | Max  | Units | Remark        |
|----------------|-----------------------|--------|------|------|-------|---------------|
| Vcc            | Input Voltage         | 10.8   | 12   | 13.2 | Volt  |               |
| Ivcc           | Input Current         | -      | 1.2  | -    | A     | 100% Dimming  |
| PLED           | Power Consumption     |        | 14.4 | 17.3 | Watt  | 100% Dimming  |
| Irush          | Inrush Current        | -      | 4    | 5    | A     |               |
| BL_EN          | On Control Voltage    | 3      | -    | 5.5  | Volt  |               |
|                | Off Control Voltage   | 0      | -    | 0.5  | Volt  |               |
| FPWM           | PWM Dimming Frequency | 200    | -    | 20K  | Hz    |               |
|                | High Voltage          | 3.0    | 3.3  | 5.5  | Volt  |               |
|                | Low Voltage           | 0      | -    | 0.5  | Volt  |               |
|                | Dimming Duty Cycle    | 10     | -    | 100  | %     |               |
| I <sub>F</sub> | LED Forward Current   |        | 45   |      | mA    | Ta = 25°C     |
| LTLED          | LED Life Time         | 50,000 | -    | -    | Hrs   | <b>Note 4</b> |

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

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

**Note 3:** LED light bar structure: ( 7 strings x 10pcs / string =70pcs LED)

**Note 4:** Definition of life time: Brightness becomes to 50% of its original value. The minimum life time of LED unit is on the condition of I<sub>F</sub> = 45 mA and 25±2°C (Room Temperature).





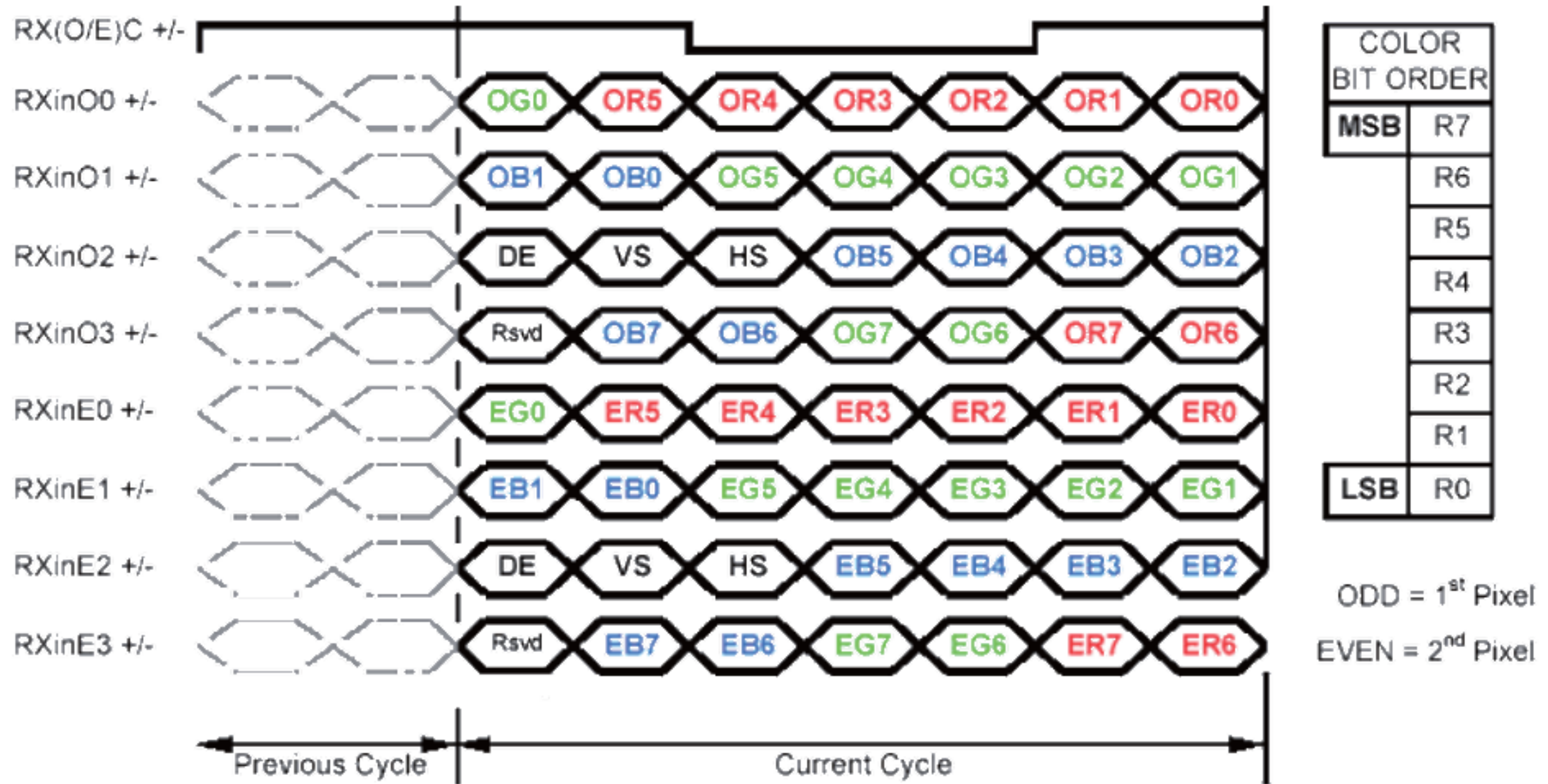
## 6.2 Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

| PIN # | SIGNAL NAME | DESCRIPTION                                                              |
|-------|-------------|--------------------------------------------------------------------------|
| 1     | RXinO0-     | Negative LVDS differential data input (Odd data)                         |
| 2     | RXinO0+     | Positive LVDS differential data input (Odd data)                         |
| 3     | RXinO1-     | Negative LVDS differential data input (Odd data)                         |
| 4     | RXinO1+     | Positive LVDS differential data input (Odd data)                         |
| 5     | RXinO2-     | Negative LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG) |
| 6     | RXinO2+     | Positive LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG) |
| 7     | GND         | Power Ground                                                             |
| 8     | RxOCLKIN-   | Negative LVDS differential clock input (Odd clock)                       |
| 9     | RxOCLKIN+   | Positive LVDS differential clock input (Odd clock)                       |
| 10    | RXinO3-     | Negative LVDS differential data input (Odd data)                         |
| 11    | RXinO3+     | Positive LVDS differential data input (Odd data)                         |
| 12    | RXinE0-     | Negative LVDS differential data input (Even data)                        |
| 13    | RXinE0+     | Positive LVDS differential data input (Even data)                        |
| 14    | GND         | Power Ground                                                             |
| 15    | RXinE1-     | Negative LVDS differential data input (Even data)                        |
| 16    | RXinE1+     | Positive LVDS differential data input (Even data)                        |
| 17    | GND         | Power Ground                                                             |
| 18    | RXinE2-     | Negative LVDS differential data input (Even data)                        |
| 19    | RXinE2+     | Positive LVDS differential data input (Even data)                        |
| 20    | RxECLKIN-   | Negative LVDS differential clock input (Even clock)                      |
| 21    | RxECLKIN+   | Positive LVDS differential clock input (Even clock)                      |
| 22    | RXinE3-     | Negative LVDS differential data input (Even data)                        |
| 23    | RXinE3+     | Positive LVDS differential data input (Even data)                        |
| 24    | GND         | Power Ground                                                             |
| 25    | NC          | No contact (For AUO test only)                                           |
| 26    | NC          | No contact (For AUO test only)                                           |
| 27    | VDD         | Power +5V                                                                |
| 28    | VDD         | Power +5V                                                                |
| 29    | VDD         | Power +5V                                                                |
| 30    | VDD         | Power +5V                                                                |



## 6.3 The Input Data Format



Note1: 8-bits signal input.

Note2: L:NS alike H:Thine alike



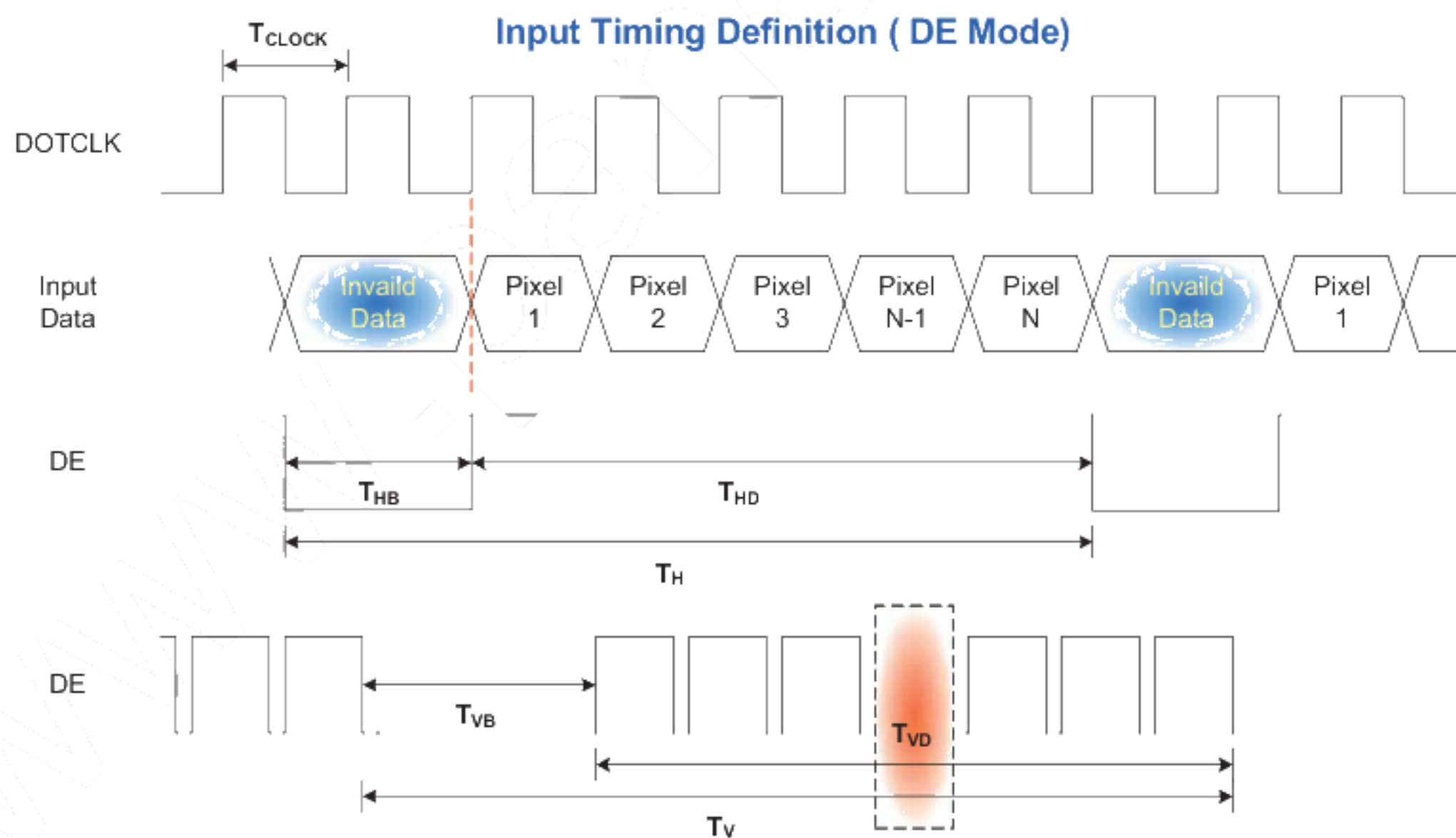
## 6.4 Interface Timing

### 6.4.1 Timing Characteristics

| Signal             | Item      | Symbol               | Min  | Typ  | Max  | Unit               |
|--------------------|-----------|----------------------|------|------|------|--------------------|
| Clock              | Frequency | $1/T_{\text{Clock}}$ | 40   | 72   | 83   | MHz                |
| Frame Rate         | Frequency | $1/T_v$              | 50   | 60   | 75   | Hz                 |
| Vertical Section   | Period    | $T_v$                | 1088 | 1120 | 2047 | $T_{\text{line}}$  |
|                    | Active    | $T_{vD}$             | 1080 | 1080 | 1080 |                    |
|                    | Blanking  | $T_{vB}$             | 8    | 40   | 967  |                    |
| Horizontal Section | Period    | $T_H$                | 1034 | 1060 | 2047 | $T_{\text{clock}}$ |
|                    | Active    | $T_{HD}$             | 960  | 960  | 960  |                    |
|                    | Blanking  | $T_{HB}$             | 74   | 100  | 1087 |                    |

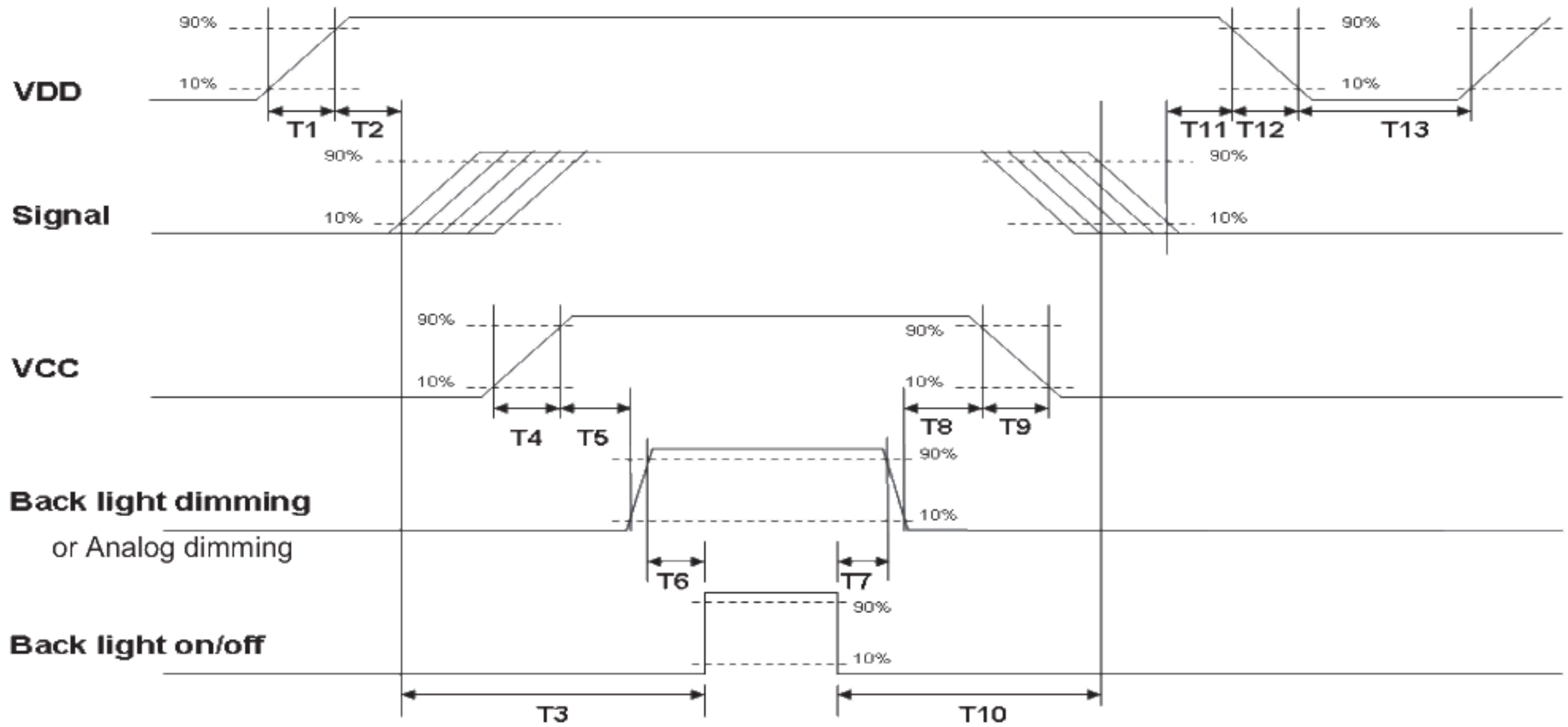
Note: DE mode only.

### 6.4.2 Input Timing Diagram



## 6.5 Power ON/OFF Sequence

VDD power and B/L 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

| 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       | --    | --   | 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.



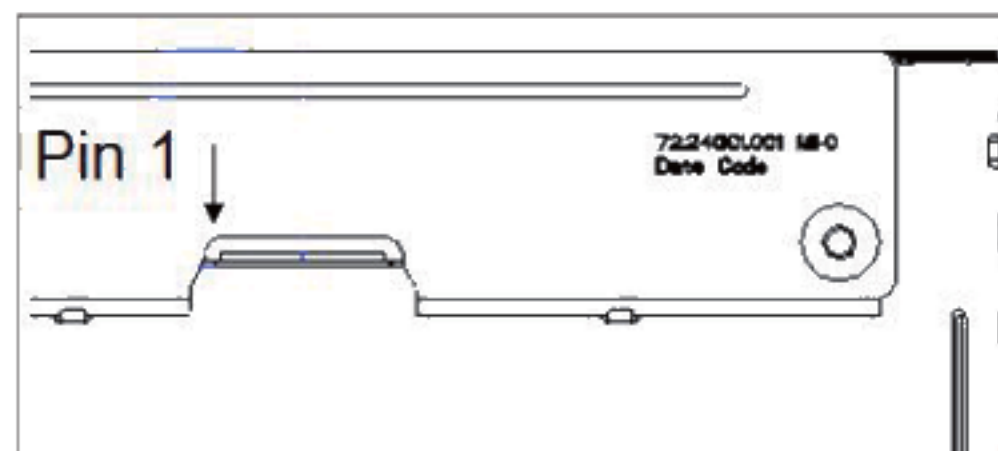
## 7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

### 7.1 TFT LCD Module: LVDS Connector

| Connector Name / Designation | Interface Connector / Interface card |
|------------------------------|--------------------------------------|
| Manufacturer                 | JAE or compatible                    |
| Type Part Number             | JAE (FI-XB30SRL-HF11) or equivalent. |
| Mating Housing Part Number   | FI-X30HL (JAE) or compatible         |

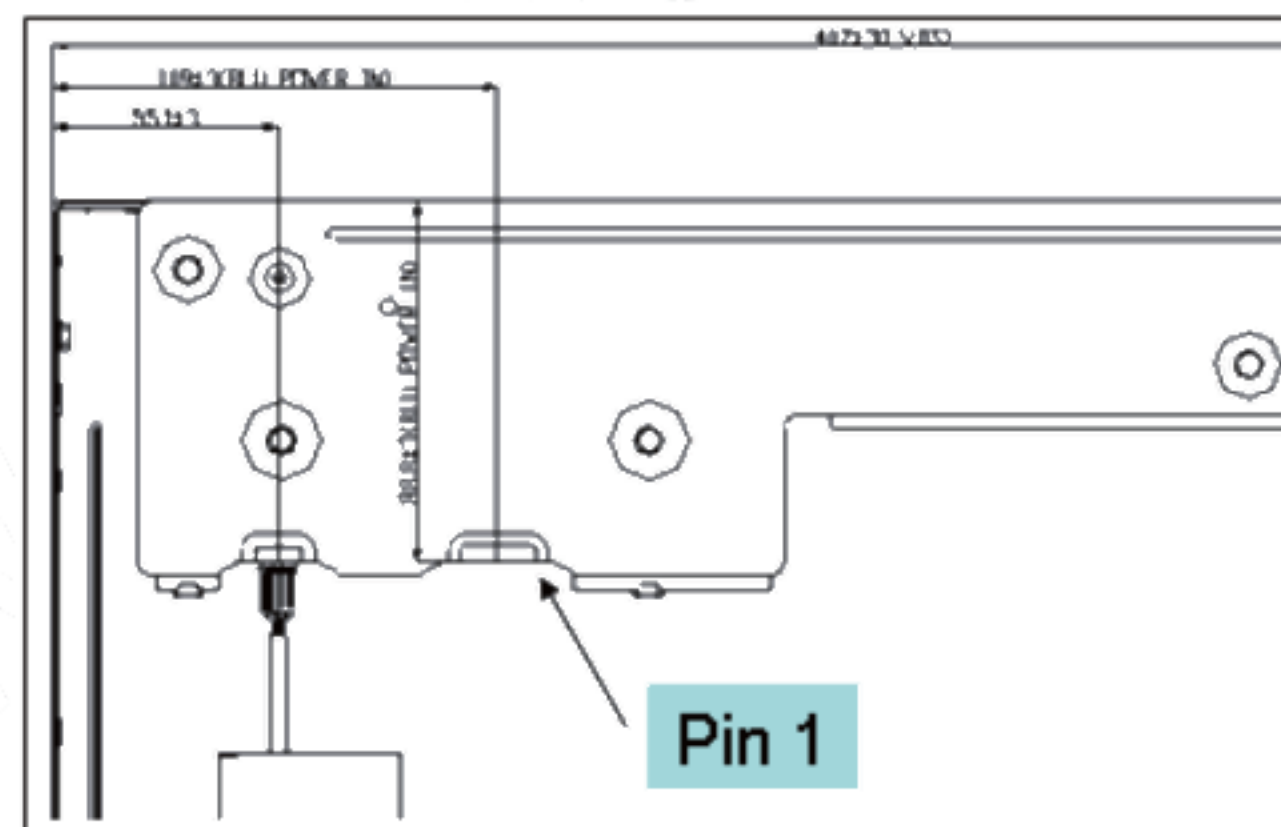
| Pin# | Signal Name | Pin# | Signal Name |
|------|-------------|------|-------------|
| 1    | RxOIN0-     | 2    | RxOIN0+     |
| 3    | RxOIN1-     | 4    | RxOIN1+     |
| 5    | RxOIN2-     | 6    | RxOIN2+     |
| 7    | GND         | 8    | RxOCLKIN-   |
| 9    | RxOCLKIN+   | 10   | RxOIN3-     |
| 11   | RxOIN3+     | 12   | RxEIN0-     |
| 13   | RxEIN0+     | 14   | GND         |
| 15   | RxEIN1-     | 16   | RxEIN1+     |
| 17   | GND         | 18   | RxEIN2-     |
| 19   | RxEIN2+     | 20   | RxECLKIN-   |
| 21   | RxECLKIN+   | 22   | RxEIN3-     |
| 23   | RxEIN3+     | 24   | GND         |
| 25   | NC          | 26   | NC          |
| 27   | VDD         | 28   | VDD         |
| 29   | VDD         | 30   | VDD         |



## 7.2 Backlight Unit: LED Connector

| Connector Name / Designation | LED Connector           |
|------------------------------|-------------------------|
| Manufacturer                 | Sin Sheng or compatible |
| Connector Model Number       | MS24049HJ               |
| Mating Housing Part Number   | P24049 or compatible    |

| PIN # | SIGNAL NAME | DESCRIPTION                 |
|-------|-------------|-----------------------------|
| 1     | V12         | Input voltage, 12V          |
| 2     | V12         | Input voltage, 12V          |
| 3     | V12         | Input voltage, 12V          |
| 4     | ---         | NC                          |
| 5     | GND         | Ground                      |
| 6     | GND         | Ground                      |
| 7     | GND         | Ground                      |
| 8     | BL_EN       | Back light enable, 3~5.5 V  |
| 9     | BL_DIM_P    | Back light dimming, 3~5.5 V |







## 8. Reliability Test

Environment test conditions are listed as following table.

| Items                             | Required Condition                                                                                            | Note |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------|------|
| Temperature Humidity Bias (THB)   | Ta= 50°C, 80%RH, 300hours                                                                                     |      |
| High Temperature Operation (HTO)  | Ta= 70℃, 300hours                                                                                             |      |
| Low Temperature Operation (LTO)   | Ta= -20℃, 300hours                                                                                            |      |
| High Temperature Storage (HTS)    | Ta= 80℃, 300hours                                                                                             |      |
| Low Temperature Storage (LTS)     | Ta= -30℃, 300hours                                                                                            |      |
| Vibration Test<br>(Non-operation) | Acceleration: 1.5 Grms<br>Wave: Random<br>Frequency: 10 - 200 Hz<br>Duration: 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: 46 cm, package test                                                                                   |      |
| Thermal Shock Test (TST)          | -20℃/30min, 60℃/30min, 100 cycles                                                                             |      |
| On/Off Test                       | On/10sec, Off/10sec, 30,000 cycles                                                                            |      |
| ESD (Electro Static Discharge)    | Contact Discharge: ± 8KV, 150pF(330Ω ) 1sec,<br>8 points, 25 times/ point.                                    | 1    |
|                                   | 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: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

Self-recoverable. No hardware failures.

Note2:

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

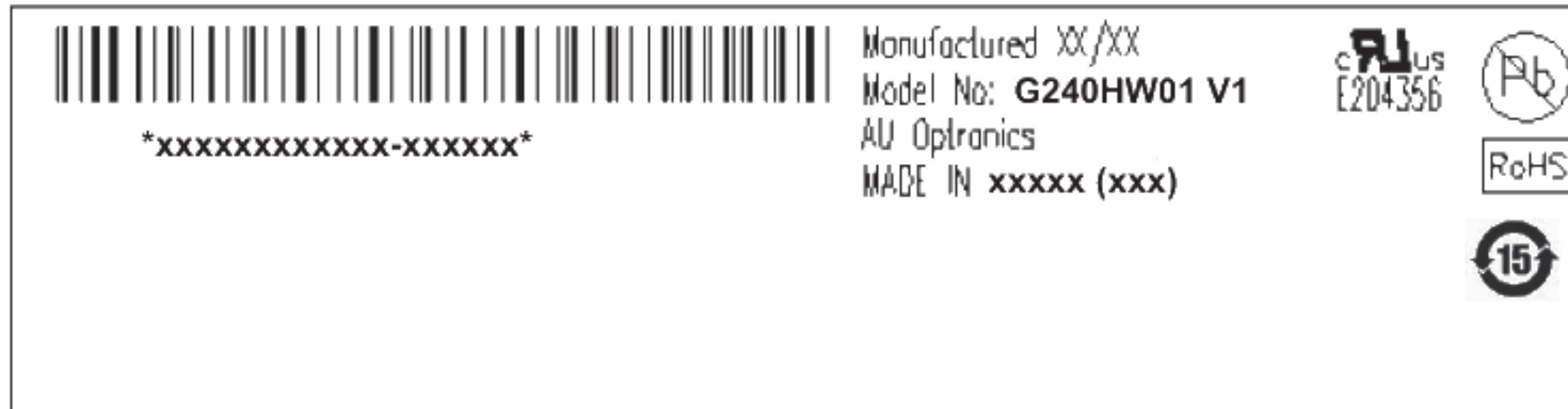
## 9. Mechanical Characteristics





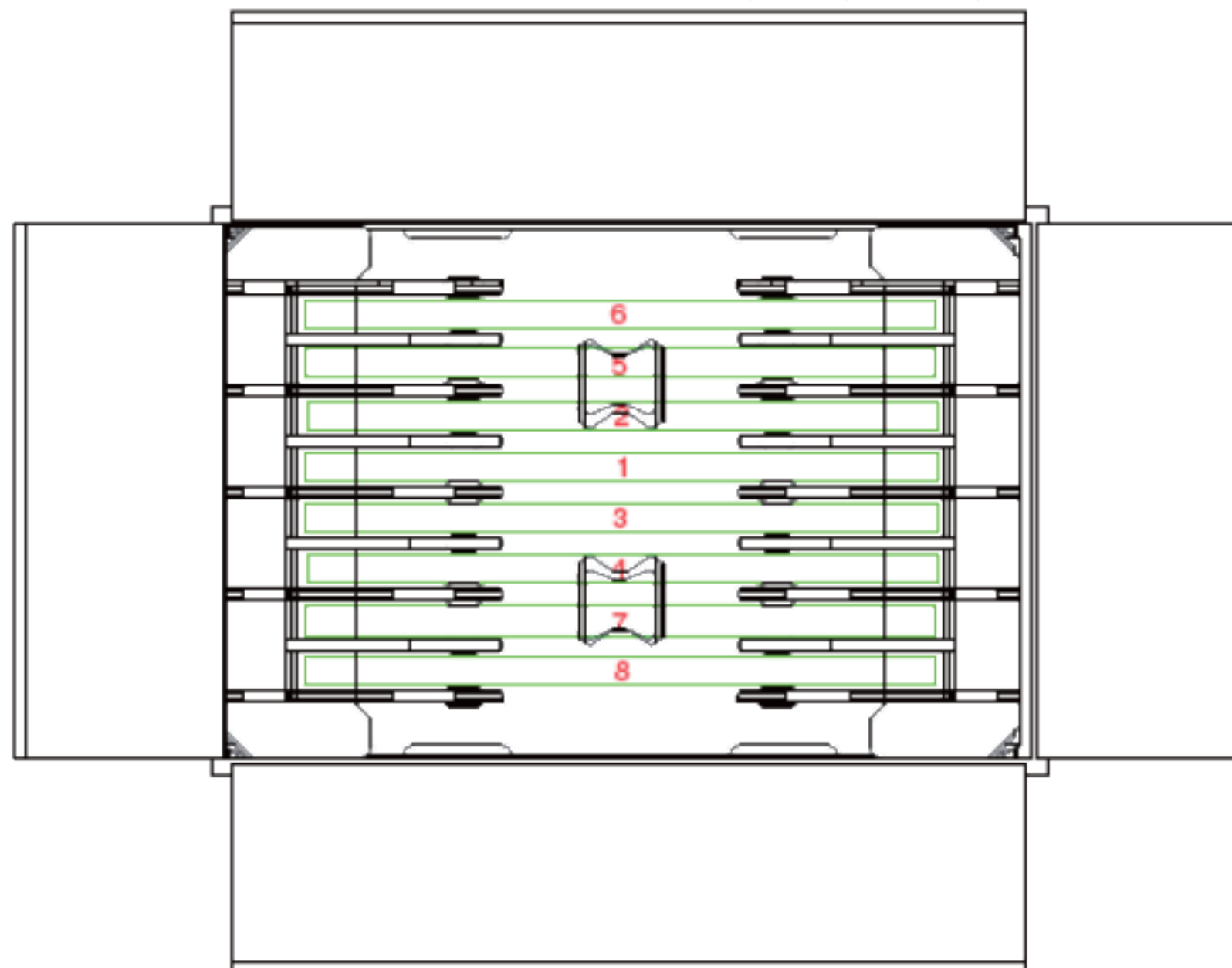
## 10. Label and Packaging

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



### 10.2 Carton Package

- The outside dimension of carton is 413 x 282x 661 (mm).
- 8 pieces per carton box.
- 2\*4 boxes per layer. By air, 2 layer / pallet. By sea, refer packing documents. Pallet size (not include carton boxes): 1150 mm \* 840 mm \* 132 mm





## 11. Safety

### 11.1 Sharp Edge Requirements

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

### 11.2 Materials

#### 11.2.1 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.

#### 11.2.2 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.

### 11.3 Capacitors

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

### 11.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

**UL 1950, First Edition**

**U.S.A. Information Technology Equipment**