

( ) Preliminary Specifications

(V) Final Specifications

|                                                                                            |                            |
|--------------------------------------------------------------------------------------------|----------------------------|
| Module                                                                                     | 24.0 Inch Color TFT-LCD    |
| Model Name                                                                                 | G240HVT01.0                |
| Note (  ) | G/G P-cap touch TTL module |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div style="display: flex; justify-content: space-around; font-weight: bold;"> <span>Customer</span> <span>Date</span> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <span><u>Coca Cola</u></span> <span><u>07/03/2018</u></span> </div> <div style="display: flex; justify-content: space-around; margin-top: 40px;"> <div style="text-align: center;"> <p><b>Checked &amp;<br/>Approved by</b></p> <p>_____</p> </div> <div style="text-align: center;"> <p>_____</p> </div> </div> | <div style="display: flex; justify-content: space-around; font-weight: bold;"> <span>Approved by</span> <span>Date</span> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <span><u>Jason Peng</u></span> <span><u>07/27/2018</u></span> </div> <div style="display: flex; justify-content: space-around; margin-top: 40px;"> <div style="text-align: center;"> <p><b>Prepared by</b></p> <p>_____</p> </div> <div style="text-align: center;"> <p><u>Mark Shih</u></p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p><u>07/27/2018</u></p> </div> </div> |
| <p>Note: This Specification is subject to change without notice.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Audio-Video Business Unit /<br/>AU Optronics corporation</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

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## Record of Revision

## Product Specification

AU OPTRONICS CORPORATION

G240HVT01.0

| Version and Date | Page | Old description                                                       | New Description                                                          |
|------------------|------|-----------------------------------------------------------------------|--------------------------------------------------------------------------|
| 0.1 2018/01/02   | All  | First Preliminary Edition                                             |                                                                          |
| 2018/01/26       | 6    | Touch Power Consumption = 500mW                                       | Touch Power Consumption = 750mW                                          |
|                  |      | TP Transmittance: 87+/- 2                                             | TP Transmittance: 87+/- 3                                                |
|                  | 15   | Touch Panel Power Supply: min/typ./max =4.75/5/5.25                   | Touch Panel Power Supply: min/typ./max =4.5/5/5.5                        |
|                  |      | Normal mode Current consumption @Report rate 100Hz: typ./max = 150/NA | Normal mode Current consumption @Report rate 100Hz: typ./max = 140/150   |
|                  | 23   | TP connector Manufacturer: Energy Industrial co. LTD                  | TP connector Manufacturer: Entery Industrial co. LTD                     |
|                  | 24   | Reliability Test<br>Vibration test/Shock test/ Altitude Test          | Reliability Test<br>Remove Vibration test/Shock test/Altitude Test       |
| 2018/07/03       | 6    | Linearity: Center $\pm 2$ Edge: $\pm 5$                               | Linearity: Center $\pm 2$ Edge: $\pm 2.5$                                |
|                  | 27   |                                                                       | Total solution Outline Dimension (Rear View)                             |
| 2018/07/27       | 6    |                                                                       | TP Thickness: 3.8mm $\pm$ 0.3 mm<br>(Cover 2.9mm,sensor 0.7mm,OCR 0.2mm) |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |
|                  |      |                                                                       |                                                                          |

## 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) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 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 Reflector edge. Instead, press at the far ends of the LED Reflector 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 without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL60950-1), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time.
- 14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

## 2. General Description

This specification applies to the 24.0 inch-wide Color a-Si TFT-LCD Module G240HVT01.0. The display supports the FHD - 1920(H) x 1080(V) screen format and 16.7M colors (RGB 8-bits data) with touch function. All input signals are LVDS interface and this module contains with an LED driver for backlight.

### 2.1 Display Characteristics

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

| Items                                                     | Unit                 | Specifications                      |
|-----------------------------------------------------------|----------------------|-------------------------------------|
| Screen Diagonal                                           | [inch]               | 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, Normally Black                  |
| White Luminance (Center)                                  | [cd/m <sup>2</sup> ] | 260                                 |
| Contrast Ratio                                            |                      | 5000: 1                             |
| Optical Response Time                                     | [msec]               | 25                                  |
| Touch Input Mode                                          |                      | Muti Finger                         |
| Nominal Input Voltage VDD                                 | [Volt]               | +5.0 V                              |
| LCD Power Consumption                                     | [Watt]               | 23.3 (max) (Cell: 6 + BL: 17.3)     |
| Weight                                                    | [Grams]              | 3665 (Typ.), 3750 (Max)             |
| Physical Size                                             | [mm]                 | 556.0(W) X 323.2(H) X 20.6 (D) Typ. |
| Electrical Interface                                      |                      | Dual channel LVDS                   |
| Surface Treatment                                         |                      | AS Coating, 7H                      |
| Support Color                                             |                      | 16.7M colors (true 8-bit)           |
| Temperature Range<br>Operating<br>Storage (Non-Operating) | [°C]<br>[°C]         | -20 to +70<br>-30 to +80            |
| RoHS Compliance                                           |                      | RoHS Compliance                     |

## 2.2 General Touch Characteristics

| Item                                   |           | Unit | Specifications                                            |
|----------------------------------------|-----------|------|-----------------------------------------------------------|
| TP Thickness                           |           | [mm] | 3.8mm ± 0.3 mm<br>(Cover_2.9mm, sensor_0.7mm & OCR_0.2mm) |
| Cover Lens                             | O.D.      | [mm] | 556.0x 323.2                                              |
|                                        | Thickness | [mm] | 2.9                                                       |
| C/L Visual Area                        |           | [mm] | NA                                                        |
| Sensor Glass                           | O.D.      | [mm] | 554 x 321.2                                               |
|                                        | Thickness | [mm] | 0.7                                                       |
| TP Active Area                         |           | [mm] | 535.296 x 302.904                                         |
| Total Weight                           |           | g    | 1770 (max.)                                               |
| Chemical Strength                      |           | Mpa  | ≥ 400                                                     |
| Surface Hardness                       |           | H    | ≥ 7                                                       |
| Interface                              |           |      | USB 1.1 full speed                                        |
| Single / Multi-touch Accuracy          |           | [mm] | Center: ±2 Edge ±2.5                                      |
| Linearity                              |           | [mm] | Center ±2 Edge:±2.5                                       |
| The smallest distance between 2 points |           | [mm] | 15                                                        |
| Channel (X * Y)                        |           |      | 96 * 56                                                   |
| Report Rate (points /sec)              |           | [Hz] | >100                                                      |
| Power Consumption                      |           | [mW] | 750 (Max)                                                 |
| Operating System                       |           |      | Support windows 7                                         |
| Transmittance                          |           | %    | 87+/- 3                                                   |
| Surface Treatment                      |           |      | AS Coating                                                |

## 2.3 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>F</sub> = 45 mA | 210   | 260   | -     | 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)     | 75    | 89    | -     | 7       |
|                                             | [degree]             | CR = 10 (Left)         | 75    | 89    | -     |         |
|                                             | [degree]             | Vertical (Upper)       | 75    | 89    | -     |         |
|                                             | [degree]             | CR = 10 (Lower)        | 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    | -     |         |

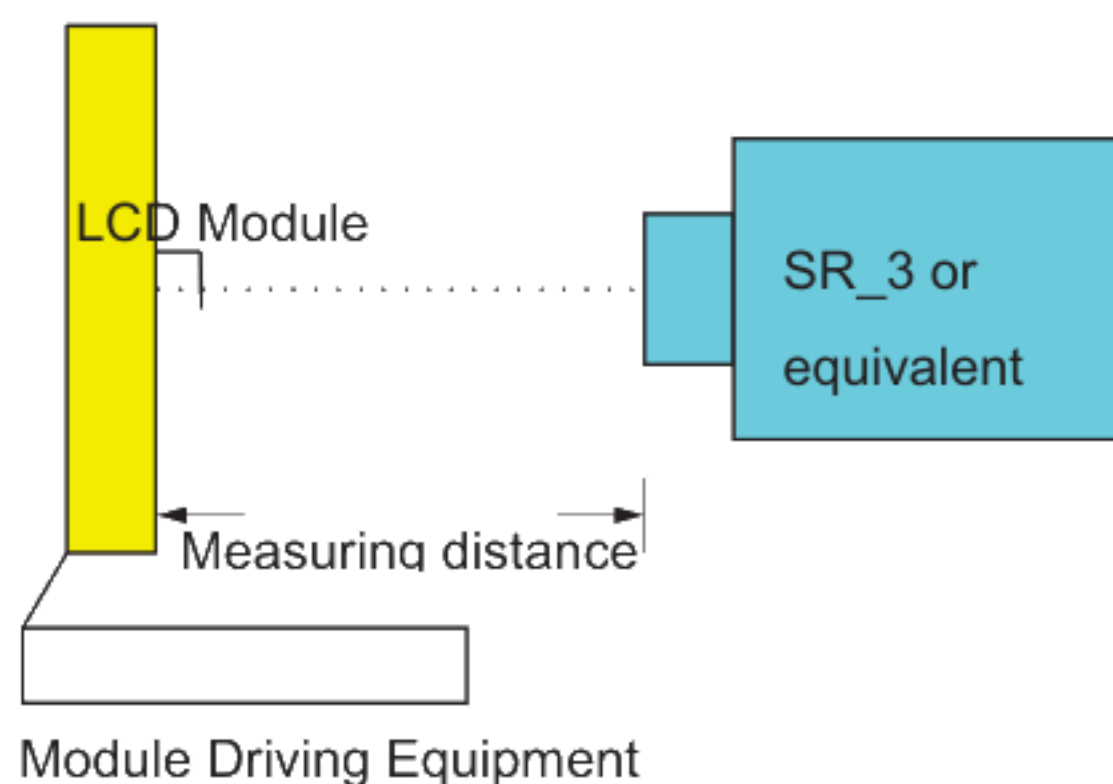
Note 1: Measurement method

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

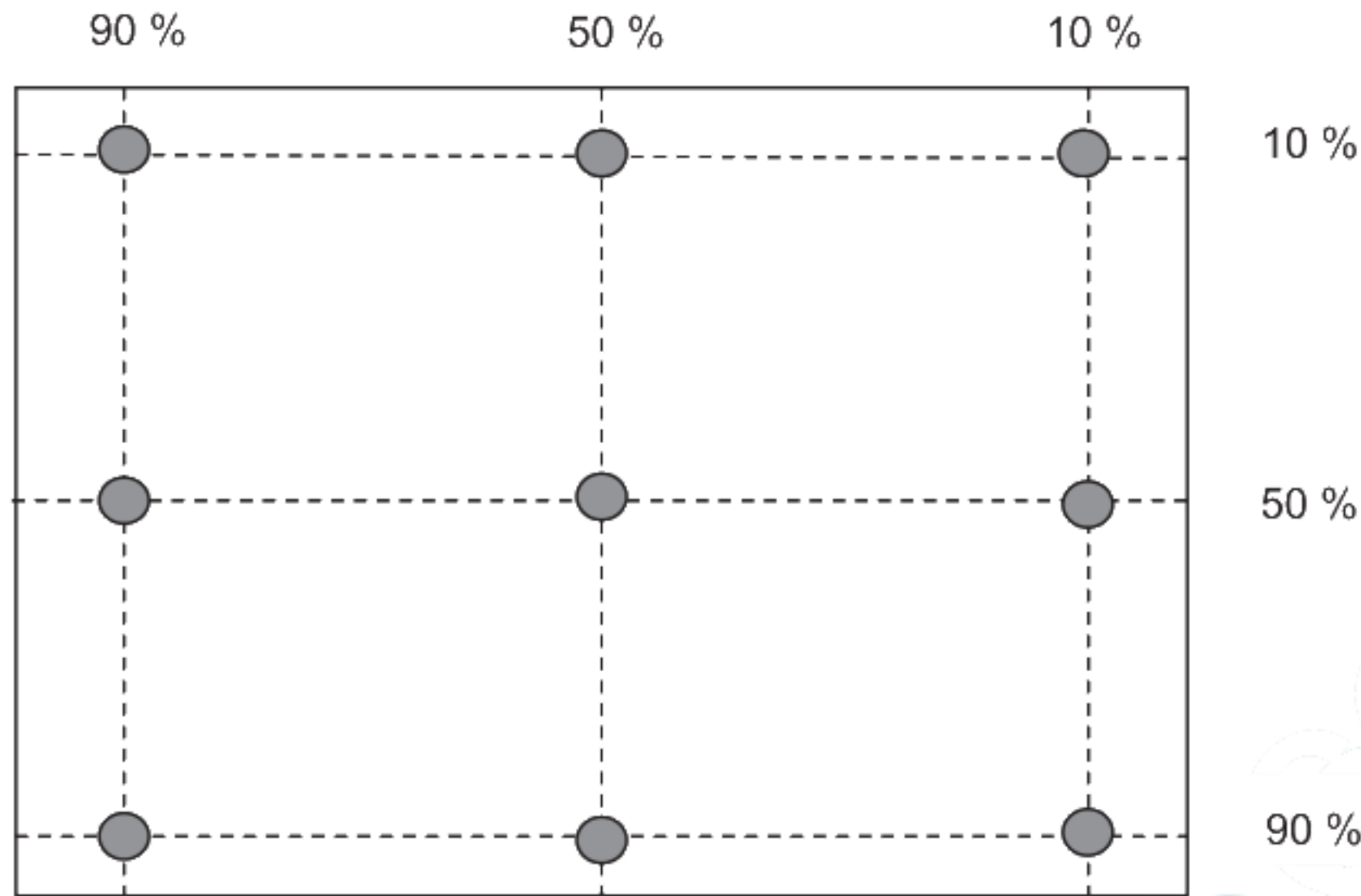
Aperture 2° with 50cm viewing distance

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):

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

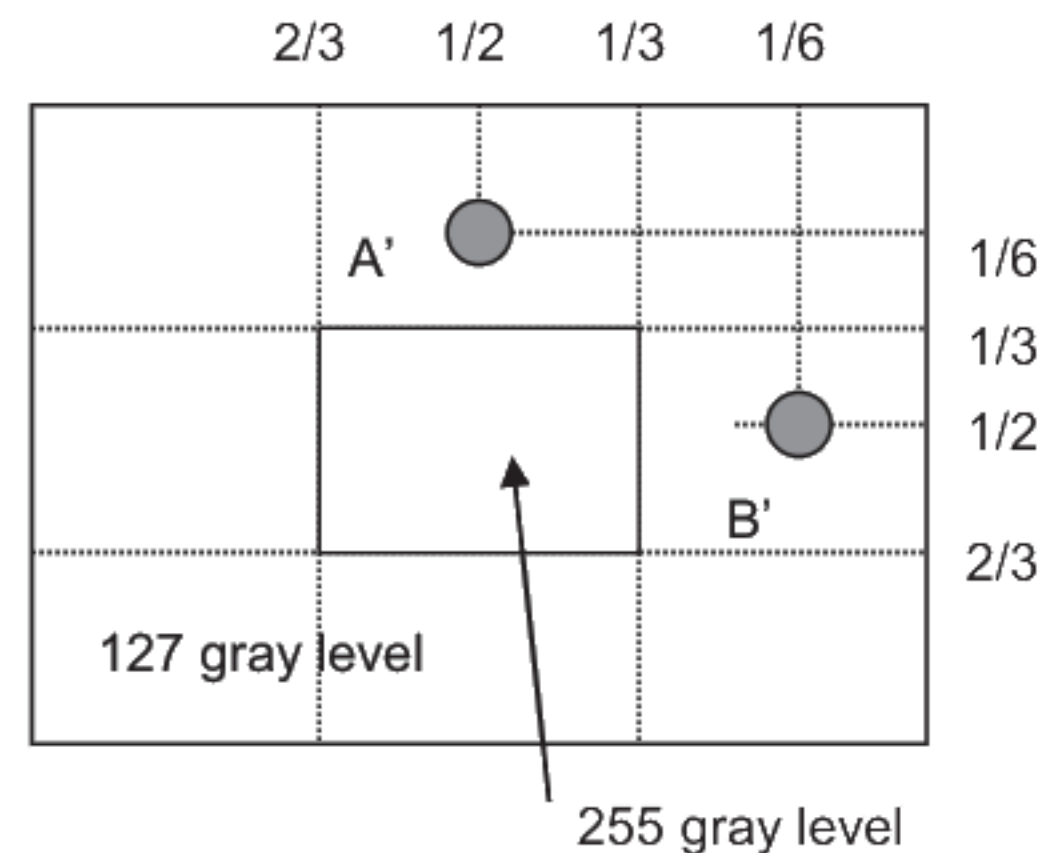
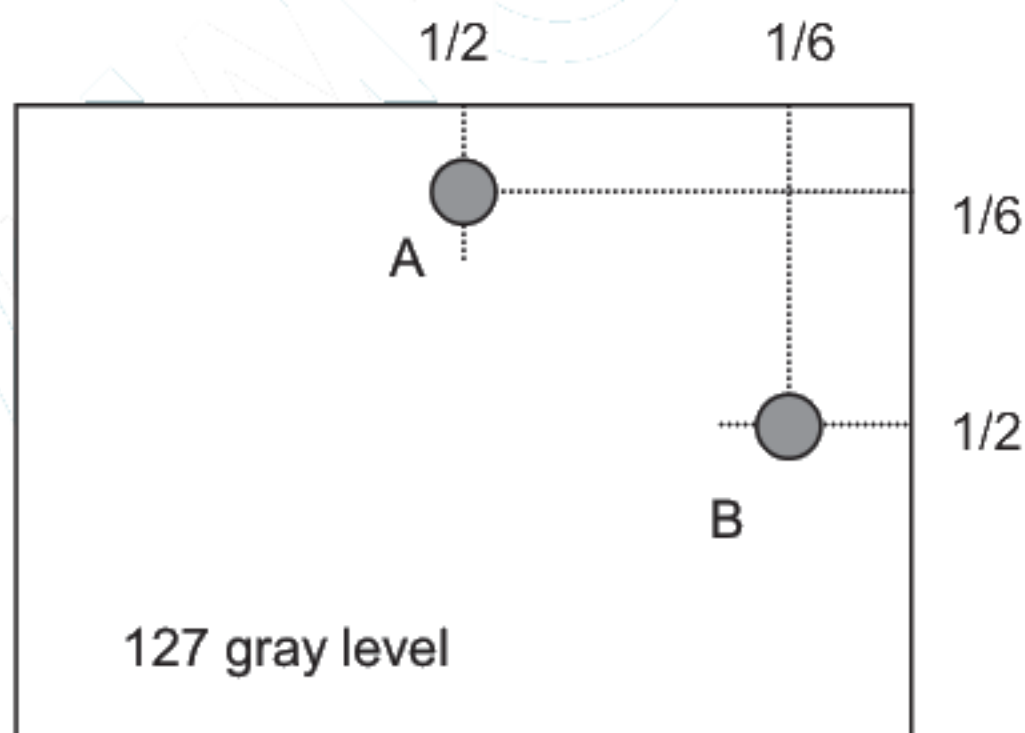
Note 5 : Definition of cross talk (CT)

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

Where

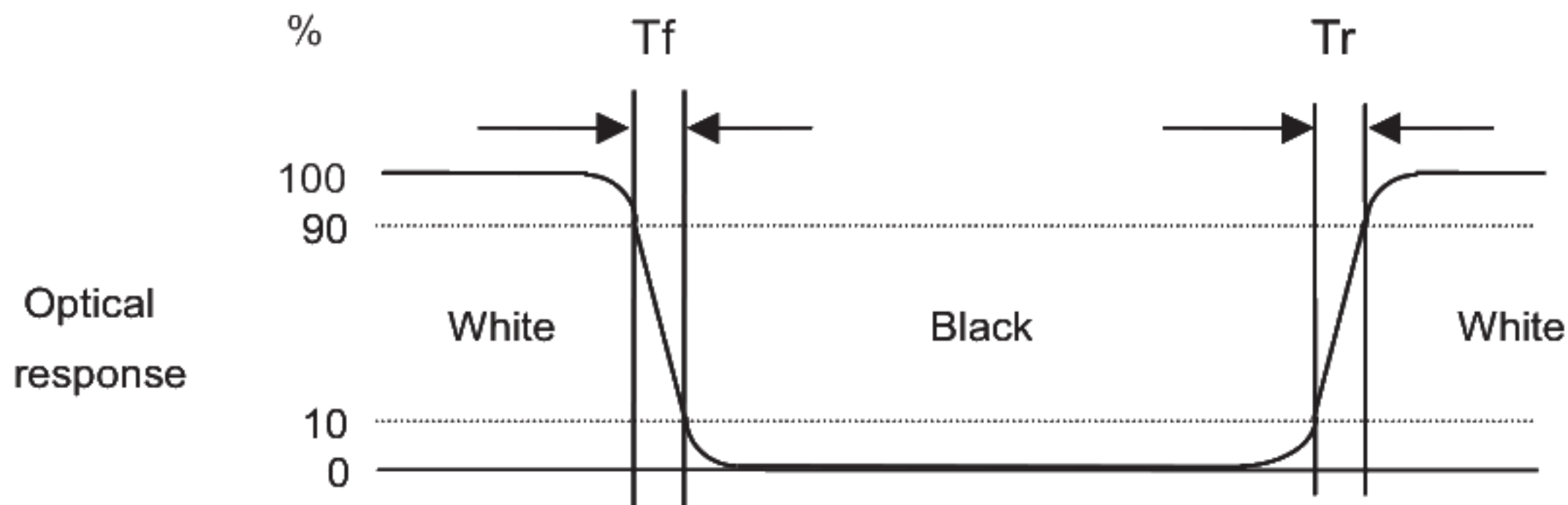
YA = Luminance of measured location without gray level 255 pattern (cd/m<sup>2</sup>)

YB = Luminance of measured location with gray level 255 pattern (cd/m<sup>2</sup>)



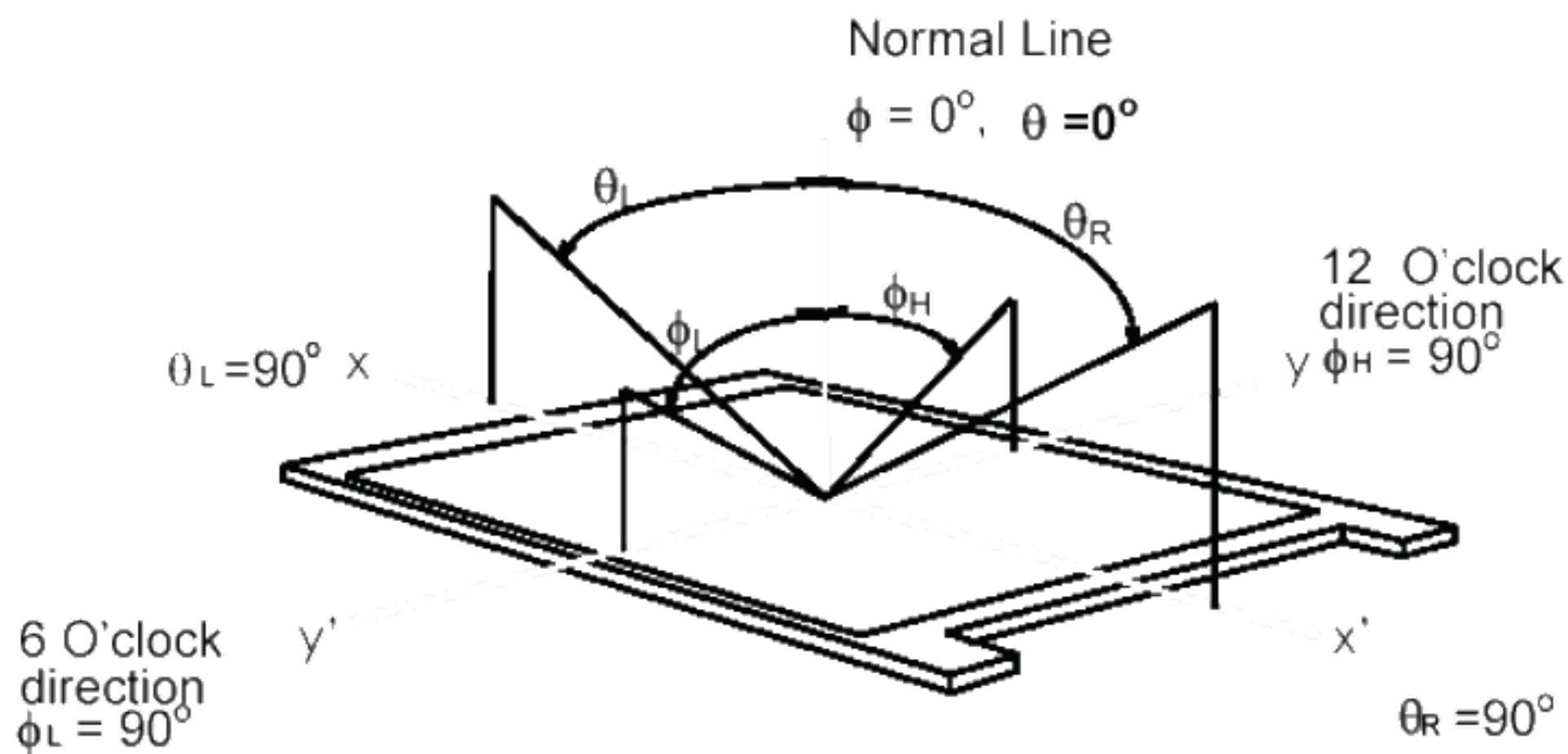
## Note 6: Definition of response time:

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.



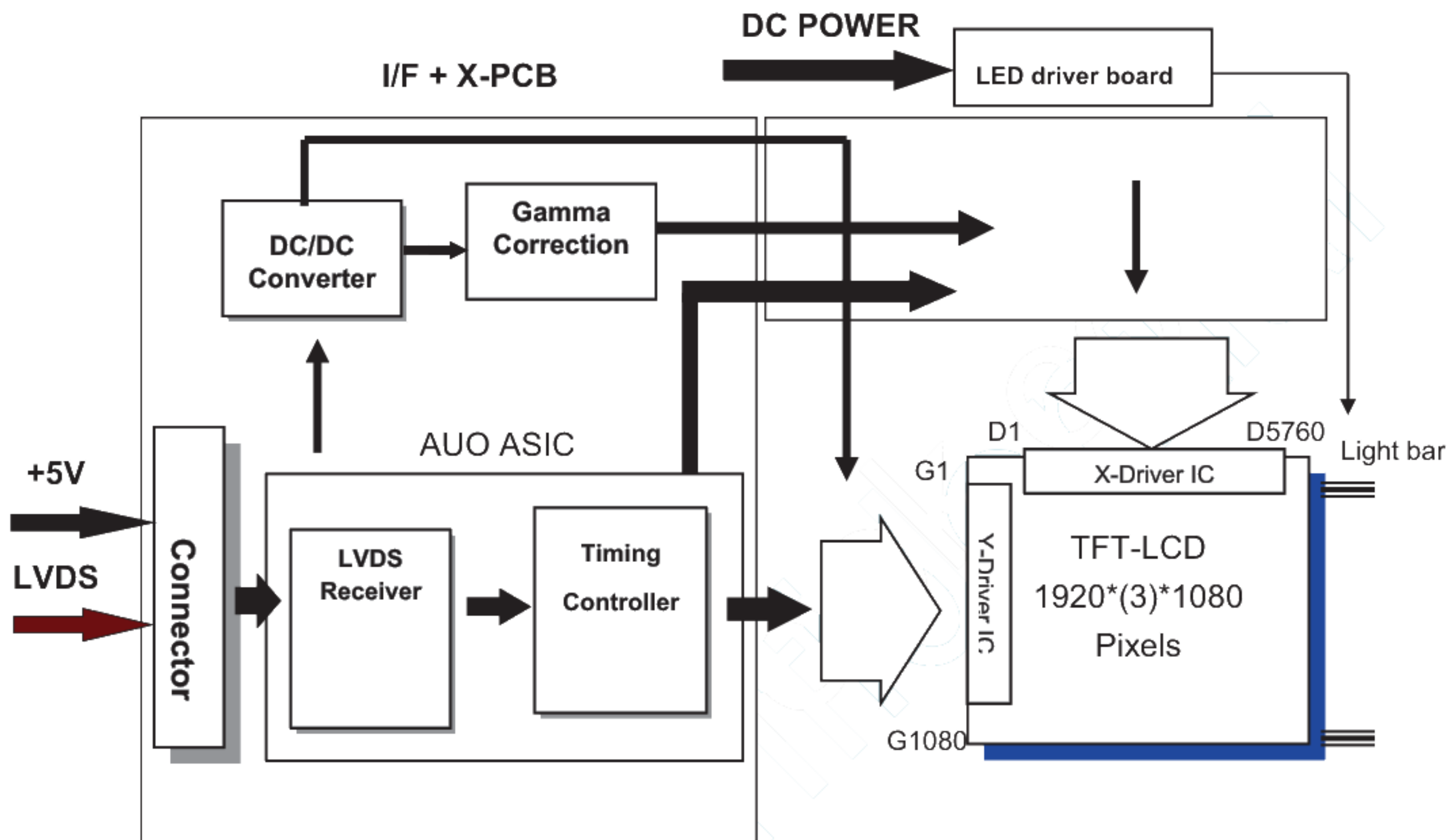
## Note 7: Definition of viewing angle

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 TTS 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).

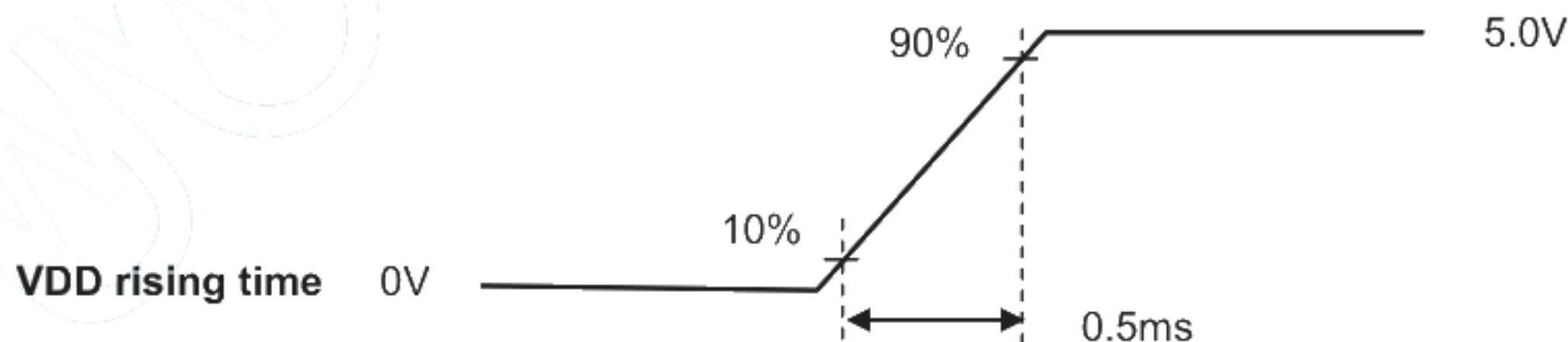
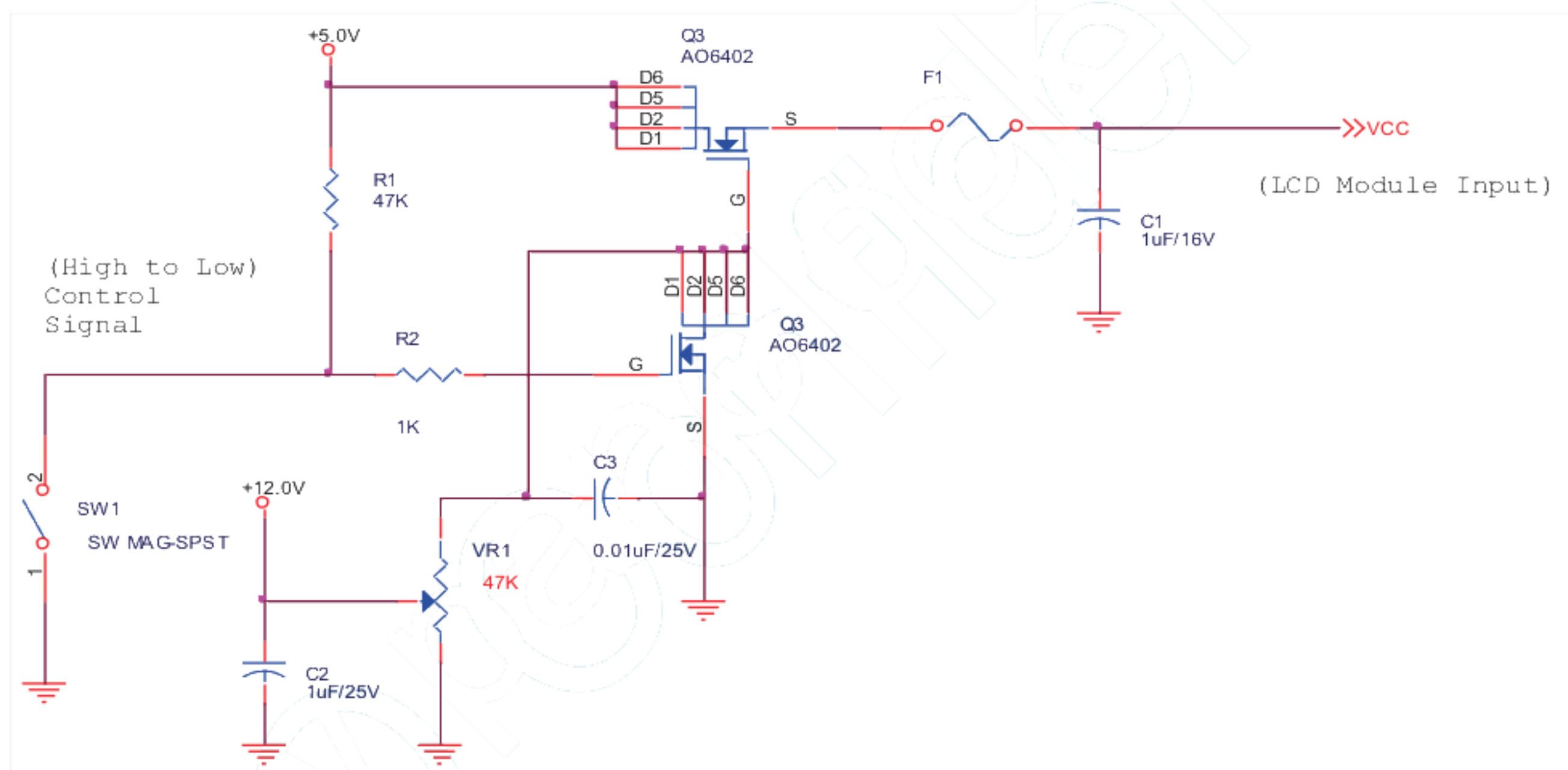
## 5. Electrical Characteristics

### 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:

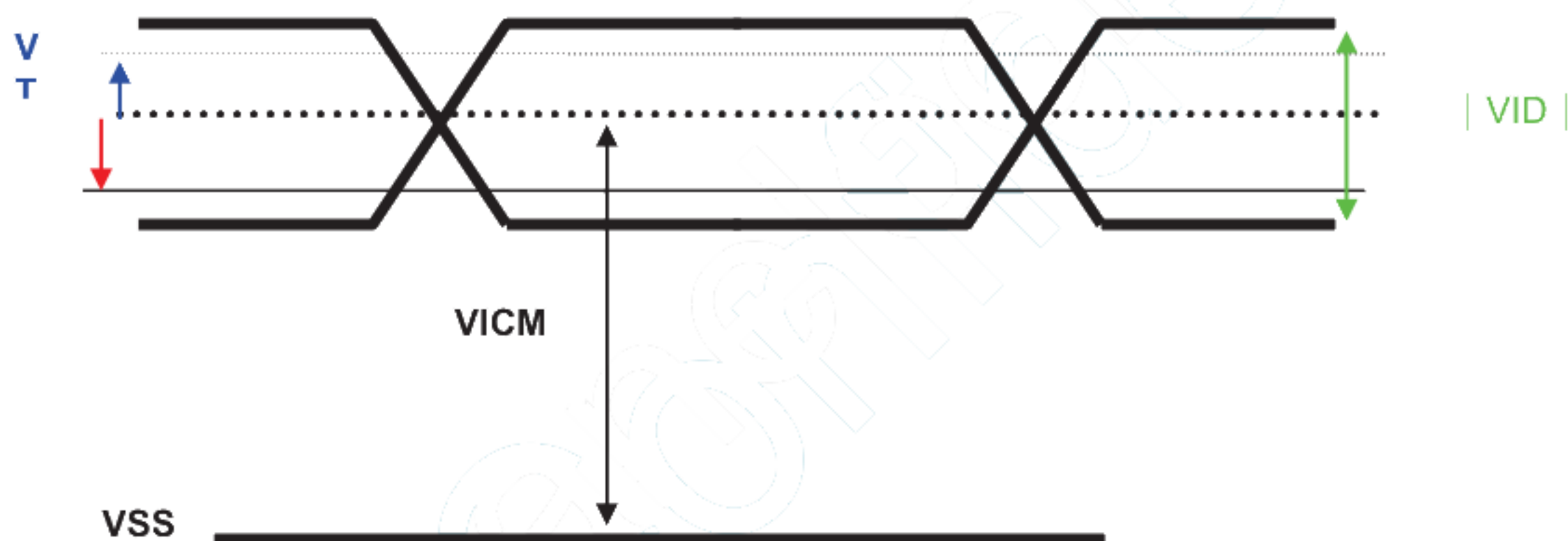


## 5.1.2 Signal Electrical Characteristics

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°C (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).

## 5.3 Touch Sensor

### 5.3.1 Power Specification

| Items                                               | Symbol  | Specifications |      |         | Unit | Notes    |
|-----------------------------------------------------|---------|----------------|------|---------|------|----------|
|                                                     |         | Min.           | Typ. | Max.    |      |          |
| Touch Panel Power Supply                            | VTSP    | 4.5            | 5    | 5.5     | V    |          |
| Input voltage                                       | VIH     | VDDx0.65       | -    | VDD+0.5 | V    | VDD=5.0V |
|                                                     | VIL     | -0.5           | -    | VDDx0.3 | V    | VDD=5.0V |
| Normal mode Current consumption @ Report rate 100Hz | INORMAL |                | 140  | 150     | mA   |          |

## 6. Signal Characteristic

### 6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.

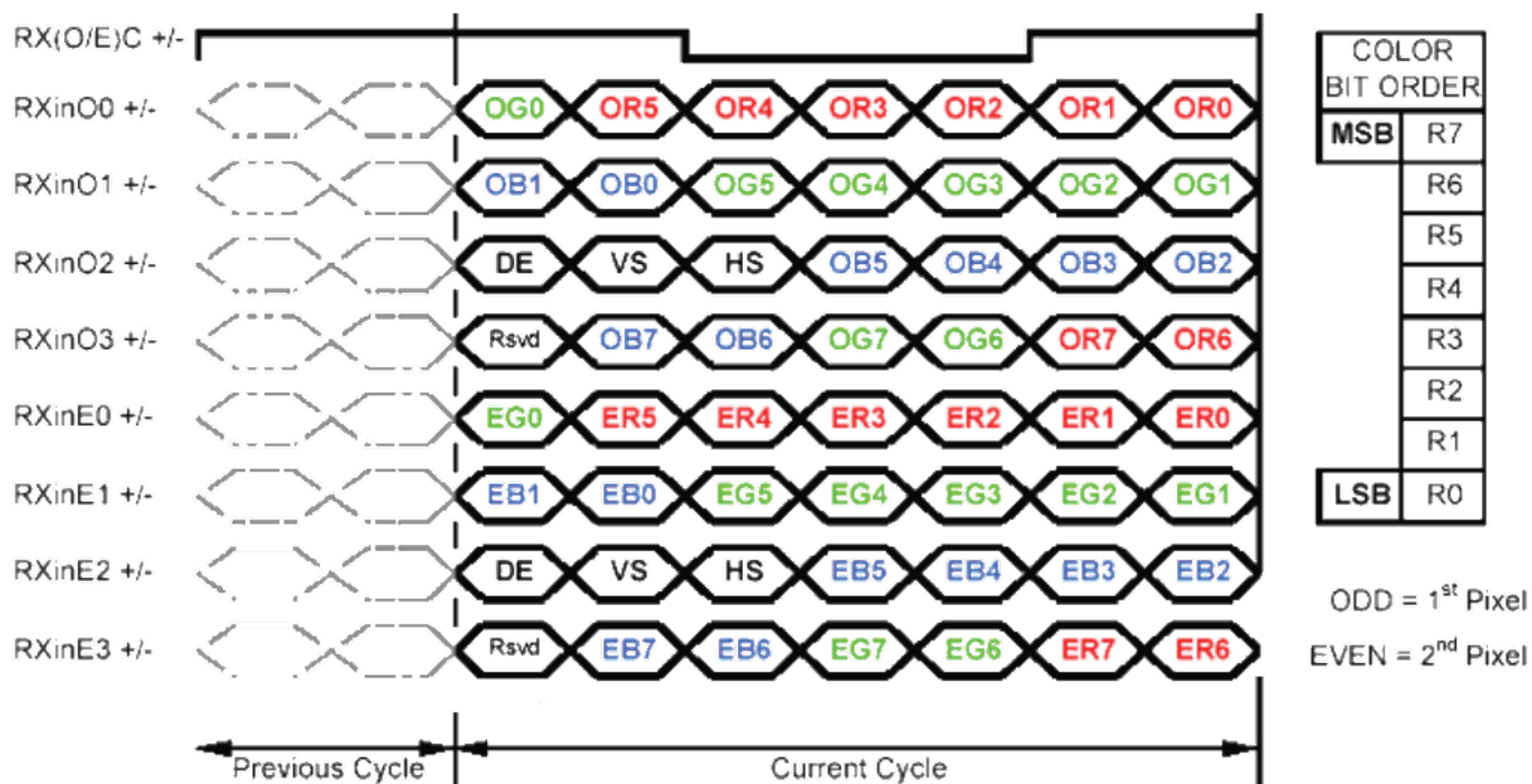
|           | 1                                                                       |   |   | 2                                                                       |   |   |                                                                              |  |  |  |  |  |  |  |  |  |  |  | 1919                                                                         |   |   | 1920                                                                         |   |   |
|-----------|-------------------------------------------------------------------------|---|---|-------------------------------------------------------------------------|---|---|------------------------------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|------------------------------------------------------------------------------|---|---|------------------------------------------------------------------------------|---|---|
| 1st Line  | R                                                                       | G | B | R                                                                       | G | B | · · · · ·                                                                    |  |  |  |  |  |  |  |  |  |  |  | R                                                                            | G | B | R                                                                            | G | B |
|           | ·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>· |   |   | ·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>· |   |   | ·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>· |  |  |  |  |  |  |  |  |  |  |  | ·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>· |   |   | ·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>·<br>· |   |   |
| 1080 Line | R                                                                       | G | B | R                                                                       | G | B | · · · · ·                                                                    |  |  |  |  |  |  |  |  |  |  |  | R                                                                            | G | B | R                                                                            | G | B |

## 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

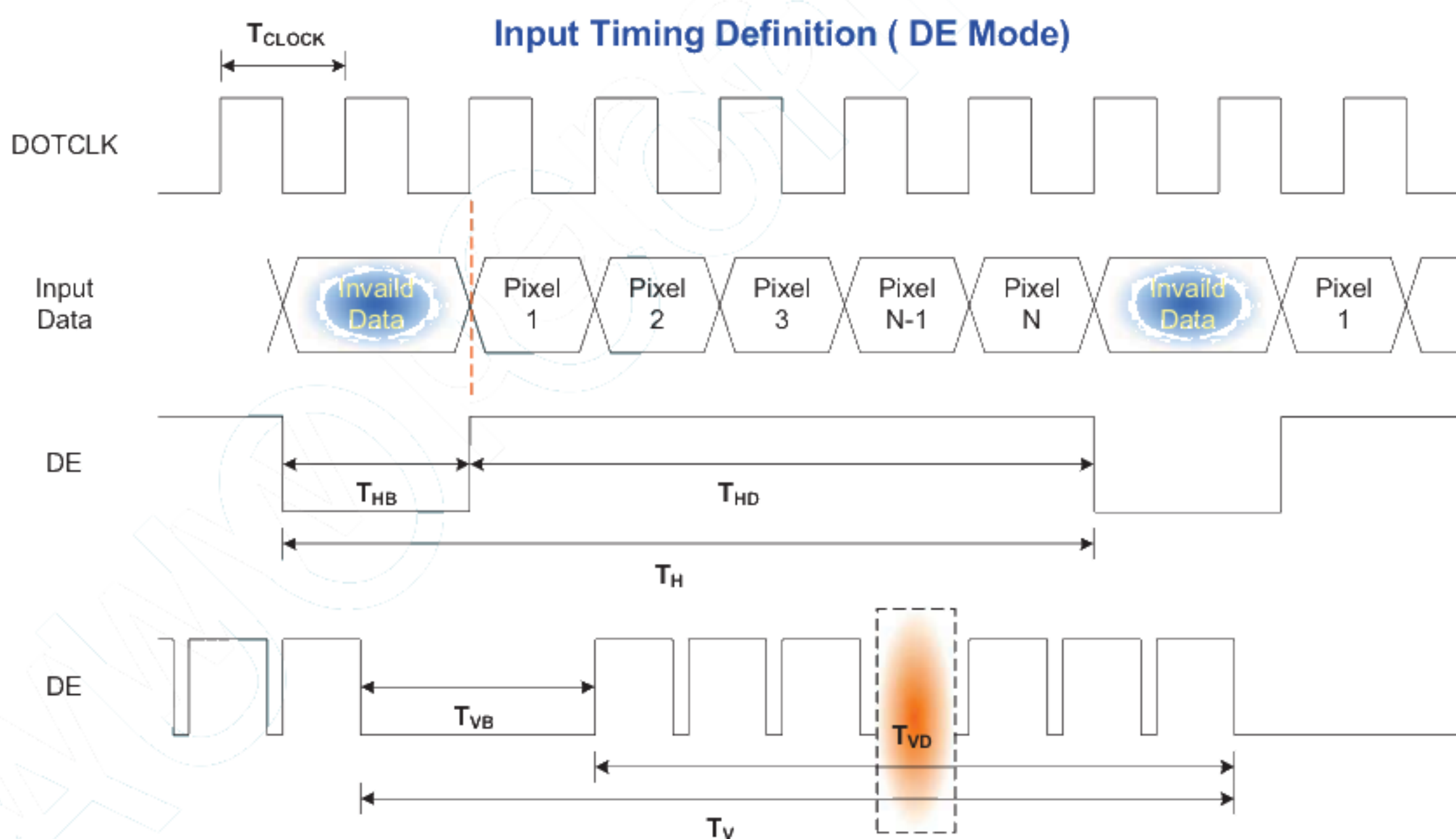
## 6.4 Interface Timing

### 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 |                    |

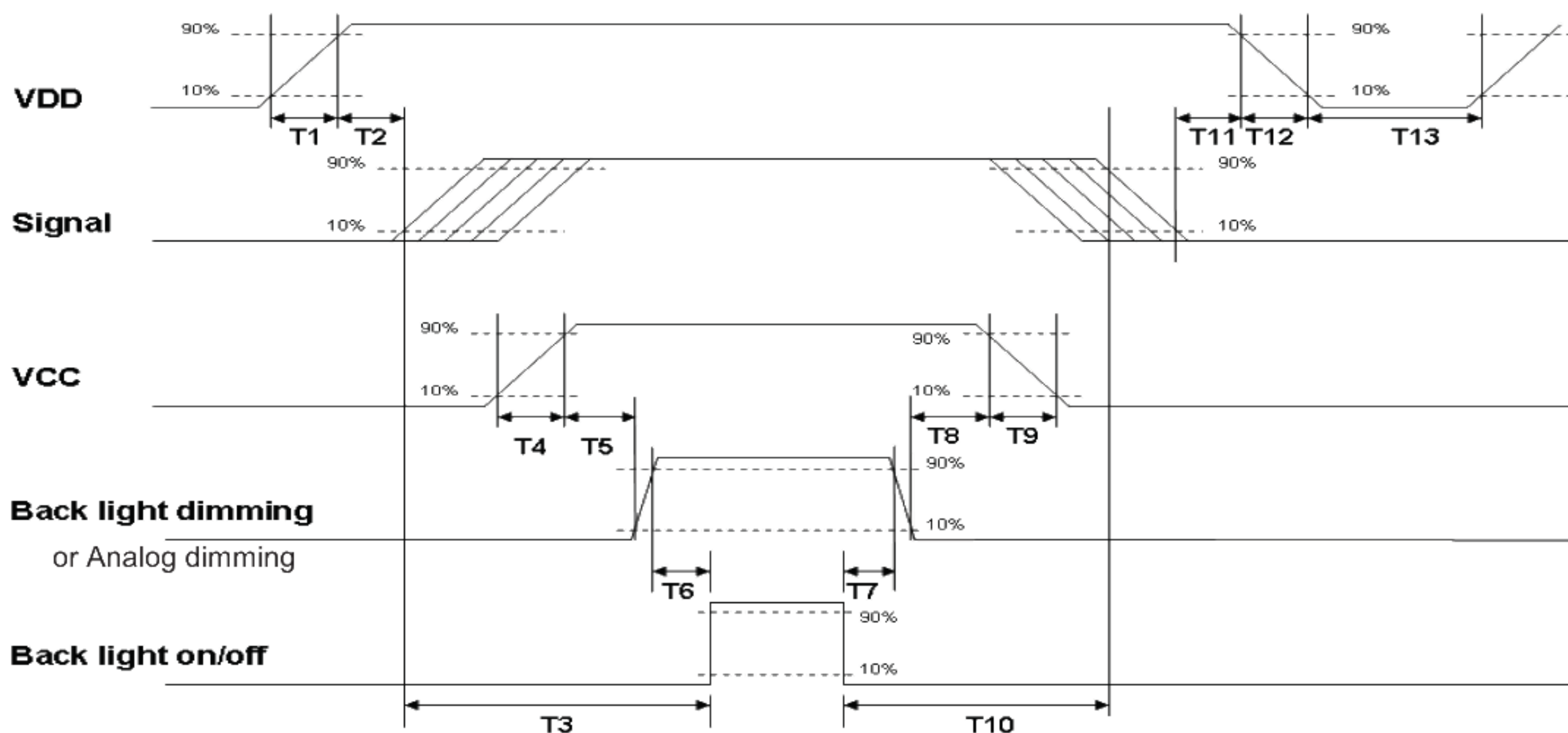
Note: DE mode only.

### 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.

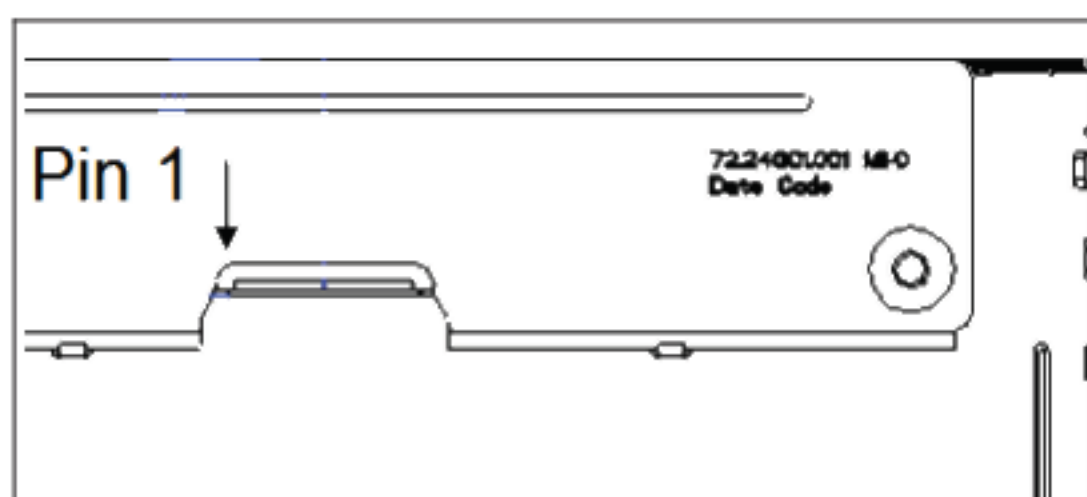
## 7. Connector & Pin Assignment

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         |

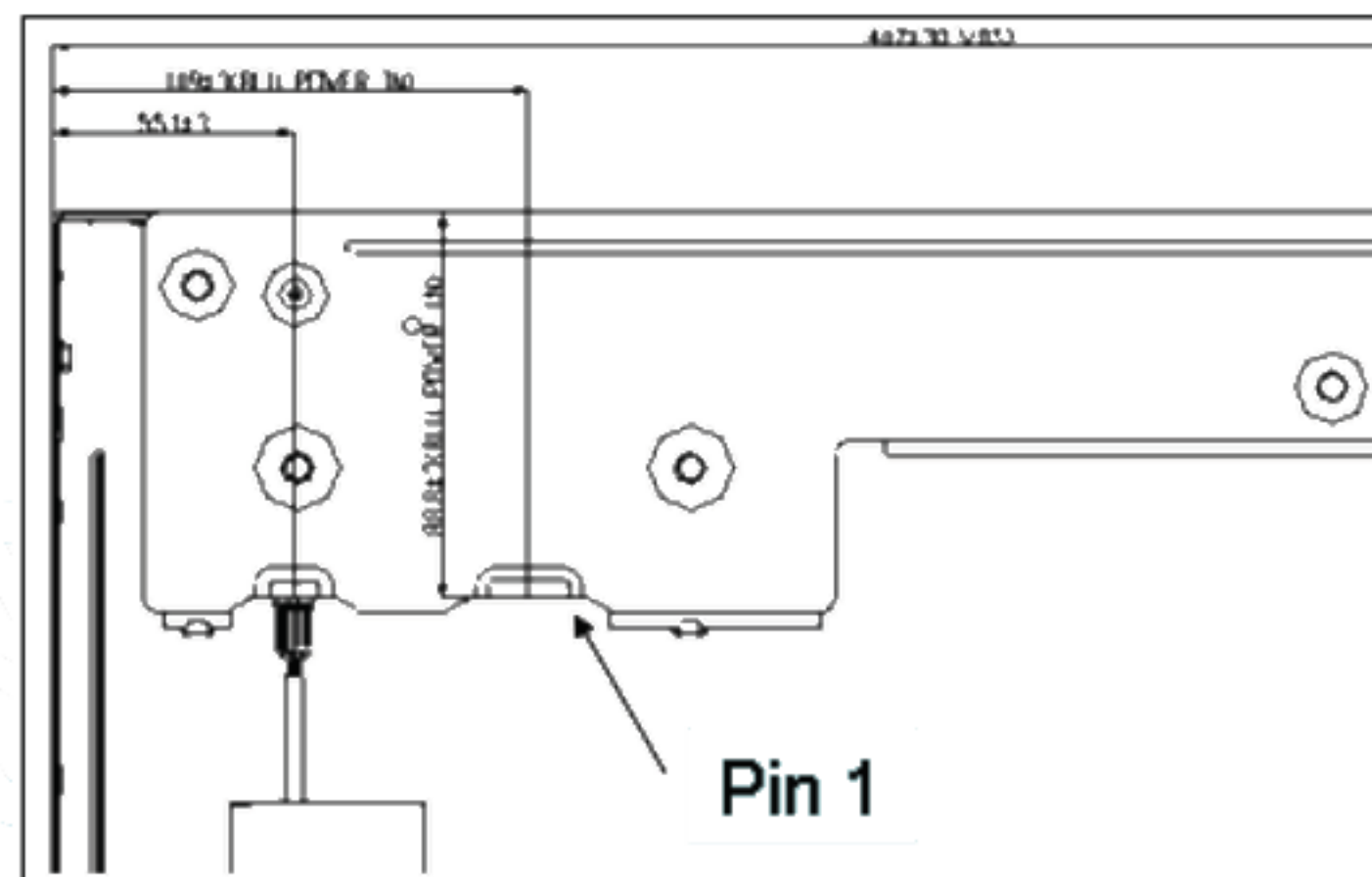
| Pin# | Signal Name | Pin# | Signal Name |
|------|-------------|------|-------------|
| 1    | RxOIN0-     | 2    | RxOIN0+     |
| 3    | RxOIN1-     | 4    | RxOIN1+     |
| 5    | RxOIN2-     | 6    | RxOIN2+     |
| 7    | GND         | 8    | RxOCLKIN-   |
| 9    | RxOCLKIN+   | 10   | RxOIN3-     |
| 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 |



## 7.3 Touch Driver Connector

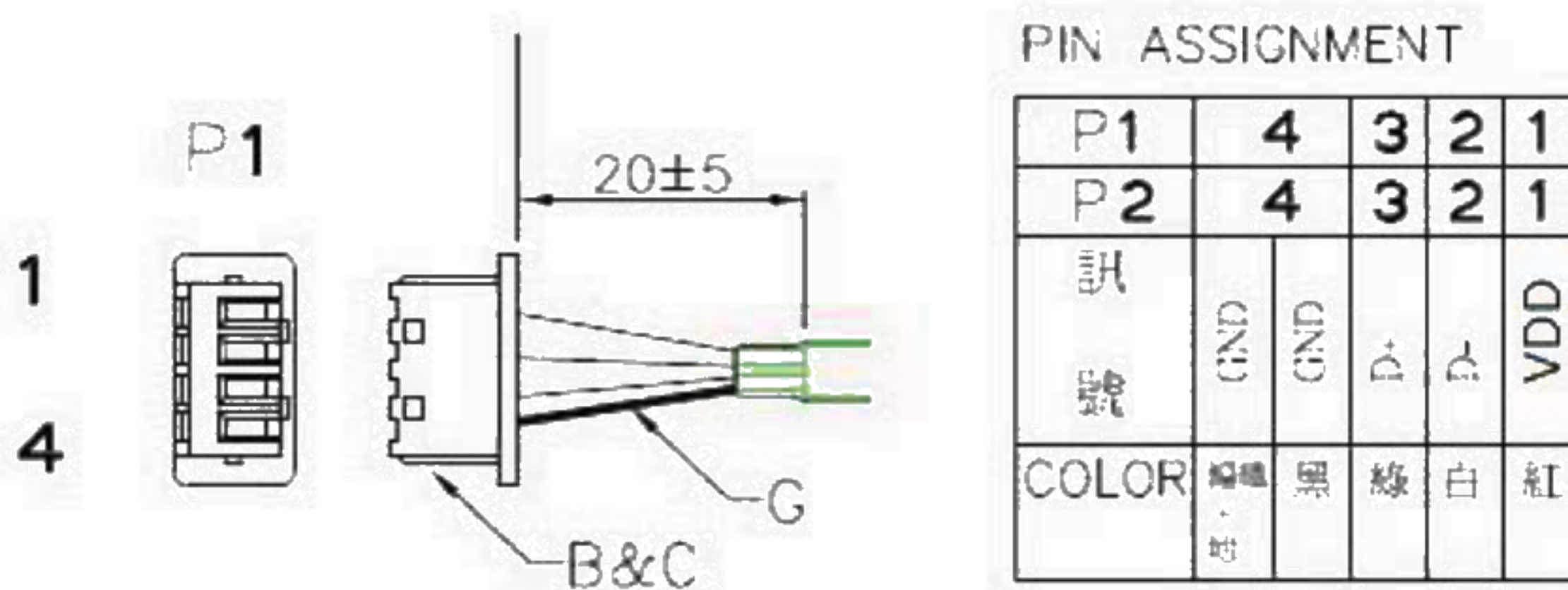
### 7.3.1 Touch Driver Connector

| Connector Name / Designation | TP Connector              |
|------------------------------|---------------------------|
| Manufacturer                 | Entery Industrial co. LTD |
| Type / Part Number           | 3802K-Q04N-01R            |

### 7.3.2 Pin Assignment

| Pin# | Symbol | Signal Name |
|------|--------|-------------|
| 1    | VDD    | Power 5V    |
| 2    | D-     | USB D-      |
| 3    | D+     | USB D+      |
| 4    | GND    | Ground      |

### 7.3.3 Connector Illustration



## 8. Reliability Test Criteria

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°C, 300hours                                                         |      |
| Low Temperature Operation (LTO)  | Ta= -20°C, 300hours                                                        |      |
| High Temperature Storage (HTS)   | Ta= 80°C, 300hours                                                         |      |
| Low Temperature Storage (LTS)    | Ta= -30°C, 300hours                                                        |      |
| Drop Test                        | Height: 46 cm, package test                                                |      |
| Thermal Shock Test (TST)         | -20°C/30min, 60°C/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.     |      |

Note 1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost  
Self-recoverable. No hardware failures.

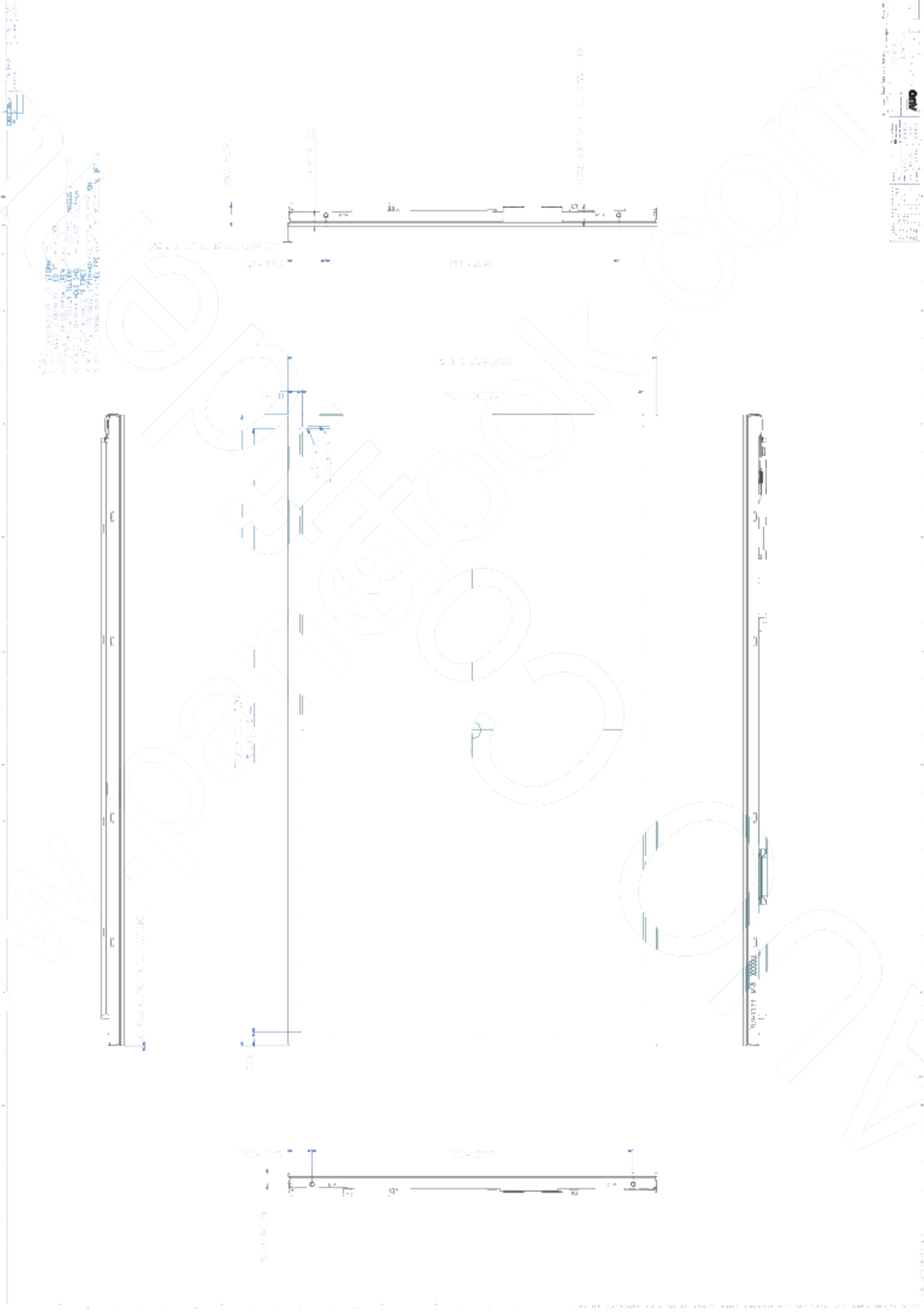
Note2:

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

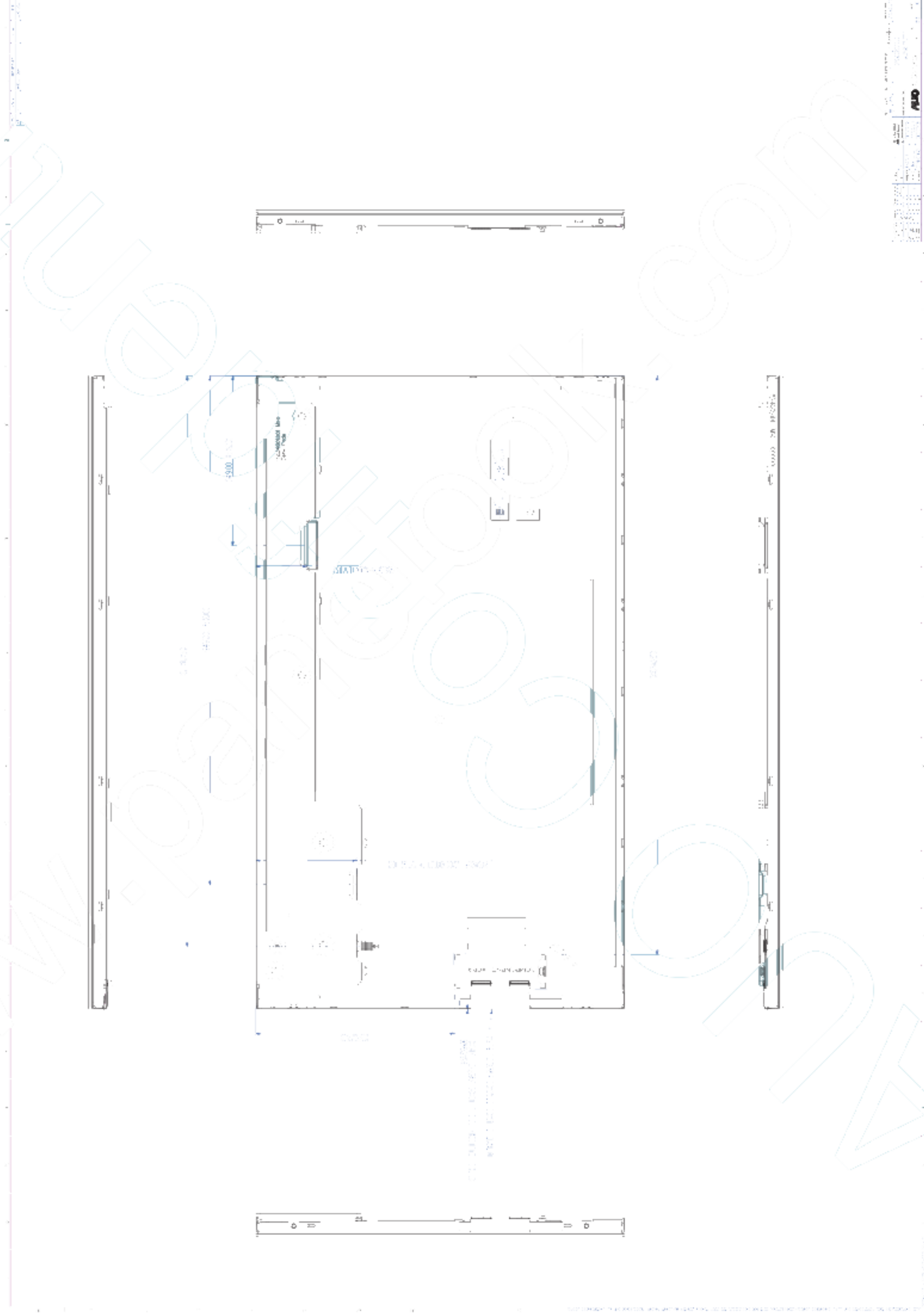
| Items       |                | Condition                    |                                                                |
|-------------|----------------|------------------------------|----------------------------------------------------------------|
| Touch panel | Ball Drop Test | 540g, 110 cm (center,point ) |                                                                |
|             | Hardness       | 7H                           | Loading:<br>500g,<br>Position:<br>VA area of<br>test<br>sample |

## 9. Mechanical Characteristics

### 9.1 Total solution Outline Dimension (Front View)

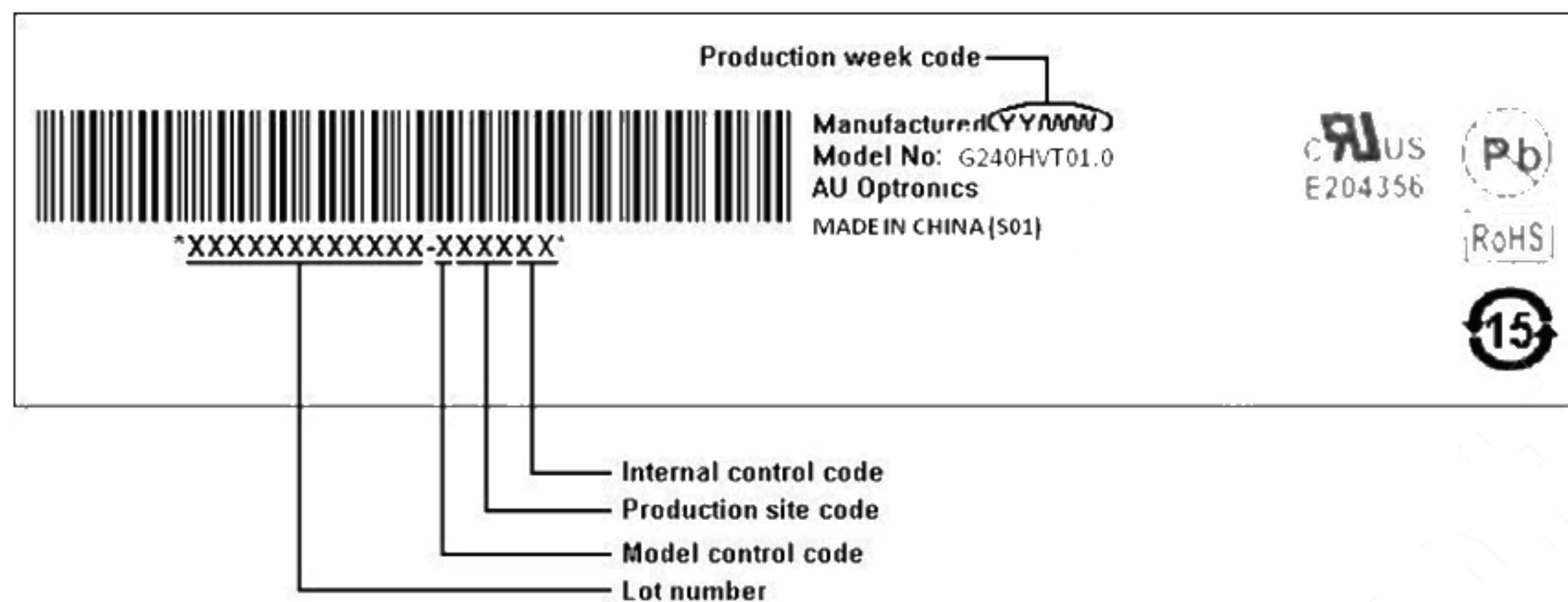


## 9.2 Total solution Outline Dimension (Rear View)

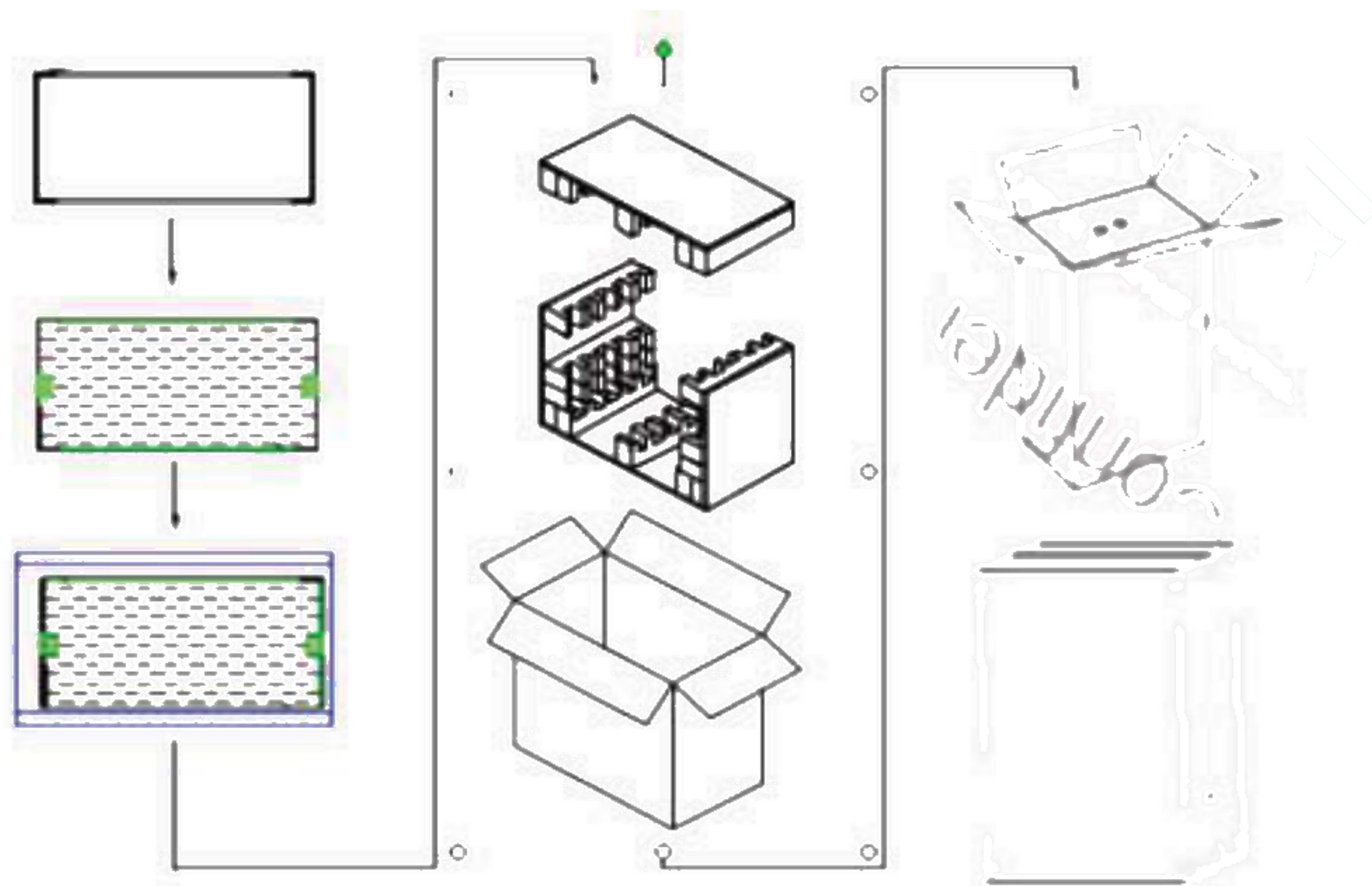


## 10. Label and Packaging

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



## 10.2 Carton Package



### 10.3 Palletizing

Max capacity : 5 TFT-LCD module per carton

Max weight: 19kg per carton

Outside dimension of carton: 404mm(L) \* 235mm(W) \* 653mm(H)

Pallet size : 820 mm \* 1000mm \* 132mm (M15)

#### Box stacked

Module by air : (2 \* 4) \* 2 layers , one pallet put 16 boxes , total 80pcs module

Module by sea : (2 \* 4) \* 2 layers , one pallet put 16 boxes , total 80 pcs module

Module by sea\_HQ : (2 \* 4) \* 2 layers + (2 \* 4) \* 1 layers, two pallet put 24 boxes, total 120 pcs module