MODEL NO. : P1210SVF1MB00

SPEC VERSION: 1.0

ISSUED DATE: 2021/5/6

■Preliminary Specification

□Final Product Specification

Customer :_____

| Approv d by | Notes |
|---|---|
| | |

TIANMA Confirmed :

| Prepared by | Checked by | Approved by |
|---|---|---|
| Anna Huang | ZhuGuanchen | DingXiaoxing |

This technical specification is subjected to change without notice

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# RECORD OF REVISION

| Rev | Issued Date | Description | Editor |
|---|---|---|---|
| 1.0 | 2021-5-6 | Preliminary Specification release | Anna Huang |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# 1 GENERAL SPECIFICATIONS

| Feature | | Spec |
|---|---|---|
| Display Spec. | Size | 12.1 inch |
| | Resolution | 800xRGBx600 |
| | Technology Type | SFT |
| | Pixel Configuration | RGB vertical stripe |
| | Pixel pitch(mm) | 0.3075(H) × 0.3075(V) |
| | Display Mode | TM with Normally Black |
| | Surface Treatment | Anti Glare |
| | Viewing Direction | All |
| Mechanical Characteristics | LCM (W x H x D) (mm) | 279.0 (H) ×209.0 (V) ×9.0 (D) |
| | Active Area(mm) | 246.0 (H) × 184.5 (V) (typ.) |
| | With /Without TSP | Without TSP |
| | Connection Type | Socket |
| | Weight (kg) | TBD |
| Electrical Characteristics | Interface | LVDS 1 port |
| | Color Depth | 16.7M/262K |

Note 1: Requirements on Environmental Protection: RoHS

Note 2: LCM weight tolerance: ± 5%

# 2 Input/Output Terminals

## 2.1 LVDS

CN1: MSB240420HE (Produced by STM) or equivalent.

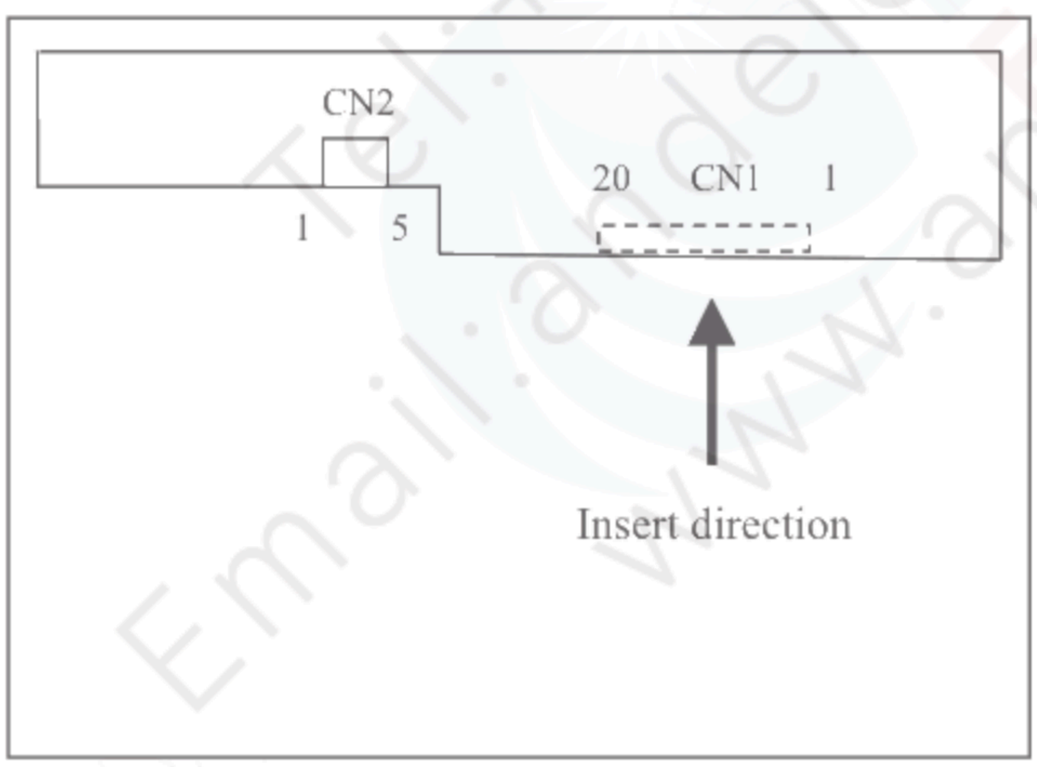
| Pin | Name | Description |
|---|---|---|
| 1 | VCC | 3.3V Power Supply |
| 2 | VCC | 3.3V Power Supply |
| 3 | GND | Ground |
| 4 | 6-8Bit SET | Select 6 or 8 Bits LVDS Input (VCC:8Bits ; GND/NC: 6Bits) |
| 5 | RIN0- | Negative(-) LVDS differential data input |
| 6 | RIN0+ | Positive(+) LVDS differential data input |
| 7 | GND | Ground |
| 8 | RIN1- | Negative(-) LVDS differential data input |
| 9 | RIN1+ | Positive(+) LVDS differential data input |
| 10 | GND | Ground |
| 11 | RIN2- | Negative(-) LVDS differential data input |
| 12 | RIN2+ | Positive(+) LVDS differential data input |
| 13 | GND | Ground |
| 14 | CLKIN- | Clock Signal(-) |
| 15 | CLKIN+ | Clock Signal(+) |
| 16 | GND | Ground |
| 17 | RIN3- | Negative(-) LVDS differential data input<br>(Used for 8Bits LVDS Input; NC for 6Bits) |
| 18 | RIN3+ | Positive(+) LVDS differential data input<br>(Used for 8Bits LVDS Input; NC for 6Bits) |
| 19 | REVERSE | Display Reversed Function<br>(VCC: Display Reverse; GND/NC: Normal Display) |
| 20 | NC/GND | Test Function Pin(Do not set this pin to High) |

## 2.2 BACKLIGHT

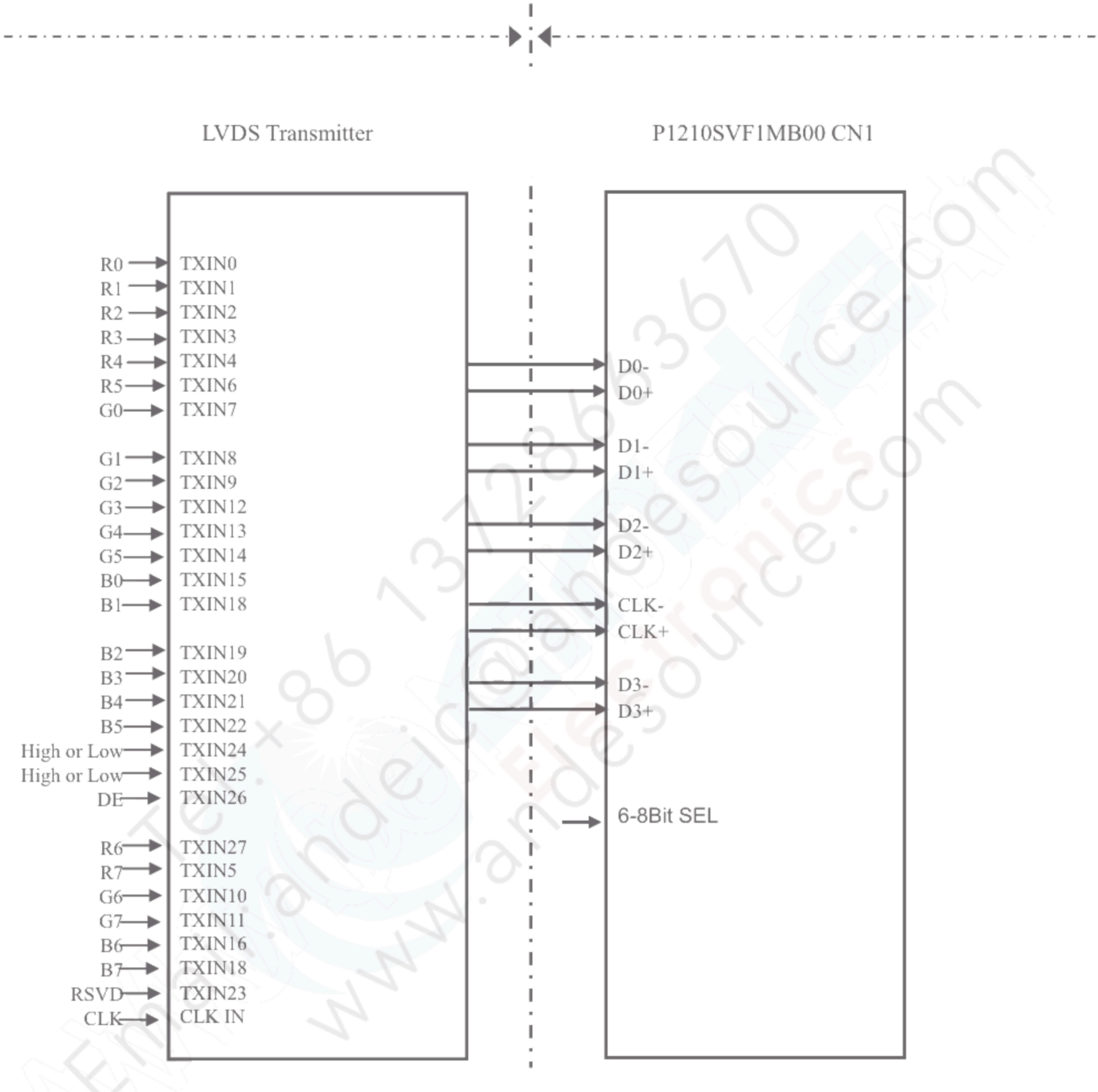
CN2: MSB24038P5 (Produced by STM) or equivalent.

| Pin | Symbol | Signal Name |
|---|---|---|
| 1 | VDD | 12V |
| 2 | GND | GND |
| 3 | Enable | 5V-On / 0V-Off |
| 4 | Dimming | PWM Dimming |
| 5 | NC | NC |

## 2.3 POSITION OF PLUGS AND A SOCKET



## 2.4 CONNECTION BETWEEN RECEIVER AND TRANSMITTER FOR LVDS




Note1: The lowest bit (R0, G0, B0), the upper bit (R7, G7, B7)

Note2:Connecting cable between LCD panel's connector and transmitter should use 100Ω twisted line.

Note3: If only Hsync and Vsync, the product don't work. Make sure DE signal has been input.

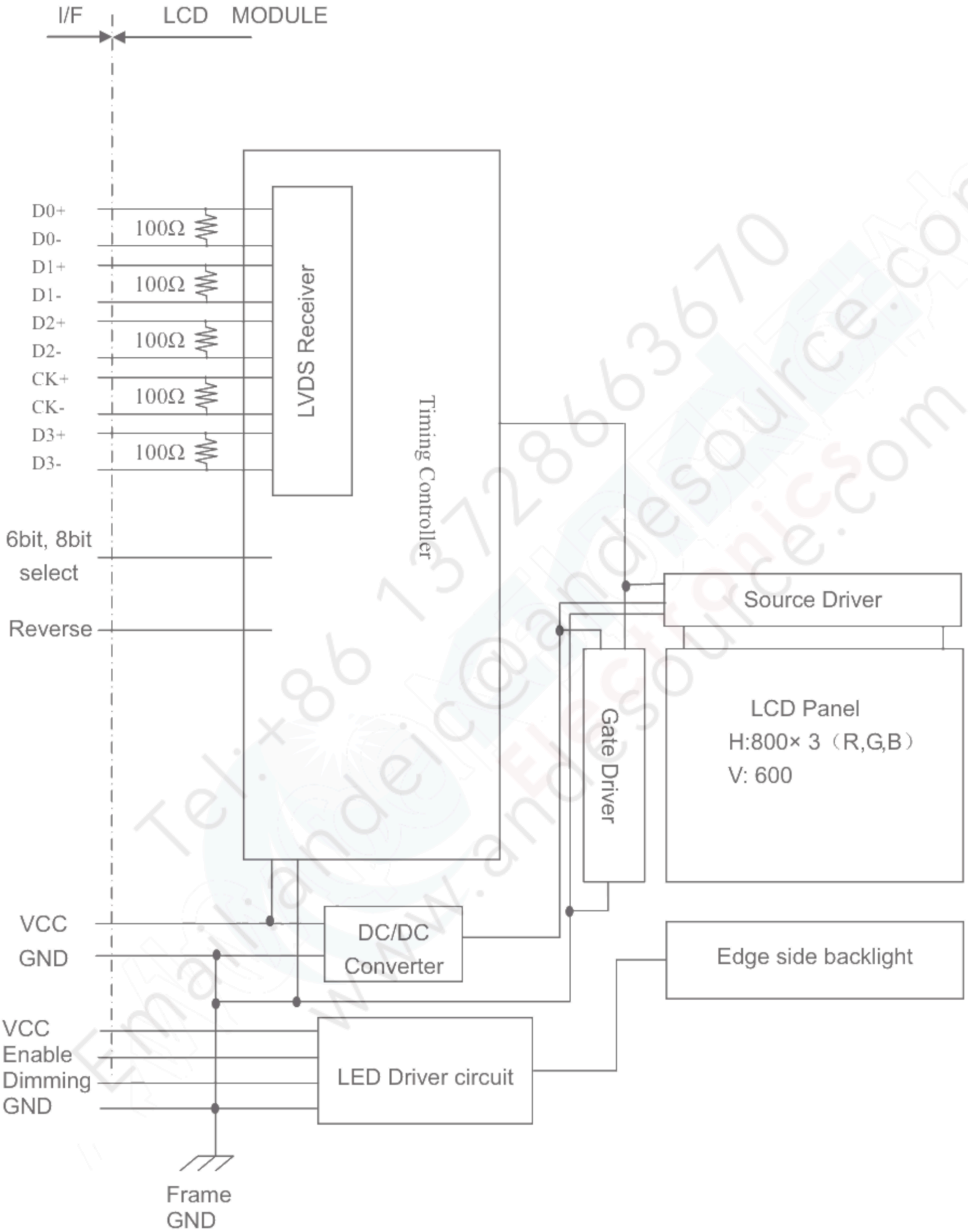
# 3 ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min | Max | Unit | Remark |
|---|---|---|---|---|---|
| LCD Power Voltage | VCC | -0.5 | 5.0 | V | |
| Backlight Power Voltage | VDD | -0.3 | 33 | V | |
| Backlight Input Voltage | $V_{IN\_BL}$ | -0.3 | 5.5 | V | Note1 |
| Operating Temperature | $T_{OPR}$ | -20 | 70 | ℃ | |
| Storage Temperature | $T_{STG}$ | -30 | 80 | ℃ | |

**Table 3.1 absolute maximum rating**

Note1: Backlight Input voltage include Dimming, Enable.

# 4 Electrical Characteristics(TBD)




Note1: System ground (GND), Frame ground in the product should be connected together in customer equipment.

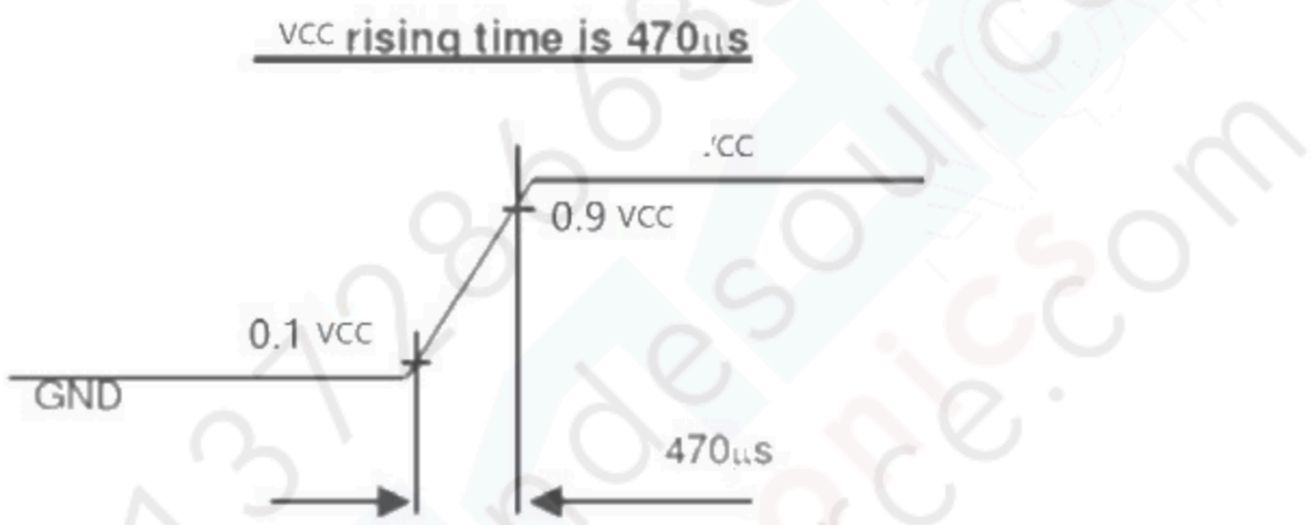
## 4.1 DRIVING FOR LCD

| Parameter | Symbol | min. | typ. | max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Power supply voltage | VCC | (3.0) | 3.3 | (3.6) | V | - |
| Power supply current | ICC | - | (300) | TBD | mA | at VCC = 3.3V<br>Note 1 |
| Permissible ripple voltage | VRP | | | 200 | mV | VCC |
| Rush current | $I_{rush}$ | | | TBD | A | Note3 |

Note 1: All white pattern

Note 2: Common mode voltage for LVDS receiver

Note 3: Measurement Conditions:



## 4.2 DRIVING FOR BACKLIGHT

(Ta=25°C) Note1

| Item | | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Backlight power supply voltage | | VDD | 11.8 | 12 | 13.2 | V | |
| Backlight power supply current | | I_Total | - | (1000) | - | mA | Note1 |
| Backlight power consumption | | P_Total | - | (12) | - | W | |
| Input voltage for Dimming | High level | - | 1.5 | - | 5 | V | Input voltage for Dimming |
| | Low level | - | - | - | 0.8 | V | |
| Input voltage for Enable | High level | - | 1.2 | - | 5 | V | Input voltage for Enable |
| | Low level | - | - | - | 0.35 | V | |
| Dimming frequency | | Fpwm | 200 | - | 10K | HZ | |
| Dimming duty | | D | 5 | - | 100 | % | Note2 |
| Inrush current | | Inrush | - | - | TBD | A | Note5 |
| LED Life Time | | | | 50000 | | H | Note6 |

Note 1: I_Total is the power supply current of LED driver, P_Total is the power consumption of LED driver and backlight.

Note 2: According to LED driver IC characteristics, the minimum value of VBR duty may vary with VBR frequency, higher the frequency, bigger the duty.

Note 3: Optical performance should be evaluated at Ta=70℃ only with 100%PWM.

If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

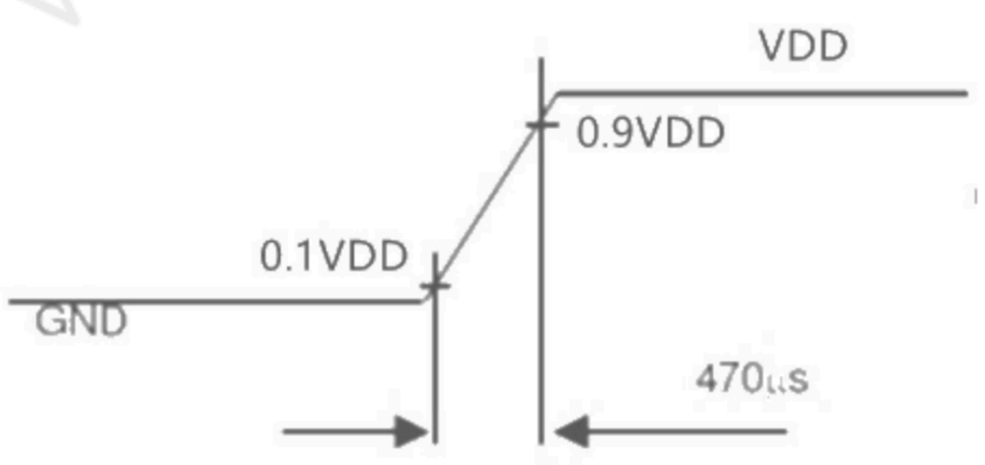
Operating life means brightness goes down to 50% of initial brightness.

Operating life time is estimated data.

Note 4: Ta=25℃ only with 100%PWM, the other condition should follow Note3.

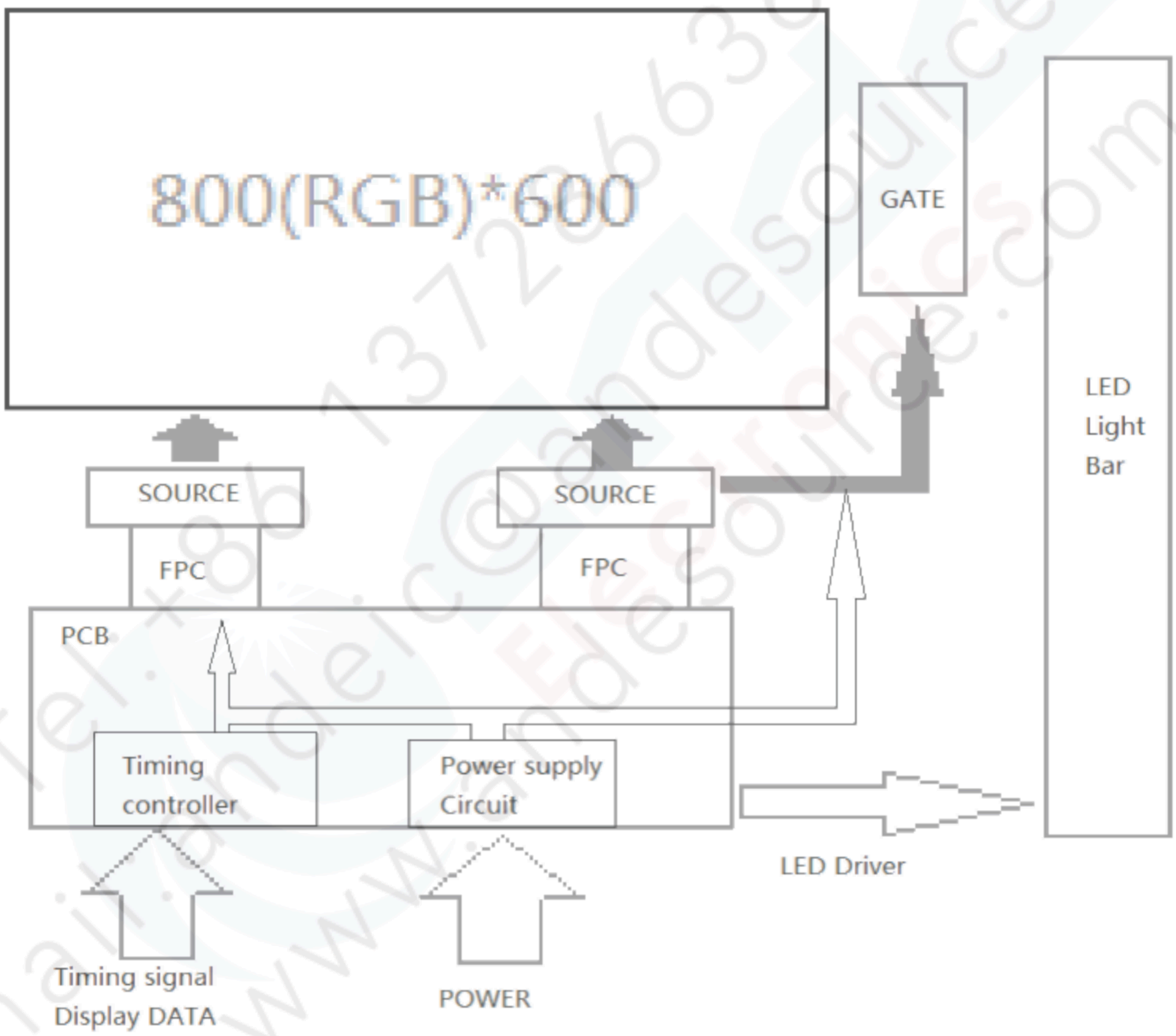
Note 5: In-rush current test conditions:

**VDD rising time is 470μs**



Note6: Optical performance should be evaluated at Ta=25℃.Only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is an estimated data.

## 4.3 TFT Block Diagram



## 5 DISPLAY COLORS AND INPUT DATA SIGNALS

This product can display in equivalent to 16.7M colors in 256 scales. Also the relation between display colors and input data signals is as the following table.

| Display colors | | Data signal （0:Low level，1:High Level） | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Color | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| Red grayscale | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Dark | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ↑ | : | | | | | | | | : | | | | | | | | : | | | | | | | |
| | ↓ | : | | | | | | | | : | | | | | | | | : | | | | | | | |
| | Bright | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 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 grayscale | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ↑ | : | | | | | | | | : | | | | | | | | : | | | | | | | |
| | ↓ | : | | | | | | | | : | | | | | | | | : | | | | | | | |
| | Bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 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 grayscale | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | ↑ | : | | | | | | | | : | | | | | | | | : | | | | | | | |
| | ↓ | : | | | | | | | | : | | | | | | | | : | | | | | | | |
| | Bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue | 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 TIMING Chart

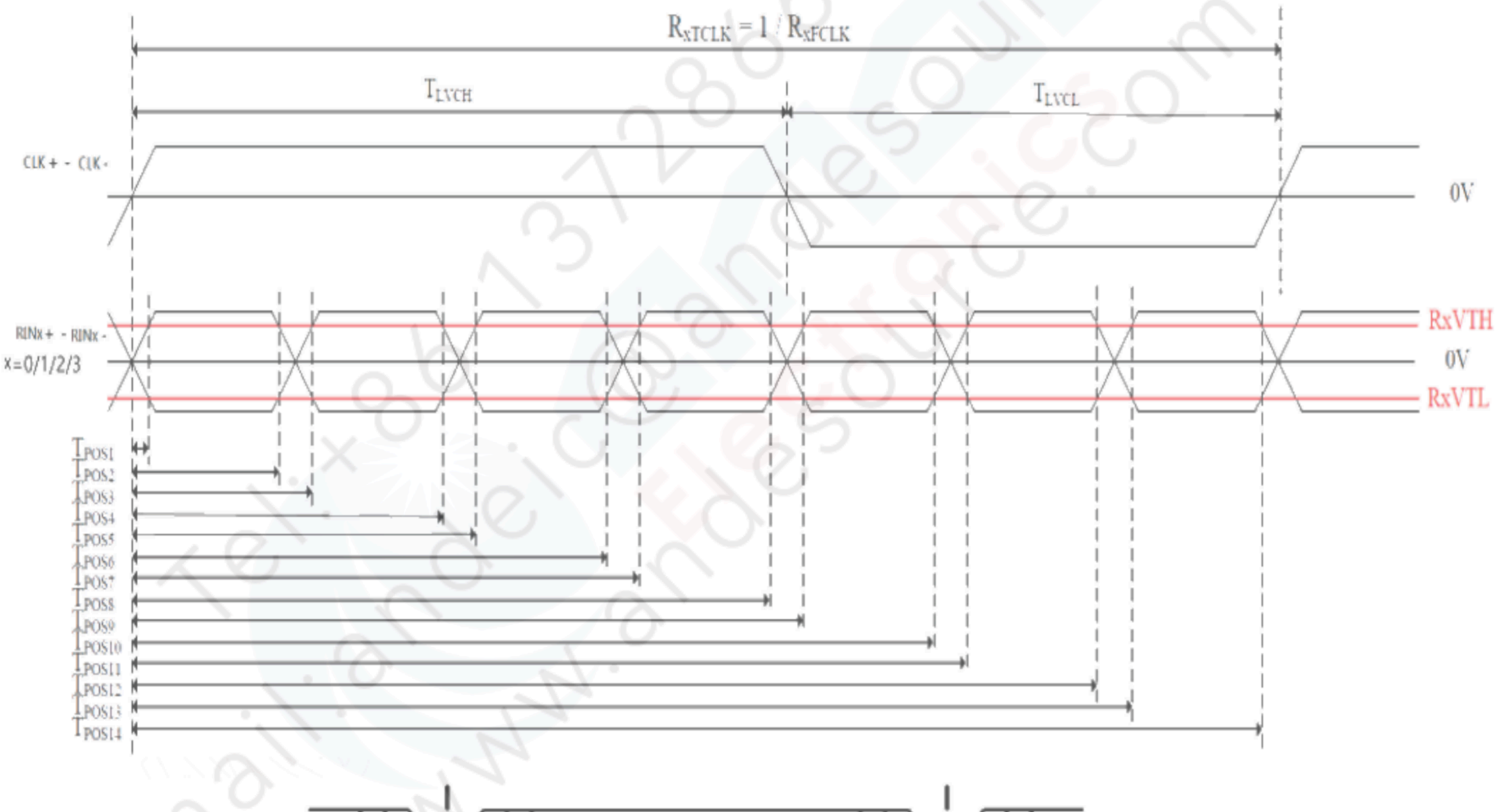
## 6.1 DC Characteristics

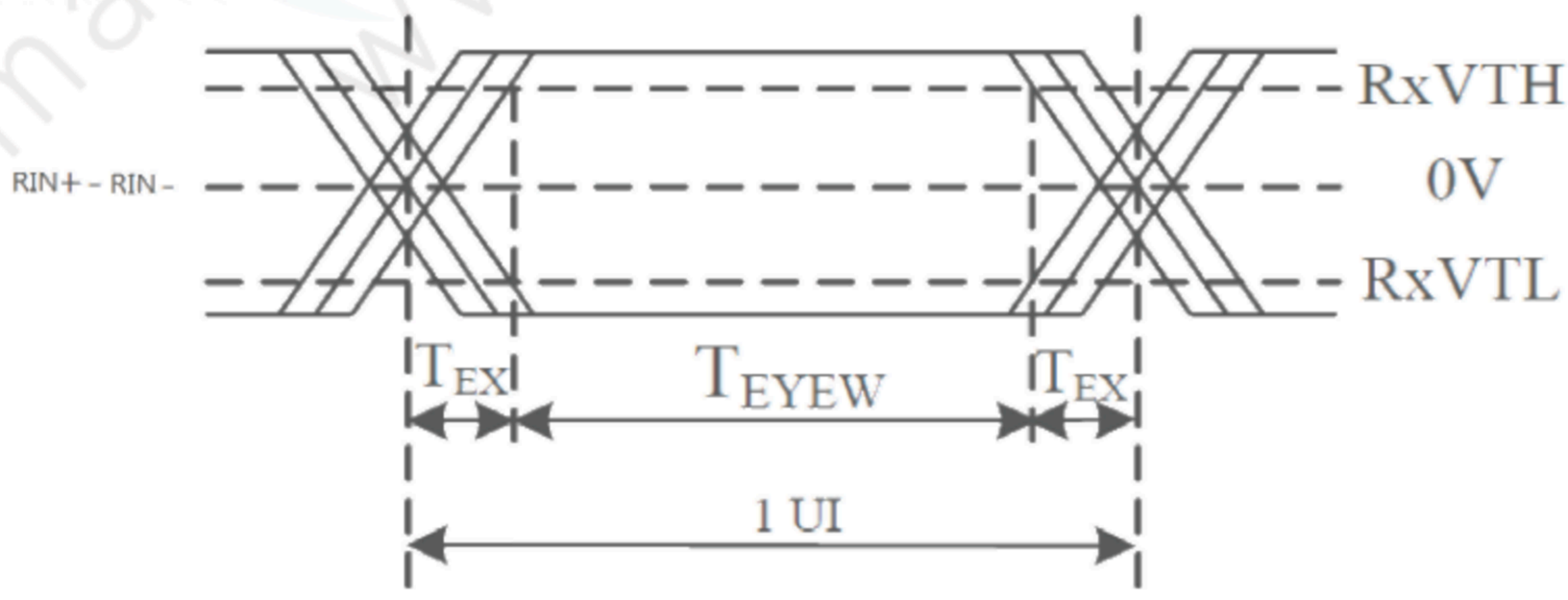
| Parameter | Symbol | Min | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Power supply voltage | VCC | 3.0 | 3.3 | 3.6 | V | |
| Low level input voltage | VIL | 0 | - | 0.3x VCC | V | CMOS I/F digital circuit |
| High level input voltage | VIH | 0.7x VCC | - | VCC | V | CMOS I/F digital circuit |
| Input leakage current | ILEAK | - | - | +/-1 | uA | CMOS I/F digital circuit |
| Pull low/high resistor | RPULL | 180K | 250K | 320K | ohm | For the digital input pin @VCC=3.3V |
| Digital operation Current | IVCC | - | 24 | 36 | mA | $F_{CLK}$=45MHz, $F_{LD}$=48K @VCC=3.3V Data pattern=55/H -> AA/H (loop) |

## 6.2 LVDS AC Electrical Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Clock Frequency | $R_{xFCLK}$ | 20 | | 80 | MHz | |
| Clock Period | $R_{xTCLK}$ | 12.5 | | 50 | ns | |
| 1 data bit time | UI | - | 1/7 | - | $R_{xTCLK}$ | |
| Clock high time | $T_{LVCH}$ | | 4 | | UI | |
| Clock low time | $T_{LVCL}$ | | 3 | | UI | |
| Position 1 | $T_{POS1}$ | -0.25 | 0 | 0.25 | UI | |
| Position 2 | $T_{POS2}$ | 0.75 | - | 1.25 | UI | |
| Position 3 | $T_{POS3}$ | 0.75 | 1 | 1.25 | UI | |
| Position 4 | $T_{POS4}$ | 1.75 | - | 2.25 | UI | |
| Position 5 | $T_{POS5}$ | 1.75 | 2 | 2.25 | UI | |
| Position 6 | $T_{POS6}$ | 2.75 | - | 3.25 | UI | |
| Position 7 | $T_{POS7}$ | 2.75 | 3 | 3.25 | UI | |
| Position 8 | $T_{POS8}$ | 3.75 | - | 4.25 | UI | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Position 9 | $T_{POS9}$ | 3.75 | 4 | 4.25 | UI | |
| Position 10 | $T_{POS10}$ | 4.75 | - | 5.25 | UI | |
| Position 11 | $T_{POS11}$ | 4.75 | 5 | 5.25 | UI | |
| Position 12 | $T_{POS12}$ | 5.75 | - | 6.25 | UI | |
| Position 13 | $T_{POS13}$ | 5.75 | 6 | 6.25 | UI | |
| Position 14 | $T_{POS14}$ | 6.75 | - | 7.25 | UI | |
| Input eye width | $T_{EYEW}$ | 0.5 | - | - | UI | |
| Input eye border | $T_{EX}$ | - | - | 0.25 | UI | |



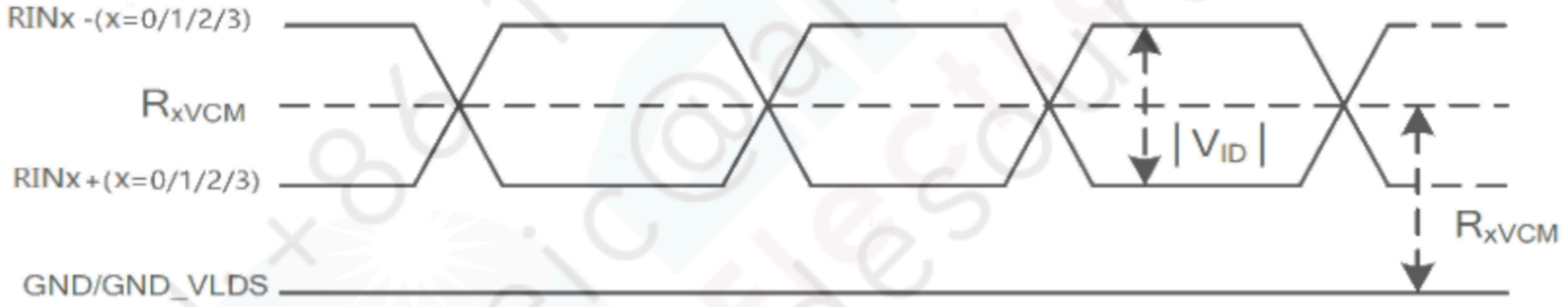



## 6.3 LVDS DC Electrical Characteristics

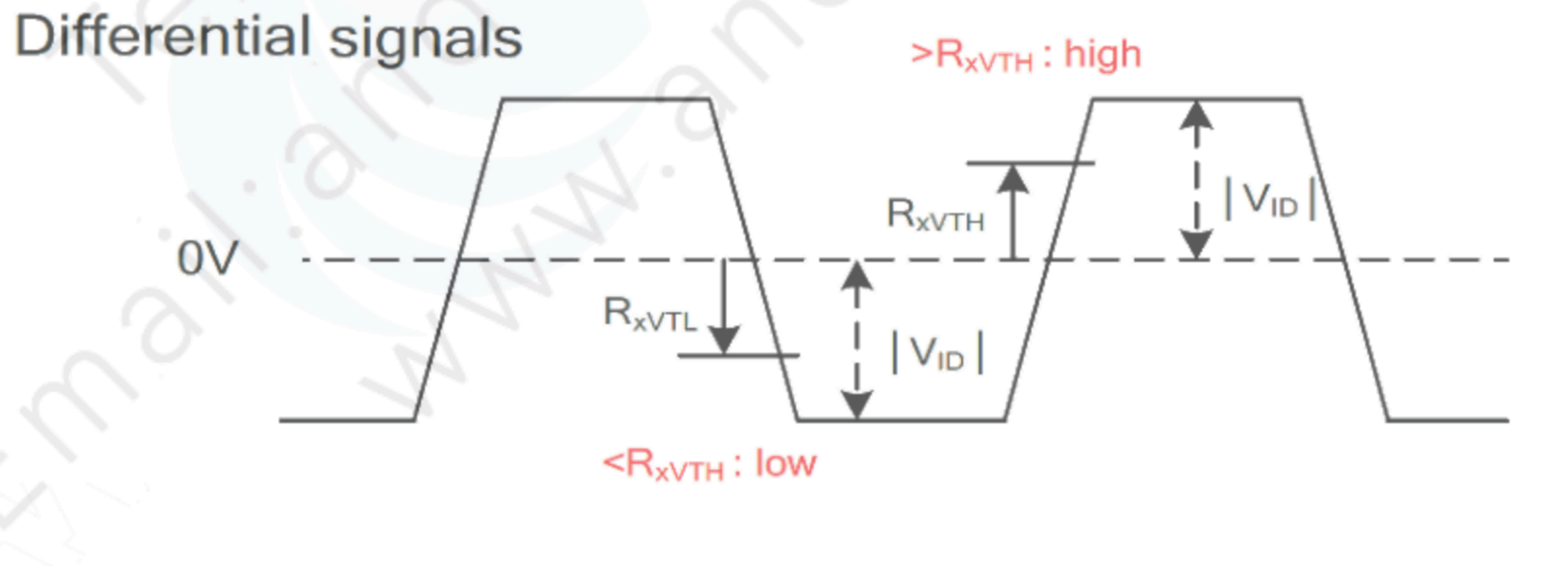
VCC=3.3V, GND=0V, Ta=25℃

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Differential input high Threshold voltage | $R_{XVTH}$ | | | 0.1 | V | |
| Differential input Low Threshold voltage | $R_{XVTL}$ | -0.1 | | | V | |
| Input voltage range(single-end) | $R_{XVIN}$ | 0 | | VCC-1.0 | V | |
| Differential input common Mode voltage | $R_{XVCM}$ | 0.6 | 1.2 | 2.4-\|VID\|/2 | V | |
| Differential input voltage | $\|V_{ID}\|$ | 0.2 | 0.4 | 0.6 | V | |
| Differential input leakage current | RVxliz | -10 | | 10 | uA | |

Single end signals



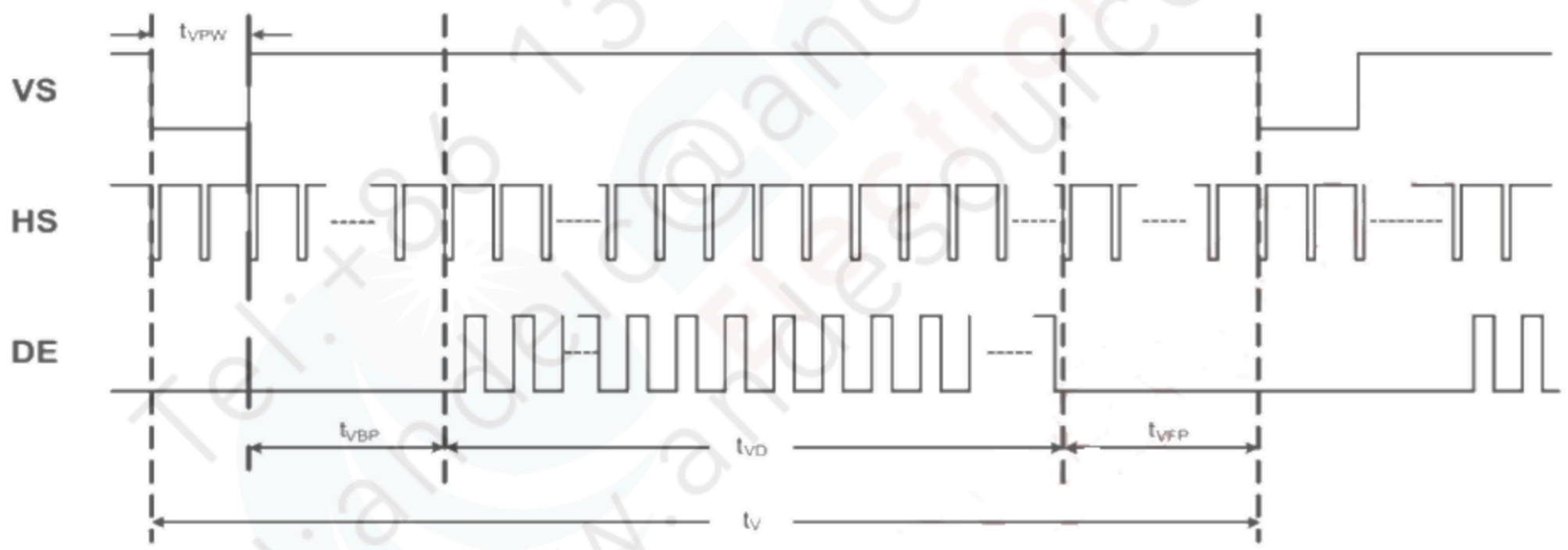

Differential signals



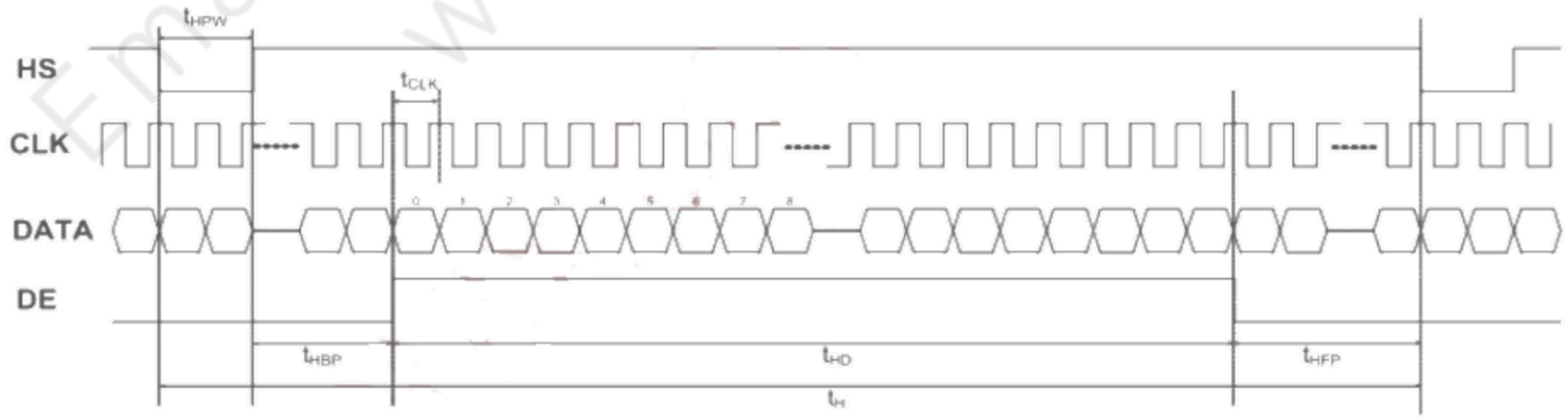
## 6.4 Input timing

| Parameter | Symbol | MIN | Typ | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| CLK frequency | tclk | 30.38 | 31.63 | 40.27 | MHz | |
| Horizontal display area | thd | | 800 | | tclk | |
| Horizontal pulse width | thpw | 2 | 2 | 8 | tclk | |
| Horizontal back porch | thbp | 8 | 16 | 40 | tclk | |
| Horizontal front porch | thfp | 16 | 16 | 100 | tclk | |
| HSYNC period | th | 826 | 834 | 948 | tclk | |
| Vertical display area | tvd | | 600 | | th | |
| Vertical plus width | tvpw | 2 | 2 | 8 | th | |
| Vertical back porch | tvbp | 3 | 10 | 40 | th | |
| Vertical front porch | tvfp | 8 | 20 | 60 | th | |
| VSD period | tv | 613 | 632 | 708 | th | |
| Frame rate | FR | | 60 | | Hz | |

**Vertical input timing**



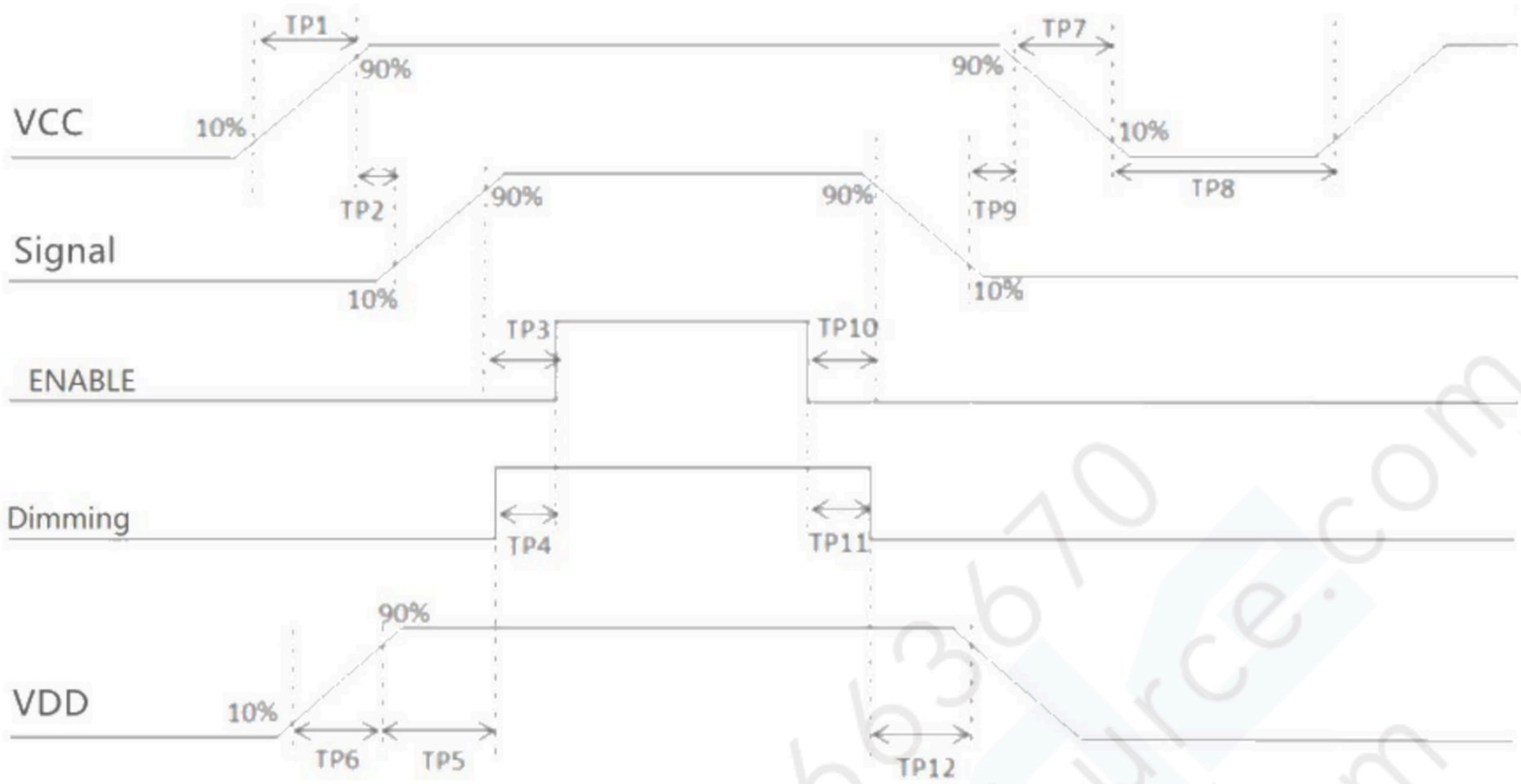

**Horizontal input timing**



## 6.5 Data Input Format VESA Data Mapping


## 6.6 Power On/Off Timing

| Item | Symbol | MIN | Typ | MAX | Unit | Remark |
|---|---|---|---|---|---|---|
| VCC on to VCC stable | Tp1 | 0.5 | - | 3 | ms | |
| VCC stable to signal on | Tp2 | (20) | - | 100 | ms | |
| Signal stable to ENABLE(BL_EN) on | Tp3 | 200 | - | - | ms | |
| Dimming(BL_ PWM) on to ENABLE(BL_EN) on | Tp4 | 0 | - | 200 | ms | |
| VDD to Dimming(BL_ PWM) on | Tp5 | 10 | - | - | ms | |
| VDD on to VDD stable | Tp6 | TBD（0.5） | - | TBD（10） | ms | |
| VCC off time | Tp7 | 0.5 | - | 10 | ms | |
| VCC off to next VCC on | Tp8 | 500 | - | - | ms | |
| Signal off before VCC off | Tp9 | 123 | - | 500 | ms | |
| ENABLE(BL_EN) off before signal off | Tp10 | 200 | - | - | ms | |
| ENABLE(BL_EN) off before Dimming(BL_ PWM) off | Tp11 | 0 | - | 200 | ms | |
| Dimming(BL_ PWM)off before VDD off | Tp12 | 10 | - | - | ms | |




**interface power on/off sequence**

6.4.3 Fuse

| Parameter | Fuse | | Rating | Fusing current | Remarks |
|---|---|---|---|---|---|
| | Type | Supplier | | | |
| VCC | (FCC16152ABTP) | KAMAYA | 1.5A<br>32V | 3.0A/5smax | Note1 |
| VDD | (FCC16202ABTP) | KAMAYA | 2A<br>32V | 4.0A/5smax | Note1 |

Note1: There are different power supply systems from the power input terminal. The power supply capacity should be less than the fusing current. If the power supply capacity is above the fusing current, the fuse may blow in a short time, and then nasty smell, smoking and so on may occur.

## 7 Optical Characteristics

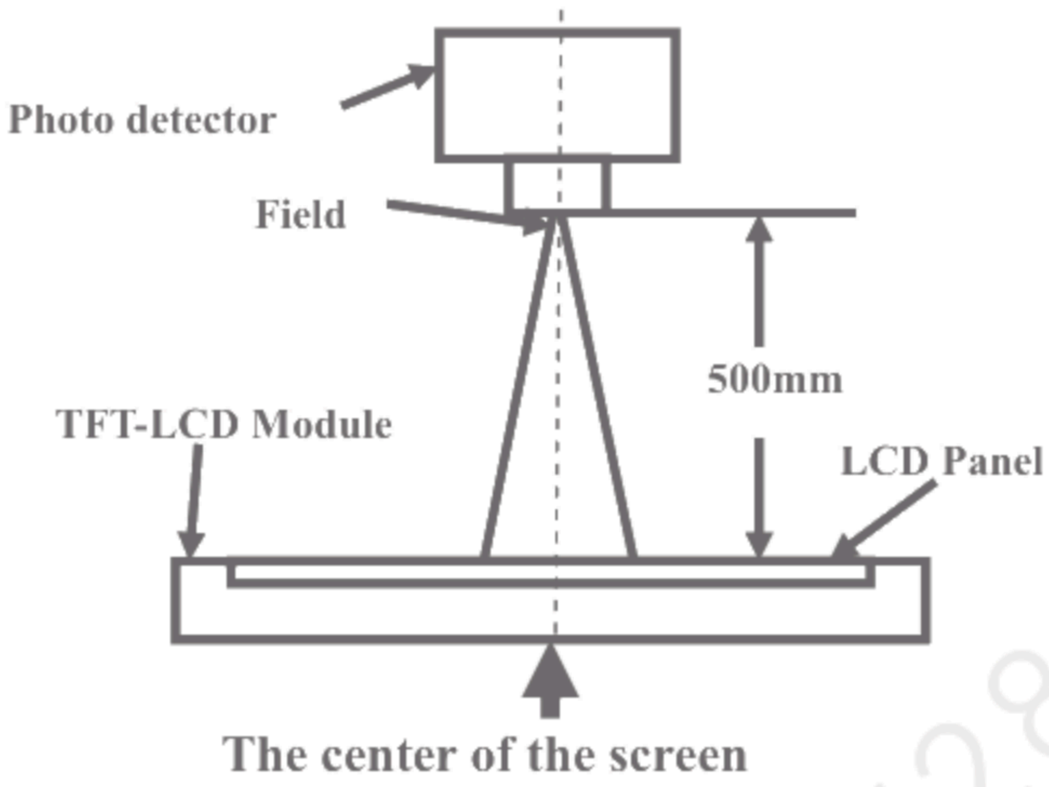
| Item | | Symbol | Condition | Min | Typ. | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| View Angles | | θT | CR≧10 | 80 | 88 | - | Degree | Note 2 |
| | | θB | | 80 | 88 | - | | |
| | | θL | | 80 | 88 | - | | |
| | | θR | | 80 | 88 | - | | |
| Contrast Ratio | | CR | θ=0° | | 1000 | - | - | Note1<br>Note3 |
| Luminance uniformity | | U | | 70 | | % | - | Note6 |
| Response Time | | $T_{ON}$ | 25℃ | - | 25 | 35 | ms | Note1<br>Note4 |
| | | $T_{OFF}$ | | | | | | |
| Chromaticity | White | x | Backlight is on | | （0.298） | | - | Note5<br>Note1 |
| | | y | | | （0.321） | | | |
| | Red | x | | | （0.634） | | | |
| | | y | | | （0.333） | | | |
| | Green | x | | | （0.289） | | | |
| | | y | | | （0.622） | | | |
| | Blue | x | | | （0.152） | | | |
| | | y | | | （0.060） | | | |
| NTSC | | | | | 72 | - | % | Note5 |
| Luminance | | L | | | 500 | - | cd/㎡ | Note7 |

Test Conditions:

1. The ambient temperature is 25℃. VDD= 3.3V, VCC=12V, 100% brightness,
2. The test systems refer to Note 1 and Note2.

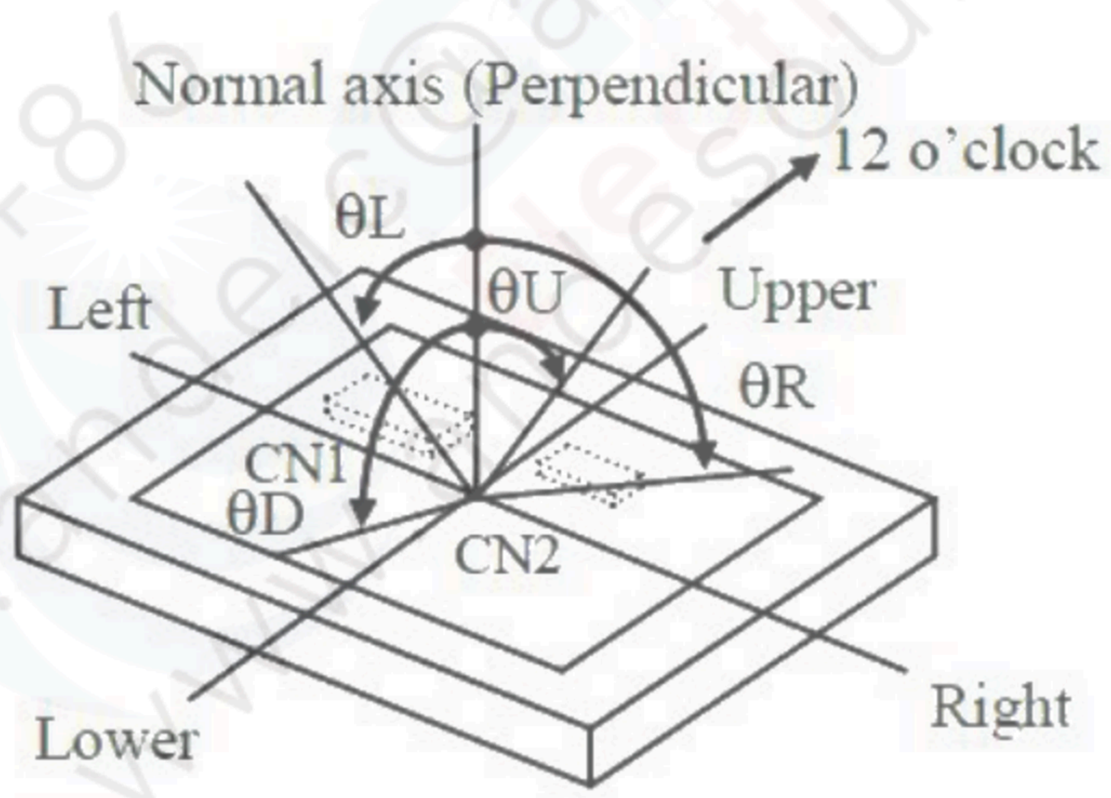
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.




Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。




Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

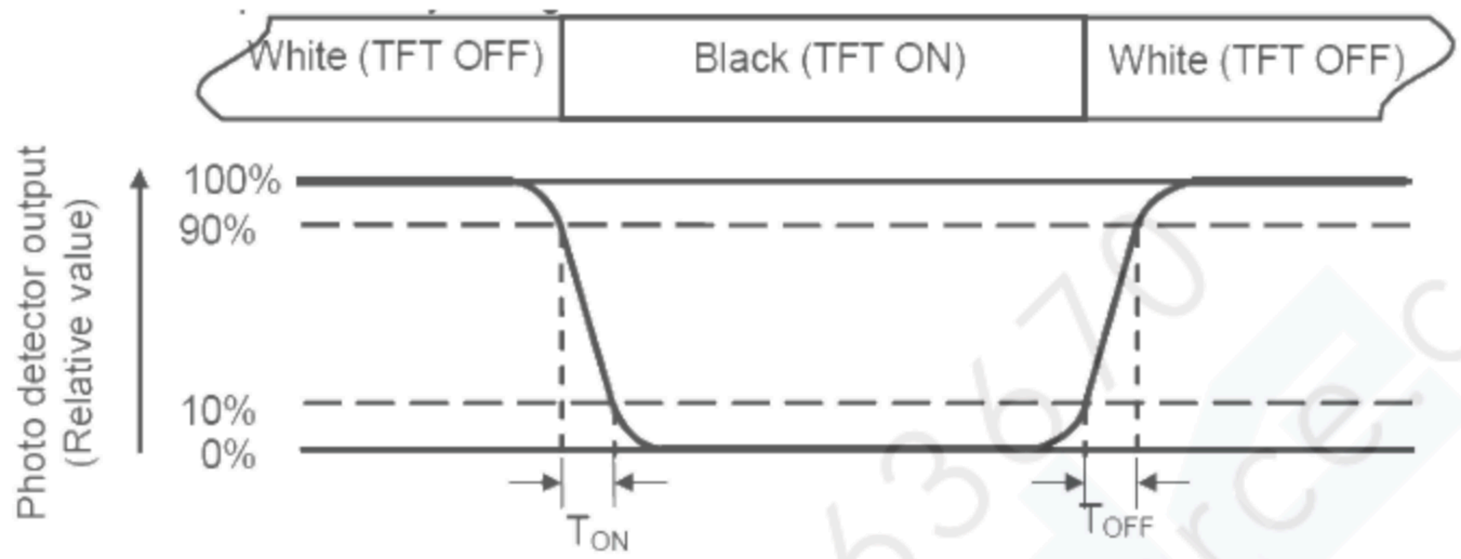
"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time ($T_{ON}$) is the time between photo detector output intensity changed from 90% to 10%. And fall time ($T_{OFF}$) is the time between photo detector output intensity changed from 10% to 90%.




Note 5: Definition of color chromaticity (CIE1931)

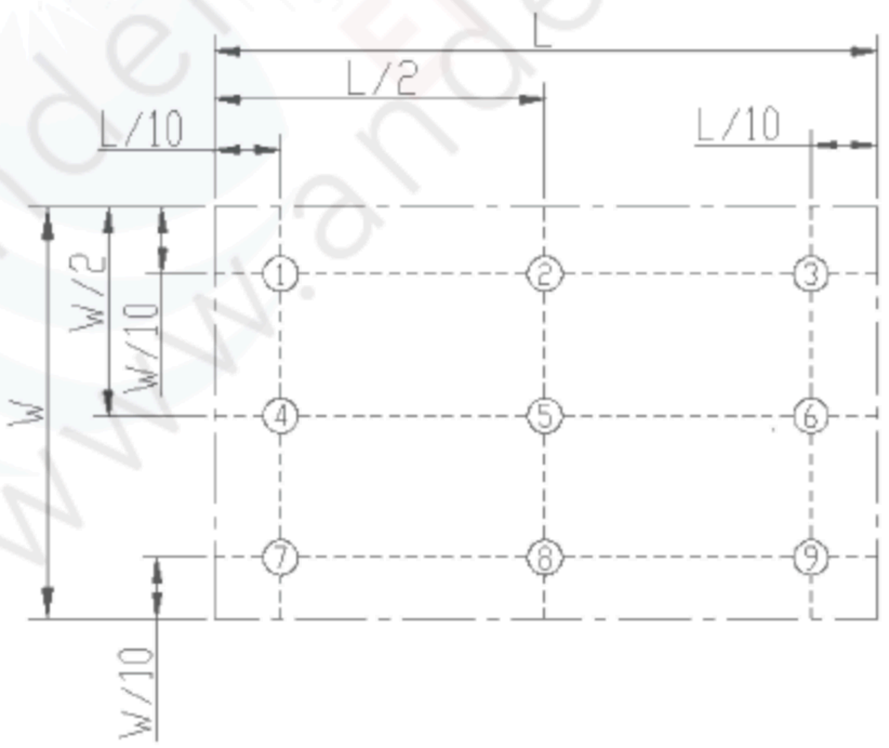
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax

L-------Active area length W----- Active area width




Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

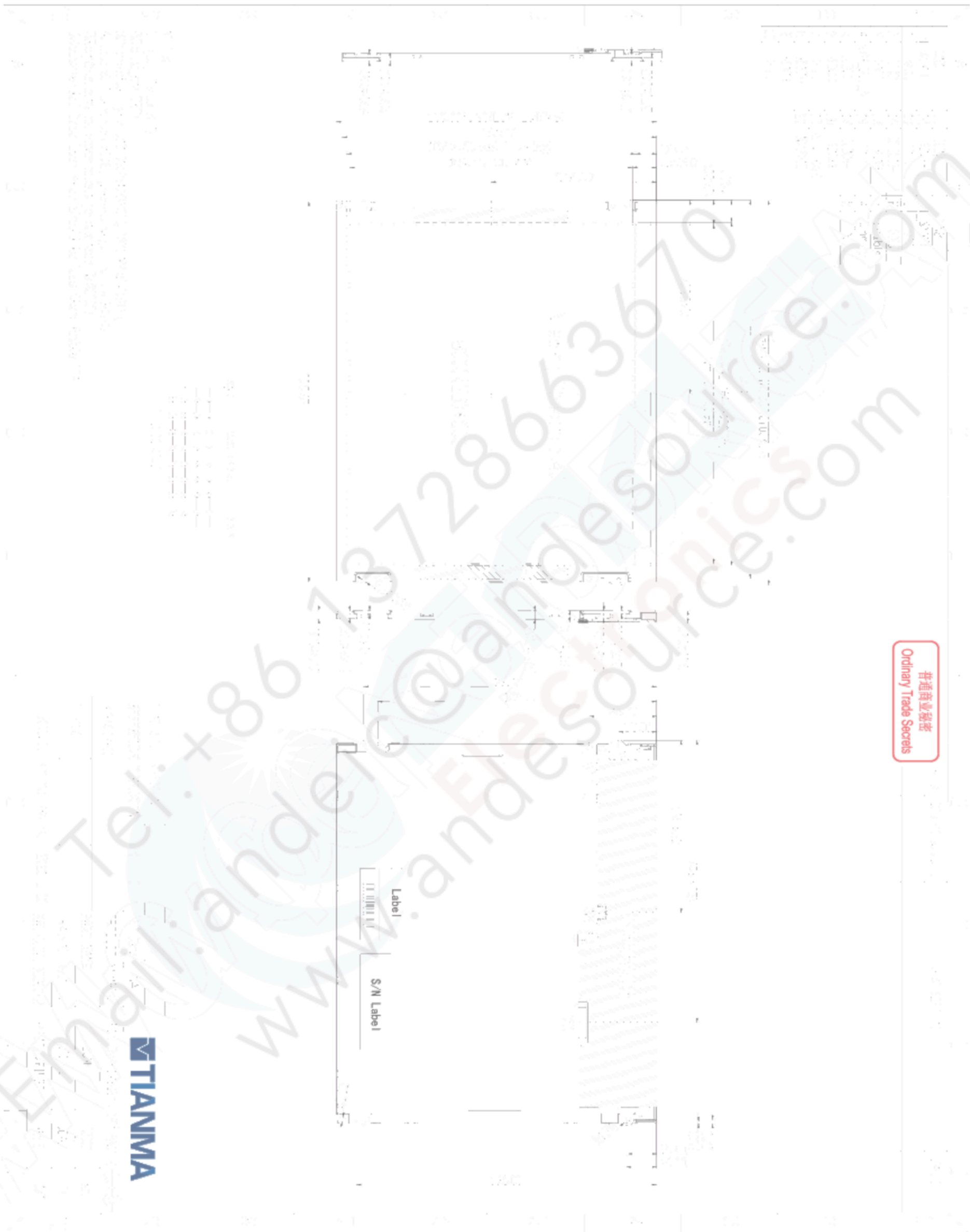
Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

## 8 Environmental / Reliability Test

| No. | Test Item | Condition | Remark |
|---|---|---|---|
| 1 | High Temperature & High Humidity Operation | 60℃，90%RH，240hrs | IEC60068-2-78<br>GB/T2423.3 |
| 2 | High Temperature Storage | +80℃, 240hrs | IEC60068-2-1<br>GB2423.2 |
| 3 | Low Temperature Storage | -30℃, 240hrs | EC60068-2-1<br>GB2423.1 |
| 4 | High Temperature Operation | +70℃， 240hrs | IEC60068-2-1,GB2423.2 |
| 5 | Low Temperature Operation | -20℃， 240hrs | IEC60068-2-1<br>GB2423.1 |
| 6 | Thermal Shock (Non-operation) | -30℃,30min;80℃,30min;1H/cycle,<br>Change time:5min, 100 Cycles | Start with cold temperature nd with high temperature,<br>EC60068-2-14,GB2423.22 |
| 7 | Vibration | 10~55HZ<br>Stroke:1.5mm<br>Sweep:10HZ~55HZ~10HZ<br>2H For X\Y\Z | IEC60068-2-6:1982<br>GB/T2423.10—1995 |
| 8 | Package condition | 5-20 -200HZ， PSD ： 0.01-0.01 -0.001<br>Total:0.781g2/HZ,<br>,x/y/z every direction every direction<br>30min） | |
| 9 | ESD | 150PF、330Ω<br>5 点、5 次<br>Air：±8KV<br>Connect：±4KV | IEC61000-4-2<br>GB/T17626.2 |

# 9 Mechanical Drawing



# 10 MARKINGS

The various markings are attached to this product. See “11.2 INDECATION LOCATIONS” for attachment positions.

## 10.1 PRODUCT LABEL (TBD)


Note1: The meaning of OEM number, Example: S190M50A12SA1SA109A0001

| S190M50A | 12 | SA1SA1 | 09A | 0001 |
|---|---|---|---|---|
| **Module Number** | **Source & Gate Driver IC Code** | **Location Line#** | **Date code** | **Serial Number** |

**Date code:**

1st Character Year Codes

| Month | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | So on |
|---|---|---|---|---|---|---|---|---|---|---|
| Code | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |

2nd Character Month Codes

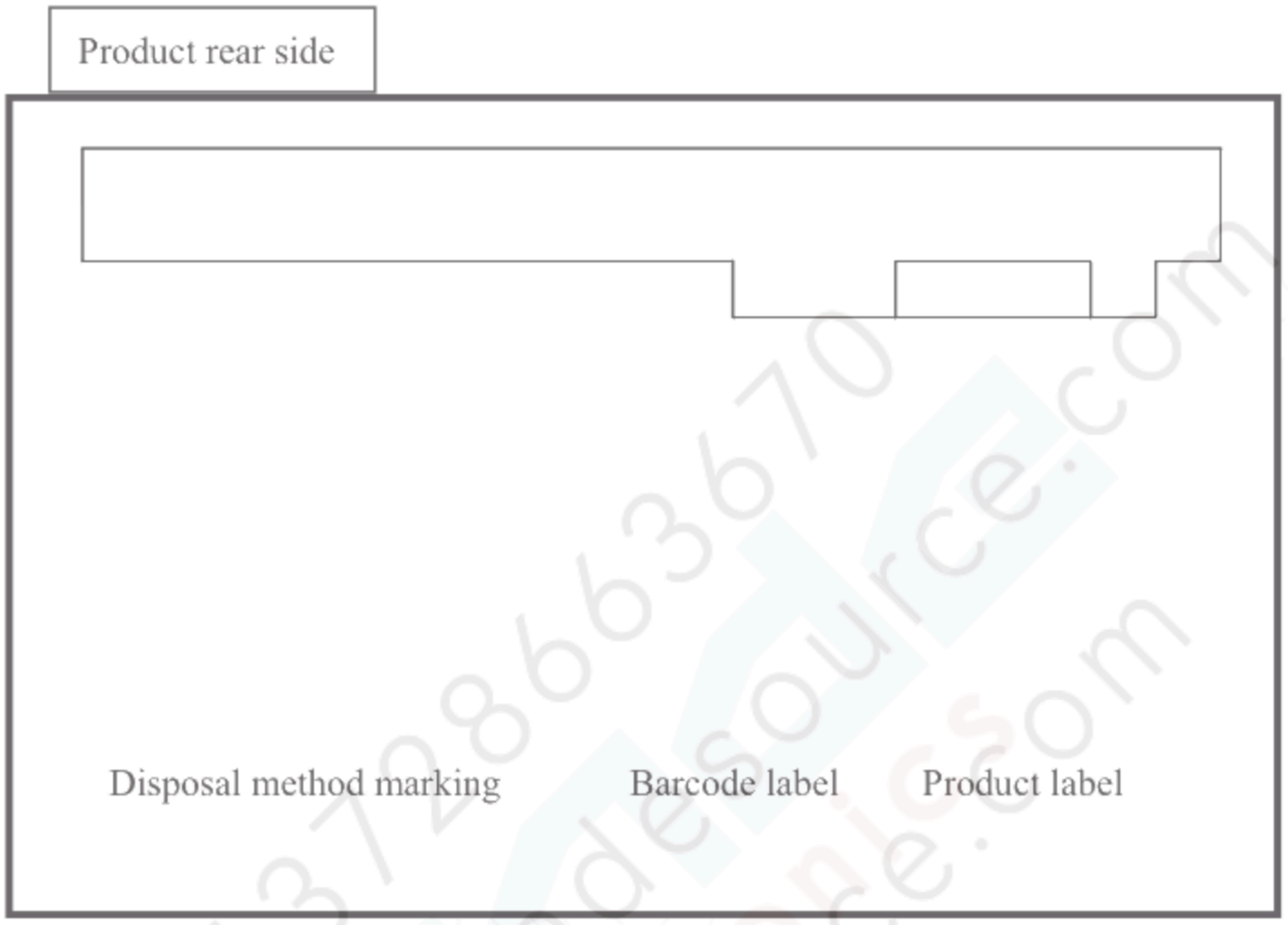
| Month | January | February | March | April | May | June | July | August | September | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

3rd Character Day Codes

| Day | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | 11st |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B |
| Day | 12nd | 13rd | 14th | 15th | 16th | 17th | 18th | 19th | 20th | 21st | 22nd |
| Code | C | D | E | F | G | H | I | J | K | L | M |
| Day | 23rd | 24nd | 25st | 26nd | 27rd | 28th | 29th | 30th | 31st | | |
| Code | N | O | P | Q | R | S | T | U | V | | |

Note2: Do not attach anything such as label and so on, on the product label! In case repair the product, AVIC needs the contents of product label such as the lot number, inspection date and so on, to identify the warranty period with individual product. If AVIC cannot decipher the contents of product label, such repair shall be entitled to charge. Also AVIC may give a new lot number to reconditioned products.

## 10.2 INDICATION LOCATIONS



# 11 PACKING, TRANSPORTATION AND DELIVERY

AVIC will pack products to deliver to customer in accordance with AVIC packing specifications, and will deliver products to customer in such a state that products will not suffer from a damage during transportation .The delivery conditions are as follows.

## 11.1 PACKING

(1) Packing box

8 products are packed up with the maximum in a packing box(See "**12.5 OUTLINE FIGURE FOR PACKING** "). Products are put into a plastic bag for prevention of moisture with cushion, and then the bag is sealed up with heat sealing.

The type name and quality are shown on outside of the packing box, either labeling or printing.

(2) Pallet Packing (See"**12.5 OUTLINE FIGURE FOR PACKING** ")

① Packing boxes are tired on a cardboard pallet.(8 boxes×4 tiers maximum)

② Cardboard sleeve and top cap are attached to the packing boxes, then they are fixed by a band.

## 11.2 INSPECTION RECORD SHEET

Inspection record sheets are included in the packing box with delivery products to customer. It is summarized to a number of products for pass/fail assessment.

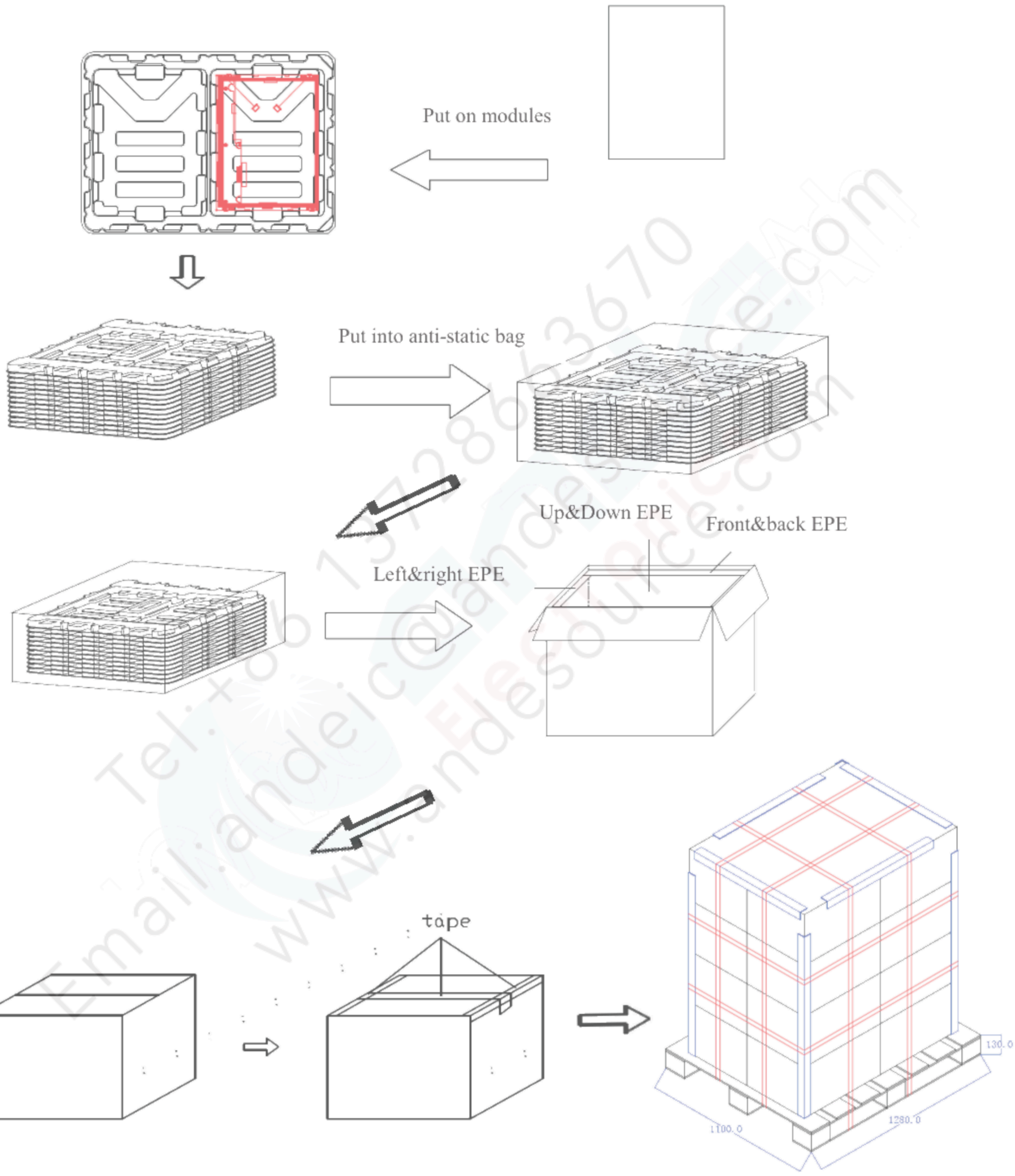
## 11.3 TRANSPORTATION

The product is transported by vehicle, aircraft or shipment in the state of pallet packing.

## 11.4 SIZE AND WEIGHT FOR PACKING BOX

| Parameter | Packing box | Unit |
|---|---|---|
| Size | 577（L）×421（W）×326（H）（typ.） | mm |
| LCD Weight | TBD ±5%（typ.） | kg |
| Total weight | TBD（typ.） | kg |

## 11.5 OUTLINE FIGURE FOR PACKING



# 12 PRECAUTIONS

## 12.1 Handling Precautions

12.1.1The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

12.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

12.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.5 If the display surface is contaMinated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

12.1.6 Do not attempt to disassemble the LCD Module.

12.1.7 If the logic circuit power is off, do not apply the input signals.

12.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

12.1.8.1 Be sure to ground the body when handling the LCD Modules.

12.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

12.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

12.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

## 12.2 Storage precautions

12.2.7 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.2.8 The LCD modules should be stored under the storage temperature range. If the LCD modules will be

stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

12.2.9 The LCD modules should be stored in the room without acid, alkali and harmful gas.

**12.3 Transportation Precautions**

12.3.7 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

**12.4 Do not display the fixed pattern for a long time because it may cause image sticking. Use a screen saver, if the fixed pattern is displayed on the screen**

**12.5 SAFETY PRECAUTIONS**

12.5.1. When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash the m off with solvents such as acetone and ethanol, which should later be burned.

12.5.2. If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly wit h soap and water.

12.5.3. Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.

d. LED driver should be designed carefully to limit or stop its function when over current is detected on the LED.