# TITLE : TDA150-005V01

## Product Specification

## P0.2

| ITEM | SIGNATURE | ITEM | SIGNATURE | | |
|---|---|---|---|---|---|
| Prepared | | Checked | | | |
| Countersigned | | Approved | | | |

## BEIJING BOE SPECIAL DISPLAY TECHNOLOGY

| REV. | ECN NO. | DESCRIPTION OF CHANGES | DATE | |
|---|---|---|---|---|
| P0.1 | - | Initial Release | 2016.01.25 | |
| P0.2 | - | P9 | 2016.06.12 | |
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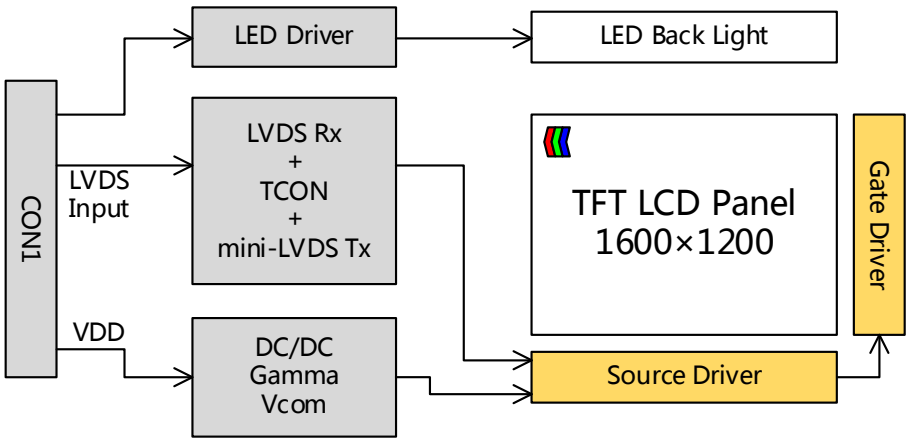
# Contents

# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

TDA150-005V01 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 15.0 inch diagonally measured active area with UXGA resolutions (1600 horizontal by 1200 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in 2 domain stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.




## 1.2 Features

- LED back-light
- High luminance
- High contrast ratio, wide viewing angle
- Wide operating temperature
- LVDS interface
- RoHS Compliant

## 1.3 Application

- TFT-LCD Monitor
- Industrial
- Vehicle

### 1.4 General Specification

The followings are general specifications at the model TDA150-001V01.

< Table 1. General Specifications >

| Parameter | Specification | Unit | Remarks |
|---|---|---|---|
| Active area | 304.8 (H) × 228.6(V) | mm | |
| Number of pixels | 1600(H) × 1200(V) | Pixels | |
| Pixel pitch | 0.1905(H) × 0.1905 (V) | mm | |
| Pixel arrangement | RGB 2 domain stripe | | |
| Display colors | 16.7M | Colors | 8bit |
| Display mode | Normally Black | | |
| Dimensional outline | 317.4 (H) × 242 (V) × 5.9(D) | mm | |
| Weight | 0.62±0.05 | kg | |
| Surface treatment | Haze 25%, 3H | | |
| Back-light | Edge side, 1-LED Lighting Bar Type | | |

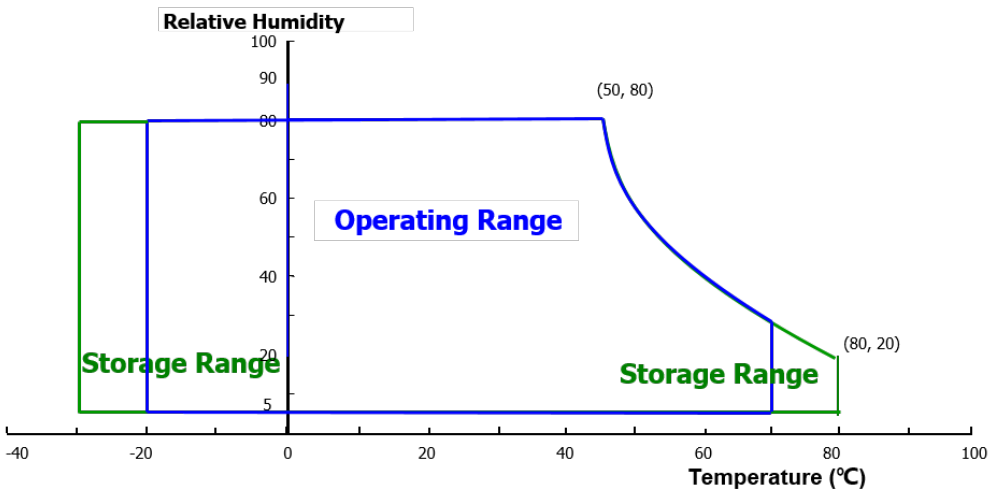
## 2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. LCD Module Electrical Specifications > [Ta =25±2 ℃]

| Parameter | Symbol | Min. | Max. | Unit | Remarks |
|---|---|---|---|---|---|
| Power Supply Voltage (LCD Module) | $V_{DD}$ | -0.3 | 4.0 | V | Note.1 |
| Back-light Power Supply Voltage | $HV_{DDOUT}$ | -0.3 | 33 | V | |
| Operating Temperature | $T_{OP}$ | -20 | +70 | ℃ | Note.2 |
| Storage Temperature | $T_{ST}$ | -30 | +80 | ℃ | |

Notes:
1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.
2. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 ℃ max. and no condensation of water.



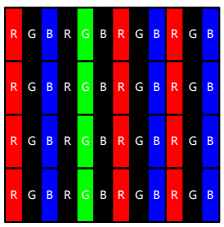
# 3.0 ELECTRICAL SPECIFICATIONS

## 3.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications > [Ta =25±2 ℃]

| Parameter | Symbol | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|
| | | Min | Typ | Max | | |
| Power Supply Input Voltage | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | Note 1 |
| Power Supply Current | $I_{DD}$ | - | 800 | 1000 | mA | |
| Positive-going Input Threshold Voltage | $V_{IT+}$ | 100 | 200 | 600 | mV | Vcom = 1.2V typ. |
| Negative-going Input Threshold Voltage | $V_{IT-}$ | -600 | -200 | -100 | mV | |
| Differential input common mode voltage | $V_{com}$ | 0.7 | 1.2 | 1.6 | V | $V_{IH}$=100mV, $V_{IL}$=-100mV |
| Power Consumption | $P_D$ | - | 2.5 | 3.0 | W | |
| | $P_{BL}$ | - | 8.0 | 9.0 | W | |
| | $P_{total}$ | - | 10.5 | 12.0 | W | |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25 ℃
1) Max value at White Pattern
2) Flicker Pattern is Column Pattern



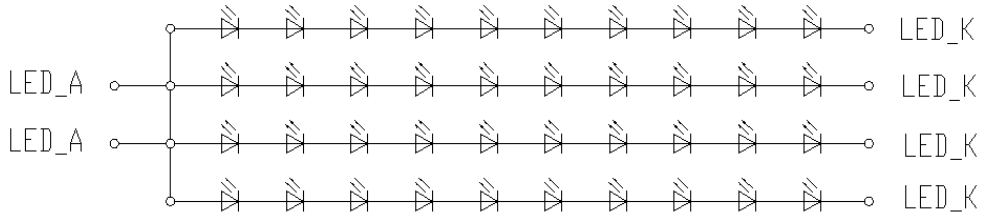
### 3.2 Back-light Unit

< Table 4. LED Driving guideline specifications > Ta=25+/-2˚C

| Parameter | | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| LED Forward Voltage | | $V_F$ | 3.0 | - | 3.2 | V | |
| LED Forward Current | | $I_F$ | - | 60 | - | mA | |
| LED Driver Power Supply Voltage | | $V_{LED}$ | 9 | 12 | 28 | V | |
| LED Driver Power Supply Current | | $I_{LED}$ | - | - | 0.7 | A | |
| LED Driver Efficiency | | η | - | 88 | - | % | |
| Power Consumption for Back light | | $P_{LED}$ | - | - | 9.0 | W | Note 1 |
| EN Control Level | Backlight on | $V_{ENH}$ | 1.5 | - | 5.5 | V | |
| | Backlight off | $V_{ENL}$ | - | - | 0.8 | V | |
| PWM Control Level | PWM High Level | $V_{PML}$ | 1.2 | - | 5.5 | V | |
| | PWM Low Level | $V_{PML}$ | - | - | 0.4 | V | |
| PWM Control Frequency | | $F_{PWM}$ | 200 | - | 10 | KHz | |
| Max Duty Ratio | | Dmax | 80 | - | - | % | |
| LED Life-Time | | N/A | 30000 | | | Hour | IF = 60mA Note 2 |

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} \div \eta = P_{LED}$

2. The estimated lifetime is specified as the time to reduce 50% brightness at 25℃。The life time of the backlight depends on the ambient temperature. The life time will decrease under high temperature.



# 4.0 OPTICAL SPECIFICATION

## 4.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance ≤ 1lux and temperature = 25±2℃) with the equipment of Luminance meter system (PR-655 and CS-2000A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to $\theta_{Ø=0}$ (=$\theta_3$ ) as the 3 o'clock direction (the "right"), θ $_{Ø=90}$ (= $\theta_{12}$ ) as the 12 o'clock direction ("upward"), θ $_{Ø=180}$ (= $\theta_9$ ) as the 9 o'clock direction ("left") and θ $_{Ø=270}$(= $\theta_6$ ) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The luminance, color and uniformity (etc) should be tested by CS-2000A. The backlight should be operating for 10 minutes prior to measurement. VDD shall be 3.3 ± 0.3V at 25°C. Optimum viewing angle direction is 6 'clock

<Table 5. Optical Specifications>

| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle range | Horizontal | $\Theta_3$ | CR > 10 | 85 | - | - | Deg. | Note 1 |
| | | $\Theta_9$ | | 85 | - | - | Deg. | |
| | Vertical | $\Theta_{12}$ | | 85 | - | - | Deg. | |
| | | $\Theta_6$ | | 85 | - | - | Deg. | |
| Luminance Contrast ratio | | CR | Θ = 0° | 700 | 1000 | - | | Note 2 |
| Luminance of White | Center 1point | $Y_w$ | Θ = 0° | 400 | 500 | - | cd/m$^2$ | Note 3 |
| White Luminance uniformity | 9 Points | $\Delta Y_9$ | | 70 | 75 | - | % | Note 4 |
| Reproduction of color | White | Wx | Θ = 0° | Typ. -0.03 | 0.313 | Typ. +0.03 | | Note 5 |
| | | Wy | | | 0.339 | | | |
| | Red | Rx | | Typ. -0.03 | 0.637 | Typ. +0.03 | | |
| | | Ry | | | 0.339 | | | |
| | Green | Gx | | Typ. -0.03 | 0.329 | Typ. +0.03 | | |
| | | Gy | | | 0.616 | | | |
| | Blue | Bx | | Typ. -0.03 | 0.154 | Typ. +0.03 | | |
| | | By | | | 0.093 | | | |
| Response Time | | $T_{RT}$ | Ta= 25° C Θ = 0° | - | 25 | 30 | ms | Note 6 |
| Cross Talk | | CT | Θ = 0° | - | - | 2.0 | % | Note 7 |
| Colour Gamut | | | NTSC 1976 | 68 | 70 | - | % | |

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Luminance of white is defined as luminance values of 9point max across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The luminance is measured by BM-5A when the LED current is set at 60mA.

4. The White luminance uniformity on LCD surface is then expressed as : ΔY = Minimum Luminance of 9 points / Maximum Luminance of 9 points (see FIGURE 2).

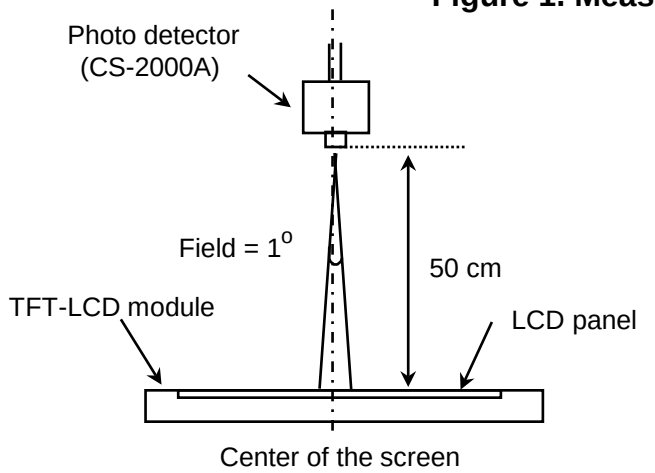
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

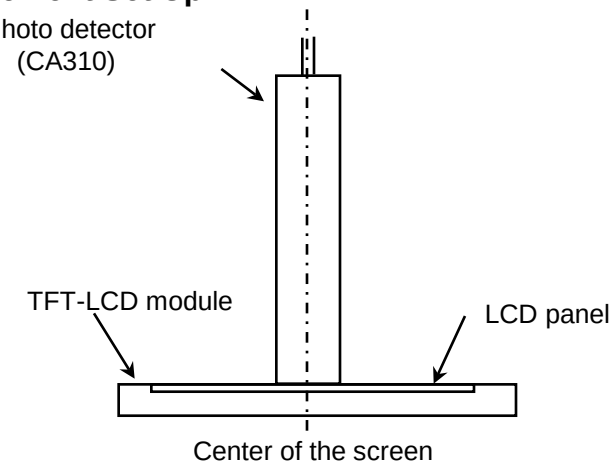
6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark. (See FIGURE 4).

## 4.2 Optical measurements

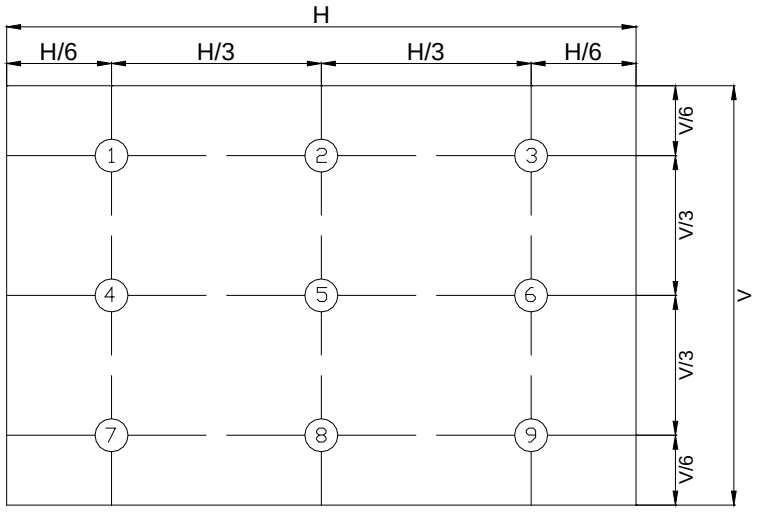
**Figure 1. Measurement Set Up**




View angel range, uniformity, etc. measurement setup  Flicker, measurement setup

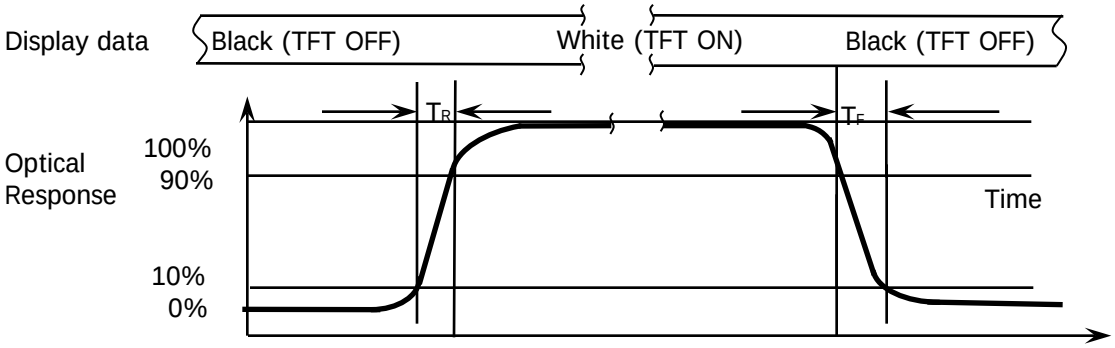
**Figure 2. White Luminance and Uniformity Measurement Locations (9 points)**




Luminance of white is defined as luminance values of max 9 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

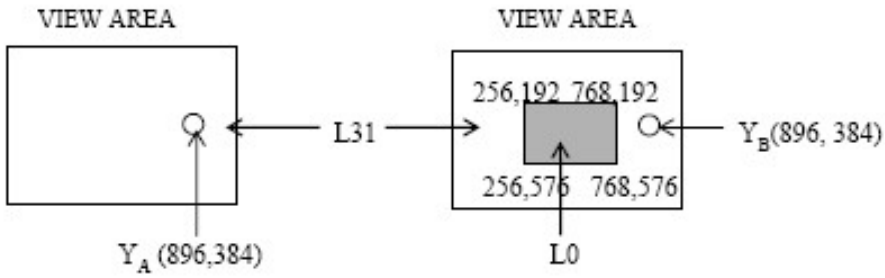
The White luminance uniformity on LCD surface is then expressed as : ΔY9 = Minimum Luminance of 9 points / Maximum Luminance of 9points (see FIGURE 2).

**Figure 3. Response Time Testing**




The electro-optical response time measurements shall be made as shown in FIGURE 3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr and 90% to 10% is Td.

**Figure 4. Cross Modulation Test Description**




$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

YA = Initial luminance of measured area (cd/m2)

YB = Subsequent luminance of measured area (cd/m2)

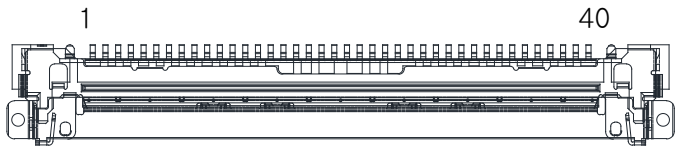
The location measured will be exactly the same in both patterns

# 5.0 INTERFACE CONNECTION.

## 5.1 Electrical Interface Connection

The electronics interface connector is I-PIX 20455-040E or Compatible STM MSAK24025P40.

The connector interface pin assignments are listed in Table 6.



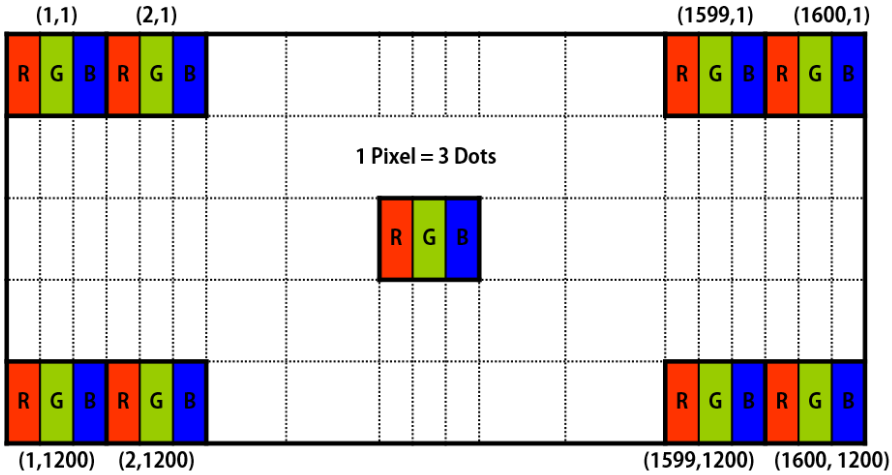

<Table 6. Pin Assignments for the Interface Connector>

| Terminal | Symbol | Functions |
|---|---|---|
| Pin No. | Symbol | Description |
| 1 | VDD | Power Supply: +3.3V |
| 2 | VDD | Power Supply: +3.3V |
| 3 | VDD | Power Supply: +3.3V |
| 4 | GND | Power Ground |
| 5 | RXE0- | Negative Transmission data of Pixel 0 (EVEN) |
| 6 | RXE0+ | Positive Transmission data of Pixel 0 (EVEN) |
| 7 | RXE1- | Negative Transmission data of Pixel 1 (EVEN) |
| 8 | RXE1+ | Positive Transmission data of Pixel 1 (EVEN) |
| 9 | GND | Power Ground |
| 10 | RXE2- | Negative Transmission data of Pixel 2 (EVEN) |
| 11 | RXE2+ | Positive Transmission data of Pixel 2 (EVEN) |
| 12 | RXEC- | Negative Transmission Clock (EVEN) |
| 13 | RXEC+ | Positive Transmission Clock (EVEN) |
| 14 | GND | Power Ground |
| 15 | RXE3- | Negative Transmission data of Pixel 3 (EVEN) |
| 16 | RXE3+ | Positive Transmission data of Pixel 3 (EVEN) |
| 17 | RXO0- | Negative Transmission data of Pixel 0 (ODD) |
| 18 | RXO0+ | Positive Transmission data of Pixel 0 (ODD) |
| 19 | GND | Power Ground |
| 20 | RXO1- | Negative Transmission data of Pixel 1 (ODD) |
| 21 | RXO1+ | Positive Transmission data of Pixel 1 (ODD) |
| 22 | RXO2- | Negative Transmission data of Pixel 2 (ODD) |

<Table 6. Pin Assignments for the Interface Connector（Sequel）>

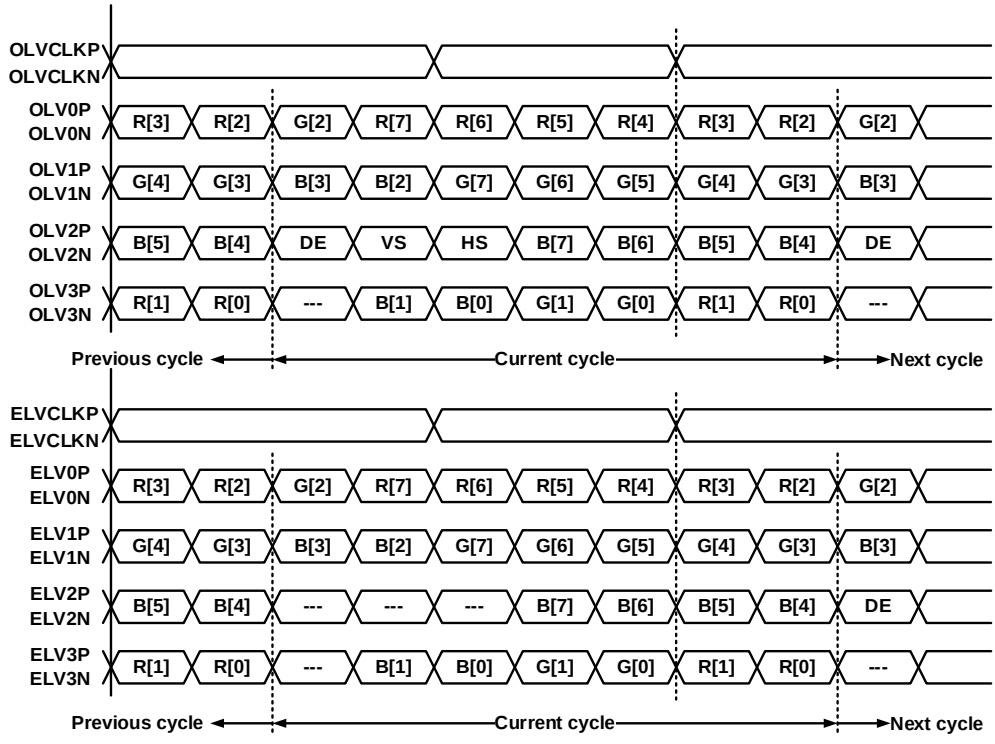
| Terminal | Symbol | Functions |
|---|---|---|
| Pin No. | Symbol | Description |
| 23 | RXO2+ | Positive Transmission data of Pixel 2 (ODD) |
| 24 | GND | Power Ground |
| 25 | RXOC- | Negative Transmission Clock (ODD) |
| 26 | RXOC+ | Positive Transmission Clock (ODD) |
| 27 | RXO3- | Negative Transmission data of Pixel 3 (ODD) |
| 28 | RXO3+ | Positive Transmission data of Pixel 3 (ODD) |
| 29 | GND | Power Ground |
| 30 | VEEDID | Power Supply for EDID |
| 31 | CLKEDID | CLOCK for EDID |
| 32 | DATAEDID | DATA for EDID |
| 33 | VLED_GND | LED Power Ground |
| 34 | BL_DET | LED Driver Operation Status output |
| 35 | PWM | System PWM Signal Input |
| 36 | LED_EN | LED enable pin(+3.3V Input),Normal: |
| 37 | VLED | LED Power Supply: +12V |
| 38 | VLED | LED Power Supply: +12V |
| 39 | VLED | LED Power Supply: +12V |
| 40 | VLED | LED Power Supply: +12V |

## 5.2 Data Input Format




Display Position of Input Data (V-H)

## 5.3 Timing Diagrams of LVDS For Transmission



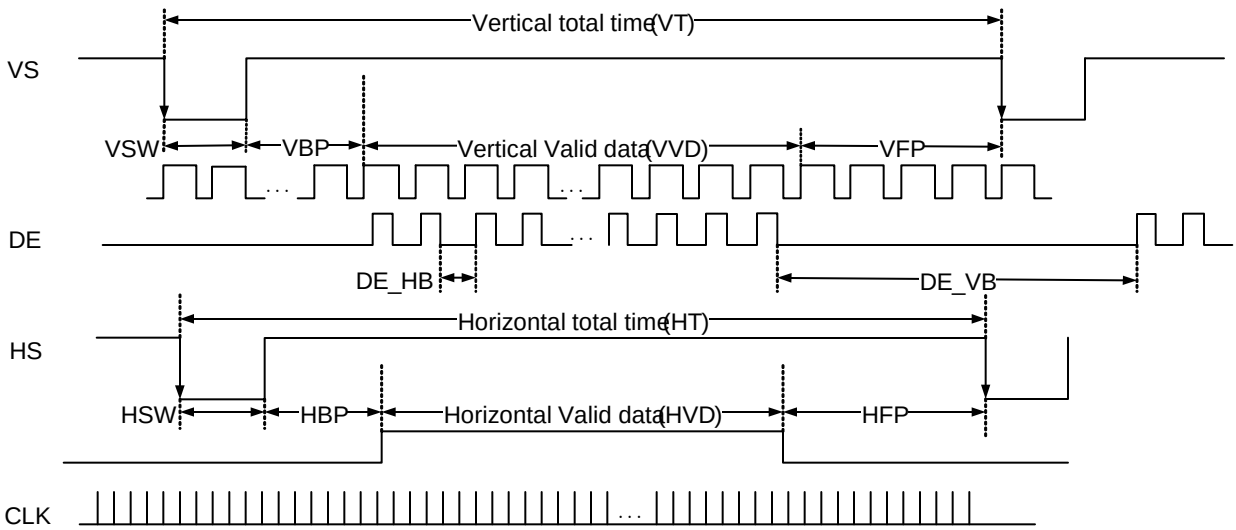

8 bit JEIDA format

# 6.0 SIGNAL TIMING SPECIFICATION

## 6.1 Timing Parameters.

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Clock Frequency | 1/Tclock | 75.7 | 90 | 113.6 | Mhz |
| Horizontal active timing | HVD | - | 1600 | - | Clocks |
| Hsync pulse width | HSW | - | 192 | - | Clocks |
| Horizontal Back porch | HBP | - | 560 | - | Clocks |
| Horizontal front porch | HFP | - | 64 | - | Clocks |
| Vertical active timing | VVD | - | 1200 | - | Lines |
| Vsync pulse width | VSW | - | 3 | - | Lines |
| Vertical Back porch | VBP | - | 50 | - | Lines |
| Vertical front porch | VFP | - | 1 | - | Lines |

## 6.2 Timing diagrams of interface signal

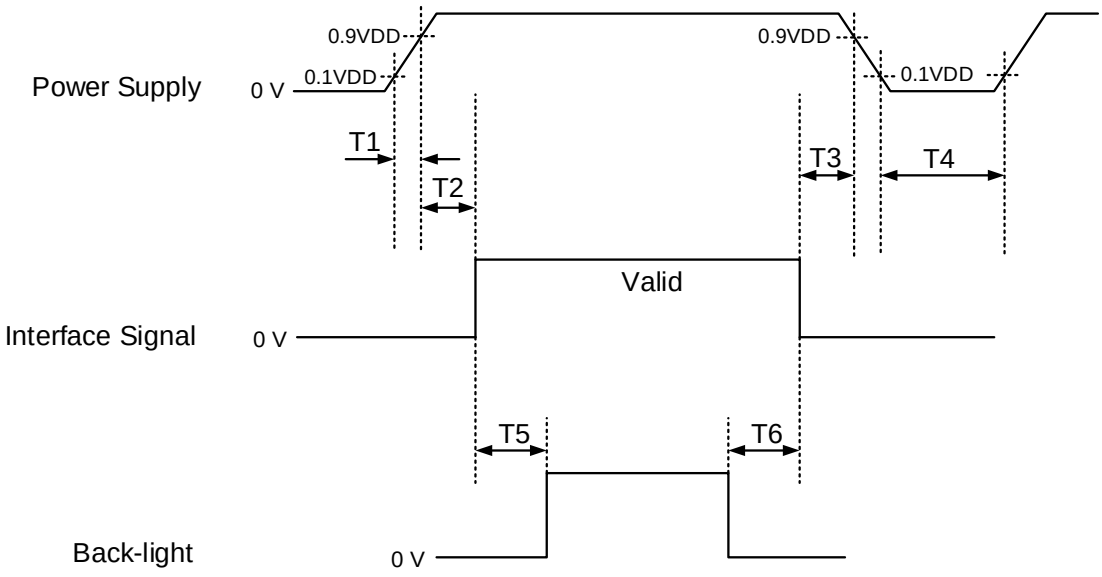


## 7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

| Color & Gray Scale | | Input Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red Data | | | | | | | | Green Data | | | | | | | | Blue Data | | | | | | | |
| | | 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 Colors | 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 |
| | 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 |
| | 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 |
| | 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 |
| Gray Scale of Red | 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 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 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 |
| Gray Scale of Green | 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 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 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 |
| Gray Scale of Blue | 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 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 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 |
| Gray Scale of White | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↑ | | | | | | | | ↑ | | | | | | | | ↑ | | | | | | | |
| | ▽ | ↓ | | | | | | | | ↓ | | | | | | | | ↓ | | | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |

## 8.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below




- 0.5 ms ≤ T1 ≤10 ms
- 0 ≤ T2 ≤ 50 ms
- 0 ≤ T3□50 ms
- 1 sec ≤ T4
- 200 ms ≤ T5
- 200 ms ≤ T6

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

# 9.0 MECHANICAL CHARACTERISTICS

## 9.0.1 Dimensional Requirements

<Table 8. Dimensional Parameters>

| Parameter | Specification | Unit |
|---|---|---|
| Active Area | 304.8 (H) × 228.6(V) | mm |
| Number of pixels | 1600(H) X1200 (V) (1 pixel = R + G + B dots) | pixels |
| Pixel pitch | 0.1905(H) × 0.1905 (V) | mm |
| Pixel arrangement | RGB 2 domain stripe | |
| Display colors | 16.7M (8bit)/262K(6bit) | colors |
| Display mode | Normally Black | |
| Dimensional outline | 317.4 (H) × 242 (V) × 5.9(D) (typ.) | mm |
| Weight | 0.62±0.05 | kg |
| Back-light | Edge side, 1-LED Lighting Bar Type | |

## 9.0.2 Mounting

See FIGURE 5&6.

## 9.0.3 Glare and Polarizer Hardness.

The surface of the LCD has a hard coating to reduce scratching.

## 9.0.4 Light Leakage

There shall not be obvious light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 150lux.

## 10.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 9. Reliability test>

| Item | | Test condition |
|---|---|---|
| High temperature storage | | 80 ℃, 240 hrs |
| Low temperature storage | | -30 ℃, 240 hrs |
| High temperature & high humidity operation | | 50℃,80 %RH, 240hrs |
| High temperature operation | | 70 ℃, 240hrs |
| Low temperature operation | | -20℃, 240hrs |
| Thermal shock | | -30 ℃ ↔ 80 ℃ (0.5 hr), 100 cycle |
| Vibration test | Frequency | 10~57Hz,amplitude : ±0.75mm ; 58~500Hz , acceleration : 15m/s$^2$ |
| | Period | ±X, ±Y, ±Z 1h/direction |
| Shock test | Gravity | 500m/s$^2$ |
| | Pulse width | 3msec, half-sine wave |
| | Direction | ±X, ±Y, ±Z 3times/direction |
| On/Off test | | On/10 sec, Off/10 sec, 30,000 cycles |
| ESD | Air | ± 15KV, 150pF(330 ) 1sec, 9 points, 20 times/ point |
| | Contact | ± 8KV, 150pF(330 ) 1sec, 5 points, 50 times/ point |

## 11.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module
- Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module
- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics
- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions
- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

## 12.0 LABEL

(1) Product label


| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

Type designation

No 1. 特品代码

No 2. 模组产地

No 3. 产品类别

No 4. 显示模式及用途

No 5~7 .产品尺寸

No 8. 生产年份

No 9.生产月份

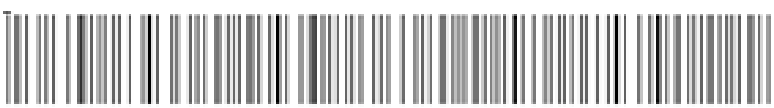
No 10~11.生产日期

No12.研制阶段

No13.批次序号

No14~17.序列编号

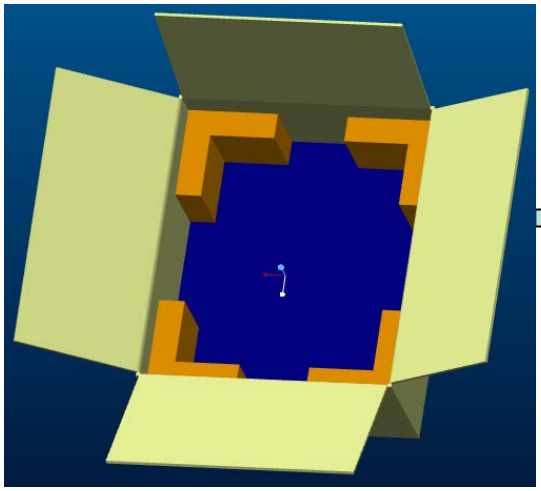
(2) Box label



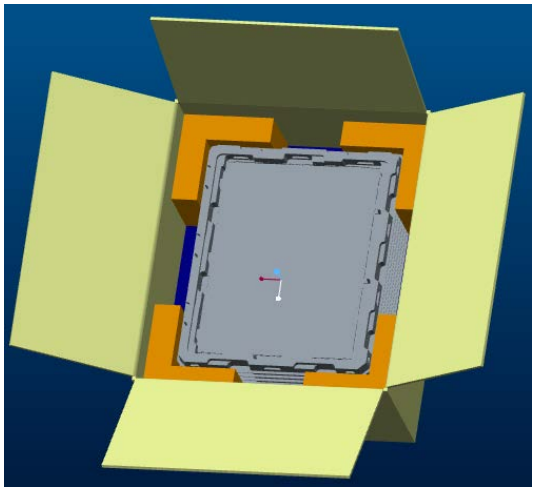
The label on the box is the same as what on every product label.

If there are two products in the box, then there are two labels on the box.

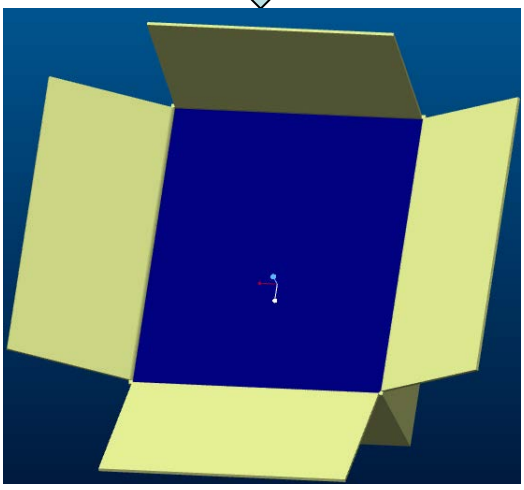
## 13.0 PACKING INFORMATION



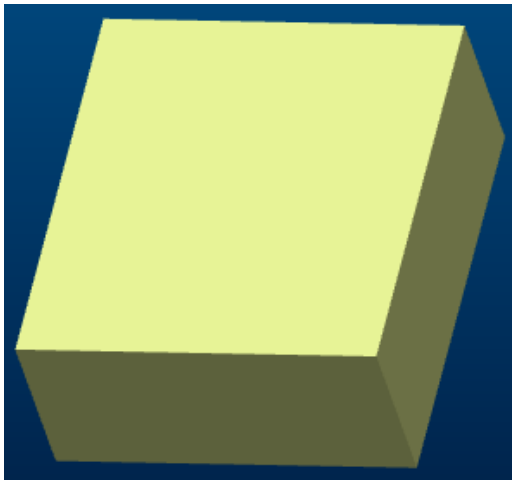
Put pads into the box.



As shown in the figure ,place the Modules bundled by shielding bag in the Tray .Pile on six Modules in total. Put a dummy Tray on the top.



Place a cover on the top of the box.



After sealing the box, attach box labels on the attach position.

## 14.0 MECHANICAL OUTLINE DIMENSION

Figure 5. TFT-LCD Module Outline Dimension (Front View)

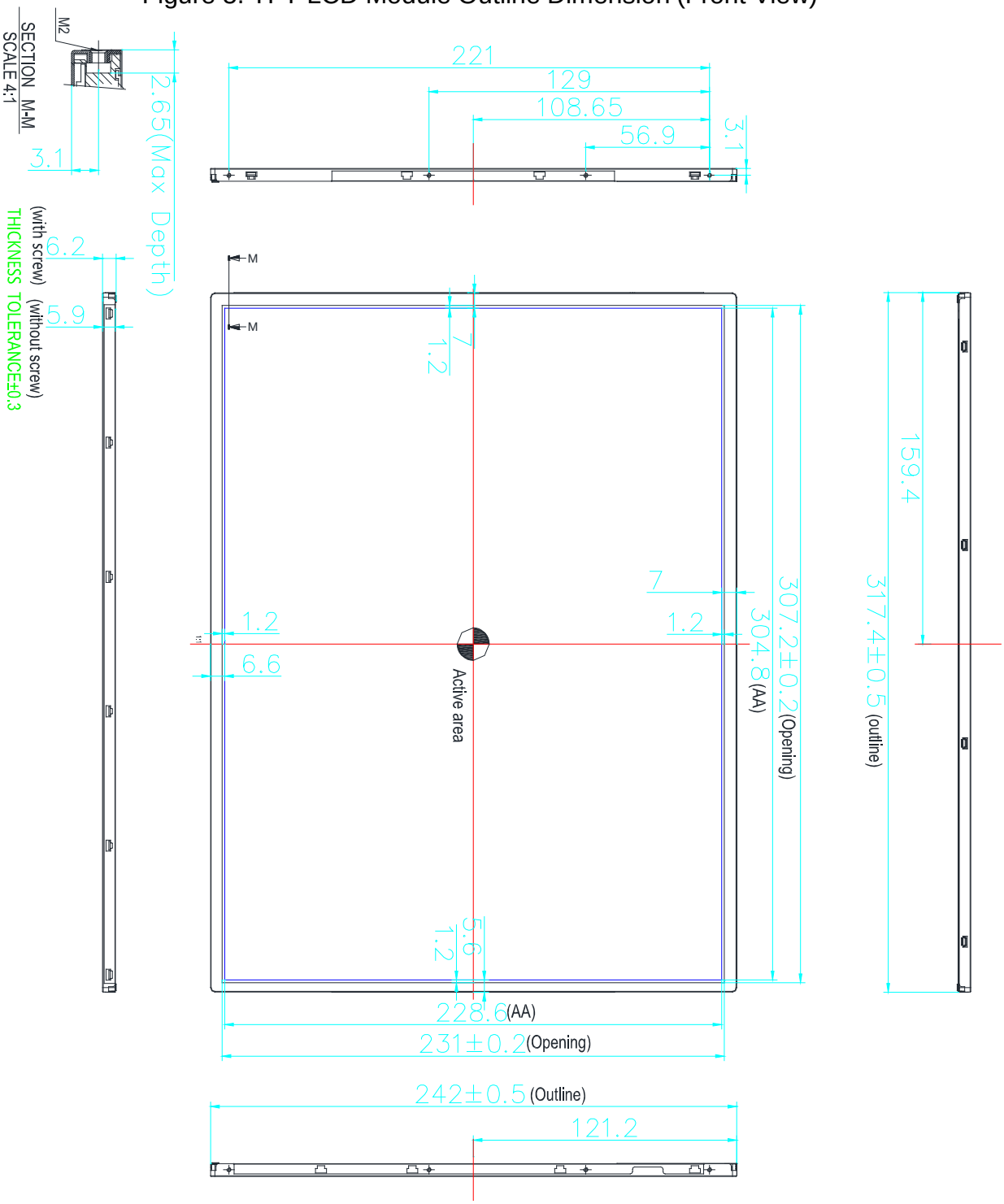


Figure 6. TFT-LCD Module Outline Dimensions (Rear view)