BOE

TITLE : TDA150-005V01(AB)

Product Specification

P0.0

ITEM	SIGNATURE	ITEM	SIGNATURE		
Prepared		Checked			
Countersigned		Approved			

BEIJING BOE SPECIAL DISPLAY TECHNOLOGY

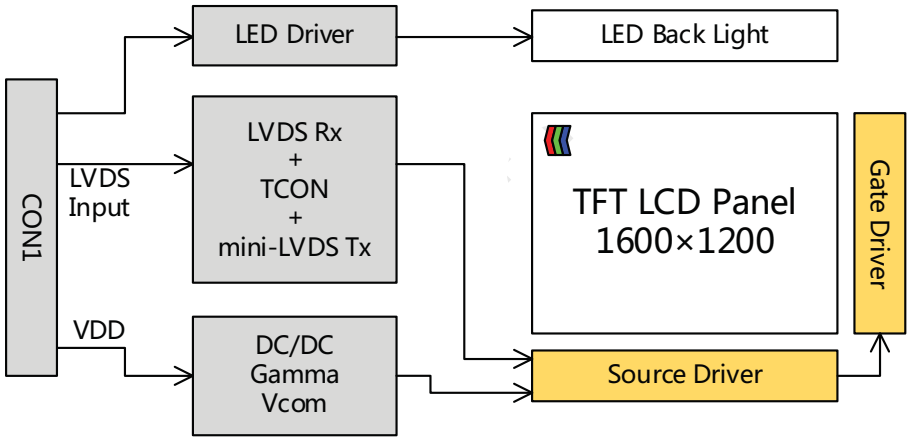
REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED

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 RGB
Display mode	Normally Black		
Dimensional outline	317.4 (H) × 242 (V) × 5.9(D) (typ.)	mm	
Weight	0.62±0.05	kg	
Surface treatment	Haze 25%, 3H		
Back-light	Edge side, 1-LED Lighting Bar Type		

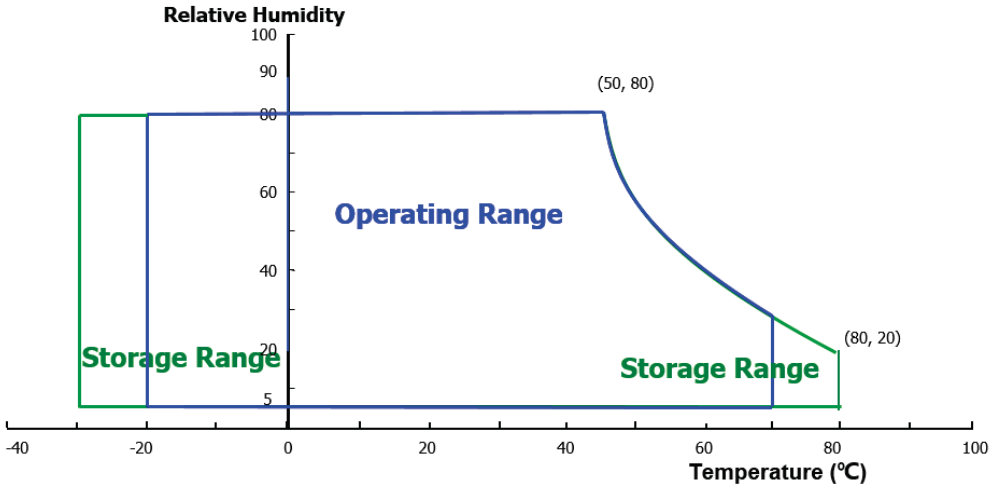
2.0 ABSOLUTE MAXIMUM RATINGS

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}	-	6	V	Note.1
Back-light Power Supply Voltage	HV_{DDOUT}	-	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.



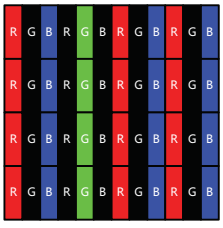
3.0 ELECTRICAL SPECIFICATIONS

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}	4.5	5	5.5	V	Note 1
Power Supply Current	I_{DD}	-	500	1200	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 5V at 25 ℃
1) Max value at L255 1 dot Pattern
2) Flicker Pattern is Column Pattern



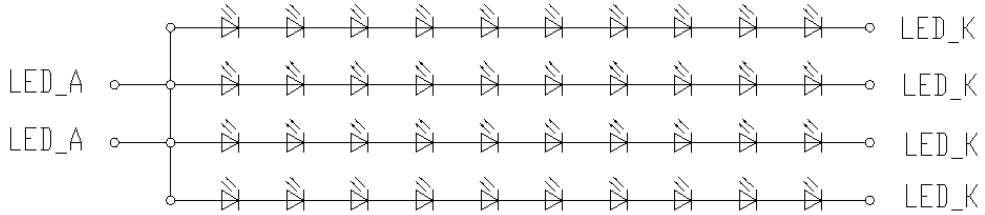
3.2 Back-light Unit

< 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	-	70	80	mA	
LED Driver Power Supply Voltage		V_{LED}	9	12	28	V	
LED Driver Power Supply Current		I_{LED}	-	-	0.8	A	
LED Driver Efficiency		η	-	88	-	%	
Power Consumption for Back light		P_{LED}	-	-	9.6	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 = 70mA 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 $\theta_{Ø=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$(= θ_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 5 ± 0.5V 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	Θ_3	CR > 10	85	-	-	Deg.	Note 1
		Θ_9		85	-	-	Deg.	
	Vertical	Θ_{12}		85	-	-	Deg.	
		Θ_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	ΔY_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).

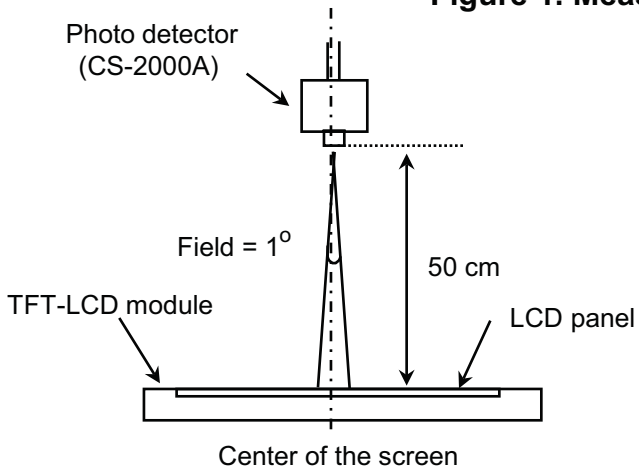
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

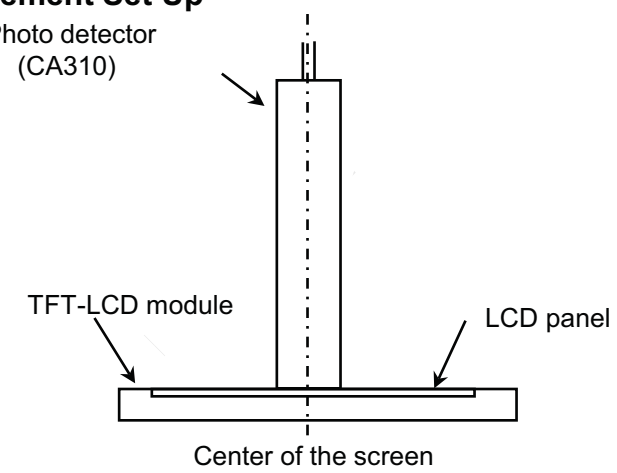
6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

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

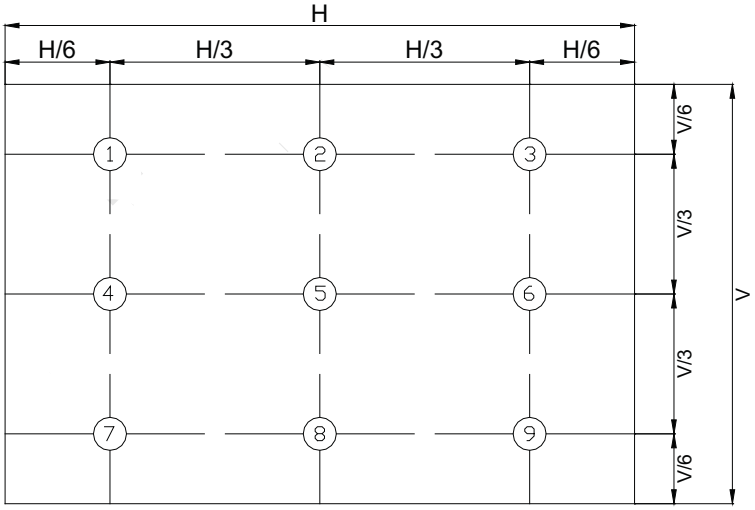
Figure 1. Measurement Set Up





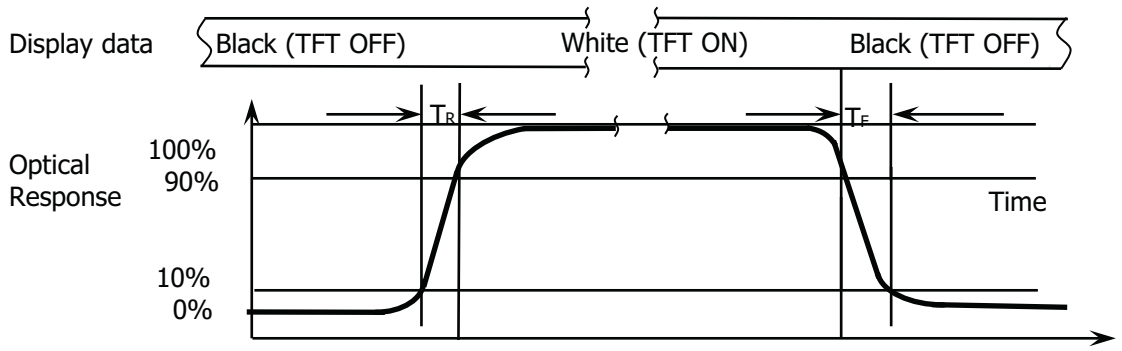
View angel range, uniformity, etc. measurement setup Flicker, measurement setup

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



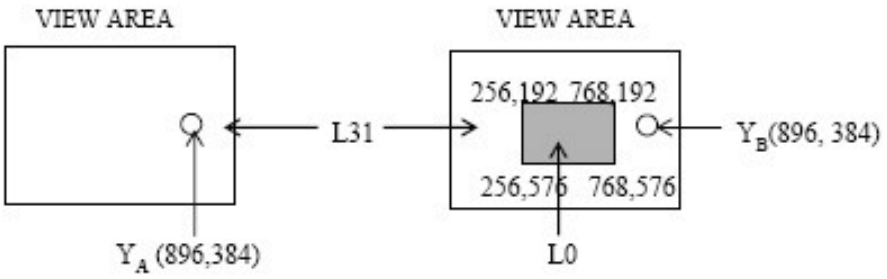
Luminance of white is defined as luminance values of max 9 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.
The White luminance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

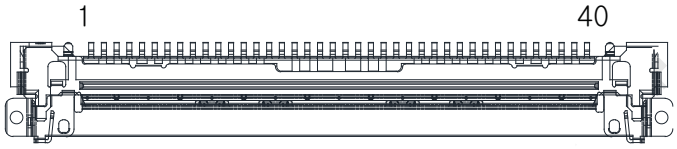
The location measured will be exactly the same in both patterns

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.



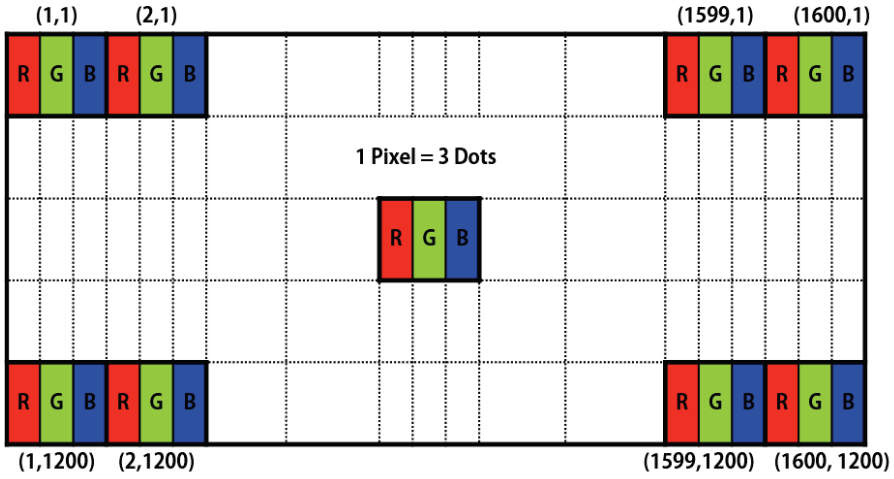
<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	VDD	Power Supply: +5.0V
2	VDD	Power Supply: +5.0V
3	VDD	Power Supply: +5.0V
4	GND	Power Ground
5	RXO0-	Negative Transmission data of Pixel 0 (ODD)
6	RXO0+	Positive Transmission data of Pixel 0 (ODD)
7	RXO1-	Negative Transmission data of Pixel 1 (ODD)
8	RXO1+	Positive Transmission data of Pixel 1 (ODD)
9	GND	Power Ground
10	RXO2-	Negative Transmission data of Pixel 2 (ODD)
11	RXO2+	Positive Transmission data of Pixel 2 (ODD)
12	RXOC-	Negative Transmission Clock (ODD)
13	RXOC+	Positive Transmission Clock (ODD)
14	GND	Power Ground
15	RXO3-	Negative Transmission data of Pixel 3 (ODD)
16	RXO3+	Positive Transmission data of Pixel 3 (ODD)
17	RXE0-	Negative Transmission data of Pixel 0 (EVEN)
18	RXE0+	Positive Transmission data of Pixel 0 (EVEN)
19	GND	Power Ground
20	RXE1-	Negative Transmission data of Pixel 1 (EVEN)
21	RXE1+	Positive Transmission data of Pixel 1 (EVEN)
22	RXE2-	Negative Transmission data of Pixel 2 (EVEN)

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

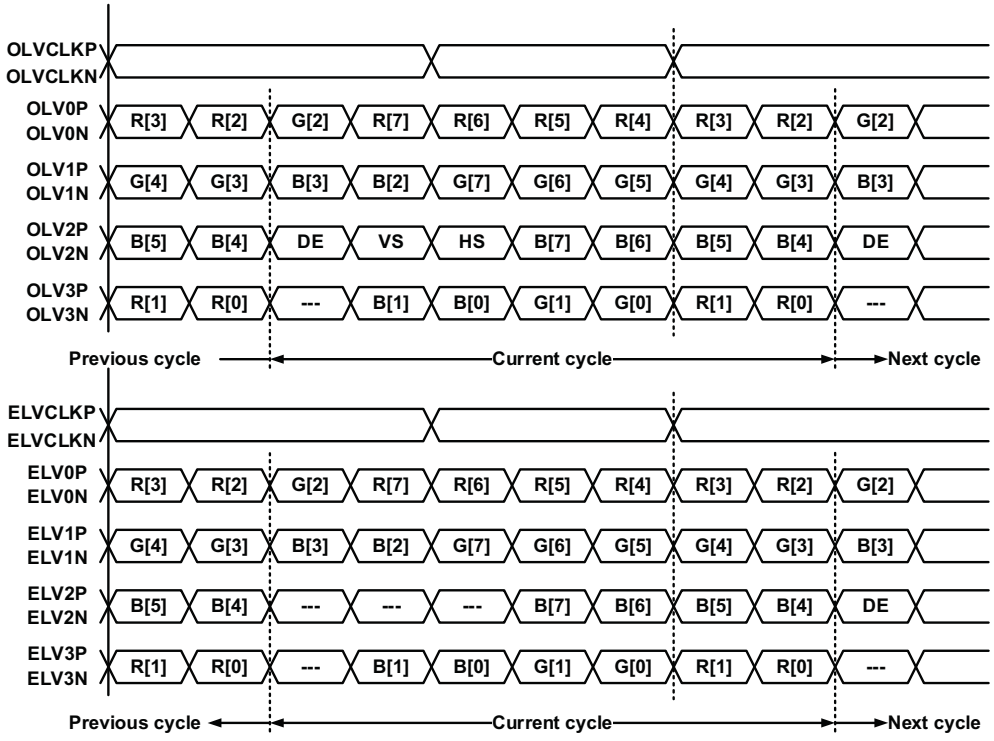
Terminal	Symbol	Functions
Pin No.	Symbol	Description
23	RXE2+	Positive Transmission data of Pixel 2 (EVEN)
24	GND	Power Ground
25	RXEC-	Negative Transmission Clock (EVEN)
26	RXEC+	Positive Transmission Clock (EVEN)
27	RXE3-	Negative Transmission data of Pixel 3 (EVEN)
28	RXE3+	Positive Transmission data of Pixel 3 (EVEN)
29	GND	Power Ground
30	VEEDID	Power Supply for EDID(3.3V)
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
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



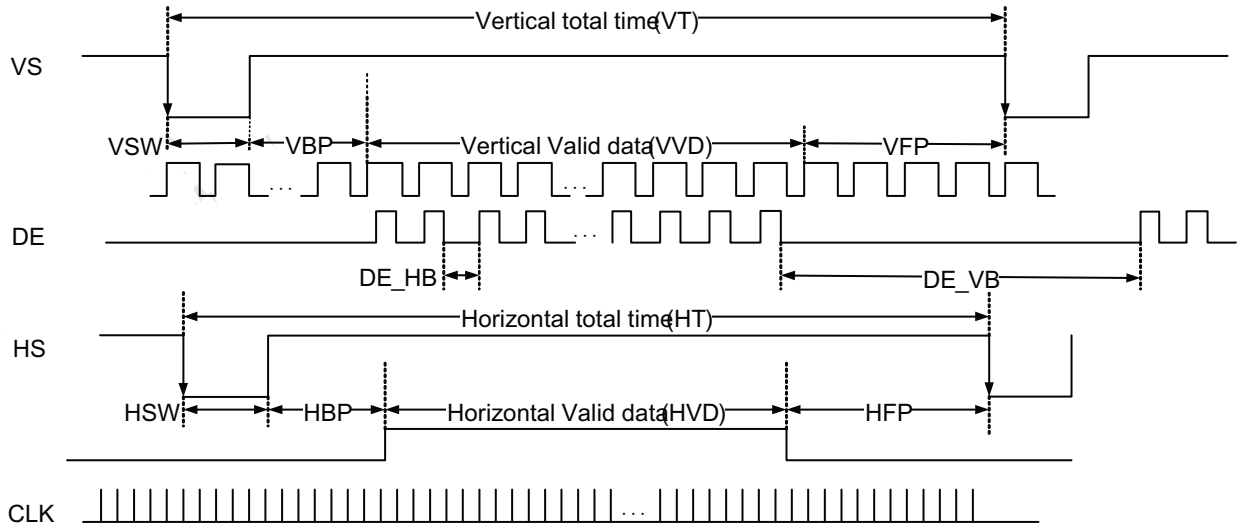
8 bit JEIDA format

6.0 SIGNAL TIMING SPECIFICATION

6.1 Timing Parameters.

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Clock Frequency	1/Tclock	60	81	101	Mhz
Horizontal active timing	HVD	-	1600	-	Clocks
Hsync pulse width	HSW	-	192	-	Clocks
Horizontal Back porch	HBP	-	304	-	Clocks
Horizontal front porch	HFP	-	64	-	Clocks
Vertical active timing	VVD	-	1200	-	Lines
Vsync pulse width	VSW	-	3	-	Lines
Vertical Back porch	VBP	-	46	-	Lines
Vertical front porch	VFP	-	1	-	Lines

6.2 Timing diagrams of interface signal

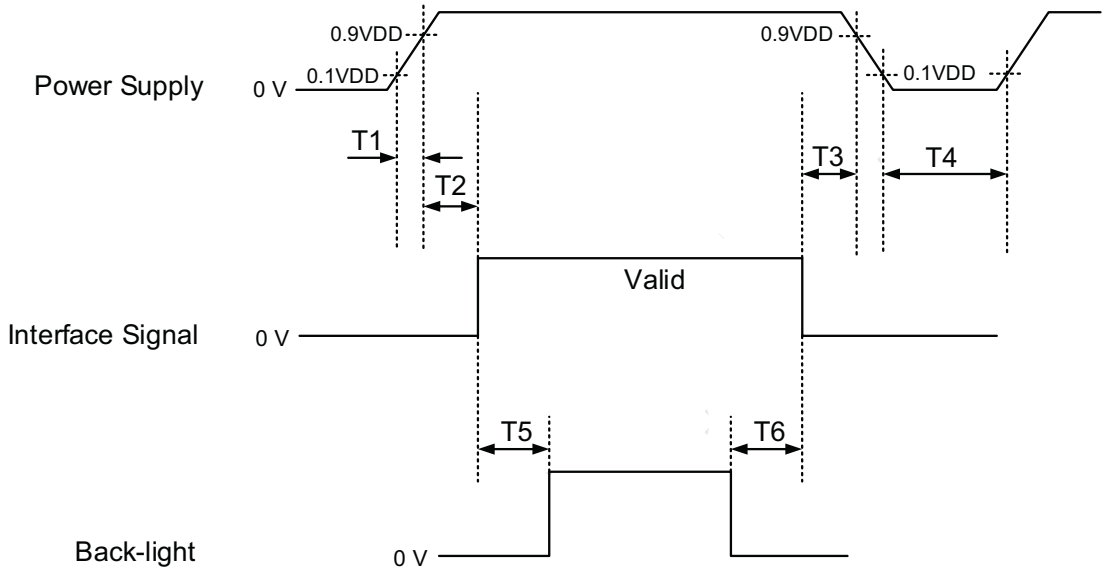


7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

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	18

Type designation

No 1. 产品类别

No 2~4. 产品尺寸

No 5~6. BOM编号

No 7. 次要变更

No 8 .产地

No 9. 生产年份

No 10.生产月份

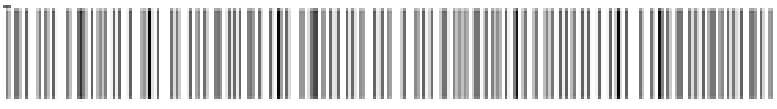
No 11~12.生产日期

No 13.研制阶段

No 14.批次序号

No 15~18.序列编号

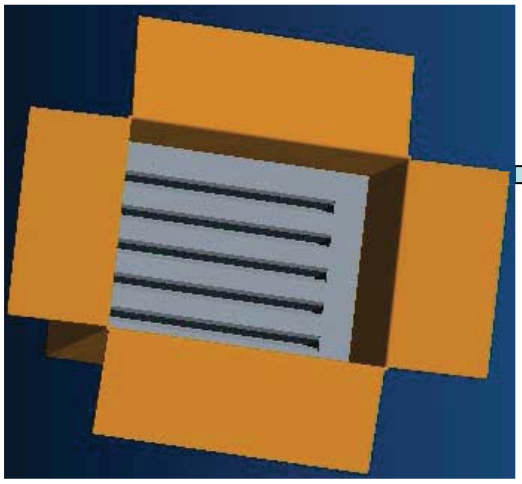
(2) Box label



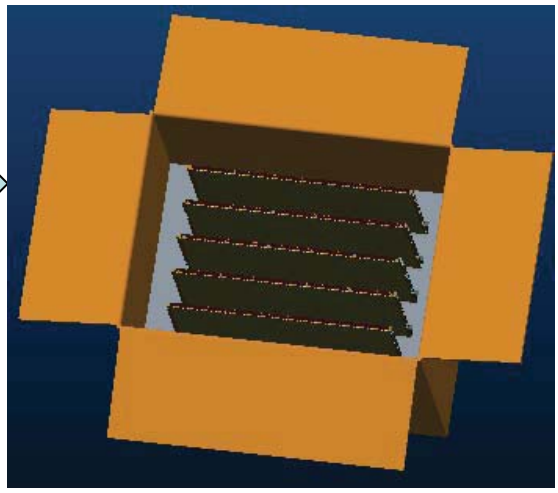
The label on the box is the same as what on every product label.

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

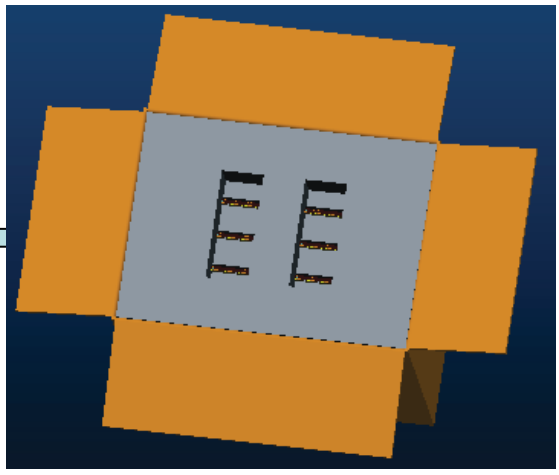
13.0 PACKING INFORMATION



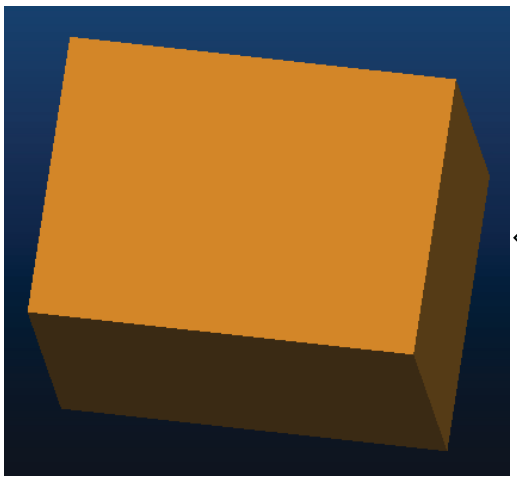
Put bottom EPE pad into the box.



As shown in the figure ,place the Modules bu ndled by antistatic bag . Five Modules in total.



Put a up EPE pad on the top. Put a bag of desiccant in the hollowed ar ea of EPE.



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)

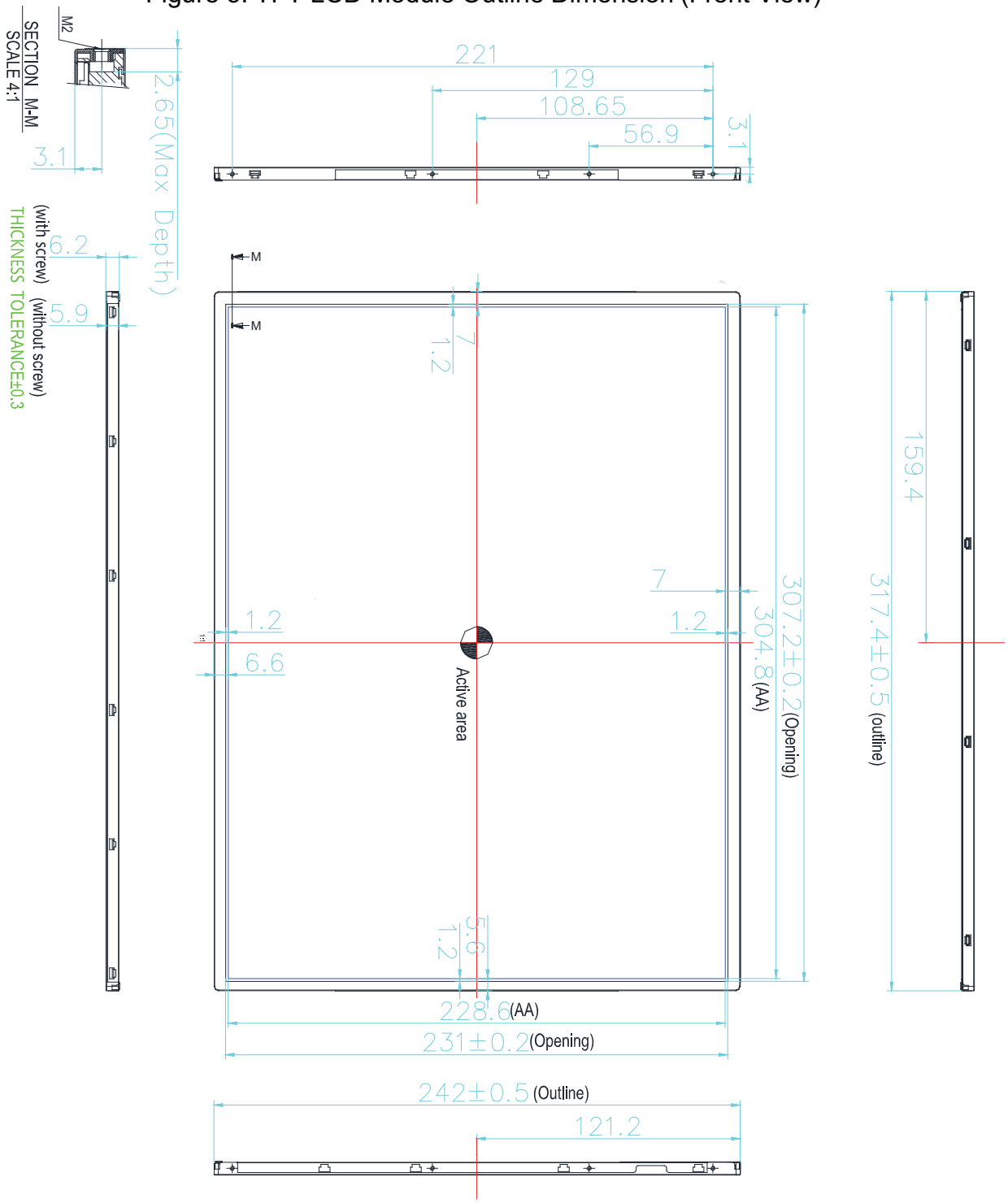


Figure 6. TFT-LCD Module Outline Dimensions (Rear view)