

PROPRIETARY NOTE

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SPEC.NUMBER	PRODUCT GROUP	Rev.	ISSUE DATE	PAGE
	TFT-LCM	P0.1	2019.01.22	1 OF 24

TITLE : RV104X0M-N01
Product Specification

ITEM	SIGNATURE	ITEM	SIGNATURE		
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BEIJING BOE SPECIAL DISPLAY TECHNOLOGY

PRODUCT GROUP

REV

ISSUE DATE



TFT- LCM PRODUCT

P0.1

2019.01.22

SPEC. NUMBER

SPEC. TITLE

PAGE

Preliminary Product Specification

2 OF 24

REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0.1		Initial Release	2019.01.22	Zhang Yongxin Cheng ziyang

Contents

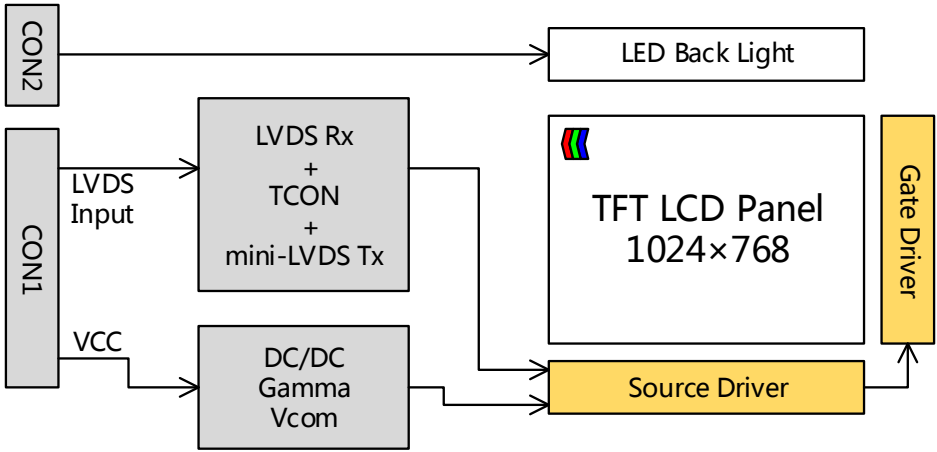
No.	Items	Page
1.0	General Description	4
2.0	Absolute Maximum ratings	6
3.0	Electrical specifications.	7
4.0	Optical specifications.	9
5.0	Interface Connection	13
6.0	Signal Timing Specifications	16
7.0	Input Signals, Display Colors & Gray Scale of Colors	17
8.0	Power Sequence	18
9.0	Mechanical Characteristics	19
10.0	Reliability Test	20
11.0	Handling & Cautions.	21
12.0	Label	22
13.0	Packing information	23
14.0	Mechanical Outline Dimension	24

PRODUCT GROUP		REV	ISSUE DATE	BOE
TFT- LCM PRODUCT		P0.1	2019.01.22	
SPEC. NUMBER	SPEC. TITLE			PAGE
	Preliminary Product Specification			4 OF 24

1.0 GENERAL DESCRIPTION

1.0.1 Introduction

RV104X0M-N01 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 10.4 inch diagonally measured active area with XGA resolutions (1024 horizontal by 768 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.



1.0.2 Features

- 1 lane LVDS Interface with embedded clock
- 8bit color depth, display 16.7M colors
- Single LED Lighting Bar(Up Side/Horizontal Direction)
- High luminance
- Wide operating temperature
- High contrast ratio, wide viewing angle

1.0.3 Application

- TFT-LCD Monitor
- Industrial
- Vehicle

1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	210.43(H) X 157.82(V)	mm	
Number of pixels	1024(H) × 768(V)	Pixels	
Pixel pitch	205.5(H) × 205.5(V)	um	
Pixel arrangement	RGB 2 domain stripe		
Liquid Crystal Alignment Method	ADS		
Display colors	16.7M	Colors	8bit
Display mode	Normally Black		
Dimensional outline	235(H) × 173(V) × 10(D)	mm	
Weight	≤500	g	
Surface treatment	HC, 3H		
LED life	30,000	hr	Min

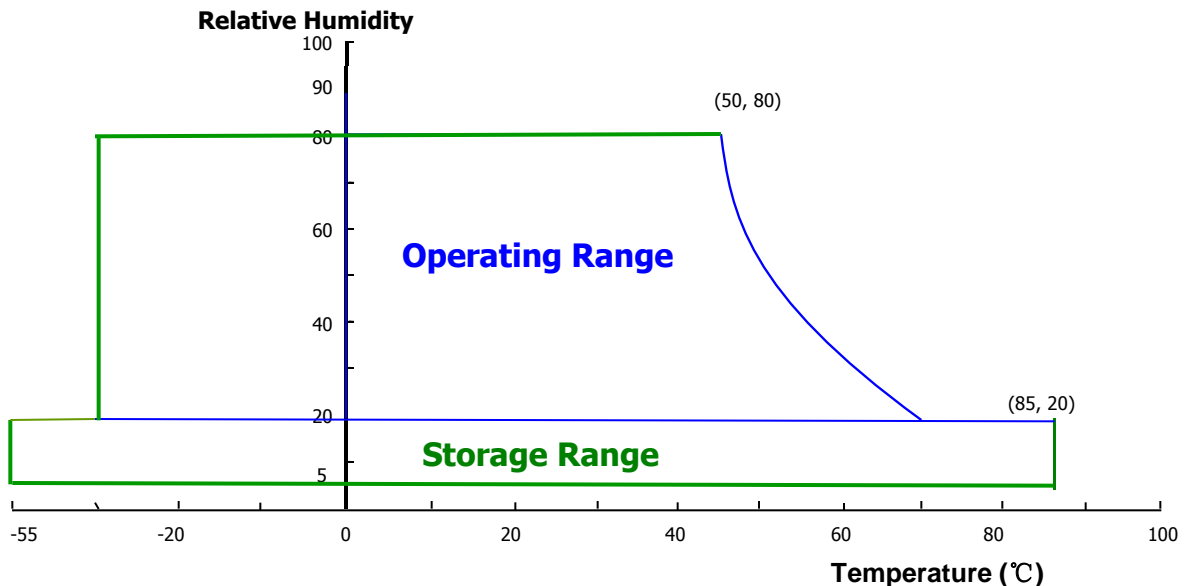
2.0 ABSOLUTE MAXIMUM RATINGS

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 °C]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage (LCD Module)	V _{DD}	3.0	3.6	V	
Back-light LED Forward Current	I _F	-	90	mA	One LED
Back-light LED Pulse Forward Current	I _{FP}	-	270	mA	One LED
Operating Temperature	T _{OP}	-40	+80	°C	Note 1
Storage Temperature	T _{ST}	-55	+85	°C	

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.0.1 TFT LCD Module

< Table 3. LCD Module Electrical Specifications >

[Ta =25±2 °C]

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}	-	500	700	mA	
Differential input common mode voltage	V _{com}	0.7	1.2	1.6	V	V _{IH} =100mV, V _{IL} =-100mV
Power Consumption	P _p	-	-	2.5	W	
	P _{BL}	-	-	8.0	W	I _F =80mA
	P _{total}	-	-	10.5	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 °C
Max value at White Pattern

2. Calculated value for reference (VLED X ILED)

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	-	80	90	mA	Single Channel
LED Power Consumption	P_{LED}	-	-	8	W	
LED Life-Time	N/A	30000			Hour	$I_F = 80mA$ Note 1
Power supply voltage for Back light	V_{LED}	-	24.0	25.6	V	

Notes : 1. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

4.0 OPTICAL SPECIFICATION

4.0.1 Overview

The test of view angle range shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) 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 $\theta_{\phi=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\phi=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\phi=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\phi=270}$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or Φ , 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 $5 \pm 0.5\text{V}$ 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	$\Theta = 0^\circ$	900		-		Note 2
Luminance of White	9points max	Y_w	$\Theta = 0^\circ$	900		-	cd/m ²	Note 3
White Luminance uniformity	9 Points	$\Delta Y9$		75	-	-	%	Note 4
Reproduction of color	White	W_x	$\Theta = 0^\circ$	Typ. -0.03	0.313	Typ. +0.03		Note 5
		W_y			0.339			
Response Time		T_{RT}	$T_a = 25^\circ\text{C}$ $\Theta = 0^\circ$	-	-	25	ms	Note 6
Cross Talk		CT	$\Theta = 0^\circ$	-	-	2	%	Note 7
Colour Gamut			NTSC 1976	72		-	%	

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).

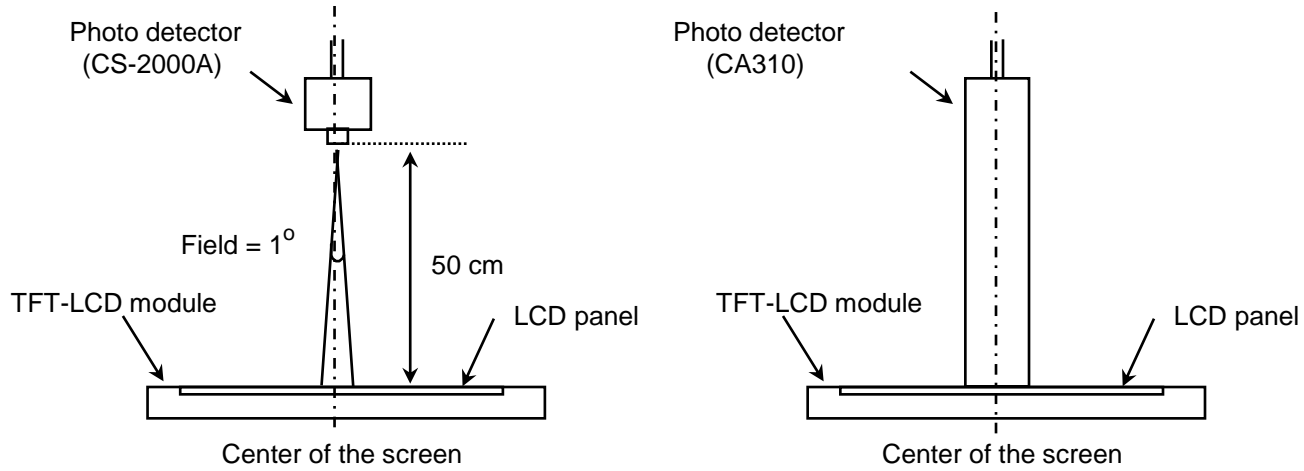
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (see FIGURE 1) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Center Luminance of white is defined as 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.
4. The White luminance uniformity on LCD surface is then expressed as : $\Delta Y = \text{Minimum Luminance of 9 points} / \text{Maximum Luminance of 9 points}$ (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 T_r , and 90% to 10% is T_d .
7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (Y_A) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (Y_B) of that same area when any adjacent area is driven dark. (See FIGURE 4).

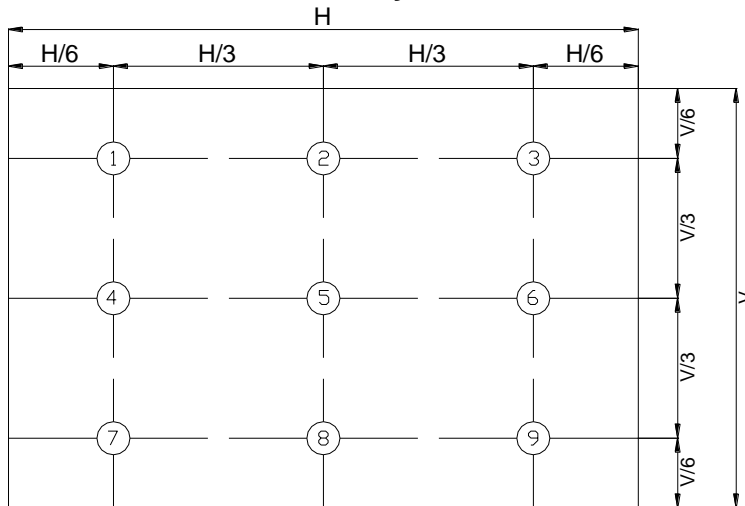
PRODUCT GROUP		REV	ISSUE DATE	BOE
TFT- LCM PRODUCT		P0.1	2019.01.22	
SPEC. NUMBER	SPEC. TITLE			PAGE
	Preliminary Product Specification			11 OF 24

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)

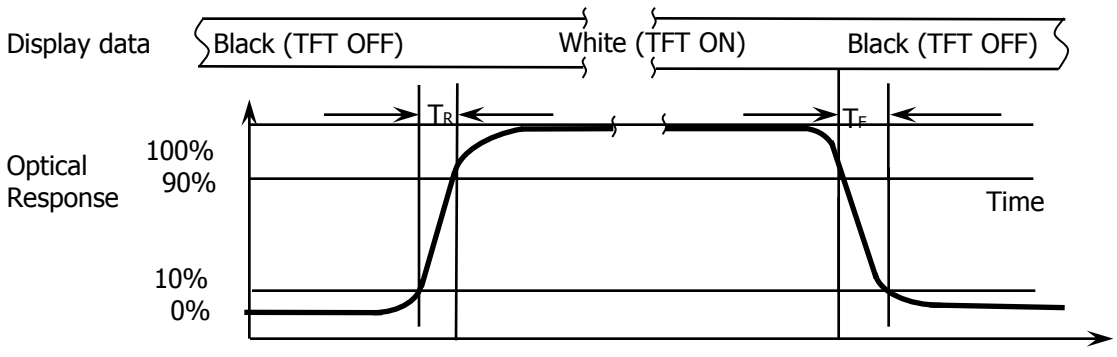


Luminance of white is defined as luminance values of max 9 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

The White luminance uniformity on LCD surface is then expressed as : $\Delta Y9 = \text{Minimum Luminance of 9 points} / \text{Maximum Luminance of 9 points}$ (see FIGURE 2).

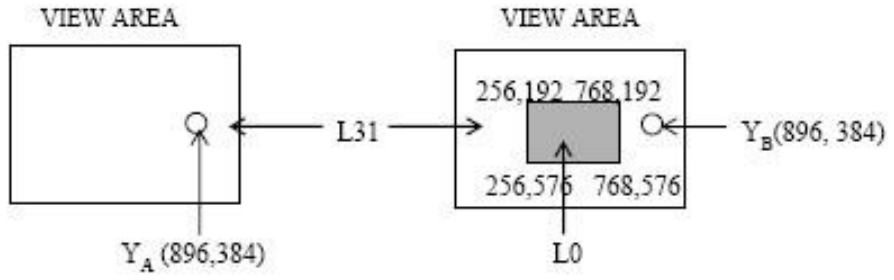
PRODUCT GROUP		REV	ISSUE DATE	BOE
TFT- LCM PRODUCT		P0.1	2019.01.22	
SPEC. NUMBER	SPEC. TITLE Preliminary Product Specification			PAGE 12 OF 24

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

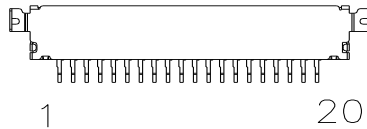
5.0 INTERFACE CONNECTION.

5.0.1 Electrical Interface Connection

Module Side Connector: 20 pin LVDS connector JAE FI-SE20P-HFE or Compatible.3.3V input power supply.

User Side Connector: JCTC A1256H00-20PA-HF or Compatible.

The connector interface pin assignments are listed in Table 6.



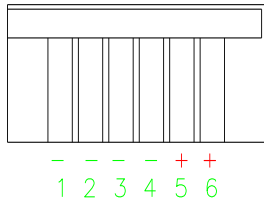
<Table 6. Pin Assignments for the Interface Connector>

No.	Symbol	Functions	No.	Symbol	Functions
1	DPS	NC	11	GND	Ground
2	GND	Ground	12	D1+	Transmission Data of 1+
3	D3+	Transmission Data of 3+	13	D1-	Transmission Data of 1-
4	D3-	Transmission Data of 3-	14	GND	Ground
5	GND	Ground	15	D0+	Transmission Data of 0+
6	CLK+	Transmission Clock+	16	D0-	Transmission Data of 0-
7	CLK-	Transmission Clock-	17	GND	Ground
8	GND	Ground	18	GND	Ground
9	D2+	Transmission Data of 2+	19	VCC	Power supply 3.3V
10	D2-	Transmission Data of 2-	20	VCC	Power supply 3.3V

5.0.2 Back-light Interface Connection

Module Side Connector: The connector of BLU PE-MSA24039P6A(6PIN 1.0mm Pitch).

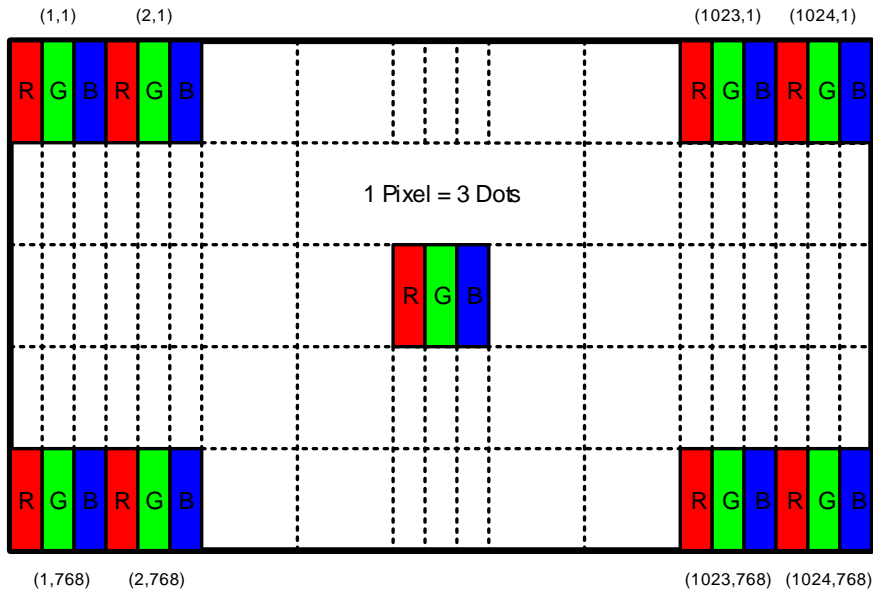
User Side Connector: JOINT A1024H-06PNOWNP00G/BOOM.



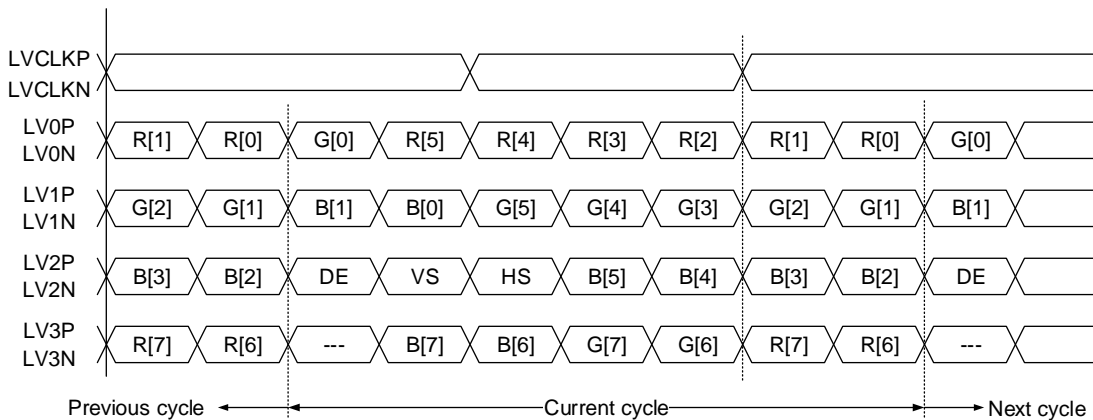
<Table 7. Pin Assignments for the Interface Connector of LED

No.	Symbol	Functions
6	Anode	Anode for LED Bar
5	Anode	Anode for LED Bar
4	Cathode	Cathode for LED Bar
3	Cathode	Cathode for LED Bar
2	Cathode	Cathode for LED Bar
1	Cathode	Cathode for LED Bar

5.0.3 Data Input Format



5.0.4 Timing Diagrams of LVDS For Transmission



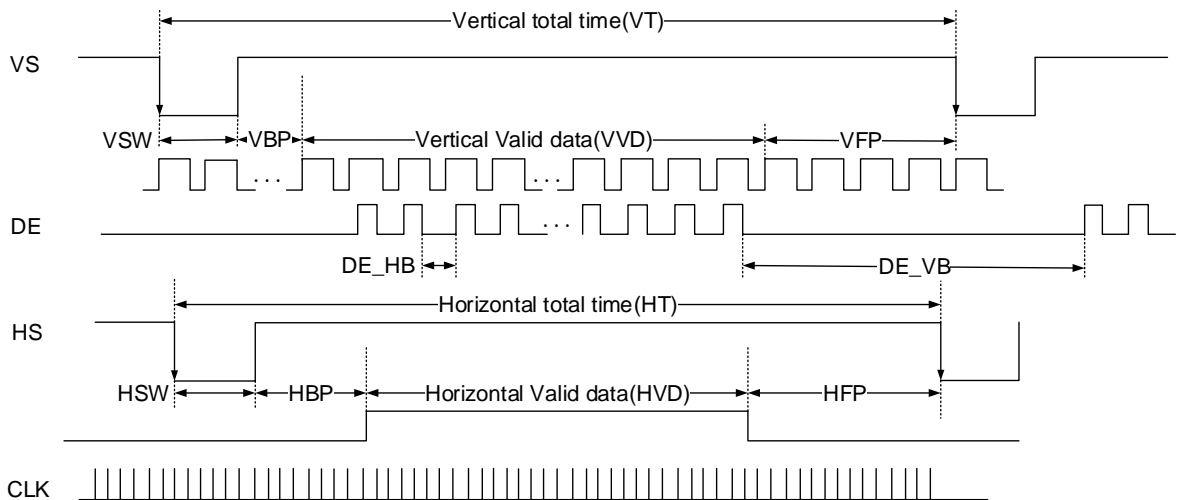
8 bit VESA mode

6.0 SIGNAL TIMING SPECIFICATION

6.0.1 Timing Parameters

Parameter	Symble	Typ	Unit
DCLK frequence	FDCLK	65	MHz
Horizontal total timing	HT	1344	pixels
Hsync pulse width	HSW	136	pixels
Horizontal back porch	HBP	160	pixels
Horizontal front porch	HFP	24	pixels
Horizontal active timing	HVD	1024	pixels
Vertical total timing	VT	806	Lines
Vsync pulse width	VSW	6	Lines
Vertical back porch	VBP	29	Lines
Vertical front porch	VFP	3	Lines
Vertical active timing	VVD	768	Lines

6.0.2 Timing diagrams of interface signal

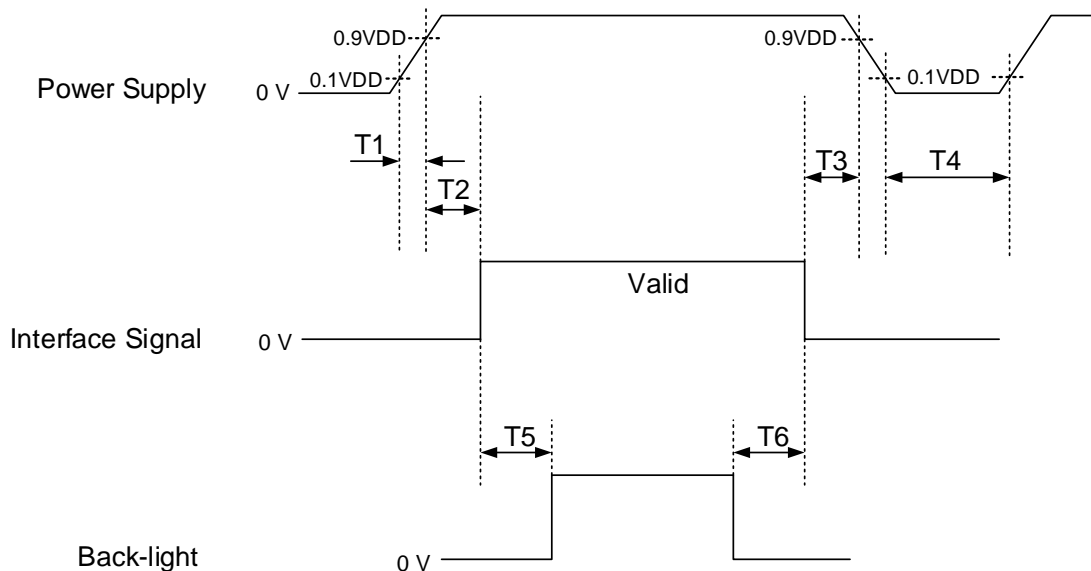


7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

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	0	1
	△	↑								↑								↑							
	▽	↓								↓								↓							
	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



- $0.5\text{ ms} \leq T1 \leq 10\text{ ms}$
- $0 \leq T2 \leq 50\text{ ms}$
- $0 \leq T3 \leq 50\text{ ms}$
- $1\text{ s} \leq T4$
- $200\text{ ms} \leq T5$
- $200\text{ ms} \leq T6$

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	Remark
Active Area	210.43(H) X 157.82(V)	mm	
Number of pixels	1024(H) RGB × 768(V)(1 pixel = R + G + B dots)	pixels	
Pixel pitch	205.5(H) × 205.5 (V)	um	
Pixel arrangement	RGB 2 domain stripe		
Display colors	16.7M (8bit)	colors	
Display mode	Normally Black		
Dimensional outline	235(H) X173(V) X 10(D)	mm	
Weight	500	g	
Back-light	Edge side, 1-LED Lighting Bar Type		
LED life	30,000	hr	Min

9.0.2 Mounting

See FIGURE 5.

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	Remark
High temperature storage		80 °C, 48 hrs	
Low temperature storage		-30 °C, 24 hrs	
High temperature & high humidity no operation		60°C,90%RH, 240hrs	
High temperature operation		70 °C, 2hrs	
Low temperature operation		-20°C, 2hrs	
Thermal shock		-30 °C ↔ 80 °C (0.5 hr),10 cycles	Note 1
High Temperature and Stable State		70 °C, 96hrs	
Vibration test	Frequency	10~57Hz,amplitude : ±0.075mm ; 57~500Hz , acceleration : 10m/s ²	
	Period	±X, ±Y, ±Z 1h/direction	
Shock test	Gravity	50G	
	Pulse width	11msec, half-sine wave	
	Direction	±X, ±Y, ±Z 3times/direction	
ESD	Air	±8KV	Note 2
	Contact	±6KV	

Note 1:

0.5h is keeping temperature time, when the temperature reach -55 °C or 85 °C

Note 2:

ESD Test based on GB/T17626 ,Store capacitance is 150pF.
Released resistance is 330Ω.

Level : Refer to Class B

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

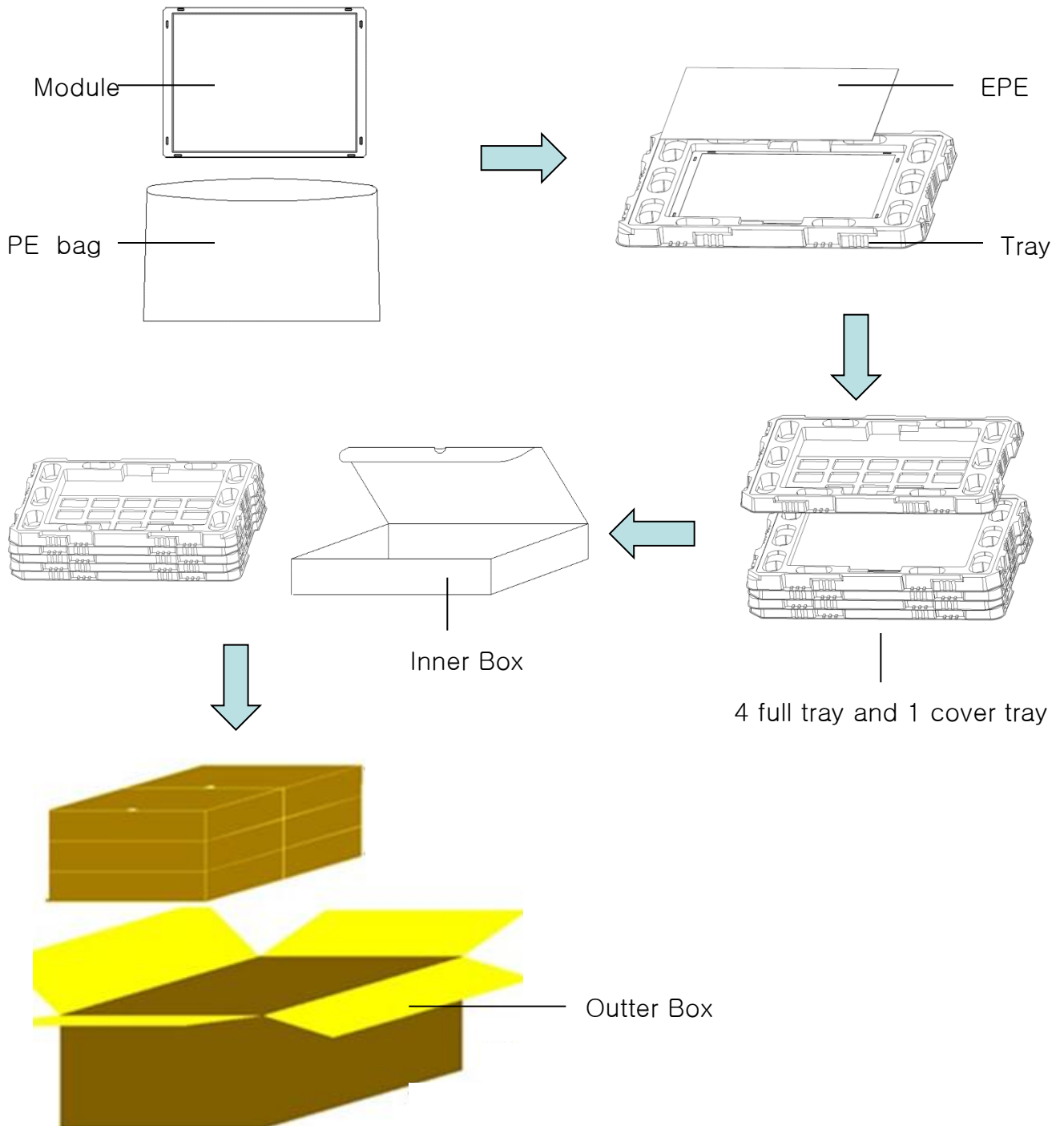


1 2 3 4 5 6 7



- 1:Manufacturer and Product Type
- 2: Product Size
- 3:Year(2010 -A 2011—B.....)
- 4:Month(1,2,3.....7,8,9,X,Y,Z)
- 5:Date
- 6: Stage Identification(Z1,D1)
- 7:Serial Number

13.0 PACKING INFORMATION



PRODUCT GROUP		REV	ISSUE DATE	BOE
TFT- LCM PRODUCT		P0.1	2019.01.22	
SPEC. NUMBER	SPEC. TITLE			PAGE
	Preliminary Product Specification			24 OF 24

14.0 MECHANICAL OUTLINE DIMENSION

Figure 5. TFT-LCD Module Outline Dimension

