BOE

TITLE : RV201U0M-N01

Product Specification

P0.1

ITEM	SIGNATURE	ITEM	SIGNATURE		
Prepared		Checked			
Countersigned		Approved			

BEIJING BOE SPECIAL DISPLAY TECHNOLOGY

A4(210 X 297)

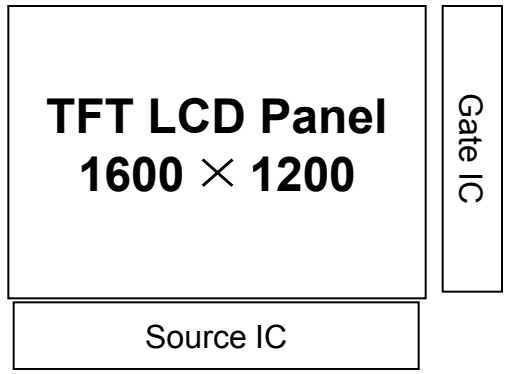
REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED

Contents

1.0 GENERAL DESCRIPTION

1.0.1 Introduction

RV201U0M-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 20.1 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.



1.0.2 Features

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

1.0.3 Application

- TFT-LCD Monitor
- Industrial
- Vehicle

1.0.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	408.0 (H) × 306.0(V)	mm	
Number of pixels	1600(H) × 1200(V)	Pixels	
Pixel pitch	0.255(H) × 0.255 (V)	mm	
Pixel arrangement	RGB 2 domain stripe		
Display colors	16.7M	Colors	8bit
Display mode	Normally Black		
Dimensional outline	432.0 (H) × 331.5 (V) × 19.5(D) typ.	mm	6max
Weight	≤2.75	kg	
Surface treatment	Haze 25%, 3H		
LED life	30,000	hr	

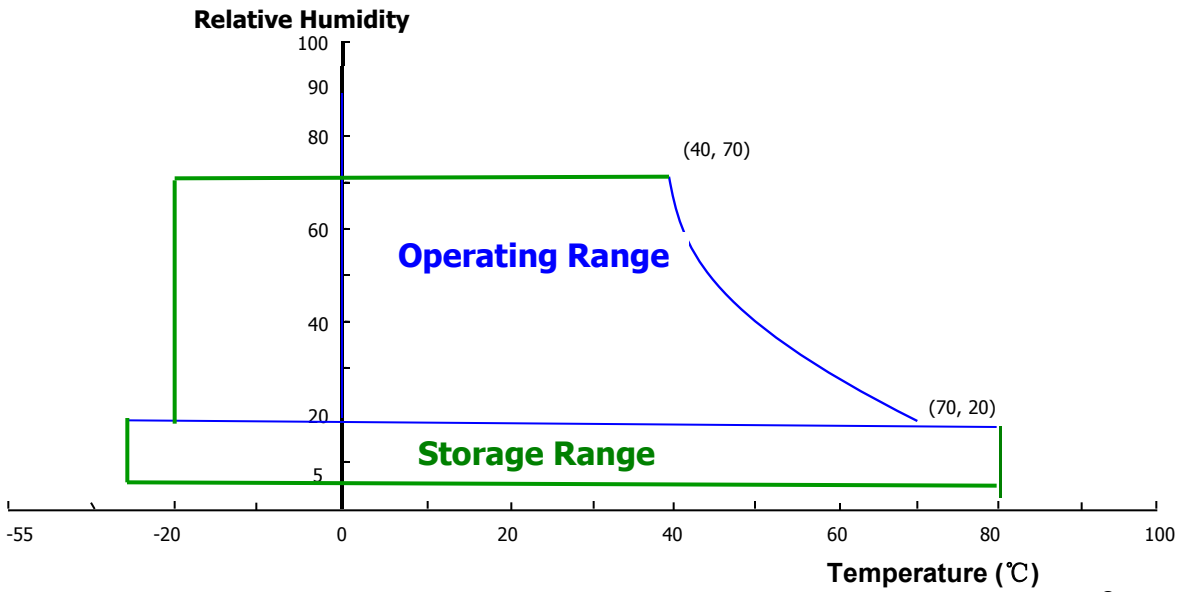
2.0 ABSOLUTE MAXIMUM RATINGS

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}	11.5	12.5	V	
Back-light LED Forward Current	I_F	-	120	mA	One LED
Back-light LED Pulse Forward Current	I_{FP}	-	240	mA	One LED
Operating Temperature	T_{OP}	-20	+70	℃	Note.1
Storage Temperature	T_{ST}	-30	+80	℃	

Note : 1) 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

3.0.1 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}	11.5	12	12.5	V	Note 1
Power Supply Current	I_{DD}	-	220	450	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	-	3	3.5	W	
	P_{BL}	-	29.7	32.4	W	
	P_{total}	-	32	36	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 12V at 25 ℃
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	-	3.6	V	-
LED Forward Current	I_F	-	120	-	mA	Single Channel
LED Power Consumption	P_{LED}	-	-	33	W	Note 1
LED Life-Time	N/A	30000			Hour	IF = 120mA Note 2
Power supply voltage for Back light	V_{LED}	30	32	36	V	
Power supply Current for Back light	I_{LED}	-	0.6	1.3	A	

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} \div 0.88 = P_{LED}$

2. 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 ≤ 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"), θ $_{Ø}$=90 (= θ_{12}) as the 12 o'clock direction ("upward"), θ $_{Ø}$=180 (= θ_9) as the 9 o'clock direction ("left") and θ $_{Ø}$=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 12 ± 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°	600	800	-		Note 2
Luminance of White	Center 1point	Y_w	Θ = 0°	800	900	-	cd/m^2	Note 3
White Luminance uniformity	9 Points	ΔY9		80	-	-	%	Note 4
Reproduction of color	White	Wx	Θ = 0°	Typ. -0.015	0.313	Typ. +0.015		Note 5
		Wy			0.329			
Response Time		T_{RT}	Ta= 25° C Θ = 0°	-	-	25	ms	Note 6
Colour Gamut			NTSC 1976	68	72	-	%	

A4(210 X 297)

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).

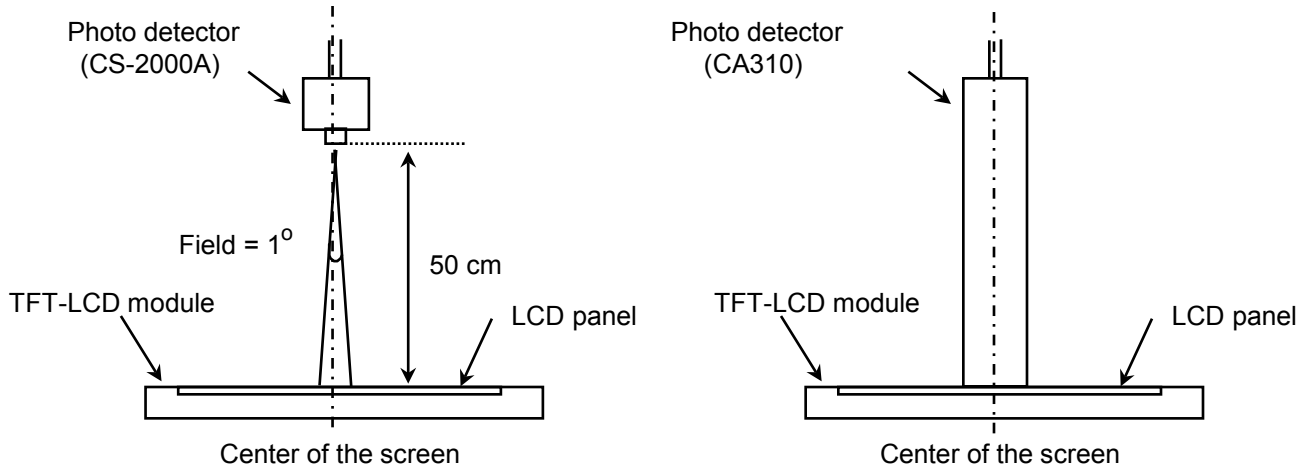
5. The color chromaticity coordinates specified in Table 5. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

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).

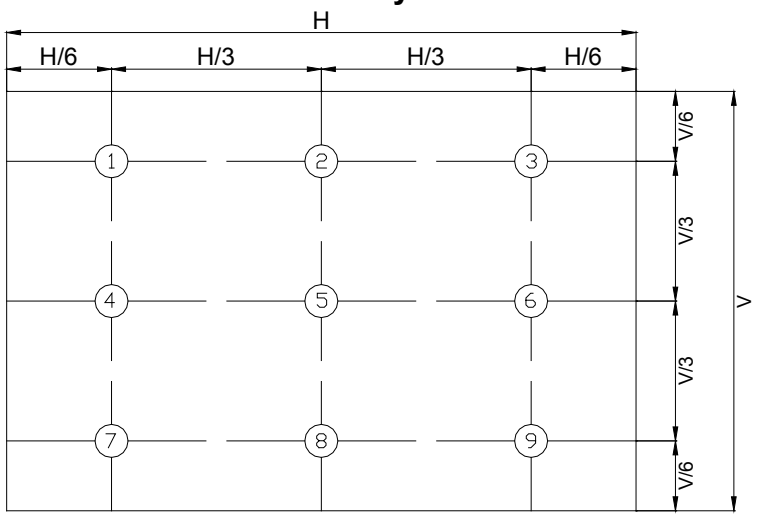
4.0.2 Optical measurements

Figure 1. Measurement Set Up



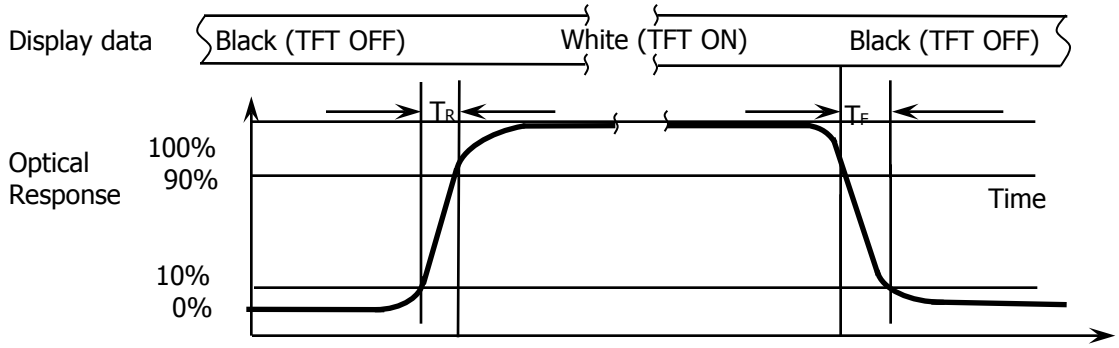
View angel range, uniformity, etc. measurement setup Flicker, measurement setup

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



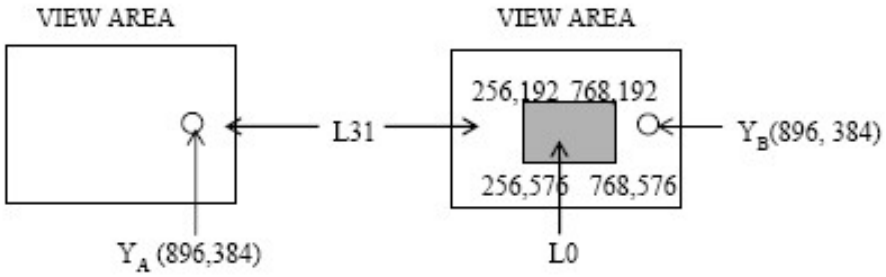
Luminance of white is defined as luminance values of max 9 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.
The White luminance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

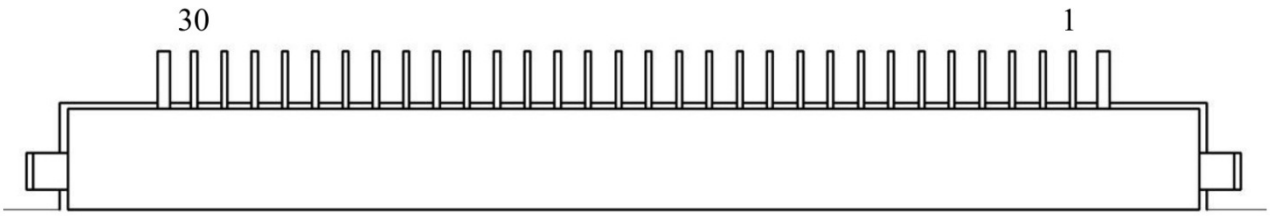
The location measured will be exactly the same in both patterns

5.0 INTERFACE CONNECTION.

5.0.1 Electrical Interface Connection

Interface Connector: 30 pin LVDS connector F76LARW-30S-1H (HIROSE) or FI-XB30SRL-HF11 (JAE);12V input power supply.

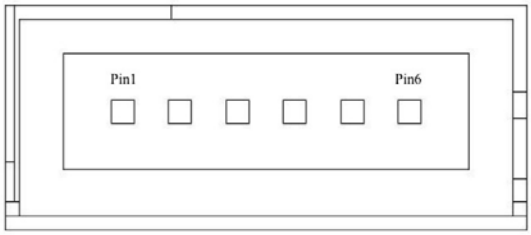
The connector interface pin assignments are listed in Table 6.



<Table 6. Pin Assignments for the Interface Connector>

Pin No.	Symbol	Functions	Pin No.	Symbol	Functions
1	VCC	+12V power supply	16	RBIN0-	LVDS EVEN Data0-
2	VCC	+12V power supply	17	VSS	GND
3	VCC	+12V power supply	18	VSS	GND
4	VCC	+12V power supply	19	RAIN3+	LVDS ODD Data3+
5	VSS	GND	20	RAIN3-	LVDS ODD Data3-
6	VSS	GND	21	CKAIN+	LVDS ODD Clock+
7	RBIN3+	LVDS EVEN Data3+	22	CKAIN-	LVDS ODD Clock-
8	RBIN3-	LVDS EVEN Data3-	23	RAIN2+	LVDS ODD Data2+
9	CKBIN+	LVDS EVEN Clock+	24	RAIN2-	LVDS ODD Data2-
10	CKBIN-	LVDS EVEN Clock-	25	RAIN1+	LVDS ODD Data1+
11	RBIN2+	LVDS EVEN Data2+	26	RAIN1-	LVDS ODD Data1-
12	RBIN2-	LVDS EVEN Data2-	27	RAIN0+	LVDS ODD Data0+
13	RBIN1+	LVDS EVEN Data1+	28	RAIN0-	LVDS ODD Data0-
14	RBIN1-	LVDS EVEN Data1-	29	VSS	GND
15	RBIN0+	LVDS EVEN Data0+	30	NC	No connection

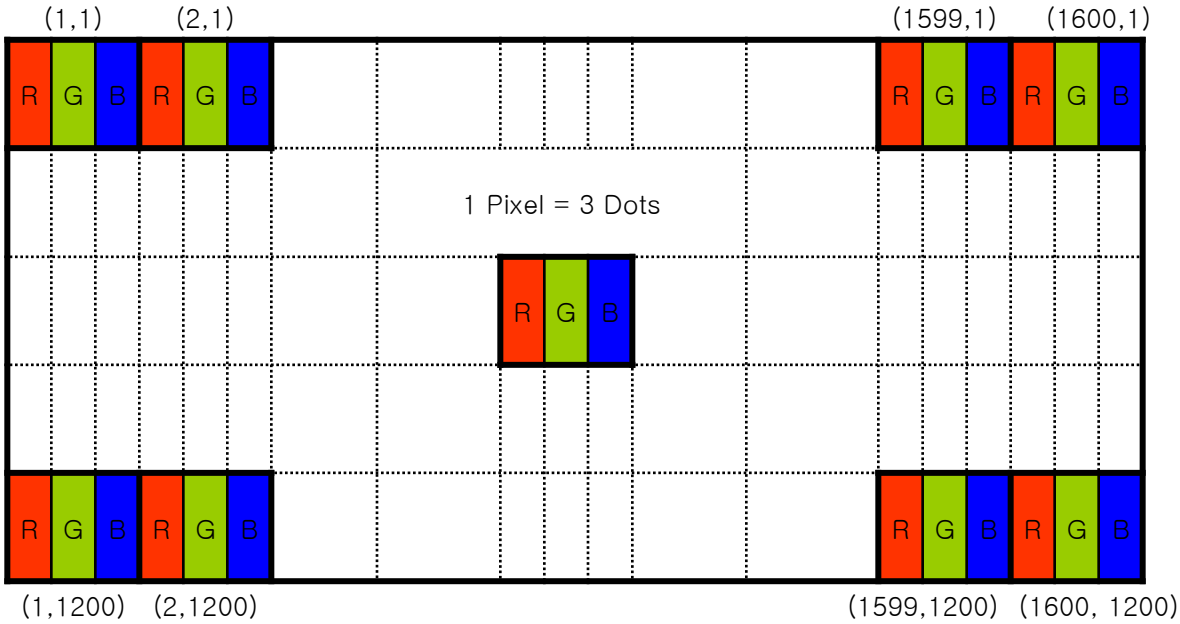
Interface Connector: The connector of BLU H112K-P06N-11B



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

Pin No	Symbol	Description
1	VLED	LED power supply
2	IRLED1	LED current sense for string1
3	IRLED2	LED current sense for string2
4	IRLED3	LED current sense for string3
5	IRLED4	LED current sense for string4
6	IRLED5	LED current sense for string5

5.2 Data Input Format



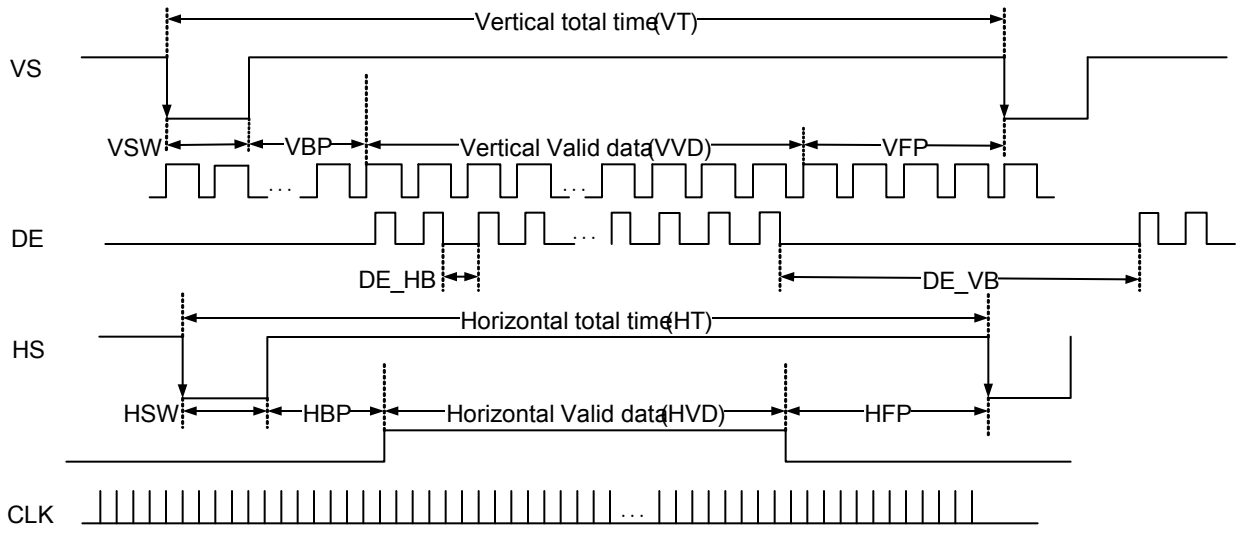
Display Position of Input Data (V-H)

6. 0SIGNAL TIMING SPECIFICATION

6.0.1 The TDA201-001V02 is operated by the DE only.

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Clock Frequency	1/Tclock	135	162	189	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

6.0.2 Timing diagrams of interface signal

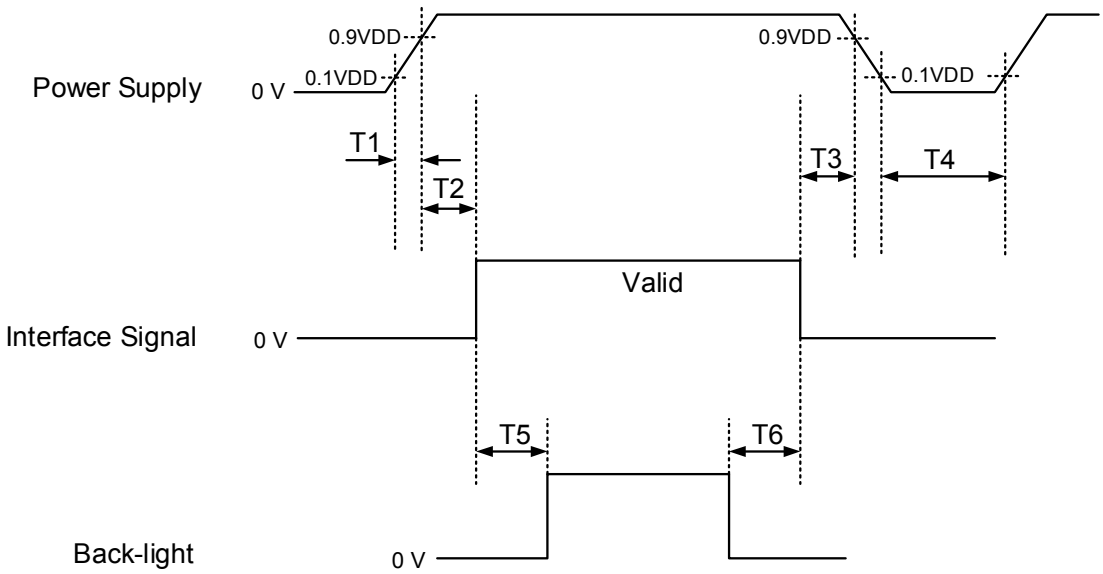


7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

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	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	408 (H) × 306(V)	mm
Number of pixels	1600(H) X1200 (V) (1 pixel = R + G + B dots)	pixels
Pixel pitch	0.225(H) × 0.225 (V)	mm
Pixel arrangement	RGB 2 domain stripe	
Display colors	16.7M (8bit)	colors
Display mode	Normally Black	
Dimensional outline	432 (H) × 331.5(V) × 19.5(D) (typ.)	mm
Weight	2.75	kg
Back-light	Edge side, 1-LED Lighting Bar Type	
LED life	30,000	hr

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 ℃, 48 hrs
Low temperature storage		-30 ℃, 24 hrs
High temperature & high humidity operation		40℃,90%-95%RH, 96hrs
High temperature operation		70 ℃, 2hrs
Low temperature operation		-20℃, 2hrs
Thermal shock		-30 ℃ ↔ 80 ℃ (2 hr), 5 cycles
High Temperature and Stable State		70 ℃, 96hrs
Vibration test	Frequency	10~57Hz,amplitude : ±0.075mm ; 57~500Hz , acceleration : 10m/s^2
	Period	±X, ±Y, ±Z 1h/direction
Shock test	Gravity	500m/s^2
	Pulse width	11msec, half-sine wave
	Direction	±X, ±Y, ±Z 3times/direction
ESD	Air	±4k
	Contact	±4k

Note1:

2hr is keeping temperature time,When the temperature reach -30℃ or 80℃ ;

Note2:

ESD Test based on GB/T17626 , Store capacitance is 15pF.Released resistance is 330Ω

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.

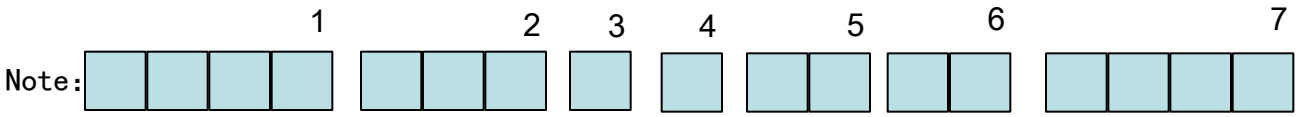
(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(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.

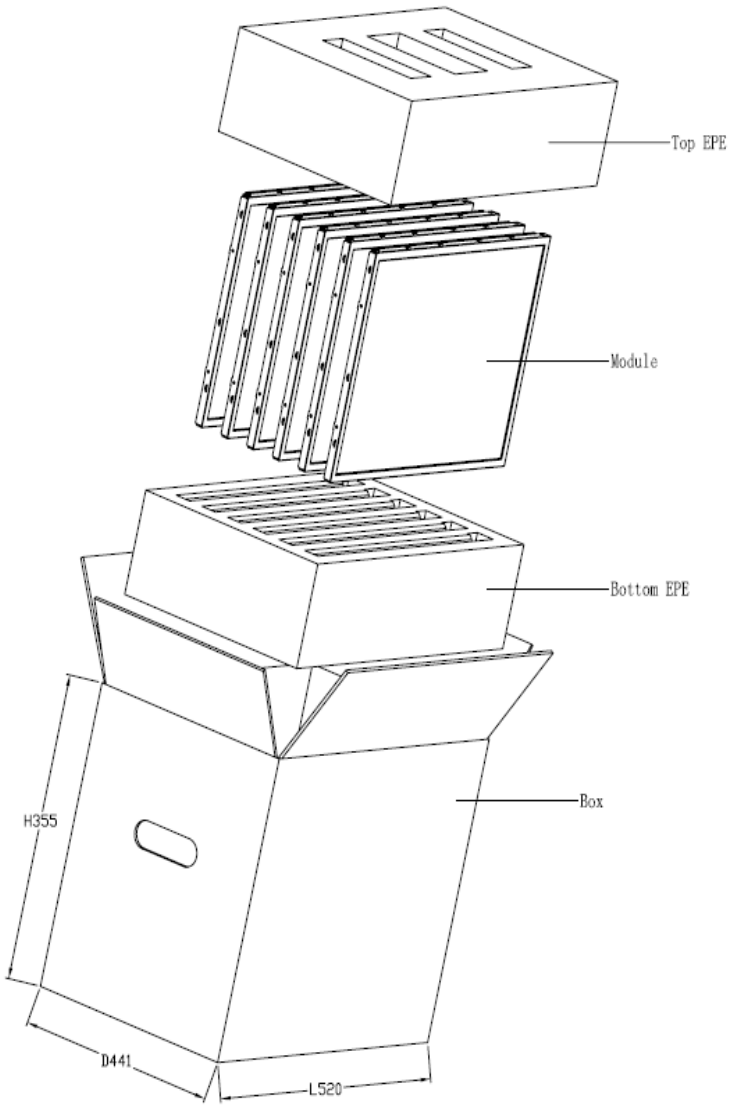
12.0 LABEL

(1) Product label



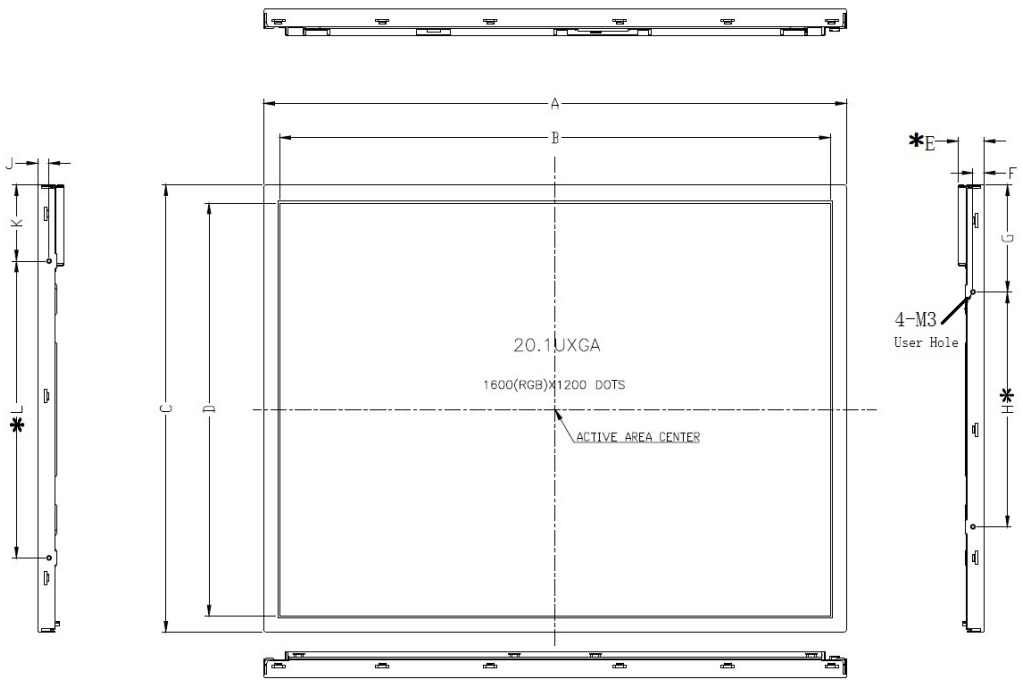
1:Manufacturer and Product Type
2: Product Size
3:Year(2010 –A 2011—B…..)
4:Month(1,2,3…..7,8,9,X,Y,Z)
5:Date
6: Stage Identification(Z1,D1)
7:Serial Number

13.0 PACKING INFORMATION



14.0 MECHANICAL OUTLINE DIMENSION

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



Symbol	Min(mm)	Max(mm)	Symbol	Min(mm)	Max(mm)
A	431.0	433.0	F	7.9	8.9
B	407.0	409.0	G	78.5	80.5
C	330.5	332.5	*H	173.0	175.0
D	305.0	307.0	J	7.4	9.4
*E	19.2	19.8	K	55.5	57.5
*L	219.0	221.0			

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