AT101WSB-NW0-3800(3900)

Product Specification Rev. P0

HEFEI BOE OPTOELECTRONICS TECHNOLOGY

REVISION HISTORY

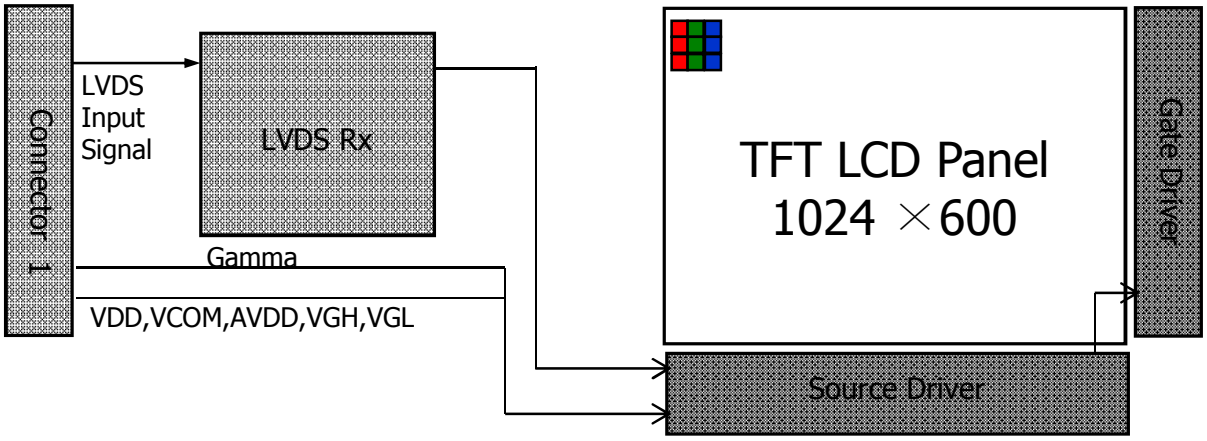
REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-		2015.02.28	杨怀伟

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

AT101WSB-NW0-3800(3900) 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 10.1 inch diagonally measured active area with WSVGA resolutions (1024horizontal by 600vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is a low reflection and higher color type. The LED Driver for back-light driving is built in this model. All input signals are LVDS interface compatible.



1.2 Features

- Data enable signal mode
- 6-bit+2bit Hi-FRC color depth, display 16.7M colors
- Low driving voltage and low power consumption
- RoHS Compliant

1.3 Application

- For Vehicle

1.4 General Specification

The followings are general specifications at the model AT101WSB-NW0-3800(3900). (listed in Table 1.)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	222.72(H) ×125.28(V)	mm	
Number of pixels	1024 (H) ×600 (V)	pixels	
Pixel pitch	0.2175 (H) ×0.2088 (V)	mm	
Panel thickness	1.43	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M	colors	
Display mode	Normally White		
Surface treatment	AG / Hardness 3H		
POL Size	224.92 ×127.48 (TFT&CF)	mm	

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. Absolute Maximum Ratings>

Parameter	Symbol	Min.	Max.	Unit	Remarks
LC operating Voltage [1]	V_{OP}		4.1	V	Ta=25+/-2°C
Operating Temperature (Humidity)	T_{OP}	-20	+70	℃	
	RH		90	%	At 60°C
Storage Temperature (Humidity)	T_{ST}	-30	+80	℃	
	RH		90	%	At 60°C

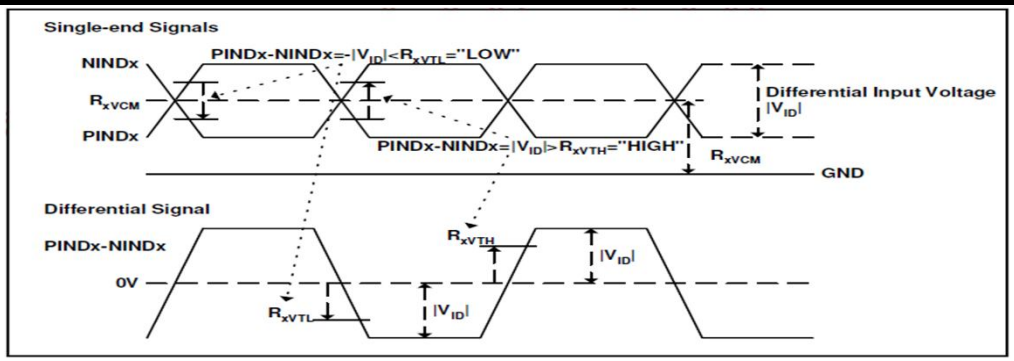
[1] Liquid Crystal driving voltage
Due to the characteristics of LC Material, this voltage varies with environmental temperature.

3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. Electrical specifications > Ta=25+/-2°C

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Power Supply Input Voltage		VDD	3	3.3	3.6	Vdc	
Power Supply Ripple Voltage		VRP			300	mV	
Analog Voltage		AVDD	9.4	9.6	9.8	V	
TFT Gate ON Voltage		VGH	16	18	20	V	
TFT Gate OFF Voltage		VGL	-5	-6	-7	V	
TFT Common Electrode Voltage		VCOM	3.3	3.8	4.3	V	
Power Consumption		PDD		0.33	0.45	Watt	1
Rush current		IRUSH	-	-	1	A	
LVDS Interface	Differential Input High Threshold Voltage	VLVTH	100		300	mV	
	Differential Input Low Threshold Voltage	VLVTL	-300		-100	mV	
	Common Input Voltage	VLVC	|Vid|/2	1.2	VDD-1.2	V	
	Differential input voltage	|Vid|	0.2	-	0.6		
CMOS Interface	Input High Threshold Voltage	VIH	2.6	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.8	V	
Power Consumption		PDD	-	0.33	0.45	W	1



Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=3.3V, Frame rate 60Hz and Clock frequency = 51.2MHz. Test Pattern of power supply current
a) Typ : Check Flag b) Max : Black

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) 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 measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V +/-10% at 25°C. Optimum viewing angle direction is 6 'clock.

4.2 Optical Specifications

<Table 4. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	80	-	Deg.	Note 1
		Θ_9		-	80	-	Deg.	
	Vertical	Θ_{12}		-	60	-	Deg.	
		Θ_6		-	70	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	500	600	-		Note 2
Cell Transmittance		Tr		-	6.6	-	%	Base on C-Light Note 3
White Chromaticity		x_w		TYP. - 0.04	0.304	TYP. + 0.04		Note 4 Base on C-Light
		y_w			0.339			
Reproduction of color	Red	R_x			0.601			
		R_y			0.324			
	Green	G_x			0.301			
		G_y			0.567			
	Blue	B_x			0.143			
		B_y			0.174			
Color Gamut (C light)				-	50	-	%	
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	25	40	ms	Note 5

Note :

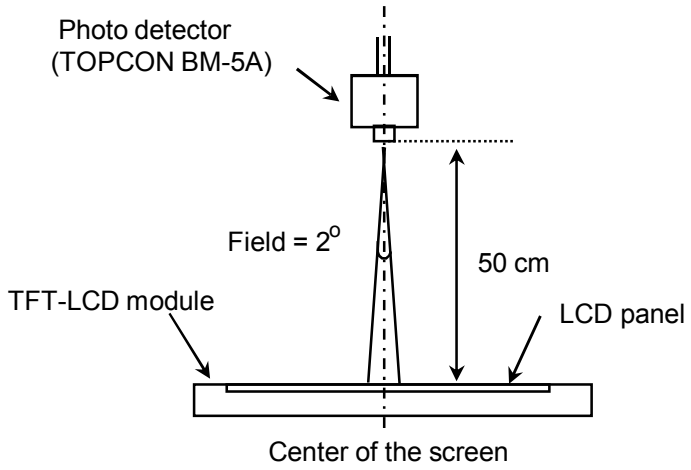
1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.
2. Contrast measurements shall be made 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 shown in Appendix) 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 :
   $\Delta Y5$ = (Minimum Luminance of 5 points / Maximum Luminance of 5 points) * 100
   $\Delta Y13$= (Minimum Luminance of 13 points / Maximum Luminance of 13 points) * 100
   (See FIGURE 2 and FIGURE 3 shown in Appendix).
5. The color chromaticity 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 4 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td, and 90% to 10% is Tr.

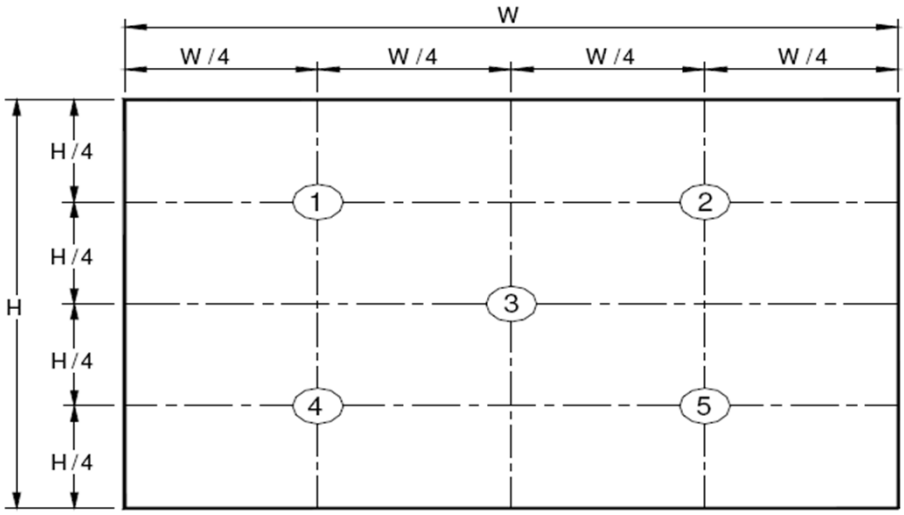
4.3 Optical measurements

Figure 1. Measurement Set Up



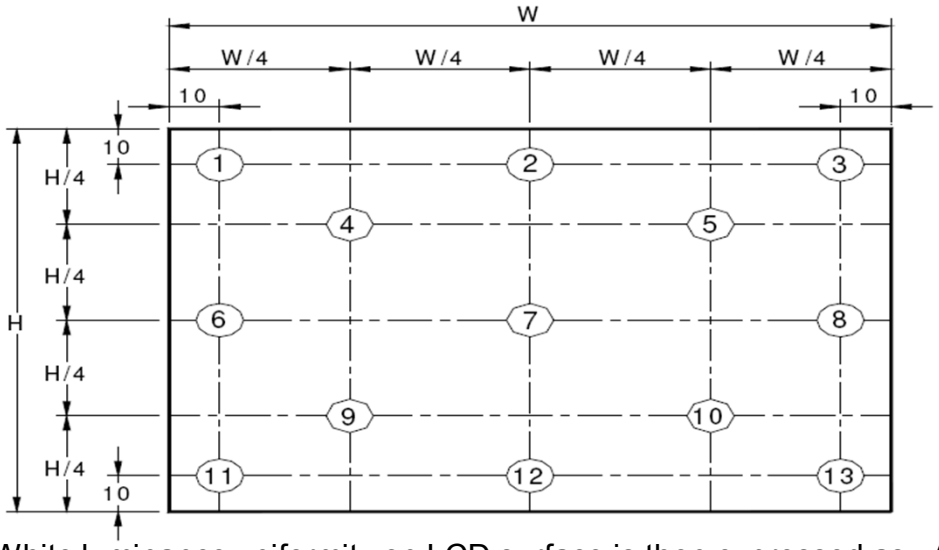
Optical characteristics measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (5 points)



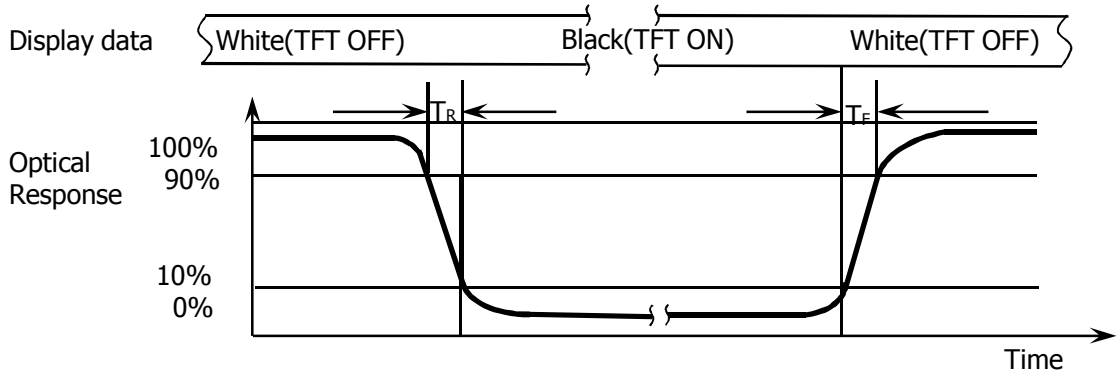
Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

Figure 3. Uniformity Measurement Locations (13 points)



The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of five points / Maximum Luminance of five points (see FIGURE 2) , ΔY13 = Minimum Luminance of 13 points /Maximum Luminance of 13 points (see FIGURE 3).

Figure 4. Response Time Testing



The electro-optical response time measurements shall be made as shown in FIGURE 4 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td and 90% to 10% is Tr.

5.0 INTERFACE CONNECTION.

5.1 Electrical Interface Connection

The electronics interface connector is 089K60-000100-G2-R. The connector interface pin assignments are listed in Table 5.

<Table 5. Pin Assignments for the Interface Connector>

Pin No.	Symbol	Description	Remark
1	AGND	Analog ground	
2	AVDD	Analog Power	
3	DVDD	Digital Power Supply +3.3V	
4	GND	Digital ground	
5	VCOM	Common voltage	
6	DVDD	Digital Power Supply +3.3V	
7	GND	Digital ground	
8	V14	Gamma correction voltage reference	
9	V13	Gamma correction voltage reference	
10	V12	Gamma correction voltage reference	
11	V11	Gamma correction voltage reference	
12	V10	Gamma correction voltage reference	
13	V9	Gamma correction voltage reference	
14	V8	Gamma correction voltage reference	
15	GND	Digital ground	
16	DVDD_LVDS	LVDS Power , same to DVDD	
17	GND	Digital ground	
18	PIND3	Positive LVDS differential data input	
19	NIND3	Negative LVDS differential data input	
20	GND	Digital ground	
21	PINC	Positive LVDS differential clock input	
22	NINC	Negative LVDS differential clock input	
23	GND	Digital ground	
24	PIND2	Positive LVDS differential data input	
25	NIND2	Negative LVDS differential data input	
26	GND	Digital ground	
27	PIND1	Positive LVDS differential data input	
28	NIND1	Negative LVDS differential data input	
29	GND	Digital ground	
30	PIND0	Positive LVDS differential data input	

Pin No.	Symbol	Description	Remark
31	NIND0	Negative LVDS differential data input	
32	GND	Digital ground	
33	GND_LVDS	LVDS Ground	
34	GRB	Global reset pin	Note1
35	STBYB	Standby mode , normally pull high	Note2
36	SHLR	Left or right display control	Note3
37	DVDD	Digital Power Supply +3.3V	
38	UPDN	Up or down display control	Note3
39	AGDN	Analog ground	
40	AVDD	Analog Power	
41	VCOM	Common voltage	
42	DITH	Dithering function enable control , Normally pull low	Note4
43	GND	Digital ground	
44	DVDD	Digital Power Supply +3.3V	
45	GND	Digital ground	
46	V7	Gamma correction voltage reference	
47	V6	Gamma correction voltage reference	
48	V5	Gamma correction voltage reference	
49	V4	Gamma correction voltage reference	
50	V3	Gamma correction voltage reference	
51	V2	Gamma correction voltage reference	
52	V1	Gamma correction voltage reference	
53	GND	Digital ground	
54	DVDD	Digital Power Supply +3.3V	
55	SELB	6bit/8bit mode select	Note5
56	VGH	Positive power for TFT	
57	DVDD	Digital Power Supply +3.3V	
58	VGL	Negative power for TFT	
59	GND	Digital ground	
60	NC	Not connection	

Note.1

Suggest to connection with an RC reset circuit for stability , Normally pull high . (R=10K , C=0.1uF)

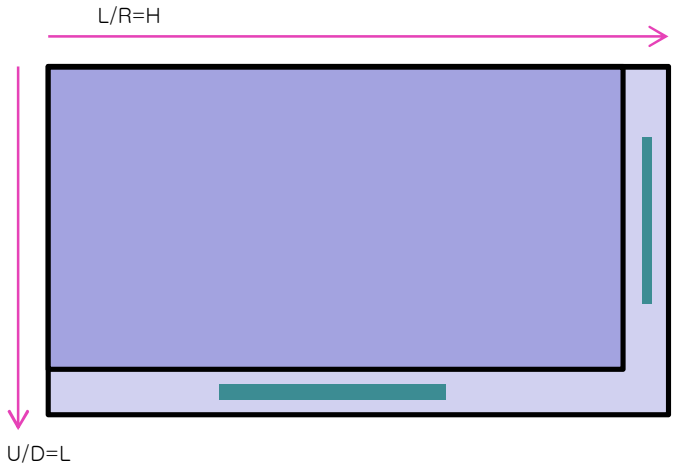
Note. 2

-STBYB="H (3.3V)": normal operation ;

-STBYB="L (GND)": timing controller, source driver will turn off, all output are High-Z

Note.3

Scan Control Input		Scanning direction
L/R	U/D	
VDD	GND	Up to Down, Left to Right
GND	GND	Up to Down, Right to Left
VDD	VDD	Down to Up, Left to Right
GND	VDD	Down to Up, Right to Left



Note. 4

-DITH="1" , Enable internal dithering function

-DITH="0" , Disable internal dithering function

Note. 5

-SELB="H (3.3V)": 6 bit ;

-SELB="L (GND)": 8 bit ;

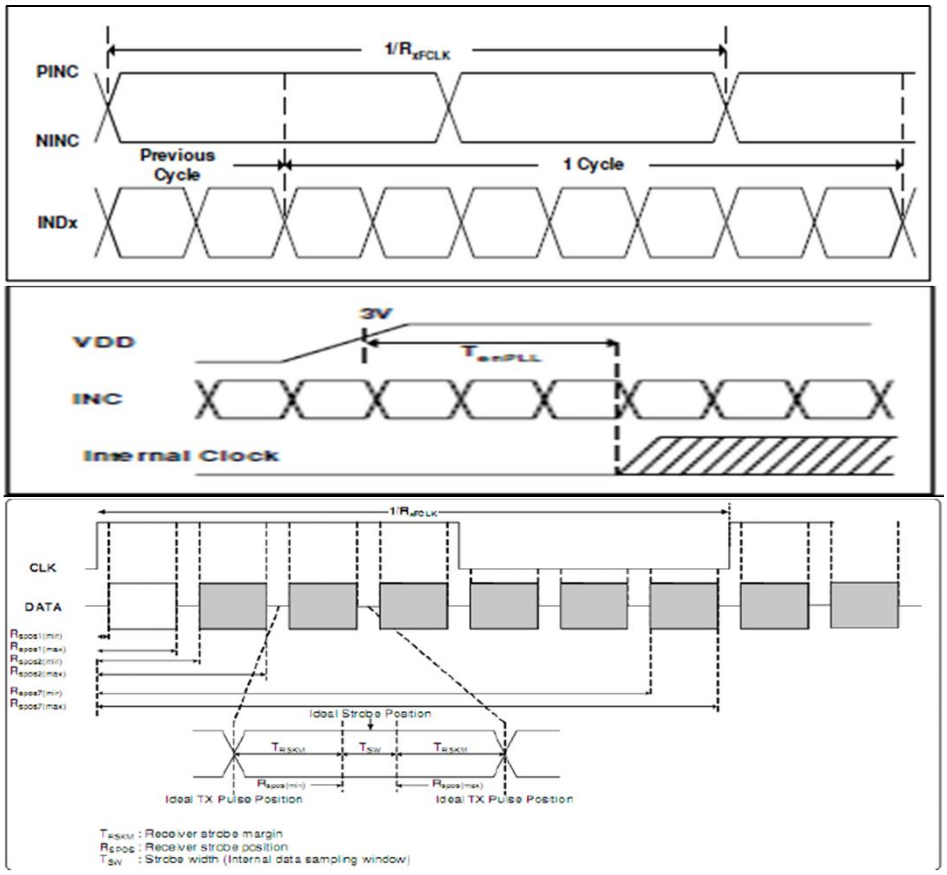
< Table 4. Gamma Voltage>

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Gamma Voltage	V1	8.1	8.2	8.3	V	
Gamma Voltage	V2	7.9	8	8.1	V	
Gamma Voltage	V3	6.6	6.7	6.8	V	
Gamma Voltage	V4	6.09	6.19	6.29	V	
Gamma Voltage	V5	5.76	5.86	5.96	V	
Gamma Voltage	V6	5	5.1	5.2	V	
Gamma Voltage	V7	4.3	4.4	4.5	V	
Gamma Voltage	V8	3.9	4	4.1	V	
Gamma Voltage	V9	3.2	3.3	3.4	V	
Gamma Voltage	V10	2.44	2.54	2.64	V	
Gamma Voltage	V11	2.11	2.21	2.31	V	
Gamma Voltage	V12	1.6	1.7	1.8	V	
Gamma Voltage	V13	0.3	0.4	0.5	V	
Gamma Voltage	V14	0.1	0.2	0.3	V	

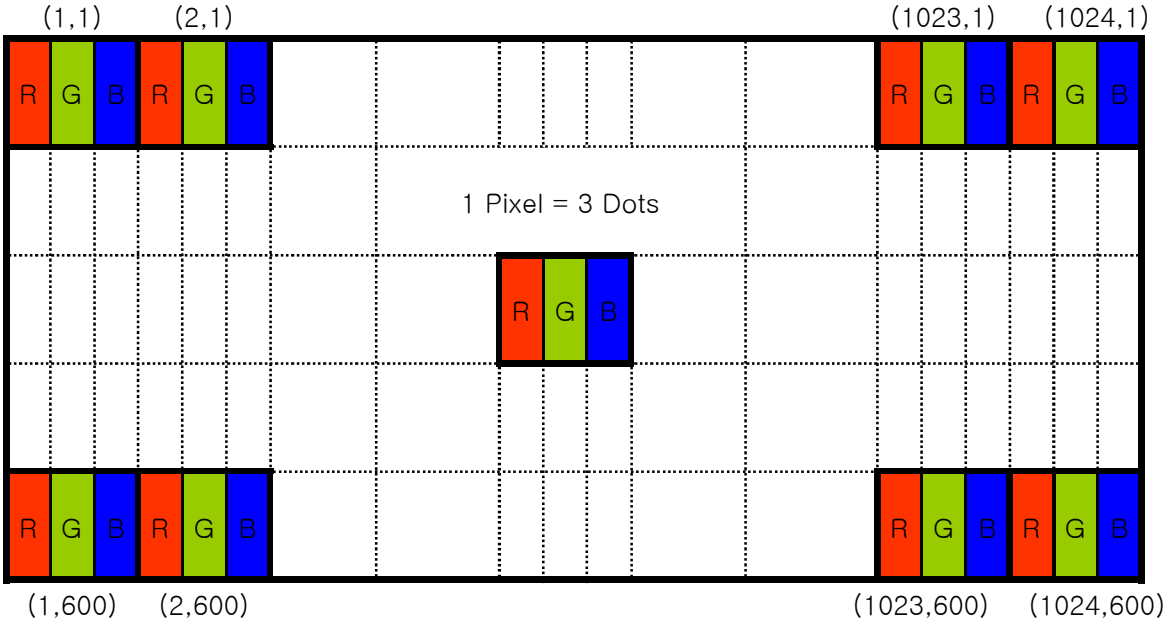
5-2. LVDS signal

< Table 6. AC Electrical Characteristics>

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Clock frequency	RxFCLK	40.8	51.2	67.2	MHz	
Input data skew margin	TRSKM	500	-	-	ps	|VID|=400mV RxVCM=1.2V RxFCLK=71MHz
Clock high time	TLVCH	-	4/ (7*RxFCLK)		ns	
Clock low time	TLVCL		3/ (7*RxFCLK)		ns	
PLL wake-up time	TenPLL			150	us	



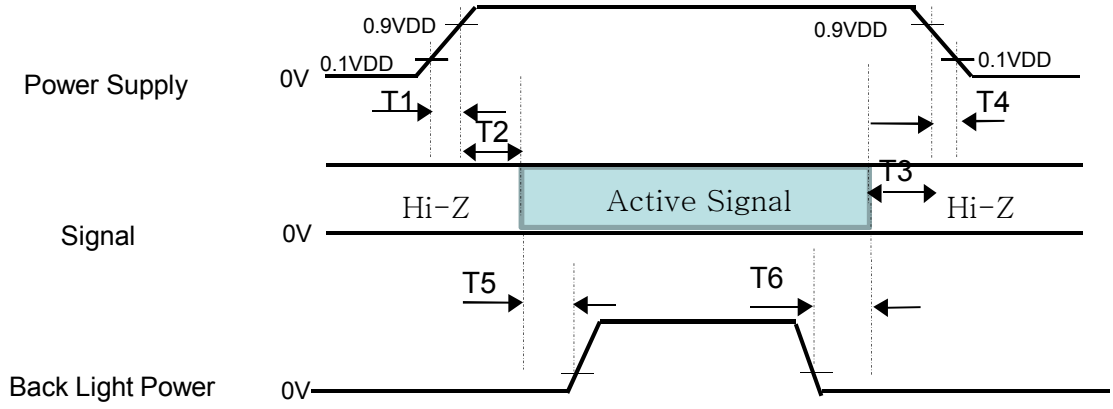
5.3 Data Input Format



Display Position of Input Data (V-H)

6.0 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



- 0.5ms ≤ T1 ≤ 10 ms
- 0 ms ≤ T2
- 0 ms ≤ T3
- 0 ms ≤ T4 ≤ 10ms
- 100ms ≤ T5 ≤ 300ms
- 100 ms ≤ T6 ≤ 300ms

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.

7.0 Connector Description

Physical interface is described as for the connector on LCM.
These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name /Description	For Signal Connector
Manufacturer	STARCONN
Type/ Part Number	089K60-000100-G2-R
Mating housing/ Part Number	-

8.0 MECHANICAL CHARACTERISTICS

8.1 Dimensional Requirements

FIGURE 5 shows mechanical outlines for the model AT101WSB-NW0.
Other parameters are shown in Table 7.

<Table 7. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	222.72 x 125.28	Mm
Number of pixels	1024(H) X 600 (V) (1 pixel = R + G + B dots)	/
Pixel pitch	0.2175X0.2088	Mm
Pixel arrangement	RGB Vertical stripe	/
Display colors	16.7M	colors
Display mode	Normally white	

8.2 Glare and Polarizer Hardness.

The surface of the LCD has a Anti-glare coating and hard coating to reduce scratching.

8.3 Light Leakage

There shall not be visible 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 350lux.

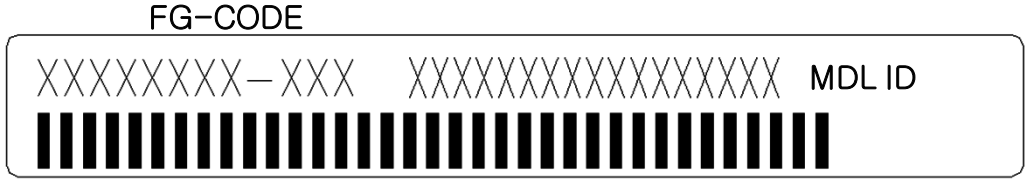
9.0 RELIABILITY TEST

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

<Table 8. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 80 ℃, 240 hrs
2	Low temperature storage test	Ta = -30 ℃, 240 hrs
3	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240hrs
4	High temperature operation test	Ta = 70 ℃, 240hrs
5	Low temperature operation test	Ta = -20 ℃, 240hrs
6	Thermal shock	Ta = -30 ℃ ↔ 80 ℃ (0.5 hr), 100 cycle
7	Vibration test (non-operating)	5-200Hz,1.47G,Random XY±Z,30min
8	Shock test (non-operating)	100G,6ms,±X, ±Y, ±Z,3times for each direction
9	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, ±6 KV Contact : 150 pF, 330Ω, ±4 KV

10.0 Product Serial Number



MDL ID 条纹码

1. 产品标签尺寸: **35mm × 6mm**
2. **MDL ID** 编码规则如下

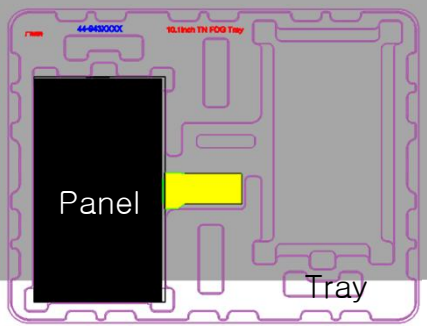
序列号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
代码	4	F	P	3	1	2	7	3	8	0	0	0	0	1	E	E	J
描述	GBN代码		等级	B3	年份		月	FG Code后四位				序列号					

11.0 PACKING INFORMATION

10.1 Packing Follow

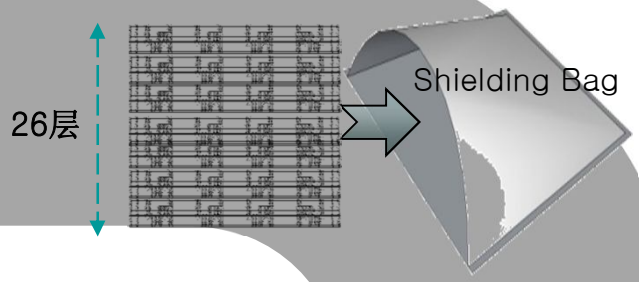
-. 将 2pcs Panel 平放入Tray

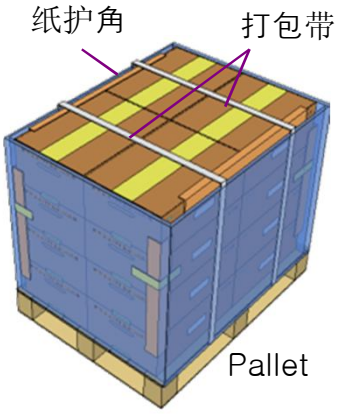
-. CF 侧向上放置



-. 将26pcs PET Tray 平放入屏蔽袋进行抽真空;

-. 顶部1pcs 空Tray;

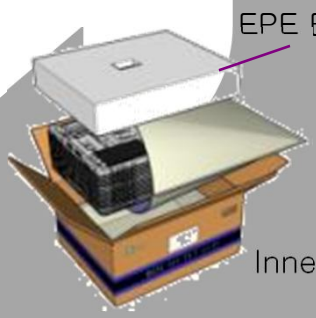




-. 每个Pallet上放3层Box
1层4箱,共计12ea Box

-. Pallet外进行缠膜包装

-. 容量: 600pcs/Pallet



-. .将PET Tray堆码后平放入Inner Box上下放置EPE Board

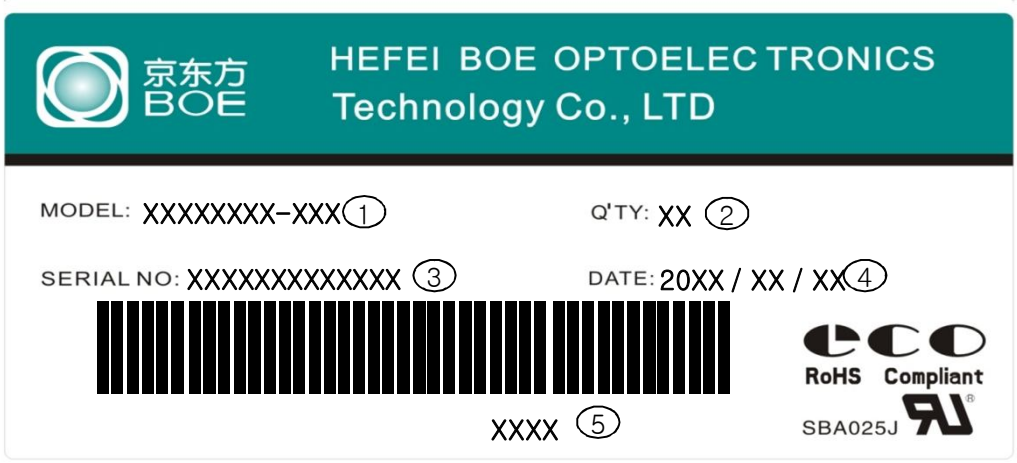
-. 容量 : 50pcs/Inner Box

-.Box Size: 500mm × 400mm × 300mm

-.Pallet Size: 1030mm × 830mm × 1030mm

10.2 Box label

- Label Size : 115 mm (L) × 55 mm (W)
- Contents
  Model : AT101WSB-NW0
  Q`ty : XX Module in one box.
  Serial No. : Box Serial No. See next page for detail description.
  Date : Packing Date
  FG Code : FG Code of Product



1. **FG-CODE**
2. **Box 产品数量**
3. **Box ID, 编码规则如下**
4. **Box Packing 日期**
5. **FG-CODE 后四位**

序列号	1	2	3	4	5	6	7	8	9	10	11	12	13
代码	4	J	P	3	1	2	7	0	0	0	1	H	D
描述	GBN代码		等级	B3	年份		月	Rev	序列号				

12.0 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.

13.0 MECHANICAL OUTLINE DIMENSION

Figure 5. TFT-LCD FOG Outline Dimension