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SPEC. NUMBER

PRODUCT GROUP

TFT-LCD

Rev. P0

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2014.12.16

PAGE

1 OF 28

TITLE : AT101WSM-NW0-3800(3900)**Preliminary Product Specification****Rev. P0****HEFEI BOE OPTOELECTRONICS TECHNOLOGY**

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 3 OF 28

Content

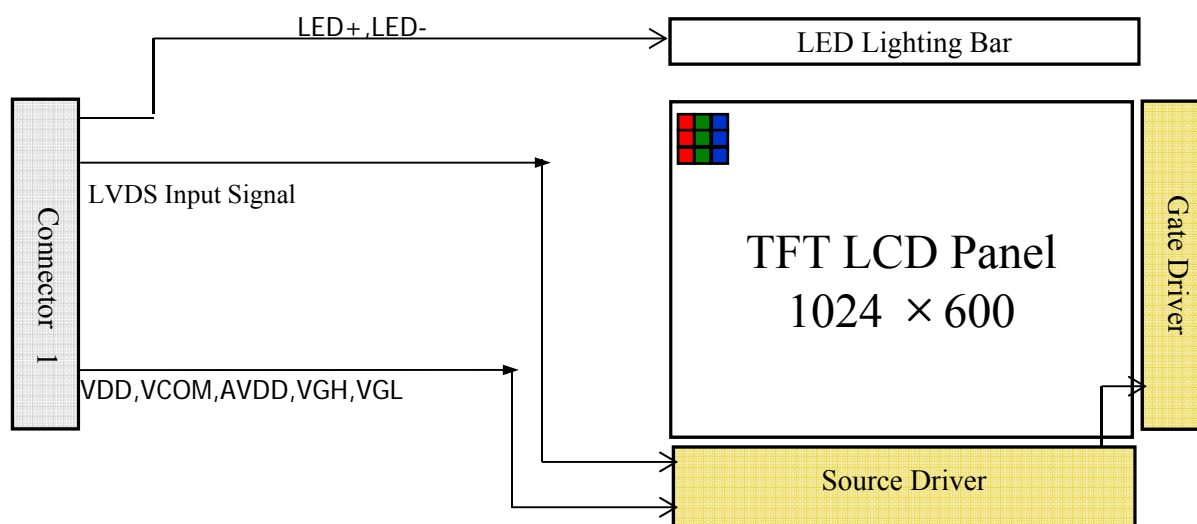
No.	Item	Page
	REVISION HISTORY	2
	CONTENTS	3
1.0	GENERAL DESCRIPTION	4
	1.1 Introduction	
	1.2 Features	
	1.3 Applications	
	1.4 General Specification	
2.0	ABSOLUTE MAXIMUM RATINGS	6
3.0	ELECTRICAL SPECIFICATIONS	7
	3.1 Electrical Specifications	
	3.2 Gamma Voltage table	
	3.3 LED Driver	
	3.4 Backlight unit	
4.0	INTERFACE CONNECTION	10
	4.1 Module Input Signal & power	
5.0	SIGNAL TIMING SPECIFICATIONS	13
	5.1 Timing Parameters	
	5.2 LVDS Rx Interface Timing Parameter	
	5.3 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL	
	5.4 Input Signals, Basic Display Colors & Gray Scale Of Colors	
6.0	OPTICAL SPECIFICATIONS	17
7.0	MECHANICAL CHARACTERISTICS	19
8.0	RELIABILITY TEST	20
9.0	PRODUCT SERIAL NUMBER	21
10.0	PACKING INFORMATION	22
11.0	HANDING & CAUTIONS	24
12.0	APPENDIX	25

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 4 OF 28

1.0 GENERAL DESCRIPTION

1.1 Introduction

AT101WSM-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 10.1inch diagonally measured active area with WSVGA resolutions (1024 horizontal by 600 vertical 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 adapted for a low reflection and higher color type.



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

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 5 OF 28

1.3 Application

- Vehicle Device

1.4 General Specification

The followings are general specifications at the model AT101WSM-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	72.5(H) × RGB × 208.8 (V)	μm	
Pixel arrangement	Pixels RGB stripe arrangement		
Display colors	16.7M(6bits + Hi FRC)	colors	
Display mode	Transmission mode, Normally White		
Outline Dimension	235 (H) × 143(V) × 4.5(body) (typ.)	mm	
Weight	314 (max.)	gram	
Power Consumption	P _D : 0.45(max.)	Watt	Black pattern
	P _{BL} : 1.2(max.)		
	P _{Total} : 1.6(max.)		
Surface Treatment	AG25(Front Polarizer) Clear(Rear Polarizer)		

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 6 OF 28

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 > [VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V _{DD}	-0.3	4.1	V	Note 1
Power Supply For LED	V _{LED}	17.4	21.6	V	
Operating Temperature	T _{OP}	-20	+70	°C	Note 2
Storage Temperature	T _{ST}	-30	+80	°C	

- 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.
95 % RH Max. (40 °C ≥ Ta)
Maximum wet - bulb temperature at 39 °C or less. (Ta > 40 °C) No condensation.

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 7 OF 28

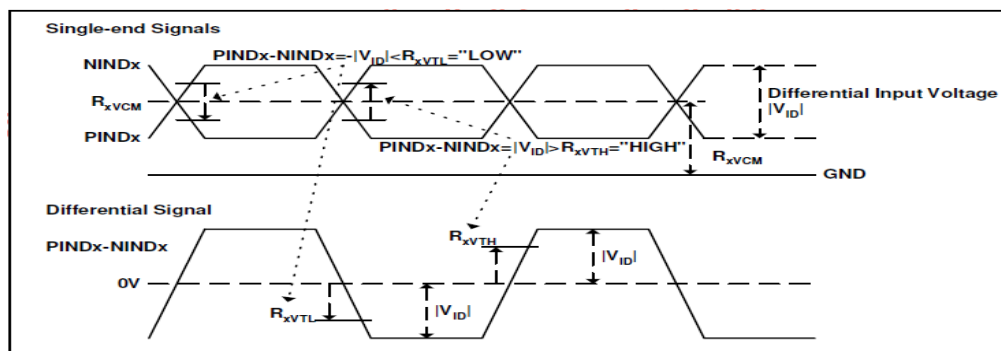
3.0 ELECTRICAL SPECIFICATIONS

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	20	21	22	V	
TFT Gate OFF Voltage		VGL	-9	-8	-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	



- 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

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 8 OF 28

3.2 Gamma Voltage table (待实物Gamma Tuning完成后提供)

3.3 LED Driver

- With LED Driver on Customer System , We only have two Pads on FPC .

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 9 OF 28

3.4 Backlight unit

< Table 4. Backlight Unit Specifications >

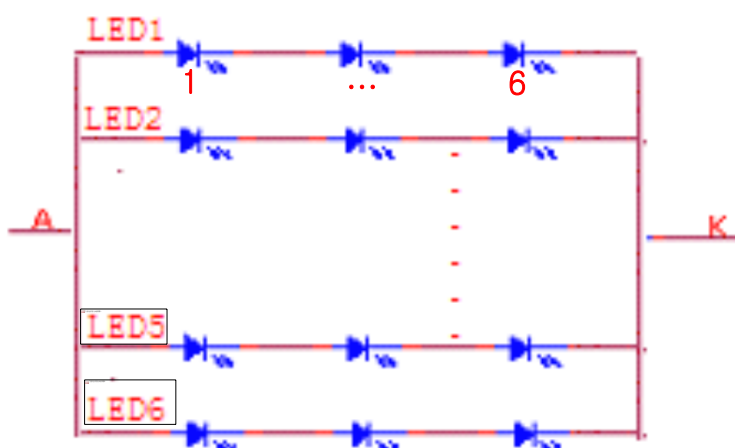
[Ta =25 ± 2 °C]

Items	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	140	-	mA	42LEDs (6LED Serial, 7LED Parallel)
Forward Voltage	V_F	17.4	19.2	21.6	V	
Backlight Power Consumption	-	-	-	3.024	W	
Operating Life Time	-	20000	-	--	Hrs	$I_F = 20\text{mA}$ Note 3

Note1: The LED driving condition is defined for each LED module (6 LED Serial, 7 LED Parallel). For each LED: $I_F (1/7) = 20\text{mA}$, $V_F (1/6) = 3.2\text{V}$

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED. Optical performance should be evaluated at $T_a = 25^\circ\text{C}$ only. If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness.



BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 10 OF 28

4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power

- LVDS Signal interface : 60Pin. The interface connector type is 089K60-000100-G2-R

< Table 5. LCM Module Input Connector Pin Configuration >

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	

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 11 OF 28

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 connecti	

Note.1

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

Note. 2

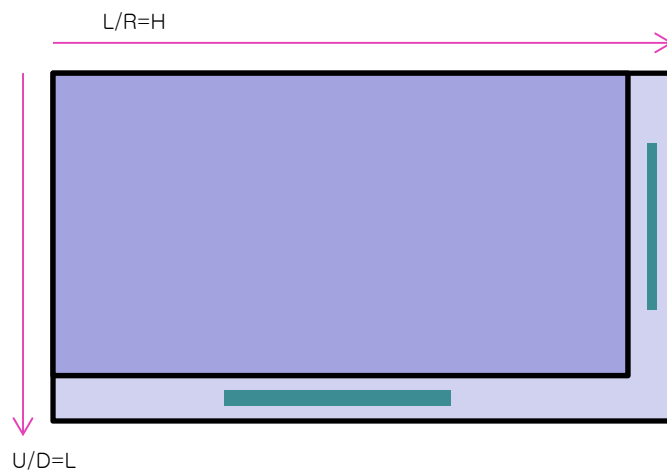
-STBYB="H (3.3V)": normal operation ;

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

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 12 OF 28

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 ;

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 13 OF 28

5.0 SIGNAL TIMING SPECIFICATIONS

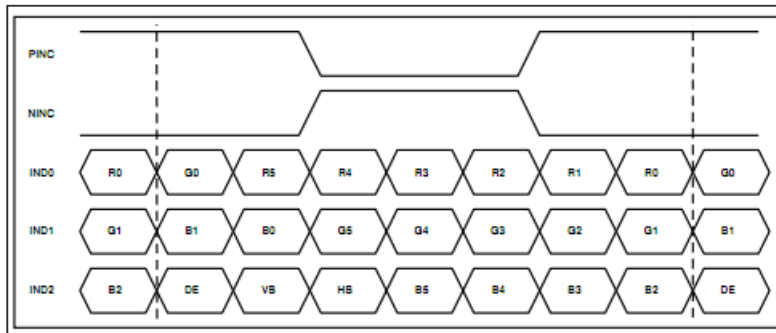
5.1 Timing Parameters (DE only mode)

< Table 6. Timing Table >

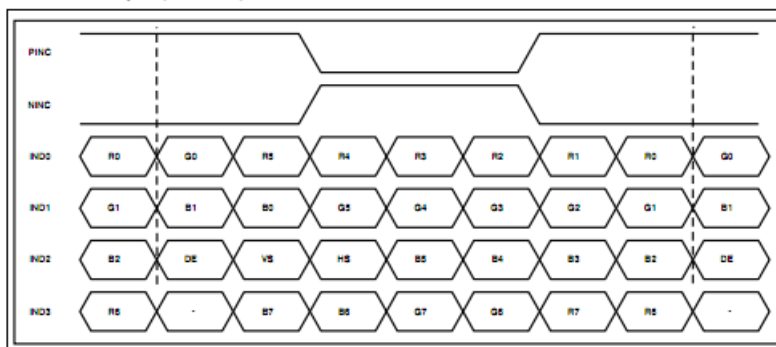
ITEM	Symbol		Min	Typ	Max	Unit	Note
CLK	Period	t_{CLK}	14.9	19.5	24.5	ns	
	Frequency	-	40.8	51.2	67.2	MHz	
Hsync	Period	t_{HP}	1114	1344	1400	t_{CLK}	
	Frequency	f_H	36	38.1	45	KHz	
Vsync	Period	t_{VP}	610	635	800	t_{HP}	
	Frequency	f_V	-	60	-	Hz	
Horizontal Active Display Term	Valid	t_{HV}	-	1024	-	t_{CLK}	
	Total	t_{HP}	1114	1344	1400	t_{CLK}	
Vertical Active Display Term	Valid	t_{VV}	-	600	-	t_{HP}	
	Total	t_{VP}	610	635	800	t_{HP}	

Notes: This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.

6bit LVDS input (HSD='H')



8-bit LVDS input (HSD='L')

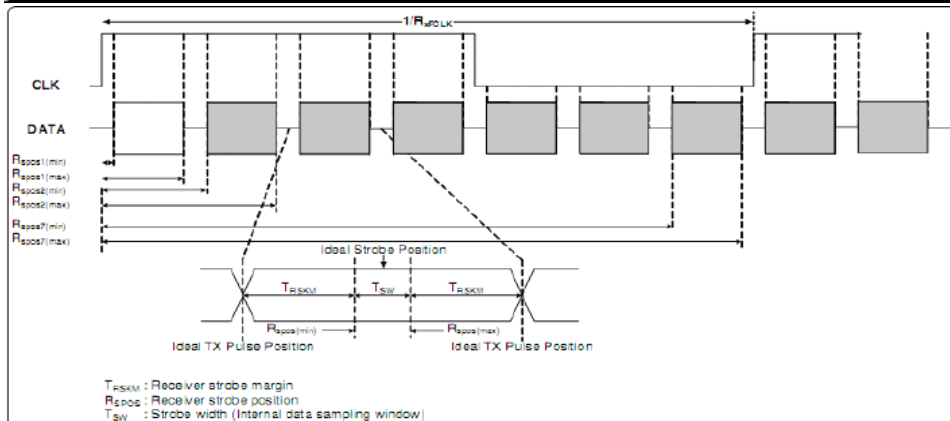
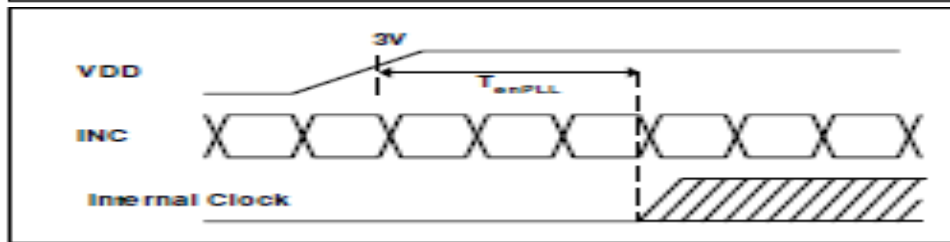
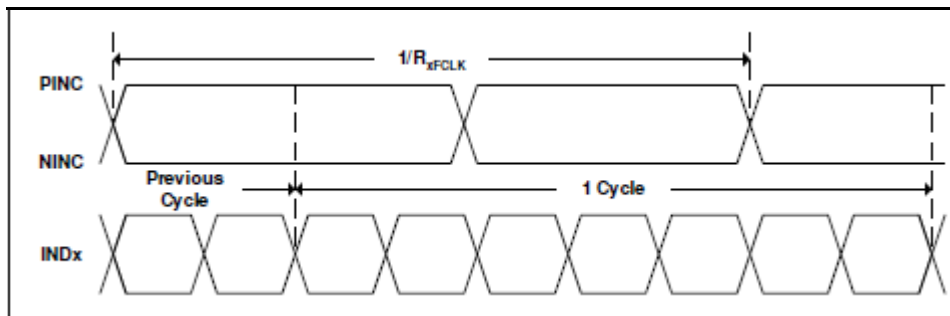


BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification	PAGE 14 OF 28	

5.2 LVDS Rx Interface Timing Parameter

The specification of the LVDS Rx interface timing parameter is shown in Table 7.

Parameters	Symbols	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	-	$4/(7 \times \text{RxFCLK})$		ns	
Clock low time	TLVCL		$3/(7 \times \text{RxFCLK})$		ns	
PLL wake-up time	TenPLL			150	us	



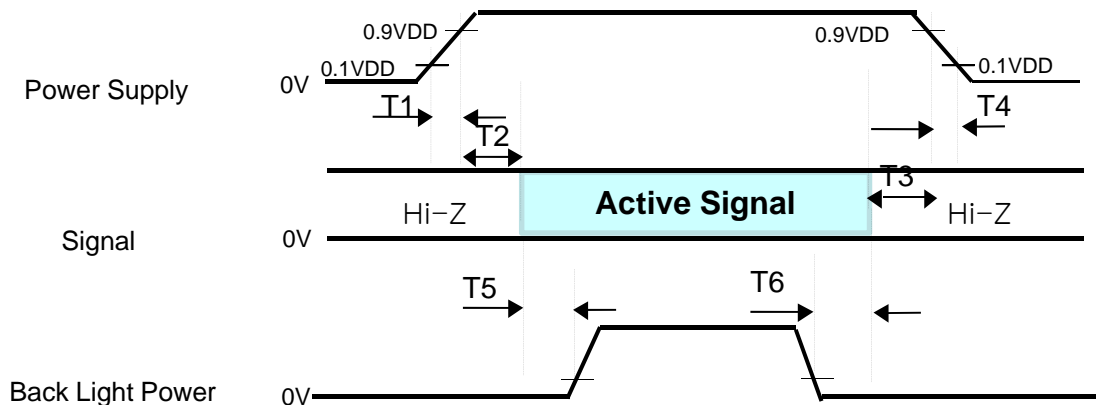
BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification	PAGE 15 OF 28	

5.3 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	1	0	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

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 16 OF 28

5.4 Power Sequence



- $0.5\text{ms} \leq T1 \leq 10\text{ ms}$
- $0\text{ ms} \leq T2$
- $0\text{ ms} \leq T3$
- $0\text{ ms} \leq T4 \leq 10\text{ms}$
- $100\text{ ms} \leq T5 \leq 300\text{ms}$
- $100\text{ ms} \leq T6 \leq 300\text{ms}$

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.

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification	PAGE 17 OF 28	

6.0 OPTICAL SPECIFICATIONS

The test of Optical specifications 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 (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 $\theta_{\theta=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\theta=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\theta=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\theta=270}$ ($=\theta_6$) 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 measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V $\pm 10\%$ at 25°C . Gray scale reversal occur in 6 o'clock direction. Optimum viewing angle direction is 12 o'clock.

[VDD = 3.3V, Frame rate = 60Hz, Ta = $25 \pm 2^\circ\text{C}$]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10	70	80	-	Deg.	Note 1
		Θ_9		70	80	-	Deg.	
	Vertical	Θ_{12}		50	60	-	Deg.	
		Θ_6		60	70	-	Deg.	
Color Gamut		-	-	45	50	-	%	NTSC
Contrast ratio		CR	$\Theta = 0^\circ$ (Center) Normal Viewing Angle	600	800	-	-	Note 2
Luminance of White		Y_w		-	500	-	-	Note 3
White luminance uniformity		$\Delta Y9$		-	-	-	-	Note 4
Reproduction of color	White	W_x		TYP. - 0.03	-	TYP. + 0.03	-	Note 5
		W_y			-		-	
	Red	R_x			-		-	
		R_y			-		-	
	Green	G_x			-		-	
		G_y			-		-	
	Blue	B_x			-		-	
		B_y			-		-	
Response Time		T_g	-	25	40	Ms	Note 6	
Gamma Scale								

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 18 OF 28

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 $\theta = 0^\circ$ 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.

Luminance when displaying a white raster

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 :

$$\Delta Y5 = (\text{Minimum Luminance of 5 points} / \text{Maximum Luminance of 5 points}) * 100$$

$$\Delta Y13 = (\text{Minimum Luminance of 13 points} / \text{Maximum Luminance of 13 points}) * 100$$
(See FIGURE 2 and FIGURE 3 shown in Appendix).
5. The color chromaticity coordinates specified in Table 4. 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.

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 19 OF 28

7.0 MECHANICAL CHARACTERISTICS

7.1 Dimensional Requirements

FIGURE 4 (located in Appendix) shows mechanical outlines for the model AT101WSM-NW0-3800(3900).

Other parameters are shown in Table 12.

<Table 12. Dimensional Parameters>

Parameter	Specification	Unit
Dimensional outline	235 (H) × 143(V) × 4.5(typ.)	mm
Weight	314(Max)	gram
Active area	222.72(H) × 125.28(V)	mm
Pixel pitch	72.5(H) × RGB × 208.8 (V)	μm
Number of pixels	1024(H) × 600(V) (1 pixel = R + G + B dots)	pixels
Back-light	LED	

7.2 AG and Polarizer Hardness.

The surface of the LCD has an AG coating to minimize reflection and a coating to reduce scratching.

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 20 OF 28

8.0 RELIABILITY TEST

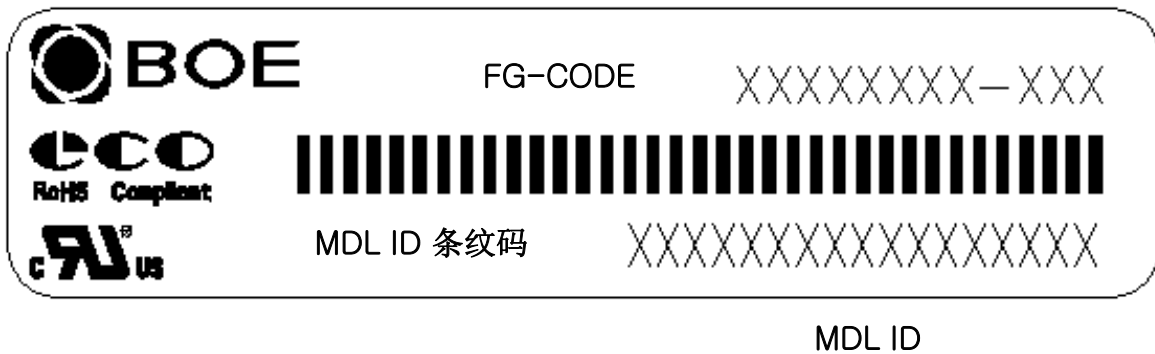
The Reliability test items and its conditions are shown in below.

<Table 13. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 80 °C, 240 hrs
2	Low temperature storage test	Ta = -30°C, 240 hrs
3	High temperature & high humidity operation test	Ta = 60 °C, 90%RH, 240hrs
4	High temperature operation test	Ta = 70 °C, 240hrs
5	Low temperature operation test	Ta = -20°C, 240hrs
6	Thermal shock	Ta = -30°C ↔ 80 °C (0.5 hr), 100 cycle
7	Vibration test (non-operating)	Packing Vibration : 1.47Grms, 1~200Hz, Random + X, + Y, ± Z per 30min
8	Drop test (non-operating)	Drop : 1Angle, 3Edge, 6Face Height : JIS-Z-0200 level 1
9	Electro-static discharge test	TBD

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 21 OF 28

9.0 Product Serial Number



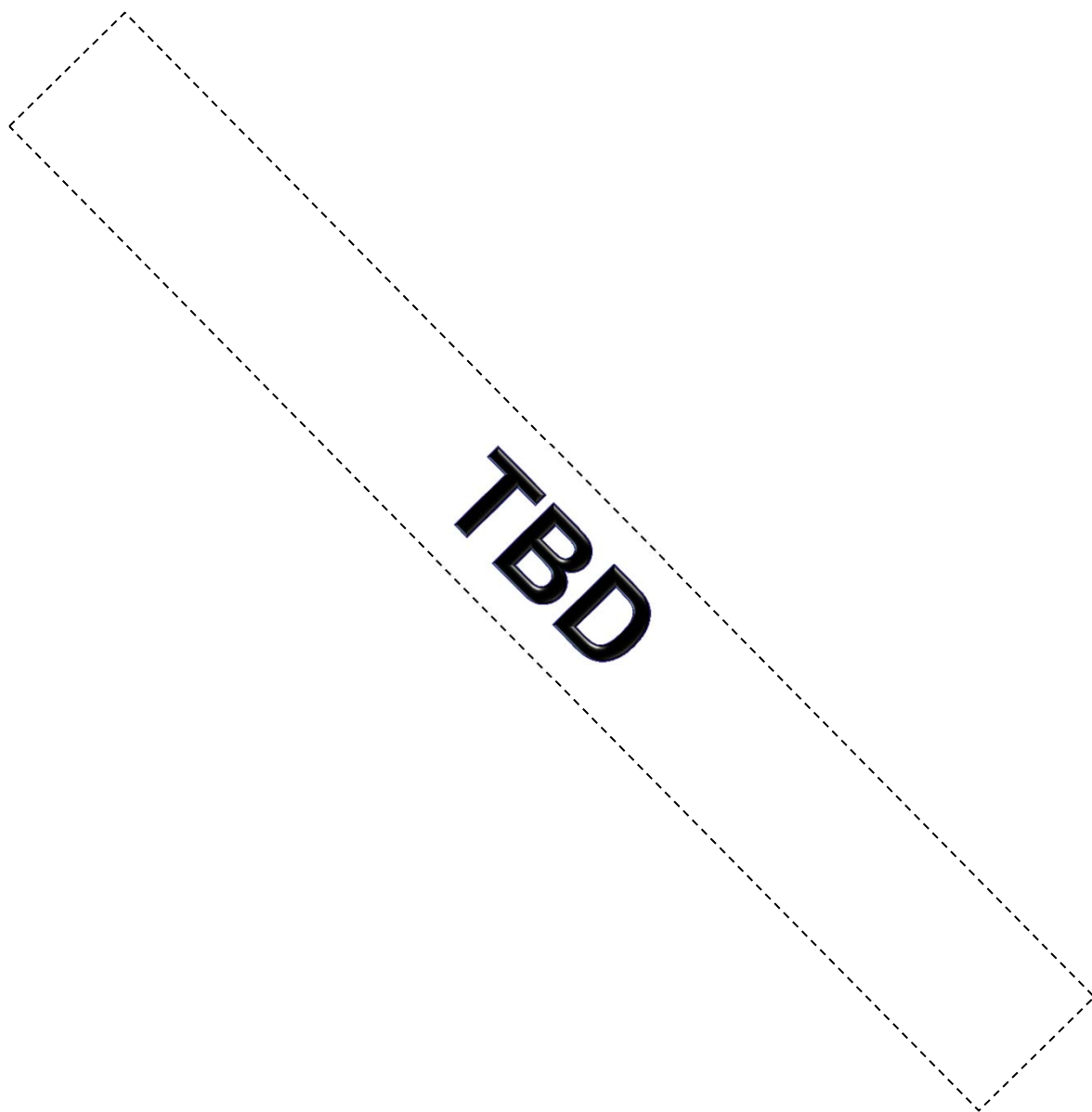
1. 产品标签尺寸: 48mm × 12mm

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					

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 22 OF 28


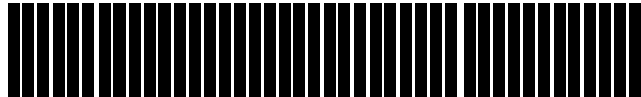

10.0 PACKING INFORMATION



BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 23 OF 28

10.2 Box label

- Label Size : 115 mm (L) × 55 mm (W)
- Contents
Model : AT101WSM-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

 HEFEI BOE OPTOELECTRONICS Technology Co., LTD	
MODEL: XXXXXXXX-XXX ①	Q'TY: XX ②
SERIAL NO: XXXXXXXXXXXX ③	DATE: 20XX / XX / XX ④
	
XXXXXXXX ⑤	XXXX ⑥
	

1. **FG-CODE**
2. **Box 产品数量**
3. **Box ID, 编码规则如下**
4. **Box Packing 日期**
5. **联想客户产品料号**
6. **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				

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 24 OF 28

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.

BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification	PAGE 25 OF 28	

12.0 APPENDIX

Figure 1. Measurement Set Up

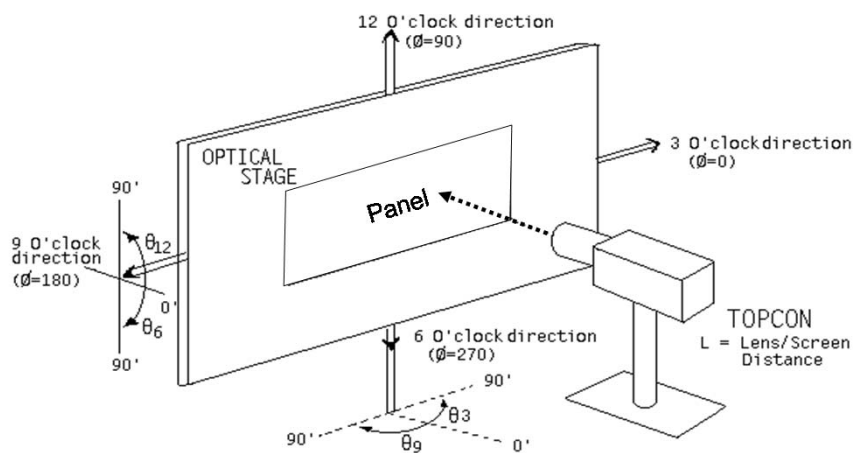
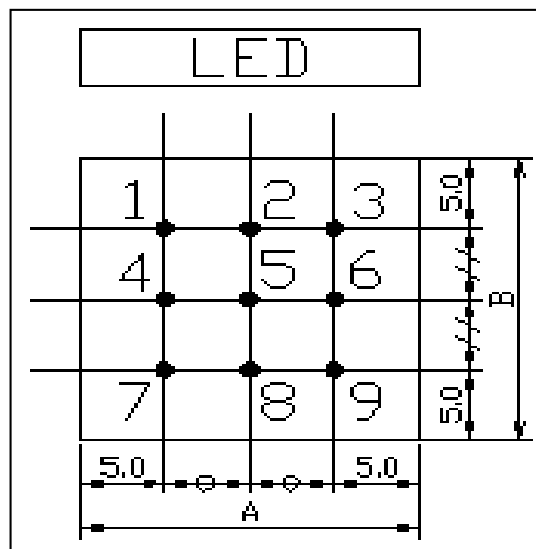


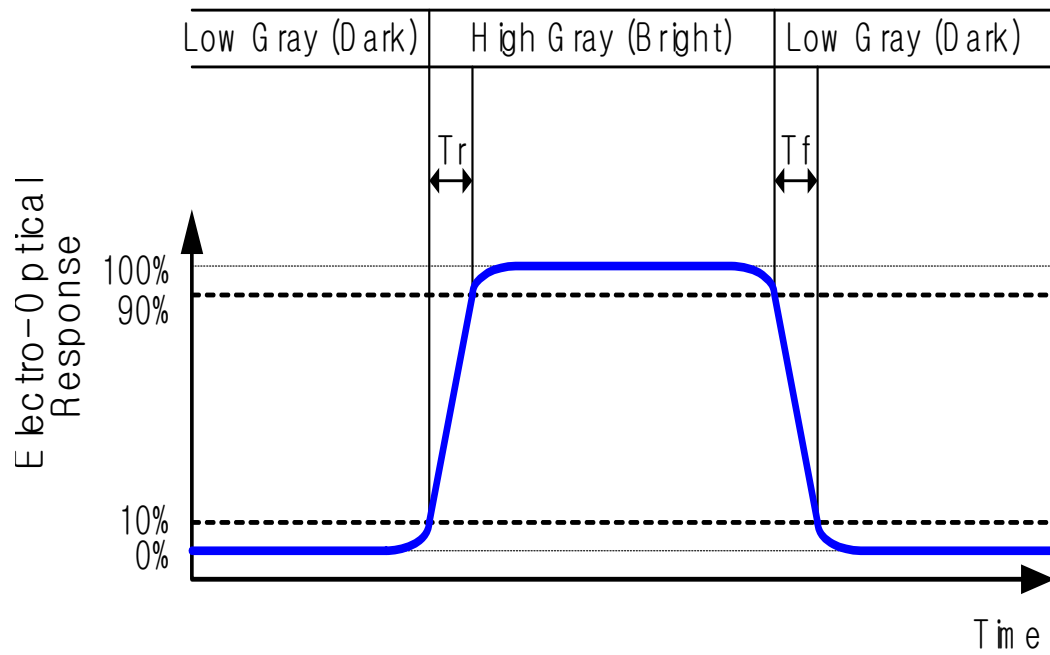
Figure 2. White Luminance and Uniformity Measurement Locations (9 points)



Center Luminance of white is defined as luminance values of center 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.

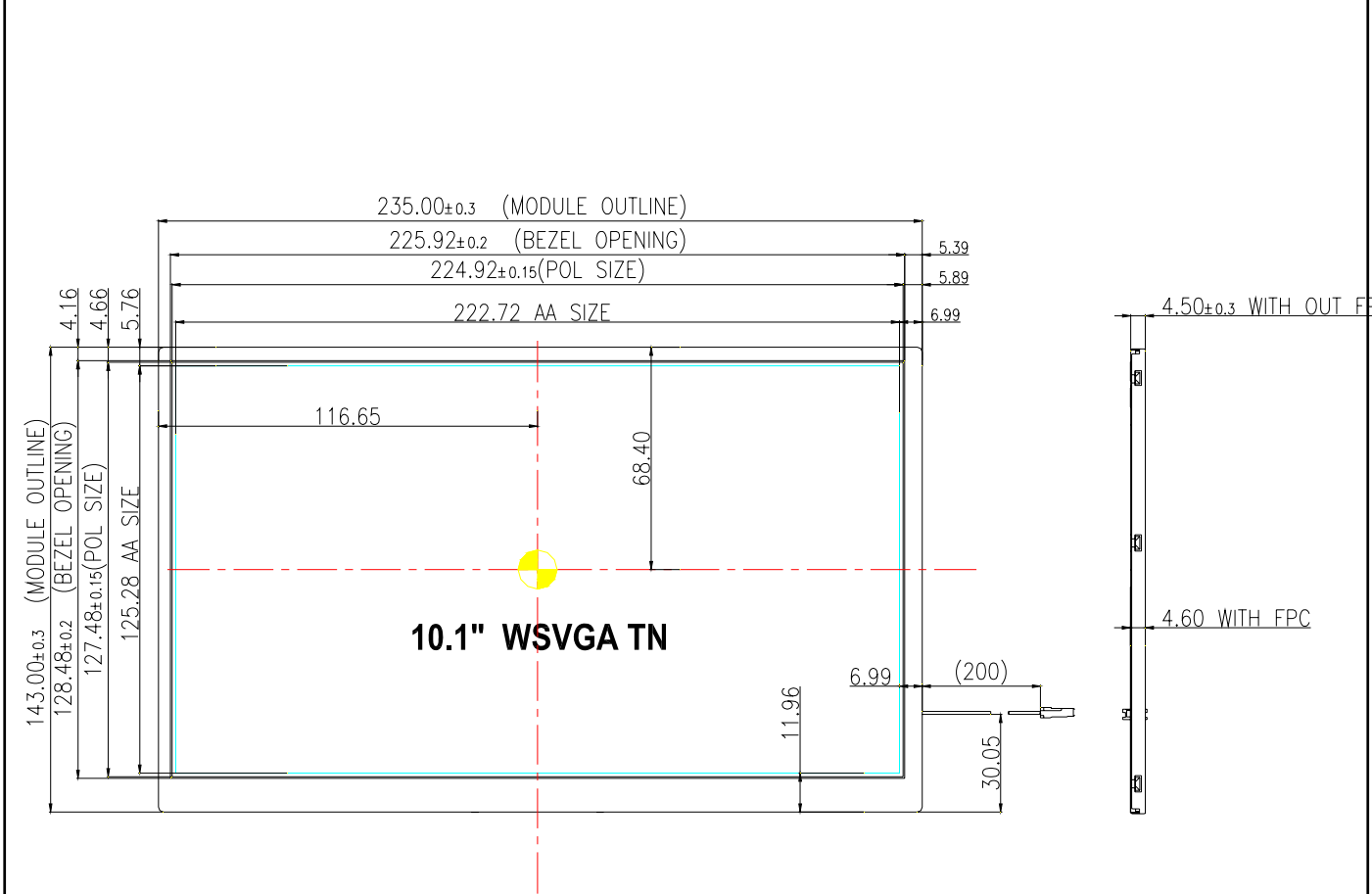
BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification		PAGE 26 OF 28

Figure 3. Response Time Testing



BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification	PAGE 27 OF 28	

Figure 4. TFT-LCD Module Outline Dimensions (Front view)



BOE	PRODUCT GROUP	REV	ISSUE DATE
	TFT- LCD PRODUCT	P0	2014.12.16
SPEC. NUMBER	SPEC. TITLE AT101WSM-NW0-3800(3900) Product Specification	PAGE 28 OF 28	

Figure 5. TFT-LCD Module Outline Dimensions (Rear view)

