



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	1/24
Document No.		Issue date	2014/05/13	Revision	00

Customer Approved Specification

To:

Product Name: M101NWWB R3

Document Issue Date: 2014/05/13

Customer	InfoVision Optoelectronics
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Please return 1 copy for your confirmation with your signature and comments.	

- Note: 1. Please contact InfoVision Company before designing your product based on this product.
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by IVO for any intellectual property claims or other problems that may result from application based on the module described herein.



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	3/24
Document No.		Issue date	2014/05/13	Revision	00

Contents

1.0	General Descriptions.....	4
2.0	Absolute Maximum Ratings.....	6
3.0	Pixel Format Image.....	7
4.0	Optical Characteristics.....	8
5.0	Backlight Characteristics.....	11
6.0	Electrical Characteristics.....	12
7.0	Interface Timings.....	15
8.0	Power Consumption.....	16
9.0	Power ON/OFF Sequence.....	18
10.0	Mechanical Characteristics.....	19
11.0	Package Specification.....	21
12.0	Lot Mark.....	22
13.0	General Precaution.....	23
14.0	EDID Table.....	24



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	4/24
Document No.		Issue date	2014/05/13	Revision	00

1.0 General Descriptions

1.1 Introduction

The M101NWWB is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a backlight system, column driver and row driver circuit. This TFT LCD has a 10.1-inch diagonally measured active display area with WXGA resolution (1280 horizontal by 800 vertical pixels array).

1.2 Features

- 10.1" TFT-LCD Panel
- LED Backlight System
- Supported WXGA Resolution
- Compatible with RoHS standard

1.3 Product Summary

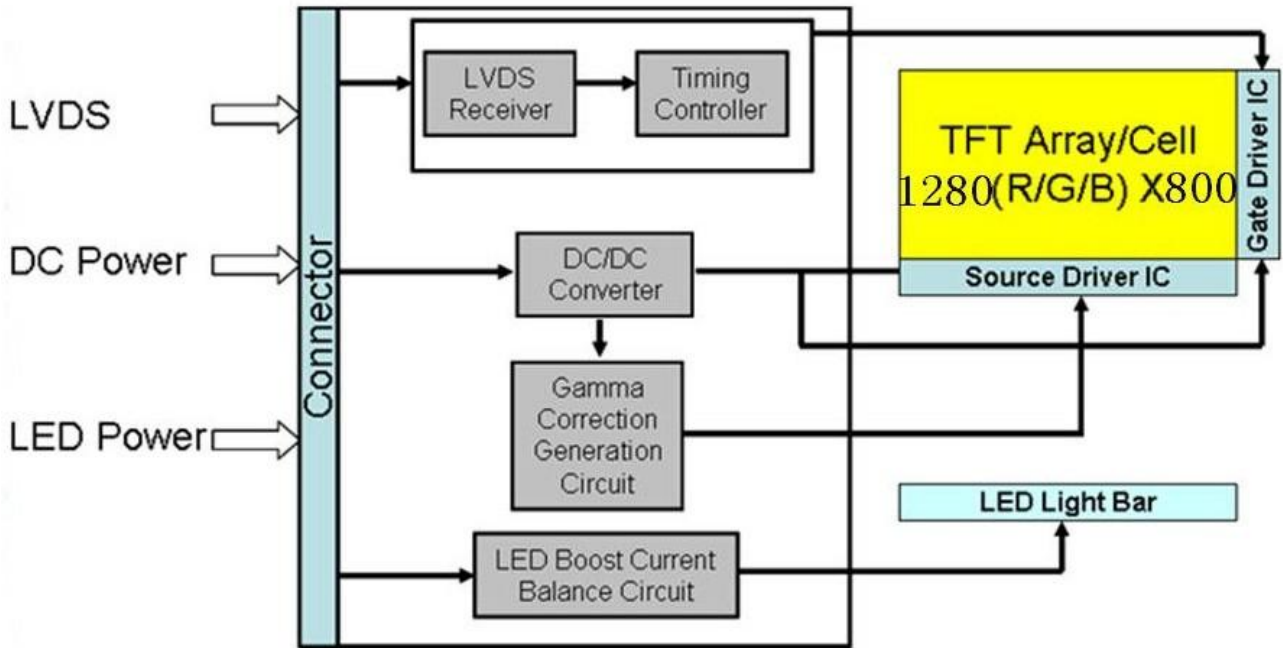
Items	Specifications	Unit
Screen Diagonal	10.1	Inch
Active Area (H x V)	216.96 x 135.6	mm
Number of Pixels (H x V)	1280 x 800	-
Pixel Pitch(H x V)	0.1695 × 0.1695	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	(350) (Typ.)	cd /m ²
Contrast Ratio	(800) (Typ.)	-
Response Time	(25) (Typ.)	ms
Input Voltage	(3.3) (Typ.)	V
Logical power consumption	(1.0) (Max.)	W
Backlight power consumption	(2.5) (Max.)	W
Weight	(190) (Max)	g
Outline Dimension (H x V x D)	w/o PCB	(229.46)(Typ.) ×(149.1)(Typ.)×(2.8)(Max.)
	w/ PCB	(229.46)(Typ.) ×(149.1)(Typ.)×(4.56)(Max.)
Electrical Interface (Logic)	LVDS	-
Support Color	16.7M	-
Surface Treatment	Glare , Hard -Coating	-

Document Title	M101NWWB R3 Customer Approved Specification			Page No.	5/24
Document No.		Issue date	2014/05/13	Revision	00

1.4 Functional Block Diagram

Figure 1 shows the functional block diagram of the LCD module.

Figure 1 Block Diagram



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	6/24
Document No.		Issue date	2014/05/13	Revision	00

2.0 Absolute Maximum Ratings

Table 1 Electrical Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply Voltage	V _{DD}	-0.3	7	V	TA=25°C
Supply V _{LED} Voltage	V _{LED}	-0.3	24	V	

Note : The module may be destroyed and not be recovered while the absolute maximum rating values of this product have been exceeded.

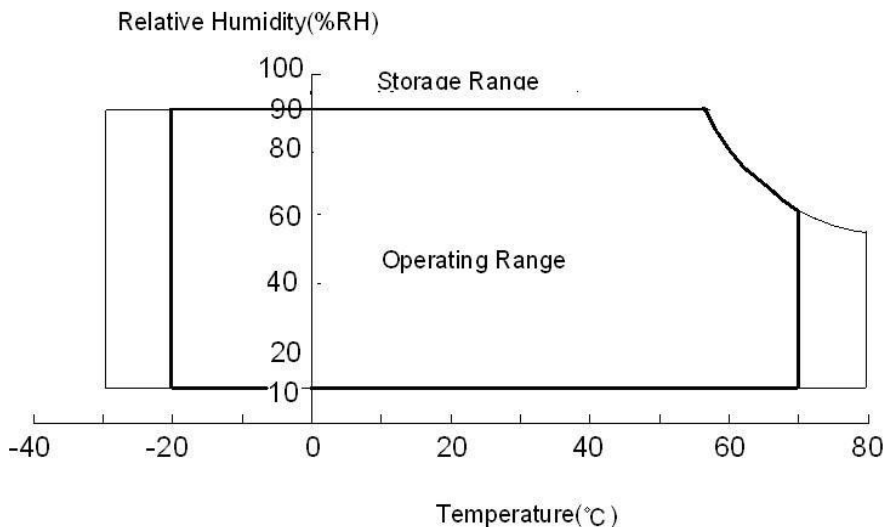
Table 2 Reliability Absolute Rating

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	-20	70	°C	(1),(2),(3)
Operating Humidity	HOP	10	90	%RH	
Storage Temperature	TST	-30	80	°C	
Storage Humidity	HST	10	90	%RH	

Note:

- (1) Maximum Wet-Bulb temperature should be 39 degree C and no condensation.
- (2) When you apply the LCD module for OA system. Please make sure to keep the temperature of LCD module is less than 70°C
- (3) Storage /Operating temperature

Figure 2 Absolute Ratings of Environment of the LCD Module

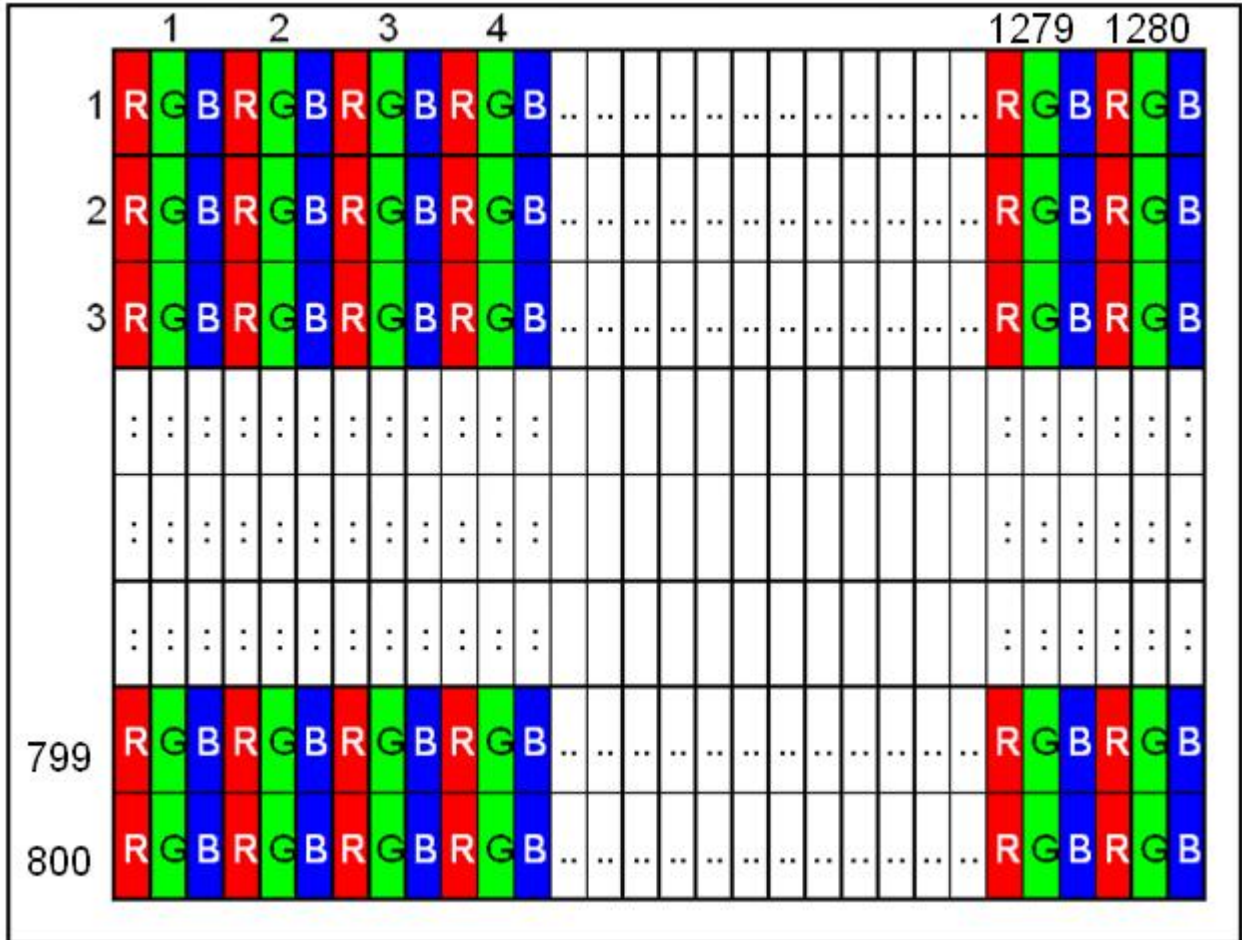


Document Title	M101NWWB R3 Customer Approved Specification			Page No.	7/24
Document No.		Issue date	2014/05/13	Revision	00

3.0 Pixel Format Image

Figure 3 shows the relationship of the input signals and LCD pixel format image.

Figure 3 Pixel Format



R+G+B dots=1 pixel



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	8/24
Document No.		Issue date	2014/05/13	Revision	00

4.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes

Table 3 Optical Characteristics

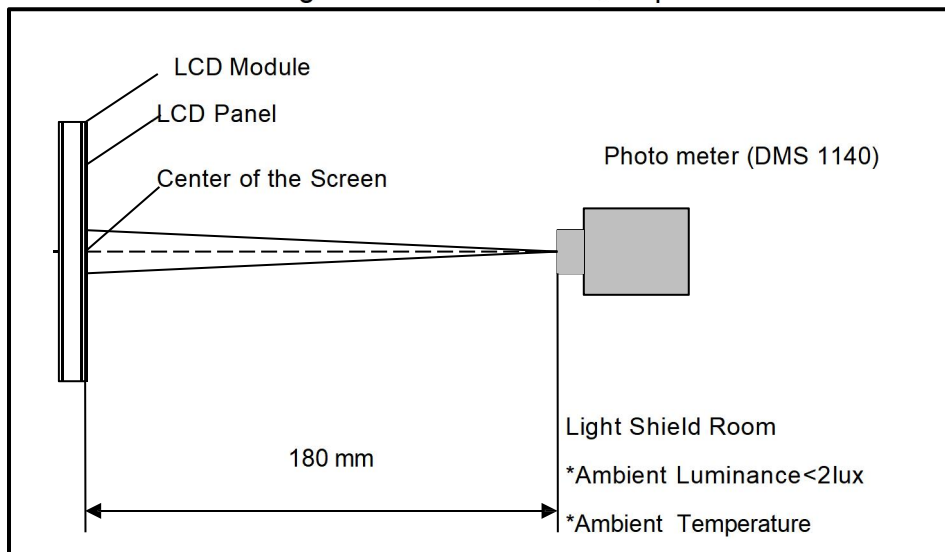
Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	Left θ_{x-}	(75)	(85)	-	degree	(1),(2),(3)
		Right θ_{x+}	(75)	(85)	-		
	Vertical	Up θ_{y+}	(75)	(85)	-		
		Down θ_{y-}	(75)	(85)	-		
Contrast Ratio	Center		(600)	(800)	-	-	(1),(2),(4)
Response Time	Rising + Falling		-	(25)	(50)	ms	(1),(2),(5)
Color Chromaticity (CIE1931)	Red	x	Typ. -0.03	(0.561)	Typ. +0.03	-	(1),(2),(3) $\theta_x=\theta_y=0^\circ$
	Red	y		(0.334)		-	
	Green	x		(0.341)		-	
	Green	y		(0.568)		-	
	Blue	x		(0.161)		-	
	Blue	y		(0.129)		-	
	White	x		(0.313)		-	
	White	y		(0.329)		-	
NTSC	-		-	(45)	-	%	(1),(2),(3) $\theta_x=\theta_y=0^\circ$
White Luminance	Center		(300)	(350)	-	cd/m ²	(1),(2),(6)
Luminance Uniformity	9Points		(70)	(75)	-	%	(1),(2),(6)

Document Title	M101NWWB R3 Customer Approved Specification	Page No.	9/24
Document No.		Issue date	2014/05/13
		Revision	00

Note (1) Measurement Setup:

The LCD module should be stabilized at given temperature(25°C) for 15 minutes to Avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

Figure 4 Measurement Setup



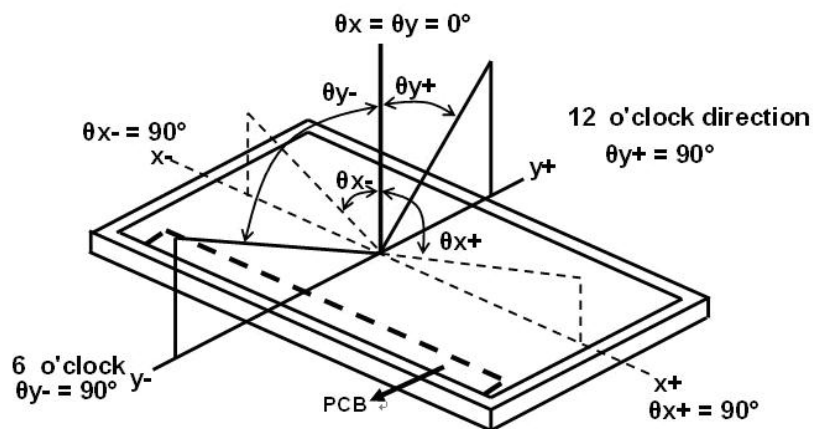
Note (2) The LED input parameter setting as:

V_LED: 12V

PWM_LED: duty 100 %

Note (3) Definition of Viewing Angle

Figure 5 Definition of Viewing Angle



Note (4) Definition Of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

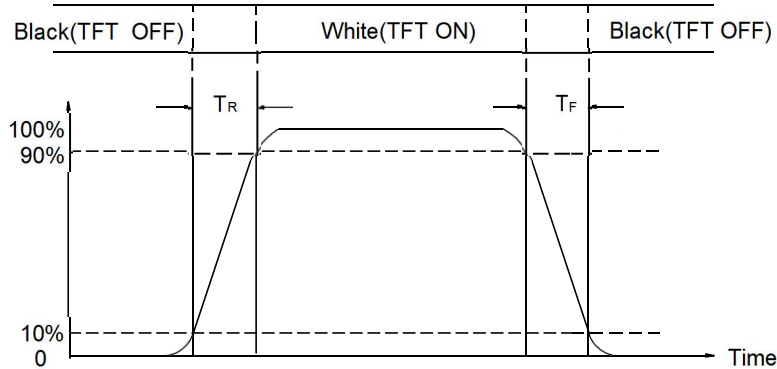
Document Title	M101NWWB R3 Customer Approved Specification			Page No.	10/24
Document No.		Issue date	2014/05/13	Revision	00

Contrast Ratio (CR) = L255 / L0

L63: Luminance of gray level 255, L0: Luminance of gray level 0

Note (5) Definition Of Response Time (TR, TF)

Figure 6 Definition of Response Time

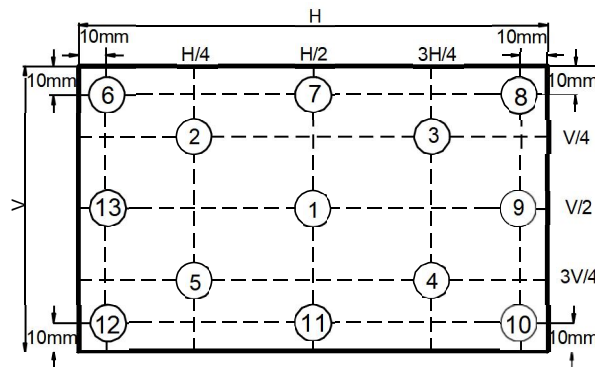


Note (6) Definition Of brightness Luminance

$$\text{Luminance uniformity} = \frac{\text{Min}(L1, L6, L7, L8, L9, L10, L11, L12, L13)}{\text{Max}(L1, L6, L7, L8, L9, L10, L11, L12, L13)} \times 100\%$$

H—Active area length V—Active area width

Figure 7 Measurement Locations





Document Title	M101NWWB R3 Customer Approved Specification			Page No.	11/24
Document No.		Issue date	2014/05/13	Revision	00

5.0 Backlight Characteristics

5.1 Parameter Guideline Of LED Backlight

Table 4 Parameter Guideline for LED Backlight

Item	Symbol		Min.	Typ.	Max.	Units	Note
LED Input Voltage	V _{LED}		(6)	(12)	(21)	V	(2)
LED Power Consumption	P _{LED}		-	-	(2.5)	W	(2)
LED Forward Voltage	V _F		(2.9)	-	(3.2)	V	(2)
LED Forward Current	I _F		-	(20)	-	mA	
PWM Signal Voltage	V _{PWM_EN}	High	(3.0)	-	(3.6)	V	
		Low	(0)	-	(0.4)		
LED Enable Voltage	V _{LED_EN}	High	(3.0)	-	(3.6)	V	
		Low	(0)	-	(0.4)		
Input PWM Frequency	FPWM		(1)	-	(2)	KHz	D _{DIM} ≥1% (2)
			(2)	-	(5)		D _{DIM} ≥2.5% (2)
			(5)	-	(10)		D _{DIM} ≥5% (2)
			(10)	-	(20)		D _{DIM} ≥10% (2)
LED Life Time	LT		(15,000)	-	-	Hours	(1)(2)

Note (1): The LED life time define as the estimated time to 50% degradation of initial luminous.

Note (2): Operating temperature 25°C, humidity 55%.



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	12/24
Document No.		Issue date	2014/05/13	Revision	00

6.0 Electrical Characteristics

6.1 Interface Connector

Table 5 Signal Connector Type

Item	Description
Manufacturer / Type	Starconn / 300E40-0010RA-G3
Mating Receptacle / Type (Reference)	TBD or Compatible

Pin #	Signal Name	Description	Remarks
1	NC	No Connection	-
2	VDD	Power Supply	-
3	VDD	Power Supply	-
4	VDD_EDID	VDD_EDID	-
5	SCL_EDID	SCL_EDID	-
6	SDA_EDID	SDA_EDID	-
7	NC	No Connection	-
8	LV0N	-LVDS Differential Data Input	-
9	LV0P	+LVDS Differential Data Input	-
10	GND	Ground	-
11	LV1N	-LVDS Differential Data Input	-
12	LV1P	+LVDS Differential Data Input	-
13	GND	Ground	-
14	LV2N	-LVDS Differential Data Input	-
15	LV2P	+LVDS Differential Data Input	-
16	GND	Ground	-
17	LVCLKN	-LVDS Differential Clock Input	-
18	LVCLKN	+LVDS Differential Clock Input	-
19	GND	Ground	-
20	LV3N	-LVDS Differential Data Input	-
21	LV3P	+LVDS Differential Data Input	-
22	GND	Ground	-
23	LED_GND	Ground for LED Driving	-
24	LED_GND	Ground for LED Driving	-
25	LED_GND	Ground for LED Driving	-
26	NC	No Connection	-

Table 6 Signal Pin Assignment



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	13/24
Document No.		Issue date	2014/05/13	Revision	00

27	LED_PWM	PWM Input Signal for LED Driver	-
28	LED_EN	LED Enable Pin	-
29	NC	Reserved For CABC	-
30	NC	No Connection	-
31	LED_VCC	Power Supply for LED Driver	-
32	LED_VCC	Power Supply for LED Driver	-
33	LED_VCC	Power Supply for LED Driver	-
34	NC	No Connection	-
35	BIST	BIST pin	-
36	NC	No Connection	-
37	NC	No Connection	-
38	NC	No Connection	-
39	NC	No Connection	-
40	NC	No Connection	-

Note: All input signals shall be low or Hi- resistance state when VDD is off.

6.2 LVDS Receiver

6.2.1 Signal Electrical Characteristics For LVDS Receiver

Table 7 LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High	V _{th}	-	-	+100	mV	V _{CM} =+1.2V
Differential Input Low	V _{tl}	-100	-	-	mV	V _{CM} =+1.2V
Magnitude Differential Input	V _{ID}	200	-	400	mV	-
Common Mode Voltage	V _{CM}	0.3+(V _{ID} /2)	-	VDD-1.2-(V _{ID} /2)	V	-
Common Mode Voltage	ΔV _{CM}	-	-	50	mV	V _{CM} =+1.2V

Note (1) Input signals shall be low or Hi-Z state when VDD is off.

(2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

Document Title	M101NWWB R3 Customer Approved Specification			Page No.	14/24
Document No.		Issue date	2014/05/13	Revision	00

Figure 8 Voltage Definitions

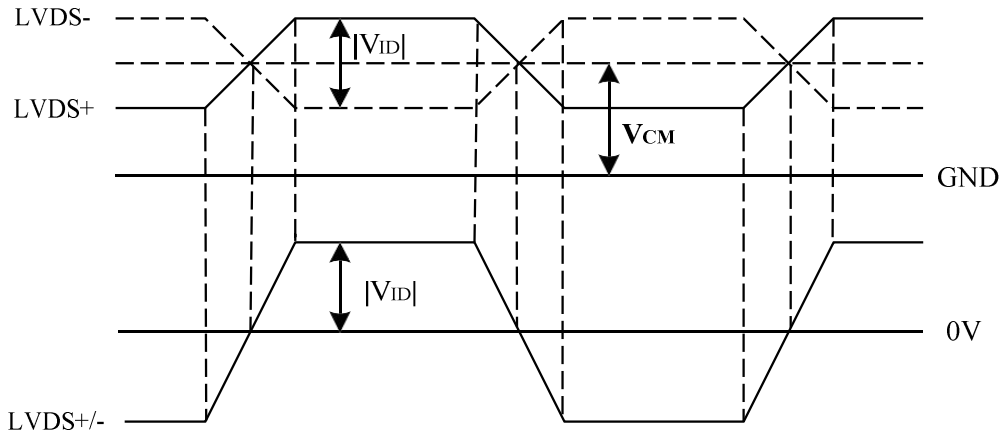
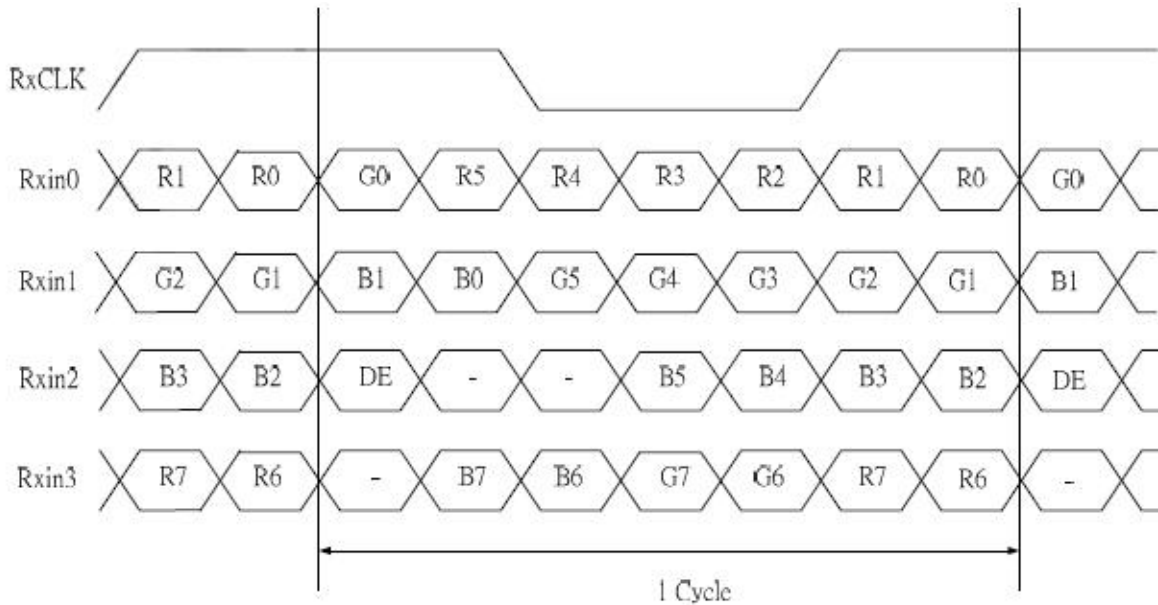


Figure 9 LVDS Data Mapping



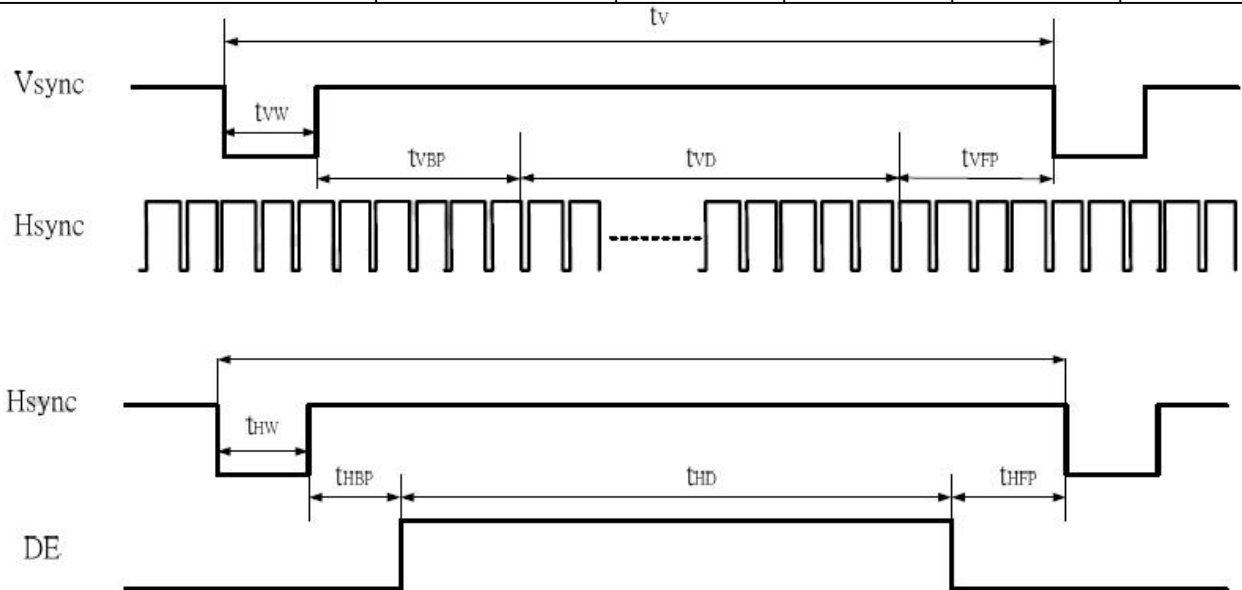
Document Title	M101NWWB R3 Customer Approved Specification			Page No.	15/24
Document No.		Issue date	2014/05/13	Revision	00

7.0 Interface Timings

7.1 Timing Characteristics

Table 8 Interface Timings

Parameter	Symbol	Unit	Min.	Typ.	Max.
Frame Rate	--	Hz	-	60	-
Frame Period	t_v	line	(815)	(823)	(1023)
Vertical Display Time	t_{VD}	line	800		
Vertical Blanking Time	$t_{VW}+t_{VBP}+t_{VFP}$	line	(15)	(23)	(33)
1 Line Scanning Time	t_H	clock	(1410)	(1440)	(1470)
Horizontal Display Time	t_{HD}	clock	1280		
Horizontal Blanking Time	$t_{HW}+t_{HBP}+t_{HFP}$	clock	(60)	(160)	(190)
Clock Rate	$1/T_C$	MHz	(68.9)	(71.1)	(73.4)



7.2 Timing Diagram of Interface Signal (DE mode)

Figure 10 Timing Characteristics

Document Title	M101NWWB R3 Customer Approved Specification			Page No.	16/24
Document No.		Issue date	2014/05/13	Revision	00

8.0 Power Consumption

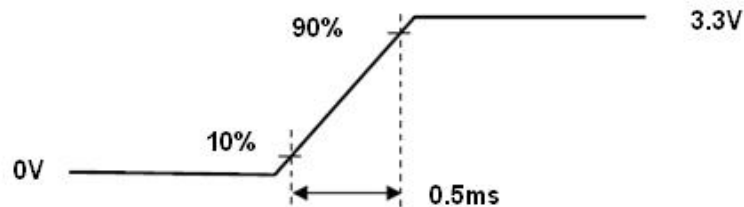
Input power voltage specifications are as follows.

Table 9 Power Voltage

Item	Symbol	Min.	Typ.	Max.	Units	Note	
LCD Drive Voltage (Logic)	VDD	(3.0)	(3.3)	(3.6)	V	(2),(4)	
VDD Current	White Pattern	IDD	-	(0.27)	-	A	(3),(4)
VDD Power Consumption	White Pattern	PDD	-	-	(1.0)	W	
LED Power Consumption	PLED	-	-	(2.5)	W		
Rush Current	Irush	-	-	(1.5)	A	(1),(4),(5)	
Allowable Logic/LCD Drive Ripple Voltage	VDDrp	-	-	(300)	mV	(4)	

Note (1) Measure Condition

Figure 11 VDD Rising Time

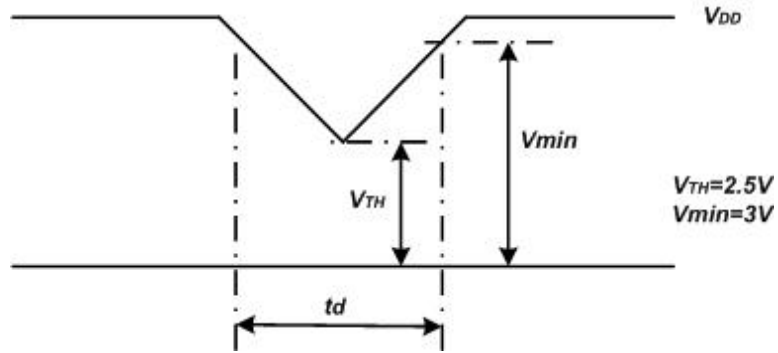


Note (2) VDD Power Dip Condition

If $V_{TH} < V_{DD} \leq V_{min}$, then $t_d \leq 10ms$; when the voltage return to normal our panel must revive automatically.

Document Title	M101NWWB R3 Customer Approved Specification			Page No.	17/24
Document No.		Issue date	2014/05/13	Revision	00

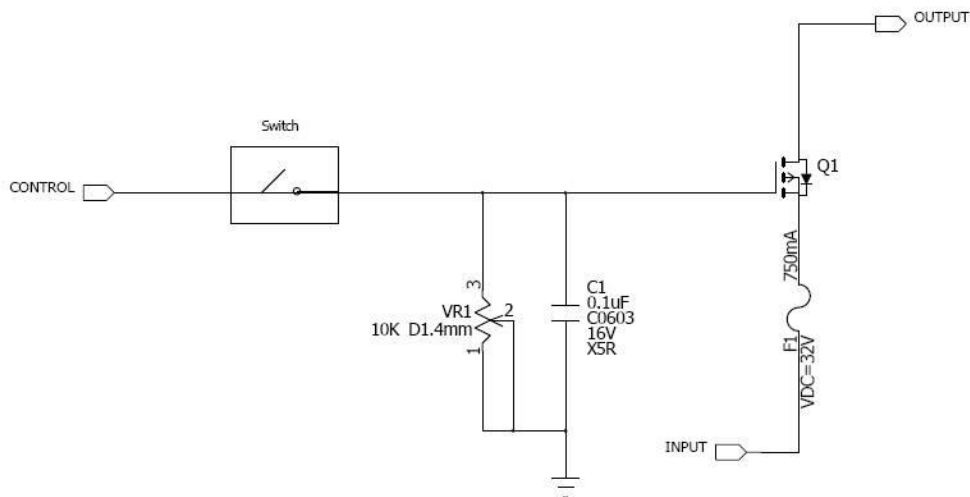
Figure 12 VDD Power Dip



Note (3) Frame Rate=60Hz, VDD=3.3V,DC Current.

Note (4) Operating temperature 25°C, humidity 55%RH.

Note (5) The reference measurement circuit of rush current.



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	18/24
Document No.		Issue date	2014/05/13	Revision	00

9.0 Power ON/OFF Sequence

Power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.

Figure 13 Power Sequence

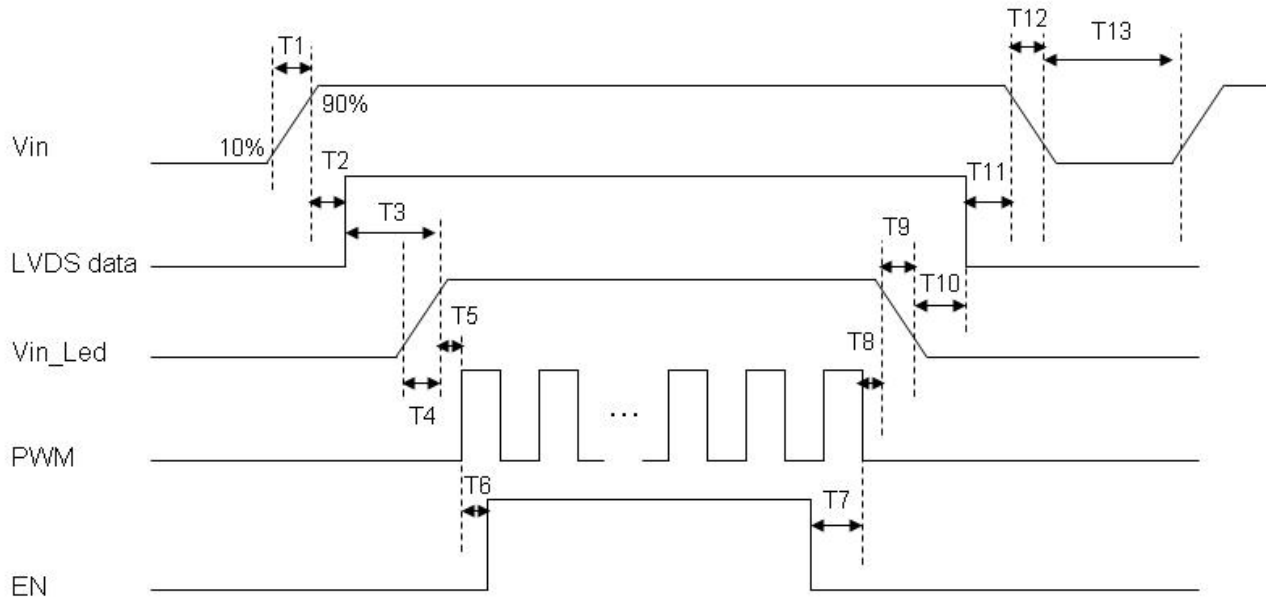


Table 10 Power Sequencing Requirements

Parameter	Symbol	Unit	Min	Typ.	Max
VIN Rise Time	T1	ms	0.5	--	10
VIN Good to Signal Valid	T2	ms	30	--	90
Signal Valid to Backlight On	T3	ms	200	--	--
Backlight Power On Time	T4	ms	0.5	--	--
Backlight VDD Good to System PWM On	T5	ms	10	--	--
System PWM ON to Backlight Enable ON	T6	ms	10	--	--
Backlight Enable Off to System PWM Off	T7	ms	0	--	--
System PWM Off to B/L Power Disable	T8	ms	10	--	--
Backlight Power Off Time	T9	ms	0.5	10	30
Backlight Off to Signal Disable	T10	ms	200	--	--
Signal Disable to Power Down	T11	ms	0	--	50
VIN Fall Time	T12	ms	0.5	10	30
Power Off	T13	ms	500	--	--

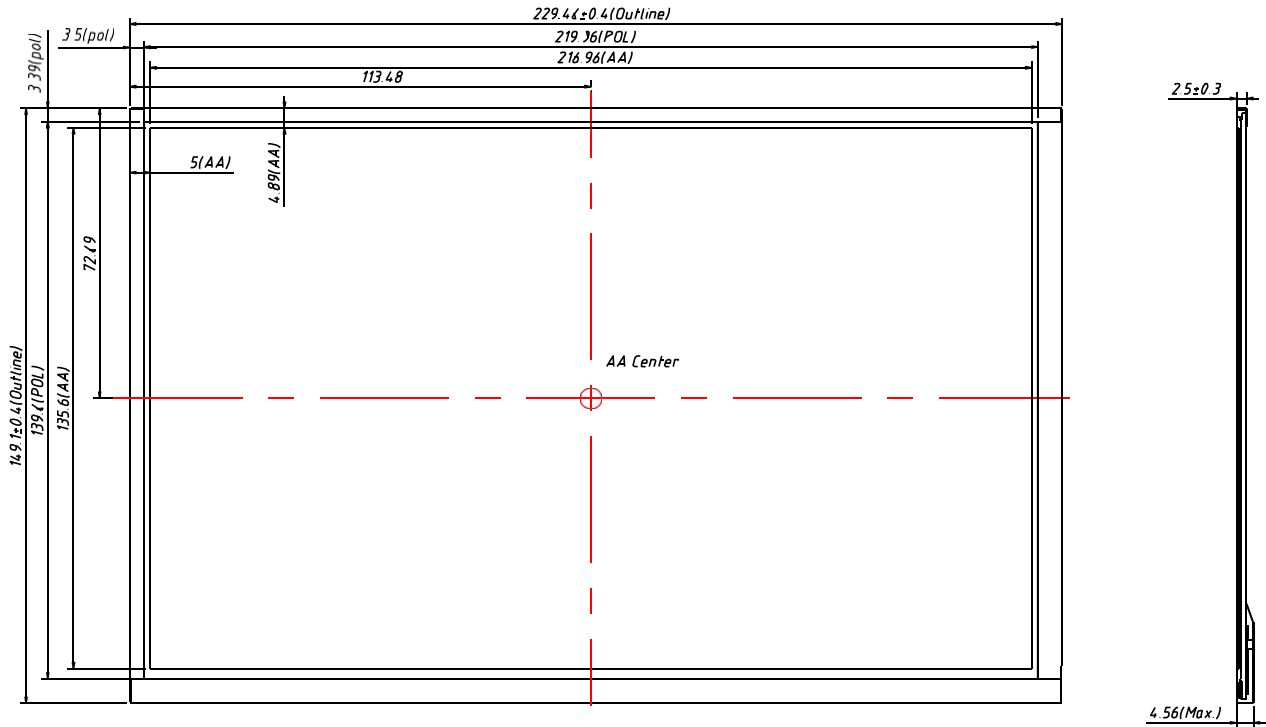


Document Title	M101NWWB R3 Customer Approved Specification	Page No.	19/24
Document No.		Issue date	2014/05/13
		Revision	00

10.0 Mechanical Characteristics

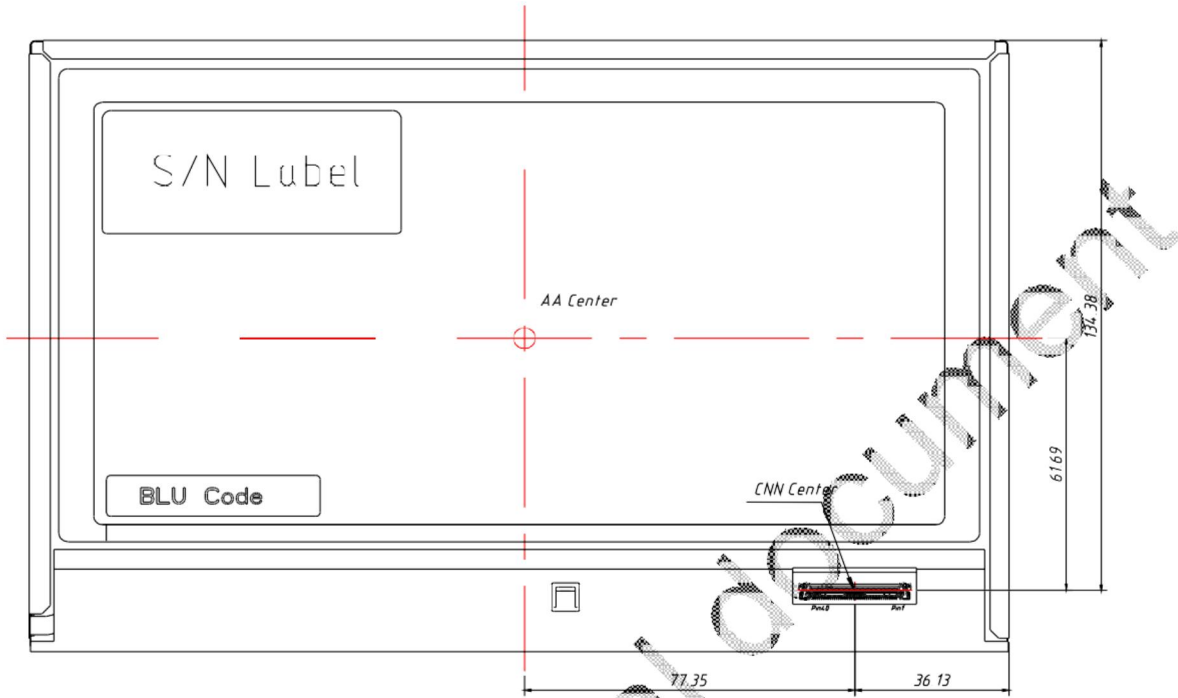
10.1 Outline Drawing

Figure 14 Outline Drawing (Front Side)



Document Title	M101NWWB R3 Customer Approved Specification		Page No.	20/24	
Document No.		Issue date	2014/05/13	Revision	00

Figure 15 Outline Drawing (Back Side)



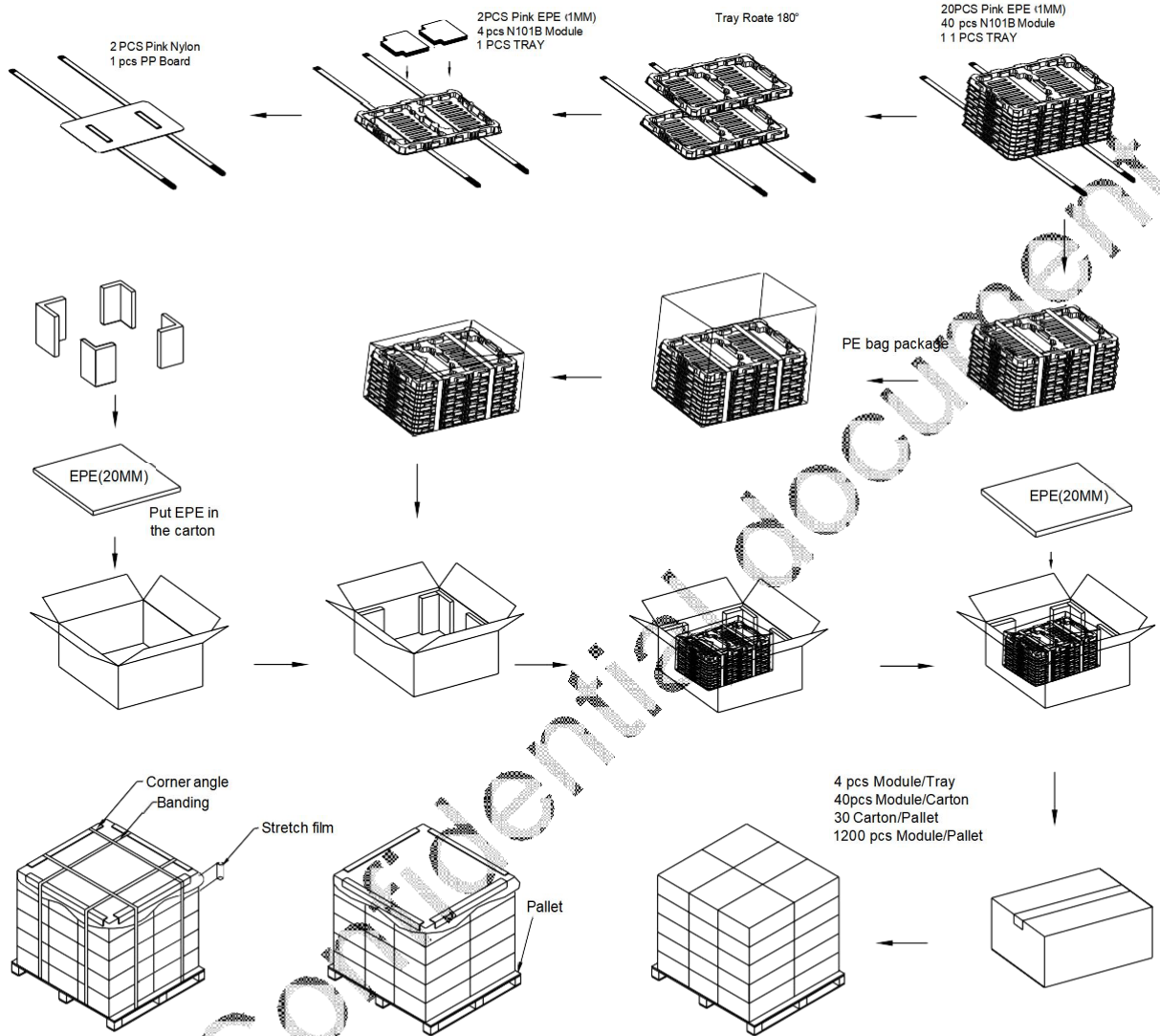
10.2 Dimension Specifications

Table 11 Module Dimension Specifications

Parameter	Min	Typ	Max	Unit
Width	(229.06)	(229.46)	(229.86)	mm
Height	(148.7)	(149.1)	(149.5)	mm
Depth w/o PCB	(2.2)	(2.5)	(2.8)	mm
Depth w/ PCB	-	-	(4.56)	mm
Weight	-	-	(190)	g

Document Title	M101NWWB R3 Customer Approved Specification		Page No.	21/24	
Document No.		Issue date	2014/05/13	Revision	00

11.0 Package Specification





InfoVision Optoelectronics (Kunshan) Co.,LTD.

Document Title	M101NWWB R3 Customer Approved Specification				Page No.	22/24
Document No.		Issue date	2014/05/13	Revision	00	

12.0 Lot Mark

TBD

12.1 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

code 1,2,4,5,6,7,8,9,10,11,16: IVO internal flow control code.

code 3: Production location.

code 12: Production year.

code 13: Production month.

code 14,15: Production date.

code 17,18,19,20: Serial number.

Note (1) Production Year

Year	2,006	2,007	2,008	2,009	2,010	2,011	2,012	2,013	2,014	2,015
Mark	6	7	8	9	A	B	C	D	E	F

Note (2) Production Month

Month	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

12.2 23 Product Barcode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----

code 1,2: Manufacture District.

code 3,4,5,6,7: IVO internal module name.

code 8,9,10,13,16: IVO internal flow control code.

code 11,12: Cell location Suzhou defined as "SZ".

code 14,15: Module line Kunshan defined as "KS".

code 17,18,19 : Year, Month, Day Refer to Note(1) and Note(2) of Lot Mark.

code 20~23 : Serial Number.



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	23/24
Document No.		Issue date	2014/05/13	Revision	00

13.0 General Precaution

13.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

13.2 Handling Precaution

- (1) Please mount LCD module by using mounting holes arranged in four corners tightly.
- (2) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. IVO does not warrant the module, if customers disassemble or modify the module.
- (3) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid Crystal, and do not contact liquid crystal with skin. If liquid crystal contacts mouth or eyes, rinse out with water immediately. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and Rinse thoroughly with water.
- (4) Disconnect power supply before handling LCD module
- (5) Refrain from strong mechanical shock and /or any force to the module.
- (6) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature; etc otherwise LCD module may be damaged. It's recommended employing protection circuit for power supply.
- (7) Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when Persons handle the LCD module for incoming inspection or assembly.
- (8) When the surface is dusty, please wipe gently with absorbent cotton or other soft Material. When cleaning the adhesives, please use absorbent cotton wetted with a little Petroleum benzene or other adequate solvent.
- (9) Wipe off saliva or water drops as soon as possible. If saliva or water drops Contact with polarizer for a long time, they may causes deformation or color Fading.
- (10) Protection film must remove very slowly from the surface of LCD module to Prevent from electrostatic occurrence.
- (11) Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is Very weak to electrostatic discharge, Please be careful with electrostatic Discharge .Persons who handle the module should be grounded through adequate methods.
- (12) Do not adjust the variable resistor located on the module.

13.3 Storage Precaution

- (1) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- (2) The module shall not be exposed under strong light such as direct sunlight. Otherwise, Display characteristics may be changed.
- (3) The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

13.4 Operation Precaution

- (1) Do not connect or disconnect the module in the "Power On" condition.
- (2) Power supply should always be turned on/off by 9.0 "Power on/off sequence"
- (3) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding



Document Title	M101NWWB R3 Customer Approved Specification			Page No.	24/24
Document No.		Issue date	2014/05/13	Revision	00

methods may be important to minimize the interference.

(4) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the

13.5 Others

- (1) Ultra-violet ray filter is necessary for outdoor operation.
- (2) Avoid condensation of water which may result in improper operation or disconnection of electrode.
- (3) If the module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.
- (4) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

13.6 Disposal

When disposing LCD module, obey the local environmental regulations.
TFT Module may be damaged.

14.0 EDID Table TBD