Tentative Product Specification

To:

Product Name: M102AWF2 R9

Document Issue Date: 2023/02/26

Customer	InfoVision Optoelectronics
SIGNATURE Please return 1 copy for your confirmation with your signature and comments.	**SIGNATURE** **REVIEWED BY CQM** **PREPARED BY FAE**

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Revision	Date	Page	Revised Content/Summary	Remark
00	2023/02/26	--	First issued.	-
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1.0 General Descriptions

1.1 Introduction

The M102AWF2 R9 is a Color Active Matrix Liquid Crystal Display with a back light system. The matrix uses a-Si Thin Film Transistor as a switching device. This TFT LCD has a 10.25 inch diagonally measured active display area with FHD resolution (1920horizontal by 720vertical pixels array).

1.2 Features

- Supported FHD Resolution
- LVDS Interface
- Wide View Angle
- Compatible with RoHS Standard

1.3 Product Summary

Items		Specifications	Unit
Screen Diagonal		10.25	inch
Active Area (H x V)		243.65 x 91.37	mm
Number of Pixels (H x V)		1,920 x 720	-
Pixel Pitch (H x V)		0.1269 x 0.1269	mm
Pixel Arrangement		R.G.B. Vertical Stripe	-
Display Mode		Normally Black	-
White Luminance		(1000) (Typ.)	cd /m2
Contrast Ratio		(1200) (Typ.)	-
Response Time		(20) (Typ.) @ 25℃	ms
Input Voltage		(3.3) (Typ.)	V
Power Consumption		(8.73)(Max.)@ White pattern ,FV=60Hz	W
Weight		(330) (Max.)	g
Outline Dimension (H x V x D)	W/O PCBA	(261.14) (Typ.) x (109.3) (Typ.) x (8.521) (Max.)	mm
	With PCBA	(261.14) (Typ.) x (109.3) (Typ.) x (12.171) (Max.)	
Electrical Interface (Logic)		LVDS	-
Support Color		16.7 M	-
NTSC		(85) (Min.)	%
Surface Treatment		HC	-

1.4 Functional Block Diagram

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

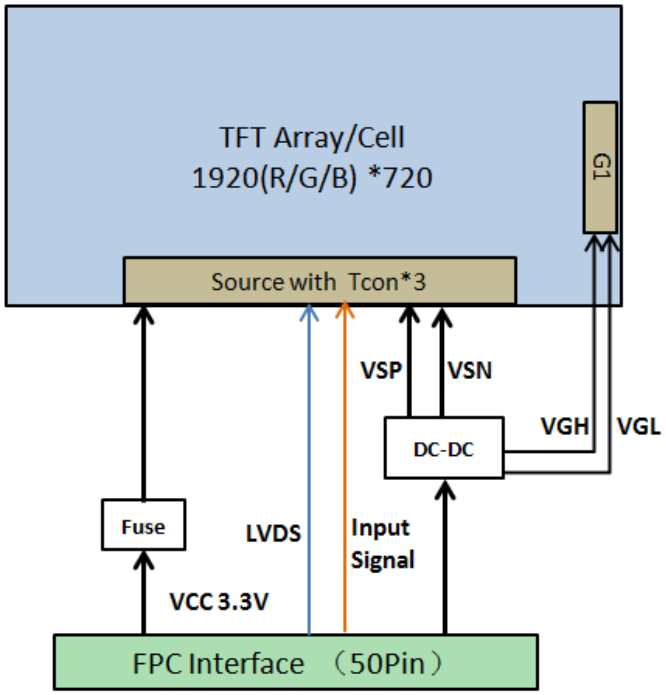


Figure 1 Block Diagram

1.5 Pixel Mapping

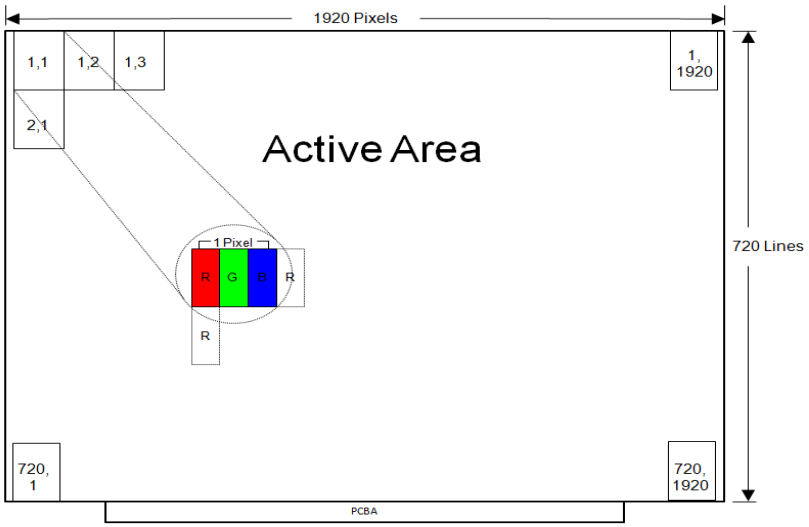


Figure 2 Pixel Mapping

2.0 Absolute Maximum Ratings

Table 1 Electrical & Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply Voltage	V_{DD}	(-0.3)	(4)	V	(1),(2),(3),(4),(5)
	V_{DD-OTP}	(-0.3)	(8.8)	V	
Logic Input LVDS Voltage	V_{LVDS}	(0.7)	(1.7)	V	
Logic input signals	V_{IO}	(-0.3)	(4)	V	
Operating Temperature	Tgs	(-30)	(85)	℃	
Storage Temperature	Ta	(-40)	(90)	℃	

Condition: GND=0V

Note (1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded. It is recommended to follow the typical value.

Note (2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. All the display fineness should be inspected under normal conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH.

Note (3) Unpredictable results may occur when it was used in extreme conditions. T_a= Ambient Temperature, T_{gs}= Glass Surface Temperature All the display fineness should be inspected under normal conditions.

Note (4) Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be lower than (57.8)℃, and no condensation of water. Besides, protect the module from static electricity.

Note (5)Logic input signal include STBYB 、RESET、UPDN、SHLR、BIST.

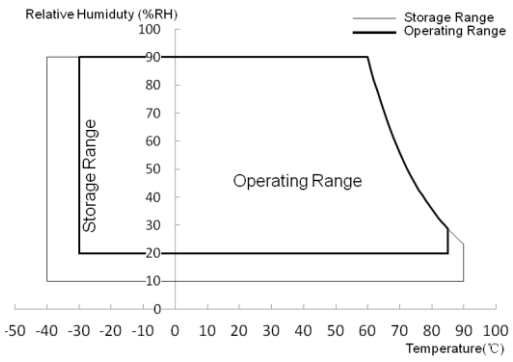


Figure 3 Absolute Ratings of Environment of the LCD Module

3.0 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes.

Table 2 Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR≥10)	Horizontal	θ_{x+}	(80)	(85)	-	degree	(1),(2),(3),(4)(8)
		θ_{x-}	(80)	(85)	-		
	Vertical	θ_{y+}	(80)	(85)	-		
		θ_{y-}	(80)	(85)	-		
Contrast Ratio	Center		(900)	(1,200)	-	-	(1),(2),(4),(8) θx=θy=0°
Response Time	Rising + Falling	25℃	-	(20)	(30)	ms	(1),(2),(5),(8) θx=θy=0°
		-20℃	-	-	(250)	ms	
		-30℃	-	-	(500)	ms	
Color Chromaticity (CIE1931)	Red x		Typ. -0.03	(0.678)	Typ. +0.03	-	(1),(2),(3),(8) θx=θy=0°
	Red y			(0.310)		-	
	Green x			(0.263)		-	
	Green y			(0.645)		-	
	Blue x			(0.153)		-	
	Blue y			(0.056)		-	
	White x			(0.307)		-	
	White y			(0.335)		-	
NTSC	-		(85)	TBD	-	%	(1),(2),(3),(8) θx=θy=0°
White Luminance	Center		(900)	(1000)	-	cd/m^2	(1),(2),(6),(8) θx=θy=0°
Luminance Uniformity(white)	9 Points		(80)	TBD	-	%	(1),(2),(7),(8) θx=θy=0°
Luminance Uniformity(black)	9 Points		(50)	TBD	-	%	

Note (1) Measurement Setup:

The LCD module should be stabilized at given ambient temperature (25℃) for 30 minutes to avoid abrupt temperature changing during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in the windless room.

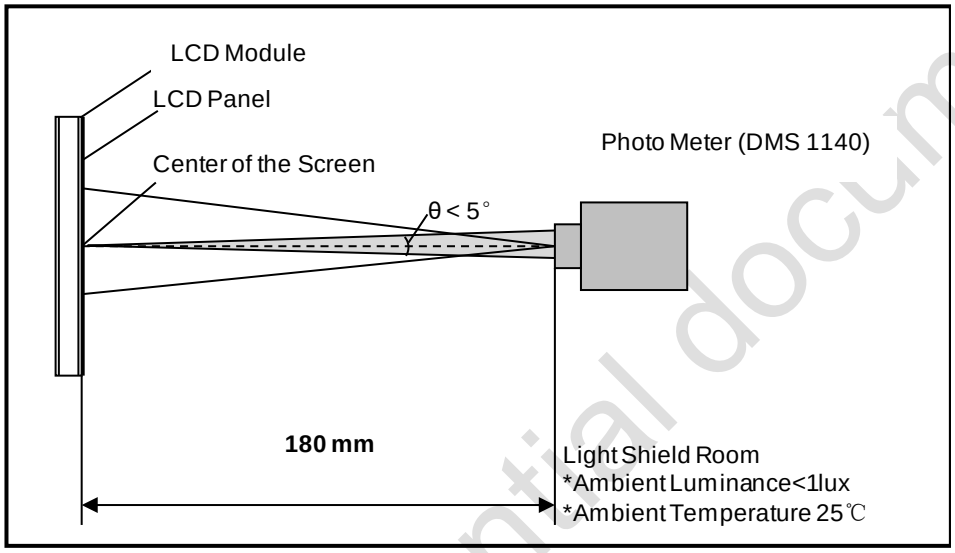


Figure 4 Measurement Setup

Note (2) The LED input parameter setting as:

I_{LED}:(240)mA, I_{LED}=(80)mA*3

Note (3) Definition of Viewing Angle

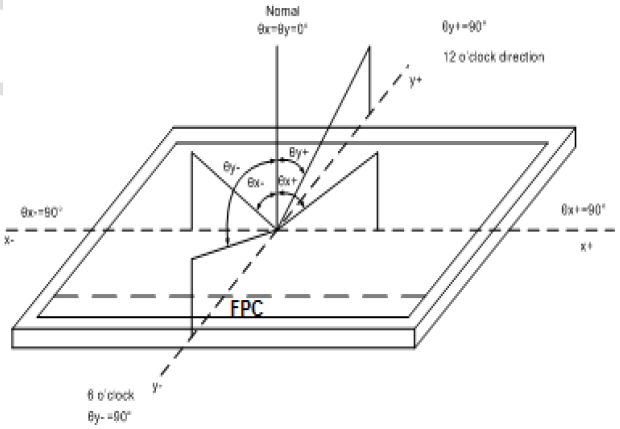


Figure 5 Definition of Viewing Angle

Note (4) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression:

Contrast Ratio (CR) = The luminance of White pattern/ The luminance of Black pattern

Note (5) Definition of Response Time (T_R, T_F)

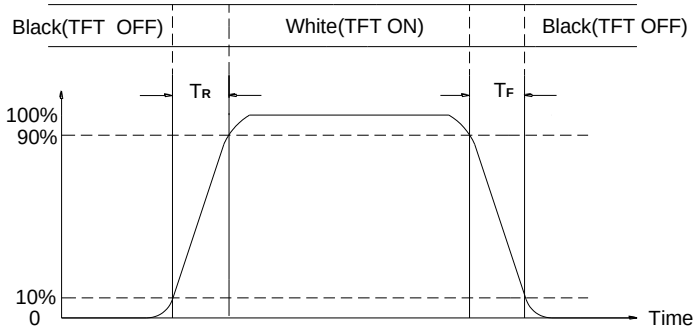


Figure 6 Definition of Response Time

Note (6) Definition of Luminance of White

Measure the luminance of White pattern (Ref.: Active Area)

Display Luminance=L1(center point)

Note (7) Definition of Luminance Uniformity (Ref.: Active Area)

Measure the luminance of White/Black pattern at 9 points.

Luminance Uniformity= Min.(L1, L2, ... L9) / Max.(L1, L2, ... L9)

H—Active Area Width, V—Active Area Height, L—Luminance

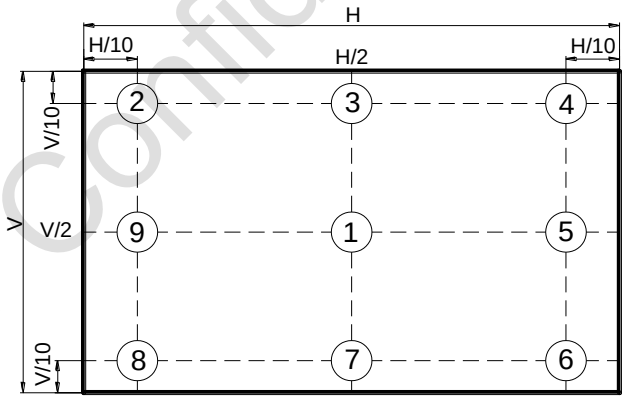


Figure 7 Measurement Locations of 9 Points

Note (8) All optical data are based on IVO given system & nominal parameter & testing machine in this document.

4.0 Electrical Characteristics

4.1 Interface Connector

Table 3 Signal Connector Type

Item	Description
Mating Receptacle / Type	FFSKL05023G50B/STM

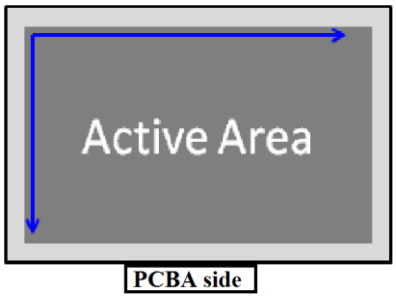
Table 4 Signal Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	GND	Ground	-
2	GND	Ground	-
3	GND	Ground	-
4	VDD	Digital Power	-
5	VDD	Digital Power	-
6	VDD	Digital Power	-
7	VDD	Digital Power	-
8	GND	Ground	-
9	SPI_SDA	Serial Interface address and data input/output for SPI interface. Only for IVO use., If not use, leave this pin floating.	-
10	SPI_SCL	Serial Interface clock input for SPI interface. Only for IVO use. If not use, leave this pin floating.	-
11	SPI_CS	Serial Interface chip enable singal for SPI interface. Only for IVO use.. If not use, leave this pin floating.	-
12	GND	Ground	-
13	OLV0N	Odd LVDS Data input 0-	-
14	OLV0P	Odd LVDS Data input 0+	-
15	GND	Ground	-
16	OLV1N	Odd LVDS Data input 1-	-
17	OLV1P	Odd LVDS Data input 1+	-
18	GND	Ground	-
19	OLV2N	Odd LVDS Data input 2-	-
20	OLV2P	Odd LVDS Data input 2+	-
21	GND	Ground	-

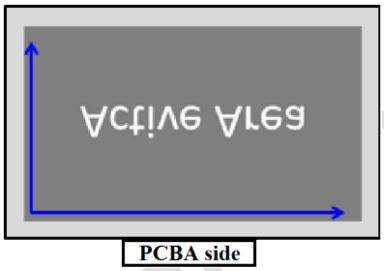
22	OLVCKN	Odd LVDS Clock input -	-
23	OLVCKP	Odd LVDS Clock input +	-
24	GND	Ground	-
25	OLV3N	Odd LVDS Data input 3-	-
26	OLV3P	Odd LVDS Data input 3+	-
27	GND	Ground	-
28	ELV0N	Even LVDS Data input 0-	-
29	ELV0P	Even LVDS Data input 0+	-
30	GND	Ground	-
31	ELV1N	Even LVDS Data input 1-	-
32	ELV1P	Even LVDS Data input 1+	-
33	GND	Ground	-
34	ELV2N	Even LVDS Data input 2-	-
35	ELV2P	Even LVDS Data input 2+	-
36	GND	Ground	-
37	ELVCKN	Even LVDS Clock input -	-
38	ELVCKP	Even LVDS Clock input +	-
39	GND	Ground	-
40	ELV3N	Even LVDS Data input 3-	-
41	ELV3P	Even LVDS Data input 3+	-
42	GND	Ground	-
43	RESET	Global Reset pin. Active low, If RESET connected to GND, the chip is in reset state. (Suggest to connecting with an RC reset circuit for stability.Suggest RC Value： R=10K，C=1uF) This pin must meet the sequence of power on/off.	-
44	STBYB	Standby mode setting pin.. STBYB=High , normal operation STBYB=Low , timing control, output buffer，DAC and power circuit all off when STBYB is low. This pin must meet the sequence of power on/off.	-

45	SHLR	Horizontal shift direction(Source output)selection，Default Pull High(Internal pull high resistor R=10K) SHLR=High，SOUT1→SOUT2→…→SOUT1920 SHLR=Low，SOUT1920→SOUT2→…→SOUT1	-
46	UPDN	Vertical shift direction(Gate output)selection，Default Pull High(Internal pull high resistor R=10K) UPDN=High，Top→Bottom（Default） UPDN=Low，Bottom→Top	-
47	Fail_T	Fail detection signal output。 FAIL_T= Low，normal operation FAIL_T= High，on error condition	-
48	GND	Ground	-
49	BIST	LCD Panel Self Test Enable ,When it is not used, Connecting to GND is recommended, Don’t floating BIST=High，Bist mode BIST=Low，Normal mode	-
50	VOTP	IVO internal used only, Please don't connect by Customer(Power input for OTP programming (8.6V)	-

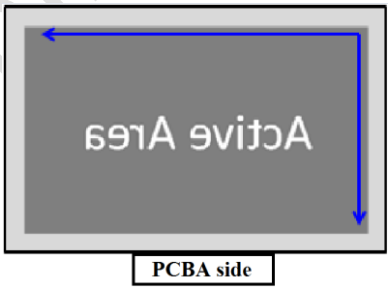
Note(1): SHLR：High(2.6~3.6V) (Default),UPDN：High(2.6~3.6V) (Default)



SHLR：High(2.6~3.6V) (Default),UPDN：Low(0~0.5V)



SHLR：Low(0~0.5V),UPDN：High(2.6~3.6V) (Default)



SHLR：Low(0~0.5V), UPDN：Low(0~0.5V)

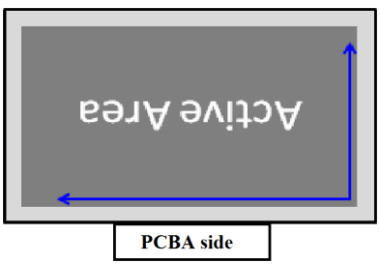


Table 5 Backlight Connector Pin Assignment

Pin No.	Symbol	Description
1	LED-PIN1	V+
2	LED-PIN2	V+
3	LED-PIN3	V+
4	LED-PIN4	/
5	LED-PIN5	NTC1
6	LED-PIN6	NTC2
7	LED-PIN7	/
8	LED-PIN8	V-
9	LED-PIN9	V-
10	LED-PIN10	V-

4.2 Signal Electrical Characteristics

4.2.1 Signal Electrical Characteristics For LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

Table 6 LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	-	-	(100)	mV	V_{CM}=+1.2V
Differential Input Low Threshold	Vtl	(-100)	-	-	mV	V_{CM}=+1.2V
Magnitude Differential Input Voltage	$\|V_{ID}\|$	(150)	-	(600)	mV	-
Common Mode Voltage	V_{CM}	(1.0)	(1.2)	(1.7-|Vid|/2)	V	-

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

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

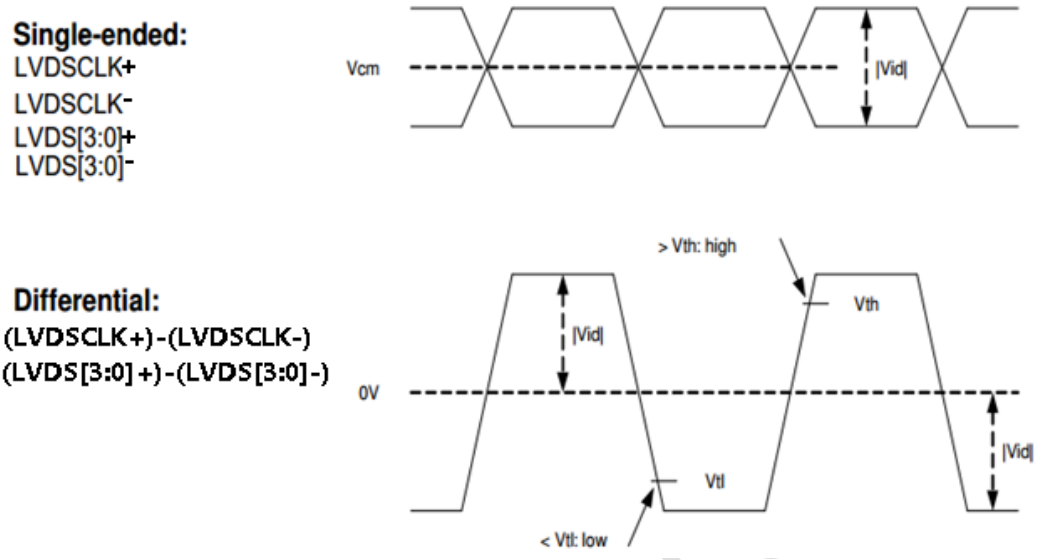


Figure 8 Voltage Definitions

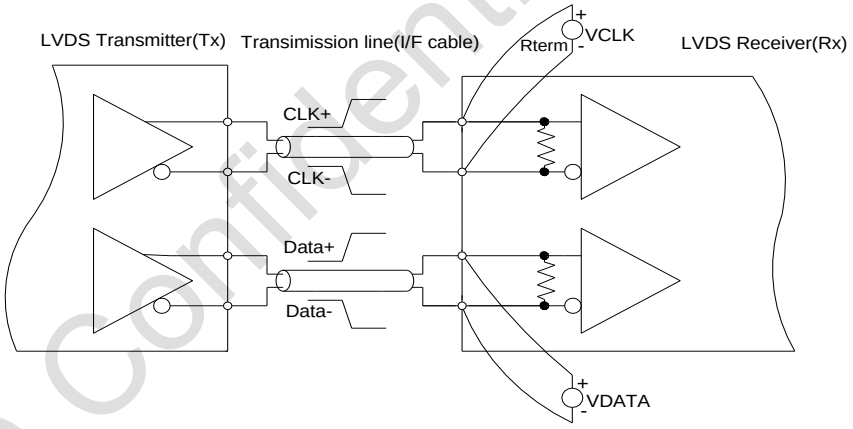


Figure 9 Measurement System

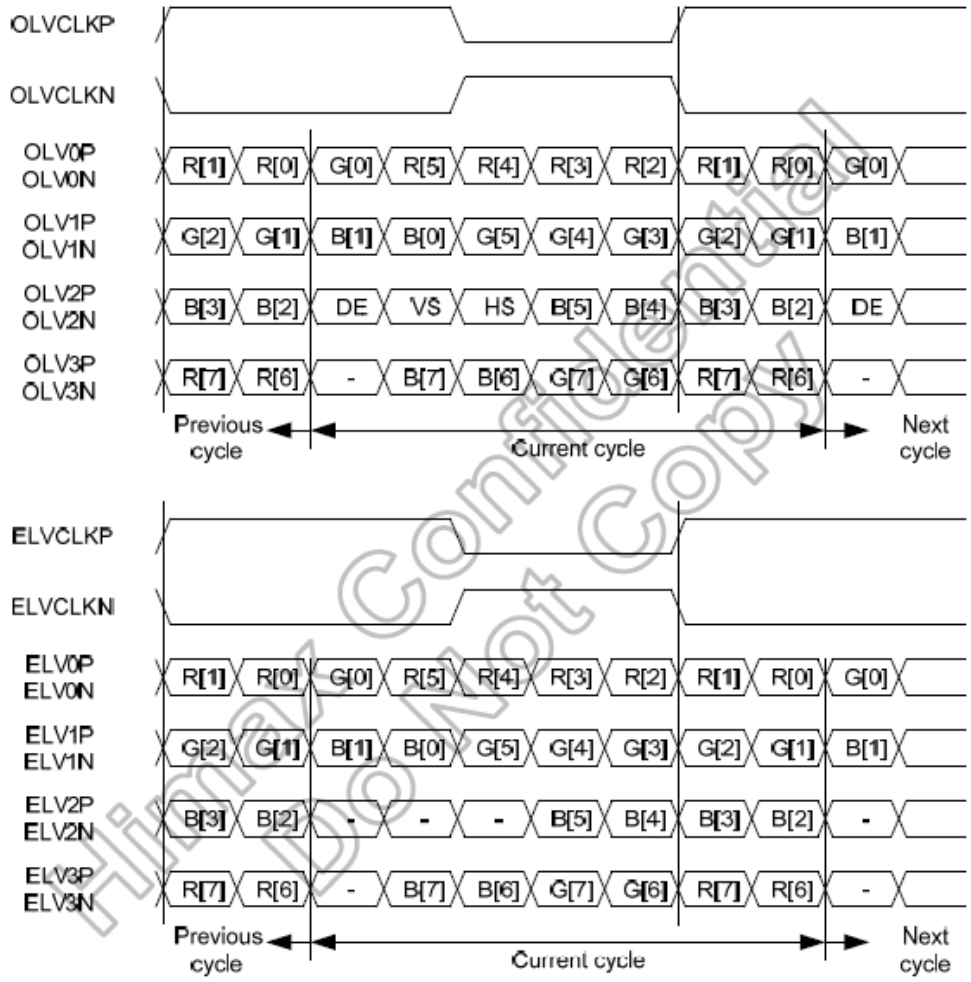
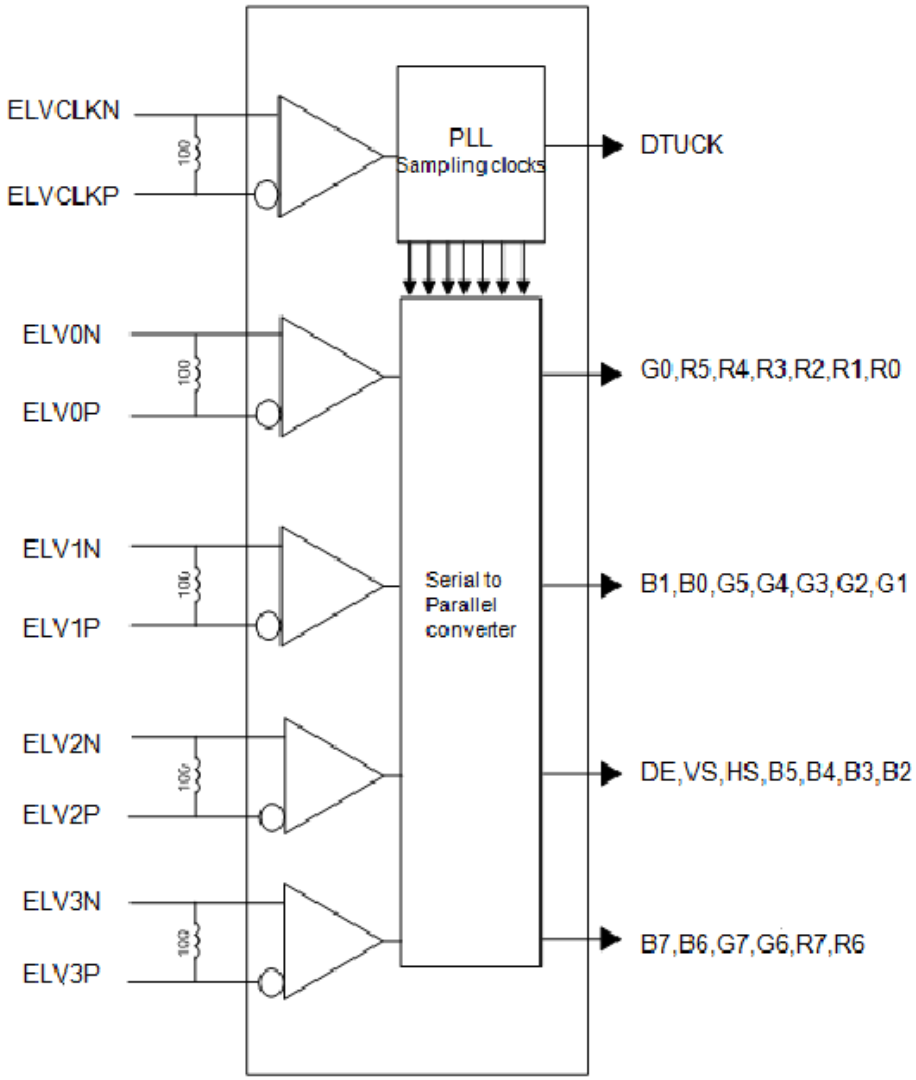


Figure 10 2 port LVDS signals,VESA format,8-bit mode

4.2.2 LVDS Receiver Internal Circuit

Figure 11 shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link.



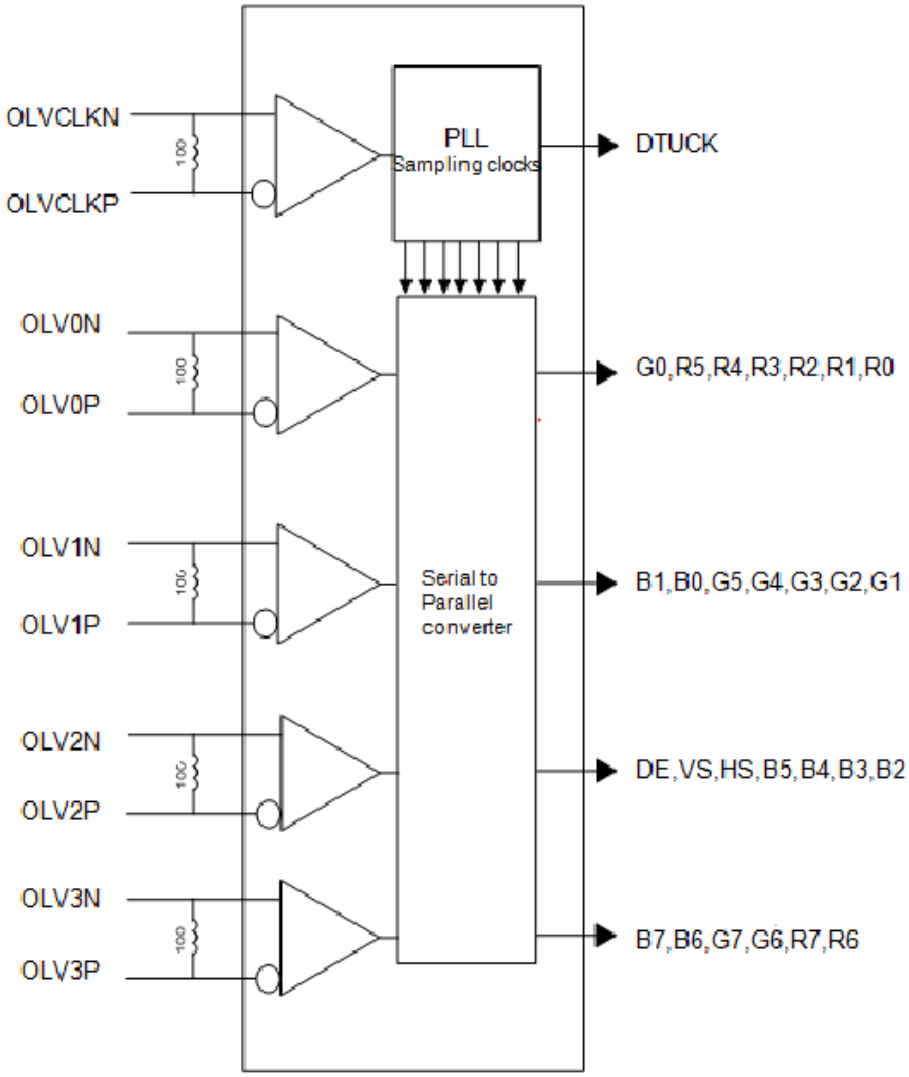


Figure 11 LVDS Receiver Internal Circuit

4.3 Interface Timings

Table 7 Interface Timings

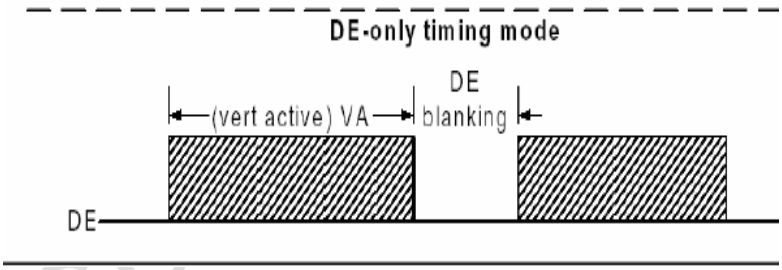
Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	F_{CLK}	(43.4)	(44.1)	(64.8)	MHz
Horizontal Total Time	T_{HP}	(990)	(1002)	(1200)	clocks
Horizontal Active Time	HA		960		clocks
HSYNC Blanking	TH_{BLANK}	(30)	(42)	(240)	clocks
Vertical Total Time	T_{VP}	(730)	(733)	(900)	lines
Vertical Active Time	VA		720		lines
VSYNC Blanking	TV_{BLANK}	(10)	(13)	(180)	lines
Frame Rate	F_V	(55)	(60)	(65)	Hz

Note1：HT * VT *Frame Frequency≤(64.8) MHz

Note2：Dual Port LVDS, Table7 shows one port LVDS.

Note3：All reliabilities are specified for timing specification based on refresh rate of 60Hz.

M102AWF2 R9 is secured only for function under lower refresh rate; 60Hz at Normal mode



4.4 Input Power Specifications

Input power specifications are as follows.

Table 8 Input Power Specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply							
LCD Drive Voltage (Logic)		V_{DD}	(3.0)	(3.3)	(3.6)	V	(1),(2)
VDD Current	White Pattern	I_{DD}	-	-	(0.25)	A	(1),(5)
VDD Power Consumption	White Pattern	P_{DD}	-	-	(0.81)	W	
Logic Input Signal	High level voltage	V_{Logic}	(0.7*VDD)	-	(VDD)	V	(1) ,(4)
	Low level voltage		(0)	-	(0.3*VDD)	V	
Rush Current		I_{Rush}	-	-	(1.5)	A	(1),(6)
Allowable Logic/LCD Drive Ripple Voltage		V_{VDD-RP}	-	-	(200)	mV	(1),(3)
LED Power Supply							
LED Input Voltage		V_{LED}	(28)	-	(33)	V	(1),(2),(9)
LED Power Consumption		P_{LED}	-	-	(7.92)	W	(1), (9)
LED Forward Voltage		V_F	(2.8)	-	(3.3)	V	(1),(2) , (9)
LED Forward Current		I_F	-	(80)	-	mA	
LED Life Time@25℃		LT	(10,000)	-	-	Hours	(1),(7)
LED Life Time@25℃		LT	(30,000)	-	-	Hours	(1),(8)
LED Life Time@85℃		LT	(10,000)	-	-	Hours	(1),(8)

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH.

Note (2) All of the absolute maximum ratings specified in the table, if exceeded, may cause faulty operation or unrecoverable damage.It is recommended to follow the typical value.

Note (3)This impedance value is needed for proper display and measured from LVDS Tx to the mating connector.

Note (4) Logic input signal include SHLR、UPDN、 BIST、RESET、STBYB.

Note (5) The specified VDD current and power consumption are measured under the VDD = (3.3) V, FV= (60) Hz condition and White pattern.

Note (6) The figures below is the measuring condition of VDD. Rush current can be measured when TRUSH is 0.5 ms.

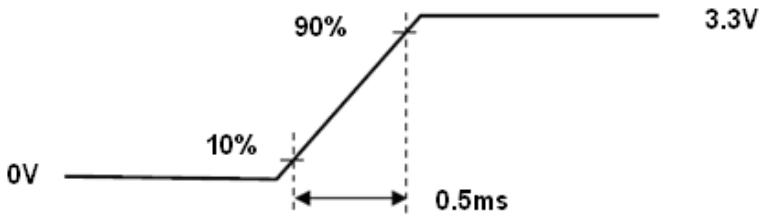


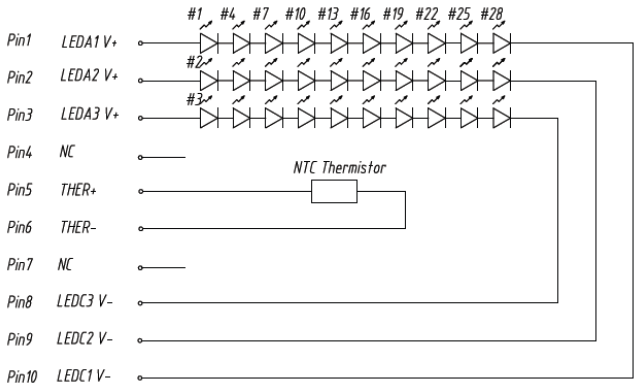
Figure 12 V_{DD} Rising Time

Note (7) The life time is determined as the sum of the lighting time till the luminance of LCD at the typical LED current reducing to 80% of the minimum value under normal operating condition.

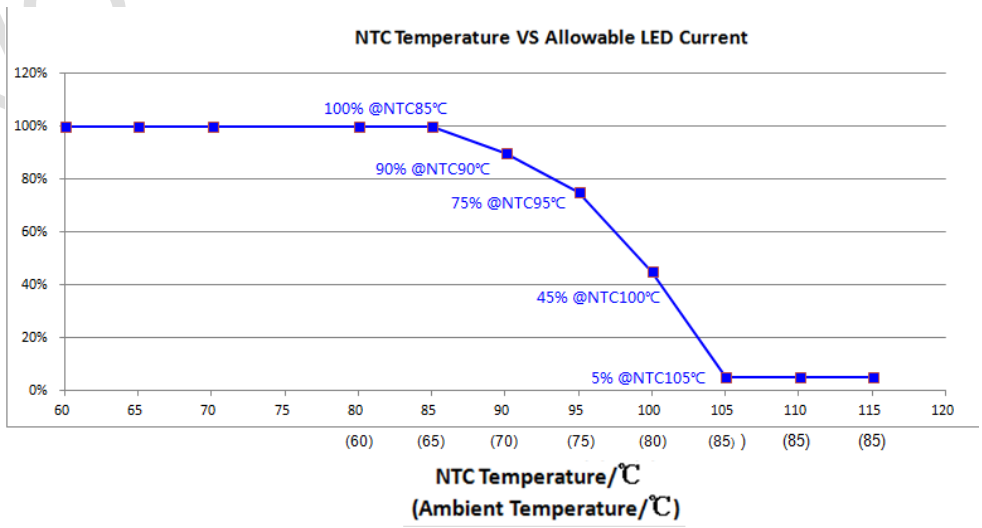
Note (8) The life time is determined as the sum of the lighting time till the luminance of LCD at the typical LED current reducing to 50% of the minimum value under normal operating condition.

Note (9) Definition of VLED and PLED

$V_{LED} = V_F \times 10$, $I_{LED} = I_F \times 3$, PLED (max.)= $V_{LED(max.)} \times I_{LED(Typ.)}$



Note (10) The allowable forward current of LED vary with environmental temperature



4.5 Power ON/OFF Sequence

1.Interface signals are also shown in the chart. Signals from any system shall be Hi-resistance state or low level when VDD voltage is off.

2. When system first start up, should keep the VDD high time longer than 200ms, otherwise may cause image sticking when VDD drop off.

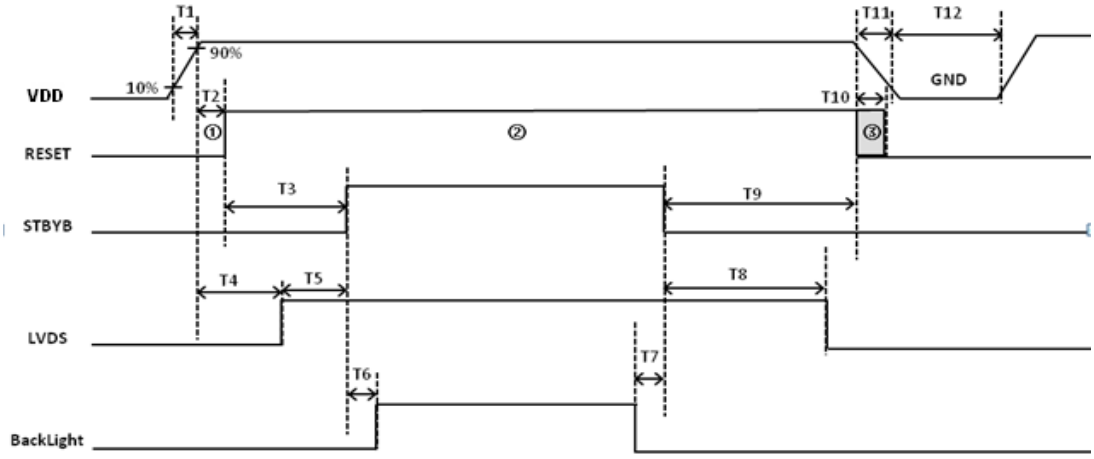


Figure 13 Power Sequence

Table 9 Power Sequencing Requirements

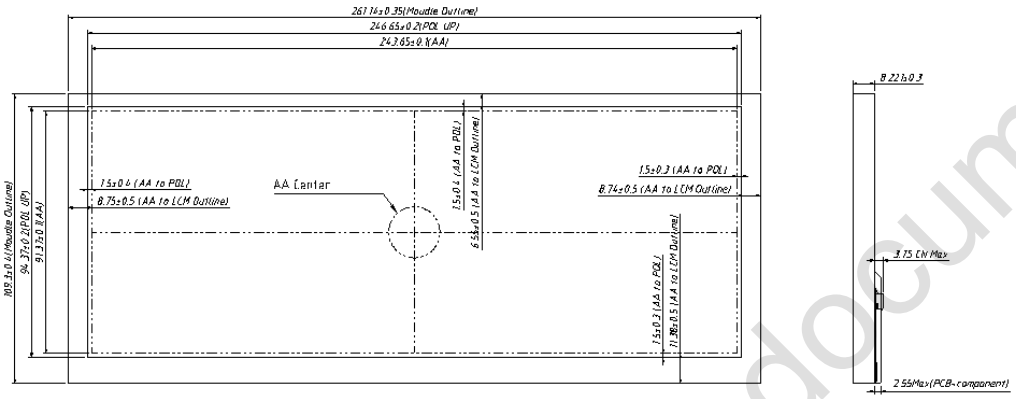
Parameter	Symbol	Min.	Typ.	Max.	Unit
VDD Rise Time	T1	(0.5)	-	(10)	ms
VDD Good to RESET pull H	T2	(10)	-	-	us
RESET pull H to STBYB pull H	T3	(90)	-	-	ms
VDD Good to Signal Valid	T4	(0)	-	(50)	ms
Signal Valid to STBYB pull H	T5	(0)	(10)	-	ms
STBYB pull H to Backlight Power On	T6	(200)	-	-	ms
Backlight Power Off to STBYB pull L	T7	(200)	-	-	ms
STBYB Pull L to Signal Disable	T8	(50)	(67)	(83)	ms
STBYB pull L to VDD Power off	T9	(50)	(67)	(83)	ms
RESET off to VDD Power off	T10	(0)	-	-	ms
VDD Fall Time	T11	(0.5)	-	(30)	ms
VDD Power off	T12	(500)	-	-	ms

Note(1)RESET has 3 status in the sequence: ①Pull Low Voltage status ②Pull High Voltage Status③Hi-Z status. Please make sure RESET change to Hi-Z status while module is shutting down.

Note(2)T8 and T9 suggest referring to the typ. value to ensure that T8 is equal to T9.

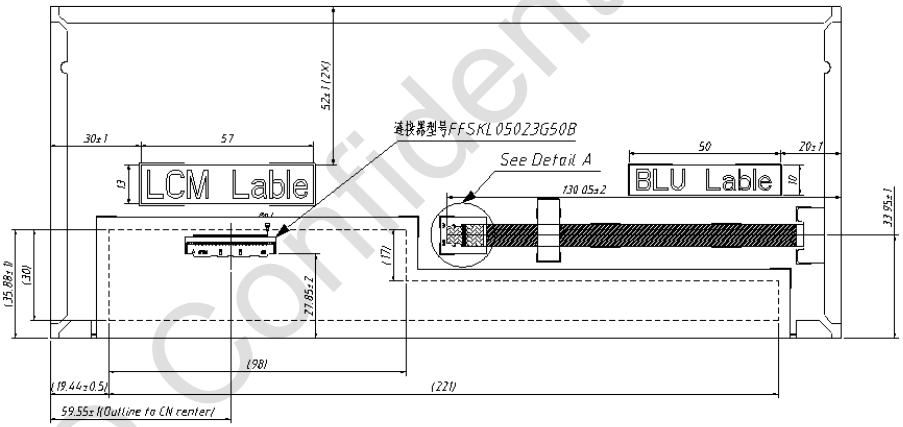
5.0 Mechanical Characteristics

5.1 Outline Drawing



Unit：mm

Figure 14 Reference Outline Drawing (Front Side)



Unit：mm

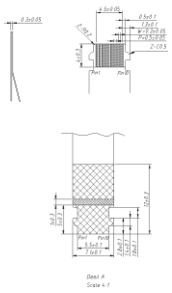


Figure 15 Reference Outline Drawing (Back Side)

Note: 1.Unnoted tolerance ±0.3mm;

5.2 Dimension Specifications

Table 10 Module Dimension Specifications

Item		Min.	Typ.	Max.	Unit
Width		(260.79)	(261.14)	(261.49)	mm
Height		(108.9)	(109.3)	(109.7)	mm
Thickness	Without PCBA	(7.921)	(8.221)	(8.521)	mm
	With PCBA	-	-	(12.171)	mm
Weight		-	(280)	(330)	g

Note：Outline dimension measure instrument: Vernier Caliper.

6.0 Reliability Conditions

Table 11 Reliability Condition

Item		Package	Test Conditions		Note
High Temperature/High Humidity Operating Test		Module	T_a=60℃, 90%RH, 500 hours		(1),(2),(3),(4)
High Temperature Operating Test		Module	T_a=85℃, 500 hours		
Low Temperature Operating Test		Module	T_a = -30℃, 500 hours		
High Temperature Storage Test		Module	T_a=90℃, 500 hours		(1),(3),(4)
Low Temperature Storage Test		Module	T_a= - 40℃, 500 hours		
Temperature Shock Test		Module	T_a= -40℃(30min.)~85℃(30min.),200cycles		
Shock Non-operating Test		Module	50G. 6msmec，1/2 Sine Wave ±X，±Y，±Z ， each axis 10 times		(1),(3),(5)
Vibration Non-operating Test		Module	half-sine Frequency: 8Hz ~ 33Hz Stroke: 1.3mm Sweep: 2.9G 33.3Hz ~ 400Hz X,Z Cycle : 15 minutes ,2 hrs for each direction of X,Z ; 4 hours for Y direction		
ESD Test	Operating	Module	Contact	±4KV,±8KV ,150pF(330Ohm)	(1),(2),(6)
			Air	±6KV,±15KV ,150pF(330Ohm)	

Note (1) A sample can only have one test. Outward appearance, image quality and optical data can only be checked at normal conditions according to the IVO document before reliable test. Only check the function of the module after reliability test.

Note (2) The setting of electrical parameters should follow the typical value before reliability test.

Note (3) During the test, it is unaccepted to have condensate water remains. Besides, protect the module from static electricity.

Note (4) The sample must be released for 24 hours under normal conditions before judging. Furthermore, all the judgment must be made under normal conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH. T_a= Ambient Temperature, T_{gs}= Glass Surface Temperature.

Note (5) The module should be fixed firmly in order to avoid twisting and bending.

Note (6) It could be regarded as pass, when the module recovers from function fault caused by ESD a few minutes later.

7.0 Package Specification

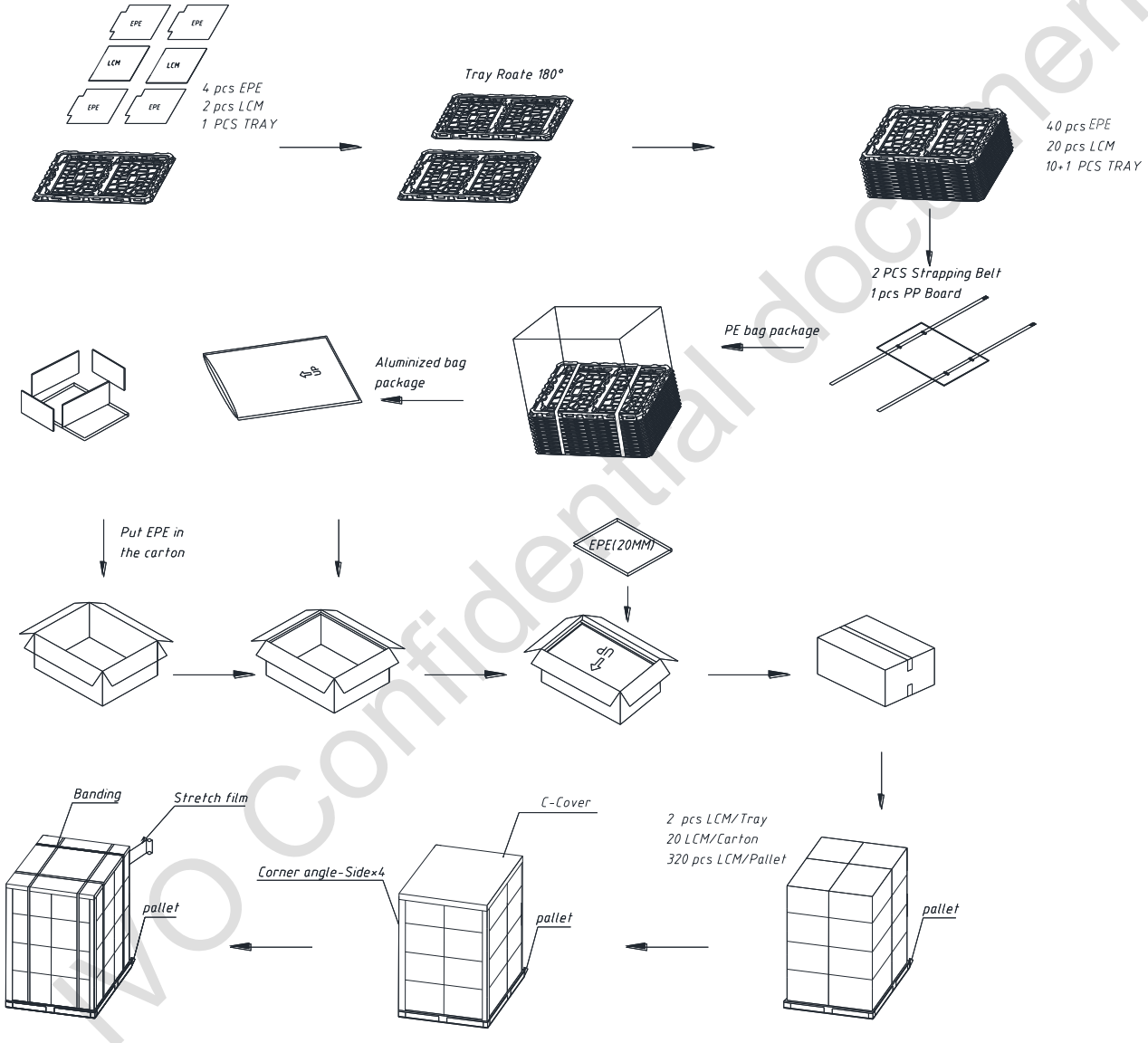
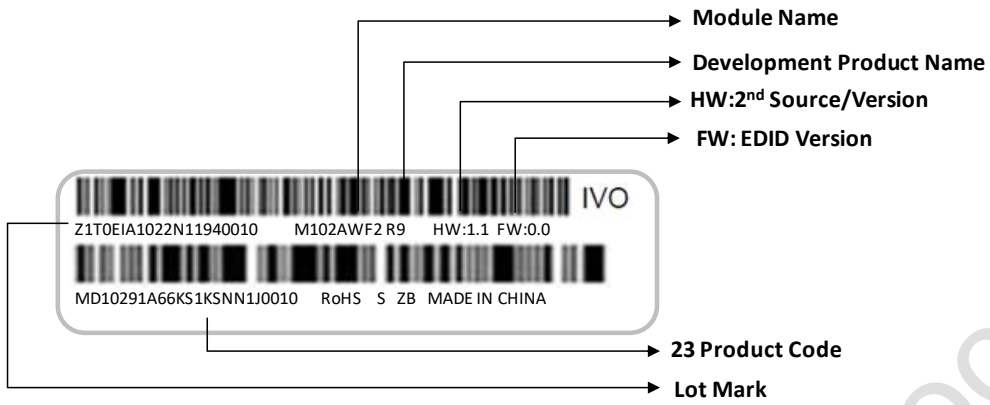


Figure 16 Packing Method

8.0 Lot Mark



Note: This picture is only an example.

8.1 20 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 Day.
Code 17,18,19,20: Serial Number.

8.2 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, China defined as “KS”.
Code 14 ,15: Module location Kunshan, China defined as “KS”; Yangzhou, China defined as “YZ”; Shenzhen, China defined as “SE”; Zhuhai, China defined as “ZH”; Suzhou, China defined as “SZ”.
Code 17,18,19 : Year, Month, Day refer to Note(1), Note(2) and Note(3).
Note (1) Production Year

Year	2006	2007	2008	2009	2010	2011	2012	2013	.....	2035
Mark	6	7	8	9	A	B	C	D	.....	Z

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

Note (3) Production Day: 1~V. Code 20~23 : Serial Number.

9.0 General Precaution

10.1 Using Restriction

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

10.2 Operation Precaution

(1)The LCD product should be operated under normal conditions.
Normal conditions are defined as below:

Temperature: 25℃

Humidity: 55±10%

Display pattern: continually changing pattern (Not stationary)

(2) Brightness and response time depend on the temperature. (It needs more time to reach normal brightness in low temperature.)

(3) It is necessary for you to pay attention to condensation when the ambient temperature drops suddenly. Condensate water would damage the polarizer and electrical contacted parts of the module. Besides, smear or spot will remain after condensate water evaporating.

(4) If the absolute maximum rating value was exceeded, it may damage the module.

(5) Do not adjust the variable resistor located on the module.

(6) Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding may be important to minimize the interference.

(7) Image sticking may occur when the module displayed the same pattern for long time.

(8) Do not connect or disconnect the module in the “power on” condition. Power supply should always be turned on/off by the “power on/off sequence”

(9) Ultra-violet ray filter is necessary for outdoor operation.

10.3 Mounting Precaution

(1) All the operators should be electrically grounded and with Ion-blown equipment turning on when mounting or handling. Dressing finger-stalls out of the gloves is important for keeping the panel clean during the incoming inspection and the process of assembly.

(2) It is unacceptable that the material of cover case contains acetic or chloric. Besides, any other material that could generate corrosive gas or cause circuit break by electro-chemical reaction is not desirable.

(3) The case on which a module is mounted should have sufficient strength so that external force is not transmitted to the module directly.

(4) It is obvious that you should adopt radiation structure to satisfy the temperature specification.

(5) So as to acquire higher luminance, the cable of the power supply should be connected directly with a minimize length.

(6) It should be attached to the system tightly by using all holes for mounting, when the module is

assembled. Be careful not to apply uneven force to the module，especially to the PCB on the back.
(7) A transparent protective film needs to be attached to the surface of the module.
(8) Do not press or scratch the polarizer exposed with anything harder than HB pencil lead. In addition, don't touch the pin exposed with bare hands directly.
(9) Clean the polarizer gently with absorbent cotton or soft cloth when it is dirty.
(10) Wipe off saliva or water droplet as soon as possible. Otherwise, it may cause deformation and fading of color.
(11)Clean the panel gently with absorbent cotton or soft cloth when it is dirty. Ethanol(C_2H_5OH) is allowed to be used. Ketone (ex. Acetone), Toluene, Ethyl acid, Methyl chloride, etc are not allowed to be used for cleaning the panel, which might react with the polarizer to cause permanent damage.
(12) Do not disassemble or modify the module. It may damage sensitive parts in the LCD module, and cause scratches or dust remains. IVO does not warrant the module, if you disassemble or modify the module.

10.4 Handling Precaution

(1) Static electricity will generate between the film and polarizer, when the protection film is peeled off. It should be peeled off slowly and carefully by operators who are electrically grounded and with Ion-blown equipment turning on. Besides, it is recommended to peel off the film from the bonding area.
(2) The protection film is attached to the polarizer with a small amount of glue. When the module with protection film attached is stored for a long time, a little glue may remain after peeling.
(3) If the liquid crystal material leaks from the panel, keep it away from the eyes and mouth. In case of contact with hands, legs or clothes, it must be clean with soap thoroughly.

10.5 Storage Precaution

When storing modules as spares for long time, the following precautions must be executed.
(1) Store them in a dark place. Do not expose to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
(3) It is recommended to use it in a short-time period, after it's unpacked. Otherwise, we would not guarantee the quality.

10.6 Others

When disposing LCD module, obey the local environmental regulations.