Customer Approved Specification

To: 苏州与来视讯科技有限公司

Product Name: E088AWR1 R0

Document Issue Date: 2023/03/01

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

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.

Revision	Date	Page	Revised Content/Summary	Remark
00	2022/10/06	--	First issued.	
01	2022/11/16	19 20 24	Update Power ON/OFF Sequence Update 2D Drawing Update Lot Mark	
02	2023/03/01	4&22 7 9 21	Update Weight Add CR Typ.1200 Add Figure 8 Update 2D Drawing	

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1.0 General Descriptions

1.1 Introduction

The E088AWR1 R0 is a Color Active Matrix Liquid Crystal Display. The matrix uses a-Si Thin Film Transistor as a switching device. This TFT LCD has a 8.8 inch diagonally measured active display area with HD resolution (1,280 horizontal by 480 vertical pixels array).

1.2 Features

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

1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	8.8	inch
Active Area (H x V)	209.28 x 78.48	mm
Number of Pixels (H x V)	1,280 x 480	-
Pixel Pitch (H x V)	0.1635 x 0.1635	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
Contrast Ratio	1000（Min.）	-
Response Time	25（Max.）@25℃	ms
Input Voltage	3.3 (Typ.)	V
Power Consumption	0.7(Max.)	W
Weight	65.63(Max.)	g
Outline Dimension (H x V x D)	216.28 (Typ.) x88.68 (Typ.) x 1.366(Max.)	mm
Electrical Interface (Logic)	LVDS	-
Refectance(SCI)	5.6(Max.)	%
Support Color	16.7 M	-
NTSC	75(Typ.)	%
Optimum Viewing Direction	All	-
Surface Treatment	Hard Coating	-
Transmittance	3.8(Typ.)	%

1.4 Functional Block Diagram

Figure 1 shows the functional block diagram of the FOG.

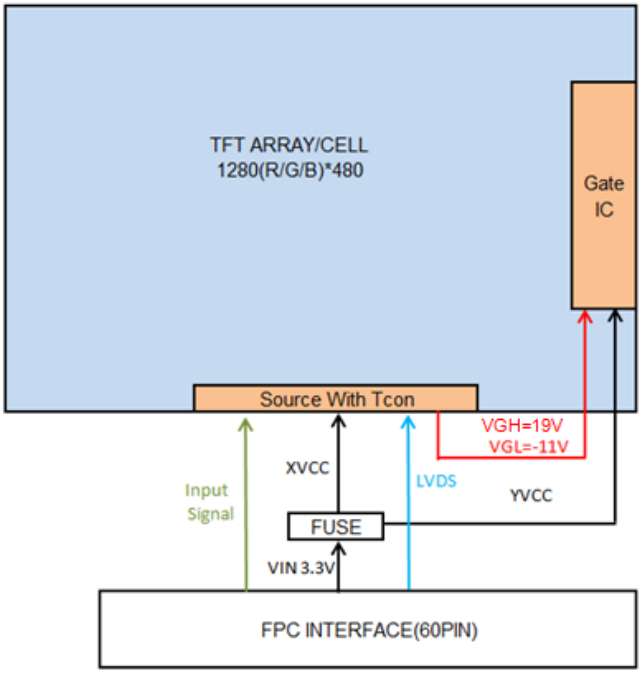


Figure 1 Block Diagram

1.5 Pixel Mapping

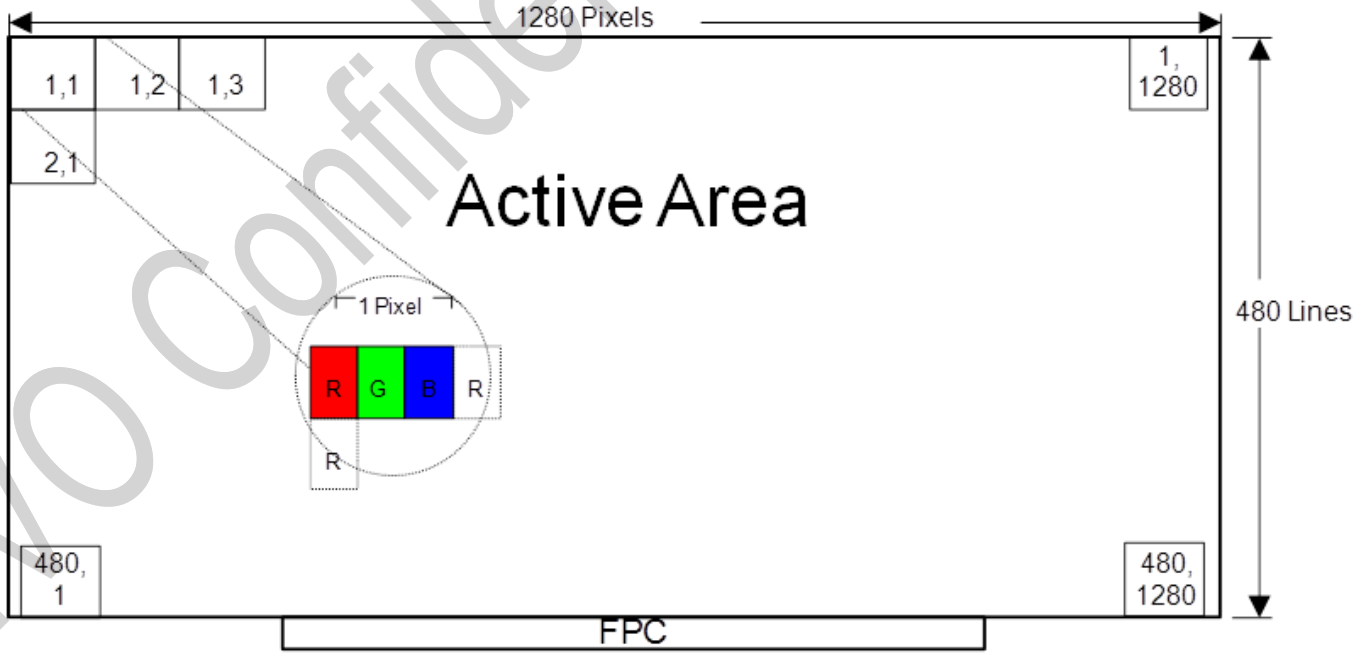


Figure 2 Pixel Mapping

2.0 Absolute Maximum Ratings

Table 1 Electrical & Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply Voltage	V_{DD}	-0.3	4.0	V	(1),(2), (3),(4)
Logic Input Signal Voltage	V_{Signal}	-0.3	3.9	V	
Operating Temperature	T_{gs}	-30	85	℃	
Storage Temperature	T_a	-40	90	℃	

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 FOG from static electricity.

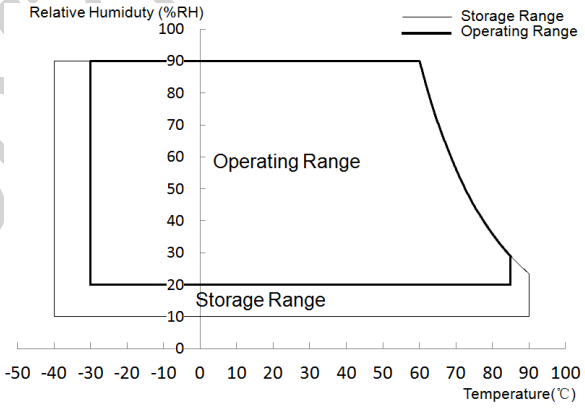


Figure 3 Absolute Ratings of Environment of the FOG

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),(6),(7)
		θ_{x-}	80	85	-		
	Vertical	θ_{y+}	80	85	-		
		θ_{y-}	80	85	-		
Contrast Ratio	Center		1000	1200	-	-	(1),(2), (3) ,(6),(7) θx=θy=0°
Response Time	Rising + Falling 25℃		-	-	25	ms	(1),(2), (4) ,(6),(7) θx=θy=0°
	Rising + Falling -20℃		-	-	200	ms	
	Rising + Falling -30℃		-	-	380	ms	
Transmittance	-		3.4	3.8	-	%	(1),(5),(7)θx=θy=0°
Color Chromaticity (CIE1931)	Red x		Typ. -0.03	0.654	Typ. +0.03	-	Under C-light (1),(5),(7) θx=θy=0°
	Red y			0.320		-	
	Green x			0.289		-	
	Green y			0.587		-	
	Blue x			0.139		-	
	Blue y			0.093		-	
	White x			0.320		-	
	White y			0.341		-	
NTSC	-		68	75	-	%	

Note (1) Measurement Setup:

The FOG 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.

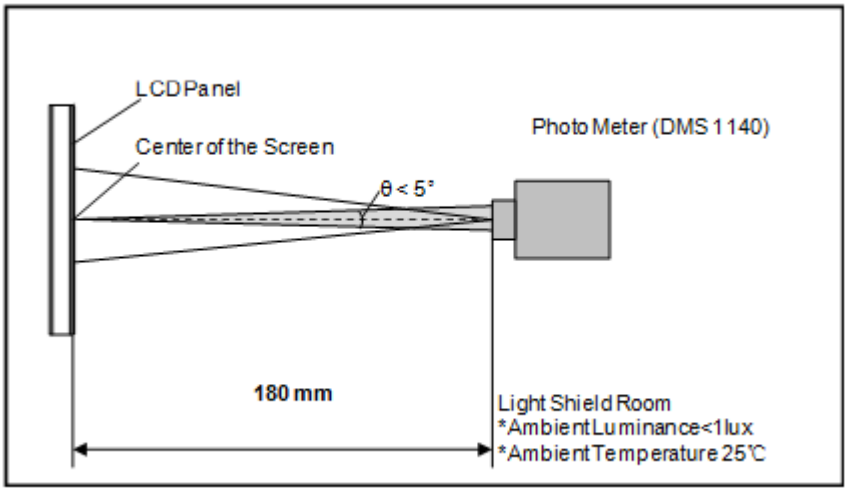


Figure 4 Measurement Setup

Note (2) Definition of Viewing Angle

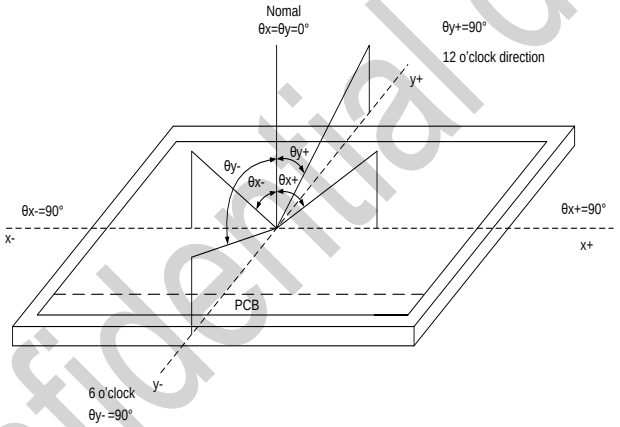


Figure 5 Definition of Viewing Angle

Note (3) 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 (4) Definition of Response Time (T_R, T_F)

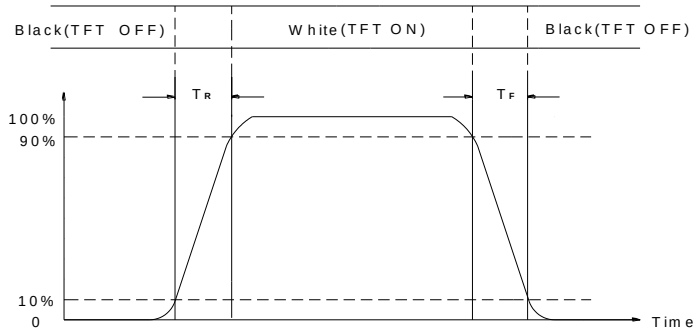


Figure 6 Definition of Response Time

Note (5) C-Light Spectrum

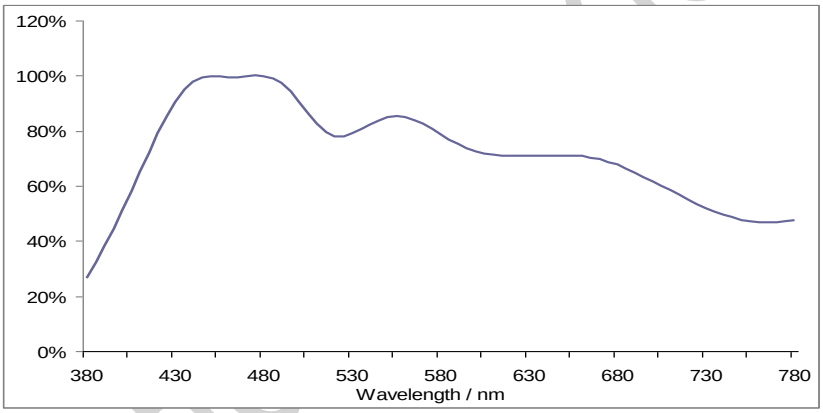


Figure 7 C-Light Spectrum

Note (6) Light source is the BL which is supplied by IVO.

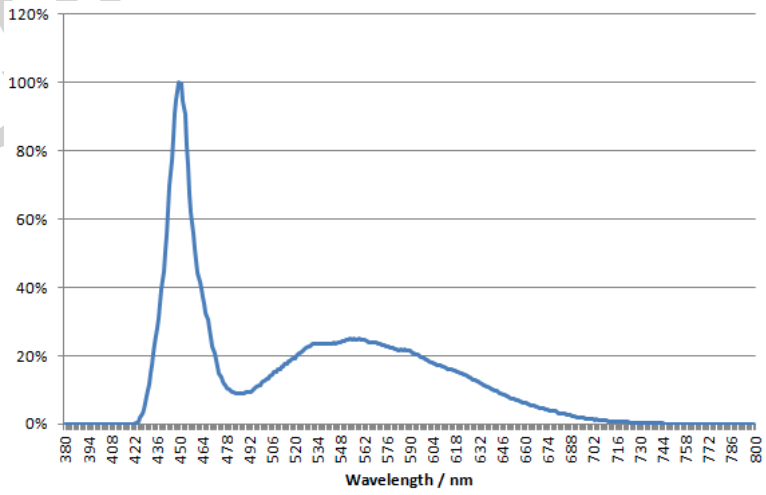


Figure 8 Back Light Spectrum

Note (7) 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 (Reference)	BEIJIDA/101049-206030

Table 4 Signal Connector Pin Assignment

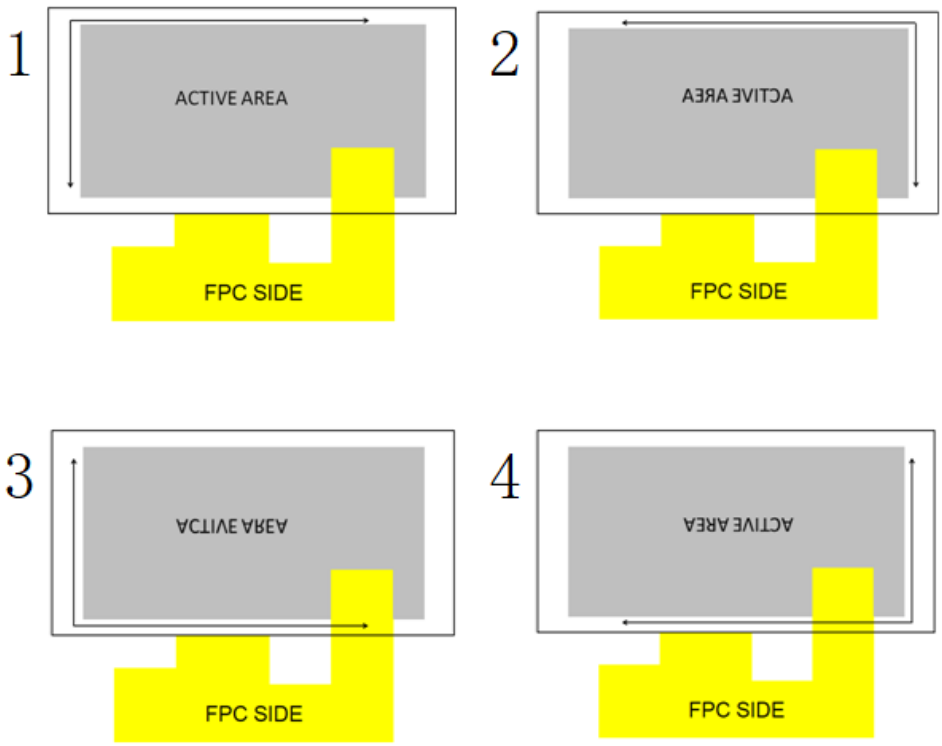
Pin No.	Symbol	Description	Remarks
1	GND	Ground	
2	NC	No Connection	
3	VDD	Digital Power(+3.3V)	3.0V-3.6V, 3.3V(TYP)
4	GND	Ground	
5	NC	No Connection	
6	VDD	Digital Power(+3.3V)	3.0V-3.6V, 3.3V(TYP)
7	GND	Ground	
8	FAIL_DET	Fail detection signal output FAIL_DET=H，on normal condition FAIL_DET=L，on error condition	
9	ATREN	Enable auto reload OTP / EEPROM every 60 frames. When stop reload or changing register values by SPI/I2C, ATREN should be kept 0. ATREN=H: Enable auto-reload OTP/EEPROM - ATREN=L: Disable auto-reload OTP/EEPROM	
10	NC	No Connection	
11	VDD_OTP	Power input for OTP programming (8.6V). Leave this pin open or connect it to VDD1 when not programming OTP	
12	NC	No Connection	
13	I2C_SCL	Serial interface clock input for I2C interface	
14	I2C_SDA	Serial Interface address and data input / output for I2C interface	

15	GND	Ground	
16	VDD	LVDS Power(+3.3V)	
17	GND	Ground	
18	PIND3	Positive LVDS differential data input	
19	NIND3	Negative LVDS differential data input	
20	GND	Ground	
21	PINC	Positive LVDS differential CLK input	
22	NINC	Negative LVDS differential CLK input	
23	GND	Ground	
24	PIND2	Positive LVDS differential data input	
25	NIND2	Negative LVDS differential data input	
26	GND	Ground	
27	PIND1	Positive LVDS differential data input	
28	NIND1	Negative LVDS differential data input	
29	GND	Ground	
30	PIND0	Positive LVDS differential data input	
31	NIND0	Negative LVDS differential data input	
32	GND	Ground	
33	GND	Ground	
34	RESET	Global Reset pin. Active low, If RESET connected to GND, the chip is in reset state. This pin must meet the sequence of power on/off.	
35	STBYB	Standby mode setting pin. Active low, Timing controller, output buffer, DAC and power circuit all off when STBYB is low This pin must meet the sequence of power on/off.	
36	RL	Horizontal shift direction (source output) selection RL=H, Forward (SOUT1→ SOUT2→...→SOUT1920) RL=L, Reverse (SOUT1920→SOUT1919→...→S1)	(1)
37	VDD	Digital Power(+3.3V)	3.0V-3.6V, 3.3V(TYP)

38	TB	Vertical shift direction(Gate output) selection TB = H, Forward,Top → Bottom TB = L, Reverse, Bottom → Top	(1)
39	GND	Ground	
40	NC	No Connection	
41	NC	No Connection	
42	NC	No Connection	
43	GND	Ground	
44	VDD	Digital Power(+3.3V)	3.0V-3.6V, 3.3V(TYP)
45	GND	Ground	
46	NC	No Connection	
47	NC	No Connection	
48	NC	No Connection	
49	BISTEN	Enable built-in self test (BIST) function BISTEN=H, BIST mode BISTEN=L, Normal mode (Please leave it to GND when normal operation)	
50	NC	No Connection	
51	NC	No Connection	
52	NC	No Connection	
53	GND	Ground	
54	VDD	Digital Power(+3.3V)	3.0V-3.6V, 3.3V(TYP)
55	SELB	8/6 bit mode selection SELB=H, 8bit SELB=L, 6bit	
56	NC	No Connection	
57	VDD	Digital Power(+3.3V)	3.0V-3.6V, 3.3V(TYP)
58	NC	No Connection	
59	GND	Ground	
60	NC	No Connection	

Note(1): Selection of scanning mode

Item	Setting of scan control input		Scanning Direction
	LR	TB	
1	H	H	Left to right, Up to down
2	L	H	Right to left,UP to down
3	H	L	Left to right, Down to up
4	L	L	Right to left, Down to up



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 5 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	$\|V_{ID}\|$	150	-	600	mV	-
Common Mode Voltage	V_{CM}	0.45	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.

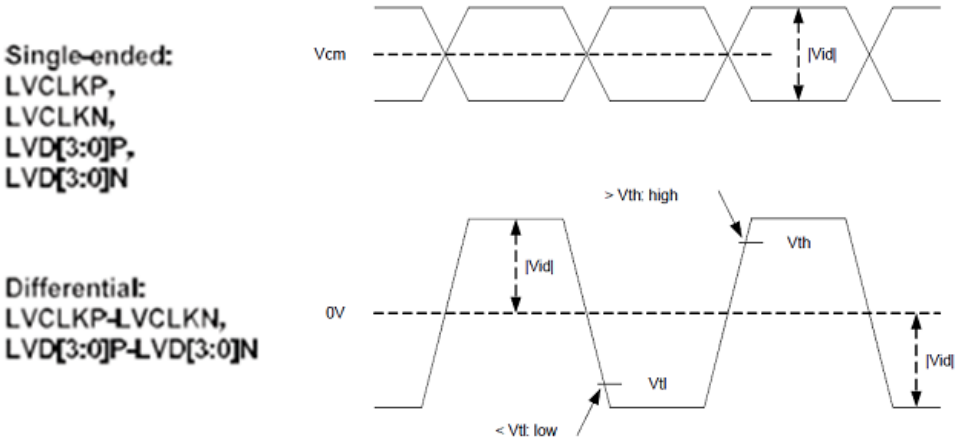


Figure 9 Voltage Definitions

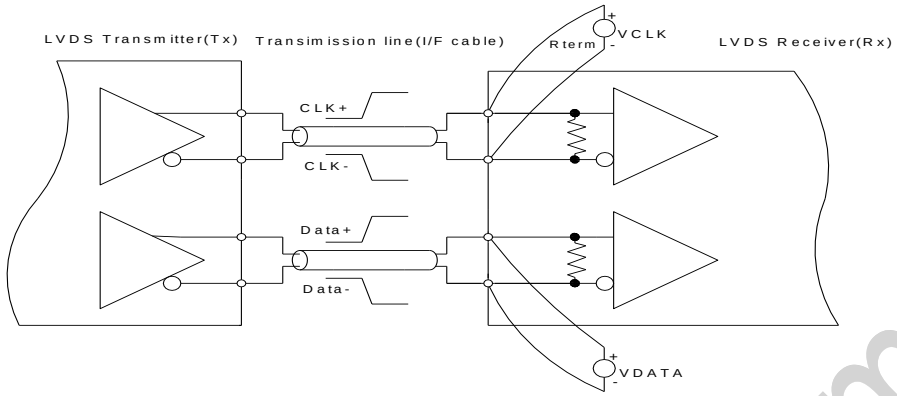


Figure 10 Measurement System

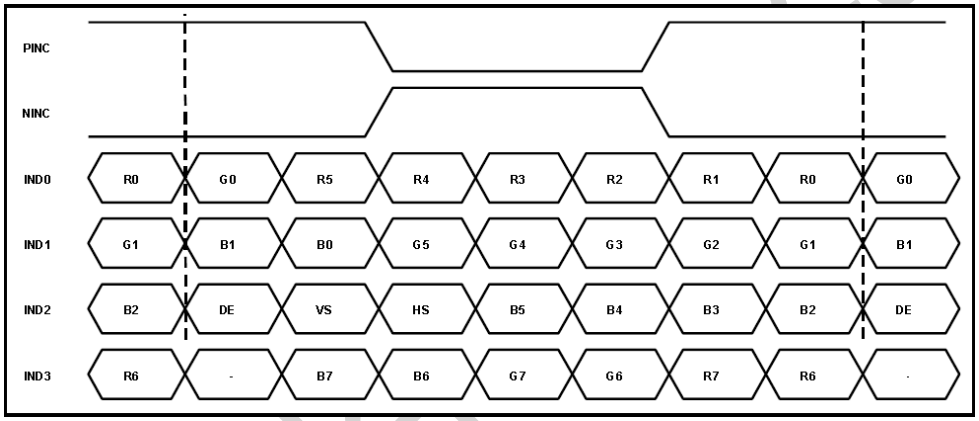


Figure 11 Data Mapping

4.2.2 LVDS Receiver Internal Circuit

Figure 12 shows the internal block diagram of the LVDS receiver. This FOG equips termination resistors for LVDS link.

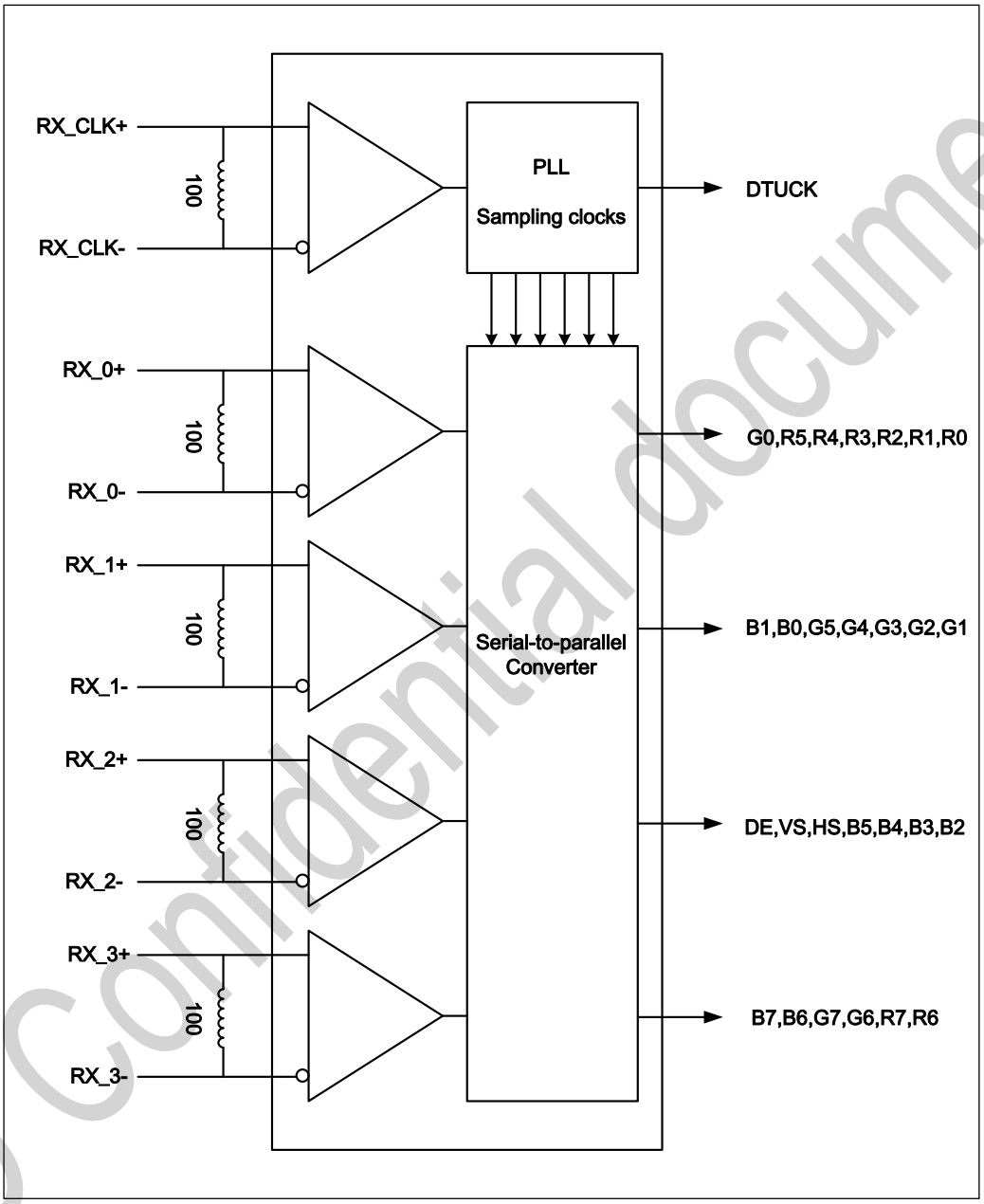


Figure 12 LVDS Receiver Internal Circuit

4.3 Interface Timings

Table 6 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	40.1	40.5	42.3	MHz
H Total Time	HT	1,342	1,346	1,398	Clocks
H Active Time	HA		1,280		
V Total Time	VT	498	502	504	Lines
V Active Time	VA		480		
Frame Rate	FV	-	60	-	Hz

Note1：HT * VT *Frame Frequency≤(42.3) MHz

Note2: All reliabilities are specified for timing specification based on refresh rate of 60Hz.

4.4 Input Power Specifications

Input power specifications are as follows.

Table 7 Input Power Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
LOGIC :						
Power Supply Input Voltage	VDD	3.0	3.3	3.6	V	(1),(3)
Power Supply Input Current	IDD	-	-	232	mA	(1), (2)
Power Consumption	PDD	-	--	0.7	W	(1), (2)
Power Supply Inrush Current	IDD_P	-	-	1000	mA	(4)
Logic Input Signal High Level Voltage	VIH	0.7*VDD		VDD+0.3	V	(5)
Logic Input Signal Low Level Voltage	VIL	0		0.3*VDD	V	(5)

Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25±2℃

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) The specified V_{DD} current and power consumption are measured under the V_{dd} = 3.3 V, FV= 60)Hz condition and White pattern.

Note(4) The below figures are the measuring VDD condition.

The Vdd condition is same as the minimum of T1 at Power on sequence.

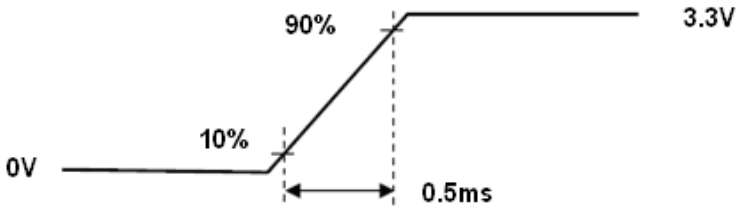


Figure 13 V_{DD} Rising Time

Note (5) Logic input signal include TB,RL, ATREN,BIST,SELB.

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.

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

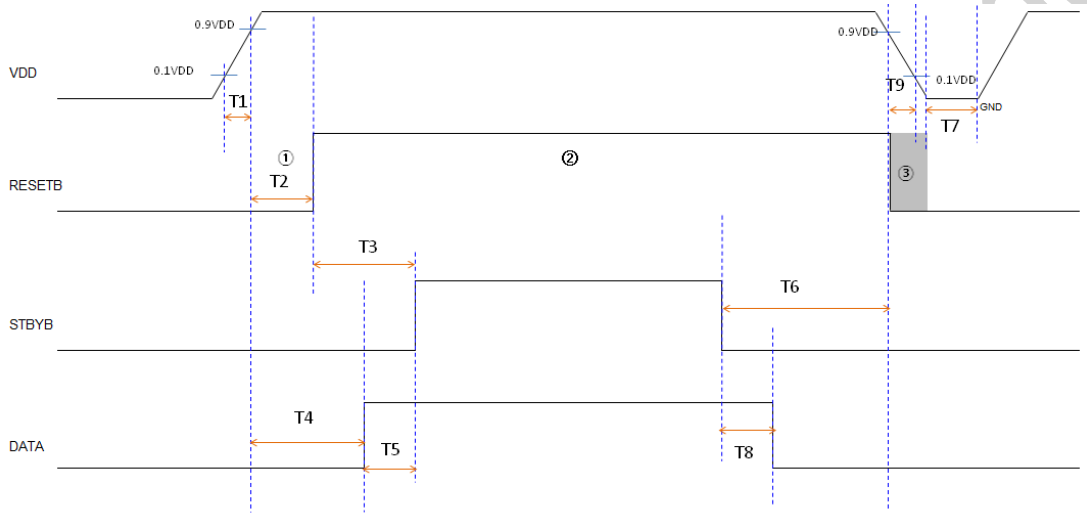


Figure 14 Power Sequence

Table 8 Power Sequencing Requirements

Parameter	Symbol	Unit	Min.	Typ.	Max.
VDD Rise Time	T1	ms	0.5	-	20
VDD to Reset	T2	us	100	-	-
Reset Good to STBYB	T3	ms	14	-	-
VDD -DATA	T4	ms	0	-	50
DATA to STBYB	T5	ms	1	10	-
STBYB to VDD	T6	ms	-	33	83
VDD power off	T7	ms	500	-	-
STBYB to L-DATA	T8	ms	33	-	50
VDD fall time	T9	ms	0.5	-	30

5.0 Mechanical Characteristics

5.1 Outline Drawing

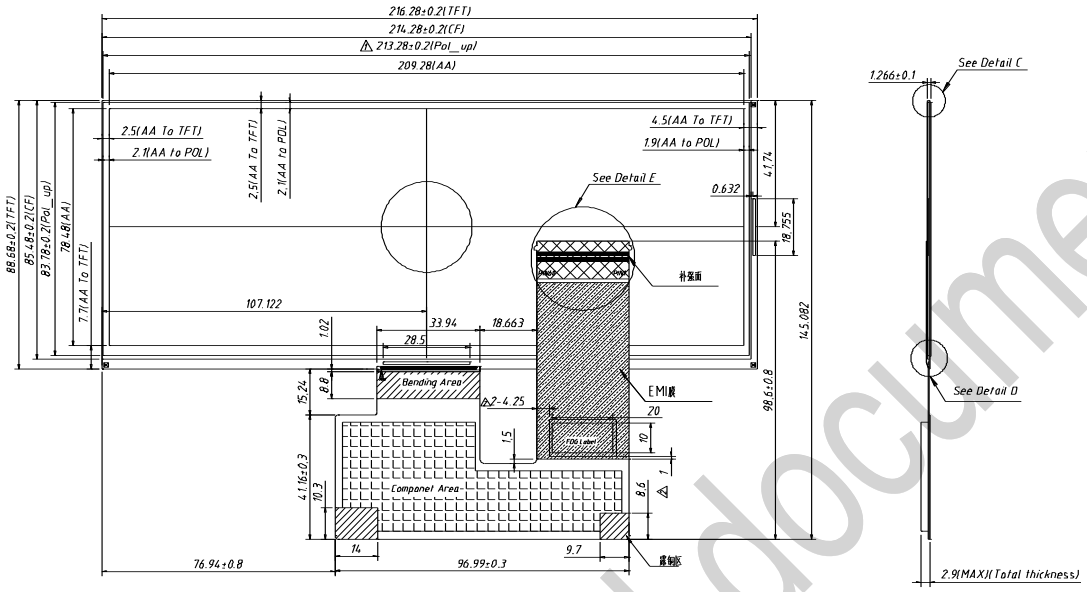


Figure 15 Reference Outline Drawing (Front Side)

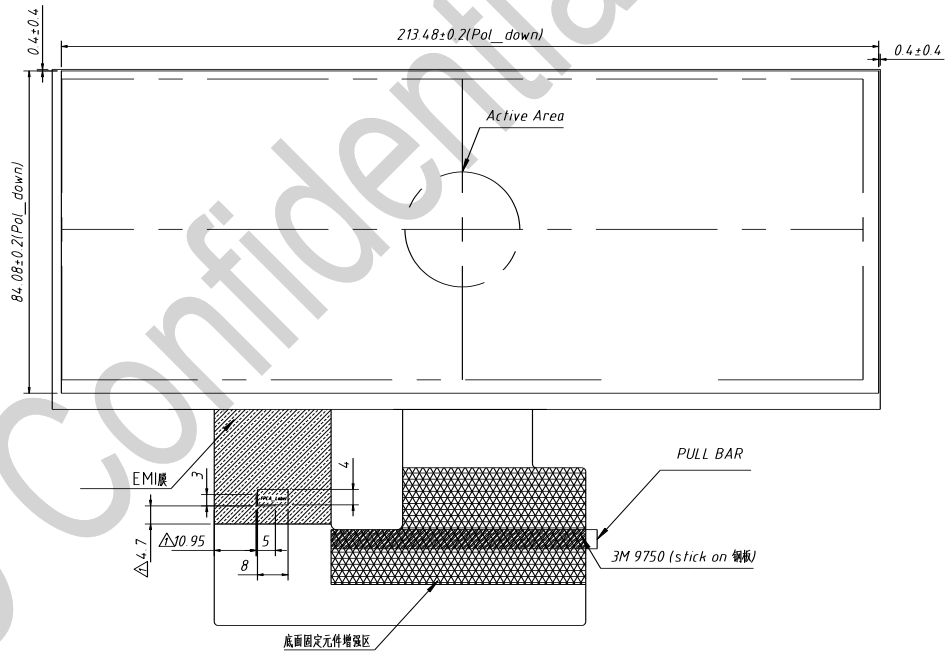


Figure 16 Reference Outline Drawing (Back Side)

Note (1) AA: Active Area;

Note(2) Unnoted tolerance ±0.5mm;

5.2 Dimension Specifications

Table 9 FOG Dimension Specifications

Item	Min.	Typ.	Max.	Unit
Width	88.48	88.68	88.88	Mm
Height	216.08	216.28	216.48	Mm
Thickness	-	-	1.366	Mm
Weight	-	59.66	65.63	G

Note：Outline dimension measure instrument: Coordinate Measuring Machine.

6.0 Reliability Conditions

Table 10 Reliability Condition

Item	Package	Test Conditions		Note
High Temperature/High Humidity Operating Test	FOG	T_{gs}=60℃, 90%RH, 500hours		(1),(2),(3),(4)
High Temperature Operating Test	FOG	T_{gs}=85℃, 500 hours		
Low Temperature Operating Test	FOG	T_a=-30℃, 500hours		
High Temperature Storage Test	FOG	T_a=90℃, 500 hours		(1),(3),(4)
Low Temperature Storage Test	FOG	T_a=-40℃, 500 hours		
ESD Operating Test	FOG	Contact	±4KV, 150pF(330Ohm)	(1),(2),(5)
		Air	±4KV, 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 FOG 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 FOG 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) It could be regarded as pass, when the FOG recovers from function fault caused by ESD a few minutes later.

7.0 Package Specification

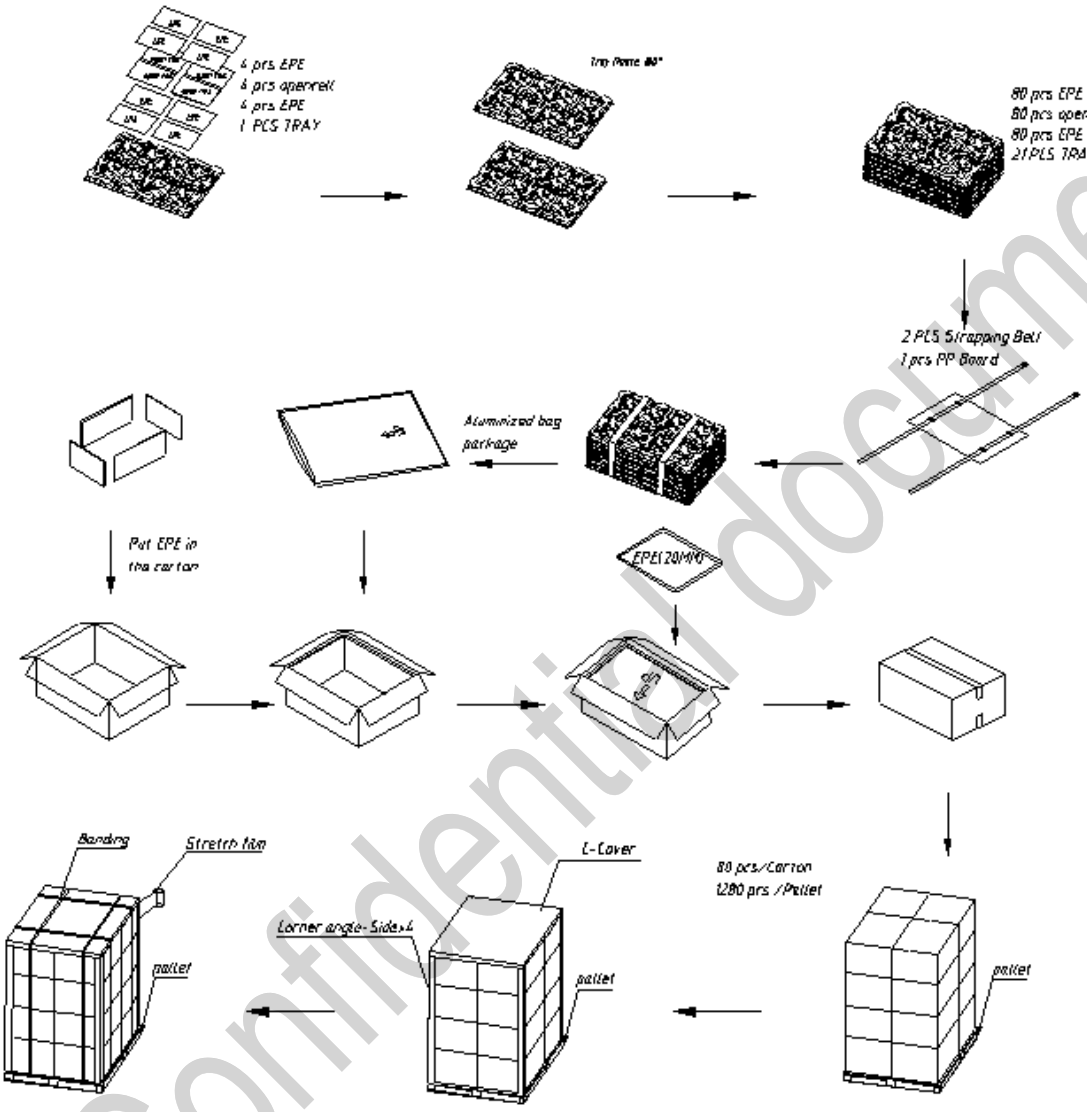
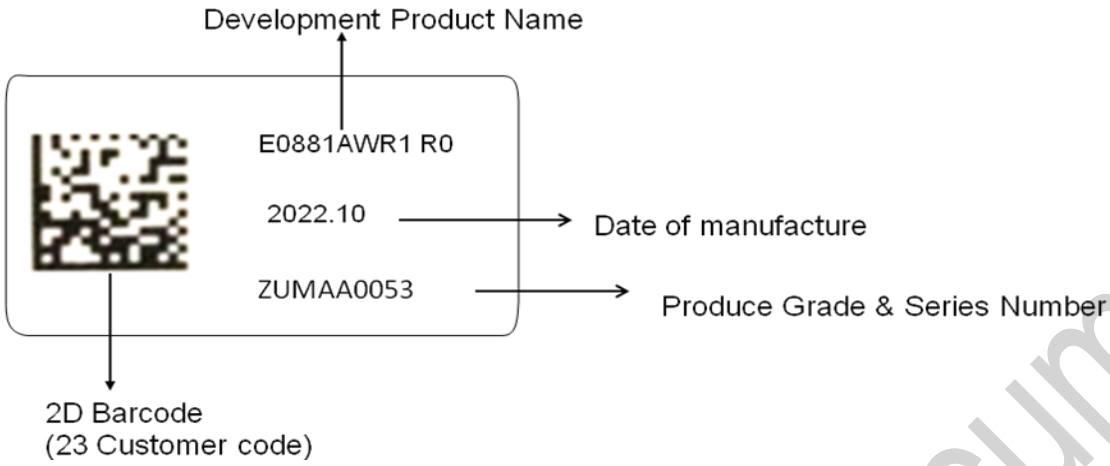


Figure 17 Packing Method

8.0 Lot Mark



Note:This picture is only example.

8.1 23 Customer Code

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

9.1 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.

9.2 Operation Precaution

(1)The FOG 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 FOG. Besides, smear or spot will remain after condensate water evaporating.

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

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

(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 FOG displayed the same pattern for long time.

(8) Do not connect or disconnect the FOG 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.

9.3 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 FOG is mounted should have sufficient strength so that external force is not transmitted to the FOG 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 FOG is

assembled. Be careful not to apply uneven force to the FOG，especially to the PCB on the back.

(7) A transparent protective film needs to be attached to the surface of the FOG.

(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 FOG. It may damage sensitive parts in the FOG, and cause scratches or dust remains. IVO does not warrant the FOG, if you disassemble or modify the FOG.

9.4 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 FOG 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.

9.5 Storage Precaution

When storing FOG 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.

9.6 Others

When disposing FOG, obey the local environmental regulations.