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Document No.		Issue date	2017/06/30	Revision	00

Product Specification

To:

Product Name: M123AWA1 R0

Document Issue Date: 2017/06/30

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.

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Revision	Date	Page	Old Description	New Description	Remark
00	2017/06/30	--	--	First issued.	

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1.0 General Descriptions

1.1 Introduction

The M123AWA1 R0 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 12.3 inch diagonally measured active display area with WVGA resolution (1,920 horizontal by 720 vertical 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	12.3	inch
Active Area (H x V)	292.032x109.512	mm
Number of Pixels (H x V)	1,920(RGB)x720	-
Pixel Pitch (H x V)	0.1521 x 0.1521	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	(800)(Typ.)	cd/m^2
Contrast Ratio	(900)(Typ.)	-
Response Time	(25)(Typ.) @25℃	ms
Input Voltage	(3.3)(Typ.)	V
Power Consumption	(9.737)(Max.)@White Pattern FV=60Hz	W
Weight	TBD	g
Outline Dimension (H x V x D)	313.00(Typ.) x 131.95 (Typ.) x 13.30 (Max.)	mm
Electrical Interface (Logic)	LVDS	-
Support Color	16.7M	-
NTSC	75(Typ.)	%
Viewing Direction	All	-
Surface Treatment	AG&Hardness 3H	-

1.4 Functional Block Diagram

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

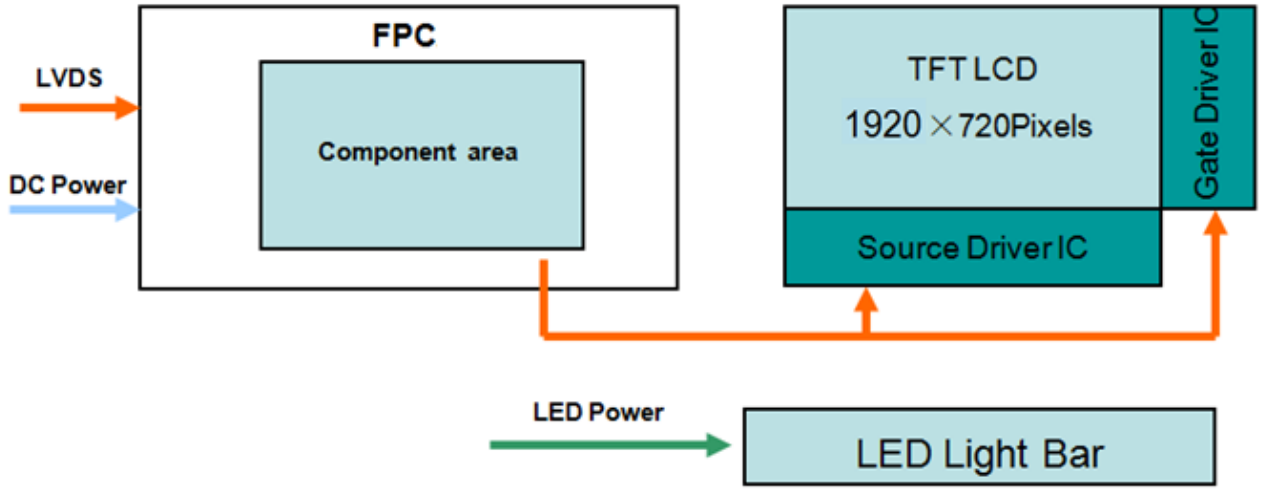


Figure 1 Block Diagram

1.5 Pixel Mapping

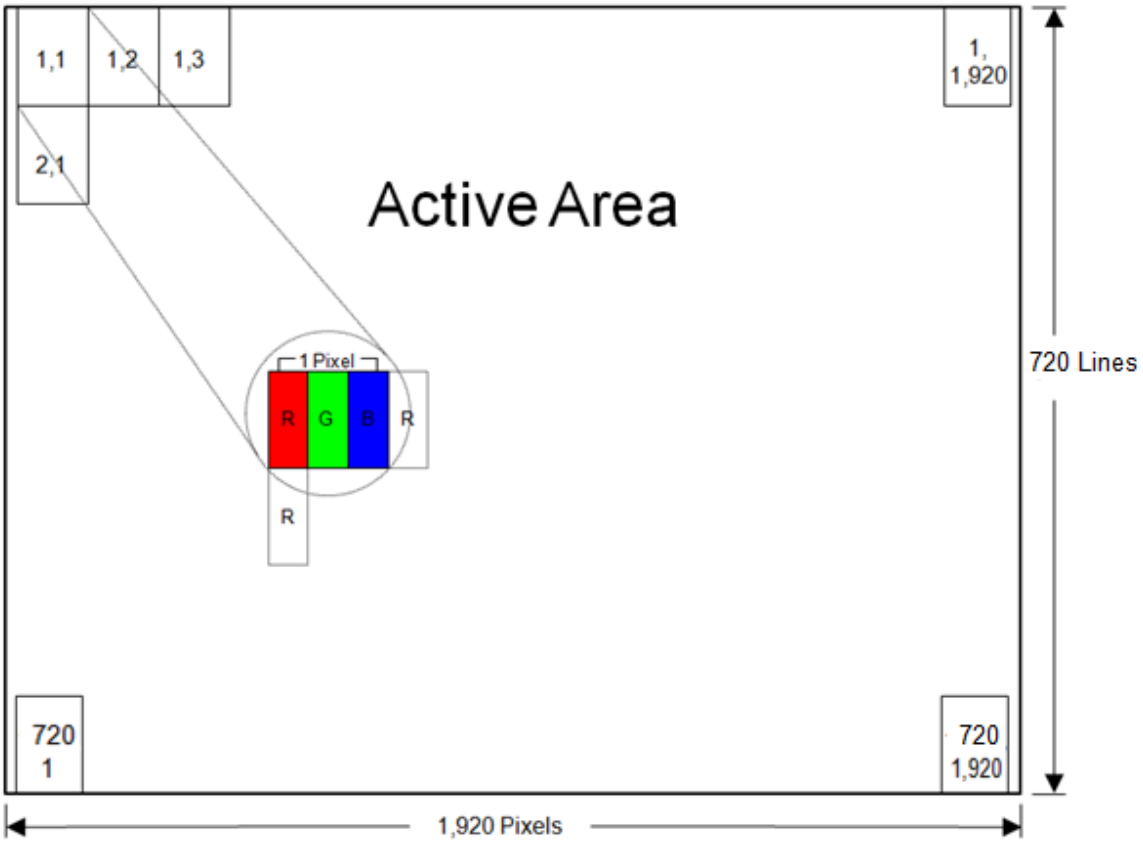


Figure2 Pixel Mapping

2.0 Absolute Maximum Ratings

Table 1 Electrical & Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Logic Supply Voltage	V_{DD}	(-0.3)	(5.0)	V	(1),(2),(3),(4)
Logic Input Signal Voltage	V_{Signal}	(-0.3)	(2.0)	V	
Operating Temperature	T_{gs}	-40	85	℃	
Storage Temperature	T_a	-40	95	℃	

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 62.7℃, and no condensation of water. Besides, protect the module from static electricity.

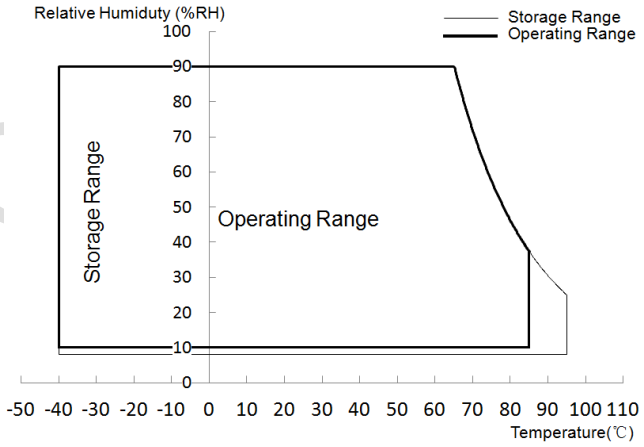


Figure 3 Absolute Ratings of Environment of the LCD Module

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+}	TBD	(85)	-	degree	(1),(2),(3),(4)(8)
		θ_{x-}	TBD	(85)	-		
	Vertical	θ_{y+}	TBD	(85)	-		
		θ_{y-}	TBD	(85)	-		
Contrast Ratio	Center		(800)	(900)	-	-	(1),(2),(4),(8) θx=θy=0°
Response Time	Rising + Falling	25ºC	-	(25)	(30)	ms	(1),(2),(5),(8) θx=θy=0°
		-20ºC	-	(250)	(300)		
		-30ºC	-	(300)	(350)		
Color Chromaticity (CIE1931)	Red x		TBD	TBD	TBD	-	(1),(2),(3),(8) θx=θy=0°
	Red y			TBD		-	
	Green x			TBD		-	
	Green y			TBD		-	
	Blue x			TBD		-	
	Blue y			TBD		-	
	White x		Typ. -0.04	(0.300)	Typ. +0.04	-	
	White y			(0.320)		-	
NTSC	-		TBD	(75)		%	(1),(2),(3),(8) θx=θy=0°
White Luminance ☆	Center Point		(600)	(800)	-	cd/m^2	(1),(2),(6),(8) θx=θy=0°
Luminance Uniformity	9Points/White		(80)	-	-	%	(1),(2),(7),(8) θx=θy=0°
	9Points/Black		(60)	-	-		

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.

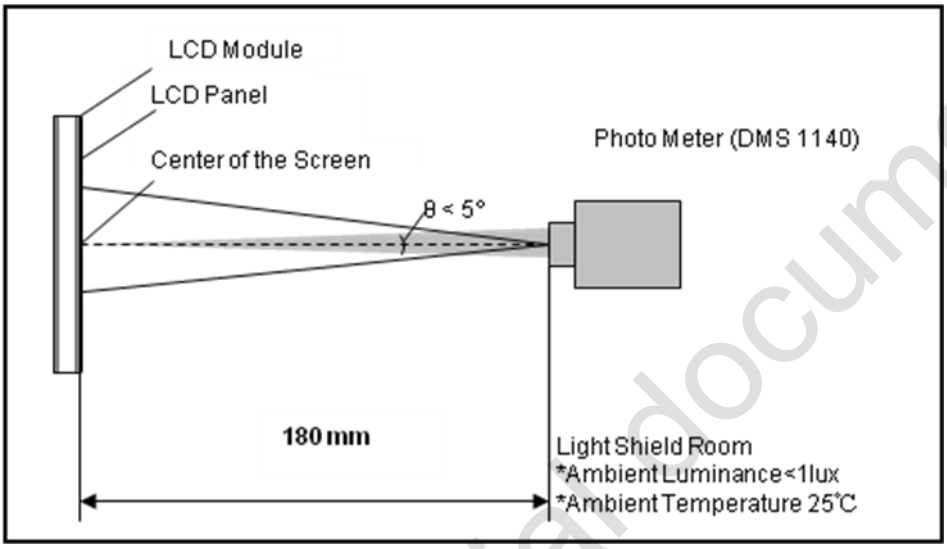


Figure 4 Measurement Setup

Note (2) The Backlight input parameter setting as:

I_{LED}:: 325mA

Note (3) Definition of Viewing Angle

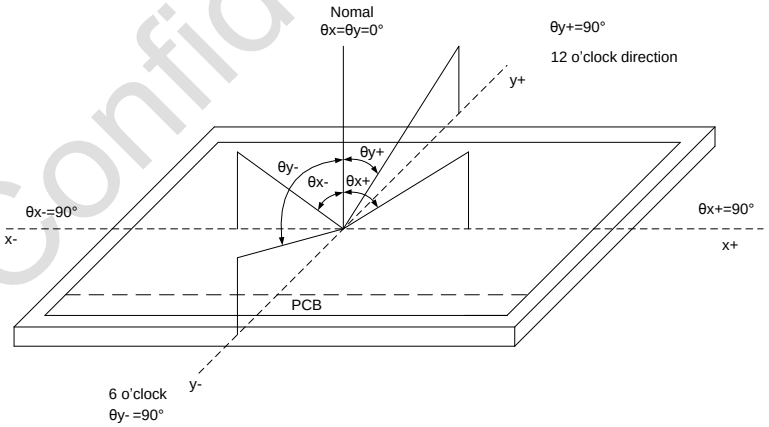


Figure 5 Definition of Viewing Angle

Note (4) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression:

Contrast Ratio (CR) = L255/ L0

L255: Luminance of gray level 255, L0: Luminance of gray level 0

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

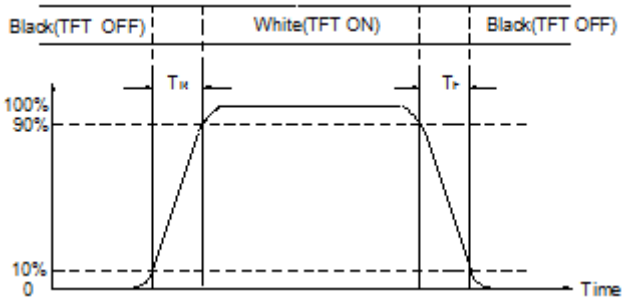


Figure 6 Definition of Response Time

Note (6) Definition of Luminance White

Measure the luminance of gray level 255 (Ref.: Active Area)

Display Luminance=L1（centre point）

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

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

Measure the luminance of gray level 255 at 9 points.

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

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

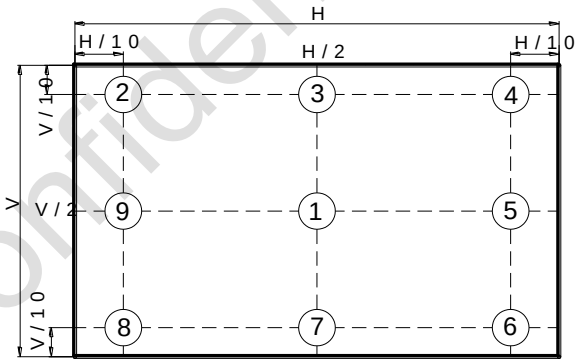


Figure 7 Measurement Locations of 9 Points

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

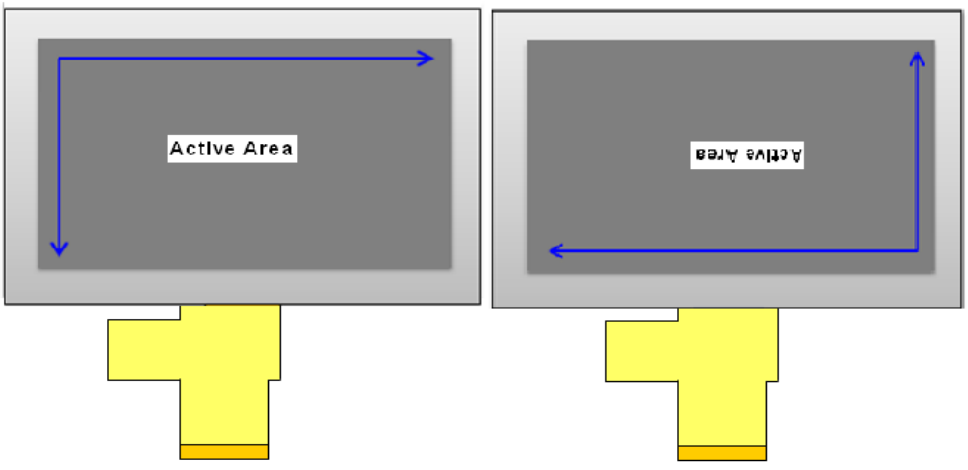
Table 3 Signal Connector Type

Item	Description
Manufacturer / Type	StarConn
Mating Receptacle / Type (Reference)	300E40-0000RA-G3

Table 4 Signal Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	VCC	Power Supply	-
2	VCC	Power Supply	-
3	GND	Ground	-
4	GND	Ground	-
5	ONIND0	LVDS differential data input	-
6	OPIND0	LVDS differential data input	-
7	GND	Ground	-
8	ONIND1	LVDS differential data input	-
9	OPIND1	LVDS differential data input	-
10	GND	Ground	-
11	ONIND2	LVDS differential data input	-
12	OPIND2	LVDS differential data input	-
13	GND	Ground	-
14	OCLKN	LVDS differential Clock input	-
15	OCLKP	LVDS differential Clock input	-
16	GND	Ground	-
17	ONIND3	LVDS differential data input	-
18	OPIND3	LVDS differential data input	-
19	GND	Ground	-
20	ENIND0	LVDS differential data input	-
21	EPIND0	LVDS differential data input	-
22	GND	Ground	-
23	ENIND1	LVDS differential data input	-

24	EPIND1	LVDS differential data input	-
25	GND	Ground	-
26	ENIND2	LVDS differential data input	-
27	EPIND2	LVDS differential data input	-
28	GND	Ground	-
29	ECLKN	LVDS differential Clock input	-
30	ECLKP	LVDS differential Clock input	-
31	GND	Ground	-
32	ENIND3	LVDS differential data input	-
33	EPIND3	LVDS differential data input	-
34	GND	Ground	-
35	BIST	BIST Mode(default NC,pull high for Bist mode)	-
36	EN	NC	-
37	PWM	NC	-
38	GND	Ground	-
39	VLED	NC	-
40	VLED	NC	-



Normal scan(High/NC:Disable) Reverse scan(Low:Enable)

Table5 LED Connector Name / Designation

Item	Description
Mating Receptacle / Type (Reference)	TBD

Table 6 LED Connector Pin Assignment

Pin No.	Symbol	Description
1	TBD	TBD

Figure 8 LED Connector

TBD

4.2 Power Voltage Specification

4.2.1 Signal Electrical Characteristics For LVDS Receiver

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

Table 7 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	$\|V_{ID}\|$	100	-	600	mV	-
Common Mode Voltage	V_{CM}	|VID|/2+0.6	1.2	1.8-|VID|/2	V	-
Common Mode Voltage Offset	ΔV_{CM}	-	-	50	mV	V_{CM}=+1.2V

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.

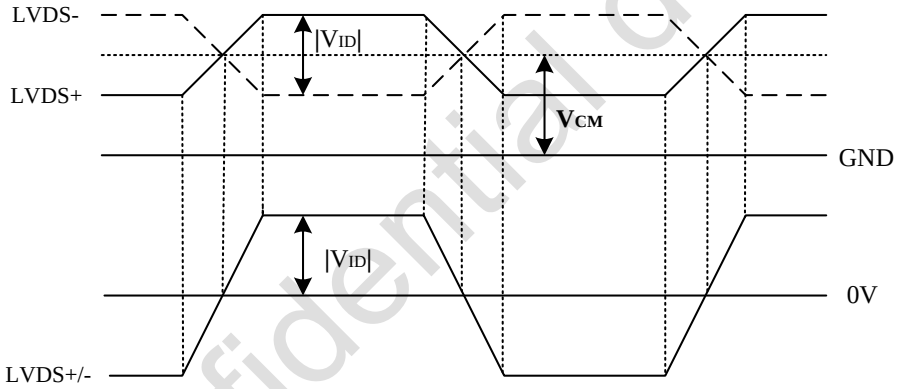


Figure 9 Voltage Definitions

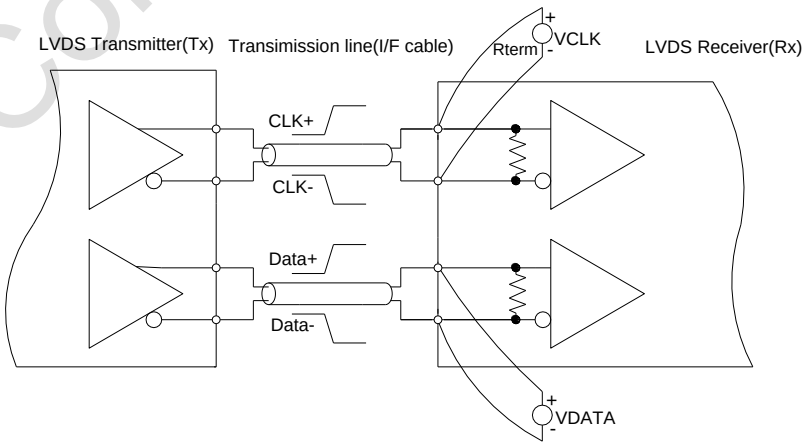


Figure 10 Measurement System

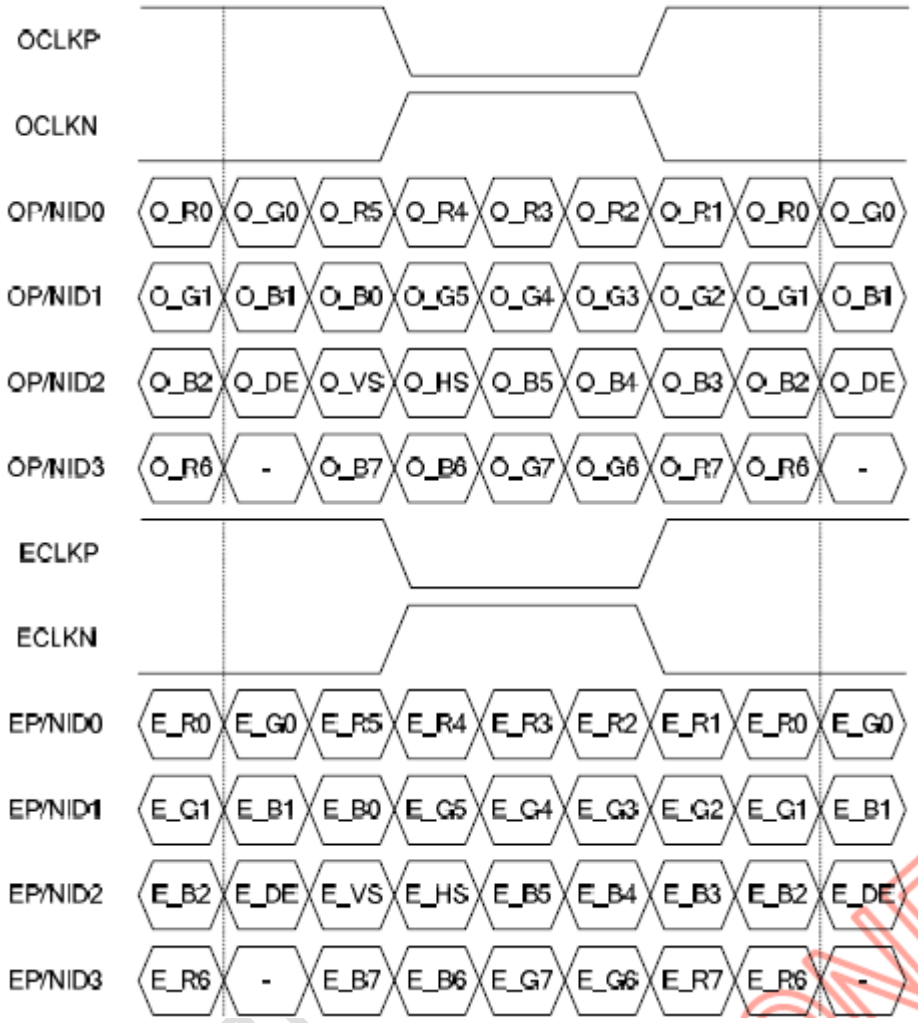


Figure 11 Data Mapping

4.2.2 LVDS Receiver Internal Circuit

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

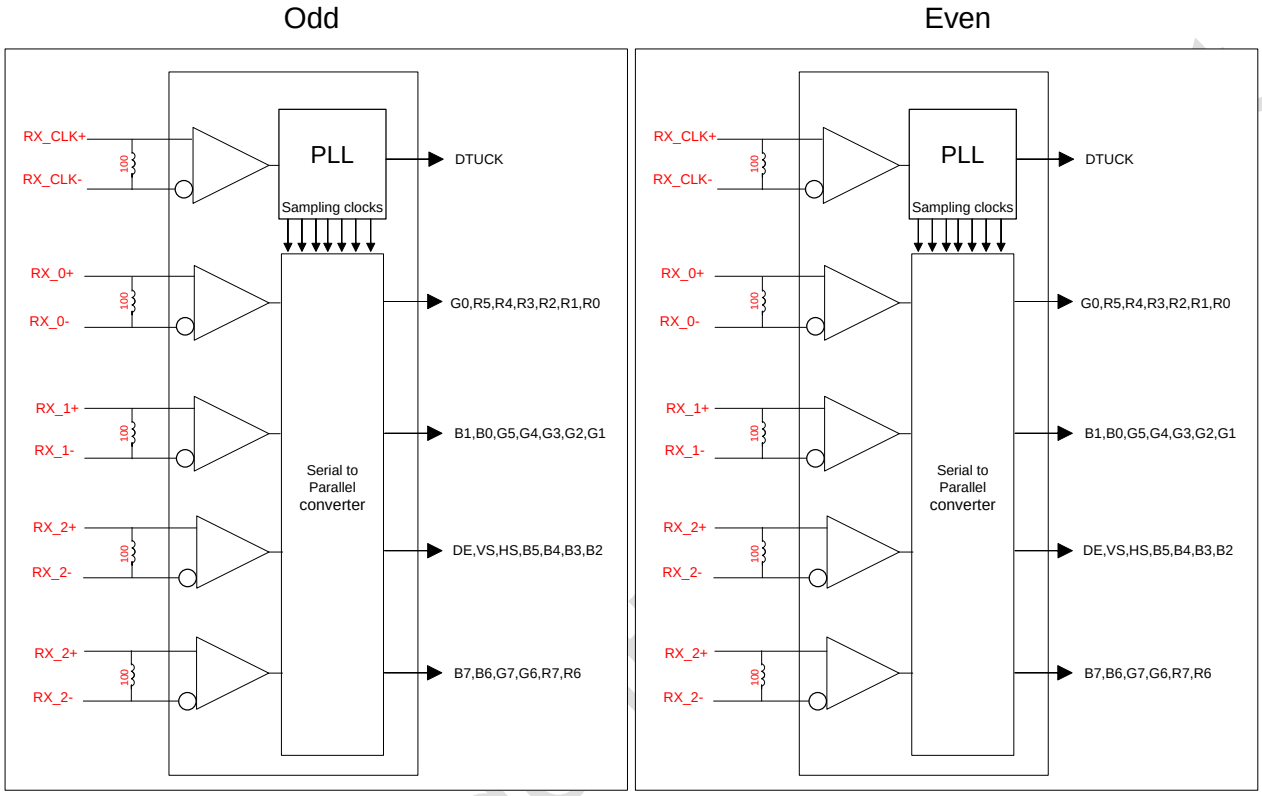


Figure 12 LVDS Receiver Internal Circuit

4.3 Interface Timings

4.3.1 Timing Characteristics

Synchronization method should be DE mode.

Table 8 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	TBD	TBD	TBD	MHz
H Total Time	HT	TBD	TBD	TBD	Clocks
H Active Time	HA		TBD		Clocks
V Total Time	VT	TBD	TBD	TBD	Lines
V Active Time	VA		TBD		Lines
Frame Rate	FV	55	60	65	Hz

Note1：HT * VT *Frame Frequency<85 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 9 Input Power Specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply							
LCD Drive Voltage (Logic)		V_{DD}	(3)	(3.3)	(3.6)	V	(1),(2)
VDD Current	White Pattern	I_{DD}	-	-	(0.279)	A	(1),(4)
VDD Power Consumption	White Pattern	P_{DD}	-	-	(0.837)	W	
Rush Current		I_{Rush}	-	-	(1)	A	(1),(5)
Allowable Logic/LCD Drive Ripple Voltage		V_{VDD-RP}	-	-	(200)	mV	(1),(3)
LED Power Supply							
LED Input Voltage		V_{LED}	(22.4)	(24.8)	(27.2)	V	(1),(2),(6)
LED Power Consumption		P_{LED}	-	-	(8.9)	W	(1),(6)
LED Forward Voltage		V_F	(2.8)	(3.1)	(3.4)	V	(1),(2)
LED Forward Current		I_F	-	(65)	-	mA	
LED Life Time		LT	(30000)	-	-	Hours	(1),(9)

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) The specified VCC current and power consumption are measured under the VCC=3.3V, Fv= 60Hz condition and white pattern.

Note (4) The figures below is the measuring condition of VCC rush current can be measured when T_{RUSH} is 0.5 ms.

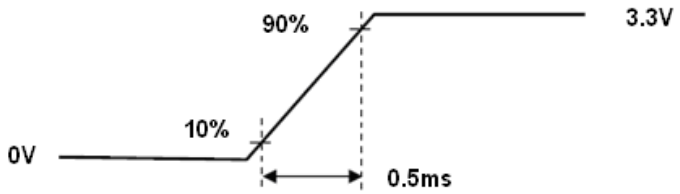
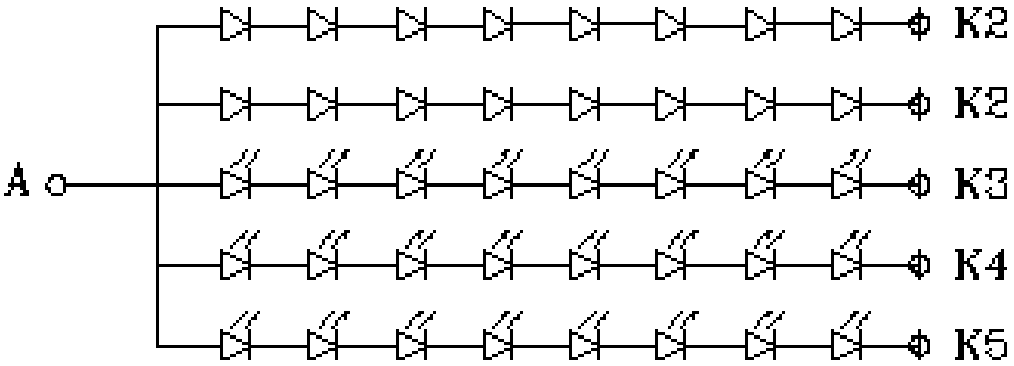


Figure 13 VCC Rising Time

Note (5) 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 (6) Definition of V_{LED} and P_{LED}

$V_{LED} = V_F \times 8$, $I_{LED} = I_F \times 5$, $PLED = V_{LED} \times I_{LED}$



4.5 Power ON/OFF Sequence

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

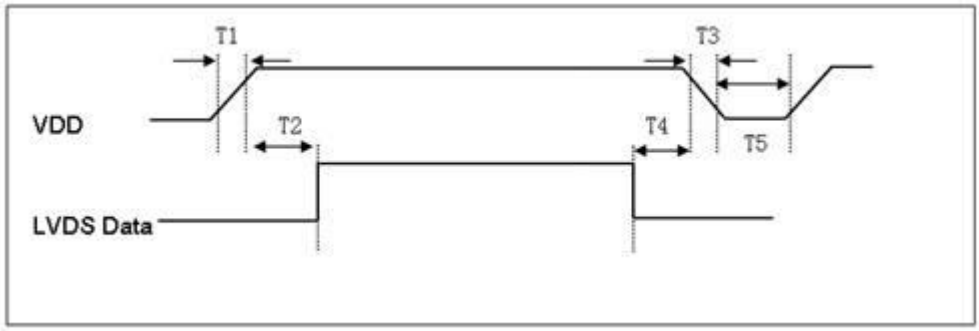


Figure 14 Power Sequence

Table 10 Power Sequencing Requirements

Parameter	Symbol	Unit	min	typ	max
VIN Rising Time	T1	ms	0.5	--	10
VIN Good to Signal Valid Data	T2	ms	30	--	90
VIN Falling Time	T3	ms	0	--	10
Signal Disable Data to Power Down	T4	ms	0	--	50
Power Down to Up	T5	ms	500	--	--

5.0 Mechanical Characteristics

5.1 Outline Drawing

Figure 12 Reference Outline Drawing (Front Side)

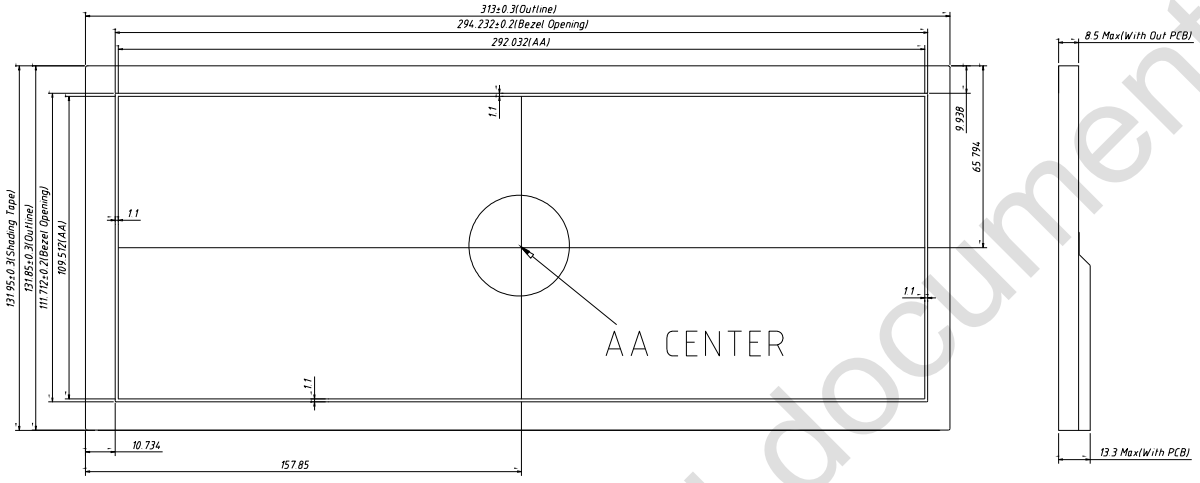


Figure 13 Reference Outline Drawing (Back Side)

5.3 Dimension Specifications

Table 11 Module Dimension Specifications

Item	Min.	Typ.	Max.	Units
Width	(312.70)	(313)	(313.30)	mm
Height	(131.65)	(131.95)	(132.25)	mm
Thickness	-	-	(13.3)	mm
Weight	-	-	TBD	g
| a-b | & | c-d |	-	-	1	mm

Note：Outline dimension measure instrument: Vernier Caliper.

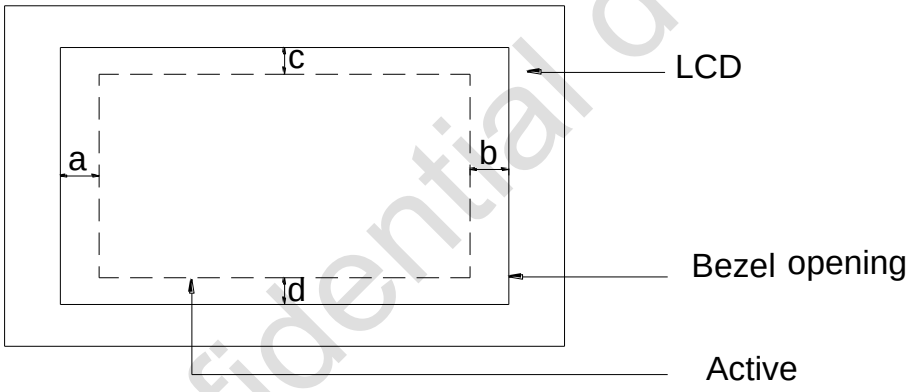


Figure 14 BM Area

6.0 Reliability Conditions

Table 12 Reliability Condition

Item		Package	Test Conditions		Note
High Temperature/High Humidity Operating Test		Module	T_{gs}= 65℃,90%RH,500hrs		(1),(2),(3),(4)
High Temperature Operating Test		Module	T_{gs}=85℃, 500 hours		
Low Temperature Operating Test		Module	T_a=-40℃, 500 hours		
High Temperature Storage Test		Module	T_a=95℃, 500 hours		(1),(3),(4)
Low Temperature Storage Test		Module	T_a=-40℃, 500 hours		
Shock Non-operating Test		Module	100G,6ms,X Y Z×2faces×3times, Total 18 times		(1),(3),(5)
Vibration Non-operating Test		Module	half-sine Frequency: 8Hz ~ 33HzStroke: 1.3mmSweep: 2.9G 33.3Hz ~ 400Hz X,Z Cycle : 15 minutes2 hrs for each direction of X,Z ; 4 hours for Y direction		
ESD Test	Operating	Module	Contact	±8KV, 150pF(2KOhm)	(1),(2),(6)
			Air	±15KV, 150pF(2KOhm)	
	Non-operating		Contact	±1KV, 150pF(2KOhm)	(1),(6)
			Air	±2KV, 150pF(2KOhm)	

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 after resetting.

7.0 Package Specification

TBD

Figure 16 Packing Method

8.0 Lot Mark

TBD

9.0 General Precaution

9.1 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 lead to be catastrophic.

9.2 Handling 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.

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 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 between the back light and the inverter 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) Desirable cleaners are IPA (Isopropyl Alcohol) or hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(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.

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 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.

9.5 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.

9.6 Others

When disposing LCD module, obey the local environmental regulations.