Customer Approval Specification

To: 苏州与来视讯科技有限公司

Product Name: M101GWN9 R2

Document Issue Date: 2018/12/14

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.

FQ-7-30-0-009-03D

Revision	Date	Page	Old Description	New Description	Remark
00	2018/12/14	all	--	First issue.	

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1.0 General Descriptions

1.1 Introduction

The M101GWN9 R2 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 10.1 inch diagonally measured active display area with WSVGA resolution (1,024 horizontal by 600 vertical pixels array).

1.2 Features

- Supported WSVGA Resolution
- LVDS Interface
- Compatible with RoHS Standard

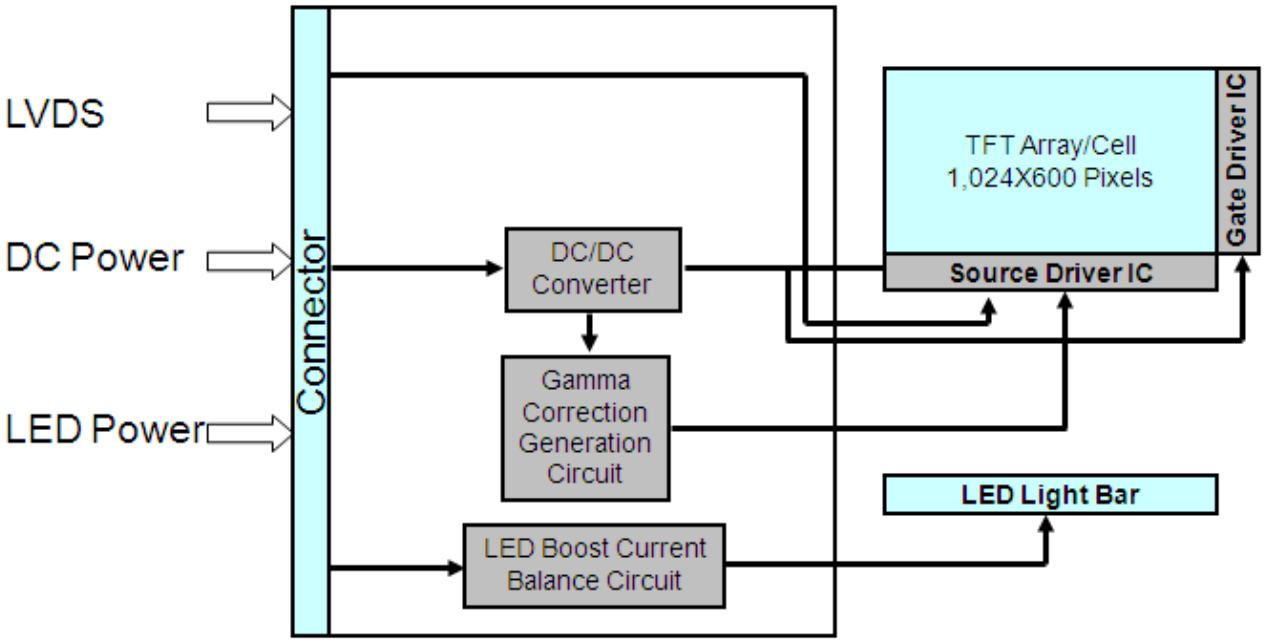
1.3 Product Summary

Items		Specifications	Unit
Screen Diagonal		10.1	inch
Active Area (H x V)		222.72 x 125.28	mm
Number of Pixels (H x V)		1,024 x600	-
Pixel Pitch (H x V)		0.2175 x 0.2088	mm
Pixel Arrangement		R.G.B. Vertical Stripe	-
Display Mode		Normally White	-
White Luminance		350 (Typ.)	cd /m^2
Contrast Ratio		500 (Typ.)	-
Response Time		16 (Typ.)	ms
Input Voltage		3.3 (Typ.)	V
Power Consumption		3.27 (Max)	W
Weight		341 (Max)	g
Outline Dimension (H x V x D)	with PCBA	235(Typ.) x 143(Typ.) x 8.04(Max)	mm
	without PCBA	235(Typ.) x 143(Typ.) x 5.8(Max)	
Electrical Interface (Logic)		LVDS	-
Support Color		16.7M	-
NTSC		45 (Typ.)	%
Viewing Direction		6 o'clock	-
Surface Treatment		Anti-glare, Hard-Coating (3H)	-

1.4 Functional Block Diagram

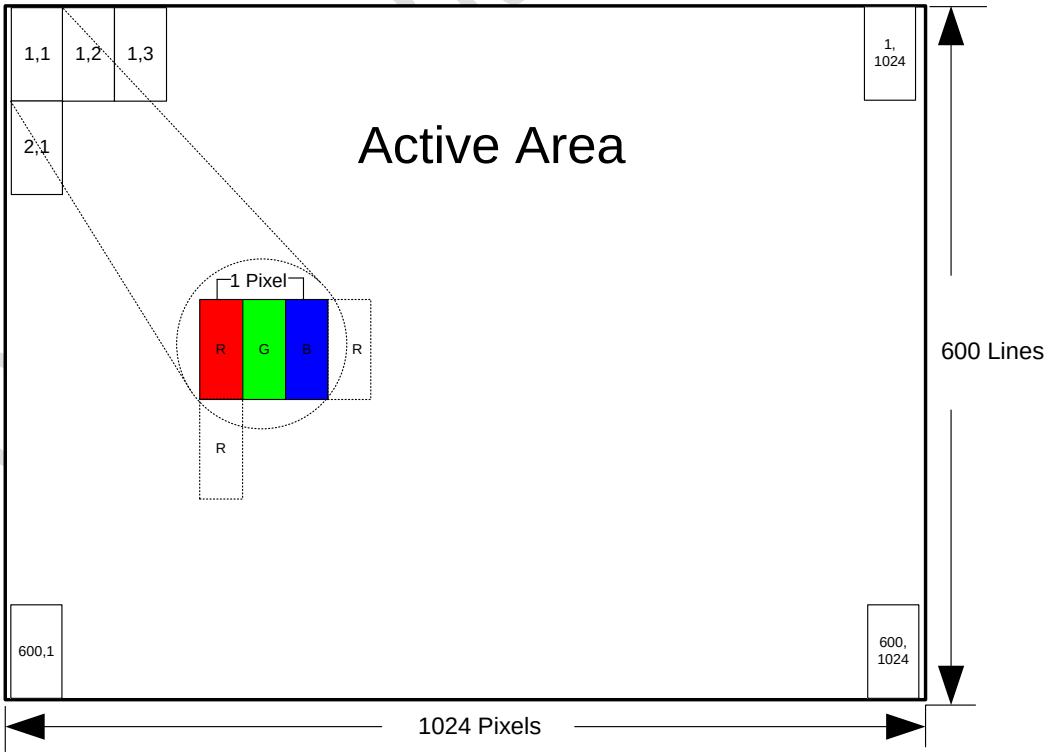
Figure 1 shows the functional block diagram of the LCD module.

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	3.96	V	(1),(2)
Logic Input Signal Voltage	V_{Signal}	-	3.6	V	
Operating Temperature	TOP	-20	70	℃	(3),(4),
Storage Temperature	TST	-30	80	℃	

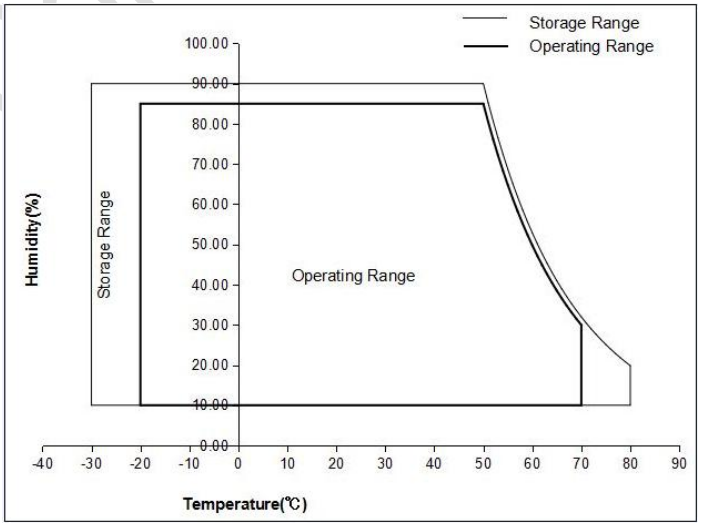
Note (1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded. It is recommended to follow the typical value.

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 39℃, 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.

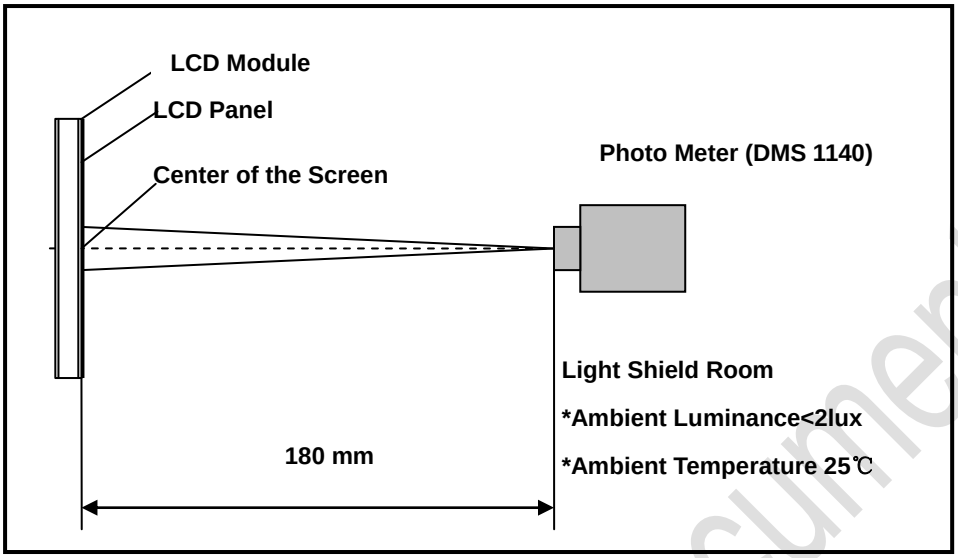
Table 2 Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle （CR≥10）	Horizontal	θ_{x+}	70	80	-	degree	(1),(2),(3) (4),(8)
		θ_{x-}	70	80	-		
	Vertical	θ_{y+}	70	80	-		
		θ_{y-}	70	80	-		
Contrast Ratio	Center		400	500	-	-	(1),(2),(4),(8) θx=θy=0°
Response Time	Rising + Falling		-	16	32	ms	(1),(2),(5),(8) θx=θy=0°
Color Chromaticity (CIE1931)	Red x		Typ. -0.03	0.582	Typ. +0.03	-	(1),(2),(3),(8) θx=θy=0°
	Red y			0.344		-	
	Green x			0.333		-	
	Green y			0.595		-	
	Blue x			0.162		-	
	Blue y			0.143		-	
	White x		0.255	0.305	0.355	-	
	White y		0.275	0.325	0.375	-	
NTSC	-		42	45	-	%	(1),(2),(3),(8) θx=θy=0°
White Luminance	Center		280	350	-	cd/m^2	(1),(2),(6),(8) θx=θy=0°
Luminance Uniformity	9 Points		75	80	-	%	(1),(2),(7),(8) θx=θy=0°

Note (1) Measurement Setup:

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

Figure 4 Measurement Setup



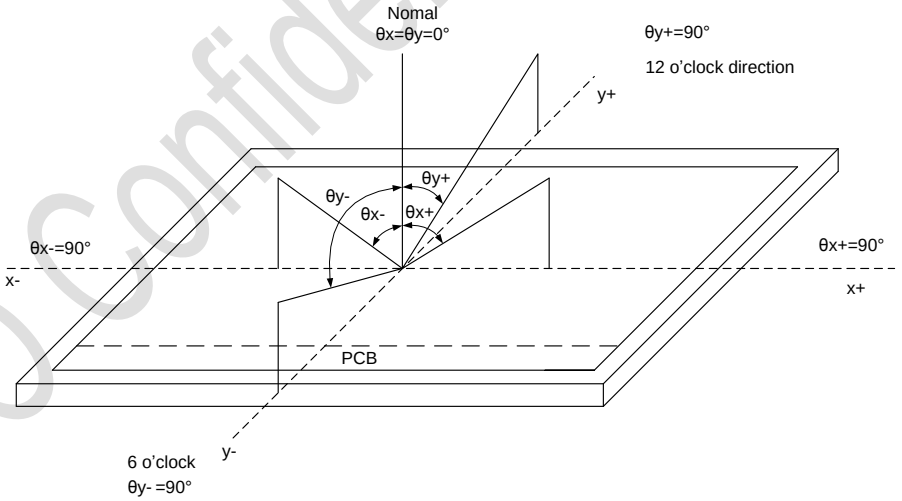
Note (2) The LED input parameter setting as:

I_LED: 160mA

PWM_LED: Duty 100 %

Note (3) Definition of Viewing Angle

Figure 5 Definition of Viewing Angle



Note (4) Definition Of Contrast Ratio (CR)

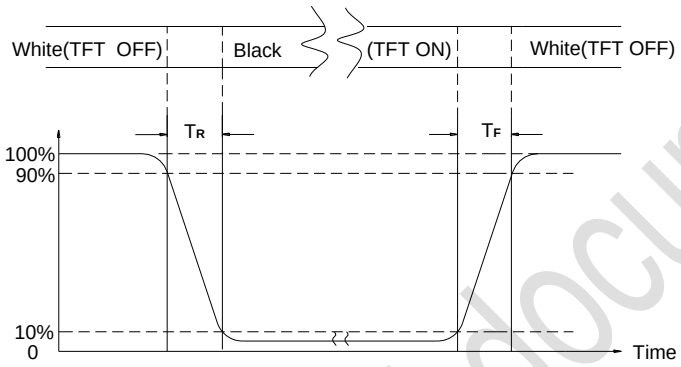
The contrast ratio can be calculated by the following expression:

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 at center.

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

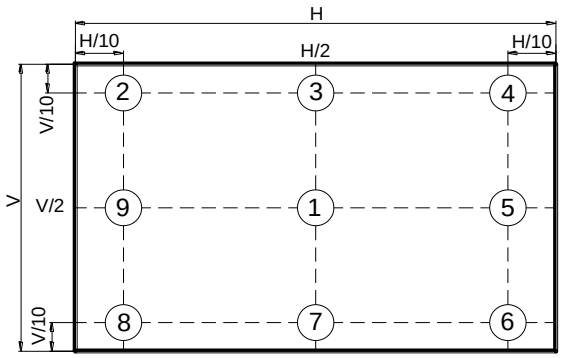
Measure the luminance of gray level 255 at 9 points.

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

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

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

Figure 7 Measurement Locations of 9 Points



4.0 Electrical Characteristics

4.1 Interface Connector

Table 3 Signal Connector Type

Item	Description
Manufacturer / Type	STM / MSAK24025P40D
Mating Receptacle / Type (Reference)	STM / PFQ24025P40 or Compatible

Table 4 Signal Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	BIST	BIST MODE SELECT(High Enable)	FOR INTERNAL TEST
2	VDD	LCD power supply (Typ. +3.3V)	-
3	VDD	LCD power supply (Typ. +3.3V)	-
4	V_EDID	EDID power supply	-
5	NC	No connection	-
6	CLK_EDID	EDID CLK signal	-
7	Data_EDID	EDID Data signal	-
8	LVDS input 0-	LVDS CH0 data signal(-)、R0～R5、G0	-
9	LVDS input 0+	LVDS CH0 data signal(+)、R0～R5、G0	-
10	GND	GND	-
11	LVDS input 1-	LVDS CH1 data signal(-)、G1～G5、B0、B1	-
12	LVDS input 1+	LVDS CH1 data signal(+)、G1～G5、B0、B1	-
13	GND	GND	-
14	LVDS input 2-	LVDS CH2 data signal(-)、B2～B5、DE	-
15	LVDS input 2+	LVDS CH0 data signal(+)、B2～B5、DE	-
16	GND	GND	-
17	LVDS CLK -	LVDS CLK data signal(-)	-
18	LVDS CLK +	LVDS CLK data signal(+)	-
19	GND	GND	-
20	LVDS input 3-	LVDS CH3 data signal(-)、R6~R7、G6~G7、B6~B7	-
21	LVDS input 3+	LVDS CH3 data signal(-)、R6~R7、G6~G7、B6~B7	-
22	GND	GND	-
23	NC	No connection	-
24	NC	No connection	-
25	GND	GND	-
26	NC	No connection	-

27	NC	No connection	-
28	GND	GND	-
29	NC	No connection	-
30	NC	No connection	-
31	GND	GND	-
32	GND	GND	-
33	GND	GND	-
34	NC	No connection	-
35	PWM	LED dimming signal	-
36	LED_EN	LED Enable signal	-
37	NC	No connection	-
38	VLED	LED power supply (Typ. 5V)	-
39	VLED	LED power supply (Typ. 5V)	-
40	VLED	LED power supply (Typ. 5V)	-

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
MagnitudeDifferentialInput Voltage	$\|V_{ID}\|$	200	-	600	mV	-
Common Mode Voltage	V_{CM}	1.0	1.2	1.4	V	V_{th} - V_{tl} =200mV
Common Mode Voltage Offset	ΔV_{CM}	-50	-	+50	mV	V_{th} - V_{tl} =200mV

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

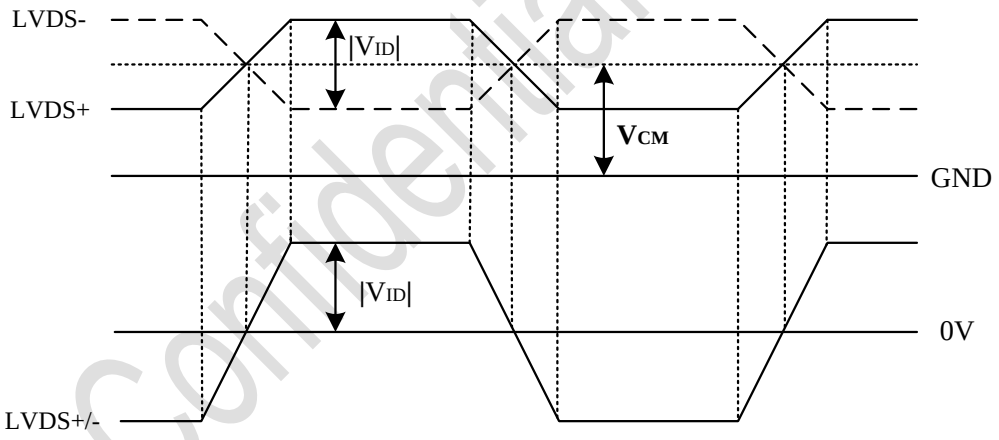


Figure 9 Measurement System

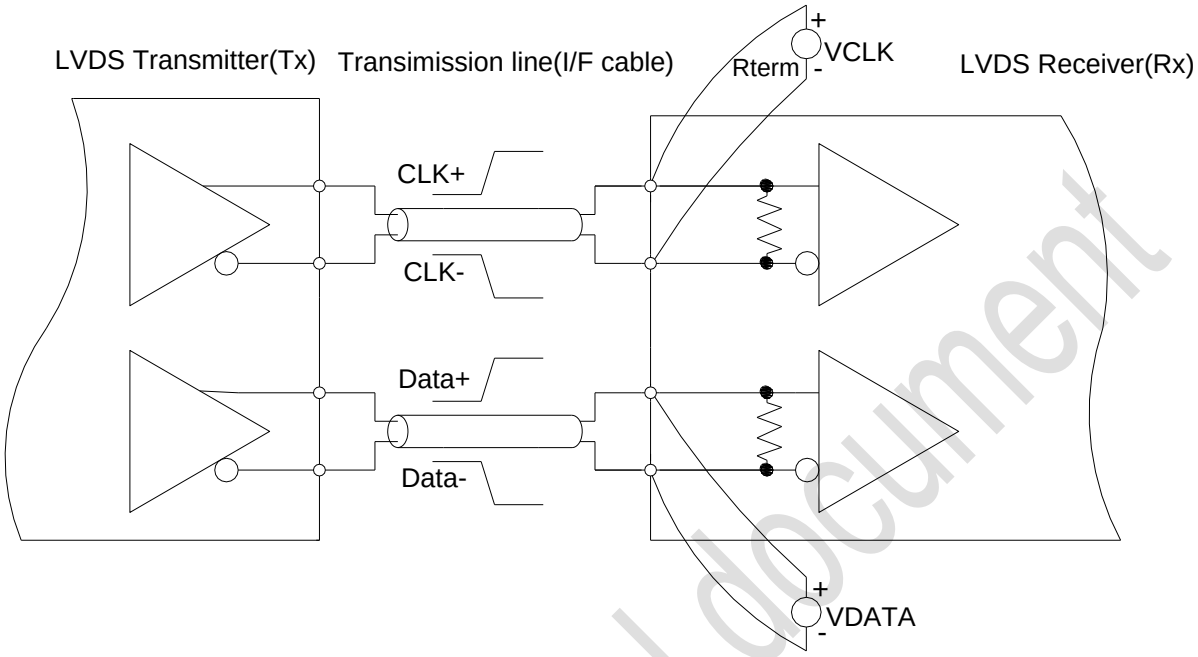
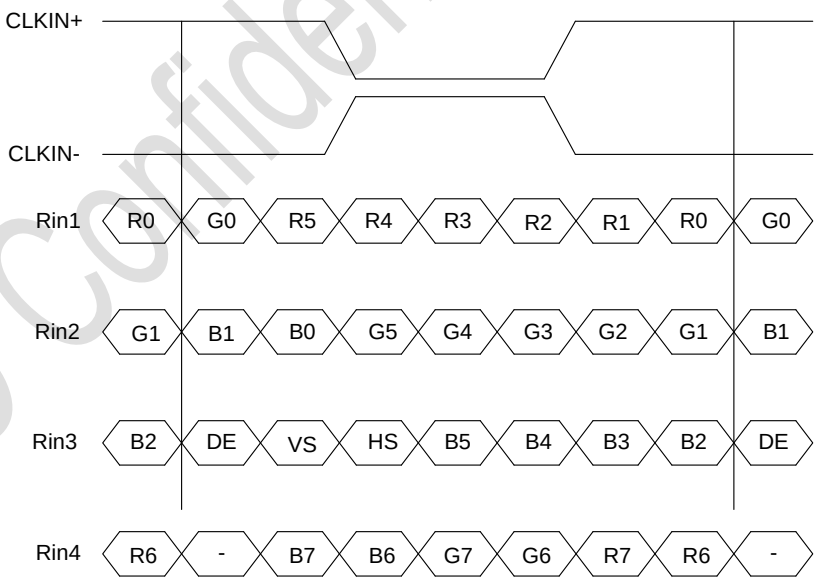


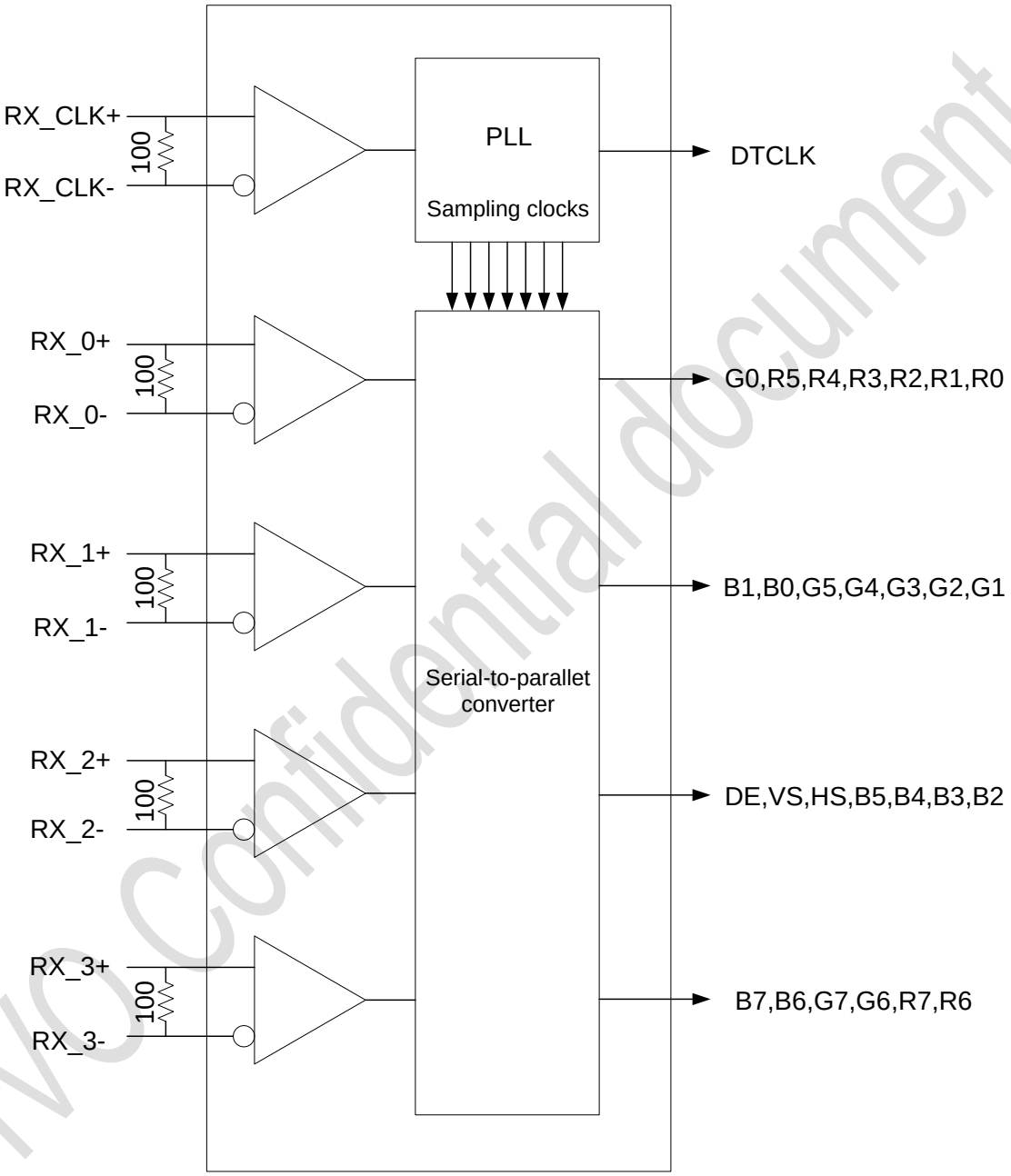
Figure 10 Data Mapping



4.2.2 LVDS Receiver Internal Circuit

Figure 11 LVDS Receiver Internal Circuit 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 6 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency	Fclk	45	51.2	65	MHz
H Total Time	HT	1,324	1,344	1,364	Clocks
H Active Time	HA	1,024	1,024	1,024	Clocks
V Total Time	VT	615	635	645	Lines
V Active Time	VA	600	600	600	Lines
Frame Rate	FV	55	60	65	Hz

4.4 Input Power Specifications

Input power specifications are as follows.

Table 7 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	Black Pattern	I_{DD}	-	-	0.22	A	(1),(4)
VDD Power Consumption	Black Pattern	P_{DD}	-	-	0.65	W	
Rush Current		I_{Rush}	-	-	1.5	A	(1),(5)
Allowable Logic/LCD Drive Ripple Voltage		V_{VDD-RP}	-	-	200	mV	(1)
LED Power Supply							
LED Input Voltage		V_{LED}	4.5	5	5.5	V	(1),(2),
LED Power Consumption		P_{LED}	-	-	2.62	W	(1),(6)
LED Forward Voltage		V_F	2.9	-	3.5	V	(1)(2)
LED Forward Current		I_F	-	20	-	mA	
PWM Signal Voltage	High	V_{PWM}	2.0	-	5.0	V	
	Low		0	-	0.5		
LED Enable Voltage	High	V_{LED_EN}	2.0	-	5.0	V	
	Low		0	-	0.5		
Input PWM Frequency		F_{PWM}	200	-	1,000	Hz	(1),(2),(7)
Duty Ratio		PWM	5	-	100	%	(1),(8)
LED Life Time		LT	30,000	-	-	Hours	(1),(9)
EDID Power Supply							
Input Power Supply Voltage		V_EDID	3.0	-	3.6	V	(1)

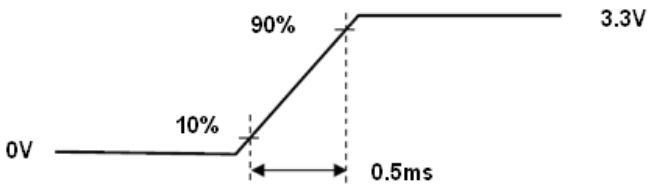
Note (1) All of the specifications are guaranteed under normal conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH.

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 V_{DD} current and power consumption are measured under the V_{DD} = 3.3 V, F_V = 60 Hz condition and Black pattern.

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

Figure 12 VDD Rising Time



Note (6) The power consumption of LED Driver are under the V_{LED} = 5V, Dimming of Max luminance.

Note (7) Although acceptable range as defined, the dimming ratio is not effective at all conditions. The PWM frequency should be fixed and stable for more consistent luminance control at any specific level desired.

Note (8) The operation of LED Driver below minimum dimming ratio may cause flickering or reliability issue.

Note (9) 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.

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 VDD voltage is off.

Figure 13 Power Sequence

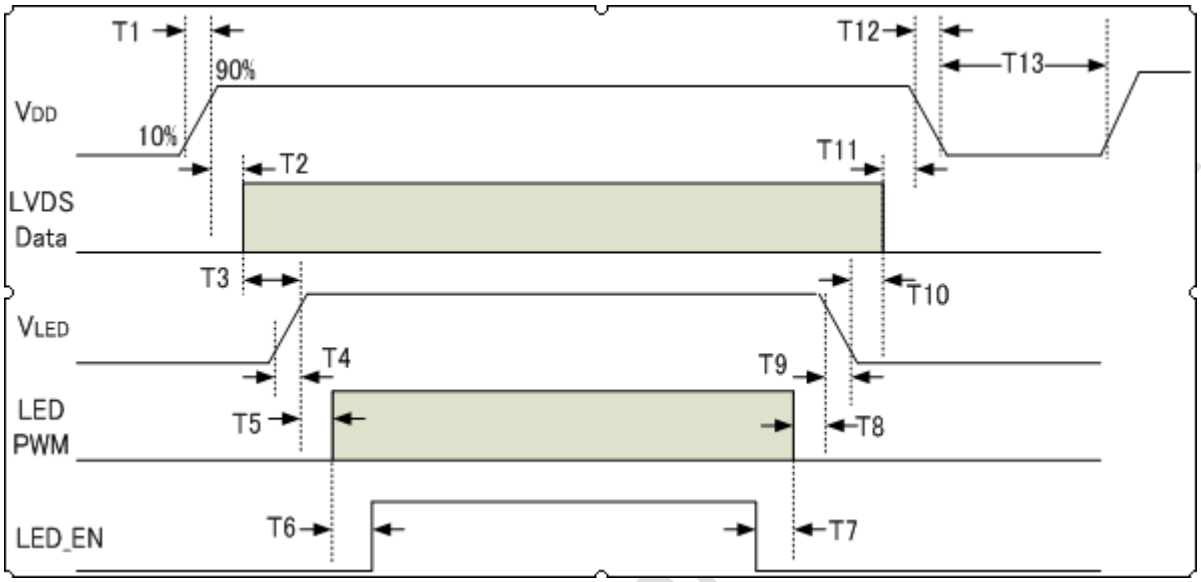


Table 8 Power Sequencing Requirements

Parameter	Symbol	Unit	min	Typ.	max
VDD rising Time	T1	ms	0.5	-	10
VDD 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	1	10	30
Backlight off to signal Disable	T10	ms	200	-	-
Signal Disable to Power Down	T11	ms	0	-	50
VDD Falling Time	T12	ms	1	10	30
Power Off	T13	ms	500	-	-

5.0 Mechanical Characteristics

5.1 Outline Drawing

Figure 14 Reference Outline Drawing (Front Side)

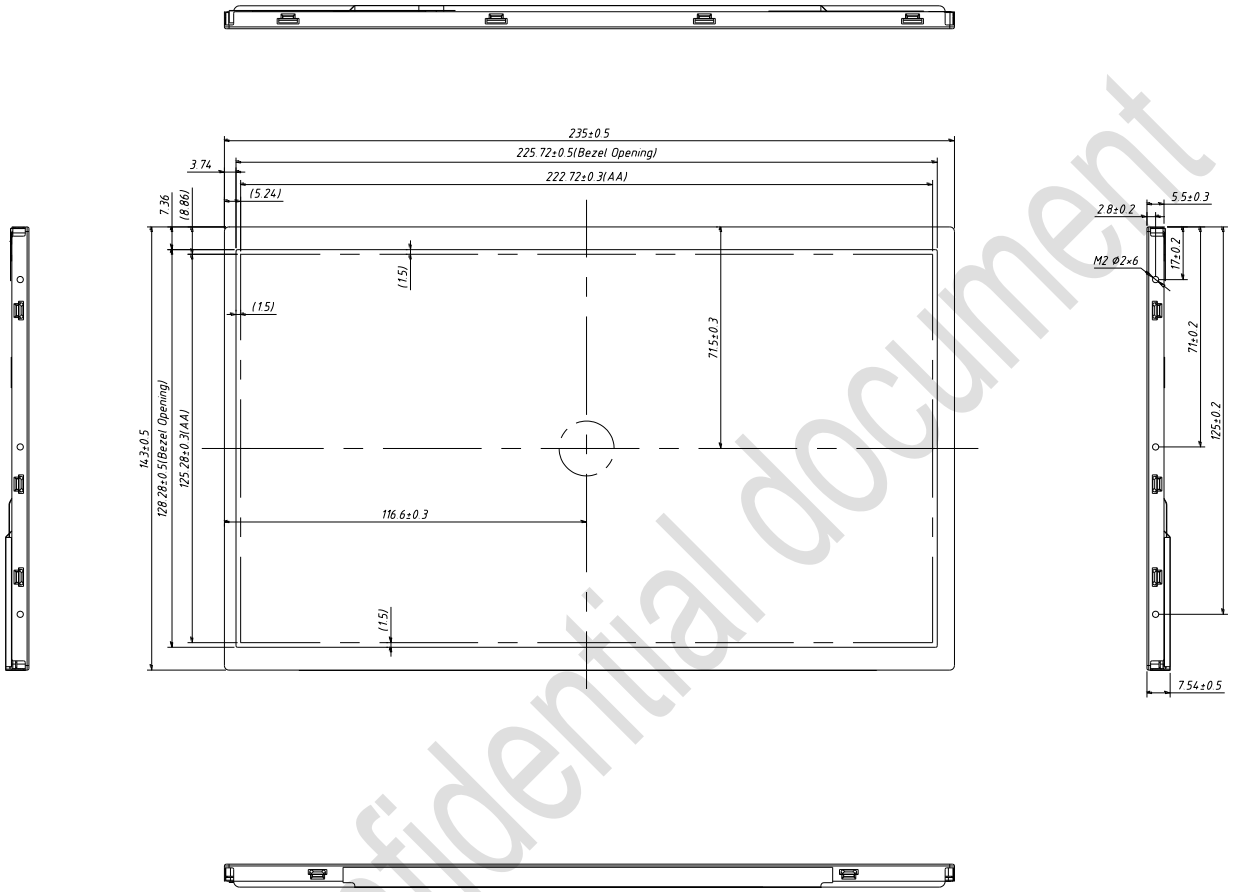
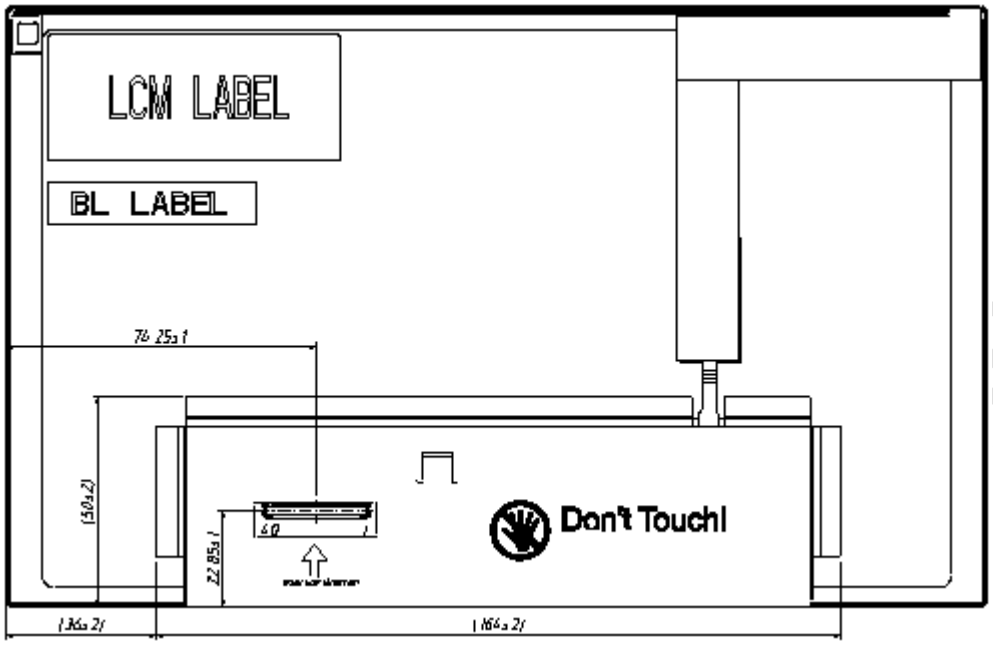


Figure 15 Reference Outline Drawing (Back Side)

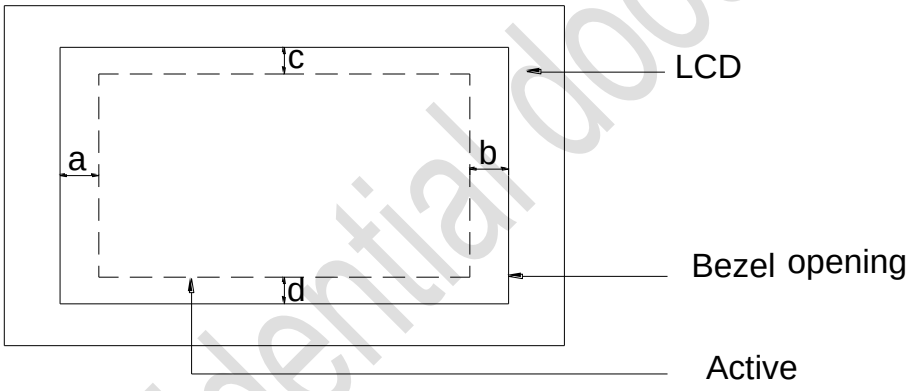


5.2 Dimension Specifications

Table 9 Module Dimension Specifications

Item		Min.	Typ.	Max.	Unit
Width		234.5	235.0	235.5	mm
Height		142.5	143.0	143.5	mm
Thickness	with PCBA	7.04	7.54	8.04	mm
	without PCBA	5.2	5.5	5.8	mm
Weight		-	310	341	g

Figure 16 BM Area



6.0 Reliability Conditions

Item	Type	Test Conditions	Note
High Temperature /High Humidity Operating Test	Module	T_{gs}=50℃, 85%, 300hrs	(1),(2),(3),(4)
High Temperature Operating Test	Module	T_{gs}=70℃, 300hrs	
Low Temperature Operating Test	Module	T_a=-20℃, 300hrs	
High Temperature Storage Test	Module	T_a=80℃, 300hrs	(1),(3),(4)
Low Temperature Storage Test	Module	T_a=-30℃, 300hrs	

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.

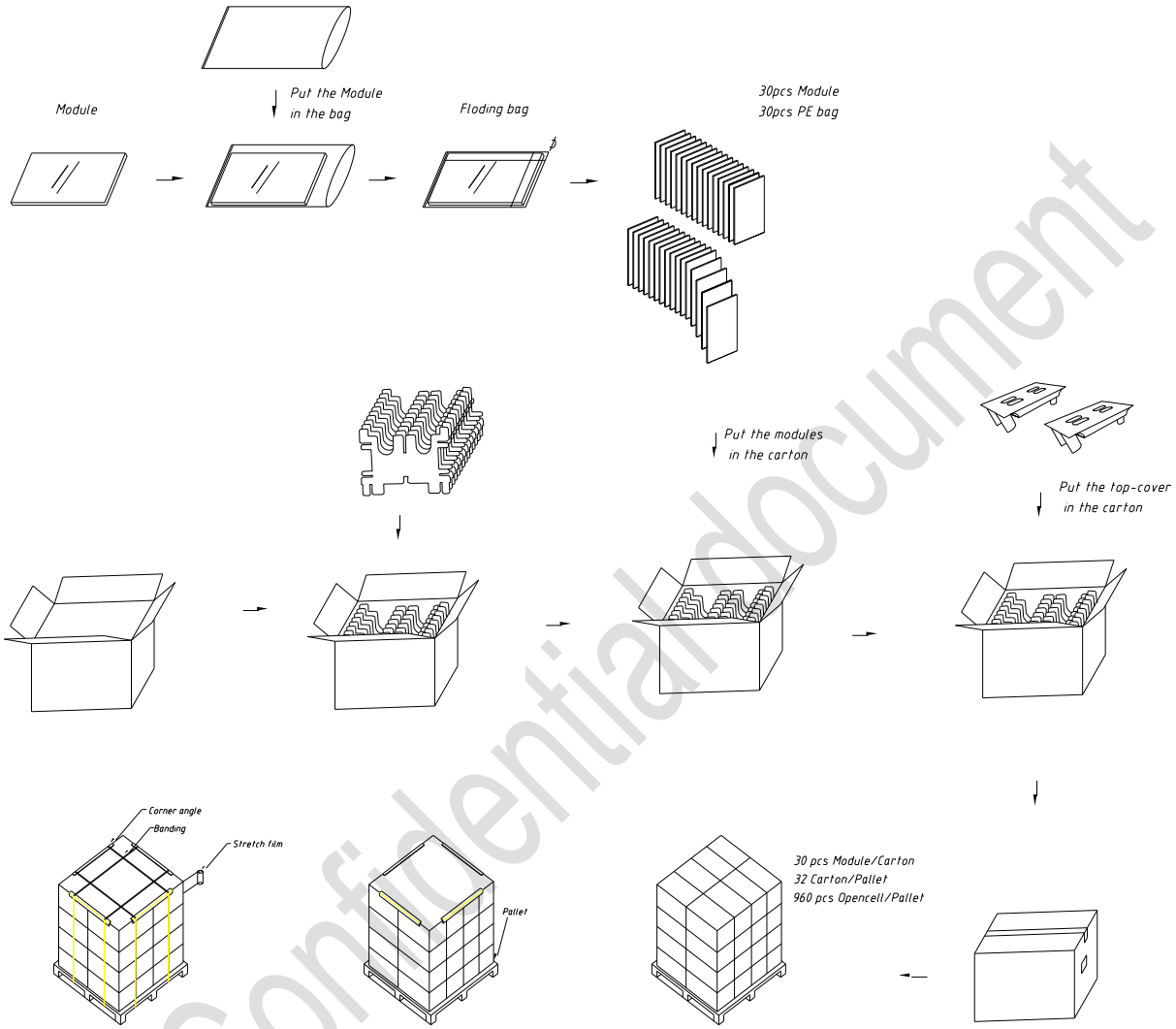
Note (2) The setting of electrical parameters should follow the typical value before reliability test.

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.

7.0 Package Specification

Figure 18 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

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 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.