版本	日期	更新内容	页码	制定者
V0	2015-5-22	新制订	All	Shiyi

CONTENTS

1.0 General Descriptions

1.1 Introduction

The N1167 R0 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driver circuit and a backlight system. This TFT LCD has a 11.6 inch diagonally measured active display area with HD resolution (1,366 horizontal by 768 vertical pixels array).

1.2 Features

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

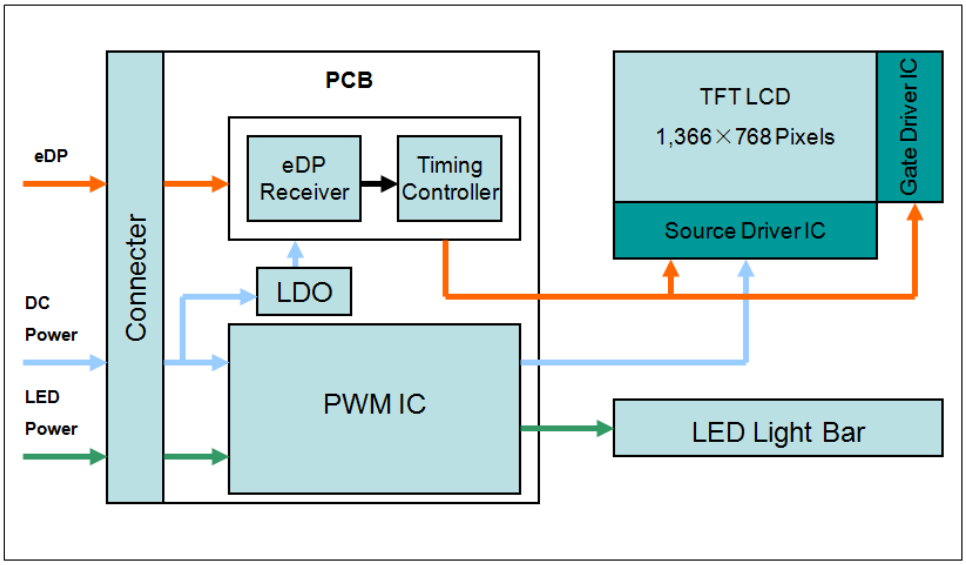
1.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	11.6	inch
Active Area (H x V)	256.125x 144.000	mm
Number of Pixels (H x V)	1,366 x 768	-
Pixel Pitch (H x V)	0.1875x0.1875	mm
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	Normally Black	-
White Luminance	(250)(Typ.)	cd /m^2
Contrast Ratio	(1200)(Typ.)	-
Response Time	(30)(Typ.)	ms
Input Voltage	3.3 (Typ.)	V
Power Consumption	(2.62)(mosaic Pattern)	W
Weight	210(Max.)	g
Outline Dimension (H x V x D)	277.80 (Typ.) x 167.00(Typ.) x(3.00)(Max.)	mm
Electrical Interface (Logic)	eDP 1.2	-
Support Color	16.7M(6bit+Hi-FRC)	-
NTSC	(50)(Typ.)	%
Viewing Direction	All	-
Surface Treatment	AG	-

1.4 Functional Block Diagram

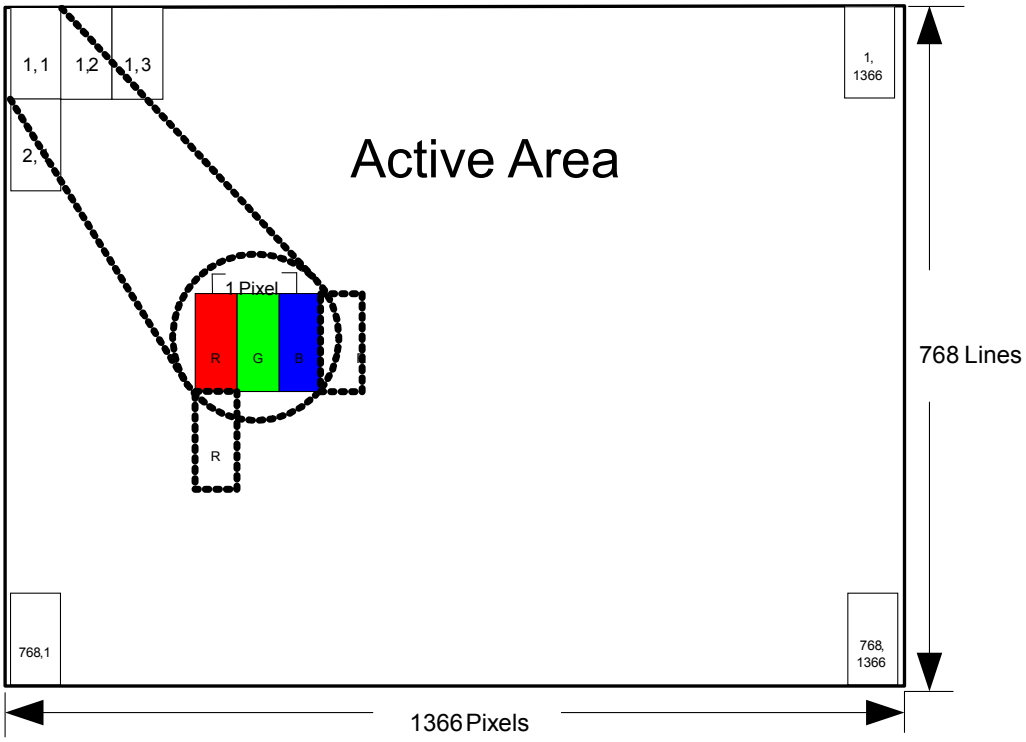
Figure 1 shows the functional block diagram of the LCD module.

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}	(3.0)	(3.6)	V	
Operating Temperature	TOP	0	60	℃	(3),(4),(5),(6)
Storage Temperature	TST	-30	70	℃	
Vibration(Non-operating)	VB	-	1.5	G	(7)
Shock(Non-operating)	Shock	-	240	G	(8)

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

Note (2) Operating temperature 25℃, humidity 55%RH.

Note (3) (T<=40℃) Note static electricity. Maximum wet bulb temperature at 39℃ or less. (T>40℃) No condensation.

Note (4) There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at 60~70℃ or -30~0℃.

Note (5) There is a possibility of causing the fineness deterioration by the prolonged use in the (high temperature) humidity environment (60%RH or more).

Note (6) In the operating temperature item, the low temperature side is the ambient temperature regulations. The high temperature side is the panel surface temperature regulations.

Note (7) 10Hz~500Hz~10Hz, X Y Z each axis/1h.

Note (8) 2ms, 1 time for ±x, ±y, ±z 6 directions.

3.0 Optical Characteristics

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

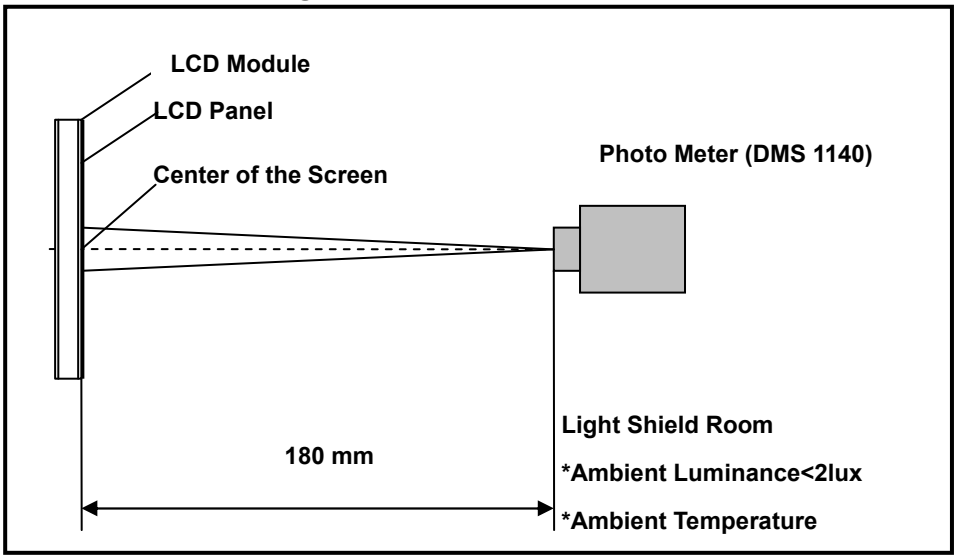
Table 2 Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle （CR>10）	Horizontal	θ_{x+}	80	85	-	degree	(1),(2),(3)
		θ_{x-}	80	85	-		
	Vertical	θ_{y+}	80	85	-		
		θ_{y-}	80	85	-		
Contrast Ratio	Center		(960)	(1200)	-	-	(1),(2),(4) θx=θy=0°
Response Time	Rising + Falling		-	(30)	(35)	ms	(1),(2),(5) θx=θy=0°
Color Chromaticity (CIE1931)	Red x		Typ. -0.03	TBD	Typ. +0.03	-	(1),(2),(3) θx=θy=0°
	Red y			TBD		-	
	Green x			TBD		-	
	Green y			TBD		-	
	Blue x			TBD		-	
	Blue y			TBD		-	
	White x		(0.283)	(0.313)	(0.343)	-	
	White y		(0.299)	(0.329)	(0.359)	-	
NTSC	-		-	(50)	-	%	(1),(2),(3) θx=θy=0°
White Luminance	5 Points Average		(200)	(250)	-	cd/m^2	(1),(2),(6) θx=θy=0°
Luminance Uniformity	5 Points		(80)	-	-	%	(1),(2),(7) θx=θy=0°
	13 Points		(60)	-	-		

Note (1) Measurement Setup:

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

Figure 3 Measurement Setup



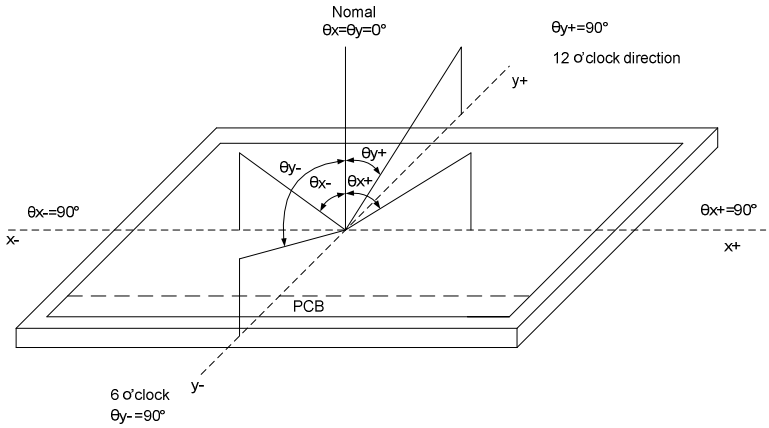
Note (2) The LED input parameter setting as:

V_LED: 12V (±0.1V)

PWM_LED: Duty 100 %

Note (3) Definition of Viewing Angle

Figure 4 Definition of Viewing Angle



Note (4) Definition of Contrast Ratio (CR)

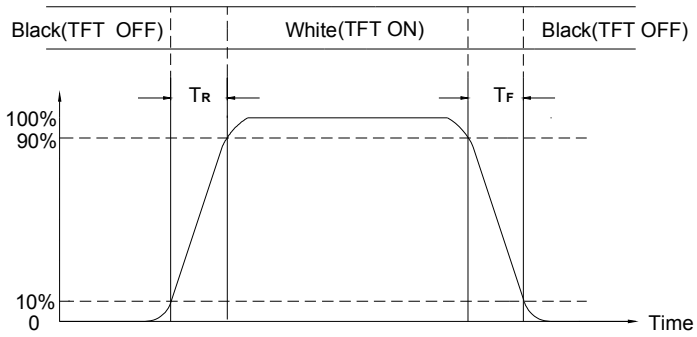
The contrast ratio can be calculated by the following expression:

Contrast Ratio (CR) = L255/ L0

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

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

Figure 5 Definition of Response Time



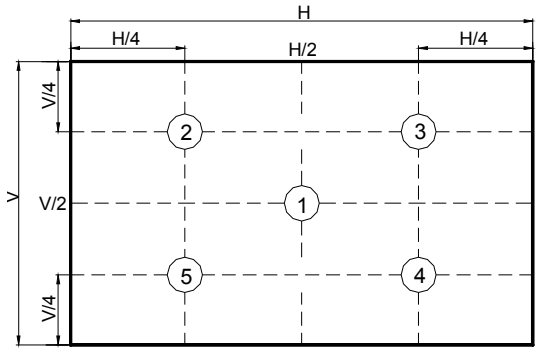
Note (6) Definition of Luminance White

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

Display Luminance=(L1+L2+L3+L4+L5) / 5

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

Figure 6 Measurement Locations of 5 Points



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

Measure the luminance of gray level 255 at 5 points

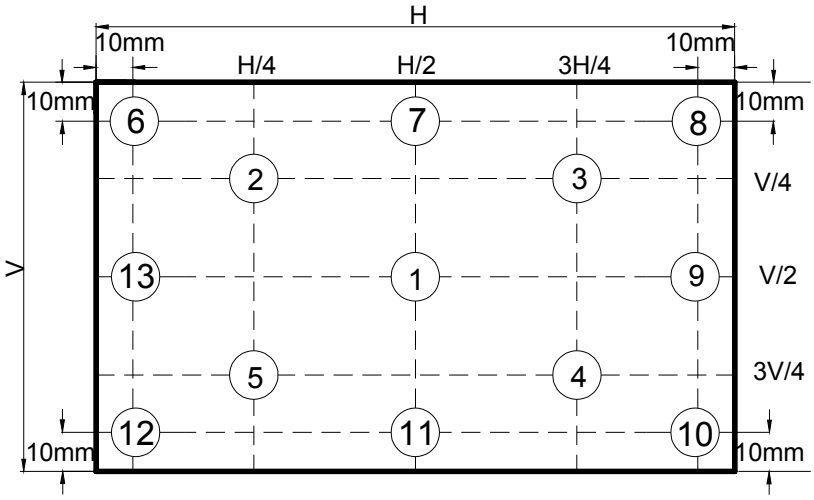
Luminance Uniformity= Min.(L1, L2, ... L5) / Max.(L1, L2, ... L5)

Measure the luminance of gray level 255 at 13 points.

Luminance Uniformity= Min.(L1, L2, ... L13) / Max.(L1, L2, ... L13)

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

Figure 7 Measurement Locations Of 13 Points



4.0 Electrical Characteristics

4.1 Interface Connector

Table 3 Signal Connector Type

Item	Description
Manufacturer / Type	IPEX 20455-030E
Mating Receptacle / Type (Reference)	TBD

Table 4 Signal Connector Pin Assignment

Pin No.	Symbol	Description	Remarks
1	DCR	Reserved DCR Function	High Enable
2	H_GND	High Speed Ground	-
3	NC	Reserved Complement Signal Link Lane 1	Not Used
4	NC	Reserved True Signal Line 1	Not Used
5	H_GND	High Speed Ground	-
6	LAN0_N	Complement Signal Link Lane 0	-
7	LLAN0_P	True Signal Line 0	-
8	H_GND	High Speed Ground	-
9	AUX_CH_P	True Signal Auxiliary CH	-
10	AUX_CH_N	Complement Signal Auxiliary CH	-
11	H_GND	High Speed Ground	-
12	LCD_VCC	LCD Logic and Driver Power	3.3V(Typ.)
13	LCD_VCC	LCD logic and Driver Power	3.3V(Typ.)
14	BIST	Reserved BIST Function	High Enable
15	LCD_GND	LCD logic and driver ground	-
16	LCD_GND	LCD logic and driver ground	-
17	HPD	HPD signal pin	-
18	BL_GND	Backlight ground	-
19	BL_GND	Backlight ground	-
20	BL_GND	Backlight ground	-
21	BL_GND	Backlight ground	-
22	BL_ENABLE	Backlight On/Off	-
23	BL_PWM_DIM	System PWM signal input for Diming	-
24	NC	No Connection	-
25	NC	No Connection	-

26	BL_PWR	Backlight power	12V(Typ.)
27	BL_PWR	Backlight power	12V(Typ.)
28	BL_PWR	Backlight power	12V(Typ.)
29	BL_PWR	Backlight power	12V(Typ.)
30	NC	No Connection	-

4.2 Signal Electrical Characteristics

Table 5 Display Port Main Link

Parameter	Description	Min.	Typ.	Max.	Unit
V_{CM}	Differentia Common Mode Voltage	0	-	2.0	V
$V_{Diff\ P-P}$ Level 1	Differential Peak to Peak Voltage Level 1	0.34	0.40	0.46	V
$V_{Diff\ P-P}$ Level 2	Differential Peak to Peak Voltage Level 2	0.51	0.60	0.68	V
$V_{Diff\ P-P}$ Level 3	Differential Peak to Peak Voltage Level 3	0.69	0.80	0.92	V
$V_{Diff\ P-P}$ Level 4	Differential Peak to Peak Voltage Level 4	1.02	1.20	1.38	V

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

(2) It is recommended to refer the specifications of VESA Display Port Standard V1.2 in detail.

(3) Follow as VESA display port standard V1.2 at both 1.62 and 2.7Gbps link rates.

Figure 9 Display Port Main Link Signal

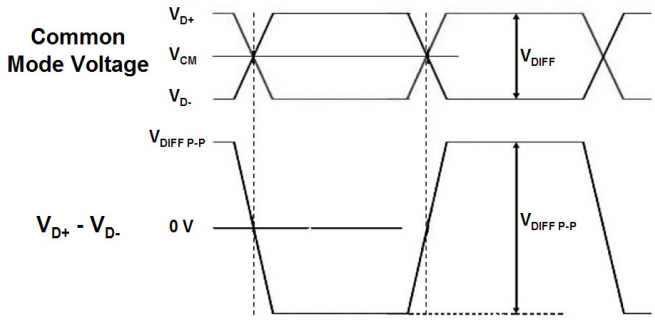


Figure10 Display Port AUX_CH Signal

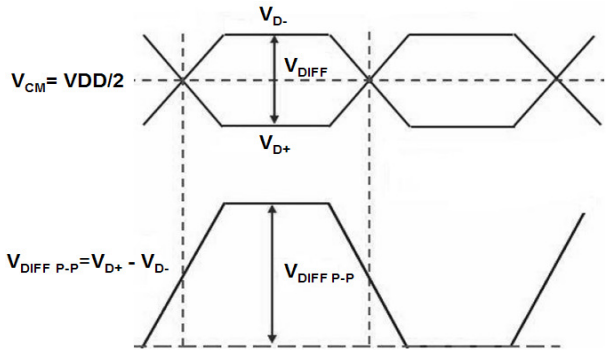


Table 6 Display Port AUX_CH

Parameter	Description	Min.	Typ.	Max.	Unit
V_{CM}	Differentia Common Mode Voltage	(0)	(VDD/2)	(2)	V
$V_{Diff\ P-P}$	Differential Peak to Peak Voltage	(0.39)	-	(1.38)	V

Note: Follow as VESA display port standard V1.2.

Table 7 Display Port V_{HPD}

Parameter	Description	Min.	Typ.	Max.	Unit
V_{HPD}	HPD Voltage	（2.25）	-	(3.60)	V

Note: Follow as VESA display port standard V1.2.

4.3 Interface Timings

Table 8 Interface Timings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Clock Frequency	Fclk	(69.2)	(72)	(80)	MHz
H Total Time	HT	(1,486)	(1,500)	(1,586)	Clocks
H Active Time	HA	-	1,366	-	Clocks
V Total Time	VT	(780)	(800)	(802)	Lines
V Active Time	VA	-	768	-	Lines
Frame Rate	FV	55	60	65	Hz

4.4 Input Power Specifications

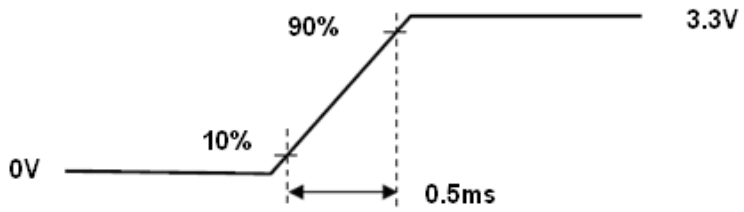
Input power specifications are as follows.

Table 9 Input Power Specifications

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
System Power Supply							
LCD Drive Voltage (Logic)		V_{DD}	3.0	3.3	3.6	V	(2), (4)
VDD Current	mosaic Pattern	I_{DD}	-	-	(0.21)	A	(3),(4),(8)
VDD Power Consumption	mosaic Pattern	P_{DD}	-	-	(0.72)	W	
Rush Current		I_{Rush}	-	-	1.5	A	(1),(4),(5)
Allowable Logic/LCD Drive Ripple Voltage		V_{VDD-RP}	-	-	200	mV	(4)
LED Power Supply							
LED Input Voltage		V_{LED}	5	12	21	V	(4),(6)
LED Power Consumption		P_{LED}	-	-	(1.9)	W	(4),(6)
LED Forward Voltage		V_F	(2.8)	-	(3.1)	V	(4)
LED Forward Current		I_F	-	-	(18.5)	mA	
PWM Signal Voltage	High	V_{PWM}	2.2	-	3.6	V	
	Low		0	-	0.6		
LED Enable Voltage	High	V_{LED_EN}	2.2	-	3.6	V	
	Low		0	-	0.6		
Input PWM Frequency		F_{PWM}	200	-	1,000	Hz	
Duty Ratio		PWM	1	-	100	%	
LED Life Time		LT	15,000	-	-	Hours	(4)(7)

Note (1) Measure Condition

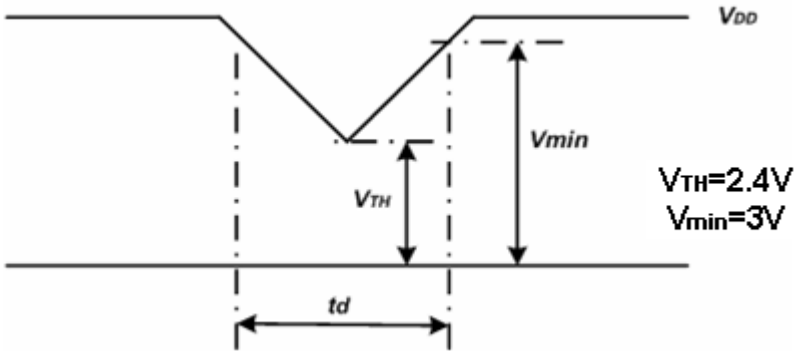
Figure 11 VDD Rising Time



Note (2) VDD Power Dip Condition

V_{TH}< V_{DD}≤ Vmin, td≤ 10ms (a time of the voltage return to normal), our panel can revive automatically.

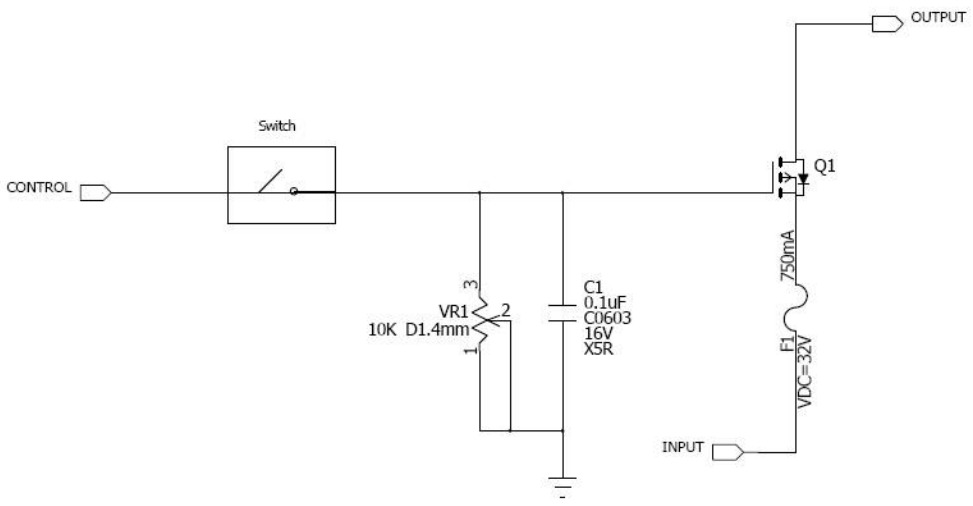
Figure 12 VDD Power Dip



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

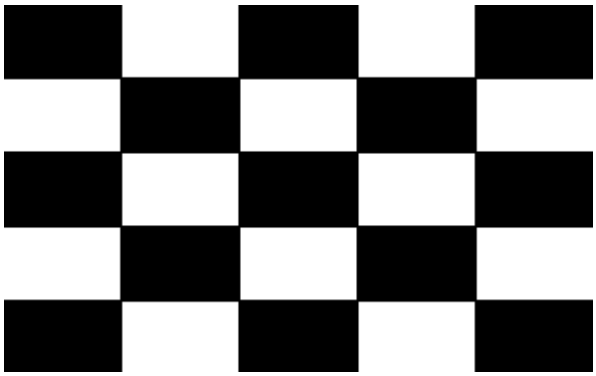
Note (4) Operating temperature 25℃, humidity 55%RH.

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



Note (6) The LED life time define as the estimated time to 50% degradation of initial luminous.

Note (7) Description of the mosaic pattern.



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

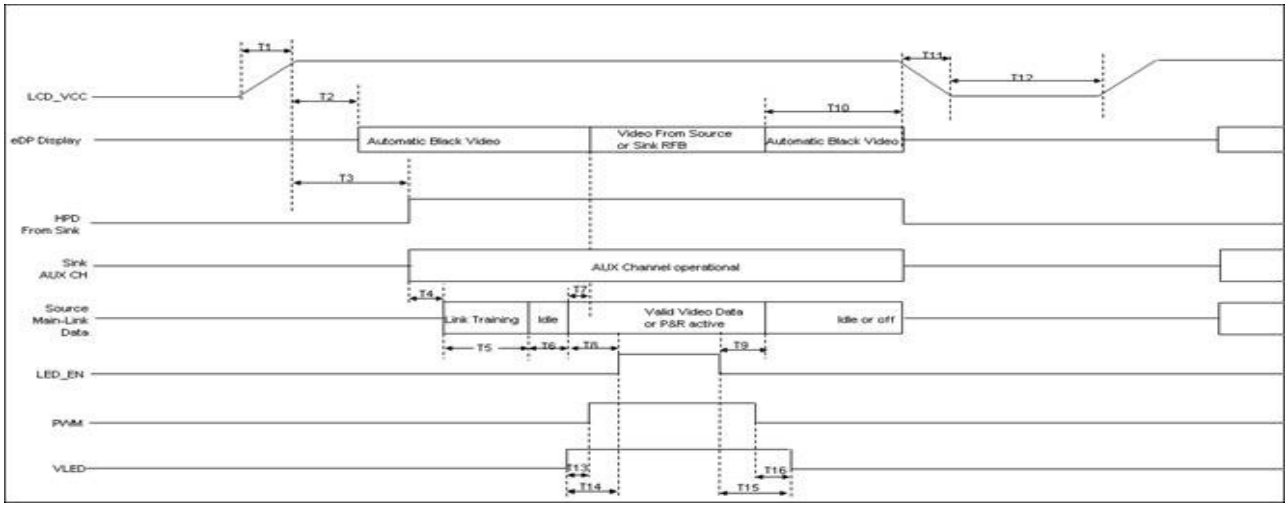


Table 10 Power Sequencing Requirements

Parameter	Symbol	Min.	Typ.	Max.	Unit
VCC Rise Time (10% to 90%)	T1	0.5	-	10	ms
Delay from VCC to automatic Black Video generation	T2	0	-	200	ms
Delay from VCC to HPD high	T3	0	-	200	ms
Delay from HPD high to link training initialization	T4	-	-	-	ms
Link training duration	T5	-	-	-	ms
Link idle	T6	-	-	-	ms
Delay from valid video data from Source to video on display	T7	0	-	50	ms
Delay from valid video data from Source to backlight enable	T8	200	-	-	ms
Delay from backlight disable to end of valid video date	T9	-	-	-	ms
Delay from end of valid video data from Source to VCC off	T10	0	-	500	ms
VCC fall time (90% to 10%)	T11	0	-	10	ms
VCC off time	T12	150	-	-	ms
Delay from VLED to PWM	T13	0	-	-	ms
Delay from VLED to backlight enable	T14	0	-	-	ms
Delay from backlight disable to VLED off	T15	0	-	-	ms
Delay from PWM off to VLED off	T16	0	-	-	ms

5.0 Mechanical Characteristics

5.1 Outline Drawing

Figure 14 Reference Outline Drawing (Front Side)

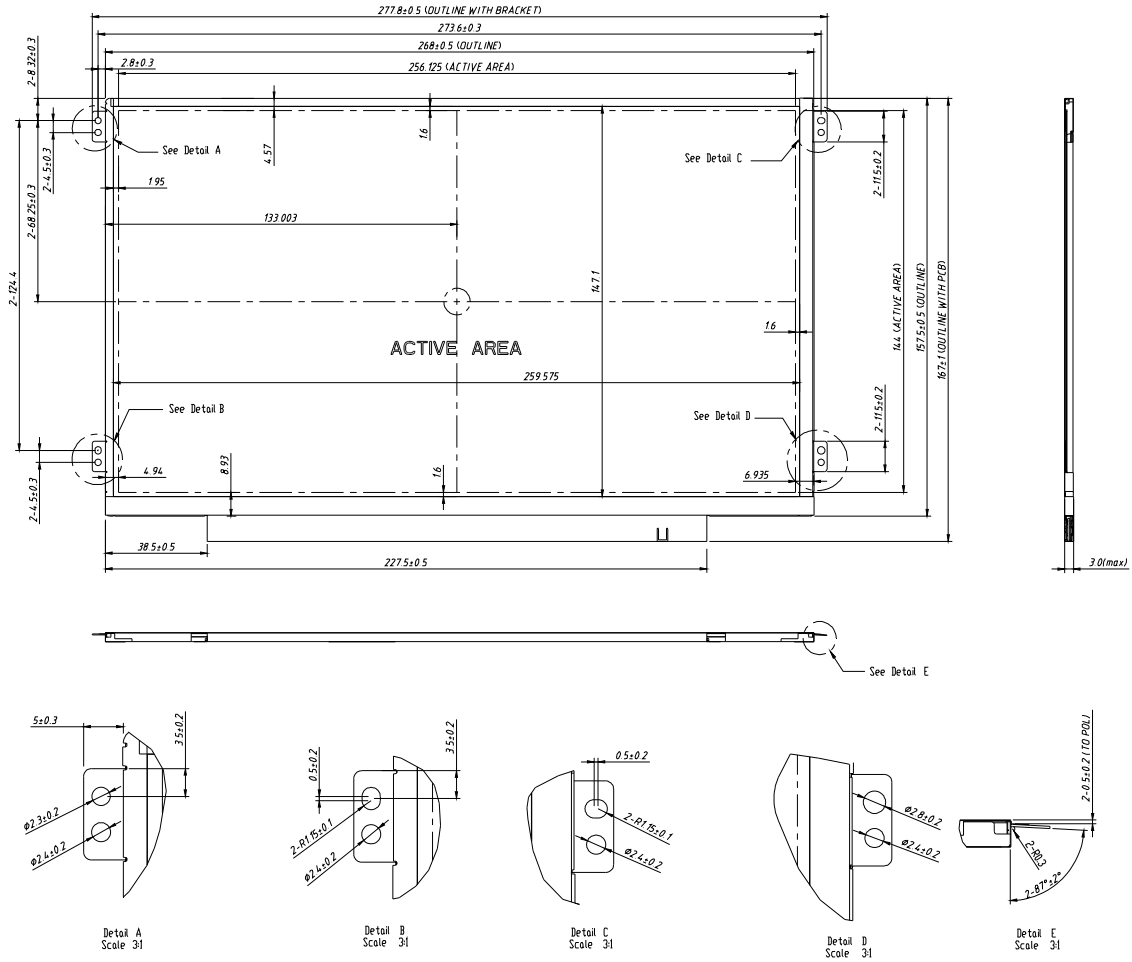
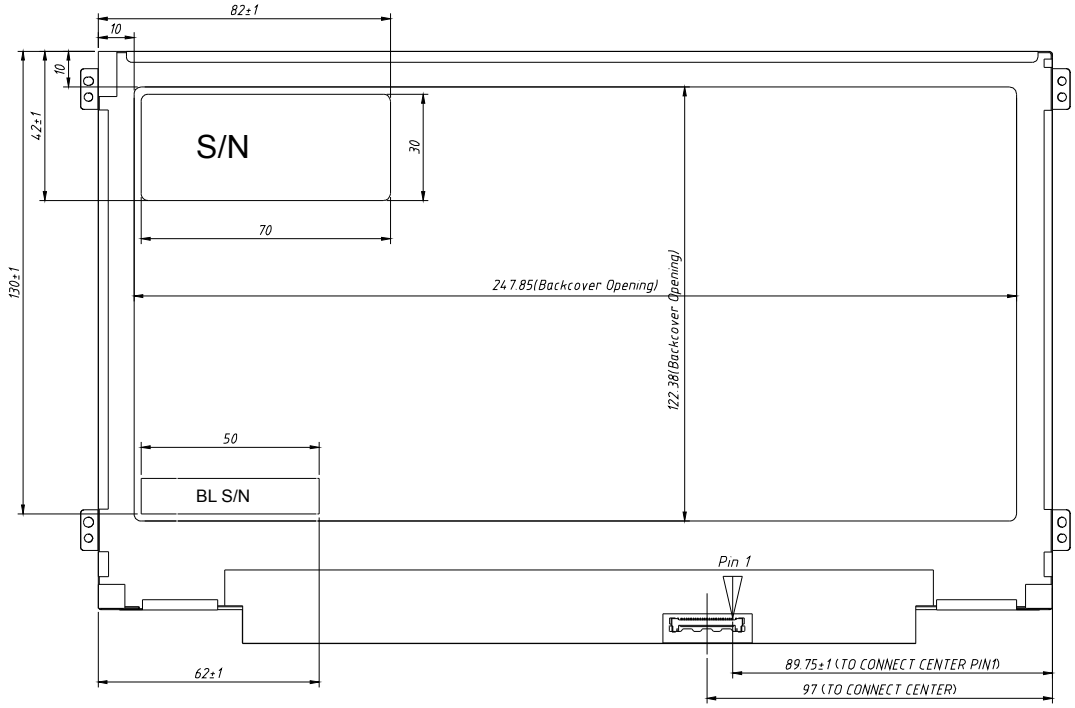


Figure 15 Reference Outline Drawing (Back Side)



5.2 Dimension Specifications

Table 11 Module Dimension Specifications

Item	Min.	Typ.	Max.	Unit
Width	(277.3)	(277.8)	(278.3)	mm
Height	(166)	(167)	(168)	mm
Thickness	-	-	(3.0)	mm
Weight	-	-	(210)	g

6.0 Reliability Conditions

Item		Package	Test Conditions		Note
High Temperature Operating Test		Module	60℃, 300 hours		(1),(2),(3),(4)
Low Temperature Operating Test		Module	0℃, 300 hours		(1),(2),(3),(4)
High Temperature Storage Test		Module	70℃, 300 hours		(1),(2),(4)
Low Temperature Storage Test		Module	-30℃, 300 hours		(1),(2),(4)
High Temperature/High Humidity Operating Test		Module	50℃, 95%RH, 500 hours		(1),(2),(3),(4)
Shock Non-operating Test		Module	240G,2ms,1time for ±x, ±y, ±z 6 directions		(4)
Vibration Non-operating Test		Module	1.5G , 10~500~10 Hz , X、Y、Z each axis/1h.		(4)
ESD Test	Operating	Module	Contact	± 8 KV	(5)
			Air	± 15 KV	

Note (1) All the judgments are under room temperature and the sample need to be static more than 2 hours in the room temperature before judge.

Note (2) During measurement, the condensation water or remains shall not be allowed.

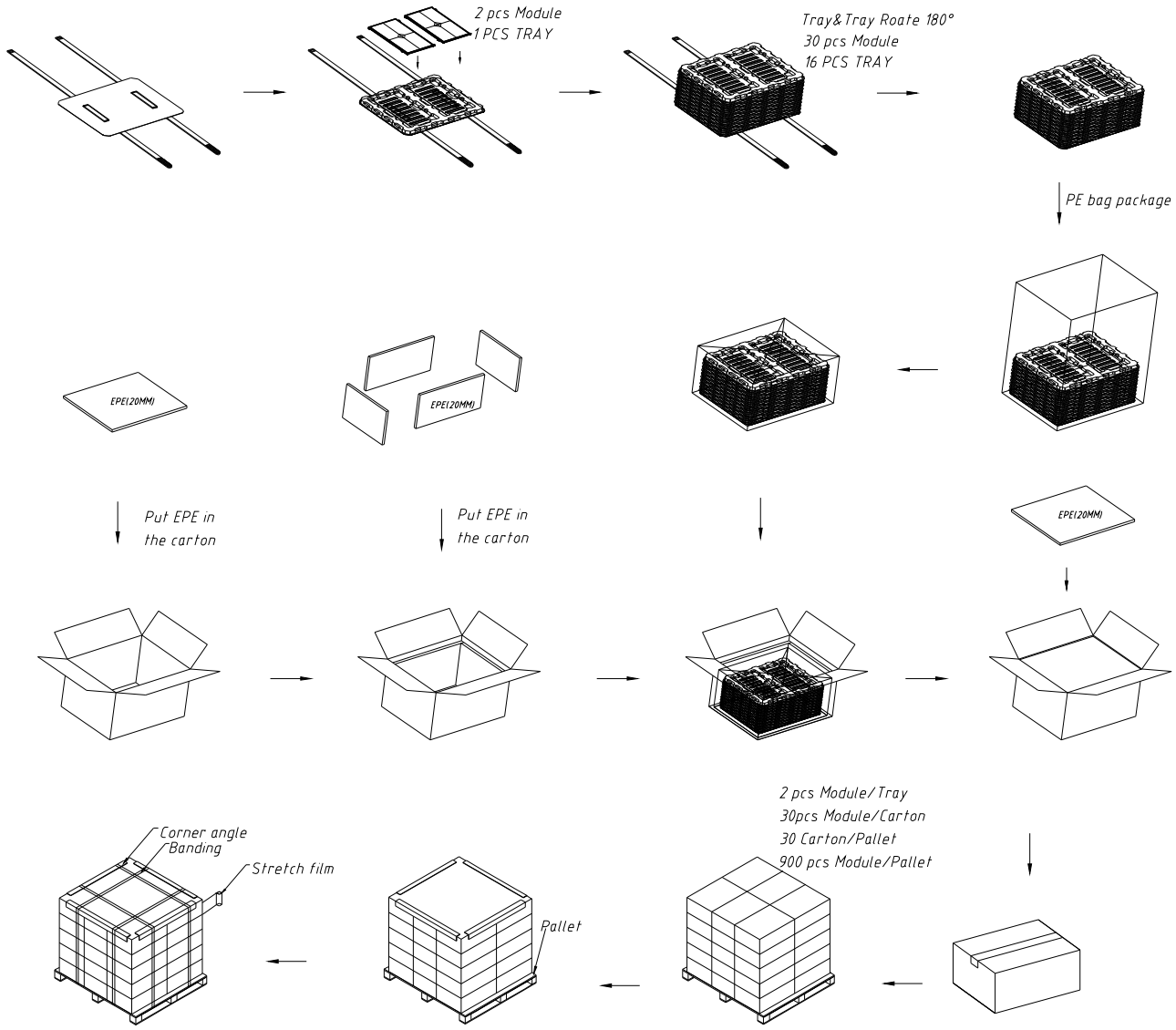
Note (3) In operating test, the backlight voltage and current must be in specification.

Note (4) There is no display function issue occurred, all the cosmetic specification is judged before the reliability stress.

Note (5) In case of malfunction defect caused by ESD damage. If it would be recovered to normal state after resetting, it would be judge as pass.

7.0 Package Specification

Figure 17 Packing Method



8.0 Lot Mark

TBD

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 Use Restriction

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

9.2 Handling Precaution

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

(2) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. IVO does not warrant the module, if customers disassemble or modify the module.

(3) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin. If liquid crystal contacts mouth or eyes, rinse out with water immediately. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

(4) Disconnect power supply before handling LCD module.

(5) Refrain from strong mechanical shock and /or any force to the module.

(6) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts parameters, environmental temperature; etc otherwise LCD module may be damaged. It's recommended employing protection circuit for power supply.

(7) Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

(8) When the surface is dusty, please wipe gently with absorbent cotton or other soft material. When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

(9) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

(10) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

(11) Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge, please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

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

9.3 Storage Precaution

(1) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

(2) The module shall not be exposed under strong light such as direct sunlight.Otherwise, display characteristics may be changed.

(3) The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

9.4 Operation Precaution

(1) Do not connect or disconnect the module in the "Power On" condition.

(2) Power supply should always be turned on/off by "Power On/Off Sequence".

(3) Module has high frequency circuits. Sufficient suppression to the electromagnetic

interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

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

9.5 Others

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

(2) Avoid condensation of water which may result in improper operation or disconnection of electrode.

(3) If the module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.

(4) This module has its circuitry PCB and should be handled carefully in order not to be stressed.

9.6 Disposal

When disposing LCD module, obey the local environmental regulations.