



**RAYSTAR**



**SPECIFICATION**

# OLED SPECIFICATION

Model No:

REX012864LYAP3N00000

## CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

## 1. Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2016/02/25		First release
A	2016/06/01		Modify Static electricity test
B	2016/12/07		Modify Interface
C	2017/09/18		Modify Reliability test Condition
D	2018/11/27		Modify Static electricity test Content of Test
E	2019/05/16		Add Interface & Size & Application recommendations & Initial code; Modify Interface Pin Function & Reliability test Condition

# Contents

- 1.General Specification
- 2.Module Classification Information
- 3.Interface Pin Function
- 4.Contour Drawing & Block Diagram
- 5.Absolute Maximum Ratings
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- 8.OLED Lifetime
- 9.Reliability
- 10.Inspection specification
- 11.Precautions in use of OLED Modules

## 1. General Specification

The Features is described as follow:

- Module dimension: 34.50 × 23.00 × 1.65 mm
- Active area: 29.42 × 14.20 mm
- Dot Matrix: 128\*64
- Pixel size: 0.205 × 0.197 mm
- Pixel pitch: 0.230 × 0.222 mm
- Duty: 1/64 Duty
- Display Mode : Passive Matrix
- Display Color: Yellow
- IC: SH1106G
- Interface: 6800/8080/3-SPI /4-SPI / I2C
- Size: 1.28inch

RAYSTAR OPTRONICS

## 2.Module Classification information

1	2	3	4	5	6	7	8	9	10	11	12	13	14
R	E	X	012864	L	Y	A	P	3	N	0	0	0	00

1	Brand : Raystar Optronics Inc.				
2	E : OLED				
3	Display Type	C : COB Character		G : COB Graphic	
		X : COG		H : COG + FR	
		P : COG + FR + PCB		T : TAB	
		A : COG + PCB			
4	Dot Matrix : 128*64				
5	Series				
6	Emitting Color	A : Amber		R : Red	C : Full Color
		B : Blue		W : White	
		G : Green		Y : Yellow	
		S : Sky Blue		X : Dual Color	
7	Polarizer	P : With Polarizer; N: Without Polarizer A : Anti-glare Polarizer			
8	Display Mode	P : Passive Matrix ; N : Active Matrix			
9	Driver Voltage	3 : 3.0~3.3V ; 5 : 5.0V			
10	Touch Panel	N : Without touch panel; T: With touch panel			
11	Product type	0 : Standard 1 : Daylight Readable 2 : Transparent OLED (TOLED) 3 : Flexible OLED (FOLED) 4 : OLED Lighting			
12	Inspection Grade	0 : Standard 2 : B grade C : Automotive grade Y : Consumer grade			
13	Option	0 : Default ; F : ZIF FPC ; H : Hot bar FPC; D : Demo Kit			
14	Serial No.	Serial number(00~ZZ)			

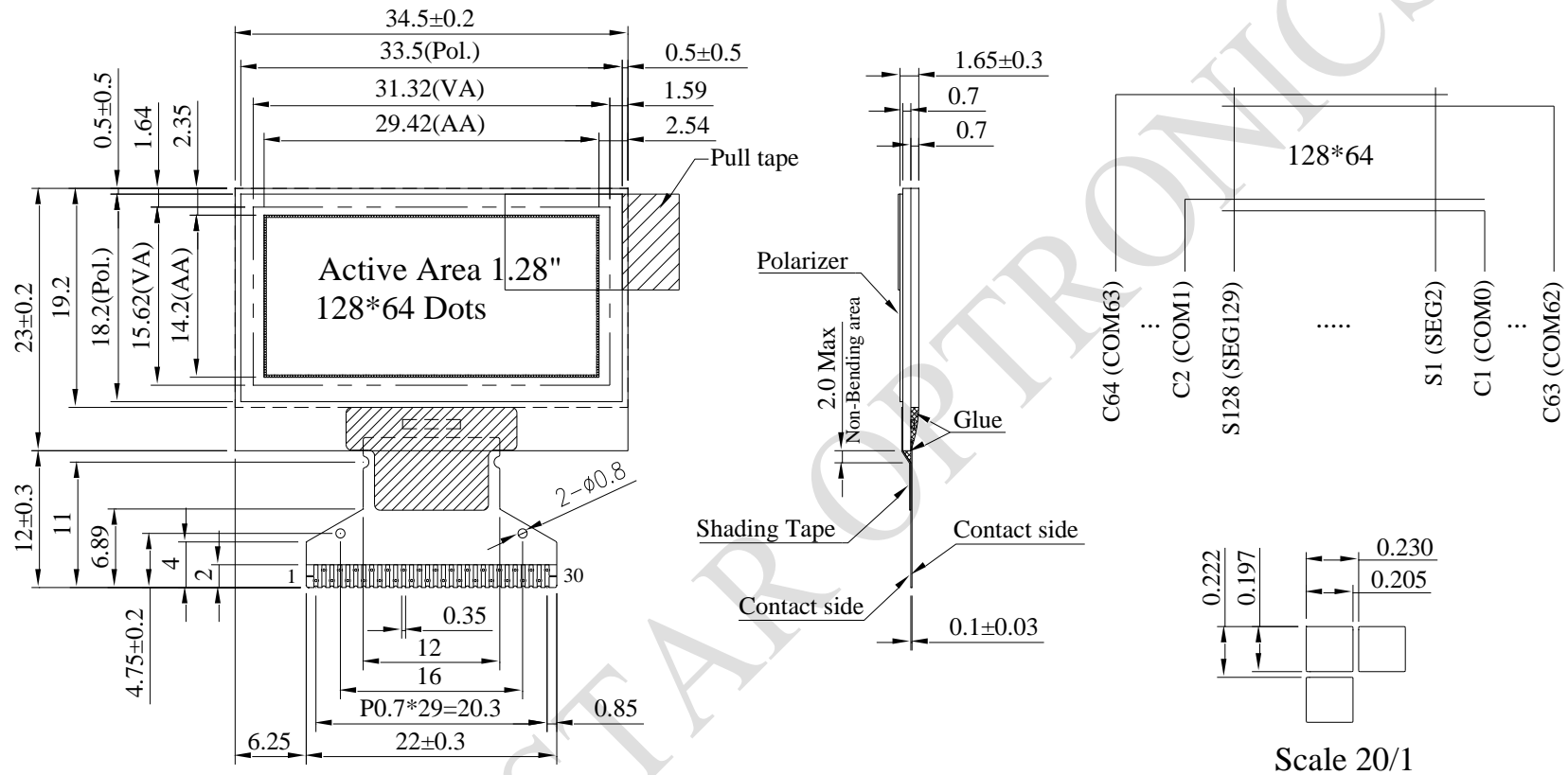
### 3. Interface Pin Function

No.	Symbol	Function																								
1	NC(GND)	No connection																								
2	C1N	Connect to charge pump capacitor.																								
3	C1P	These pins are not used and should be disconnected when Vpp is supplied externally.																								
4	C2P	Connect to charge pump capacitor.																								
5	C2N	These pins are not used and should be disconnected when Vpp is supplied externally.																								
6	VDD2	3.0 – 4.7V power supply pad for Power supply for charge pump circuit. This pin should be disconnected when VPP is supplied externally																								
7	NC	No connection																								
8	VSS	Ground.																								
9	VDD1	Power supply input: 1.65 - 3.5V																								
10	IM0	These are the MPU interface mode select pads.																								
11	IM1	<table border="1"> <thead> <tr> <th></th> <th>8080</th> <th>I<sup>2</sup>C</th> <th>6800</th> <th>4-wire SPI</th> <th>3-wire SPI</th> </tr> </thead> <tbody> <tr> <td>IM0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>IM1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>IM2</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> </tbody> </table>		8080	I <sup>2</sup> C	6800	4-wire SPI	3-wire SPI	IM0	0	0	0	0	1	IM1	1	1	0	0	0	IM2	1	0	1	0	0
	8080	I <sup>2</sup> C	6800	4-wire SPI	3-wire SPI																					
IM0	0	0	0	0	1																					
IM1	1	1	0	0	0																					
IM2	1	0	1	0	0																					
12	IM2																									
13	CSB	This pad is the chip select input. When CSB = “L”, then the chip select becomes active, and data/command I/O is enabled.																								
14	RESB	This is a reset signal input pad. When RES is set to “L”, the settings are initialized. The reset operation is performed by the RES signal level.																								
15	A0	This is the Data/Command control pad that determines whether the data bits are data or a command. A0 = “H”: the inputs at D0 to D7 are treated as display data. A0 = “L”: the inputs at D0 to D7 are transferred to the command registers. In I2C interface, this pad serves as SA0 to distinguish the different address of OLED driver.																								
16	WRB	This is a MPU interface input pad. When connected to an 8080 MPU, this is active LOW. This pad connects to the 8080 MPU WR signal. The signals on the data bus are latched at the rising edge of the WR signal. When connected to a 6800 Series MPU: This is the read/write control signal input terminal. When R/W = “H”: Read. When R/W = “L”: Write.																								

17	RDB	<p>This is a MPU interface input pad. When connected to an 8080 series MPU, it is active LOW. This pad is connected to the RD signal of the 8080 series MPU, and the data bus is in an output status when this signal is "L". When connected to a 6800 series MPU, this is active HIGH. This is used as an enable clock input of the 6800 series MPU. When RD = "H": Enable. When RD = "L": Disable.</p>
18	D0	<p>This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus. When the serial interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SI). At this time, D2 to D7 are set to high impedance. When the I2C interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SDAI). At this time, D2 to D7 are set to high impedance.</p>
19	D1	
20	D2	
21	D3	
22	D4	
23	D5	
24	D6	
25	D7	
26	IREF	<p>This is a segment current reference pad. A resistor should be connected between this pad and VSS. Set the current at 18.75uA.</p>
27	VCOMH	<p>This is a pad for the voltage output high level for common signals. A capacitor should be connected between this pad and VSS.</p>
28	VPP	<p>OLED panel power supply. Generated by internal charge pump. Connect to capacitor. It could be supplied externally.</p>
29	VSL	<p>This is a segment voltage reference pad. This pad should be connected to VSS externally.</p>
30	NC(GND)	No connection



## 4. Contour Drawing & Block Diagram

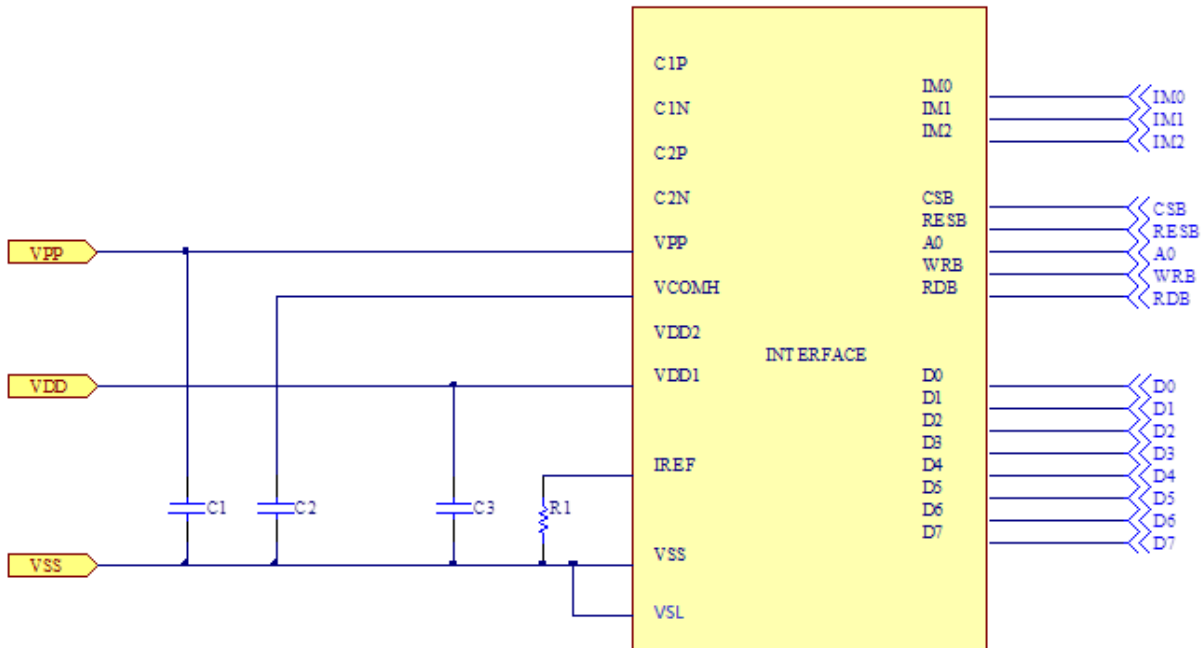


PIN	SYMBOL
1	NC(GND)
2	C1N
3	C1P
4	C2P
5	C2N
6	VDD2
7	NC
8	VSS
9	VDD1
10	IM0
11	IM1
12	IM2
13	CSB
14	RESB
15	A0
16	WRB
17	RDB
18	D0
19	D1
20	D2
21	D3
22	D4
23	D5
24	D6
25	D7
26	IREF
27	VCOMH
28	VPP
29	VSL
30	NC(GND)

The non-specified tolerance of dimension is  $\pm 0.3$ mm.

## 4.1 Application recommendations

### External VPP Solution



Recommended components :

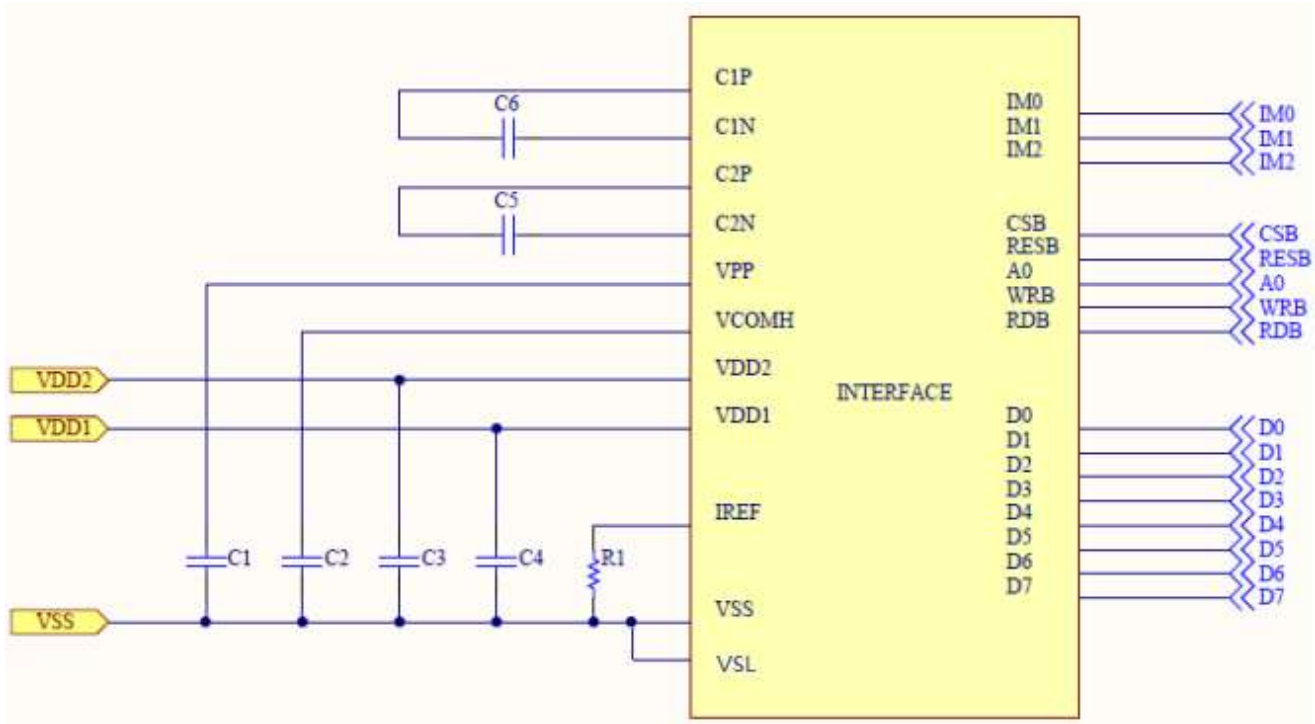
C1, C2 , C3 : 4.7uF

Bus Interface selection: (Must be set the IM[2:0], refer to item 4)

8-bits 6800 and 8080 parallel, 3 or 4-wire SPI, I2C

R1: about 310k (ISEG=300uA) ,  $R1 = (\text{Voltage at IREF} - VSS) / IREF$

## Built-in DC-DC Solution



Recommended components :

C1, C2, C3, C4 : 4.7uF

C5, C6 : 0.22uF

Bus Interface selection: (Must be set the IM[2:0], refer to item 4)

8-bits 6800 and 8080 parallel, 3 or 4-wire SPI, I2C

R1: about 310k (ISEG=300uA) ,  $R1 = (\text{Voltage at IREF} - \text{VSS})/\text{IREF}$

## 5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage for Logic	VDD1	-0.3	3.6	V
Power supply for charge pump circuit	VDD2	-0.3	4.8	V
Supply Voltage for Display	VPP	-0.3	14.5	V
Operating Temperature	TOP	-40	+80	°C
Storage Temperature	TSTG	-40	+85	°C

## 6. Electrical Characteristics

### 6.1 DC Electrical Characteristics

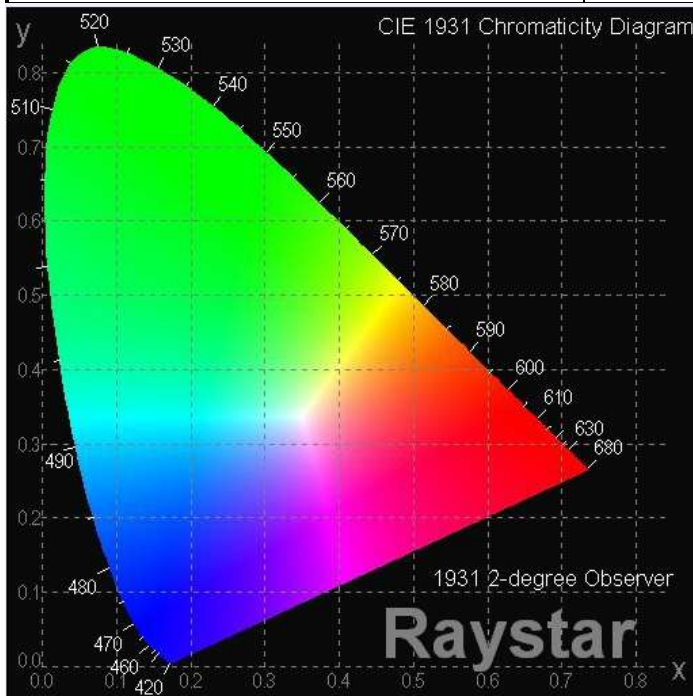
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD1	—	2.8	3.0	3.3	V
Supply Voltage for Display	VPP	—	6.75	7.25	7.75	V
High Level Input	VIH	—	0.8xVDD1	—	VDD1	V
Low Level Input	VIL	—	VSS	—	0.2xVDD1	V
High Level Output	VOH	—	0.8xVDD1	—	VDD1	V
Low Level Output	VOL	—	VSS	—	0.2xVDD1	V
50% Check Board operating Current		VPP =7.25V	5.0	6.0	7.0	mA

## 6.2 Initial code

```
void INIT_SH1106G(){  
  
    WriteCommand(0xB0);        //set page address  
    WriteCommand(0x10);        //set higher column address  
    WriteCommand(0x00);        //set lower column address  
  
    WriteCommand(0xA4);        //set entire display off  
  
    WriteCommand(0xD5);        //set display clock dievid ratio/osc frequency  
    WriteCommand(0x50);  
  
    WriteCommand(0xA8);        //buguan  
    WriteCommand(0x3F);        //3F  
  
    WriteCommand(0xD3);        //display offset,set to 0x00  
    WriteCommand(0x00);  
  
    WriteCommand(0x40);        //set start line,set to 0x40  
  
    WriteCommand(0xAD);        //set DC-DC OFF  
    WriteCommand(0x8A);        // 8B: ON ; 8A: OFF  
  
    WriteCommand(0x31);        //VPP   SET   7.4V  
  
    WriteCommand(0xA1);        //set segment re-map,SEG131~S0  
  
    WriteCommand(0xc8);        //set commom output scan direction;  
  
    WriteCommand(0xDA);        //common pad configuration  
    WriteCommand(0x12);  
  
    WriteCommand(0x81);        //set contrast  
    WriteCommand(0xff);  
  
    WriteCommand(0xD9);        //set dis-charge/pre-charge period  
    WriteCommand(0x11);  
  
    WriteCommand(0xDB);        //set VCOM deselect level  
    WriteCommand(0x35);  
  
    WriteCommand(0xA6);        //set normal display  
  
    WriteCommand(0xAF);        //display on  
  
}
```

## 7. Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) $\theta$	—	160	—	—	deg
	(H) $\phi$	—	160	—	—	deg
Contrast Ratio	CR	Dark	2000:1	—	—	—
Response Time	T rise	—	—	10	—	$\mu$ s
	T fall	—	—	10	—	$\mu$ s
Display with 50% check Board Brightness			100	120	—	cd/m <sup>2</sup>
CIEx(Yellow)		x,y(CIE1931)	0.45	0.47	0.49	—
CIEy(Yellow)		x,y(CIE1931)	0.48	0.50	0.52	—



## 8.OLED Lifetime

ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% check board brightness 100cd/ m <sup>2</sup>	50,000 Hrs	-	Note


Notes:

1. Life time is defined the amount of time when the luminance has decayed to <50% of the initial value.
2. This analysis method uses life data obtained under accelerated conditions to extrapolate an estimated probability density function (*pdf*) for the product under normal use conditions.
3. Screen saving mode will extend OLED lifetime.



## 9. Reliability

### Content of Reliability Test

Environmental Test			
Test Item	Content of Test	Test Condition	Applicable Standard
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85°C 240hrs	—
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40°C 240hrs	—
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 240hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-40°C 240hrs	—
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60°C, 90%RH 240hrs	—
High Temperature/ Humidity Operation	Endurance test applying the high temperature and high humidity Operation for a long time.	60°C, 90%RH 120hrs	—
Temperature Cycle	Endurance test applying the low and high temperature cycle. -40°C    25°C    80°C  30min    5min    30min 	-40°C / 80°C 30 cycles	—
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	Frequency: 10~55Hz amplitude: 1.5mm Time: 0.5hrs/axis Test axis: X, Y, Z	—
Others			
Static electricity test	Endurance test applying the electric stress to the finished product housing.	Air Discharge model ±4kv, 10 times	—

\*\*\* Supply voltage for OLED system = Operating voltage at 25°C

### Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability. After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at  $23\pm 5^{\circ}\text{C}$ ;  $55\pm 15\%$  RH.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for High Temperature storage, High Temperature/ Humidity Storage, Temperature Cycle

### Evaluation criteria

1. The function test is OK.
2. No observable defects.
3. Luminance:  $> 50\%$  of initial value.
4. Current consumption: within  $\pm 50\%$  of initial value.

### APPENDIX:

#### RESIDUE IMAGE

Because the pixels are lighted in different time, the luminance of active pixels may reduce or differ from inactive pixels. Therefore, the residue image will occur. To avoid the residue image, every pixel needs to be lighted up uniformly.

## 10. Inspection specification

### Inspection Standard:

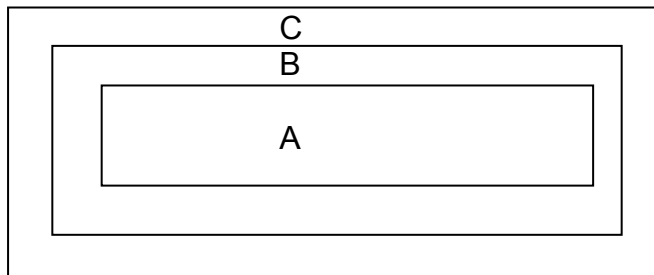
MIL-STD-105E table normal inspection single sample level II.

### Definition

1 Major defect : The defect that greatly affect the usability of product.

2 Minor defect : The other defects, such as cosmetic defects, etc.

Definition of inspection zone:



Zone A: Active Area

Zone B: Viewing Area except Zone A

Zone C: Outside Viewing Area

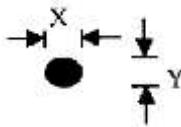
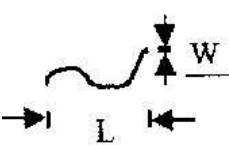
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer's product.

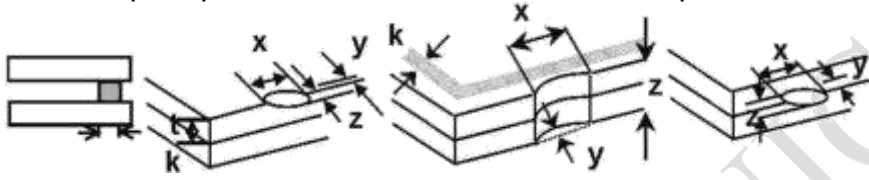
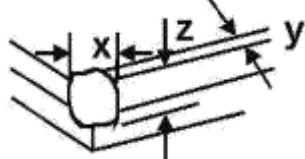
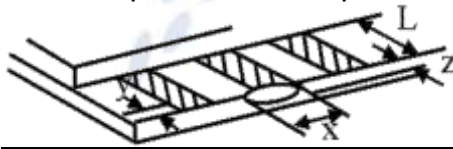
### Inspection Methods

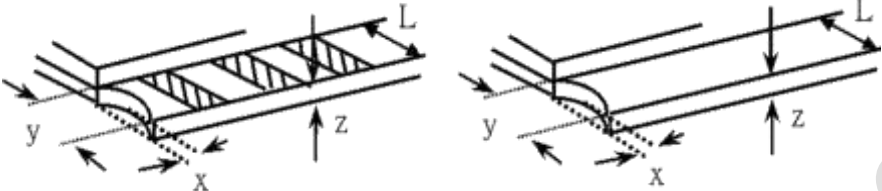
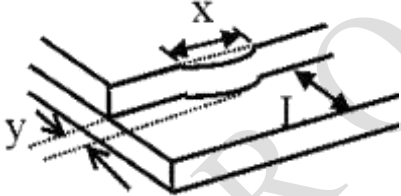
1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm viewing distance, within 45° viewing angle, under 25±5°C.

2 The luminance and color coordinate inspection : By SR-3 or BM-7 or the equal equipments, in the dark room, under 25±5°C.

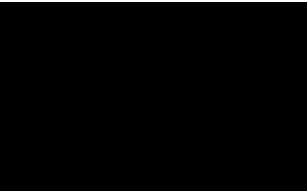
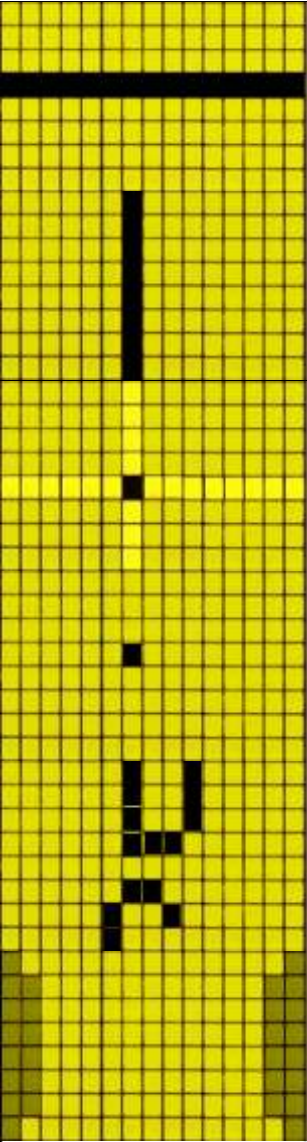
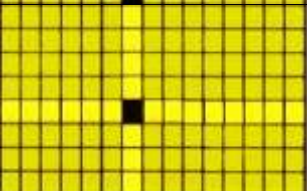
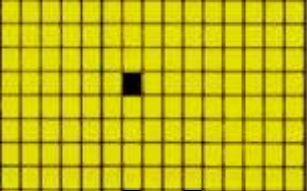
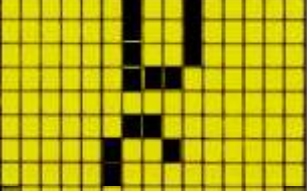
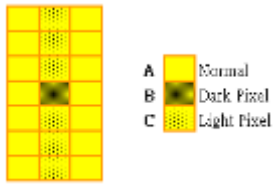
NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65
02	Black or white spots on OLED (display only)	2.1 White and black spots on display $\leq 0.25\text{mm}$ , no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm.	2.5

NO	Item	Criterion	AQL																			
03	OLED black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi = (x + y) / 2$  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>SIZE</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td>Accept no dense</td> <td>A+ B,</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.20</math></td> <td>2</td> <td>A+ B</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.25</math></td> <td>1</td> <td>A+ B</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> <td>A+ B</td> </tr> </tbody> </table>	SIZE	Acceptable QTY	Zone	$\Phi \leq 0.10$	Accept no dense	A+ B,	$0.10 < \Phi \leq 0.20$	2	A+ B	$0.20 < \Phi \leq 0.25$	1	A+ B	$0.25 < \Phi$	0	A+ B	2.5				
		SIZE	Acceptable QTY	Zone																		
$\Phi \leq 0.10$	Accept no dense	A+ B,																				
$0.10 < \Phi \leq 0.20$	2	A+ B																				
$0.20 < \Phi \leq 0.25$	1	A+ B																				
$0.25 < \Phi$	0	A+ B																				
		3.2 Line type : (As following drawing)  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.02</math></td> <td>Accept no dense</td> <td>A+B</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.03</math></td> <td rowspan="2">2</td> <td>A+B</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>A+B</td> </tr> <tr> <td>---</td> <td><math>0.05 &lt; W</math></td> <td>As round type</td> <td></td> </tr> </tbody> </table>	Length	Width	Acceptable QTY	Zone	---	$W \leq 0.02$	Accept no dense	A+B	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	A+B	$L \leq 2.5$	$0.03 < W \leq 0.05$	A+B	---	$0.05 < W$	As round type		2.5
Length	Width	Acceptable QTY	Zone																			
---	$W \leq 0.02$	Accept no dense	A+B																			
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$L \leq 2.5$	$0.03 < W \leq 0.05$		A+B																			
---	$0.05 < W$	As round type																				
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Size <math>\Phi</math></th> <th>Acceptable QTY</th> <th>Zone</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.20</math></td> <td>Accept no dense</td> <td>A+B</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.50</math></td> <td>3</td> <td>A+B</td> </tr> <tr> <td><math>0.50 &lt; \Phi \leq 1.00</math></td> <td>2</td> <td>A+B</td> </tr> <tr> <td><math>1.00 &lt; \Phi</math></td> <td>0</td> <td>A+B</td> </tr> <tr> <td>Total QTY</td> <td>3</td> <td></td> </tr> </tbody> </table>	Size $\Phi$	Acceptable QTY	Zone	$\Phi \leq 0.20$	Accept no dense	A+B	$0.20 < \Phi \leq 0.50$	3	A+B	$0.50 < \Phi \leq 1.00$	2	A+B	$1.00 < \Phi$	0	A+B	Total QTY	3		2.5	
Size $\Phi$	Acceptable QTY	Zone																				
$\Phi \leq 0.20$	Accept no dense	A+B																				
$0.20 < \Phi \leq 0.50$	3	A+B																				
$0.50 < \Phi \leq 1.00$	2	A+B																				
$1.00 < \Phi$	0	A+B																				
Total QTY	3																					
05	Scratches	Follow NO.3 OLED black spots, white spots, contamination.																				

NO	Item	Criterion	AQL									
06	Chipped glass	<p>Symbols Define:            x: Chip length      y: Chip width      z: Chip thickness            k: Seal width      t: Glass thickness      a: OLED side length            L: Electrode pad length:            6.1 General glass chip :            6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="435 730 1339 856"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></td> </tr> </tbody> </table> <p>⊙ If there are 2 or more chips, x is total length of each chip.</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
	z: Chip thickness	y: Chip width	x: Chip length									
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$										
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$										
		<p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="435 1180 1360 1306"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></td> </tr> </tbody> </table> <p>⊙ If there are 2 or more chips, x is the total length of each chip.</p>	z: Chip thickness	y: Chip width	x: Chip length	$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$	$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$	2.5
z: Chip thickness	y: Chip width	x: Chip length										
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$										
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$										
	Glass crack	<p>Symbols :            x: Chip length      y: Chip width      z: Chip thickness            k: Seal width      t: Glass thickness      a: OLED side length            L: Electrode pad length            6.2 Protrusion over terminal :            6.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="435 1753 1339 1837"> <thead> <tr> <th>y: Chip width</th> <th>x: Chip length</th> <th>z: Chip thickness</th> </tr> </thead> <tbody> <tr> <td><math>y \leq 0.5mm</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </tbody> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5mm$	$x \leq 1/8a$	$0 < z \leq t$	2.5			
y: Chip width	x: Chip length	z: Chip thickness										
$y \leq 0.5mm$	$x \leq 1/8a$	$0 < z \leq t$										

NO	Item	Criterion	AQL										
06	Glass crack	<p>6.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="506 594 1377 674"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq L</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p>⊙ If the product will be heat sealed by the customer, the alignment mark not be damaged.</p> <p>6.2.3 Substrate protuberance and internal crack.</p> <table border="1" data-bbox="841 957 1344 1037"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td><math>y \leq 1/3L</math></td> <td><math>x \leq a</math></td> </tr> </table> 	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$x \leq a$	2.5
y: Chip width	x: Chip length	z: Chip thickness											
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$											
y: width	x: length												
$y \leq 1/3L$	$x \leq a$												
07	Cracked glass	The OLED with extensive crack is not acceptable.	2.5										
08	Backlight elements	<p>8.1 Illumination source flickers when lit.</p> <p>8.2 Spots or scratched that appear when lit must be judged. Using OLED spot, lines and contamination standards.</p> <p>8.3 Backlight doesn't light or color wrong.</p>	0.65 2.5 0.65										
09	Bezel	<p>9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination.</p> <p>9.2 Bezel must comply with job specifications.</p>	2.5 0.65										

NO	Item	Criterion	AQL
10	PCB , COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination.	2.5
		10.2 COB seal surface may not have pinholes through to the IC.	2.5
		10.3 The height of the COB should not exceed the height indicated in the assembly diagram.	0.65
		10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places.	2.5
		10.5 No oxidation or contamination PCB terminals.	2.5
		10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts.	0.65
		10.7 The jumper on the PCB should conform to the product characteristic chart.	0.65
		10.8 If solder gets on bezel tab pads, OLED pad, zebra pad or screw hold pad, make sure it is smoothed down.	2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB.	2.5
		11.2 No cold solder joints, missing solder connections, oxidation or icicle.	2.5
		11.3 No residue or solder balls on PCB.	2.5
		11.4 No short circuits in components on PCB.	0.65
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		12.7 Sealant on top of the ITO circuit has not hardened.	2.5
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 OLED pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	0.65

Check Item	Classification	Criteria
No Display	Major	
Missing Line	Major	
Pixel Short	Major	
Darker Short	Major	
Wrong Display	Major	
Un-uniform B/A x 100% < 70% A/C x 100% < 70%	Major	 <p> <b>A</b> Normal  <b>B</b> Dark Pixel  <b>C</b> Light Pixel         </p>



## 11. Precautions in use of OLED Modules

- (1) Avoid applying excessive shocks to module or making any alterations or modifications to it.
- (2) Don't make extra holes on the printed circuit board, modify its shape or change the components of OLED display module.
- (3) Don't disassemble the OLED display module.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist OLED display module.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please storage in anti-static electricity container and clean environment.
- (8) It's pretty common to use "Screen Saver" to extend the lifetime and Don't use fix information for long time in real application.
- (9) Don't use fixed information in OLED panel for long time, that will extend "screen burn" effect time.
- (10) Raystar has the right to change the passive components, including R2 and R3 adjust resistors. (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.)
- (11) Raystar have the right to change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance...etc, under the premise of not affecting the electrical characteristics and external dimensions, Raystar have the right to modify the version.)

### 11.1 Handling Precautions

- (1) Since the display panel is being made of glass, do not apply mechanical impacts such as dropping from a high position.
- (2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale nor lick the organic substance.
- (3) If pressure is applied to the display surface or its neighborhood of the OLED display module, the cell structure may be damaged and be careful not to apply pressure to these sections.
- (4) The polarizer covering the surface of the OLED display module is soft and easily scratched. Please be careful when handling the OLED display module.
- (5) When the surface of the polarizer of the OLED display module has soil, clean the surface. It takes advantage of by using following adhesion tape.

\* Scotch Mending Tape No. 810 or an equivalent

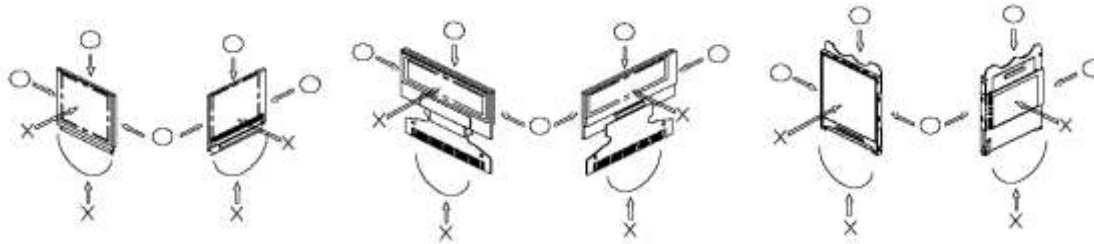
Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent. Also, pay attention that the following liquid and solvent may spoil the polarizer:

\* Water

\* Ketone

\* Aromatic Solvents

- (6) Hold OLED display module very carefully when placing OLED display module into the System housing. Do not apply excessive stress or pressure to OLED display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the display performance. Also, secure sufficient rigidity for the outer cases.



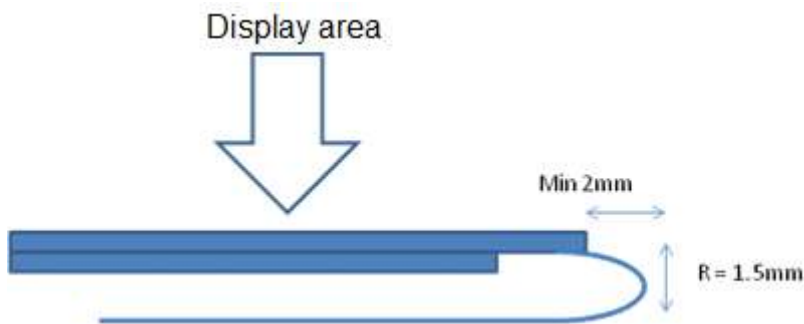
- (7) Do not apply stress to the LSI chips and the surrounding molded sections.
- (8) Do not disassemble nor modify the OLED display module.
- (9) Do not apply input signals while the logic power is off.
- (10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence of element breakage accidents by static electricity.
  - \* Be sure to make human body grounding when handling OLED display modules.
  - \* Be sure to ground tools to use or assembly such as soldering irons.
  - \* To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
  - \* Protective film is being applied to the surface of the display panel of the OLED display module. Be careful since static electricity may be generated when exfoliating the protective film.
- (11) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. At this time, if the OLED display module has been stored surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5.
- (12) If electric current is applied when the OLED display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

## 11.2 Storage Precautions

- (1) When storing OLED display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps. And, also, avoiding high temperature and high humidity environment or low temperature (less than 0°C) environments. (We recommend you to store these modules in the packaged state when they were shipped from Raystar Optronics Inc. At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.
- (2) If electric current is applied when water drops are adhering to the surface of the OLED display module, when the OLED display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

### 11.3 Designing Precautions

- (1) The absolute maximum ratings are the ratings which cannot be exceeded for OLED display module, and if these values are exceeded, panel damage may be happen.
- (2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
- (3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
- (4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighboring devices.
- (5) As for EMI, take necessary measures on the equipment side basically.
- (6) When fastening the OLED display module, fasten the external plastic housing section.
- (7) If power supply to the OLED display module is forcibly shut down by such errors as taking out the main battery while the OLED display panel is in operation, we cannot guarantee the quality of this OLED display module. Connection (contact) to any other potential than the above may lead to rupture of the IC.
- (8) The limitation of FPC and Film bending.



**Module Sample Estimate Feedback Sheet**

**Module Number :** \_\_\_\_\_

**1 、 Panel Specification :**

1. Panel Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Numbers of Pixel :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. View Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Active Area :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Emitting Color :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Uniformity :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Operating Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Storage Temperature :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9. Others :	_____	

**2 、 Mechanical Specification :**

1. PCB Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Frame Size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Material of Frame :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Connector Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Fix Hole Position :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6. Thickness of PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7. Height of Frame to PCB :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8. Height of Module :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
9. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

**3 、 Relative Hole Size :**

1. Pitch of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2. Hole size of Connector :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3. Mounting Hole size :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4. Mounting Hole Type :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5. Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

>> **Go to page 2** <<

Module Number : \_\_\_\_\_

**4 · Electronic Characteristics of Module :**

1.Input Voltage :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
2.Supply Current :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
3.Driving Voltage for OLED :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
4.Contrast for OLED :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
5.Negative Voltage Output :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
6.Interface Function :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
7.ESD test :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____
8.Others :	<input type="checkbox"/> Pass	<input type="checkbox"/> NG , _____

**5 · Summary :**

Sales signature : \_\_\_\_\_

Customer Signature : \_\_\_\_\_

Date : / /