RAYSTAR

SPECIFICATION

OLED SPECIFICATION

Model No:

REX002004CYPP5N00000

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	2014/07/29		First release
A	2015/12/08		Modify Life Time
B	2016/06/01		Modify Static electricity test
C	2017/09/12		Modify Reliability test Condition
D	2018/11/27		Modify Static electricity test Content of Test
E	2019/09/02		Modify Precautions in use of OLED Modules
F	2019/12/18		Modify Reliability Test measurement conditions & Inspection specification:" Accept no dense" modify to "ignore"& Precautions
G	2020/02/06		Modify Drawing & thickness & Absolute Maximum Ratings & Electrical Characteristics & Reliability test Condition Add Application recommendations & Initial code

Contents

1.General Specification

The Features is described as follow:

- Module dimension: 84.5 x 27.5 x 2.17 mm

- View area: 72.42 x 22.82mm

- Active area: 70.42 x 20.82 mm

- Number of Characters: 20 characters x 4 Lines

- Dot size: 0.57 x 0.57 mm

- Dot pitch: 0.60 x 0.60 mm

- Character size: 2.97 x 4.77 mm

- Character pitch: 3.55 x 5.35 mm

- Duty: 1/32

- Emitting Color: OLED , Yellow

- IC: SSD1311

- Interface: 6800,8080,SPI,I2C

- Size: 2.89 inch

2.Module Classification Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14
R	E	X	002004	C	Y	P	P	5	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	Number of Characters：20Characters,04Lines.		
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

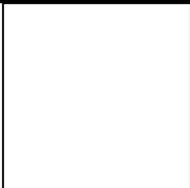| Pin No.	Symbol	Pin Type	Description
1	NC	—	No connection
2	VSL	P	This is segment voltage (output low level) reference pin. When external VSL is not used, this pin should be left open. When external VSL is used, connect with resistor and diode to ground (details depend on application).
3	VSS	P	Ground pin. It must be connected to external ground.
4	REGVDD	I	Internal VDD regulator selection pin in 5V I/O application mode. When this pin is pulled HIGH, internal VDD regulator is enabled (5V I/O application). When this pin is pulled LOW, internal VDD regulator is disabled (Low voltage I/O application).
5	SHLC	I	This pin is used to determine the Common output scanning direction. COM scan direction <table><tr><td>SHLC</td><td>COM scan direction</td></tr><tr><td>1</td><td>COM0 to COM31 (Normal)</td></tr><tr><td>0</td><td>COM31 to COM0 (Reverse)</td></tr></table> Note (1) 0 is connected to VSS (2) 1 is connected to VDDIO
6	SHLS	I	This pin is used to change the mapping between the display data column address and the Segment driver. SEG scan direction <table><tr><td>SHLS</td><td>SEG direction</td></tr><tr><td>1</td><td>SEG0 to SEG99 (Normal)</td></tr><tr><td>0</td><td>SEG99 to SEG0 (Reverse)</td></tr></table> Note (1) 0 is connected to VSS (2) 1 is connected to VDDIO
7	VDD	P	Power supply for core logic operation. VDD can be supplied externally or regulated internally. In LV IO application (internal VDD is disabled), this is a power input pin. In 5V IO application (internal VDD is enabled), VDD is regulated internally from VDDIO. A capacitor should be connected between VDD and VSS under all circumstances.

8	VDDIO	P	Low voltage power supply and power supply for interface logic level in both Low Voltage I/O and 5V I/O application. It should match with the MCU interface voltage level and must be connected to external source.
9	BS0	I	MCU bus interface selection pins. Select appropriate logic setting as described in the following table. BS2, BS1 and BS0 are pin select.
10	BS1		
11	BS2		Bus Interface selection

<table>
<tr><td>BS[2:0]</td><td>Interface</td></tr>
<tr><td>000</td><td>Serial Interface</td></tr>
<tr><td>001</td><td>Invalid</td></tr>
<tr><td>010</td><td>I²C</td></tr>
<tr><td>011</td><td>Invalid</td></tr>
<tr><td>100</td><td>8-bit 6800 parallel</td></tr>
<tr><td>101</td><td>4-bit 6800 parallel</td></tr>
<tr><td>110</td><td>8-bit 8080 parallel</td></tr>
<tr><td>111</td><td>4-bit 8080 parallel</td></tr>
</table>

Note
(1) 0 is connected to VSS
(2) 1 is connected to VDDIO

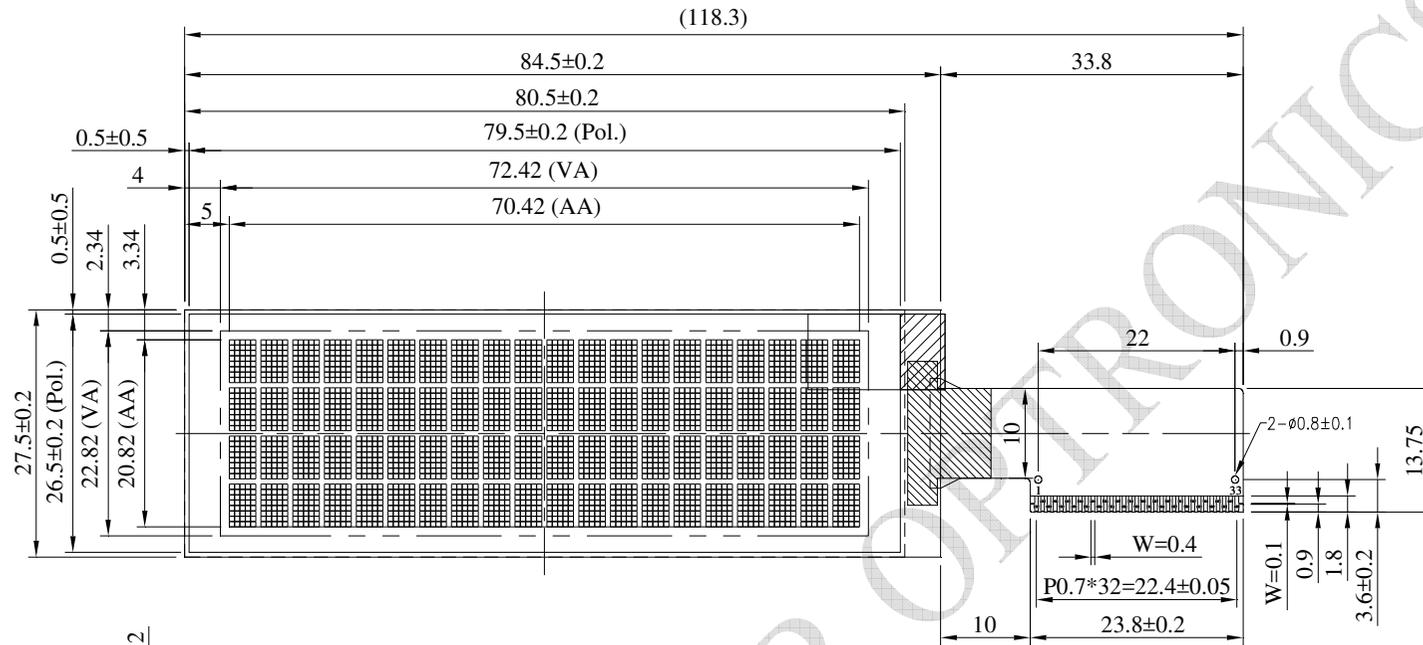| 12	GPIO	I/O	It is a GPIO pin. Details refer to OLED command DCh.
13	CS#	I	This pin is the chip select input connecting to the MCU. The chip is enabled for MCU communication only when CS# is pulled LOW (active LOW). In I2C mode, this pin must be connected to VSS.
14	RES#	I	This pin is reset signal input. When the pin is pulled LOW, initialization of the chip is executed. Keep this pin pull HIGH during normal operation.
15	D/C#	I	This pin is Data/Command control pin connecting to the MCU. When the pin is pulled HIGH, the data at D[7:0] will be interpreted as data. When the pin is pulled LOW, the data at D[7:0] will be transferred to a command register. In I2C mode, this pin acts as SA0 for slave address selection. When serial interface is selected, this pin must be connected to VSS.

| 16	R/W#(WR#)	I	This pin is read / write control input pin connecting to the MCU interface. When 6800 interface mode is selected, this pin will be used as Read/Write (R/W#) selection input. Read mode will be carried out when this pin is pulled HIGH and write mode when LOW. When 8080 interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected. When serial or I2C interface is selected, this pin must be connected to VSS.
17	E(RD#)	I	This pin is MCU interface input. When 6800 interface mode is selected, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled HIGH and the chip is selected. When 8080 interface mode is selected, this pin receives the Read (RD#) signal. Read operation is initiated when this pin is pulled LOW and the chip is selected. When serial or I2C interface is selected, this pin must be connected to VSS.
18	D0	I/O	These pins are bi-directional data bus connecting to the MCU data bus. Unused pins are recommended to tie LOW. When serial interface mode is selected, D0 will be the serial clock input: SCLK; D1 will be the serial data input: SID and D2 will be the serial data output: SOD. When I2C mode is selected, D2, D1 should be tied together and serve as SDAout, SDAin in application and D0 is the serial clock input, SCL.
19	D1		
20	D2		
21	D3		
22	D4		
23	D5		
24	D6		
25	D7		
26	IREF	I	This pin is the segment output current reference pin. IREF is supplied externally. A resistor should be connected between this pin and VSS to maintain current of around 15uA.
27	ROM0	I	These pins are used to select Character ROM; select

| 28 | ROM1 | | appropriate logic setting as described in the following table. ROM1 and ROM0 are pin select as shown in below table: Character ROM selection |

ROM1	ROM0	ROM
0	0	A
0	1	B
1	0	C
1	1	S/W selectable [3]

Note
(1) 0 is connected to VSS
(2) 1 is connected to VDDIO

| 29 | OPR0 | I | This pin is used to select the character number of character generator. |
| 30 | OPR1 | | Character RAM selection |

OPR1	OPR0	CGROM	CGRAM
1	1	256	0
0	1	248	8
1	0	250	6
0	0	240	8

Note
(1) 0 is connected to VSS
(2) 1 is connected to VDDIO

31	VCOMH	P	COM signal deselected voltage level. A capacitor should be connected between this pin and VSS. No external power supply is allowed to connect to this pin.
32	VCC	P	Power supply for panel driving voltage. This is also the most positive power voltage supply pin. It is supplied by external high voltage source.
33	NC	—	No connection

4.Contour Drawing & Block Diagram

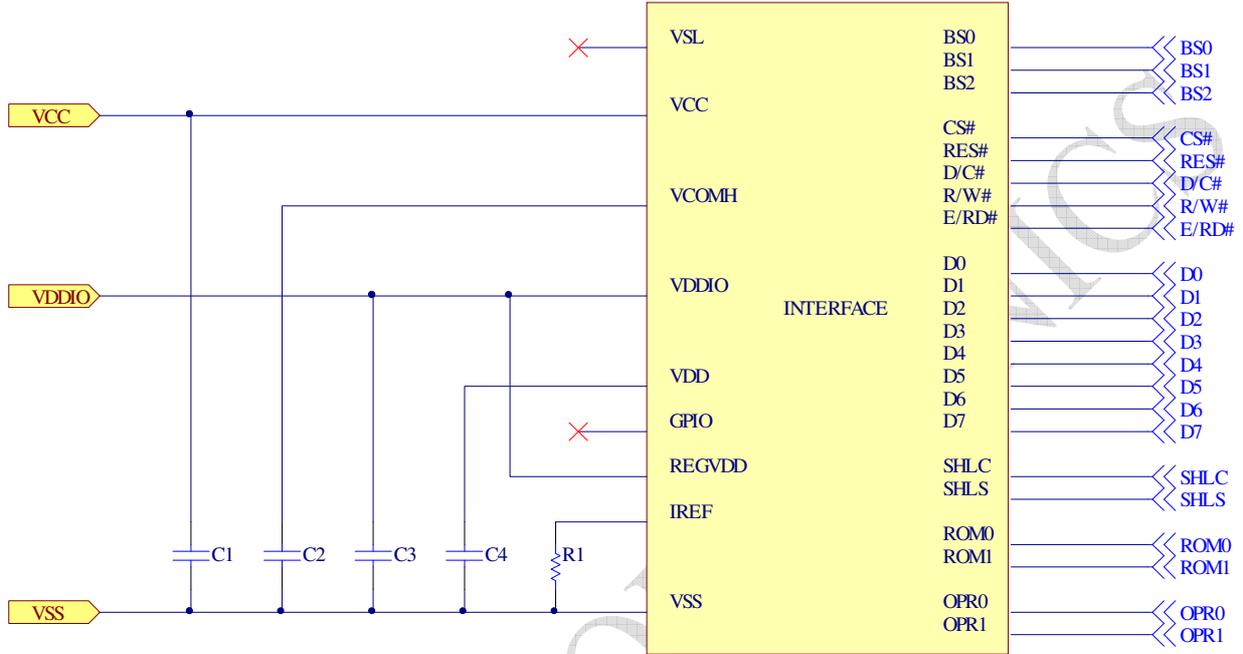| PIN	SYMBOL	PIN	SYMBOL
1	NC	18	D0
2	VSL	19	D1
3	VSS	20	D2
4	REGVDD	21	D3
5	SHLC	22	D4
6	SHLS	23	D5
7	VDD	24	D6
8	VDDIO	25	D7
9	BS0	26	IREF
10	BS1	27	ROM0
11	BS2	28	ROM1
12	GPIO	29	OPR0
13	CS#	30	OPR1
14	RES#	31	VCOMH
15	D/C#	32	VCC
16	R/W#(WR#)	33	NC
17	E(RD#)		
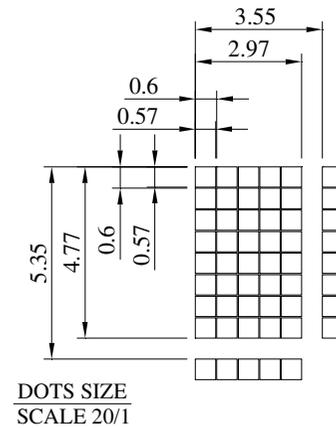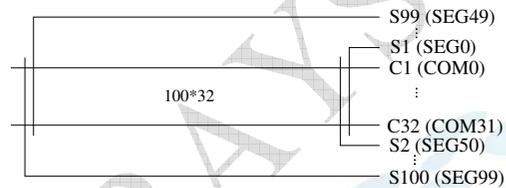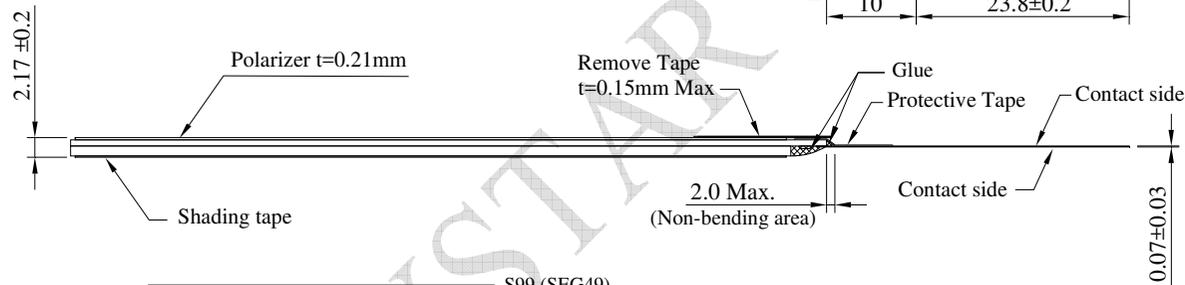
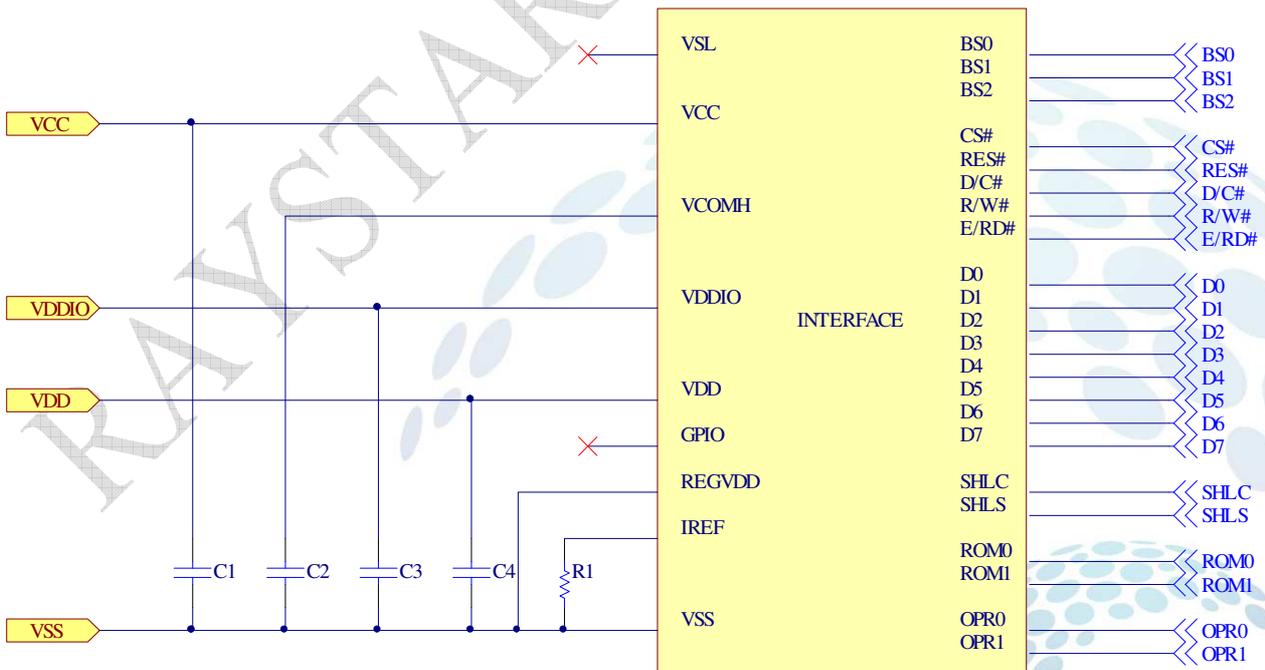The non-specified tolerance of dimension is ±0.3mm.

4.1 Application recommendations

5V I/O Application:

Low Voltage I/O Application:

C1, C2: 4.7uF (1)
C3, C4: 1.0uF (1) Place close to IC VDDIO / VDD and VSS pins on PCB

Bus Interface selection: (Must be set the BS[2:0], refer to item 3)
8-bits 6800 and 8080 parallel, 4-bits 6800 and 8080 parallel, SPI, I2C

Voltage at IREF = VCC – 4.5V. For VCC = 10V, IREF = 15uA:
R1 = (Voltage at IREF - VSS) / IREF
≈ (10-4.5)V / 15uA
= 365KΩ

Pin Name	Low Voltage I/O Application	5V I/O Application
REGVDD	LOW, disable 5V I/O regulator	HIGH, enable 5V I/O regulator
VDD	2.8 - VDDIO	NC with stabilizing capacitor It is internally regulated
VDDIO	2.8V - 3.3V	4.8V - 5.3V

Note
The capacitor value is recommended value. Select appropriate value against module application.

5.Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Notes
Supply Voltage For Logic	VDD	-0.3	VDDIO	V	—
Power Supply for I/O pins	VDDIO	-0.3	6	V	—
Operating Voltage	VCC	0	16	V	—
Operating Temperature	TOP	-40	+80	°C	—
Storage Temperature	TST	-40	+85	°C	—

Note 1: All the above voltages are on the basis of "VSS = 0V".

Note 2: When this module is used beyond the above absolute maximum ratings, permanent

breakage of the module may occur. Also, for normal operations, it is desirable to use this

module under the conditions according to Section 6 ''Electrical Characteristics''. If this module

is used beyond these conditions, malfunctioning of the module can occur and the reliability of

the module may deteriorate

6.Electrical Characteristics

6.1 DC Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	VDD	Low Voltage I/O	2.8	3.0	3.3	V
		5V I/O (VDD as output)	—	—	—	V
Power supply for I/O pins	VDDIO	Low Voltage I/O	2.8	3.0	3.3	V
		5V I/O	4.8	5.0	5.3	V
Operating Voltage	VCC	—	9.5	10.0	10.5	V
Input High Volt.	VIH	—	0.8xVDDIO	—	—	V
Input Low Volt.	VIL	—	—	—	0.2xVDDIO	V
Output High Volt.	VOH	IOH=-0.5mA	0.9xVDDIO	—	—	V
Output Low Volt.	VOL	IOL=0.5mA	—	—	0.1xVDDIO	V
50% Check Board Operating Current	ICC	VCC=10V	—	19	21	mA

6.2 Initial code

```
void Initial_SSD1311(){

    WriteCmd(0x08);        //Display off

    WriteCmd(0x2A);        //Function Set

    //RE =1,SD=0,IS = 0

    WriteCmd(0x71);        //Function Selection A
    WriteData(0x4C);       //Internal VDD Regulator ON for 5V I/O Application
    //WriteData(0x00);     //Internal VDD Regulator OFF for Low Voltage I/O Application

    WriteCmd(0x72);        //Function Selection B
    WriteData(0x00);       //Select Font table

    WriteCmd(0x79);        //OLED characterization    ON

    //RE =1,SD=1,IS = 0

    WriteCmd(0x81);         //Set Contrast
    WriteCmd(0xCF)

    WriteCmd(0xD5);        //Set display clock divide Ratio
    WriteCmd(0x60);        //105Hz

    WriteCmd(0xD9);        //Set phase Length
    WriteCmd(0x78);

    WriteCmd(0xDA);        //Set SEG pin Hardware Config.
    WriteCmd(0x10);        //Default value

    WriteCmd(0xDB);        //Set VcomH Deselect Level
    WriteCmd(0x40);

    WriteCmd(0xDC);         // Function Selection C
    WriteCmd(0x03);         // Internal VSL

    delay(10);

    WriteCmd(0x78);            //OLED characterization    OFF
```

```
    //RE = 1 ,SD=0,IS = 0

    WriteCmd(0x09);        ,        // Extended function Set

    WriteCmd(0x06);                // scan direction

    WriteCmd(0x28);                //Function Set //Extended command Set ending

    //RE = 0,SD=0,IS = 0

    WriteCmd(0x01);                //clear display

    WriteCmd(0x02);                //Return home

    WriteCmd(0x06);                //entry mode Set

    WriteCmd(0x0C);                //display on
}
```
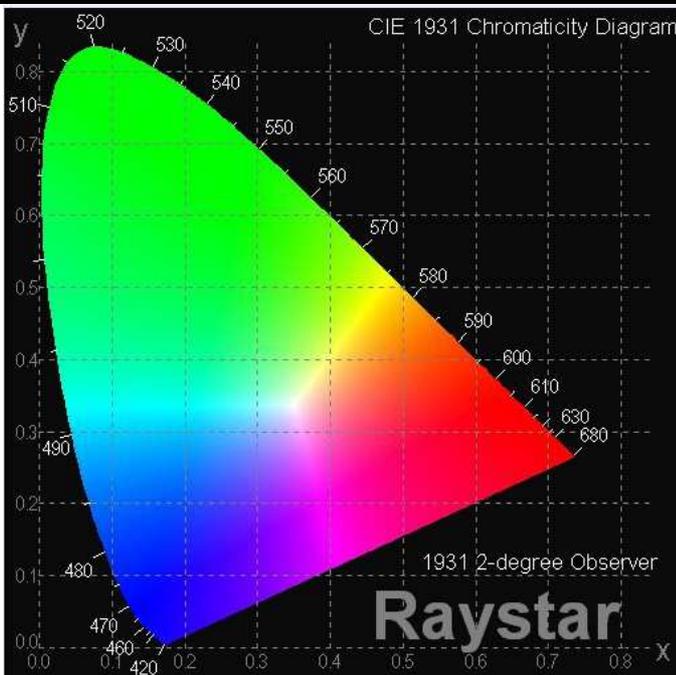
7.Optical Characteristics

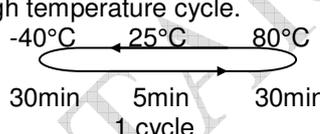| Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ	—	160	—	—	deg
	(H)φ	—	160	—	—	deg
Contrast Ratio	CR	Dark	2000:1	—	—	—
Response Time	T rise	—	—	10	—	µs
	T fall	—	—	10	—	µs
Display with 50% check Board Brightness			120	130	—	cd/m2
CIEx(Yellow)		x,y(CIE1931)	0.45	0.47	0.49	—
CIEy(Yellow)		x,y(CIE1931)	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^2	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 1 cycle	-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±5°C; 55±15% RH.
2. All-pixels on/off exchange 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 ± 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:

```
                    C
                    B
                    A
```
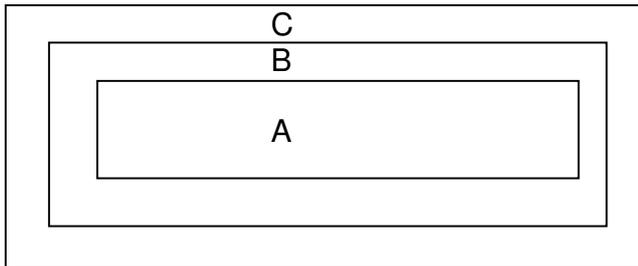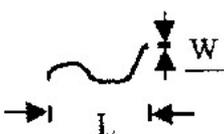
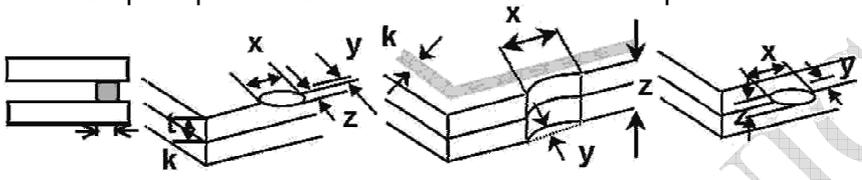Zone A: Active Area

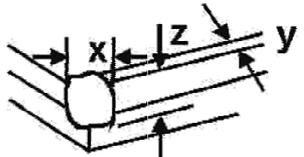Zone B: Viewing Area except Zone A

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.
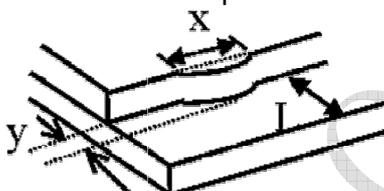
Inspection Methods

1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm viewing distance, within 45º 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.
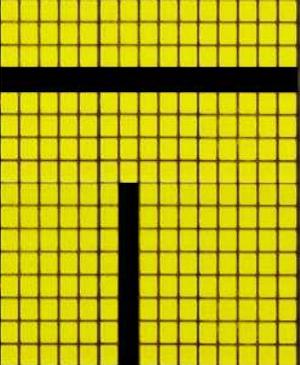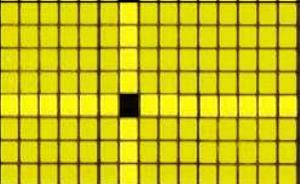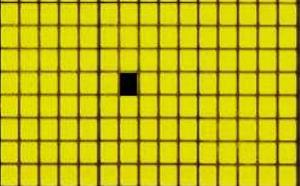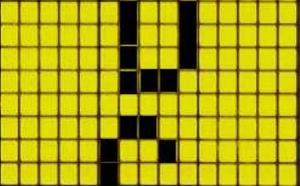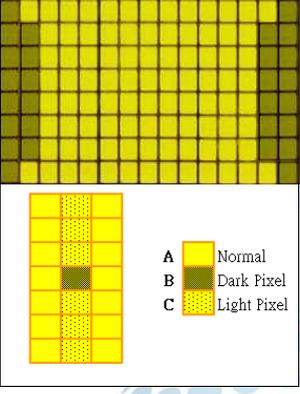
NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed 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 $\leqq$ 0.25mm, 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 $\Phi = (x + y) / 2$				2.5

3.1 Round type table:
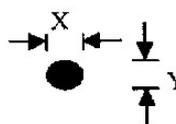
SIZE	Acceptable QTY	Zone
$\Phi \leqq 0.10$	ignore	A+ B,
$0.10 < \Phi \leqq 0.20$	2	A+ B
$0.20 < \Phi \leqq 0.25$	1	A+ B
$0.25 < \Phi$	0	A+ B

3.2 Line type : (As following drawing)

Length	Width	Acceptable Q TY	Zone
---	$W \leqq 0.02$	ignore	A+B
$L \leqq 3.0$	$0.02 < W \leqq 0.03$	2	A+B
$L \leqq 2.5$	$0.03 < W \leqq 0.05$		A+B
---	$0.05 < W$	As round type	

AQL for item 03: 2.5

NO	Item	Criterion	AQL
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.	2.5

Size Φ	Acceptable Q TY	Zone
$\Phi \leqq 0.20$	ignore	A+B
$0.20 < \Phi \leqq 0.50$	3	A+B
$0.50 < \Phi \leqq 1.00$	2	A+B
$1.00 < \Phi$	0	A+B
Total Q TY	3	

| 05 | Scratches | Follow NO.3 OLED black spots, white spots, contamination. | |

NO	Item	Criterion	AQL
06	Chipped glass	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: | z: Chip thickness	y: Chip width	x: Chip length | | $Z \leqq 1/2t$ | Not over viewing area | $x \leqq 1/8a$ | | $1/2t < z \leqq 2t$ | Not exceed $1/3k$ | $x \leqq 1/8a$ | ⊙If there are 2 or more chips, x is total length of each chip.	2.5
06	Chipped glass	6.1.2 Corner crack: | z: Chip thickness | y: Chip width | x: Chip length | | $Z \leqq 1/2t$ | Not over viewing area | $x \leqq 1/8a$ | | $1/2t < z \leqq 2t$ | Not exceed $1/3k$ | $x \leqq 1/8a$ | ⊙If there are 2 or more chips, x is the total length of each chip.	2.5
06	Glass crack	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 : | y: Chip width | x: Chip length | z: Chip thickness | | $y \leqq 0.5mm$ | $x \leqq 1/8a$ | $0 < z \leqq t$ |	2.5

6.1.1 Chip on panel surface and crack between panels:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leqq 1/2t$	Not over viewing area	$x \leqq 1/8a$
$1/2t < z \leqq 2t$	Not exceed $1/3k$	$x \leqq 1/8a$

⊙If there are 2 or more chips, x is total length of each chip.

6.1.2 Corner crack:

z: Chip thickness	y: Chip width	x: Chip length
$Z \leqq 1/2t$	Not over viewing area	$x \leqq 1/8a$
$1/2t < z \leqq 2t$	Not exceed $1/3k$	$x \leqq 1/8a$

⊙If there are 2 or more chips, x is the total length of each chip.

6.2.1 Chip on electrode pad :

y: Chip width	x: Chip length	z: Chip thickness
$y \leqq 0.5mm$	$x \leqq 1/8a$	$0 < z \leqq t$

NO	Item	Criterion	AQL
06	Glass crack	6.2.2 Non-conductive portion: | y: Chip width	x: Chip length	z: Chip thickness | | $y \leq L$ | $x \leq 1/8a$ | $0 < z \leq t$ | ⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙If the product will be heat sealed by the customer, the alignment mark not be damaged. 6.2.3 Substrate protuberance and internal crack. | y: width | x: length | | $y \leq 1/3L$ | $x \leq a$ |	2.5
07	Cracked glass	The OLED with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using OLED spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
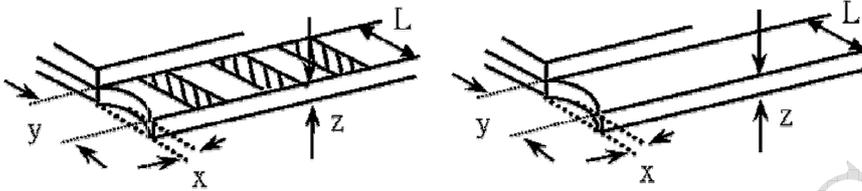
NO	Item	Criterion	AQL
10	PCB , COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 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. 10.7 The jumper on the PCB should conform to the product characteristic chart. 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 2.5 0.65 2.5 2.5 0.65 0.65 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. 12.2 No cracks on interface pin (OLB) of TCP. 12.3 No contamination, solder residue or solder balls on product. 12.4 The IC on the TCP may not be damaged, circuits. 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. 12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 12.7 Sealant on top of the ITO circuit has not hardened. 12.8 Pin type must match type in specification sheet. 12.9 OLED pin loose or missing pins. 12.10 Product packaging must the same as specified on packaging specification sheet. 12.11 Product dimension and structure must conform to product specification sheet.	2.5 0.65 2.5 2.5 2.5 2.5 2.5 0.65 0.65 0.65 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	A Normal B Dark Pixel C Light Pixel

11.Precautions in use of OLED Modules 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, change the components or modify its shape of OLED display module.
(3) Don't disassemble the OLED display module.
(4) Do not apply input signals while the logic power is off.
(5) Don't operate it above the absolute maximum rating.
(6) Don't drop, bend or twist OLED display module.
(7) Soldering: only to the I/O terminals.
(8) Hot-Bar FPC soldering condition: 280~350C, less than 5 seconds.
(9) Raystar has the right to change the passive components (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.) and 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.)
(10) Raystar has the right to upgrade or modify the product function.

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. So, 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.
(5) When the surface of the polarizer of the OLED display module has soil, clean the surface. It takes advantage 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 such as ethyl alcohol, since the surface of the polarizer will become cloudy.
   Also, pay attention that the following liquid and solvent may spoil the polarizer:
   * Water
   * Ketone
   * Aromatic Solvents
(6) 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 for a long period of time, residue adhesive material of the protection film may remain on the 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.
(7) Do not touch the following sections whenever possible while handling the OLED display modules.
   * Pins and electrodes
   * Pattern layouts such as the TCP & FPC
(8) 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.
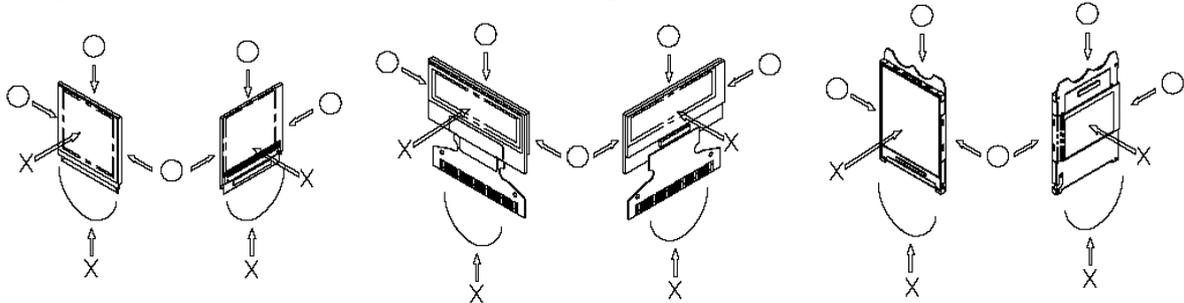
(9)   Do not apply stress to the LSI chips and the surrounding molded sections.
(10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence of element breakage accidents by static electricity.
      * Be sure to make human body grounding when handling 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.

11.2. Storage Precautions
(1)   When storing OLED display modules, put them in static electricity preventive bags to avoid be directly exposed to sun or lights of fluorescent lamps. (We recommend you to store these modules in the packaged state when they were shipped from Raystar. At that time, be careful not to let water drops adhere to the packages or bags.)

(2)   When the OLED display module is being dewed or when it is placed under high temperature or high humidity environments, the electrodes may be corroded if electric current is applied. Please store it in clean environment.

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, OLED display module may be damaged.
(2)   To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specification and 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 / VCC). (Recommend value: 0.5A)
(4)   Pay sufficient attention to avoid occurrence of mutual noise interference with the nearby devices.
(5)   As for EMI, take necessary measures on the equipment side basically.
(6)   If the power supplied 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.

(7) If this OLED driver is exposed to light, malfunctioning may occur and semiconductor elements may change their characteristics.

(8) The internal status may be changed, if excessive external noise enters into the module. Therefore, it is necessary to take appropriate measures to suppress noise generation or to protect module from influences of noise on the system design.

(9) We recommend you to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

(10) It's pretty common to use "Screen Saver" to extend the lifetime and Don't use the same image for long time in real application. When an OLED display module is operated for a long of time with fixed pattern, an afterimage or slight contrast deviation may occur.

(11) The limitation of FPC and Film bending.
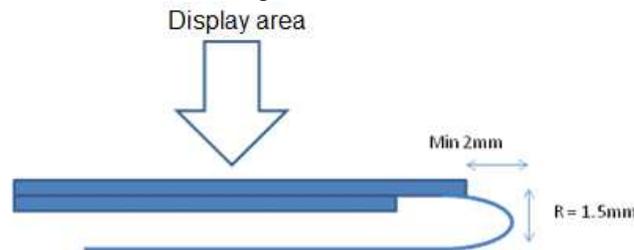
(12) The module should be fixed balanced into the housing, or the module may be twisted.
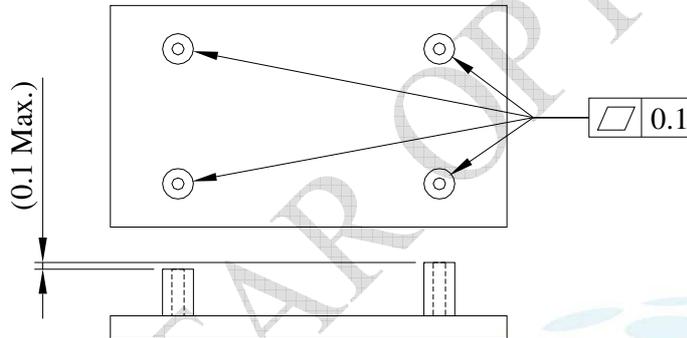
(13) Please heat up a little the tape sticking on the components when removing it; otherwise the components might be damaged.

11.4. Precautions when disposing of the OLED display modules

(1) Request the qualified companies to handle industrial wastes when disposing of the OLED display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.

Module Sample Estimate Feedback Sheet

Module Number：_____

1、Panel Specification：

1. Panel Type：	□ Pass	□NG ,_____
2. Numbers of Pixel：	□ Pass	□NG ,_____
3. View Area：	□ Pass	□NG ,_____
4. Active Area：	□ Pass	□NG ,_____
5.Emitting Color：	□ Pass	□NG ,_____
6.Uniformity：	□Pass	□NG ,_____
7.Operating Temperature：	□ Pass	□NG ,_____
8.Storage Temperature：	□ Pass	□NG ,_____
9.Others： _____		

2、Mechanical Specification：

1. PCB Size：	□Pass	□NG ,_____
2.Frame Size：	□Pass	□NG ,_____
3.Materal of Frame：	□Pass	□NG ,_____
4.Connector Position：	□Pass	□NG ,_____
5.Fix Hole Position：	□Pass	□NG ,_____
6. Thickness of PCB：	□Pass	□NG ,_____
7. Height of Frame to PCB：	□Pass	□NG ,_____
8.Height of Module：	□Pass	□NG ,_____
9.Others：	□Pass	□NG ,_____

3、Relative Hole Size：

1.Pitch of Connector：	□Pass	□NG ,_____
2.Hole size of Connector：	□Pass	□NG ,_____
3.Mounting Hole size：	□Pass	□NG ,_____
4.Mounting Hole Type：	□Pass	□NG ,_____
5.Others：	□Pass	□NG ,_____

＞＞ **Go to page 2** ＜＜

Module Number：		
4、Electronic Characteristics of Module：		
1.Input Voltage：	□Pass	□NG ,
2.Supply Current：	□Pass	□NG ,
3.Driving Voltage for OLED：	□Pass	□NG ,
4.Contrast for OLED：	□Pass	□NG ,
5.Negative Voltage Output：	□Pass	□NG ,
6.Interface Function：	□Pass	□NG ,
7.ESD test：	□Pass	□NG ,
8.Others：	□Pass	□NG ,

5、Summary：

Sales signature：

Customer Signature：   **Date**： / /