RAYSTAR

SPECIFICATION

OLED SPECIFICATION

Model No:

REX012832EYAP3N00000

New Product only for reference

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

1. Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2016/02/25		First release

Contents

1.General Specification

The Features is described as follow:

- Module dimension: 33.4× 14.5 × 1.65 mm

- Active area: 25.58×6.38 mm

- Dot Matrix: 128*64

- Pixel size: 0.176 × 0.176 mm

- Pixel pitch: 0.200× 0.200 mm

- Display Mode：Passive Matrix

- Duty: 1/32 Duty

- Display Color: Yellow

- IC: SSD1306BZ

2.Module Coding System

1	2	3	4	5	6	7	8	9	10	11	12	13
R	E	X	012832	E	Y	A	P	3	N	0	0	000

Item	Description		
1	R：Raystar Optronics Inc.		
2	E：OLED		
3	Display Type: C→Character Type, G→Graphic Type,T→TAB Type ,X→COG Type		
4	Dot Matrix： 128* 32		
5	Serials code		
6	Emitting Color	A：Amber	R：RED
		B：Blue	Y：Yellow
		G：Green	W：White
		S：Sky Blue	
7	Polarizer	P：With Polarizer; N: Without Polarizer	
		A：Anti-glare Polarizer	
8	Display Mode	P：Passive Matrix ; A: Active Matrix	
9	Driver Voltage	3: 3.0 V; 5: 5.0V	
10	Touch Panel	N：Without touch panel; T: With touch panel	
		S：Resistive touch panel	
11	Products type	0:Standard type 1: Sunlight Readable type 2:Transparent OLED (TOLED) 3:Flexible OLED 4:OLED for Lighting	
12	Product grades	0：Standard(A-level) 2：B-level 3：C-level 1：high class(AA-level) Y：Consumer product	
13	Serial No.	Application serial number(000~ZZZ)	

3. Interface Pin Function

No.	Symbol	Function
1	N.C. (GND)	*Reserved Pin (Supporting Pin)* The supporting pins can reduce the influences from stresses on the function pins. These pins must be connected to external ground.
2	C2N	*Positive Terminal of the Flying Inverting Capacitor Negative Terminal of*
3	C2P	*the Flying Boost Capacitor* The charge-pump capacitors are required
4	C1P	between the terminals. They must be floated when the converter is not
5	C1N	used.
6	VBAT	*Power Supply for DC/DC Converter Circuit* This is the power supply pin for the internal buffer of the DC/DC voltage converter. It must be connected to external source when the converter is used. It should be connected to VDD when the converter is not used.
7	NC	NC
8	VSS	*Ground of Logic Circuit* This is a ground pin. It acts as a reference for the logic pins. It must be connected to external ground.
9	VDD	*Power Supply for Logic* This is a voltage supply pin. It must be connected to external source.
10	BS0	*Communicating Protocol Select* These pins are MCU interface selection input. See the following table:
11	BS1	
12	BS2	

	BS0	BS1	BS2
I2C	0	1	0
3-wire SPI	1	0	0
4-wire SPI	0	0	0
8-bit 68XX Parallel	0	0	1
8-bit 80XX Parallel	0	1	1

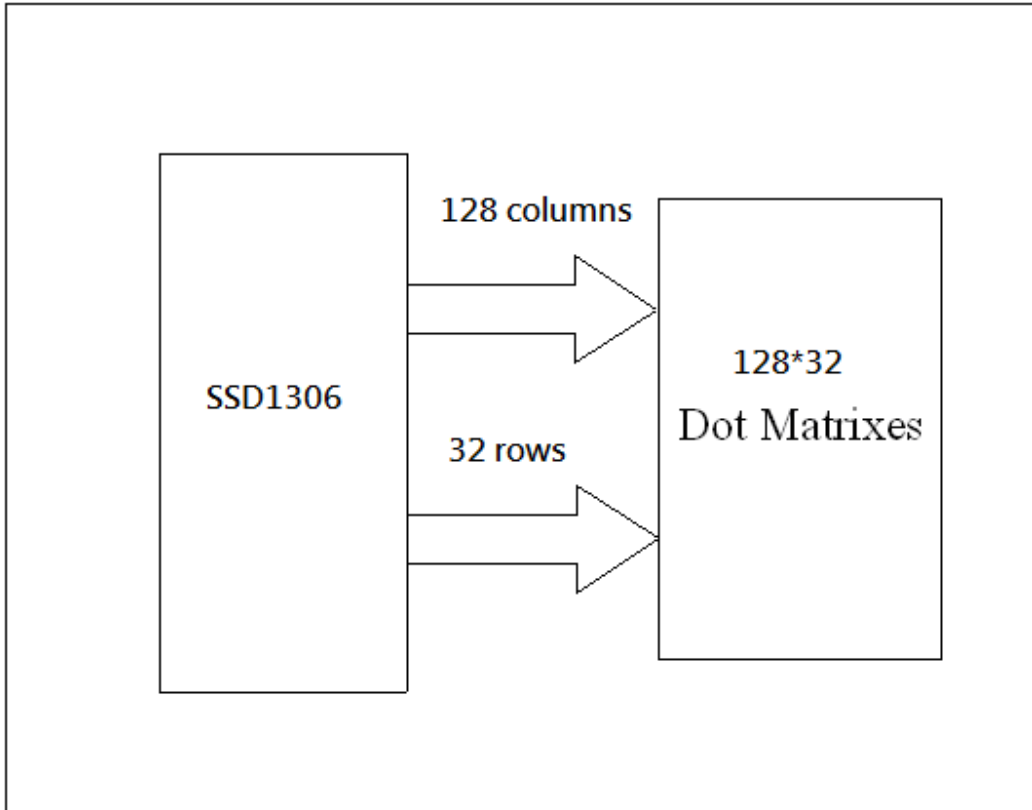| No.	Symbol	Function
13	CS#	*Chip Select* This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.
14	RES#	*Power Reset for Controller and Driver* This pin is reset signal input. When the pin is low, initialization of the chip is executed.
15	D/C#	*Data/Command Control* This pin is Data/Command control pin. When the pin is pulled high, the input at D7~D0 is treated as display data. When the pin is pulled low, the input at D7~D0 will be transferred to the command register. For detail relationship to MCU interface signals, please refer to the Timing Characteristics Diagrams. When the pin is pulled high and serial interface mode is selected, the data at SDIN is treated as data. When it is pulled low, the data at SDIN will be transferred to the command register. In I2C mode, this pin acts as SA0 for slave address selection.

17	RDB	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.
18	D0	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.
19	D1	
20	D2	
21	D3	
22	D4	
23	D5	
24	D6	
25	D7	
26	IREF	This is a segment current reference pad. A resistor should be connected between this pad and VSS. Set the current at 12.5mA.
27	VCOMH	This is a pad for the voltage output high level for common signals. A capacitor should be connected between this pad and VSS.
28	VPP	OLED panel power supply. Generated by internal charge pump. Connect to capacitor. It could be supplied externally.
29	VLSS	This is a segment voltage reference pad. This pad should be connected to VSS externally.
30	NC(GND)	No connection

4. Contour Drawing & Block Diagram

PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	NC(GND)	14	RES#
2	C2N	15	D/C#
3	C2P	16	R/W#
4	C1P	17	E/RD#
5	C1N	18	D0
6	VBAT	19	D1
7	NC	20	D2
8	VSS	21	D3
9	VDD	22	D4
10	BS0	23	D5
11	BS1	24	D6
12	BS2	25	D7
13	CS#	26	IREF
		27	VCOMH
		28	VCC
		29	VLSS
		30	NC(GND)

Active Area 1.04"
128*32 Dots

Pull tape

Contact Side   Contact Side

SCALE: 10/1

The non-specified tolerance of dimension is ±0.3mm.
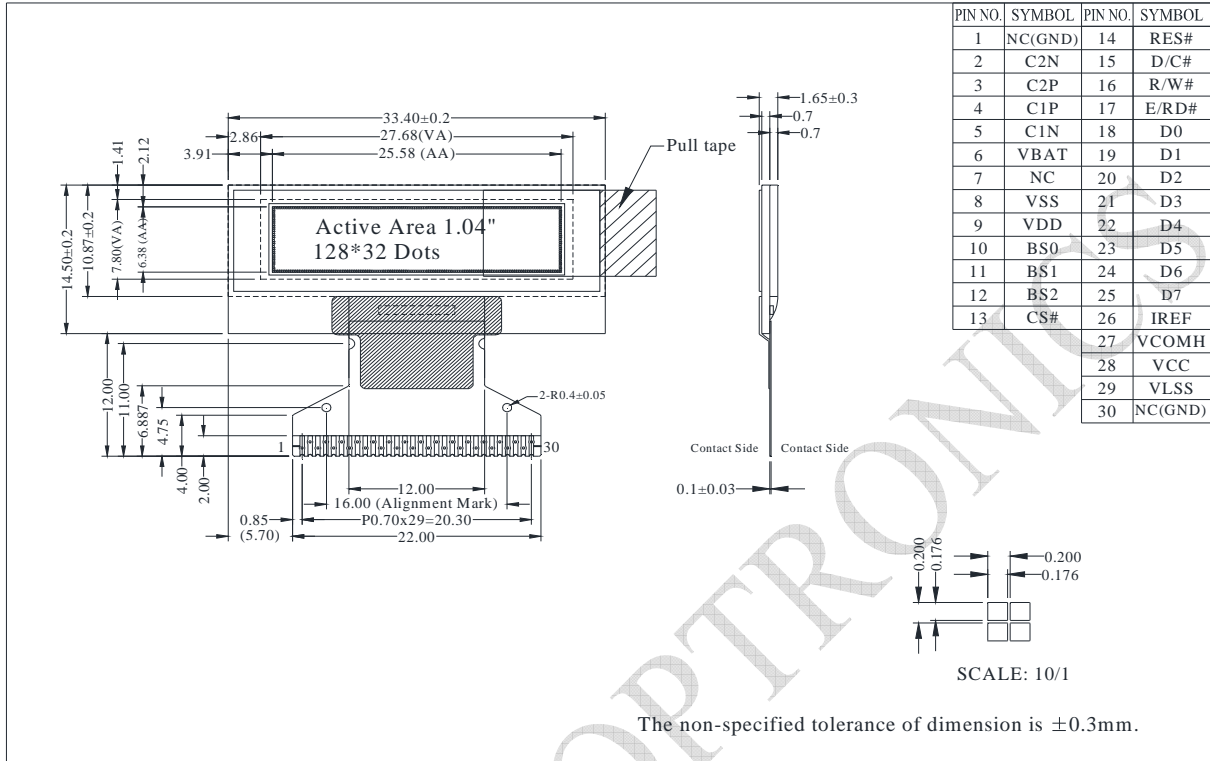
FUNCTION BLOCK DIAGRAM

*For more information, please refer to Application Note provided by Raystar Optronics.

5.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	VDD	0	4	V	1,2
Supply Voltage for Display	VCC	0	16	V	1,2
Operating Temperature	TOP	-40	+80	°C	—
Storage Temperature	TSTG	-40	+80	°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."Optics & 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

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	—	2.8	3.0	3.3	V
Supply Voltage for Display	VCC	—	7	7.25	7.5	V
High Level Input	VIH	—	0.8VDD	—	VDD	V
Low Level Input	VIL	—	VSS	—	0.2VDD	V
High Level Output	VOH	—	0.8VDD	—	VDD	V
Low Level Input	VOL	—	VSS	—	0.2VDD	V
50% Check Board operating Current		VCC =7.25V	4	5	6	mA

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			100	120	—	cd/m2
CIEx(Yellow)		x,y(CIE1931)	0.45	0.47	0.49	—
CIEy(Yellow)		x,y(CIE1931)	0.48	0.50	0.52	—
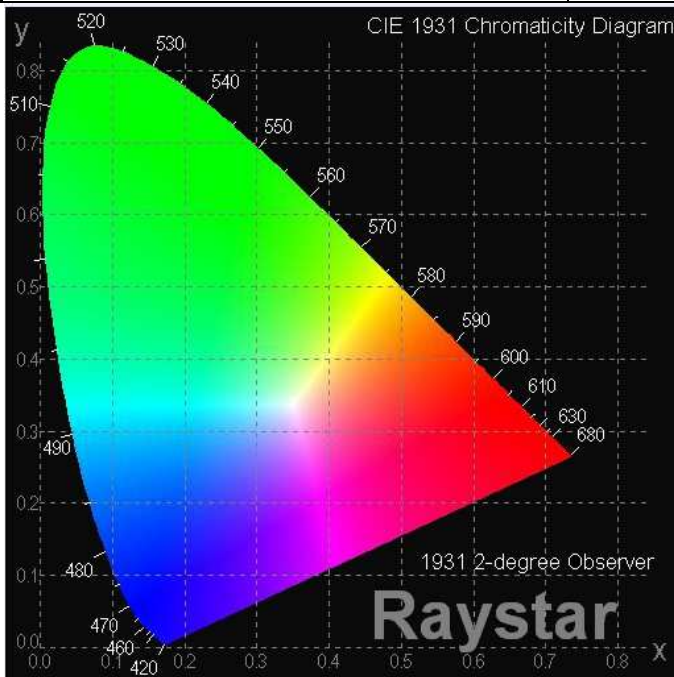
8.OLED Lifetime
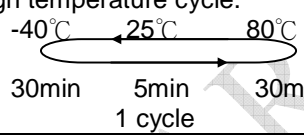
ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25℃ / Initial 50% check board brightness Typical Value	50,000 Hrs	-	Note

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.	80℃ 240hrs	____
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40℃ 240hrs	____
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80℃ 240hrs	____
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-40℃ 240hrs	____
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60℃,90%RH 240hrs	____
Temperature Cycle	Endurance test applying the low and high temperature cycle. -40℃　25℃　80℃ 30min　5min　30min 1 cycle	-40℃/80℃ 100 cycles	____
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hr	____
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sin wave 11 ms 3 times of each direction	____
Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	____
Others			
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	____

*** Supply voltage for OLED system =Operating voltage at 25℃

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 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.
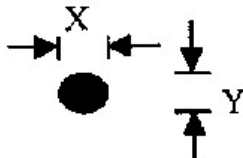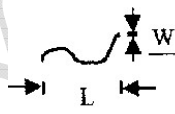
APPENDIX:
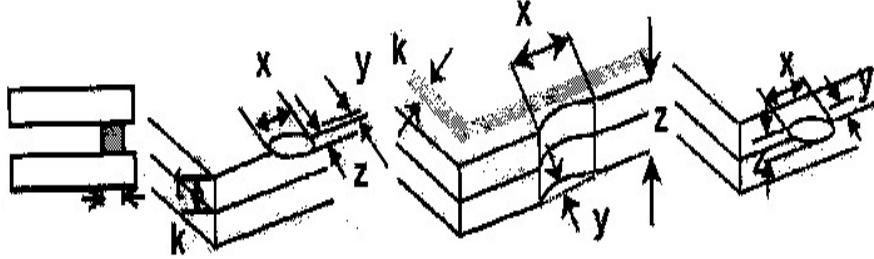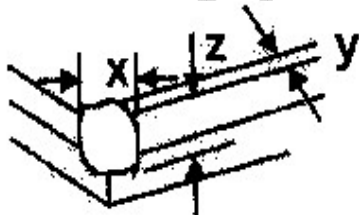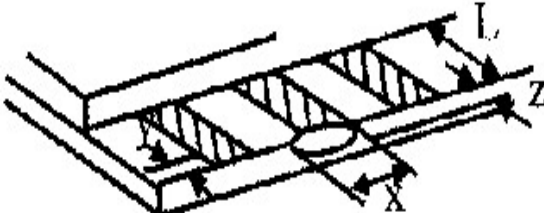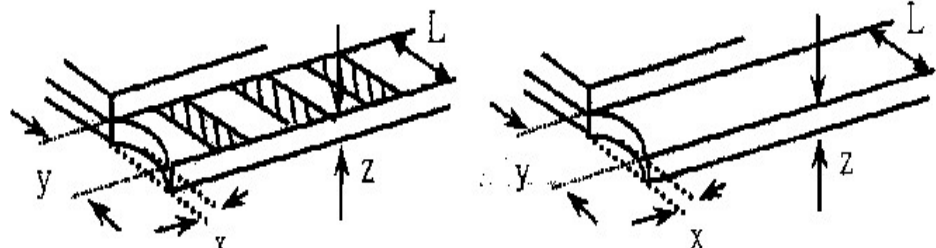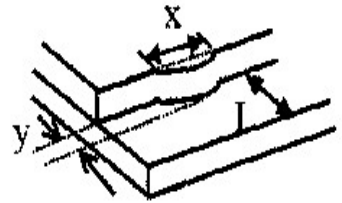
RESIDUE IMAGE
Because the pixels are lighted in different time, the luminance of active pixels
may reduce or differ from inactive pixels. Therefore, the residue image will occur.
To avoid the residue image, every pixel needs to be lighted up uniformly.
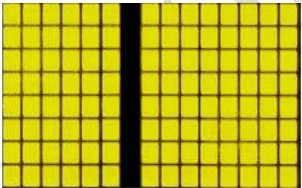
10.Inspection specification
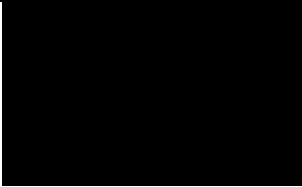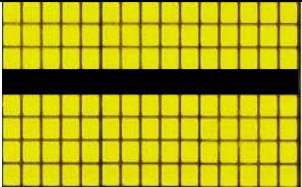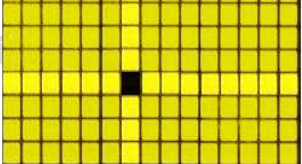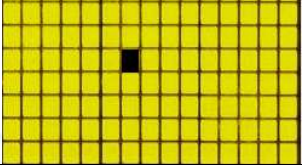
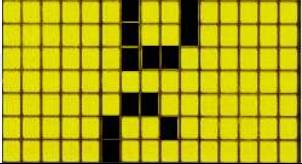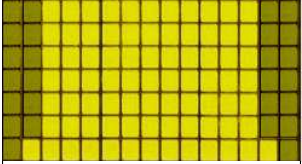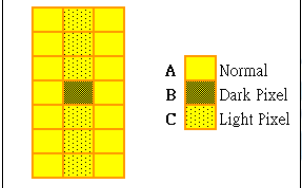| NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed 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 $\leqq 0.25$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
03	OLED black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi=(x + y) / 2$ 	2.5

SIZE	Acceptable Q TY
$\Phi \leqq 0.10$	Accept no dense
$0.10 < \Phi \leqq 0.20$	2
$0.20 < \Phi \leqq 0.25$	1
$0.25 < \Phi$	0

3.2 Line type : (As following drawing)

Length	Width	Acceptable Q TY
---	$W \leqq 0.02$	Accept no dense
$L \leqq 3.0$	$0.02 < W \leqq 0.03$	2
$L \leqq 2.5$	$0.03 < W \leqq 0.05$	
---	$0.05 < W$	As round type

(AQL 2.5)

| 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
$\Phi \leqq 0.20$	Accept no dense
$0.20 < \Phi \leqq 0.50$	3
$0.50 < \Phi \leqq 1.00$	2
$1.00 < \Phi$	0
Total Q TY	3

NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 OLED black spots, white spots, contamination	
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 | | --- | --- | --- | | $Z \leq 1/2t$ | Not over viewing area | $x \leq 1/8a$ | | $1/2t < z \leq 2t$ | Not exceed 1/3k | $x \leq 1/8a$ | ⊙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 | | --- | --- | --- | | $Z \leq 1/2t$ | Not over viewing area | $x \leq 1/8a$ | | $1/2t < z \leq 2t$ | Not exceed 1/3k | $x \leq 1/8a$ | ⊙If there are 2 or more chips, x is the total length of each chip.	2.5

6.1.1 Chip on panel surface and crack between panels:

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	$x \leq 1/8a$

⊙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
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$

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

NO	Item	Criterion	AQL
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 : 6.2.2 Non-conductive portion: ⊙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. 	2.5

6.2.1 table:

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

6.2.2 table:

y: Chip width	x: Chip length	z: Chip thickness
y≦ L	x≦1/8a	0 ＜ z ≦ t

6.2.3 table:

y: width	x: length
y≦1/3L	x ≦ a

NO	Item	Criterion	AQL
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
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

NO	Item	Criterion	AQL
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
			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
			0.65
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		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.	

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	

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 R2and 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 us 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.
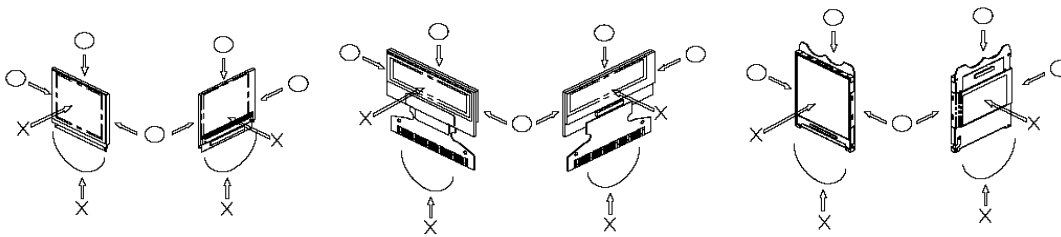
(7) Do not apply stress to the LSI chips and the surrounding molded sections.

(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.

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 , _____

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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**： / /