



***Vishay Dale Electronics, LLC
Information Display Products***

OLED Product Data Sheet

OLED SPECIFICATION

Model No:

OLED-256Y064B-SPP3N00000

SPECIFICATION

Version: M

Model # : OLED-256Y064B-SPP3N00000

Global / SAP # : O256Y064BSPP3N0000

APPROVED BY:
(FOR CUSTOMER USE ONLY)

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
RELEASE DATE:			

APPROVAL FOR SPECIFICATIONS ONLY

APPROVAL FOR SPECIFICATIONS AND SAMPLE

MODEL NO : OLED-256Y064B-SPP3N00000

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2015/09/09		First release
A	2015/12/11		Modify Life Time
B	2016/03/23		Modify Static electricity test
C	2016/05/04		Modify Interface Pin Function.
D	2016/11/10		Added IC P/N.
E	2016/11/22		Add FPC bending rule
F	2019/08/30		Modify Precautions in use of OLED Modules
G	2019/12/18		Modify Reliability Test and measurement conditions & Inspection specification:" Accept no dense" modify to "ignore"& Precautions
H	2020/06/29		Modify Interface Pin Function
I	2020/08/27		Modify Inspection specification
J	2020/11/04		Modify Drawing & DC Electrical Characteristics & Optical Characteristics & Contrast Ratio & Reliability test Condition & Storage Precautions Add Application recommendations & Initial code
K	2021/01/21		1.Modify VCC Min value

		2.Electrical Characteristics & Initial code Add notes
L	2021/02/25	Modify Precautions in use of OLED Modules
M	2021/07/16	Modify Drawing

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- 9.Reliability
- 10.Inspection Specification
- 11.Precautions in Use of OLED Modules

1. Module Classification Information

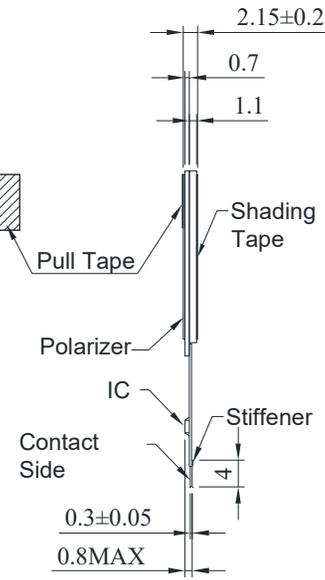
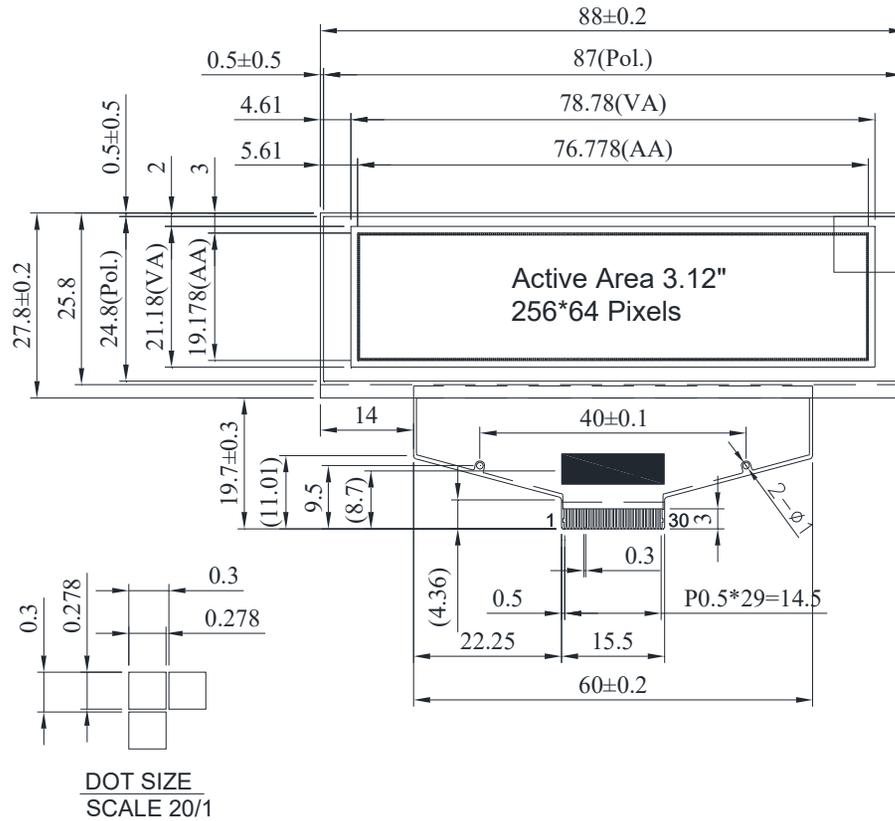
OLED- 256 Y 064 B- S P P 3 N 0 0 0 00
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭

1	Brand	Vishay Intertechnology, Inc.	
2	Horizontal	256 columns	
3	Display Type (RoHS-compliant)	N : COB Character	H : COB Graphic
		O : COG	F : COG + FRAME
		P : COG + FRAME + PCB	Y : TAB
		A : COG + PCB	
4	Vertical Format	64 rows	
5	Series code	B	
6	Emitting Color	A : Amber	S : Sky Blue
		B : Blue	W : White
		G : Green	X : Dual Color
		L : Yellow	C : Full Color
		R : Red	
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: +3.0V / +3.3 V; 5: +5.0V	
10	Touch Panel	N: Without TP; T: Resistive TP; D: DCT Attached CTP; R: OCR Attached CTP; A: OCA Attached CTP	
11	Products type	0 : Standard type 1 : Daylight Readable type 2 : Transparent OLED (TOLED) 3 : Flexible OLED 4 : OLED for Lighting	
12	Inspection Grade	0 : Standard 2 : Special grade C : Automotive grade Y : Consumer grade	
13	Interface	0: Default; 1: COB 6800; 2: COB 8080; 3: COB SPI; F: COG ZIF FPC; H: COG Hot-bar FPC; D: Demo Kit; Z: Semi-custom	
14	Serial No.	Application serial number (00~ZZ)	

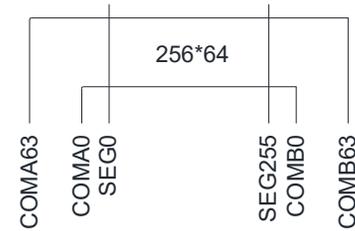
2. General Specification

Item	Dimension	Unit
Dot Matrix	256 x 64 Dots	—
Module dimension	88.0 x 27.8 x 2.15	mm
Active Area	76.778 x 19.178	mm
Pixel Size	0.278 x 0.278	mm
Pixel Pitch	0.3 x 0.3	mm
Display Mode	Passive Matrix	
Display Color	Sky Blue	
Drive Duty	1/64 Duty	
Gray Scale	4 bits	
IC	SSD1322 (COF)	
Interface	6800, 8080, SPI	
Size	3.12 inch	

3. Contour Drawing & Block Diagram

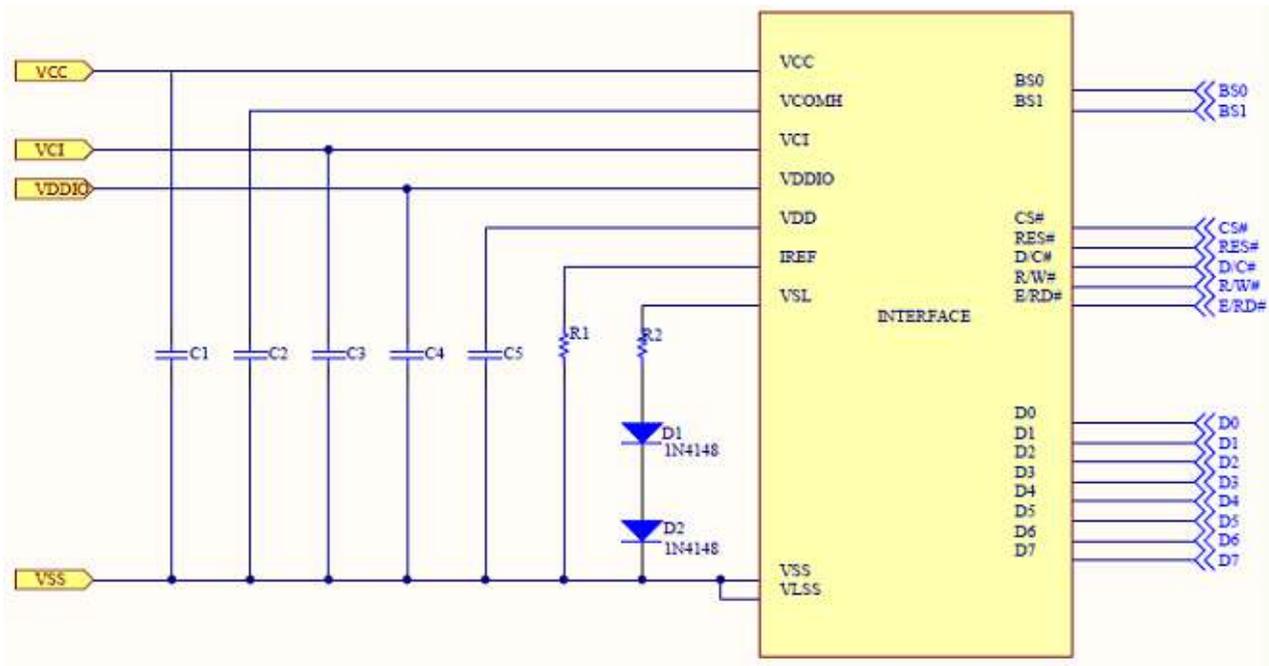


PIN	SYMBOL	PIN	SYMBOL
1	NC(GND)	16	BS0
2	VSS	17	BS1
3	VCC	18	DC#
4	VCOMH	19	CS#
5	VLSS	20	RES#
6	D7	21	FR
7	D6	22	IREF
8	D5	23	NC
9	D4	24	VDDIO
10	D3	25	VDD
11	D2	26	VCI
12	D1	27	VSL
13	D0	28	VLSS
14	E/RD#	29	VCC
15	R/W#	30	NC(GND)



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

3.1 Application Recommendations



Recommended components :

- C3, C4, C5 : 1.0uF
- C1, C2 : 4.7uF
- D1, D2 : 1N4148, 0.7V
- R2 : 50ohm, 1/8W

Bus Interface selection: (BS [1:0] must be sent. Refer to Section #4.)

- 8-bits 6800 or 8080 parallel
- 3 or 4-wire SPI

Voltage at IREF = VCC – 6V. For VCC = 14.5V, IREF = 10uA:

$$R1 = (\text{Voltage at IREF} - VSS) / IREF$$

$$= (14.5 - 6)V / 10\mu A$$

$$\geq 850K \text{ ohm}^{(2)}$$

Note:

- (1) Capacitor values are recommended values. Select appropriate values for the application.
- (2) Minimum value, R1 must be greater than the calculated value.
- (3) For further information, please refer to the SSD1322 video controller/driver datasheet.

4.Interface Pin Function

Pin Number	Symbol	I/O	Function										
1	N.C. (GND)	P	Ground										
2	VSS	P	Ground.										
3	VCC	P	Power supply for panel driving voltage. This is also the most positive power voltage supply pin.										
4	VCOMH	P	COM signal deselected voltage level. A capacitor should be connected between this pin and VSS.										
5	VLSS	P	Analog system ground pin.										
6~13	D7~D0	I/O	Host Data Input/Output Bus These pins are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK.										
14	E/RD#	I	Read/Write Enable or Read This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled high and the CS# is pulled low. When connecting to an 80XX-microprocessor, this pin receives the Read (RD#) signal. Data read operation is initiated when this pin is pulled low and CS# is pulled low. When serial mode is selected, this pin must be connected to VSS.										
15	R/W#	I	Read/Write Select or Write This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Pull this pin to "High" for read mode and pull it to "Low" for write mode. When 80XX 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 CS# is pulled low. When serial mode is selected, this pin must be connected to VSS.										
16	BS0	I	Communicating Protocol Select These pins are MCU interface selection input. See the following table: <table border="1" data-bbox="574 1577 1209 1759"> <thead> <tr> <th>BS[1:0]</th> <th>Bus Interface Selection</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>4 line SPI</td> </tr> <tr> <td>01</td> <td>3 line SPI</td> </tr> <tr> <td>10</td> <td>8-bit 8080 parallel</td> </tr> <tr> <td>11</td> <td>8-bit 6800 parallel</td> </tr> </tbody> </table>	BS[1:0]	Bus Interface Selection	00	4 line SPI	01	3 line SPI	10	8-bit 8080 parallel	11	8-bit 6800 parallel
BS[1:0]	Bus Interface Selection												
00	4 line SPI												
01	3 line SPI												
10	8-bit 8080 parallel												
11	8-bit 6800 parallel												
17	BS1	Note (1) 0 is connected to VSS (2) 1 is connected to VDDIO											

18	D/C#	I	Data/Command Control This pin is Data/Command control pin connecting to the MCU. When the pin is pulled HIGH, the content at D[7:0] will be interpreted as data. When the pin is pulled LOW, the content at D[7:0] will be interpreted as command.
19	CS#	I	Data/Command Control This pin is the chip select input connecting to the MCU. The chip is enabled for MCU communication only when CS# is pulled LOW.
20	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.
21	FR	O	This pin is No Connection pins. Nothing should be connected to this pin. This pin should be left open individually.
22	IREF	I	Current Reference for Brightness Adjustment This pin is segment current reference pin. A resistor should be connected between this pin and VSS. Set the current lower than 10uA.
23	N.C.	-	Reserved Pin The N.C. pin between function pins are reserved for compatible and flexible design.
24	VDDIO	P	Power Supply for I/O Pin It should be matched with the MCU interface voltage level.
25	VDD	P	Power Supply for Core Logic Circuit Power supply pin for core logic operation. A capacitor is required to connect between this pin and VSS
26	VCI	P	Power Supply for Operation VCI must always be equal to or higher than VDD and VDDIO.
27	VSL	P	Voltage Output Low Level for SEG Signal This is segment voltage reference pin. When external VSL is not used, this pin should be left open. When external VSL is used, this pin should connect with resistor and diode to ground.
28	VLSS	P	Ground of Analog Circuit These are the analog ground pins. They should be connected to VSS externally.
29	VCC	P	Power Supply for OLED Panel These are the most positive voltage supply pin of the chip. They must be connected to external source.
30	N.C. (GND)	P	Ground

5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Operation	VCI	-0.3	4	V	1, 2
Supply Voltage for Logic	VDD	-0.5	2.75	V	1, 2
Supply Voltage for I/O Pins	VDDIO	-0.5	VCI	V	1, 2
Supply Voltage for Display	VCC	-0.5	20	V	1, 2
Operating Temperature	TOP	-40	80	°C	-
Storage Temperature	TSTG	-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	—	2.4	2.5	2.6	V
Power Supply for I/O pins	VDDIO	—	1.65	3.0	VCI	V
Low voltage power supply	VCI	—	2.4	3.0	3.5	V
Supply Voltage for Display	VCC	—	10	14.5	15	V
High Level Input	VIH	—	$0.8 \times VDDIO$	—	VDDIO	V
Low Level Input	VIL	—	0	—	$0.2 \times VDDIO$	V
High Level Output	VOH	—	$0.9 \times VDDIO$	—	VDDIO	V
Low Level Output	VOL	—	0	—	$0.1 \times VDDIO$	V
50% Check Board operating Current	ICC	VCC =12V	—	24	32	mA
		VCC =14.5V	—	32	42.5	mA

Note 1: The VDD core logic supply can be regulated from VCI.

Note 2: VCI must be greater than or equal to VDD

Notes 3: VCC can be adjusted according to brightness requirements. Decreased VCC decreases brightness. Increased VCC increases brightness. VCC must be within the recommended range. The life of OLED is directly related to the brightness. Lower brightness helps to improve the life.

6.2 Initial code

```
void Initial_ic(void)
{
    write_command(0xFD); //set Command Lock
    write_data(0x12);

    write_command(0xAE); //Sleep mode ON (Display OFF)

    write_command(0xB4); //Display Enhancement A
    write_data(0xA2); // Internal VSL
    write_data(0xB5);

    write_command(0xA0); //set Re-map and Dual COM Line mode
    write_data(0x10);
    write_data(0x11);

    write_command(0xCA); //set MUX Ratio
    write_data(0x3F);

    write_command(0xD1); //Display Enhancement B
    write_data(0x82);
    write_data(0x20);

    write_command(0xC1); //set Contrast current
    write_data(0x7D);

    write_command(0xC7); //master Contrast current Control
    write_data(0x0F);

    write_command(0xB3); //set Front Clock Divider/Oscillator Frequency
    write_data(0x61); //105Hz

    write_command(0xB1); //set Phase Length
    write_data(0xF5);

    write_command(0xBB); //set pre-charge voltage
    write_data(0x1F);

    write_command(0xBE); //set VCOMH
    write_data(0x07);

    write_command(0xB6); //set Current Pre-charge Period
    write_data(0x0F);

    write_command(0xB9); // Select Default Linear Gray Scale table

    write_command(0xAB); //Function Selection
    write_data(0x01);

    write_command(0x00); // Enable Gray Scale Table

    write_command(0xA1); //set Display Start Line
    write_data(0x00);

    write_command(0xA2); //set Display Offset
    write_data(0x00);
}
```

```
write_command(0xA6); //set Display Mode

write_command(0x15); //set Column Address
write_data(0x1C);
write_data(0x5B);

write_command(0x75); //set Row Address
write_data(0x00);
write_data(0x3F);

write_command(0x5C); //Write RAM Command

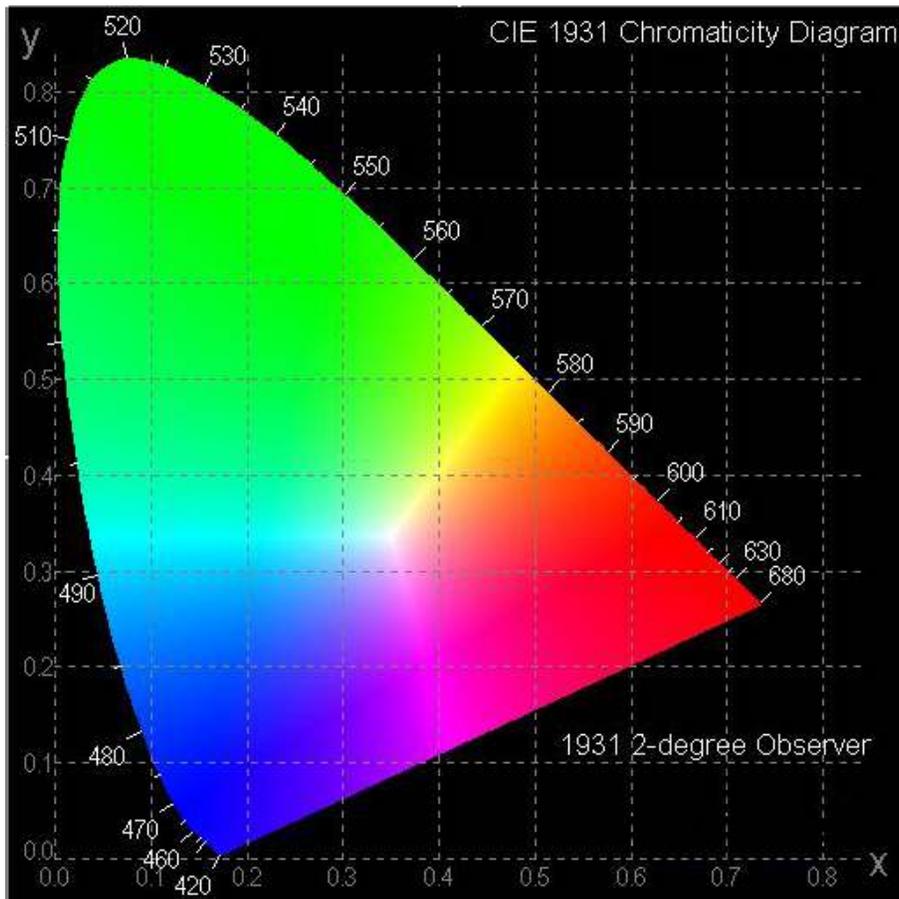
write_command(0xAF); //Sleep mode OFF (Display ON)
}
```

Note1: Initial code is for reference only. Please make the best adjustment with the OLED module.

Note2: Command: Set Contrast Control (0xC1) , This command sets the Contrast Setting of the display. The chip has 256 contrast steps from 00h to FFh. The segment output current increases as the contrast step value increases. The segment current increases, the OLED brightness increases.

7.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ	—	160	—	—	deg
	(H) ϕ	—	160	—	—	deg
Contrast Ratio	CR	Dark	10,000:1	—	—	—
Response Time	T rise	—	—	10	—	μ s
	T fall	—	—	10	—	μ s
Display with 50% check Board Brightness		VCC=12V	60	80	—	cd/m ²
		VCC=14.5V	80	100	—	
CIEx(Sky Blue)		CIE 1931	0.12	0.16	0.20	—
CIEy(Sky Blue)		CIE 1931	0.22	0.26	0.30	—



8.OLED Lifetime

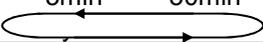
ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% check board brightness 100cd/m ²	20,000 Hrs	—	Note

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/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 $\pm 50\%$ of initial value.

APPENDIX:**RESIDUAL IMAGE**

When pixels are operated (lit) for different durations, the luminance of active pixels may reduce or differ from inactive pixels, causing residual images. To avoid residual images, all pixels must be lit uniformly.

10. Inspection Specification

Inspection Standard:

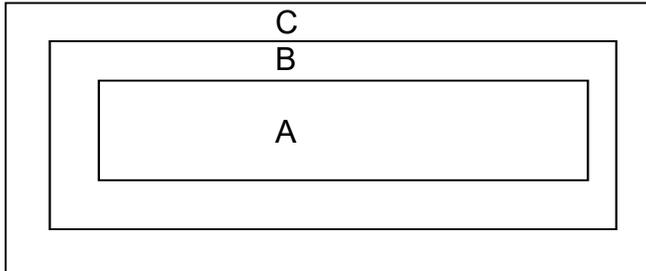
MIL-STD-105E table normal inspection single sample level II.

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

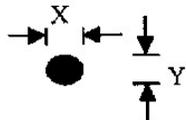
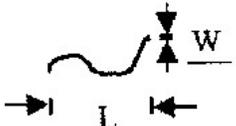
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer's product.

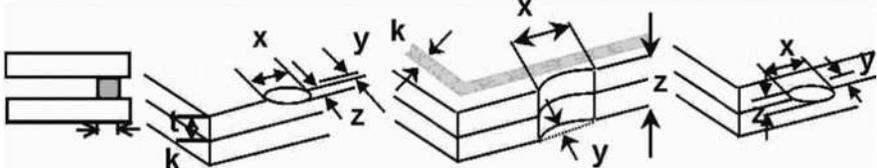
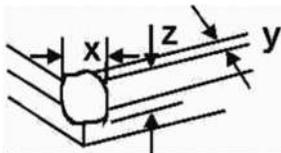
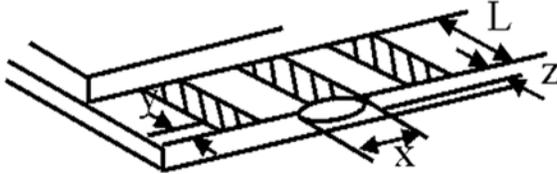
Inspection Methods

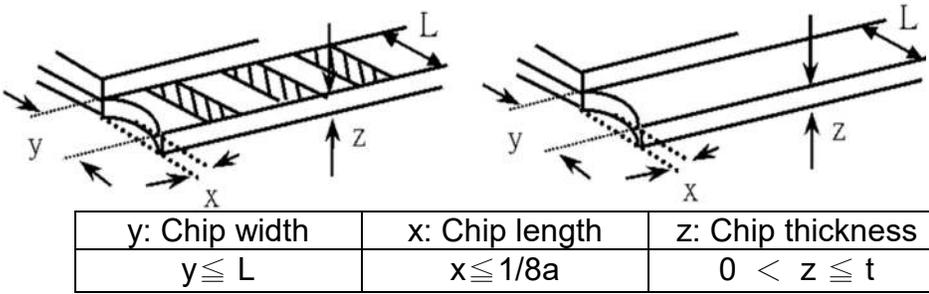
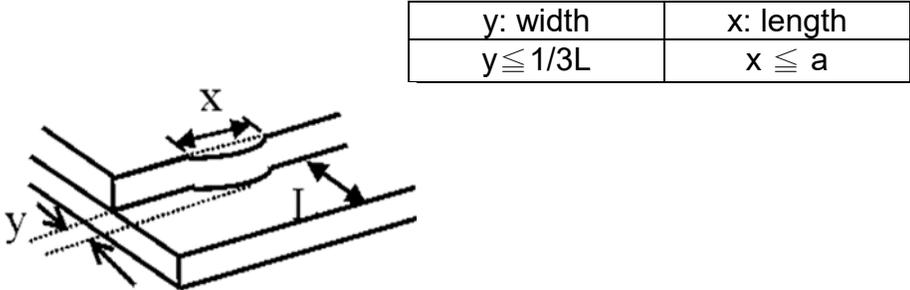
1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm viewing distance, within 45° viewing angle, under 25±5°C.

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

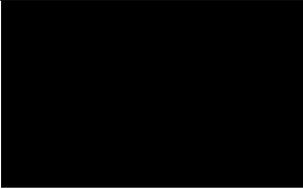
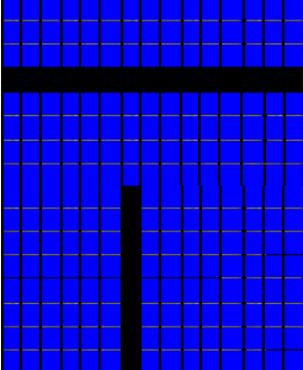
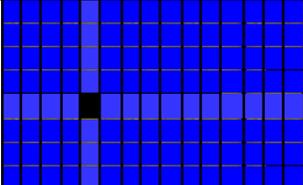
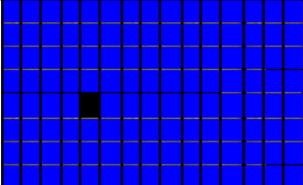
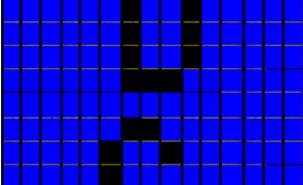
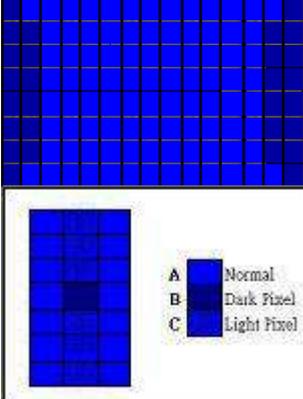
NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot, or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed 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 $\square 0.25\text{mm}$, 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																			
	OLED black spots, white spots, contamination (non-display)	<p>3.1 Round type : As following drawing $\Phi = (x + y) / 2$</p>  <table border="1" data-bbox="737 279 1399 527"> <thead> <tr> <th>SIZE</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.10$</td> <td>ignore</td> <td>A+ B,</td> </tr> <tr> <td>$0.10 < \Phi \leq 0.20$</td> <td>2</td> <td>A+ B</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.25$</td> <td>1</td> <td>A+ B</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>0</td> <td>A+ B</td> </tr> </tbody> </table>	SIZE	Acceptable QTY	Zone	$\Phi \leq 0.10$	ignore	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																				
$\Phi \leq 0.10$	ignore	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																				
03		<p>3.2 Line type : (As following drawing)</p>  <table border="1" data-bbox="607 884 1399 1131"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>ignore</td> <td>A+B</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.03$</td> <td rowspan="2">2</td> <td>A+B</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>A+B</td> </tr> <tr> <td>---</td> <td>$0.05 < W$</td> <td>As round type</td> <td></td> </tr> </tbody> </table>	Length	Width	Acceptable QTY	Zone	---	$W \leq 0.02$	ignore	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																			
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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 /Dent	<p>4.1 If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.</p> <table border="1" data-bbox="732 1287 1399 1535"> <thead> <tr> <th>Size Φ</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td>ignore</td> <td>A+B</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> <td>A+B</td> </tr> <tr> <td>$0.50 < \Phi \leq 1.00$</td> <td>2</td> <td>A+B</td> </tr> <tr> <td>$1.00 < \Phi$</td> <td>0</td> <td>A+B</td> </tr> <tr> <td>Total QTY</td> <td>3</td> <td></td> </tr> </tbody> </table> <p>4.2 The polarizer dent follows this specification.</p>	Size Φ	Acceptable QTY	Zone	$\Phi \leq 0.20$	ignore	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	
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$1.00 < \Phi$	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="472 562 1377 688"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</td> </tr> </tbody> </table> <p>⊙ If there are 2 or more chips, x is total length of each chip.</p> <p>6.1.2 Corner crack:</p>  <table border="1" data-bbox="472 953 1395 1079"> <thead> <tr> <th>z: Chip thickness</th> <th>y: Chip width</th> <th>x: Chip length</th> </tr> </thead> <tbody> <tr> <td>$Z \leq 1/2t$</td> <td>Not over viewing area</td> <td>$x \leq 1/8a$</td> </tr> <tr> <td>$1/2t < z \leq 2t$</td> <td>Not exceed 1/3k</td> <td>$x \leq 1/8a$</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	$x \leq 1/8a$	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
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06	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="472 1619 1377 1703"> <thead> <tr> <th>y: Chip width</th> <th>x: Chip length</th> <th>z: Chip thickness</th> </tr> </thead> <tbody> <tr> <td>$y \leq 0.5\text{mm}$</td> <td>$x \leq 1/8a$</td> <td>$0 < z \leq t$</td> </tr> </tbody> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	2.5												
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$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$																			

NO	Item	Criterion	AQL
06	Glass crack	<p>6.2.2 Non-conductive portion:</p>  <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> 	2.5
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
10	PCB , COB	<p>10.1 COB seal may not have pinholes larger than 0.2mm or contamination.</p> <p>10.2 COB seal surface may not have pinholes through to the IC.</p> <p>10.3 The height of the COB should not exceed the height indicated in the assembly diagram.</p> <p>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.</p> <p>10.5 No oxidation or contamination PCB terminals.</p> <p>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.</p> <p>10.7 The jumper on the PCB should conform to the product characteristic chart.</p> <p>10.8 If solder gets on bezel tab pads, OLED pad, zebra pad or screw hold pad, make sure it is smoothed down.</p>	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5

NO	Item	Criterion	AQL
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 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 $B/A \times 100\% < 70\%$ $A/C \times 100\% < 70\%$	Major	

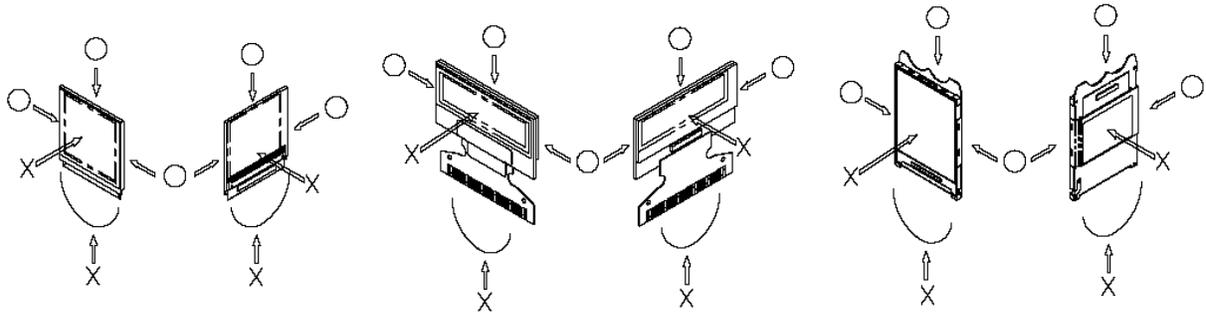
11. Precautions in Use of OLED Modules

General

- (1) Avoid shock / impact to the module, or making any alterations or modifications.
- (2) Do not drill holes in the printed circuit board, change the components, or otherwise modify the OLED display module.
- (3) Do not disassemble the OLED display module.
- (4) Do not apply input signals while the logic power is off. This will cause electrical overstress.
- (5) Do not operate beyond the absolute maximum rating.
- (6) Do not drop, bend, or twist OLED display module.
- (7) Solder only to the I/O terminals.
- (8) Hot-bar FPC soldering condition: 280-350C, less than 5 seconds.
- (9) The manufacturer has the right to change components. (Resistors, capacitors and other passive components may have different appearance from different suppliers.)
- (10) The manufacturer has the right to revise the PCB to ensure supply stability, optimization, product performance, etc., which does not affect electrical characteristics or outline dimensions. The manufacturer has the right to modify the product revision.
- (11) The manufacturer has the right to upgrade or modify the product function.
- (12) For OLED products with chip-on-glass (COG) & chip-on-flex (COF) construction, ability to adjust the panel driving voltage VCC (VPP) in the application circuit or software is recommended. Potential improvements to OLED light-emitting material efficiencies may require adjustment of the panel driving voltage. The brightness may be otherwise adjusted as needed.

11.1. Handling Precautions

- (1) The display panel is made of glass, avoid mechanical impacts such as dropping or striking.
- (2) If the display panel is broken and the internal organic material leaks, use care not to inhale or ingest the organic substance.
- (3) If pressure is applied to the OLED display module or surrounding hardware, the OLED cell structure may be damaged.
- (4) The polarizer on the view surface of the OLED display module is soft and easily scratched.
- (5) If the view surface is soiled, it might be cleaned using the following adhesive tape.
 - * Scotch Mending Tape No. 810 or an equivalentDo not breathe upon the soiled surface or wipe using cloth containing solvents (e.g.; ethyl alcohol), else the surface of the polarizer may cloud.
Avoid the following liquids / solvents to prevent damage to the polarizer:
 - * Water
 - * Ketone
 - * Aromatic Solvents
- (6) Protective film is applied to the surface of the display panel. Remove the protective film before assembly. After extended storage, adhesive residue from the protective film may remain after the film is removed. If so, try removing the adhesive residue using adhesive tape as described above.
- (7) Do not touch the following sections while handling the OLED display modules.
 - * Pins, terminations, and electrodes
 - * Circuitry such as components or PCB / TCP / FPC conductors or traces.
- (8) Hold OLED display module carefully by the edges when placing OLED display module into the system enclosure. Do not apply excessive stress or pressure to OLED display module. Do not crease the film. Do not bend the film near terminations or components. Ensure that the mounting hardware and enclosure have sufficient rigidity.



- (9) Do not apply stress to the LSI chips or surrounding moldings.
- (10) Handle only in ESD-safe environments to prevent damage by static electricity.
 - * The operator/handler must be grounded, and proper attire/clothing must be worn.
 - * Tools, workstations, and equipment (e.g.; soldering irons) must be grounded.
 - * Suppress generation of static electricity by controlling humidity and using air ionizers.
 - * Protective film is applied to the surface of the OLED display module. Use caution when removing the protective film as it will generate static electricity.

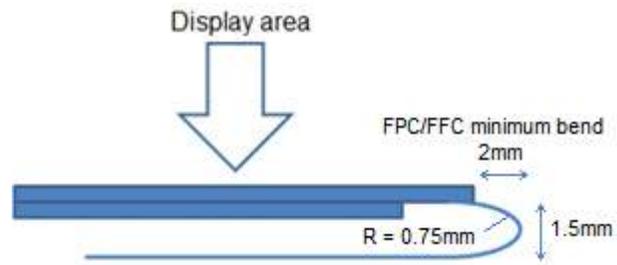
11.2. Storage Precautions

- (1) When storing OLED display modules, place in static (ESD) protective bags or enclosures, and avoid exposure to sun or fluorescent lights. Store in original packaging as possible.
- (2) Store in clean, temperature & humidity controlled environments ($25\pm 5^{\circ}\text{C}$ and $<65\%$ RH). Condensation, high temperature, or high humidity may damage the OLED or cause corrosion.
- (3) In end applications, sealed packaging & enclosures may breathe with temperature and barometric pressure changes, trapping water and creating high humidity environments. Packaging with desiccant and routine maintenance of enclosures should be considered.

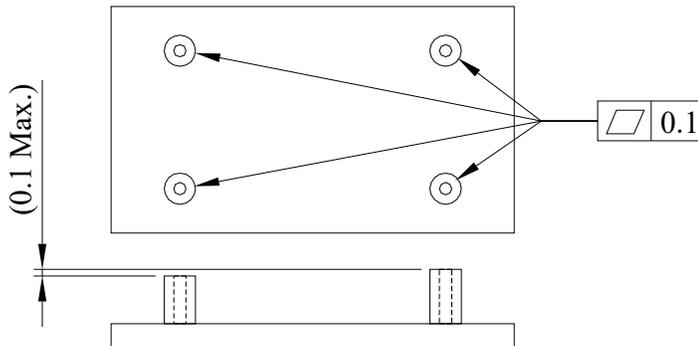
11.3. Design Precautions

- (1) The absolute maximum ratings must not be exceeded, else the OLED display module may be damaged.
- (2) To prevent malfunctioning due to noise, satisfy the VIL and VIH specifications, and make signal paths/cables as short as possible. Use adequate supply decoupling.
- (3) Excess current protection devices (fuses, etc.) are recommended on the power supplies (VDD, VCC, etc.). The suggested value is 0.5A
- (4) Take precautions to avoid mutual noise / interference with the nearby devices.
- (5) Take necessary measures in the application equipment to prevent EMI.
- (6) If power is interrupted, the OLED display module may be damaged.
- (7) Connection or contact to any potential other than that specified may rupture the IC.
- (8) If this OLED driver is exposed to light, malfunctioning or damage may occur to the IC.
- (9) Internal register status may change due to external noise. Take appropriate measures to suppress noise or protect the module from noise in the system design.
- (10) Periodic resetting / initialization and refreshing of displayed information is recommended to cope with or recover from catastrophic noise.
- (11) Screen-saver techniques (blanking, dimming, scrolling, changing / moving images, etc.) are strongly recommended to extend life. Do not show the same image for long periods. Fixed patterns will cause latent (residual) images, pixel brightness/contrast variations, non-uniform pixel aging, and reduced life.

(12) The limitation of FPC and film bending:



(13) Mounting must be coplanar to prevent OLED warping / twisting.



11.4. Disposal Precautions

- (1) Contact local industrial waste handlers for proper disposal of OLED display modules. Observe local environmental and hygienic laws and regulations.



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