Vishay Dale Electronics, LLC Information Display Products

OLED Product Data Sheet

OLED SPECIFICATION

Model No:

OLED-016N002D-GPP5N00100

Model # :   **OLED-016N002D-GPP5N00100**

Global / SAP # :   **O016N002DGPP5N0010**

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-016N002D-GPP5N00100**

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2021/05/10		First release

Contents

1.Module Classification Information

OLED- 016 N 002 D- G P P 5 N 0 0 1 00
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭

| 1	Brand	Vishay Intertechnology, Inc.	
2	Horizontal	16 characters per row	
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	2 rows of characters	
5	Series code	D	
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
Number of Characters	16 characters x 2 Lines	—
Module dimension	85.0 x 30.0 x 10.0(MAX)	mm
View area	66.0 x 16.0	mm
Active area	56.95 x 11.85	mm
Dot size	0.55 x 0.65	mm
Dot pitch	0.60 x 0.70	mm
Character size	2.95 x 5.55	mm
Character pitch	3.6 x 6.3	mm
Panel type	OLED , Green	
Duty	1/16	
IC	OLED-0010-TX	
Interface	6800	
Size	2.29 inch	

3.Contour Drawing & Block Diagram
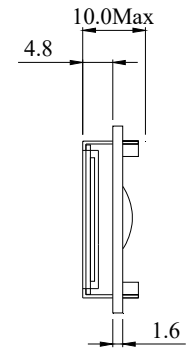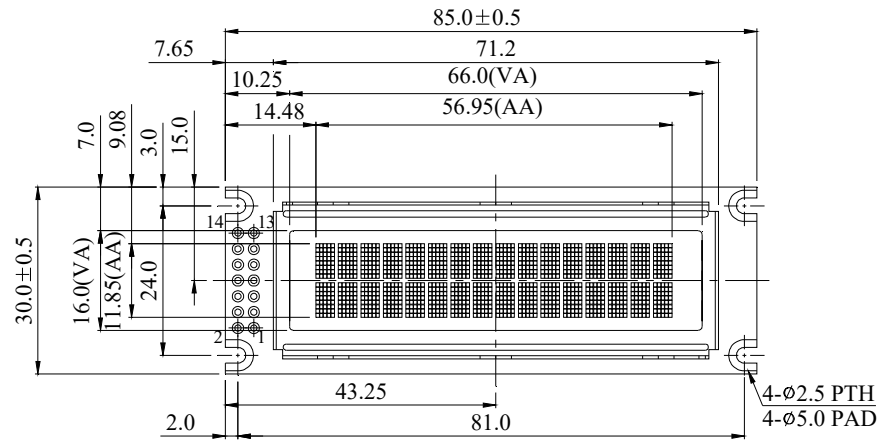
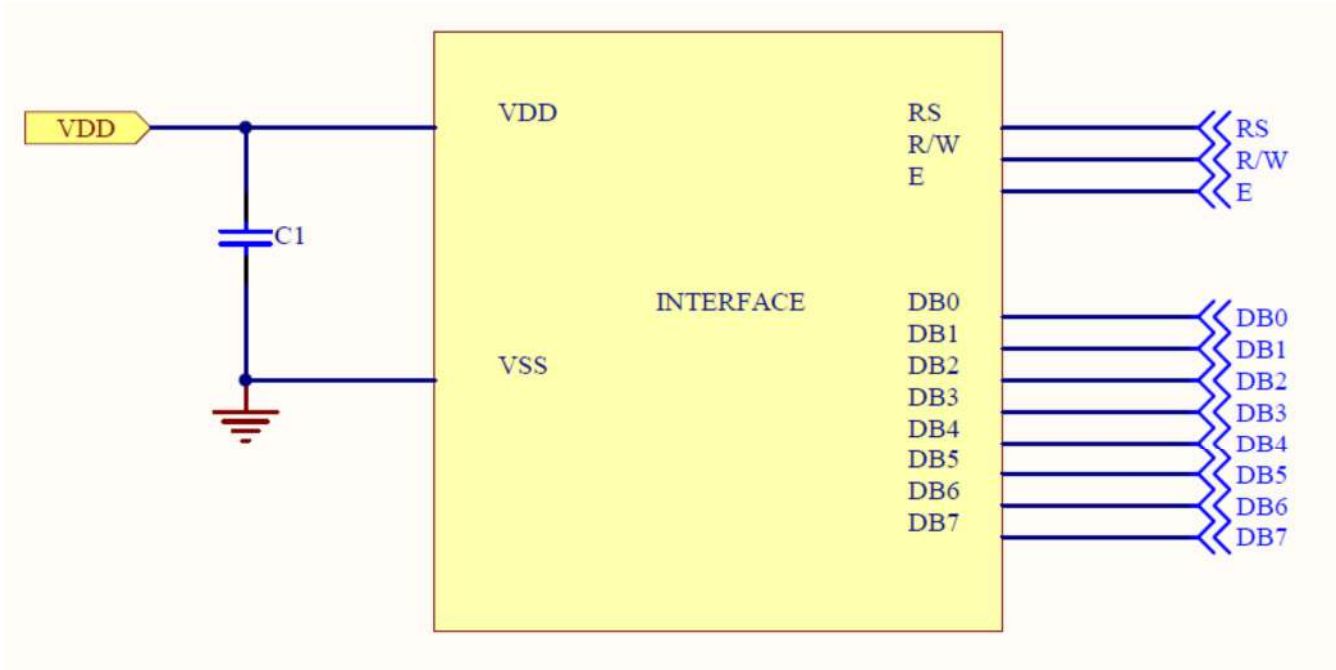| PIN NO.	SYMBOL
1	Vdd
2	Vss
3	NC
4	RS
5	R/$\overline{W}$
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
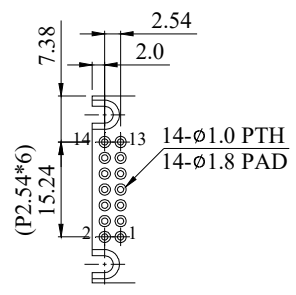
PIN DETAIL
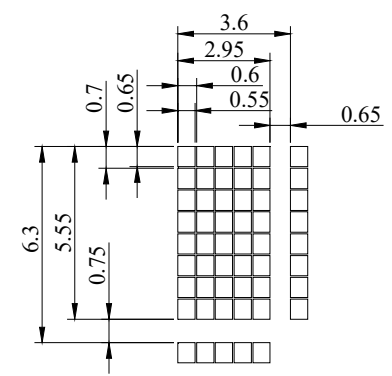
DOT SIZES

SCALE 5/1

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

3.1 Application Recommendations

Pin connected to MCU interface: RS, R/W, E, DB0~7

C1：1.0uF [1]

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

*For more information, please refer to the OLED-0010 video controller datasheet.

4.Interface Pin Function

Pin No.	Symbol	Level	Description
1	VDD	5.0V	Supply Voltage for logic
2	VSS	0V	Ground
3	NC	—	
4	RS	H/L	H: DATA, L: Instruction code
5	R/W	H/L	H: Read(Module→MPU) L: Write(MPU→Module)
6	E	H,H→L	Chip enable signal
7	DB0	H/L	Data bit 0
8	DB1	H/L	Data bit 1
9	DB2	H/L	Data bit 2
10	DB3	H/L	Data bit 3
11	DB4	H/L	Data bit 4
12	DB5	H/L	Data bit 5
13	DB6	H/L	Data bit 6
14	DB7	H/L	Data bit 7

5.Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Notes
Operating Temperature	TOP	-40	+80	°C	-
Storage Temperature	TST	-40	+85	°C	-
Supply Voltage For Logic	VDD-VSS	-0.3	5.3	V	-

6.Electrical Characteristics

6.1 DC Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	VDD-VSS	—	4.8	5.0	5.3	V
Input High Volt.	VIH	—	0.8xVDD	—	VDD	V
Input Low Volt.	VIL	—	GND	—	0.2xVDD	V
Output High Volt.	VOH	IOH=-0.5mA	0.8xVDD	—	VDD	V
Output Low Volt.	VOL	IOL=0.5mA	GND	—	0.2xVDD	V
50% Check Board Operating Current	IDD	VDD=5V	—	35	52.5	mA

Note: This OLED module is specified for VDD = +5V logic supply & signal levels.   When operating at VDD = +5V, using +3V or +3.3V logic signal levels will cause improper operation.
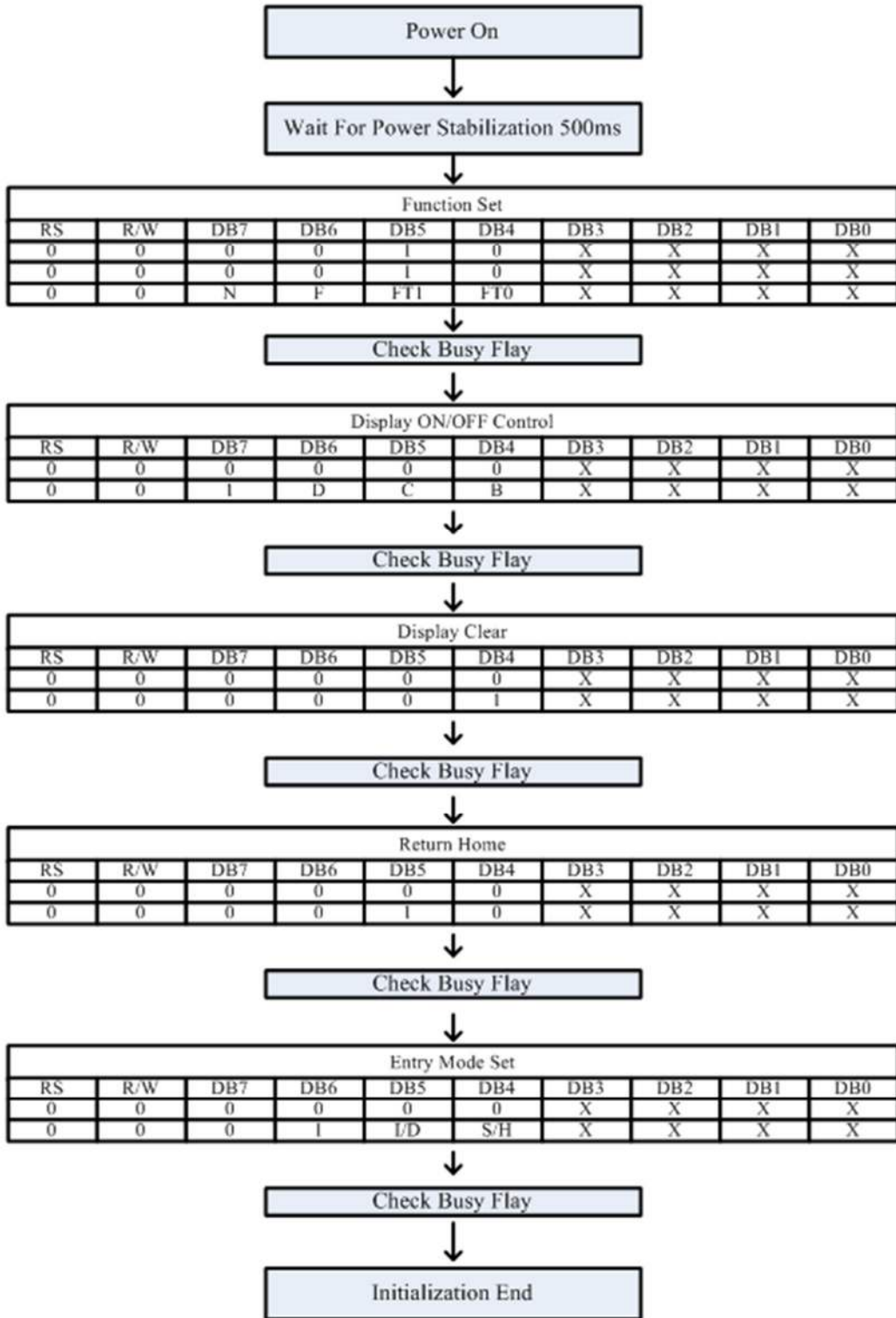
6.2 Initial code
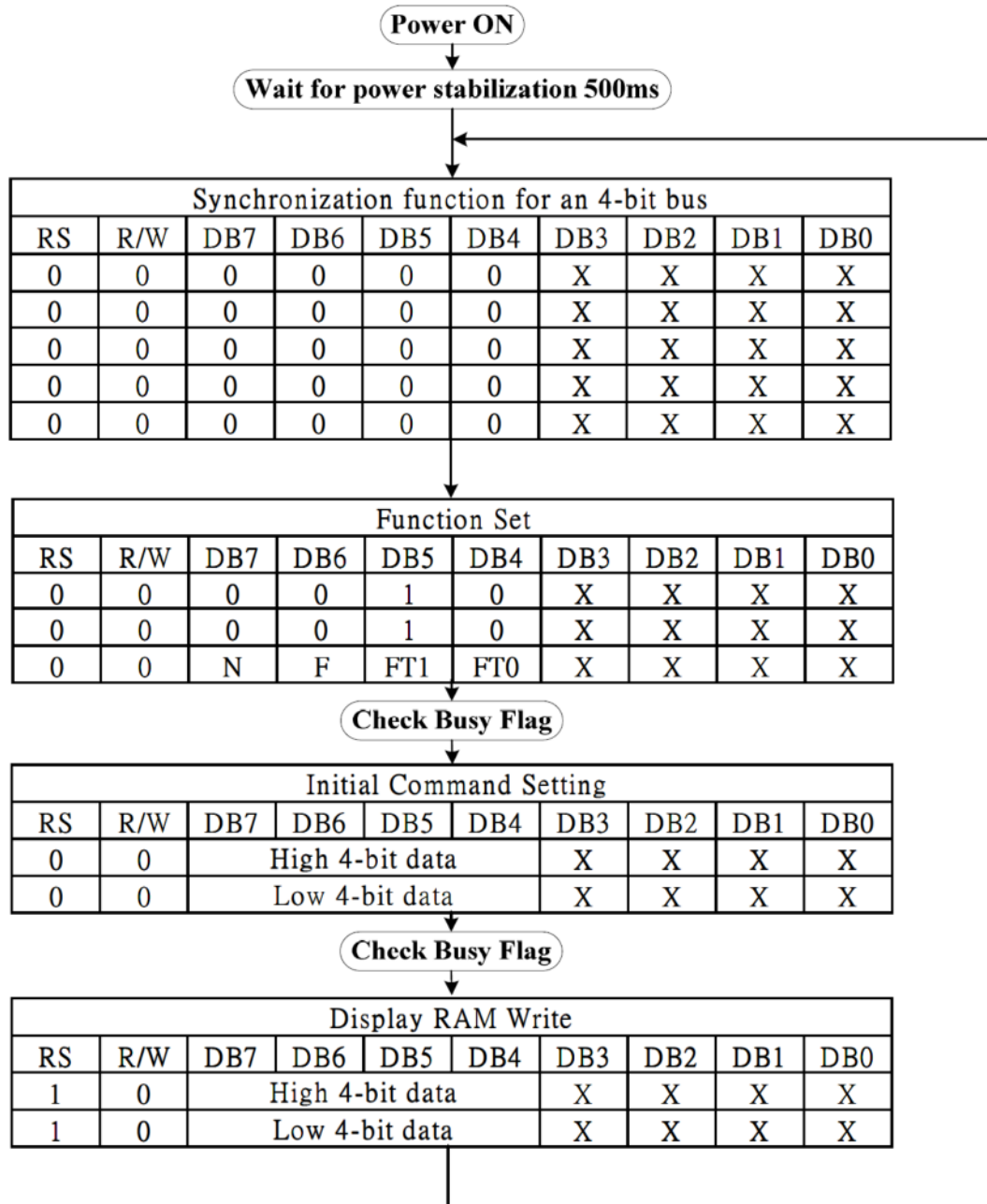
INITIALIZATION BY INSTRUCTION

(1)8-bit mode

```
┌─────────────────────┐
│      Power on        │
└─────────────────────┘
           │
           ▼
┌─────────────────────────────────┐
│ Wait for power stabilization 500ms │
└─────────────────────────────────┘
           │
           ▼
```

function set									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	N	F	FT1	FT0

```
           │
           ▼
┌─────────────────────┐
│   Check Busy Flag    │
└─────────────────────┘
           │
           ▼
```

Display ON/OFF Control									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	C	B

```
           │
           ▼
┌─────────────────────┐
│   Check Busy Flag    │
└─────────────────────┘
           │
           ▼
```

Display Clear									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

```
           │
           ▼
┌─────────────────────┐
│   Check Busy Flag    │
└─────────────────────┘
           │
           ▼
```

Entry Mode Set									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	1	I/D	SH

```
           │
           ▼
┌─────────────────────┐
│   Initialization end │
└─────────────────────┘
```

(2)4-bit mode

```
Power On
```
↓
```
Wait For Power Stabilization 500ms
```
↓

Function Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	X	X	X	X
0	0	0	0	1	0	X	X	X	X
0	0	N	F	FT1	FT0	X	X	X	X

↓
```
Check Busy Flay
```
↓

Display ON/OFF Control

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	1	D	C	B	X	X	X	X

↓
```
Check Busy Flay
```
↓

Display Clear

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	1	X	X	X	X

↓
```
Check Busy Flay
```
↓

Return Home

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	1	0	X	X	X	X

↓
```
Check Busy Flay
```
↓

Entry Mode Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	1	I/D	S/H	X	X	X	X

↓
```
Check Busy Flay
```
↓
```
Initialization End
```

(2)4-bit mode

Notes

Repeated procedures for an 4-bit bus interface

Noise causing transfer mismatch between the four upper and lower bits can be corrected by a reset triggered by consecutively writing a "0000" instruction five times. The next transfer starts from the lower four bits and then first instruction "Function set" can be executed normally.

Please insert the synchronization function in the head of procedures. The repeated procedures are show as follows :

$$\boxed{\text{Power ON}}$$

$$\boxed{\text{Wait for power stabilization 500ms}}$$

Synchronization function for an 4-bit bus

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	0	X	X	X	X
0	0	0	0	0	0	X	X	X	X

Function Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	0	X	X	X	X
0	0	0	0	1	0	X	X	X	X
0	0	N	F	FT1	FT0	X	X	X	X

$$\boxed{\text{Check Busy Flag}}$$

Initial Command Setting

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	High 4-bit data				X	X	X	X
0	0	Low 4-bit data				X	X	X	X

$$\boxed{\text{Check Busy Flag}}$$

Display RAM Write

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	High 4-bit data				X	X	X	X
1	0	Low 4-bit data				X	X	X	X

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

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		μs
	T fall	—		10		μs
Display with 50% check Board Brightness			100	120		cd/m2
CIEx(Green)		(CIE1931)	0.24	0.28	0.32	
CIEy(Green)		(CIE1931)	0.59	0.63	0.67	
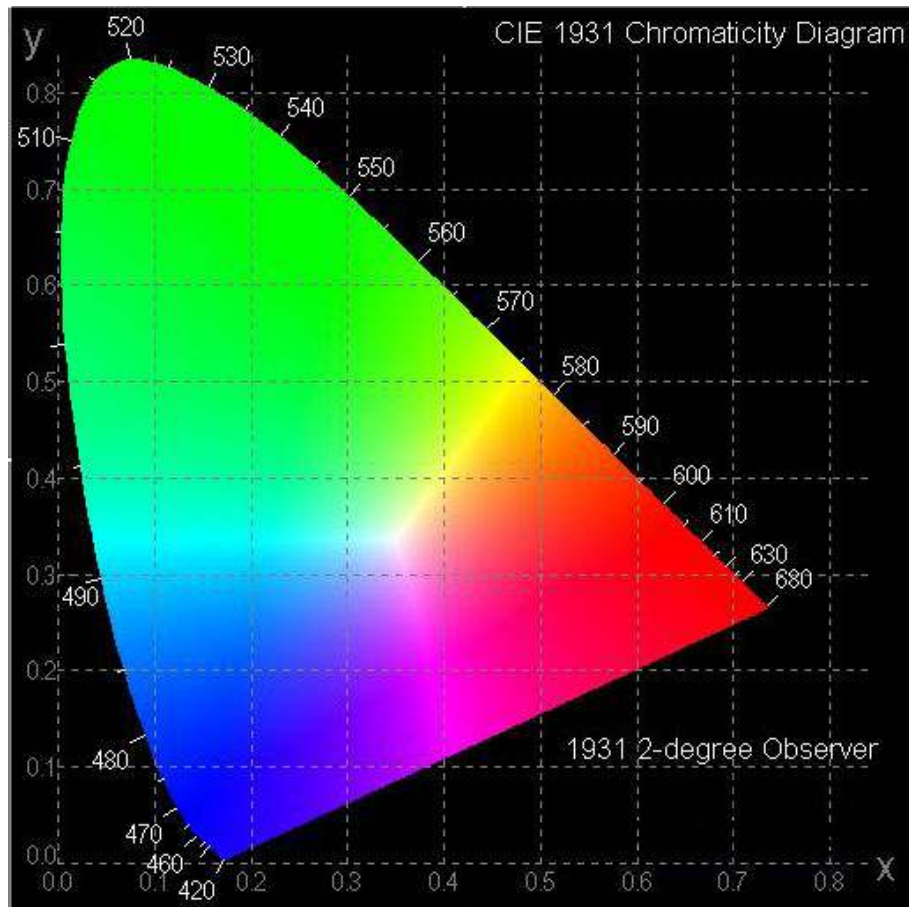
8.OLED Lifetime
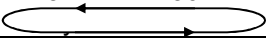
ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% check board brightness 100cd/m2	80,000 Hrs	100,000 Hrs	Note

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±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:

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

10.Inspection Specification

Inspection Standard:

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

Definition

1 Major defect : The defect that greatly affect the usability of product.
2 Minor defect : The other defects, such as cosmetic defects, etc.
   Definition of inspection zone:
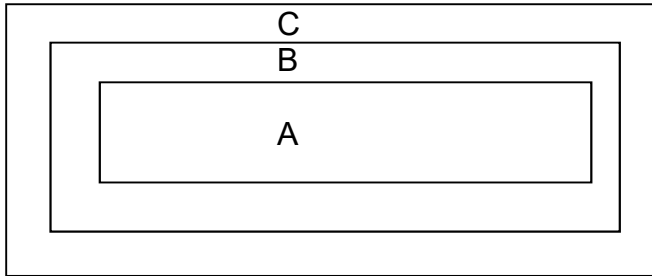
Zone A: Active Area
Zone B: Viewing Area except Zone A
Zone C: Outside Viewing Area
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of
      quality and assembly to customer`s product.
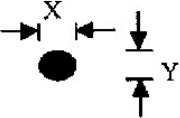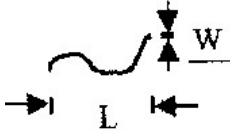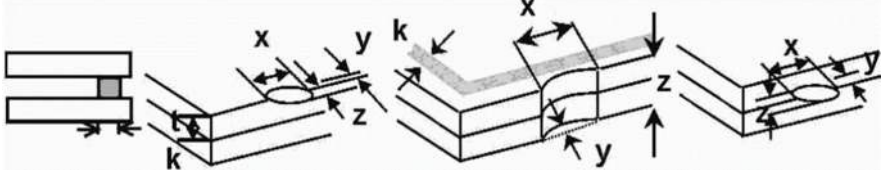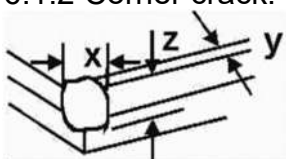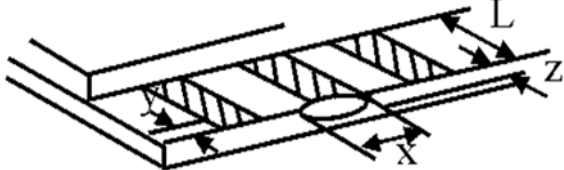
Inspection Methods
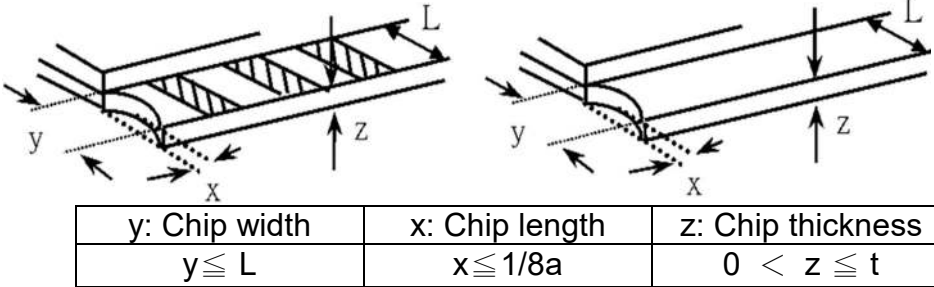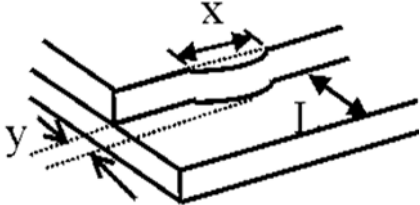
1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm
 viewing distance, within 45º viewing angle, under 25±5°C.
2 The luminance and color coordinate inspection : By SR-3 or BM-7 or the equal
 equipment, in the dark room, under 25±5°C.
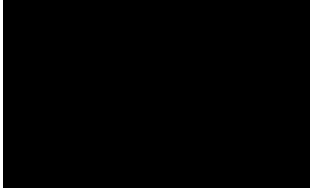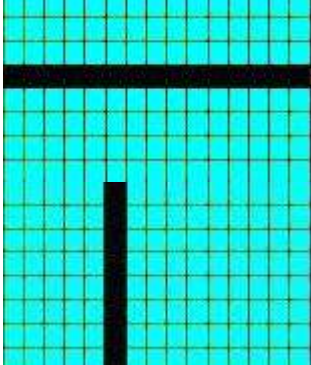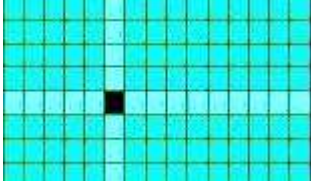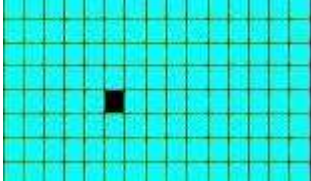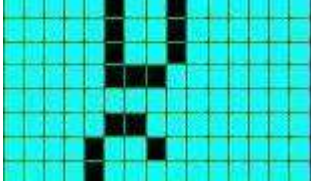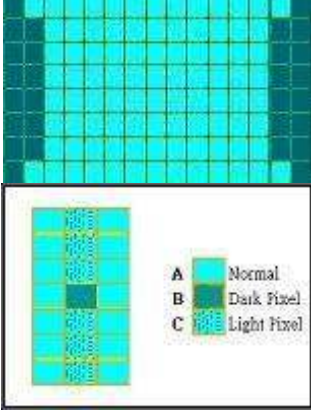
NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot, or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed 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 □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 Φ=(x + y) / 2				2.5

3.1 Round type:

SIZE	Acceptable QTY	Zone
Φ≦0.10	ignore	A+ B
0.10＜Φ≦0.20	2	A+ B
0.20＜Φ≦0.25	1	A+ B
0.25＜Φ	0	A+ B

3.2 Line type : (As following drawing)

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

AQL (item 03): 2.5

04	Polarizer bubbles /Dent					2.5

4.1 If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.

Size Φ	Acceptable Q TY	Zone
Φ≦0.20	ignore	A+B
0.20＜Φ≦0.50	3	A+B
0.50＜Φ≦1.00	2	A+B
1.00＜Φ	0	A+B
Total Q TY	3	

4.2 The polarizer dent follows this specification.

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: _table below_ ⊙If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack: _table below_ ⊙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 : _table below_	2.5

6.1.1 table:

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	$x \leq 1/8a$

6.1.2 table:

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	$x \leq 1/8a$

6.2.1 table:

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

NO	Item	Criterion	AQL
06	Glass crack	6.2.2 Non-conductive portion: <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>y ≦ L</td><td>x ≦ 1/8a</td><td>0 < z ≦ t</td></tr></table>⊙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
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

The table within item 06 for substrate protuberance:

y: width	x: length
y ≦ 1/3L	x ≦ a

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 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

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 equivalent
    Do 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.
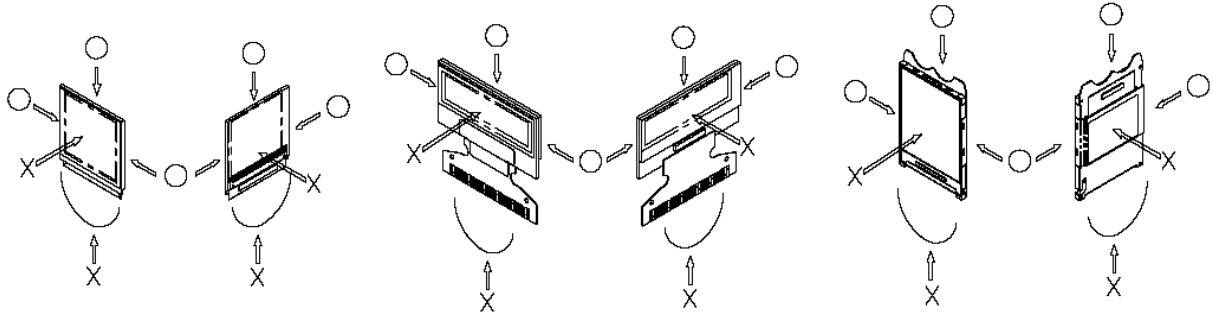
(9) Do not apply stress to the LSI chips or surrounding moldings.
(10) Handle only in ESD-safe environments to prevent damage by static electricity.
     * The operator/handler must be grounded, and proper attire/clothing must be worn.
     * Tools, workstations, and equipment (e.g.; soldering irons) 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±5°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:
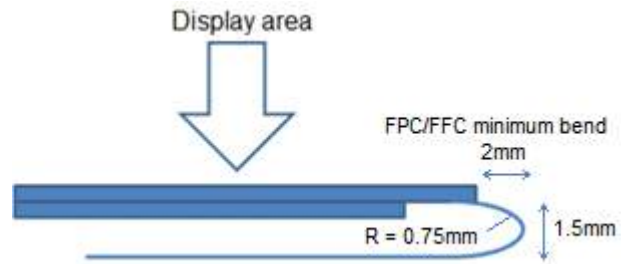
(13) Mounting must be coplanar to prevent OLED warping / twisting.
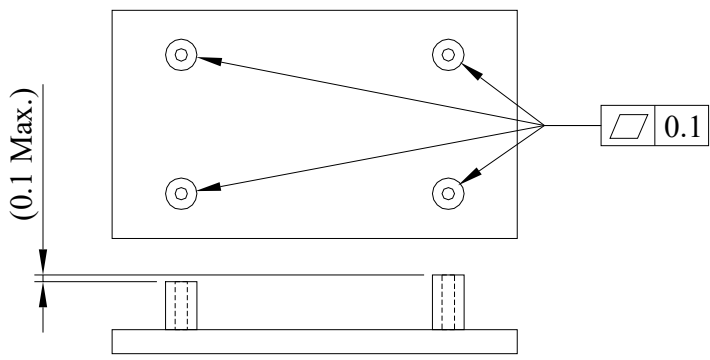
11.4. Disposal Precautions
(1) Contact local industrial waste handlers for proper disposal of OLED display modules. Observe local environmental and hygienic laws and regulations.

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