WINSTAR Display

OLED SPECIFICATION

Model No:

WEO128128HLAP3N00000

SPECIFICATION Version: C

CUSTOMER :

MODULE NO. : WEO128128HLAP3N00000

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 :

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2022/08/29		First release
A	2022/10/04		Modify Reliability Test and measurement conditions
B	2023/04/27		Modify Lifetime note
C	2023/05/18		Modify the inspection criteria name of the inspection specification

Contents

1.Module Classification Information

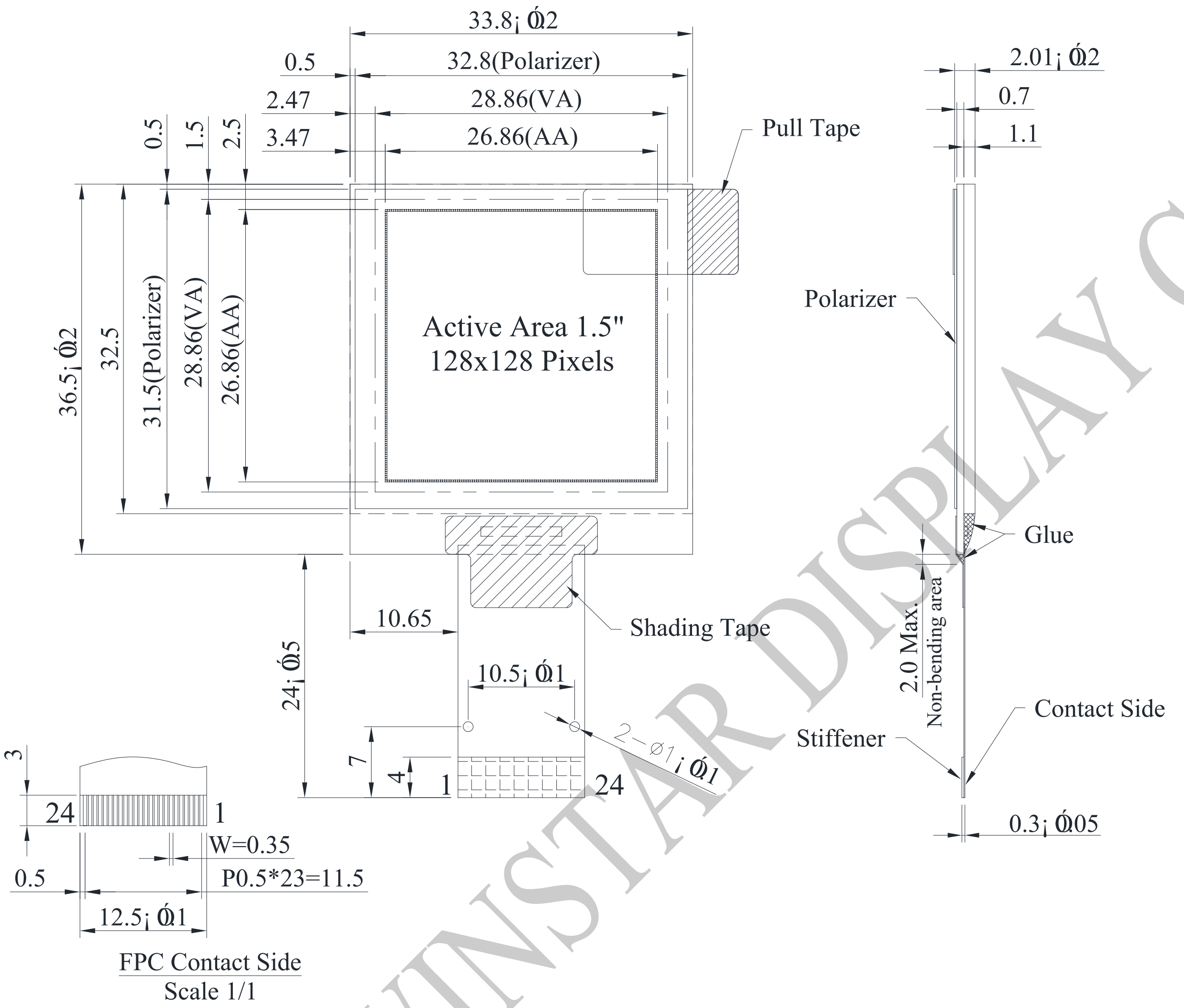
W	E	O	128128	H	L	A	P	3	N	0	0	0	00
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭

1	Brand：WINSTAR DISPLAY CORPORATION			
2	E：OLED			
3	Display Type	H：COB Character	G：COB Graphic	
		O：COG	F：COG + FR	
		P：COG + FR + PCB	X：COF	
		A：COG + PCB	N：COF + FR + PCB	
4	Dot Matrix： 128 * 128			
5	Serials code			
6	Emitting Color	A：Amber	R：Red	C：Full Color
		B：Blue	W：White	
		G：Green	L：Yellow	
		S：Sky Blue	X：Dual Color	
7	Polarizer	P：With Polarizer; N: Without Polarizer A：Anti-glare Polarizer		
8	Display Mode	P：Passive Matrix ; N：Active Matrix		
9	Driver Voltage	3：3.0~3.3V ； 5：5.0V		
10	Touch Panel	N：Without touch panel; T: With touch panel		
11	Product type	0：Standard		
12	Inspection Grade	0：Standard		
13	Option	0：Default		
14	Serial No.	Serial number(00~99)		

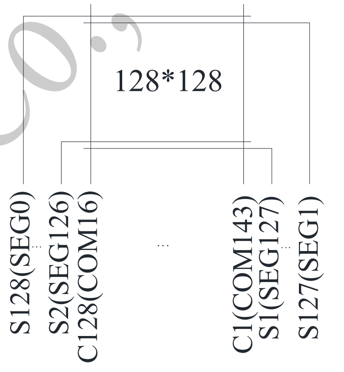
2.General Specification

Item	Dimension	Unit
Dot Matrix	128 x 128 Dots	—
Module dimension	33.80 x 36.50 x 2.01	mm
Active Area	26.86 x 26.86	mm
Pixel Size	0.185 x 0.185	mm
Pixel Pitch	0.210 x 0.210	mm
Display Mode	Passive Matrix	
Display Color	Yellow	
Drive Duty	1/128 Duty	
Gray Scale	4 bits	
IC	CH1120	
Interface	8080,SPI,I2C	
Size	1.5 inch	

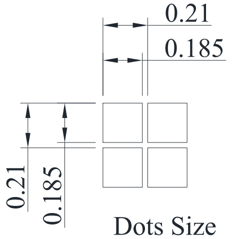
3. Contour Drawing & Block Diagram



FPC Contact Side
Scale 1/1



Seg&Com Layout

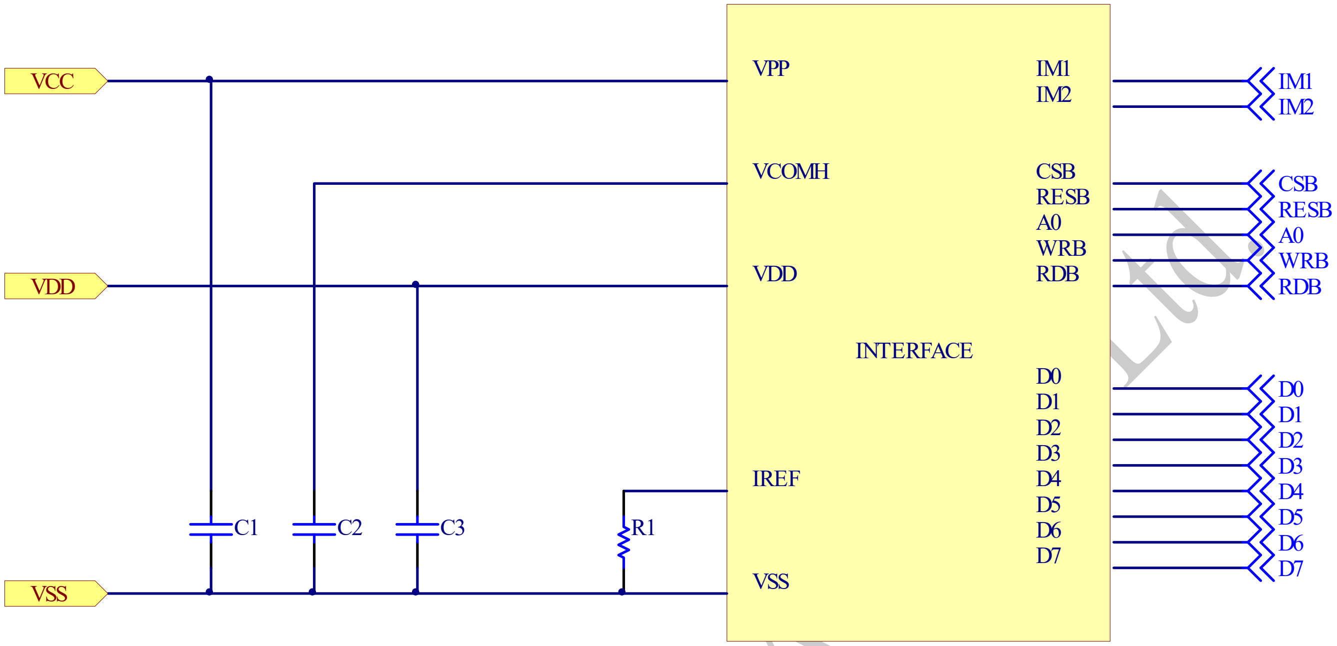


Dots Size
Scale 20/1

PIN	SYMBOL
1	ESD_GND
2	VPP
3	VCOMH
4	VDD
5	NC
6	IM1
7	IM2
8	VSS
9	IREF
10	CSB
11	RESB
12	A0
13	WRB
14	RDB
15	D0
16	D1
17	D2
18	D3
19	D4
20	D5
21	D6
22	D7
23	VPP
24	ESD_GND

The non-specified tolerance of dimension is ¡Ó0.3 mm .

3.1 Application recommendations



Recommended components:

C1, C2, C3：4.7uF

Bus Interface selection: (Must be set the IM[2:1], refer to item 4)

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

Voltage at IREF ≈ VPP – 2V. For VPP = 14.5V, IREF = 18.75uA:

R1 = (Voltage at IREF - VSS) / IREF

= (14.5 - 2)V / 18.75uA

≧ 667 KΩ(2)

Note:
(1).The capacitor value is recommended value. Select appropriate value against module application.
(2). Minimum value. When OLED product application, then R1 must be greater than the calculated value.

4.Interface Pin Function

<table>
<tr><th>No.</th><th>Symbol</th><th>Function</th></tr>
<tr><td>1</td><td>ESD_GND</td><td>This pin should be connected to GND.</td></tr>
<tr><td>2</td><td>VPP</td><td>This is the most positive voltage supply pin of the chip.
It should be supplied externally.</td></tr>
<tr><td>3</td><td>VCOMH</td><td>This is a pin for the voltage output high level for common signals.
A capacitor should be connected between this pin and GND.</td></tr>
<tr><td>4</td><td>VDD</td><td>Power supply for logic</td></tr>
<tr><td>5</td><td>NC</td><td>No connection</td></tr>
<tr><td>6</td><td>IM1</td><td rowspan="2">These are the MPU interface mode select pins.
<table>
<tr><th></th><th>8080</th><th>3-wire SPI</th><th>4-wire SPI</th><th>I2C</th></tr>
<tr><td>IM1</td><td>1</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>IM2</td><td>1</td><td>1</td><td>0</td><td>0</td></tr>
</table>
These pins must be connected to “H” or “L”.</td></tr>
<tr><td>7</td><td>IM2</td></tr>
<tr><td>8</td><td>VSS</td><td>Ground for logic and analog. This pin should be connected to GND externally.</td></tr>
<tr><td>9</td><td>IREF</td><td>This is a segment current reference pin.
A resistor should be connected between this pin and GND.</td></tr>
<tr><td>10</td><td>CSB</td><td>This pin is the chip select input. When CSB = “L”, then the chip select becomes active, and data/command I/O is enabled.
When in I2C interface, this pin is not used, so it must be connected to “L”.</td></tr>
<tr><td>11</td><td>RESB</td><td>This is a reset signal input pin. When RESB is set to “L”, the settings are initialized. The reset operation is performed by the RESB signal level.
This pin internal pull high.</td></tr>
<tr><td>12</td><td>A0</td><td>This is the Data/Command control pin that determines whether the data bits are data or a command.
A0 = “H”: the inputs at D0 to D7 are treated as display data.
A0 = “L”: the inputs at D0 to D7 are transferred to the command registers.
In I2C interface, this pin serves as SA0 to distinguish the different address of OLED driver.
When in 3-wire interface, this pin is not used, so it must be connected to “L”.</td></tr>
<tr><td>13</td><td>WRB</td><td>This is a MPU interface input pin.
When connected to an 8080 MPU, this is active LOW. This pin connects to the 8080 MPU WR signal. The signals on the data bus are latched at the rising edge of the WR signal.
When in 3-wire.4-wire & I2C interface, this pin is not used, so it must be connected to “L”.</td></tr>
</table>

14	RDB	This is a MPU interface input pin. When connected to an 8080 series MPU, it is active LOW. This pin 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 in 3-wire.4-wire & I2C interface, this pin is not used, so it must be connected to “L”.
15	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(SPI) and I2C is selected, then D0 serves as the serial clock input pin (SCL) and D1 serves as the serial data input pin (SI). At this time, D2 to D7 are set to high impedance. D7~D2 is recommended to connect the VDD or GND. It is also allowed to leave D7~D2 unconnected.
16	D1	
17	D2	
18	D3	
19	D4	
20	D5	
21	D6	
22	D7	
23	VPP	This is the most positive voltage supply pin of the chip. It should be supplied externally.
24	ESD_GND	This pin should be connected to GND.

5.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	3.5	V	1, 2
Supply Voltage for Display	VPP	-0.3	15.0	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”.
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.
3. The absolute limit temperature was verified according to the test conditions of reliability test (See section 9. Reliability) , and module was met all criteria.
4. The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80 °C.

6.Electrical Characteristics

6.1 DC Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	—	1.65	3.0	3.3	V
Supply Voltage for Display	VPP	—	8.0	14.5	15.0	V
High Level Input	VIH	—	0.8×VDD	—	VDD	V
Low Level Input	VIL	—	GND	—	0.2×VDD	V
High Level Output	VOH	—	0.8×VDD	—	VDD	V
Low Level Output	VOL	—	GND	—	0.1×VDD	V
Display 50% Pixel on	IPP	VPP =14.5V	—	20	30	mA

Note: The VCC (VPP) value can be adjusted according to the demand brightness. When VCC (VPP) is lowered, the brightness decreases or when VCC (VPP) is increased, the brightness increases. The VCC (VPP) value is set within the recommended range. The life time of OLED is directly related to the set brightness, and lower brightness helps to improve the life time.

6.2 Initial code

```
void Initial_ic(void){
      WriteCommand(0xAE);     // Display OFF

      WriteCommand(0x21);     // Set Column Start/End Address of Display RAM
      WriteCommand(0x00);
      WriteCommand(0x1F);

      WriteCommand(0x22);     // Set Row Start/End Address of Display RAM
      WriteCommand(0x00);
      WriteCommand(0x3F);

      WriteCommand(0xA2);     // Set Display Start Line
      WriteCommand(0x00);

      WriteCommand(0x81);     // The Contrast Control Mode Set
      WriteCommand(0x53);

      WriteCommand(0xAC);     // Set Grayscale/Mono display mode
      WriteCommand(0x01);     // Mono mode

      WriteCommand(0x20);     // Set Memory addressing mode
      WriteCommand(0x00);     // Horizontal Addressing Mode

      WriteCommand(0xA0);     // Set Segment Re-map

      WriteCommand(0xC8);     // Set Common Output Scan Direction

      WriteCommand(0xA3);     // Set Display Rotation
      WriteCommand(0x01);     // Display rotates 90 degrees

      WriteCommand(0xA4);     // Disable Entire Display OFF/ON

      WriteCommand(0xA6);     // Set Normal/Reverse Display

      WriteCommand(0xA8);     // Set Multiplex Ratio
      WriteCommand(0x7F);

      WriteCommand(0xD3);     // Set Display Offset
      WriteCommand(0x10);

      WriteCommand(0xD5);     // Set Display Divide Ratio/Oscillator Frequency Mode Set
      WriteCommand(0x00);

      WriteCommand(0x93);     // Set Dis-charge_front Period
      WriteCommand(0x1A);

      WriteCommand(0xD8);     // Set Dis-charge_back Period
      WriteCommand(0x02);

      WriteCommand(0xD9);     // Set Pre-charge Period
      WriteCommand(0x1F);

      WriteCommand(0xDA);     // Set SEG pads hardware configuration
      WriteCommand(0x00);
```

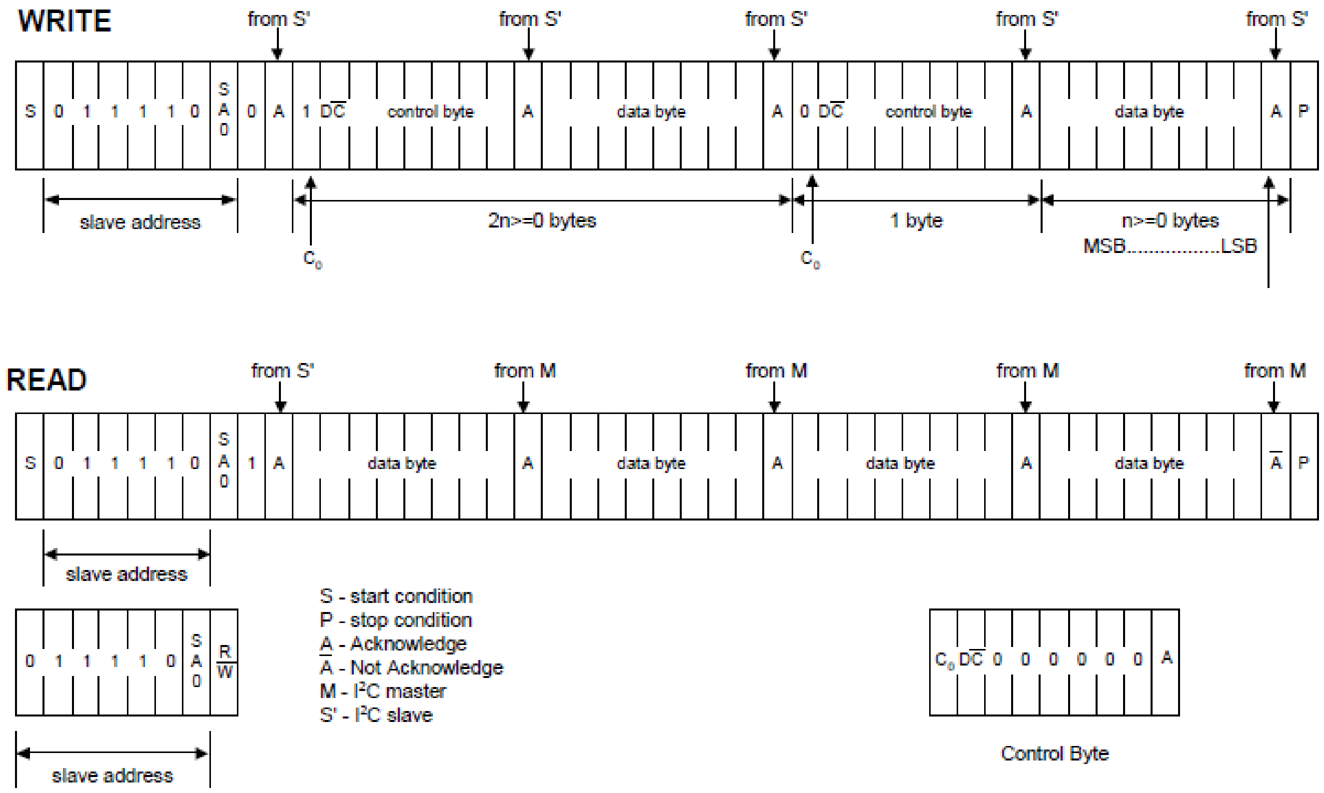
```
        WriteCommand(0xDB);      // VCOM Deselect Level
        WriteCommand(0x3F);

        WriteCommand(0xAD);      // External or internal IREF Set
        WriteCommand(0x02);

        WriteCommand(0xAF);      // Display ON
}
```

Note 1: Initial code is for reference only. Please make the best adjustment with the OLED module.
Note 2: Command: Set Contrast Control (0x81) , 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.

I2C-bus data format



Note1:

1. Co ＝ “0” : The last control byte , only data bytes to follow,
   Co ＝ “1” : Next two bytes are a data byte and another control byte;
2. D/C ＝ “0” : The data byte is for command operation,
   D/C ＝ “1” : The data byte is for RAM operation.
3. SA0 ＝ Slave address bit

I2C address bit (SA0)

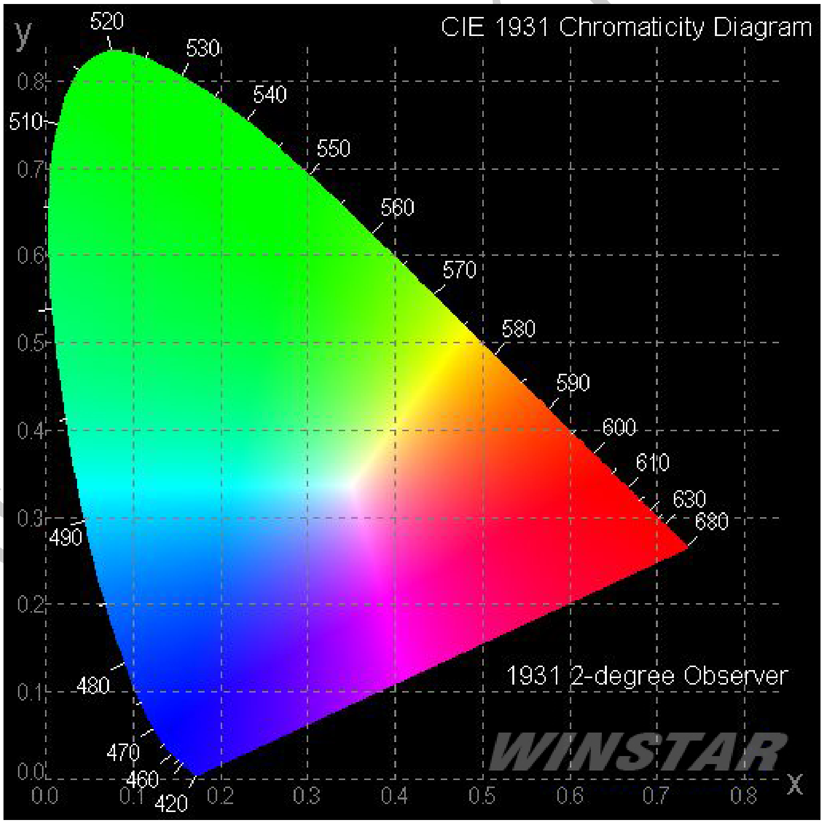
The slave address is following the start condition for recognition use. The slave address is either “b0111100” or “b0111101” by changing the SA0 to LOW or HIGH (A0 pin acts as SA0).

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% checkerboard Brightness(1)			100	150	—	cd/m^2
CIEx(Yellow)		(CIE1931)	0.45	0.47	0.49	—
CIEy(Yellow)		(CIE1931)	0.48	0.50	0.52	—

Note：

1. The brightness value is based on the setting of VCC(VPP) equal to the Typical value.
2. 50% checkerboard means half of the display area turn on & half area turn off, shown as a checkerboard.



8.OLED Lifetime

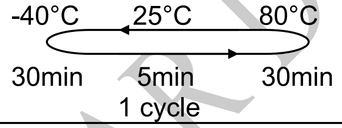
ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% checkerboard brightness 100cd/m^2	50,000 Hrs	—	Note

Note:

1. Lifetime is defined the amount of time when the luminance has decayed to <50% of the minimal brightness.
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.
4. Lifetime is not guaranteed one but expected lifetime in normal condition.

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 /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 functional 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.
4. No Condensation.

Evaluation criteria

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

APPENDIX:

RESIDUE IMAGE

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

10.Inspection specification

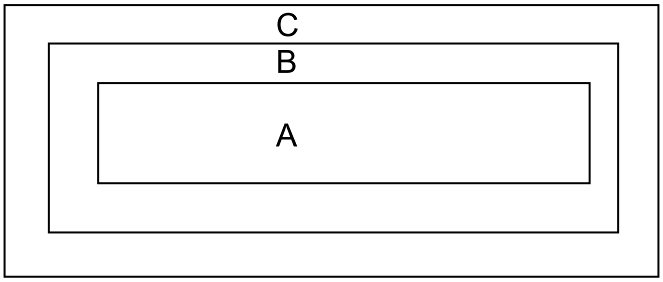
Inspection Standard:

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

Definition

1 Major defect : The defect that greatly affect the usability of product.
2 Minor defect : The other defects, such as cosmetic defects, etc.

Definition of inspection zone:



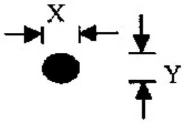
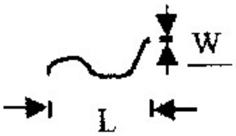
Zone A: Active Area
Zone B: Viewing Area except Zone A
Zone C: Outside Viewing Area

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

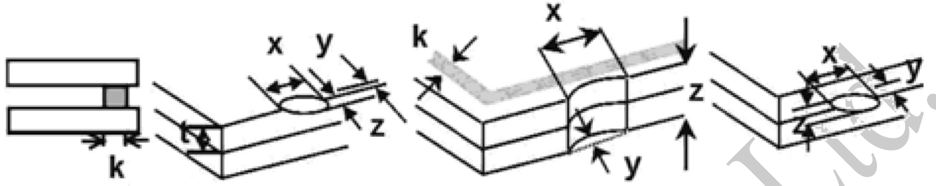
Inspection Methods

1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm viewing distance, within 45º viewing angle, under 25±5°C.
2 The luminance and color coordinate inspection : By SR-3 or BM-7 or the equal equipments, in the dark room, under 25±5°C.

NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65
02	Black or white spots on OLED (display only)	2.1 White and black spots on display ≦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

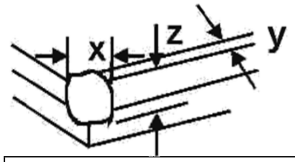
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td rowspan="2">03</td><td>OLED black spots, white spots, contamination (non-display)</td><td>3.1 Round type :
As following drawing
Φ=(x + y) / 2

<table>
<tr><th>SIZE</th><th>Acceptable QTY</th><th>Zone</th></tr>
<tr><td>Φ≦0.10</td><td>ignore</td><td>A+ B</td></tr>
<tr><td>0.10＜Φ≦0.20</td><td>2</td><td>A+ B</td></tr>
<tr><td>0.20＜Φ≦0.25</td><td>1</td><td>A+ B</td></tr>
<tr><td>0.25＜Φ</td><td>0</td><td>A+ B</td></tr>
</table></td><td>2.5</td></tr>
<tr><td></td><td>3.2 Line type : (As following drawing)

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th><th>Zone</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>ignore</td><td>A+B</td></tr>
<tr><td>L≦3.0</td><td>0.02＜W≦0.03</td><td rowspan="2">2</td><td>A+B</td></tr>
<tr><td>L≦2.5</td><td>0.03＜W≦0.05</td><td>A+B</td></tr>
<tr><td>---</td><td>0.05＜W</td><td>As round type</td><td></td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles /Dent</td><td>4.1 If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size Φ</th><th>Acceptable Q TY</th><th>Zone</th></tr>
<tr><td>Φ≦0.20</td><td>ignore</td><td>A+B</td></tr>
<tr><td>0.20＜Φ≦0.50</td><td>3</td><td>A+B</td></tr>
<tr><td>0.50＜Φ≦1.00</td><td>2</td><td>A+B</td></tr>
<tr><td>1.00＜Φ</td><td>0</td><td>A+B</td></tr>
<tr><td>Total Q TY</td><td>3</td><td></td></tr>
</table>
4.2 The polarizer dent follows this specification.</td><td>2.5</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 OLED black spots, white spots, contamination.</td><td></td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Chipped glass</td><td>
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:

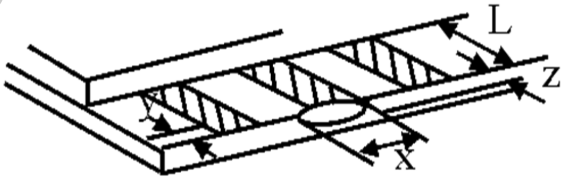


<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is total length of each chip.

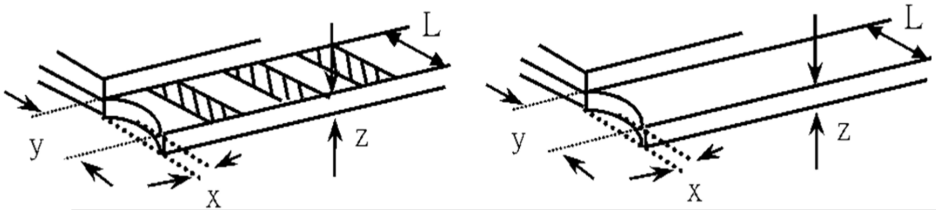
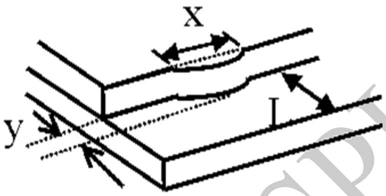
6.1.2 Corner crack:



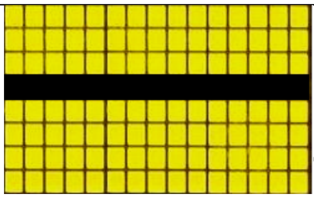
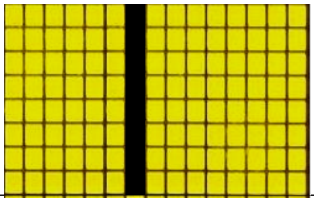
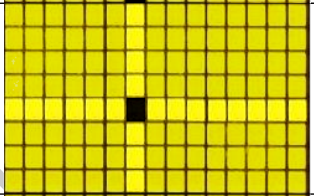
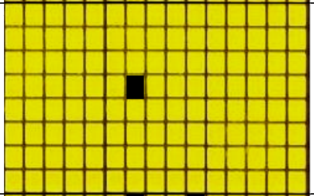
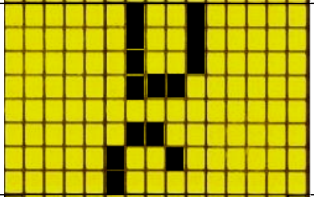
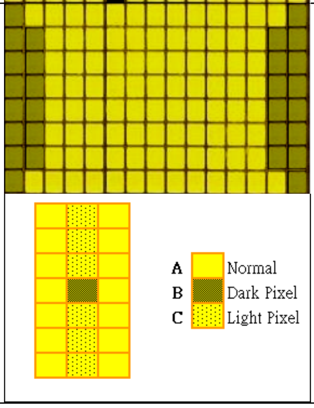
<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is the total length of each chip.
</td><td>2.5</td></tr>
<tr><td>06</td><td>Glass crack</td><td>
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>
<tr><th>y: Chip width</th><th>x: Chip length</th><th>z: Chip thickness</th></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Glass crack</td><td>6.2.2 Non-conductive portion:
 <table><tr><th>y: Chip width</th><th>x: Chip length</th><th>z: Chip thickness</th></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.<table><tr><th>y: width</th><th>x: length</th></tr><tr><td>y≦1/3L</td><td>x ≦ a</td></tr></table> </td><td>2.5</td></tr>
<tr><td>07</td><td>Cracked glass</td><td>The OLED with extensive crack is not acceptable.</td><td>2.5</td></tr>
<tr><td>08</td><td>Backlight elements</td><td>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.</td><td>0.65
2.5
0.65</td></tr>
<tr><td>09</td><td>Bezel</td><td>9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination.
9.2 Bezel must comply with job specifications.</td><td>2.5
0.65</td></tr>
<tr><td>10</td><td>PCB , COB</td><td>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.</td><td>2.5
2.5
0.65
2.5
2.5
0.65
0.65
2.5</td></tr>
</table>

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	
Dark Pixel	Major	
Wrong Display	Major	
Un-uniform B/A x 100% < 70% A/C x 100% < 70%	Major	

11.Precautions in use of OLED Modules

Modules

(1) Avoid applying excessive shocks to module or making any alterations or modifications to it.
(2) Don't make extra holes on the printed circuit board, change the components or modify its shape of OLED display module.
(3) Don't disassemble the OLED display module.
(4) Do not apply input signals while the logic power is off.
(5) Don't operate it above the absolute maximum rating.
(6) Don't drop, bend or twist OLED display module.
(7) Soldering: only to the I/O terminals.
(8) Hot-Bar FPC soldering condition: 280~350C, less than 5 seconds.
(9) Winstar has the right to change the passive components (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.) and change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance...etc, under the premise of not affecting the electrical characteristics and external dimensions, Winstar have the right to modify the version.)
(10) Winstar has the right to upgrade or modify the product function.
(11) For COG & COF structure OLED products, customers should reserve VCC (VPP) adjustment function or software update function when designing OLED supporting circuit. (The progress of OLED light-emitting materials will increase the conversion efficiency and the brightness. The brightness can be adjusted if necessary).

11.1. Handling Precautions

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

* Scotch Mending Tape No. 810 or an equivalent

Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.

Also, pay attention that the following liquid and solvent may spoil the polarizer:

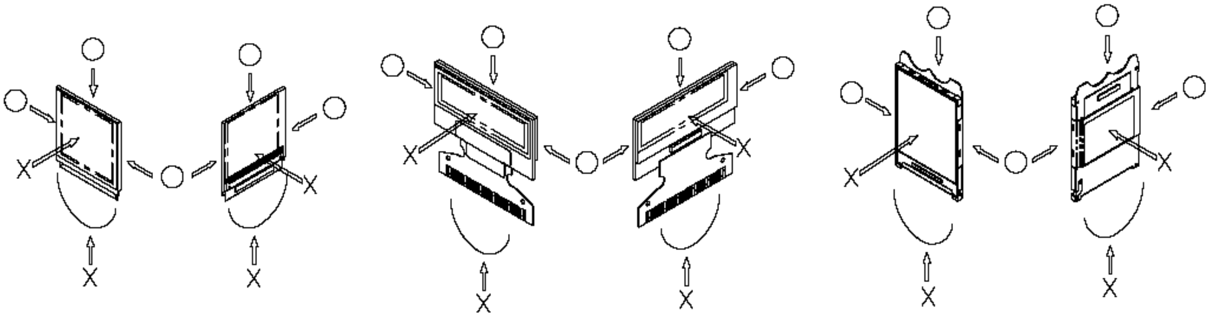
* Water
* Ketone
* Aromatic Solvents

(6) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. At this time, if the OLED display module has been stored for a long period of time, residue adhesive material of the protection film may remain on the surface of the display panel after removed of the film. In such case, remove the residue material by the method introduced in the above Section 5.
(7) Do not touch the following sections whenever possible while handling the OLED display modules.

* Pins and electrodes

* Pattern layouts such as the TCP & FPC

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



(9) Do not apply stress to the LSI chips and the surrounding molded sections.

(10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence of element breakage accidents by static electricity.

* Be sure to make human body grounding when handling OLED display modules.

* Be sure to ground tools to use or assembly such as soldering irons.

* To suppress generation of static electricity, avoid carrying out assembly work under dry environments.

* Protective film is being applied to the surface of the display panel of the OLED display module. Be careful since static electricity may be generated when exfoliating the protective film.

11.2. Storage Precautions

(1) When storing OLED display modules, put them in static electricity preventive bags to avoid be directly exposed to sun or lights of fluorescent lamps. And, also, place in the temperature 25±5°C and Humidity below 65% RH.(We recommend you to store these modules in the packaged state when they were shipped from Winstar. At that time, be careful not to let water drops adhere to the packages or bags.)

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

11.3. Designing Precautions

(1) The absolute maximum ratings are the ratings which cannot be exceeded for OLED display module, and if these values are exceeded, OLED display module may be damaged.

(2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specification and to make the signal line cable as short as possible.

(3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD / VCC). (Recommend value: 0.5A)

(4) Pay sufficient attention to avoid occurrence of mutual noise interference with the nearby devices.

(5) As for EMI, take necessary measures on the equipment side basically.

(6) If the power supplied to the OLED display module is forcibly shut down by such errors as taking out the main battery while the OLED display panel is in operation, we cannot guarantee the quality of this OLED display module.

* Connection (contact) to any other potential than the above may lead to rupture of the IC.

(7) If this OLED driver is exposed to light, malfunctioning may occur and semiconductor

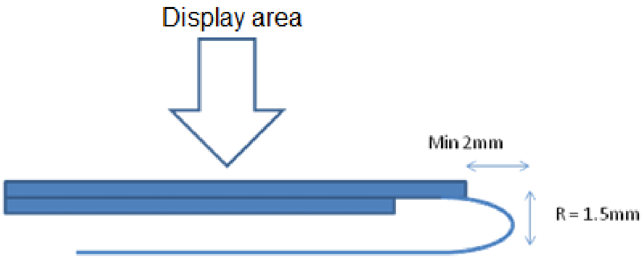
elements may change their characteristics.

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

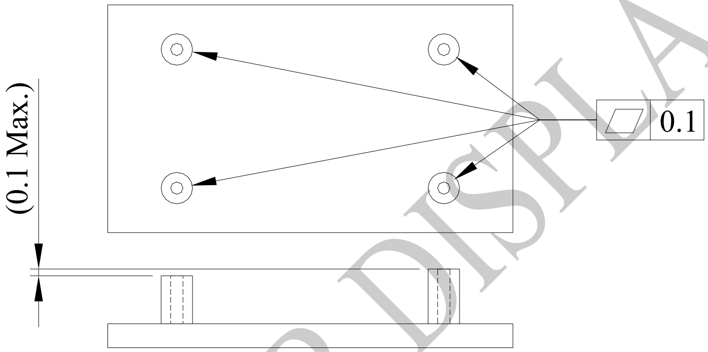
(9) We recommend you to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

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

(11) The limitation of FPC and Film bending.



(12) The module should be fixed balanced into the housing, or the module may be twisted.



(13) Please heat up a little the tape sticking on the components when removing it; otherwise the components might be damaged.

11.4. Precautions when disposing of the OLED display modules

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