

WINSTAR Display

OLED SPECIFICATION

Model No:

WEO160128AWPP3N00000

SPECIFICATION

Version: A

CUSTOMER :

MODULE NO. : WEO160128AWPP3N00000

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	2017/10/27		First release
A	2018/06/14		Sample spec

Contents

- 1.Module Classification Information
- 2.General Specification
- 3.Contour Drawing & Block Diagram
- 4.Interface Pin Function
- 5.Absolute Maximum Ratings
- 6.Electrical Characteristics
- 7.Optical Characteristics
- 8.OLED Lifetime
- 9.Reliability
- 10.Inspection specification
- 11.Precautions in use of OLED Modules

1.Module Classification Information

W E O 160128 A W P P 3 N 0 0 0 00

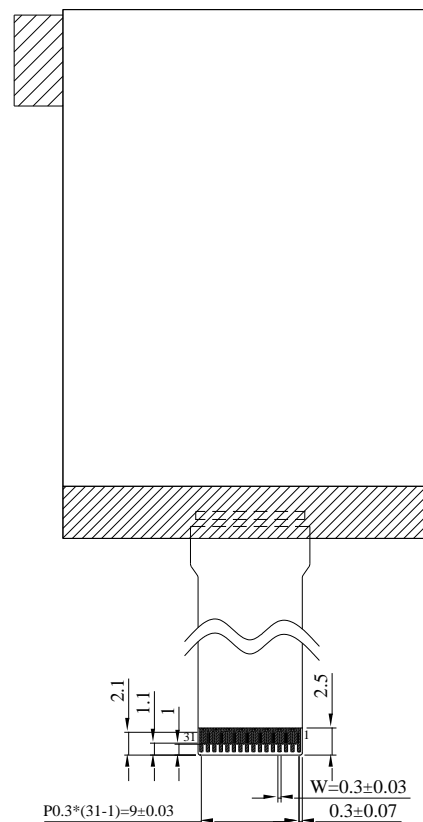
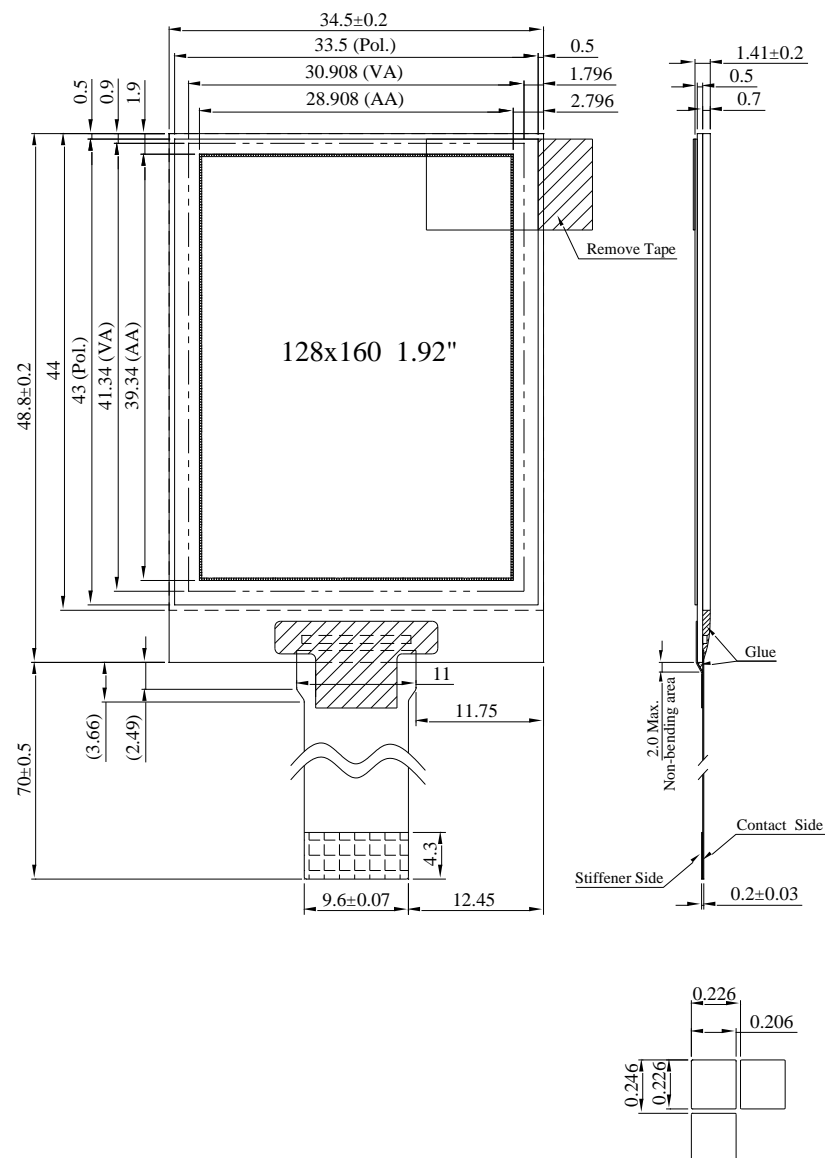
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭

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 : TAB			
		A : COG + PCB					
4	Dot Matrix : 160 * 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 1 : Daylight Readable 2 : Transparent OLED (TOLED) 3 : Flexible OLED (FOLED) 4 : OLED Lighting					
12	Inspection Grade	0 : Standard 2 : Special grade C : Automotive grade Y : Consumer grade					
13	Option	0 : Default ; F : ZIF FPC ; H : Hot bar FPC; D : Demo Kit					
14	Serial No.	Serial number(00~ZZ)					

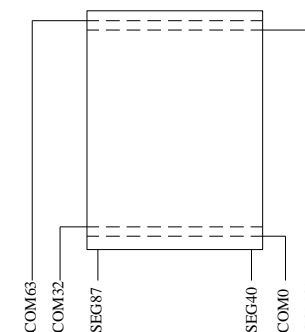
2.General Specification

Item	Dimension	Unit
Dot Matrix	128 × 160 Dots	—
Module dimension	34.5 × 48.8 × 1.41	mm
Active Area	28.908 × 39.34	mm
Pixel Size	0.206 × 0.226	mm
Pixel Pitch	0.226 × 0.246	mm
Display Mode	Passive Matrix	
Display Color	White	
Drive Duty	1/128 Duty	
IC	SH1108	
Interface	6800, 8080,I2C, SPI	
Size	1.92 inch	

3. Contour Drawing & Block Diagram

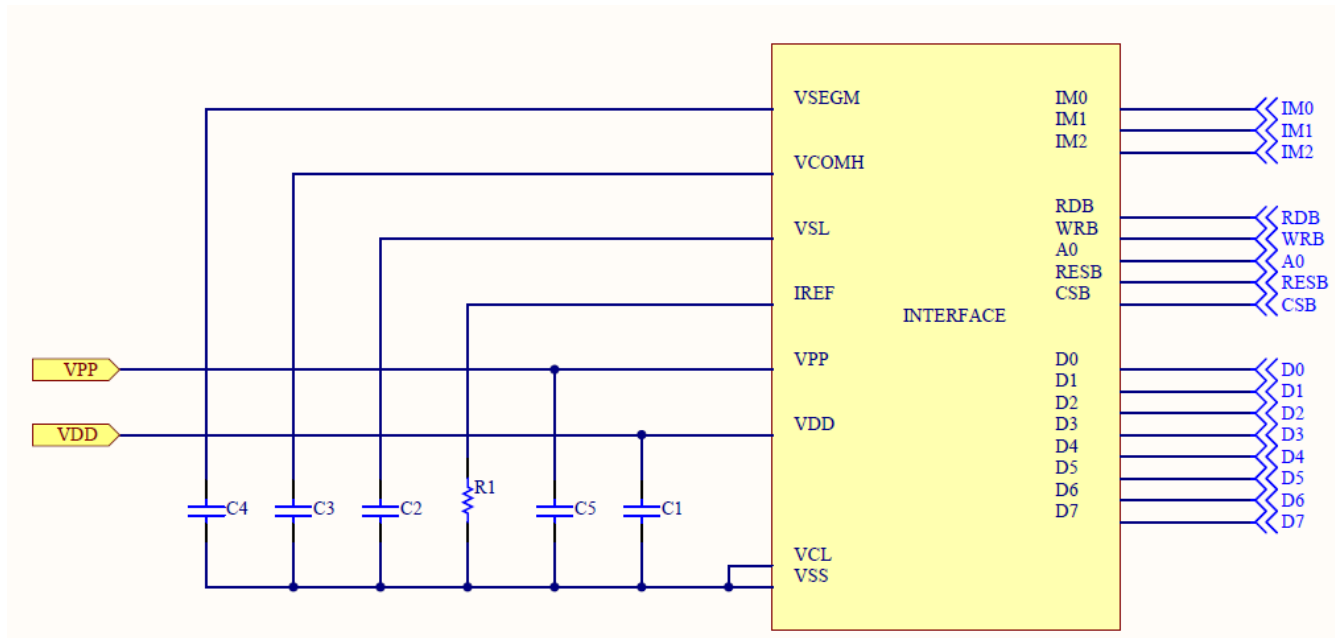


PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	NC	16	IM2
2	VPP	17	CS
3	VSEGM	18	RES
4	VCOMH	19	A0
5	VSL	20	WR
6	NC	21	RD
7	IREF	22	D0
8	VPP	23	D1
9	NC	24	D2
10	VSS	25	D3
11	VCL	26	D4
12	VDD	27	D5
13	IM0	28	D6
14	IM1	29	D7
15	VDD	30	NC
		31	VPP



The non-specified tolerance of dimension is $\pm 0.3\text{mm}$.

3.1 Application recommendations



Recommended components :

C1: 0.1uF

C2,C3,C4,C5: 4.7μF

R1: about 750K ohm , $R1 = (\text{Voltage at IREF} - \text{GND})/\text{IREF}$

Bus Interface selection: (Must be set the IM[2:0], refer to item 4)

8-bits 6800 and 8080 parallel, 3 or 4-wire SPI, I2C

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

4. Interface Pin Function

No.	Symbol	Function																														
1	NC	NC																														
2	VPP	This is the most positive voltage supply pad of the chip. It should be supplied externally.																														
3	VSEGM	This is a pad for the voltage output level for segment pre-charge. A capacitor should be connected between this pad and VSS.																														
4	VCOMH	This is a pad for the voltage output high level for common signals. A capacitor should be connected between this pad and VSS.																														
5	VSL	This is a segment voltage reference pad. A capacitor should be connected between this pad and VSS.																														
6	NC	NC																														
7	IREF	This is a segment current reference pad. A resistor should be connected between this pad and VSS. Set the current at 15.625uA.																														
8	VPP	This is the most positive voltage supply pad of the chip. It should be supplied externally.																														
9	NC	NC																														
10	VSS	Ground for analog, logic&buffer respectively.																														
11	VCL	This is a common voltage reference pad. This pad should be connected to VSS externally.																														
12	VDD	1.65 - 3.5V power supply input pad for logic.																														
13	IM0	<table><tr><td colspan="6">These are the MPU interface mode select pads.</td></tr><tr><td></td><td>8080</td><td>I2C</td><td>6800</td><td>4-Wire SPI</td><td>3-Wire SPI</td></tr><tr><td>IM0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>IM1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>IM2</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table>	These are the MPU interface mode select pads.							8080	I2C	6800	4-Wire SPI	3-Wire SPI	IM0	0	0	0	0	1	IM1	1	1	0	0	0	IM2	1	0	1	0	0
These are the MPU interface mode select pads.																																
	8080		I2C	6800	4-Wire SPI	3-Wire SPI																										
IM0	0		0	0	0	1																										
IM1	1	1	0	0	0																											
IM2	1	0	1	0	0																											
14	IM1																															
16	IM2																															
15	VDD	1.65 - 3.5Vpower supply input pad																														
17	CS	This pad is the chip select input. When /CS = “L”, then the chip select becomes active, and data/command I/O is enabled.																														
18	RES	This is a reset signal input pad. When /RES is set to “L”, the settings are initialized. The reset operation is performed by the /RES signal level.																														
19	A0	This is the Data/Command control pad 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 pad serves as SA0 to distinguish the different address of OLED driver.																														

20	WR	This is a MPU interface input pad. When connected to an 8080 MPU, this is active LOW. This pad connects to the 8080 MPU /WR signal. The signals on the data bus are latched at the rising edge of the /WR signal. When connected to a 6800 Series MPU: This is the read/write control signal input terminal. When /WR = "H": Read. When /WR = "L": Write.
21	RD	This is a MPU interface input pad. When connected to an 8080 series MPU, it is active LOW. This pad is connected to the /RD signal of the 8080 series MPU, and the data bus is in an output status when this signal is "L". When connected to a 6800 series MPU, this is active HIGH. This is used as an enable clock input of the 6800 series MPU.
22	D0	Data bus.
23	D1	Data bus.
24	D2	Data bus.
25	D3	Data bus.
26	D4	Data bus.
27	D5	Data bus.
28	D6	Data bus.
29	D7	Data bus.
30	NC	NC
31	VPP	This is the most positive voltage supply pad of the chip. It should be supplied externally.

5.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	3.6	V	1,2
Supply Voltage for Display	VPP	-0.3	17.0	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”.

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 6.“Optics & Electrical Characteristics”. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

6. Electrical Characteristics

6.1 DC Electrical Characteristics

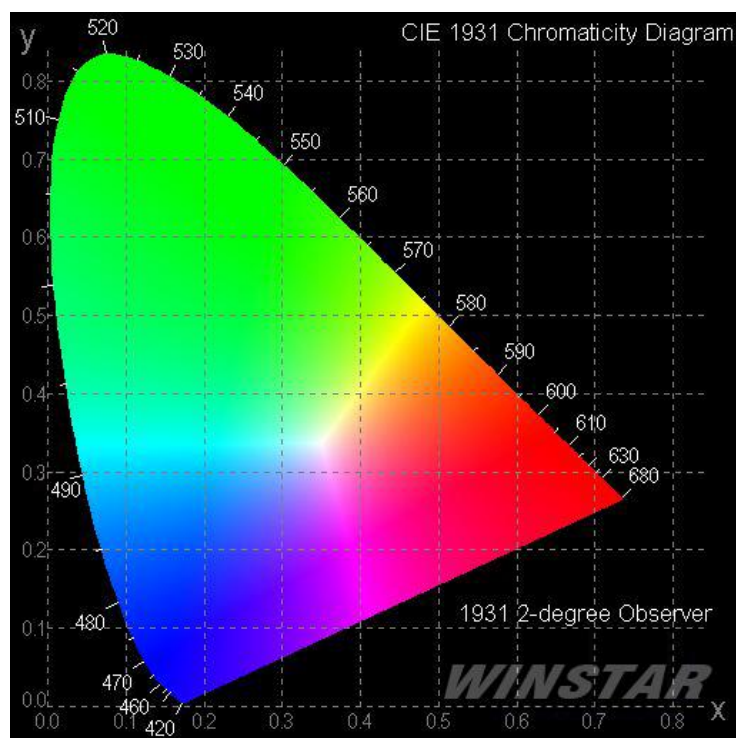
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	—	1.65	3.0	3.5	V
Supply Voltage for Display	VPP	—	11.5	12.0	12.5	V
Input High Volt.	VIH	—	0.8xVDD	—	VDD	V
Input Low Volt.	VIL	—	VSS	—	0.2xVDD	V
Output High Volt.	VOH	IOH=-0.5mA	0.8xVDD	—	VDD	V
Output Low Volt.	VOL	IOL=0.5mA	VSS	—	0.2xVDD	V
Operating Current for VPP (VCC Supplied Externally)	Ipp	VPP=12.0V	—	23.0	34.5	mA

6.2 Initial code

```
WriteCommand(0xAE); // Display OFF
WriteCommand(0x20); // Set Memory addressing mode
WriteCommand(0x81); // Set contrast control
WriteCommand(0x78);
WriteCommand(0xA0); // Segment remap
WriteCommand(0xA6); // Normal display
WriteCommand(0xA9); // Set Display Resolution
WriteCommand(0x02); // 160*128
WriteCommand(0xAD); // Set external VPP
WriteCommand(0x80);
WriteCommand(0xC0); // Set Common scan direction
WriteCommand(0xD5); // Divide Ratio/Oscillator Frequency Mode Set
WriteCommand(0xF1); // 86Hz
WriteCommand(0xD9); // Set Dis-charge/Pre-charge Period
WriteCommand(0x1F); // 0.687*VPP
WriteCommand(0xDB); // Set Vcomh voltage
WriteCommand(0x2B);
WriteCommand(0xDC); // Set VSEGM Deselect Level
WriteCommand(0x35);
WriteCommand(0x30); // Set Discharge VSL Level,0V
WriteCommand(0xAF); // Display ON
```

7.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) θ	—	160	—	—	deg
	(H) ϕ	—	160	—	—	deg
Contrast Ratio	CR	Dark	2000:1	—	—	—
Response Time	T rise	—	—	10	—	μ s
	T fall	—	—	10	—	μ s
Display with 50% check Board Brightness			60	80	—	cd/m ²
CIEx(White)		(CIE1931)	0.24	0.28	0.32	—
CIEy(White)		(CIE1931)	0.28	0.32	0.36	—



8.OLED Lifetime

ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% check board brightness Typical Value	16,000 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. <div style="text-align: center;"> <p>-40°C 25°C 80°C 30min 5min 30min 1 cycle</p> </div>	-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 terminal.	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 $23\pm5^{\circ}\text{C}$; $55\pm15\%$ RH.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for High Temperature storage, High Temperature/Humidity Storage, Temperature Cycle

Evaluation criteria

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

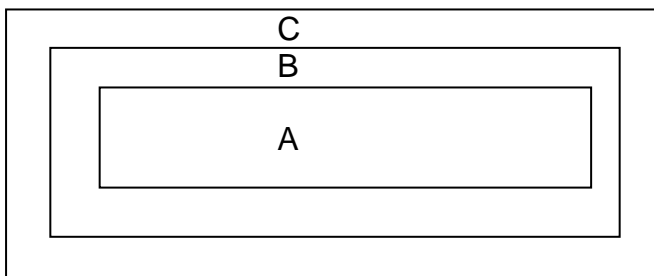
MIL-STD-105E table normal inspection single sample level II.

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

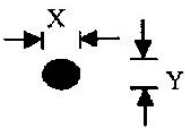
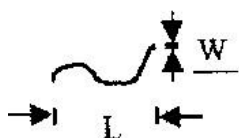
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble of quality and assembly to customer's product.

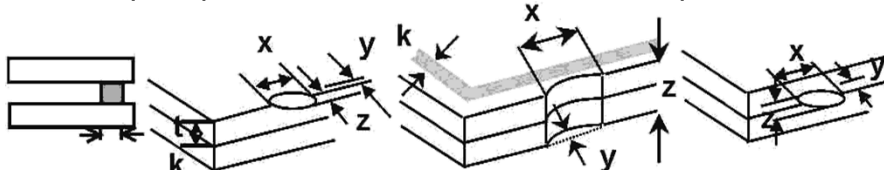
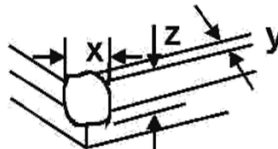
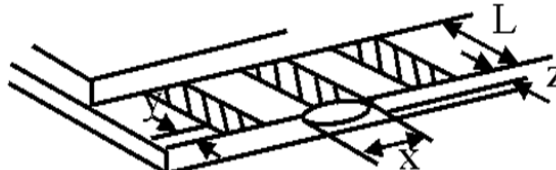
Inspection Methods

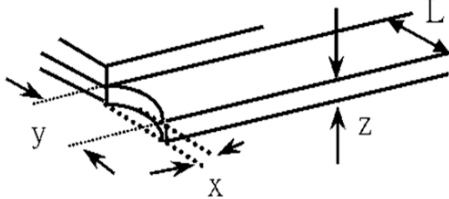
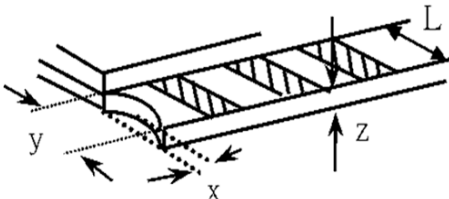
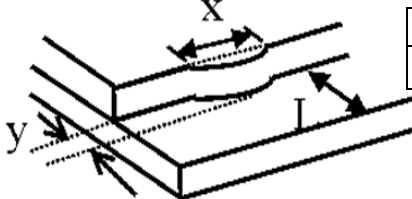
1 The general inspection : Under fluorescent light illumination: 750~1500 Lux, about 30cm viewing distance, within 45° viewing angle, under 25±5°C.

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.


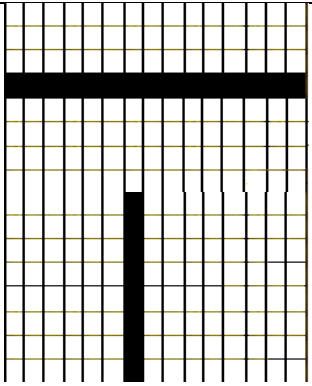
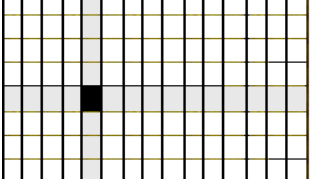
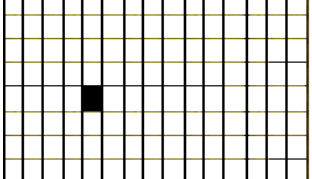
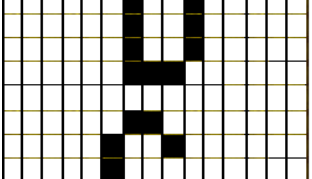
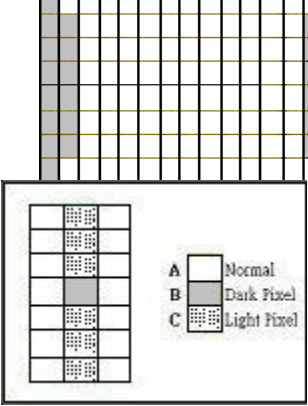
NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character , dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed 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 $\leq 0.25\text{mm}$, 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																			
03	OLED black spots, white spots, contamination (non-display)	<div> <div> 3.1 Round type : As following drawing $\Phi = (x + y) / 2$  </div> <table> <tr> <th>SIZE</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> <tr> <td>$\Phi \leq 0.10$</td> <td>Accept no dense</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> </table> </div>	SIZE	Acceptable QTY	Zone	$\Phi \leq 0.10$	Accept no dense	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																			
$\Phi \leq 0.10$	Accept no dense	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																				
		<div> 3.2 Line type : (As following drawing)  <table> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> <th>Zone</th> </tr> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>Accept no dense</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> </table> </div>	Length	Width	Acceptable QTY	Zone	---	$W \leq 0.02$	Accept no dense	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																			
---	$W \leq 0.02$	Accept no dense	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																				
04	Polarizer bubbles	<div> 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 QTY</th> <th>Zone</th> </tr> <tr> <td>$\Phi \leq 0.20$</td> <td>Accept no dense</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> </table> </div>	Size Φ	Acceptable QTY	Zone	$\Phi \leq 0.20$	Accept no dense	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	
Size Φ	Acceptable QTY	Zone																				
$\Phi \leq 0.20$	Accept no dense	A+B																				
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$0.50 < \Phi \leq 1.00$	2	A+B																				
$1.00 < \Phi$	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><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><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></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><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><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></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
z: Chip thickness	y: Chip width	x: Chip length																			
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$																			
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z: Chip thickness	y: Chip width	x: Chip length																			
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$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$																			
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><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>$y \leq 0.5\text{mm}$</td><td>$x \leq 1/8a$</td><td>$0 < z \leq t$</td></tr></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												
y: Chip width	x: Chip length	z: Chip thickness																			
$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$																			

NO	Item	Criterion	AQL										
06	Glass crack	<p>6.2.2 Non-conductive portion:</p> <div></div> <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>$y \leq L$</td><td>$x \leq 1/8a$</td><td>$0 < z \leq t$</td></tr></table> <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> <div><table><tr><td>y: width</td><td>x: length</td></tr><tr><td>$y \leq 1/3L$</td><td>$x \leq a$</td></tr></table></div>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$x \leq a$	2.5
		y: Chip width	x: Chip length	z: Chip thickness									
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$											
y: width	x: length												
$y \leq 1/3L$	$x \leq a$												
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										

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 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	

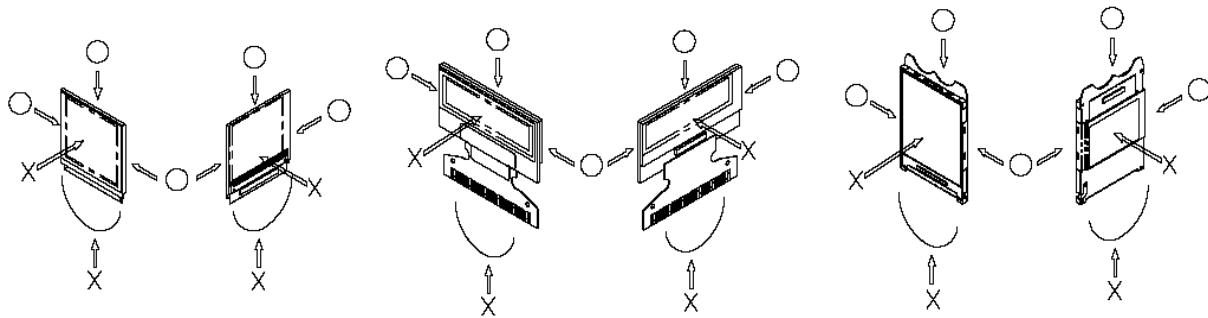
11. Precautions in use of OLED Modules

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, modify its shape or change the components of OLED display module.
- (3) Don't disassemble the OLED display module.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist OLED display module.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please storage in anti-static electricity container and clean environment.
- (8) It's pretty common to use "Screen Saver" to extend the lifetime and Don't use fix information for long time in real application.
- (9) Don't use fixed information in OLED panel for long time, that will extend "screen burn" effect time.
- (10) Winstar has the right to change the passive components, including R2 and R3 adjust resistors. (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.)
- (11) Winstar have the right to change the PCB Rev. (In order to satisfy the supplying stability, management optimization and the best product performance...etc, under the premise of not affecting the electrical characteristics and external dimensions, Winstar have the right to modify the version.)

11.1. Handling Precautions

- (1) Since the display panel is being made of glass, do not apply mechanical impacts such 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 and be careful not to apply pressure to these sections.
- (4) The polarizer covering the surface of the OLED display module is soft and easily scratched. Please be careful when handling the OLED display module.
- (5) When the surface of the polarizer of the OLED display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
 - * Scotch Mending Tape No. 810 or an equivalentNever 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) Hold OLED display module very carefully when placing OLED display module into the System housing. Do not apply excessive stress or pressure to OLED display module. And, do not over bend the film with electrode pattern layouts. These stresses will influence the display performance. Also, secure sufficient rigidity for the outer cases.



- (7) Do not apply stress to the LSI chips and the surrounding molded sections.
- (8) Do not disassemble nor modify the OLED display module.
- (9) Do not apply input signals while the logic power is off.
- (10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence of element breakage accidents by static electricity.
 - * Be sure to make human body grounding when handling OLED display modules.
 - * Be sure to ground tools to use or assembly such as soldering irons.
 - * To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
 - * Protective film is being applied to the surface of the display panel of the OLED display module. Be careful since static electricity may be generated when exfoliating the protective film.
- (11) Protection film is being applied to the surface of the display panel and removes the protection film before assembling it. At this time, if the OLED display module has been stored 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.
- (12) If electric current is applied when the OLED display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful to avoid the above.

11.2. Storage Precautions

- (1) When storing OLED display modules, put them in static electricity preventive bags avoiding exposure to direct sun light nor to lights of fluorescent lamps. and, also, avoiding high temperature and high humidity environment or low temperature (less than 0°C) environments.

(We recommend you to store these modules in the packaged state when they were shipped from Winstar.

At that time, be careful not to let water drops adhere to the packages or bags nor let dewing occur with them.

- (2) If electric current is applied when water drops are adhering to the surface of the OLED display module, when the OLED display module is being dewed or when it is placed under high humidity environments, the electrodes may be corroded and be careful about the above.

11.3. Designing Precautions

- (1) The absolute maximum ratings are the ratings which cannot be exceeded for OLED display module, and if these values are exceeded, panel damage may be happen.
- (2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
- (3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
- (4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighboring devices.
- (5) As for EMI, take necessary measures on the equipment side basically.
- (6) When fastening the OLED display module, fasten the external plastic housing section.

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

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

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.

11.5. Other Precautions

(1) When an OLED display module is operated for a long of time with fixed pattern may remain as an after image or slight contrast deviation may occur.

Nonetheless, if the operation is interrupted and left unused for a while, normal state can be restored. Also, there will be no problem in the reliability of the module.

(2) To protect OLED display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the OLED display modules.

* Pins and electrodes

* Pattern layouts such as the TCP & FPC

(3) With this OLED display module, the OLED driver is being exposed. Generally speaking, semiconductor elements change their characteristics when light is radiated according to the principle of the solar battery. Consequently, if this OLED driver is exposed to light, malfunctioning may occur.

* Design the product and installation method so that the OLED driver may be shielded from light in actual usage.

* Design the product and installation method so that the OLED driver may be shielded from light during the inspection processes.

(4) Although this OLED display module stores the operation state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal status may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.

(5) We recommend you to construct its software 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.

(6) Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.

(7) Our company will has the right to upgrade and modify the product function.

(8) The limitation of FPC and Film bending.

