Vishay Dale Electronics, Inc.
Information Display Products

OLED Product Data Sheet

OLED SPECIFICATION

Model No:

OLED-128O032A-BPP3N00000

SPECIFICATION   Version: G

CUSTOMER # :   **OLED-128O032A-BPP3N00000**

Global / SAP # :   **O128O032ABPP3N0000**

APPROVED BY:

(FOR CUSTOMER USE ONLY)

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
RELEASE DATE:			

MODEL # :   OLED-128O032A-BPP3N00000

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2013/11/01		First issue
A	2013/12/25		Add information of Module Life Time
B	2014/02/14		Correct Brightness
C	2014/06/12		Add Low Temperature storage.
D	2014/09/30		Correct Block Diagram.
E	2015/07/23		Modify VCC.
F	2015/11/09		Modify Life time.
G	2016/03/23		Modify Static electricity test

Contents

1.Module Classification Information

OLED- 128 O 032 A- B P P 3 N 0 0 0 00
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭

1	Brand	Vishay Intertechnology, Inc.	
2	Horizontal Format	128 Columns	
3	Display Type	N→Character Type, H→Graphic Type, Y→TAB Type, O→COG Type	
4	Vertical Format	32 Lines (Rows)	
5	Series code	A	
6	Emitting Color	A：Amber	R：RED
		B：Blue	W：White
		G：Green	L：Yellow
7	Polarizer	P：With Polarizer; N: Without Polarizer	
8	Display　Mode	P：Passive Matrix ; A: Active Matrix	
9	Driver Voltage	3: 3.0 V; 5: 5.0V	
10	Touch Panel	N：Without touch panel; T: With touch panel	
11	Products type	0：Standard type 1. Sunlight 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; F：FPC; H：Hot bar; D：Demo Kit	
14	Serial No.	Application serial number (00~ZZ)	

2.General Specification

Item	Dimension	Unit
Dot Matrix	128 x 32 Dots	—
Module dimension	62.0 × 24.0 × 2.35	mm
Active Area	55.018 × 13.098	mm
Pixel Size	0.408 × 0.388	mm
Pixel Pitch	0.43 × 0.41	mm
Display Mode	Passive Matrix	
Display Color	Blue	
Drive Duty	1/32 Duty	
IC	SSD1305Z	

3. Contour Drawing & Block Diagram

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

62.00±0.2
57.02 VA
55.018 AA
2.491
3.491
2.00
3.00
24.00±0.2
20.10±0.2
15.10 VA
13.098 AA
19.60±0.3
8.60±0.15
4.50±0.5
3.00±0.3
"A"
8.50±0.1
2.00±0.15
2-Ø0.80±0.1
1 24
W=0.30±0.03
0.50
P0.5*23=11.50±0.05
(24.75)
12.50±0.2

MAX 2.35
2.05±0.2
0.70±0.07
1.10±0.1
0.50±0.5
Remove tape
T=0.15 Max
Shading plate
T=0.2
Glue
Protect tape
15*3.5*0.05
Contact side
Stiffener side
0.30±0.03

0.41
0.388
0.43
0.408

Detail "A"
Scale(5/1)

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

FUNCTION BLOCK DIAGRAM
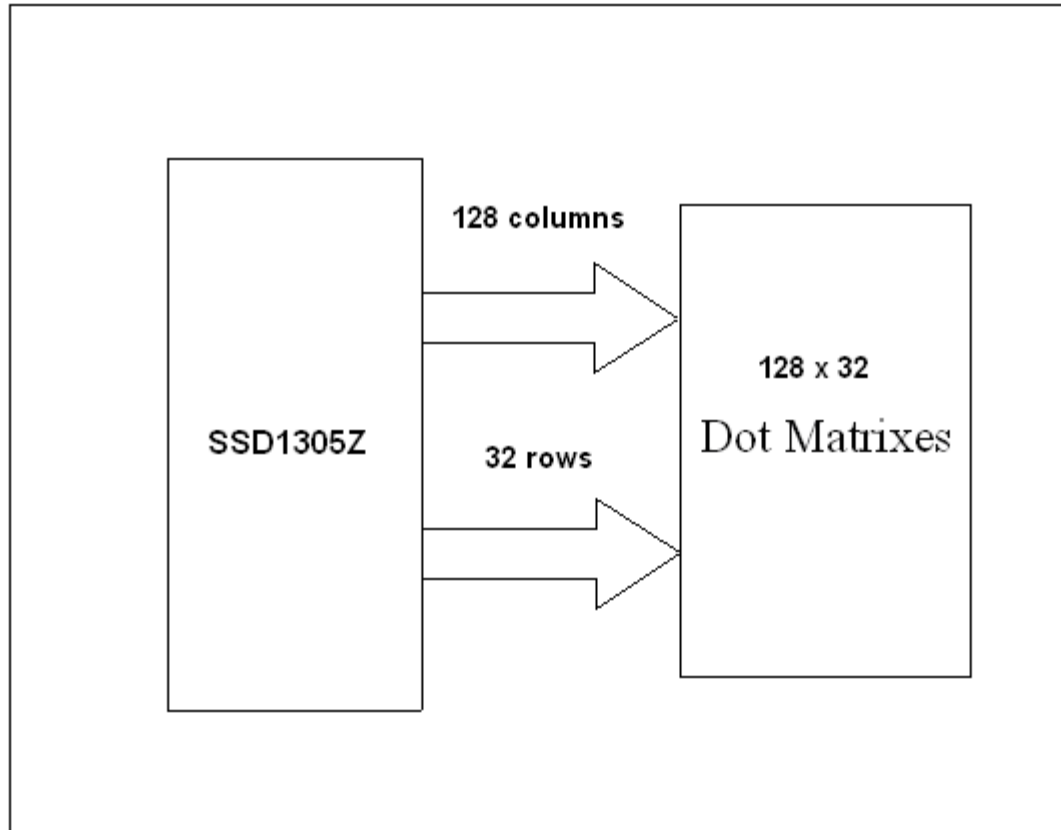
*For more information, please refer to the SSD1305 datasheet.

4. Interface Pin Function

No.	Symbol	Function
1	N.C.(GND)	No connection
2	VLSS	This is an analog ground pin. It should be connected to VSS externally.
3	VSS	Ground.
4	N.C.	No connection
5	VDD	Power supply pin for core logic operation
6	BS1	Communicating Protocol Select These pins are MCU interface selection input. See the following table:
7	BS2	<table><tr><td></td><td>68XX-parallel</td><td>80XX-parallel</td><td>Serial</td><td>I2C</td></tr><tr><td>BS1</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>BS2</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table>
8	CS#	This pin is the chip select input. (active LOW)
9	RES#	This pin is reset signal input. When the pin is LOW, initialization of the chip is executed. Keep this pin HIGH (i.e. connect to VDDIO) during normal operation.
10	D/C#	This is Data/Command control pin. When it is pulled HIGH (i.e. connect to VDDIO), the data at D[7:0] is treated as data. When it is pulled LOW, the data at D[7:0] will be transferred to the command register. In I2C mode, this pin acts as SA0 for slave address selection.
11	R/W#	This is read / write control input pin connecting to the MCU interface. When interfacing to a 6800-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Read mode will be carried out when this pin is pulled HIGH (i.e. connect to VDDIO) and write mode when LOW. When 8080 interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected. When serial interface is selected, this pin must be connected to VSS.
12	E/RD#	When interfacing to a 6800-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled HIGH (i.e. connect to VDDIO) and the chip is selected. When connecting to an 8080-microprocessor, this pin receives the Read (RD#) signal. Read operation is initiated when this pin is pulled LOW and the chip is selected. When serial interface is selected, this pin must be connected to VSS.
13	D0	These are 8-bit bi-directional data bus to be connected to the microprocessor's data bus.
14	D1	

15	D2	When serial interface mode is selected, D0 will be the serial clock input: SCLK; D1 will be the serial data input: SDIN and D2 should be left opened. When I2C mode is selected, D2, D1 should be tied together and serve as SDAout, SDAin in application and D0 is the serial clock input, SCL.
16	D3	
17	D4	
18	D5	
19	D6	
20	D7	
21	IREF	This is segment output current reference pin. A resistor should be connected between this pin and VSS to maintain the IREF current at 10uA.
22	VCOMH	The pin for COM signal deselected voltage level. A capacitor should be connected between this pin and VSS.
23	VCC	Power supply for panel driving voltage. This is also the most positive power voltage supply pin.
24	N.C.(GND)	No connection

5.Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	VDD	-0.3	4	V	1, 2
Supply Voltage for Display	VCC	0	15	V	1, 2
Operating Temperature	TOP	-40	+80	°C	-
Storage Temperature	TSTG	-40	+80	°C	-

Note 1: All the above voltages are on the basis of "VSS = 0V".
Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 6 ''Electrical Characteristics''. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate

6.Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	VDD	—	2.8	3.0	3.3	V
Supply Voltage for Display	VCC	—	9	10	11	V
High Level Input	VIH	—	0.8×VDD	—	VDD	V
Low Level Input	VIL	—	0	—	0.2×VDD	V
High Level Output	VOH	—	0.9×VDD	—	VDD	V
Low Level Output	VOL	—	0	—	0.1×VDD	V
Supply Current	ICC	VCC=10.0V	18	20	25	mA

7.Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V)θ		160			deg
	(H)φ		160			deg
Contrast Ratio	CR	Dark	2000:1		—	—
Response Time	T rise	—		10		μs
	T fall	—		10		μs
Supply Voltage For　Vcc=10.0V 50% Check Board Brightness		With polarizer	80	100		nits Note1
CIEx(Blue)		x,y(CIE1931)	0.12	0.16	0.20	
CIEy(Blue)		x,y(CIE1931)	0.19	0.23	0.27	
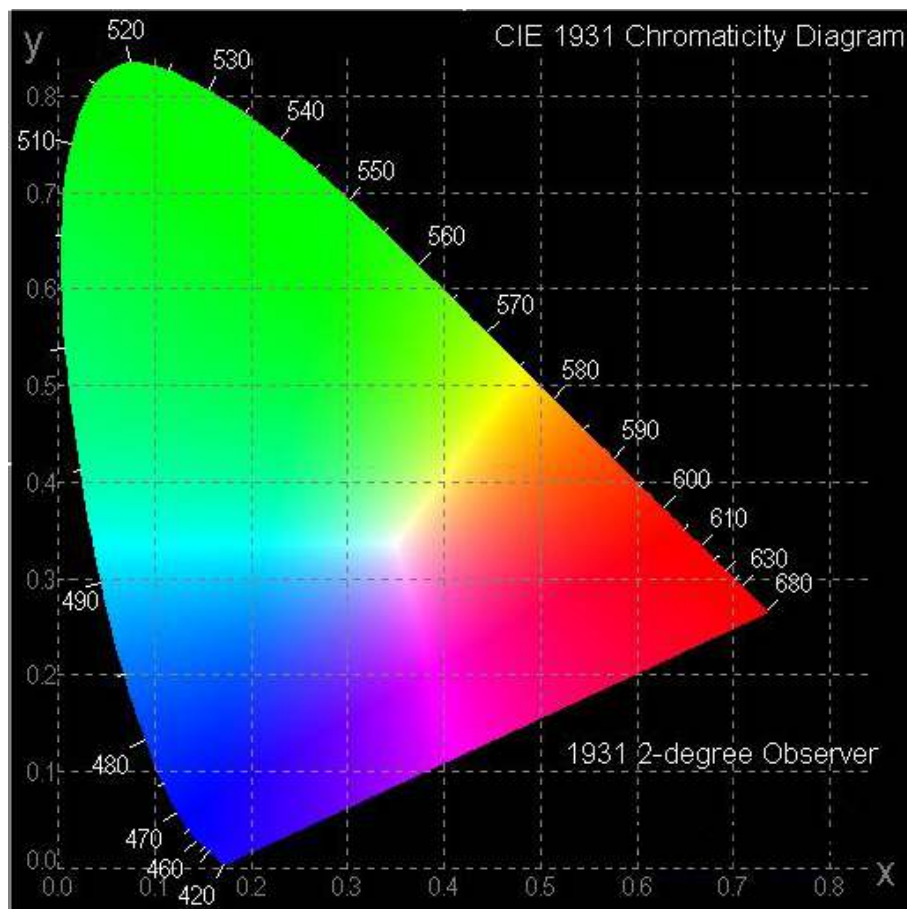
8.OLED Lifetime
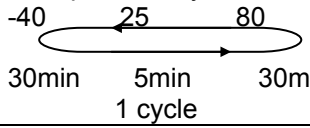
ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25℃ / Initial 50% check board brightness Typical Value	20,000 Hrs	―	Note

Notes:
1. Life time is defined the amount of time when the luminance has decayed to <50% of the initial value.
2. This analysis method uses life data obtained under accelerated conditions to extrapolate an estimated probability density function (*pdf*) for the product under normal use conditions.
3. Screen saving mode will extend OLED lifetime.

9.Reliability

Content of Reliability Test

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Applicable Standard**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80 240hrs	――
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40 240hrs	――
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80 240hrs	――
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-40 240hrs	――
High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60 ,90%RH 240hrs	――
Temperature Cycle	Endurance test applying the low and high temperature cycle. -40　　　25　　　80 30min　　5min　　30min 1 cycle	-40 /80 100 cycles	――
Mechanical Test			
Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hr	――
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sin wave 11 ms 3 times of each direction	――
Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	――
Others			
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	――

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

Test and measurement conditions
1. All measurements shall not be started until the specimens attain to temperature stability. After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at 23±5°C; 55±15% RH.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for High Temperature storage, High Temperature/ Humidity Storage, Temperature Cycle
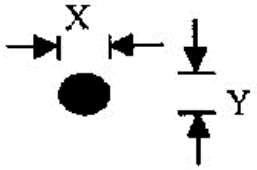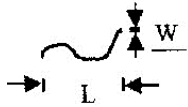
Evaluation criteria
1. The function test is OK.
2. No observable defects.
3. Luminance: > 50% of initial value.
4. Current consumption: within ± 50% of initial value.
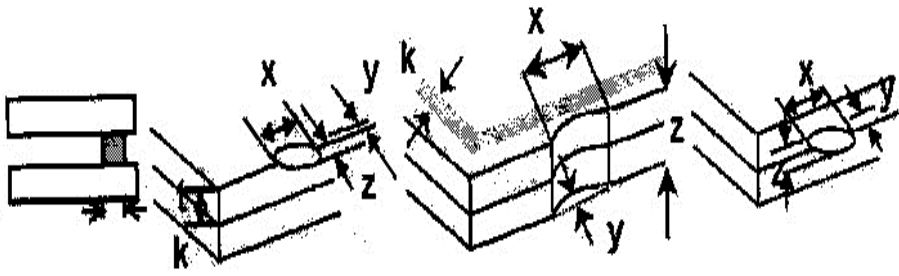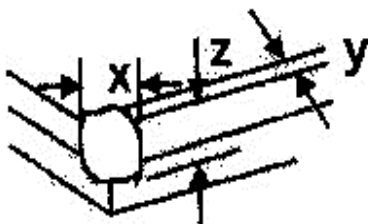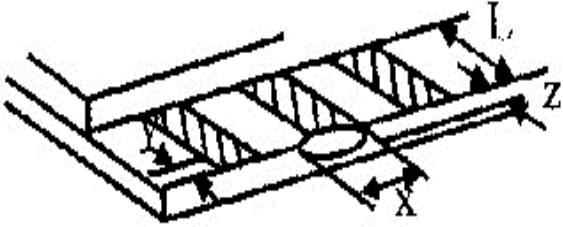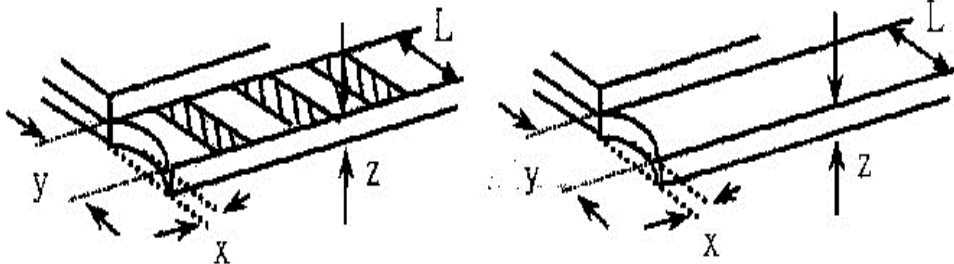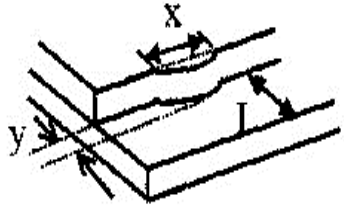
APPENDIX:
RESIDUE IMAGE
Because the pixels are lighted in different time, the luminance of active pixels
may reduce or differ from inactive pixels. Therefore, the residue image will occur.
To avoid the residue image, every pixel needs to be lighted up uniformly.
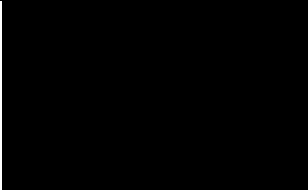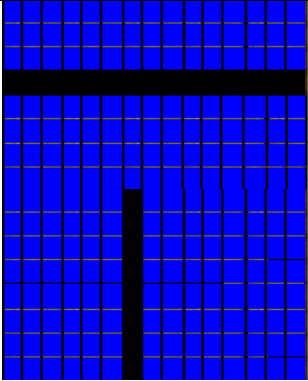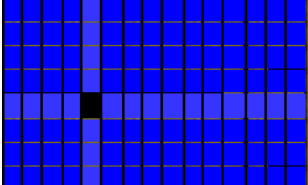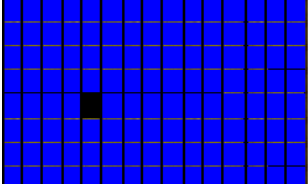
10.Inspection Specification

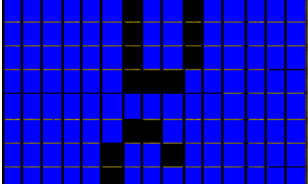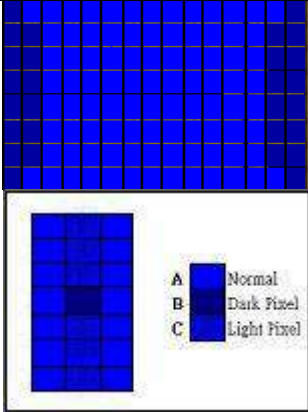| NO	Item	Criterion			AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 OLED viewing angle defect. 1.7 Mixed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

SIZE	Acceptable Q TY
Φ≦0.10	Accept no dense
0.10＜Φ≦0.20	2
0.20＜Φ≦0.25	1
0.25＜Φ	0

3.2 Line type : (As following drawing)

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

AQL: 2.5

| 04 | Polarizer bubbles | If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. | | | 2.5 |

Size Φ	Acceptable Q TY
Φ≦0.20	Accept no dense
0.20＜Φ≦0.50	3
0.50＜Φ≦1.00	2
1.00＜Φ	0
Total Q TY	3

NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 OLED black spots, white spots, contamination	
06	Chipped glass	Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: OLED side length L: Electrode pad length: 6.1 General glass chip : 6.1.1 Chip on panel surface and crack between panels: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$ | ⊙If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed 1/3k	$x \leq 1/8a$ | ⊙If there are 2 or more chips, x is the total length of each chip.	2.5

NO	Item	Criterion	AQL
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: OLED side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad : <table><tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr><tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0 < z ≦ t</td></tr></table> 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. <table><tr><td>y: width</td><td>x: length</td></tr><tr><td>y≦1/3L</td><td>x ≦ a</td></tr></table>	2.5

NO	Item	Criterion	AQL
07	Cracked glass	The OLED with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using OLED spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, OLED pad, zebra pad or screw hold pad, make sure it is smoothed down.	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
			2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
			0.65
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 OLED pin loose or missing pins.	
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	

Check Item	Classification	Criteria
No Display	Major	
Missing Line	Major	
Pixel Short	Major	
Darker Short	Major	
Wrong Display	Major	
Un-uniform B/A x 100% < 70% A/C x 100% < 70%	Major	

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 store in anti-static electricity container and clean environment.
(8)Use a "Screen Saver" to extend the lifetime. Do not show fixed information for a long time in
   the application.
(9)Don't use fixed information in OLED panel for long time that will cause "screen burn" effect.
(10)The manufacturer has the right to change the passive components, including R2and R3
   adjust resistors.   (Resistors, capacitors and other passive components will have different
   appearance and color caused by the different supplier.)
(11)The manufacturer has the right to change the PCB Rev. (In order to satisfy supply stability,
   management optimization, and the best product performance..., under the premise of not
   affecting the electrical characteristics and external dimensions. The manufacturer has the right
   to modify the version.)

11.1. Handling Precautions

(1) Since the display panel is made of glass, do not apply mechanical impacts such us dropping
   from a high position.
(2) If the display panel is broken by some accident and the internal organic substance leaks out,
   be careful not to inhale or ingest 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, be careful not to apply pressure to these sections.
(4) The polarizer covering the surface of the OLED display module is soft and easily scratched.
   Please be careful when handling the OLED display module.
(5) When the surface of the polarizer of the OLED display module has soil, clean the surface. It
   takes advantage of by using following adhesion tape.
   * Scotch Mending Tape No. 810 or an equivalent
   Never try to breathe upon the soiled surface or 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 solvents can damage 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.
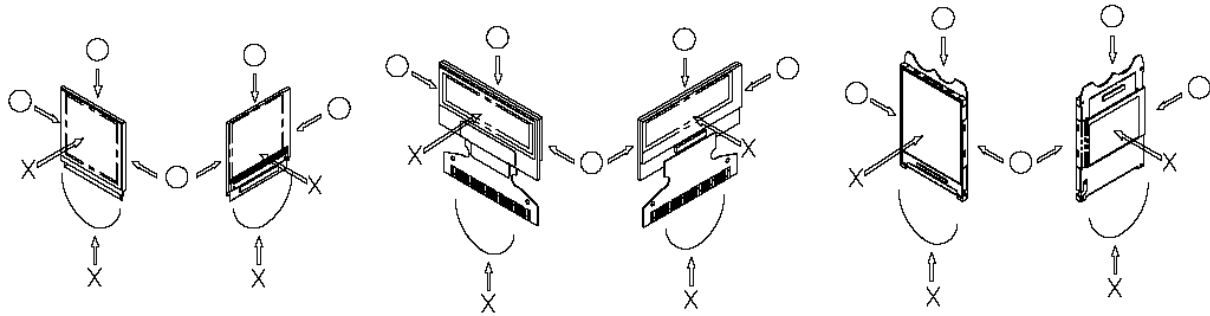
(7) Do not apply stress to the LSI chips and the surrounding molded sections.
(8) Do not disassemble or modify the OLED display module.
(9) Do not apply input signals while the logic power is off.
(10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence 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 removing the protective film.
(11) Protective film is applied to the surface of the display panel.   Remove the protective film before assembly.   If the OLED display module has been stored for a long period of time, residue adhesive material from the protective film may remain on the surface of the display panel after the film is removed. 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 has moisture condensation or when it is placed under high humidity environments, the electrodes may corrode.

11.2. Storage Precautions
(1) When storing OLED display modules, put them in static electricity preventive bags avoiding exposure to direct sun light and fluorescent lamps.   Avoid high temperature and high humidity environment or low temperature (less than 0°C) environments.
(The manufacturer recommends storing these modules in the packaged state as they were shipped.)
At that time, be careful not to let water drops adhere to the packages or bags or let condensation occur with them.
(2) If electric current is applied when condensation is present or when it is placed under high humidity environments, the electrodes may corrode.

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) Excess current protection devices (fuses, etc.) are recommend on the power circuit (VDD).   (Recommend value: 0.5A)
(4) Give sufficient attention to avoid occurrence of mutual noise interference with the neighboring devices.
(5) For EMI, take necessary measures in the application equipment.
(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, the manufacturer cannot

guarantee the quality of the 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 time with a fixed pattern, the pattern
   may remain as an after image with slight contrast or brightness variation.

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 exposed. Generally, semiconductor
   elements change their characteristics when exposed to light, similar 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 operational state data by the commands and
   the indication data, when excessive external noise, etc. enters into the module, the internal
   states 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) The manufacturer recommends periodic refreshment of the operation status (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)The manufacturer has the right to upgrade and modify the product function.

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