


MCOB21605G1V-EWS	2 x 16	Euro/Jap/Cyrillic	OLED Module
<b>Specification</b>			
Version: 1		Date: 13/04/2014	
<b>Revision</b>			
1	11/04/2014	First Issue	

Display Features			Box Quantity	Weight / Display			
Character Count	2 x 16					---	---
Appearance	White on Black						
Logic Voltage	5V						
Interface	Parallel						
Font Set	English / European / Cyrillic						
Character Height	5.55 mm						
Module Size	80.00 x 36.00 x 10.00 mm						
Operating Temperature	-40°C ~ +80°C						
Construction	COB						

Display Accessories	
Part Number	Description

Optional Variants	
Appearance	Voltage



# General Specification

The Features is described as follow:

- Module dimension: 80.0 x 36.0 x 10.0 (max.) mm
- View area: 66.0 x 16.0 mm
- Active area: 56.95 x 11.85 mm
- Number of Characters: 16 Character x 2 Line
- Dot size: 0.55 x 0.65 mm
- Dot pitch: 0.60x 0.70 mm
- Character size: 2.95 x 5.55 mm
- Character pitch: 3.6 x 6.3 mm
- Duty: 1/16
- Emitting Color: OLED , White

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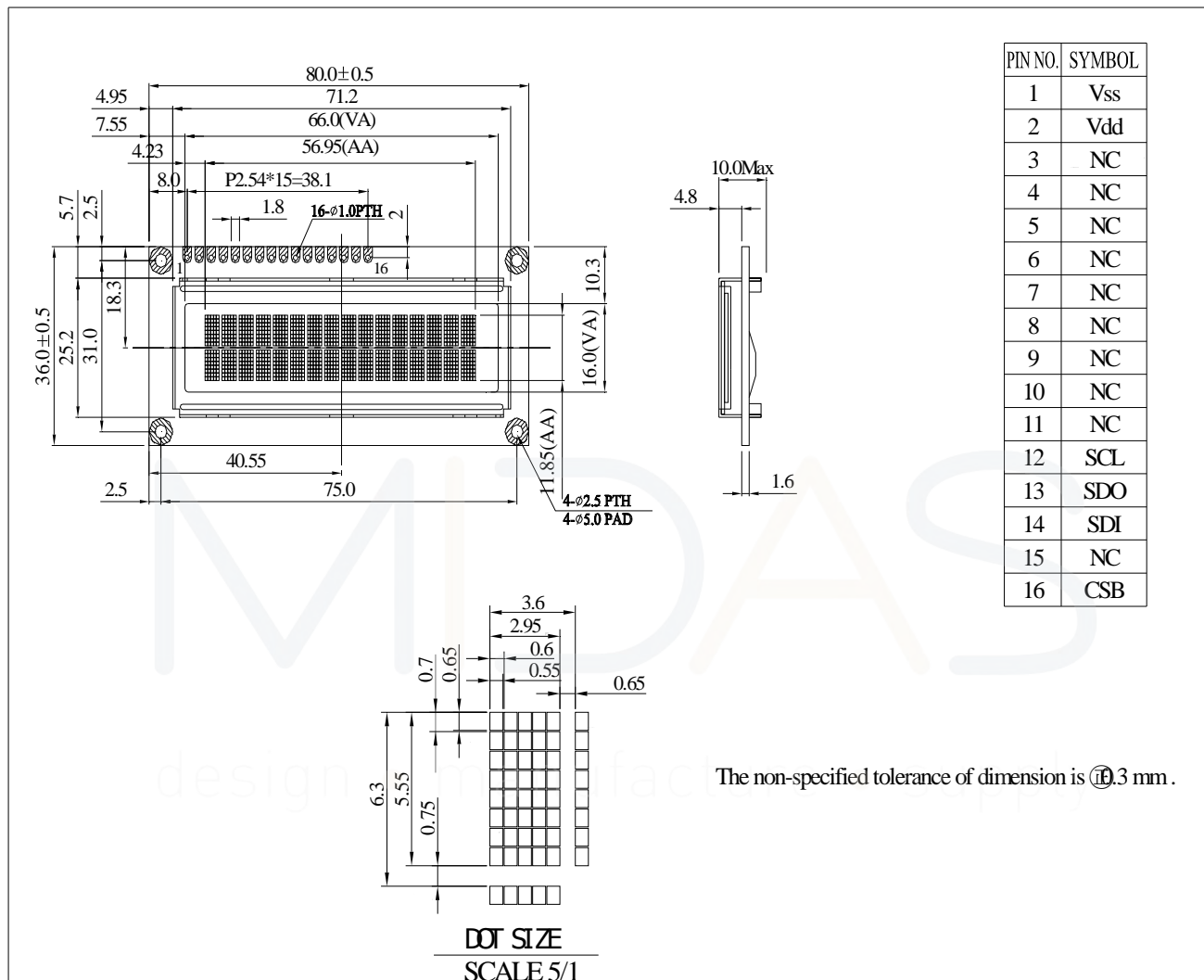


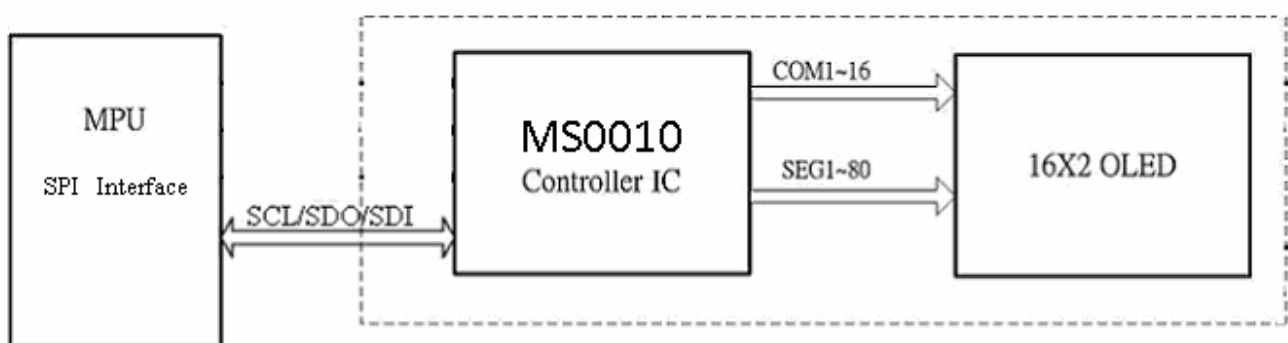
## Interface Pin Function

Pin No.	Symbol	Level	Description
1	VSS	0V	Ground
2	VDD	5.0V	Supply Voltage for logic
3	NC	—	No connection
4	NC	—	No connection
5	NC	—	No connection
6	NC	—	No connection
7	NC	—	No connection
8	NC	—	No connection
9	NC	—	No connection
10	NC	—	No connection
11	NC	—	No connection
12	SCL	H/L	Serial Clock
13	SDO	H/L	Serial Data output
14	SDI	H/L	Serial Data input
15	NC	—	No connection
16	CSB	—	Chip select input pins Data / instruction I/O is enabled only when CSB is “L”.



# Outline Dimension





Address Format	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
CA (Character Address)	1	ADD6	ADD5	ADD4	ADD3	ADD2	ADD1	ADD0

1	2	3	4	.....	.....	13	14	15	16
CA10000000	CA10000001	CA10000010	CA10000011	.....	.....	CA10001100	CA10001101	CA10001110	CA10001111
CA11000000	CA11000001	CA11000010	CA11000011	.....	.....	CA11001100	CA11001101	CA11001110	CA11001111



## Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Notes
Operating Temperature	$T_{OP}$	-40	+80	°C	
Storage Temperature	$T_{ST}$	-40	+80	°C	
Supply Voltage For Logic	VDD-V <sub>SS</sub>	-0.3	5.3	V	

## Electrical Characteristics

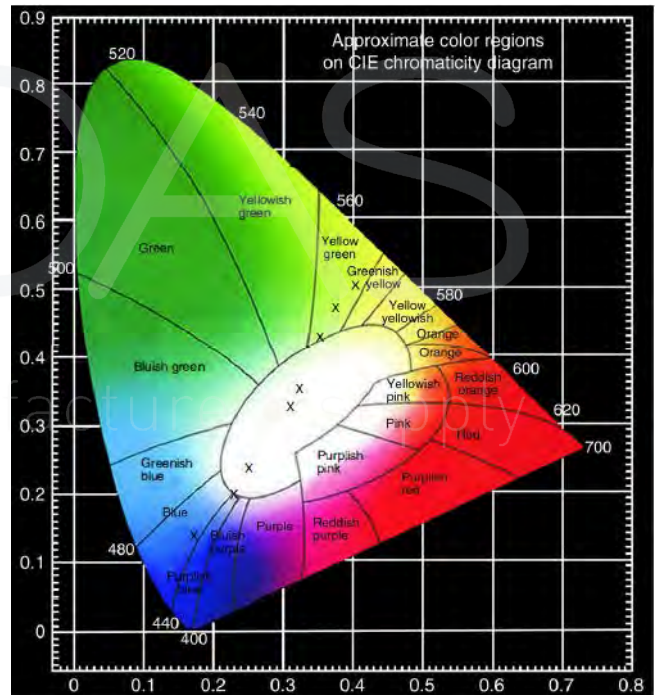
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	VDD-V <sub>SS</sub>	—	4.8	5.0	5.3	V
Input High Volt.	V <sub>IH</sub>	—	0.9 VDD	—	VDD	V
Input Low Volt.	V <sub>IL</sub>	—	GND	—	0.1VDD	V
Output High Volt.	V <sub>OH</sub>	I <sub>OH</sub> =-0.5mA	0.8 VDD	—	VDD	V
Output Low Volt.	V <sub>OL</sub>	I <sub>OL</sub> =0.5mA	GND	—	0.2 VDD	V
50% Check Board Operating Current	I <sub>DD</sub>	VDD=5V	25	31	40	mA

Note: In order to avoid any possible damages, 3V or 3.3V logic I/O for VDD 5V OLED module is not recommended.



# Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle	(V) $\theta$		160			deg
	(H) $\phi$		160			deg
Contrast Ratio	CR	Dark	2000:1		—	—
Response Time	T rise	—		10		$\mu$ s
	T fall	—		10		$\mu$ s
Display with 50% check Board Brightness			50	60		cd/m2
CIEx(White)		(CIE1931)	0.26	0.28	0.30	
CIEy(White)		(CIE1931)	0.30	0.32	0.34	



## OLED Lifetime

ITEM	Conditions	Min	Typ	Remark
Operating Life Time	Ta=25°C / Initial 50% check Board Typical Brightness Value	40,000 Hrs	50,000 Hrs	Note

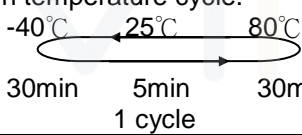
Note:

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.



# 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°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	—
Temperature Cycle	Endurance test applying the low and high temperature cycle.  <p>-40°C    25°C    80°C            30min    5min    30min            1 cycle</p>	-40°C/80°C 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=800V,RS=1.5kΩ CS=100pF 1 time	—

\*Supply voltage for OLED module =Operating voltage at 25°C





### **Test and measurement conditions**

1. All measurements shall not be started until the specimens attain to temperature stability.
2. After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at  $23\pm 5^{\circ}\text{C}$ ;  $55\pm 15\%$  RH.
3. All-pixels-on is used as operation test pattern.
4. 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.

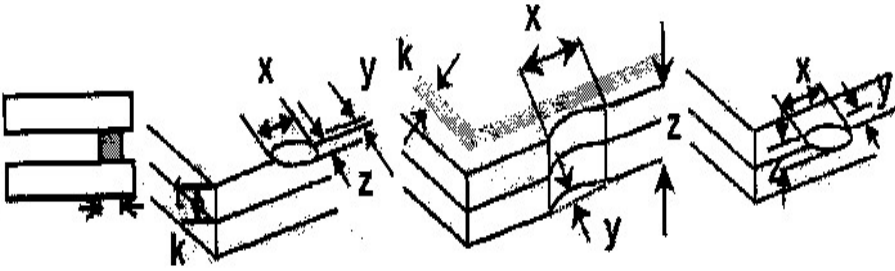
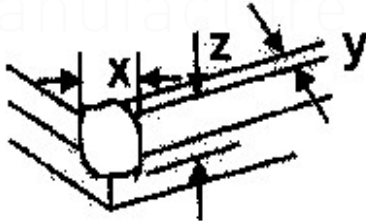
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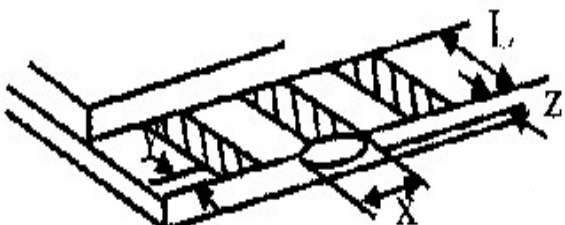
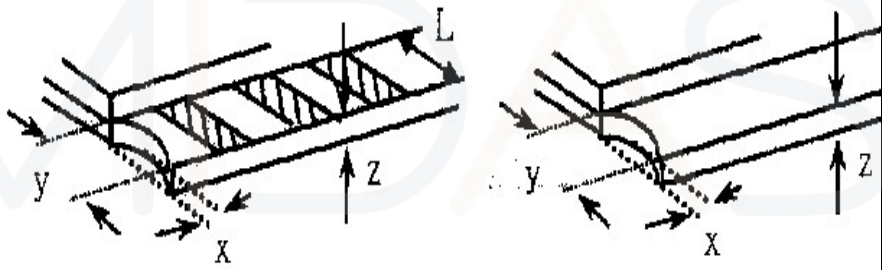
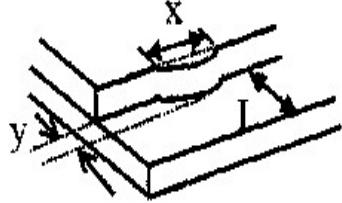
# Inspection specification

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 Viewing angle defect. 1.7 Mixed product types. 1.8 Contrast defect.	0.65												
02	Black or bright spots on OLED (display only)	2.1 Bright and black spots on display $\leq 0.25\text{mm}$ , no more than three Bright or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5												
03	Black spots, bright spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi = (x + y) / 2$	2.5												
		3.2 Line type : (As following drawing)  <table border="1"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.02</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.03</math></td> <td rowspan="2">2</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> </tr> <tr> <td>---</td> <td><math>0.05 &lt; W</math></td> <td>As round type</td> </tr> </tbody> </table>	Length	Width	Acceptable QTY	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	---	$0.05 < W$
Length	Width	Acceptable QTY													
---	$W \leq 0.02$	Accept no dense													
$L \leq 3.0$	$0.02 < W \leq 0.03$	2													
$L \leq 2.5$	$0.03 < W \leq 0.05$														
---	$0.05 < W$	As round type													
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction. <table border="1"> <thead> <tr> <th>Size <math>\Phi</math></th> <th>Acceptable QTY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.20</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.50</math></td> <td>3</td> </tr> <tr> <td><math>0.50 &lt; \Phi \leq 1.00</math></td> <td>2</td> </tr> <tr> <td><math>1.00 &lt; \Phi</math></td> <td>0</td> </tr> <tr> <td>Total QTY</td> <td>3</td> </tr> </tbody> </table>	Size $\Phi$	Acceptable QTY	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total QTY	3	2.5
Size $\Phi$	Acceptable QTY														
$\Phi \leq 0.20$	Accept no dense														
$0.20 < \Phi \leq 0.50$	3														
$0.50 < \Phi \leq 1.00$	2														
$1.00 < \Phi$	0														
Total QTY	3														

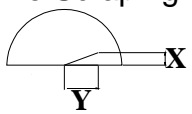


NO	Item	Criterion	AQL																		
05	Scratches	Follow NO.3 black spots, bright spots, contamination																			
06	Chipped glass	<p>Symbols Define:  x: Chip length      y: Chip width      z: Chip thickness  k: Seal width      t: Glass thickness      a: OLED side length  L: Electrode pad length:</p> <p>6.1 General glass chip :  6.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="443 927 1184 1155"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></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 border="1" data-bbox="443 1491 1184 1720"> <tr> <td>z: Chip thickness</td> <td>y: Chip width</td> <td>x: Chip length</td> </tr> <tr> <td><math>Z \leq 1/2t</math></td> <td>Not over viewing area</td> <td><math>x \leq 1/8a</math></td> </tr> <tr> <td><math>1/2t &lt; z \leq 2t</math></td> <td>Not exceed 1/3k</td> <td><math>x \leq 1/8a</math></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	$x \leq 1/8a$																			
$1/2t < z \leq 2t$	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	$x \leq 1/8a$																			



NO	Item	Criterion	AQL																
06	Glass crack	<p>Symbols :</p> <p>x: Chip length      y: Chip width      z: Chip thickness  k: Seal width      t: Glass thickness      a: OLED side length  L: Electrode pad length</p> <p>6.2 Protrusion over terminal :</p> <p>6.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="443 784 1118 902"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq 0.5\text{mm}</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>6.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="496 1232 1118 1350"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq L</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <ul style="list-style-type: none"> <li>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</li> <li>⊙ If the product will be heat sealed by the customer, the alignment mark not be damaged.</li> </ul> <p>6.2.3 Substrate protuberance and internal crack.</p>  <table border="1" data-bbox="853 1585 1230 1664"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td><math>y \leq 1/3L</math></td> <td><math>x \leq a</math></td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	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																	
$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$																	
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$																	
y: width	x: length																		
$y \leq 1/3L$	$x \leq a$																		



NO	Item	Criterion	AQL
07	Cracked glass	The OLED with extensive crack is not acceptable.	2.5
08	Bezel	8.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 8.2 Bezel must comply with job specifications.	2.5 0.65
9	PCB - COB	<p>9.1 COB seal may not have pinholes larger than 0.2mm or contamination.</p> <p>9.2 COB seal surface may not have pinholes through to the IC.</p> <p>9.3 The height of the COB should not exceed the height indicated in the assembly diagram.</p> <p>9.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places.</p> <p>9.5 No oxidation or contamination PCB terminals.</p> <p>9.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts.</p> <p>9.7 The jumper on the PCB should conform to the product characteristic chart.</p> <p>9.8 If solder gets on bezel tab pads, zebra pad or screw hold pad, make sure it is smoothed down.</p> <p>9.9 The Scraping testing standard for Copper Coating of PCB</p>  <p style="text-align: center;"><math>X * Y \leq 2\text{mm}^2</math></p>	2.5 2.5 0.65 2.5 2.5 0.65 2.5 2.5
10	Soldering	10.1 No un-melted solder paste may be present on the PCB. 10.2 No cold solder joints, missing solder connections, oxidation or icicle. 10.3 No residue or solder balls on PCB. 10.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65



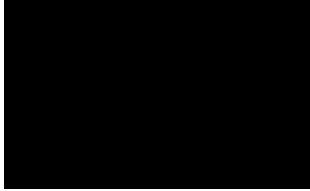
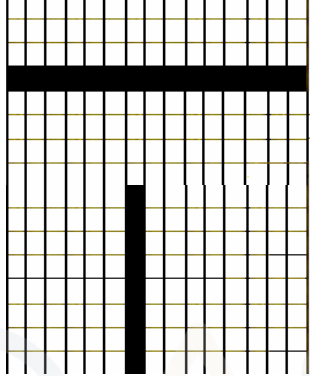
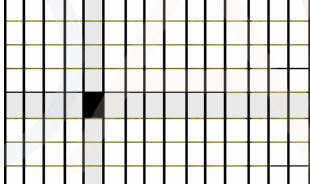
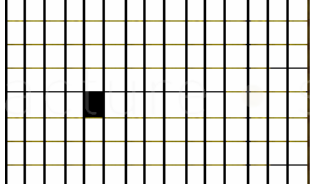
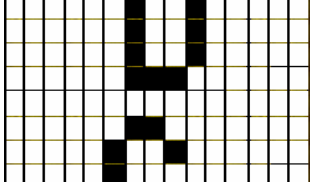
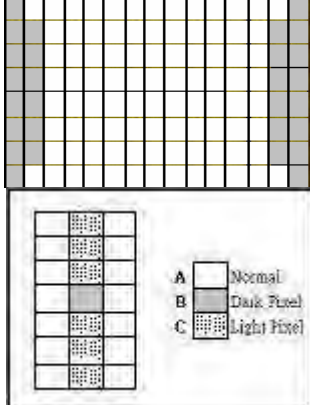
NO	Item	Criterion	AQL
11	General appearance	11.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		11.2 No cracks on interface pin (OLB) of TCP.	0.65
		11.3 No contamination, solder residue or solder balls on product.	2.5
		11.4 The IC on the TCP may not be damaged, circuits.	2.5
		11.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it causes the interface pin to sever.	2.5
		11.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		11.7 Sealant on top of the ITO circuit has not hardened.	0.65
		11.8 Pin type must match type in specification sheet.	0.65
		11.9 OLED pin loose or missing pins.	0.65
		11.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		11.11 Product dimension and structure must conform to product specification sheet.	0.65

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Standard :

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



## Precautions in use of 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) Raystar 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) Raystar 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, Raystar have the right to modify the version.)

### 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 equivalent

Never try to breathe upon the soiled surface nor wipe the surface using cloth containing solvent

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

\* Water

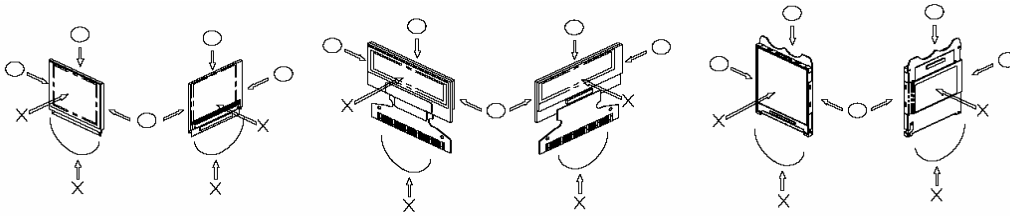
\* Ketone

\* 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 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.

### 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 Raystar Optronics Inc. 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.



## 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.

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