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Specification	
Part Number:	MCOB21609AV-EWP
Version:	
Date:	



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Midas Displays OLED Part Number System

MCO	B	21605	A	*	V	-	E	W	I	*		
1	2	3	4	5	6		7	8	9	10		
1	=	MCO:	Midas Displays OLED									
2	=	Blank:	B: COB (Chip on Board) T: TAB (Taped Automated Bonding)									
3	=	No of dots:	(e.g. 240064 = 240 x 64 dots)				(e.g. 21605 = 2 x 16 5mm C.H.)					
4	=	Series	A to Z									
5	=	Series Variant:	A to Z and 1 to 9 – see addendum									
6	=	Operating Temp Range:	A: -30+85° C		V: -40+80° C		Y: -40 +70° C		Z: -30+70° C			
			X: -40 +85° C									
7	=	Character Set:	Blank: Not Applicable E: Multi European Font Set (English/Japanese – Western European (K) – Cyrillic (R))									
8	=	Colour:	Y: Yellow		W: White		B: Blue		R: Red		G: Green	RGB: Full Colour
9	=	Interface:	P: Parallel		I: I ² C		S: SPI		M: Multi			
10	=	Voltage Variant:	e.g. 3 = 3v									

1. Revision History

DATE	VERSION	REVISED PAGE NO.	Note
2012/11/28	1		First issue

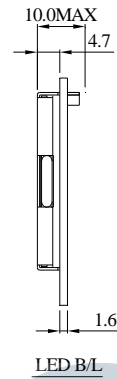
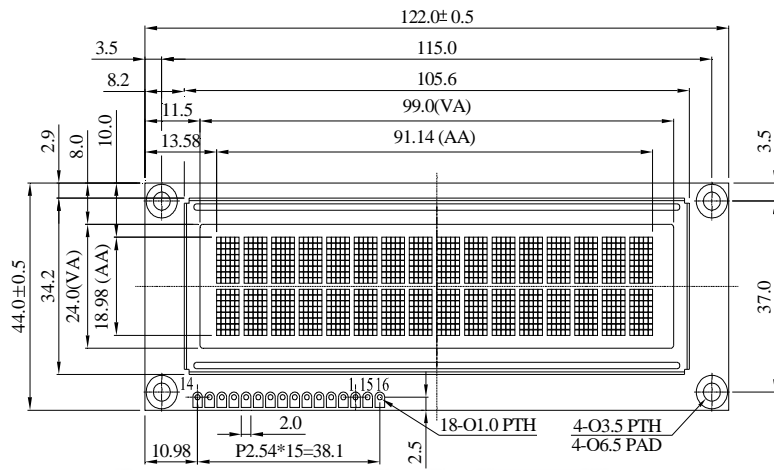
2. General Specification

The Features is described as follow:

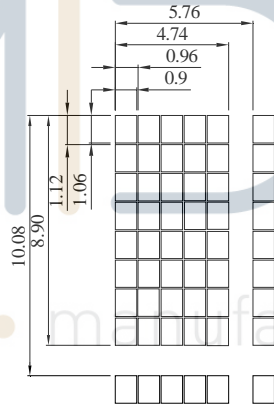
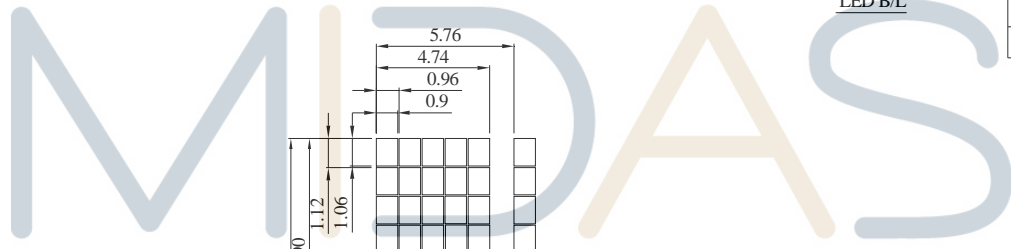
- Module dimension: 122.0 x 44.0 x 10.0 (max.) mm³
- View area: 99.0 x 24.0 mm²
- Active area: 91.14 x 18.98 mm²
- Number of dots: 16 Character x 2 Line
- Pixel size: 0.90 x 1.06 mm²
- Pixel pitch: 0.96 x 1.12 mm²
- Character size: 4.74 x 8.90 mm²
- Character pitch: 5.73 x 10.08 mm²
- Duty: 1/16
- Emitting Color: White

4. Interface Pin Function

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



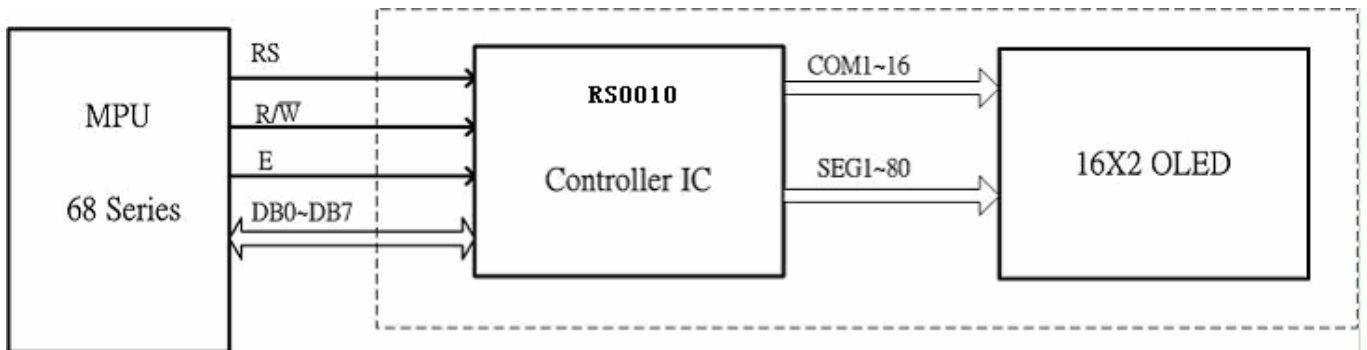
PIN NO.	SYMBOL
1	V _{ss}
2	V _{dd}
3	NC
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	NC
16	NC



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

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DOT SIZE
SCALE 5/1



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
CA1000000	CA1000001	CA1000010	CA1000011	.....	.....	CA1000100	CA1000101	CA1000110	CA1000111
CA1100000	CA1100001	CA1100010	CA1100011	.....	.....	CA1100100	CA1100101	CA1100110	CA1100111

Item	Symbol	Min	Max	Unit	Notes
Operating Temperature	T_{OP}	-40	+80	°C	
Storage Temperature	T_{ST}	-40	+80	°C	
Input Voltage	V_I	-0.3	VDD	V	
Supply Voltage For Logic	VDD-V _{SS}	-0.3	5.3	V	

7. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	VDD-V _{SS}	—	3.0	5.0	5.3	V
Input High Volt.	V _{IH}	—	0.9 VDD	—	VDD	V
Input Low Volt.	V _{IL}	—	GND	—	0.1VDD	V
Output High Volt.	V _{OH}	I _{OH} =-0.5mA	0.8 VDD	—	VDD	V
Output Low Volt.	V _{OL}	I _{OL} =0.5mA	GND	—	0.2 VDD	V
Supply Current	I _{DD}	VDD=5V	—	57	—	mA
CIE _x (White)		x,y(CIE1931)	0.24	0.28	0.32	
CIE _y (White)		x,y(CIE1931)	0.28	0.32	0.36	

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
Supply Voltage For Logic 5V 50% CheckBoard Brightness		With polarizer 285mW(5V*57mA)		60		Nits Note1
Supply Voltage For Logic 3V 50% CheckBoard Brightness		With polarizer		35		nits

Notes: 1. When random texts pattern is running, averagely, at any instance, about 1/2 of pixels will be on.
2. You can use the display off mode to make long life.

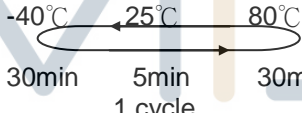
9. OLED Lifetime

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ITEM	Conditions	Typ	Remark
Operating Life Time	Ta=25°C /Initial 50% checkboard brightness 60nits	50,000 Hrs	Note

Notes:

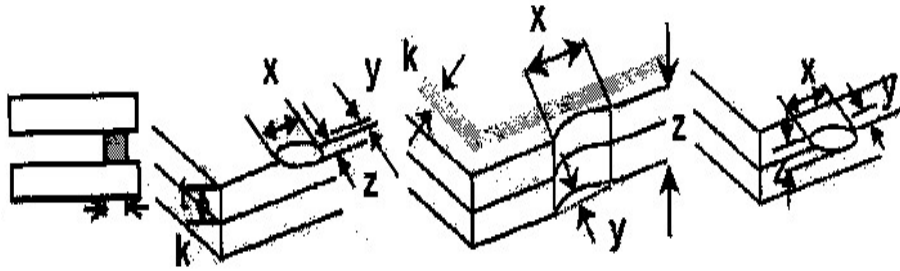
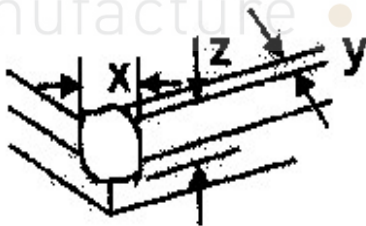
- Simulation pattern for operation test: interchanging with 50% checkboard.
The brightness decay does not exceed 50%
- You can use the display off mode to make long life.
- The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

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. 	-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 0.5hrs	—
Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 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 logic system=5V. Supply voltage for OLED system =Operating voltage at 25°C

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" data-bbox="721 1169 1331 1350"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.02$</td> <td>Accept no dense</td> </tr> <tr> <td>$L \leq 3.0$</td> <td>$0.02 < W \leq 0.03$</td> <td rowspan="2">2</td> </tr> <tr> <td>$L \leq 2.5$</td> <td>$0.03 < W \leq 0.05$</td> </tr> <tr> <td>---</td> <td>$0.05 < W$</td> <td>As round type</td> </tr> </tbody> </table>	Length	Width	Acceptable Q TY	---	$W \leq 0.02$	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 Q TY													
---	$W \leq 0.02$	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" data-bbox="868 1420 1331 1697"> <thead> <tr> <th>Size Φ</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.20$</td> <td>Accept no dense</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.50$</td> <td>3</td> </tr> <tr> <td>$0.50 < \Phi \leq 1.00$</td> <td>2</td> </tr> <tr> <td>$1.00 < \Phi$</td> <td>0</td> </tr> <tr> <td>Total Q TY</td> <td>3</td> </tr> </tbody> </table>	Size Φ	Acceptable Q TY	$\Phi \leq 0.20$	Accept no dense	$0.20 < \Phi \leq 0.50$	3	$0.50 < \Phi \leq 1.00$	2	$1.00 < \Phi$	0	Total Q TY	3
Size Φ	Acceptable Q TY														
$\Phi \leq 0.20$	Accept no dense														
$0.20 < \Phi \leq 0.50$	3														
$0.50 < \Phi \leq 1.00$	2														
$1.00 < \Phi$	0														
Total Q TY	3														

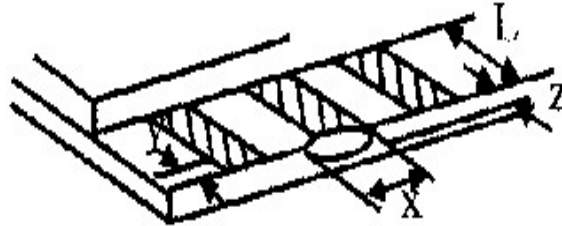
05	Scratches	Follow NO.3 black spots, bright spots, contamination	
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06	Chipped glass	<p>Symbols Define: x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: OLED side length L: Electrode pad length:</p> <p>6.1 General glass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

06

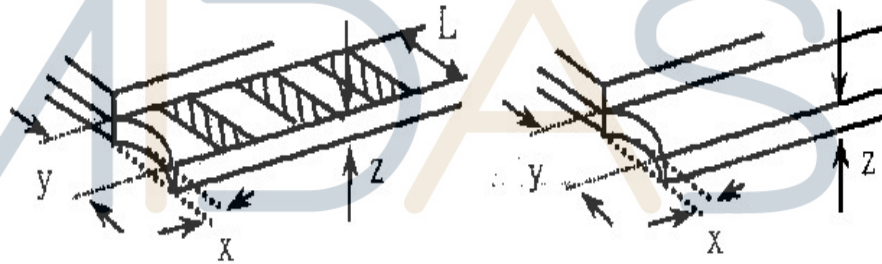
Glass crack

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 :



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

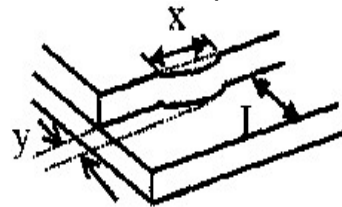
6.2.2 Non-conductive portion:



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

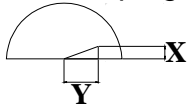
- ⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.
- ⊙ If the product will be heat sealed by the customer, the alignment mark not be damaged.

6.2.3 Substrate protuberance and internal crack.



y: width	x: length
$y \leq 1/3L$	$x \leq a$


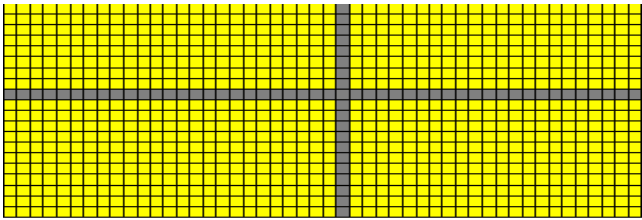
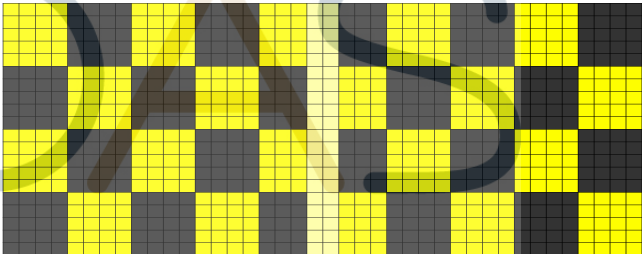
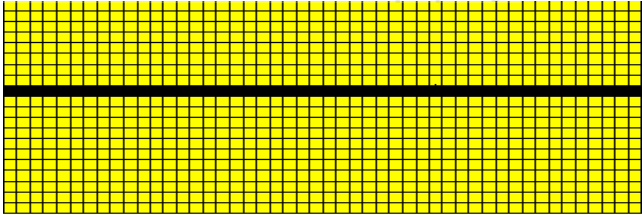
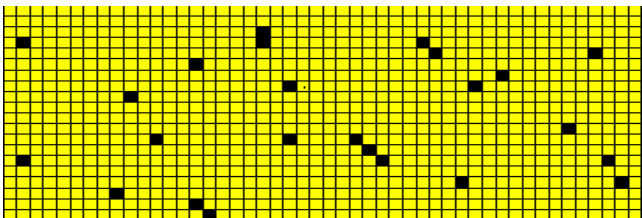
2.5

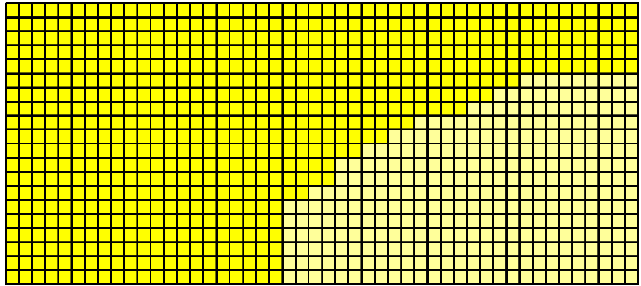
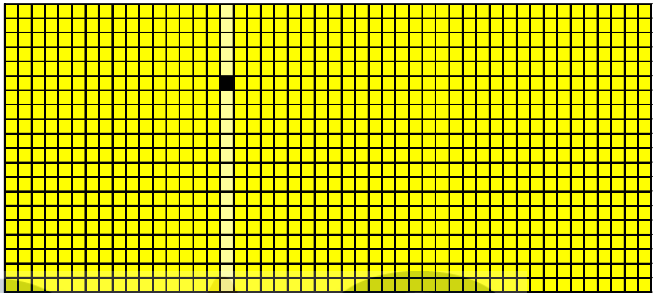
07	Cracked glass	The OLED with extensive crack is not acceptable.	2.5
08	Bezel	8.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 8.2 Bezel must comply with job specifications.	2.5 0.65
9	PCB - COB	<p>9.1 COB seal may not have pinholes larger than 0.2mm or contamination.</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;">$X * Y \leq 2\text{mm}^2$</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

11	General appearance	<p>11.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. 2.5</p> <p>11.2 No cracks on interface pin (OLB) of TCP. 0.65</p> <p>11.3 No contamination, solder residue or solder balls on product. 2.5</p> <p>11.4 The IC on the TCP may not be damaged, circuits. 2.5</p> <p>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</p> <p>11.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 2.5</p> <p>11.7 Sealant on top of the ITO circuit has not hardened. 0.65</p> <p>11.8 Pin type must match type in specification sheet. 0.65</p> <p>11.9 OLED pin loose or missing pins. 0.65</p> <p>11.10 Product packaging must the same as specified on packaging specification sheet. 0.65</p> <p>11.11 Product dimension and structure must conform to product specification sheet. 0.65</p>	
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No Display	Major	
Dark crisscross line	Major	
Short	Major	
Miss line	Major	
Wrong Display	Major	

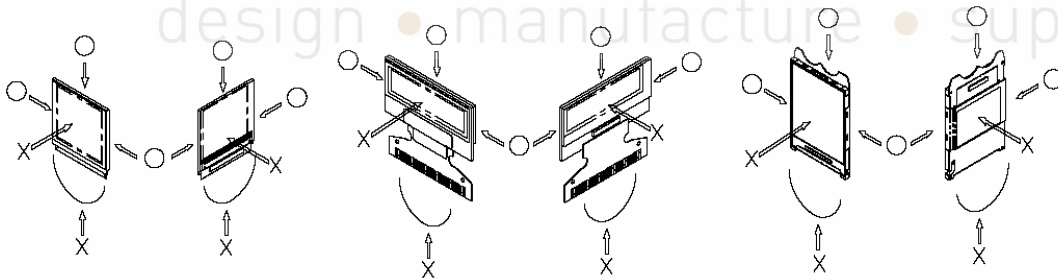
		
Dark dot and light line	Major	

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- (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.

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
Supply Voltage For Logic 5V 50% CheckBoard Brightness		With polarizer 285mW(5V*57mA)		60		Nits Note1
Supply Voltage For Logic 3V 50% CheckBoard Brightness		With polarizer		35		nits

Notes: 1. When random texts pattern is running, averagely, at any instance, about 1/2 of pixels will be on.
2. You can use the display off mode to make long life.

9. OLED Lifetime

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ITEM	Conditions	Typ	Remark
Operating Life Time	Ta=25°C /Initial 50% checkboard brightness 60nits	50,000 Hrs	Note

Notes:

- Simulation pattern for operation test: interchanging with 50% checkboard.
The brightness decay does not exceed 50%
- You can use the display off mode to make long life.
- The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.