SPECIFICATIONS FOR OLED MODULE

MODEL NO.
BL12856ABMNH$
VER.01

FOR MESSRS:

_____

ON DATE OF:

_____

APPROVED BY:

_____

BOLYMIN, INC.
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History of Version

Version	Contents	Date	Note
01	NEW VERSION	2018/10/31	SPEC.

C O N T E N T S

1. Numbering System

	B	L	12856	A	B	M	N	-	H	$
	0	1	2	3	4	5	6	7	8	9

0	Brand	Bolymin	
1	Module Type	C= character type G= graphic type P= TAB/TCP type R=color STN	O= COG type F= COF type L=PLED/OLED
2	Format	2002=20 characters, 2 lines 12232= 122 x 32 dots	
3	Version No.	A type	
4	LCD Color	W=OLED/White G=STN/gray Y=STN/yellow-green C=color STN,OLED	B=blue F=FSTN T=TN
5	LCD Type	R=positive/reflective P=positive/transflective	M=positive/transmissive N=negative/transmissive
6	Backlight type/color	L=LED array/ yellow-green H=LED edge/white R=LED array/red G=LED edge/yellow-green F=RGB Q=LED edge/red A=LED edge/amber N=No backlight	D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white Y=LED Bottom/yellow O=LED array/orange K=LED edge/green A=LED edge/amber
7	CGRAM Font (applied only on character type)	J=English/Japanese Font E=English/European Font G=Chinese(simple) F=Chinese(traditional)	C=English/Cyrillic Font H=English/Hebrew Font A=English/Arabic Font
8	View Angle/ Operating Temperature	B=Bottom/Normal Temperature H=Bottom/Wide Temperature U=Bottom/Ultra wide Temperature	T=Top/Normal Temperature W=Top/Wide Temperature C=9H/Normal Temperature E=Top/ultra wide temperature
9	Special Code	n=positive voltage for LCD $:RoHS	

2. General Specification

(1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	128 x 56	dots
Module dimension (L*W*H)	40.04 x 63.22 x 1.25	mm
Active area	35.05 x 15.32	mm
Dot size	0.254(W) x 0.254(H)	mm
Dot pitch	0.274(W) x 0.274(H)	mm

(2) Controller IC: SSD1309 Controller

(3) Temperature Range

Operating	-40 ~ +70℃
Storage	-40 ~ +85℃

3. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Logic	V_{DD}	-0.3	4	V	1, 2
Supply Voltage for Display	V_{CC}	0	15	V	1, 2
Operating Temperature	T_{OP}	-40	70	°C	3
Storage Temperature	T_{STG}	-40	85	°C	3
Life Time (120 cd/m^2)		5,000	-	hour	4
Life Time (80 cd/m^2)		12,000	-	hour	
Life Time (60 cd/m^2)		15,000	-	hour	

Note 1: All the above voltages are on the basis of “V SS = 0V”.

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

Note 3: The defined temperature ranges do not include the polarizer. The maximum withstood temperature of the polarizer should be 80°C.

Note 4: VCC = 12.5V, T a = 25°C, 50% Checkerboard. Software configuration follows Section 4.4 Initialization. End of lifetime is specified as 50% of initial brightness reached. The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic	V_{DD}-V_{SS}	–	1.65	2.8	3.3	V
Supply Voltage For Panel	Vcc-V_{SS}	–	12.0	12.5	13.0	V
Input High Vol	V_{IH}	–	0.8V_{DD}	–	V_{DD}	V
Input Low Vol	V_{IL}	–	0	–	0.2V_{DD}	V
Output High Vol	V_{OH}	–	0.9V_{DD}	–	V_{DD}	V
Output Low Vol.	V_{OL}	–	0	–	0.1V_{DD}	V
Supply Current For Logic	I_{CC}	Note 6	–	9.5	11.9	mA
		Note 7	–	15.2	19.0	
		Note 8	–	27.4	34.3	

Note 6: V_{DD} =2.8V, Vcc=12.5V, 30% Display Area Turn on.

Note 7: V_{DD} =2.8V, Vcc=12.5V, 50% Display Area Turn on.

Note 8: V_{DD} =2.8V, Vcc=12.5V, 100% Display Area Turn on.

5. Optical Characteristics

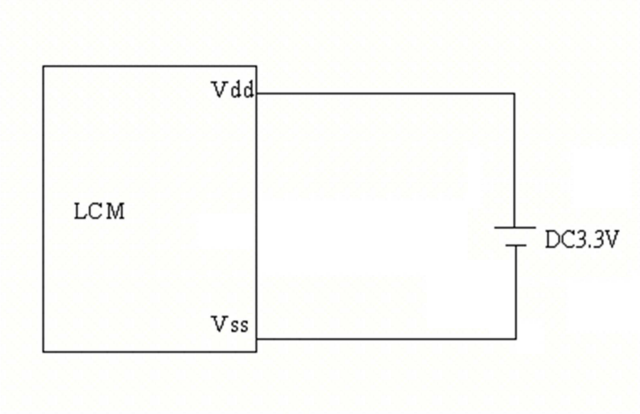
Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Brightness	L_{br}	Note 5	100	120	-	cd/m^2
C.I.E. (Light Blue)	(x) (y)	C.I.E. 1931	0.12 0.22	0.16 0.26	0.20 0.30	
Dark Room Contrast	CR		5000	10000	-	
Viewing Angle			-	Free	-	degree
Transmittance	T	Wavelength 550nm	40	50	-	%

6. Interface Pin Function

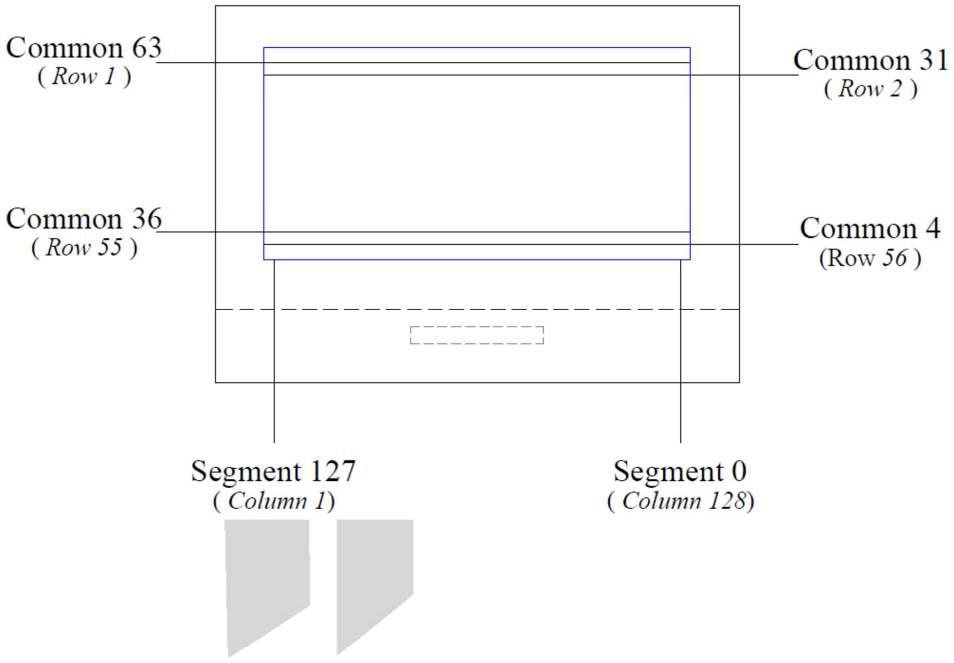
<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Level</th><th>Description</th></tr>
<tr><td>1,24</td><td>NC</td><td>—</td><td>No connection. These pins must be connected to external ground as the ESD protection circuit.</td></tr>
<tr><td>2</td><td>VLSS</td><td>—</td><td>Positive voltage power supply</td></tr>
<tr><td>3</td><td>VSS</td><td></td><td>This is ground pin</td></tr>
<tr><td>4</td><td>NC</td><td></td><td>No connection</td></tr>
<tr><td>5</td><td>VDD</td><td>—</td><td>Voltage power supply for logic</td></tr>
<tr><td>6</td><td>BS1</td><td>H/L</td><td rowspan="2">These pins are MCU interface selection input.
See the following table:
<table>
<tr><td></td><td>BS1</td><td>BS2</td></tr>
<tr><td>I2C</td><td>1</td><td>0</td></tr>
<tr><td>4-wire SPI</td><td>0</td><td>0</td></tr>
<tr><td>8-bit 68XX Parallel</td><td>0</td><td>1</td></tr>
<tr><td>8-bit 80XX Parallel</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>7</td><td>BS2</td><td>H/L</td></tr>
<tr><td>8</td><td>CS#</td><td>H/L</td><td>This is chip select control pin</td></tr>
<tr><td>9</td><td>RES#</td><td>H/L</td><td>Hardware reset pin</td></tr>
<tr><td>10</td><td>D/C#</td><td>H/L</td><td>This is data/command control pin ,
H: Data input ,L: Command input .</td></tr>
<tr><td>11</td><td>R/W#</td><td>H/L</td><td>80: write signal 68:R/W signal</td></tr>
<tr><td>12</td><td>E/RD#</td><td>H/L</td><td>80: read signal , 68: enable signal</td></tr>
<tr><td>13~20</td><td>D0~D7</td><td>H/L</td><td>Data bus line
When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK.
When I2C mode is selected, D2,D1 should be tired together and serve as SDA OUT, SDA IN in application and D0 is the serial clock input, SCL. Unused pins must be connected to VSS except for D2 in serial mode.</td></tr>
<tr><td>21</td><td>IREF</td><td>—</td><td>The Current voltage reference input pin. A resistor should be connected between this pin and Vss.</td></tr>
<tr><td>22</td><td>VCOMH</td><td>—</td><td>The Com voltage reference input pin. A capacitor should be connected between this pin and Vss.</td></tr>
<tr><td>23</td><td>VCC</td><td>—</td><td>Positive voltage power supply</td></tr>
</table>

7. Power Supply For OLED Module And Panel Layout Diagram

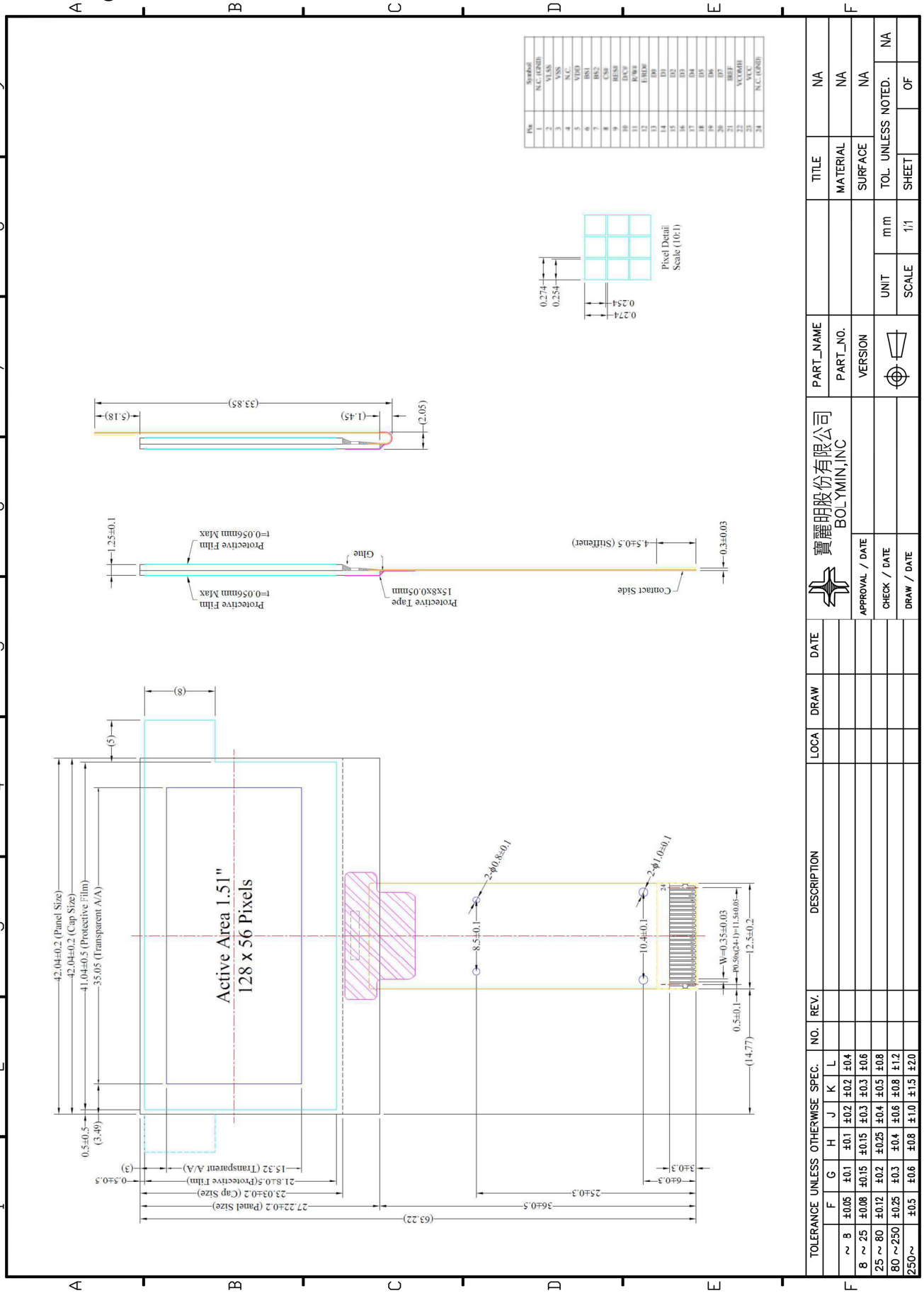
LCM operating on " DC 3.3V " input with external positive voltage.



Panel Layout Diagram



8. Drawing


Active Area 1.51"
128 x 56 Pixels
42.04±0.2 (Panel Size)
42.04±0.2 (Cap Size)
41.04±0.5 (Protective Film)
35.05 (Transparent A/A)
(63.22)
27.22±0.2 (Panel Size)
23.03±0.2 (Cap Size)
21.8±0.5 (Protective Film)
15.32 (Transparent A/A)
36±0.5
25±0.3
6±0.3
3±0.3
2-φ0.8±0.1
2-φ1.0±0.1
8.5±0.1
10.4±0.1
W=0.35±0.03
P0.56x(24-1)=11.5±0.05
12.5±0.2
14.77
0.5±0.1
(3.49)
0.5±0.5
(3)
(8)
(5)
Pixel Detail
Scale (10:1)
0.274
0.254
0.254
0.274
(33.85)
(5.18)
(1.45)
(2.05)
1.25±0.1
Protective Film
t=0.056mm Max
Protective Film
t=0.056mm Max
Glue
Protective Tape
15x8x0.05mm
Contact Side
4.5±0.5 (Stiffener)
0.3±0.03
Pin
Symbol
1 N.C. (OGND)
2 VLSS
3 VSS
4 N.C.
5 VDD
6 BS1
7 DS2
8 CS2
9 RESE
10 D/C
11 R/W
12 E/RDE
13 D0
14 D1
15 D2
16 D3
17 D4
18 D5
19 D6
20 D7
21 REF
22 VCOMH
23 VLCC
24 N.C. (OGND)
TOLERANCE UNLESS OTHERWISE SPEC.
F G H J K L
~ 8 ±0.05 ±0.1 ±0.1 ±0.2 ±0.2 ±0.4
8 ~ 25 ±0.08 ±0.15 ±0.15 ±0.3 ±0.3 ±0.6
25 ~ 80 ±0.12 ±0.2 ±0.25 ±0.4 ±0.5 ±0.8
80 ~250 ±0.25 ±0.3 ±0.4 ±0.6 ±0.8 ±1.2
250~ ±0.5 ±0.6 ±0.8 ±1.0 ±1.5 ±2.0
NO.
REV.
DESCRIPTION
LOCA
DRAW
DATE
寶麗明股份有限公司
BOLYMIN,INC
APPROVAL / DATE
CHECK / DATE
DRAW / DATE
PART_NAME
PART_NO.
VERSION
UNIT mm
SCALE 1/1
TITLE NA
MATERIAL NA
SURFACE NA
TOL. UNLESS NOTED. NA
SHEET OF

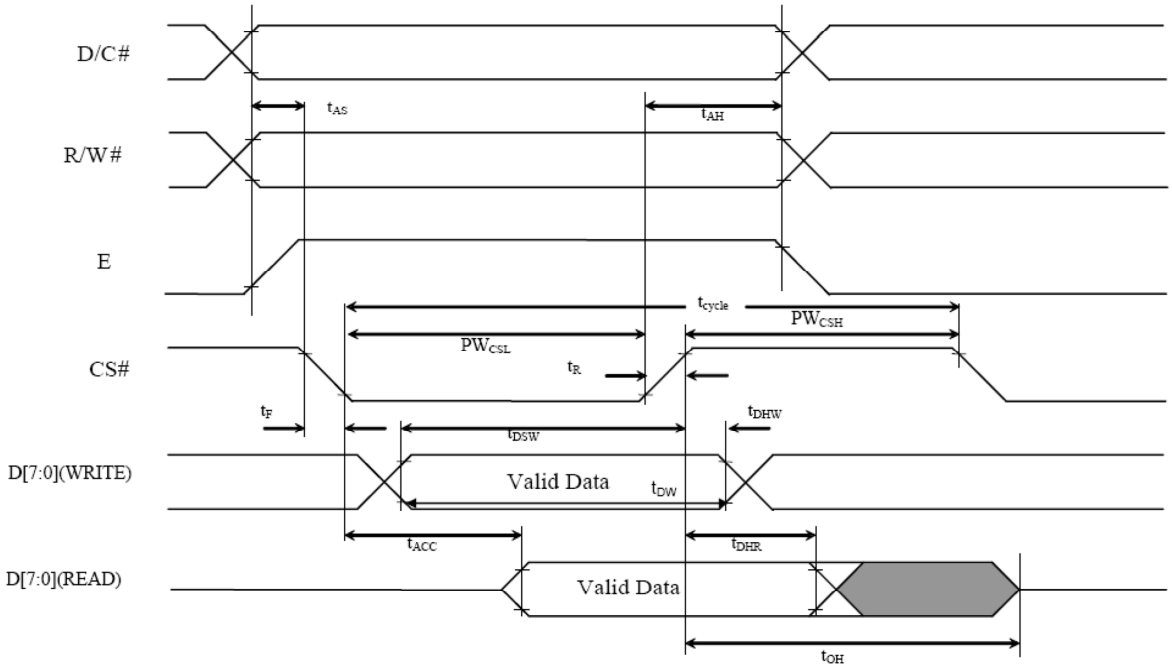
9.SSD1309 controller data

9.1 Timing Characteristics

68XX MPU Interface

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	ns
t_{AS}	Address Setup Time	20	-	ns
t_{AH}	Address Hold Time	0	-	ns
t_{DW}	Data Write Time	80	-	ns
t_{DSW}	Write Data Setup Time	40	-	ns
t_{DHW}	Write Data Hold Time	20	-	ns
t_{DHR}	Read Data Hold Time	20	-	ns
t_{OH}	Output Disable Time	-	70	ns
t_{ACC}	Access Time	-	140	ns
PW_{CSL}	Chip Select Low Pulse Width (Read)	120	-	ns
	Chip Select Low Pulse width (Write)	60		
PW_{CSH}	Chip Select High Pulse Width (Read)	60	-	ns
	Chip Select High Pulse Width (Write)	60		
t_R	Rise Time	-	40	ns
t_F	Fall Time	-	40	ns

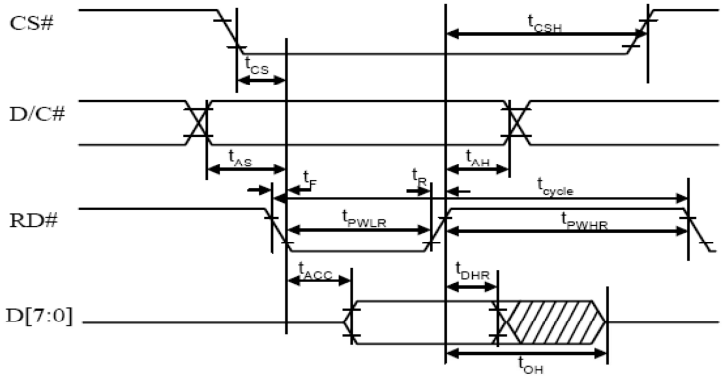
* (V_{DD} - V_{SS} = 1.65V to 3.3V, T_a = 25°C)



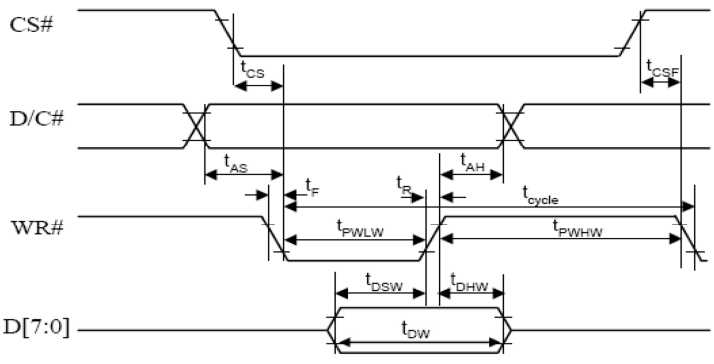
80XX MPU Interface

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	300	-	ns
t_{AS}	Address Setup Time	20	-	ns
t_{AH}	Address Hold Time	0	-	ns
t_{DW}	Data Write Time	70	-	ns
t_{DSW}	Write Data Setup Time	40	-	ns
t_{DHW}	Write Data Hold Time	15	-	ns
t_{DHR}	Read Data Hold Time	20	-	ns
t_{OH}	Output Disable Time	-	70	ns
t_{ACC}	Access Time	-	140	ns
t_{PWLR}	Read Low Time	120	-	ns
t_{PWLW}	Write Low Time	60	-	ns
t_{PWHR}	Read High Time	60	-	ns
t_{PWHW}	Write High Time	60	-	ns
t_{CS}	Chip Select Setup Time	0	-	ns
t_{CSH}	Chip Select Hold Time to Read Signal	0	-	ns
t_{CSF}	Chip Select Hold Time	20	-	ns
t_R	Rise Time	-	40	ns
t_F	Fall Time	-	40	ns

* (V_{DD} - V_{SS} = 1.65V to 3.5V, T_a = 25°C)



(***Read Timing***)

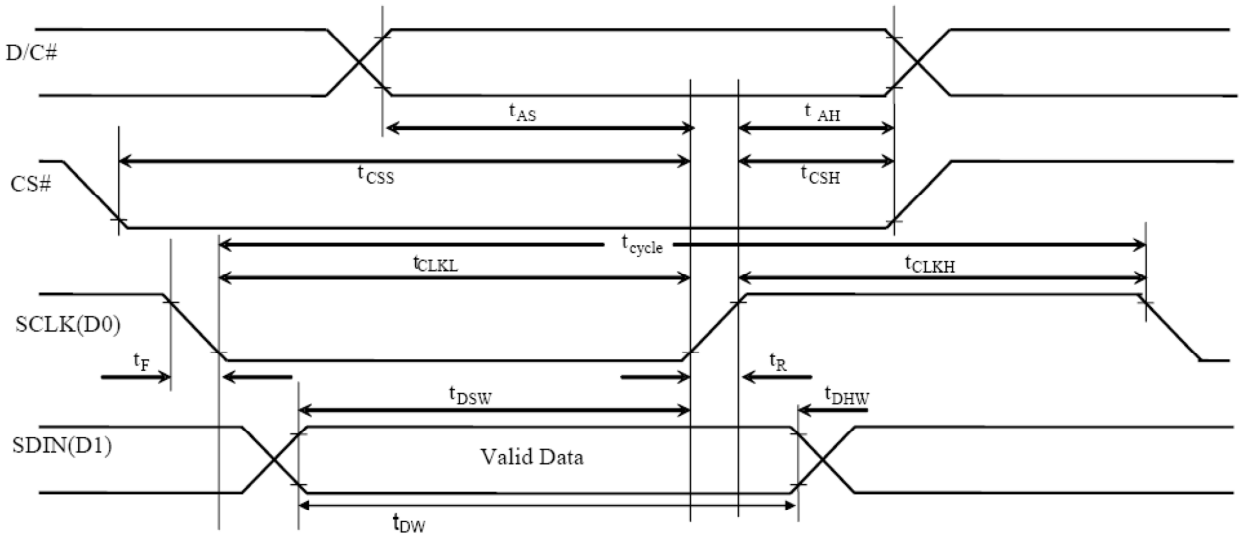


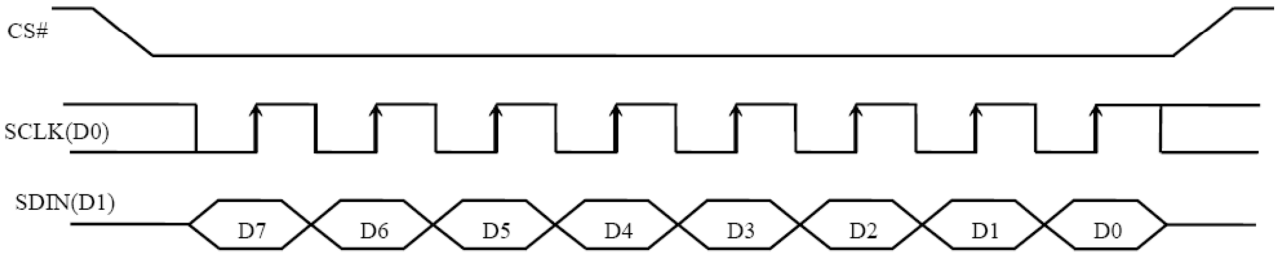
(***Write Timing***)

Serial Interface (4-wire SPI)

Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	100	-	ns
t_{AS}	Address Setup Time	15	-	ns
t_{AH}	Address Hold Time	15	-	ns
t_{CSS}	Chip Select Setup Time	20	-	ns
t_{CSH}	Chip Select Hold Time	50	-	ns
t_{DW}	Data Write Time	55	-	ns
t_{DSW}	Write Data Setup Time	15	-	ns
t_{DHW}	Write Data Hold Time	15	-	ns
t_{CLKL}	Clock Low Time	50	-	ns
t_{CLKH}	Clock High Time	50	-	ns
t_R	Rise Time	-	40	ns
t_F	Fall Time	-	40	ns

* (V_{DD} - V_{SS} = 1.65V to 3.5V, T_a = 25°C)

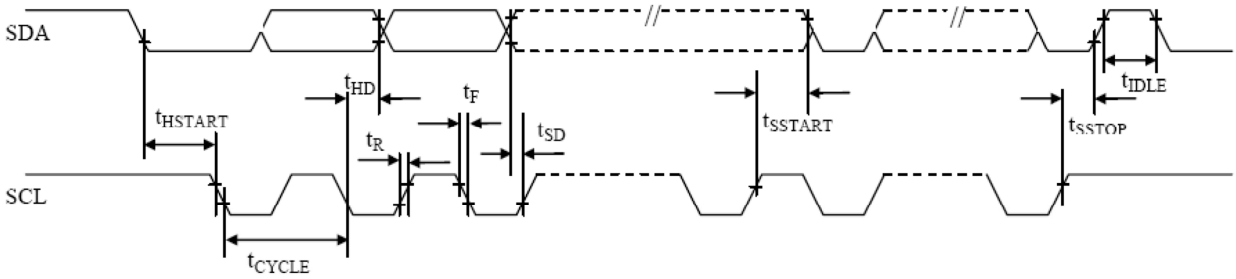




I2C Interface

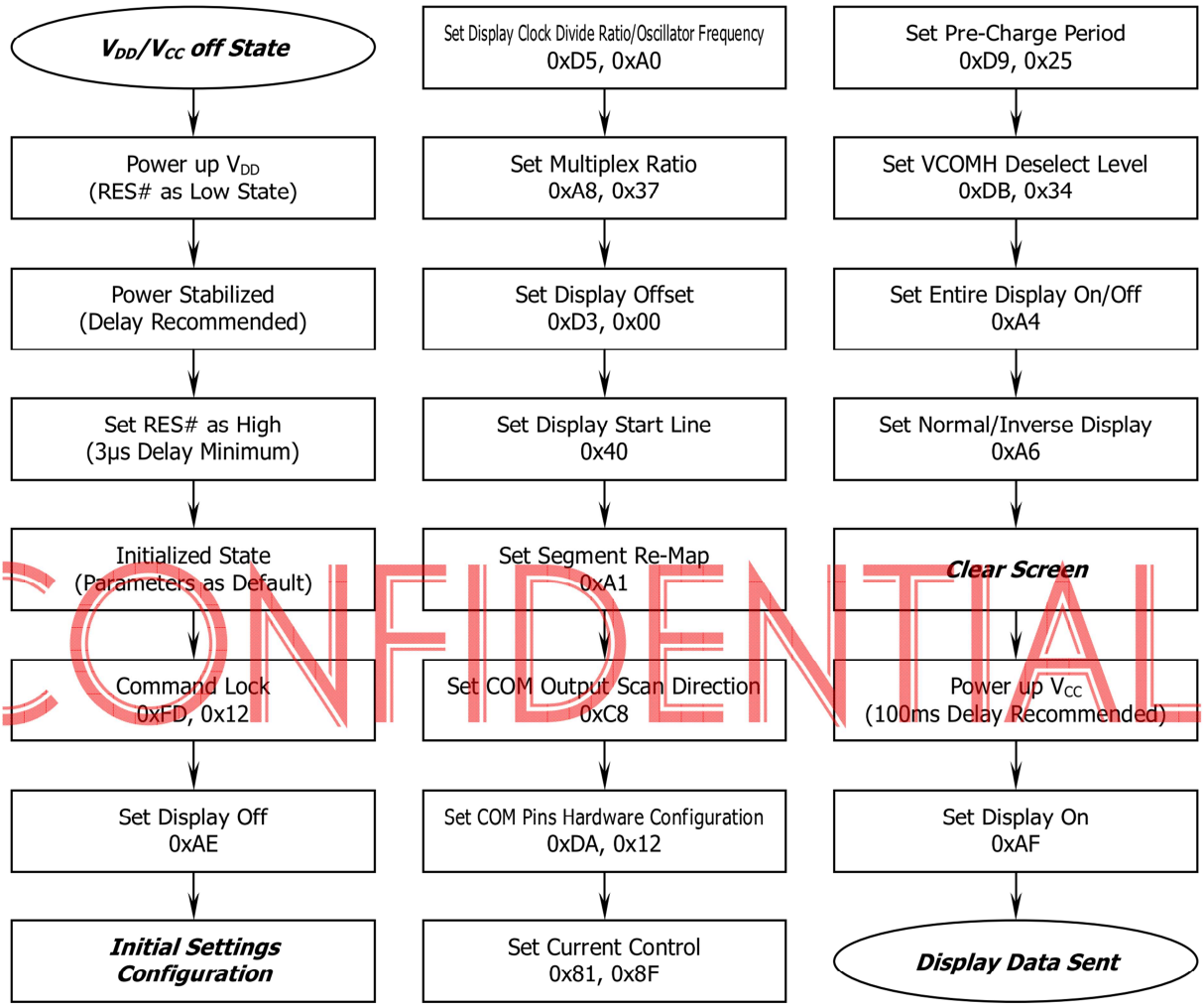
Symbol	Description	Min	Max	Unit
t_{cycle}	Clock Cycle Time	2.5	-	μs
t_{HSTART}	Start Condition Hold Time	0.6	-	μs
t_{HD}	Data Hold Time (for "SDA_{OUT}" Pin)	0	-	ns
	Data Hold Time (for "SDA_{IN}" Pin)	300		
t_{SD}	Data Setup Time	100	-	ns
t_{SSTART}	Start Condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	μs
t_{SSTOP}	Stop Condition Setup Time	0.6	-	μs
t_R	Rise Time for Data and Clock Pin		300	ns
t_F	Fall Time for Data and Clock Pin		300	ns
t_{IDLE}	Idle Time before a New Transmission can Start	1.3	-	μs

* (V_{DD} - V_{SS} = 1.65V to 3.5V, T_a = 25°C)



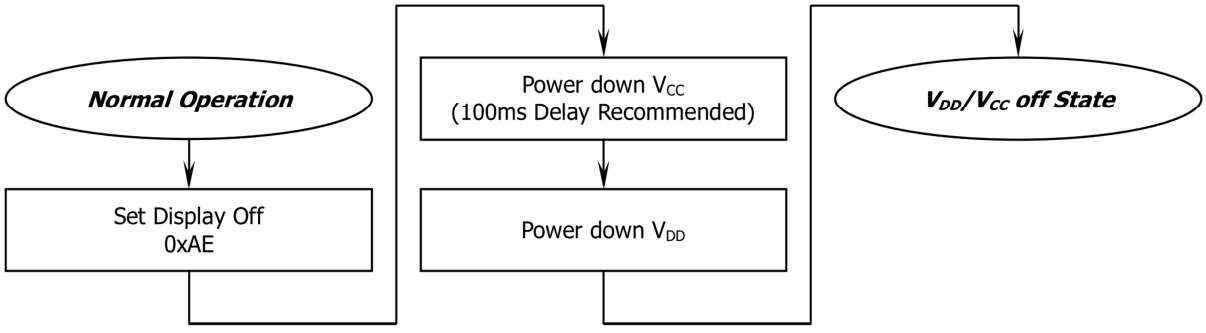
9.2 Application Example

<Power up Sequence>

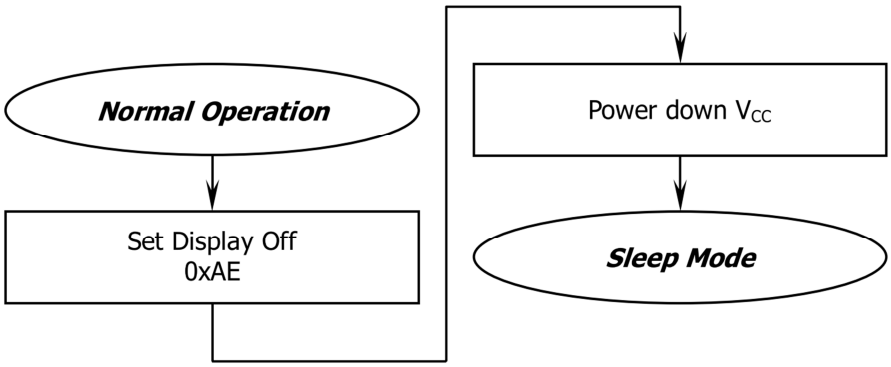


If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

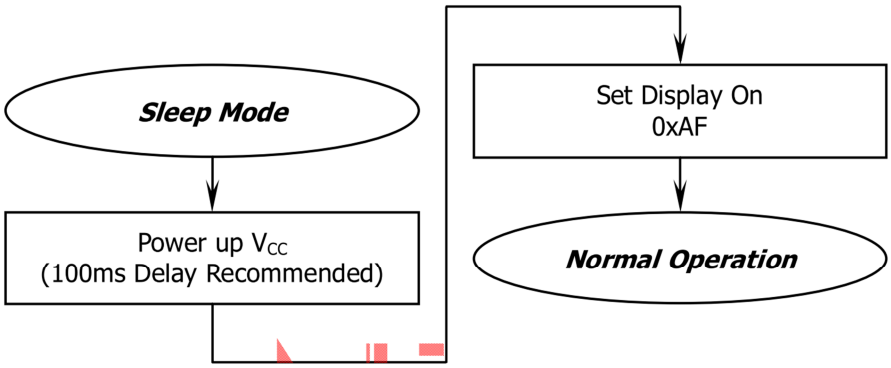
<Power down Sequence>



<Entering Sleep Mode>



<Exiting Sleep Mode>

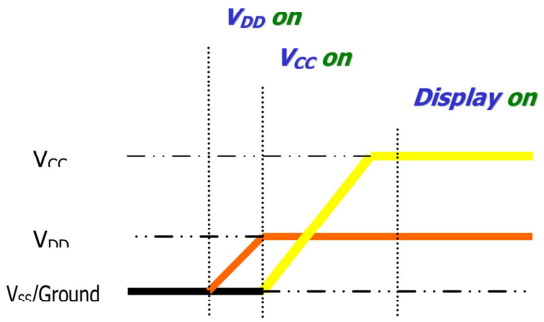


9.3 Power ON / OFF Sequence

Power down and Power up Sequence
To protect OEL panel and extend the panel life time, the driver IC power up/down routine should include a delay period between high voltage and low voltage power sources during turn on/off. It gives the OEL panel enough time to complete the action of charge and discharge before/after the operation.

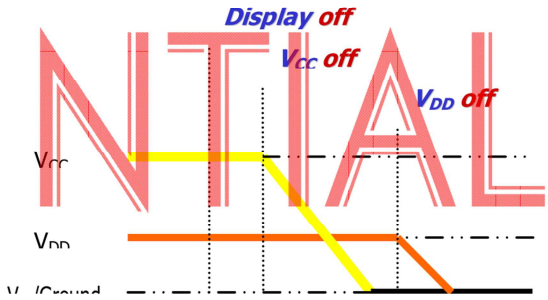
Power up Sequence:

1. Power up V_{DD}
2. Send Display off command
3. Initialization
4. Clear Screen
5. Power up V_{CC}
6. Delay 100ms
   (When V_{CC} is stable)
7. Send Display on command



Power down Sequence:

1. Send Display off command
2. Power down V_{CC}
3. Delay 100ms
   (When V_{CC} is reach 0 and panel is completely discharges)
4. Power down V_{DD}



Note 9:

1) Since an ESD protection circuit is connected between VDD and VCC inside the driver IC, VCC becomes lower than VDD whenever VDD is ON and VCC is OFF.
2) VCC should be kept float (disable) when it is OFF.
3) Power Pins (VDD, VCC) can never be pulled to ground under any circumstance.
4) VCI, VDDIO should not be power down before VCC power down.

10. Quality Assurance

10.1 Inspection conditions

1. The inspection and measurement are performed under the following conditions,
2. Unless otherwise specified.
3. Temperature: 25±5℃
4. Humidity: 50±10%R.H.
5. Distance between the panel and eyes of the inspector≧30cm

10.2 Inspection Parameters

Severity	Inspection Item	Defect	Remark
Major Defect	1. Panel	(1) Non-displaying	
		(2) Line defects	
		(3) Malfunction	
		(4) Glass cracked	
	2. Film	(1) Film dimension out of specification	Can not be assembled
	3. Dimension	(1) Outline dimension out of specification	
Minor Defect	1. Panel	(1) Glass scratch	Appearance defect
		(2) Glass cutting NG	
		(3) Glass chip	
	2. Polarizer	(1) Polarizer scratch	
		(2) Stains on surface	
		(3) Polarizer bubbles	
	3. Displaying	(1) Dim spot、Bright spot、dust	
	4. Film	(1) Damage (2) Foreign material	

<table>
<tr><th>Description</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>1. Glass scratch</td><td>
<table>
<tr><th>Width (mm)
W</th><th>Length (mm)
L</th><th>number of pieces permitted</th></tr>
<tr><td>W≦0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.03＜ W≦0.05</td><td>L≦3</td><td>3</td></tr>
<tr><td>0.05＜ W</td><td>------</td><td>None</td></tr>
<tr><td>beyond A.A.</td><td>------</td><td>Ignore</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>2. Polarizer bubble</td><td>
<table>
<tr><th>Size</th><th>number of pieces permitted</th></tr>
<tr><td>Φ≦0.2</td><td>Ignore</td></tr>
<tr><td>0.2＜Φ≦0.5</td><td>2</td></tr>
<tr><td>0.5＜Φ</td><td>0</td></tr>
<tr><td>beyond A.A.</td><td>Ignore</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>3. Dimming spot、
Lighting spot、
Dust</td><td>
<table>
<tr><th>average</th><th>number of</th></tr>
<tr><td>D ≦0.1</td><td>Ignore</td></tr>
<tr><td>0.1＜ D ≦0.15</td><td>2</td></tr>
<tr><td>0.15＜ D ≦0.2</td><td>1</td></tr>
<tr><td>0.2 ＜ D</td><td>0</td></tr>
<tr><td>beyond A.A.</td><td>Ignore</td></tr>
</table>
D=(long diameter + short diameter)/2.
Pixel off is not allowed.
</td><td>Minor</td></tr>
</table>

10.3 WARRANTY POLICY

Bolymin .Will provide one-year warranty for the products only if under specification operating conditions.
If there are functional defects found during the period of warranty, the defective products would be replaced on a one-to-one basis.
Bolymin would not be responsible for any direct/indirect liabilities consequential to any parties.

10.4 MTBF

10.4.1 .MTBF based on specific test condition is 5K hours.

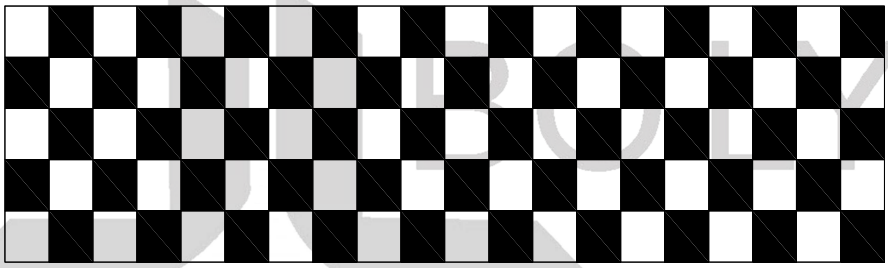
10.4.2 Test Condition:

10.4.2.1 Supply Voltage: Vcc=12.5V

10.4.2.2 Luminance: 120 cd/m2

10.4.2.3 Operation temperature and humidity:25 ℃ and 50%RH

10.4.2.4 Run-Patterns:



10.4.3 Test Criteria:

Luminance has decayed to less than 50% of the initial measured luminance.

11. Reliability

■**Content of Reliability Test**

NO.	Items.	Specification	Applicable Standard
1	High temp. (Non-operation)	85℃, 240hrs	——
2	High temp. (Operation)	70℃, 120hrs	——
3	Low temp. (Operation)	-40℃, 120hrs	——
4	High temp. / High. humidity (Operation)	65℃, 90%RH, 120hrs	——
5	Thermal shock(Non-operation)	-40℃ ~85℃ (-40℃ /30min; transit /3min; 85℃ /30min; transit /3min) 1cycle: 66min, 100 cycles.	——
6	Vibration	Frequency : 5~50HZ, 0.5G Scan rate : 1 oct/min Time : 2 hrs/axis Test axis : X, Y, Z	——

Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for item 1 & 4 & 5.

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.

Reliability Test

Bolymin only guarantees the reliability of the panel under the test conditions and durations listed in the specification, and is not responsible for any test results that are conducted using more stringent conditions and/or with lengthened durations. Also, when the testing the panel in a chamber or oven, make sure they won't produce any condensation on the panel, especially on the electrical leads, before lighting on the panel to see if it passes the test. Also the panel should rest for about an hour at room temperature and pressure before the measurement, as indicated in the specification. Be aware that one should use fresh panel for each of the reliability test items listed in the specification, in other words, don't use the panels that were tested for subsequent tests.

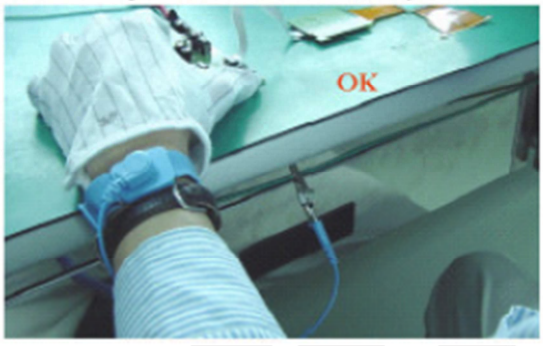
12. Precautions for Handling

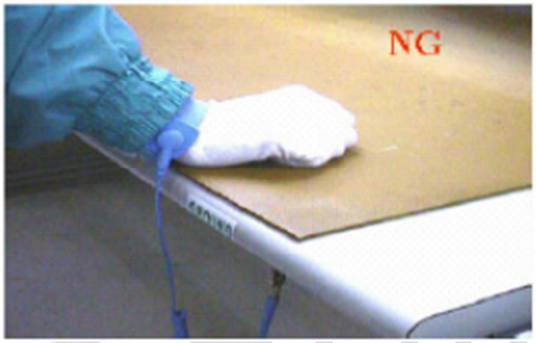
12.1 When handling the module, wear powder-free antistatic rubber finger cots, and be careful not to bend and twist it.

12.2 The OLED module is consisted of glass and film, and it should avoid pressure, strong impact, or being dropped from a height.

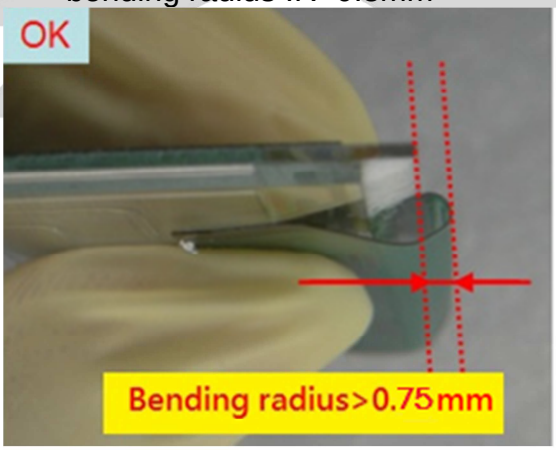
12.3 The OLED module is an electronic component and is subject to damage caused by Electro Static

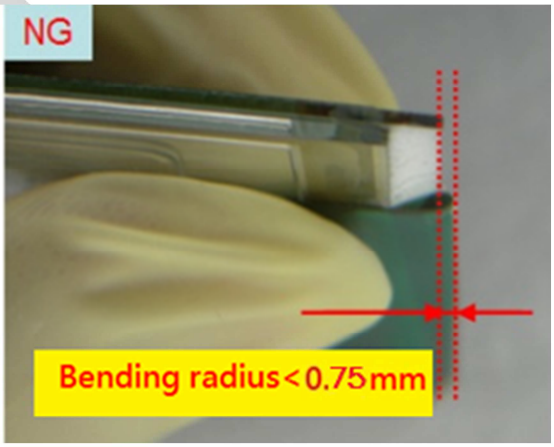
Discharge (ESD) and hence normal ESD precautions must be taken when handling it. Also, appropriate ESD protective environment must be administered and maintained in the production line. When handling and assembling the panel, wear an antistatic wrist strap with the alligator clip attached to the ground to prevent ESD damage on the panel. Also, ground the tools being used for panel assembly and make sure the working environment is not too dry to cause ESD problems. (See the photos below).

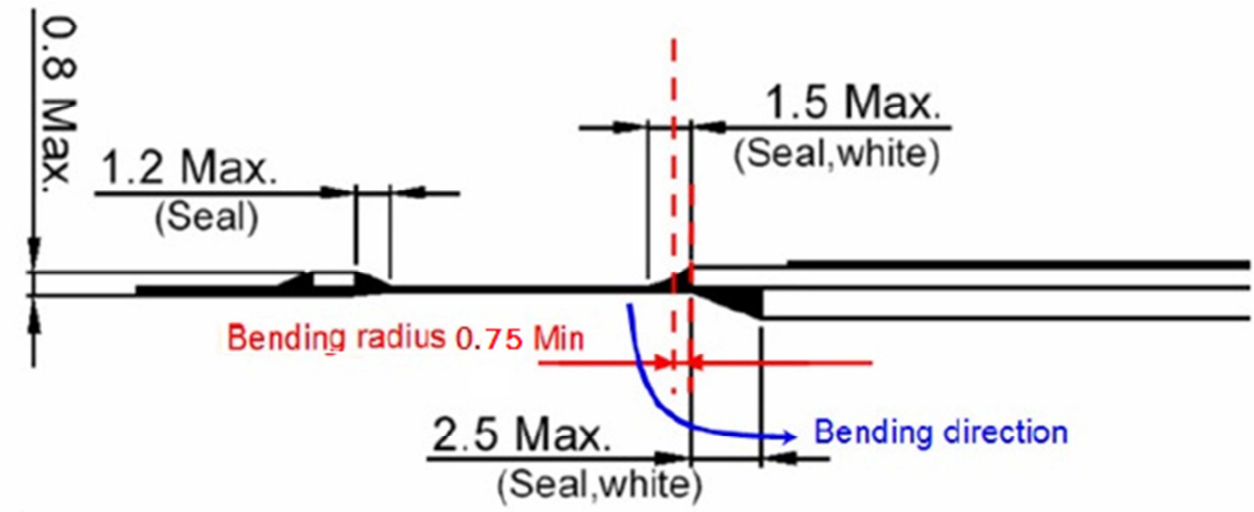




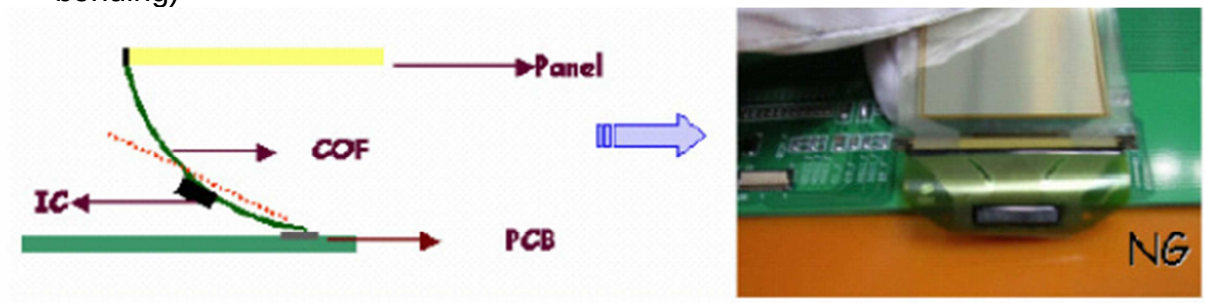
12.4 Please do not bend the film near the substrate glass.(this could cause film peeling and COF damage) and the peeling strength about 600g/cm, the bending <20times and the bending radius :R>0.8mm



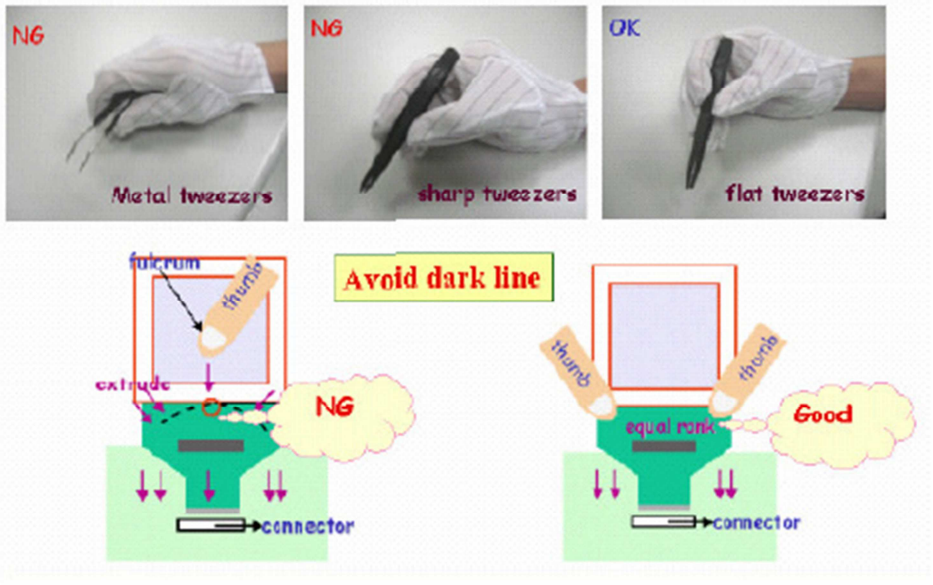




12.5 Avoid bending the film at IC bonding area.(>1.5mm)(this could damage the ILB bonding)



12.6 Use both thumbs to insert COF into the connector when assembling the panel. See the photo on the far right below for correct insertion of the film into the connector (one-handed insertion exerts uneven force on the film and could cause its breakage, photo on the left)



12.7 Do not wipe the pin of film with the dry or hard materials that will damage the surface. When cleaning the display surface, use soft cloth solvent and wipe gently (Recommend solvent: IPA, alcohol), and do not wipe the display with dry or hard materials that will damage the polarizer surface and do not use the solvent like: Water, Acetone, Aromatic

13. Precautions for Electrical

13.1. Design using the settings in the specification

It is extremely important to design and operate the panel using the settings listed in the specification. This includes voltage, current, frame rate, duty cycle... etc. Operation of the OLED outside the specified range in the specification should be entirely avoided to ensure proper operation of the OLED.

13.2. Maximum Ratings

To ensure proper operation of the panel, never design the panel with parameters running over the maximum ratings listed in the specification. Also the logic voltages such as VIL and VIH have to be within the specified range in the specification to prevent any improper operation of the panel.

13.3 Power savings

To save power consumption of the OLED, one can use partial display or sleep mode when the panel is not fully activated. Also, if possible, make maximum use of black background to save power. The OLED is a self-luminous device, and a particular pixel cluster or image can be lit on via software control, so power savings can be achieved by partial display or dimming down the luminance. Depending on the application, the user can choose among Ultra Bright Mode, Normal Operation Mode, and Sleeping Mode.

The power consumption is almost in direct proportion to the brightness of the panel, and also in direct proportion to the number of pixels lit on the panel, so the customer can save the power by the use of black background and Sleeping Mode. One benefit from using these design schemes is the extension of the OLED lifetime.

13.4 Residual Image (Image Sticking)

The OLED is a self-emissive device. As with other self-emissive device or displays consisting of self-emissive pixels, when a static image frozen for a long period of time is changed to another one with all-pixels-on background, residual image or image sticking is noticed by the human eye. Image sticking is due to the luminance difference or contrast between the pixels that were previously turned on and the pixels that are newly turned on. The time when image sticking happens depends on the luminance decay curve of the display. The slower the decay, the less prominent the image sticking is. It is strongly recommended that the user employ the following three strategies to minimize image sticking

13.4.1 Employ image scrolling or animation to even out the lit-on time of each and every pixel on the display, also could use sleeping mode for reduced the residual image and extend the power capacity.

13.4.2 Minimize the use of all-pixels-on or full white background in their application because when the panel is turned on full white, the image sticking from previously shown patterns is the most revealing. Black background is the best for power savings, greatest visibility, eye appealing, and dazzling displays

13.4.3 If in the reliability test when a static logo is used, change the pattern into its inverse (i.e., turn off the while pixels and turn on the previously unlit pixels) and freeze the inverse pattern as long as the original logo is used, so every pixel on the panel can be lit on for about the same time to minimize image sticking, caused by the differential turn-on time between the original and its reverse patterns

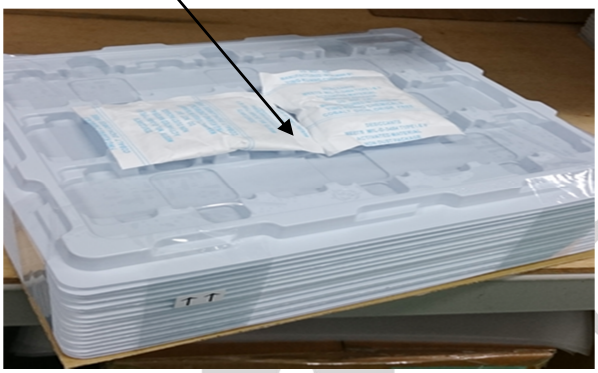
14. Precautions for Storage

Although the storage conditions and guarantee period are indicated in the specification, it is advisable to store the packed cartons or packages at 23℃±5℃,55%±10%RH(Note A), Do not store the OLED module under direct sunlight or UV light and for best panel performance. The constant working OLED display module decays slower than the module that is not working. And it's better to use the module on the field within one month after unpacking the package.

Note (A):

Vacuum Packaging

Desiccant x 2



Humidity indicator card

Humidity indicator card

As the humidity increases, the chemically impregnated spots change from a brown color (DRY) to a blue color (HUMID).