SPECIFICATIONS FOR OLED MODULE

MODEL NO.
BL12864G5-ERNNHN$
VER.01

RoHS COMPLIANT

FOR MESSRS:

_____

ON DATE OF:

_____

APPROVED BY:

_____

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History of Version

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01	NEW VERSION	2021/9/6	SPEC.

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1. Numbering System

B	L	12864	G5	-	E	R	N	N	H	N	$	-
0	1	2	3		4	5	6	7	8	9	10	11

0	Bolymin	B				
1	Module Type	C	Character type	P	TAB /TCP type	
		F	COF type	R	Color STN	
		G	Graphic type	L	OLED	
		O	COG type	Z	Customize	
2	Format	2004	20 character type,4lines			
		12232	122 × 32 dots			
3	Version No.	G4				
		-				
4	LCD Color	B	STN / Blue, OLED/Blue	H	HTN	
		C	Color	T	TN	
		F	FSTN	Y	STN/Yellow-green	
		G	STN/Grey	D	OLED/Blue+Yellow	
		A	OLED/Blue+Yellow+Green	E	OLED/Yellow	
		L	OLED/Green	R	OLED/RED	
		W	OLED/White	J	ASTN	
		K	DFSTN	V	VA LCD	
5	LCD Type	R	Positive/reflective	M	Positive/ transmissive	
		P	Positive/transflective	N	Negative/ transmissive	
		T	Negative/ transflective			
6	Backlight type/color	L	(LED)Array/yellow-green	G	(LED)Edge/yellow-green	
		M	(LED)Array/amber	H	(LED)Edge/white	
		R	(LED)Array/red	D	(LED)Edge/blue	
		U	(LED)Array/blue	E	(EL)white	
		W	(LED)Array/white	B	(EL)blue	
		C	(CCFL) white	F	(LED)Array/RGB	
		Y	(LED)Array/yellow	N	No backlight	
		O	(LED)Array/orange	K	(LED)Edge/green	
		A	(LED)Edge/amber	Q	(LED)Edge/red	
		J	(LED)Array/green	I	(LED)Edge/RGB	
		Z	(LED) arrayred/green	P	(LED)Edge/orange	

		S	(LED)edge/RGW	T	(LED)edge red/green
		V	EL blue/green、	X	(LED) Edgewhite /red
7	CGRAM Font	J	English/Japanese Font	C	English/Cyrillic Font
		G	Chinese(simple)	H	English/Hebrew Font
		E	English/European Font (ST7066U0B-BB)	S	English/European Font (ST7066U-0E-BB)
		F	Chinese(traditional)	M	Japanese-Kanji
		Z	Z=Chinese(simple)+Chinese (traditional)+Japanese+Korean	K	Korean (only for BG16032A BG24064C)
		A	English/Arabic Font	D	Chinese (simple/traditional) English/Japanese
		B	English/Japanese/European	N	None
8	View Angle /Operation Temperature	B	Bottom/Normal Temperature06:00	W	Top/Wide Temperature 12:00
		H	Bottom/Wide Temperature 06:00	E	Top/Ultra Temperature 12:00
		C	9H/Normal Temperature 09:00	U	Bottom/Ultra wide Temperature 06:00
		T	Top/Normal Temperature 12:00	F	9H/Ultra wide Temperature 09:00
		G	3H/Wide Temperature 3:00	D	9H/Wide Temperature 09:00
		I	3H/ Ultra Wide Temperature 3:00		
9	Special Code	N	Positive voltage for LCD	T	Negative voltage and Temperature compensation for LCD
		P	Touch panel	3/5	3/5 voltage logic power supply
10	RoHS	$			
11	Customer Code	00 0 ~ 99 0 、AA 0 ~ ZZ 0			

2. General Specification

(1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	128 × 64	dots
Module dimension (L*W*H)	75.0 x 52.7 x 8.5(MAX)	mm
View area	60.0 x 30.0	mm
Active area	55.01 x 27.49	mm
Dot size	0.40(W) × 0.40(H)	mm
Dot pitch	0.43(W) × 0.43 (H)	mm

(2) Controller IC: SSD1309 Controller

(3) Temperature Range

Operating	-40 ~ +85℃
Storage	-40 ~ +90℃

3. Absolute Maximum Ratings

Item	Symbol	Condition	Min	Max	Unit
Supply Voltage for Logic	TOP		-0.3	4	V
Supply Voltage for Display	TST		0	15	V
Operating life time		80cd/m²	150000(4)		Hrs
Operating life time		60cd/m²	200000		Hrs

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 3. “Optics & Electrical Characteristics”. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

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 = 13.0V, Ta= 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 (V_{DD})	V_{DD}-V_{SS}	—	1.65		3.3	V
Supply Voltage (V_{cc})	V_{cc}-V_{SS}		12.5	13	13.5	V
Input High Vol	V_{IH}	—	0.8V_{DD}	—	—	V
Input Low Vol	V_{IL}	—	—	—	0.2V_{DD}	V
Output High Vol	V_{OH}	—	0.9V_{DD}	—	—	V
Output Low Vol.	V_{OL}	—	—	—	0.1V_{DD}	V
Supply Current (with positive voltage)	I_{DD}	—	—	—	TBD	mA

5. Optical Characteristics

Item	Min.	Typ.	Max.	Unit
View Angle	—	Free	—	deg
Dark Room contrast	10000:1	—	—	—
Response Time	—	10	—	us
Pixel Luminance	60	80		cd/m2
CIE x (Yellow)	0.46	0.50	0.54	
CIE y (Yellow)	0.45	0.49	0.53	

6. Interface Pin Function

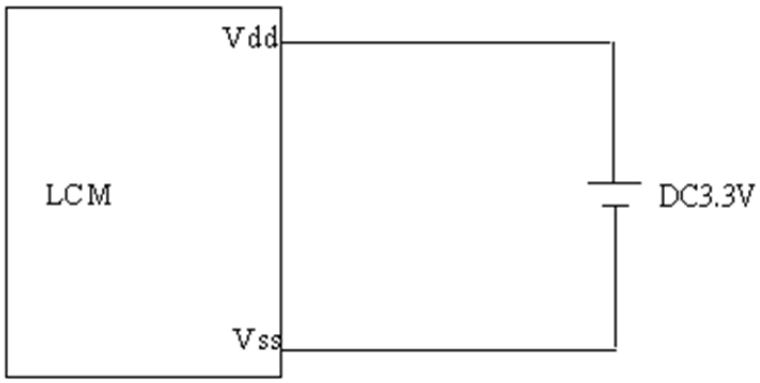
Pin No.	Symbol	Level	Description
1	Vdd	3.3V	Supply voltage for logic
2	Vss	0V	Ground
3	NC	—	No connection
4	DB0	H/L	Data bus line
5	DB1	H/L	Data bus line
6	DB2	H/L	Data bus line
7	DB3	H/L	Data bus line
8	DB4	H/L	Data bus line
9	DB5	H/L	Data bus line
10	DB6	H/L	Data bus line
11	DB7	H/L	Data bus line
12	CS	H/L	Chip select pin
13	NC	—	No connection
14	/RES	H/L	Hardware Reset pin
15	WR	H/L	8080: data write enable pin 6800: Read/Write select pin
16	RS	H/L	H: Data; L: Command.
17	RD	H/L	8080: data read enable pin 6800: Read/Write enable pin
18	NC	—	No connection
19	DISF	H/L	DISF: VCC Voltage ON/OFF
20	NC	—	No connection

※80 Series Interface is Default

(6800 series MPU interface is option) (SPI interface is option) (I2C interface is option)

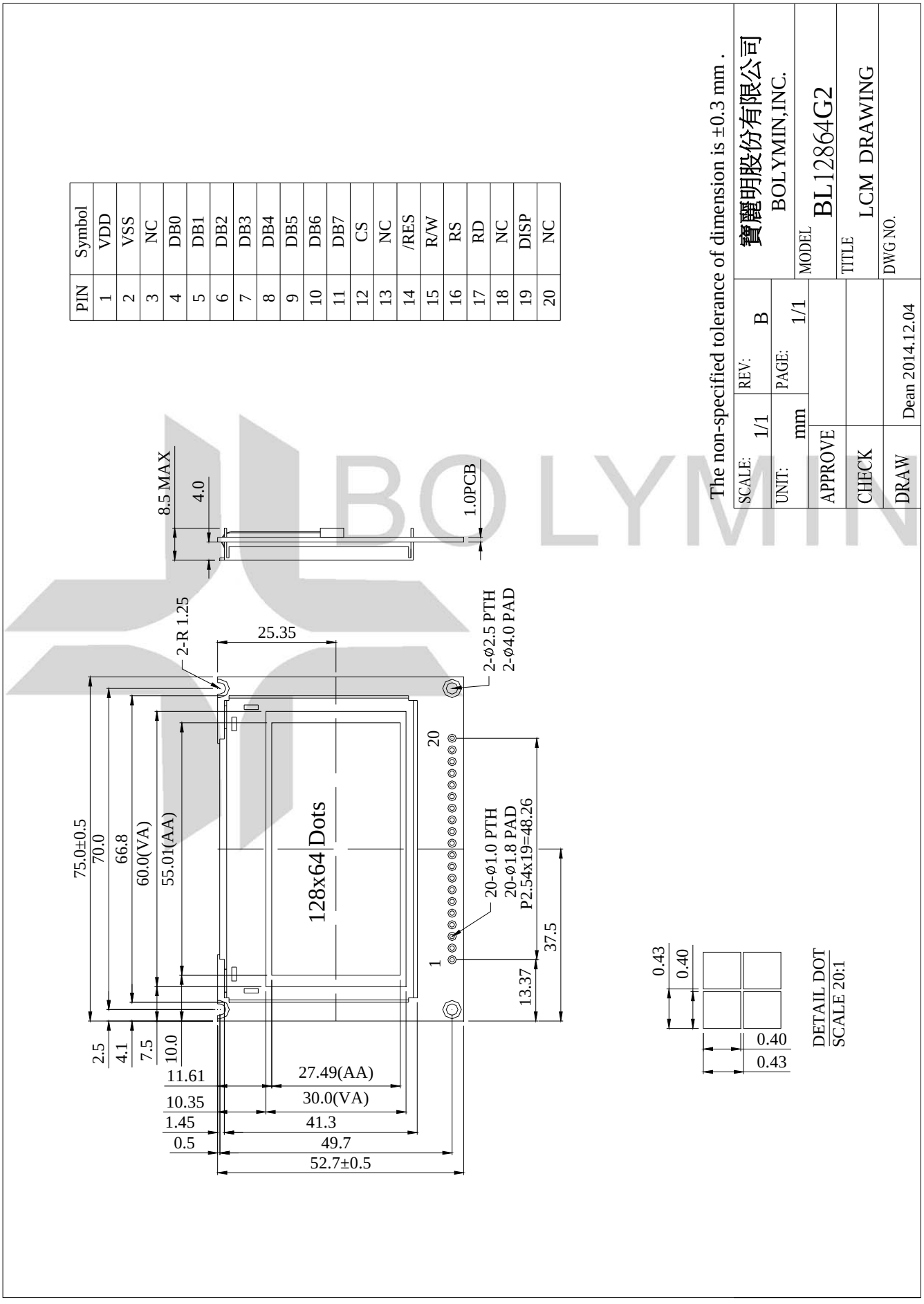
7. Power supply for LCD Module

＊LCM operating on "DC 3.3V " input with built-in positive voltage



8. Drawing

PIN	Symbol
1	VDD
2	VSS
3	NC
4	DB0
5	DB1
6	DB2
7	DB3
8	DB4
9	DB5
10	DB6
11	DB7
12	CS
13	NC
14	/RES
15	R/W
16	RS
17	RD
18	NC
19	DISP
20	NC

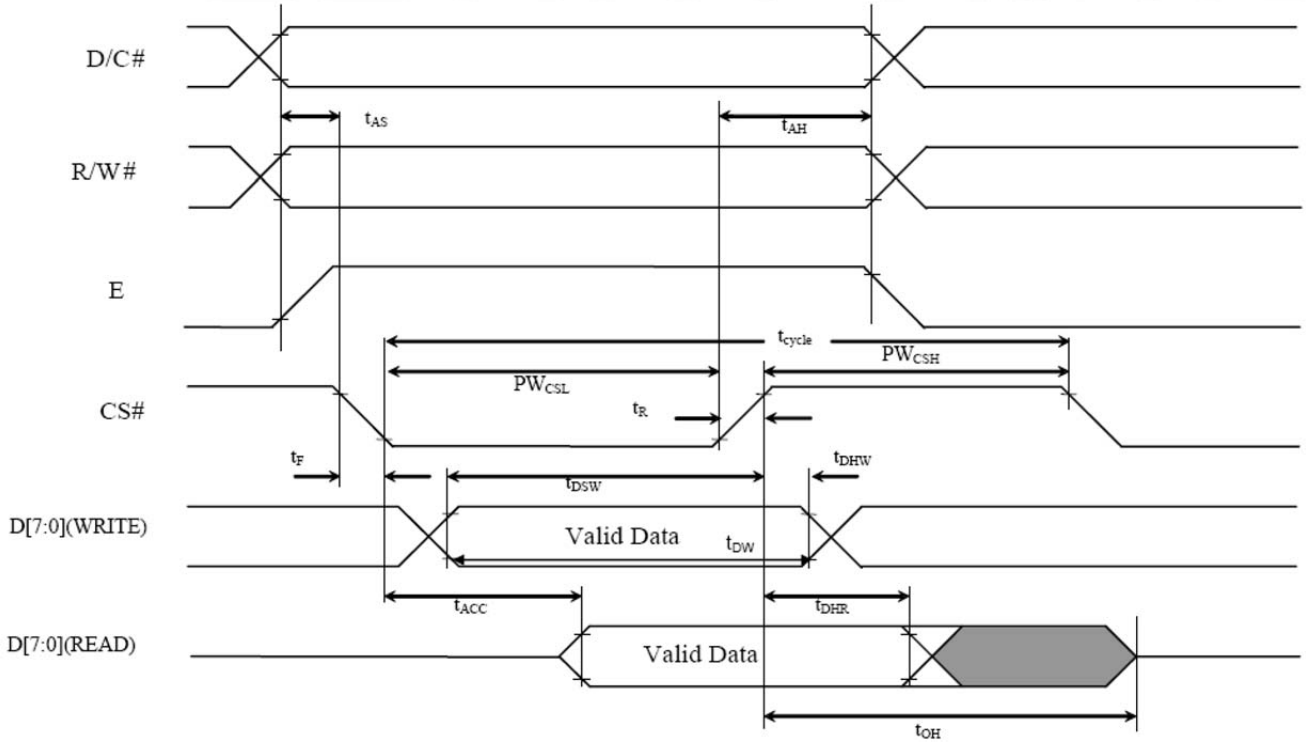


9. SSD1309 controller data

9.1 Timing Characteristics

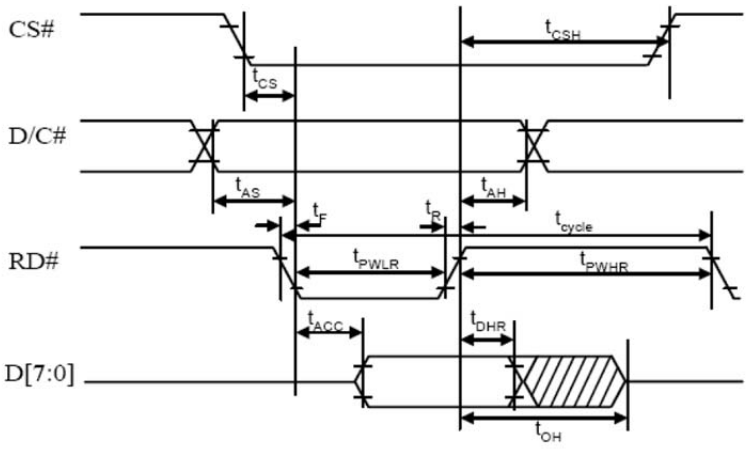
6800 MPU Interface

Symbol	Parameter	Min	Max	Unit
tcycle	Clock Cycle Time	300	-	ns
tAS	Address Setup Time	20	-	ns
tAH	Address Hold Time	0	-	ns
tDW	Data Write Time	80	-	ns
tDSW	Write Data Setup Time	40	-	ns
tDHW	Write Data Hold Time	20	-	ns
tDHR	Read Data Hold Time	20	-	ns
tOH	Output Disable Time	-	70	ns
tACC	Access Time	-	140	ns
PWCSL	Chip Select Low Pulse Width (read)	120	-	ns
	Chip Select Low Pulse Width (write)	60		
PWCSH	Chip Select High Pulse Width (read)	60	-	ns
	Chip Select High Pulse Width (write)	60		
tR	Rise Time	-	40	ns
tF	Fall Time	-	40	ns

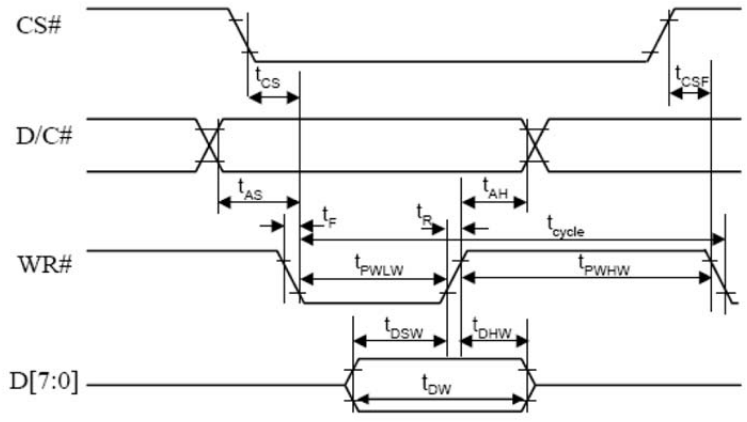


8080 MPU Interface

Symbol	Parameter	Min	Max	Unit
tcycle	Clock Cycle Time	300	-	ns
tAS	Address Setup Time	20	-	ns
tAH	Address Hold Time	0	-	ns
tDW	Data Write Time	70	-	ns
tDSW	Write Data Setup Time	40	-	ns
tDHW	Write Data Hold Time	15	-	ns
tDHR	Read Data Hold Time	20	-	ns
tOH	Output Disable Time	-	70	ns
tACC	Access Time	-	140	ns
PWCSL	Chip Select Low Pulse Width (read)	120	-	ns
	Chip Select Low Pulse Width (write)	60		
PWCSH	Chip Select High Pulse Width (read)	60 60	-	ns
	Chip Select High Pulse Width (write)			
tR	Rise Time	-	40	ns
tF	Fall Time	-	40	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



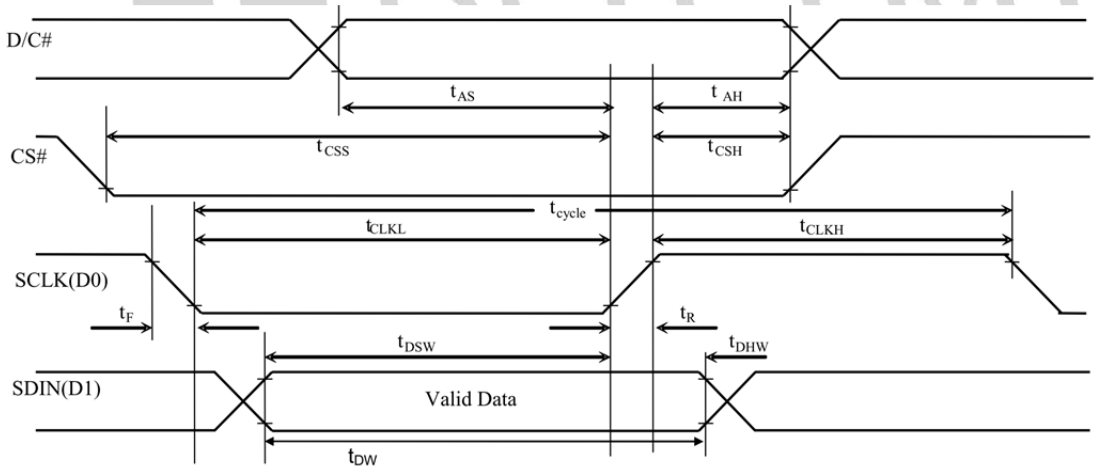
(***Read Timing***)

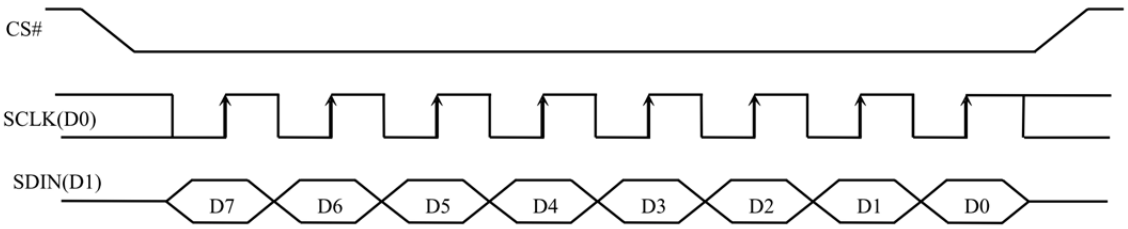


(***Write Timing***)

SPI Interface

Symbol	Parameter	Min	Max	Unit
tcycle	Clock Cycle Time	100	-	ns
tAS	Address Setup Time	15	-	ns
tAH	Address Hold Time	15	-	ns
tCSS	Chip Select Setup Time	20	-	ns
tCSH	Chip Select Hold Time	50	-	ns
tDW	Data Write Time	55	-	ns
tDSW	Write Data Setup Time	15	-	ns
tDHW	Write Data Hold Time	15	-	ns
tCLKL	Clock Low Time	50	-	ns
tCLKH	Clock High Time	50	-	ns
tR	Rise Time	-	40	ns
tF	Fall Time	-	40	ns





9.2 Display Control Instruction

Command table refer to IC spec.: SSD1309

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°C
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
0.03＜ W≦0.05
0.05＜ W
beyond A.A.</td><td>Ignore
L≦3

------</td><td>Ignore
3
None
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
0.2＜Φ ≦0.5
0.5＜Φ
beyond A.A.</td><td>Ignore
2
0
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
0.1＜ D ≦0.15
0.15＜ D ≦0.2
0.2 ＜ D
beyond A.A.</td><td>Ignore
2
1
0
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 200K hours.

10.4.2 Test Condition:

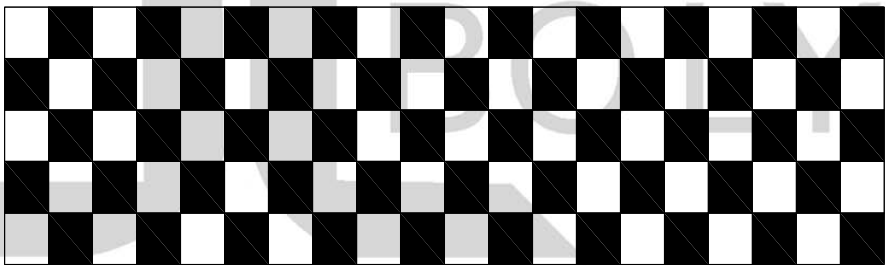
10.4.2.1 Supply Voltage: Vcc=13V

10.4.2.2 Luminance: <60cd/m^2

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)	90°C, 240hrs	——
2	High temp. (Operation)	85°C, 240hrs	——
3	Low temp. (Operation)	-40°C, 240hrs	——
4	High temp. / High. humidity (Operation)	65°C, 90%RH, 120hrs	——
5	Thermal shock(Non-operation)	-40°C ~85°C (-40°C /30min; transit /3min; 85°C /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*

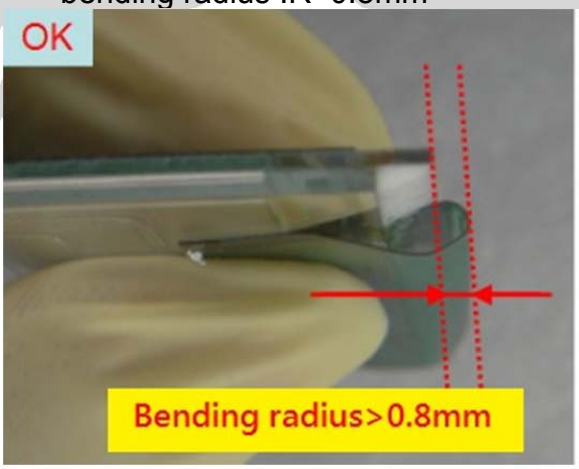
12.1 When handling the module, wear powder-free antistatic rubber finger cots, and be careful not to bend and twist it.

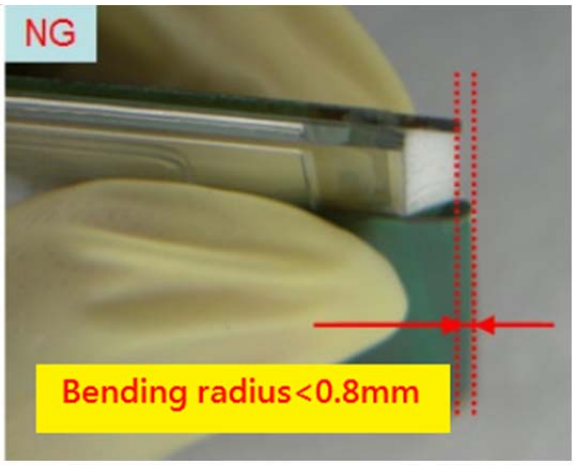
12.2 The OLED module is consisted of glass and film, and it should avoid pressure, strong impact, or being dropped from a height.

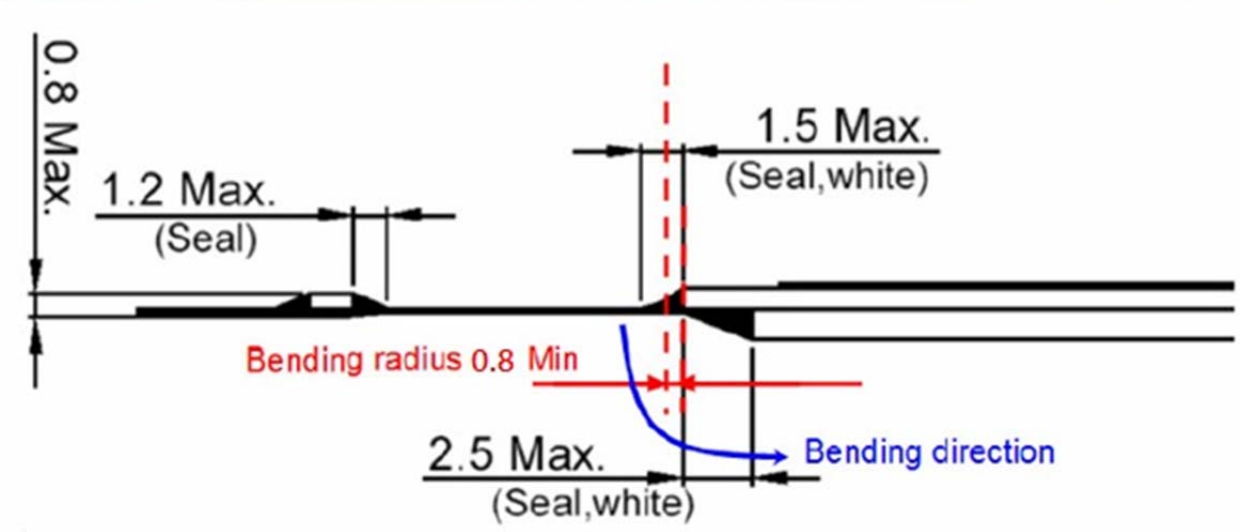
12.3 The OLED module is an electronic component and is subject to damage caused by Electro Static

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).

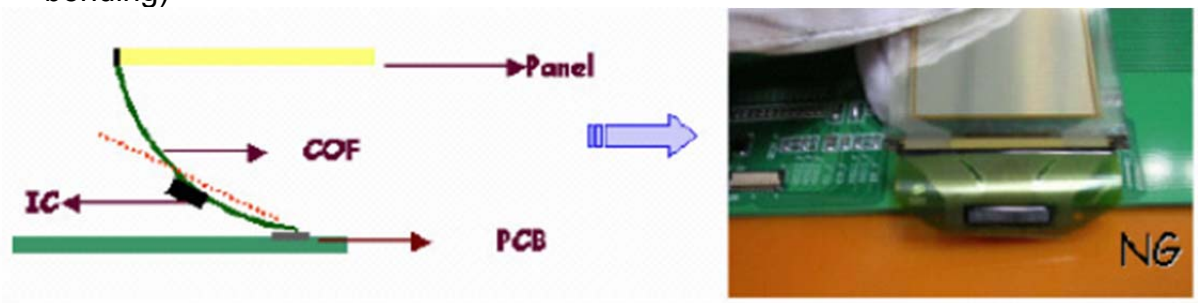
12.4 Please do not bend the film near the substrate glass.(this could cause film peeling and COF damage) and the peeling strength about 600g/cm, the bending <20times and the bending radius :R>0.8mm



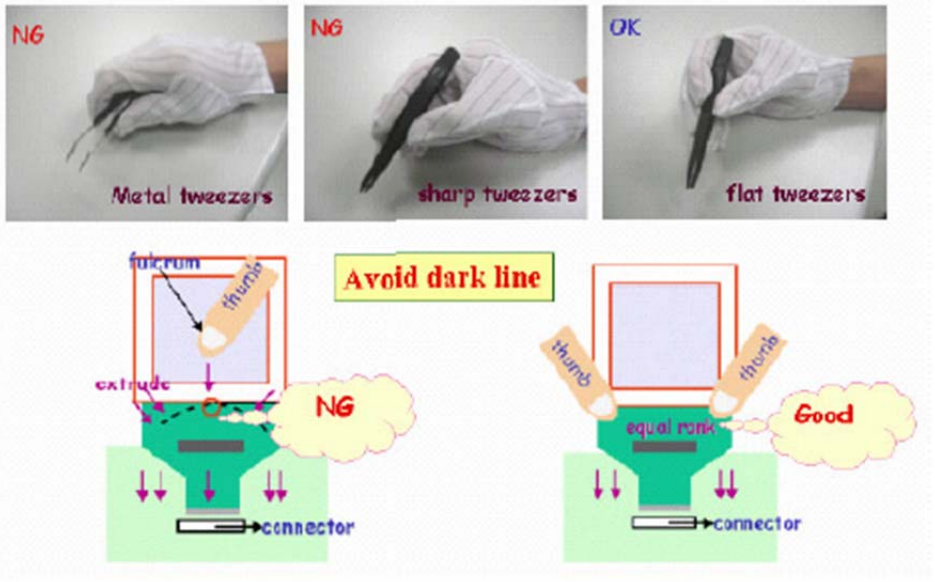




12.5 Avoid bending the film at IC bonding area.(>1.5mm)(this could damage the ILB bonding)



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

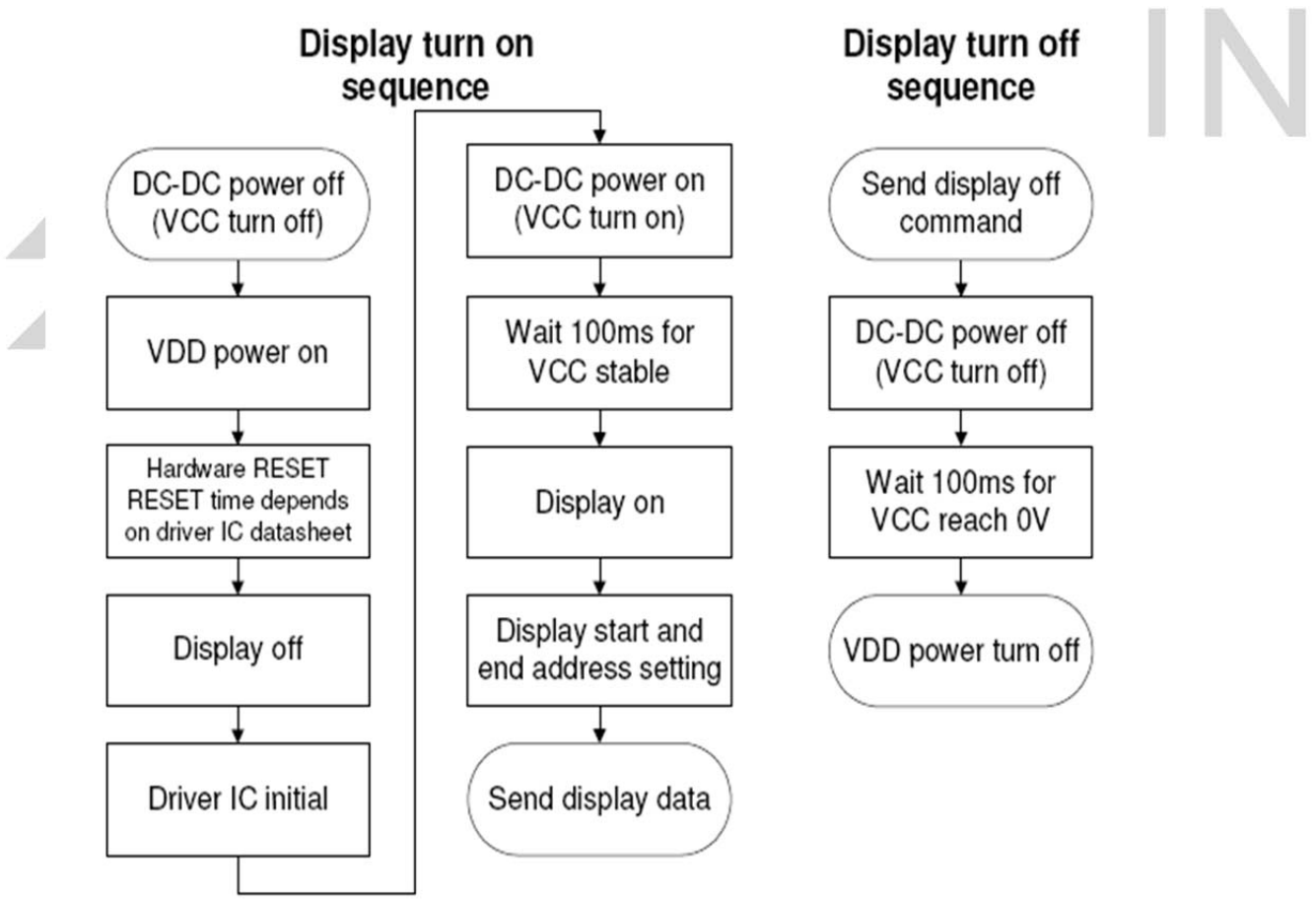
It is extremely important to design and operate the panel using the settings listed in the specification. This includes voltage, current, frame rate, duty cycle... etc. Operation of the OLED outside the specified range in the specification should be entirely avoided to ensure proper operation of the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

Any operation that does not comply with the procedure could cause permanent damage of the IC and should be avoided. When the logic power is not on, do not activate any input signal. Abrupt shutdown of power to the module, while the OLED panel is on, could cause OLED panel malfunctioning.



13.4 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.

13.5 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

13.5.1 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.

13.5.2 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

13.5.3 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).