



DM-OLED208-638

**2.08" 256 X 64 MONOCHROME
GRAPHIC OLED DISPLAY MODULE-
SPI**

Contents

- 1 Revision History
- 2 Main Features
- 3 Pin Description
 - 3.1 Panel Pin Description
 - 3.2 Module Pin Description
- 4 Mechanical Drawing
 - 4.1 Panel Mechanical Drawing
 - 4.2 Module Mechanical Drawing
- 5 Electrical Characteristics
- 6 Optical Characteristics
- 7 System buses Read/Write characteristics
 - 7.1 Write characteristics (4-wire SPI)
 - 7.2 I2C interface characteristics
- 8 Power on/off sequence
- 9 Schematic
 - 9.1 Module schematic
 - 9.2 Application circuit for 4-wire SPI mode
 - 9.3 Application circuit for IIC mode
- 10 Command Table
- 11 Recommended Software Initialization
- 12 Reliability
- 13 Warranty and Conditions

1 Revision History

Date	Changes
2018-09-19	First release

2 Main Features

Item	Specification	Unit
Diagonal Size	2.08	inch
Display Mode	Passive Matrix OLED	-
Display Colors	Monochrome (16 Gray Scale)	Colors
Resolution	256 x 64	pixel
Controller IC	SH1122	-
Interface	4wire SPI	-
Active Area	51.18 x 12.78	mm
Module Dimension	72.50 x 27.24	mm
Weight	TBD	g

3 Pin Description

3.1 Panel Pin Description

Pin No.	Symbol	Function Description																									
1	VPP	This is the most positive voltage supply pad of the chip It should be supplied externally																									
2	VSEGM	This is a pad for the voltage output level for segment pre-charge. A capacitor should be connected between this pad and VSS																									
3	VCOMH	This is a pad for the voltage output high level for common signals A capacitor should be connected between this pad and VSS																									
4	VSL	This is a segment voltage reference pad A capacitor should be connected between this pad and VSS.																									
5	IREF	This is a segment current reference pad A resistor should be connected between this pad and VSS. Set the current at 15.625 μ A																									
6	VSS	Ground for analog, logic & buffer respectively																									
7	VCL	This is a common voltage reference pad This pad should be connected to VSS externally																									
8	VDD	1.65 - 3.5V power supply input pad for logic.																									
9	IM0	These are the MPU interface mode select pads.																									
10	IM1		<table border="1"> <thead> <tr> <th></th> <th>8080</th> <th>IIC</th> <th>6800</th> <th>4-wire SPI</th> <th>3-wire SPI</th> </tr> </thead> <tbody> <tr> <td>IM0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> <tr> <td>IM1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>IM2</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> </tbody> </table>		8080	IIC	6800	4-wire SPI	3-wire SPI	IM0	0	0	0	0	1	IM1	1	1	0	0	0	IM2	1	0	1	0	0
	8080		IIC	6800	4-wire SPI	3-wire SPI																					
IM0	0		0	0	0	1																					
IM1	1	1	0	0	0																						
IM2	1	0	1	0	0																						
11	IM2																										
12	/CS	This pad is the chip select input. When /CS = "L", then the chip select becomes active, and data/command I/O is enabled.																									
13	/RES	This is a reset signal input pad. When /RES is set to "L", the settings are initialized. The reset operation is performed by the /RES signal level.																									
14	A0	This is the Data/Command control pad that determines whether the data bits are data or a command. A0 = "H": the inputs at D0 to D7 are treated as display data. A0 = "L": the inputs at D0 to D7 are transferred to the command registers. In I2C interface, this pad serves as SA0 to distinguish the different address of OLED driver.																									
15	/WR	This is a MPU interface input pad. When connected to an 8080 MPU, this is active LOW. This pad connects to the 8080 MPU /WR signal. The signals on the data bus are latched at the rising edge of the /WR signal. When connected to a 6800 Series MPU: This is the read/write control signal input terminal. When /WR = "H": Read. When /WR = "L": Write.																									
16	/RD	This is a MPU interface input pad. When connected to an 8080 series MPU, it is active LOW. This pad is connected to the /RD signal of the 8080 series MPU, and the SH1122 data bus is in an output status when this signal is "L". When connected to a 6800 series MPU, this is active HIGH. This is used as an enable clock input of the 6800 series MPU.																									
17-24	D0-D7	This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus. When the serial interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SI). At this time, D2 to D7 are set to high impedance. When the I2C interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SDA). At this time, D2 to																									

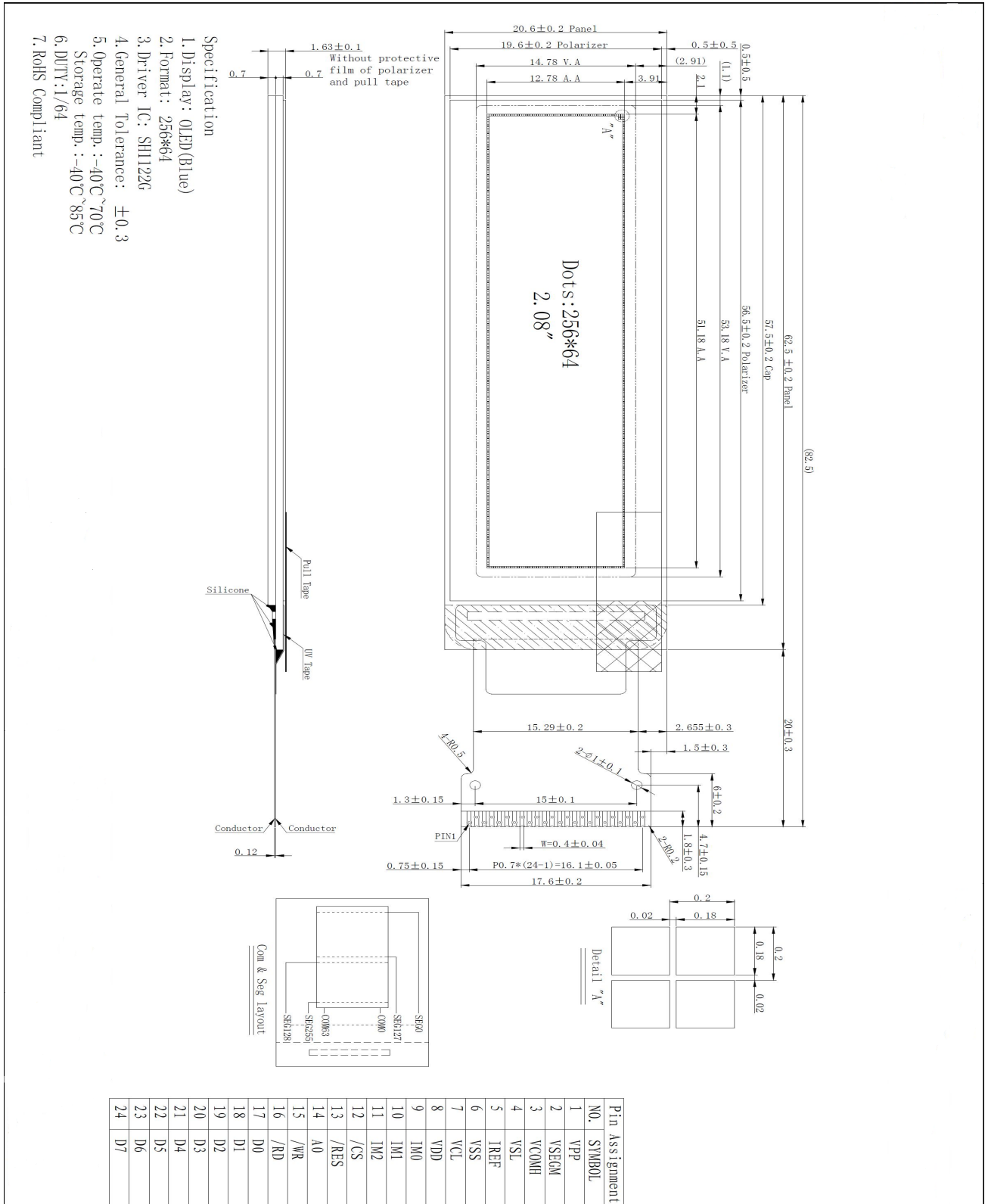
		D7 are set to high impedance. When the chip select is inactive, D0 to D7 are set to high impedance.
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3.2 Module Pin Description

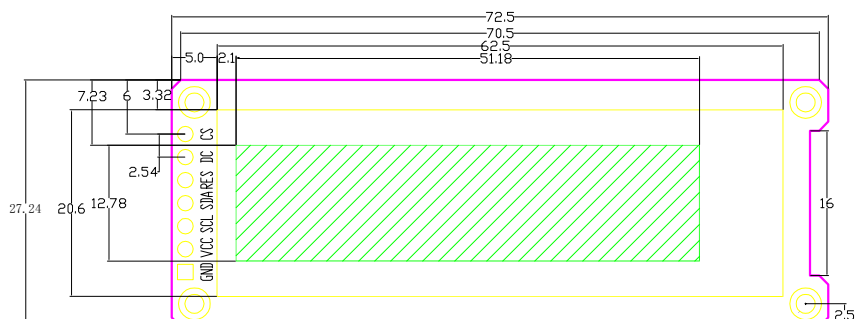
Pin No.	Symbol	Function Description
1	GND	Ground
2	VCC	Power Supply 3.3V
3	SCL	SPI Clock
4	SDA	SPI DATA
5	RES	OLED reset Pin.
6	D/C	Data/Command Control This pin is Data/Command control pin.
7	CS	Chip Select This pin is pulled low to active. Connect to ground if no used .

4 Mechanical Drawing

4.1 Panel Mechanical Drawing



4.2 Module Mechanical Drawing



5 Electrical Characteristics

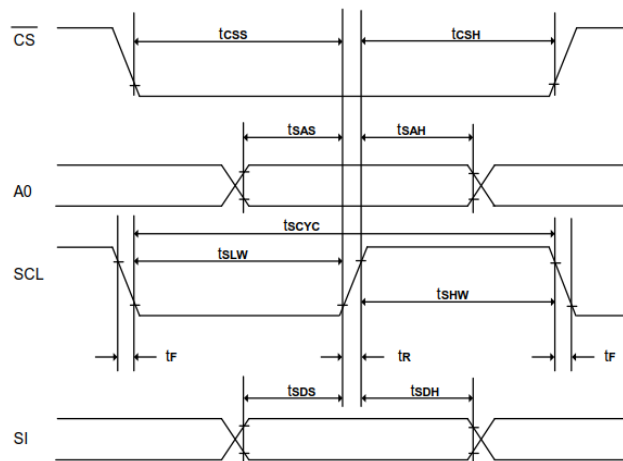
Item	Symbol	Condition	Min	Typ.	Max	Unit
Power supply	VCC		2.6	3.3	3.5	V
Supply Voltage for Display(for OLED Panel)	VPP		11.5	12	12.5	V
Sleep mode current consumption in VPP	ISP			0.02	10	uA
Operating Maximum Temperature	TOP		-40		70	°C
Storage Maximum Temperature	TST		-40		85	°C

6 Optical Characteristics

Item	Symbol	Min	Typ	Max	Unit
View Angles		160		-	°
Response Time (25 °C)	Tr + Tf		10		ns
Brightness	Lbr	80	100	-	cd/m ²
Dark room Contrast Ratio	CR	2000:1		-	

7 System buses Read/Write characteristics

7.1 Write characteristics (4-wire SPI)



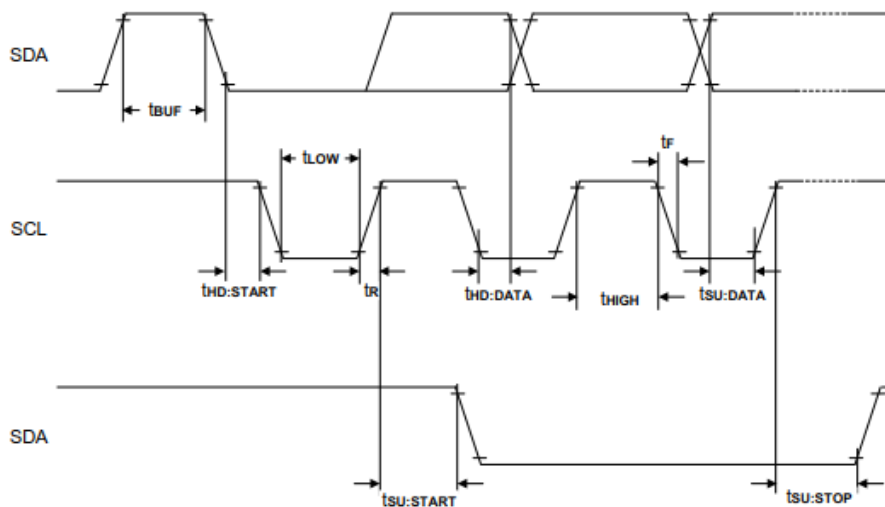
(VDD = 1.65 - 3.5V, TA = +25°C)

Symbol	Parameter	Min	Typ	Max	Unit	Condition
tscyc	Serial clock cycle	500	-	-	ns	
tsAS	Address setup time	300	-	-	ns	
tsAH	Address hold time	300	-	-	ns	
tsDS	Data setup time	200	-	-	ns	
tsDH	Data hold time	200	-	-	ns	
tcSS	\overline{CS} setup time	240	-	-	ns	
tcSH	\overline{CS} hold time time	120	-	-	ns	
tSHW	Serial clock H pulse width	200	-	-	ns	
tSLW	Serial clock L pulse width	200	-	-	ns	
tr	Rise time	-	-	30	ns	
tf	Fall time	-	-	30	ns	

(VDD = 2.4 - 3.5V, TA = +25°C)

Symbol	Parameter	Min	Typ	Max	Unit	Condition
tscyc	Serial clock cycle	250	-	-	ns	
tsAS	Address setup time	150	-	-	ns	
tsAH	Address hold time	150	-	-	ns	
tsDS	Data setup time	100	-	-	ns	
tsDH	Data hold time	100	-	-	ns	
tcSS	\overline{CS} setup time	120	-	-	ns	
tcSH	\overline{CS} hold time time	60	-	-	ns	
tSHW	Serial clock H pulse	100	-	-	ns	
tSLW	Serial clock L pulse	100	-	-	ns	
tr	Rise time	-	-	15	ns	
tf	Fall time	-	-	15	ns	

7.2 I2C interface characteristics

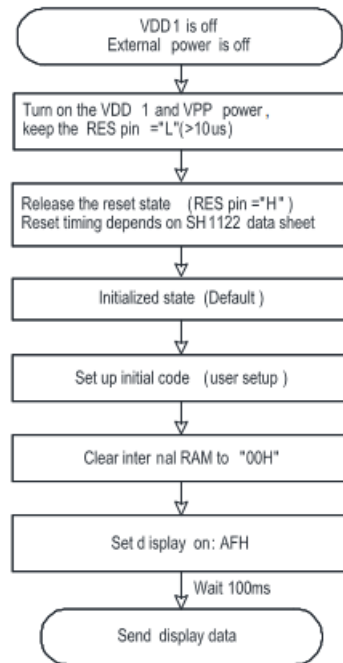


(VDD = 1.65 - 3.5V, TA = +25°C)

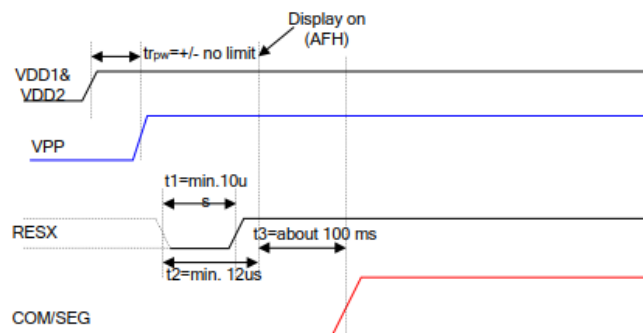
Symbol	Parameter	Min	Typ	Max	Unit	Condition
f_{SCL}	SCL clock frequency	DC	-	400	kHz	
T_{LOW}	SCL clock Low pulse width	1.3	-	-	uS	
T_{HIGH}	SCL clock H pulse width	0.6	-	-	uS	
$T_{SU:DATA}$	data setup time	100	-	-	nS	
$T_{HD:DATA}$	data hold time	0	-	0.9	uS	
T_R	SCL,SDA rise time	$20+0.1C_b$	-	300	nS	
T_F	SCL,SDA fall time	$20+0.1C_b$	-	300	nS	
C_b	Capacity load on each bus line	-	-	400	pF	
$T_{SU:START}$	Setup time for re-START	0.6	-	-	uS	
$T_{HD:START}$	START Hold time	0.6	-	-	uS	
$T_{SU:STOP}$	Setup time for STOP	0.6	-	-	uS	
T_{BUF}	Bus free times between STOP and START condition	1.3	-	-	uS	

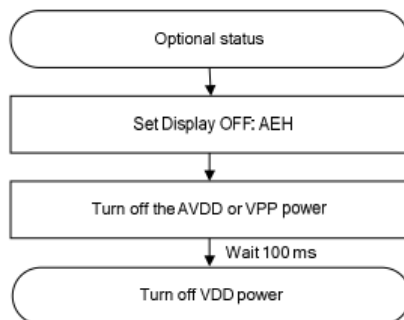
8 Power on/off sequence

External DC-DC pump power is being used immediately after turning on the power

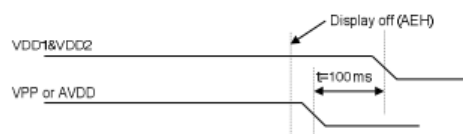


Power on sequence:



Power Off


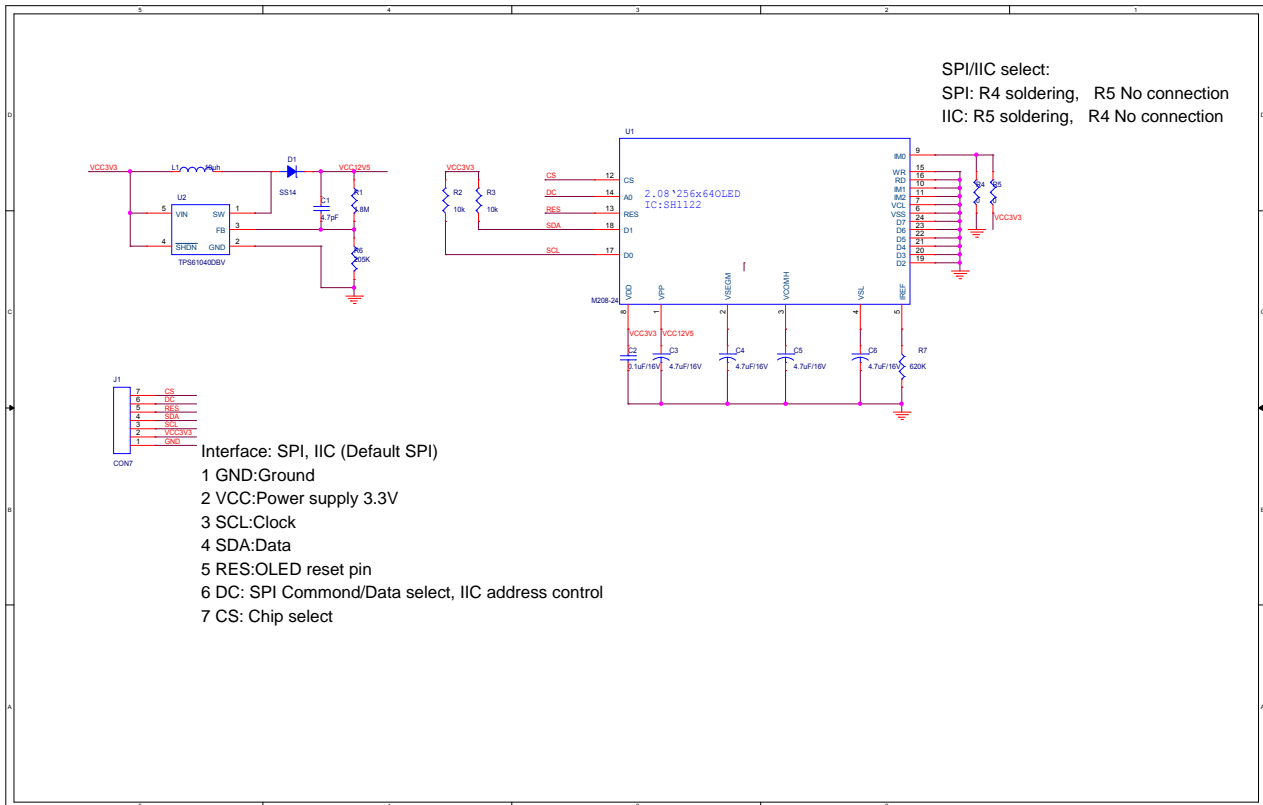
Power off sequence:



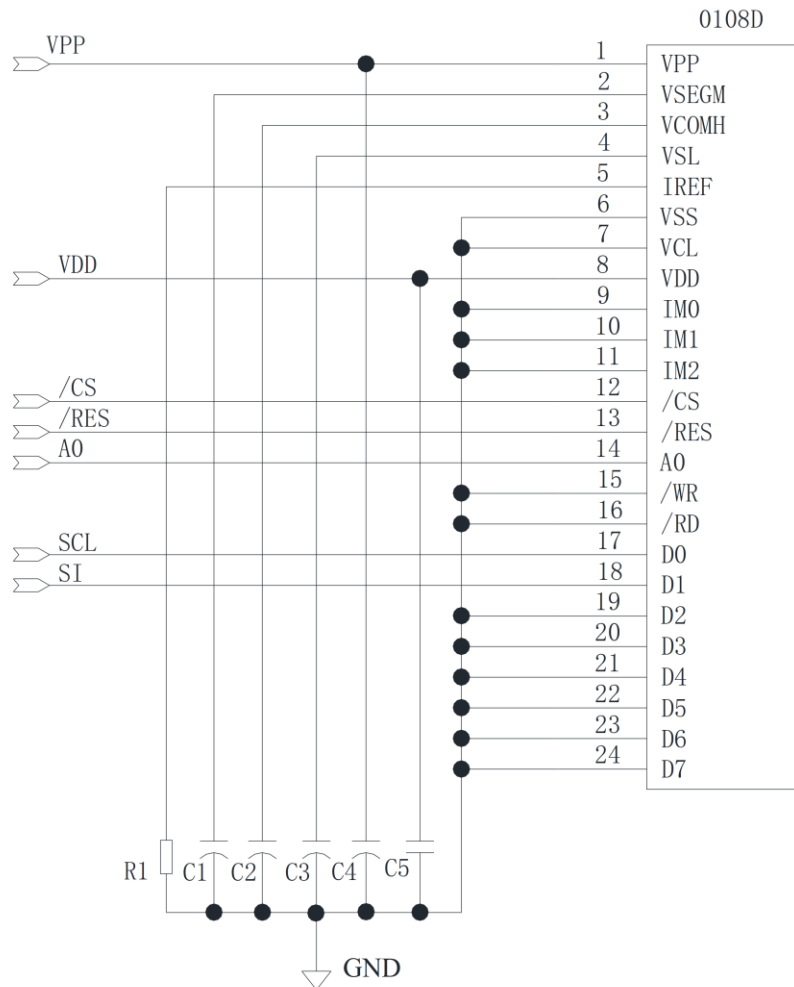
Note: There will be no damages to the display module if the power on/off sequences are not met.

9 Schematic

9.1 Module schematic



9.2 Application circuit for 4-wire SPI mode



Pin connected to MCU interface: SCL,SI, A0, /RES ,/CS

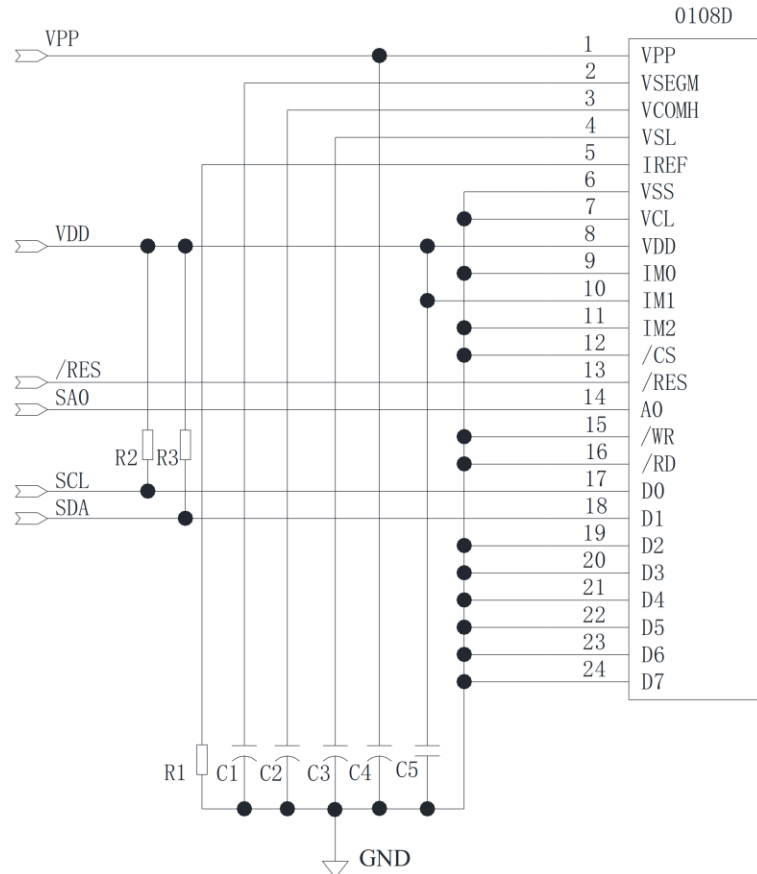
Recommended components

C1,C2,C3,C4: 4.7 μ F/25V.ROHS (Tantalum Capacitors)

C5: 0.1 μ F-0603-X7R \pm 10%.ROHS

R1: 0603 1/10W +/-5% 620Kohm.ROHS

9.3 Application circuit for IIC mode



Pin connected to MCU interface: SCL,SDA, SA0,/RES

SA0	I ² C Address
0	0x78
1	0x7a

Recommended components

C1,C2,C3,C4: 4.7 μ F/25V.ROHS (Tantalum Capacitors)

C5: 0.1 μ F-0603-X7R \pm 10%.ROHS

R1: 0603 1/10W +/-5% 620Kohm.ROHS

R2,R3: 0603 1/10W +/-5% 10Kohm.ROHS

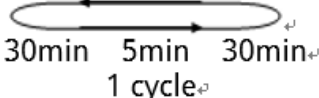
10 Command Table

Please check in driver IC DATASHEET

11 Recommended Software Initialization

```
void Init_IC()
{
  Write_Command(0xAE); //Set Display Off
  Write_Command(0xB0); //Row address Mode Setting
  Write_Command(0x00);
  Write_Command(0x10); //Set Higher Column Address of display RAM
  Write_Command(0x00); //Set Lower Column Address of display RAM
  Write_Command(0xD5); //Set Display Clock Divide Ratio/Oscillator Frequency
  Write_Command(0x50); //50 125hz
  Write_Command(0xD9); //Set Discharge/Precharge Period
  Write_Command(0x22);
  Write_Command(0x40); //Set Display Start Line
  Write_Command(0x81); //The Contrast Control Mode Set
  Write_Command(0x26);
  Write_Command(0xA0); //Set Segment Re-map
  Write_Command(0xC8); //Set Common Output Scan Direction
  Write_Command(0xA4); //Set Entire Display OFF/ON
  Write_Command(0xA6); //Set Normal/Reverse Display
  Write_Command(0xA8); //Set Multiplex Ration
  Write_Command(0x3F);
  Write_Command(0xAD); //DC-DC Setting
  Write_Command(0x80); //DC-DC is disable
  Write_Command(0xD3); //Set Display Offset
  Write_Command(0x00);
  Write_Command(0xDB); //Set VCOM Deselect Level
  Write_Command(0x30);
  Write_Command(0xDC); //Set VSEGM Level
  Write_Command(0x30);
  Write_Command(0x33); //Set Discharge VSL Level 1.8V
  Write_Command(0xAF); //Set Display On
}
```

12 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	85°C 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-40°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-40 °C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation 	-40°C/85°C 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.

Note3: Test performed on product itself, not inside a container.

13 Warranty and Conditions

<http://www.displaymodule.com/pages/faq> HYPERLINK

"http://www.displaymodule.com/pages/faq"