MULTI-INNO TECHNOLOGYCO., LTD.

www.multi-inno.com

OLED MODULE SPECIFICATION

Model: MI12864AKO-Y

This module is ROHS compliant

For Customer's Acceptance:

Customer	
Approved by	
Comment	

The standard product specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for the standard product or release of the order.	Revision	1.0
	Engineering	
	Date	2019-08-23
	Our Reference	

■ REVISION RECORD

REV NO.	REV DATE	CONTENTS	REVISED PAGE NO.
1.0	2019-08-23	First Release	

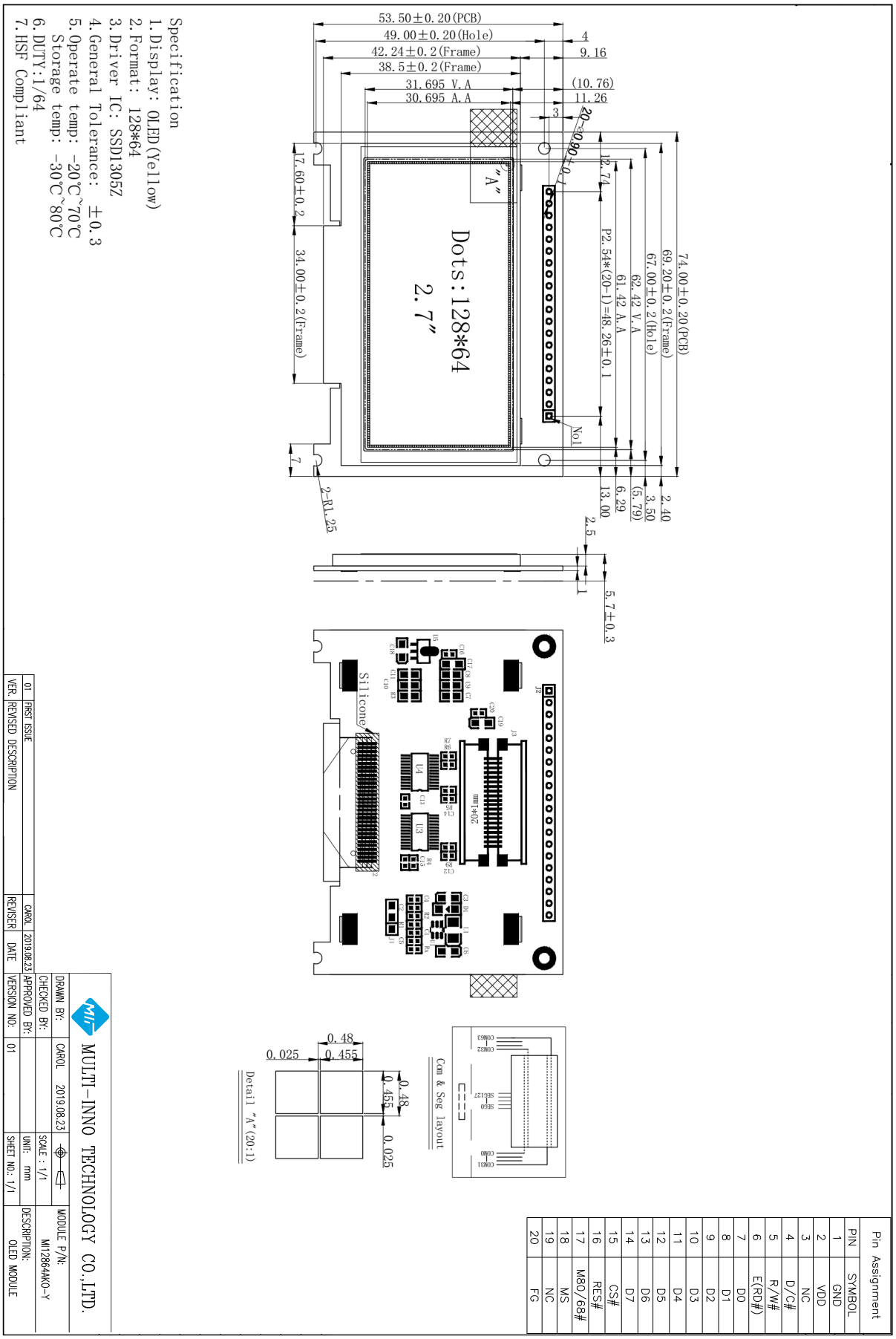
CONTENTS

■ PHYSICAL DATA

Item	Specification	Unit
Display Mode	Passive Matrix OLED	/
Display Color	Monochrome (Yellow)	/
Duty	1/64	/
Resolution (H × V)	128 × 64	Pixel
Active Area (W × H)	61.42 × 30.695	mm^2
Panel Size (W × H × D)	68.40 × 37.70 ×1.80	mm^3
Module Size (W × H × D)	74.00 × 53.50 × 5.70	mm^3
Pixel Pitch (W × H)	0.48 × 0.48	mm^2
Pixel Size (W × H)	0.455 × 0.455	/
Driver IC	SSD1305Z	/
Interface Type	8-bit 6800/8080 Parallel, 4-wire SPI, I^2C	/
Aperture Rate	90	%
Weight	TBD	g

Note 1: ROHS compliant;
Note 2: OLED weight tolerance: ±10%.

■ EXTERNAL DIMENSIONS



Pin Assignment	
PIN	SYMBOL
1	GND
2	VDD
3	NC
4	D/C#
5	R/W#
6	E(RD#)
7	D0
8	D1
9	D2
10	D3
11	D4
12	D5
13	D6
14	D7
15	CS#
16	RES#
17	M80/68#
18	MS
19	NC
20	FG

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Unit	Notes
Logic Supply Voltage	V_{DD}	-0.3	5.5	V	1,2
Operating Temperature	T_{OP}	-20	70	℃	3
Storage Temperature	T_{ST}	-30	80	℃	3
Life Time (60cd/m²)	-	30,000	-	Hour	4

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. Also, for normal operations, it is desirable to use this module under the conditions according to "Electro-Optical 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℃.

Note 4: V_{DD}=5.0V, Ta=25℃, 50% Checkerboard.
Software configuration follows "Actual Application Example".
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.

■ ELECTRICAL CHARACTERISTICS

◆ DC Characteristics

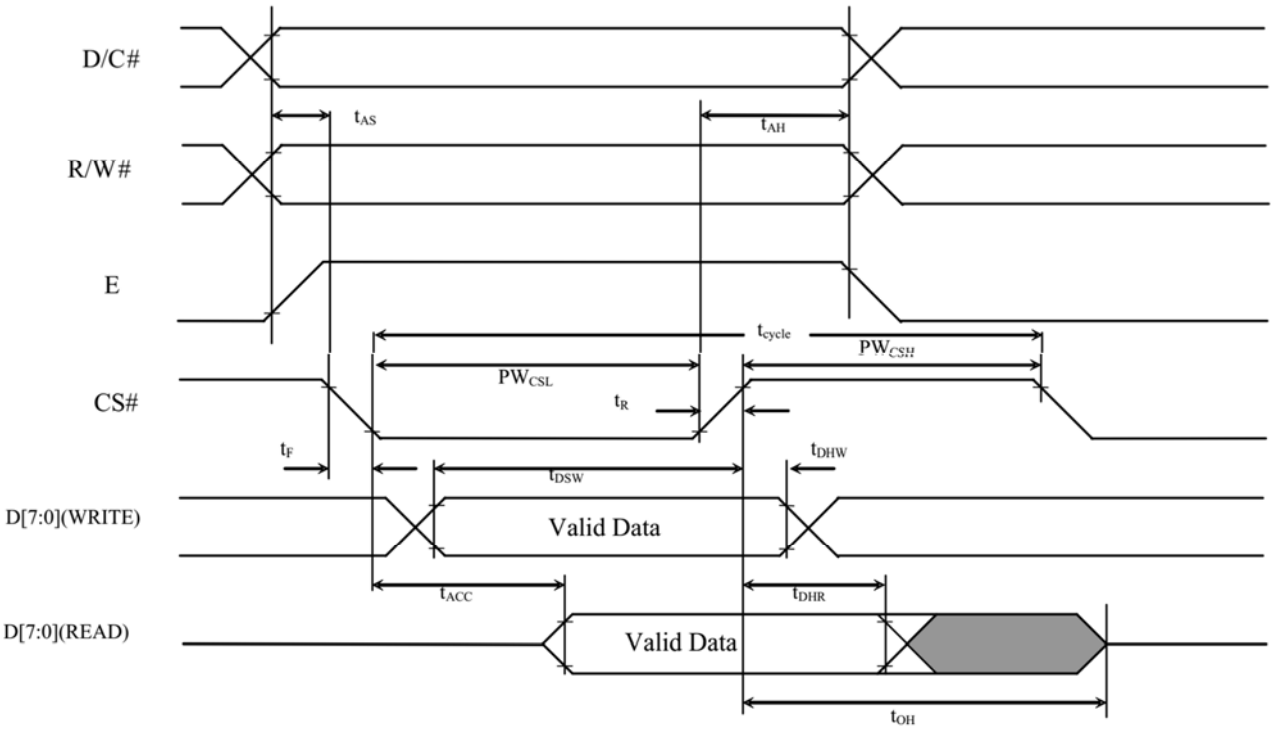
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Logic Supply Voltage	V_{DD}		-	5.0	-	V
High Level Input Voltage	V_{IH}		0.8V_{DD}	-	-	V
Low Level Input Voltage	V_{IL}		-	-	0.2V_{DD}	V
High Level Output Voltage	V_{OH}	I_{OUT}=100uA, 3.3MHz	0.9V_{DD}	-	-	V
Low Level Output Voltage	V_{OL}	I_{OUT}=100uA, 3.3MHz	-	-	0.1V_{DD}	V

◆ AC Characteristics

1. 68XX-Series MPU Parallel Interface Timing Characteristics

Symbol	Description	Min.	Max.	Unit
t_{cycle}	Clock Cycle Time	300	-	ns
t_{AS}	Address Setup Time	0	-	ns
t_{AH}	Address Hold Time	0	-	ns
t_{DSW}	Write Data Setup Time	40	-	ns
t_{DHW}	Write Data Hold Time	7	-	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

* (VDD-GND=2.4V to 3.5V, Ta=25°C)

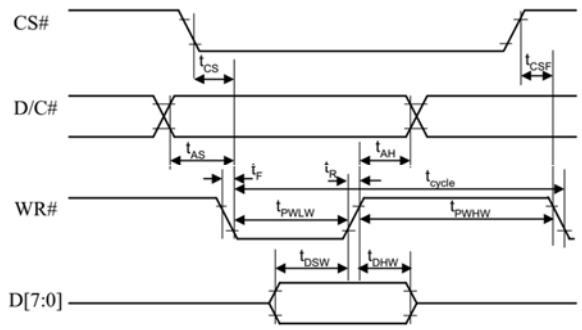


2. 80XX-Series MPU Parallel Interface Timing Characteristics

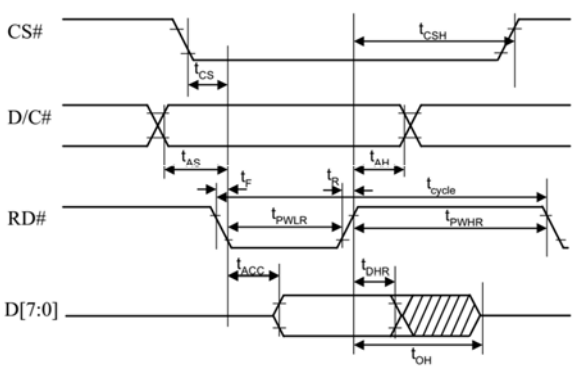
Symbol	Description	Min.	Max.	Unit
t_{cycle}	Clock Cycle Time	300	-	ns
t_{AS}	Address Setup Time	10	-	ns
t_{AH}	Address Hold Time	0	-	ns
t_{DSW}	Write Data Setup Time	40	-	ns
t_{DHW}	Write Data Hold Time	7	-	ns
t_{DHR}	Read Data Hold Time	20	-	ns
t_{OH}	Output Disable Time	-	70	ns
t_{ACC}	Access Time	-	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

* (VDD -GND=2.4V to 3.5V, Ta=25°C)

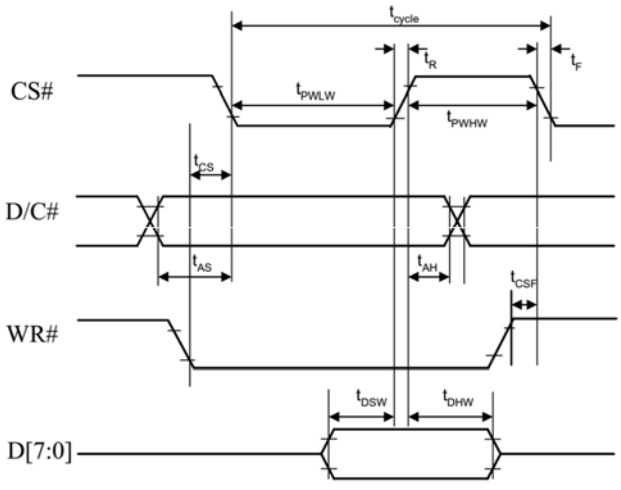
Write cycle (Form 1)



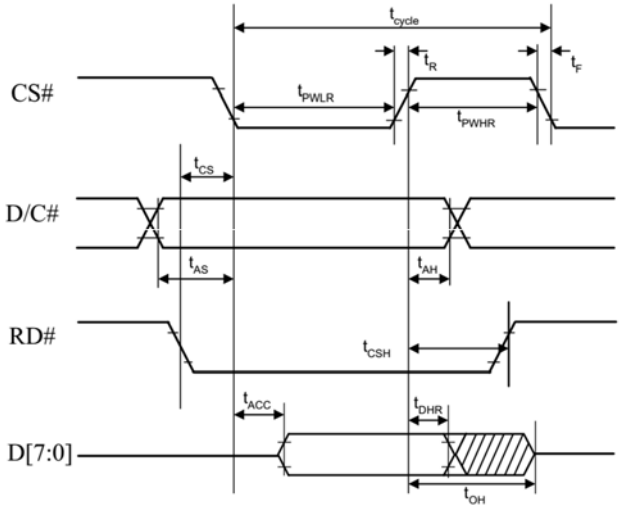
Read cycle (Form 1)



Write cycle (Form 2)



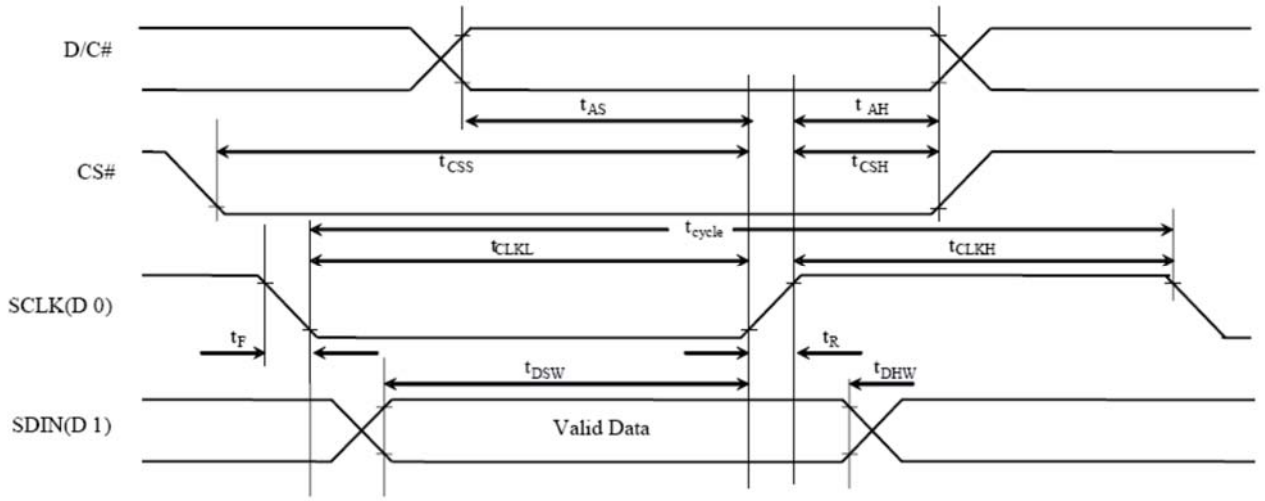
Read cycle (Form 2)

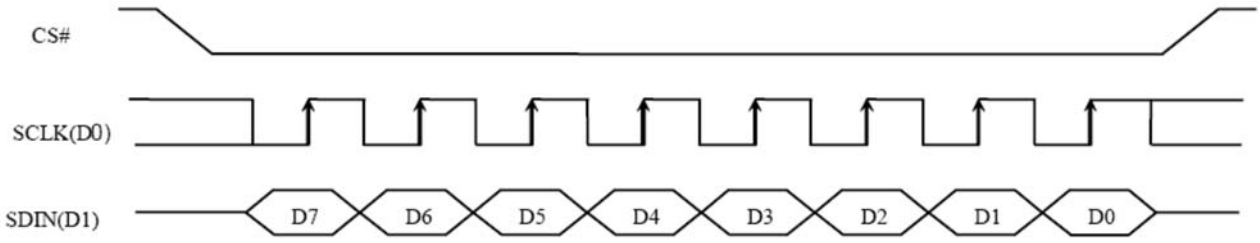


3. Serial Interface Timing Characteristics: (4-wire SPI)

Symbol	Description	Min.	Max.	Unit
t_{cycle}	Clock Cycle Time	250	-	ns
t_{AS}	Address Setup Time	150	-	ns
t_{AH}	Address Hold Time	150	-	ns
t_{CSS}	Chip Select Setup Time	120	-	ns
t_{CSH}	Chip Select Hold Time	60	-	ns
t_{DSW}	Write Data Setup Time	50	-	ns
t_{DHW}	Write Data Hold Time	15	-	ns
t_{CLKL}	Clock Low Time	100	-	ns
t_{CLKH}	Clock High Time	100	-	ns
t_R	Rise Time	-	40	ns
t_F	Fall Time	-	40	ns

* (VDD -GND=2.4V to 3.5V, Ta=25°C)

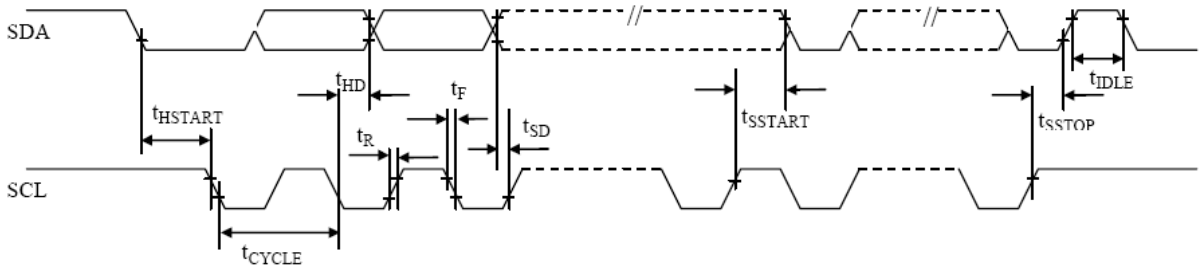




4. I²C Interface Timing Characteristics

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

* (VDD -GND=2.4V to 3.5V, Ta=25°C)

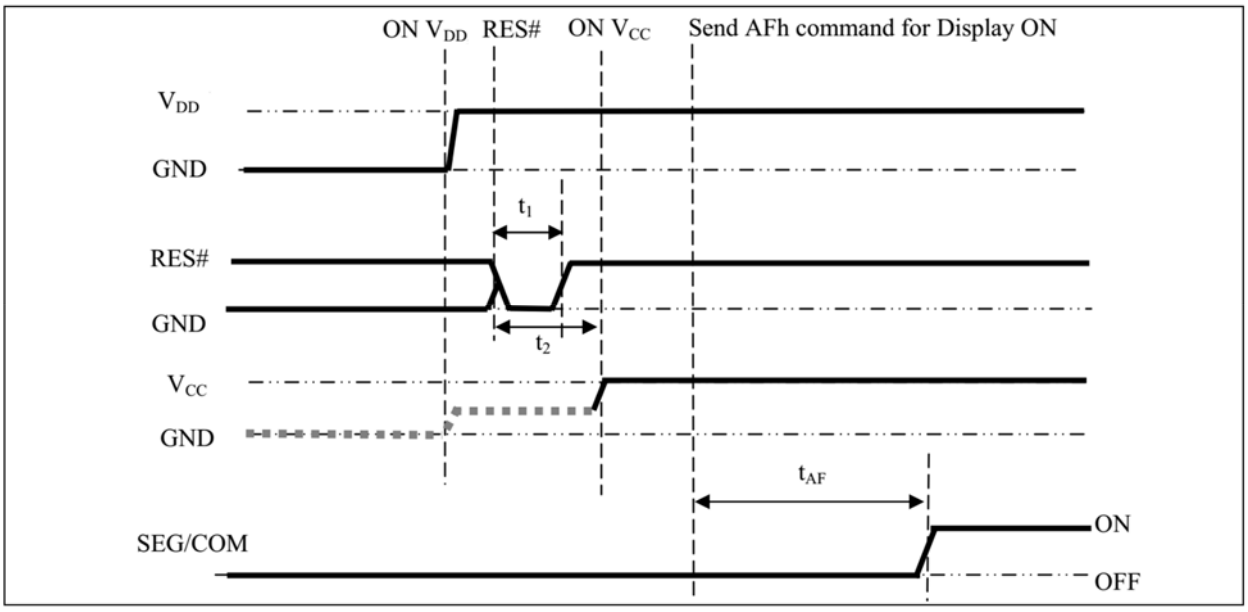


■ TIMING OF POWER SUPPLY

1. Power ON and Power OFF Sequence

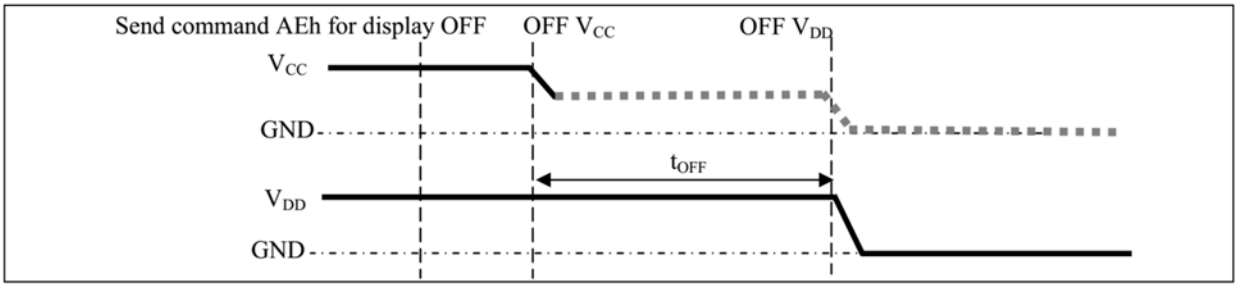
Power ON Sequence:

1. Power ON VDD.
2. After VDD become stable, set RES# pin LOW (logic low) for at least 3us(t_1) [4] and then HIGH (logic high)
3. After set RES# pin LOW (logic low), wait for at least 3us(t_2). Then Power ON VCC [1].
4. After VCC become stable, send command AFh for display ON. SEG/COM will be ON after 100ms(t_{AF}).



Power OFF Sequence:

1. Send command AEh for display OFF.
2. Power OFF VCC [1], [2], [3].
3. Wait for t_{OFF} Power OFF VDD. (where Minimum t_{OFF}=0ms[5], Typical t_{OFF}=100ms)

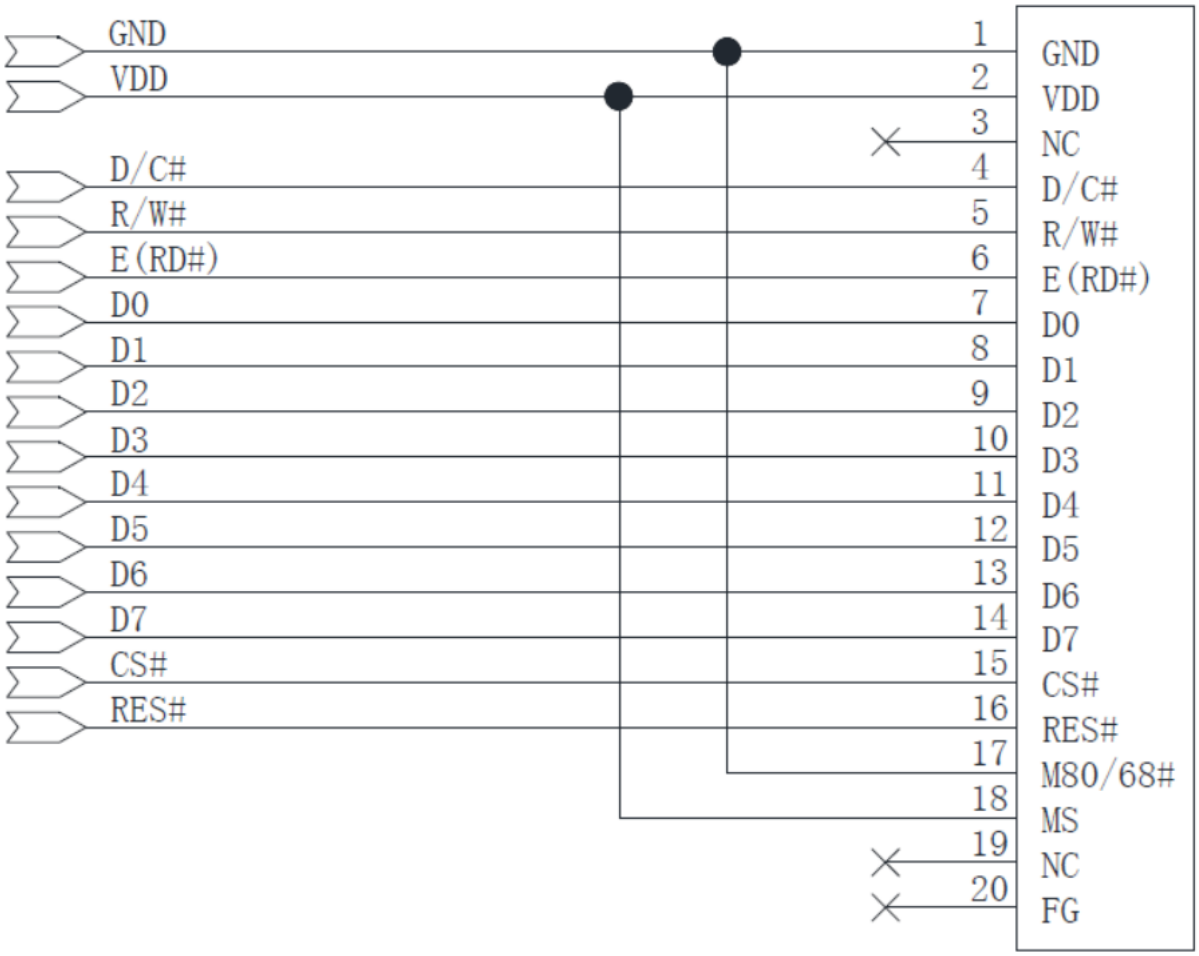


Note:

1. Since an ESD protection circuit is connected between VDD and VCC, VCC becomes lower than VDD whenever VDD is ON and VCC is OFF as shown in the dotted line of VCC in above figures.
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. The register values are reset after t_1.
5. VDD should not be Power OFF before VCC Power OFF.

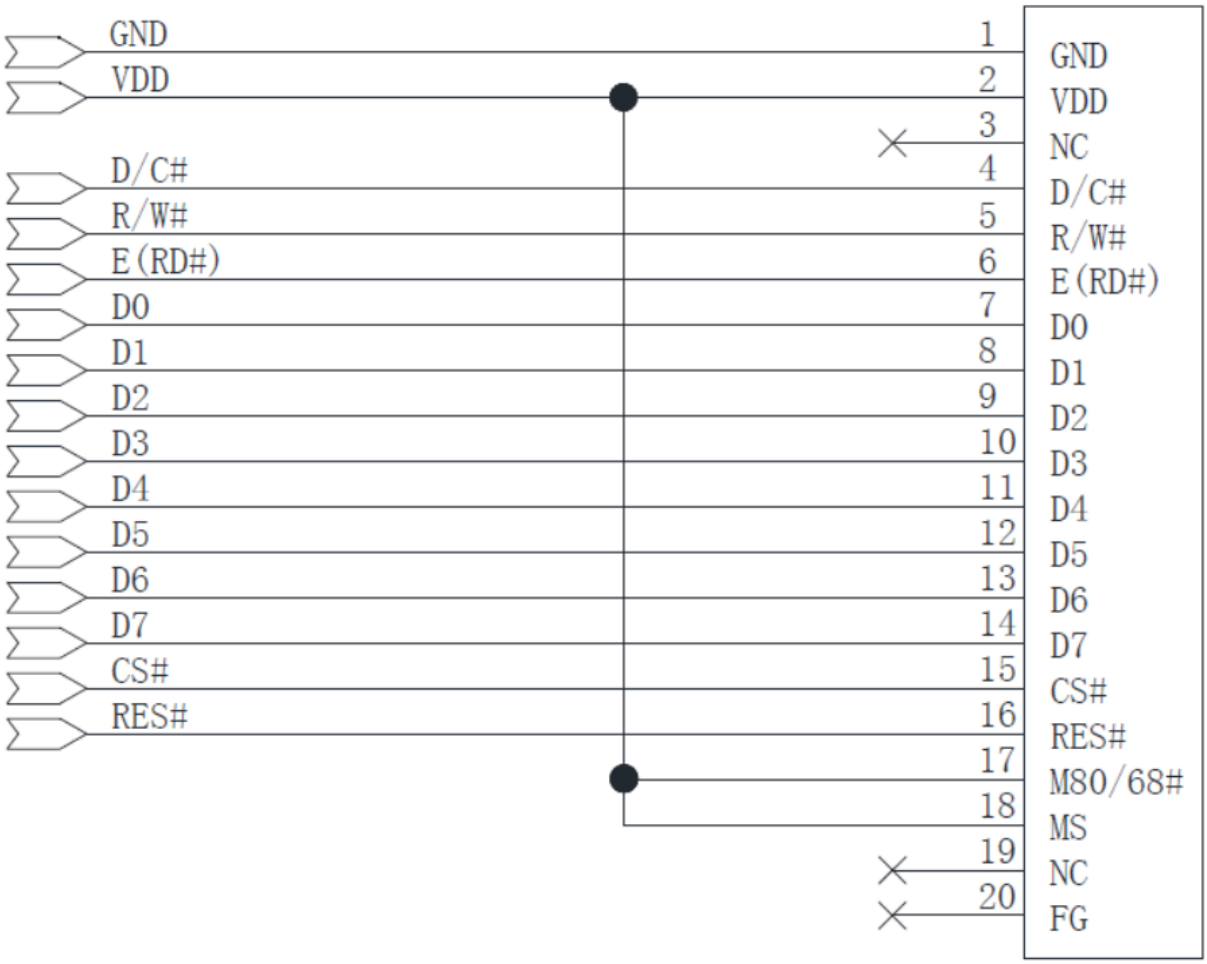
2. Application Circuit

2.1 The configuration for 6800-parallel interface mode is shown in the following diagram:



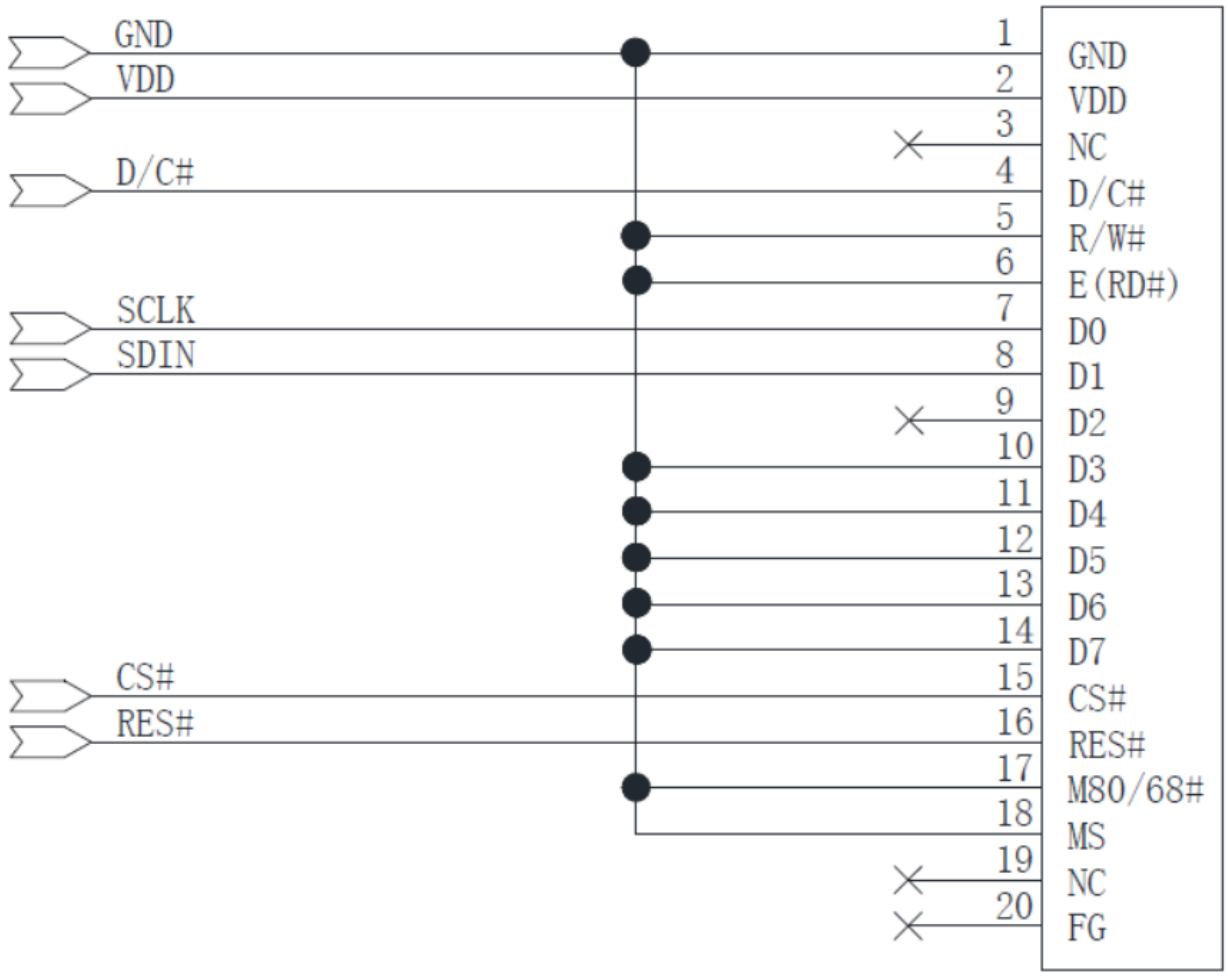
Pin connected to MCU interface: D[0:7], E(RD#), R/W#, RES#, D/C#, CS#.

2.2 The configuration for 8080-parallel interface mode is shown in the following diagram:



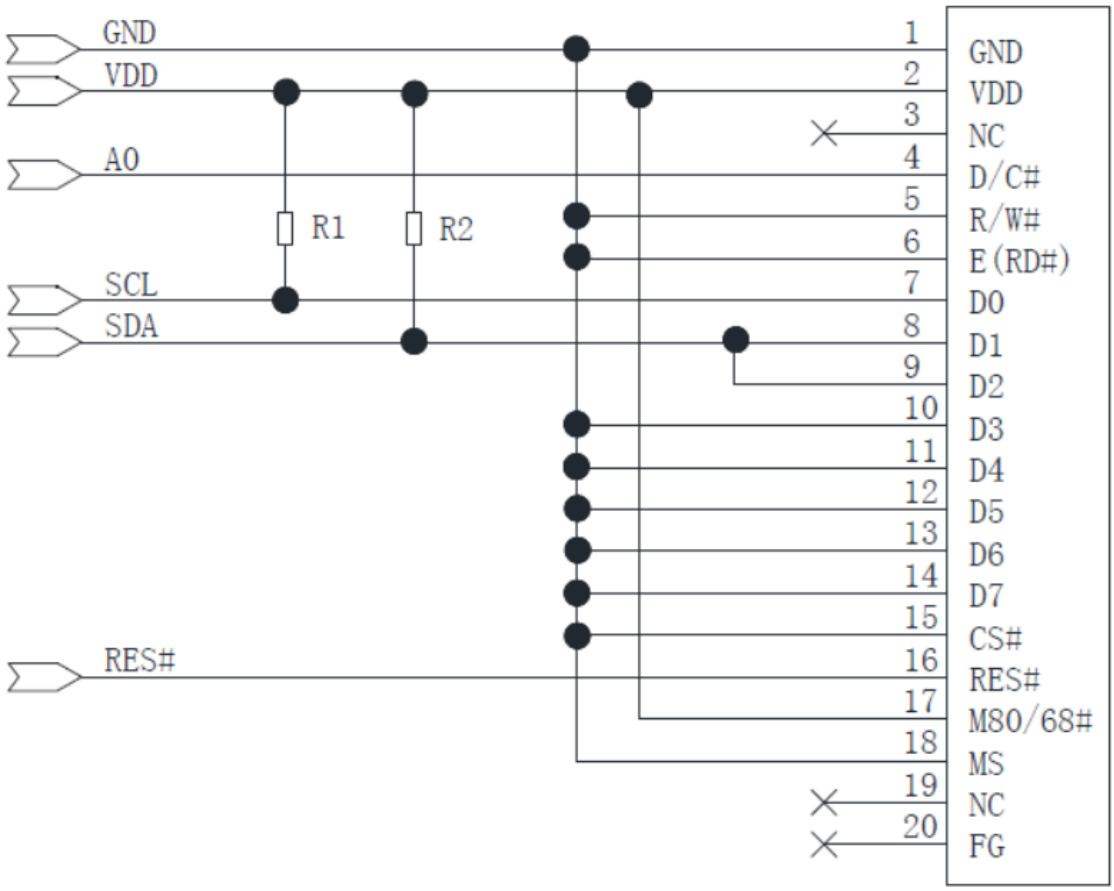
Pin connected to MCU interface: D[0:7], E(RD#), R/W#, RES#, D/C#, CS#.

2.3 The configuration for SPI interface mode is shown in the following diagram:



Pin connected to MCU interface: SDIN, SCLK, RES#, D/C#, CS#.

2.4 The configuration for I^2C interface mode is shown in the following diagram:



Pin connected to MCU interface: SDA, SCL, SA0, RES#.

Recommended components

SA0	I^2C Address
0	0x78
1	0x7A

R1, R2: 0603 1/10W±5% 10K ohm. RoHS

3. Display Control Instruction

Refer to SSD1306Z IC Specification.

4. Recommended Software Initialization

In order to ensure the reliability and stability of the module, the module must initialized use the following code, Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the initialize code.

```
void Init_IC ( )
{
Write_Command(0xae);        // display off
Write_Command(0xd5);        //Set Display ClocDivide Ratio/Oscillator Frequency
Write_Command(0xf1);        //105HZ
Write_Command(0xa8);        //Set Multiplex Ratio
```

```
Write_Command(0x3f);        //set 64mux
Write_Command(0xd9);        //Set Pre-charge Period
Write_Command(0xf1);        //0xf1
Write_Command(0x20);        //Set Memory Addressing Mode
Write_Command(0x02);
Write_Command(0xa0);        //seg re-map 0->127
Write_Command(0xc8);        //COM scan direction COM(N-1)-->COM0
Write_Command(0xda);        //Set COM Pins Hardware Configuration
Write_Command(0x12);
Write_Command(0xd8);       // color_mode_set
Write_Command(0x00);       // monochrome mode & normal power mode
Write_Command(0x81);       //Set Contrast Control
Write_Command(0xcf);
Write_Command(0xb0);       //Set Page Start Address for Page Addressing Mode
Write_Command(0xd3);       //Set Display offset
Write_Command(0x00);
Write_Command(0xa6);       //Display Normal
Write_Command(0xa4);       //Entire Display Off
Write_Command(0xdb);       //Set VCOMH Level
Write_Command(0x3c);       //0.83*VCC
Clear_Screen();
Write_Command(0xaf);        //display on
}
```

■ ELECTRO-OPTICAL CHARACTERISTICS (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Normal Mode Brightness (With Polarizer)		L_{br}	40	60	-	cd/m²	All pixels ON (1)
Normal Mode Power Consumption		Pt	-	400	475	mW	All pixels ON (1)
Sleep Mode Current consumption in VDD		ISP	-	-	20	uA	VDD=2.4V~3.5V, Display OFF, No panel attached
Color Coordinate	Yellow	CIE x	0.47	0.51	0.55	-	CIE1931
		CIE y	0.44	0.48	0.52		
Contrast Ratio		Cr	≥2000:1	-	-	-	-
Viewing Angle		-	≥160	-	-	Degree	-
Response Time		-	-	10	-	μs	-

Note (1): Normal Mode test conditions are as follows:
- Driving voltage: 5V
- Contrast setting: 0xCF
- Frame rate: 105Hz
- Duty setting: 1/64

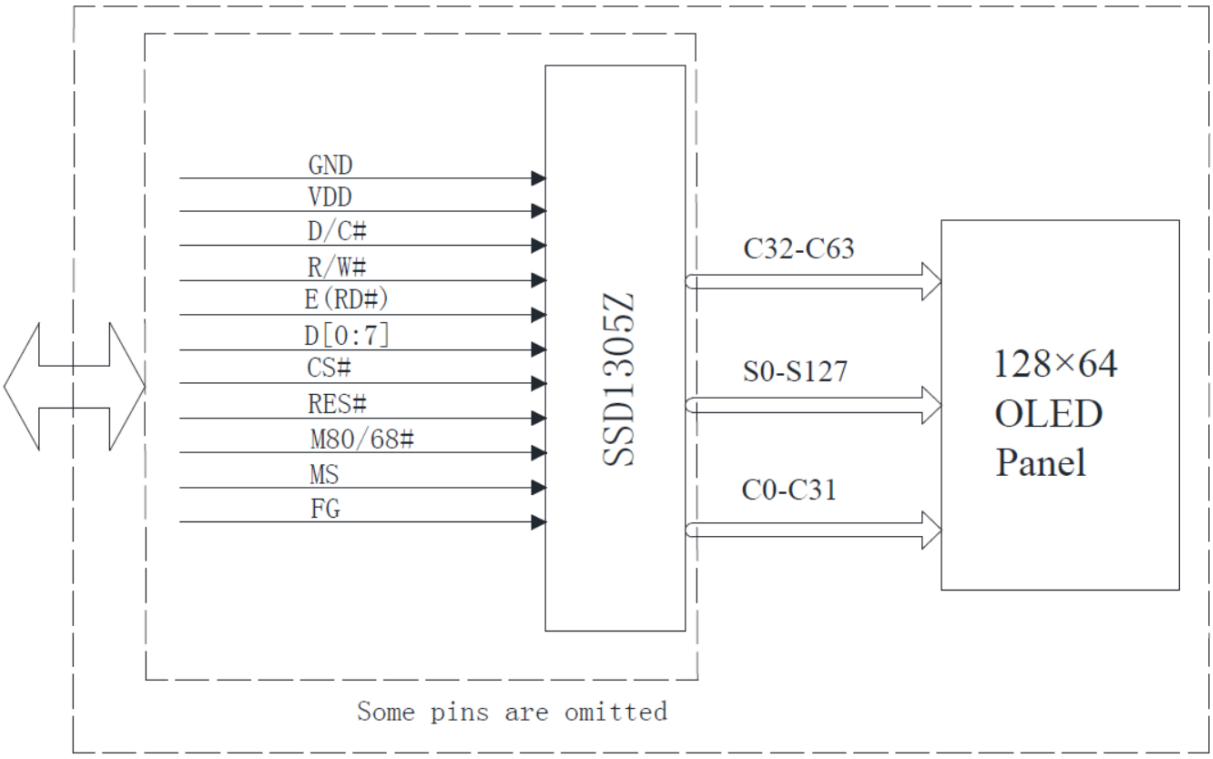
■ INTERFACE DESCRIPTION

Pin No.	Symbol	Description
1	GND	This is a ground pin.
2	VDD	Power supply pin for core logic operation & power supply for panel driving voltage.
3	NC	No connection.
4	D/C#	This is data/command control pin. When it is pulled HIGH (i.e. connect to VDDIO), the data at D[7:0] is treated as data. When it is pulled LOW, the data at D[7:0] will be transferred to the command register.
5	R/W#	This is read / write control input pin connecting to the MCU interface. When interfacing to a 6800-series microprocessor, this pin will be used as Read / Write (R/W#) selection input. Read mode will be carried out when this pin is pulled HIGH (i.e. connect to VDDIO) and write mode when LOW. When 8080 interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected. When serial interface is selected, this pin must be connected to GND.
6	E(RD#)	When interfacing to a 6800-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this is pulled HIGH (i.e. connect to VDDIO) and the chip is selected. When connecting to an 8080-microprocessor, this pin receives the Read (RD#) signal. Read operation is initiated when this pin is pulled LOW and the chip is selected. When serial interface is selected, this pin must be connected to GND.
7~14	D[0:7]	These are 8-bit bi-directional data bus to be connected to the microprocessor's data bus. When serial interface mode is selected. D0 will be the serial clock input: SCLK; D1 will be the serial data input: SDIN and D2 should be left opened. When I^2C mode is selected, D2, D1 should be tied together and serve as SDAout, SDAin in application and D0 is the serial clock input, SCL.
15	CS#	This pin is the chip select input. (active LOW)
16	RES#	This pin is reset signal input.
17	M80/68#	[M80/68, MS] MCU bus interface selection pins. Table 1.
18	MS	
19	NC	No connection.
20	FG	No connection.

Table 1

MS	M80/68#	Interface
0	0	Serial Interface
0	1	I^2C
1	0	8-bit 6800 parallel
1	1	8-bit 8080 parallel

■ FUNCTION BLOCK DIAGRAM



■ RELIABILITY TEST

No.	Test Item		Test Condition	Remark
1	High Temperature Storage Test		80℃ ± 2℃ / 240Hrs.	1. After testing, the function test is ok. 2. After testing, no addition to the defect. 3. After testing, the change of luminance should be within ±50% of initial value. 4. After testing, the change for the mono and area color must be within (±0.02, ±0.02) and for the full color it must be within (±0.04, ±0.04) of initial value based on 1931 CIE coordinates. 5. After testing, the change of total current consumption should be within ±50% of initial value.
2	Low Temperature Storage Test		-30℃± 2℃ / 240Hrs.	
3	High Temperature Operating Test		70℃ ± 2℃ / 240Hrs.	
4	Low Temperature Operating Test		-20℃ ± 2℃ / 240Hrs.	
5	High Temperature and High Humidity Operation Test		60 ± 5℃, 90%RH 240Hrs.	
6	Thermal Shock Test (Non-operating)		-30±2℃ ~ 25±2℃ ~ 805±2℃ (30Min.) (5Min.) (30Min.) 30Cycles	
7	Vibration Test (Packing)	10~55~10Hz, amplitude 1.5mm, 1 hour for each direction x, y, z	1. One box for each test. 2. No addition to the cosmetic and the electrical defects.	
8	Drop (Packing)	Height: 1m, each time for 6 sides, 3 edges, 1angle		

Note 1: For each reliability test, the sample quantity is 3, and only for one test item.

Note 2: The HTHHS test is requested the Pure Water (Resistance > 10MΩ).

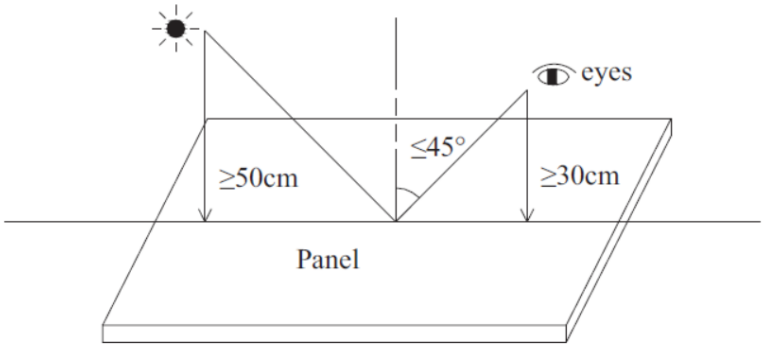
■ OUTGOING QUALITY CONTROL SEPCIFICATION

1. Sampling Method

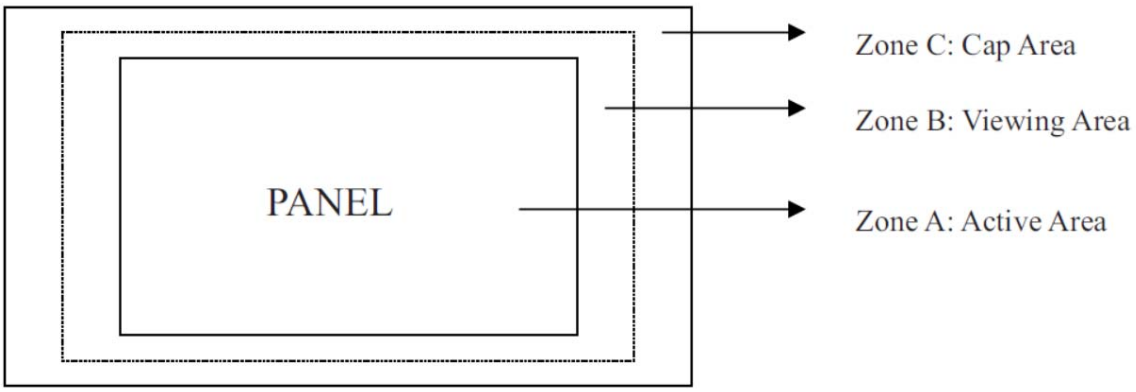
1.1 GB/T 2828.1-2003/ISO2859-1: 1999, inspection level II, normal inspection, single sample inspection.
1.2 AQL: Major 0.65; Minor 1.0

2. Inspection Conditions

The environmental conditions for test and measurement are performed as follows.
Temperature: 22±3℃
Humidity: 55±15%R.H
Fluorescent Lamp: 30W
Distance between the Panel & Lamp: ≥50cm
Distance between the Panel & Eyes: ≥30cm
Viewing angle from the vertical in each direction: ≤45°
(See the sketch below)

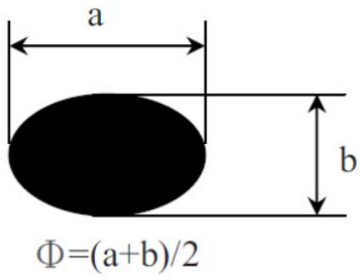


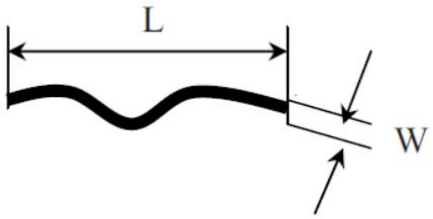
3. Quality Assurance Zones



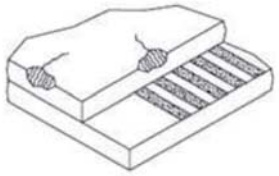
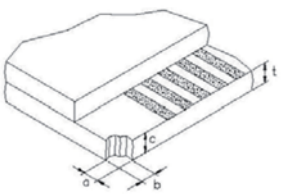
4. Inspection Standard

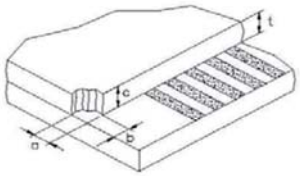
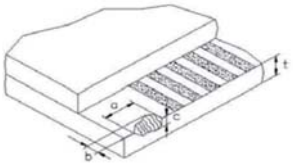
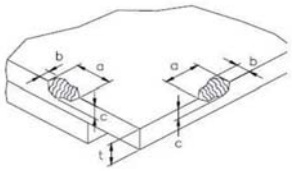
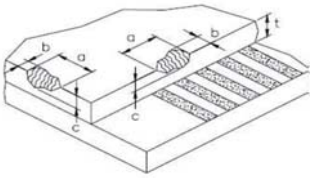
Definition of Φ&L&W (Unit: mm)





4.1 Appearance Defects

<table>
<tr><th>No.</th><th>Item</th><th>Criteria</th><th>Classification</th></tr>
<tr><td>1</td><td>Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer</td><td>
<table>
<tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr>
<tr><td>Zone A, B</td><td>Zone C</td></tr>
<tr><td>Φ≤0.15</td><td>Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.15<Φ≤0.30</td><td>3</td></tr>
<tr><td>Φ>0.30</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>2</td><td>Scratch/line on the glass/polarizer</td><td>
<table>
<tr><td rowspan="2">Width (mm)</td><td rowspan="2">Length (mm)</td><td colspan="2">Acceptable Number</td></tr>
<tr><td>Zone A, B</td><td>Zone C</td></tr>
<tr><td>W≤0.03</td><td>-</td><td>Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.03<W≤0.08</td><td>L≤5.0</td><td>3</td></tr>
<tr><td>W>0.08</td><td>-</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>3</td><td>Polarizer bubble</td><td>
<table>
<tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr>
<tr><td>Zone A, B</td><td>Zone C</td></tr>
<tr><td>Φ≤0.2</td><td>Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.2<Φ≤0.5</td><td>3</td></tr>
<tr><td>Φ>0.5</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>4</td><td>Any dirt & Scratch on polarizer’s Protective film</td><td>Ignore for not affect the polarizer.</td><td>Acceptable</td></tr>
<tr><td>5</td><td>Any dirt on cap glass</td><td>
<table>
<tr><td>Average Diameter (mm)</td><td>Acceptable Number</td></tr>
<tr><td>Φ≤0.5</td><td>Ignore</td></tr>
<tr><td>0.5<Φ≤1.0</td><td>3</td></tr>
<tr><td>Φ>1.0</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>6</td><td>Glass crack</td><td>  Propagation crack is not acceptable.</td><td>Major</td></tr>
<tr><td>7</td><td>Cornet chip</td><td>  t=Glass thickness accept a≤2.0mm or b≤2.0mm, c≤t</td><td>Minor</td></tr>
</table>

No.	Item	Criteria	Classification
8	Cornet chip on cap glass	 t=Glass thickness accept a≤1.5mm or b≤1.5mm, c≤t	Minor
9	Chip on contact pad	 t=Glass thickness accept a≤3.0mm or b≤0.8mm, c≤t (on the contact pin) a≤3.0mm or b≤1.5mm, c≤t (outside of the contact pin)	Minor
10	Chip on face of display	 t=Glass thickness accept a≤1.5mm or b≤1.5mm, c≤t	Minor
11	Chip on cap glass	 t=Glass thickness accept a≤3.0mm or b≤3.0mm, c≤t/2 a≤1.5mm or b≤1.5mm, t/2≤c≤t	Minor
12	Stain on surface	Staie removable by soft cloth or air blow is acceptable.	Minor
13	TCP/FPC damage	(1) Crack, deep scratch, deep hole and deep pressure mark on the TCP/FPC are not acceptable. (2) Terminal lead twisted or broken is not allowable. (3) Copper exposed is not allowed by naked eye inspection.	Minor
14	Dimension Unconformity	Checking by mechanical drawing.	Major

4.2 Displaying Defects

No.	Item	Criteria	Classification
1	Black/White spot, Dirty spot, Foreign matter	Average Diameter (mm) / Acceptable Number — Zone A, B / Zone C Φ≤0.10 — Ignore / Ignore 0.10<Φ≤0.20 — 3 / Ignore Φ>0.20 — 0 / Ignore	Minor
2	No display	Not allowable.	Major
3	Irregular display	Not allowable.	Major
4	Missing line (row or column)	Not allowable.	Major
5	Short	Not allowable.	Major
6	Flicker	Not allowable.	Major
7	Abnormal color	Refer to the SPEC.	Major
8	Luminance NG	Refer to the SPEC.	Major
9	Over current	Refer to the SPEC.	Major

■ CAUTIONS IN USING OLED MODULE

◆ Precautions for Handing OLED Module

1. OLED module consists of glass and polarizer. Pay attention to the following items when handing:
 1.1 Avoid drop from high, avoid excessive impact and pressure.
 1.2 Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead.
 1.3 If the surface becomes dirty, breathe on the surface and gently wipe it off with a soft dry cloth. If it is terrible dirty, moisten the soft cloth with Isopropyl alcohol or Ethyl alcohol. Other solvents may damage the polarizer. Especially water, Ketone and Aromatic solvents.
 1.4 Wipe off saliva or water drops immediately, contact the polarizer with water over a long period of time may cause deformation.
 1.5 Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peeling-off may occur with high temperature and high humidity.
 1.6 Condensation on the surface and the terminals due to cold or anything will damage, stain or dirty the polarizer, so make it clean as the way of 1.3.
2. Do not attempt to disassemble or process the OLED Module.
3. Make sure the TCP or the FPC of the Module is free of twisting, warping and distortion, do not pull or bend them forcefully, especially the soldering pins. On the other side, the SLIT part of the TCP is made to bend in the necessary case.
4. When assembling the module into other equipment, give the glass enough space to avoid excessive pressure on the glass, especially the glass cover which is much more fragile.
5. Be sure to keep the air pressure under 120kPa, otherwise the glass cover is to be cracked.
6. Be careful to prevent damage by static electricity:
 6.1 Be sure to ground the body when handling the OLED Modules.
 6.2 All machines and tools required for assembling, such as soldering irons, must be properly grounded.
 6.3 Do not assemble and do other work under dry conditions to reduce the amount of static electricity generated. A relative humidity of 50%~60% is recommended.
 6.4 Peel off the protective film slowly to avoid the amount of static electricity generated.
 6.5 Avoid to touch the circuit, the soldering pins and the IC on the Module by the body.
 6.6 Be sure to use anti-static package.
7. Contamination on terminals can cause an electrochemical reaction and corrade the terminal circuit, so make it clean anytime.
8. All terminals should be open, do not attach any conductor or semiconductor on the terminals.
9. When the logic circuit power is off, do not apply the input signals.
10. Power on sequence: VDD (logic voltage) ⟶ VCC (driving voltage), and power off sequence: VCC (driving voltage) ⟶ VDD (logic voltage).
11. Be sure to keep temperature, humidity and voltage within the ranges of the spec., otherwise shorten Module's life time, even make it damaged.
12. Be sure to drive the OLED Module following the Specification and Datasheet of IC controller, otherwise something wrong may be seen.
13. When displaying images, keep them rolling, and avoid one fixed image displaying more than 30 seconds, otherwise the residue image is to be seen. This is the speciality of OLED.

◆ **Precautions for Soldering OLED Module**

1. Soldering temperature: 260℃ ± 10℃.
2. Soldering time: 3~4 sec.
3. Repeating time: no more than 3 times.
4. If soldering flux is used, be sure to remove any remaining flux after finishing soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended to protect the surface with a cover during soldering to prevent any damage due to flux spatters.

◆ **Precautions for Storing OLED Module**

1. If the module cannot be used up in 3 months, make sure to seal the module in the vacuum bag with dessicant.
2. Store the Module in a dark place, do not expose to sunlight or fluorescent light.
3. The polarizer surface should not touch any other objects. It is recommended to store the Module in the shipping container.
4. It is recommended to keep the temperature between 0℃ and 30℃, the relative humidity not over 60%.

◆ **Limited Warranty**

Unless agreed between Multi-Inno and customer, Multi-Inno will replace or repair any of its OLED modules which are found to be functionally defective when inspected in accordance with Multi-Inno OLED acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic / Visual defects must be returned to Multi-Inno within 90days of shipment. Confirmation of such data shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and / or replacement on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

◆ **Return OLED Module Under Warranty**

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

- Broken OLED glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely.

■ PRIOR CONSULT MATTER

1. For Multi-Inno standard products, we keep the right to change material, process... for the product property without notice on our customer.
2. For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
3. If you have special requirement about reliability condition, please let us know before you start the test on our sample.