Product Specification

（Household Appliances and Industrial control）

Product Name: VGM128064B0W19

Product Code: M00541

Customer
Approved by Customer
Approved Date:

Designed By	Checked By	Approved By	
		R&D	QA
2024-11-22		2024.11.26 杨海丹 2024.11.26	2024.11.26

CONTENT

REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
Y01	Initial release.	2024-11-19	

1 Application filed

Household Appliances and Industrial control

2 Overview

VGM128064B0W19 is a monochrome OLED display module with 128×64 dot matrix. The characteristics of this display module are high brightness, self-emission, high contrast ratio, slim/thin outline, wide viewing angle, wide temperature range, and low power consumption.

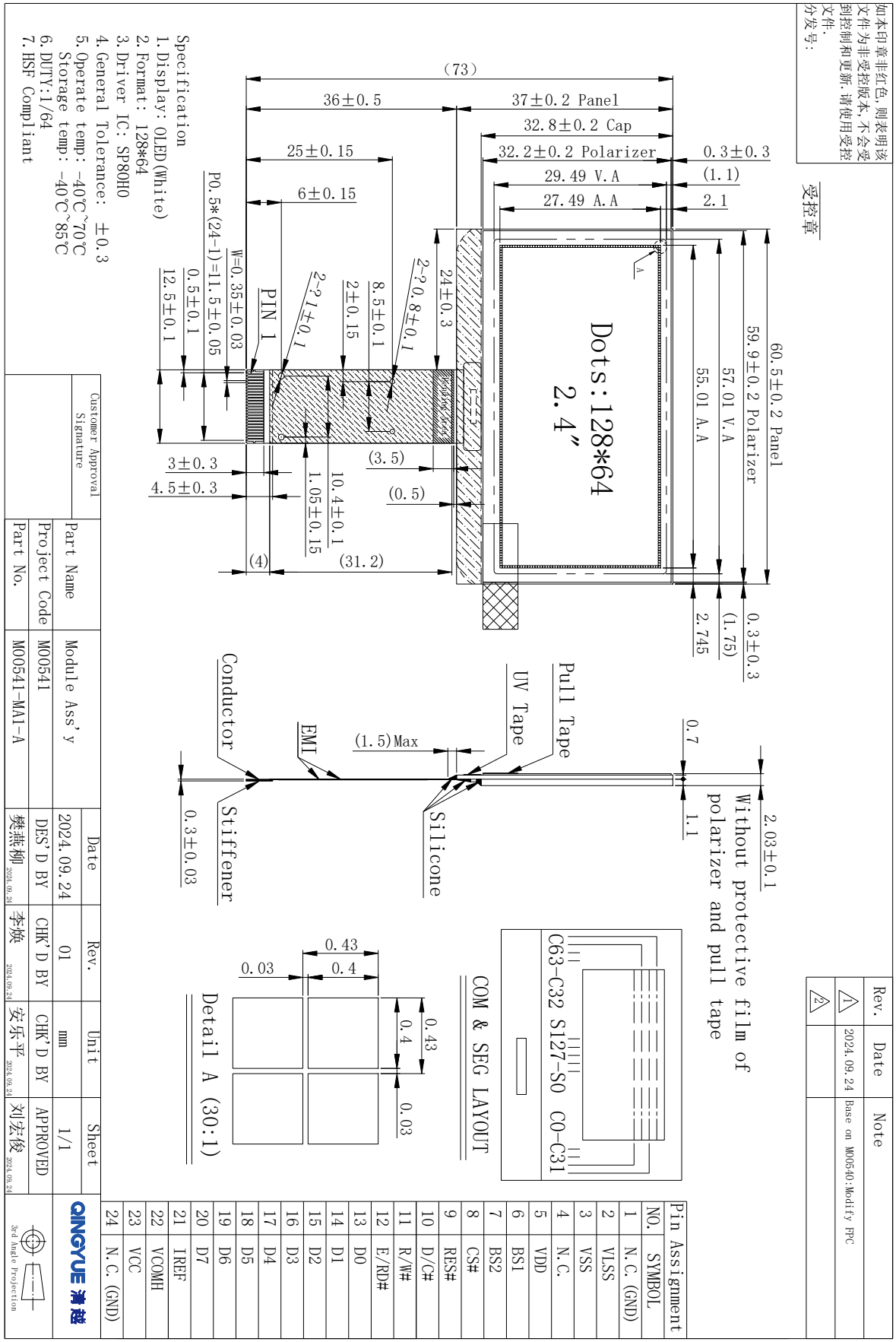
3 Features

- Display Color: White
- Dot Matrix:128×64
- Driver IC: SP80H0
- Interface: 8-bit 8080,8-bit 6800, 4-wire SPI, I^2C
- Wide range of operating temperature: -40℃ to 70℃
- Wide range of Storage temperature: -40℃ to 85℃

4 Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128(W)×64(H)	-
2	Dot Size	0.4(W)×0.4(H)	mm^2
3	Dot Pitch	0.43(W)×0.43(H)	mm^2
4	Aperture Rate	86	%
5	Active Area	55.01(W)×27.49(H)	mm^2
6	Panel Size	60.5(W)×37(H) ×1.8(T)	mm^3
7	Module Size	60.5(W)×73(H) ×2.03(T)	mm^3
8	Diagonal A/A Size	2.4	inch
9	Module Weight	TBD±10%	g

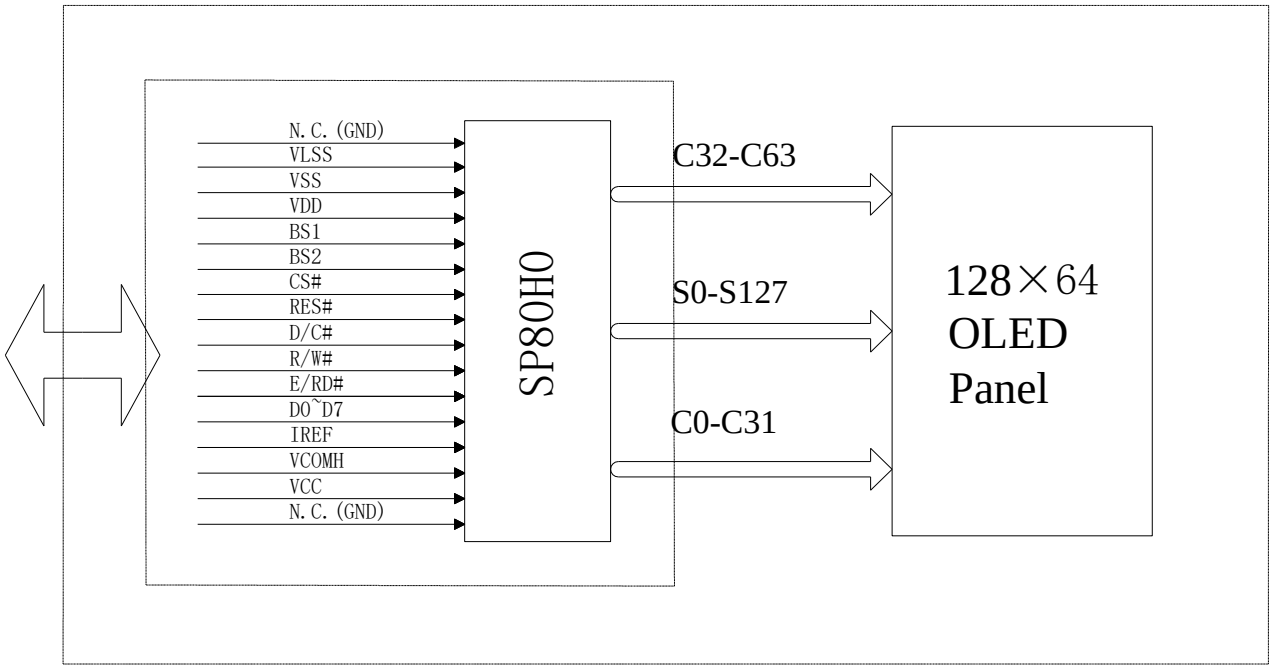
5 Mechanical Drawing



6 Module Interface

<table>
<tr><th>PIN NO.</th><th>PIN NAME</th><th>DESCRIPTION</th></tr>
<tr><td>1,24</td><td>N.C.(GND)</td><td>FPC layout Ground.</td></tr>
<tr><td>2</td><td>VLSS</td><td>Analog system ground pin. It must be connected to external ground.</td></tr>
<tr><td>3</td><td>VSS</td><td>Ground.</td></tr>
<tr><td>4</td><td>N.C.</td><td>No connection.</td></tr>
<tr><td>5</td><td>VDD</td><td>Power supply pin for core logic operation.</td></tr>
<tr><td>6~7</td><td>BS[1:2]</td><td>MCU bus interface selection pins.
<table>
<tr><th>Pin Name</th><th>I²C Interface</th><th>6800-Parallel Interface(8 bit)</th><th>8080-Parallel Interface(8 bit)</th><th>Series Interface</th></tr>
<tr><td>BS1</td><td>1</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>BS2</td><td>0</td><td>1</td><td>1</td><td>0</td></tr>
</table></td></tr>
<tr><td>8</td><td>CS#</td><td>Chip Select, active low.</td></tr>
<tr><td>9</td><td>RES#</td><td>Reset, active low.</td></tr>
<tr><td>10</td><td>D/C#</td><td>H: Data; L: Command In I²C mode, this pin acts as SA0 for slave address selection.</td></tr>
<tr><td>11</td><td>R/W#</td><td>8080: Write; 6800: Read/Write select pin; SPI or I²C:connected to VSS.</td></tr>
<tr><td>12</td><td>E/RD#</td><td>8080: Read; 6800: Read/Write enable pin; SPI or I²C:connected to VSS.</td></tr>
<tr><td>13~20</td><td>D[0:7]</td><td>Data bus.
<table>
<tr><th>Pin Name / Bus Interface</th><th colspan="8">Date/Command Interface</th></tr>
<tr><td></td><td>D7</td><td>D6</td><td>D5</td><td>D4</td><td>D3</td><td>D2</td><td>D1</td><td>D0</td></tr>
<tr><td>8-bit 8080</td><td colspan="8">D[7:0]</td></tr>
<tr><td>8-bit 6080</td><td colspan="8">D[7:0]</td></tr>
<tr><td>SPI</td><td colspan="5">Tie LOW</td><td>NC</td><td>SDIN</td><td>SCLK</td></tr>
<tr><td>I²C</td><td colspan="5">Tie LOW</td><td>SDA_{OUT}</td><td>SDA_{IN}</td><td>SCL</td></tr>
</table></td></tr>
<tr><td>21</td><td>IREF</td><td>This is segment output current reference pin. A resistor should be connected between this pin and VSS.</td></tr>
<tr><td>22</td><td>VCOMH</td><td>The pin for COM signal deselected voltage level. A capacitor should be connected Between this pin and VSS.</td></tr>
<tr><td>23</td><td>VCC</td><td>Power supply for panel driving voltage.</td></tr>
</table>

7 Function Block Diagram



8 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Logic supply voltage	VDD	-0.3	4.0	V	IC maximum rating
OLED Operating voltage	VCC	0	17	V	IC maximum rating
Operating Temp.	Top	-40	+70	℃	-
Storage Temp	Tstg	-40	+85	℃	-

Note (1): All of the voltages are on the basis of "VSS = 0V".

Note (2): Permanent breakage of module may occur if the module is used beyond the maximum rating. The module can be normal operated under the conditions according to Section 9 "Electrical Characteristics". Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.

9 Electrical Characteristics

9.1 DC Electrical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT
Logic Supply Voltage	VDD	-	1.65	-	3.3	V
OLED Driver Supply Voltage	VCC	-	12.7	13	13.3	V
High-level Input Voltage	V_{IHC}	-	0.8×VDD	-	-	V
Low-level Input Voltage	V_{ILC}	-	-	-	0.2×VDD	V
High-level Output Voltage	V_{OHC}	I_{OUT} = 100uA, 3.3MHz	0.9×VDD	-	-	V
Low-level Output Voltage	V_{OLC}	I_{OUT} = 100uA, 3.3MHz	-	-	0.1×VDD	V

Note : The VCC input must be kept in a stable value; ripple and noise are not allowed.

9.2 Electro-optical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT
Normal Mode Brightness	L_{br}	All pixels ON (1)	40	60	-	cd/m^2
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	403	523.9	mW
Sleep mode current consumption in V_{DD}	I_{DD}, SLEEP	V_{DD} = 1.65V ~3.3V, V_{CC} = 7V~16V, Display OFF, No panel attached	-	-	20	uA
Sleep mode current consumption in V_{CC}	I_{CC}, SLEEP	V_{DD} = 1.65V ~3.3V, V_{CC} = 7V~16V, Display OFF, No panel attached	-	-	20	uA
C.I.E(White)	(X)	x,y(CIE1931)	0.26	0.30	0.34	-
	(Y)		0.29	0.33	0.37	-
Dark Room Contrast	CR	-	10000:1	-	-	-
Response Time	-	-	-	10	-	μs
View Angle	-	-	＞160	-	-	Degree

Note(1): Normal Mode test conditions are as follows:

- Driving voltage: 13V
- Contrast setting: 0xA0
- Frame rate: 109Hz
- Duty setting: 1/64

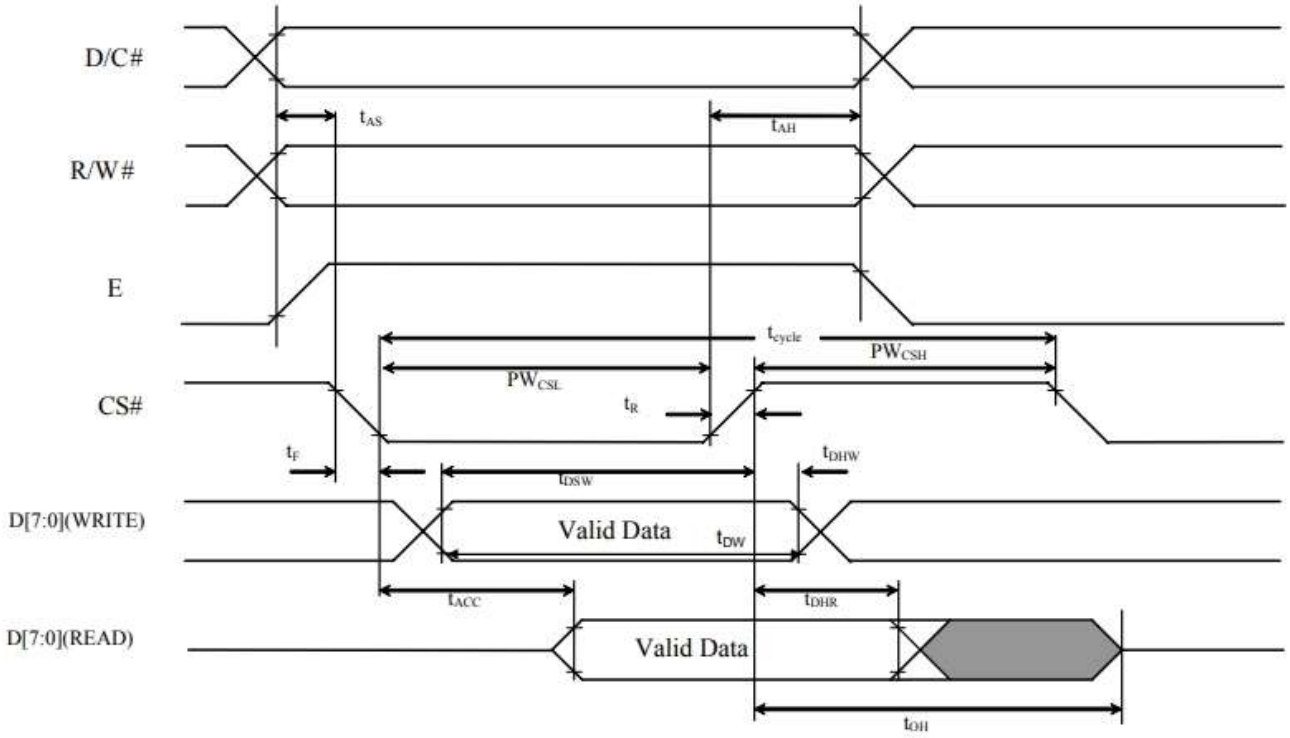
9.3 AC Electrical Characteristics

(1) System buses Read/Write characteristics (For 6800-Series MCU Parallel Interface)

(VDD - VSS = 1.65V to 3.3V, T_A = 25°C)

Symbol	Parameter	Min	Typ	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) Chip Select Low Pulse Width (write)	120 60	-	-	ns
PW_{CSH}	Chip Select High Pulse Width (read) Chip Select High Pulse Width (write)	60 60	-	-	ns
t_R	Rise Time	-	-	40	ns
t_F	Fall Time	-	-	40	ns

Serial 6800-series MCU parallel interface characteristics

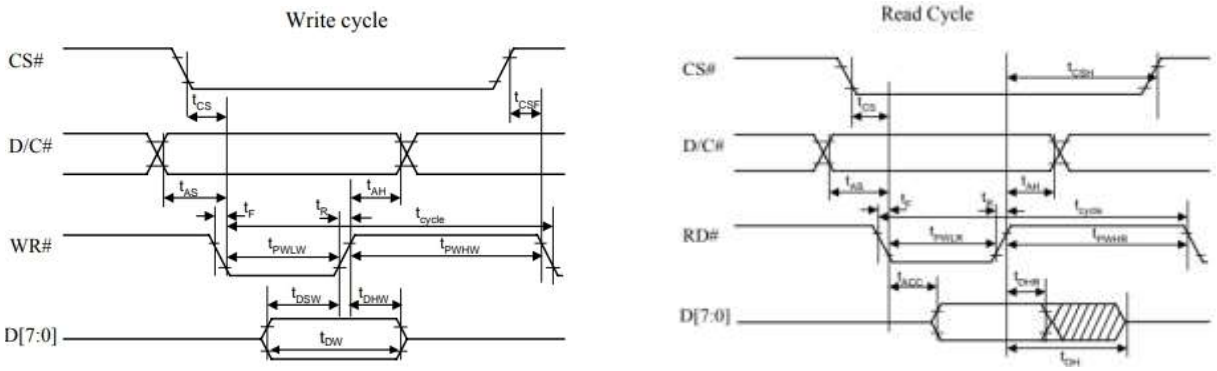


(2) System buses Read/Write characteristics (For 8080-Series MCU Parallel Interface)

(VDD - VSS = 1.65V to 3.3V, T_A = 25°C)

Symbol	Parameter	Min	Typ	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_R	Rise Time	-	-	40	ns
t_F	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

8080-series parallel interface characteristics

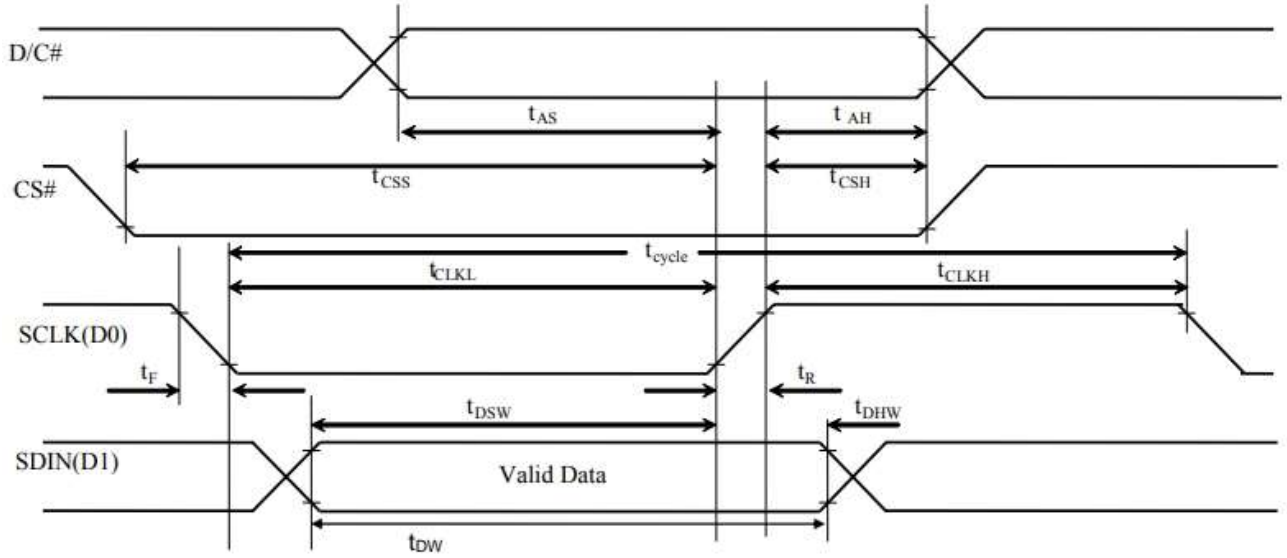


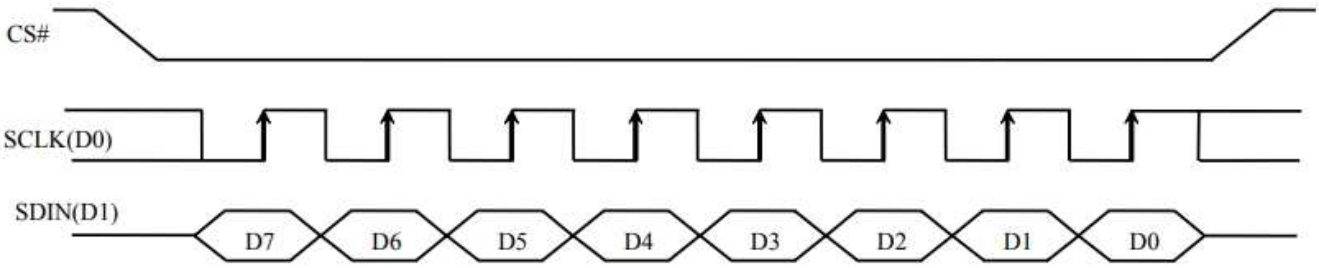
(3) System buses Read/Write characteristics (For 4-wire SPI MCU Interface)

(VDD - VSS = 1.65V to 3.3V, T_A = 25°C)

Symbol	Parameter	Min	Typ	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

Serial interface characteristics (4-wire SPI)



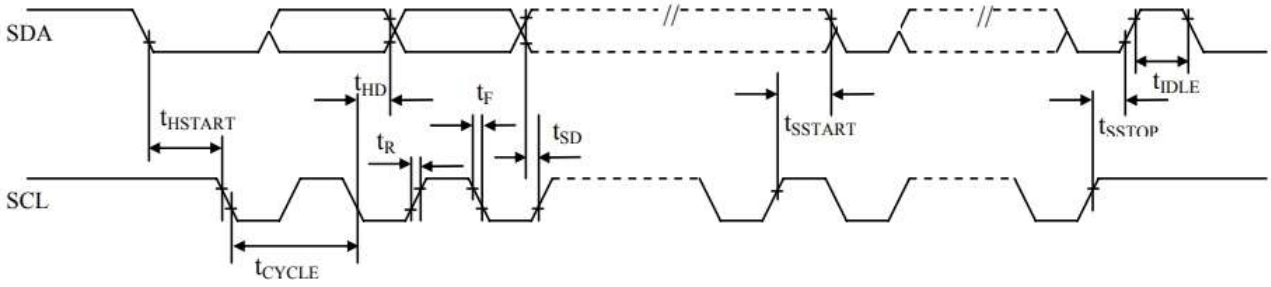


(4) System buses Read/Write characteristics (For I^2C MCU Interface)

(VDD - VSS = 1.65V to 3.3V, T_A = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	2.5	-	-	us
t_{HSTART}	Start condition Hold Time	0.6	-	-	us
t_{HD}	Data Hold Time (for "SDA_{OUT}" pin)	0	-	-	ns
	Data Hold Time (for "SDA_{IN}" pin)	300	-	-	ns
t_{SD}	Data Setup Time	100	-	-	ns
t_{SSTART}	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t_{SSTOP}	Stop condition Setup Time	0.6	-	-	us
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	-	-	us

Serial interface characteristics (I^2C)

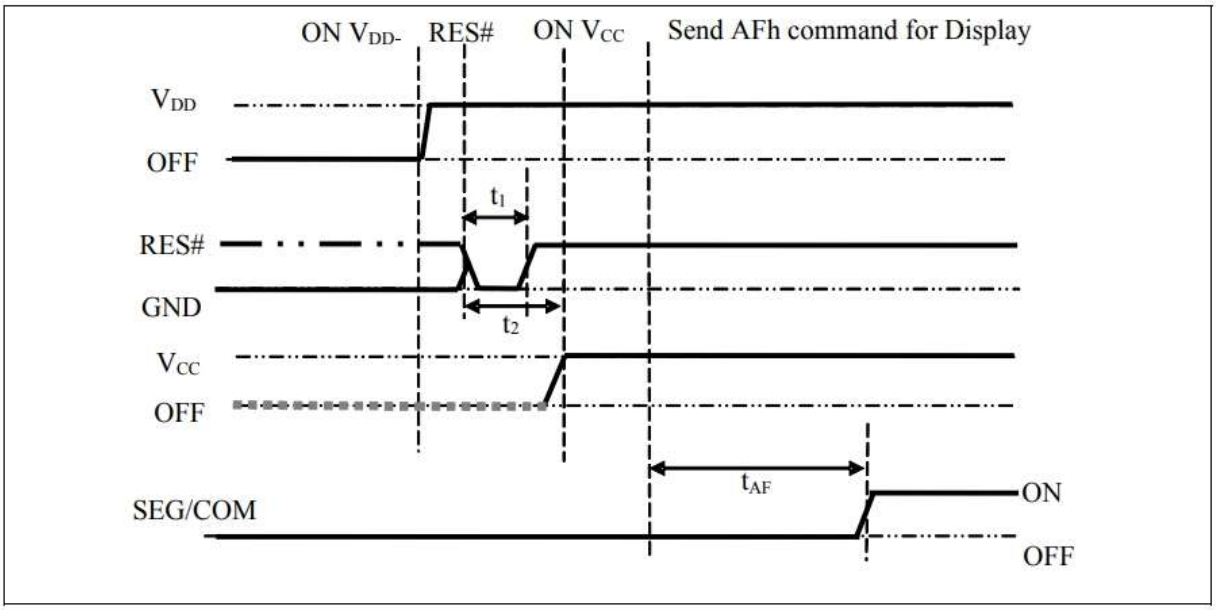


10 Functional Specification and Application Circuit

10.1 Power ON and OFF sequence with External VCC

Power ON Sequence:

1. Power ON V_{DD}.
2. After V_{DD} become stable, set RES# pin LOW (logic low) for at least 3us(t_1)[3] 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 V_{CC} become stable, send command AFh for display ON. SEG/COM will be ON after 100ms(t_{AF}).

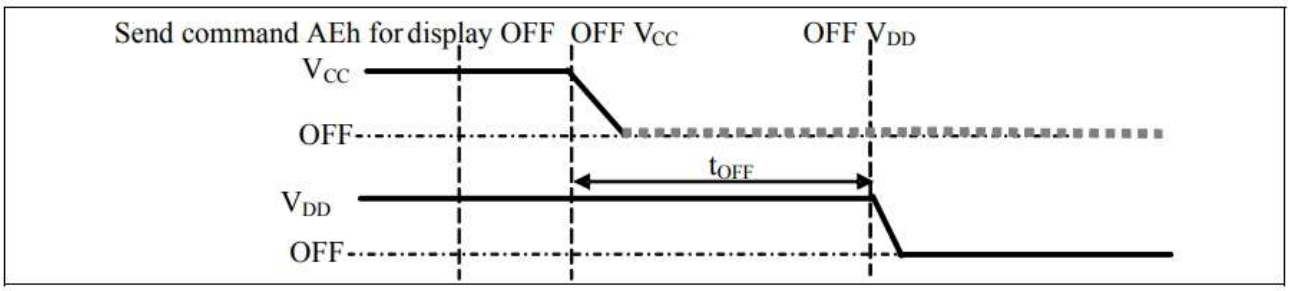


Power OFF Sequence:

1. Send command AEh for display OFF.

2. Power OFF V_{CC}.[1], [2],

3. Power OFF V_{DD} after t_{OFF}. [4] (where Minimum t_{OFF}=0ms, typical t_{OFF}=100ms)



Note:

[1] V_{CC} should be kept float (i.e. disable) when it is OFF.

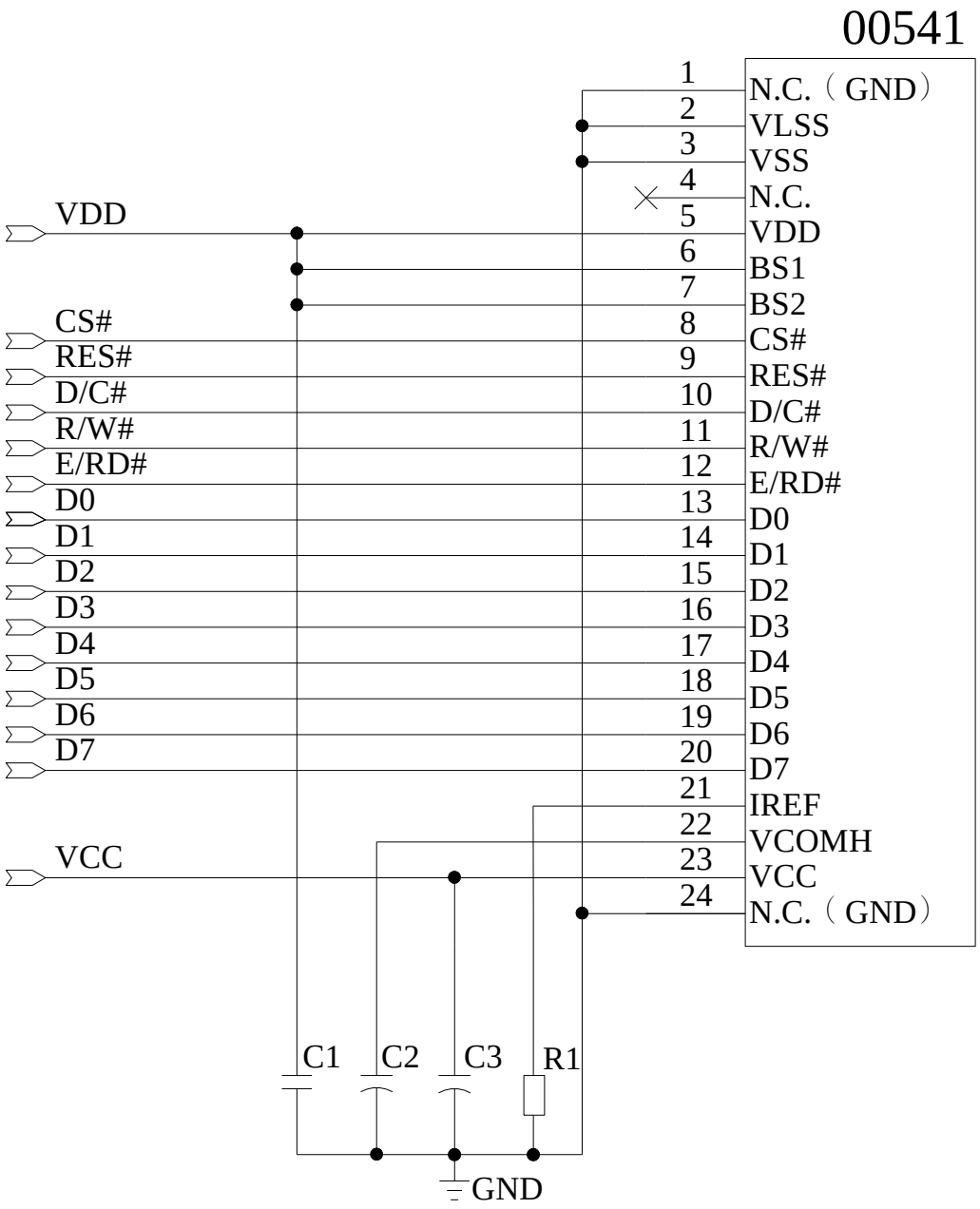
[2] Power Pins (V_{DD}, V_{CC}) can never be pulled to ground under any circumstance.

[3] The register values are reset after t_1.

[4] V_{DD} should not be Power OFF before V_{CC} Power OFF.

10.2 Application Circuit

10.2.1 The configuration for 8-bit 8080-parallel interface mode, external VCC is shown in the following diagram:



Pin connected to MCU interface: D[0:7], RD#, WR#, D/C#, CS#, RES#

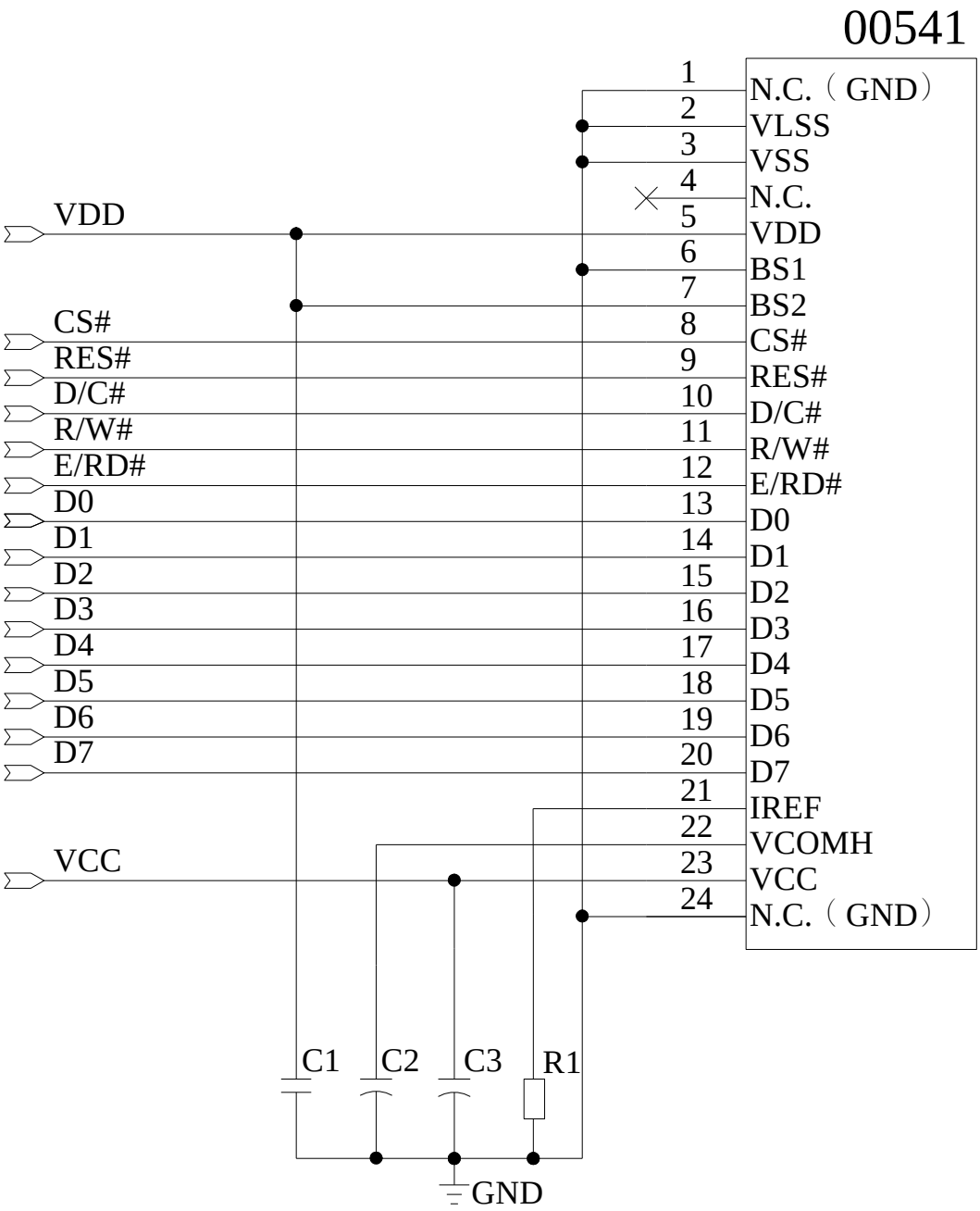
Recommended components:

C1: 1.0uF-0603-X7R±10%.RoHS

C2, C3: 2.2μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 910kΩ.RoHS

10.2.2 The configuration for 8-bit 6800-parallel interface mode, external VCC is shown in the following diagram:



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

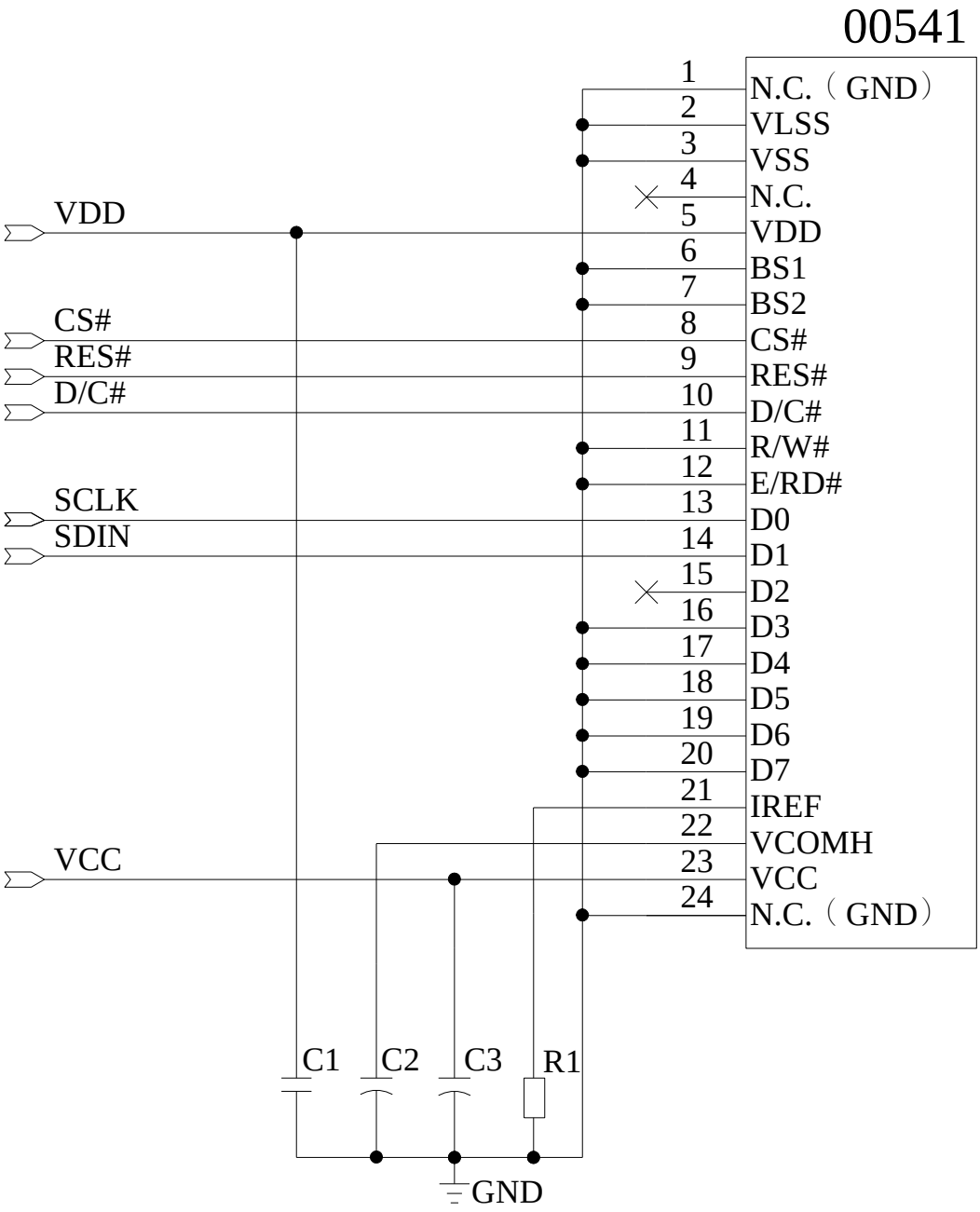
Recommended components:

C1: 1.0uF-0603-X7R±10%.RoHS

C2, C3: 2.2μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 910kΩ.RoHS

10.2.3 The configuration for 4-wire SPI interface mode, external VCC is shown in the following diagram:



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

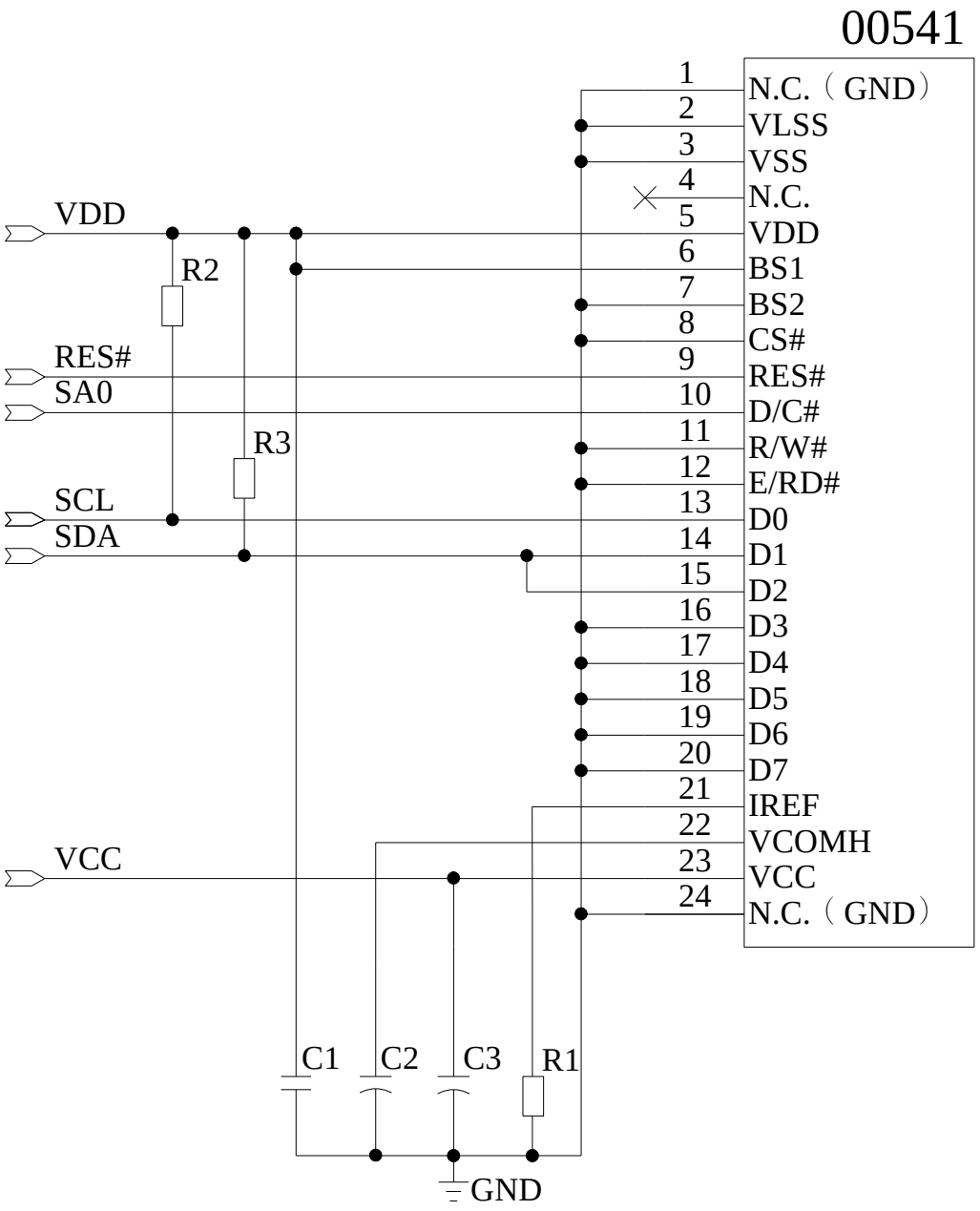
Recommended components:

C1: 1.0uF-0603-X7R±10%.RoHS

C2, C3: 2.2μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 910kΩ.RoHS

10.2.4 The configuration for I^2C interface mode, external VCC is shown in the following diagram:



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

SA0	Slave Address
0	0X78
1	0X7A

Recommended components:

C1: 1.0uF-0603-X7R±10%.RoHS

C2, .C3: 2.2μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 910kΩ.RoHS

R2,R3: 0603 1/10W +/-5% 10KΩ.RoHS

10.3 Display Control Instruction

Refer to SP80H0 IC Specification.

10.4 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);          //Set Display Off
   Write_Command(0x81);          //contrast control
   Write_Command(0xA0);
   Write_Command(0xA4);          //Set Entire Display On/Off
   Write_Command(0xA6);          //Set Normal Display
   Write_Command(0x20);          //Set Data Address Mode
   Write_Command(0x02);
   Write_Command(0x40);          //Set Display Start Line
   Write_Command(0xA0);          //Segment Remap
   Write_Command(0xA8);          //multiplex ration mode:64
   Write_Command(0x3F);
   Write_Command(0xC0);          //Set COM Output Scan Direction
   Write_Command(0xD3);          //    Set COM0 (    Set Display Offset )
   Write_Command(0x00);
   Write_Command(0xDA);          //common pads hardware: alternative
   Write_Command(0x12);
   Write_Command(0xD5);          //Set Frame Rate
   Write_Command(0x90);          //109Hz
   Write_Command(0xD9);          //set pre-charge period
   Write_Command(0x22);
   Write_Command(0xDB);          //VCOM deselect level mode
   Write_Command(0x34);          //0.78*vcc
   Clear_Screen();
   Write_Command(0xAF);          //Set Display On
}
```

11 Package Specification

Controlled Seal

Packing Process(1)~(9)

(1) Tray Type: 0048E-MT1-C
Display face Up

A

Detail A

(2)

② 180° revers

① normal

TRAY

(3) order ①、②、①、②
fix trays with tape
204 pcs of 1 small carton
1 tray contain 12 pcs
17 contained trays, 1 empty tray

(4) Use vaccum bag to package the tray and add 5 bags of desiccant into the vacuum bag

*5

(5)

EPE

(6)

EPE

(7)

RoHS MARK

small carton package
L390*W290*L120 mm

(8)

RoHS MARK

2 small cartons in 1 big carton

(9) 34 contained trays, 2 empty trays,
Package quantity products:
408 pcs of 1 big carton

RoHS Mark

苏州清越光电科技股份有限公司

Package finished

NOTE: 1、The inner carton and master carton must be sealed with adhesive tape.

2、Fill up the gap with EPE.

3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at ©.

4、Packaging materials are not recommended for recycling.

12 Reliability

12.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85℃,240h	5
2	Low Temperature (Non-operation)	-40℃,240h	5
3	High Temperature (Operation)	70℃,240h	5
4	Low Temperature (Operation)	-40℃,240h	5
5	High Temperature / High Humidity (Operation)	60℃,90%RH,240h	5
6	Thermal shock (Non-operation)	-40 ℃ ~85 ℃ (-40 ℃ /30min;transit/5min;85 ℃ /30min;transit/5min) 1cycle: 70min,30cycles	5
7	ESD Air discharge (Non-operation)	±8kV, Test 9 point; Each point discharge 10 times. Time interval is not less than 1 second.	5

Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability, the stable time is at least 15 minutes.

2. The degradation of polarizer is ignored for item 5.

3.The tolerance of temperature is ±3℃, and the tolerance of relative humidity is ±5%.

Evaluation 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.

12.2 Lifetime

End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	40,000	-	h	60 cd/m^2, 50% alternating checkerboard, 22±5°C, 55±25% RH

12.3 Failure Check Standard

After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at 22±5°C; 55±25% RH.

13 Illustration of OLED Product Name

Flow No. :

01~99

Display Color :

R—red

G—green

B—blue

Y—yellow

W—white

A—area color

F—full color

M—amber

Panel Flow No. :

A0~A9, B0~B9…Z0~Z9

Display Format :

Graphic—columns and rows

Character—characters and line number

Segment—segment number

Mixed—pixel number

Product Type :

P—panel

M—module

Display Type :

G—graphic

C—character

S—segment

I—Icon

M—mixed

Company :

V—QingYue

14 Outgoing Quality Control Specifications

14.1 Sampling Method

(1) GB/T 2828.1/ISO2859-1: inspection level II, normal inspection, single sample inspection

(2) AQL: Major 0.65; Minor 1.0

14.2 Inspection Conditions

The environmental conditions for test and measurement are performed as follows.

Temperature: 22±5°C

Humidity: 55±25%R.H

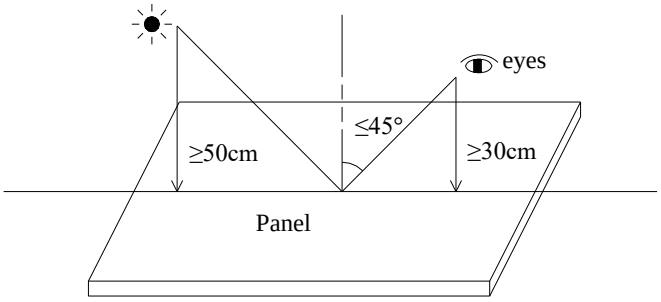
Fluorescent Lamp: 30W

Distance between the Panel & Lamp: ≥50cm

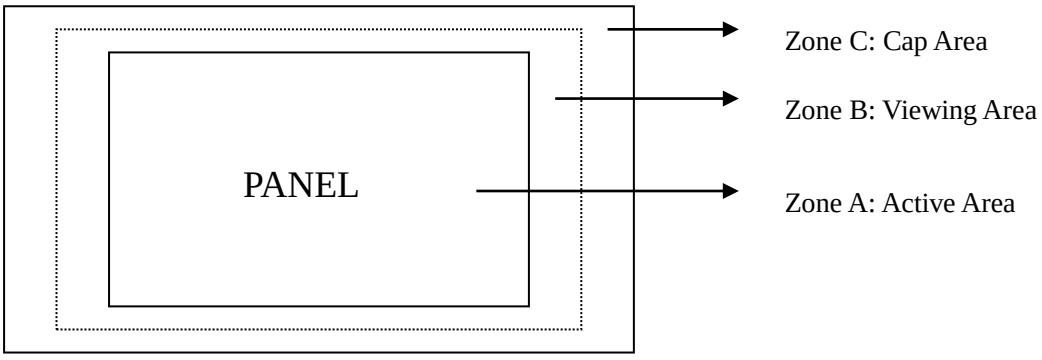
Distance between the Panel & Eyes: ≥30cm

Viewing angle from the vertical in each direction: ≤45°

(See the sketch below)

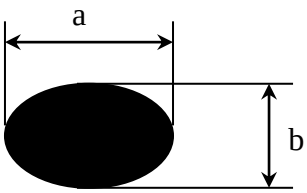


14.3 Quality Assurance Zones

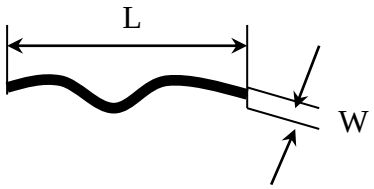


14.4 Inspection Standard

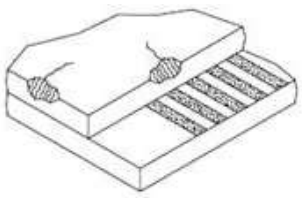
Definition of Φ&L&W (Unit: mm)

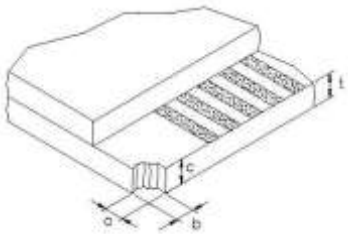
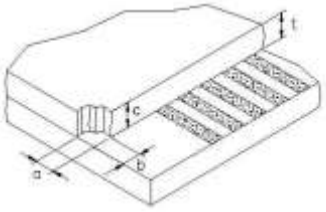
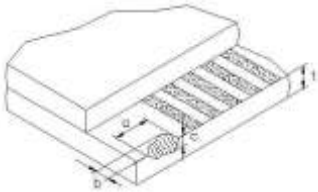
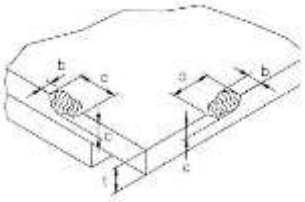
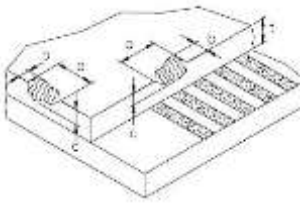


Φ=(a+b)/2



Ⅰ. 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≤0.05</td><td>-</td><td>Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.1</td><td>L≤5.0</td><td>3</td></tr>
<tr><td>W>0.1</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>Minor</td></tr>
<tr><td>5</td><td>Any Dirt on Cap Glass</td><td>Inside the Cap，Ignore the dirt without moving.</td><td>Minor</td></tr>
<tr><td>6</td><td>Glass Crack</td><td>  Propagation crack is not acceptable.</td><td>Major</td></tr>
</table>

7	Corner Chip	 t= Glass thickness Accept a≤2.0mm or b≤2.0mm, c≤t	Minor
8	Corner 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≤2.0 mm or b≤0.5mm, c≤t (on the contact pin) a≤2.0 mm 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≤2.0mm or b≤2.0mm, c≤t/2 a≤1.5mm or b≤1.5mm, t/2≤c≤t	Minor
12	Stain on Surface	Stain 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

Ⅱ. Displaying Defects

<table>
<tr><th>NO.</th><th>Items</th><th>Criteria</th><th>Classification</th></tr>
<tr><td>1</td><td>Black/White spot
Dirty spot
Foreign matter</td><td>
<table>
<tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Pieces Permitted</td></tr>
<tr><td>Zone A,B</td><td>Zone C</td></tr>
<tr><td>Φ≤0.10</td><td>Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.10＜Φ≤0.20</td><td>3</td></tr>
<tr><td>Φ＞0.20</td><td>0</td></tr>
</table>
</td><td>Minor</td></tr>
<tr><td>2</td><td>No Display</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>3</td><td>Irregular Display</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>4</td><td>Missing Line
(row or column)</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>5</td><td>Abnormal Color</td><td>Refer to the SPEC.</td><td>Major</td></tr>
<tr><td>6</td><td>Luminance NG</td><td>Refer to the SPEC.</td><td>Major</td></tr>
</table>

15 Precautions for operation and Storage

15.1 Precautions for Operation

(1) Since OLED panel is made of glass, do not apply any mechanical shock or impact or excessive force to it when installing the OLED module. Any strong mechanical impact due to falling dropping etc. may cause damage (breakage or cracking).

(2) The polarizer on the OLED surface is made of soft material and is easily scratched. Please take most care when handing. When the surface of the polarizer of OLED Module is contaminated, please wipe it off gently by using moisten soft cloth with isopropyl alcohol, do not use water, ketone or aromatics. If there is saliva or water on the OLED surface, please wipe it off immediately.

(3) When handling OLED module, please be sure that the body and the tools are properly grounded. And do not touch I/O pins with bare hands or contaminate I/O pins, it will cause disconnection or defective insulation of terminals.

(4) Do not attempt to disassemble or process the OLED module.

(5) OLED module should be used under recommended operating conditions shown in the specification. Since the higher voltage leads to the shorter lifetime, be sure to use the specified operating voltage.

(6) Foggy dew, moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage, the deteriorated display quality and electrochemical reaction then leads to shorter life time and permanent damage to the module probably. Please pay attention to the environmental temperature and humidity.

(7) An afterimage is created by the difference in brightness between unused dot and the fixed dot, according to the decrease of brightness of the emitting time. Therefore, to avoid having an afterimage, the full set should be thoroughly used instead of using a fixed dot. When the fixed dot emits, an afterimage can be created.

(8) Flicker could be come out at full on display. And it disappears when frame frequency increase, but brightness decreases too.

15.2 Soldering

(1) Soldering should be performed only on the I/O terminals.

(2) Use soldering irons with proper grounding and no leakage.

(3) Iron:The temperature setting of electric iron is 350℃, but we suggest that during soldering, the tem perature of iron tip should be no higher than 330℃ and soldering be finished within 3~4 seconds.

15.3 Precautions for Storage

(1) Please store OLED module in a dark place. Avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.

(2) Keep the environment temperature between 10℃ and 35℃ and the relative humidity less than 70%. Avoid high temperature and high humidity.

(3) Keep the OLED modules stored in the container when shipped from supplier before using them is recommended.

(4) Do not leave any article on the OLED module surface for an extended period of time.

15.4 Warranty period

QingYue warrants for a period of 12 months from the shipping date when stored or used under normal condition. In addition to failure and quality problems caused by man-made damage and force majeure, we promise to provide maintenance and replacement free of charge during the warranty period. If the warranty period has been exceeded, we need to collect the staff's travel expenses, materials and other related costs.