Product Specification

Product Name: GGM096096A4W01

Product Code:

Customer
Approved by Customer
Approved Date:

Designed By	Checked By	Approved By	
		R&D	QA

CONTENT

REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
D01	Initial Release	2014-04-15	

1 Overview

GGM096096A4W01 is a monochrome OLED display module with 96×96 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.

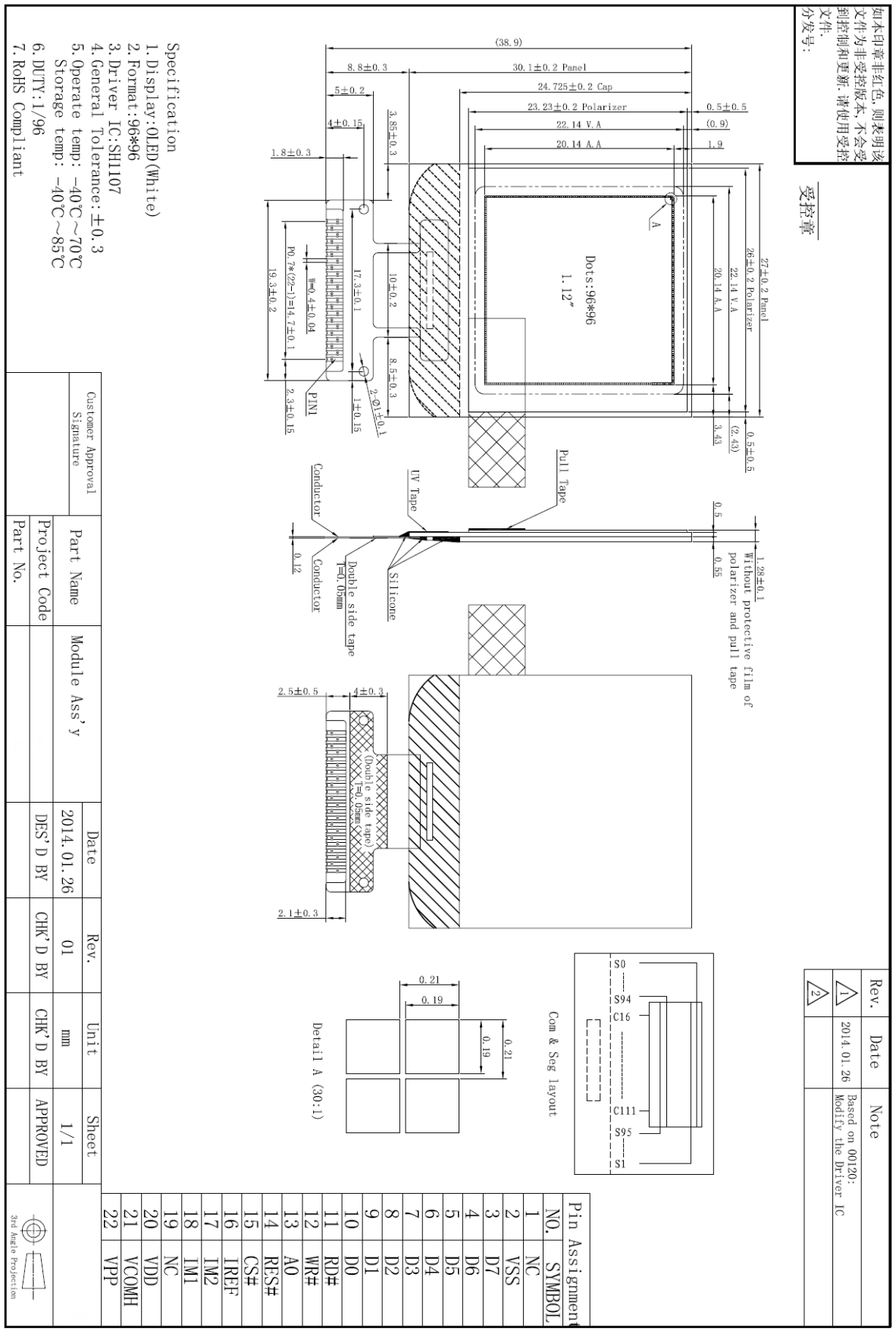
2 Features

- Display Color: White
- Dot Matrix:96×96
- Driver IC: SH1107G
- Interface: 4-wire SPI,6800,8080,I^2C
- Wide range of operating temperature: -40℃ to 70℃

3 Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	96(W)×96(H)	-
2	Dot Size	0.19(W)×0.19(H)	mm^2
3	Dot Pitch	0.21(W)×0.21(H)	mm^2
4	Aperture Rate	82	%
5	Active Area	20.14(W)×20.14(H)	mm^2
6	Panel Size	27(W) ×30.1(H) × 1.05(T)	mm^3
7	Module Size	27(W) ×38.9(H) × 1.28(T)	mm^3
8	Diagonal A/A Size	1.12	inch
9	Module Weight	1.99±10%	gram

4 Mechanical Drawing



Pin Assignment		
NO.	SYMBOL	
1	NC	
2	VSS	
3	D7	
4	D6	
5	D5	
6	D4	
7	D3	
8	D2	
9	D1	
10	D0	
11	RD#	
12	WR#	
13	A0	
14	RES#	
15	CS#	
16	IREF	
17	IM2	
18	IM1	
19	NC	
20	VDD	
21	VCOMH	
22	VPP	

5 Module Interface

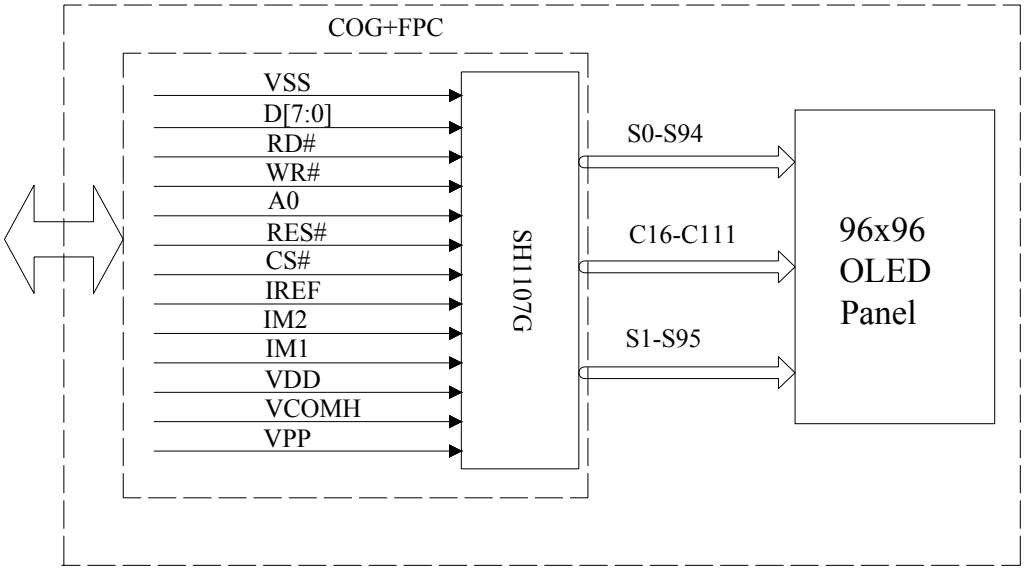
PIN NO.	PIN NAME	DESCRIPTION
1	NC	No Connection.
2	VSS	Ground pin. It must be connected to external ground.
3~10	D[7:0]	These pins are bi-directional data bus connecting to the MCU data bus. Unused pins are recommended to tie LOW. When serial interface mode is selected,D0 will be the serial colck input:SCL;D1 Will be the serial data input: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 D1serves as the serial data input pad (SDA). At this time, D2 to D7 are set to high impedance.
11	RD#	This pin is MCU interface input. When 6800 interface mode is selected, this pin will be used as the Enable(E) signal. Read/write operation is initiated when this pin is pulled HIGH and the chip is selected. When 8080 interface mode is selected, this pin receives the Read (RD#) signal.Read Operation is initiated when this pin is pulled LOW and the chip is selected. When serial or I² C interface is selected,this pin must be connected to VSS.
12	WR#	This pin is read/write control input pin connecting to the MCU Interface. When 6800 interface mode is selected, this pin will be used as Read/Write (RD/WR#) Selection input. Read mode will be carried out when this pin is pulled HIGH 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 or I² C interface is selected, this pin must be connected to VSS.
13	A0	This pin is Data/Command control pin connecting to the MCU.
14	RES#	This pin is reset signal input.
15	CS#	This pin is the chip select input connecting to the MCU.
16	IREF	This pin is the segment output current reference pin. A resistor should be connected between this pin and VSS to maintain the current around 15.625uA.
17-18	IM[2:1]	MCU bus interface selection pins. Table 5-1
19	NC	No Connection.
20	VDD	Power supply pin for core logic operation.
21	VCOMH	COM signal deselcted voltage level. A capacitor should be connected between this pin and VSS. No external power supply is allowed to connect to this pin.
22	VPP	Power supply for panel driving voltage.

Table 5-1:

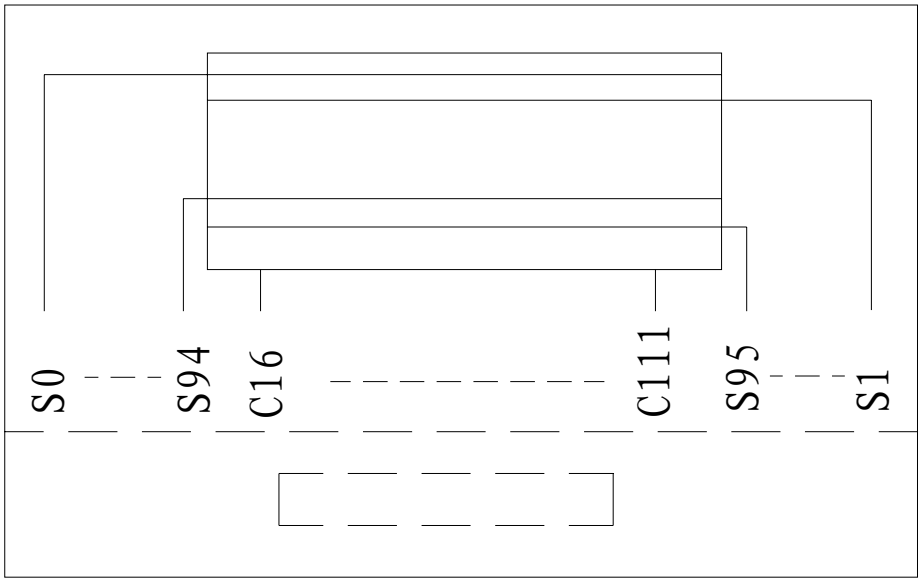
IM[2:1]	Interface
00	4-wire SPI
01	I² C
10	8-bit 6800 parallel
11	8-bit 8080 parallel

6 Function Block Diagram

6.1 Function Block Diagram



6.2 Panel Layout Diagram



7 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Supply voltage	VDD	-0.3	3.6	V	IC maximum rating
	VPP	-0.3	17.0	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 8 "Electrical Characteristics". Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.

8 Electrical Characteristics

8.1 DC Electrical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Voltage	VPP	-	11.5	12	12.5	V
Logic Supply Voltage	VDD	-	1.65	3.0	3.5	V
High-level Output voltage	V_{OHC}	I_{oH}=-0.5mA(SDA，SCL)	0.8×VDD	-	VDD	V
Low-level Output voltage	V_{OLC}	I_{oL}=0.5mA(SDA，SCL)	VSS	-	0.2×VDD	V
High Logic Input voltage	V_{IHC}	SDA，SCL and RES#.	0.8×VDD	-	VDD	V
Low Logic Input voltage	V_{ILC}		VSS	-	0.2×VDD	V

8.2 Electro-optical Characteristics

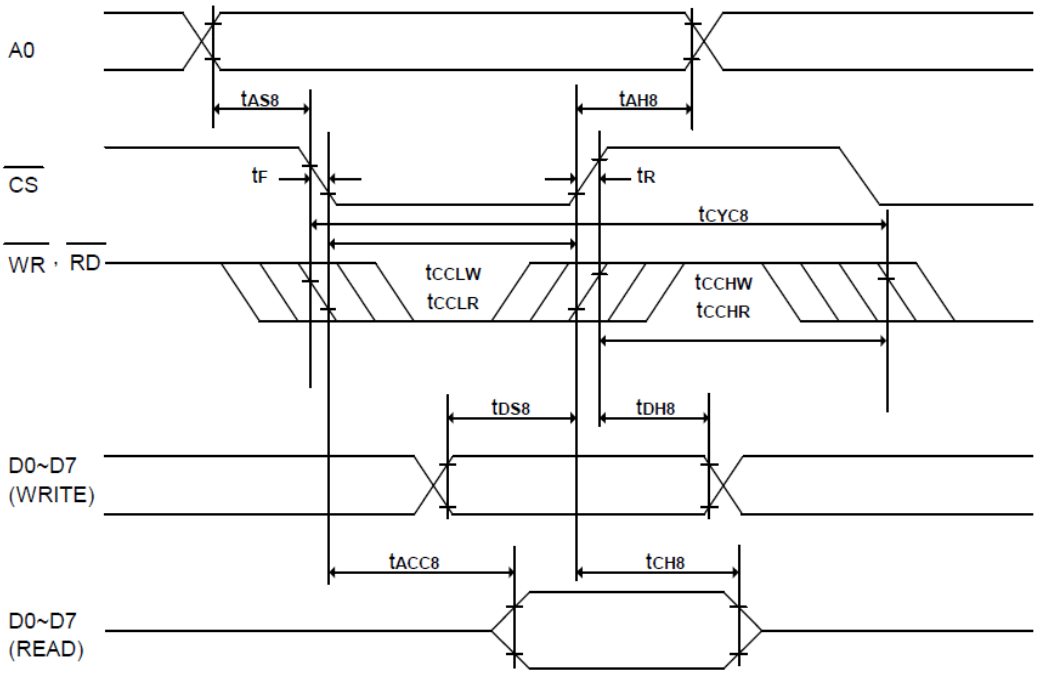
ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Normal Mode Brightness	L_{br}	All pixels ON(1)	80	100	-	cd/m^2
VDD Sleep mode Current	ISP_VDD	VDD=2.8V,VPP=OFF Display OFF, No panel attached	-	0.02	10	uA
VPP Sleep mode Current	ISP_VPP	VDD=2.8V,VPP=7-16.5V Display OFF, No panel attached	-	0.02	10	uA
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	210	252	mW
C.I.E(White)	(x)	x,y(CIE1931)	0.25	0.29	0.33	-
	(y)		0.28	0.32	0.36	-
Dark Room Contrast	CR	-	≥2000:1	-	-	-
Response Time	-	-	---	10	-	μs
View Angle	-	-	≥160	-	-	Degree

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

- Driving voltage : 12V
- Contrast setting : 0x80
- Frame rate : 100Hz
- Duty setting : 1/96

8.3 AC Electrical Characteristics

(1) System buses Read/Write characteristics 1 (For the 8080 Series Interface MPU)



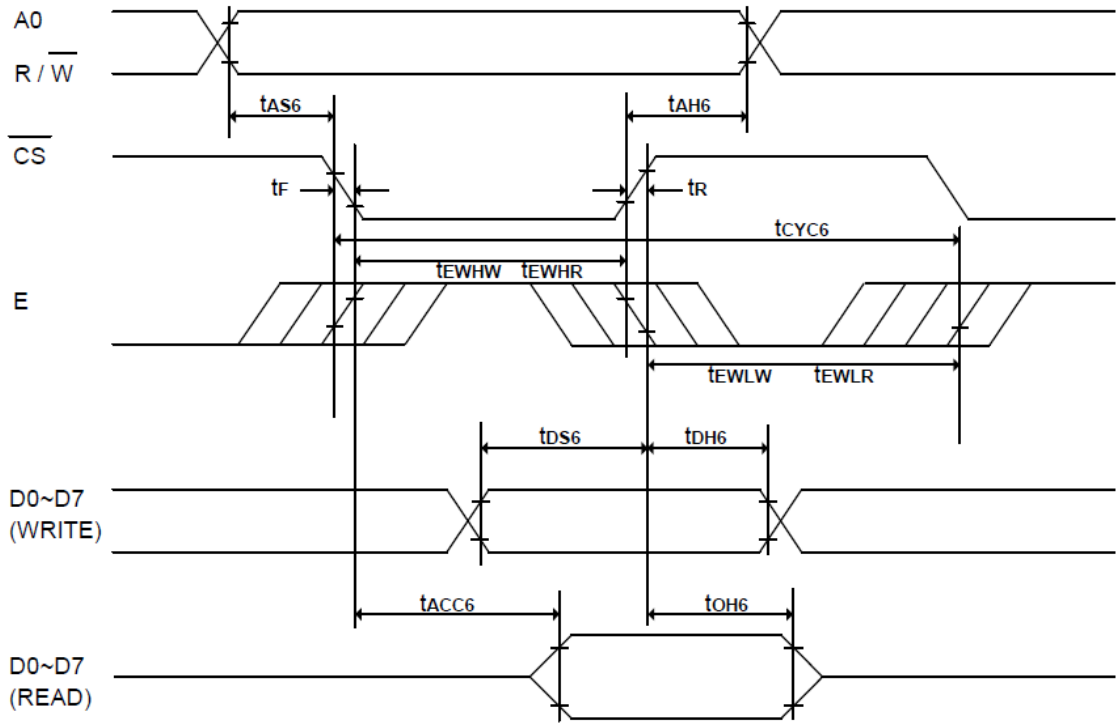
(V_{DD} = 1.65V – 2.4V, T_A = +25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{CYC8}	System cycle time	300	-	-	ns	
t_{AS8}	Address setup time	0	-	-	ns	
t_{AH8}	Address hold time	0	-	-	ns	
t_{DS8}	Data setup time	40	-	-	ns	
t_{DH8}	Data hold time	30	-	-	ns	
t_{CH8}	Output disable time	10	-	70	ns	C_L = 100pF
t_{ACC8}	$\overline{RD}$ access time	-	-	280	ns	C_L = 100pF
t_{CCLW}	Control L pulse width (WR)	100	-	-	ns	
t_{CCLR}	Control L pulse width (RD)	120	-	-	ns	
t_{CCHW}	Control H pulse width (WR)	100	-	-	ns	
t_{CCHR}	Control H pulse width (RD)	100	-	-	ns	
t_R	Rise time	-	-	15	ns	
t_F	Fall time	-	-	15	ns	

(V_{DD} = 2.4V – 3.5V, T_A = +25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{CYC8}	System cycle time	300	-	-	ns	
t_{AS8}	Address setup time	0	-	-	ns	
t_{AH8}	Address hold time	0	-	-	ns	
t_{DS8}	Data setup time	40	-	-	ns	
t_{DH8}	Data hold time	15	-	-	ns	
t_{CH8}	Output disable time	10	-	70	ns	C_L = 100pF
t_{ACC8}	$\overline{RD}$ access time	-	-	140	ns	C_L = 100pF
t_{CCLW}	Control L pulse width (WR)	100	-	-	ns	
t_{CCLR}	Control L pulse width (RD)	120	-	-	ns	
t_{CCHW}	Control H pulse width (WR)	100	-	-	ns	
t_{CCHR}	Control H pulse width (RD)	100	-	-	ns	
t_R	Rise time	-	-	15	ns	
t_F	Fall time	-	-	15	ns	

（2）System buses Read/Write characteristics 2 (For the 6800 Series Interface MPU)



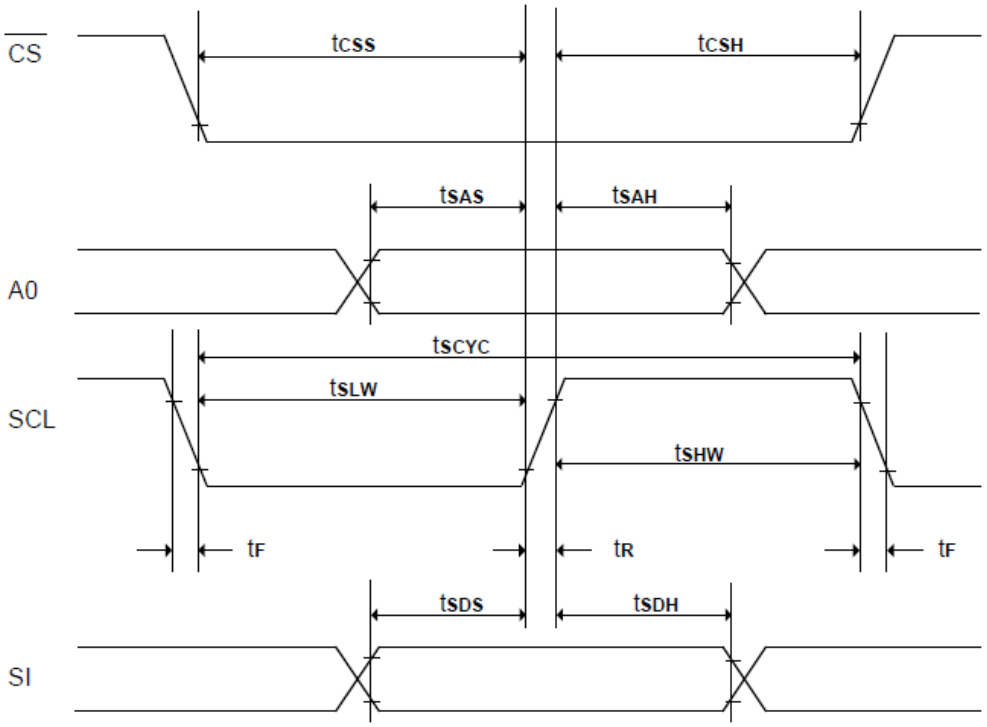
(V_{DD} = 1.65 – 2.4V, TA = +25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tCYC6	System cycle time	300	-	-	ns	
tAS6	Address setup time	0	-	-	ns	
tAH6	Address hold time	0	-	-	ns	
tDS6	Data setup time	40	-	-	ns	
tDH6	Data hold time	30	-	-	ns	
tOH6	Output disable time	10	-	70	ns	C_L = 100pF
tACC6	Access time	-	-	280	ns	C_L = 100pF
tEWHW	Enable H pulse width (Write)	100	-	-	ns	
tEWHR	Enable H pulse width (Read)	120	-	-	ns	
tEWLW	Enable L pulse width (Write)	100	-	-	ns	
tEWLR	Enable L pulse width (Read)	100	-	-	ns	
tR	Rise time	-	-	15	ns	
tF	Fall time	-	-	15	ns	

(V_{DD} = 2.4 – 3.5V, TA = +25°C)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
t_{CYC6}	System cycle time	300	-	-	ns	
t_{AS6}	Address setup time	0	-	-	ns	
t_{AH6}	Address hold time	0	-	-	ns	
t_{DS6}	Data setup time	40	-	-	ns	
t_{DH6}	Data hold time	15	-	-	ns	
t_{OH6}	Output disable time	10	-	70	ns	C_L = 100pF
t_{ACC6}	Access time	-	-	140	ns	C_L = 100pF
t_{EWHW}	Enable H pulse width (Write)	100	-	-	ns	
t_{EWHR}	Enable H pulse width (Read)	120	-	-	ns	
t_{EWLW}	Enable L pulse width (Write)	100	-	-	ns	
t_{EWLR}	Enable L pulse width (Read)	100	-	-	ns	
t_R	Rise time	-	-	15	ns	
t_F	Fall time	-	-	15	ns	

（3）System buses Write characteristics 3(For 4 wire SPI)



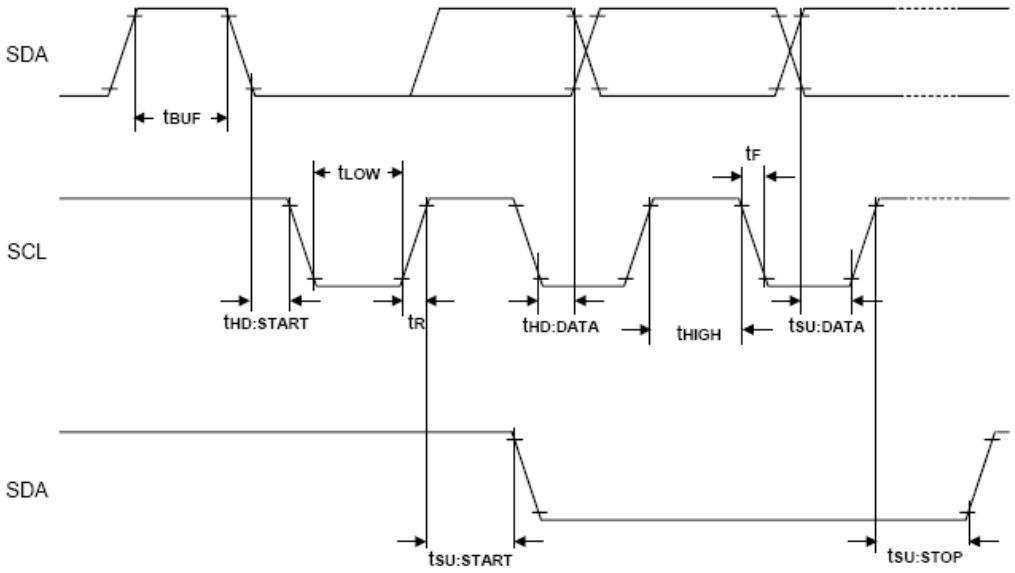
(V_{DD1} = 1.65 – 2.4V, TA = +25°C)

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	

(V_{DD1} = 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 width	100	-	-	ns	
tSLW	Serial clock L pulse width	100	-	-	ns	
tR	Rise time	-	-	15	ns	
tF	Fall time	-	-	15	ns	

（4）I² C Interface Timing characteristics



(VDD = 1.65 - 3.5V, TA = +25°C)

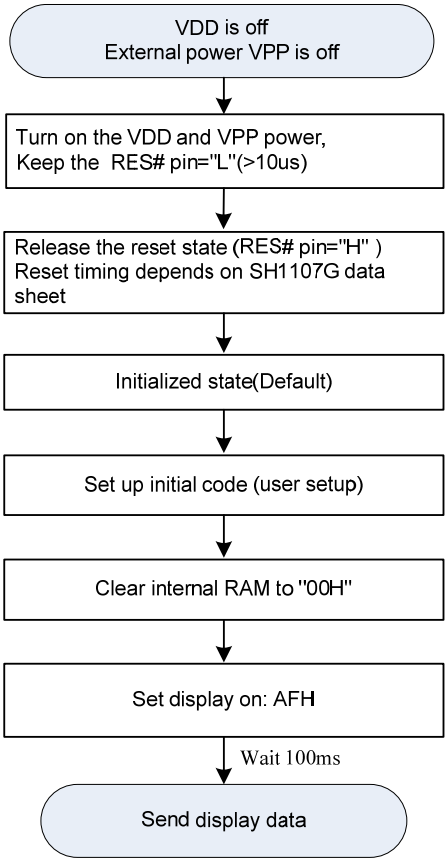
Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
fSCL	SCL clock frequency	DC	-	400	kHz	
TLOW	SCL clock Low pulse width	1.3	-	-	μs	
THIGH	SCL clock H pulse width	0.6	-	-	μs	
TSU:DATA	data setup time	100	-	-	ns	
THD:DATA	data hold time	0	-	0.9	μs	
TR	SCL、SDA rise time	20+0.1Cb	-	300	ns	
TF	SCL、SDA fall time	20+0.1Cb	-	300	ns	
Cb	Capacity load on each bus line	-	-	400	pF	
TSU:START	Setup timefor re-START	0.6	-	-	μs	
THD:START	START Hold time	0.6	-	-	μs	
TSU:STOP	Setup time for STOP	0.6	-	-	μs	
TBUF	Bus free times between STOP and START condition	1.3	-	-	μs	

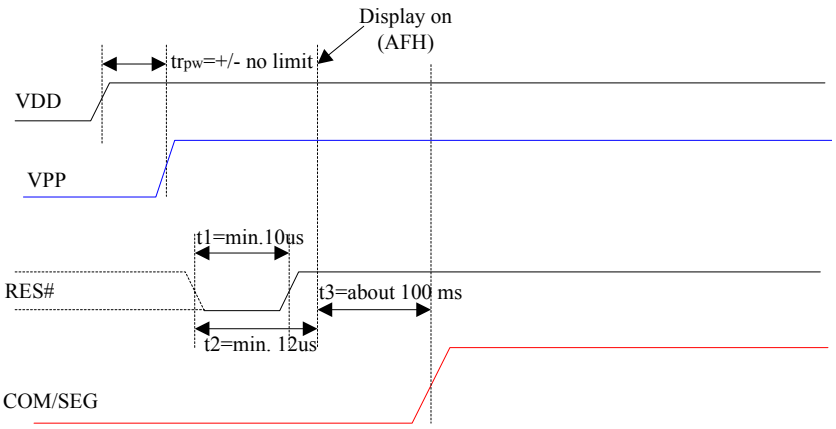
9 Functional Specification and Application Circuit

9.1 Power ON/OFF Sequence and Initialization

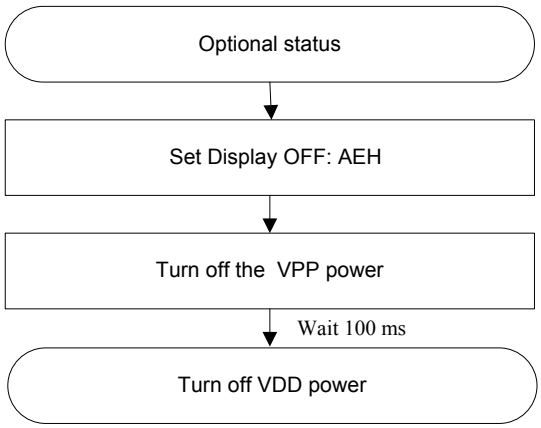
Power on sequence:

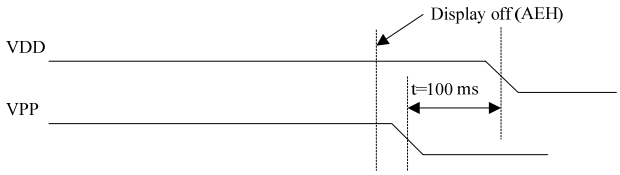
External power is being used immediately after turning on the power:





Power off sequence：

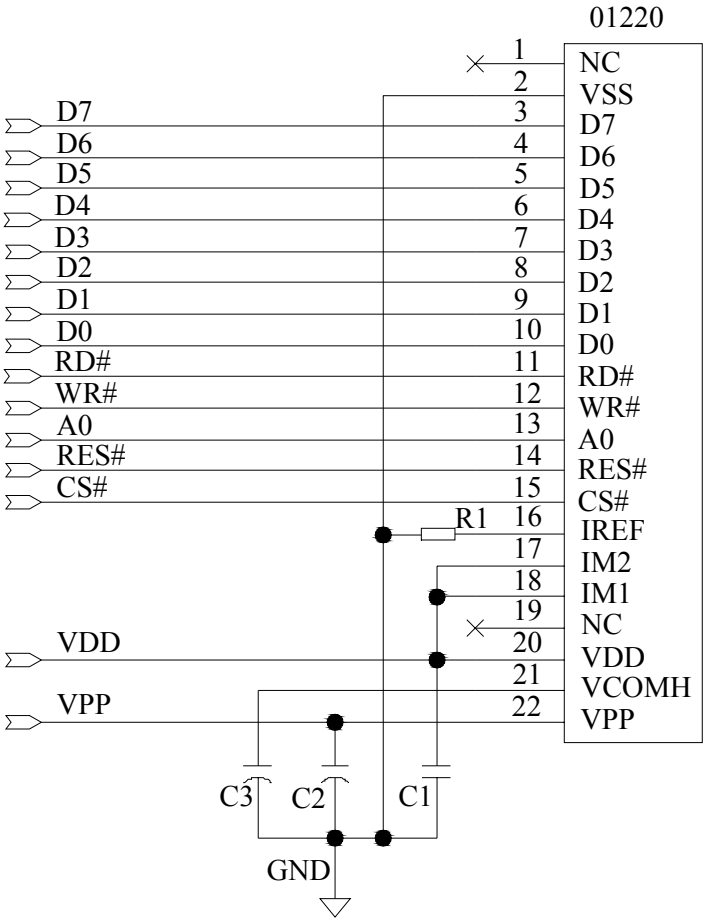




Note：There will be no damages to the display module if the power sequences are not met.

9.3 Application Circuit

(1).The configuration for8080 interface mode, external VCC is shown in the following diagram:



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

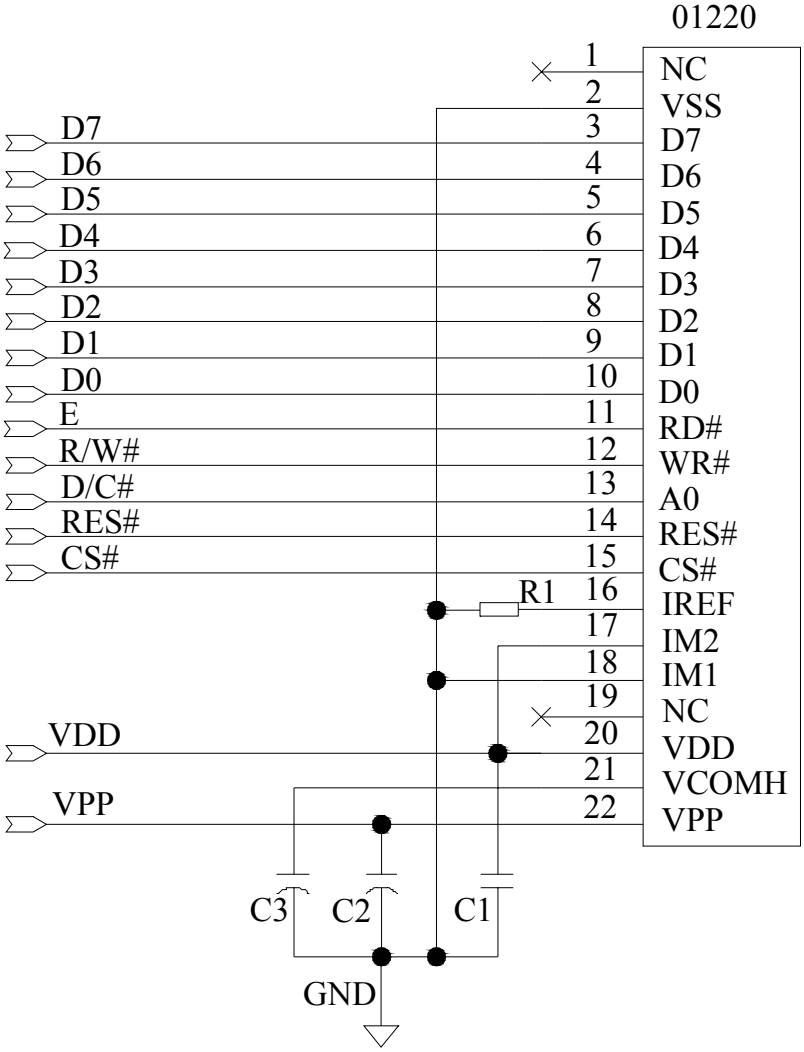
Recommended components

C1: 0.1uF-0603-X7R±10%.RoHS

C2,C3: 4.7μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 750Kohm.RoHS

(2).The configuration for6800 interface mode, external VCC is shown in the following diagram:



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

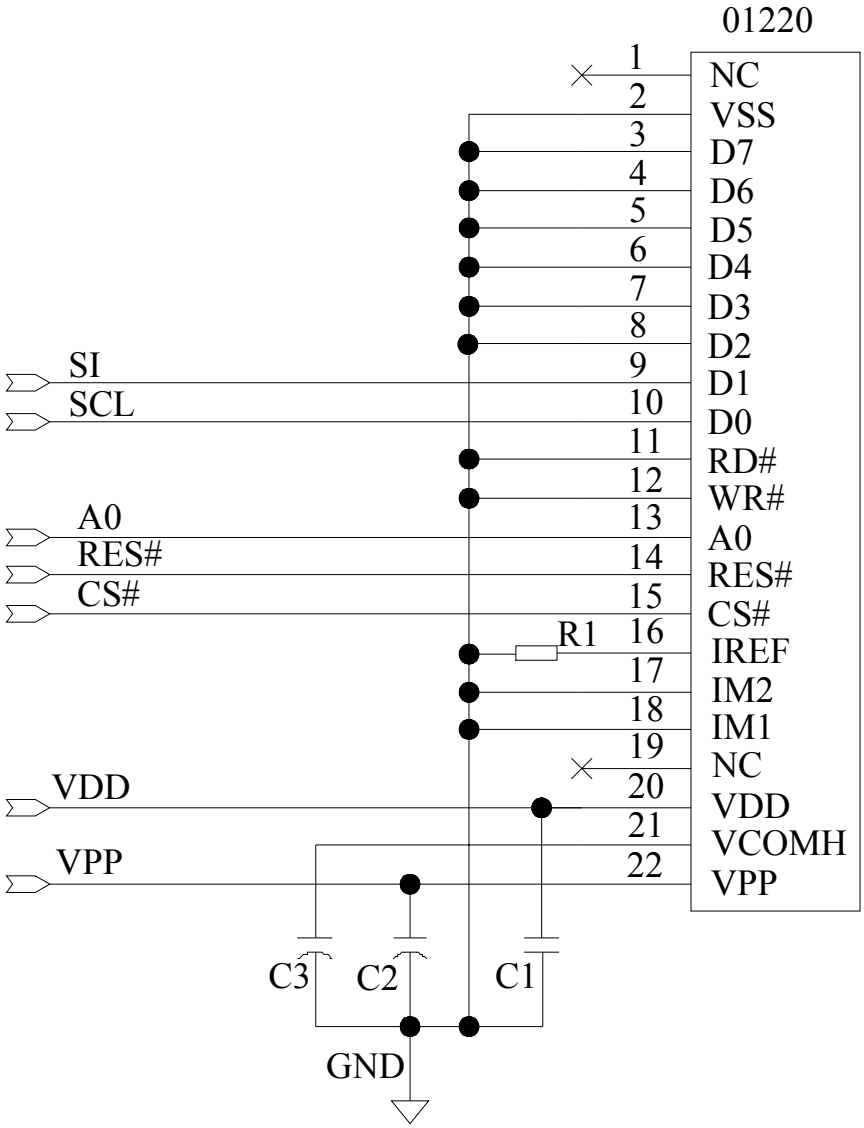
Recommended components

C1: 0.1uF-0603-X7R±10%.RoHS

C2,C3: 4.7μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 750K ohm.RoHS

(3). The configuration for 4-wire-SPI interface mode, external VCC is shown in the following diagram:



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

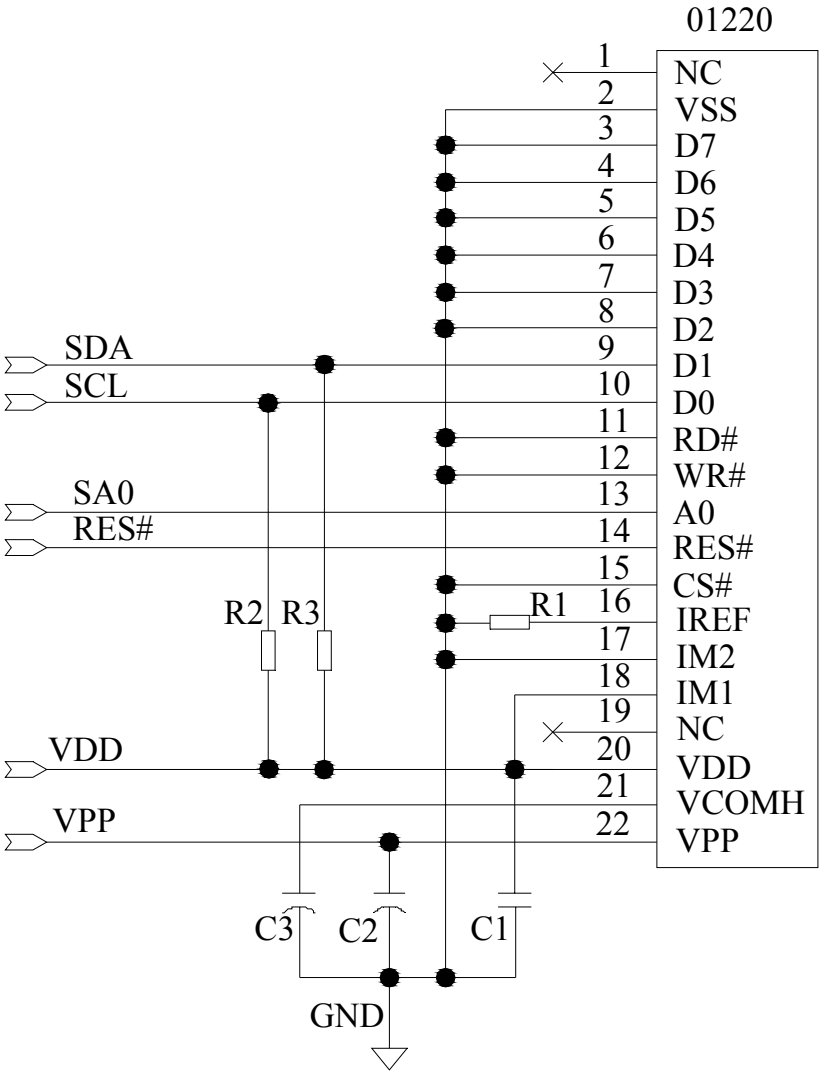
Recommended components

C1: 0.1uF-0603-X7R±10%.RoHS

C2,C3: 4.7μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 750K Mohm.RoHS

(4). The configuration for I²C interface mode, external VCC is shown in the following diagram



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

SA0	I² C Address
0	0x78
1	0x7A

Recommended components

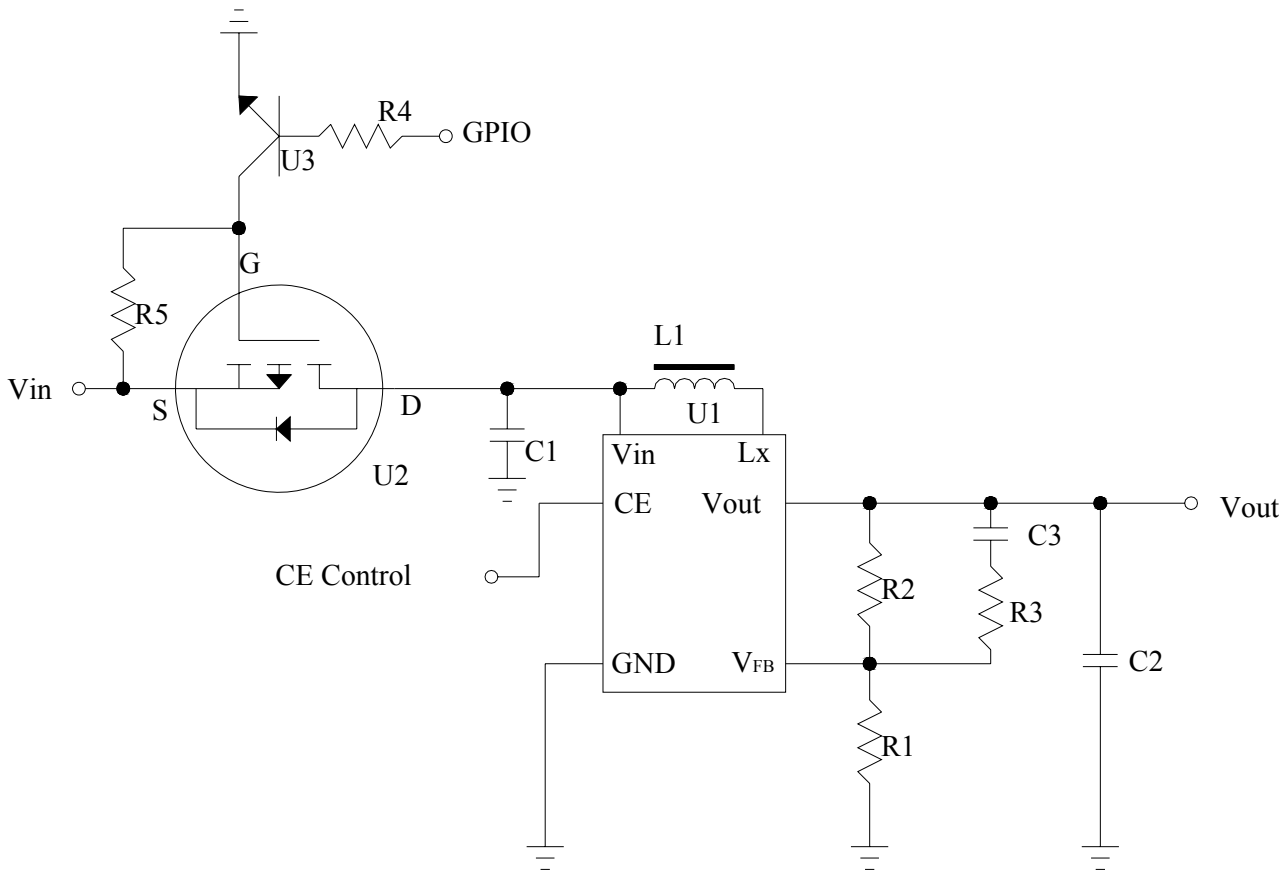
C1: 0.1uF-0603-X7R±10%.RoHS

C2,C3: 4.7μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5%750K ohm.RoHS

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

9.4 External DC-DC application circuit



Recommend component

The C1	: 1 uF-0603-X7R±10%.RoHS
The C2	: 1 uF-0603-X7R±10%.RoHS
The C3	: 220pF-0603-X7R±10%.RoHS
The R1	: 0603 1/10W +/-5% 10Kohm.RoHS
The R2	: 0603 1/10W +/-5% 110Kohm.RoHS
The R3	: 0603 1/10W +/-5% 2Kohm.RoHS
The R4	: 0603 1/10W +/-5% 1Kohm.RoHS
The R5	: 0603 1/10W +/-5% 10Kohm.RoHS
The L1	: 22uH
The U1	: R1200
The U2	: FDN338P
The U3	: 8050

9.5 Display Control Instruction

Refer to SH1107G IC Specification.

9.6 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_program()
{
    Write_c(0xae);       //Display OFF
    Write_c(0xd5);       // Set Dclk
    Write_c(0x50);       //       100Hz
    Write_c(0x20);       // Set row address
    Write_c(0x81);       // Set contrast control
    Write_c(0x80);
    Write_c(0xa0);       // Segment remap
    Write_c(0xa4);       // Set Entire Display ON
    Write_c(0xa6);       // Normal display
    Write_c(0xad);       // Set external VCC
    Write_c(0x80);
    Write_c(0xc0);       // Set Common scan direction
    Write_c(0xd9);       // Set phase leghth
    Write_c(0x1f);
    Write_c(0xdb);       // Set Vcomh voltage
    Write_c(0x27);
    Clear_All_RAM();
    Write_c(0xaf);       //Display ON
}

    void Clear_All_RAM();    //Clear the whole of RAM
{
     unsigned char i,j;
     for(i=0;i<16;i++)          //16 Pages
{
    Write_c (0xb0+i);
    Write_c (0x00);
    Write_c (0x10);
    for(j=0;j<128;j++)       //128 Common
```

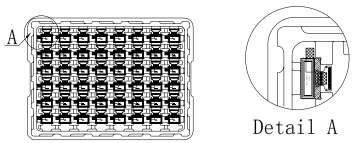
```
{
        Write_d (0x00);
                                }
                        }
                }
```

10 Package Specification

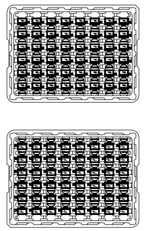
Controlled Seal

Packing Process(1)~(9)

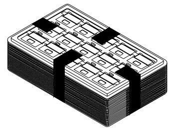
(1) Tray Type:00790-MT6-A



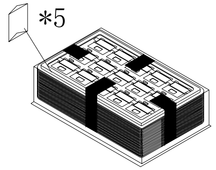
(2)



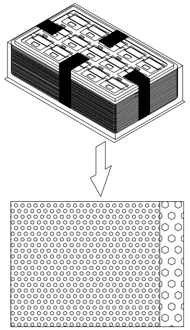
(3) order①、②、①、② fix trays with tape
792 pcs of 1 small carton
1 tray contain 36 pcs
22 contained trays, 1 empty tray



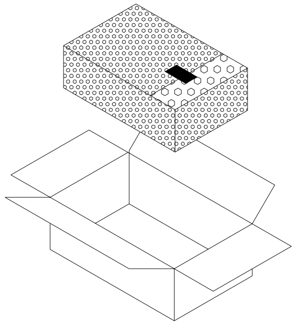
(4) Use vaccum bag to package the tray and add 5 bags of desiccant into the vacuum bag



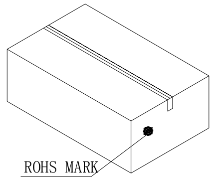
(5) After tray be packaged, wrap the package in a bubble bag and seal with scoth tape.



(6)

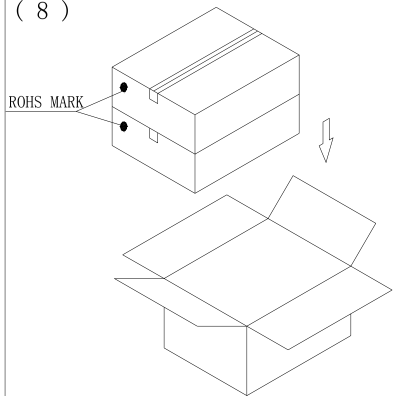


(7)



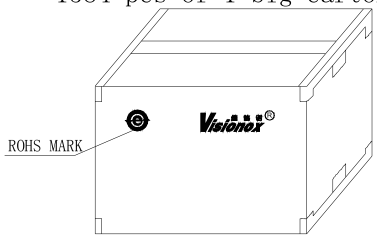
small carton package
L390*W290*L120 mm

(8)



2 small cartons in 1 big carton

(9) 44 contained trays, 2 empty trays,
Package quantity products:
1584 pcs of 1 big carton



Package finished
L410*W310*L272 mm

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

2、Fill up the gap with tray.

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

11 Reliability

11.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85℃,240hrs	4
2	Low Temperature (Non-operation)	-40℃,240hrs	4
3	High Temperature (Operation)	70℃,240hrs	4
4	Low Temperature (Operation)	-40℃,240hrs	4
5	High Temperature / High Humidity (Operation)	60℃,90%RH,240hrs	4
6	Thermal shock (Non-operation)	-40℃~85℃(-40℃/30min;transit/3min;85℃/30min;transit/3min) 1cycle: 66min,30cycles	4
7	Vibration	Frequency: 5~50Hz,0.5G Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X,Y, Z	1 Carton
8	Drop	Height: 100 cm Sequence: 1 angle, 3 edges and 6 faces	1 Carton

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.

11.2 Lifetime

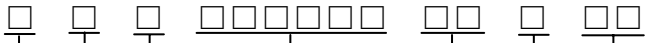
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	35,000	-	hrs	100 cd/m^2, 50% alternating checkerboard, 22±3°C, 55±15% RH

11.3 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±3°C; 55±15% RH.

12 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

Panel Flow No. :

A0~A9, B0~B9…Z0~Z9

Display Format :

Graphic—columns and rows

Character—characters and line number

Segment—segment number

Icon—pixel number

Product Type :

P—panel

M—module

Display Type :

G—graphic

C—character

S—segment

I—Icon

M—mixed

Company :

G—GJX

13 Outgoing Quality Control Specifications

13.1 Sampling Method

(1) GB/T 2828.1-2003/ISO2859-1：1999, inspection level Ⅱ, normal inspection, single sample inspection

(2) AQL: Major 0.65; Minor 1.0

13.2 Inspection Conditions

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

Temperature: 22±3°C

Humidity: 55±15%R.H

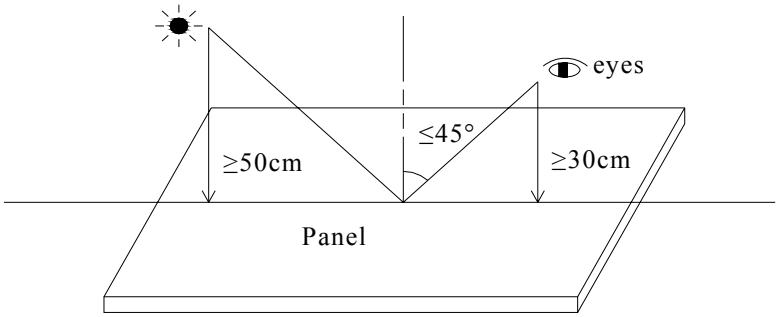
Fluorescent Lamp: 30W

Distance between the Panel & Lamp: ≥50cm

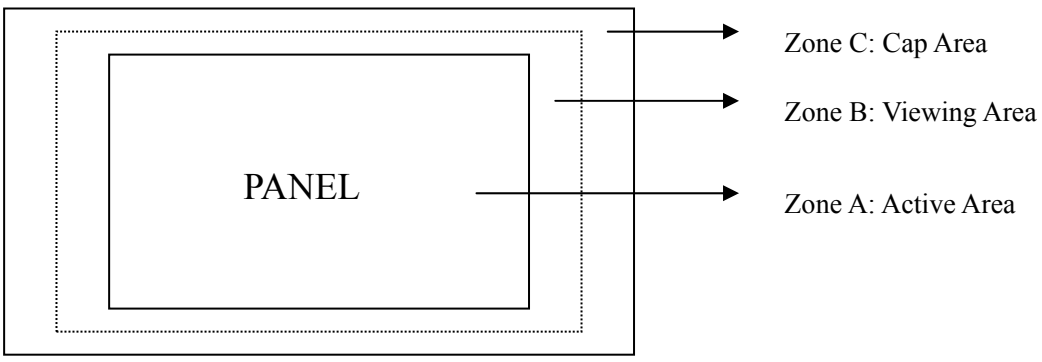
Distance between the Panel & Eyes: ≥30cm

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

(See the sketch below)

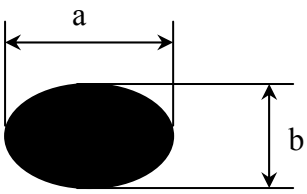


13.3 Quality Assurance Zones

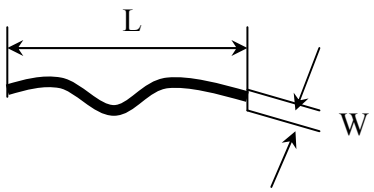


13.4 Inspection Standard

Definition of Φ&L&W (Unit: mm)

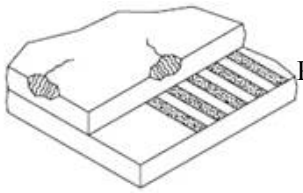
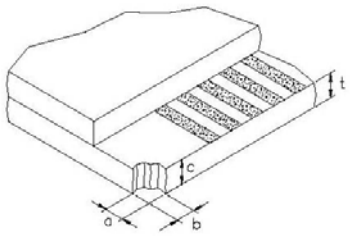
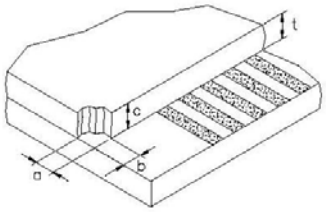
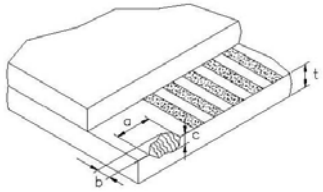
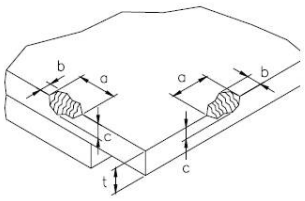
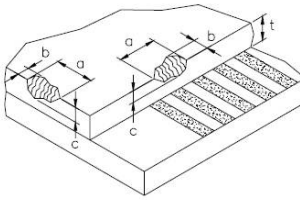


Φ=(a+b)/2



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≤0.03</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>0.5</td><td>0</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.2<Φ≤0.5</td><td>3</td></tr>
<tr><td>Φ≤0.2</td><td>Ignore</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>
<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>
</table>

6	Glass Crack	 Propagation crack is not acceptable.	Major
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≤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	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>ITEM</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>Short</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>6</td><td>Flicker</td><td>Not allowable.</td><td>Major</td></tr>
<tr><td>7</td><td>Abnormal Color</td><td>Refer to the SPEC.</td><td>Major</td></tr>
<tr><td>8</td><td>Luminance NG</td><td>Refer to the SPEC.</td><td>Major</td></tr>
<tr><td>9</td><td>Over Current</td><td>Refer to the SPEC.</td><td>Major</td></tr>
</table>

14 Precautions for operation and Storage

14.1 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.

14.2 Soldering

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

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

(3) Iron: no higher than 300℃ and 3~4 sec during soldering.

14.3 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 60%. 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.

14.4 Warranty period

GJX warrants for a period of 12 months from the shipping date when stored or used under normal condition.