

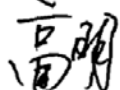



Product Specification

Product Name: VGM128036A5W02

Product Code: M01011

| |
|-----------------------------|
| Customer |
| |
| Approved by Customer |
| |
| Approved Date: |

| Designed By | Checked By | Approved By | |
|--|--|--|--|
| | | R&D | QA |
|  2014.2.20 |  2014.2.20 |  2014.2.20 |  2014.2.20 |

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1 Overview

VGM128036A5W02 is a monochrome OLED display module with 128×36 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.

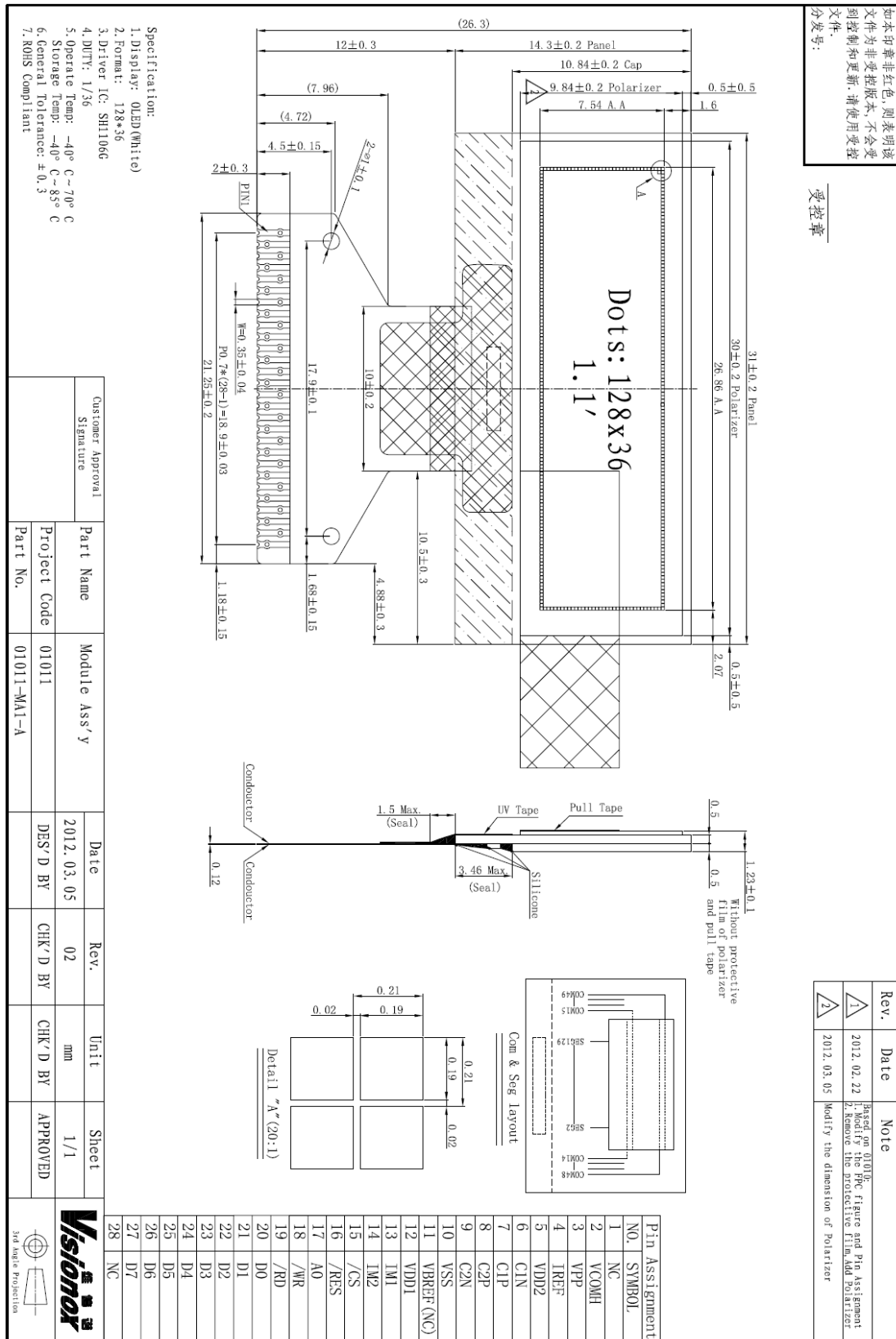
2 Features

- Display Color: White
- Dot Matrix: 128×36
- Driver IC: SH1106G
- Interface: 8-bit 6800、8-bit 8080、I²C 、4-wire SPI
- Wide range of operating temperature: -40℃ to 70℃

3 Mechanical Data

| NO. | ITEM | SPECIFICATION | UNIT |
|-----|-------------------|------------------------|-----------------|
| 1 | Dot Matrix | 128(W)×36(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 | 26.86(W)×7.54 (H) | mm ² |
| 6 | Panel Size | 31(W)×14.3(H)×1.0(T) | mm ³ |
| 7 | Module Size | 31(W)×26.3(H)×1.23 (T) | mm ³ |
| 8 | Diagonal A/A Size | 1.1 | inch |
| 9 | Module Weight | 1.04±10% | gram |

4 Mechanical Drawing

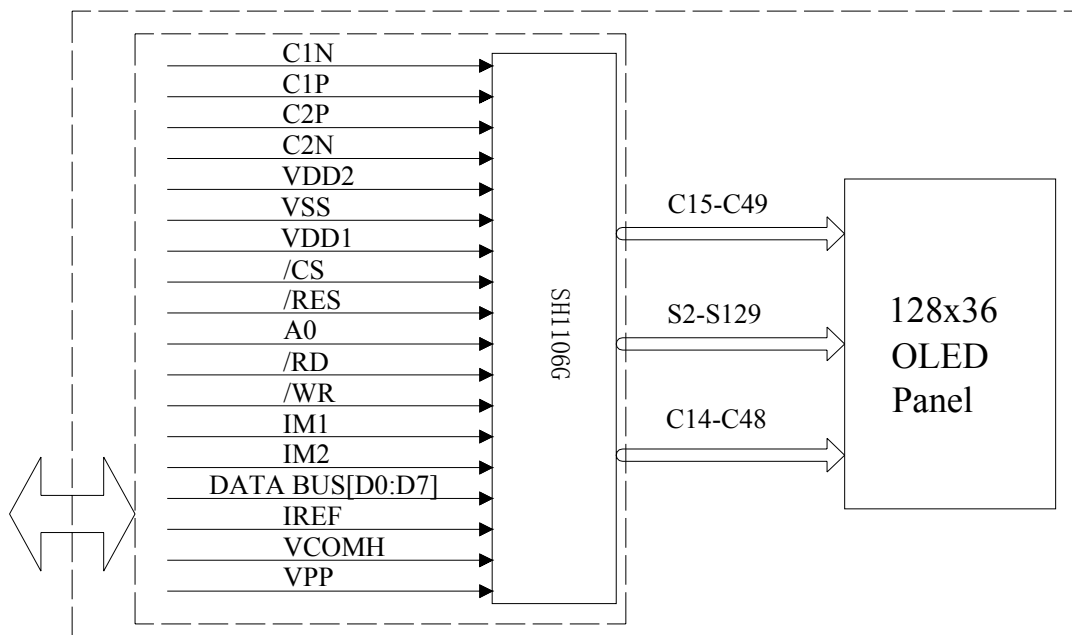


5 Module Interface

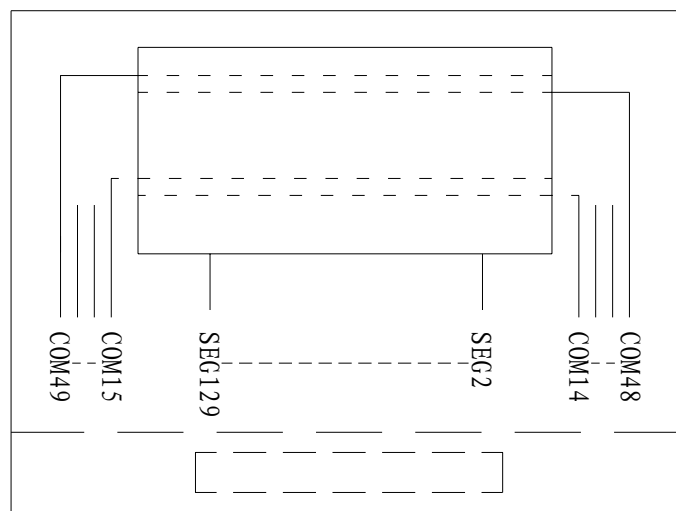
| PIN NO. | PIN NAME | DESCRIPTION | | | | | | |
|---------|-----------|--|----------|------------------|------|------|-------|--|
| 1 | NC | No Connection. | | | | | | |
| 2 | VCOMH | This is a pad for the voltage output high level for common signals. A capacitor should be connected between this pad and VSS. | | | | | | |
| 3 | VPP | OLED panel power supply. Generated by internal charge pump. Connect to capacitor. It could be supplied externally. | | | | | | |
| 4 | IREF | This is a segment current reference pad. A resistor should be connected between this pad and VSS. Set the current at 10 μ A. | | | | | | |
| 5 | VDD2 | 3.0 – 4.2V power supply pad for Power supply for charge pump circuit. This pin can be disconnected or connect to VDD1 when VPP is supplied externally. | | | | | | |
| 6 | C1N | Connect to charge pump capacitor. | | | | | | |
| 7 | C1P | | | | | | | |
| 8 | C2P | Connect to charge pump capacitor. | | | | | | |
| 9 | C2N | | | | | | | |
| 10 | VSS | Ground. | | | | | | |
| 11 | VBREF(NC) | This is an internal voltage reference pad for booster circuit. Keep floating. | | | | | | |
| 12 | VDD1 | Power supply input: 1.65 - 3.5V | | | | | | |
| 13 | IM1 | | Pin Name | I ² C | 6800 | 8080 | 4-SPI | |
| 14 | IM2 | | IM1 | 1 | 0 | 1 | 0 | |
| | | | IM2 | 0 | 1 | 1 | 0 | |
| 15 | /CS | This pad is the chip select input. When /CS = “L”, then the chip select becomes active, and data/command I/O is enabled. | | | | | | |
| 16 | /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. | | | | | | |
| 17 | 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 I ² C interface, this pad serves as SA0 to distinguish the different address of OLED driver. | | | | | | |
| 18 | /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. | | | | | | |
| 19 | /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 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. When /RD = “H”: Enable. When /RD = “L”: Disable. | | | | | | |
| 20~27 | 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 I ² C interface is selected, then D0 serves as the serial clock input pad (SCL) and D1 serves as the serial data input pad (SDAI). At this time, D2 to D7 are set to high impedance. | | | | | | |
| 28 | NC | No Connection. | | | | | | |

6 Function Block Diagram

6.1 Function Block Diagram



6.2 Panel Layout Diagram



Com & Seg layout

7 Absolute Maximum Ratings

| ITEM | SYMBOL | MIN | MAX | UNIT | REMARK |
|--------------------------------------|--------|------|------|------|-------------------|
| Logic supply voltage | VDD1 | -0.3 | 3.6 | V | IC maximum rating |
| Charge Pump Regulator Supply Voltage | VDD2 | -0.3 | 4.3 | V | IC maximum rating |
| OLED Operating voltage | VPP | -0.3 | 14.5 | V | IC maximum rating |
| Operating Temp. | Top | -40 | 70 | °C | - |
| Storage Temp | Tstg | -40 | 85 | °C | - |

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 |
|--|-----------------|----------------------|----------|-----|----------|------|
| Logic Supply Voltage | VDD1 | 22±3°C, 55±15%R.H | 1.65 | 3.0 | 3.5 | V |
| OLED Driver Supply Voltage (Supply Externally) | VPP | 22±3°C, 55±15%R.H | 11.5 | 12 | 12.5 | V |
| OLED Driver Supply Voltage (Generated by Internal DC/DC) | VPP | 22±3°C, 55±15%R.H | - | 9.0 | - | V |
| Charge Pump Regulator Supply Voltage | VDD2 | 22±3°C, 55±15%R.H | 3.0 | 3.7 | 4.2 | V |
| High-level Input Voltage | V _{IH} | - | 0.8×VDD1 | - | VDD1 | V |
| Low-level Input Voltage | V _{IL} | - | VSS | - | 0.2×VDD1 | V |
| High-level Output Voltage | V _{OH} | - | 0.8×VDD1 | - | VDD1 | V |
| Low-level Output Voltage | V _{OL} | - | VSS | - | 0.2×VDD1 | V |

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

8.2 Electro-optical Characteristics

| ITEM | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|--|-----------------|--|---------|--------|-------|-------------------|
| Normal Mode Brightness | L _{br} | All pixels ON(1) (VPP generated by internal DC/DC) | 100 | 150 | - | cd/m ² |
| | | All pixels ON VPP = 12V (External) | 200 | 240 | - | |
| Normal Mode Power Consumption | Pt | All pixels ON(1) (VPP generated by internal DC/DC) | - | 138.75 | 166.5 | mW |
| | | All pixels ON VPP = 12V (External) | - | 234 | 288 | mW |
| Sleep mode current consumption in VDD1 & VDD2(2) | ISP | During sleep, TA = +25°C, VDD1 = 3V, VDD2 = 3V. (2) | - | - | 5 | uA |
| Sleep mode current consumption in VPP | | During sleep, TA = +25°C, VPP = 9V (External) | - | - | 5 | 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 | - | ≥2000:1 | - | - | - |
| Response Time | - | - | - | 10 | - | μ s |
| View Angle | - | - | ≥160 | - | - | Degree |

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

- Driving voltage : VDD2:3.7V(VPP Generated by Internal DC/DC).
- Contrast setting : 0xa3
- Frame rate : 102Hz
- Duty setting : 1/36
- Driving voltage : External VPP Mode(VPP=12V).
- Contrast setting : 0xb0
- Frame rate : 102Hz
- Duty setting : 1/36

Note(2): Sleep Mode test conditions are as follows:

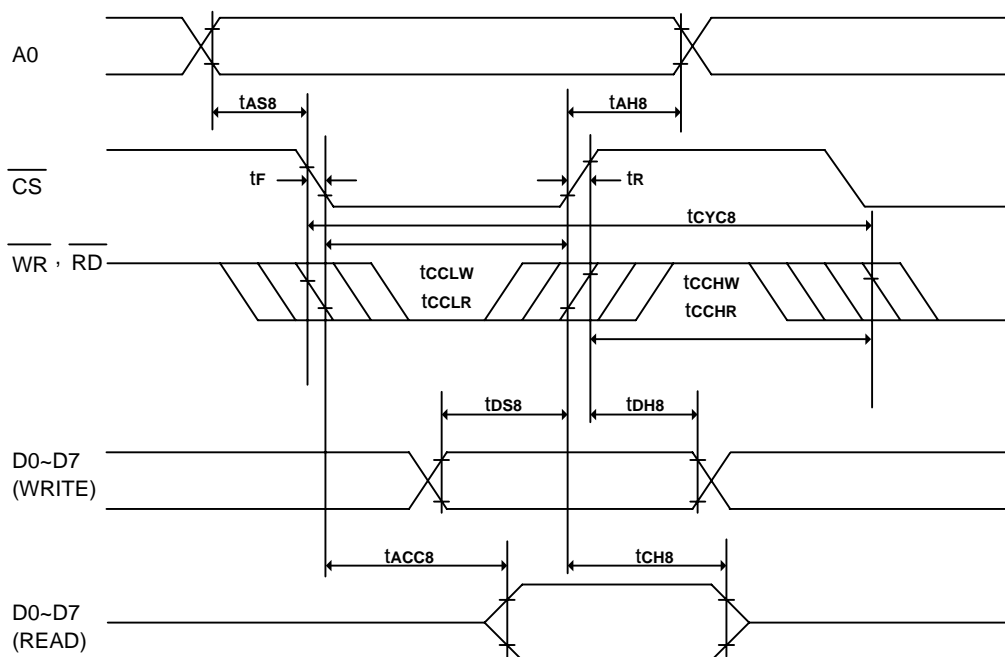
Disable Charge Pump:0XAD,0X8A.

Set Display OFF:0XAE ,

When the display OFF command is executed, power saver mode will be entered.

8.3 AC Electrical Characteristics

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



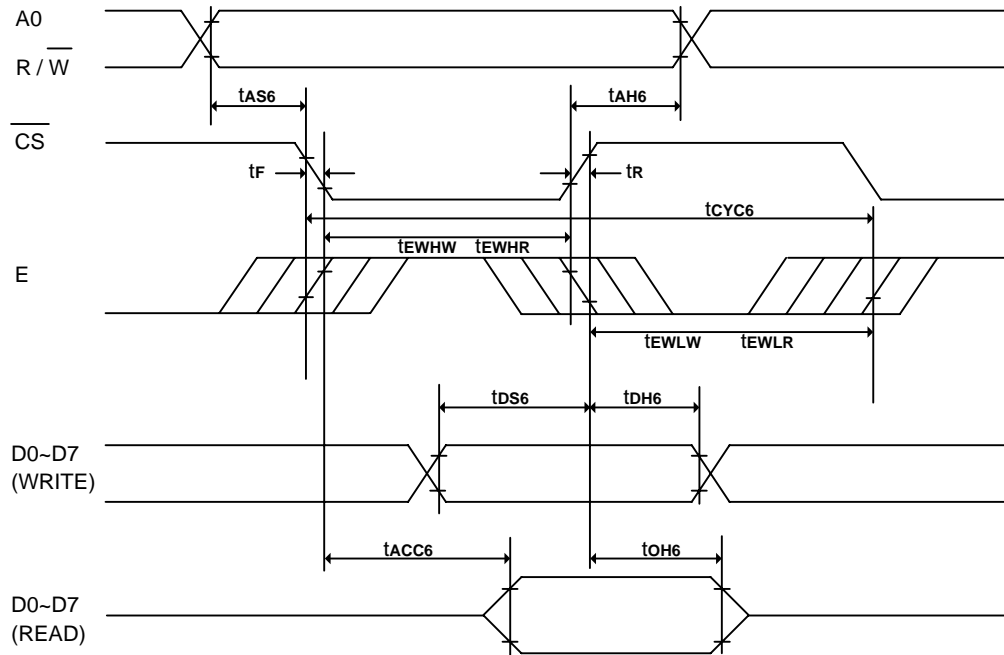
(VDD1 = 1.65 - 3.5V, TA = +25°C)

| Symbol | Parameter | Min | Typ | Max | Unit | Condition |
|--------|-----------------------------|-----|-----|-----|------|------------|
| tCYC8 | System cycle time | 600 | - | - | ns | |
| tAS8 | Address setup time | 0 | - | - | ns | |
| tAH8 | Address hold time | 0 | - | - | ns | |
| tDS8 | Data setup time | 80 | - | - | ns | |
| tDH8 | Data hold time | 30 | - | - | ns | |
| tCH8 | Output disable time | 20 | - | 140 | ns | CL = 100pF |
| tACC8 | \overline{RD} access time | - | - | 280 | ns | CL = 100pF |
| tCCLW | Control L pulse width (WR) | 200 | - | - | ns | |
| tCCLR | Control L pulse width (RD) | 240 | - | - | ns | |
| tCCHW | Control H pulse width (WR) | 200 | - | - | ns | |
| tCCHR | Control H pulse width (RD) | 200 | - | - | ns | |
| tR | Rise time | - | - | 30 | ns | |
| tF | Fall time | - | - | 30 | ns | |

(VDD1 = 2.4 - 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)



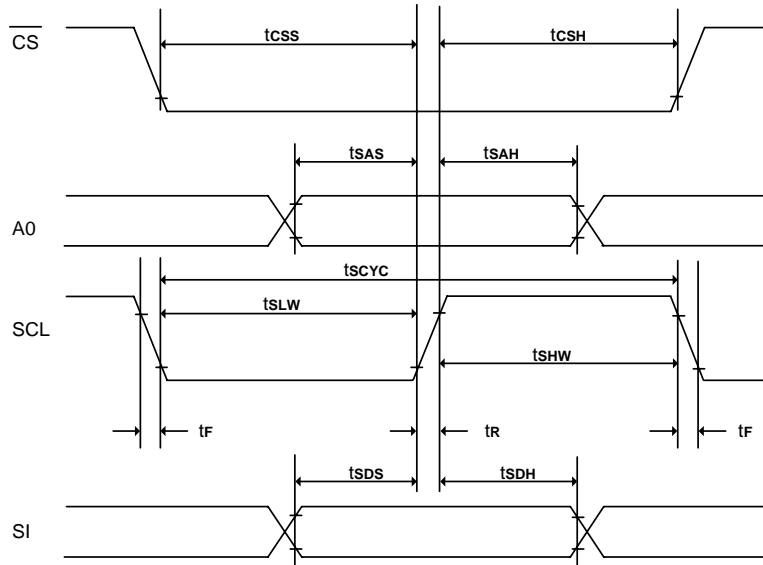
(VDD1 = 1.65 - 3.5V, TA = +25°C)

| Symbol | Parameter | Min | Typ | Max | Unit | Condition |
|--------|------------------------------|-----|-----|-----|------|------------|
| tCYC6 | System cycle time | 600 | - | - | ns | |
| tAS6 | Address setup time | 0 | - | - | ns | |
| tAH6 | Address hold time | 0 | - | - | ns | |
| tDS6 | Data setup time | 80 | - | - | ns | |
| tDH6 | Data hold time | 30 | - | - | ns | |
| tOH6 | Output disable time | 20 | - | 140 | ns | CL = 100pF |
| tACC6 | Access time | - | - | 280 | ns | CL = 100pF |
| tEWHW | Enable H pulse width (Write) | 200 | - | - | ns | |
| tEWHR | Enable H pulse width (Read) | 240 | - | - | ns | |
| tEWLW | Enable L pulse width (Write) | 200 | - | - | ns | |
| tEWLR | Enable L pulse width (Read) | 200 | - | - | ns | |
| tR | Rise time | - | - | 30 | ns | |
| tF | Fall time | - | - | 30 | ns | |

(VDD1 = 2.4 - 3.5V, T_A = +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 the Serial Interface MPU)



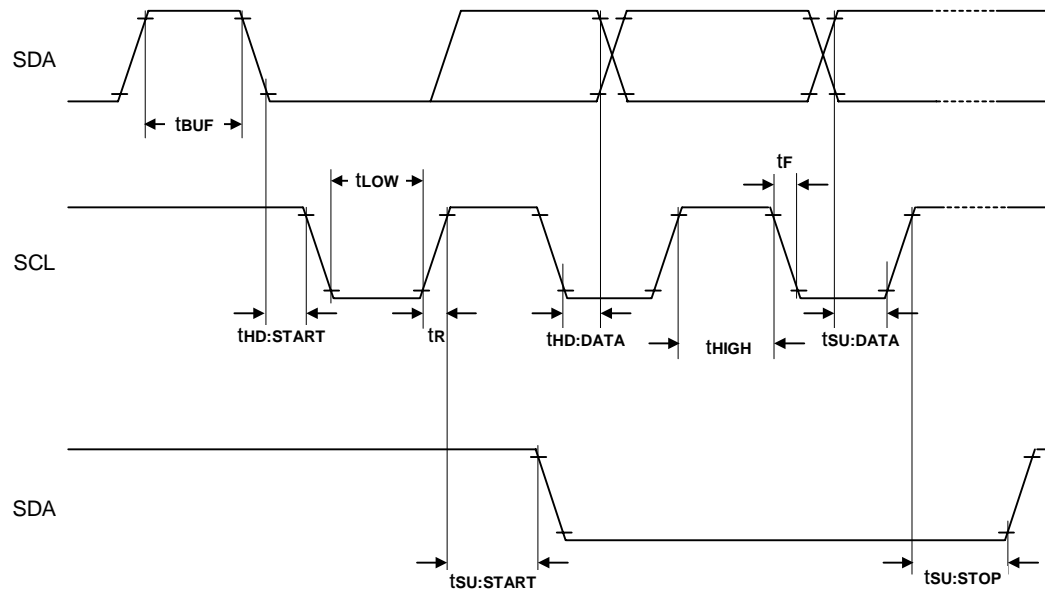
(VDD1 = 1.65 - 3.5V, TA = +25°C)

| 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 | |

(VDD1 = 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 | |

(4) I²C interface characteristics



(VDD1 = 1.65 - 3.5V, TA = +25°C)

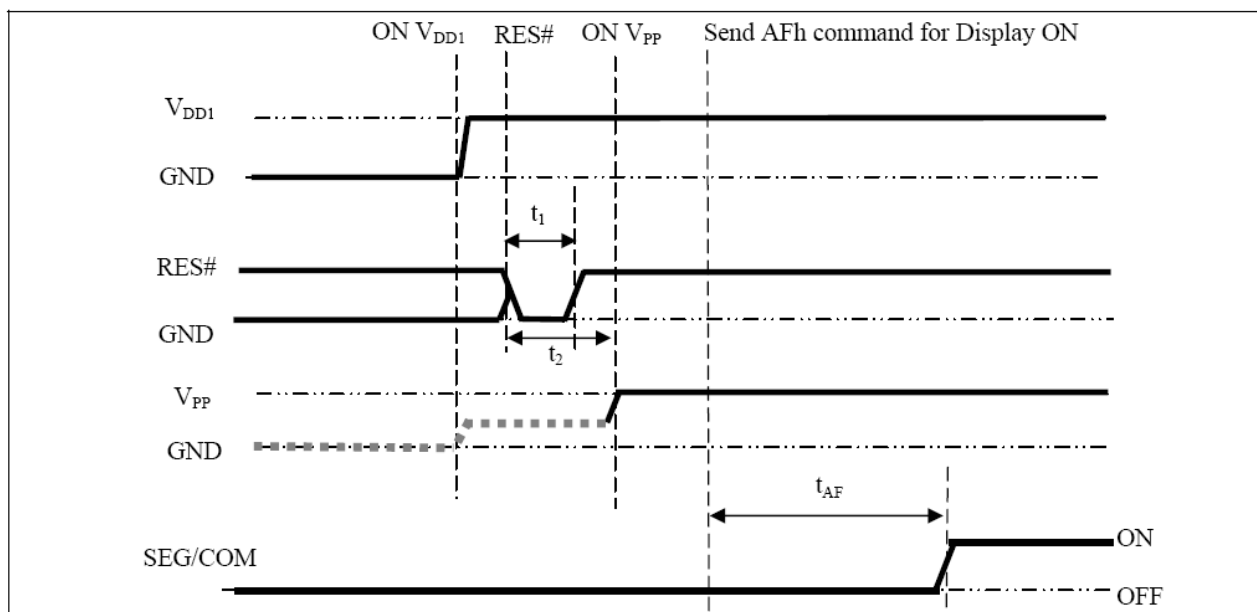
| Symbol | Parameter | Min | Typ | Max | Unit | Condition |
|-----------------------|---|----------|-----|-----|------|-----------|
| f _{SCL} | SCL clock frequency | DC | - | 400 | kHz | |
| T _{LOW} | SCL clock Low pulse width | 1.3 | - | - | uS | |
| T _{HIGH} | SCL clock H pulse width | 0.6 | - | - | 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+0.1Cb | - | 300 | nS | |
| T _F | SCL , SDA fall time | 20+0.1Cb | - | 300 | nS | |
| Cb | 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 | |

9 Functional Specification and Application Circuit

9.1 Power ON and Power OFF Sequence

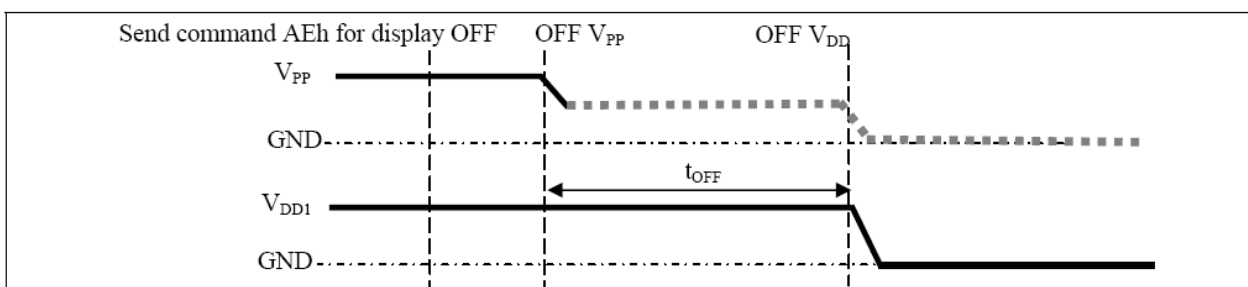
Power ON Sequence:

1. Power ON VDD1.
2. After VDD1 become stable, set RES pin LOW (logic low) for at least 5us (t_1) and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 5us (t_2). Then Power ON VPP. (1)
4. After VPP become stable, send command AFh for display ON. SEG/COM will be ON after 150ms(t_{AF}).



Power OFF Sequence:

1. Send command AEh for display OFF.
2. Power OFF VPP.(1), (2)
3. Wait for t_{OFF} . Power OFF VDD1. (where Minimum t_{OFF} =0ms, Typical t_{OFF} =100ms)



Note:

- (1) Since an ESD protection circuit is connected between VDD1 and VPP, VPP becomes lower than VDD1 whenever VDD1 is ON and VPP is OFF as shown in the dotted line of VPP in above figures.
- (2). VPP should be kept float (disable) when it is OFF.

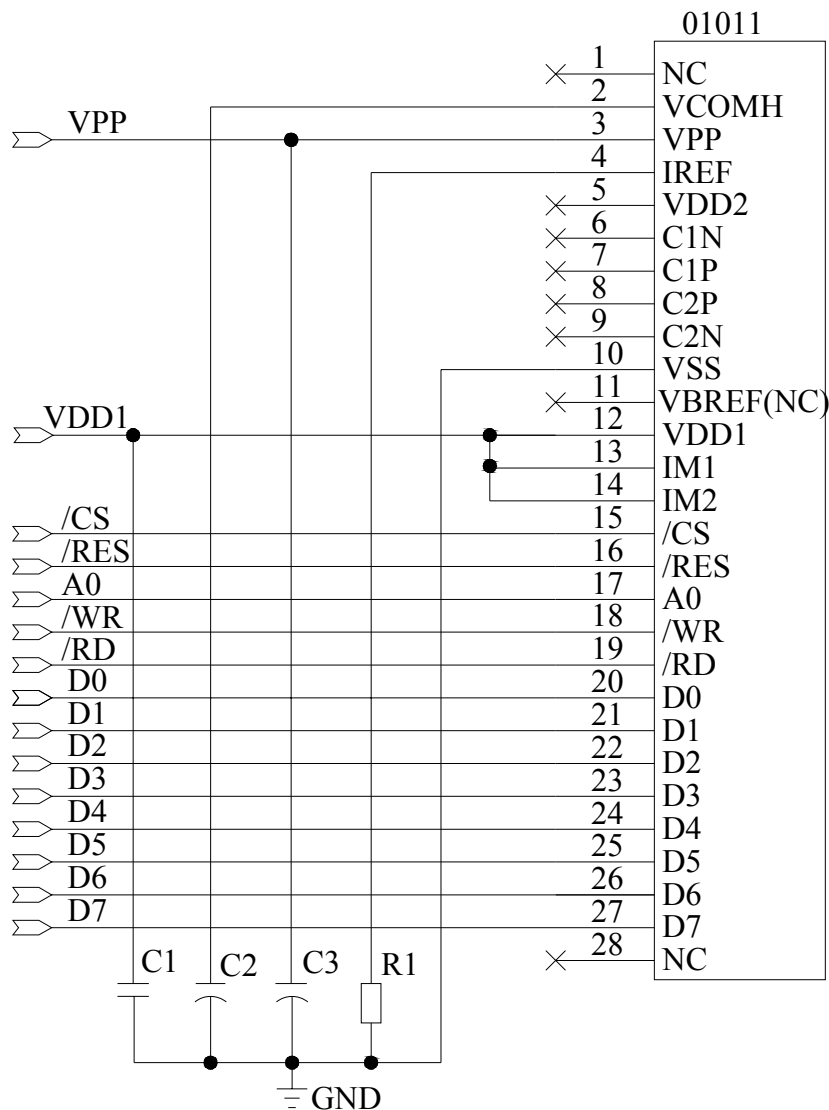
9.2 Application Circuit

9.2.1 Under external VPP Mode, the charge Pump Setting (ADh) must be set as follow:

ADh: Charge Pump Setting

8Ah: Disable Charge Pump

(1). The configuration for 8080-parallel interface mode, external VPP is shown in the following diagram:



Pin connected to MCU interface: D[0:7], /RD, /WR, A0, /RES, /CS

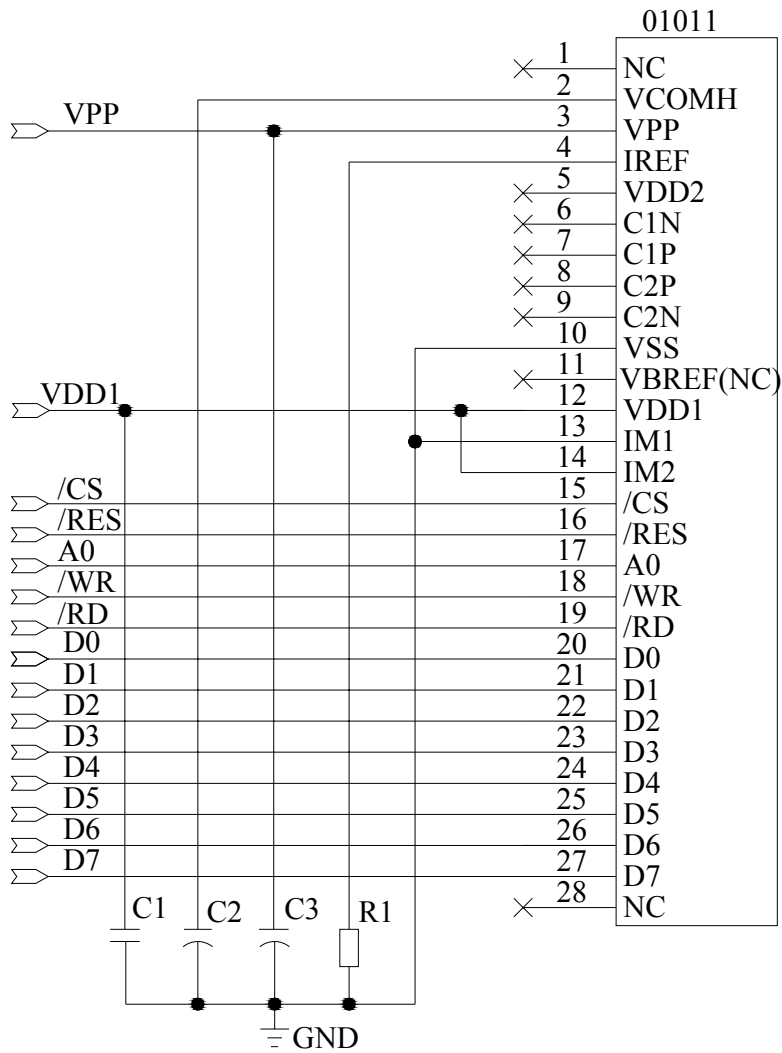
Recommended components

C1: 1uF-0603-X7R±10%.RoHS

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

R1: 0603 1/10W +/-5% 910K ohm.RoHS

(2).The configuration for 6800-parallel interface mode, external VPP is shown in the following diagram:



Pin connected to MCU interface: D[0:7],/RD, /WR, A0,/RES , /CS

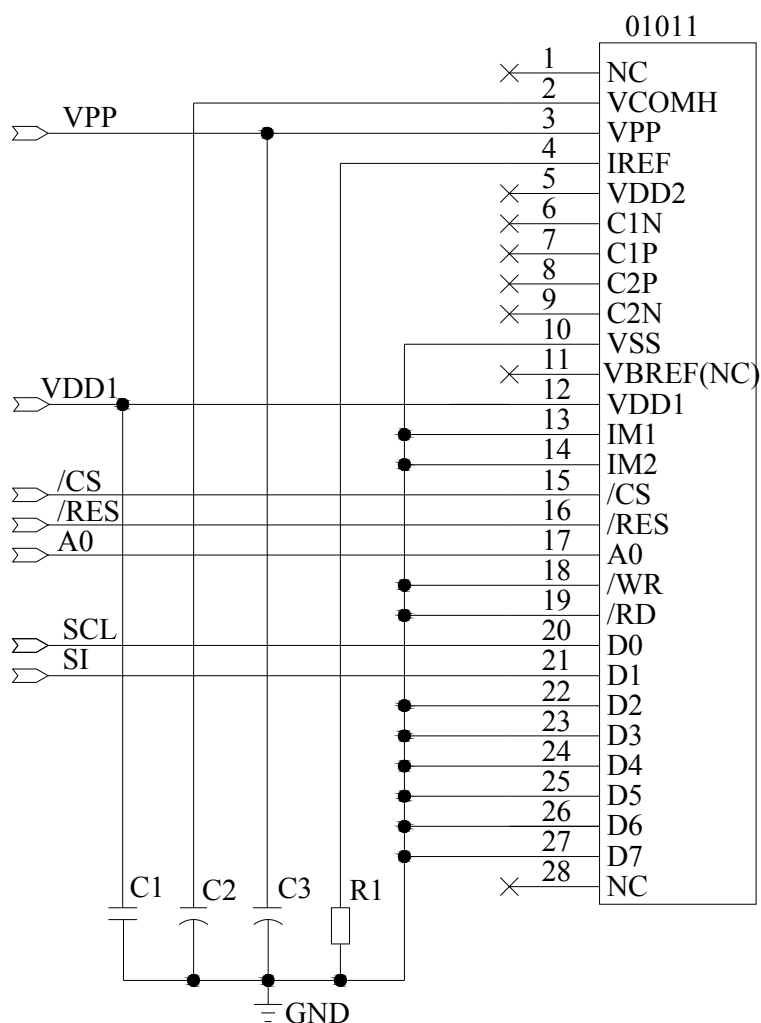
Recommended components

C1: 1uF-0603-X7R±10%.RoHS

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

R1: 0603 1/10W +/-5% 910K ohm.RoHS

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



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

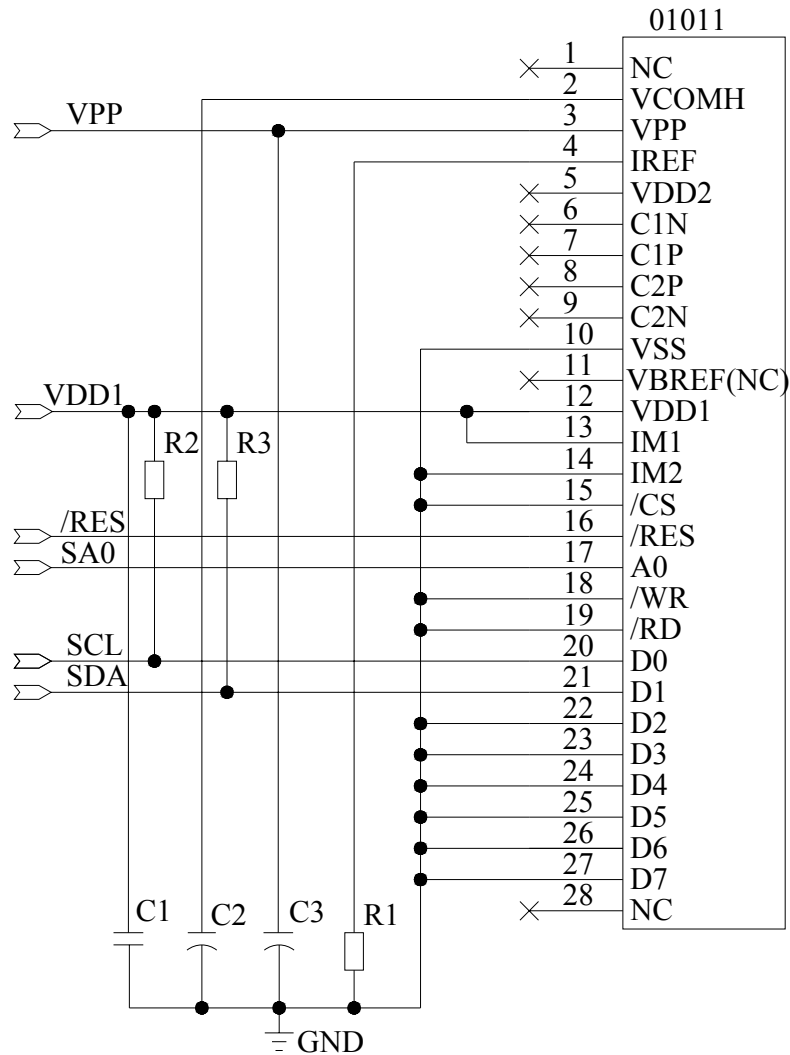
Recommended components

C1 : 1uF-0603-X7R±10%.RoHS

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

R1: 0603 1/10W +/-5% 910K ohm.RoHS

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



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

Recommended components

C1: 1uF-0603-X7R±10%.RoHS

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

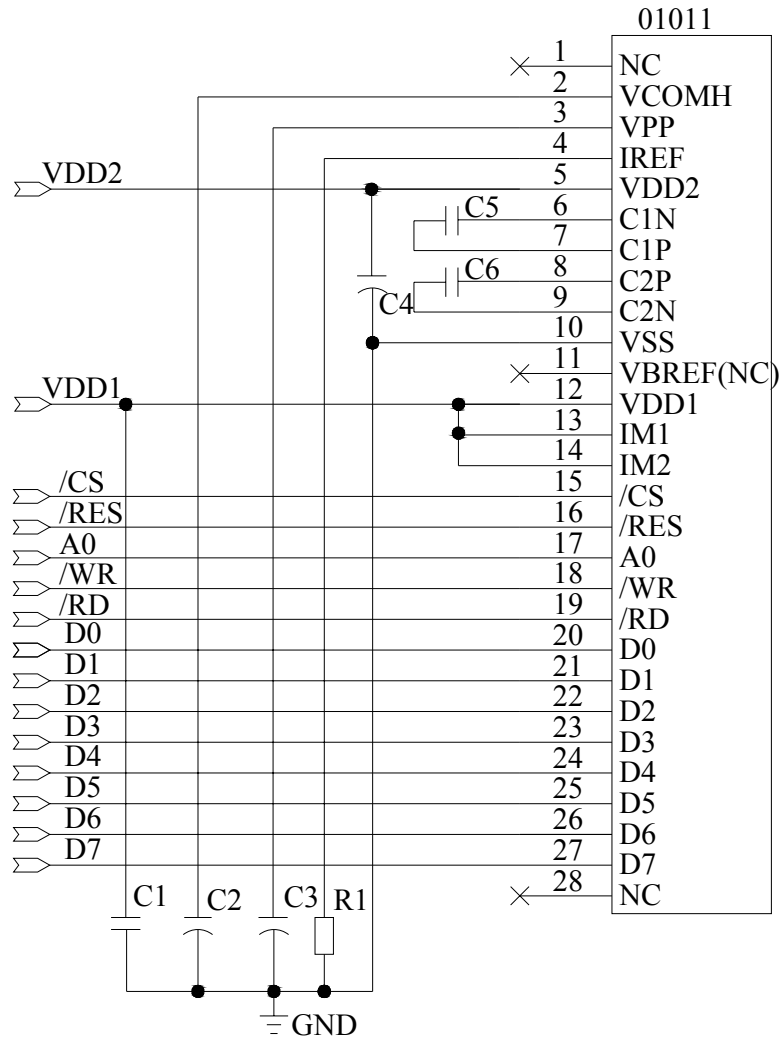
R1: 0603 1/10W +/-5% 910K ohm.RoHS

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

9.2.2 Under Internal DC/DC Mode, the charge Pump Setting (ADh) must be set as follow:

ADh: Charge Pump Setting 8Bh: Enable Charge Pump

The configuration for 8080-parallel interface mode, VPP Generated by Internal DC/DC Circuit is shown in the following diagram:



Pin connected to MCU interface: D[0:7], /RD, /WR, A0, /RES, /CS

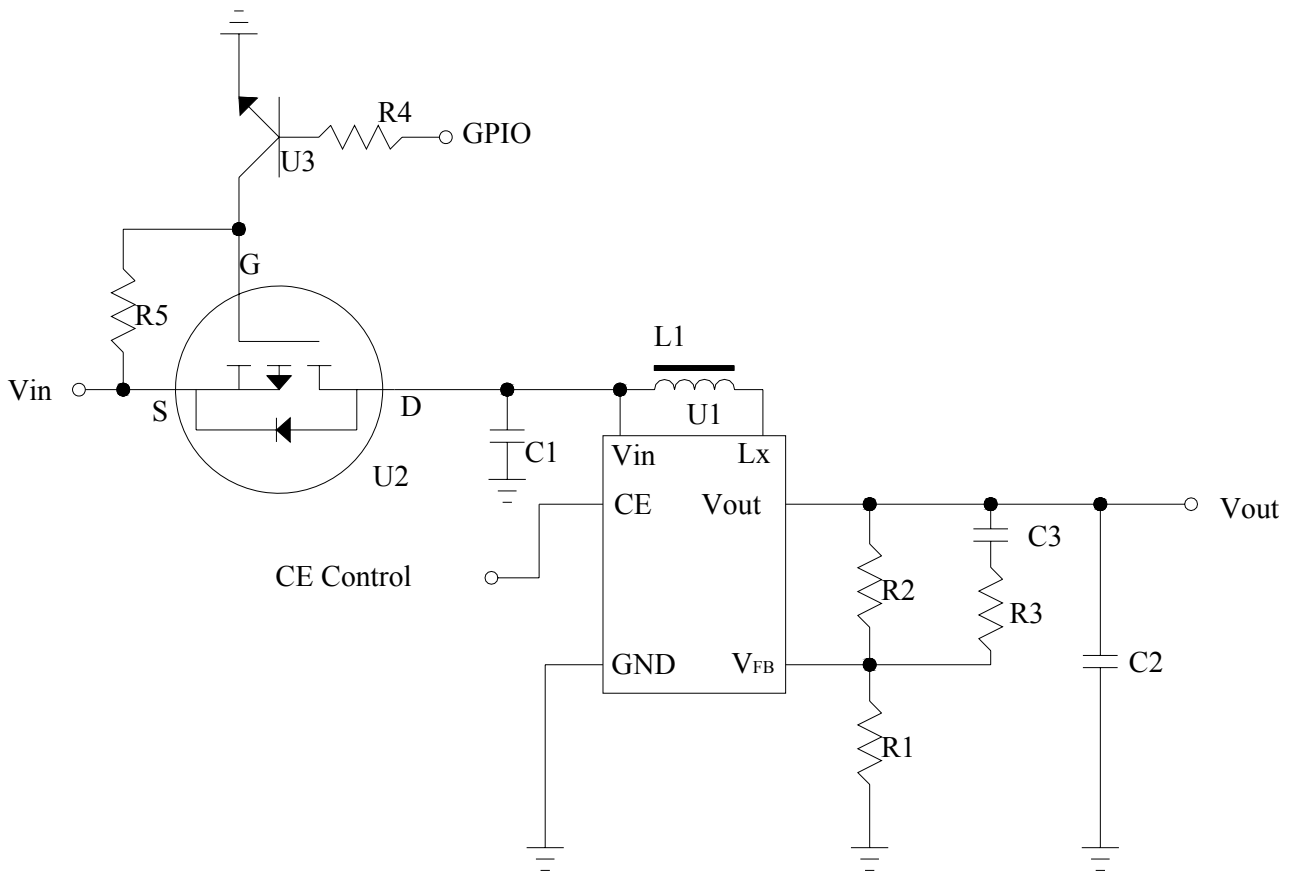
Recommended components

C1, C5, C6: 1uF-0603-X7R±10%.RoHS

C2,C3,C4 : 4.7μF/25V.RoHS (Tantalum Capacitors)

R1: 0603 1/10W +/-5% 910K ohm.RoHS

9.3 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 |


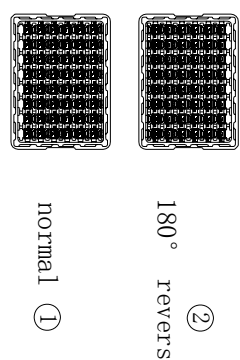
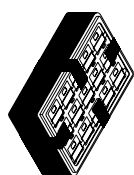
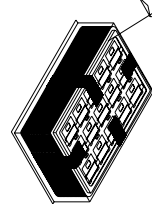
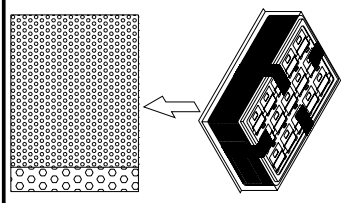
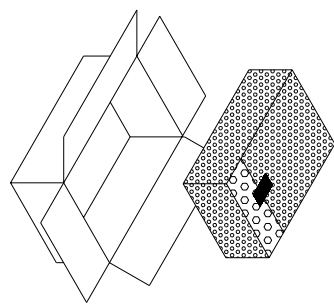
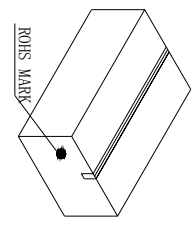
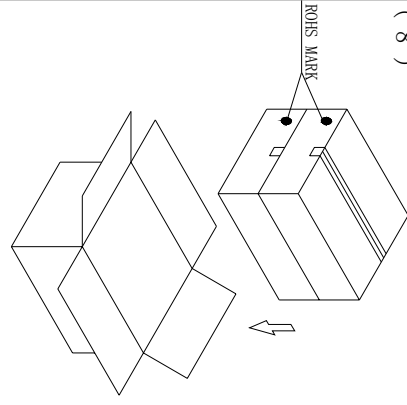
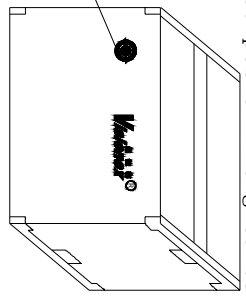

9.4 Display Control Instruction

Refer to SH1106G IC Specification.

9.5 Recommended Software Initialization


```
void Init_IC()
{
    Write_Command(0xAE);    //Display Off
    Write_Command(0xd5);    //Divide Ratio/Oscillator Frequency Mode Set
    Write_Command(0xC1);    //
    Write_Command(0xA8);    //Multiplex Ration Mode Set
    Write_Command(0x23);
    Write_Command(0xD3);    //Display Offset Mode Set
    Write_Command(0x0e);
    Write_Command(0x40);    //Set Display Start Line
    Write_Command(0xAD);    //DC-DC Control Mode Set
    Write_Command(0x8b);    //DC-DC ON/OFF Mode Set
    Write_Command(0x33);    //Set Pump voltage value
    Write_Command(0xA1);    //Set Segment Re-map
    Write_Command(0xC8);    //Set Common Output Scan Direction:
    Write_Command(0xDA);    //Common Pads Hardware Configuration Mode Set
    Write_Command(0x12);
    Write_Command(0x81);    //The Contrast Control Mode Set
    Write_Command(0xa3);    //
    Write_Command(0xD9);    //Pre-charge Period Mode Set:
    Write_Command(0x1f);
    Write_Command(0xDB);    //VCOM Deselect Level Mode Set
    Write_Command(0x40);    //
    Write_Command(0xA4);    //Set Entire Display OFF/ON
    Write_Command(0xA6);    //Set Normal/Reverse Display
    Write_Command(0xAF);    //Display On
}
```


10 Package Specification

| Controlled Seal | | Packing Process (1)~(9) | | | | | | |
|--|--|--|--|---|---|---|--|--|
| (1) Tray Type:00960-MT6-A | (2) | (3) order①、②、①、② fix trays with tape 1250 pcs of 1 small carton 1 tray contain 50 pcs 25 contained trays, 1 empty tray | (4) Use vacuum bag to package the tray and add 5 bags of desiccant into the vacuum bag *5 | (5) After tray be packaged, wrap the package in a bubble bag and seal with scotch tape. | (6) | (7) | (8) | (9) 50 contained trays, 2 empty trays, Package quantity products: 2500 pcs of 1 big carton |
|  |  |  |  |  |  |  |  |  |
| <p>NOTE:1、The inner carton and master carton must be sealed with adhesive tape.</p> <p>2、Fill up the gap with tray.</p> <p>3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at .</p> | | | | | | | | |

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°C,240hrs | 4 |
| 2 | Low Temperature (Non-operation) | -40°C,240hrs | 4 |
| 3 | High Temperature (Operation) | 70°C,240hrs | 4 |
| 4 | Low Temperature (Operation) | -40°C,240hrs | 4 |
| 5 | High Temperature / High Humidity (Operation) | 60°C,90%RH,240hrs | 4 |
| 6 | Thermal shock (Non-operation) | -40°C~85°C (-40°C/30min;transit/3min;85°C/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 $\pm 3^{\circ}\text{C}$, and the tolerance of relative humidity is $\pm 5\%$.

Evaluation criteria

1. The function test is OK.
2. No observable defects.
3. Luminance: $\geq 50\%$ of initial value.
4. Current consumption: within $\pm 50\%$ of initial value.

11.2 Lifetime

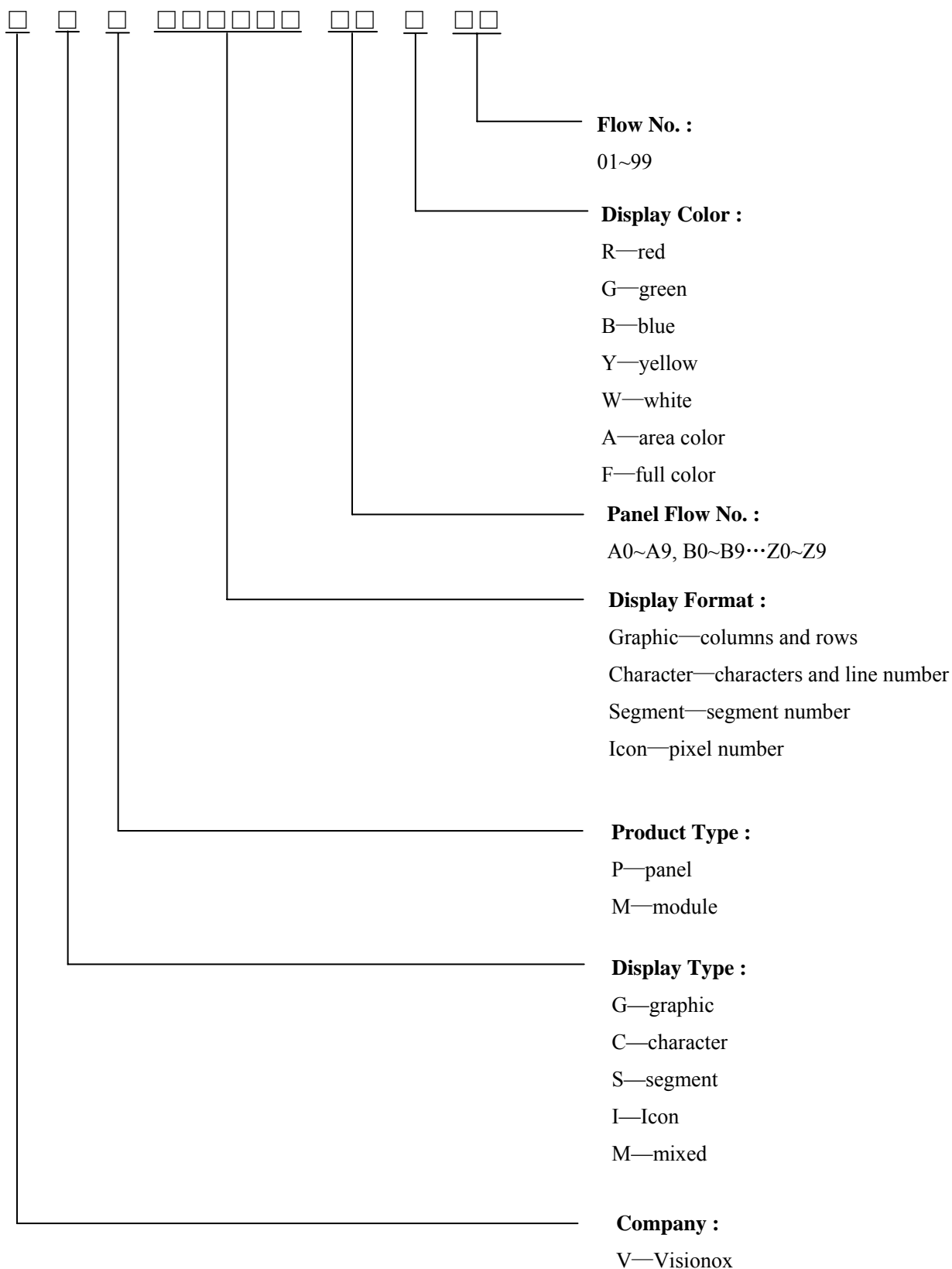
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

| ITEM | MIN | MAX | UNIT | CONDITION |
|---------------------|--------|-----|------|---|
| Operation Life Time | 10,000 | - | hrs | 150 cd/m ² , 50% alternating checkerboard 22 \pm 3°C; 55 \pm 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 \pm 3°C; 55 \pm 15% RH.

12 Illustration of OLED Product Name



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: $22 \pm 3^{\circ}\text{C}$

Humidity: $55 \pm 15\% \text{R.H}$

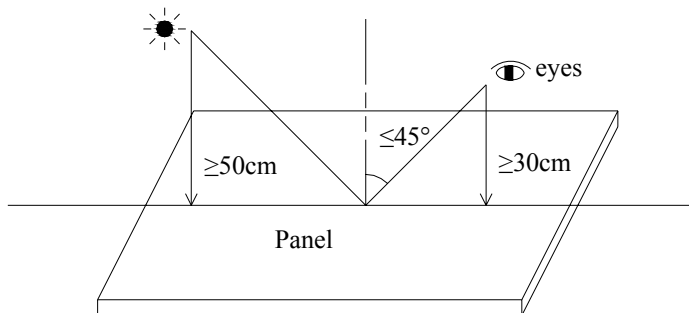
Fluorescent Lamp: 30W

Distance between the Panel & Lamp: $\geq 50\text{cm}$

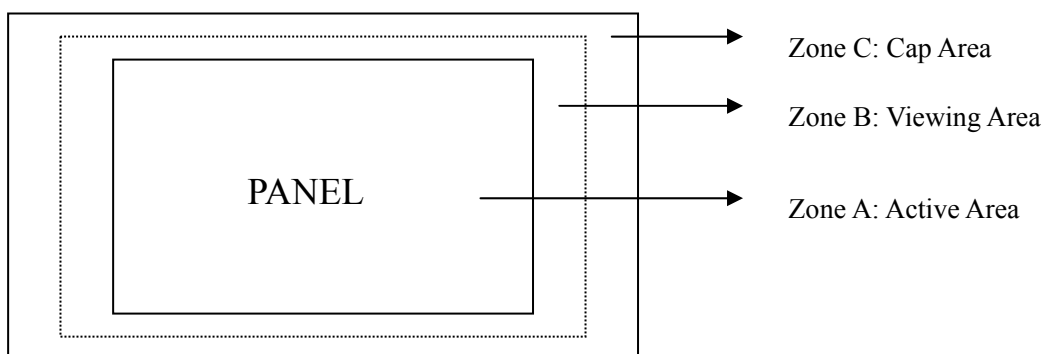
Distance between the Panel & Eyes: $\geq 30\text{cm}$

Viewing angle from the vertical in each direction: $\leq 45^{\circ}$

(See the sketch below)

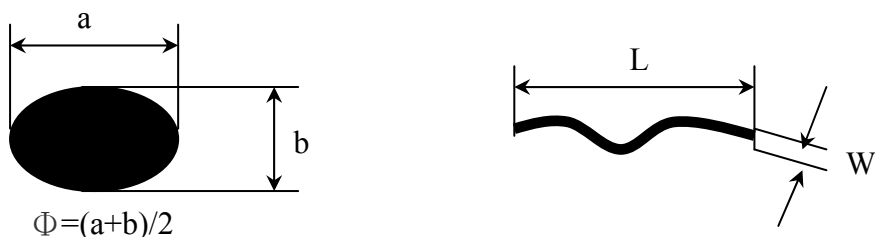


13.3 Quality Assurance Zones



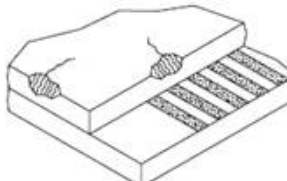
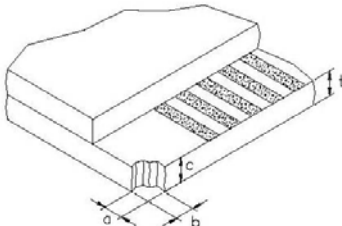
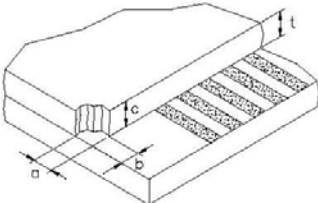
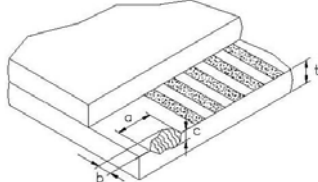
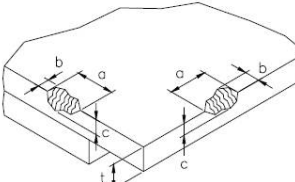
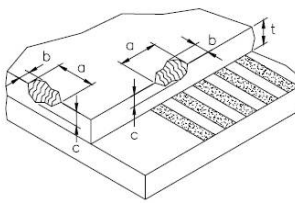
13.4 Inspection Standard

Definition of Φ & L & W (Unit: mm)



I . Appearance Defects

| NO. | ITEM | CRITERIA | | | | CLASSIFICATION | | | | | | | | | | | | | | | | |
|-------------------------|--|--|--------|--|--|-----------------------|-------------------|-------------------|-----------------|----------|------------------|-----------------------|--------|-------------------------|--------------|----------------------|--------------|-------|------------|-----|---|-------|
| 1 | Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer | <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>$\Phi \leq 0.15$</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.15 < \Phi \leq 0.30$</td><td>3</td></tr><tr><td>$\Phi > 0.30$</td><td>0</td></tr></table> | | | | Average Diameter (mm) | Acceptable Number | | Zone A,B | Zone C | $\Phi \leq 0.15$ | Ignore | Ignore | $0.15 < \Phi \leq 0.30$ | 3 | $\Phi > 0.30$ | 0 | Minor | | | | |
| Average Diameter (mm) | Acceptable Number | | | | | | | | | | | | | | | | | | | | | |
| | Zone A,B | Zone C | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.15$ | Ignore | Ignore | | | | | | | | | | | | | | | | | | | | |
| $0.15 < \Phi \leq 0.30$ | 3 | | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.30$ | 0 | | | | | | | | | | | | | | | | | | | | | |
| 2 | Scratch/line on the glass/Polarizer | <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>$W \leq 0.03$</td><td>---</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td>$0.03 < W \leq 0.08$</td><td>$L \leq 5.0$</td><td>3</td></tr><tr><td>$W > 0.08$</td><td>---</td><td>0</td></tr></table> | | | | Width (mm) | Length (mm) | Acceptable Number | | Zone A,B | Zone C | $W \leq 0.03$ | --- | Ignore | Ignore | $0.03 < W \leq 0.08$ | $L \leq 5.0$ | 3 | $W > 0.08$ | --- | 0 | Minor |
| Width (mm) | Length (mm) | Acceptable Number | | | | | | | | | | | | | | | | | | | | |
| | | Zone A,B | Zone C | | | | | | | | | | | | | | | | | | | |
| $W \leq 0.03$ | --- | Ignore | Ignore | | | | | | | | | | | | | | | | | | | |
| $0.03 < W \leq 0.08$ | $L \leq 5.0$ | 3 | | | | | | | | | | | | | | | | | | | | |
| $W > 0.08$ | --- | 0 | | | | | | | | | | | | | | | | | | | | |
| 3 | Polarizer Bubble | <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>$\Phi > 0.5$</td><td>0</td><td rowspan="3">Ignore</td></tr><tr><td>$0.2 < \Phi \leq 0.5$</td><td>3</td></tr><tr><td>$\Phi \leq 0.2$</td><td>Ignore</td></tr></table> | | | | Average Diameter (mm) | Acceptable Number | | Zone A,B | Zone C | $\Phi > 0.5$ | 0 | Ignore | $0.2 < \Phi \leq 0.5$ | 3 | $\Phi \leq 0.2$ | Ignore | Minor | | | | |
| Average Diameter (mm) | Acceptable Number | | | | | | | | | | | | | | | | | | | | | |
| | Zone A,B | Zone C | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 0.5$ | 0 | Ignore | | | | | | | | | | | | | | | | | | | | |
| $0.2 < \Phi \leq 0.5$ | 3 | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.2$ | Ignore | | | | | | | | | | | | | | | | | | | | | |
| 4 | Any Dirt & Scratch on Polarizer's Protective Film | Ignore for not affect the polarizer. | | | | Minor | | | | | | | | | | | | | | | | |
| 5 | Any Dirt on Cap Glass | <table><tr><td>Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>$\Phi \leq 0.5$</td><td colspan="2">Ignore</td></tr><tr><td>$0.5 < \Phi \leq 1.0$</td><td colspan="2">3</td></tr><tr><td>$\Phi > 1.0$</td><td colspan="2">0</td></tr></table> | | | | Average Diameter (mm) | Acceptable Number | | $\Phi \leq 0.5$ | Ignore | | $0.5 < \Phi \leq 1.0$ | 3 | | $\Phi > 1.0$ | 0 | | Minor | | | | |
| Average Diameter (mm) | Acceptable Number | | | | | | | | | | | | | | | | | | | | | |
| $\Phi \leq 0.5$ | Ignore | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < \Phi \leq 1.0$ | 3 | | | | | | | | | | | | | | | | | | | | | |
| $\Phi > 1.0$ | 0 | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|----|--------------------------|---|-------|
| 6 | Glass Crack |  <p>Propagation crack is not acceptable.</p> | Major |
| 7 | Corner Chip |  <p> t = Glass thickness Accept $a \leq 2.0\text{mm}$ or $b \leq 2.0\text{mm}$, $c \leq t$ </p> | Minor |
| 8 | Corner Chip on Cap Glass |  <p> t = Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$ </p> | Minor |
| 9 | Chip on Contact Pad |  <p> t = Glass thickness Accept $a \leq 3.0\text{mm}$ or $b \leq 0.8\text{mm}$, $c \leq t$ (on the contact pin) $a \leq 3.0\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$ (outside of the contact pin) </p> | Minor |
| 10 | Chip on Face of Display |  <p> t = Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$ </p> | Minor |
| 11 | Chip on Cap Glass |  <p> t = Glass thickness Accept $a \leq 3.0\text{mm}$ or $b \leq 3.0\text{mm}$, $c \leq t/2$ $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $t/2 \leq c \leq t$ </p> | 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

| NO. | ITEM | CRITERIA | | | CLASSIFICATION |
|-----|--|--------------------------|------------------|--------|----------------|
| 1 | Black/White spot Dirty spot Foreign matter | Average Diameter (mm) | Pieces Permitted | | Minor |
| | | | Zone A,B | Zone C | |
| | | $\Phi \leq 0.10$ | Ignore | Ignore | |
| | | $0.10 < \Phi \leq 0.20$ | 3 | | |
| | | $\Phi > 0.20$ | 0 | | |
| 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 |

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°C 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°C and 35°C 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

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