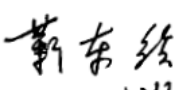
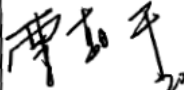

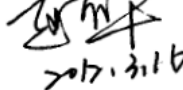


# Product Specification

**Product Name:** VGM128032A7W01

**Product Code:** M01000

|                             |
|-----------------------------|
| <b>Customer</b>             |
|                             |
| <b>Approved by Customer</b> |
|                             |
| <b>Approved    Date:</b>    |

| Designed By  | Checked By   | Approved By   |  |
|--|--|---|--|
|  |  | R&D   | QA   |
| <br>2012.3.15 | <br>2012.3.16 | <br>2012.3.16 | <br>2012.3.16 |

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## 1 Overview

VGM128032A7W01 is a monochrome OLED display module with 128×32 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.

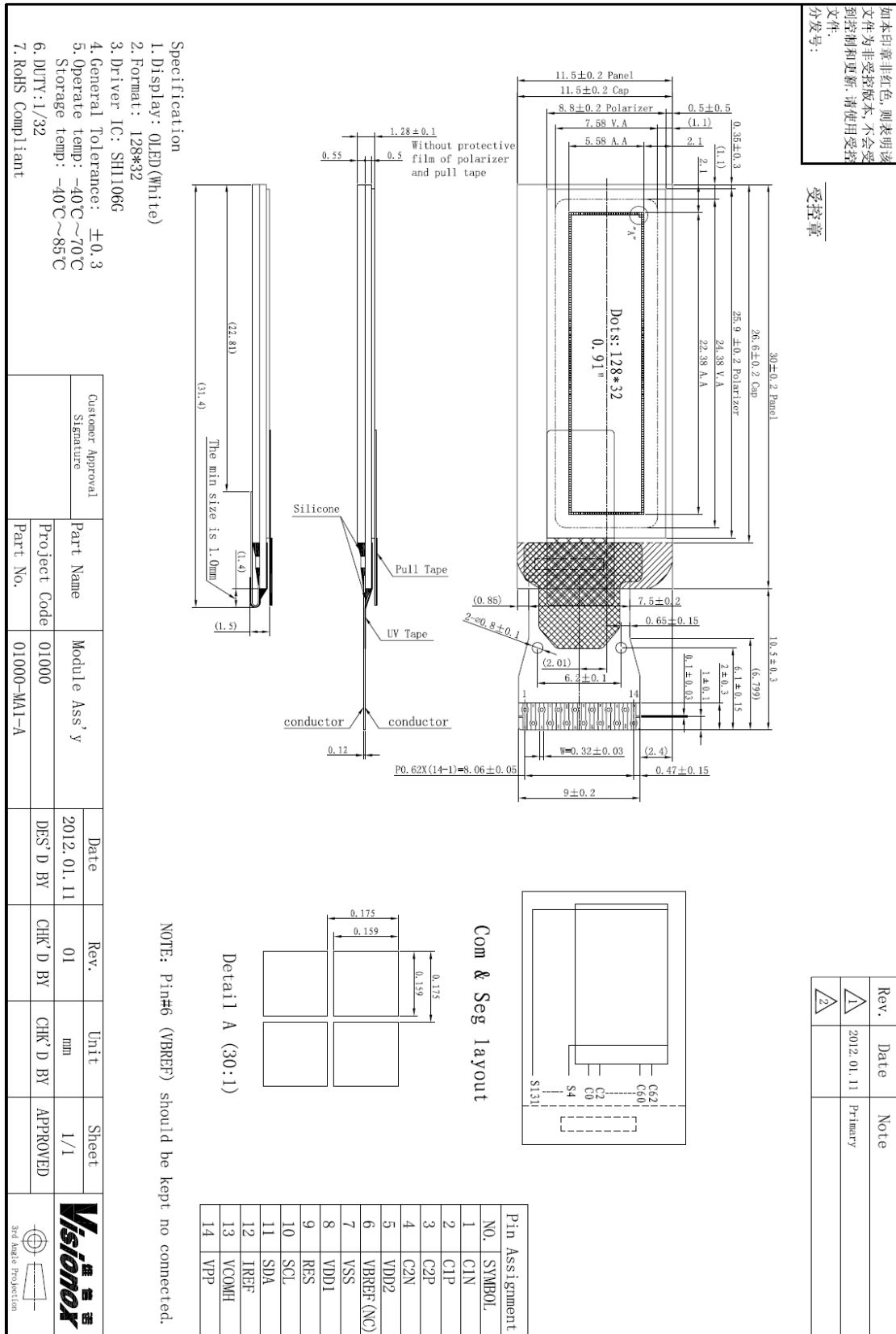
## 2 Features

- Display Color: White
- Dot Matrix: 128×32
- Driver IC: SH1106G
- Interface: I<sup>2</sup>C
- Wide range of operating temperature: -40°C to 70°C

## 3 Mechanical Data

| NO. | ITEM              | SPECIFICATION            | UNIT            |
|-----|-------------------|--------------------------|-----------------|
| 1   | Dot Matrix        | 128(W)×32(H)             | -               |
| 2   | Dot Size          | 0.159(W)×0.159(H)        | mm <sup>2</sup> |
| 3   | Dot Pitch         | 0.175(W)×0.175(H)        | mm <sup>2</sup> |
| 4   | Aperture Rate     | 82                       | %               |
| 5   | Active Area       | 22.38 (W)×5.58 (H)       | mm <sup>2</sup> |
| 6   | Panel Size        | 30(W)×11.5(H) ×1.05(T)   | mm <sup>3</sup> |
| 7   | Module Size       | 40.5(W)×11.5(H) ×1.28(T) | mm <sup>3</sup> |
| 8   | Diagonal A/A Size | 0.91                     | inch            |
| 9   | Module Weight     | 0.88±10%                 | gram            |

## 4 Mechanical Drawing

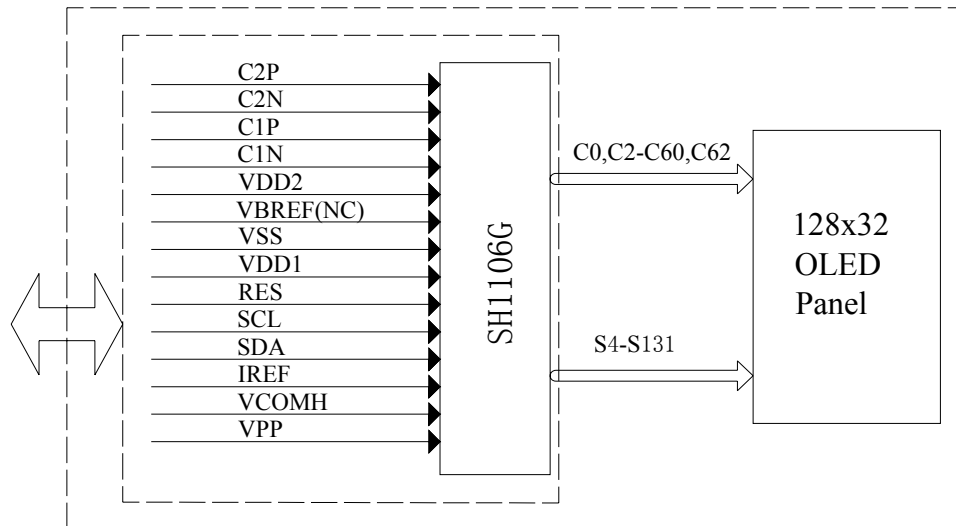


## 5 Module Interface

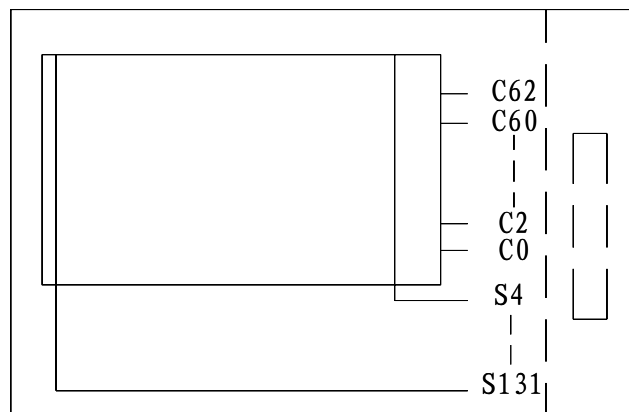
| PIN NO. | PIN NAME  | DESCRIPTION   |
|---------|-----------|---|
| 1       | C1N       | Connect to charge pump capacitor.   |
| 2       | C1P       | These pins are not used and should be disconnected when Vpp is supplied externally.   |
| 3       | C2P       | Connect to charge pump capacitor.   |
| 4       | C2N       | These pins are not used and should be disconnected when Vpp is supplied externally.   |
| 5       | VDD2      | 3.0 – 4.2V power supply pad for Power supply for charge pump circuit.<br>This pin can be disconnected or connect to VDD1 when VPP is supplied externally. |
| 6       | VBREF(NC) | No Connection.  |
| 7       | VSS       | Ground.   |
| 8       | VDD1      | Power supply input: 1.65 - 3.5V   |
| 9       | RES       | This is a reset signal input pad. When RES is set to “L”, the settings are initialized.<br>The reset operation is performed by the RES signal level.      |
| 10      | SCL       | serial clock input.   |
| 11      | SDA       | serial data input.  |
| 12      | IREF      | This is a segment current reference pad. A resistor should be connected between this pad and VSS. Set the current at 10 $\mu$ A.                          |
| 13      | VCOMH     | This is a pad for the voltage output high level for common signals.<br>A capacitor should be connected between this pad and VSS.                          |
| 14      | VPP       | OLED panel power supply. Generated by internal charge pump.<br>Connect to capacitor. It could be supplied externally.                                     |

## 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            |
|------------------------|-----------|------|------|------|-------------------|
| Supply Voltage         | $V_{DD1}$ | -0.3 | 3.6  | V    | IC maximum rating |
|                        | $V_{DD2}$ | -0.3 | 4.3  | V    | IC maximum rating |
| OLED Operating Voltage | $V_{PP}$  | 0    | 13.5 | 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  | $V_{DD1}$ | 22±3°C,<br>55±15%R.H | 1.65                 | 2.8 | 3.5                  | V    |
| OLED Driver Supply Voltage<br>(Supplied Externally)         | $V_{PP}$  | 22±3°C,<br>55±15%R.H | 7.5                  | 8.0 | 8.5                  | V    |
| Supply Voltage for DC/DC                                    | $V_{DD2}$ | 22±3°C,<br>55±15%R.H | 3.0                  | -   | 4.2                  | V    |
| OLED Driver Supply Voltage<br>(Generated by Internal DC/DC) | $V_{PP}$  | 22±3°C,<br>55±15%R.H | 7.5                  | 8.0 | 8.5                  | V    |
| High-level Input Voltage                                    | $V_{IHC}$ | -                    | $0.8 \times V_{DD1}$ | -   | $V_{DD1}$            | V    |
| Low-level Input Voltage                                     | $V_{ILC}$ | -                    | $V_{SS}$             | -   | $0.2 \times V_{DD1}$ | V    |
| High-level Output Voltage                                   | $V_{OHC}$ | -                    | $0.8 \times V_{DD1}$ | -   | $V_{DD1}$            | V    |
| Low-level Output Voltage                                    | $V_{OLC}$ | -                    | $V_{SS}$             | -   | $0.2 \times V_{DD1}$ | V    |

Note : The  $V_{PP}$  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<br>(With Polarizer)                               | L <sub>br</sub> | All pixels ON(1)(2)   | 120     | 150  | -     | cd/m <sup>2</sup> |
| Normal Mode Power<br>Consumption   | Pt              | All pixels ON(1)<br>(V <sub>PP</sub> generated by internal DC/DC) | -       | 81.4 | 98.05 | mW                |
| Normal Mode Power<br>Consumption   | Pt              | All pixels ON(2)<br>(V <sub>PP</sub> Supply Externally)           | -       | -    | -     | mW                |
| Sleep mode current<br>consumption in V <sub>DD1</sub> & V <sub>DD2</sub> | I <sub>SP</sub> | During sleep, TA = +25°C,<br>VDD1 = 3V, VDD2 = 3V.                | -       | -    | 5     | uA                |
| Sleep mode current<br>consumption in VPP                                 |                 | During sleep, TA = +25°C,<br>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 : 0x33
- Frame rate : 105Hz
- Duty setting : 1/32

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

- Driving voltage : 8.0V(VPP Supplied Externally).
- Contrast setting : 0x33
- Frame rate : 105Hz
- Duty setting : 1/32

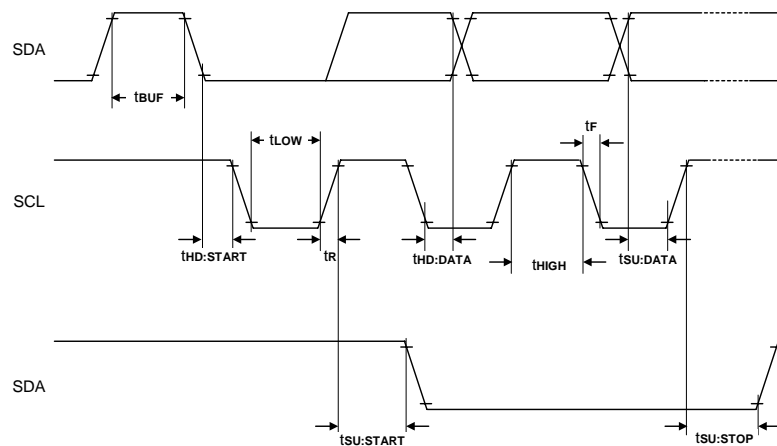
### 8.3 AC Electrical Characteristics

#### I<sup>2</sup>C Interface Timing Characteristics

(VDD - VSS = 1.65V to 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   |           |

I<sup>2</sup>C interface characteristics

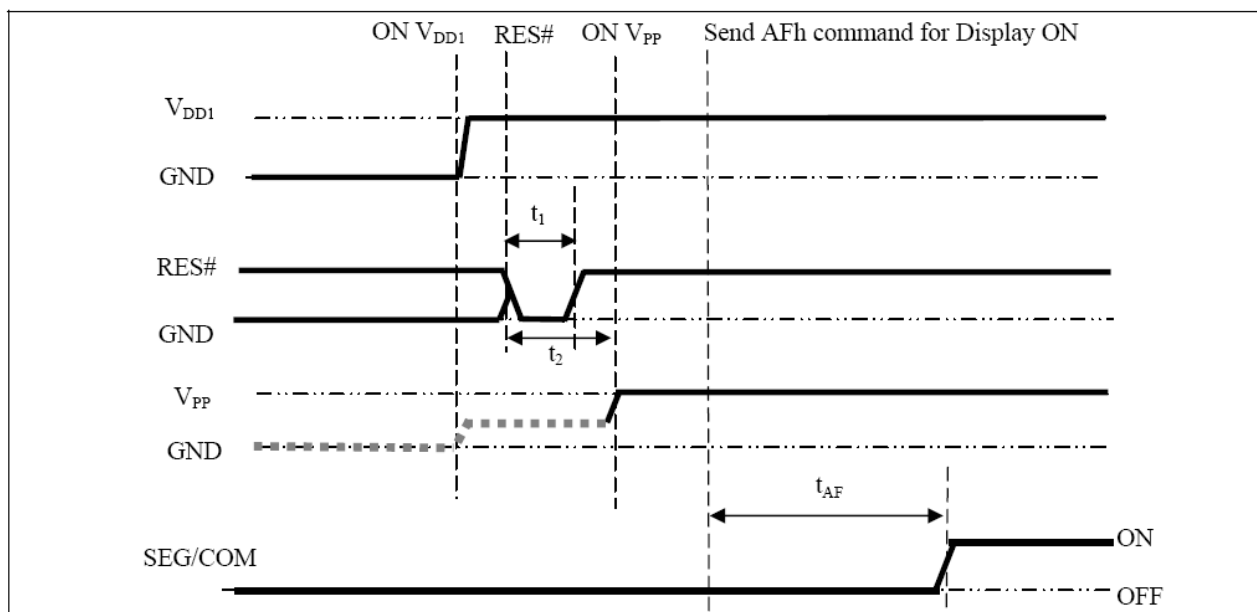


## 9 Functional Specification and Application Circuit

### 9.1 Power ON and Power OFF Sequence

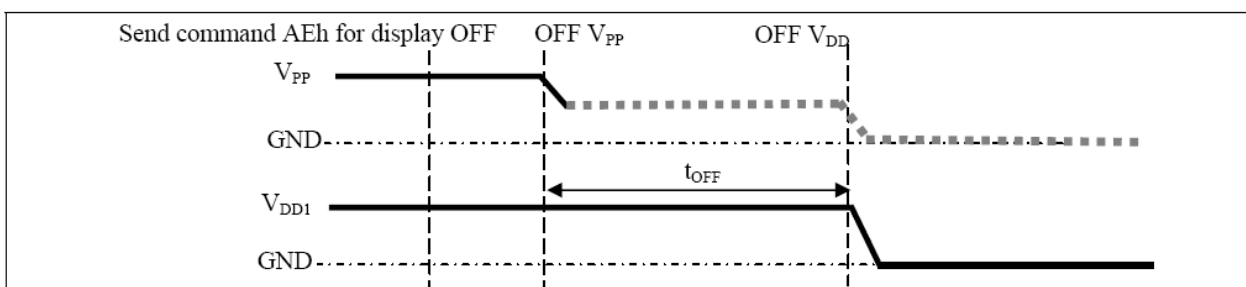
#### Power ON Sequence:

1. Power ON  $V_{DD1}$ .
2. After  $V_{DD1}$  become stable, set RES pin LOW (logic low) for at least 5 $\mu$ s ( $t_1$ ) and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 5 $\mu$ s ( $t_2$ ). Then Power ON  $V_{PP}$ .<sup>(1)</sup>
4. After  $V_{PP}$  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  $V_{PP}$ .<sup>(1), (2)</sup>
3. Wait for  $t_{OFF}$ . Power OFF  $V_{DD1}$ . (where Minimum  $t_{OFF}$ =0ms, Typical  $t_{OFF}$ =100ms)

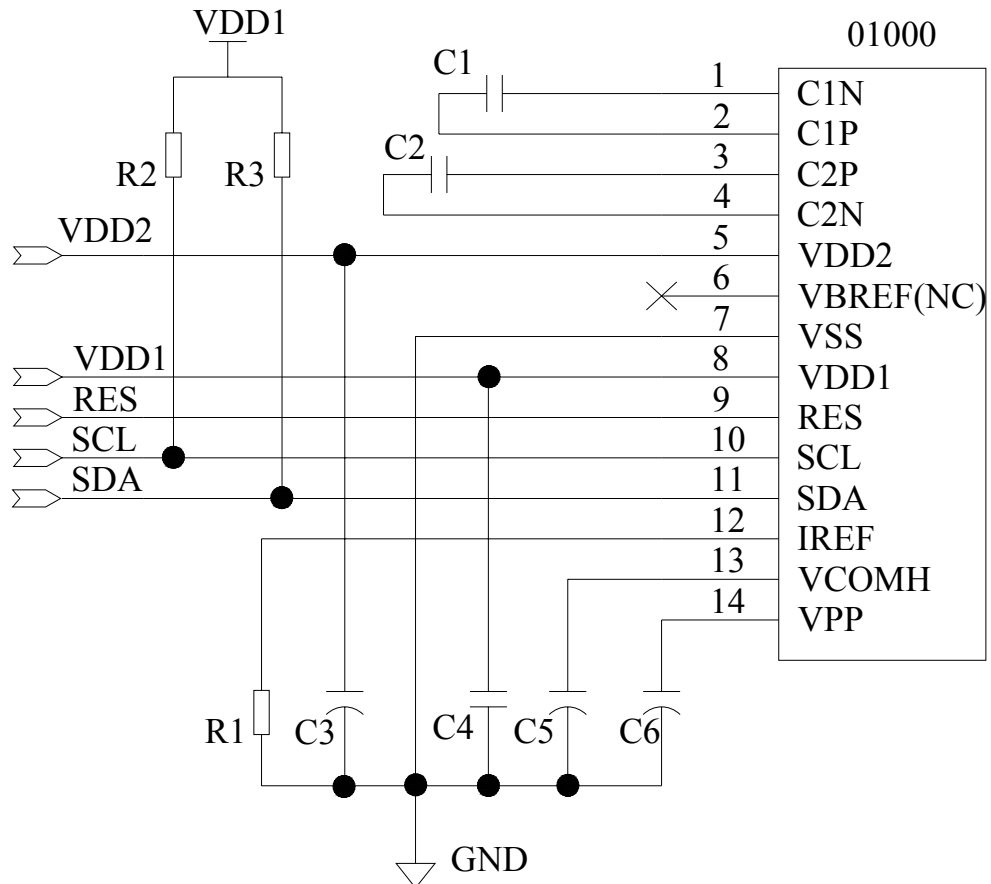


Note:

- (1) Since an ESD protection circuit is connected between  $V_{DD1}$  and  $V_{PP}$ ,  $V_{PP}$  becomes lower than  $V_{DD1}$  whenever  $V_{DD1}$  is ON and  $V_{PP}$  is OFF as shown in the dotted line of VPP in above figures.
- (2)  $V_{PP}$  should be kept float (disable) when it is OFF.

## 9.2 Application Circuit

1) The configuration for IIC interface mode, VPP Generated by Internal DC/DC Circuit is shown in the following diagram:



Pin connected to MCU interface: SCL, SDA, RES

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

ADh: Charge Pump Setting

8Bh; Enable Charge Pump

### Recommended components

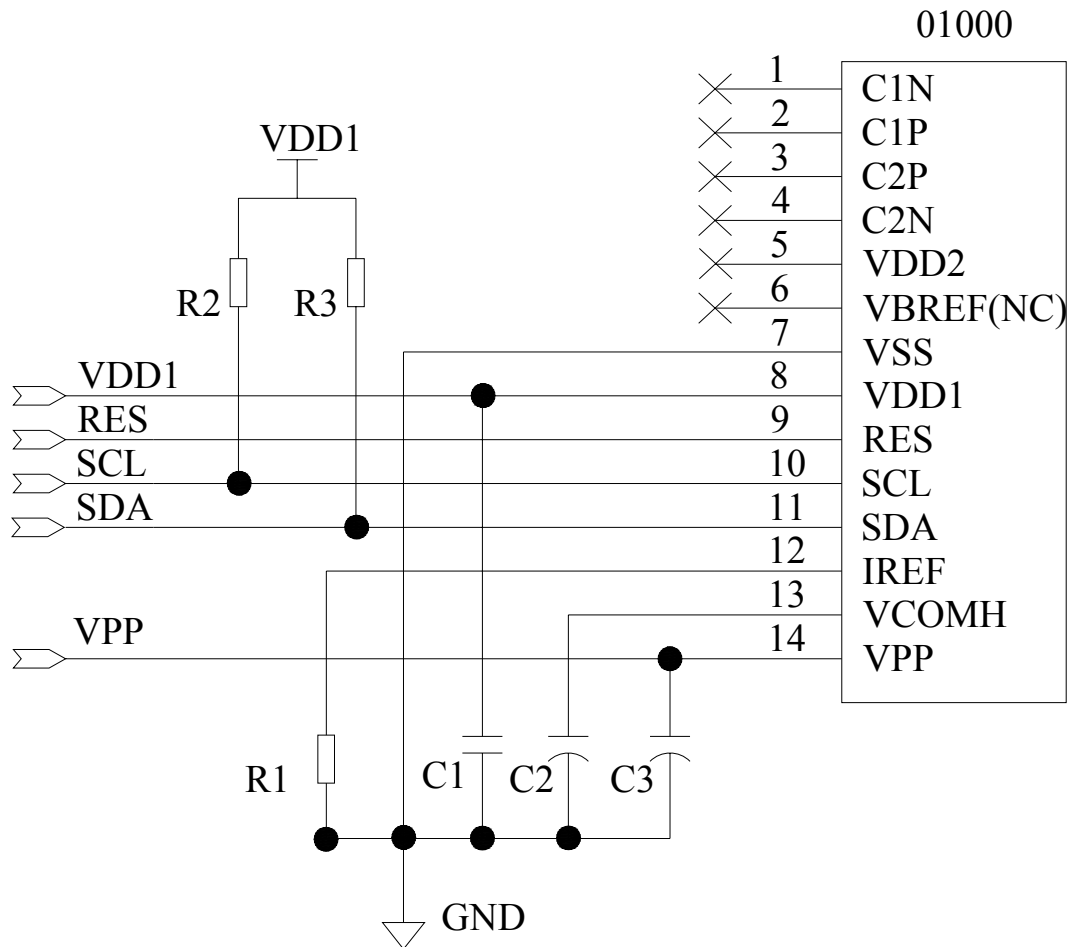
C3,C5,C6: 4.7 $\mu$ F/16V.ROHS (Tantalum Capacitors)

C1,C2,C4: 1 $\mu$ F-0603-X7R $\pm$ 10%.RoHS

R1: 0603 1/10W  $\pm$ 5% 390Kohm.RoHS

R2,R3: 0603 1/10W  $\pm$ 5% 10Kohm.RoHS

2) The configuration for IIC interface mode, external VPP is shown in the following diagram



Pin connected to MCU interface: SCL, SDA, RES

C1P, C1N, C2P, C2N, VDD2 should be left open.

Under external V<sub>PP</sub> Mode, the Charge Pump Setting(ADh) must be set as follow:

ADh: Charge Pump Setting

8Ah; Disable Charge Pump

### Recommended components

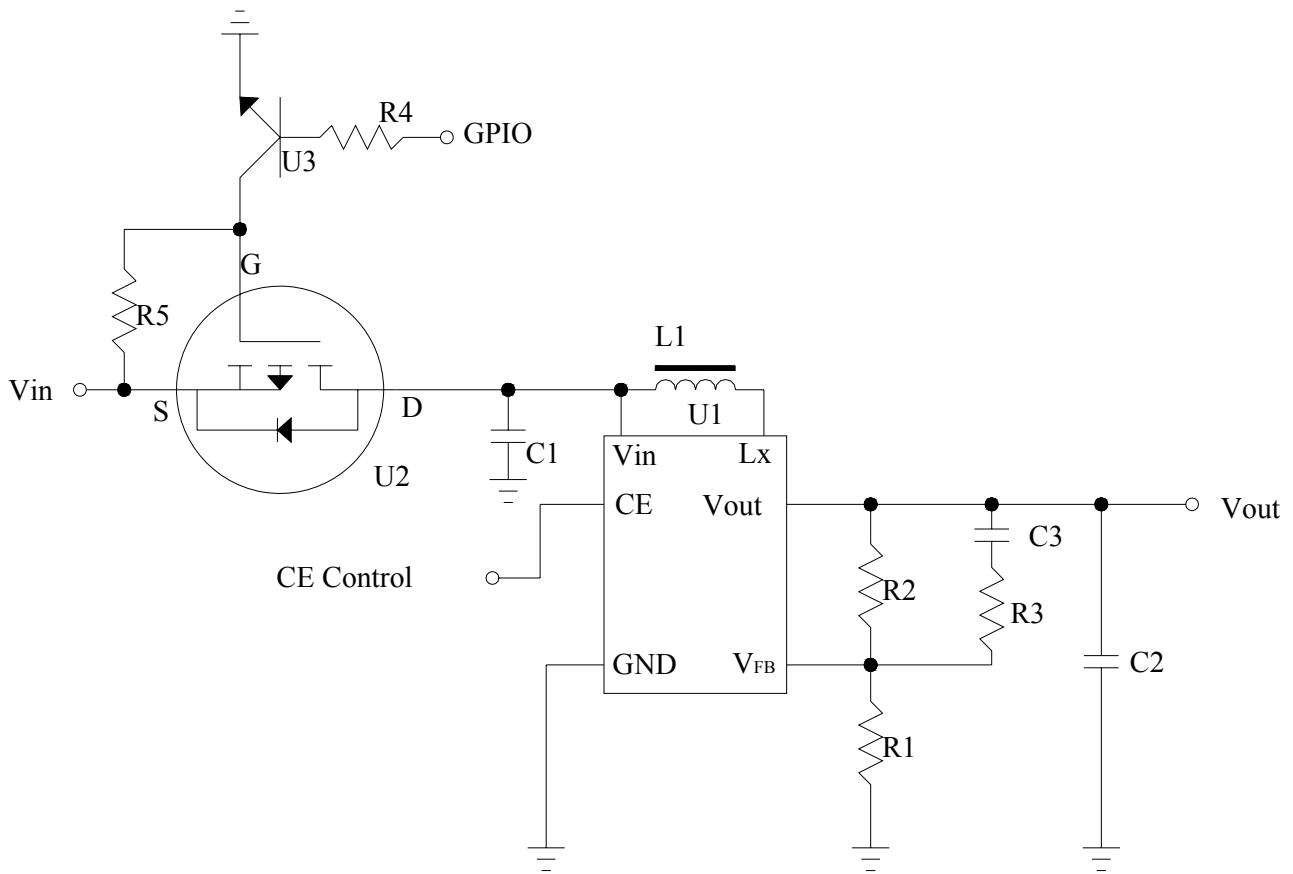
C2,C3: 4.7μF/16V.ROHS (Tantalum Capacitors)

C1: 1uF-0603-X7R±10%.RoHS

R1: 0603 1/10W +/-5% 390Kohm.RoHS

R2,R3: 0603 1/10W +/-5% 10Kohm.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 +/-1% 70Kohm.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                         |

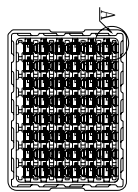
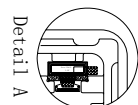
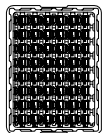

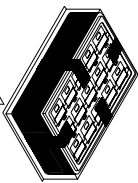
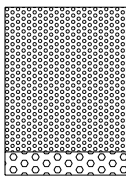
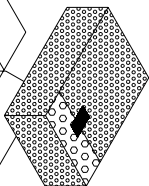
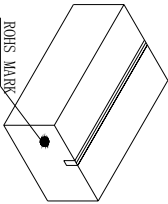
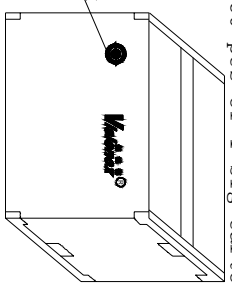

#### 9.4 Display Control Instruction

Refer to SH1106G IC Specification.

#### 9.5 Recommended Software Initialization

```
void Init_IC()
{
    Write_Command(0xAE);    //Set Display Off
    Write_Command(0xD5);    //display divide ratio/osc. freq. mode
    Write_Command(0x91);    //
    Write_Command(0xA8);    //multiplex ration mode:63
    Write_Command(0x1F);
    Write_Command(0xD3);    //Set Display Offset
    Write_Command(0x00);
    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(0x32);    //Set Pump voltage value
    Write_Command(0xA1);    //Segment Remap
    Write_Command(0xC8);    //Sst COM Output Scan Direction
    Write_Command(0xDA);    //common pads hardware: alternative
    Write_Command(0x02);
    Write_Command(0x81);    //contrast control
    Write_Command(0x33);    //
    Write_Command(0xD9);    //set pre-charge period
    Write_Command(0x1f);
    Write_Command(0xDB);    //VCOM deselect level mode
    Write_Command(0x40);    //
    Write_Command(0xA4);    //Set Entire Display On/Off
    Write_Command(0xA6);    //Set Normal Display
    Write_Command(0xAF);    //Set Display On
}
```

## 10 Package Specification

| Controlled Seal   |  | Packing Process(1) ~ (9)   |  |  |       |
|---|--|--|--|--|-------|
| ( 1 ) Tray Type:00530-MT6-A   | <br><br>Detail A | ( 2 )  | <br>180° revers ② | <br>normal ①                                  | TRAY  |
| ( 5 ) After tray be packaged, wrap the package in a bubble bag and seal with scotch tape.           | <br>                 | ( 6 )  | <br>TRAY          | <br>small carton package<br>L390*W290*L120 mm | ( 7 ) |
| ( 9 ) 1/4 contained trays, 2 empty trays,<br>Package quantity products:<br>1760 pcs of 1 big carton | <br>ROHS MARK   | NOTE:1、The inner carton and master carton must be sealed with adhesive tape.<br>2、Fill up the gap with tray.<br>3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at  . |  |  |       |
| Package finished<br>L410*W310*L272 mm   |  | 2 small cartons in 1 big carton  |  |  |       |



## 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<br>Scan rate: 1 oct/min<br>Time: 2 hrs/axis<br>Test axis: X,Y, Z | 1 Carton |
| 8   | Drop   | Height: 100 cm<br>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

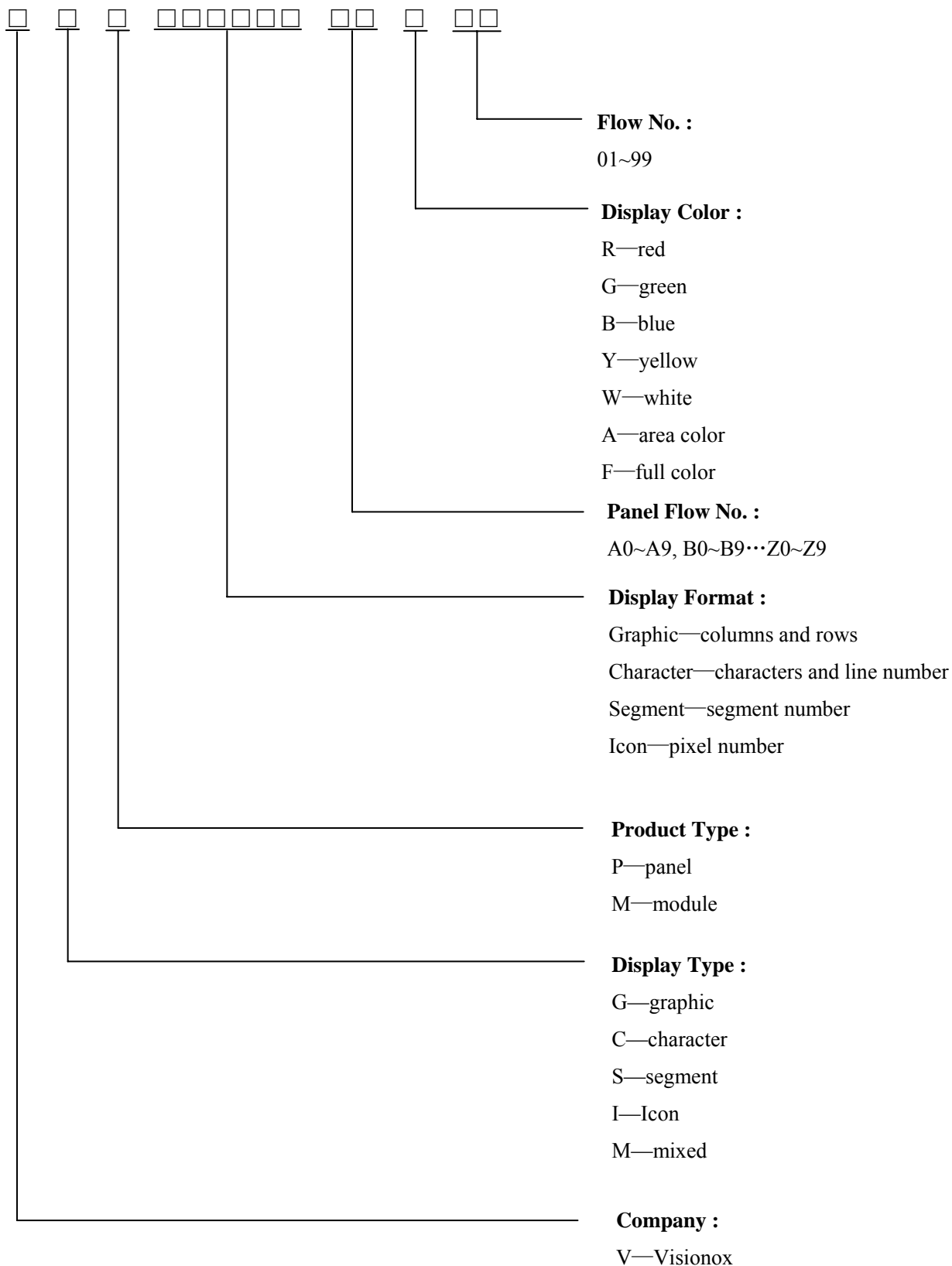
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

| ITEM                | MIN    | MAX | UNIT | CONDITION   |
|---------------------|--------|-----|------|---|
| Operation Life Time | 10,000 | -   | hrs  | 150 cd/m <sup>2</sup> ,<br>50% alternating checkerboard,<br>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:  $55 \pm 15\% \text{R.H}$

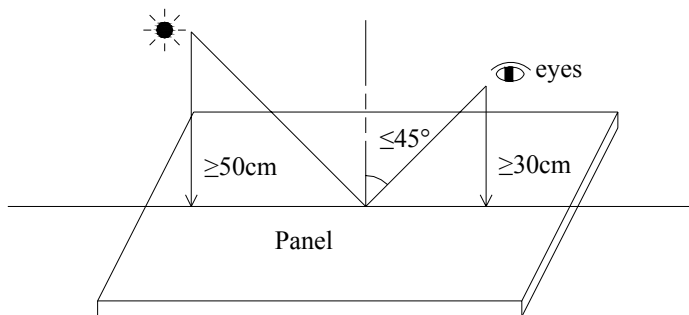
Fluorescent Lamp: 30W

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

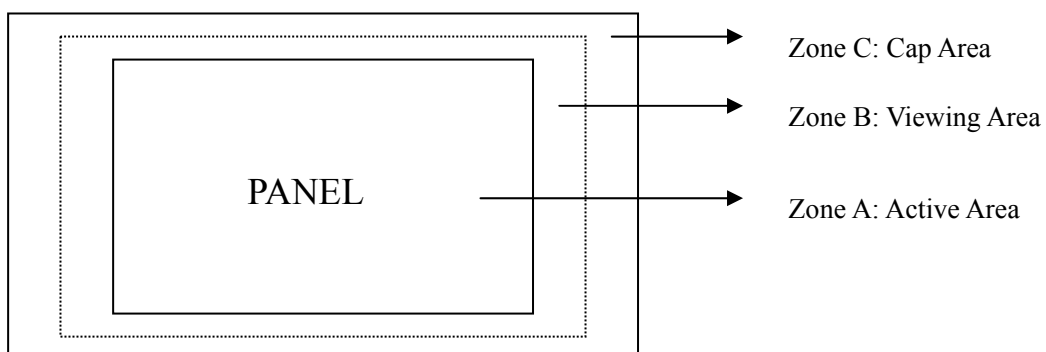
Distance between the Panel & Eyes:  $\geq 30\text{cm}$

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

(See the sketch below)

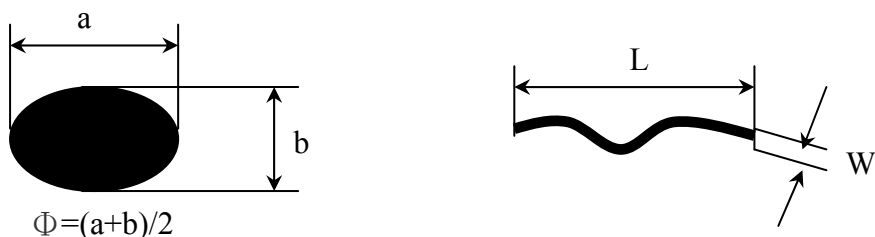


### 13.3 Quality Assurance Zones



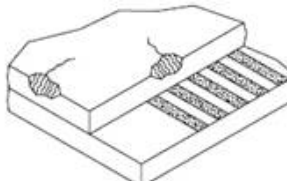
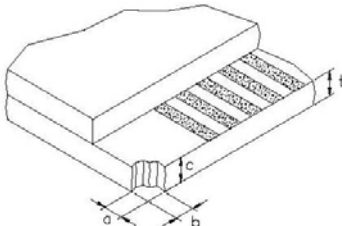
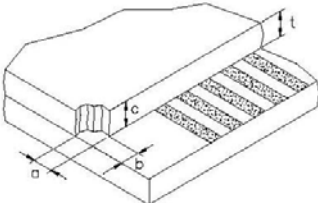
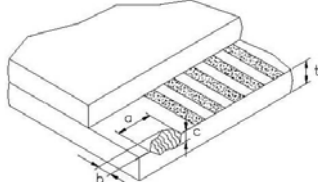
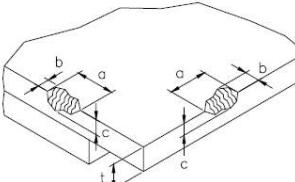
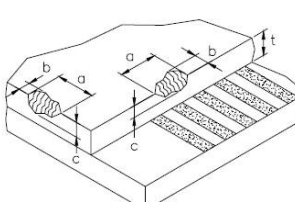
### 13.4 Inspection Standard

Definition of  $\Phi$ &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><math>\Phi \leq 0.15</math></td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td><math>0.15 &lt; \Phi \leq 0.30</math></td><td colspan="2">3</td></tr><tr><td><math>\Phi &gt; 0.30</math></td><td colspan="2">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><math>W \leq 0.03</math></td><td>---</td><td>Ignore</td><td rowspan="3">Ignore</td></tr><tr><td><math>0.03 &lt; W \leq 0.08</math></td><td><math>L \leq 5.0</math></td><td>3</td></tr><tr><td><math>W &gt; 0.08</math></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><math>\Phi &gt; 0.5</math></td><td>0</td><td rowspan="3">Ignore</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.5</math></td><td>3</td></tr><tr><td><math>\Phi \leq 0.2</math></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.   |        |  |  | Acceptable            |                   |                   |                 |          |                  |                       |        |                       |                         |                      |              |               |            |     |       |       |
| 5                       | Any Dirt on Cap Glass  | <table><tr><td>Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td><math>\Phi \leq 0.5</math></td><td colspan="2">Ignore</td></tr><tr><td><math>0.5 &lt; \Phi \leq 1.0</math></td><td colspan="2">3</td></tr><tr><td><math>\Phi &gt; 1.0</math></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              |  Propagation crack is not acceptable.  | Major |
| 7  | Corner Chip              |  <p> <math>t</math> = Glass thickness<br/> Accept<br/> <math>a \leq 2.0\text{mm}</math> or <math>b \leq 2.0\text{mm}</math>, <math>c \leq t</math> </p>  | Minor |
| 8  | Corner Chip on Cap Glass |  <p> <math>t</math> = Glass thickness<br/> Accept<br/> <math>a \leq 1.5\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math> </p>   | Minor |
| 9  | Chip on Contact Pad      |  <p> <math>t</math> = Glass thickness<br/> Accept<br/> <math>a \leq 3.0\text{mm}</math> or <math>b \leq 0.8\text{mm}</math>, <math>c \leq t</math><br/> (on the contact pin)<br/> <math>a \leq 3.0\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math><br/> (outside of the contact pin) </p> | Minor |
| 10 | Chip on Face of Display  |  <p> <math>t</math> = Glass thickness<br/> Accept<br/> <math>a \leq 1.5\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math> </p>  | Minor |
| 11 | Chip on Cap Glass        |  <p> <math>t</math> = Glass thickness<br/> Accept<br/> <math>a \leq 3.0\text{mm}</math> or <math>b \leq 3.0\text{mm}</math>, <math>c \leq t/2</math><br/> <math>a \leq 1.5\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>t/2 \leq c \leq t</math> </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.<br>(2) Terminal lead twisted or broken is not allowable.<br>(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<br>Dirty spot<br>Foreign matter | Average Diameter<br>(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<br>(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 Display Co., Ltd. warrants for a period of 12 months from the shipping date when stored or used under normal condition.