

# Product Specification

**Product Name: VGM128128A0F01**

**Product Code: M00090**

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

| Designed By     | Checked By      | Approved By |             |
|-----------------|-----------------|-------------|-------------|
|                 |                 | R&D         | QA          |
| 曹朝平<br>09.09.16 | 陈理军<br>09.17.16 | <br>09.9.16 | <br>09.9.16 |

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## 1 Overview

VGM128128A0F01 is an OLED full color 128(RGB)×128dot matrix display module. 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: Full Color
- Dot Matrix:128(RGB)×128
- Driver IC: SSD1355U8R1
- Interface:8/16-bit 8080, 8/16-bit 6800, 3/4SPI
- Wide range of operating temperature: -40°C -70°C

## 3 Mechanical Data

| NO. | ITEM              | SPECIFICATION                               | UNIT            |
|-----|-------------------|---|-----------------|
| 1   | Dot Matrix        | 128(W)(RGB)×128(H)                          | -               |
| 2   | Dot Size          | 0.0435(W)×0.1855(H)                         | mm <sup>2</sup> |
| 3   | Dot Pitch         | 0.0685(W)×0.2055(H)                         | mm <sup>2</sup> |
| 4   | Aperture Rate     | 57  | %               |
| 5   | Active Area       | 26.279(W)×26.284 (H)                        | mm <sup>2</sup> |
| 6   | Panel Size        | 33.5(W)×33.5(H)                             | mm <sup>2</sup> |
| 7   | Module Size       | According to the annexed mechanical drawing | mm <sup>3</sup> |
| 8   | Diagonal A/A Size | 1.46  | inch            |
| 9   | Module Weight     | TBD   | gram            |

### 4 Mechanical Drawing

如本印章非红色, 则表明该文件为非受控版本, 不会受到控制和更新. 请使用受控文件.  
分发号:

受控章

**Specifications:**

- Display: QMDFull Color
- Form: 1384X8
- Driver IC: S80J550R1
- General Tolerance: ±0.3
- Operate Temp: -10° C~70° C
- STRT: I128
- RoHS Compliant

**COMSEC LAYOUT**

|      |       |
|------|-------|
| SCO  | SA127 |
| SBO  | SB127 |
| SNO  | SC127 |
| CO   | C1    |
| C126 | C127  |

**Pin Assignment**

| NO. | SYMBOL | Pin Assignment |
|-----|--------|----------------|
| 1   | NC     |                |
| 2   | V1SS   |                |
| 3   | VCC    |                |
| 4   | VSL    |                |
| 5   | VCI    |                |
| 6   | VDD10  |                |
| 7   | AS0    |                |
| 8   | BS1    |                |
| 9   | CS#    |                |
| 10  | RIS#   |                |
| 11  | D/#    |                |
| 12  | R/#    |                |
| 13  | E/BD#  |                |
| 14  | VFP    |                |
| 15  | VDD    |                |
| 16  | D0     |                |
| 17  | D1     |                |
| 18  | D2     |                |
| 19  | D3     |                |
| 20  | D4     |                |
| 21  | D5     |                |
| 22  | D6     |                |
| 23  | D7     |                |
| 24  | D8     |                |
| 25  | D9     |                |
| 26  | D10    |                |
| 27  | D11    |                |
| 28  | D12    |                |
| 29  | D13    |                |
| 30  | D14    |                |
| 31  | D15    |                |
| 32  | VSS    |                |
| 33  | IRE#   |                |
| 34  | VCOMH  |                |
| 35  | VCC    |                |
| 36  | V1SS   |                |
| 37  | NC     |                |

**Detail "A"**

|        |        |
|--------|--------|
| 0.1804 | 0.2055 |
| 0.0685 | 0.025  |
| 0.0435 | 0.025  |
| 0.1855 | 0.02   |
| 0.2055 |        |

**Customer Approval**

| Part Name    | Module Ass'y | Date       | Rev      | Unit     | Sheet    |
|--------------|--------------|------------|----------|----------|----------|
| Project Code |              | 2009.02.21 | 01       | mm       | 1/1      |
| Part No.     |              | DS'D BY    | CHK'D BY | CHK'D BY | APPROVED |

**Rev. Table**

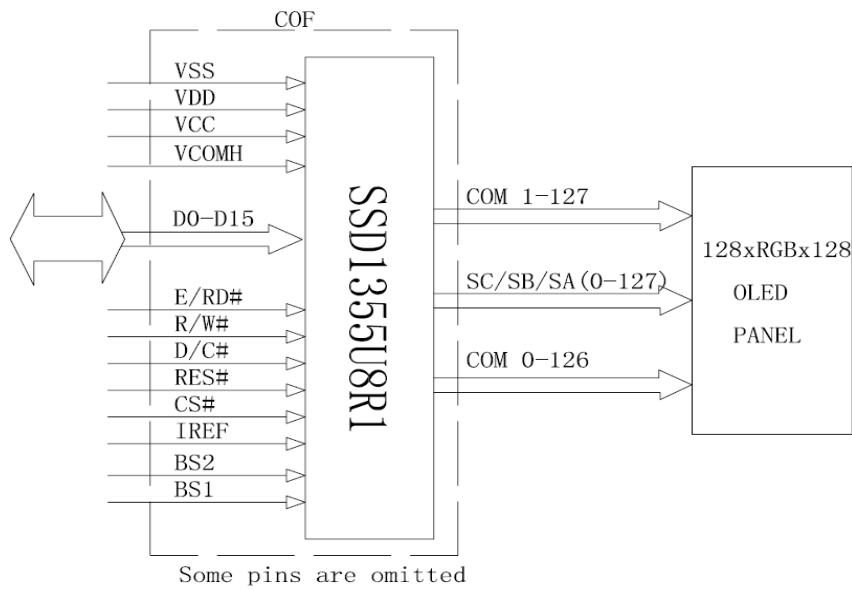
| Rev. | Date       | Note    |
|------|------------|---------|
| 1    | 2009.02.21 | Primary |
| 2    |            |         |

## 5 Module Interface

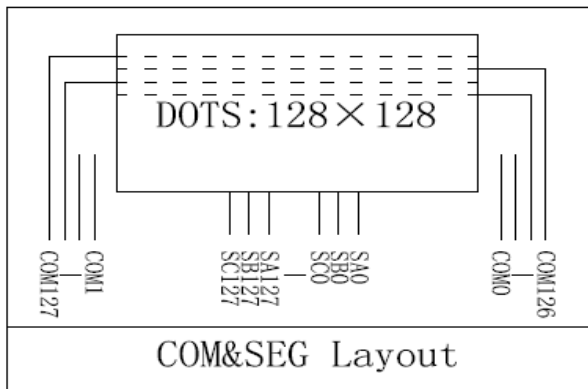
| PIN NO. | PIN NAME             | DESCRIPTION   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
|---------|----------------------|---|---------|-----------|------|------------|------|------------|------|---------------------|------|---------------------|------|----------------------|------|----------------------|
| 1       | NC                   | No Connection.  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 2       | VLSS                 | Analog system ground pin  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 3       | VCC                  | Power supply for panel driving voltage  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 4       | VSL                  | This is segment voltage reference pin   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 5       | VCI                  | Low voltage power supply  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 6       | VDDIO                | Power supply for interface logic level  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 7       | BS0                  | BS3 and BS2 are command programmable (by command 36H). BS1 and BS0 are pin select <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>BS[3:0]</th> <th>Interface</th> </tr> </thead> <tbody> <tr> <td>0000</td> <td>4 line SPI</td> </tr> <tr> <td>0001</td> <td>3 line SPI</td> </tr> <tr> <td>0011</td> <td>8-bit 6800 parallel</td> </tr> <tr> <td>0010</td> <td>8-bit 8080 parallel</td> </tr> <tr> <td>0111</td> <td>16-bit 6800 parallel</td> </tr> <tr> <td>0110</td> <td>16-bit 8080 parallel</td> </tr> </tbody> </table> | BS[3:0] | Interface | 0000 | 4 line SPI | 0001 | 3 line SPI | 0011 | 8-bit 6800 parallel | 0010 | 8-bit 8080 parallel | 0111 | 16-bit 6800 parallel | 0110 | 16-bit 8080 parallel |
| BS[3:0] | Interface            |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 0000    | 4 line SPI           |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 0001    | 3 line SPI           |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 0011    | 8-bit 6800 parallel  |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 0010    | 8-bit 8080 parallel  |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 0111    | 16-bit 6800 parallel |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 0110    | 16-bit 8080 parallel |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 8       | BS1                  |   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 9       | CS#                  | Chip select pin, active low.  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 10      | RES#                 | Reset pin, active low.  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 11      | D/C#                 | This pin is Data/Command control pin. When the pin is pulled high, the data at D7-D0 is treated as display data. When the pin is pulled low, the data at D7-D0 will be transferred to the command register.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 12      | R/W#                 | This pin is MCU interface input. When interfacing to a 6800-series microprocessor, this pin will be used as Read/Write (R/W) selection input. Read mode will be carried out when this pin is pulled high and write mode when low.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 13      | E/RD#                | This pin is MCU interface input. When interfacing to a 6800-series microprocessor, 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.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 14      | VPP                  | Power supply for programming OTP.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 15      | VDD                  | Power Supply pin for logic operation of the driver.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 16~31   | D0~D15               | Data bus.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 32      | VSS                  | Ground.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 33      | IREF                 | A resistor should be connected between this pin and VSS.  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 34      | VCOMH                | A capacitor should be connected between this pin and VSS.   |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 35      | VCC                  | Power supply for panel driving voltage  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 36      | VLSS                 | Analog system ground pin  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |
| 37      | NC                   | No Connection.  |         |           |      |            |      |            |      |                     |      |                     |      |                      |      |                      |

## 6 Function Block Diagram

### 6.1 Function Block Diagram



### 6.2 Panel Layout Diagram



## 7 Absolute Maximum Ratings

| ITEM                   | SYMBOL   | MIN  | MAX | UNIT | REMARK            |
|------------------------|----------|------|-----|------|-------------------|
| Logic supply voltage   | $V_{DD}$ | -0.3 | 4   | V    | IC maximum rating |
| OLED Operating voltage | $V_{CC}$ | 0    | 20  | V    | IC maximum rating |
| Operating Temp.        | Top      | -40  | 70  | °C   | -                 |
| Storage Temp           | Tstg     | -40  | 80  | °C   | -                 |

Note (1): All of the voltages are on the basis of “GND = 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                 | TYPE | MAX                 | UNIT |
|----------------------------|------------|----------------------|---------------------|------|---------------------|------|
| Logic Supply Voltage       | $V_{DD}$   | 22±3°C,<br>55±15%R.H | 2.4                 | -    | 2.6                 | V    |
| OLED Driver Supply Voltage | $V_{CC}$   | 22±3°C,<br>55±15%R.H | 16                  | 16.5 | 17                  | V    |
| Low Voltage power supply   | $V_{CI}$   |                      | 2.4                 | -    | 3.5                 | V    |
| Power Supply for I/O pins  | $V_{DDIO}$ |                      | 1.6                 |      | $V_{CI}$            | V    |
| High-level Input Voltage   | $V_{IH}$   | -                    | $0.8 \times V_{DD}$ | -    | $V_{DD}$            | V    |
| Low-level Input Voltage    | $V_{IL}$   | -                    | 0                   | -    | $0.2 \times V_{DD}$ | V    |
| High-level Output Voltage  | $V_{OH}$   | -                    | $0.9 \times V_{DD}$ | -    | $V_{DD}$            | V    |
| Low-level Output Voltage   | $V_{OL}$   | -                    | 0                   | -    | $0.1 \times V_{DD}$ | V    |

Note : The  $V_{CC}$  input must be kept in a stable value; ripple and noise are not allowed.



## 8.2 Electro-optical Characteristics

| ITEM                           | SYMBOL          | TEST CONDITION                   | MIN     | TYPE | MAX | UNIT              |
|--------------------------------|-----------------|----------------------------------|---------|------|-----|-------------------|
| Normal Mode Brightness         | L <sub>br</sub> | All pixels ON(1)                 | TBD     | 100  | -   | cd/m <sup>2</sup> |
| Standby Mode Brightness        |                 | Standby Mode<br>10% pixels ON(2) | -       | TBD  | -   | cd/m <sup>2</sup> |
| Normal Mode Power Consumption  | Pt              | All pixels ON(1)                 | -       | 600  | TBD | mW                |
| Standby Mode Power Consumption |                 | Standby Mode<br>10% pixels ON(2) | -       | TBD  | -   | mW                |
| C.I.E(White)                   | (x)             | x,y(CIE1931)                     | TBD     | 0.28 | TBD | -                 |
|                                | (y)             |                                  | TBD     | 0.34 | TBD | -                 |
| C.I.E(Red)                     | (x)             | x,y(CIE1931)                     | TBD     | TBD  | TBD | -                 |
|                                | (y)             |                                  | TBD     | TBD  | TBD | -                 |
| C.I.E(Green)                   | (x)             | x,y(CIE1931)                     | TBD     | TBD  | TBD | -                 |
|                                | (y)             |                                  | TBD     | TBD  | TBD | -                 |
| C.I.E(Blue)                    | (x)             | x,y(CIE1931)                     | TBD     | TBD  | TBD | -                 |
|                                | (y)             |                                  | TBD     | TBD  | TBD | -                 |
| 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 : 16.5V
- Master contrast setting : TBD
- Frame rate : TBD
- Duty setting : 1/128

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

- Driving voltage : 16.5V
- Master contrast setting : TBD
- Frame rate : TBD
- Duty setting : 1/128

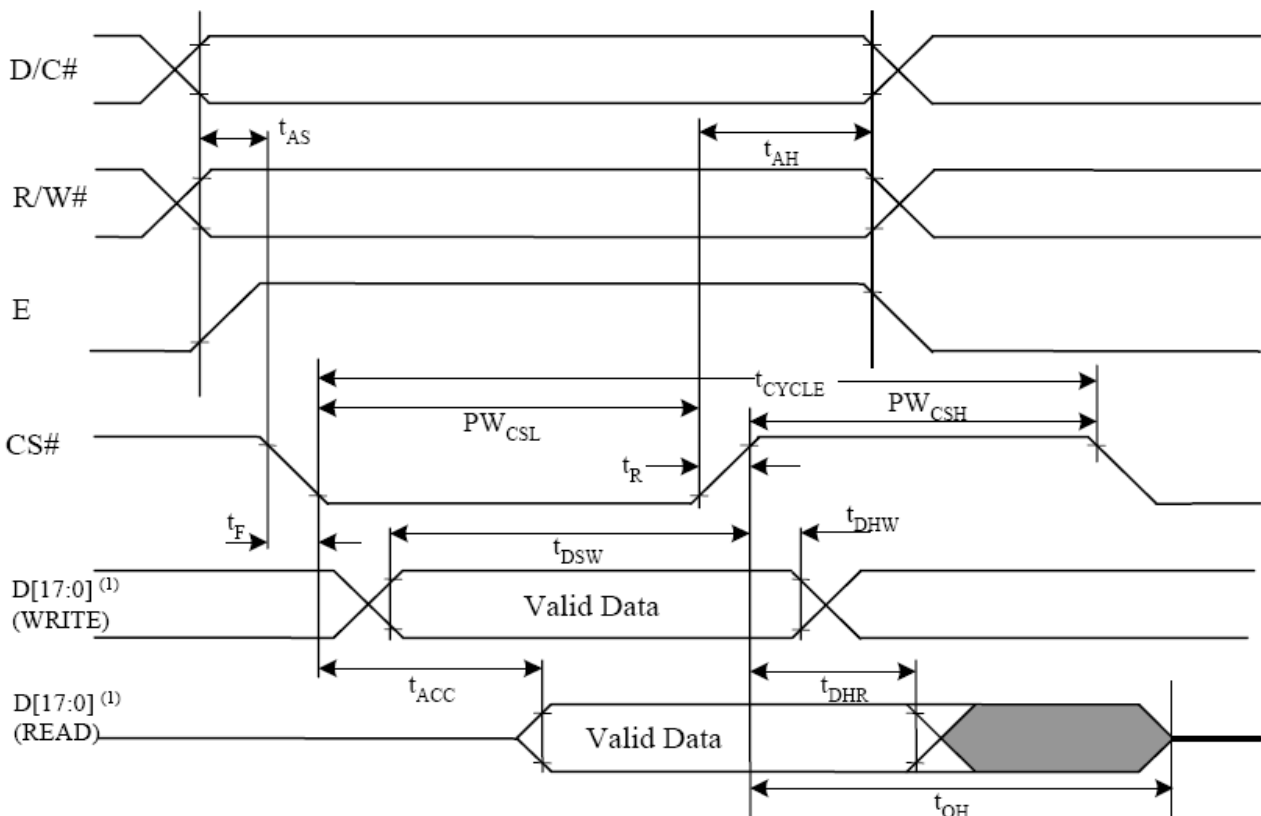
### 8.3 AC Electrical Characteristics

#### (1)6800-Series MPU Parallel Interface Timing Characteristics

( $V_{DD} - V_{SS} = 2.4$  to  $2.6V$ ,  $V_{DDIO} = 1.6V$ ,  $V_{CI} = 2.8V$ ,  $T_A = 25^\circ C$ )

| Symbol            | Parameter                            | Min | Typ | Max | Unit |
|-------------------|--------------------------------------|-----|-----|-----|------|
| $t_{CYCLE}$       | Clock Cycle Time                     | 300 | -   | -   | ns   |
| $t_{AS}$          | Address Setup Time                   | 10  | -   | -   | ns   |
| $t_{AH}$          | Address Hold Time                    | 0   | -   | -   | ns   |
| $t_{DSW}$         | Write Data Setup Time                | 40  | -   | -   | ns   |
| $t_{DHW}$         | Write Data Hold Time                 | 7   | -   | -   | ns   |
| $t_{DHR}$         | Read Data Hold Time                  | 20  | -   | -   | ns   |
| $t_{OH}$          | Output Disable Time                  | -   | -   | 70  | ns   |
| $t_{ACC}$         | Access Time                          | -   | -   | 140 | ns   |
| PW <sub>CSL</sub> | Chip Select Low Pulse Width (read)   | 120 | -   | -   | ns   |
|                   | Chip Select Low Pulse Width (write)  | 60  | -   | -   | ns   |
| PW <sub>CSH</sub> | Chip Select High Pulse Width (read)  | 60  | -   | -   | ns   |
|                   | Chip Select High Pulse Width (write) | 60  | -   | -   | ns   |
| $t_R$             | Rise Time                            | -   | -   | 15  | ns   |
| $t_F$             | Fall Time                            | -   | -   | 15  | ns   |

Figure 12-1 : 6800-series MCU parallel interface characteristics

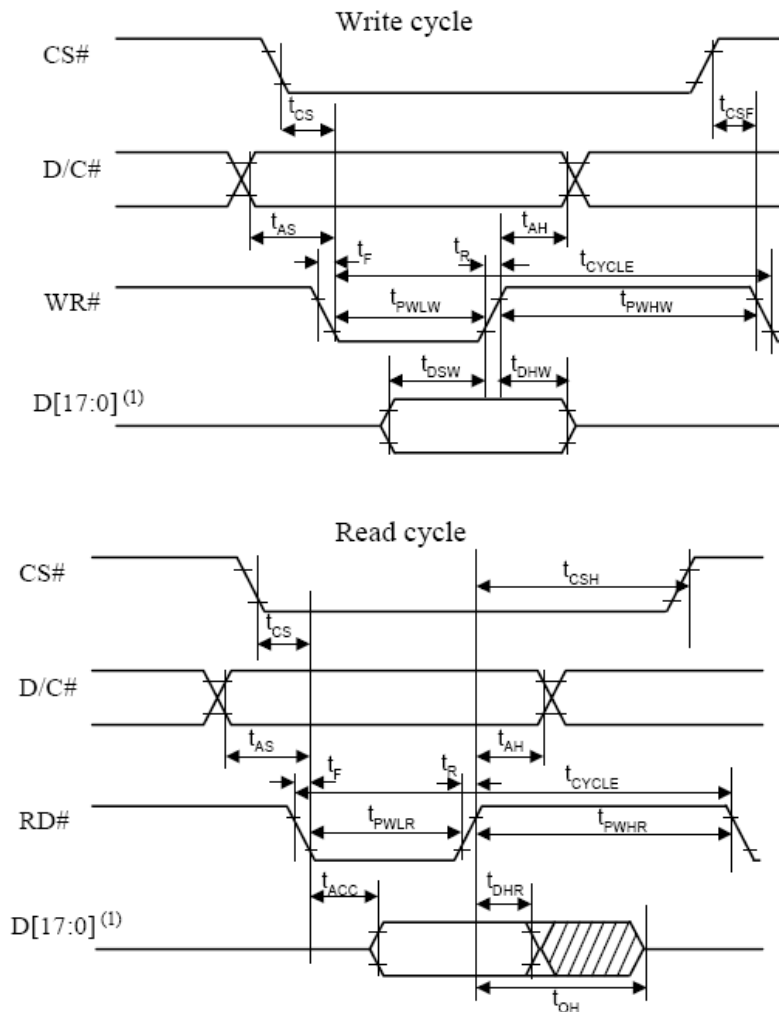


(2)8080-Series MPU Parallel Interface Timing Characteristics

( $V_{DD} - V_{SS} = 2.4$  to  $2.6V$ ,  $V_{DDIO} = 1.6V$ ,  $V_{CI} = 2.8V$ ,  $T_A = 25^\circ C$ )

| Symbol      | Parameter                            | Min | Typ | Max | Unit |
|-------------|--------------------------------------|-----|-----|-----|------|
| $t_{CYCLE}$ | Clock Cycle Time                     | 300 | -   | -   | ns   |
| $t_{AS}$    | Address Setup Time                   | 10  | -   | -   | ns   |
| $t_{AH}$    | Address Hold Time                    | 0   | -   | -   | ns   |
| $t_{DSW}$   | Write Data Setup Time                | 40  | -   | -   | ns   |
| $t_{DHW}$   | Write Data Hold Time                 | 7   | -   | -   | ns   |
| $t_{DHR}$   | Read Data Hold Time                  | 20  | -   | -   | ns   |
| $t_{OH}$    | Output Disable Time                  | -   | -   | 70  | ns   |
| $t_{ACC}$   | Access Time                          | -   | -   | 140 | ns   |
| $t_{PWLW}$  | Read Low Time                        | 150 | -   | -   | ns   |
| $t_{PWLW}$  | Write Low Time                       | 60  | -   | -   | ns   |
| $t_{PWHR}$  | Read High Time                       | 60  | -   | -   | ns   |
| $t_{PWHW}$  | Write High Time                      | 60  | -   | -   | ns   |
| $t_R$       | Rise Time                            | -   | -   | 15  | ns   |
| $t_F$       | Fall Time                            | -   | -   | 15  | ns   |
| $t_{CS}$    | Chip select setup time               | 0   | -   | -   | ns   |
| $t_{CSH}$   | Chip select hold time to read signal | 0   | -   | -   | ns   |
| $t_{CSF}$   | Chip select hold time                | 20  | -   | -   | ns   |

Figure 12-2 : 8080-series MCU parallel interface characteristics

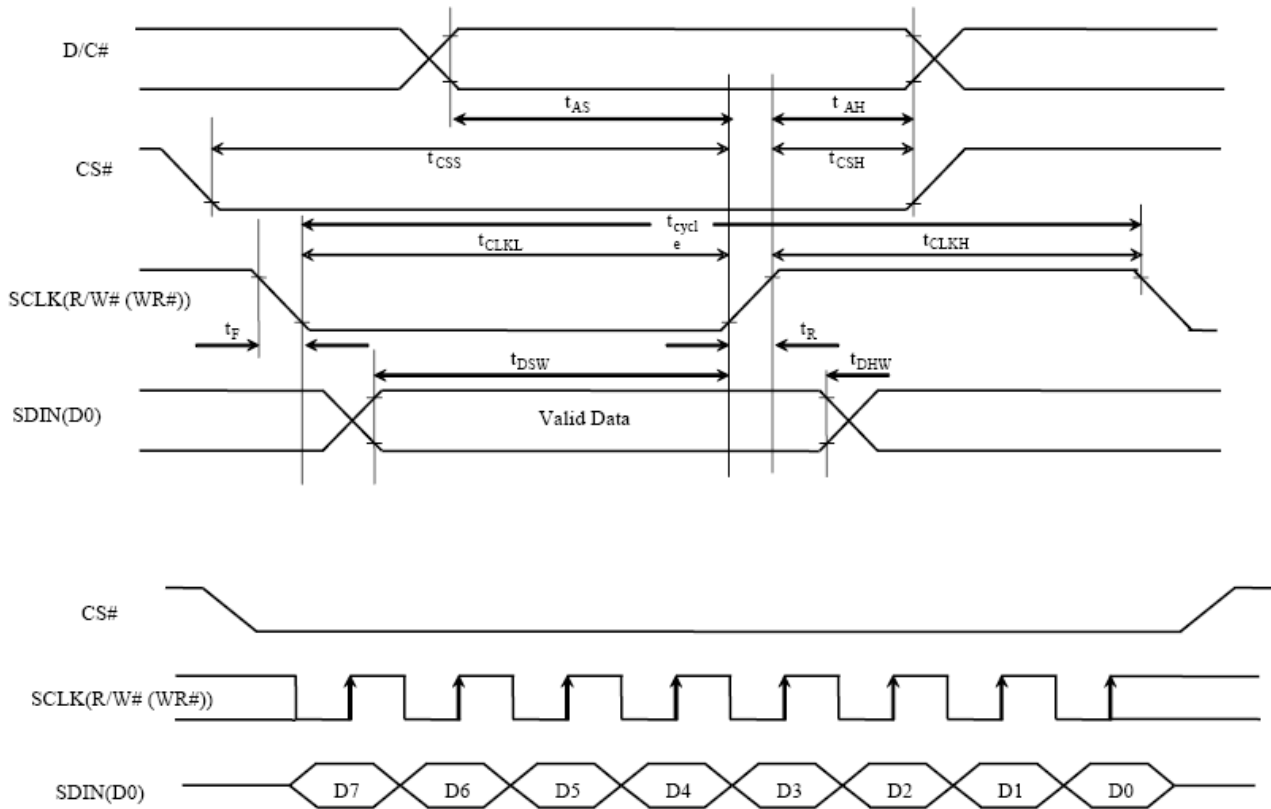


(3)Serial Interface Timing Characteristics(4-wire SPI)

( $V_{DD} - V_{SS} = 2.4$  to  $2.6V$ ,  $V_{DDIO} = 1.6V$ ,  $V_{CI} = 2.8V$ ,  $T_A = 25^\circ C$ )

| Symbol      | Parameter              | Min | Typ | Max | Unit |
|-------------|------------------------|-----|-----|-----|------|
| $t_{cycle}$ | Clock Cycle Time       | 50  | -   | -   | ns   |
| $t_{AS}$    | Address Setup Time     | 15  | -   | -   | ns   |
| $t_{AH}$    | Address Hold Time      | 15  | -   | -   | ns   |
| $t_{CSS}$   | Chip Select Setup Time | 20  | -   | -   | ns   |
| $t_{CSH}$   | Chip Select Hold Time  | 10  | -   | -   | ns   |
| $t_{DSW}$   | Write Data Setup Time  | 15  | -   | -   | ns   |
| $t_{DHW}$   | Write Data Hold Time   | 15  | -   | -   | ns   |
| $t_{CLKL}$  | Clock Low Time         | 20  | -   | -   | ns   |
| $t_{CLKH}$  | Clock High Time        | 20  | -   | -   | ns   |
| $t_R$       | Rise Time              | -   | -   | 15  | ns   |
| $t_F$       | Fall Time              | -   | -   | 15  | ns   |

Figure 12-3 : Serial interface characteristics (4-wire SPI)

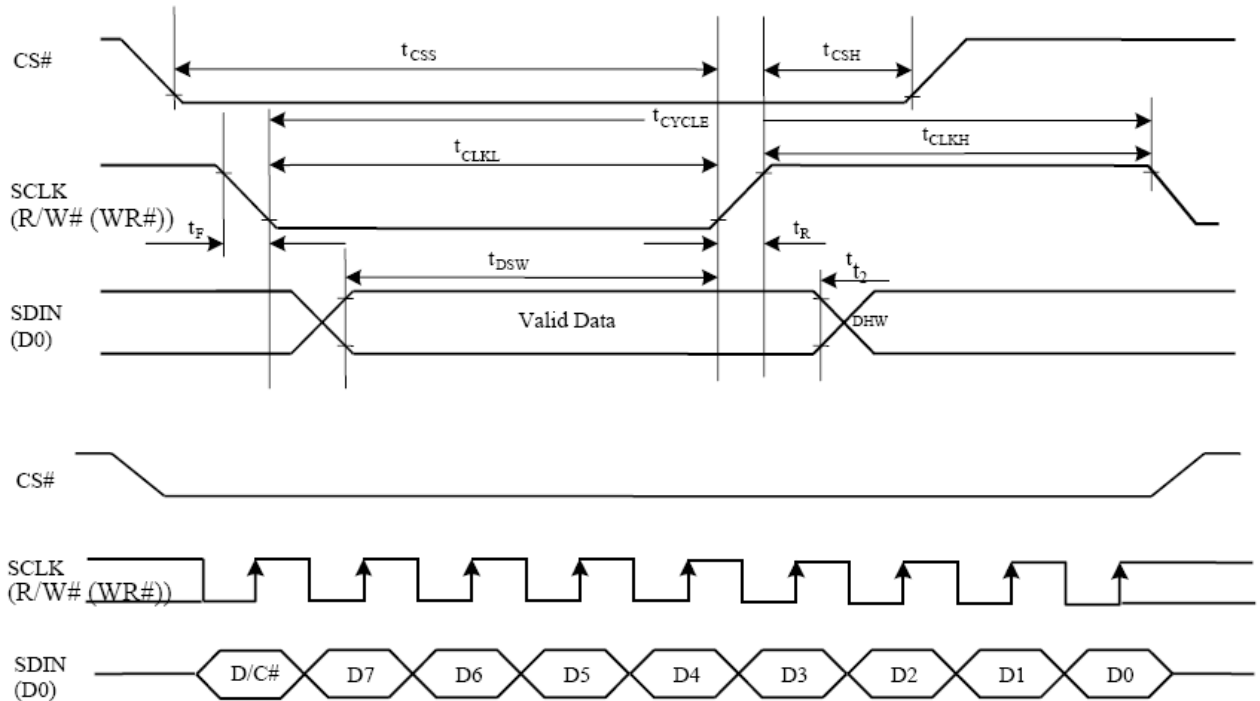


(4)Serial Interface Timing Characteristics(3-wire SPI)

( $V_{DD} - V_{SS} = 2.4$  to  $2.6V$ ,  $V_{DDIO}=1.6V$ ,  $V_{CI} = 2.8V$ ,  $T_A = 25^{\circ}C$ )

| Symbol      | Parameter              | Min | Typ | Max | Unit |
|-------------|------------------------|-----|-----|-----|------|
| $t_{cycle}$ | Clock Cycle Time       | 50  | -   | -   | ns   |
| $t_{AS}$    | Address Setup Time     | 15  | -   | -   | ns   |
| $t_{AH}$    | Address Hold Time      | 15  | -   | -   | ns   |
| $t_{CSS}$   | Chip Select Setup Time | 20  | -   | -   | ns   |
| $t_{CSH}$   | Chip Select Hold Time  | 10  | -   | -   | ns   |
| $t_{DSW}$   | Write Data Setup Time  | 15  | -   | -   | ns   |
| $t_{DHW}$   | Write Data Hold Time   | 15  | -   | -   | ns   |
| $t_{CLKL}$  | Clock Low Time         | 20  | -   | -   | ns   |
| $t_{CLKH}$  | Clock High Time        | 20  | -   | -   | ns   |
| $t_R$       | Rise Time              | -   | -   | 15  | ns   |
| $t_F$       | Fall Time              | -   | -   | 15  | ns   |

Figure 12-4 : Serial interface characteristics (3-wire SPI)

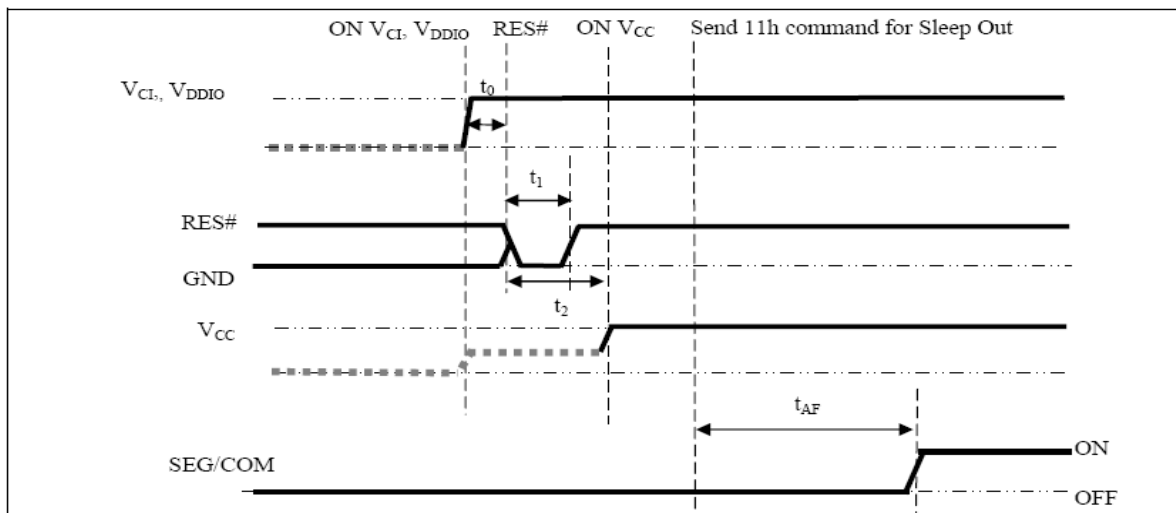


## 9 Functional Specification and Application Circuit

### 9.1 Power ON and Power OFF Sequence

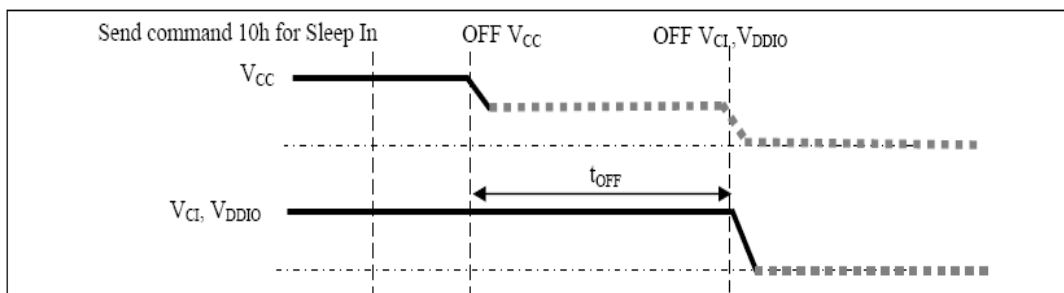
#### Power ON Sequence:

1. Power ON  $V_{DD}$ .
2. After  $V_{CI}, V_{DDIO}$  become stable, set wait time at least 1ms ( $t_0$ ) for internal  $V_{DD}$  become stable set RES# pin LOW (logic low) for at least 3us ( $t_1$ ) and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 3us ( $t_2$ ). Then Power ON  $V_{CC}$ . (1)
4. After  $V_{CC}$  become stable, send command 11h for Sleep Out. SEG/COM will be ON after 200ms( $t_{AF}$ ).



#### Power OFF Sequence:

1. Send command 10h for Sleep In
2. Power OFF  $V_{cc}$ .(1), (2)
4. Wait for  $t_{OFF}$ . Power OFF  $V_{DD}$ . (where Minimum  $t_{OFF}$ =0ms, Typical  $t_{OFF}$ =100ms)

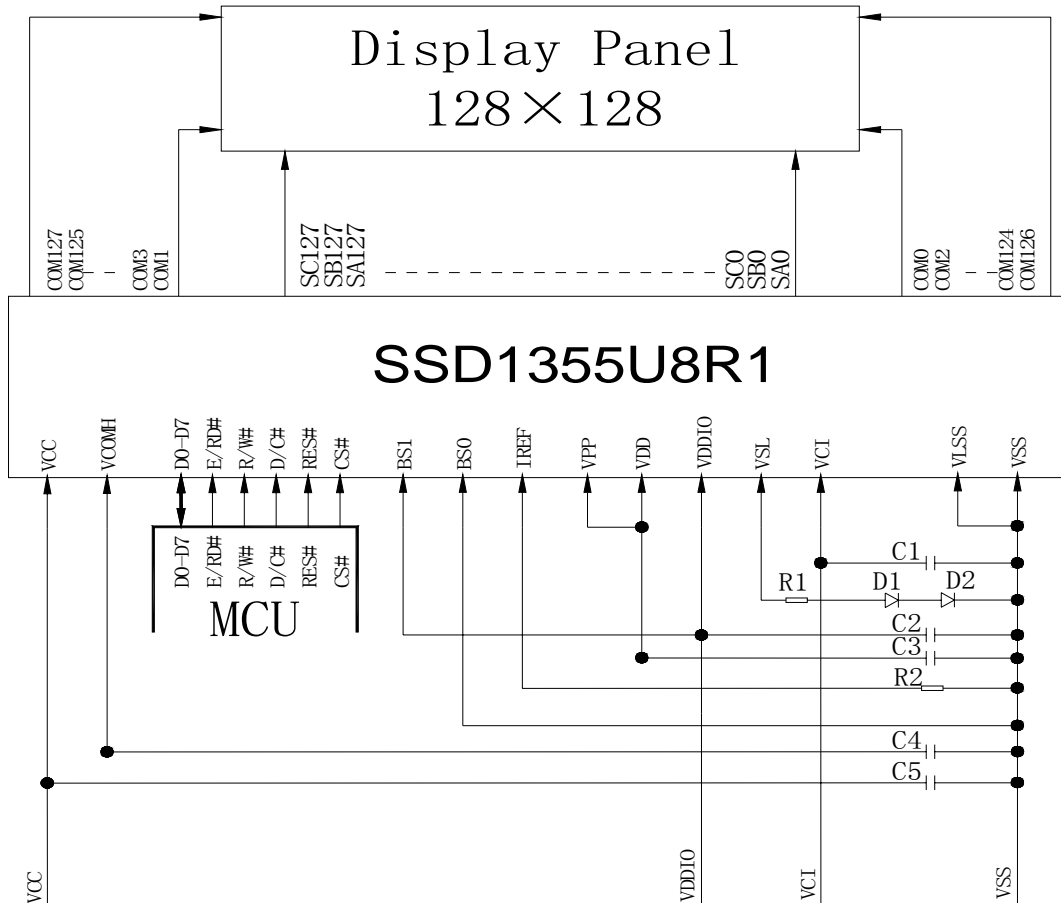


Note:

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

### 9.2 Application Circuit

The configuration for 8080-parallel interface mode, external V<sub>CC</sub> is shown in the following diagram:



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

#### Recommended components

C1, C2, C3: 1.0uF

C4, C5: 4.7uF (Tantalum Capacitors)

R1: 33Ω, D1, D2 (V<sub>th</sub>=0.7V IN4148)

R2: 1.2MΩ, R2 = (Voltage at IREF - GND) / IREF

### **9.3 Display Control Instruction**

Refer to SSD1355U8R1 Specification.

### **9.4 Recommended Software Initialization**

TBD



### 10 Package Specification

|   |   |  |   |
|---|---|--|---|
| <p>( 1 ) Tray: 370*273 t=0.8mm<br/>Add EPE in every contained tray</p>  | <p>( 2 )</p> <p>normal ①<br/>S13A01 081 ②</p> | <p>( 3 ) order ① ② ① ②<br/>fix trays with tape<br/>Package quantity products:<br/>392 pcs of 1 small carton<br/>1 tray contain 28 pcs<br/>14 contained trays, 1 empty tray</p> | <p>( 4 ) package with plastic bags<br/>add five desiccants<br/>create a power vacuum<br/>*5</p> |
| <p>( 5 )</p>  | <p>( 6 )</p>                                  | <p>( 7 )</p> <p>small carton package<br/>L425*W330*L175 mm</p>   | <p>( 8 )</p> <p>2 small cartons in 1 big carton</p>   |
| <p>( 9 )</p> <p>28 contained trays, 2 empty trays,<br/>Package quantity products:<br/>784 pcs of 1 big carton</p> <p>Package finished<br/>L450*W350*L360 mm</p> | <p>Package order (1)~(9)</p>                  |  |   |

NOTE: Tape on the small carton & big carton

## 11 Reliability

### 11.1 Reliability Test

| NO. | ITEM   | CONDITION  | QUANTITY |
|-----|--|--|----------|
| 1   | High Temperature (Non-operation)             | 80°C,240hrs  | 4        |
| 2   | Low Temperature (Non-operation)              | -30°C,240hrs   | 4        |
| 3   | High Temperature (Operation)                 | 70°C,240hrs  | 4        |
| 4   | Low Temperature (Operation)                  | -30°C,240hrs   | 4        |
| 5   | High Temperature / High Humidity (Operation) | 60°C,90%RH,240hrs  | 4        |
| 6   | Thermal shock (Non-operation)                | -30°C~80°C(-30°C/30min;transit/3min;80°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

- All measurements shall not be started until the specimens attain to temperature stability, the stable time is at least 15 minutes.
- The degradation of polarizer is ignored for item 5.
- The tolerance of temperature is  $\pm 3^{\circ}\text{C}$ , and the tolerance of relative humidity is  $\pm 5\%$ .

#### Evaluation criteria

- The function test is OK.
- No observable defects.
- Luminance:  $\geq 50\%$  of initial value.
- 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 | TBD | -   | hrs  | 100cd/m <sup>2</sup> ,50% Checkerboard |

An average operating lifetime of more than 10,000 hrs (50% checkerboard) at room temperature is approached by 240 hrs @ 80°C operating.

### 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  $22\pm 3^{\circ}\text{C}$ ;  $55\pm 15\%$  RH.



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

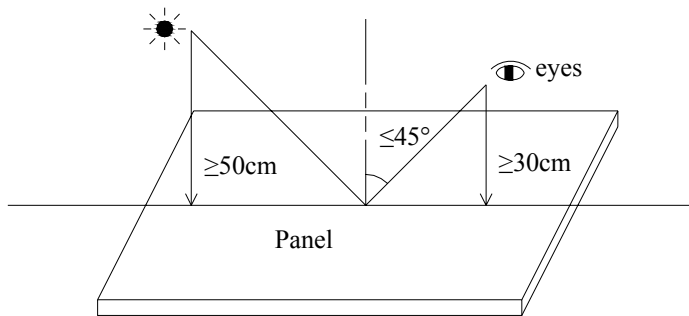
Fluorescent Lamp: 30W

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

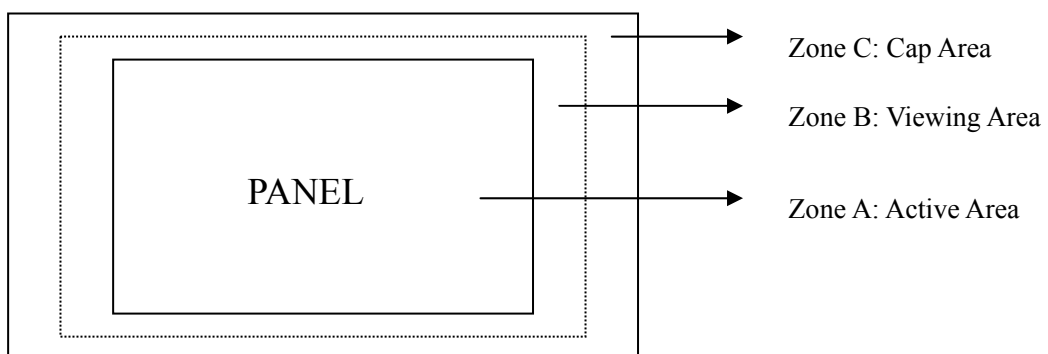
Distance between the Panel & Eyes:  $\geq 30\text{cm}$

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

(See the sketch below)

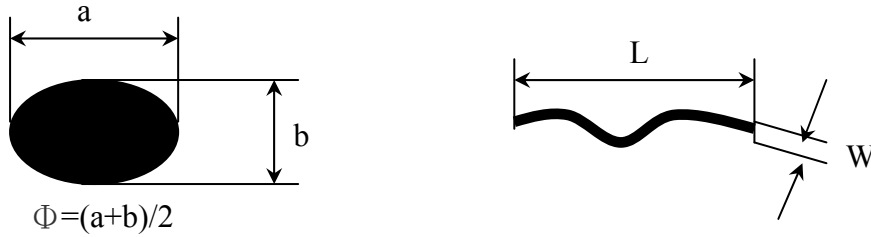


#### 13.3 Quality Assurance Zones

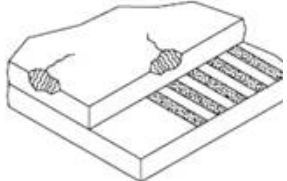


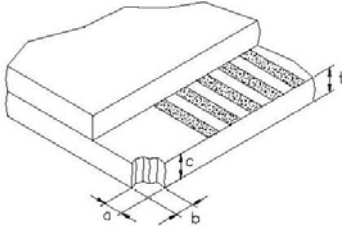
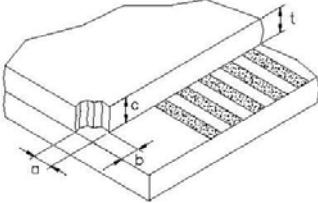
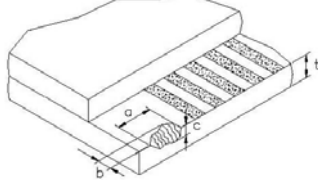
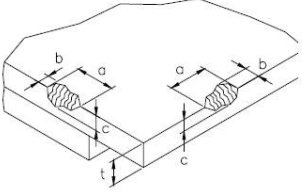
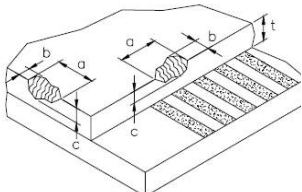
### 13.4 Inspection Standard

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 border="1"> <thead> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.15</math></td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.30</math></td> <td>3</td> </tr> <tr> <td><math>\Phi &gt; 0.30</math></td> <td>0</td> </tr> </tbody> </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 border="1"> <thead> <tr> <th rowspan="2">Width (mm)</th> <th rowspan="2">Length (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <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> </tbody> </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 border="1"> <thead> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <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> </tbody> </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                       | Glass Crack  |  <p>Propagation crack is not acceptable.</p>   | Major                 |                   |                   |          |          |                  |               |        |                         |        |                      |              |       |            |     |   |       |

|    |                          |  |       |
|----|--------------------------|--|-------|
| 6  | Corner Chip              |  <p>t= 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 |
| 7  | Corner Chip on Cap Glass |  <p>t= 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 |
| 8  | Chip on Contact Pad      |  <p>t= 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 |
| 9  | Chip on Face of Display  |  <p>t= 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 |
| 10 | Chip on Cap Glass        |  <p>t= 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 |
| 11 | Stain on Surface         | Stain removable by soft cloth or air blow is acceptable.   | Minor |
| 12 | TCP/FPC Damage           | <p>(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.</p>   | Minor |
| 13 | Dimension Unconformity   | Checking by mechanical drawing.  | Major |

**II. Displaying Defects**

| NO.                     | ITEM   | CRITERIA  | CLASSIFICATION        |                  |  |                  |          |        |                         |        |  |               |       |
|-------------------------|--|---|-----------------------|------------------|--|------------------|----------|--------|-------------------------|--------|--|---------------|-------|
| 1                       | Black/White spot<br>Dirty spot<br>Foreign matter | <table border="1"> <thead> <tr> <th data-bbox="517 371 794 439">Average Diameter (mm)</th> <th colspan="2" data-bbox="794 371 1222 405">Pieces Permitted</th> </tr> <tr> <td data-bbox="517 439 794 472"><math>\Phi \leq 0.10</math></td> <td data-bbox="794 405 1003 439">Zone A,B</td> <td data-bbox="1003 405 1222 439">Zone C</td> </tr> <tr> <td data-bbox="517 472 794 506"><math>0.10 &lt; \Phi \leq 0.20</math></td> <td colspan="2" data-bbox="794 439 1222 506" rowspan="2">Ignore</td> </tr> <tr> <td data-bbox="517 506 794 539"><math>\Phi &gt; 0.20</math></td> </tr> </thead> </table> | Average Diameter (mm) | Pieces Permitted |  | $\Phi \leq 0.10$ | Zone A,B | Zone C | $0.10 < \Phi \leq 0.20$ | Ignore |  | $\Phi > 0.20$ | Minor |
| Average Diameter (mm)   | Pieces Permitted                                 |   |                       |                  |  |                  |          |        |                         |        |  |               |       |
| $\Phi \leq 0.10$        | Zone A,B   | Zone C  |                       |                  |  |                  |          |        |                         |        |  |               |       |
| $0.10 < \Phi \leq 0.20$ | Ignore   |   |                       |                  |  |                  |          |        |                         |        |  |               |       |
| $\Phi > 0.20$           |  |   |                       |                  |  |                  |          |        |                         |        |  |               |       |
| 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 Display Co., Ltd. warrants for a period of 12 months from the shipping date when stored or used under normal condition.