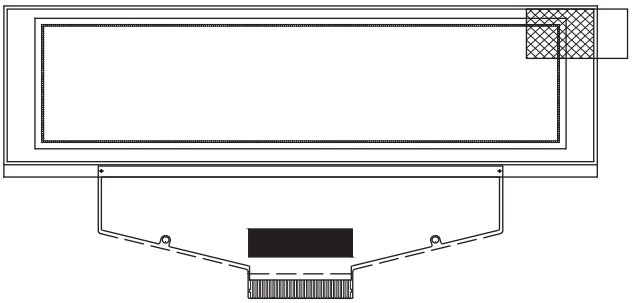
## 256 x 64 Graphic OLED



### FEATURES

- Type: graphic
- Display format: 256 x 64 dots
- Built-in controller: SSD1322
- Duty cycle: 1/64
- +3 V power supply
- Interface: 6800, 8000, and SPI
- With polarizer
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

### MECHANICAL DATA

| ITEM | STANDARD VALUE | UNIT |
|---|---|---|
| Module dimension | 88.0 x 27.8 x 2.05 | mm |
| Viewing area | 78.78 x 21.18 | |
| Active area | 76.778 x 19.178 | |
| Dot size | 0.278 x 0.278 | |
| Dot pitch | 0.3 x 0.3 | |
| Mounting hole | n/a | |

### ABSOLUTE MAXIMUM RATINGS

| ITEM | SYMBOL | STANDARD VALUE | | UNIT |
|---|---|---|---|---|
| | | MIN. | MAX. | |
| Supply voltage for operation (1)(2) | $V_{CI}$ | -0.3 | 4 | V |
| Supply voltage for logic (1)(2) | $V_{DD}$ | -0.5 | 2.75 | |
| Supply voltage for I/O pins (1)(2) | $V_{DDI/O}$ | -0.5 | $V_{CI}$ | |
| Supply voltage for display (1)(2) | $V_{CC}$ | -0.5 | 20 | |
| Operating temperature | $T_{OP}$ | -40 | +80 | °C |
| Storage temperature | $T_{STG}$ | -40 | +80 | |

**Notes**

(1) All the above voltages are on the basis of "$V_{SS}$ = 0 V".

(2) When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to section 6 "Electrical Characteristics". If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

### ELECTRICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | STANDARD VALUE | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN. | TYP. | MAX. | |
| Supply voltage for logic | $V_{CI}$ | (1) | 2.8 | 3.0 | 3.3 | V |
| Supply voltage for display | $V_{CC}$ | - | 14 | 14.5 | 15 | |
| Input high voltage | $V_{IH}$ | - | 0.8 $V_{DDI/O}$ | - | $V_{DDI/O}$ | |
| Input low voltage | $V_{IL}$ | - | 0 | - | 0.2 $V_{DDI/O}$ | |
| Output high voltage | $V_{OH}$ | - | 0.9 $V_{DDI/O}$ | - | $V_{DDI/O}$ | |
| Output low voltage | $V_{OL}$ | - | 0 | - | 0.1 $V_{DDI/O}$ | |
| 50 % check board operating current | $I_{DD}$ | $V_{CC}$ = 14.5 V | 23 | 25 | 32 | mA |

**Note**

(1) Supply voltage for logic = $V_{DD}$ core power supply can be regulated from $V_{CI}$.

### OPTIONS

| EMITTING COLOR | | | | | MOQ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| YELLOW | GREEN | RED | BLUE | WHITE | YELLOW | GREEN | RED | BLUE | WHITE |
| - | Yes | - | - | - | - | Yes | - | - | - |

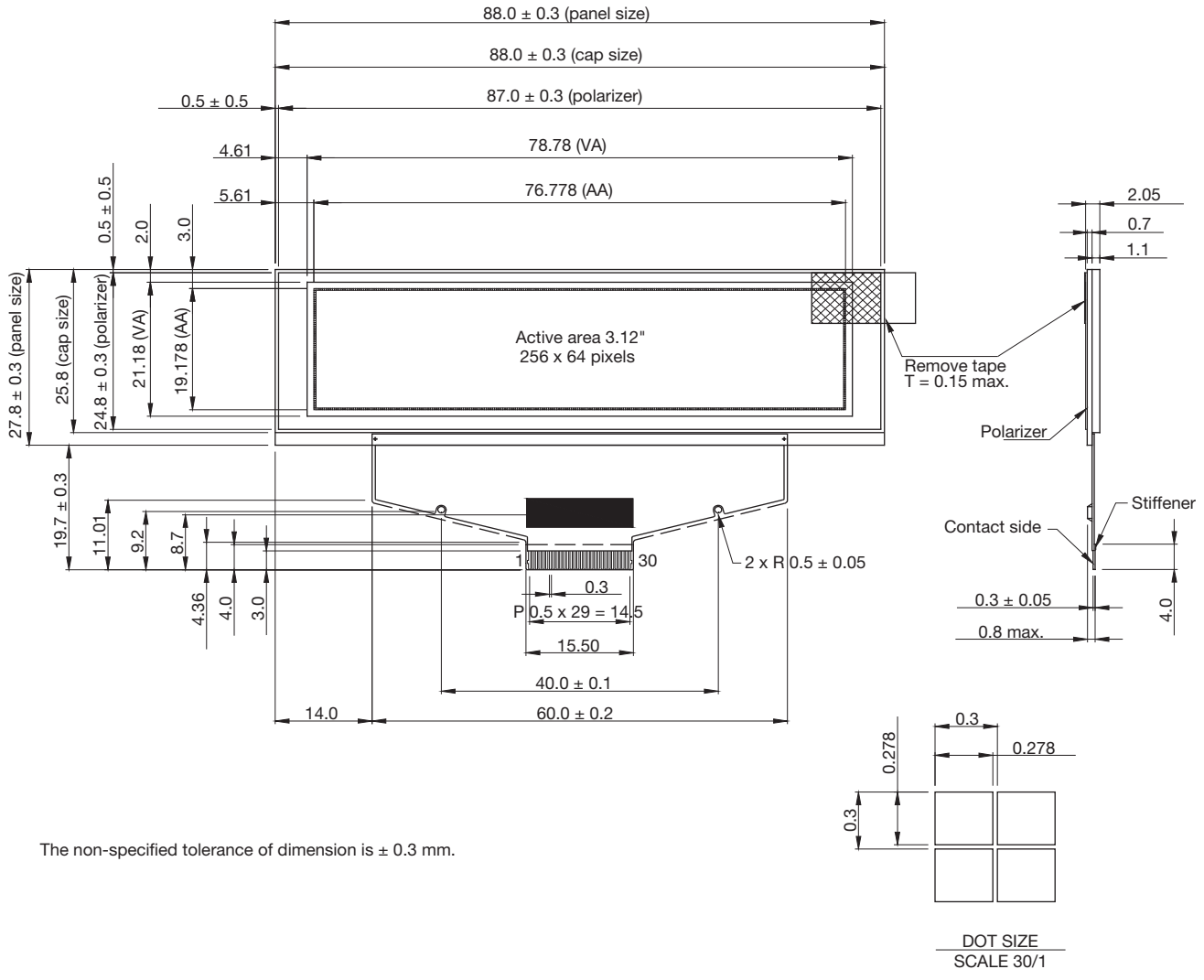
## INTERFACE PIN FUNCTION

| PIN NO. | SYMBOL | I/O | FUNCTION |
|---|---|---|---|
| **POWER SUPPLY** | | | |
| 26 | $V_{CI}$ | P | Power supply for operation<br>This is a voltage supply pin. It must be connected to external source and always be equal to or higher than $V_{DD}$ and $V_{DDI/O}$. |
| 25 | $V_{DD}$ | P | Power supply for core logic circuit<br>This is a voltage supply pin. It can be supplied externally (within the range of 2.4 V to 2.6 V) or regulated internally from $V_{CI}$. A capacitor should be connected between this pin and $V_{SS}$ under all circumstances. |
| 24 | $V_{DDI/O}$ | P | Power supply for I/O pin<br>This pin is a power supply pin of I/O buffer. It should be connected to $V_{DD}$ or external source. All I/O signal should have $V_{IH}$ reference to $V_{DDI/O}$. When I/O signal pins (BS0 to BS1, D0 to D7, control signals…) pull high, they should be connected to $V_{DDI/O}$. |
| 2 | $V_{SS}$ | P | Ground of logic circuit<br>This is a ground pin. It also acts as a reference for the logic pins. It must be connected to external ground. |
| 3, 29 | $V_{CC}$ | P | Power supply for OLED panel<br>These are the most positive voltage supply pin of the chip. They must be connected to external source. |
| 5, 28 | $V_{LSS}$ | P | Ground of analog circuit<br>These are the analog ground pins. They should be connected to $V_{SS}$ externally. |
| **DRIVER** | | | |
| 22 | $I_{REF}$ | I | Current reference for brightness adjustment<br>This pin is segment current reference pin. A resistor should be connected between this pin and $V_{SS}$. Set the current lower than 10 µA. |
| 4 | $V_{COMH}$ | P | Voltage output high level for COM signal<br>This pin is the input pin for the voltage output high level for COM signals. A tantalum capacitor should be connected between this pin and $V_{SS}$. |
| 27 | $V_{SL}$ | P | Voltage output low level for SEG signal<br>This is segment voltage reference pin. When external $V_{SL}$ is not used, this pin should be left open. When external $V_{SL}$ is used, this pin should connect with resistor and diode to ground. |
| **TESTING PADS** | | | |
| 21 | FR | O | Frame frequency triggering signal<br>This pin will send out a signal that could be used to identify the driver status. Nothing should be connected to this pin. It should be left open individually. |
| 16 | BS0 | I | Communicating protocol select<br>These pins are MCU interface selection input. See the following table: |
| 17 | BS1 | | |
| 20 | RES# | I | Power reset for controller and driver<br>This pin is reset signal input. When the pin is low, initialization of the chip is executed. |
| 19 | CS# | I | Chip select<br>This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low. |
| 18 | D / C# | I | Data / command control<br>This pin is data / command control pin. When the pin is pulled high, the input at D7 to D0 is treated as display data. When the pin is pulled low, the input at D7 to D0 will be transferred to the command register. For detail relationship to MCU interface signals, please refer to the timing characteristics diagrams. |
| 14 | E / RD# | I | Read / write enable or read<br>This pin is MCU interface input. When interfacing to a 68XX-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 CS# is pulled low. When connecting to an 80XX microprocessor, this pin receives the read (RD#) signal. Data read operation is initiated when this pin is pulled low and CS# is pulled low. When serial mode is selected, this pin must be connected to $V_{SS}$. |

| | 3-wire SPI | 4-wire SPI | 8-bit 68XX parallel | 8-bit 80XX parallel |
|---|---|---|---|---|
| BS0 | 1 | 0 | 1 | 0 |
| BS1 | 0 | 0 | 1 | 1 |

| INTERFACE PIN FUNCTION | | | |
|---|---|---|---|
| **PIN NO.** | **SYMBOL** | **I/O** | **FUNCTION** |
| 15 | R / W# | I | Read / write select or write<br>This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as read / write (R / W#) selection input. Pull this pin to “high” for read mode and pull it to “low” for write mode. When 80XX interface mode is selected, this pin will be the write (WR#) input. Data write operation is initiated when this pin is pulled low and the CS# is pulled low. When serial mode is selected, this pin must be connected to $V_{SS}$. |
| 6 to 13 | D7 to D0 | I/O | Host data input / output bus<br>These pins are 8-bit bi-directional data bus to be connected to the microprocessor’s data bus. When serial mode is selected, D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK. Unused pins must be connected to $V_{SS}$ except for D2 in serial mode. |
| **RESERVE** | | | |
| 23 | NC | - | Reserved pin<br>The NC pin between function pins are reserved for compatible and flexible design. |
| 1, 30 | NC (GND) | - | Reserved pin (supporting pin)<br>The supporting pins can reduce the influences from stresses on the function pins. These pins must be connected to external ground. |

## **DIMENSIONS** in millimeters




The non-specified tolerance of dimension is ± 0.3 mm.

# 1.Module Classification Information

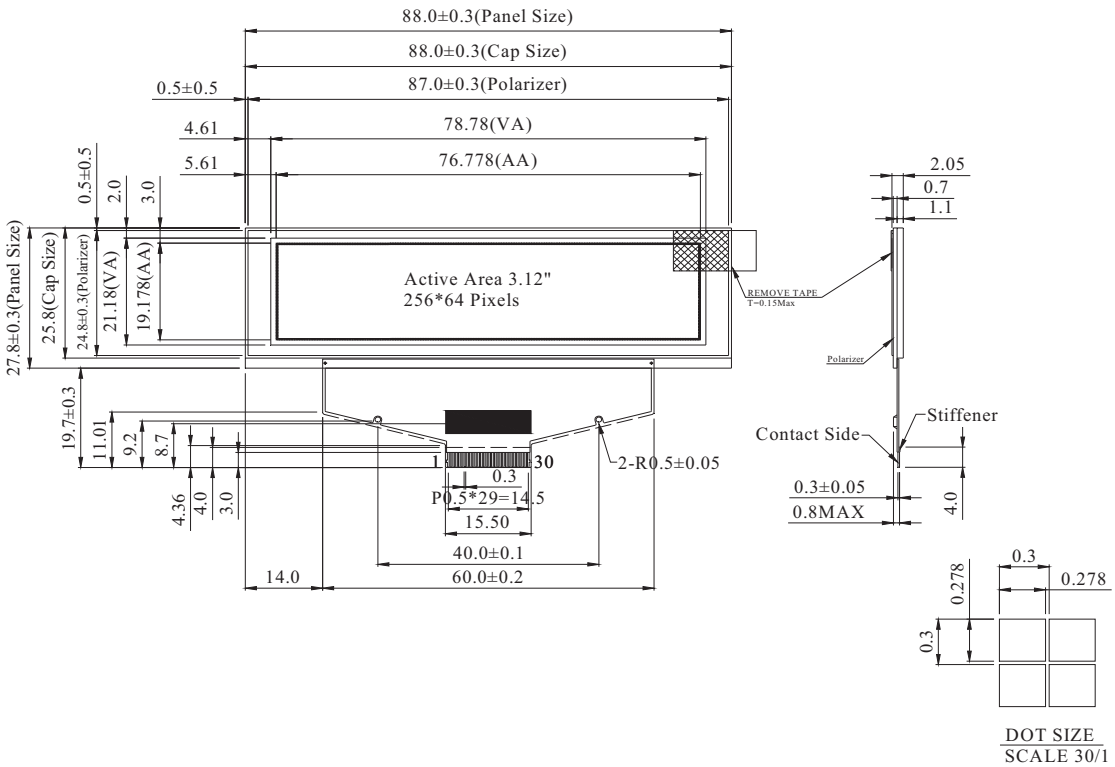
| OLED | -256 | Y | 064 | B | G | P | P | 3 | N | 0 | 0 | 000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |

| | | | |
|---|---|---|---|
| 1 | Brand：Vishay Intertechnology, Inc. | | |
| 2 | Horizontal Format: 256 columns | | |
| 3 | Display Type：N→Character Type, H→Graphic Type, Y→TAB Type ,O→COG Type | | |
| 4 | Vertical Format: 64 rows or lines | | |
| 5 | Series code: B | | |
| 6 | Emitting Color | A：Amber | R：RED |
| | | B：Blue | C：Full color |
| | | G：Green | W：White |
| | | Y：Yellow Green | L：Yellow |
| 7 | Polarizer | P：With Polarizer; N: Without Polarizer | |
| 8 | Display Mode | P：Passive Matrix ; A: Active Matrix | |
| 9 | Driver Voltage | 3: 3.0 V; 5: 5.0V | |
| 10 | Touch Panel | N：Without touch panel; T: With touch panel | |
| 11 | Products type | 0：Standard type<br>1. Sunlight Readable type<br>2. Transparent OLED (TOLED)<br>3. Flexible OLED<br>4. OLED for Lighting | |
| 12 | Product grades | 0：Standard(A-level)<br>2：B-level<br>3：C-level<br>4：high class(AA-level)<br>5：Customer offerings | |
| 13 | Serial No. | Application serial number(000~ZZZ) | |

# 2.General Specification

| Item | Dimension | Unit |
|---|---|---|
| Dot Matrix | 256 x 64 Dots | — |
| Module dimension | 88.0 × 27.8 × 2.05 (mm) | mm |
| Active Area | 76.778×19.178 (mm) | mm |
| Pixel Size | 0.278×0.278 (mm) | mm |
| Pixel Pitch | 0.3×0.3 (mm) | mm |
| Display Mode | Passive Matrix | |
| Display Color | Green | |
| Drive Duty | 1/64 Duty | |
| IC | SSD1322 | |

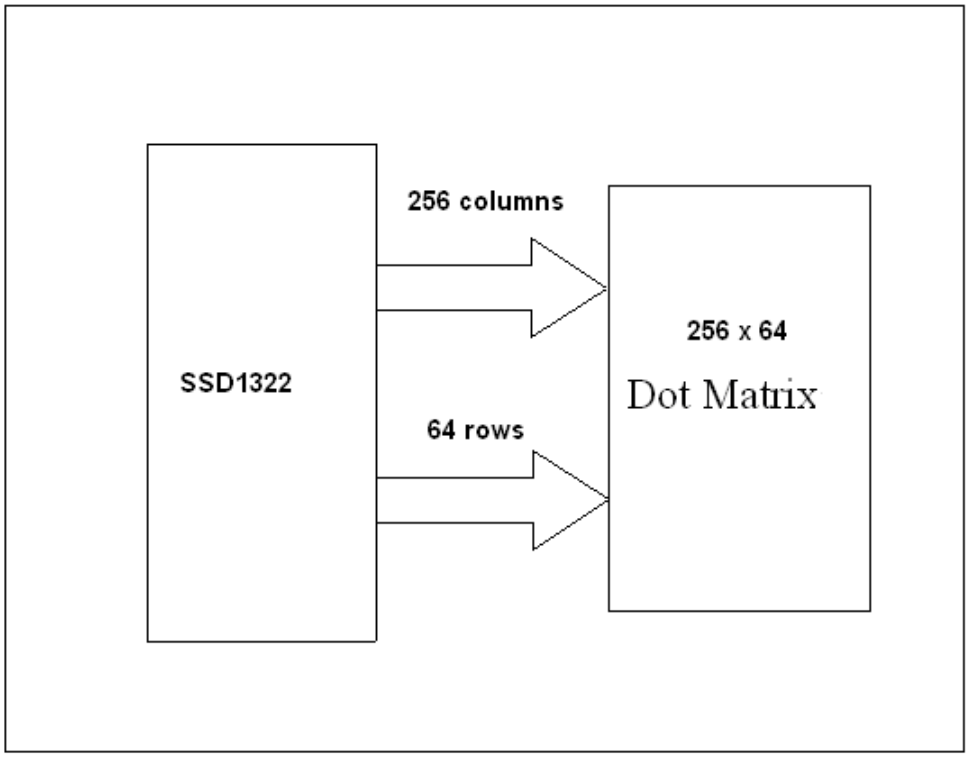
## 3. Contour Drawing & Block Diagram




| PIN NO. | SYMBOL |
|---|---|
| 1 | NC(GND) |
| 2 | VSS |
| 3 | VCC |
| 4 | VCOMH |
| 5 | VLSS |
| 6 | D7 |
| 7 | D6 |
| 8 | D5 |
| 9 | D4 |
| 10 | D3 |
| 11 | D2 |
| 12 | D1 |
| 13 | D0 |
| 14 | E/RD# |
| 15 | R/W# |
| 16 | BS0 |
| 17 | BS1 |
| 18 | DC# |
| 19 | CS# |
| 20 | RES# |
| 21 | FR |
| 22 | IREF |
| 23 | NC |
| 24 | VDDIO |
| 25 | VDD |
| 26 | VCI |
| 27 | VSL |
| 28 | VLSS |
| 29 | VCC |
| 30 | NC(GND) |

The non-specified tolerance of dimension is ±0.3mm.

## FUNCTION BLOCK DIAGRAM




*For more information, please refer to the SSD1322 datasheet.

# 4. Interface Pin Function

| Pin Number | Symbol | I/O | Function |
|---|---|---|---|
| ***Power Supply*** | | | |
| **26** | **VCI** | P | ***Power Supply for Operation***<br>This is a voltage supply pin. It must be connected to external source & always be equal to or higher than VDD & VDDIO. |
| **25** | **VDD** | P | ***Power Supply for Core Logic Circuit***<br>This is a voltage supply pin. It can be supplied externally (within the range of 2.4~2.6V) or regulated internally from VCI. A capacitor should be connected between this pin & VSS under all circumstances. |
| **24** | **VDDIO** | P | ***Power Supply for I/O Pin***<br>This pin is a power supply pin of I/O buffer. It should be connected to VDD or external source. All I/O signal should have VIH reference to VDDIO. When I/O signal pins (BS0~BS1, D0~D7, control signals…) pull high, they should be connected to VDDIO. |
| **2** | **VSS** | P | ***Ground of Logic Circuit***<br>This is a ground pin. It also acts as a reference for the logic pins. It must be connected to external ground. |
| **3,29** | **VCC** | P | ***Power Supply for OLED Panel***<br>These are the most positive voltage supply pin of the chip. They must be connected to external source. |
| **5,28** | **VLSS** | P | ***Ground of Analog Circuit***<br>These are the analog ground pins. They should be connected to VSS externally. |
| ***Driver*** | | | |
| **22** | **IREF** | I | ***Current Reference for Brightness Adjustment***<br>This pin is segment current reference pin. A resistor should be connected between this pin and VSS. Set the current lower than 10uA. |
| **4** | **VCOMH** | P | ***Voltage Output High Level for COM Signal***<br>This pin is the input pin for the voltage output high level for COM signals. A tantalum capacitor should be connected between this pin and VSS. |
| **27** | **VSL** | P | ***Voltage Output Low Level for SEG Signal***<br>This is segment voltage reference pin.<br>When external VSL is not used, this pin should be left open.<br>When external VSL is used, this pin should connect with resistor and diode to ground. |

<table>
<tr><td colspan="4">Testing Pads</td></tr>
<tr><td>21</td><td>FR</td><td>O</td><td>Frame Frequency Triggering Signal<br>This pin will send out a signal that could be used to identify the driver status. Nothing should be connected to this pin. It should be left open individually.</td></tr>
<tr><td>16</td><td>BS0</td><td rowspan="2">I</td><td rowspan="2">Communicating Protocol Select<br>These pins are MCU interface selection input. See the following table:<br><table><tr><th></th><th>BS0</th><th>BS1</th></tr><tr><td>3-wire SPI</td><td>1</td><td>0</td></tr><tr><td>4-wire SPI</td><td>0</td><td>0</td></tr><tr><td>8-bit 68XX Parallel</td><td>1</td><td>1</td></tr><tr><td>8-bit 80XX Parallel</td><td>0</td><td>1</td></tr></table></td></tr>
<tr><td>17</td><td>BS1</td></tr>
<tr><td>20</td><td>RES#</td><td>I</td><td>Power Reset for Controller and Driver<br>This pin is reset signal input. When the pin is low, initialization of the chip is executed.</td></tr>
<tr><td>19</td><td>CS#</td><td>I</td><td>Chip Select<br>This pin is the chip select input. The chip is enabled for MCU communication only when CS# is pulled low.</td></tr>
<tr><td>18</td><td>D/C#</td><td>I</td><td>Data/Command Control<br>This pin is Data/Command control pin. When the pin is pulled high, the input at D7~D0 is treated as display data.<br>When the pin is pulled low, the input at D7~D0 will be transferred to the command register. For detail relationship to MCU interface signals, please refer to the<br>Timing Characteristics Diagrams.</td></tr>
<tr><td>14</td><td>E/RD#</td><td>I</td><td>Read/Write Enable or Read<br>This pin is MCU interface input. When interfacing to a 68XX-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 CS# is pulled low.<br>When connecting to an 80XX-microprocessor, this pin receives the Read (RD#) signal. Data read operation is initiated when this pin is pulled low and CS# is pulled low.<br>When serial mode is selected, this pin must be connected to VSS.</td></tr>
<tr><td>15</td><td>R/W#</td><td>I</td><td>Read/Write Select or Write<br>This pin is MCU interface input. When interfacing to a 68XX-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Pull this pin to “High” for read mode and pull it to “Low” for write mode.<br>When 80XX interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled low and the CS# is pulled low.<br>When serial mode is selected, this pin must be connected to VSS.</td></tr>
<tr><td>6~13</td><td>D7~D0</td><td>I/O</td><td>Host Data Input/Output Bus<br>These pins are 8-bit bi-directional data bus to be connected to the microprocessor’s data bus. When serial mode is selected,</td></tr>
</table>

| | | | |
|---|---|---|---|
| | | | D1 will be the serial data input SDIN and D0 will be the serial clock input SCLK.<br>Unused pins must be connected to VSS except for D2 in serial mode. |
| ***Reserve*** | | | |
| **23** | **N.C.** | - | ***Reserved Pin***<br>The N.C. pin between function pins are reserved for compatible and flexible design. |
| **1,30** | **N.C. (GND)** | - | ***Reserved Pin*** (Supporting Pin)<br>The supporting pins can reduce the influences from stresses on the function pins. These pins must be connected to external ground. |

# 5.Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit | Notes |
|---|---|---|---|---|---|
| Supply Voltage for Operation | VCI | -0.3 | 4 | V | 1, 2 |
| Supply Voltage for Logic | VDD | -0.5 | 2.75 | V | 1, 2 |
| Supply Voltage for I/O Pins | VDDIO | -0.5 | VCI | V | 1, 2 |
| Supply Voltage for Display | VCC | -0.5 | 20 | V | 1, 2 |
| Operating Temperature | TOP | -40 | 80 | °C | - |
| Storage Temperature | TSTG | -40 | 80 | °C | - |

Note 1: All the above voltages are on the basis of “VSS = 0V”.
Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also, for normal operations, it is desirable to use this module under the conditions according to Section 6 ‘’Electrical Characteristics’’. If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate

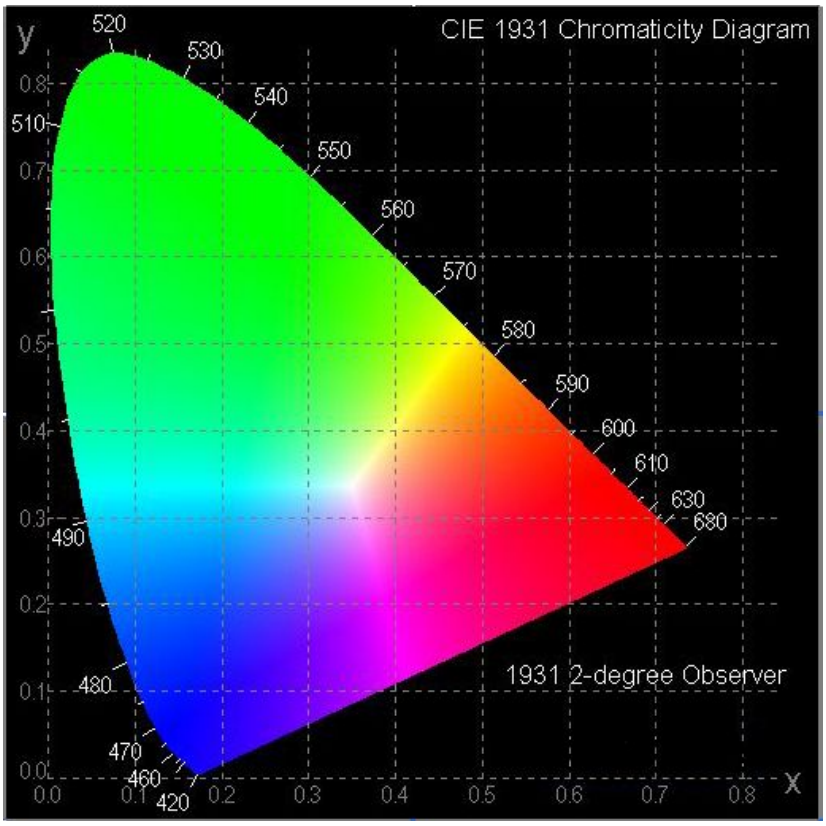
# 6.Electrical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage for Operation | VCI | Note | 2.8 | 3.0 | 3.3 | V |
| Supply Voltage for Display | VCC | — | 14 | 14.5 | 15 | V |
| High Level Input | VIH | — | 0.8×$V_{DDIO}$ | — | $V_{DDIO}$ | V |
| Low Level Input | VIL | — | 0 | — | 0.2×$V_{DDIO}$ | V |
| High Level Output | VOH | — | 0.9×$V_{DDIO}$ | — | $V_{DDIO}$ | V |
| Low Level Output | VOL | — | 0 | — | 0.1×$V_{DDIO}$ | V |
| 50% Check Board operating Current | | VCC =14.5V | 23 | 25 | 32 | mA |

Note: Supply Voltage for Logic = VDD core power supply can be regulated from VCI.

# 7.Optical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| View Angle | (V)θ | | 160 | | | deg |
| | (H)φ | | 160 | | | deg |
| Contrast Ratio | CR | Dark | 2000:1 | | — | — |
| Response Time | T rise | — | | 10 | | μs |
| | T fall | — | | 10 | | μs |
| Display with 50% check Board Brightness | | | 100 | 120 | | cd/m2 |
| CIEx(Green) | | (CIE1931) | 0.24 | 0.28 | 0.32 | |
| CIEy(Green) | | (CIE1931) | 0.59 | 0.63 | 0.67 | |



# 8.OLED Lifetime

| ITEM | Conditions | Min | Typ | Remark |
|---|---|---|---|---|
| Operating Life Time | Ta=25℃ / Initial 50% check board brightness Typical Value | 40,000 Hrs | — | Note |

Notes:
1. Life time is defined the amount of time when the luminance has decayed to <50% of the initial value.
2. This analysis method uses life data obtained under accelerated conditions to extrapolate an estimated probability density function (*pdf*) for the product under normal use conditions.
3. Screen saving mode will extend OLED lifetime.

# 9.Reliability

## Content of Reliability Test

| Environmental Test | | | |
|---|---|---|---|
| **Test Item** | **Content of Test** | **Test Condition** | **Applicable Standard** |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 80□<br>240hrs | —— |
| Low Temperature storage | Endurance test applying the low storage temperature for a long time. | -40□<br>240hrs | —— |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 80□<br>240hrs | —— |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -40□<br>240hrs | —— |
| High Temperature/ Humidity Storage | Endurance test applying the high temperature and high humidity storage for a long time. | 60□,90%RH<br>240hrs | —— |
| Temperature Cycle | Endurance test applying the low and high temperature cycle.<br>-40□ 25□ 80□<br>30min 5min 30min<br>1 cycle | -40□/80□<br>100 cycles | —— |
| Mechanical Test | | | |
| Vibration test | Endurance test applying the vibration during transportation and using. | 10~22Hz→1.5mmp-p<br>22~500Hz→1.5G<br>Total 0.5hr | —— |
| Shock test | Constructional and mechanical endurance test applying the shock during transportation. | 50G Half sin wave 11 ms<br>3 times of each direction | —— |
| Atmospheric pressure test | Endurance test applying the atmospheric pressure during transportation by air. | 115mbar<br>40hrs | —— |
| Others | | | |
| Static electricity test | Endurance test applying the electric stress to the terminal. | VS=800V,RS=1.5kΩ<br>CS=100pF<br>1 time | —— |

*** Supply voltage for OLED system =Operating voltage at 25℃

**Test and measurement conditions**

1. All measurements shall not be started until the specimens attain to temperature stability. 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 23±5°C; 55±15% RH.
2. All-pixels-on is used as operation test pattern.
3. The degradation of Polarizer are ignored for High Temperature storage, High Temperature/ Humidity Storage, Temperature Cycle

**Evaluation criteria**

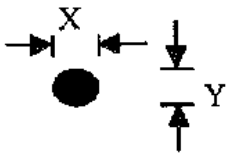
1. The function test is OK.
2. No observable defects.
3. Luminance: > 50% of initial value.
4. Current consumption: within ± 50% of initial value.

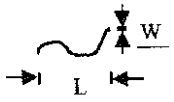
**APPENDIX:**

**RESIDUE IMAGE**

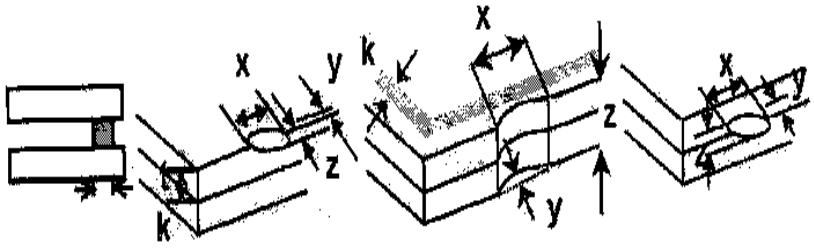
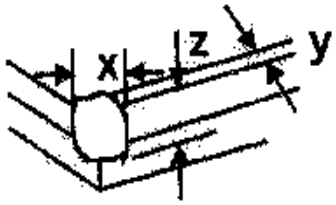
Because the pixels are lighted in different time, the luminance of active pixels may reduce or differ from inactive pixels. Therefore, the residue image will occur. To avoid the residue image, every pixel needs to be lighted up uniformly.

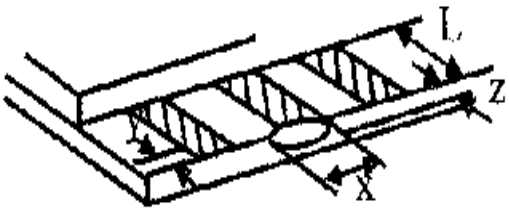
# 10.Inspection Specification

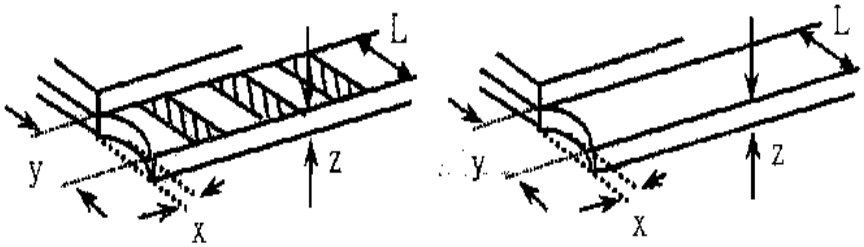
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.<br>1.2 Missing character, dot or icon.<br>1.3 Display malfunction.<br>1.4 No function or no display.<br>1.5 Current consumption exceeds product specifications.<br>1.6 OLED viewing angle defect.<br>1.7 Mixed product types.<br>1.8 Contrast defect.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or white spots on OLED (display only)</td><td>2.1 White and black spots on display ≦0.25mm, no more than three white or black spots present.<br>2.2 Densely spaced: No more than two spots or lines within 3mm.</td><td>2.5</td></tr>
<tr><td>03</td><td>OLED black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing<br>Φ=( x + y ) / 2<br> 

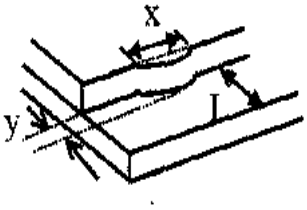
<table>
<tr><th>SIZE</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ≦0.10</td><td>Accept no dense</td></tr>
<tr><td>0.10＜ Φ≦0.20</td><td>2</td></tr>
<tr><td>0.20＜ Φ≦0.25</td><td>1</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table></td><td>2.5</td></tr>
<tr><td></td><td></td><td>3.2 Line type : (As following drawing)<br> 

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02＜W≦0.03</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03＜W≦0.05</td></tr>
<tr><td>---</td><td>0.05＜W</td><td>As round type</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size Φ</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20＜Φ≦0.50</td><td>3</td></tr>
<tr><td>0.50＜Φ≦1.00</td><td>2</td></tr>
<tr><td>1.00＜Φ</td><td>0</td></tr>
<tr><td>Total Q TY</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
</table>

<table>
<tr><td>NO</td><td>Item</td><td>Criterion</td><td>AQL</td></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 OLED black spots, white spots, contamination</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>Symbols Define:<br>x: Chip length y: Chip width z: Chip thickness<br>k: Seal width t: Glass thickness a: OLED side length<br>L: Electrode pad length:<br><br>6.1 General glass chip :<br>6.1.1 Chip on panel surface and crack between panels:<br>  <br><br><table><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr><tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr></table>⊙If there are 2 or more chips, x is total length of each chip.<br><br>6.1.2 Corner crack:<br>  <br><br><table><tr><td>z: Chip thickness</td><td>y: Chip width</td><td>x: Chip length</td></tr><tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr><tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr></table>⊙If there are 2 or more chips, x is the total length of each chip.</td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>06</td><td>Glass crack</td><td>
Symbols :<br>
x: Chip length y: Chip width z: Chip thickness<br>
k: Seal width t: Glass thickness a: OLED side length<br>
L: Electrode pad length<br>
6.2 Protrusion over terminal :<br>
6.2.1 Chip on electrode pad :<br>


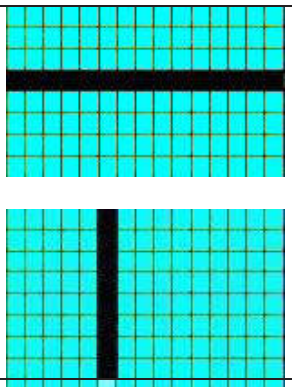
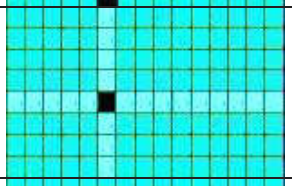
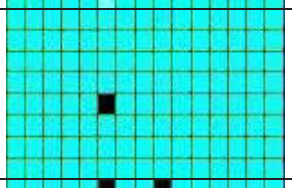
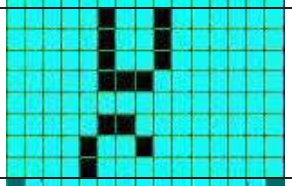
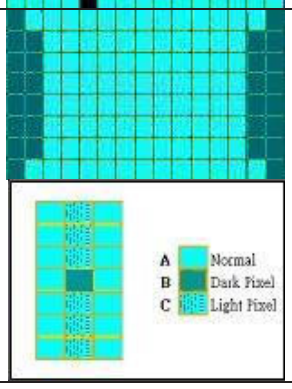
<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦0.5mm</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
6.2.2 Non-conductive portion:<br>


<table>
<tr><td>y: Chip width</td><td>x: Chip length</td><td>z: Chip thickness</td></tr>
<tr><td>y≦ L</td><td>x≦1/8a</td><td>0 ＜ z ≦ t</td></tr>
</table>
⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.<br>
⊙If the product will be heat sealed by the customer, the alignment mark not be damaged.<br>
6.2.3 Substrate protuberance and internal crack.<br>


<table>
<tr><td>y: width</td><td>x: length</td></tr>
<tr><td>y≦1/3L</td><td>x ≦ a</td></tr>
</table>
</td><td>2.5</td></tr>
</table>

| NO | Item | Criterion | AQL |
|---|---|---|---|
| 07 | Cracked glass | The OLED with extensive crack is not acceptable. | 2.5 |
| 08 | Backlight elements | 8.1 Illumination source flickers when lit.<br>8.2 Spots or scratched that appear when lit must be judged. Using OLED spot, lines and contamination standards.<br>8.3 Backlight doesn't light or color wrong. | 0.65<br>2.5<br><br>0.65 |
| 09 | Bezel | 9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination.<br>9.2 Bezel must comply with job specifications. | 2.5<br>0.65 |
| 10 | PCB、COB | 10.1 COB seal may not have pinholes larger than 0.2mm or contamination.<br>10.2 COB seal surface may not have pinholes through to the IC.<br>10.3 The height of the COB should not exceed the height indicated in the assembly diagram.<br>10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places.<br>10.5 No oxidation or contamination PCB terminals.<br>10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts.<br>10.7 The jumper on the PCB should conform to the product characteristic chart.<br>10.8 If solder gets on bezel tab pads, OLED pad, zebra pad or screw hold pad, make sure it is smoothed down. | 2.5<br><br>2.5<br>0.65<br><br>2.5<br><br><br>2.5<br>0.65<br><br><br>0.65<br><br>2.5 |
| 11 | Soldering | 11.1 No un-melted solder paste may be present on the PCB.<br>11.2 No cold solder joints, missing solder connections, oxidation or icicle.<br>11.3 No residue or solder balls on PCB.<br>11.4 No short circuits in components on PCB. | 2.5<br>2.5<br><br>2.5<br>0.65 |

| NO | Item | Criterion | AQL |
|---|---|---|---|
| 12 | General appearance | 12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP. | 2.5 |
| | | 12.2 No cracks on interface pin (OLB) of TCP. | 0.65 |
| | | 12.3 No contamination, solder residue or solder balls on product. | 2.5 |
| | | | 2.5 |
| | | 12.4 The IC on the TCP may not be damaged, circuits. | 2.5 |
| | | 12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever. | 2.5 |
| | | 12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. | 2.5 |
| | | | 0.65 |
| | | 12.7 Sealant on top of the ITO circuit has not hardened. | 0.65 |
| | | 12.8 Pin type must match type in specification sheet. | 0.65 |
| | | 12.9 OLED pin loose or missing pins. | |
| | | 12.10 Product packaging must the same as specified on packaging specification sheet. | 0.65 |
| | | 12.11 Product dimension and structure must conform to product specification sheet. | |

| Check Item | Classification | Criteria |
|---|---|---|
| No Display | Major |  |
| Missing Line | Major |  |
| Pixel Short | Major |  |
| Darker Short | Major |  |
| Wrong Display | Major |  |
| Un-uniform<br>B/A x 100% < 70%<br>A/C x 100% < 70% | Major |  |

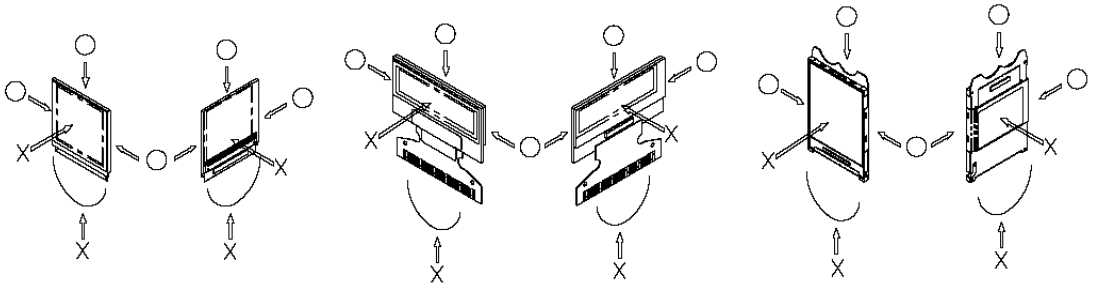
# 11.Precautions in Use of OLED Modules

## Modules

(1)Avoid applying excessive shocks to module or making any alterations or modifications to it.
(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of OLED display module.
(3)Don't disassemble the OLED display module.
(4)Don't operate it above the absolute maximum rating.
(5)Don't drop, bend or twist OLED display module.
(6)Soldering: only to the I/O terminals.
(7)Storage: please store in anti-static electricity container and clean environment.
(8)Use a "Screen Saver" to extend the lifetime. Do not show fixed information for a long time in the application.
(9)Don't use fixed information in OLED panel for long time that will cause "screen burn" effect.
(10)The manufacturer has the right to change the passive components, including R2and R3 adjust resistors. (Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.)
(11)The manufacturer has the right to change the PCB Rev. (In order to satisfy supply stability, management optimization, and the best product performance..., under the premise of not affecting the electrical characteristics and external dimensions. The manufacturer has the right to modify the version.)

11.1. Handling Precautions

(1) Since the display panel is made of glass, do not apply mechanical impacts such us dropping from a high position.
(2) If the display panel is broken by some accident and the internal organic substance leaks out, be careful not to inhale or ingest the organic substance.
(3) If pressure is applied to the display surface or its neighborhood of the OLED display module, the cell structure may be damaged, be careful not to apply pressure to these sections.
(4) The polarizer covering the surface of the OLED display module is soft and easily scratched. Please be careful when handling the OLED display module.
(5) When the surface of the polarizer of the OLED display module has soil, clean the surface. It takes advantage of by using following adhesion tape.
* Scotch Mending Tape No. 810 or an equivalent
Never try to breathe upon the soiled surface or wipe the surface using cloth containing solvent such as ethyl alcohol, since the surface of the polarizer will become cloudy.
Also, pay attention that the following liquid and solvents can damage the polarizer:
* Water
* Ketone
* Aromatic Solvents
(6) Hold OLED display module very carefully when placing OLED display module into the system housing. Do not apply excessive stress or pressure to OLED display module. And, do not over bend the film with electrode pattern layouts.
These stresses will influence the display performance. Also, secure sufficient rigidity for the outer cases.



(7) Do not apply stress to the LSI chips and the surrounding molded sections.
(8) Do not disassemble or modify the OLED display module.
(9) Do not apply input signals while the logic power is off.
(10) Pay sufficient attention to the working environments when handing OLED display modules to prevent occurrence of element breakage accidents by static electricity.
* Be sure to make human body grounding when handling OLED display modules.
* Be sure to ground tools to use or assembly such as soldering irons.
* To suppress generation of static electricity, avoid carrying out assembly work under dry environments.
* Protective film is being applied to the surface of the display panel of the OLED display module. Be careful since static electricity may be generated when removing the protective film.
(11) Protective film is applied to the surface of the display panel. Remove the protective film before assembly. If the OLED display module has been stored for a long period of time, residue adhesive material from the protective film may remain on the surface of the display panel after the film is removed. In such case, remove the residue material by the method introduced in the above Section 5.
(12) If electric current is applied when the OLED display module has moisture condensation or when it is placed under high humidity environments, the electrodes may corrode.

**11.2. Storage Precautions**

(1) When storing OLED display modules, put them in static electricity preventive bags avoiding exposure to direct sun light and fluorescent lamps. Avoid high temperature and high humidity environment or low temperature (less than 0°C) environments.
(We recommend storing these modules in the packaged state as they were shipped.)
At that time, be careful not to let water drops adhere to the packages or bags or let condensation occur with them.
(2) If electric current is applied when condensation is present or when it is placed under high humidity environments, the electrodes may corrode.

**11.3. Designing Precautions**

(1) The absolute maximum ratings are the ratings which cannot be exceeded for OLED display module, and if these values are exceeded, panel damage may be happen.
(2) To prevent occurrence of malfunctioning by noise, pay attention to satisfy the VIL and VIH specifications and, at the same time, to make the signal line cable as short as possible.
(3) We recommend you to install excess current preventive unit (fuses, etc.) to the power circuit (VDD). (Recommend value: 0.5A)
(4) Pay sufficient attention to avoid occurrence of mutual noise interference with the neighboring devices.
(5) For EMI, take necessary measures in the application equipment.
(6) When fastening the OLED display module, fasten the external plastic housing section.
(7) If power supply to the OLED display module is forcibly shut down by such errors as taking out the main battery while the OLED display panel is in operation, we cannot guarantee the quality of this OLED display module.

* Connection (contact) to any other potential than the above may lead to rupture of the IC.11.4.

**Precautions when disposing of the OLED display modules**

1) Request the qualified companies to handle industrial wastes when disposing of the OLED display modules. Or, when burning them, be sure to observe the environmental and hygienic laws and regulations.

**11.5. Other Precautions**

(1) When an OLED display module is operated for a long time with a fixed pattern, the pattern may remain as an after image with slight contrast or brightness variation.
Nonetheless, if the operation is interrupted and left unused for a while, normal state can be restored. Also, there will be no problem in the reliability of the module.

(2) To protect OLED display modules from performance drops by static electricity rapture, etc., do not touch the following sections whenever possible while handling the OLED display modules.

* Pins and electrodes
* Pattern layouts such as the TCP & FPC

(3) With this OLED display module, the OLED driver is exposed. Generally, semiconductor elements change their characteristics when exposed to light, similar to the principle of the solar battery. Consequently, if this OLED driver is exposed to light, malfunctioning may occur.

* Design the product and installation method so that the OLED driver may be shielded from light in actual usage.
* Design the product and installation method so that the OLED driver may be shielded from light during the inspection processes.

(4) Although this OLED display module stores the operational state data by the commands and the indication data, when excessive external noise, etc. enters into the module, the internal states may be changed. It therefore is necessary to take appropriate measures to suppress noise generation or to protect from influences of noise on the system design.

(5) We recommend you to construct its software to make periodical refreshment of the operation statuses (re-setting of the commands and re-transference of the display data) to cope with catastrophic noise.

(6)Resistors, capacitors and other passive components will have different appearance and color caused by the different supplier.

(7)The manufacturer has the right to upgrade and modify the product function.

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