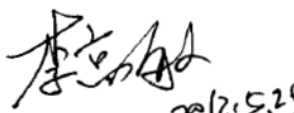


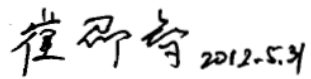


# Product Specification

**Product Name:** VGM256032A0W04

**Product Code:** M00415

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

Designed By	Checked By	Approved By	
		R&D	QA
 <small>2012.5.29</small>	 <small>2012.5.31</small>	 <small>2012.5.31</small>	 <small>2012.5.31</small>

---

## CONTENT

<b>REVISION RECORD</b> .....	<b>3</b>
<b>1 OVERVIEW</b> .....	<b>4</b>
<b>2 FEATURES</b> .....	<b>4</b>
<b>3 MECHANICAL DATA</b> .....	<b>4</b>
<b>4 MECHANICAL DRAWING</b> .....	<b>5</b>
<b>5 MODULE INTERFACE</b> .....	<b>6</b>
<b>6 FUNCTION BLOCK DIAGRAM</b> .....	<b>7</b>
6.1 FUNCTION BLOCK DIAGRAM.....	7
6.2 PANEL LAYOUT DIAGRAM .....	7
<b>7 ABSOLUTE MAXIMUM RATINGS</b> .....	<b>8</b>
<b>8 ELECTRICAL CHARACTERISTICS</b> .....	<b>9</b>
8.1 DC ELECTRICAL CHARACTERISTICS .....	9
8.2 ELECTRO-OPTICAL CHARACTERISTICS .....	9
8.3 AC ELECTRICAL CHARACTERISTICS .....	10
<b>9 FUNCTIONAL SPECIFICATION AND APPLICATION CIRCUIT</b> .....	<b>14</b>
9.1 POWER ON AND POWER OFF SEQUENCE.....	14
9.2 APPLICATION CIRCUIT.....	15
9.3 EXTERNAL DC-DC APPLICATION CIRCUIT .....	19
9.4 DISPLAY CONTROL INSTRUCTION.....	20
9.5 RECOMMENDED SOFTWARE INITIALIZATION .....	20
<b>10 PACKAGE SPECIFICATION</b> .....	<b>22</b>
<b>11 RELIABILITY</b> .....	<b>23</b>
11.1 RELIABILITY TEST.....	23
11.2 LIFETIME.....	23
11.3 FAILURE CHECK STANDARD.....	23
<b>12 ILLUSTRATION OF OLED PRODUCT NAME</b> .....	<b>24</b>
<b>13 OUTGOING QUALITY CONTROL SPECIFICATIONS</b> .....	<b>25</b>
13.1 SAMPLING METHOD .....	25
13.2 INSPECTION CONDITIONS .....	25
13.3 QUALITY ASSURANCE ZONES.....	25
13.4 INSPECTION STANDARD.....	26
13.5 LUMINANCE UNIFORMITY .....	28
<b>14 PRECAUTIONS FOR OPERATION AND STORAGE</b> .....	<b>29</b>
14.1 PRECAUTIONS FOR OPERATION .....	29
14.2 SOLDERING .....	29
14.3 PRECAUTIONS FOR STORAGE.....	29
14.4 WARRANTY PERIOD.....	29

## REVISION RECORD

REV.	REVISION DESCRIPTION	REV. DATE	REMARK
A01	Initial release.	2010-02-23	
A02	Modify the Mechanical Data Update the Mechanical Drawing(Add Protection Tape)	2010-09-17	Page 4 Page 5
A03	Modify the DC Electrical Characteristics	2010-09-17	Page 9
A04	Update the Mechanical Drawing Update the Electro-optical Characteristics Update the Application Circuit Add the External DC-DC application circuit Update the Package Specification	2011-1-21	Page 5 Page 9 Page 14~18 Page 19 Page 22
A05	Update the External DC-DC application circuit Update the Package Specification	2012-01-30	Page 19 Page 22
A06	Update the Power ON and Power OFF Sequence Update the Application Circuit Update the Package Specification	2012-05-29	Page 14 Page 15~18 Page 22

## 1 Overview

VGM256032A0W04 is an OLED grayscale display module with 256×32 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:256×32
- Driver IC: SSD1326U3R1
- Interface:8-bit 8080,8-bit 6800, SPI, I<sup>2</sup>C
- Wide range of operating temperature: -40°C to 85°C

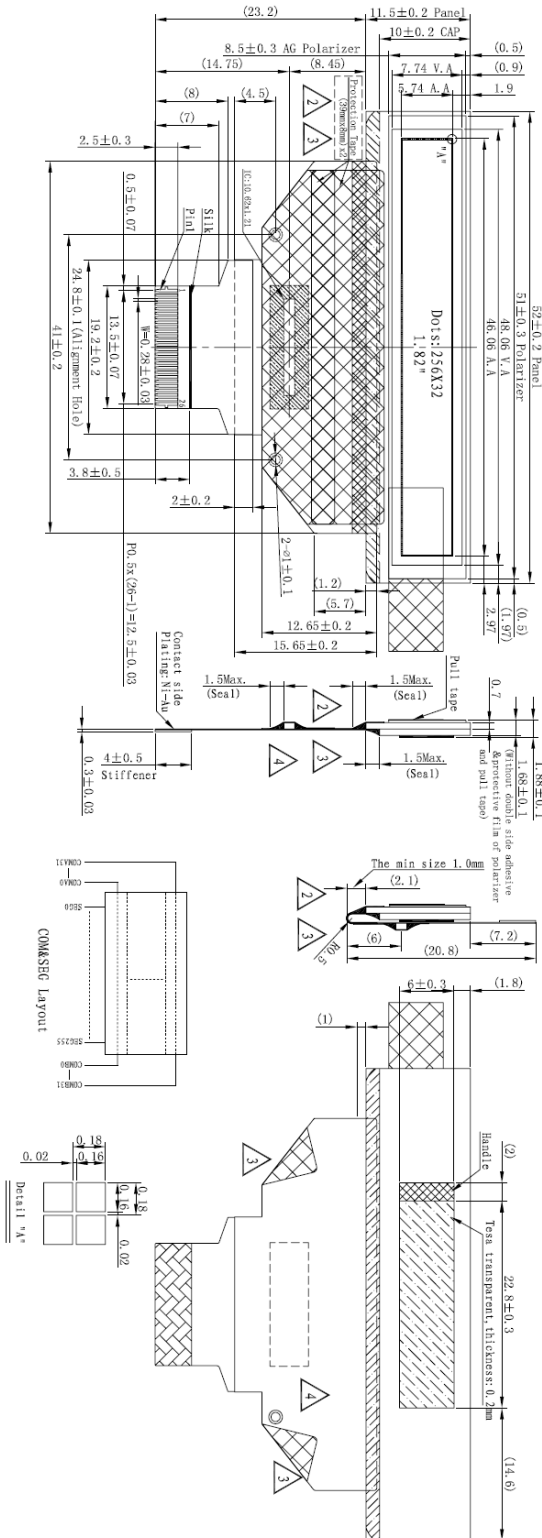
## 3 Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	256(W)×32(H)	-
2	Dot Size	0.16(W)×0.16(H)	mm <sup>2</sup>
3	Dot Pitch	0.18(W)×0.18(H)	mm <sup>2</sup>
4	Aperture Rate	79	%
5	Active Area	46.06(W)×5.74(H)	mm <sup>2</sup>
6	Panel Size	52(W)×11.5(H) ×1.4(T)	mm <sup>3</sup>
7	Module Size	52(W)×34.7(H) ×1.88(T)	mm <sup>3</sup>
8	Diagonal A/A Size	1.82	inch
9	Module Weight	2.26±10%	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



Rev.	Date	Note
1	2010.02.22	Primary
2	2010.08.06	Add Protection Tape
3	2010.09.01	Add Protection Tape
4	2010.12.02	Remove double-sided adhesive

- Specification:
1. Display: OLED (White)
  2. Format: 256\*32
  3. Driver IC: SSD1326U3R1
  4. DUTY: 1/32
  5. Operate Temp: -40° C ~ 85° C
  6. Storage Temp: -40° C ~ 85° C
  7. General Tolerance: ± 0.3
  7. ROHS Compliant

Customer Approval Signature	Part Name	Module Ass'y	Date	Rev.	Unit	Sheet
	Project Code	00415	2010.12.02	04	mm	1/1
	Part No.	00415-MA1-A	DES'D BY	CHK'D BY	CHK'D BY	APPROVED

Pin Assignment	NO.	SYMBOL
1	NC	NC
2	VCC	VCC
3	VCOMH	VCOMH
4	VSS	VSS
5	D7	D7
6	D6	D6
7	D5	D5
8	D4	D4
9	D3	D3
10	D2	D2
11	D1	D1
12	DO	DO
13	E	E
14	R/W#	R/W#
15	D/C#	D/C#
16	RES#	RES#
17	CS#	CS#
18	BS2	BS2
19	BS1	BS1
20	BS0	BS0
21	VDD10	VDD10
22	VDD	VDD
23	VSS	VSS
24	IREF	IREF
25	VCC	VCC
26	NC	NC

## 5 Module Interface

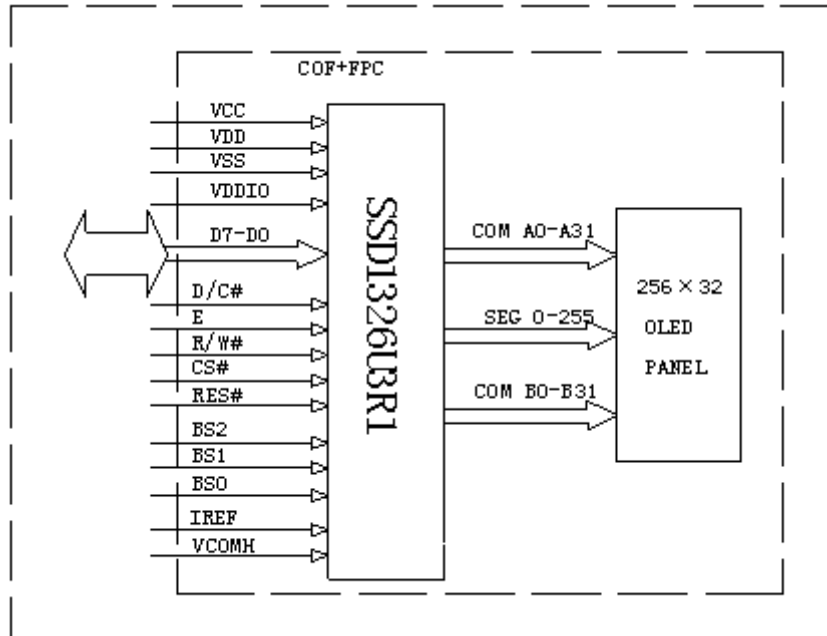
PIN NO.	PIN NAME	DESCRIPTION
1	NC	No Connection. (or connect to VSS)
2	VCC	OLED drive voltage, it should be supplied externally.
3	VCOMH	This is an input pin for the voltage output high level for COM signals.
4	VSS	Ground.
5~12	D7~D0	These is 8-bit-directional data bus. When serial interface mode is selected, D1 will be the serial data input,SDIN, and D0 will be serial clock input,SCLK. When I <sup>2</sup> C mode is selected, D2,D1 should be tied together and serve as SDAout,SDAin in application and D0 is the serial clock input, SCL.
13	E	8080: data read enable pin; 6800: Read/Write enable pin. Data read operation is initiated when it's pull low.
14	R/W#	8080: data write enable pin; 6800: Read/Write select pin. Data write operation is initiated when it's pull low.
15	D/C#	Data/Command Select. H: Data; L: Command.
16	RES#	Reset, active low.
17	CS#	Chip Select, active low.
18	BS2	Table 5.1
19	BS1	
20	BS0	
21	VDDIO	This pin is a power supply pin of I/O buffer.It should be connected to VDD or external source.
22	VDD	Power supply pin for core logic operation.
23	VSS	Ground.
24	IREF	This is a segment current reference pin.
25	VCC	OLED drive voltage, it should be supplied externally.
26	NC	No Connection. (or connect to VSS)

Table 5.1

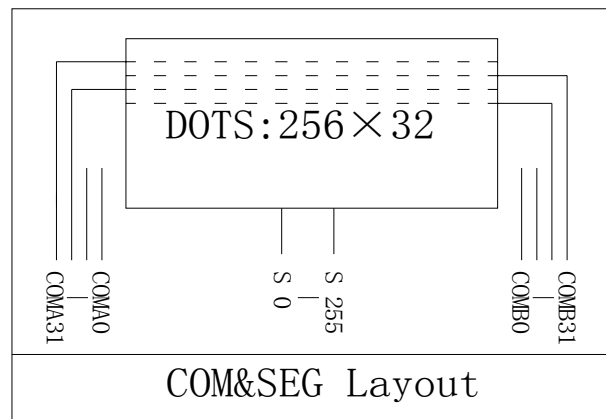
Pin Name	I <sup>2</sup> C	8-bit 6800	8-bit 8080	SPI
BS0	0	0	0	0
BS1	1	0	1	0
BS2	0	1	1	0

## 6 Function Block Diagram

### 6.1 Function Block Diagram



### 6.2 Panel Layout Diagram



## 7 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Supply Voltage	VDD	-0.3	+4.0	V	IC maximum rating
	VDDIO	-0.3	VDD +0.5	V	
	VCC	0	+16	V	IC maximum rating
Operating Temp.	Top	-40	+85	°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	VDD	22±3°C, 55±15%R.H	2.4	3.0	3.5	V
Power Supply for I/O pins	VDDIO	22±3°C, 55±15%R.H	1.7	-	VDD	V
OLED Driver Supply Voltage	VCC	22±3°C, 55±15%R.H	11.5	12	12.5	V
High-level Input Voltage	V <sub>IH</sub>	-	0.8×VDDIO	-	-	V
Low-level Input Voltage	V <sub>IL</sub>	-	-	-	0.2×VDDIO	V
High-level Output Voltage	V <sub>OH</sub>	-	0.9×VDDIO	-	-	V
Low-level Output Voltage	V <sub>OL</sub>	-	-	-	0.1×VDDIO	V

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

### 8.2 Electro-optical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Normal Mode Brightness	L <sub>br</sub>	All pixels ON(1)	80	100	-	cd/m <sup>2</sup>
Sleep mode Current	ICC,SLEEP	VDD=VDDIO=2.7V, display OFF, No panel attached	-	-	10	uA
	IDD,SLEEP		-	-	10	uA
	IDDIO,SLEEP		-	-	10	uA
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	144	175	mW
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	-	μs
View Angle	-	-	≥160	-	-	Degree

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

- Driving voltage : 12V
- Contrast setting : 0x27
- Frame rate : 105HZ
- Duty setting : 1/32

### 8.3 AC Electrical Characteristics

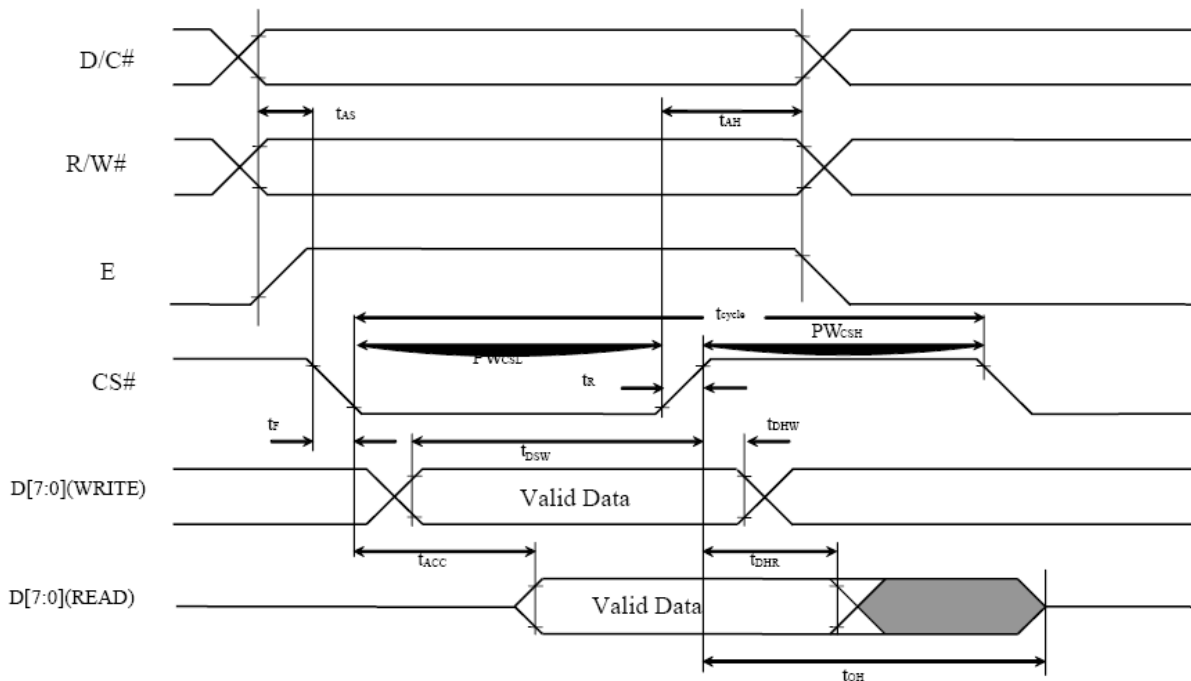
#### (1)6800-Series MPU Parallel Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

Table 13-4 : 6800-Series MCU Parallel Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	300	-	-	ns
$t_{AS}$	Address Setup Time	0	-	-	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
$PW_{CSL}$	Chip Select Low Pulse Width (read) Chip Select Low Pulse Width (write)	120 60	-	-	ns
$PW_{CSH}$	Chip Select High Pulse Width (read) Chip Select High Pulse Width (write)	60 60	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

Figure 13-3 : 6800-series MCU parallel interface characteristics



6800-series MCU parallel interface characteristics

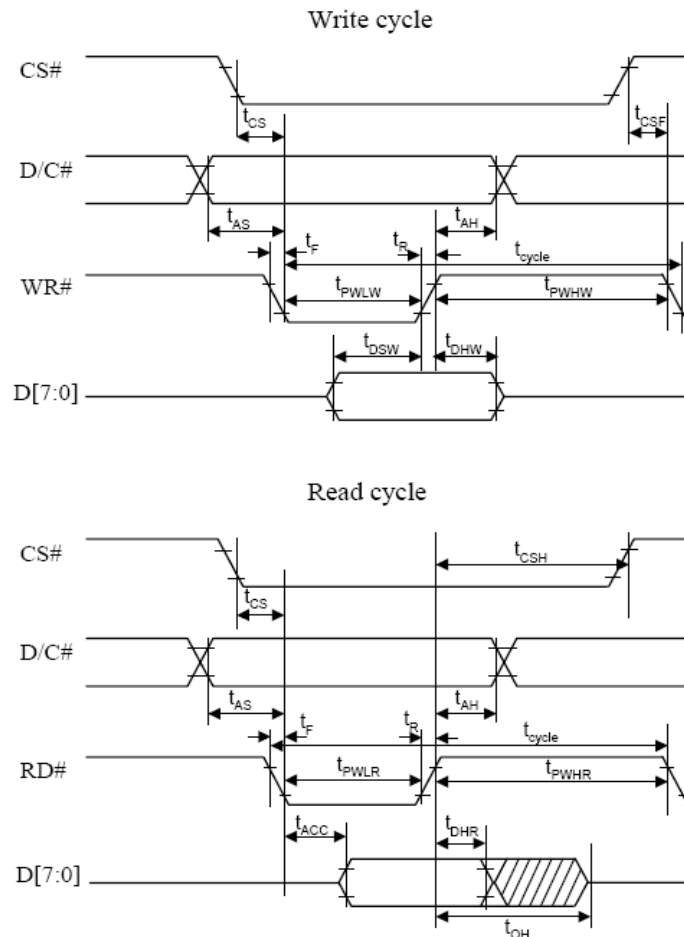
(2)8080-Series MPU Parallel Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

Table 13-5 : 8080-Series MCU Parallel Interface Timing Characteristics

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
$t_{PWLr}$	Read Low Time	120	-	-	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 13-4 : 8080-series MCU parallel interface characteristics



8080-series MPU parallel interface characteristics

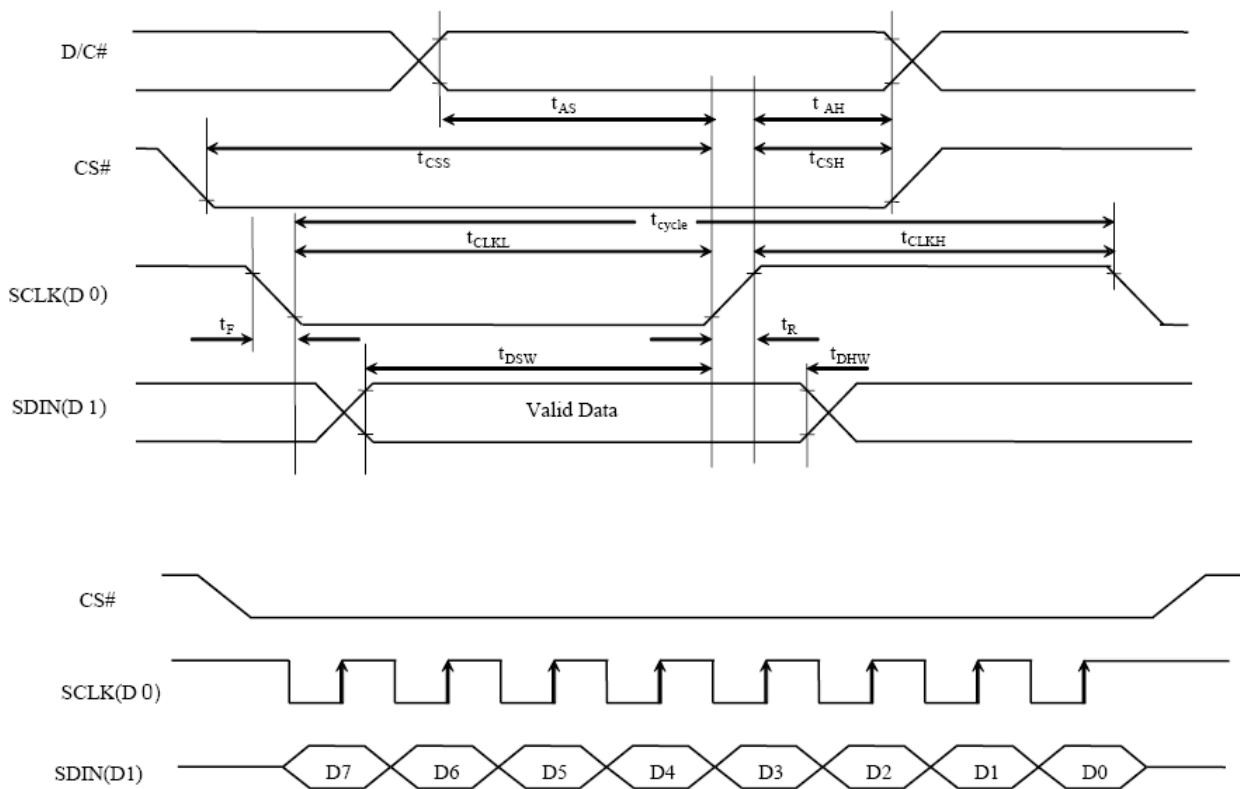
**(3)Serial Interface Timing Characteristics**

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

**Table 13-3 : Serial Interface Timing Characteristics**

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	250	-	-	ns
$t_{AS}$	Address Setup Time	150	-	-	ns
$t_{AH}$	Address Hold Time	150	-	-	ns
$t_{CSS}$	Chip Select Setup Time	120	-	-	ns
$t_{CSH}$	Chip Select Hold Time	60	-	-	ns
$t_{DSW}$	Write Data Setup Time	100	-	-	ns
$t_{DHW}$	Write Data Hold Time	100	-	-	ns
$t_{CLKL}$	Clock Low Time	100	-	-	ns
$t_{CLKH}$	Clock High Time	100	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

**Figure 13-2 : Serial interface characteristics**



**Serial interface characteristics**

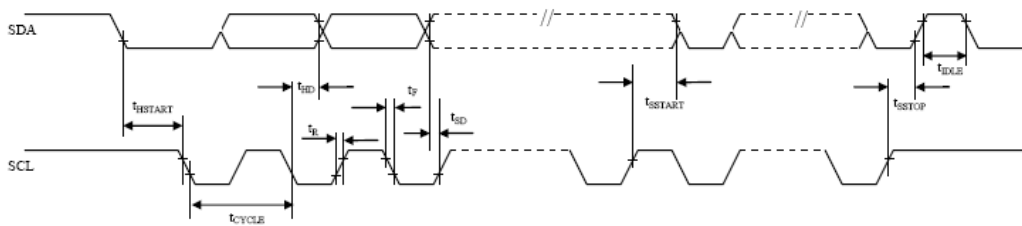
**(4) I<sup>2</sup>C Interface Timing Characteristics**

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

**Table 13-2 : I<sup>2</sup>C Interface Timing Characteristics**

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>cycle</sub>	Clock Cycle Time	2.5	-	-	us
t <sub>HSTART</sub>	Start condition Hold Time	0.6	-	-	us
t <sub>HD</sub>	Data Hold Time	300	-	-	ns
t <sub>SD</sub>	Data Setup Time	100	-	-	ns
t <sub>SSSTART</sub>	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t <sub>SSSTOP</sub>	Stop condition Setup Time	0.6	-	-	us
t <sub>R</sub>	Rise Time for data and clock pin	-	-	300	ns
t <sub>F</sub>	Fall Time for data and clock pin	-	-	300	ns
t <sub>IDLE</sub>	Idle Time before a new transmission can start	1.3	-	-	us

**Figure 13-1 : I<sup>2</sup>C interface characteristics**

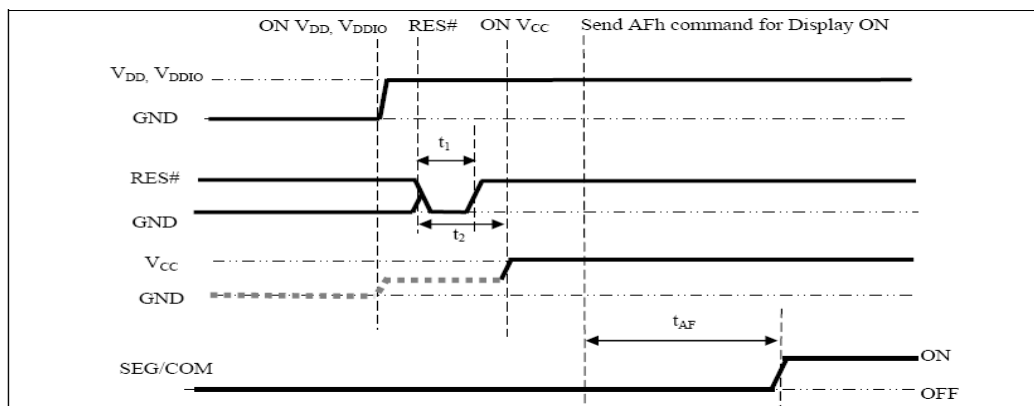


## 9 Functional Specification and Application Circuit

### 9.1 Power ON and Power OFF Sequence

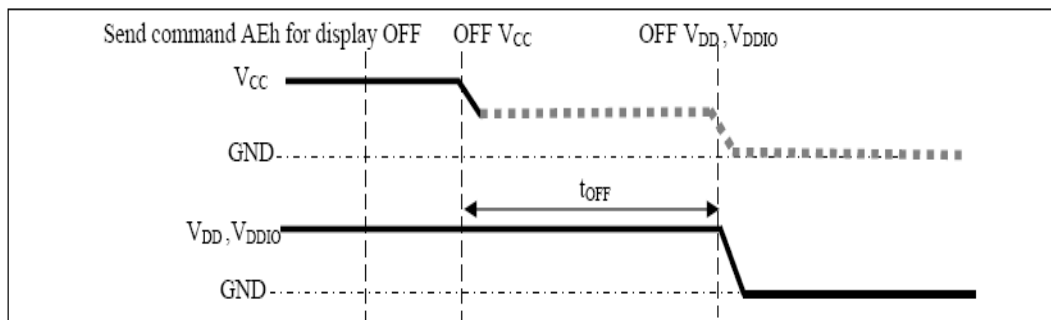
#### Power ON Sequence:

1. Power ON VDD , VDDIO.
2. After VDD , VDDIO become stable, set RES# pin LOW (logic low) for at least 2us ( $t_1$ ) and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 2us ( $t_2$ ). Then Power ON VCC. (1)
4. After VCC 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 VCC.(1), (2)
3. Wait for  $t_{OFF}$ . Power OFF VDD. (where Minimum  $t_{OFF}$ =0ms, Typical  $t_{OFF}$ =100ms)

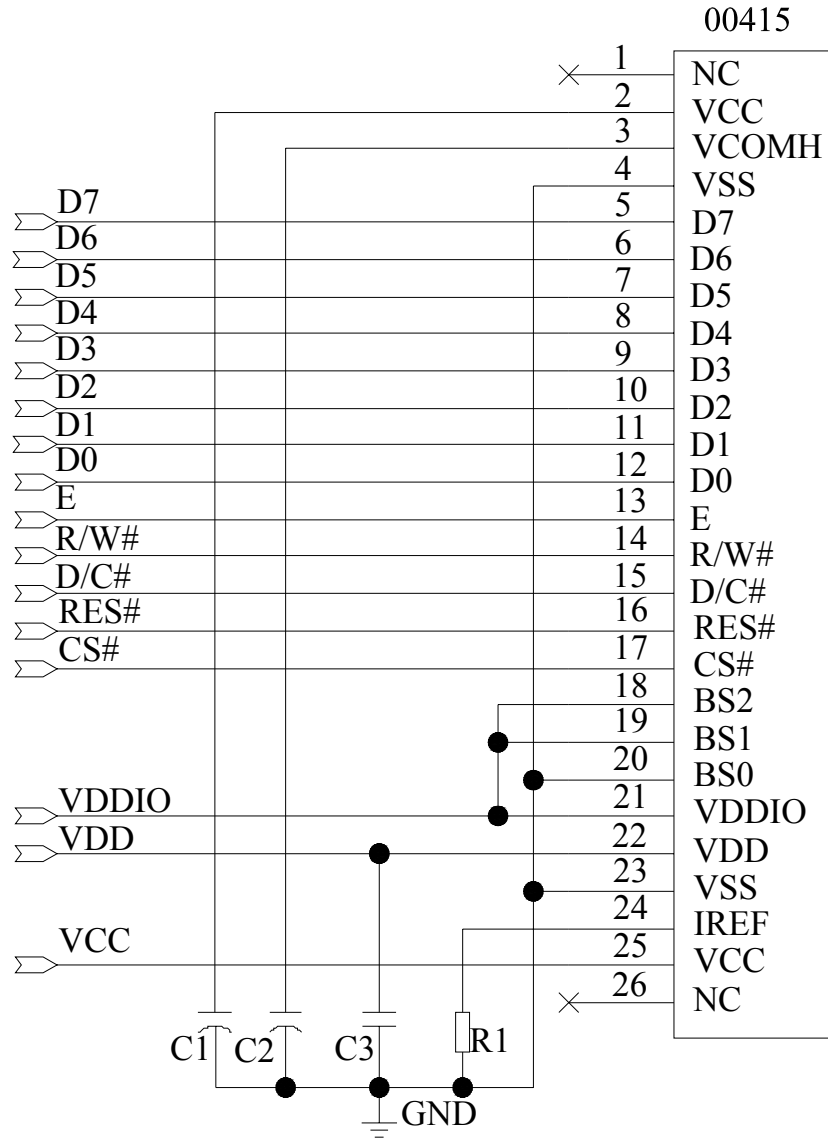


Note:

- (1) Since an ESD protection circuit is connected between VDD and VCC, VCC becomes lower than VDD whenever VDD is ON and VCC is OFF as shown in the dotted line of VCC in above figures.
- (2).VCC should be kept float (disable) when it is OFF.
- (3).Power Pins (VDD,VCC)can never be pulled to ground under any circumstance.
- (4).The register values are reset after  $t_1$ .
- (5).VDD should not be Power OFF before VCC Power OFF.

### 9.2 Application Circuit

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



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

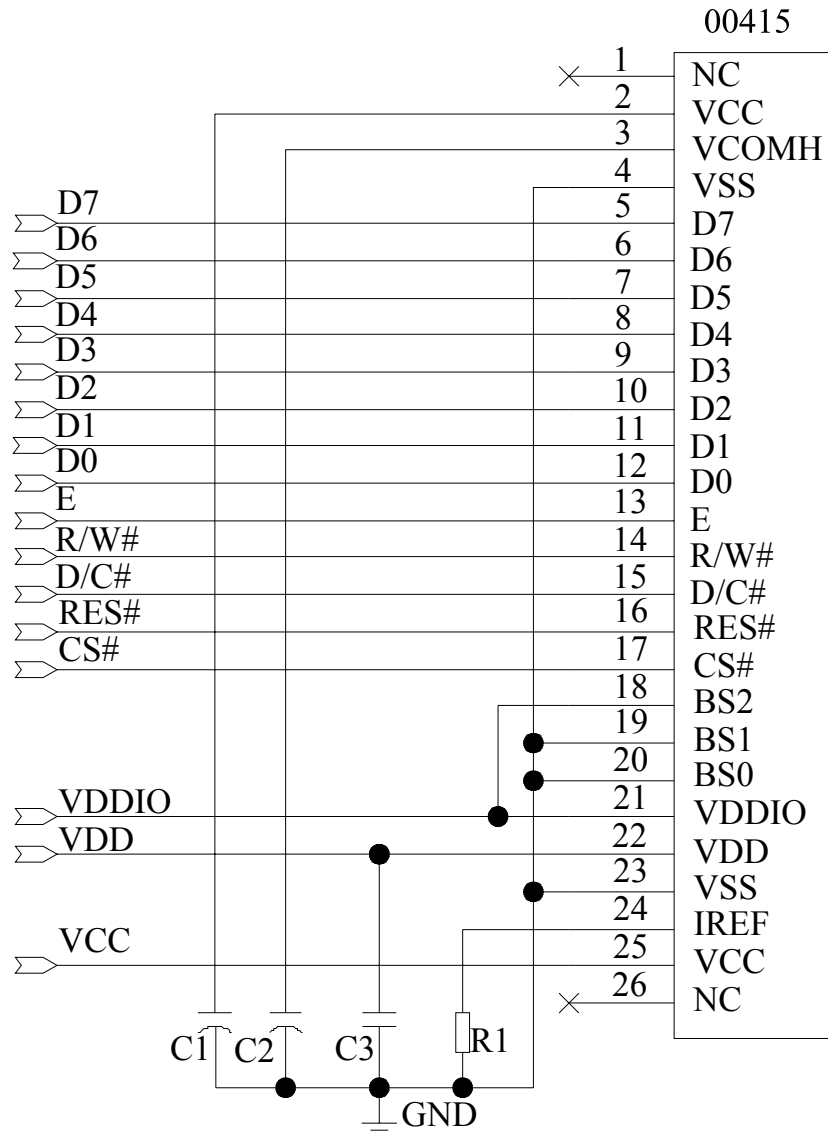
#### Recommended components

C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS

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



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

**Recommended components**

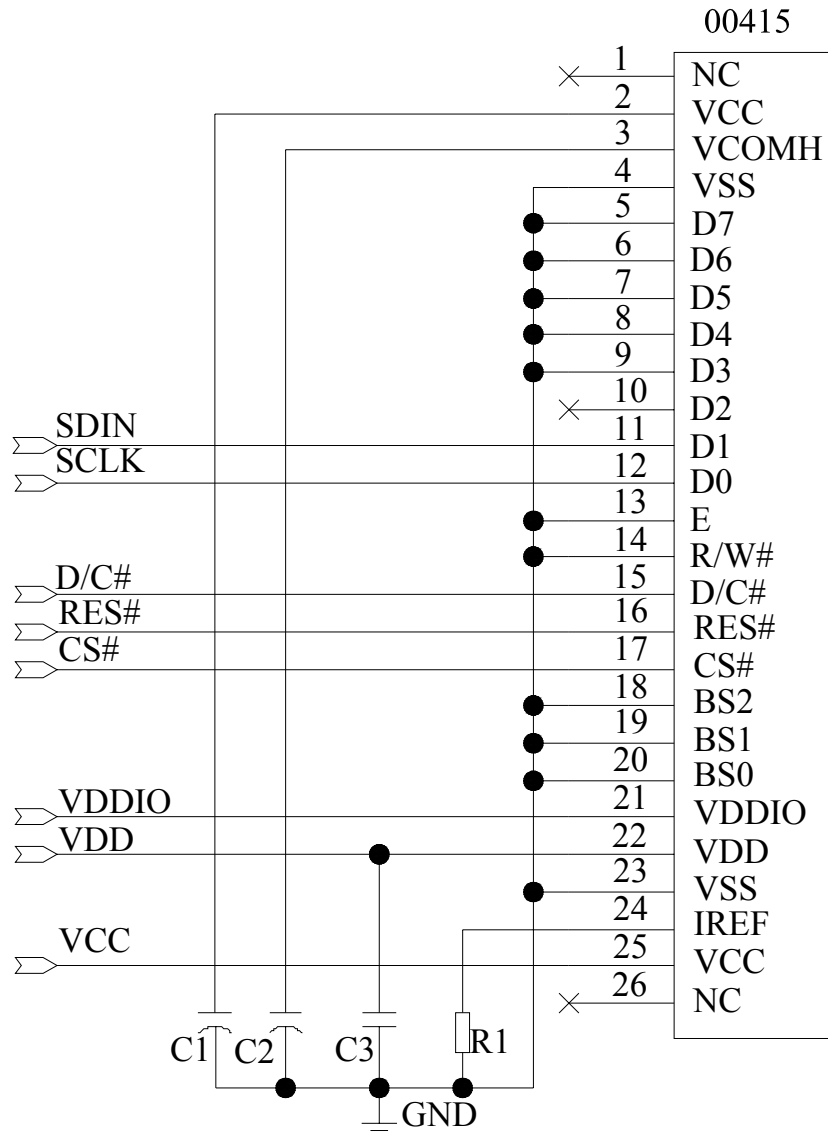
C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS



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



Pin connected to MCU interface: D/C#, SDIN, SCLK, CS#, RES#

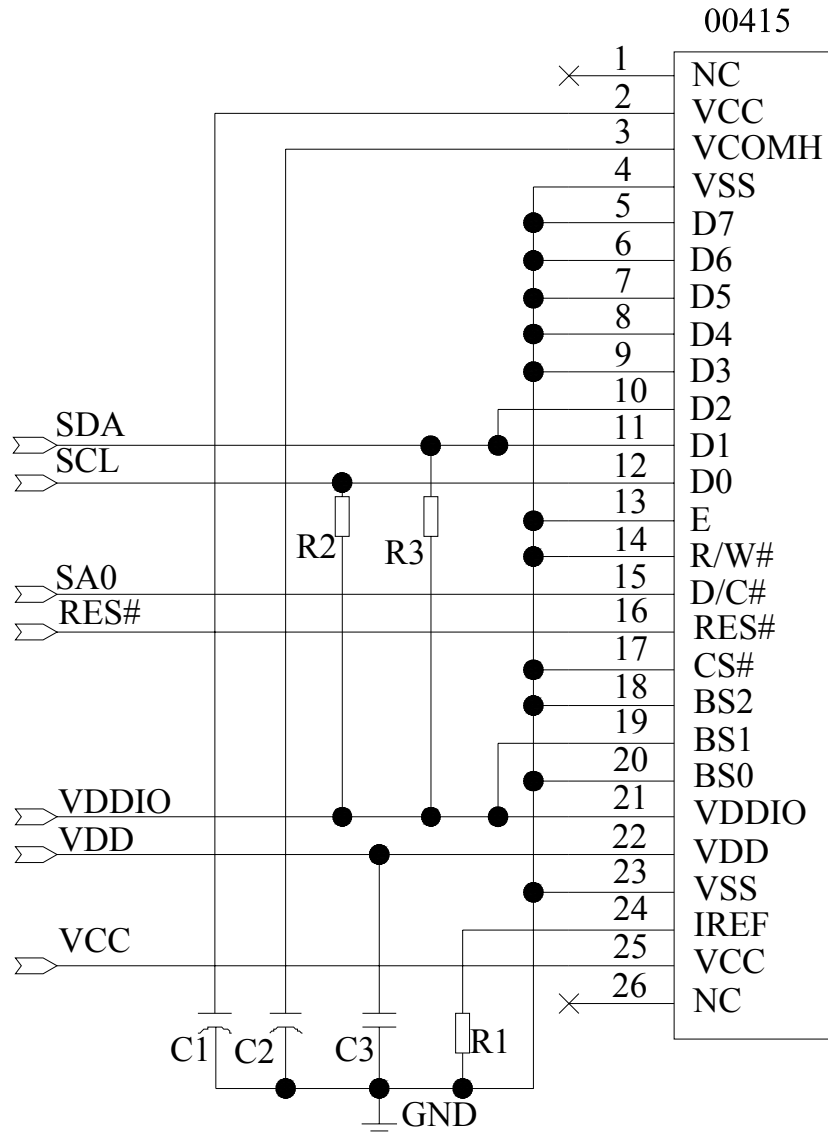
**Recommended components**

C1, C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.ROHS

(4). The configuration for I<sup>2</sup>C interface mode, external VCC is shown in the following diagram:



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

SA0	I <sup>2</sup> C Slave address
0	0X78
1	0X7B

### Recommended components

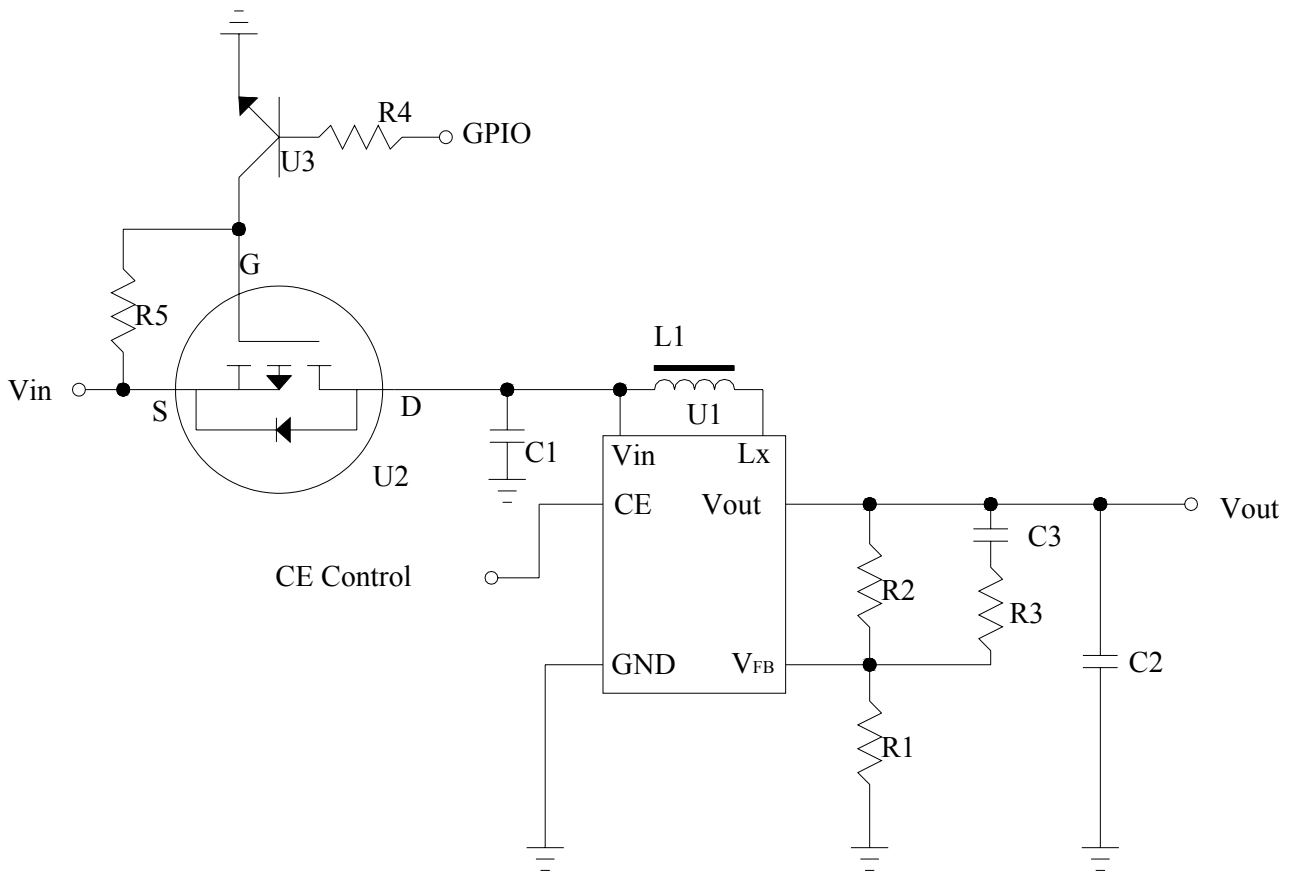
C1,C2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C3: 0.1uF-0603-X7R±10%.ROHS

R1: 0603 1/10W +/-5% 680Kohm.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% 110Kohm.ROHS
The R3	: 0603 1/10W +/-5% 2Kohm.ROHS
The R4	: 0603 1/10W +/-5% 1Kohm.ROHS
The R5	: 0603 1/10W +/-5% 10Kohm.ROHS
The L1	: 22uH
The U1	: R1200
The U2	: FDN338P
The U3	: 8050

#### 9.4 Display Control Instruction

Refer to SSD1326 IC Specification.

#### 9.5 Recommended Software Initialization

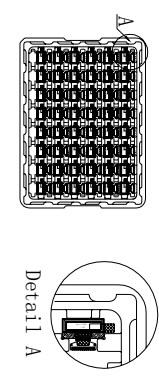
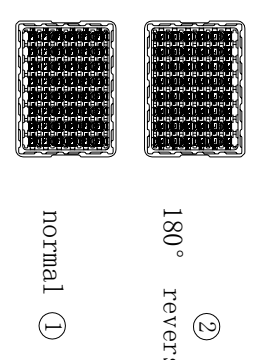
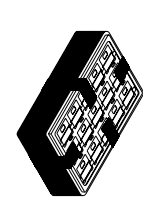
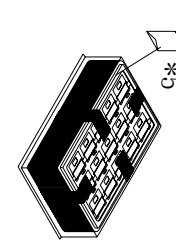
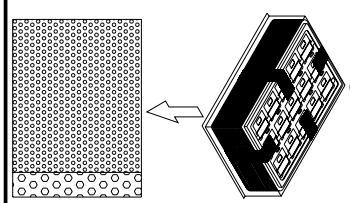
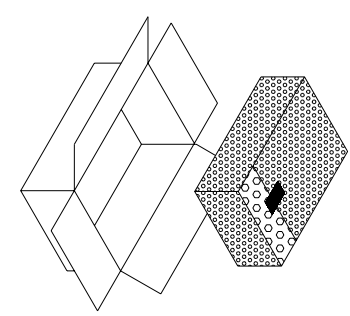
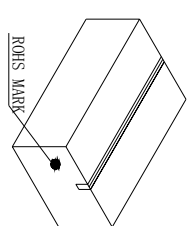
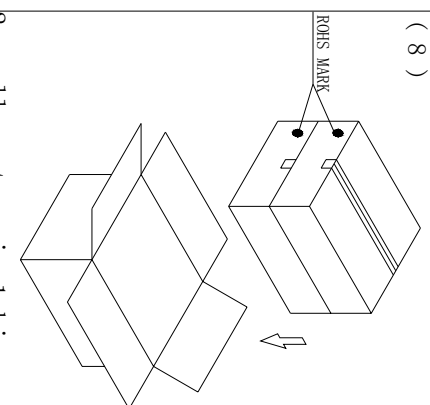
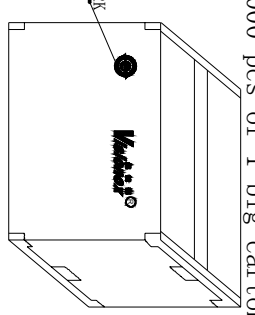

```

/*****
//****M00415
//****256*32
//****Initial SSD1326
//****Edit:caocg
*****/
//
void Write_Command(uchar command)
{
    CS=0;
    DC=0;
    WR=0;
    _nop();_nop();
    P0=command;
    WR=1;
    _nop();_nop();
    CS=1;
}
void Init_1326()
{
    Write_Command(0xFD);    //Set Command Lock
    Write_Command(0x12);
    Write_Command(0xAE);    //Set Display ON/OFF
    Write_Command(0x15);    //Set Column Address
    Write_Command(0x00);
    Write_Command(0x7F);
    Write_Command(0x75);    //Set Row Address
    Write_Command(0x00);
    Write_Command(0x1F)
    Write_Command(0x81);    //Set Contrast Current
    Write_Command(0x27);
    Write_Command(0x87);    //Set Current Range
    Write_Command(0xA0);    //Set Re-map and Gray Scale /Mono Mode
    Write_Command(0x07);

```

```
Write_Command(0xA1); //Set Display Start Line
Write_Command(0x00);
Write_Command(0xA2); //Set Display Offset
Write_Command(0x00)
Write_Command(0xA8); //Set MUX Ratio
Write_Command(0x1F);
Write_Command(0xB1); //Set Phase Length
Write_Command(0x71);
Write_Command(0xB3); //Set Front Clock Divider / Oscillator
Write_Command(0xF0)
Write_Command(0xB7); //Select Default Linear Gray Scale table
Write_Command(0xBB); //Set Pre-charge Steup
Write_Command(0x35);
Write_Command(0xFF);
Write_Command(0xBC); //Set Pre-charge voltage
Write_Command(0x1F);
Write_Command(0xBE); //Set VCOMH
Write_Command(0x0F);
Write_Command(0xAF); //Set Display ON/OFF
}
```

### 10 Package Specification

Controlled Seal		Packing Process (1) ~ (9)		
<p>( 1 ) Tray Type:00410-MT1-B</p> 	<p>( 2 )</p>  <p style="text-align: center;">TRAY</p>	<p>( 3 ) order ①, ②, ①, ②</p> <p>fix trays with tape 500 pcs of 1 small carton 1 tray contain 24 pcs 21 contained trays, 1 empty tray</p> 	<p>( 4 ) Use vacuum bag to package the tray and add 5 bags of desiccant into the vacuum bag *5</p> 	
<p>( 5 ) After tray be packaged, wrap the package in a bubble bag and seal with scotch tape.</p> 	<p>( 6 )</p> 	<p>( 7 )</p> <p>small carton package L390*W290*L120 mm</p> 	<p>( 8 )</p>  <p>2 small cartons in 1 big carton</p>	
<p>( 9 ) 42 contained trays, 2 empty trays, Package quantity products: 1000 pcs of 1 big carton</p>  <p>Package finished L410*W310*L272 mm</p>	<p>NOTE:1、The inner carton and master carton must be sealed with adhesive tape.</p> <p>2、Fill up the gap with tray.</p> <p>3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at .</p>			

## 11 Reliability

### 11.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85°C,240hrs	5
2	Low Temperature (Non-operation)	-40°C,240hrs	5
3	High Temperature (Operation)	85°C,240hrs	5
4	Low Temperature (Operation)	-40°C,240hrs	5
5	High Temperature / High Humidity (Operation)	85°C,98%RH,120hrs	5
6	Thermal shock (Non-operation)	-40°C~85°C (-40°C/30min;transit/3min;85°C/30 min;transit/3min) 1cycle: 66min,100cycles	5
7	Vibration	Frequency: 5~50Hz,0.5G Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X, Y, Z	1 Carton
8	Drop	Height: 120 cm 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 1,4,&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

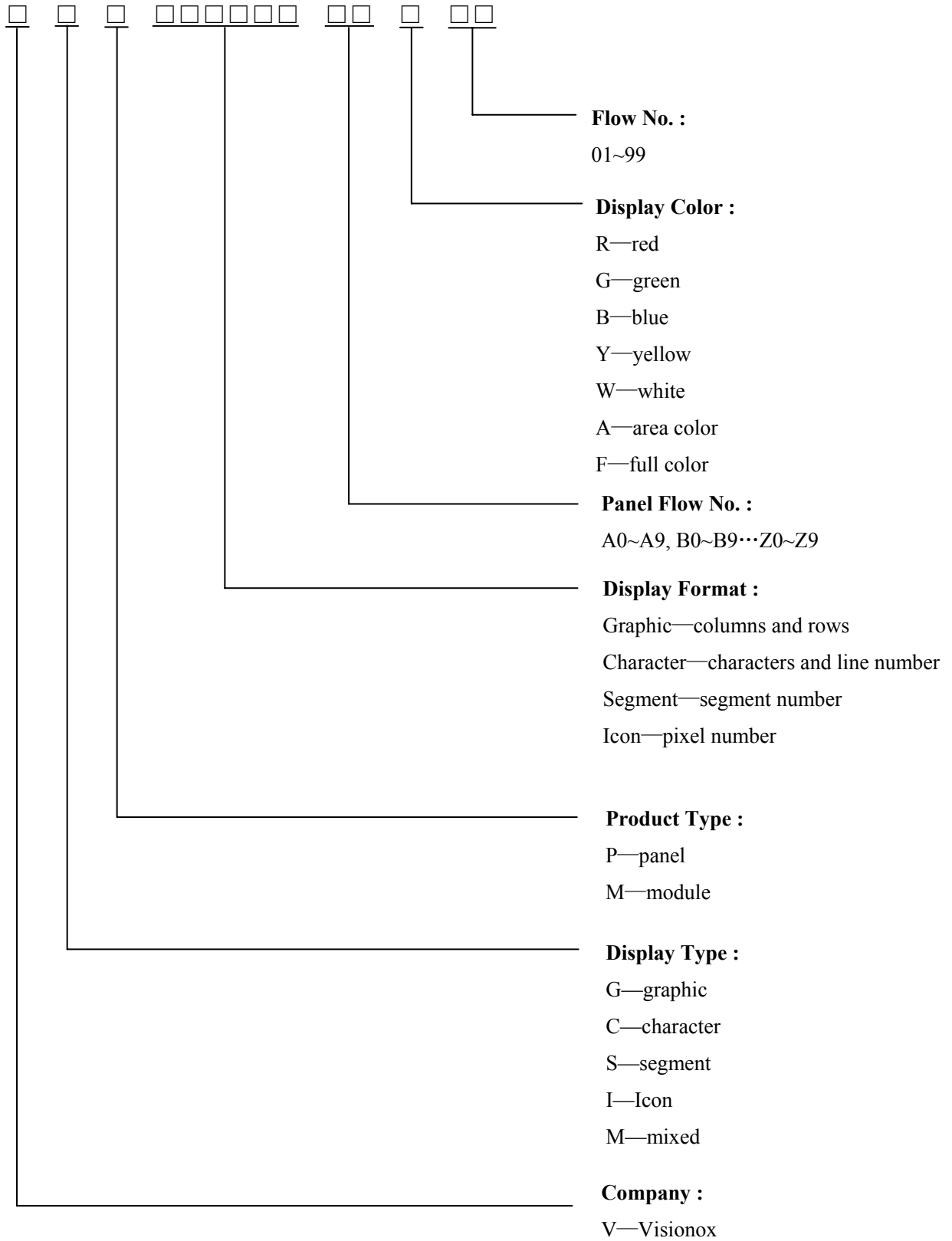
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	16,000	-	hrs	100 cd/m <sup>2</sup> , 50% alternating checkerboard, 22 $\pm$ 3°C, 55 $\pm$ 15% RH

### 11.3 Failure Check Standard

After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at 22 $\pm$ 3°C; 55 $\pm$ 15% RH.

## 12 Illustration of OLED Product Name





### 13 Outgoing Quality Control Specifications

#### 13.1 Sampling Method

- (1) GB/T 2828.1-2003/ISO2859-1: 1999, inspection level II , normal inspection, single sample inspection
- (2) AQL: Major 0.65; Minor 1.0

#### 13.2 Inspection Conditions

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

Temperature: 22±3°C

Humidity: 55±15%R.H

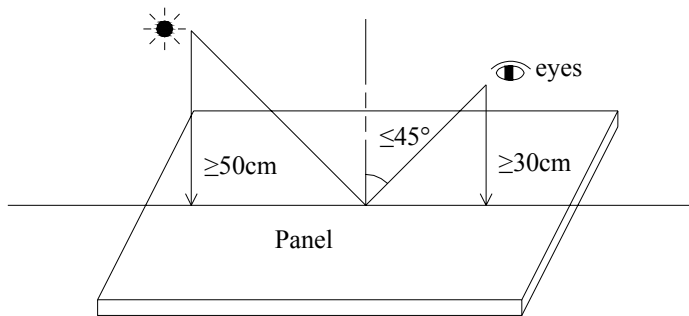
Fluorescent Lamp: 30W

Distance between the Panel & Lamp: ≥50cm

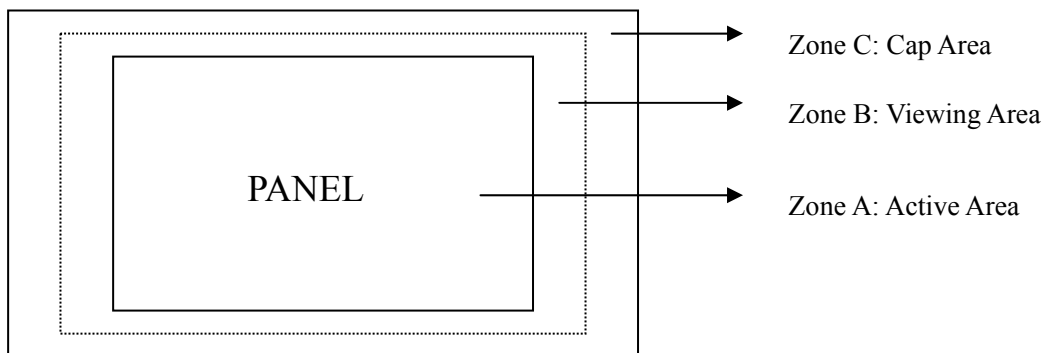
Distance between the Panel & Eyes: ≥30cm

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

(See the sketch below)

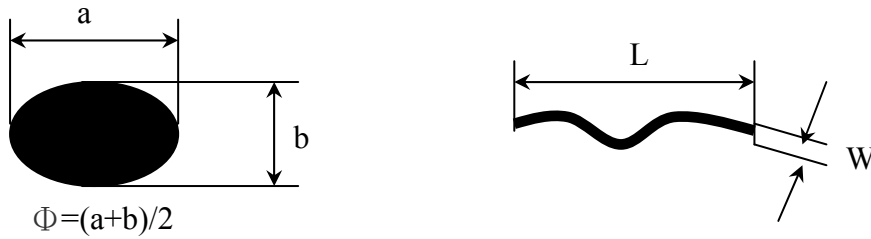


#### 13.3 Quality Assurance Zones

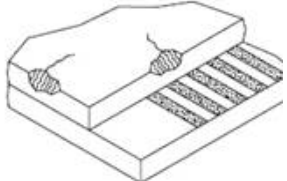


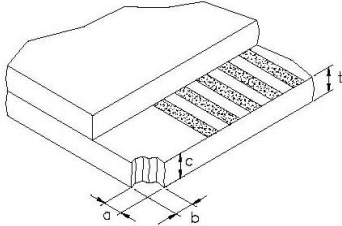
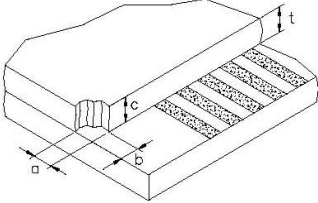
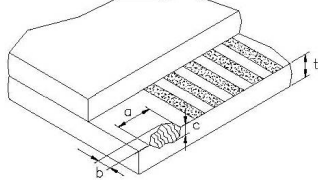
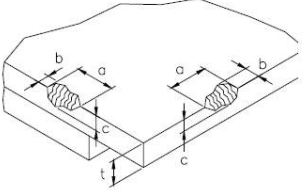
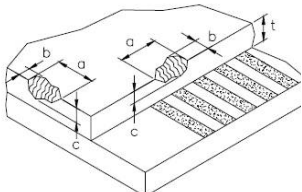
### 13.4 Inspection Standard

Definition of  $\Phi$ &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 Accept <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 Accept <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 Accept <math>a \leq 3.0\text{mm}</math> or <math>b \leq 0.8\text{mm}</math>, <math>c \leq t</math> (on the contact pad) <math>a \leq 3.0\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math> (outside of the contact pad)</p>	Minor
9	Chip on Face of Display	 <p>t= Glass thickness Accept <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 Accept <math>a \leq 3.0\text{mm}</math> or <math>b \leq 3.0\text{mm}</math>, <math>c \leq t/2</math> <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. (2) Terminal lead twisted or broken is not allowable. (3) Copper exposed is not allowed by naked eye inspection.</p>	Minor
13	Dimension Unconformity	Checking by mechanical drawing.	Major

**II. Displaying Defects**

NO.	Items	Criteria	Classification														
1	Black/White spot Dirty spot Foreign matter	<table border="1"> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Pieces Permitted</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> <tr> <td><math>\Phi \leq 0.10</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.20</math></td> <td colspan="2">3</td> </tr> <tr> <td><math>\Phi &gt; 0.20</math></td> <td colspan="2">0</td> </tr> </table>	Average Diameter (mm)	Pieces Permitted		Zone A,B	Zone C	$\Phi \leq 0.10$	Ignore		$0.10 < \Phi \leq 0.20$	3		$\Phi > 0.20$	0		Minor
		Average Diameter (mm)		Pieces Permitted													
			Zone A,B	Zone C													
		$\Phi \leq 0.10$	Ignore														
$0.10 < \Phi \leq 0.20$	3																
$\Phi > 0.20$	0																
2	No Display	Not allowable.	Major														
3	Irregular Display	Not allowable.	Major														
4	Missing Line (row or column)	Not allowable.	Major														
5	Short	Not allowable.	Major														
6	Flicker	Not allowable.	Major														
7	Abnormal Color	Refer to the SPEC.	Major														
8	Luminance NG	Refer to the SPEC.	Major														
9	Over Current	Refer to the SPEC.	Major														

**13.5 Luminance Uniformity**

Parameter	Max	Unit
Luminance Uniformity	5	%

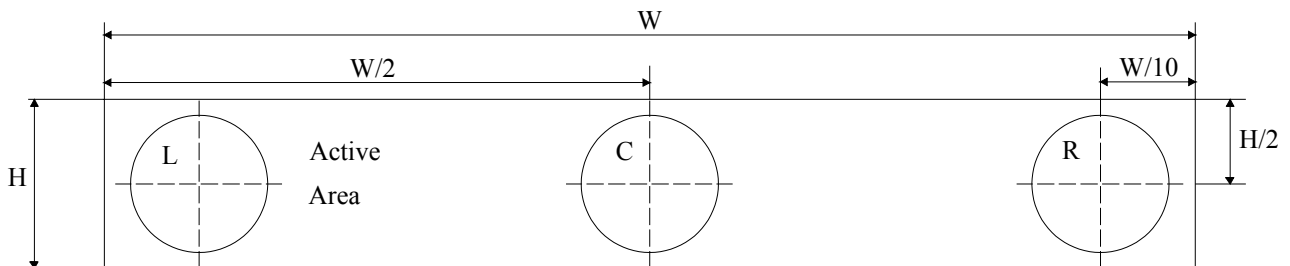
Luminance uniformity is measured as the relative deviation of brightness across the panel in 3 regions .

$$Lu = (L_{max} - L_{min}) / L_{max} \times 100\%$$

Lu: Luminance uniformity

Lmax: indicates the maximum luminance of the 3 points

Lmin: indicates the minimum luminance of the 3 points



## 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.