

Product Specification

Product Name: VGM128032A1B01

Product Code: M00078

Customer
Approved by Customer
Approved Date:

Designed By	Checked By	Approved By	
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1 Overview

VGM128032A1B01 is an OLED monochrome 128×32 dot 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: Blue
- Dot Matrix:128×32
- Driver IC: SSD1305Z
- Interface: 8-bit 8080,8-bit 6800, SPI, I²C
- Wide range of operating temperature: -30°C~70°C

3 Mechanical Data

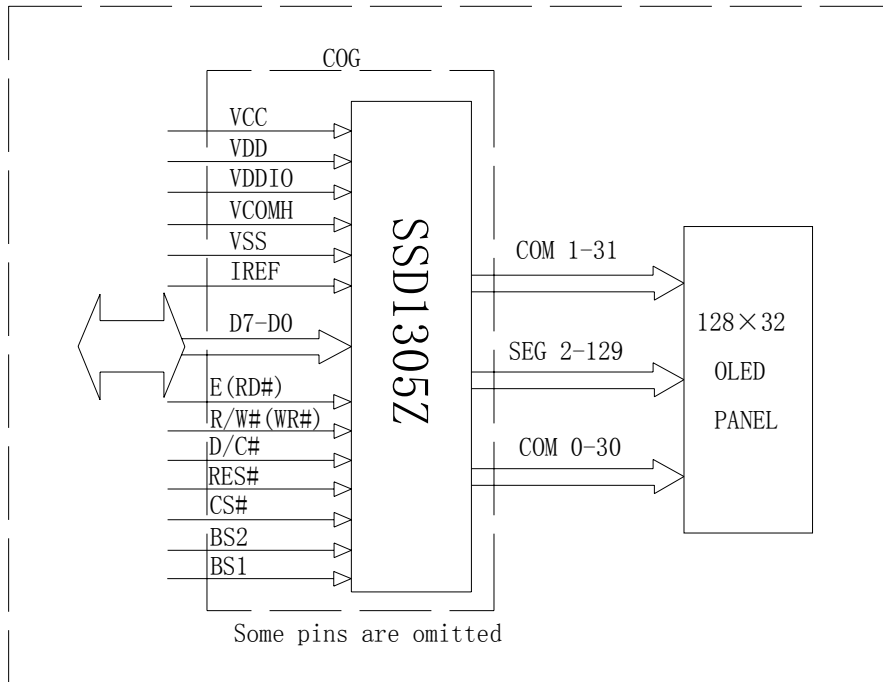
NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	128(W)×32(H)	-
2	Dot Size	0.18(W)×0.18 (H)	mm ²
3	Dot Pitch	0.2(W)×0.2 (H)	mm ²
4	Aperture Rate	81	%
5	Active Area	25.58(W)×6.38 (H)	mm ²
6	Panel Size	30.4(W)×14.5(H)	mm ²
7	Module Size	According to the annexed mechanical drawing	mm ³
8	Diagonal A/A Size	1.0	inch
9	Module Weight	1.35±10%	gram

5 Module Interface

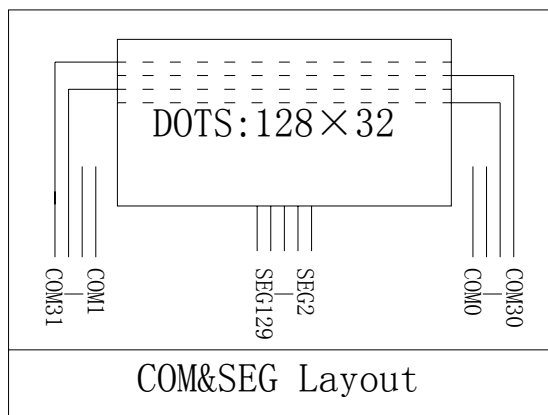
PIN NO.	PIN NAME	DESCRIPTION																				
1	NC	No Connection.																				
2	VSS	Ground.																				
3	VCC	Power supply for panel driving voltage.																				
4	VCOMH	Common signal deselected voltage level. Connected a capacitor to VSS.																				
5	IREF	Segment output current reference pin.Connected a resistor to VSS.																				
6~13	D7~D0	Data Bus																				
14	E(RD#)	6800: Enable (E); 8080:Read.																				
15	R/W#(WR#)	6800: Read or Write ; 8080: Write.																				
16	D/C#	H: Data; L: Command.																				
17	RES#	Reset, active low.																				
18	CS#	In serial interface mode, This pin is the chip select input.(active LOW).																				
19~20	BS2~BS1	<table border="1"> <thead> <tr> <th>Pin Name</th> <th>I²C Interface</th> <th>6800-parallel interface (8 bit)</th> <th>8080-parallel interface (8 bit)</th> <th>Serial interface</th> </tr> </thead> <tbody> <tr> <td>BS0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>BS1</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>BS2</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table>	Pin Name	I ² C Interface	6800-parallel interface (8 bit)	8080-parallel interface (8 bit)	Serial interface	BS0	0	0	0	0	BS1	1	0	1	0	BS2	0	1	1	0
		Pin Name	I ² C Interface	6800-parallel interface (8 bit)	8080-parallel interface (8 bit)	Serial interface																
		BS0	0	0	0	0																
		BS1	1	0	1	0																
BS2	0	1	1	0																		
21	VDDIO	Power supply for interface logic level.																				
22	VDD	Power supply pin for core logic operation.																				
23	VSS	Ground.																				
24	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	4.0	V	IC maximum rating
OLED Operating voltage	V _{CC}	0	16	V	IC maximum rating
Operating Temp.	Top	-30	70	°C	-
Storage Temp	Tstg	-30	80	°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	TYPE	MAX	UNIT
Logic Supply Voltage	V _{DD}	22±3°C, 55±15%R.H	2.4	3.0	3.5	V
OLED Driver Supply Voltage	V _{CC}	22±3°C, 55±15%R.H	9.5	10	10.5	V
High-level Input Voltage	V _{IH}	-	0.8 × V _{DDIO}	-	-	V
Low-level Input Voltage	V _{IL}	-	0	-	0.2 × V _{DDIO}	V
High-level Output Voltage	V _{OH}	-	0.9 × V _{DDIO}	-	-	V
Low-level Output Voltage	V _{OL}	-	0	-	0.1 × V _{DDIO}	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 _{br}	All pixels ON(1)	40	60	-	cd/m ²
Standby Mode Brightness		Standby Mode 10% pixels ON(2)	-	9	-	cd/m ²
Normal Mode Power Consumption	Pt	All pixels ON(1)	-	47	60	mW
Standby Mode Power Consumption		Standby Mode 10% pixels ON(2)	-	3	6	mW
C.I.E(Blue)	(x)	x,y(CIE1931)	0.12	0.160	0.20	-
	(y)		0.20	0.240	0.28	-
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 : 10V
- Contrast setting : 0x17
- Frame rate : 105Hz
- Duty setting : 1/32

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

- Driving voltage : 10V
- Contrast setting : 0x17
- Frame rate : 105Hz
- Duty setting : 1/32

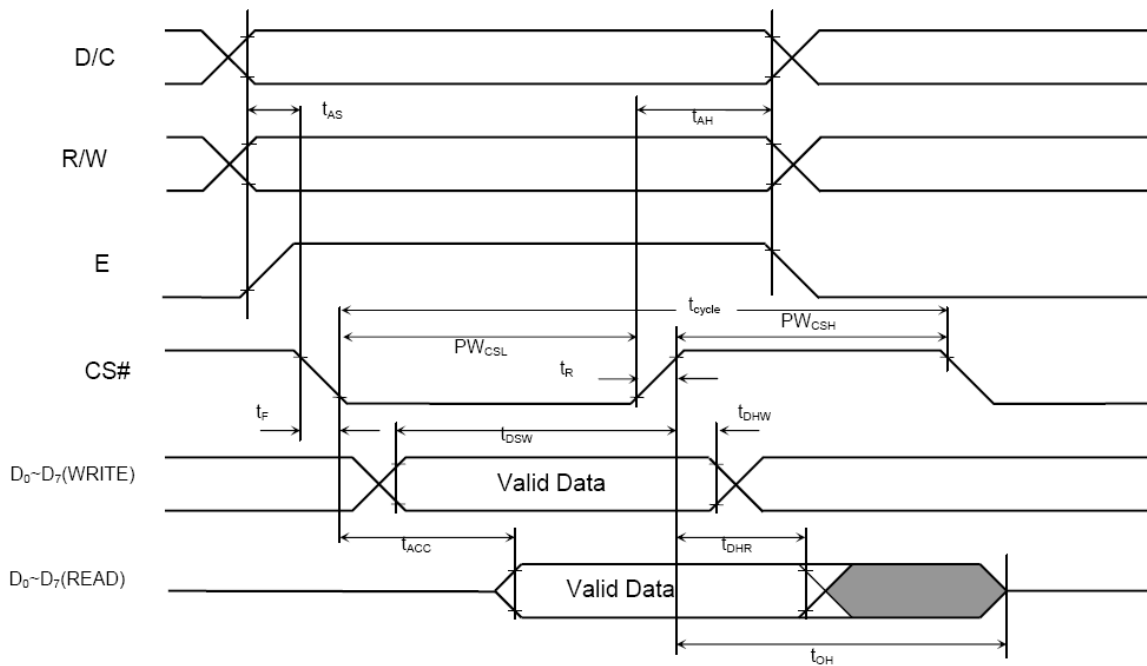
8.3 AC Electrical Characteristics

(1)6800-Series MPU Parallel Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

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	-	-	40	ns
t_F	Fall Time	-	-	40	ns

6800-series MCU parallel interface characteristics

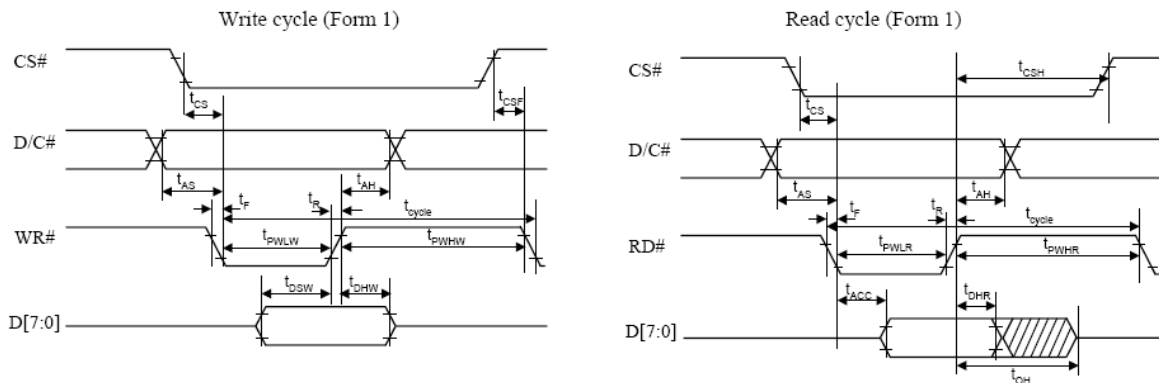


(2)8080-Series MPU Parallel Interface Timing Characteristics

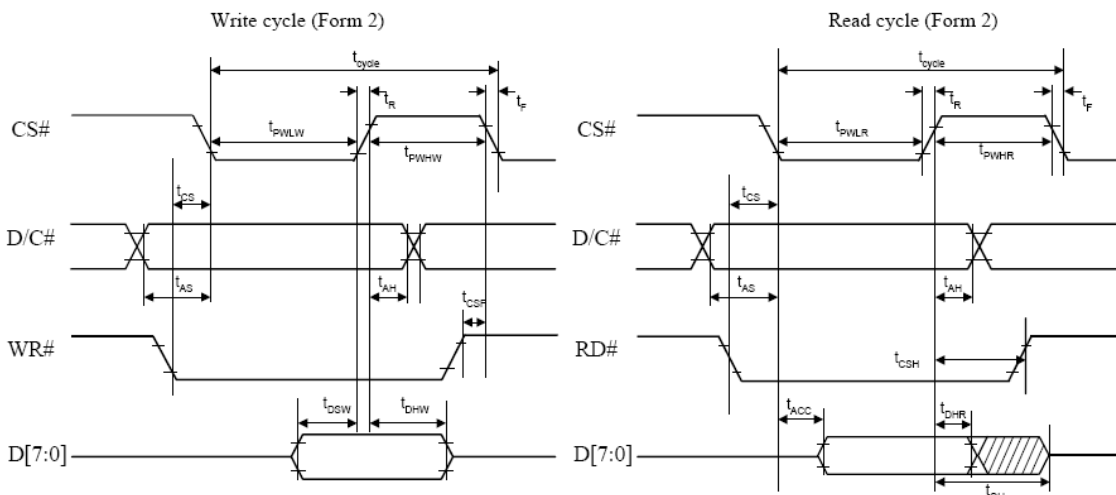
(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

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_{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	-	-	40	ns
t_F	Fall Time	-	-	40	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

8080-series parallel interface characteristics (Form 1)



8080-series parallel interface characteristics (Form 2)

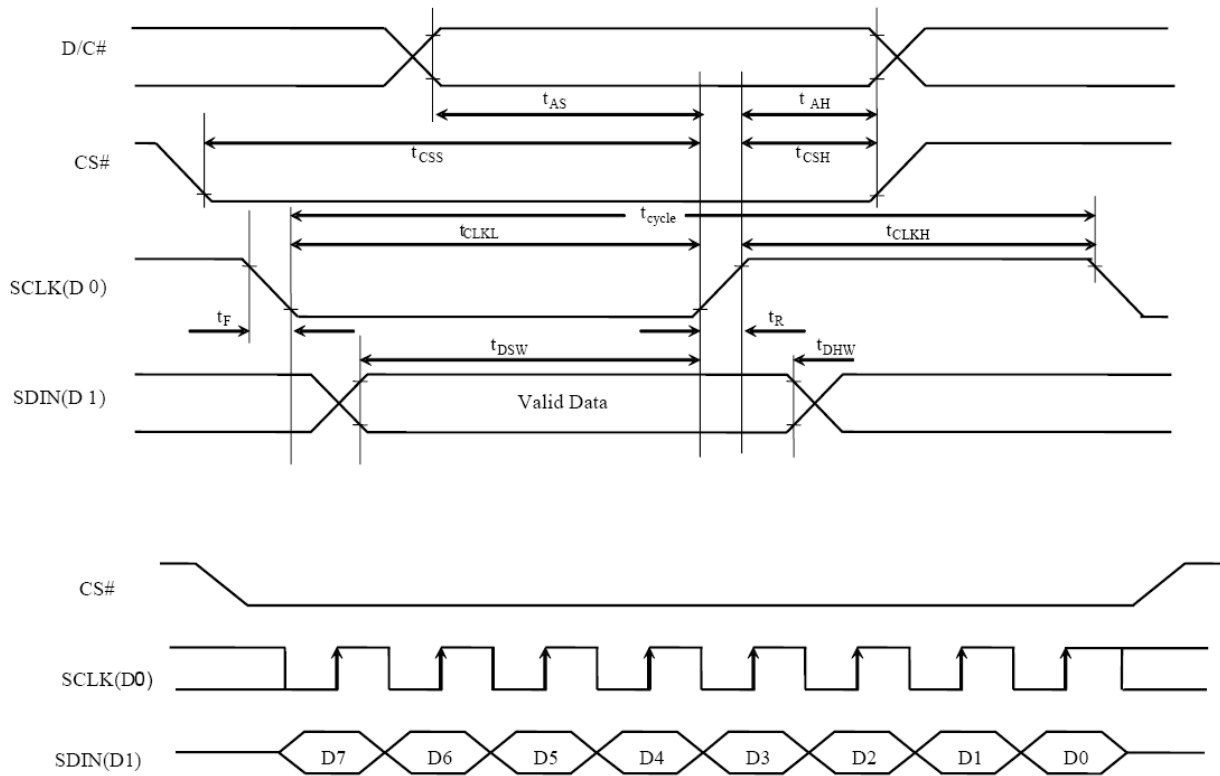


(3)Serial Interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

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	50	-	-	ns
t_{DHW}	Write Data Hold Time	15	-	-	ns
t_{CLKL}	Clock Low Time	100	-	-	ns
t_{CLKH}	Clock High Time	100	-	-	ns
t_R	Rise Time	-	-	40	ns
t_F	Fall Time	-	-	40	ns

Serial interface characteristics

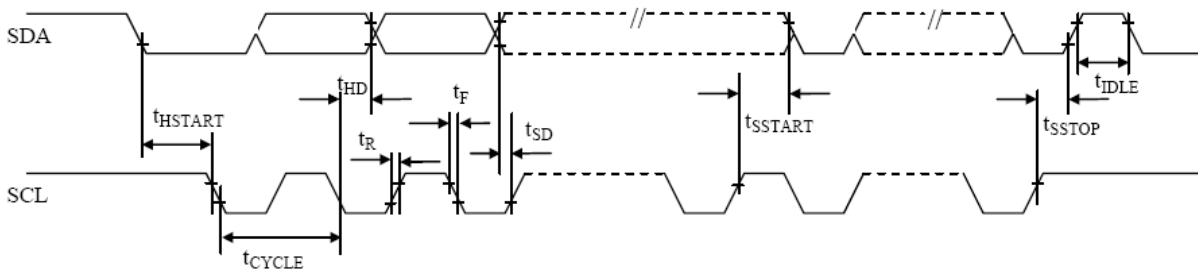


(4) I²C interface Timing Characteristics

(VDD - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t _{cycle}	Clock Cycle Time	2.5	-	-	us
t _{HSTART}	Start condition Hold Time	0.6	-	-	us
t _{HD}	Data Hold Time (for “SDA _{OUT} ” pin)	0	-	-	ns
	Data Hold Time (for “SDA _{IN} ” pin)	300	-	-	ns
t _{SD}	Data Setup Time	100	-	-	ns
t _{SSTART}	Start condition Setup Time (Only relevant for a repeated Start condition)	0.6	-	-	us
t _{SSTOP}	Stop condition Setup Time	0.6	-	-	us
t _R	Rise Time for data and clock pin	-	-	300	ns
t _F	Fall Time for data and clock pin	-	-	300	ns
t _{IDLE}	Idle Time before a new transmission can start	1.3	-	-	us

I²C interface Timing characteristics

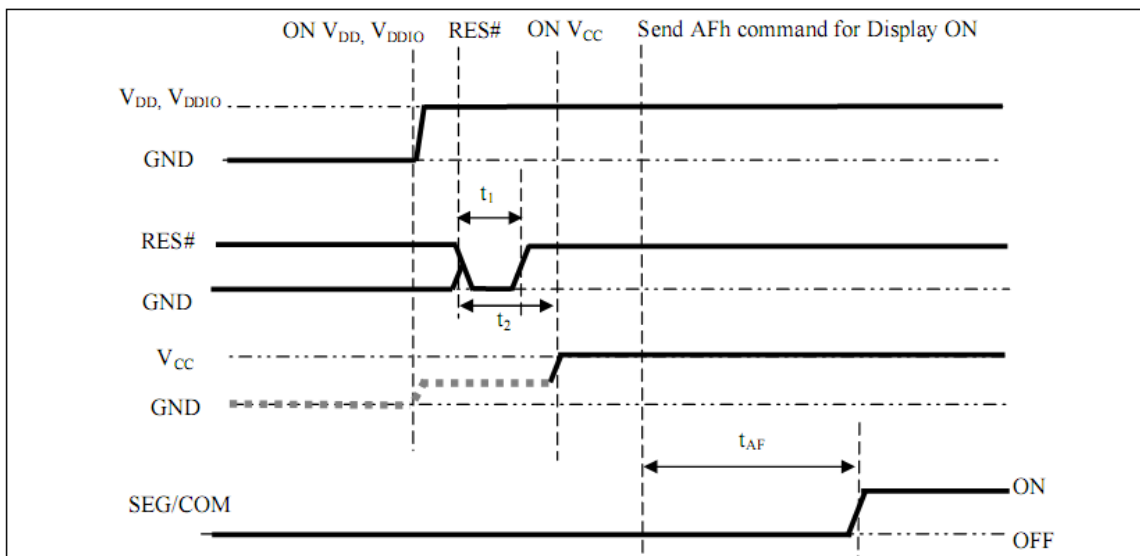


9 Functional Specification and Application Circuit

9.1 Power ON and Power OFF Sequence

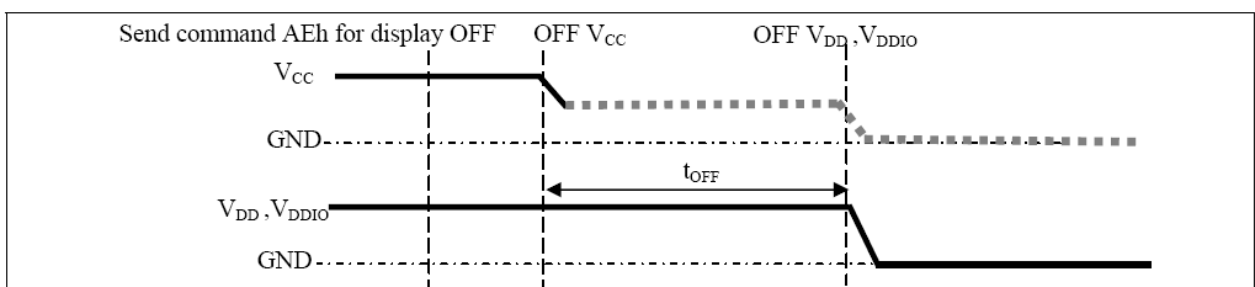
Power ON Sequence:

1. Power ON V_{DD}, V_{DDIO}
2. After V_{DD}, V_{DDIO} become stable, set RES# pin LOW (logic low) for at least $3\mu s$ (t_1)⁽⁴⁾ and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least $3\mu s$ (t_2). Then Power ON V_{CC} ⁽¹⁾.
4. After V_{CC} become stable, send command AFh for display ON. SEG/COM will be ON after $100ms$ (t_{AF}).



Power OFF Sequence:

1. Send command AEh for display OFF.
2. Power OFF V_{CC} ^{(1),(2),(3)}.
3. Wait for t_{OFF} . Power OFF V_{DD}, V_{DDIO} . (where Minimum $t_{OFF}=0ms$ ⁽⁵⁾, Typical $t_{OFF}=100ms$)

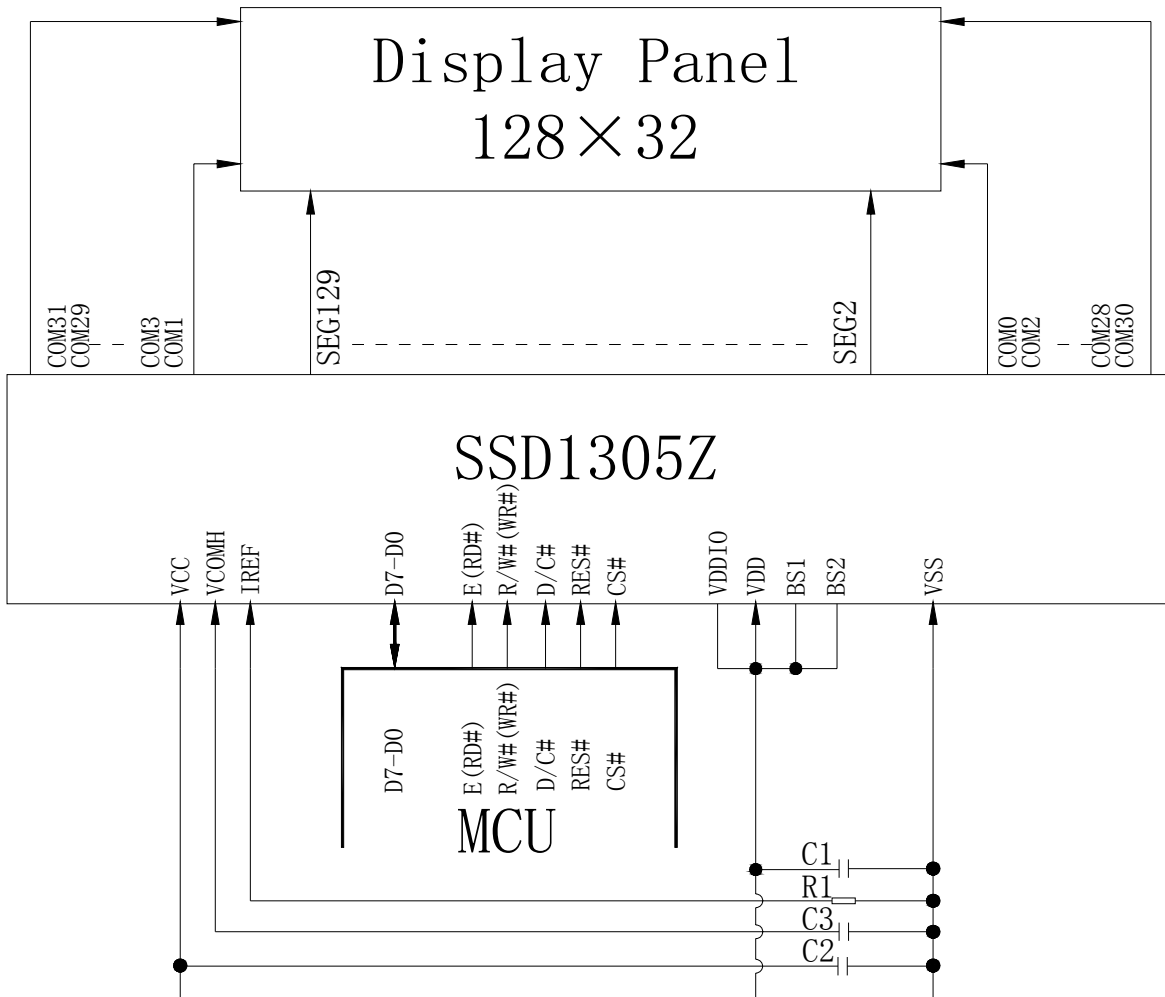


Note:

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

9.2 Application Circuit

The configuration for 8-bit 8080 mode, external VCC is shown in the following diagram:



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

Recommended components

C1: 4.7μF/16V (Tantalum Capacitors)

C2:0.01μF

C3: 4.7μF/16V (Tantalum Capacitors)

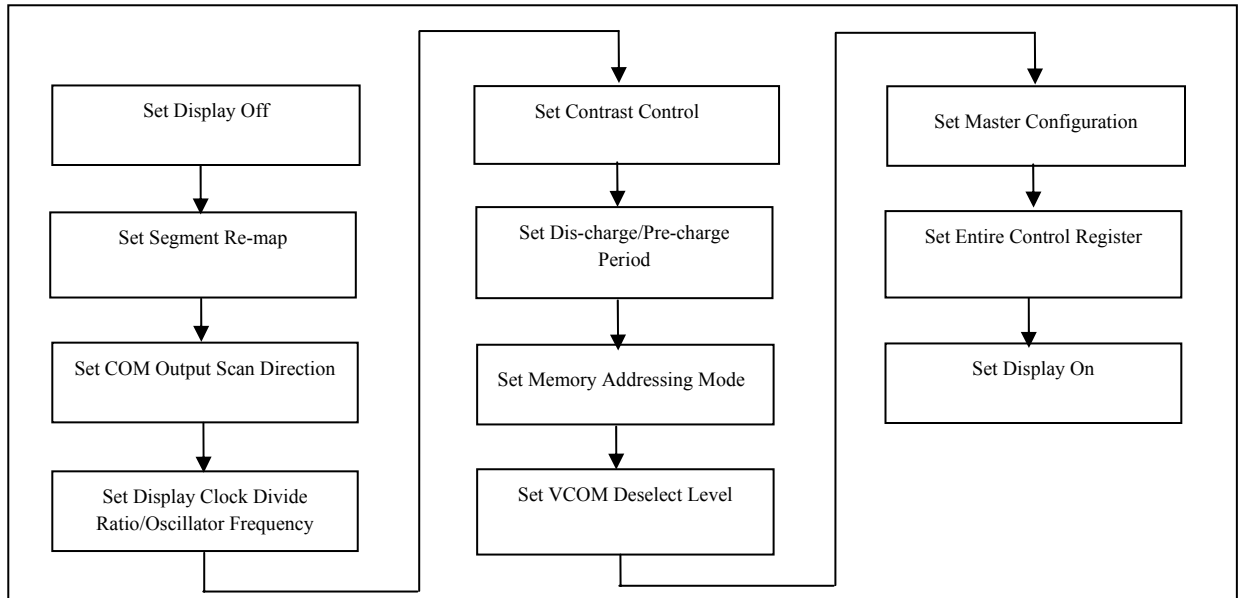
R1: 910kΩ, $R1 = (\text{Voltage at IREF} - \text{GND}) / \text{IREF}$

Voltage at IREF pin = VCC-3V

9.3 Display Control Instruction

Refer to SSD1305 IC Specification.

9.4 Recommended Software Initialization



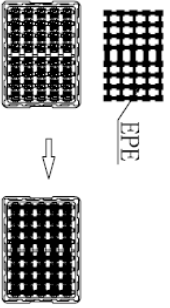
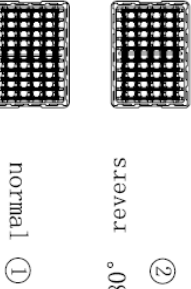

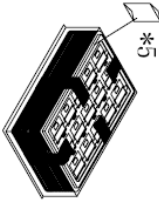
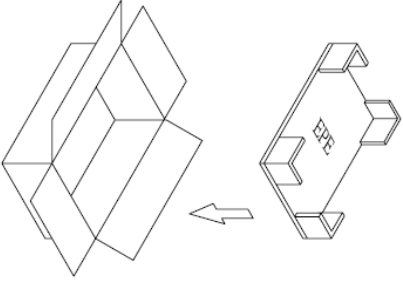
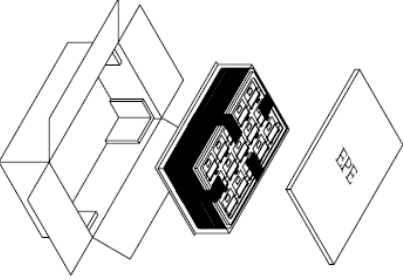
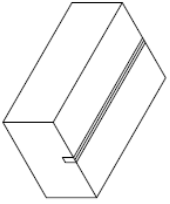
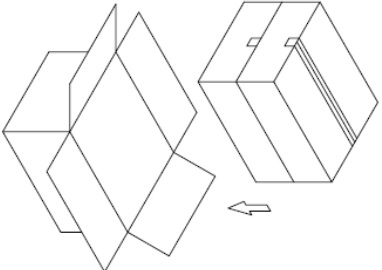
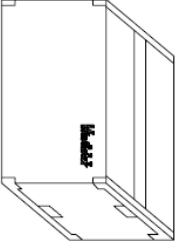
```
void init_program()
```

```
{
    write_c(0xae);           // display off
    write_c(0xd5);           //Set Display ClocDivide Ratio/Oscillator Frequency
    write_c(0x71);           //105HZ
    write_c(0xa8);           //Set Multiplex Ratio
    write_c(0x1f);           //set 32mux
    write_c(0xd9);           //Set Pre-charge Period
    write_c(0x22);           //
    write_c(0x20);           //Set Memory Addressing Mode
    write_c(0x02);           //
    write_c(0xa1);           //seg re-map 127->0
    write_c(0xc8);           //COM scan direction COM(N-1)-->COM0
    write_c(0xda);           //Set COM Pins Hardware Configuration
    write_c(0x12);           //
    write_c(0xd8);           // color_mode_set
    write_c(0x00);           // monochrome mode & normal power mode
    write_c(0x81);           //Set Contrast Control
    write_c(0x17);           //
    write_c(0xb0);           //Set Page Start Address for Page Addressing Mode
    write_c(0xd3);           //Set Display offset
    write_c(0x00);           //
}
```

```
write_c(0x21);      //Set Column Address
write_c(0x02);      //Colum address start
write_c(0x81);      //Colum address end
write_c(0x22);      //Set page Address
write_c(0x00);      //Page address start
write_c(0x03);      //Page address end
write_c(0x10);      //Set Higher Column Start Address for Page Addressing Mode
write_c(0x00);      //Set Lower Column Start Address for Page Addressing Mode
write_c(0x40);      //Set Display Start Line
write_c(0xa6);      //Display Normal
write_c(0xa4);      //Entire Display Off
write_c(0xdb);      //Set VCOMH Level
write_c(0x3c);      //0.83*VCC
write_c(0xaf);      //display on
}
```

10 Package Specification

Package order (1) ~ (9)

<p>(1) Tray: 370*273 t=0.8mm Add EPE in every contained tray</p> 	<p>(2)</p>  <p>normal ① server .081 ②</p>	<p>(3) order ① ② ① ② fix trays with tape Package quantity products: 588 pcs of 1 small carton 1 tray contain 42 pcs 14 contained trays, 1 empty tray</p> 	<p>(4) package with plastic bags add five desiccants create a power vacuum *5</p> 
<p>(5)</p> 	<p>(6)</p> 	<p>(7)</p>  <p>small carton package L425*W330*L175 mm</p>	<p>(8)</p>  <p>2 small cartons in 1 big carton</p>
<p>(9) 28 contained trays, 2 empty trays, Package quantity products: 1176 pcs of 1 big carton</p>  <p>Package finished L450*W350*L360 mm</p>	<p>NOTE:Tape on the small carton & big carton</p>		

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 Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X, Y, Z	1 Carton
8	Drop	Height: 100 cm Sequence: 1 angle, 3 edges and 6 faces	1 Carton

Test and measurement conditions

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

Evaluation criteria

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

11.2 Lifetime

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

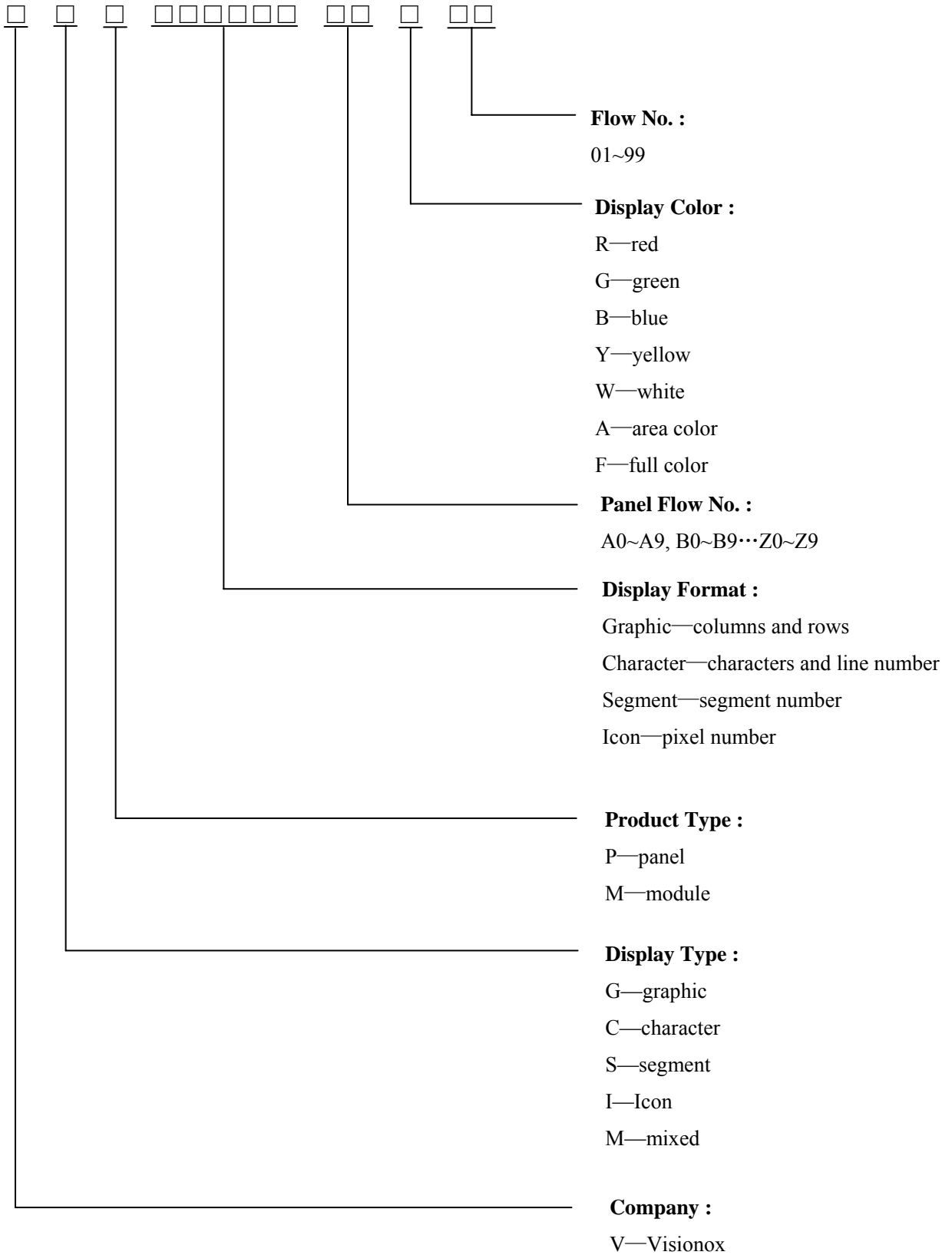
ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	20000	-	hrs	60 cd/m ² ,50% Checkerboard

An average operating lifetime of more than 10,000 hrs (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.

12 Illustration of OLED Product Name



13 Outgoing Quality Control Specifications

13.1 Sampling Method

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

13.2 Inspection Conditions

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

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

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

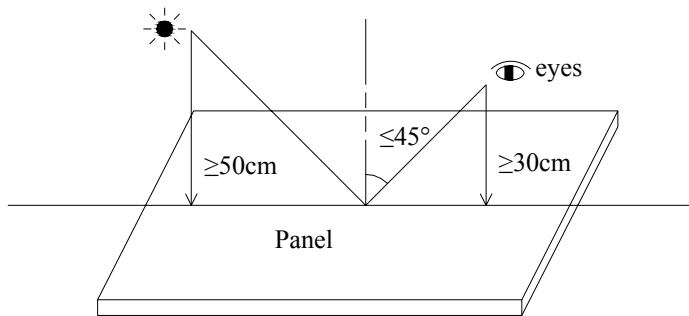
Fluorescent Lamp: 30W

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

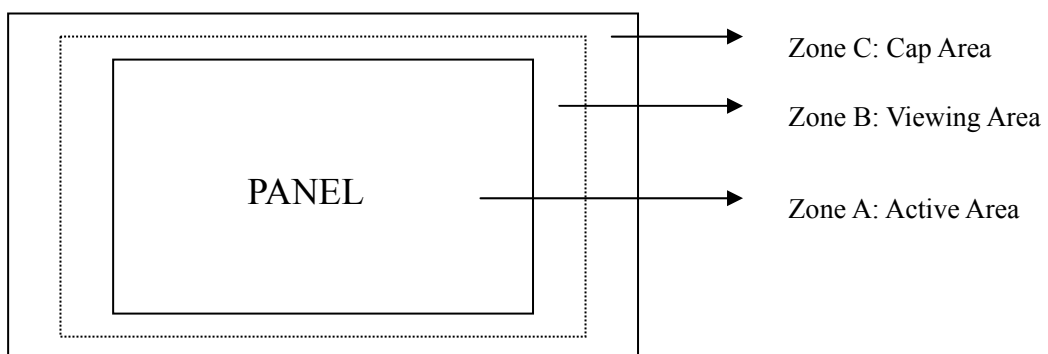
Distance between the Panel & Eyes: $\geq 30\text{cm}$

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

(See the sketch below)

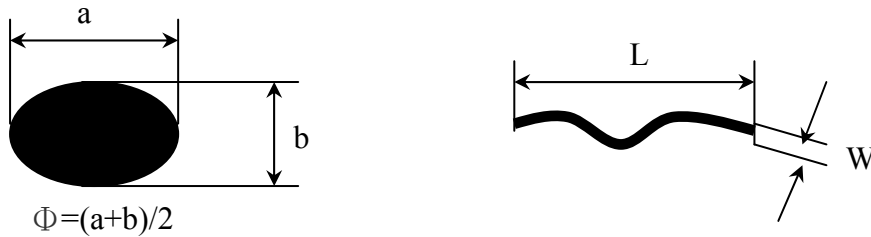


13.3 Quality Assurance Zones



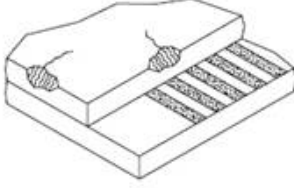
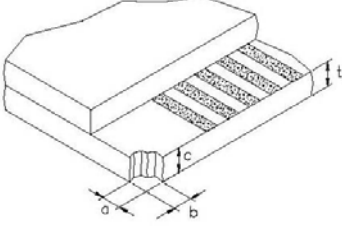
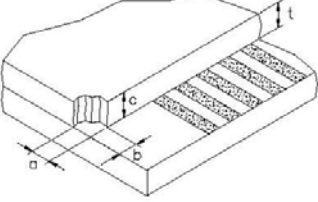
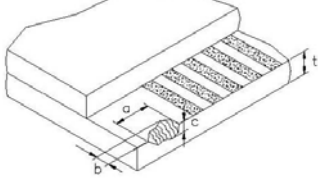
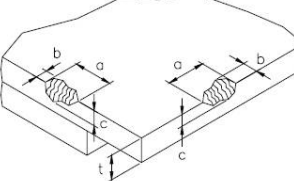
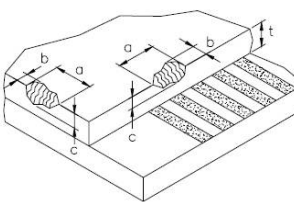
13.4 Inspection Standard

Definition of Φ &L&W (Unit: mm)



I . Appearance Defects

NO.	ITEM	CRITERIA	CLASSIFICATION																
1	Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer	<table 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>$\Phi \leq 0.15$</td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.30$</td> <td>3</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td>0</td> </tr> </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>$W \leq 0.03$</td> <td>---</td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.08$</td> <td>$L \leq 5.0$</td> <td>3</td> </tr> <tr> <td>$W > 0.08$</td> <td>---</td> <td>0</td> </tr> </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>$\Phi > 0.5$</td> <td>0</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>3</td> </tr> <tr> <td>$\Phi \leq 0.2$</td> <td>Ignore</td> </tr> </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	Any Dirt on Cap Glass	<table border="1"> <thead> <tr> <th>Average Diameter (mm)</th> <th>Acceptable Number</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.5$</td> <td>Ignore</td> </tr> <tr> <td>$0.5 < \Phi \leq 1.0$</td> <td>3</td> </tr> <tr> <td>$\Phi > 1.0$</td> <td>0</td> </tr> </tbody> </table>	Average Diameter (mm)	Acceptable Number	$\Phi \leq 0.5$	Ignore	$0.5 < \Phi \leq 1.0$	3	$\Phi > 1.0$	0	Minor								
Average Diameter (mm)	Acceptable Number																		
$\Phi \leq 0.5$	Ignore																		
$0.5 < \Phi \leq 1.0$	3																		
$\Phi > 1.0$	0																		

5	Glass Crack	 <p>Propagation crack is not acceptable.</p>	Major
6	Corner Chip	 <p>t= Glass thickness Accept $a \leq 2.0\text{mm}$ or $b \leq 2.0\text{mm}$, $c \leq t$</p>	Minor
7	Corner Chip on Cap Glass	 <p>t= Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$</p>	Minor
8	Chip on Contact Pad	 <p>t= Glass thickness Accept $a \leq 3.0\text{mm}$ or $b \leq 0.8\text{mm}$, $c \leq t$ (on the contact pin) $a \leq 3.0\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$ (outside of the contact pin)</p>	Minor
9	Chip on Face of Display	 <p>t= Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$</p>	Minor
10	Chip on Cap Glass	 <p>t= Glass thickness Accept $a \leq 3.0\text{mm}$ or $b \leq 3.0\text{mm}$, $c \leq t/2$ $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $t/2 \leq c \leq t$</p>	Minor
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.	ITEM	CRITERIA	CLASSIFICATION															
1	Black/White spot Dirty spot 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 1155 405">Pieces Permitted</th> </tr> <tr> <td data-bbox="517 439 794 472">$\Phi \leq 0.10$</td> <td data-bbox="794 405 979 439">Zone A,B</td> <td data-bbox="979 405 1155 439">Zone C</td> </tr> <tr> <td data-bbox="517 472 794 506">$0.10 < \Phi \leq 0.20$</td> <td colspan="2" data-bbox="794 439 1155 472">Ignore</td> </tr> <tr> <td data-bbox="517 506 794 539">$\Phi > 0.20$</td> <td data-bbox="794 472 979 506">3</td> <td data-bbox="979 472 1155 506">Ignore</td> </tr> <tr> <td data-bbox="517 539 794 568">$\Phi > 0.20$</td> <td data-bbox="794 506 979 539">0</td> <td data-bbox="979 506 1155 539">Ignore</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		$\Phi > 0.20$	3	Ignore	$\Phi > 0.20$	0	Ignore	Minor
Average Diameter (mm)	Pieces Permitted																	
$\Phi \leq 0.10$	Zone A,B	Zone C																
$0.10 < \Phi \leq 0.20$	Ignore																	
$\Phi > 0.20$	3	Ignore																
$\Phi > 0.20$	0	Ignore																
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.