

Product Specification

(Preliminary)

Product Name: VGM064032A0W01

Product Code: M00930

Customer
Approved by Customer
Approved Date:

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1 Overview

VGM064032A0W01 is a monochrome OLED display module with 64×32 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.

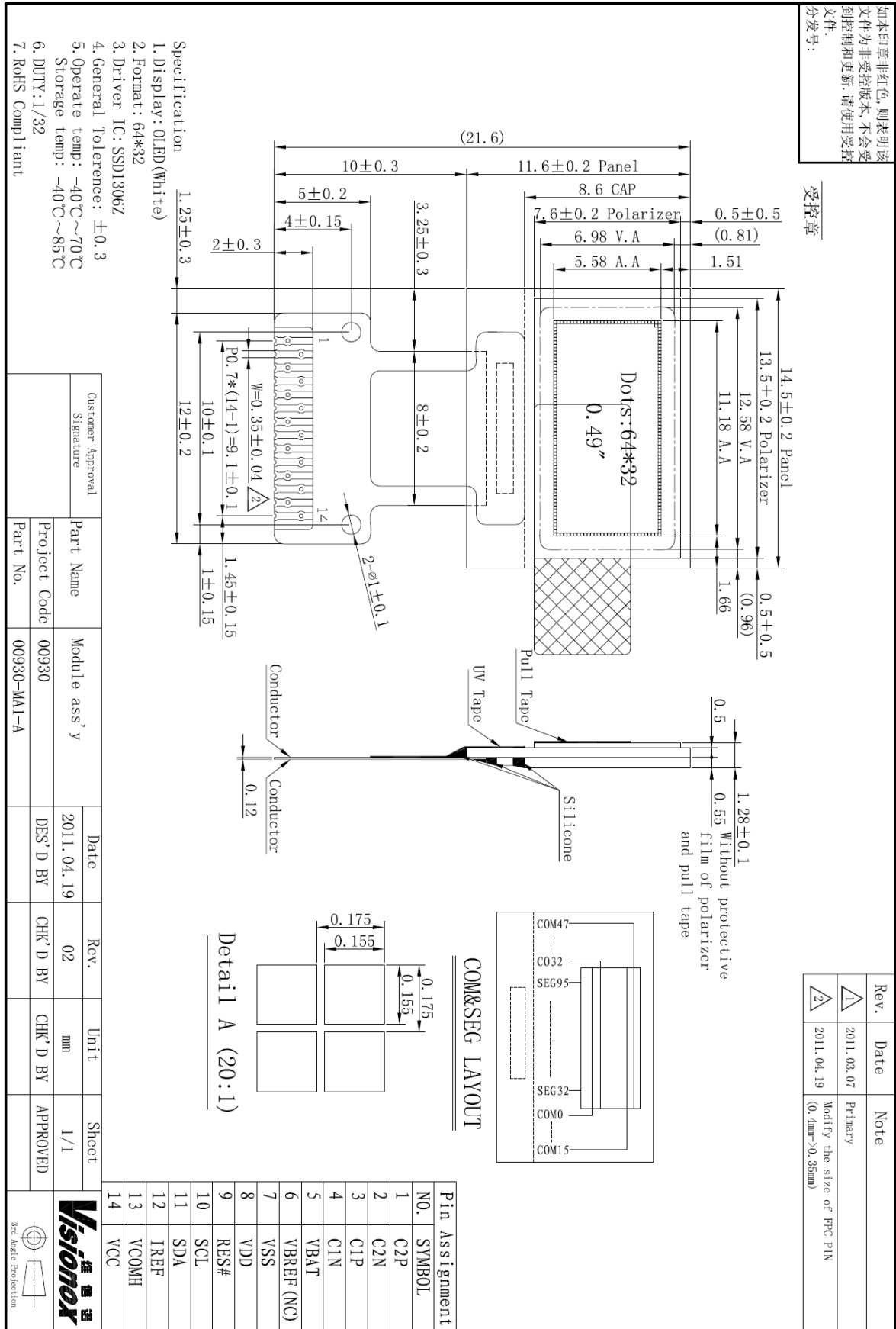
2 Features

- Display Color: White
- Dot Matrix: 64×32
- Driver IC: SSD1306Z
- Interface: I²C
- Wide range of operating temperature: -40℃ to 70℃

3 Mechanical Data

NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	64(W)×32(H)	-
2	Dot Size	0.155(W)×0.155(H)	mm ²
3	Dot Pitch	0.175(W)×0.175(H)	mm ²
4	Aperture Rate	78	%
5	Active Area	11.18 (W)×5.58 (H)	mm ²
6	Panel Size	14.5(W)×11.6(H) ×1.05(T)	mm ³
7	Module Size	14.5(W)×21.6(H) ×1.28(T)	mm ³
8	Diagonal A/A Size	0.49	inch
9	Module Weight	0.42±10%	gram

4 Mechanical Drawing



5 Module Interface

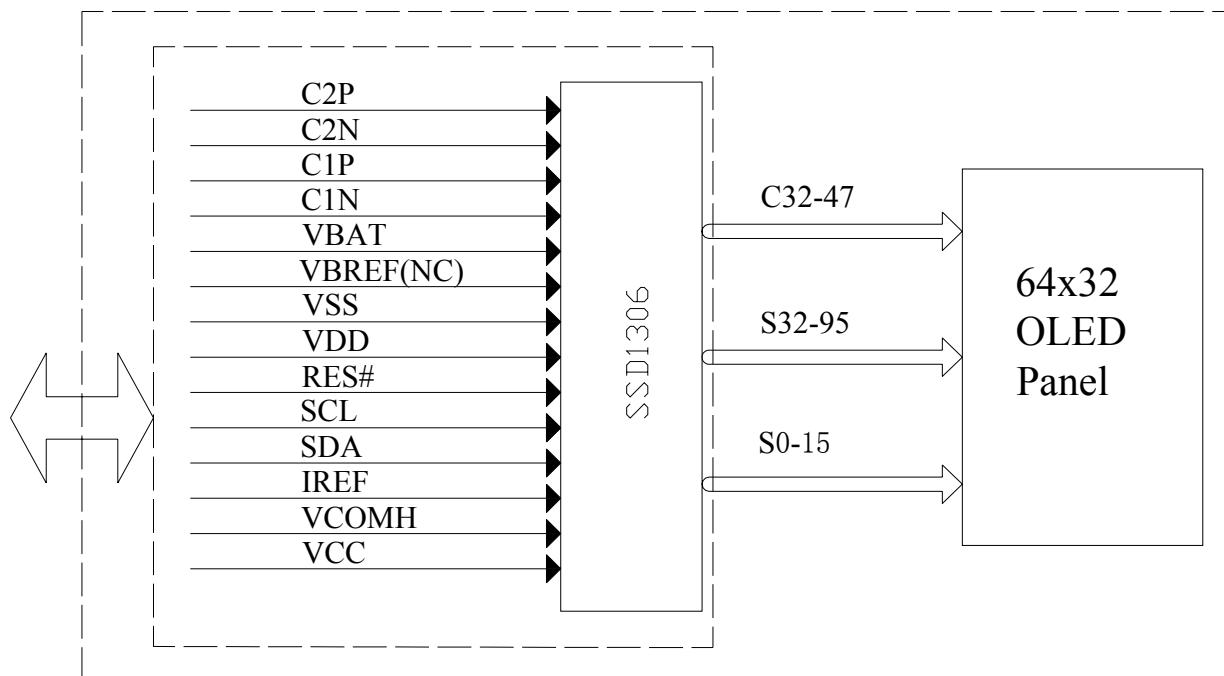
PIN NO.	PIN NAME	DESCRIPTION
1	C2P	C1P/C1N – Pin for charge pump capacitor; Connect to each other with a capacitor. C2P/C2N – Pin for charge pump capacitor; Connect to each other with a capacitor.
2	C2N	
3	C1P	
4	C1N	
5	VBAT	Power supply for charge pump regulator circuit. Table 5.1
6	VBREF(NC)	No Connection.
7	VSS	This is a ground pin.
8	VDD	Power supply pin for core logic operation.
9	RES#	This pin is reset signal input. When the pin is low, initialization of the chip is executed.
10	SCL	When I ² 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.
11	SDA	
12	IREF	This pin is segment current reference pin. A resistor should be connected between this pin and VSS.
13	VCOMH	This pin is the input pin for the voltage output high level for COM signals. A capacitor should be connected between this pin and VSS.
14	VCC	Power supply for panel driving voltage. This is also the most positive power voltage supply pin. When charge pump is enabled, a capacitor should be connected between this pin and VSS.

Table 5.1

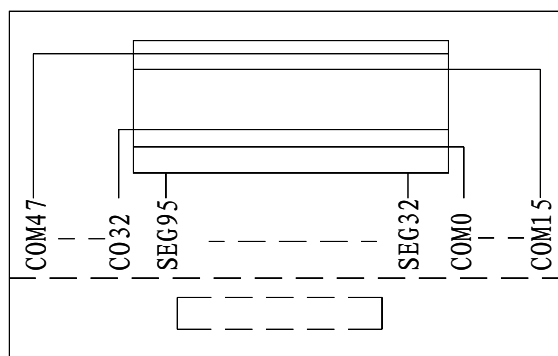
Status	VBAT	VDD	VCC
Enable charge pump	Connect to external VBAT source	Connect to external VDD source	A capacitor should be connected between this pin and VSS
Disable charge pump	Keep float	Connect to external VDD source	Connect to external VCC source

6 Function Block Diagram

6.1 Function Block Diagram



6.2 Panel Layout Diagram



COM&SEG LAYOUT

7 Absolute Maximum Ratings

ITEM	SYMBOL	MIN	MAX	UNIT	REMARK
Supply Voltage	VDD	-0.3	4.0	V	IC maximum rating
	VBAT	-0.3	5.0	V	IC maximum rating
OLED Operating Voltage	VCC	0	16	V	IC maximum rating
Operating Temp.	Top	-40	70	°C	-
Storage Temp	Tstg	-40	85	°C	-

Note (1): All of the voltages are on the basis of “VSS = 0V”.

Note (2): Permanent breakage of module may occur if the module is used beyond the maximum rating. The module can be normal operated under the conditions according to Section 8 “Electrical Characteristics”.

Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.

8 Electrical Characteristics

8.1 DC Electrical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYPE	MAX	UNIT
Logic Supply Voltage	VDD	22±3°C, 55±15%R.H	1.65	2.8	3.3	V
OLED Driver Supply Voltage (Supplied Externally)	VCC	22±3°C, 55±15%R.H	7.0	7.25	7.5	
Supply Voltage for DC/DC	VBAT	22±3°C, 55±15%R.H	3.3	3.7	4.2	
OLED Driver Supply Voltage (Generated by Internal DC/DC)	VCC	22±3°C, 55±15%R.H	7.0	7.25	7.5	V
High-level Input Voltage	V _{IH}	-	0.8×VDD	-	-	V
Low-level Input Voltage	V _{IL}	-	-	-	0.2×VDD	V
High-level Output Voltage	V _{OH}	-	0.9×VDD	-	-	V
Low-level Output Voltage	V _{OL}	-	-	-	0.1×VDD	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	TYPE	MAX	UNIT
Normal Mode Brightness	L_{br}	All pixels ON(1)	TBD	TBD	-	cd/m ²
ICC,Sleep mode Current	ICC,SLEEP	VDD=1.65V~3.3V, VCC = 7V~15V Display OFF, No panel attached	-	-	10	uA
IDD,Sleep mode Current	IDD,SLEEP	VDD=1.65V~3.3V, VCC = 7V~15V Display OFF, No panel attached	-	-	10	uA
Normal Mode Power Consumption(V _{CC} Supplied Externally)	$P_t=(I_{CC}*V_{CC})$	All pixels ON(1)	-	TBD	TBD	mW
Normal Mode Power Consumption (V _{CC} Generated by Internal DC/DC)	$P_t=(I_{BAT}*V_{BAT})$	All pixels ON(1)		TBD	TBD	
C.I.E(White)	(x)	x,y(CIE1931)	TBD	TBD	TBD	-
	(y)		TBD	TBD	TBD	-
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 : 7.25V(VCC Supplied Externally) or VBAT:3.7V(VCC Generated by Internal DC/DC).
- Contrast setting : TBD
- Frame rate : TBD
- Duty setting : 1/32

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

- Driving voltage : VCC:7.25V(VCC Supplied Externally) or VBAT:3.7V(VCC Generated by Internal DC/DC).
- Contrast setting : TBD
- Frame rate : TBD
- Duty setting : 1/32

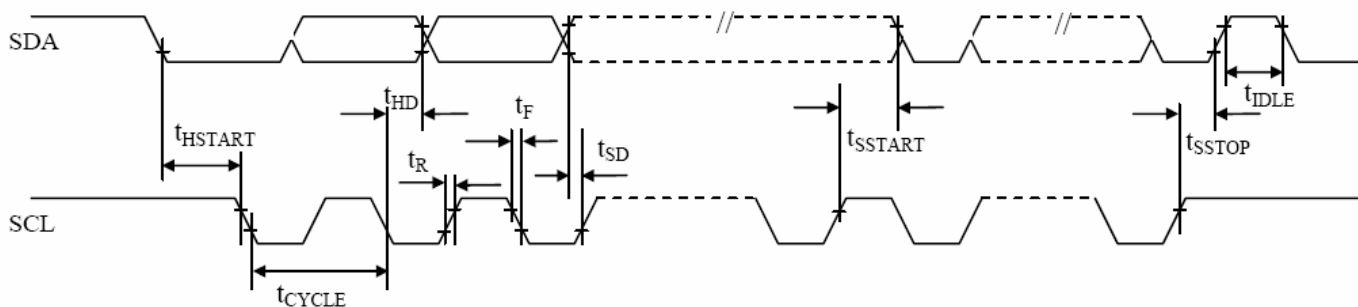
8.3 AC Electrical Characteristics

I²C Interface Timing Characteristics

(VDD - VSS = 1.65V to 3.3V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t _{cycle}	Clock Cycle Time	2.5	-	-	μs
t _{HSTART}	Start condition Hold Time	0.6	-	-	μs
t _{HD}	Data Hold Time (for “SDA _{OUT} ” pin)	0	-	-	ns
	Data Hold Time (for “SDA _N ” 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	-	-	μs
t _{SSTOP}	Stop condition Setup Time	0.6	-	-	μs
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	-	-	μs

I²C interface characteristics

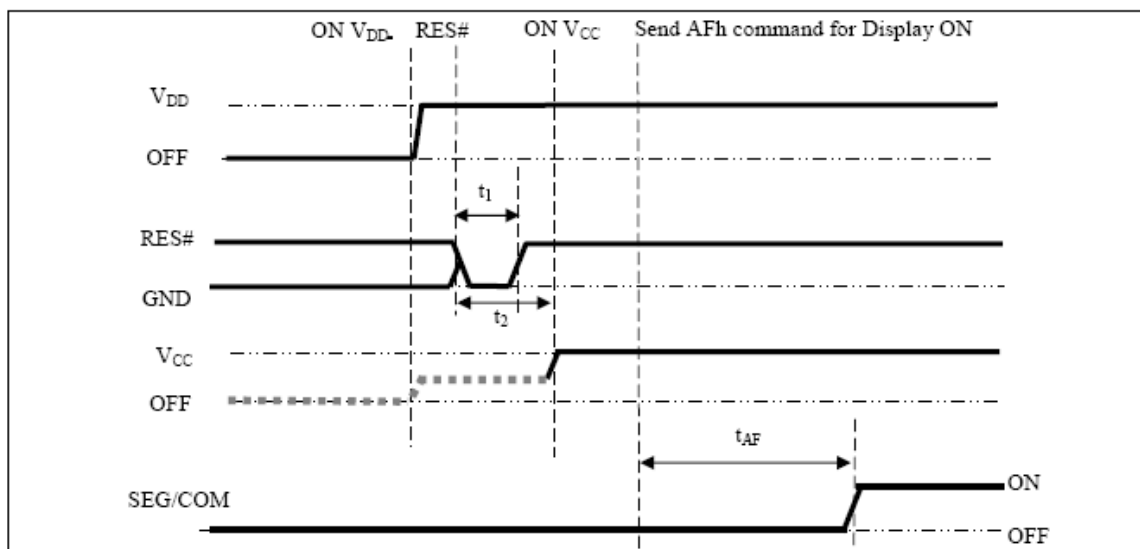


9 Functional Specification and Application Circuit

9.1 Power ON and Power OFF Sequence

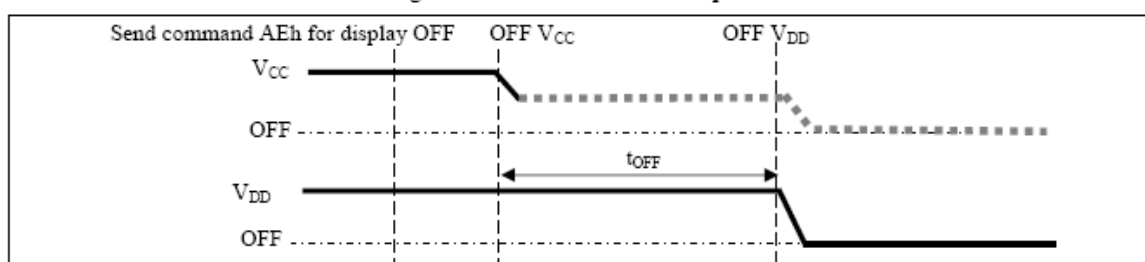
Power ON Sequence:

1. Power ON VDD
2. After VDD become stable, set RES# pin LOW (logic low) for at least 3 μ s (t_1)⁽⁴⁾ and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 3 μ s (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:

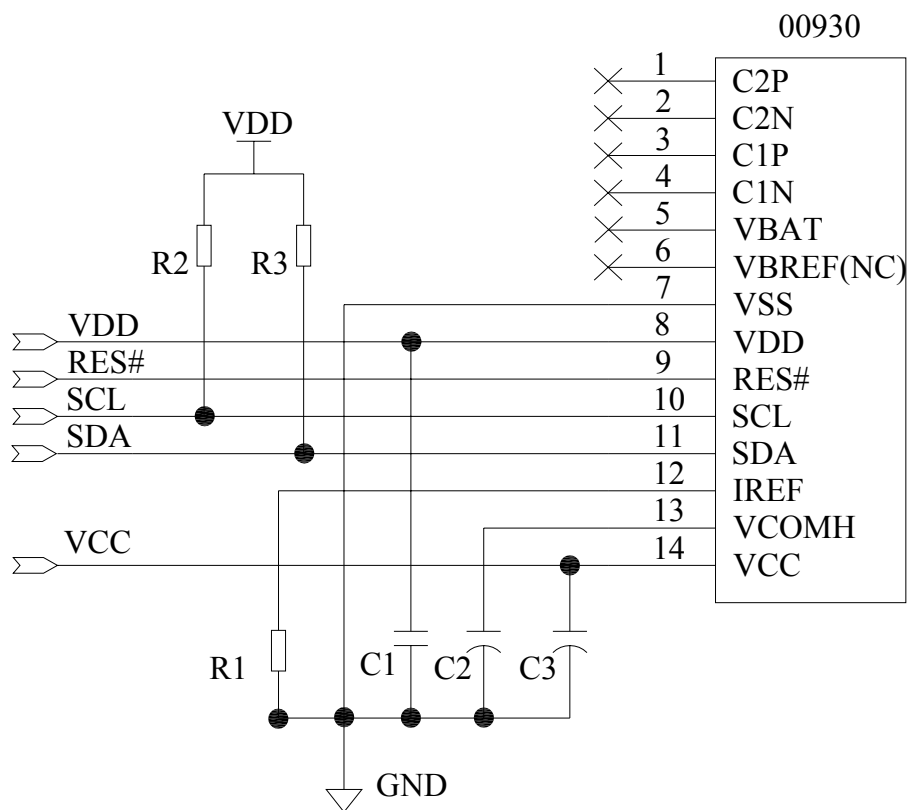
1. Send command AEh for display OFF.
2. Power OFF VCC⁽¹⁾⁽²⁾⁽³⁾.
3. Power OFF VDD after t_{OFF} .⁽⁵⁾ (Typical t_{OFF} =100ms)



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.

2) Application Example of M00930 with External VCC and I²C mode.



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

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

Under external V_{CC} Mode, the Charge Pump Setting(8Dh) must be set as follow:

8Dh: Charge Pump Setting

10h; Disable Charge Pump

Recommended components

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

C1: 1uF-0603-X7R±10%.RoHS

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

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

9.3 Display Control Instruction

Refer to SSD1306 IC Specification.

9.4 Recommended Software Initialization

TBD

10 Package Specification

TBD

11 Reliability

11.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85°C,240hrs	4
2	Low Temperature (Non-operation)	-40°C,240hrs	4
3	High Temperature (Operation)	70°C,240hrs	4
4	Low Temperature (Operation)	-40°C,240hrs	4
5	High Temperature / High Humidity (Operation)	60°C,90%RH,240hrs	4
6	Thermal shock (Non-operation)	-40°C~85°C (-40°C/30min;transit/3min;85°C/30min;transit/3min) 1cycle: 66min,30cycles	4
7	Vibration	Frequency: 5~50Hz,0.5G 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

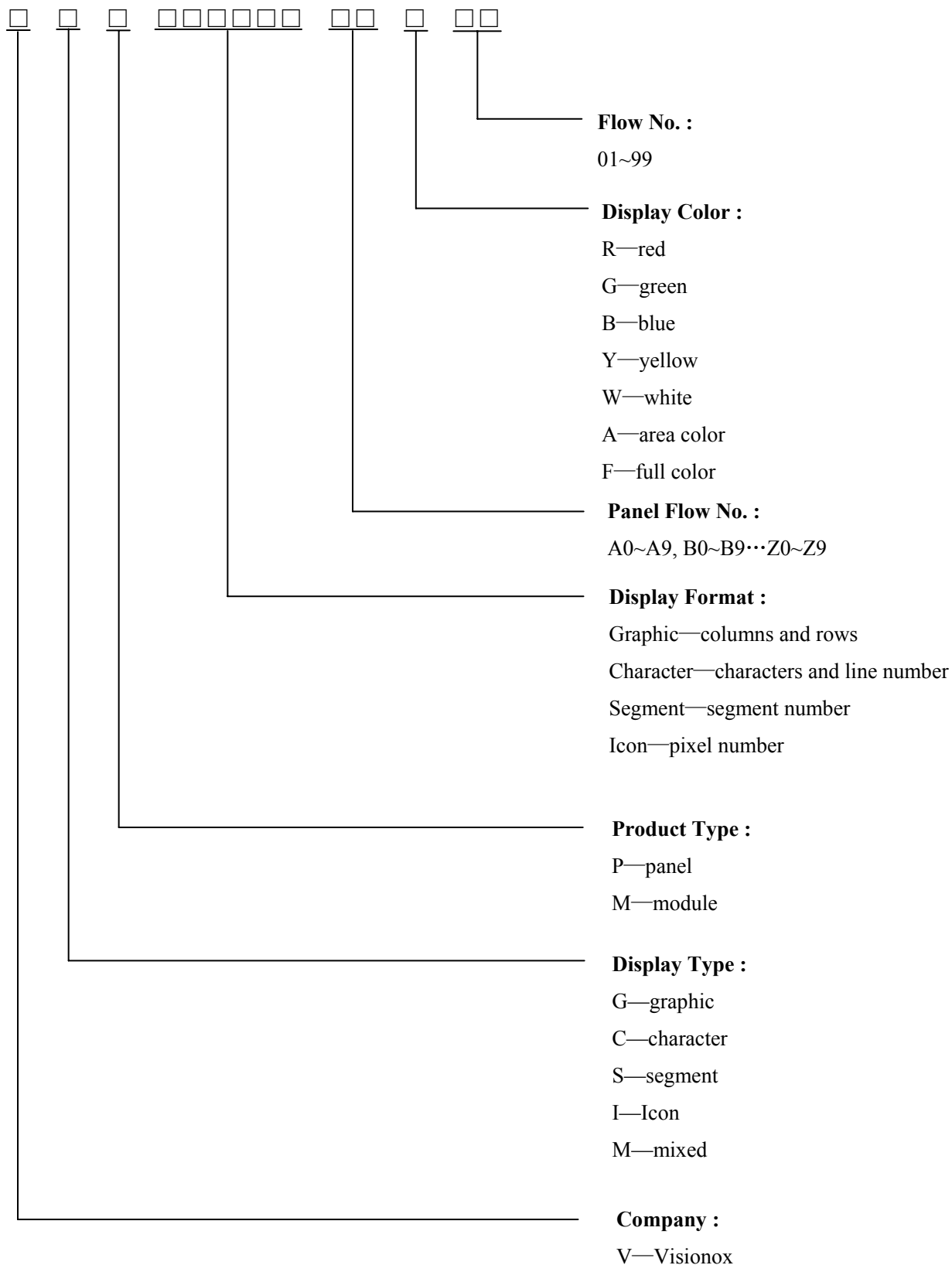
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

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

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

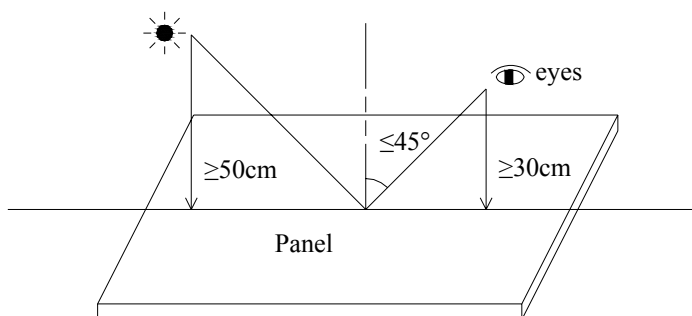
Fluorescent Lamp: 30W

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

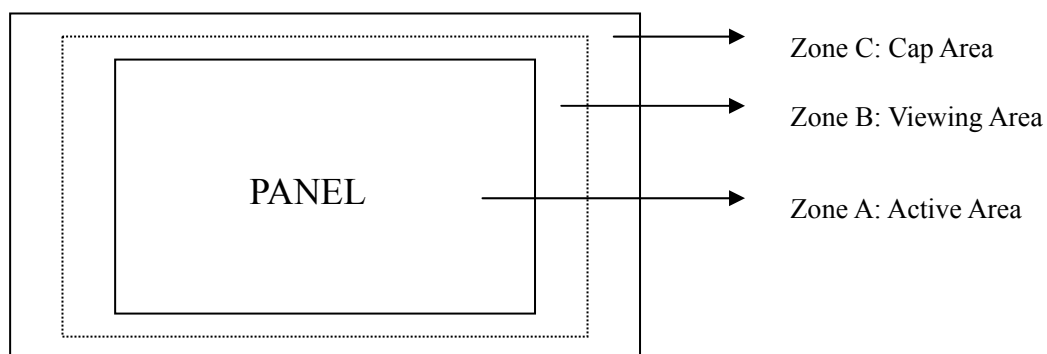
Distance between the Panel & Eyes: $\geq 30\text{cm}$

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

(See the sketch below)

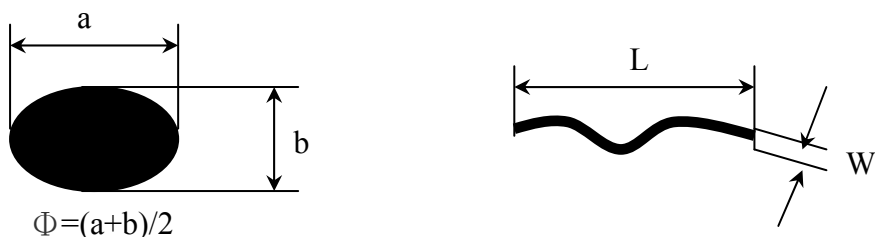


13.3 Quality Assurance Zones



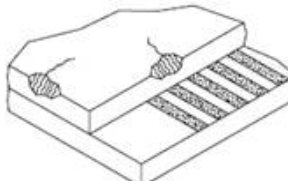
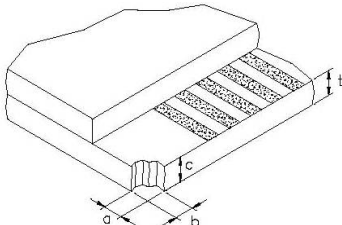
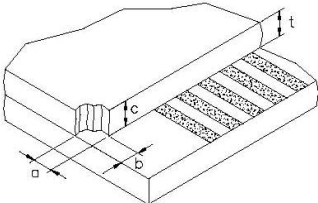
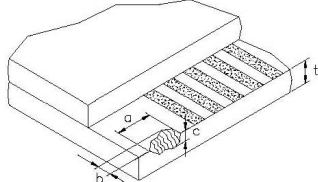
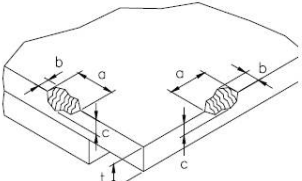
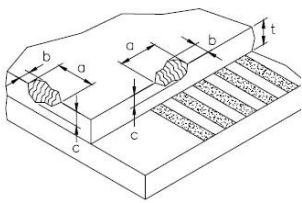
13.4 Inspection Standard

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><tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>Zone A,B</td><td>Zone C</td></tr><tr><td>$\Phi \leq 0.15$</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></table>				Average Diameter (mm)	Acceptable Number		Zone A,B	Zone C	$\Phi \leq 0.15$	Ignore	Ignore	$0.15 < \Phi \leq 0.30$	3	$\Phi > 0.30$	0	Minor				
Average Diameter (mm)	Acceptable Number																					
	Zone A,B	Zone C																				
$\Phi \leq 0.15$	Ignore	Ignore																				
$0.15 < \Phi \leq 0.30$	3																					
$\Phi > 0.30$	0																					
2	Scratch/line on the glass/Polarizer	<table><tr><td rowspan="2">Width (mm)</td><td rowspan="2">Length (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>Zone A,B</td><td>Zone C</td></tr><tr><td>$W \leq 0.03$</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></table>				Width (mm)	Length (mm)	Acceptable Number		Zone A,B	Zone C	$W \leq 0.03$	---	Ignore	Ignore	$0.03 < W \leq 0.08$	$L \leq 5.0$	3	$W > 0.08$	---	0	Minor
Width (mm)	Length (mm)	Acceptable Number																				
		Zone A,B	Zone C																			
$W \leq 0.03$	---	Ignore	Ignore																			
$0.03 < W \leq 0.08$	$L \leq 5.0$	3																				
$W > 0.08$	---	0																				
3	Polarizer Bubble	<table><tr><td rowspan="2">Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>Zone A,B</td><td>Zone C</td></tr><tr><td>$\Phi > 0.5$</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></table>				Average Diameter (mm)	Acceptable Number		Zone A,B	Zone C	$\Phi > 0.5$	0	Ignore	$0.2 < \Phi \leq 0.5$	3	$\Phi \leq 0.2$	Ignore	Minor				
Average Diameter (mm)	Acceptable Number																					
	Zone A,B	Zone C																				
$\Phi > 0.5$	0	Ignore																				
$0.2 < \Phi \leq 0.5$	3																					
$\Phi \leq 0.2$	Ignore																					
4	Any Dirt & Scratch on Polarizer's Protective Film	Ignore for not affect the polarizer.				Acceptable																
5	Any Dirt on Cap Glass	<table><tr><td>Average Diameter (mm)</td><td colspan="2">Acceptable Number</td></tr><tr><td>$\Phi \leq 0.5$</td><td colspan="2">Ignore</td></tr><tr><td>$0.5 < \Phi \leq 1.0$</td><td colspan="2">3</td></tr><tr><td>$\Phi > 1.0$</td><td colspan="2">0</td></tr></table>				Average Diameter (mm)	Acceptable Number		$\Phi \leq 0.5$	Ignore		$0.5 < \Phi \leq 1.0$	3		$\Phi > 1.0$	0		Minor				
Average Diameter (mm)	Acceptable Number																					
$\Phi \leq 0.5$	Ignore																					
$0.5 < \Phi \leq 1.0$	3																					
$\Phi > 1.0$	0																					

5	Glass Crack	 Propagation crack is not acceptable.	Major
6	Corner Chip	 t = Glass thickness Accept $a \leq 2.0\text{mm}$ or $b \leq 2.0\text{mm}$, $c \leq t$	Minor
7	Corner Chip on Cap Glass	 t = Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$	Minor
8	Chip on Contact Pad	 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)	Minor
9	Chip on Face of Display	 t = Glass thickness Accept $a \leq 1.5\text{mm}$ or $b \leq 1.5\text{mm}$, $c \leq t$	Minor
10	Chip on Cap Glass	 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 $b \leq 1.5\text{mm}$, $t/2 \leq c \leq t$	Minor
11	Stain on Surface	Stain removable by soft cloth or air blow is acceptable.	Minor
12	TCP/FPC Damage	(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.	Minor
13	Dimension Unconformity	Checking by mechanical drawing.	Major

II. Displaying Defects

NO.	ITEM	CRITERIA			CLASSIFICATION
1	Black/White spot Dirty spot Foreign matter	Average Diameter (mm)	Pieces Permitted		Minor
			Zone A,B	Zone C	
		$\Phi \leq 0.10$	Ignore	Ignore	
		$0.10 < \Phi \leq 0.20$	3		
		$\Phi > 0.20$	0		
2	No Display	Not allowable.			Major
3	Irregular Display	Not allowable.			Major
4	Missing Line (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.