国兆光电
GUO ZHAO OPTOELECTRONICS

XGA039HW06C

Silicon-based OLED Microdisplay

Datasheet

Version 1.0

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Revision

Version	Date	Page No.	Description
1.0	2023-02-20		Official version release

Contents

1 Overview / Applications

The XGA039HW06C microdisplay is a top-emitting, high-efficiency, active-matrix-driven silicon-based OLED microdisplay independently developed by Nanjing Guozhao Optoelectronics Technology Co., Ltd. Its silicon substrate is manufactured by 0.18μm CMOS technology. This product integrates some modules like signal enhancement circuit, row and column drive circuit, logic control circuit, etc. It supports the 8/16/24bit digital video signal. Through the I^2C-bus interface, it can realize the control and adjustment of display mode, display position, brightness, contrast and other functions. This product has the characteristics of low power consumption, high-resolution, high-integration, miniaturization, etc., and it can be widely used in various near-eye display systems with miniaturization, high-resolution, low power consumption, and wide-temperature range.

1.1 Key Features

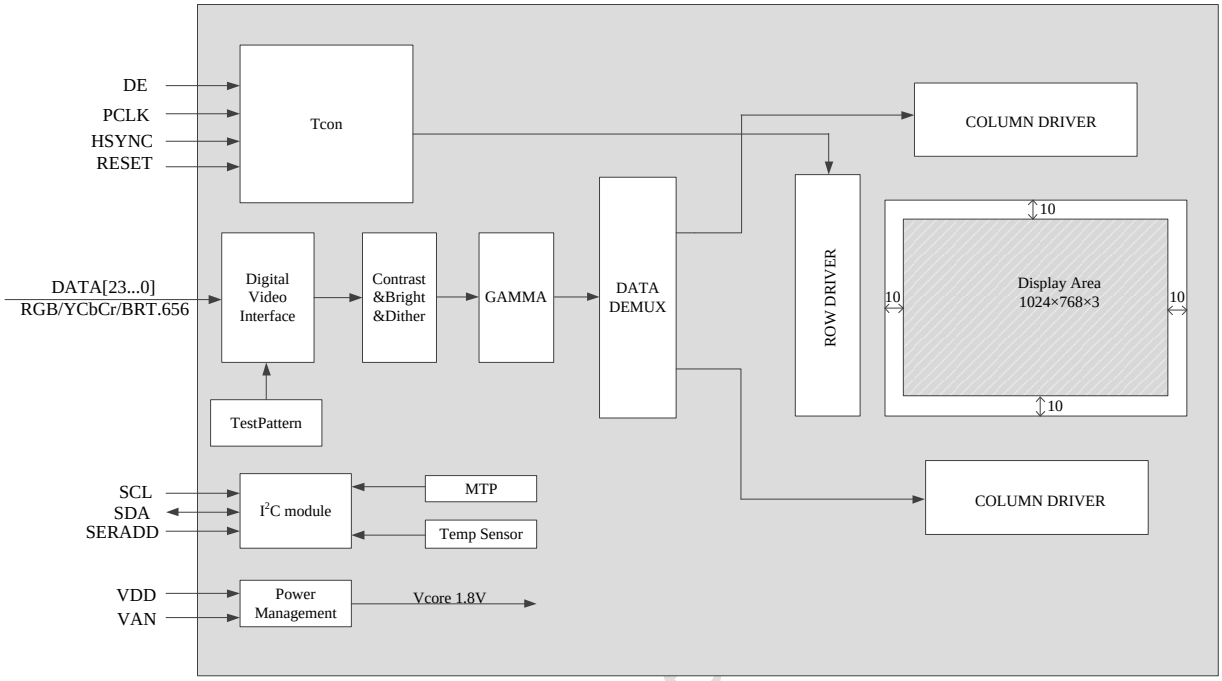
- Low power consumption
- High contrast
- The Communication interface supports I^2C
- The video interface supports RGB, YCbCr and ITU-R BT.656
- Embedded digital temperature sensor
- Support PWM-mode brightness adjustment function
- Support automatic brightness-temperature compensation function
- Support image brightness and contrast digital signal enhancement functions
- Support horizontal / vertical inverse display of video images
- Support image position adjustment
- Compatible with low-resolution image display

1.2 General Features

Parameter	Specification
Product category	Color
Resolution	1024×768 (1044×788 reserved)
Pixel arrangement	RGB hexagon
Pixel size	7.8цm×7.8цm
Active area	7.99mm×5.99mm (0.39 inches diagonally)
Gray levels	Up to 256 per primary color
Uniformity@200cd/m^2	≥ 90%
Contrast Ratio	>10000:1
Refresh rate	25Hz～75Hz
Video interface	24bit-RGB, 8/16bit-YCbCr, ITU-RBT.656
Typical brightness	200 cd/m^2
Recommended brightness range	40 cd/m^2 ～ 400 cd/m^2
Supply voltage	VDD = 1.8V, VAN = 5.0V
Typical power consumption	120mW @60Hz
	84mW @25Hz
Weight	< 1g
Operating temperature	-20℃ ~ +65℃
Storage temperature	-55℃ ~ +70℃

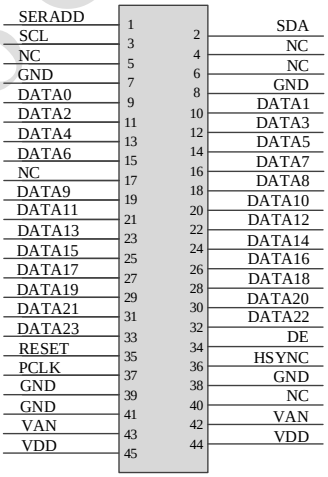
2 Function Overview and Interfaces

2.1 System Block Diagram



2.2 Pin Description

The electrical interface of the microdisplay adopts a lift-off 45pin connector with a spacing of 0.3mm.



Note:

Please refer to Chapter 6 for detailed dimensions of connectors and recommended design dimensions of FPC connectors.

The electrical interface pins of the microdisplay are defined as follows.

Pin No.	Symbol	Description
1	SERADD	I²C slave address selection
2	SDA	I²C data
3	SCL	I²C clock
4	NC	Not used, recommended to connect to GND
5	NC	Not used, recommended to connect to GND
6	NC	Not used, recommended to connect to GND
7	GND	Power GND
8	GND	Power GND
9	DATA0	Data signal B[0]
10	DATA1	Data signal B[1]
11	DATA2	Data signal B[2]
12	DATA3	Data signal B[3]
13	DATA4	Data signal B[4]
14	DATA5	Data signal B[5]
15	DATA6	Data signal B[6]
16	DATA7	Data signal B[7]
17	NC	Not used, recommended to connect to GND
18	DATA8	Data signal G[0]
19	DATA9	Data signal G[1]
20	DATA10	Data signal G[2]
21	DATA11	Data signal G[3]
22	DATA12	Data signal G[4]
23	DATA13	Data signal G[5]
24	DATA14	Data signal G[6]
25	DATA15	Data signal G[7]
26	DATA16	Data signal R[0]
27	DATA17	Data signal R[1]
28	DATA18	Data signal R[2]
29	DATA19	Data signal R[3]
30	DATA20	Data signal R[4]
31	DATA21	Data signal R[5]
32	DATA22	Data signal R[6]
33	DATA23	Data signal R[7]

Pin No.	Symbol	Description
34	DE	Video data enable
35	$\overline{\text{RESET}}$	Reset signal, active low
36	HSYNC	Video horizontal synchronization
37	PCLK	Video point clock
38	GND	Power GND
39	GND	Power GND
40	NC	Not used, recommended to connect to GND
41	GND	Power GND
42	VAN	Analog circuit power supply
43	VAN	Analog circuit power supply
44	VDD	Digital circuit power supply
45	VDD	Digital circuit power supply

Note:

The signal $\overline{\text{RESET}}$ is active at a low level. In order to ensure that the screen is in an effective reset state when starting, a pull-down resistor should be designed at the pin. The recommended resistance value is 10K.

3 Electrical Characteristics

3.1 Absolute Maximum Ratings

Symbol	Description	Min.	Max.	Unit
VDD	Digital circuit power supply	-0.3	2.2	V
VAN	Analog circuit power supply	-0.3	5.5	V
V_I	Input digital signal level	-0.3	VAN-0.3	V
Tst	Storage temperature	-55	+70	℃

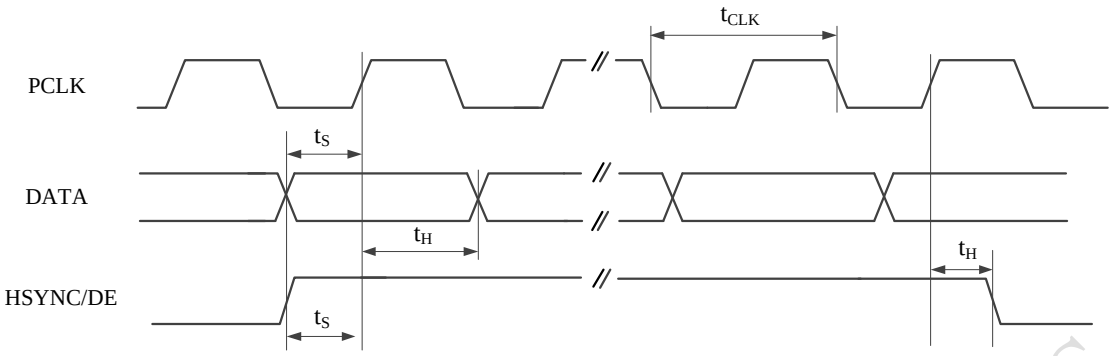
3.2 DC Characteristics

Symbol	Description	Min.	Typ.	Max.	Unit
V_D	VDD voltage	1.70	1.80	1.90	V
I_D	VDD current	—	—	40	mA
V_A	VAN voltage	4.80	5.00	5.10	V
I_A	VAN current	—	—	25	mA
V_{IL}	Valid low level of digital signal	-0.3	—	0.5	V
V_{IH}	Valid high level of digital signal	1.2	—	3.6	V
Top	Operating temperature	-20	+25	+65	℃

Note:

Digital input signals are compatible with level standards such as 1.8V, 2.5V, 3.3V, etc., but must meet the electrical standards in the table above.

3.3 **AC Characteristics**



Symbol	Description	Min.	Typ.	Max.	Unit
t_S	Setup time	4	—	—	ns
t_H	Hold time	1.5	—	—	ns
t_{CLK}	Clock cycle	—	15.4	—	ns
d_{CLK}	Duty cycle	45	50	55	%

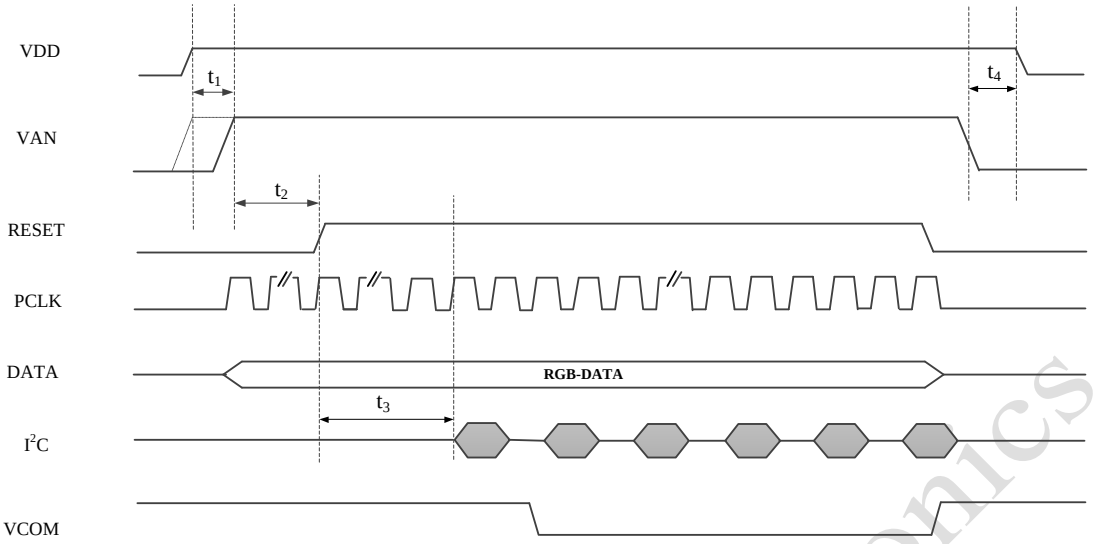
3.4 **Power Consumption**

Symbol	Description	Typ.		Unit
		60Hz	25Hz	
P_{VDD}	VDD power consumption	55	22	mW
P_{VAN}	VAN power consumption	65	62	mW
P_{POWER}	Total power consumption	120	84	mW

Note:

All white display, brightness = 200cd/m^2, temperature = +25°C ± 2°C.

3.5 **Power Sequence**



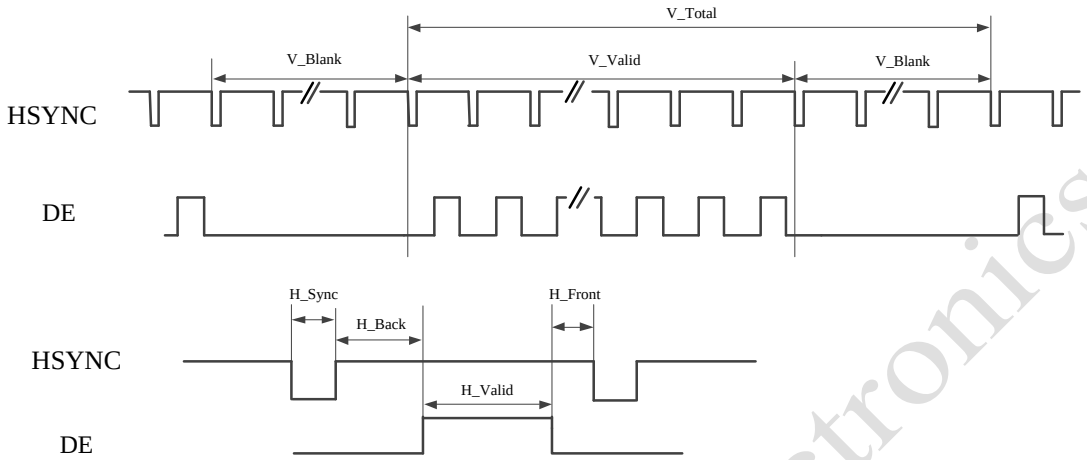
Symbol	Description	Min.	Typ.	Max.	Unit
t_1	Power on time between VDD and VAN	0	—	—	ms
t_2	Reset time	5	—	—	ms
t_3	MTP reload time	5 frames time	—	—	—
t_4	Power-off interval time	0	—	—	ms

Note:

1. In order to avoid display errors when the screen is powered on, it is necessary to ensure that the video data is accurate and at least one frame time later, then configure the 94H register with 0xDA, turn on the VCOM voltage and light up the screen.
2. Before powering off, to avoid unstable graphics during shutdown, it is recommended to turn off the VCOM voltage first and set the 94H register to 0xD8. During the power-off process, as long as the VDD voltage is not lower than the VAN voltage, the two power supplies can be turned off at the same time.
3. PCLK needs to be in a stable state before RESET is pulled high.

3.6 **Video Sequence**

The timing of the video signal input to the microdisplay shall be in accordance with VESA Standard. When the timing of the video signal is not in accordance with VESA Standard, the parameters below can be configured according to the timing requirements as shown in figure.



Symbol	Min.	Typ.	Max.	Unit
V_Blank	22	38	240	HSYNC
V_Valid		768		HSYNC
H_Sync	20	136	500	PCLK
H_Back	20	160	500	PCLK
H_Front	20	24	500	PCLK
H_Valid		1024		PCLK

4 Function Description

4.1 Register Map

Address	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Default
01H	0	0	Test pattern selection			Input video format selection			0x03
03H	Signal scanning starting position selection								0x00
07H	Synchronization mode		1	0	Interlaced / progressive scanning		Vertical scanning	Horizontal scanning	0x60
78H	Image brightness digital adjustment								0x80
7CH	Image contrast digital adjustment								0x80
8BH	Data mode selection								0x01
8CH	Temperature reading								read only
94H	VCOM voltage enable control								0xD8
A9H	Brightness temperature compensation function enable control								0x01
ACH	Counter range selection								0x11
ADH	Parity field difference								0x00
AEH	Counter starting position selection								0x1F
B0H	Set 256-level red gray of test pattern								0x00
B1H	Set 256-level green gray of test pattern								0x00
B2H	Set 256-level blue gray of test pattern								0x00
B4H	Horizontal total pixels H_Total [7:0]								0x40
B5H	0	0	0	0	Horizontal total pixels H_Total [11:8]				0x05
B6H	Horizontal movement enable control								0x0A
B7H	Horizontal valid pixels H_Valid [7:0]								0x00
B8H	0	0	0	0	Horizontal valid pixels H_Valid [11:8]				0x04
B9H	Horizontal movement enable control								0x0A
BAH	Number of valid rows per frame V_Valid [7:0]								0x00
BBH	0	0	0	0	Number of valid rows per frame V_Valid [11:8]				0x03
BCH	Vertical movement enable control								0x0A
BDH	Vertical movement enable control								0x0A
BEH	Number of total rows per frame V_Total [7:0]								0x26
BFH	0	0	0	0	Number of total rows per frame V_Total [11:8]				0x03
C2H	Vertical movement setting								0x00
C3H									
C4H	Horizontal movement setting								0x00
C5H									
C6H	0	1	0	0	PWM scanning mode selection				0x44
CEH	PWM value								0x64

4.2 Test Pattern Selection

The microdisplay is equipped with various test patterns, and when used, only a stable clock signal PCLK needs to be provided.

Address	Bit	Description
01H	bit5 – bit3	000: With registers B0H, B1H and B2H, 0~255 grayscale of R, G, B signals can be set respectively 001: White field 010: Red field 011: Green field 100: Blue field 101: Transition grayscale pattern from left to right 110: Color bar 111: Checkerboard

4.3 Video Signal Transfer Format

4.3.1 Selection of Video Signal Format

The microdisplay supports various video signal formats, the details are as follows.

Address	Bit	Description
01H	bit2 - bit0	000: 8bit - YCbCr, progressive mode, 8bit - BT.656, interlaced mode; 001: 16bit - YCbCr, 4:2:2 mode; 011: 24bit - RGB, 4:4:4 mode; 101: Test pattern;

Interfaces	BT.656 (Interlaced)	YCbCr (Progressive)	YCbCr 4:2:2	RGB 4:4:4
DATA23	GND	GND	GND	R[7]
DATA22				R[6]
DATA21				R[5]
DATA20				R[4]
DATA19				R[3]
DATA18				R[2]
DATA17				R[1]
DATA16				R[0]
DATA15	Y/Cb/Cr[7]	Y/Cb/Cr[7]	Y[7]	G[7]
DATA14	Y/Cb/Cr[6]	Y/Cb/Cr[6]	Y[6]	G[6]
DATA13	Y/Cb/Cr[5]	Y/Cb/Cr[5]	Y[5]	G[5]
DATA12	Y/Cb/Cr[4]	Y/Cb/Cr[4]	Y[4]	G[4]
DATA11	Y/Cb/Cr[3]	Y/Cb/Cr[3]	Y[3]	G[3]
DATA10	Y/Cb/Cr[2]	Y/Cb/Cr[2]	Y[2]	G[2]
DATA9	Y/Cb/Cr[1]	Y/Cb/Cr[1]	Y[1]	G[1]
DATA8	Y/Cb/Cr[0]	Y/Cb/Cr[0]	Y[0]	G[0]
DATA7	GND	GND	Cb/Cr[7]	B[7]
DATA6			Cb/Cr[6]	B[6]
DATA5			Cb/Cr[5]	B[5]
DATA4			Cb/Cr[4]	B[4]
DATA3			Cb/Cr[3]	B[3]
DATA2			Cb/Cr[2]	B[2]
DATA1			Cb/Cr[1]	B[1]
DATA0			Cb/Cr[0]	B[0]

4.3.2 ITU-R BT.656 Configuration Instructions

The microdisplay supports ITU-R BT.656 signals in embedded synchronous format. Take the standard PAL-D video as an example, the register settings when the image is centered are shown below.

Address	Value	Description
01H	0x00	The BT.656 (interlaced) format: 0x00
03H	0x01	The BT.656 (interlaced) format: 0x01
07H	0x24	Embedded synchronization, interlaced scanning
8BH	0x00	When the number of horizontal valid pixels is less than 1024, set to 0x00.
ACH	0x10	When the number of horizontal valid pixels is less than 1024, set to 0x10.
ADH	0x01	Set to 0x01
AEH	0x10	Set to 0x10
B4H	0x60	H_Total: 0x360
B5H	0x03	
B6H	0x0A	Horizontal movement disable
B7H	0xD0	H_Valid: 0x2D0
B8H	0x02	
B9H	0x0A	Horizontal movement disable
BAH	0x20	V_Valid: 0x120
BBH	0x01	
BCH	0x0A	Vertical movement disable
BDH	0x0A	Vertical movement disable
BEH	0x38	V_Total: 0x138
BFH	0x01	
C2H	0x60	The first row display starting position, (768-576)/ 2 = 96, and set to 0x60
C3H	0x60	The last row display starting position, (768-576)/ 2 = 96, and set to 0x60
C4H	0x98	The first column display starting position, (1024-720)/ 2 =152, and set to 0x98
C5H	0x98	The last column display starting position, (1024-720)/ 2 = 152, and set to 0x98
C6H	0x47	The BT.656 (interlaced) format: 0x47
CEH	0x00	PWM value, at which point the brightness is maximum

4.3.3 YCbCr Format Signal Description

When the input digital video signal is in YCbCr encoding format, the chip needs to perform color space transformation on the YCbCr digital signal, and the conversion relationship is as follows.

R = Y + Cr×179/128 − 179

G = Y − Cb×44/128 – Cr×91/128 + 135

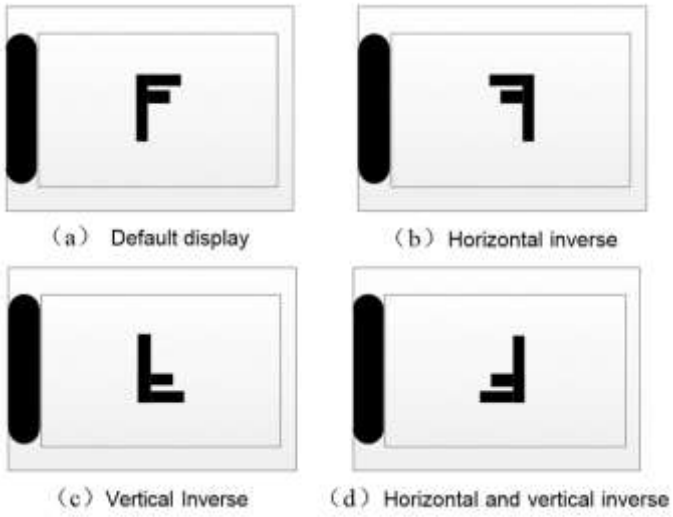
B = Y + Cb×227/128 – 227

4.4 Up / Down and Left / Right Inverse Display

The microdisplay supports inverse display of video images in horizontal and vertical directions.

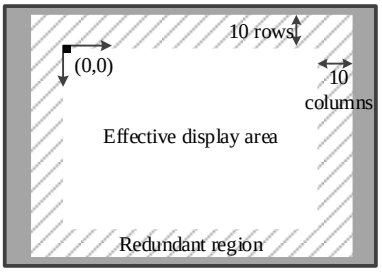
Address	Bit	Description
07H	bit1	Vertical display settings 0: Vertical normal display 1: Vertical inverse display
	bit0	Horizontal display settings 0: Horizontal normal display 1: Horizontal inverse display

The schematic diagram of inverse display in horizontal and vertical directions is as follows.



4.5 Image Display Position Movement

The microdisplay supports the movement of the full-screen image at any position within the display area and the offset position value can be set separately. Taking an image with a resolution of 1024×768 as an example, the maximum horizontal and vertical movement values are both 0x0A. The schematic diagram of the full screen display in the center is as follows.



Before setting the movement, it is necessary to turn on the movement enable, that is, set B6H, B9H, BCH and BDH to 0x00 respectively.

The image movement can be completed by configuring the register values with addresses ranging from C2H to C5H. Please refer to the table below for the movement configuration.

Address	Value	Description
C2H	0x0A+Y	The Y value is the vertical movement adjustment amount, and its range is [-10,+10]. The specific description is as follows. $\begin{cases} Y > 0, The\ image\ moves\ down \\ Y = 0, The\ image\ is\ centered\ vertically \\ Y < 0, The\ image\ moves\ up \end{cases}$
C3H	0x0A-Y	
C4H	0x0A+X	The X value is the horizontal movement adjustment amount, and its range is [-10,+10]. The specific description is as follows. $\begin{cases} X > 0, The\ image\ moves\ right \\ X = 0, The\ image\ is\ centered\ horizontally \\ X < 0, The\ image\ moves\ left \end{cases}$
C5H	0x0A-X	

Note:

When moving low-resolution images, the moving range can be greater than 10 rows/columns, and the specific value is calculated according to the actual resolution.

4.6 Compatible with Low-resolution Image Display

The microdisplay is compatible with images below 1024×768 resolution for display, such as 800×600, 640×480 resolution or other irregular resolution. When compatible with low-resolution images for display, the registers need to be configured accordingly.

Take 640×480 resolution video image conforming to VESA standard as an example, with point clock = 31.5MHz, refresh rate = 60Hz, H_Total = 800 pixels, and V_Total = 525 lines. The register configuration is shown below when the input image in 24bit-RGB format is displayed in the center.

Address	Value	Description
01H	0x03	0x03: in 24bit-RGB format
8BH	0x00	Set to 0x00
ACH	0x10	Set to 0x10
B4H	0x20	H_Total: 0x320
B5H	0x03	
B6H	0x0A	Horizontal movement disable
B7H	0x80	H_Valid: 0x280
B8H	0x02	
B9H	0x0A	Horizontal movement disable
BAH	0xE0	V_Valid: 0x1E0
BBH	0x01	
BCH	0x0A	Vertical movement disable
BDH	0x0A	Vertical movement disable
BEH	0x0D	V_Total: 0x20D
BFH	0x02	
C2H	0x90	The first row display starting position, (768-480)/ 2 = 144, and set to 0x90
C3H	0x90	The last row display starting position, (768-480)/ 2 = 144, and set to 0x90
C4H	0xC0	The first column display starting position, (1024-640)/ 2 = 192, and set to 0xC0
C5H	0xC0	The last column display starting position, (1024-640)/ 2 = 192, and set to 0xC0

Note:

The minimum resolution must be no less than 534×278.

4.7 Temperature Detection

The microdisplay has temperature detection function, and the temperature conversion formula is shown as below.

$$T = 0.49 \times Reg(8CH) - 47.7$$

T is the actual temperature value and Reg(8CH) is the reading of the temperature register 8CH.

Note:

1. During the initialization period when the microdisplay is powered on, the temperature reading changes significantly. It is recommended to stabilize for a few seconds before reading the temperature value;
2. During normal operation, the temperature reading update cycle is four frame image cycles.

4.8 Brightness Adjustment

The factory default brightness of the microdisplay is about 200cd/m^2, and the recommended brightness range is 40cd/m^2 ~ 400cd/m^2. Users can adjust the brightness appropriately according to the needs of the use. The brightness adjustment method is the PWM method, the corresponding configuration register address is CEH, and the brightness adjustment can be realized only by changing the value of the register. The factory default value of the CEH register is 0x64, and the adjustment step is 0x04. The higher the PWM value, the lower the brightness, and the PWM value corresponding to the maximum brightness is 0x00.

The usable brightness range of the microdisplay varies at different refresh rates. The brightness adjustable range at typical refresh rates is shown below, beyond which the image display will be abnormal.

	Typical refresh rate (Hz)				
	60	**50**	**40**	**30**	**25**
Recommended brightness range (cd/m^2)	10～400	10～400	20～400	40～400	40～400

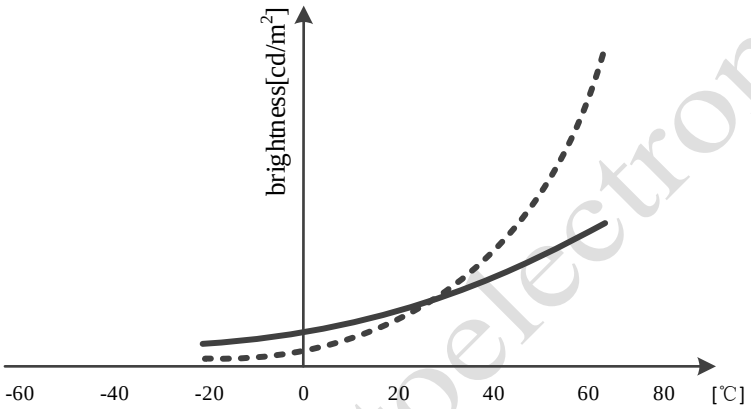
The PWM value of the register is inversely proportional to the brightness of the screen, and the relationship formula is as follows.

$$L = 400 * （N - 4 * M）/N$$

M represents the value of the PWM register converted to decimal, N represents the number of V_Total, and L represents the brightness value. The value of PWM cannot exceed one quarter of the number of total rows V_Total, which needs to be restricted.

4.9 **Automatic Brightness-Temperature Compensation**

Due to the inconsistent full temperature characteristics of the silicon-based OLED microdisplay, the brightness increases at high temperatures and decreases at low temperatures. In order to improve the consistency of brightness at different temperatures, the microdisplay has a built-in brightness adaptive adjustment mechanism, which automatically compensates for the brightness of the screen at different temperatures. Register A9H is the enable control register, and the default value is 0x01, which is in the enabled state. To turn off this function, the configuration value is set to 0x00.



In the figure above, the dashed line represents the brightness curve at full temperature when the brightness adaptive adjustment is turned off, while the solid line represents the brightness curve at full temperature when the brightness adaptive adjustment function is turned on. By testing, the brightness is effectively compensated in both high and low temperature stages after the brightness adaptive adjustment function is turned on, making the brightness at high and low temperatures as close as possible to the default brightness at room temperature. The image display effect basically meets the observation requirements at full temperature.

4.10 **Image Brightness Digital Adjustment**

The microdisplay has the image brightness digital adjustment function, and the brightness adjustment formula is as follows:

$$Y = Y_0 + (BRT - 128) \times 4$$

Y is the adjusted data value, Y_0 is the input image data value, and BRT is the configuration value of the 78H register. Data overflow may occur in the low gray stage and high gray stage after adjustment, resulting in image distortion. It is recommended to configure it appropriately.

4.11 Image Contrast Adjustment

The microdisplay has the image contrast adjustment function, that is, the input image data is processed in the same proportion multiplier mode to achieve the effect of image contrast change. The image contrast adjustment register address is 7CH, and the adjustment range is 0x00 to 0xFF.

The contrast adjustment formula is as follows.

$$Y = Y_0 \times C_{ONT} / 128$$

Y is the adjusted data value, Y_0 is the input image data value, and C_{ONT} is the 7CH register value.

4.12 I^2C Interface

The user can write or read the values of the register inside the screen through the I^2C interface. The I^2C interface communication mode conforms to the standard communication protocol. The host can realize functions of test pattern selection, brightness adjustment, contrast adjustment, temperature reading and so on by reading and writing internal registers of the microdisplay.

The communication rate supports 10KHz~400KHz.

Note:

1. SDA and SCL signals must be pulled up with resistors to V_{IH};
2. When the transmission distance of I^2C communication signal is long, please pay attention to the signal integrity and anti-interference measures of SDA and SCL;
3. When the I^2C communication signal is seriously disturbed, I^2C communication can be carried out during the vertical blanking interval, or the communication frequency can be appropriately reduced.

4.12.1 Slave Address Selection

The microdisplay is used as a slave device. Its address can be selected by the SERADD pin, which is 0x54 when the SERADD pin is low and 0x55 when the SERADD pin is high. The specific slave address and read / write instructions are as follows.

Slave address	Instructions	Bit7 (MSB)	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1 (SERADD)	Bit0 (R/W)	Valid bytes
0x54	Write	1	0	1	0	1	0	0	0	0xA8
	Read	1	0	1	0	1	0	0	1	0xA9
0x55	Write	1	0	1	0	1	0	1	0	0xAA
	Read	1	0	1	0	1	0	1	1	0xAB

4.12.2 Data Transfer Format

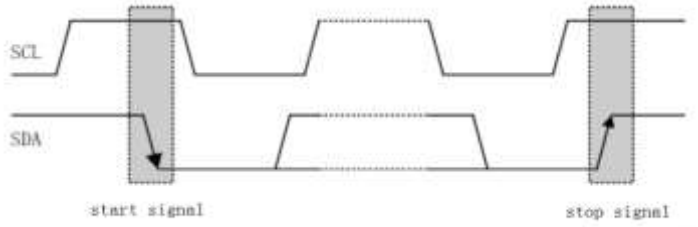
4.12.2.1 Flag Bit Description

Start signal(S): the change of SDA line from high level to low level when the SCL line is high level;

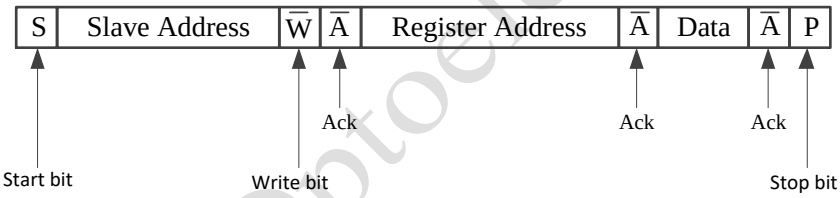
Pause signal (P): the change of SDA line from low level to high level when the SCL line is high level;

Active answer (ACK): SDA at low level indicates active answer;

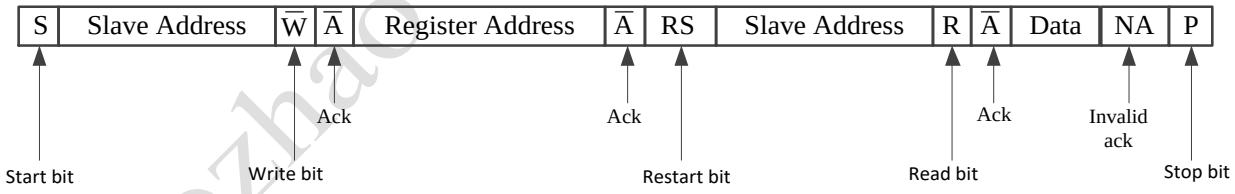
Negative answer (NAK): SDA at high level indicates negative answer;



4.12.2.2 Write Sequence



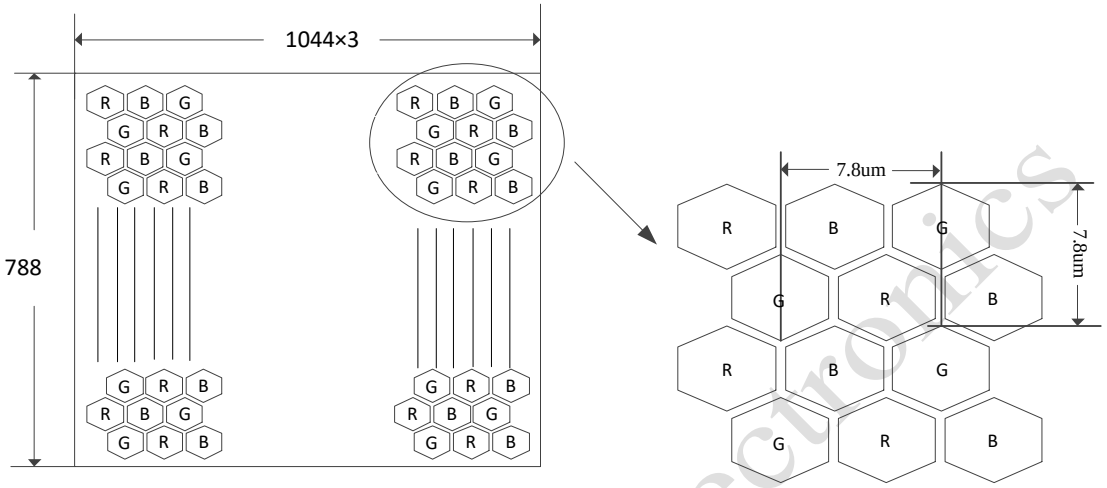
4.12.2.3 Read Sequence



5 Optical Features

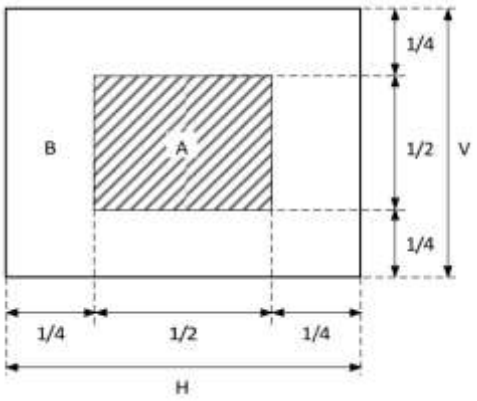
5.1 Pixel Arrangement

The pixel arrangement of the XGA039HW06C silicon-based OLED microdisplay is shown below, where every three sub-pixels form a pixel. The pixel size is 7.8μm×7.8μm.



5.2 Display Quality Standard

5.2.1 Display Area Definition



5.2.2 Inspection Standards for Defect Points

Defect points refer to subpixels that cannot display correctly, such as pixels that are always bright or dim. The inspection standards for defect points are carried out in accordance with the requirements as follows.

No.	Item	Request
1	Bad pixel	No black dots exceeding 1 pixel in full screen
2	Consecutive bad pixels	0
3	Bright point	No bright point above 100 grayscale in full screen

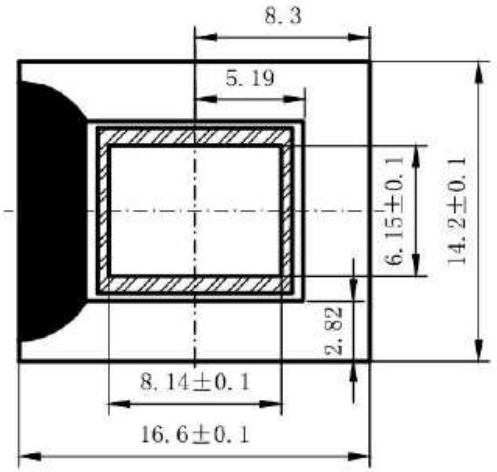
5.2.3 Test Conditions

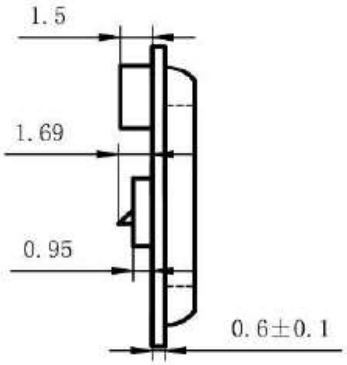
1) Use a dedicated test fixture to light up the microdisplay, and inspect the white field display of the microdisplay under the microscope's bright field at a magnification of 100× (objective 10×, eyepiece 10×);
2) Use a dedicated test fixture to light up the microdisplay, the microdisplay shows the black field, and use the 12× eyepiece to observe the bright points.

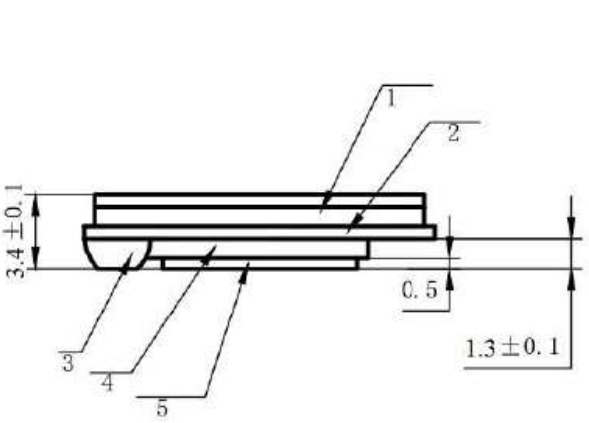
6 Structure and Package

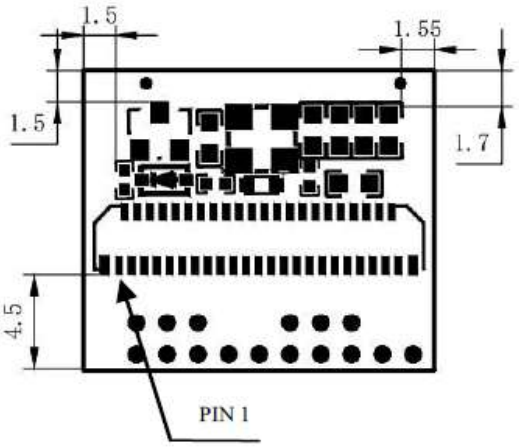
6.1 Product Structure

The overall size of the microdisplay is 16.6mm×14.2mm, and other dimensions are shown below.





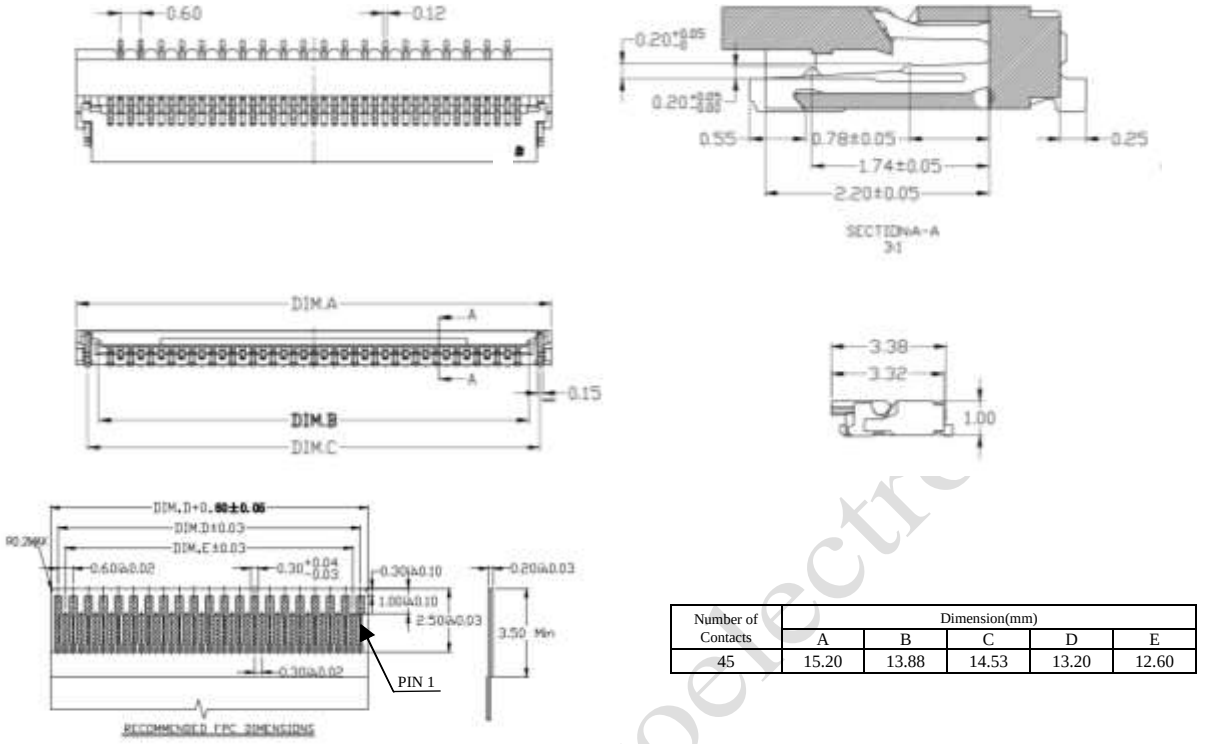




No.	Description
1	Connector
2	PCB substrate
3	Sealant between the silicon substrate and the PCB substrate
4	Silicon substrate
5	Glass

6.2 Connector Dimensions and FPC Design Recommendations

Unit: mm



Number of Contacts	Dimension(mm)				
	A	B	C	D	E
45	15.20	13.88	14.53	13.20	12.60

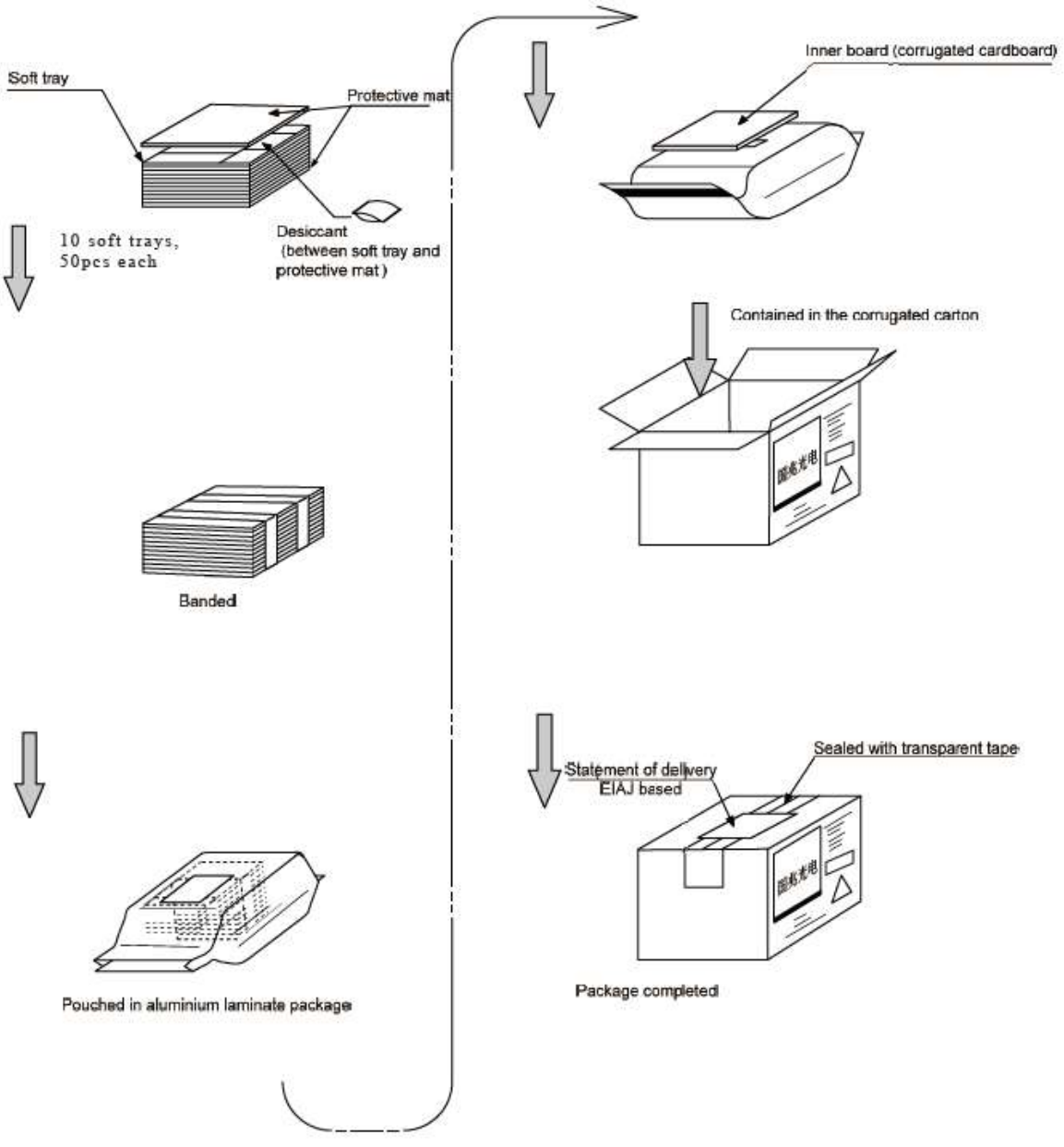
Note:

When the FPC is inserted, the front of the gold finger is facing the PCB substrate.

6.3 **Product Packing Specification**

Packaging composition: Soft tray (capacity: 50 pcs)

Packing quantity: 500 pcs (10×50, 10 soft trays, 50 pcs per tray)



7 Product Precautions

7.1 Use Precautions

1. The XGA039HW06C silicon-based OLED microdisplay shall be strictly in accordance with the definition of the electrical interface in this datasheet for power supply and signal lines connection. Maintain the stability of the power supply, and illegal power supply is not allowed;
2. During the use of the microdisplay, if abnormal phenomena such as short circuit or overheating are found, it is prohibited to repeatedly power on to test. Please timely find the problem or contact Guozhao Optoelectronics Company for maintenance;
3. In order to improve the service life of the product and avoid the aggravation of residual images affecting use, it is necessary to minimize the time for the product to display a fixed image under high temperature or high brightness conditions;
4. The glass and silicon edges of the silicon-based OLED microdisplay are easily damaged and shall not be subject to physical stress;

7.2 Cleaning Precautions

1. It is prohibited to use any acid, alkali, organic solvent/reagent and other chemicals to scrub or come into contact with the product;
2. Use lens paper or a clean cloth to dip a small amount of water or organic solvent, wring dry and then wipe the silicon-based OLED microdisplay surface. Do not wipe it directly with a wet cloth;
3. When wiping the screen with organic solvents, try to avoid wiping the edge of the screen, otherwise it may damage the rubber layer.

7.3 Storage Requirements

1. Short-term storage requirements: the silicon-based OLED microdisplay allows short-term storage in a dry environment between -55 °C ~ 70 °C (≤ 100 hours);
2. Long-term storage requirements:

1) Room temperature of 25 °C ± 5 °C;
2) The dry nitrogen or vacuum sealed container;
3) Avoid violent shaking.

7.4 Others

1. Keep the silicon-based OLED microdisplay away from ultraviolet rays and ionizing radiation;

2. Do not bend the silicon-based OLED microdisplay by external force;
3. Keep the silicon-based OLED microdisplay away from heat sources during storage or use;
4. Avoid falling of the silicon-based OLED microdisplay at high altitude.
