Winsen 炜盛科技

Digital MEMS Alcohol Sensor Module

（Model No.：ZM03）

Manual

Version:1. 5

Valid from: 2022-06-07

Zhengzhou Winsen Electronics Technology Co., Ltd

Statement

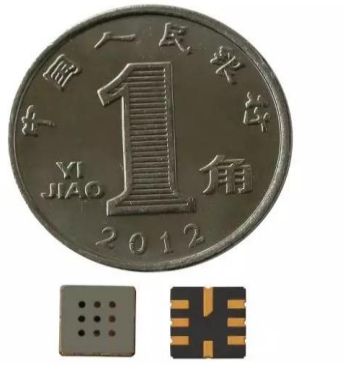
Thanks for purchasing our product. To make customers better use our products and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss. The specific such as color, appearance, sizes & etc., please in kind prevail. We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

Please keep the manual properly, to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

ZM03 Digital MEMS alcohol sensor module

Product description



The digital alcohol module is a low-power, miniaturized module. The module uses a combination of a semiconductor gas sensor and a high-performance microprocessor to detect the gas concentration in the environment. The module has high sensitivity, small size and precision, and adopts I2C digital signal output mode, which is convenient for users to use and debug, and greatly shorten the user's design and development cycle.The module can be widely used in many fields such as environmental safety and portable instruments.

Character

MEMS technology
Ultra-low power consumption
Stable and reliable
High sensitivity
Anti - electromagnetic interference

Application

Portable instrument,industrial and mining safety,medical hygiene,on-site control,weather monitoring.

Main Parameter

Table 1

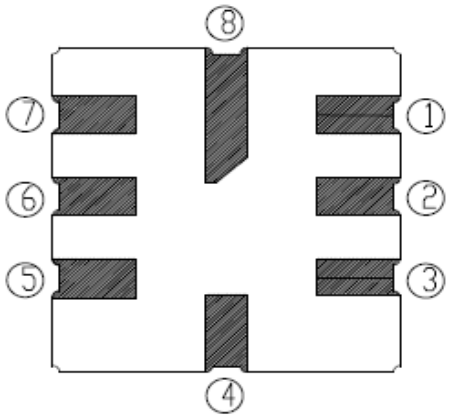
Working Voltage	2.5±0.1V
Working Current	≤25mA
Max. heating power	80mW
Measure range	50ppm(alcohol)
Output method	I2C slave mode
Default address	0x55
I2C rate	10-100kbps
Pull-up resistor	External pull-up resistor required
Preheating time	≤3min
Response time	≤60S

Chip limit value

Table 2

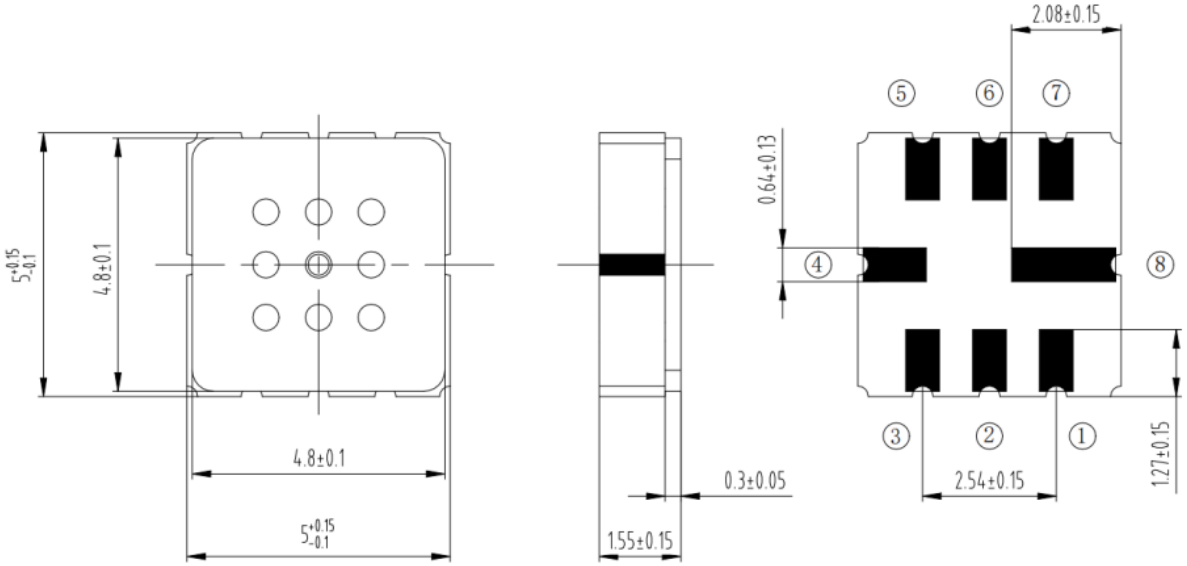
Parameter	Minimum value	Typical value	Maximum value	Unit
stored temperature	-25	—	60	℃
Operating temperature	-10	—	50	℃
Limit voltage (VCC and GND)	-0.3	—	VCC+0.3	V
Limit voltage (any pin)	-0.3	—	VCC+0.3	V
Limit current	—	—	100	mA

Pin Definition

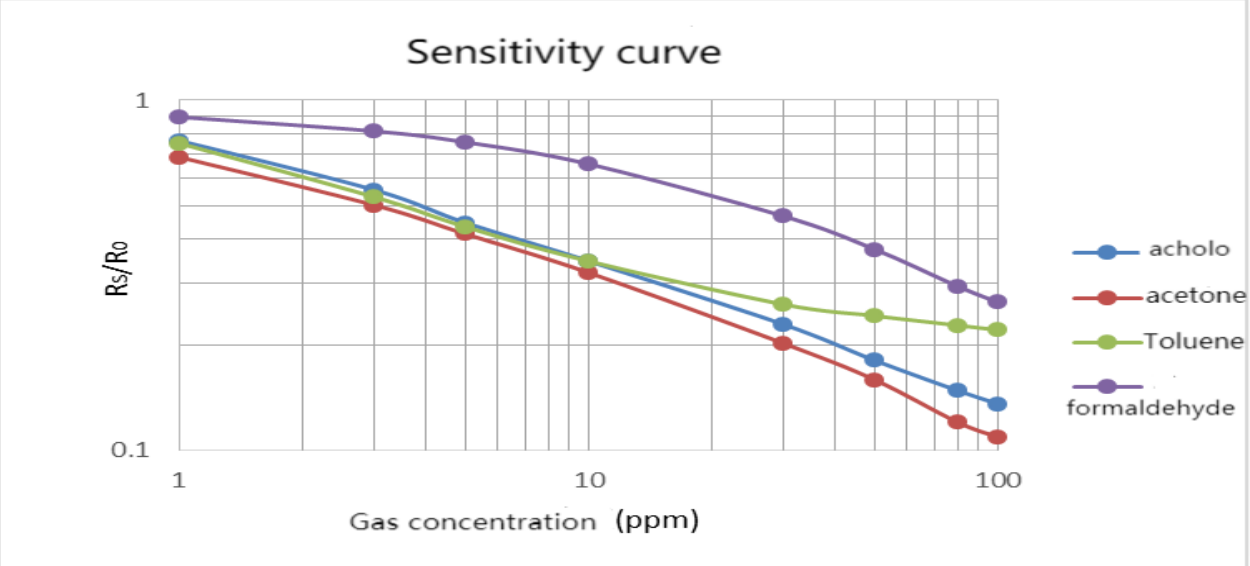


Pins	Connection
①	PIN1
②	SCL
③	SDA
④	PIN4
⑤	NC
⑥	NC
⑦	VCC
⑧	GND

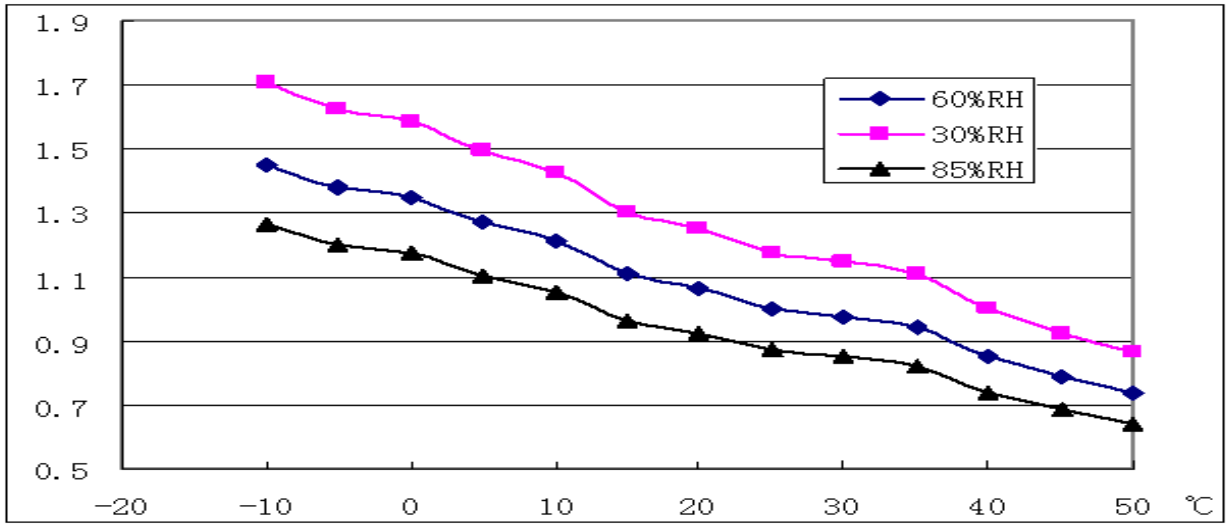
Module size



Sensitivity curve



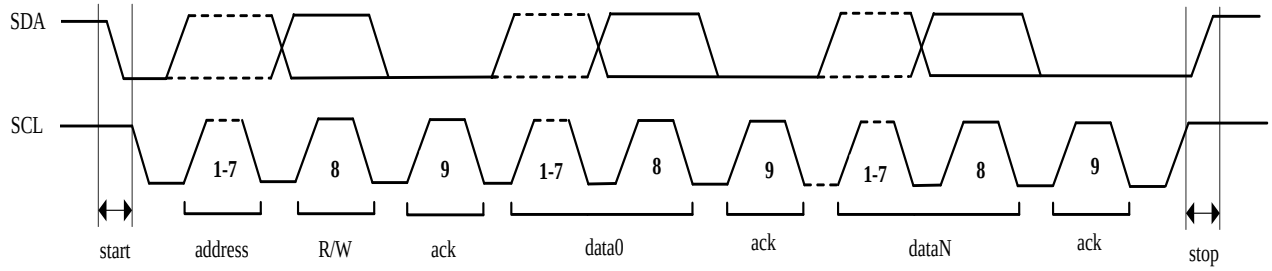
Temperature and humidity curve



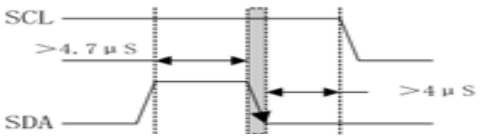
IIC communication protocol

Bus description

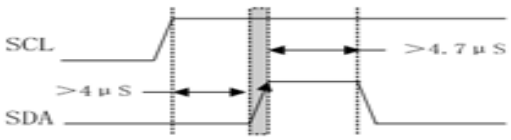
The IIC protocol is a special bus signal protocol. It is composed of three parts: start (start signal), stop (end signal), and binary data, as shown in the figure below. At the beginning, SCL is high and SDA is falling edge. After that, send the slave address. After the 7-bit address bit, it is the control read and write bit to select the read and write operation. When the slave recognizes its corresponding address information, it will send a response signal to the master, pulling down SDA in the 9th clock cycle. When stopped, SCL remains high and SDA rises.



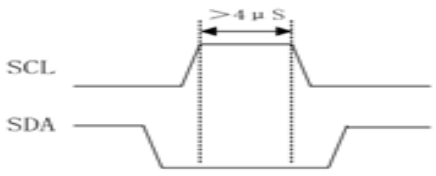
Typical signal simulation



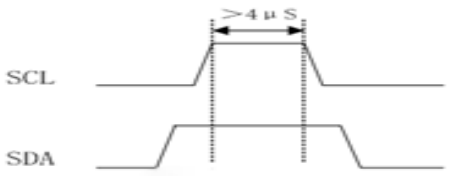
Start Signal S



End signal P



Response "0"



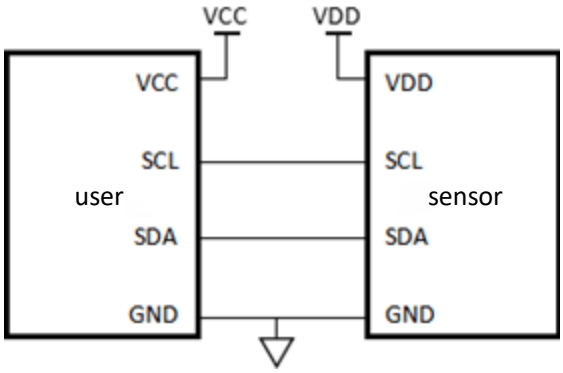
Non-response "1"

Slave address

Address format: the upper 7 bits are the module address of the sensor (0x55), the lowest bit is the read/write operation bit, 1 means read, 0 means write.

A7	A6	A5	A4	A3	A2	A1	R/W
0	1	0	1	0	1	0	1

Hardware connection



Note:

In the user's internal, IIC communication needs to use pull-up resistors on the SCL and SDA lines, with a resistance value of 1-10K. The recommended clock frequency is less than 50KHz.

Data frame format

The data frame contains 4 bytes in total, and the data content is shown in the table below.

0	1	2	3
0x55	0xAA	0x55	DATA
Slave address	Read command	Slave address	VOC concentration level value

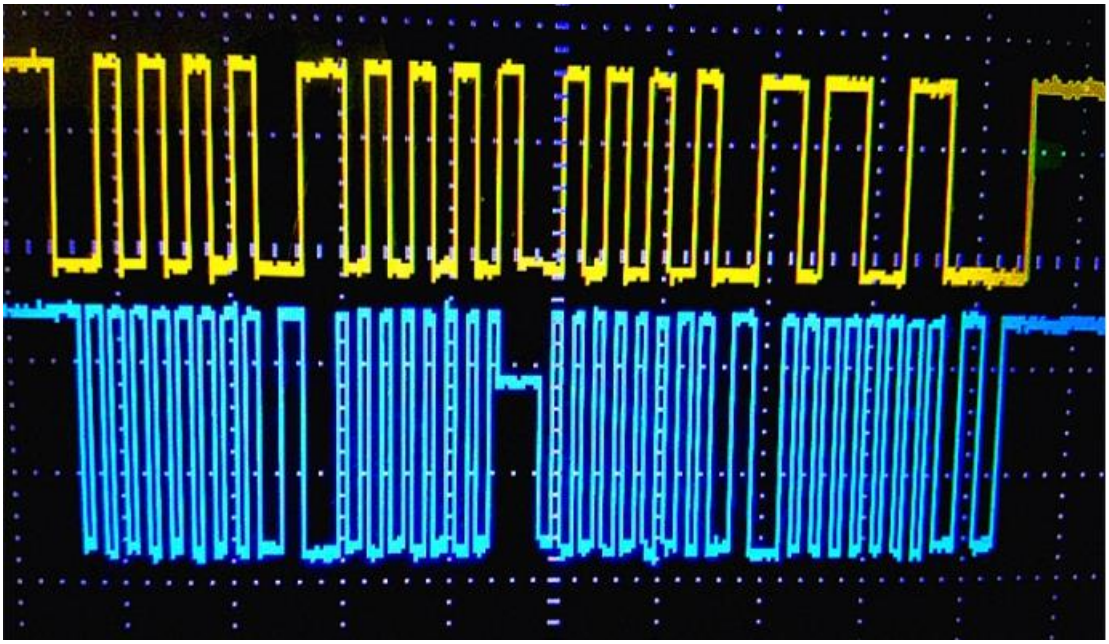
Note: The VOC concentration is divided into 200 levels, the minimum is 1, the maximum is 200.
VOC concentration = grade value*range/200

Instructions

After the module is powered on, it needs to be warmed up for about 100 seconds. After the warm-up is completed, the module enters the normal working state. Connect the module to the I2C bus, and the host will send the address and read commands 0x55 and 0xAA (hexadecimal) for the slave in turn, and then enter the read state. The module will immediately return an 8-bit data value, which represents the current VOC Concentration value, the larger the value, the higher the VOC concentration. The lowest value is 1, and the highest value is 200. If the range is 50ppm, the value read is 50, and the current concentration is 50*50/200=12.5ppm.

The following figure is the complete waveform of an I2C communication process, for reference only, SDA-yellow

line, SCL-blue line, communication process: start signal, send slave address 0x55, receive slave response signal, send read command 0xAA, Receive slave response signal; start signal, send slave address 0x55, receive slave response signal, read VOC level value, end signal.



Precautions

1. Preheating time

If the module is stored for a long time without power, its sensor resistance will have a reversible drift. Before use, the module needs to be preheated to achieve the chemical balance inside the sensor. The storage time and corresponding warm-up time are recommended as follows:

Storage time	Suggested warm-up time
Less than 1 month	not less than 24 hours
1-6 months	not less than 48 hours
More than 6 months	not less than 72 hours

2. Situations that must be avoided

2.1 Exposure to the vapor of volatile silicon compounds The module should avoid exposure to silicone adhesive, hair spray, silicone rubber, putty or other places where volatile silicone compounds exist. If silicon compound vapor is adsorbed on the surface of the module, the sensitive material of the module will be wrapped by the silicon dioxide formed by the decomposition of the silicon compound, which inhibits the sensitivity of the module and cannot be recovered.

2.2 Highly corrosive environment The module is exposed to high-concentration corrosive gases (such as H2S, SOX, Cl2, HCl, etc.), which will not only cause corrosion or damage to the heating materials and module leads, but also cause irreversible deterioration of the performance of sensitive materials.

2.3 Pollution by alkali, alkali metal salt and halogen After the module is contaminated by alkali metal, especially salt water spray, or exposed to halogen such as Freon, it will also cause performance deterioration.

2.4 Exposure to water Splashing or immersing in water will cause the sensitivity of the module to decrease.

2.5 Freezing Water freezing on the surface of the module's sensitive material will cause the sensitive layer to break and lose its sensitivity.

2.6 Applied voltage The overload heating power caused by the overload voltage will cause irreversible damage to the module, and static electricity will also damage the module. Therefore, anti-static measures should be taken when touching the module.

3. Situations to avoid as much as possible

3.1 Condensate Under indoor conditions, slight condensation will have a slight impact on the performance of the module. However, if water condenses on the surface of the sensitive layer for a period of time, the module characteristics will decrease.

3.2 Being in high concentration gas Regardless of whether the module is energized or not, long-term storage in high-concentration gas will affect the characteristics of the module. If you spray lighter gas directly to the module, it will cause great damage to the module.

3.3 Long-term exposure to extreme environments Regardless of whether the module is powered on or exposed to extreme conditions for a long time, such as extreme conditions such as high humidity, high temperature or high pollution, the performance of the module will be seriously affected.

3.4 Vibration Frequent and excessive vibration will cause resonance and breakage inside the module. The use of pneumatic screwdrivers/ultrasonic welding during transportation and assembly lines can generate such vibrations.

3.5 Impact If the module receives a strong impact or collision, it will break inside.

3.6 Welding

3.6.1 Recommended conditions for reflow soldering

Neutral atmosphere

Welding temperature 250±10℃;

Avoid flux vapor.

3.6.2 Recommended conditions for manual welding

Rosin flux with the least chlorine;

Welding temperature≤350℃;

Duration ≤ 5s.

Violation of the above conditions of use will degrade the module characteristics.

Packing

A special protective film is attached to the surface of the MEMS module to prevent the influence of dust, water, atmosphere and high temperature. The protective film can be removed after the welding is completed. Tape packaging is adopted, and other packaging methods can also be provided according to customer requirements.

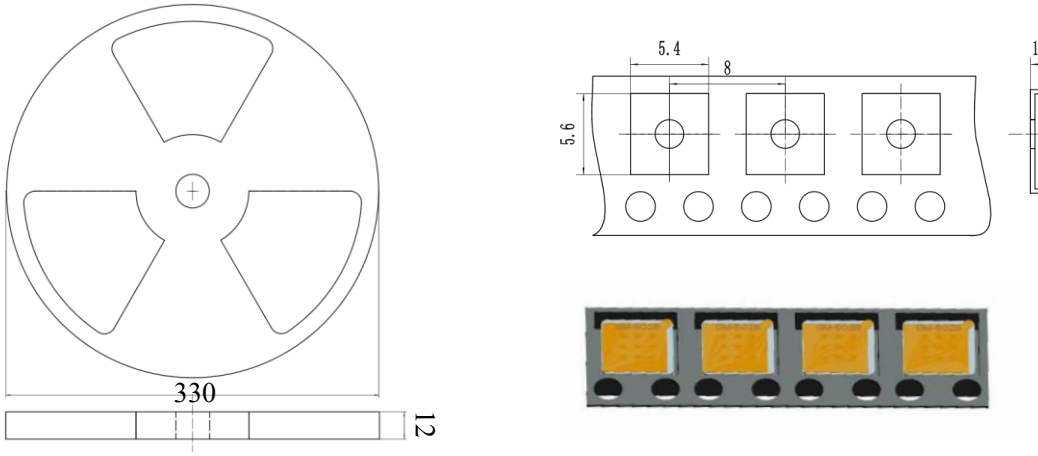


Figure6: Module packaging diagram

Environmental protection

clause RoHS: This product complies with the current RoHS directive and does not contain ten chemical substances restricted by the environment.

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