



# MEMS Ammonia/NH3 Gas Sensor

(Model No.: GM-802B)

# Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Zhengzhou Winsen Electronics Technology CO., LTD

## GM-802B MEMS NH3 Gas Sensor

### Product description

MEMS NH3 gas sensor is using MEMS micro-fabrication hot plate on a Si substrate base, gas-sensitive materials used in the clean air with low conductivity metal oxide semiconductor material. When the sensor exposed to gas atmosphere, the conductivity is changing as the detected gas concentration in the air. The higher the concentration of the gas, the higher the conductivity. Use simple circuit can convert the change of conductivity of the gas concentration corresponding to the output signal.



### Character

MEMS technology, Strong construction  
 High sensitivity to NH3 gases  
 Small sizes and low power consumption  
 Fast response and resume  
 Simple drive circuit, Long lifespan

### Application

Widely used in gas detection of refrigerators, ammonia leak detection in cold storage, and ventilation control in agricultural breeding.

### Parameters Stable1.

Part No.			GM-802B
Sensor Type			MEMS
Standard Encapsulation			Ceramic
Detection Gas			NH3 etc.
Detection Range			1~300ppm (NH <sub>3</sub> )
Standard Circuit Conditions	Loop Voltage	V <sub>C</sub>	≤24V DC
	Heater Voltage	V <sub>H</sub>	2.0V±0.1V AC or DC
	Load Resistance	R <sub>L</sub>	Adjustable
Sensor character under standard test conditions	Heater Resistance	R <sub>H</sub>	80Ω±20Ω ( room temperature )
	Heater consumption	P <sub>H</sub>	≤45mW
	sensitive materials resistance	R <sub>S</sub>	1KΩ~30KΩ(in 50ppm NH <sub>3</sub> )
	Sensitivity	S	R <sub>0</sub> (in air)/R <sub>s</sub> (in 50ppm NH <sub>3</sub> )≥3
	Concentration Slope	α	≤0.9(R <sub>200ppm</sub> /R <sub>50ppm NH<sub>3</sub></sub> )
Standard test conditions	Temp. Humidity		20°C±2°C; 55%±5%RH
	Standard test circuit		V <sub>H</sub> :2.0V±0.1V; V <sub>C</sub> :5.0V±0.1V
	Preheat time		Not less than 48 hours

**Sensor Structure Diagram**

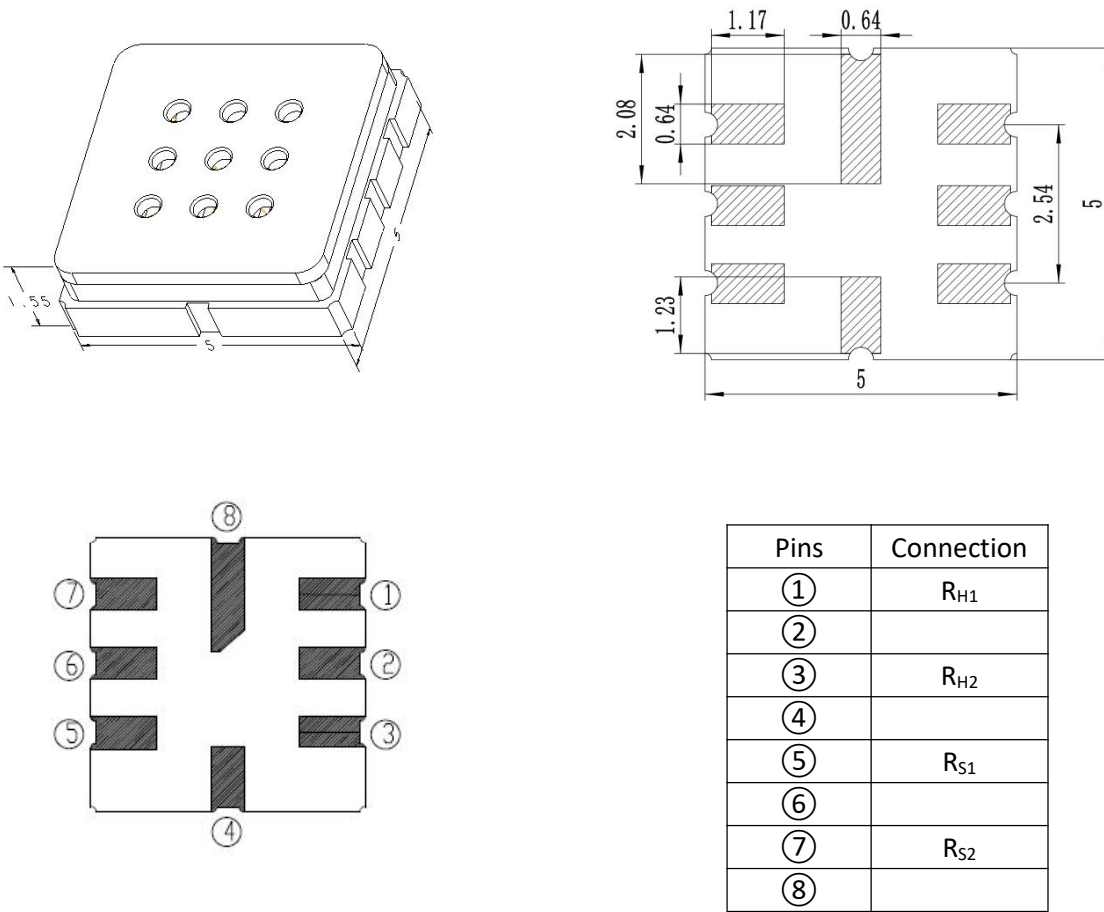


Fig1.Sensor structure

**Basic Circuit**

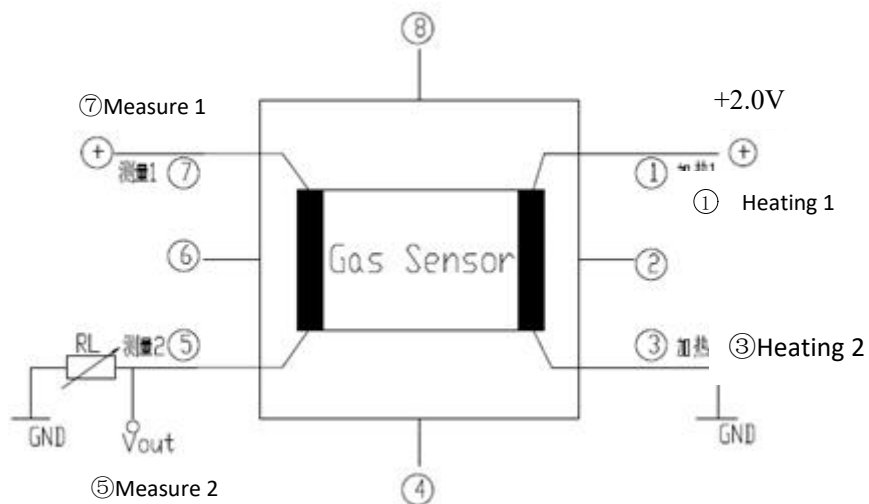
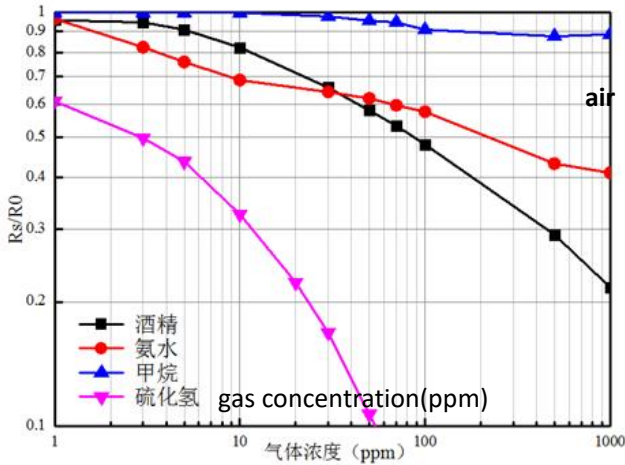


Fig2. GM-802B test circuit

Instructions: The above fig is the basic test circuit of GM-802B. The sensor requires two voltage inputs: heater voltage (V<sub>H</sub>) and circuit voltage (V<sub>C</sub>). V<sub>H</sub> is used to supply specific working temperature to the sensor and it can

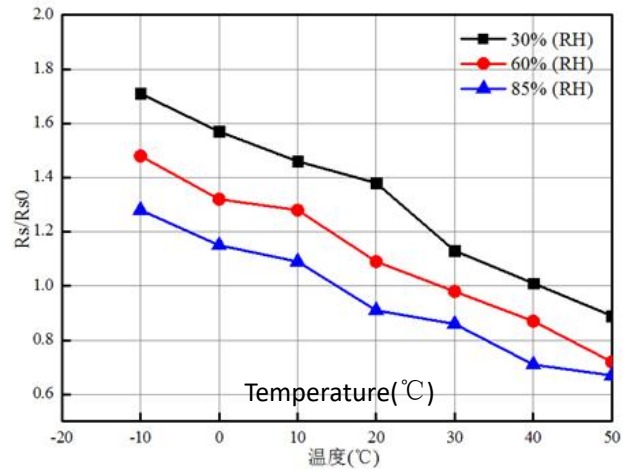
adopt DC or AC power.  $V_{out}$  is the voltage of load resistance  $R_L$  which is in series with sensor.  $V_c$  supplies the detect voltage to load resistance  $R_L$  and it should adopt DC power.

**Sensor's Characteristics:**



**Fig3. Typical Sensitivity Curve**

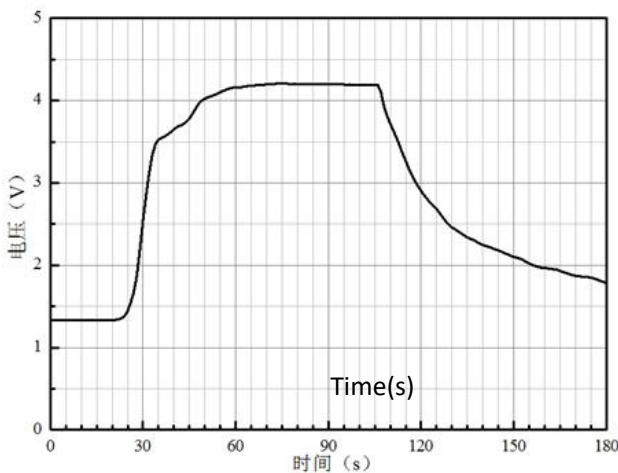
$R_s$  means resistance in target gas with different concentration,  $R_0$  means resistance of sensor in clean air. All tests are finished under standard test conditions.



**Fig4. Typical temperature/humidity characteristics**

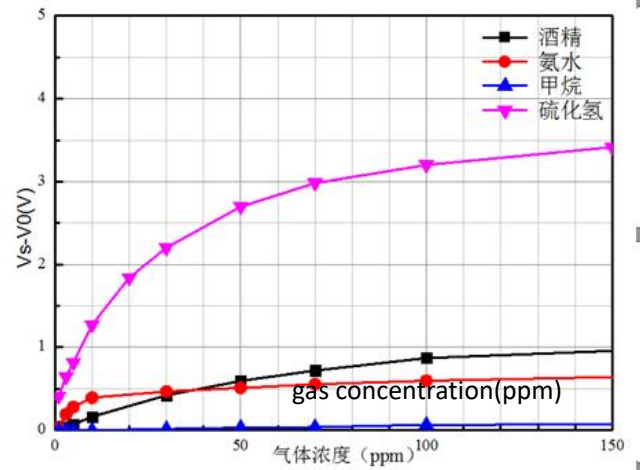
$R_s$  means resistance of sensor in 50ppm Ammonia ( $NH_3$ ) under different temp. and humidity.  $R_{s0}$  means resistance of the sensor in 50ppm  $NH_3$  under 20°C/55%RH.

**Voltage output(V)**



**Fig5. Responce and Resume**

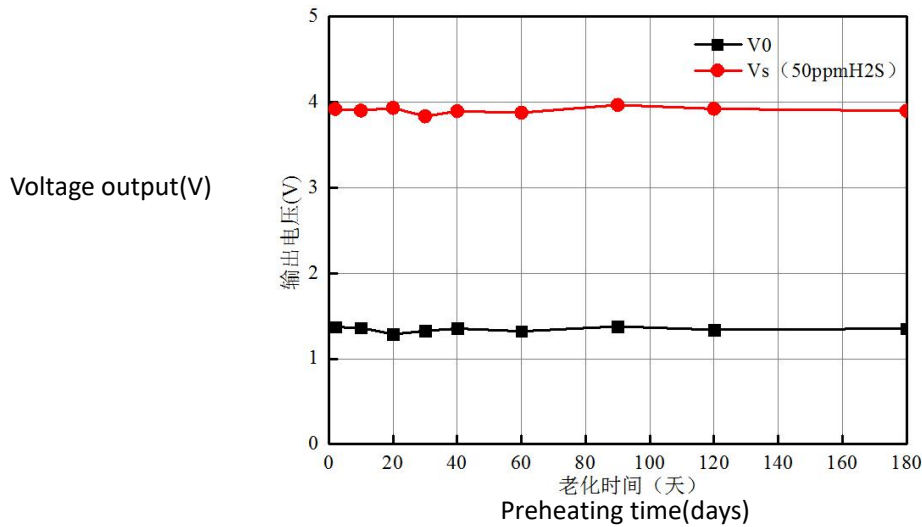
The output in above Fig is the voltage of  $R_L$  which is in series with sensor. All tests are finished under standard test conditions and the test gas is 50ppm  $NH_3$ .



**Fig6. Linearity character**

The output in above Fig is the voltage of  $R_L$  which is in series with sensor. All tests are finished under standard test conditions.

**Long-term stability:**



**Fig7.long-term Stability**

Test is finished in standard test condition, the abscissa is observing time and the ordinate is voltage output of RL.

**Instructions:**

**1. Preheating time**

Sensor’s resistance may drift reversibly after long-term storage without power. It need to preheat the sensor to reach inside chemical equilibrium. Preheating voltage is same with heating voltage  $V_H$ . The suggested preheating time as follow:

Storage Time	Suggested aging time
Less than one month	No less than 48 hours
1 ~ 6 months	No less than 72 hours
More than six months	No less than 168 hours

**2. Calibration**

Sensor’s accuracy is effected by many factors such as reference resistance’s difference, the sensitivity difference, temperature, humidity, interfering gases, preheating time, the relationship between input and output is not linear, hysteretic and non-repetitive. For absolute concentration measurement, they need regular calibration (one-point calibration / multi-points calibration for full scale) to ensure that the measuring value is accurate. For relative measurement calibration is not required.

**Cautions**

**1 .Following conditions must be prohibited**

1.1 Exposed to organic silicon steam

Sensing material will lose sensitivity and never recover if the sensor absorbs organic silicon steam. Sensors must be avoid exposing to silicon bond, fixture, silicon latex, putty or plastic contain silicon environment.

1.2 High Corrosive gas

If the sensors are exposed to high concentration corrosive gas (such as H<sub>2</sub>S, SOX, Cl<sub>2</sub>, HCL etc.), it will not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.

#### 1.3 Alkali, Alkali metals salt, halogen pollution

The sensors performance will be changed badly if sensors be sprayed polluted by alkali metals salt especially brine, or be exposed to halogen such as fluorine.

#### 1.4 Touch water

Sensitivity of the sensors will be reduced when splattered or dipped in water.

#### 1.5 Freezing

Do avoid icing on sensor's surface, otherwise sensing material will be broken and lost sensitivity.

#### 1.6 Applied voltage

Applied voltage on sensor should not be higher than 120mW, it will cause irreversible heater damaged, also hurt from static, so anti-static precautions should be taken when touching sensors.

### **2. Following conditions must be avoided**

#### 2.1 Water Condensation

Indoor conditions, slight water condensation will influence sensors' performance lightly. However, if water condensation on sensors surface and keep a certain period, sensors' sensitive will be decreased.

#### 2.2 Used in high gas concentration

No matter the sensor is electrified or not, if it is placed in high gas concentration for long time, sensors characteristic will be affected. If lighter gas sprays the sensor, it will cause extremely damage.

#### 2.3 Long time exposed to extreme environment

No matter the sensors electrified or not, if exposed to adverse environment for long time, such as high humidity, high temperature, or high pollution etc., it will influence the sensors' performance badly.

#### 2.4 Vibration

Continual vibration will result in sensors down-lead response then break. In transportation or assembling line, pneumatic screwdriver/ultrasonic welding machine can lead this vibration.

#### 2.5 Concussion

If sensors meet strong concussion, it may lead its lead wire disconnected.

#### 2.6 Soldering

Soldering flux: Rosin soldering flux contains least chlorine and safeguard procedures.

If disobey the above using terms, sensors sensitivity will be reduced.

### **3. Environmental protection**

This product complies with the current ROHS directive and does not contain ten chemicals subject to environmental restrictions.

### **4. Packing Method**

The surface of MEMS sensor is pasted with special protective film to prevent the influence of dust, water, atmosphere and high temperature. The protective film can be removed after welding. Braided packaging is adopted, and other packaging methods can also be provided according to customer requirements.

