Semiconductor gas-sensitive element instructions

Model: MQ-K3B

Version: V1.2

Date: Jan.1st, 2022

Taiyuan Tengxing sensor technology Co., Ltd

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1.**Product Description**:

The gas-sensitive material used in the MQ-K3B gas sensor is tin dioxide (SnO_2) with low conductivity in clean air. When alcohol vapor exists in the sensor's environment, the conductivity of the sensor increases with the increase of the alcohol vapor concentration in the air. A simple circuit can be used to convert the change in conductivity into an output signal corresponding to the gas concentration.

The MQ-K3B gas sensor is highly sensitive to alcohol and can resist interference from gasoline, smoke, and water vapor. This sensor can detect various concentrations of alcohol atmosphere and is a low-cost sensor suitable for a variety of applications.

2. **Sensor Features**:

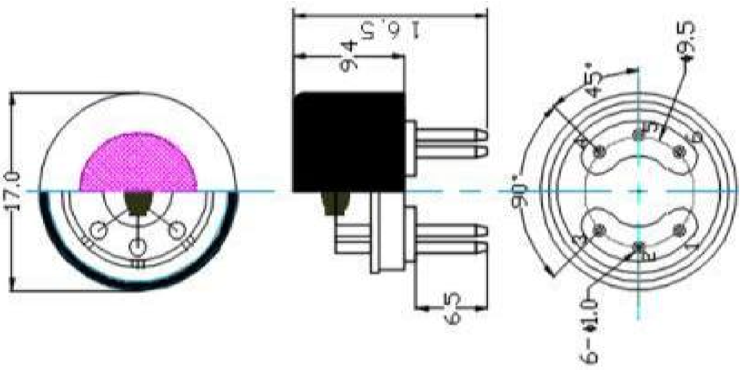
This product has good sensitivity to alcohol in a wide concentration range and has the advantages of long life, low cost and simple driving circuit.

3. Main Applications

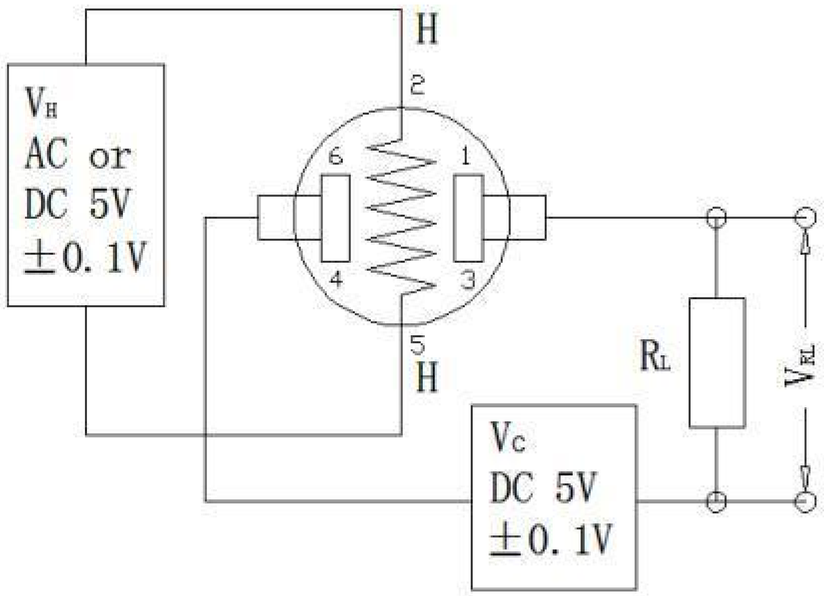
It is widely used in automotive alcohol gas alarms, industrial alcohol gas alarms and portable gas detectors.

4.Technical specifications

Product model			MQ-K3B
Product type			Semiconductor gas sensor
Standard packaging			Plastic packaging
Detect gas			Alcohol vapor
Detect concentration			25-500ppm Alcohol
Standard circuit conditions	Heat voltage (DC)	V_H	5.0V±0.1V AC or DC
	Circuit voltage(Dc)	Vc	≤24V DC
	Load resistance	R_L	adjustable
Characteristics of gas sensing components under standard testing conditions	Heating resistor	R_H	29Ω±3Ω(indoor temperature)
	Heating power	P_H	≤900mW
	Sensitivity	S	R_0 (in air)/Rs(125ppm alcohol)≥5
	Output voltage	Vs	2.5V~4.0V (in 125ppm alcohol)
	Concentration slope	α	≤0.6(R_{300ppm}/R_{50ppm} alcohol)
Standard testing conditions	Temperature/humidity		20℃±2℃; 55%±5%RH
	Standard Test Circuit		VC: 5V±0.1V; VH: 5V±0.1V
	Warm-up time		no less than 48 hours
	Oxygen concentration		21% (not less than 18%) (Oxygen concentration will affect the initial value, sensitivity, and repeatability of the sensor. Please consult for use when using at low oxygen concentrations)
Product Life			10 years

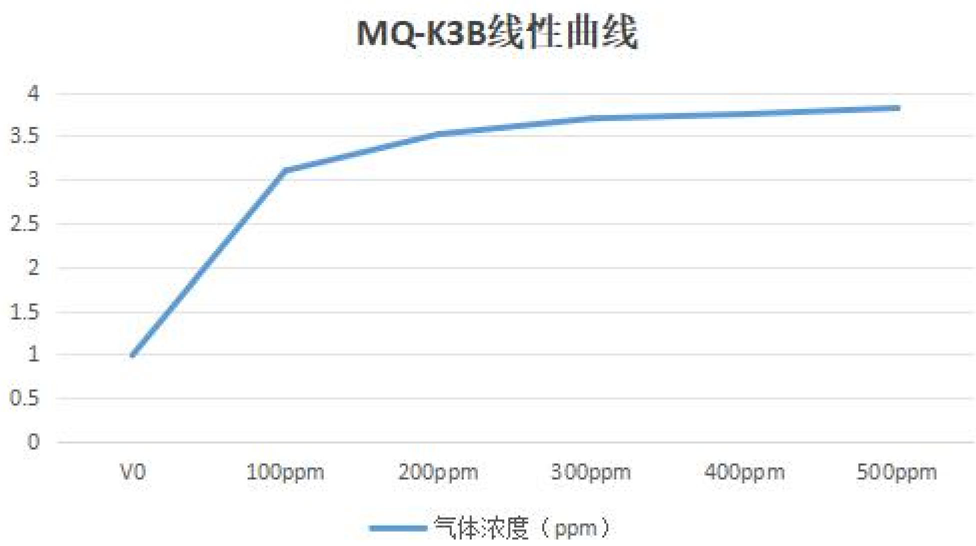


5.Test circuit

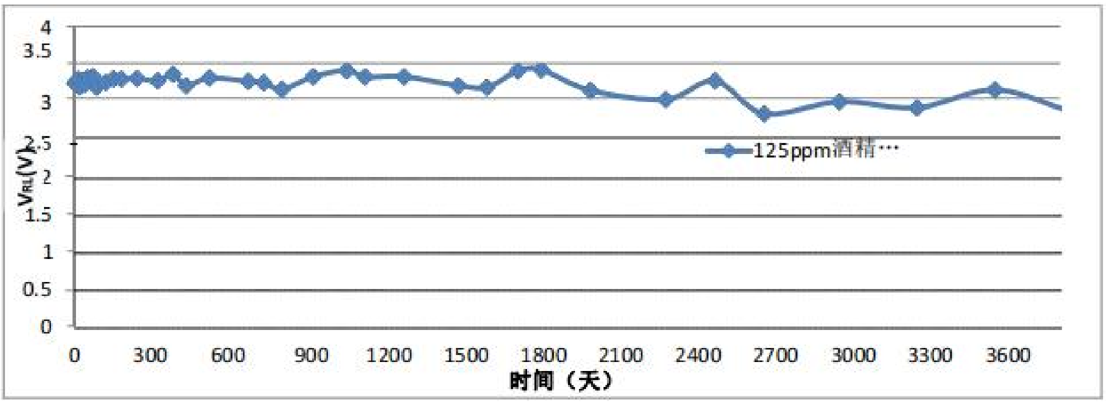


Description: The figure above is the basic test circuit of the MQ-K3B sensor. The sensor needs to apply 2 voltages: heater voltage (VH) and test voltage (VC). VH is used to provide a specific operating temperature for the sensor, and can be a DC power supply or an AC power supply. VRL is the voltage on the load resistor (RL) connected in series with the sensor. VC is the test voltage for the load resistor RL, and a DC power supply must be used.

6.Sensor Characterization



Indicates the VRL value of the sensor in different concentrations of ethanol atmosphere. The load (RL) used is 4.7 K Ω, and all tests in the figure are completed under standard test conditions.



长期观察灵敏度曲线

All tests in the figure were completed under standard test conditions. The horizontal axis is the observation time and the vertical axis is the VRL value.

7.Precautions

1 Situations that must be avoided

1.1 Exposure to volatile silicon compound vapor

The sensor should avoid exposure to silicone adhesives, hair spray, silicone rubber, putty or other places where volatile silicon compounds exist. If the surface of the sensor is adsorbed with silicon compound vapor, the sensitive material of the sensor will be wrapped by silicon dioxide formed by the decomposition of the silicon compound, which will inhibit the sensitivity of the sensor and cannot be restored.

1.2 Highly corrosive environment

When the sensor is exposed to high concentrations of corrosive gases (such as H2S, SOX, Cl2, HCl, etc.), it will not only cause corrosion or damage to the heating material and sensor leads, but also cause irreversible deterioration of the performance of the sensitive material.

1.3 Alkali, alkali metal salts, halogen pollution

When the sensor is contaminated by alkali metals, especially salt water spray, or exposed to halogens such as Freon, it will also cause performance deterioration.

1.4 Contact with water

Splashing or immersion in water will cause the sensor's sensitivity to decrease.

1.5 Freezing

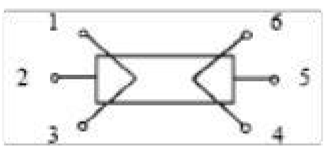
Water freezing on the surface of the sensor's sensitive material will cause the sensitive layer to break and lose its sensitive characteristics.

1.6 Excessive voltage applied

If the voltage applied to the sensor or heater is higher than the specified value, even if the sensor is not physically damaged or destroyed, it will cause damage to the lead wire and/or heater, and cause the sensor's sensitivity to decrease.

1.7 Voltage applied to the wrong pin (only for the indirect heating series)

For 6-pin sensors, 2 and 5 are heating electrodes, (1, 3)/(4, 6) are test electrodes, 1 and 3 are connected, and 4 and 6 are connected. If voltage is applied to pins 1, 3 or 4, 6, the lead wire will burn out, and if it is applied to pins 2 and 4, no signal will be obtained. (See the figure below)



2 Situations to avoid as much as possible

2.1 Condensation

Under indoor conditions, slight condensation will have a slight effect on sensor performance. However, if water condenses on the surface of the sensitive layer and remains for a period of time, the sensor characteristics will decrease.

2.2 In high-concentration gas

Regardless of whether the sensor is powered on or not, long-term placement in high-concentration gas will affect the sensor characteristics. For example, if lighter gas is directly sprayed on the sensor, it will cause great damage to the sensor.

2.3 Long-term storage

When the sensor is stored for a long time without power, its resistance will have a reversible drift, which is related to the storage environment. The sensor should be stored in a sealed bag that does not contain volatile silicon compounds. Sensors that have been stored for a long time need to be powered on for a longer time before use to stabilize them. The storage time and corresponding aging time recommendations are shown as follows:

Time of storage and suggested stabilization time

Time of storage	Suggested stabilization time
≤1 month	No less than 48 hours
1-6 months	No less than 72 hours
≥6 months	No less than 168 hours

2.4 Long-term exposure to extreme environments

Regardless of whether the sensor is powered on or not, long-term exposure to extreme conditions such as high humidity, high temperature or high pollution will seriously affect the performance of the sensor.

2.5 Vibration

Frequent and excessive vibration can cause the internal leads of the sensor to resonate and break. The use of pneumatic screwdrivers/ultrasonic welders during transportation and on the assembly line can cause such vibrations.

2.6 Shock

If the sensor is subjected to strong shock or falls, its leads will break.

2.7 Conditions of use:

2.7.1 Manual soldering is the most ideal soldering method for sensors. The recommended soldering conditions are as follows:

Flux: Rosin soldering with the least chlorine

Constant temperature soldering iron

Temperature: 250℃

Time: no more than 3 seconds

2.7.2 The following conditions should be met when using wave soldering:

Flux: Rosin flux with the least chlorine

Speed: (1-2) m/min

Preheating temperature: (100±20)°C

Soldering temperature: (250±10)℃

1 pass through the wave soldering machine

Violation of the above conditions will degrade the sensor characteristics.