Refrigerant detection Gas Sensor

(Model:MP510C)

Manual

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MP510C Refrigerant Gas Sensor

Profile

The MP510C Freon gas sensor uses a multilayer thick film manufacturing process to fabricate heating and measuring electrodes and a metal oxide semiconductor gas-sensitive layer on a miniature Al2O3 ceramic substrate, and encapsulate it in a metal casing. When the detected gas exists in the ambient air, the conductivity of the sensor changes. The higher the concentration of the gas, the higher the conductivity of the sensor. This change in conductivity is converted into an output signal corresponding to the gas concentration through the circuit. The product has good anti-interference ability against common gases such as alcohol and acetic acid in usage scenarios.

Features

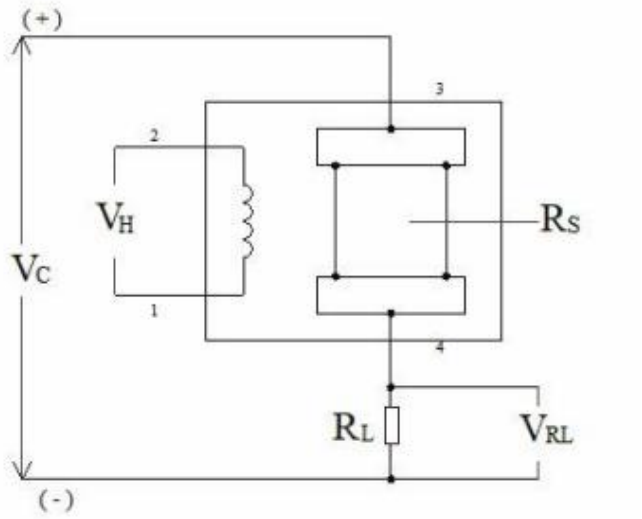
High selectivity for detecting Freon gas, excellent anti-alcohol interference performance, low power consumption, simple application circuit

Main Application

Used for leak detection of refrigerants in air conditioning and refrigeration systems

Basic test circuit

The figure below shows the basic test circuit of the MP510C sensor. The sensor needs to apply two voltages: heating voltage (VH) and test voltage (VC). Among them, VH is used to provide a specific operating temperature for the sensor, and the voltage applied to both ends of the heating electrode uses a DC power supply. VC is used to measure the loop voltage of the circuit. VRL is the voltage on the load resistance (RL) connected in series with the sensor, that is, the output voltage Vout. Under the premise of meeting the electrical characteristics of the sensor, VH and VC can share a power supply circuit.



Technical Parameters Stable1.

Model			MP510C
Sensor Type			Planar semiconductor gas sensor
Standard Encapsulation			Metal Cap
Detection Gas			Refrigerant gas
Detection range			100～10000ppm
Standard circuit	Loop voltage	V_C	5.0V±0.1V DC
	Heating voltage	V_H	5.0V±0.1V DC
	Load resistance	R_L	Adjustable
sensor features in standard test condition	Heating consumption	P_H	≤300mW
	Surface resistance	R_S	0.5～10KΩ 5000ppm in R32
	Sensitivity (Rs change rate)		0.3~0.7 (R32) Rs9000ppm/Rs3000ppm
Standard condition of test	Temperature, humidity		20℃±2℃；65%±5%RH
	Standard test circuit		Vc:5.0V±0.05V； V_H:5.0V±0.05V
	Warm-up time		7 days

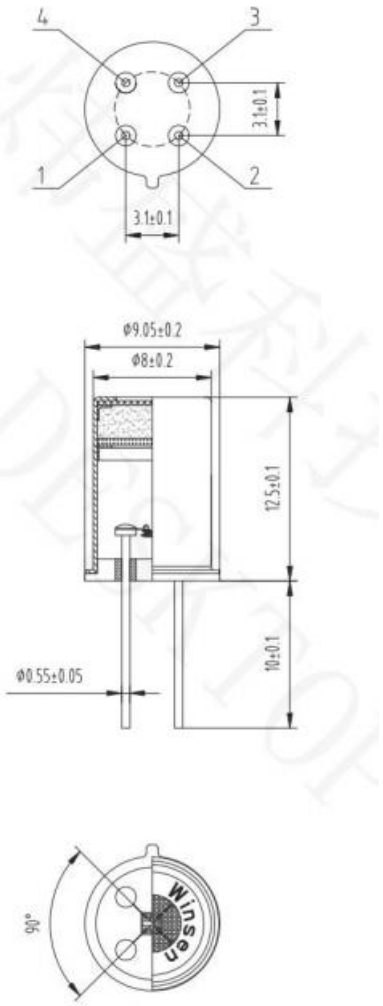


Fig1.Sensor Structure

Calculation formula

Power consumption Ps $P_S = \frac{(V_C - V_{RL})^2}{R_S}$

Calculate Rs according to VRL $Rs = (\frac{Vc}{V_{RL}} - 1) \times R_L$

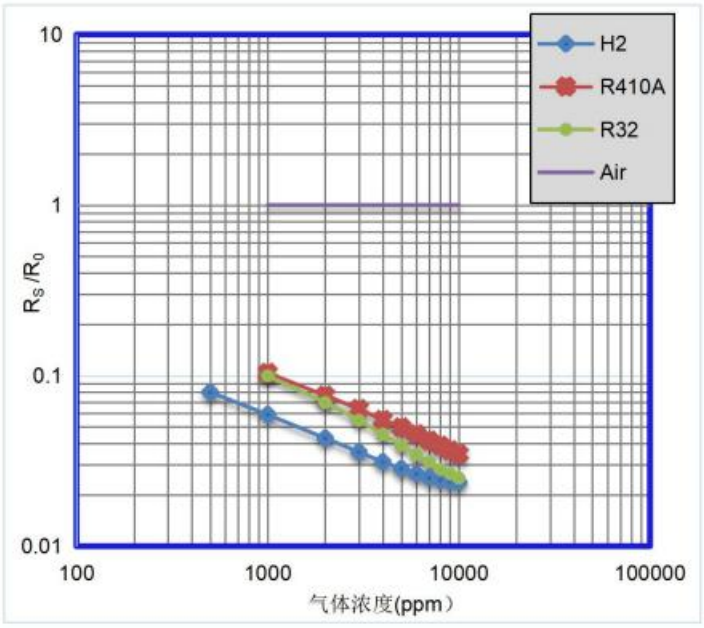
Pin definition

1 Heater
2 Heater
3 Sensorelectrodes + electrode)
4 Sensor electrode - electrode)

Sensor characteristics

Sensitivity characteristics

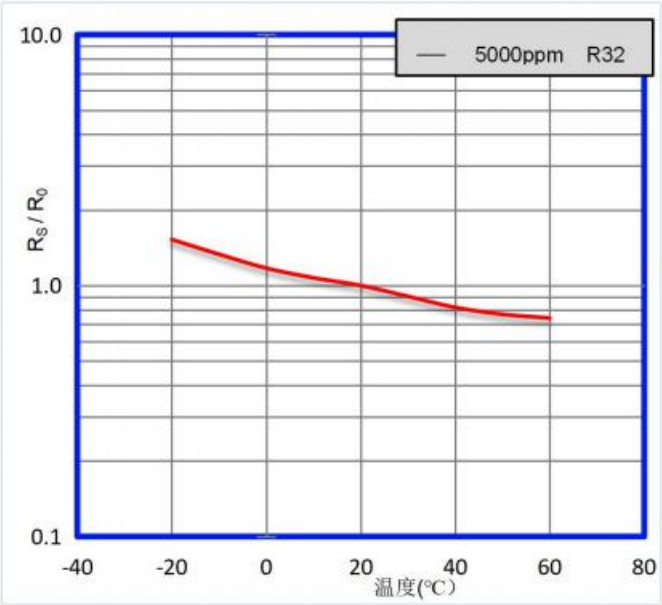
The following figure is the sensitivity characteristic curve of different gases measured under standard test conditions. The ordinate represents the sensor resistance ratio Rs/R0. Rs and R0 are defined as follows: Rs The resistance value of the sensor in various gas concentrations R0 The sensor in clean air resistance.



Gas concentration (ppm)

Temperature/humidity characteristics

The figure below shows the characteristic curve of the sensor affected by temperature and humidity. The ordinate represents the sensor resistance ratio Rs/R0. Rs and R0 are defined as follows: Rs sensor under different temperature conditions: 5000ppm R32 resistance value in an atmosphere R0 sensor at 22℃, 50% Resistance value in 5000ppm R32 atmosphere under RH temperature and humidity conditions.



Temperature (℃)

Precautions

1. Situations that must be avoided

1.1 Exposure to volatile silicon compound vapor

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

1.2 Highly corrosive environment

Exposure of the sensor to high concentrations of corrosive gases (such as H2S, SOX, Cl2, HCl, etc.) will not only cause the key materials inside the sensor to be corroded or destroyed, but also cause irreversible deterioration of the performance of sensitive materials.

1.3 Pollution of alkalis and alkali metal salts

When the sensor is polluted by alkali metal, especially salt water spray, it will cause performance deterioration.

1.4 Exposure to water

Splashing or immersing 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 sensitivity.

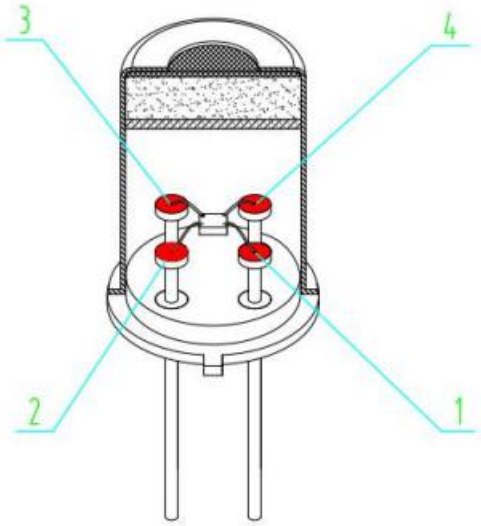
1.6 Applied voltage is too high

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 characteristics to decrease.

1.7 The voltage is added to the wrong pin

As shown in Figure 8, pins 1 and 2 of the sensor are connected to the heating circuit, and pins 3 and 4 are connected to the measurement circuit; under the premise of meeting the electrical performance requirements of the sensor, heating and measurement can share the same power circuit.

Note: Please pay attention to the protruding mark on the sensor. The two pins next to the mark are heating electrodes.



Pin diagram

2. Situations to avoid as much as possible

2.1 Condensate

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

2.2 Being in a high-concentration gas

Regardless of whether the sensor is energized or not, long-term storage in high-concentration gas will affect the sensor characteristics. If the lighter gas is sprayed directly to 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. This drift 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 period of time need to be energized for a longer period of time to stabilize before use. The storage time and the corresponding aging time are recommended as follows:

Table: Correspondence between storage time and aging time

Storage time	Recommended aging time
Less than 1 month	Not less than 48 hours
1-6 months	Not less than 72 hours
More than 6 months	Not less than 168 hours

2.4 Long-term exposure to extreme environments

Regardless of whether the sensor 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 sensor will be seriously affected.

2.5 Vibration

Frequent and excessive vibration will cause the internal leads of the sensor to resonate and break. The use of pneumatic screwdrivers/ultrasonic welding during transportation and assembly lines may generate such vibrations.

2.6 Shock

If the sensor receives a strong impact or falls, its lead wire will break.

2.7 Conditions of use:

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

- Flux: Rosin flux with the least chlorine
- Constant temperature soldering iron
- Temperature: ≤350℃
- Time: no more than 3 seconds

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

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