

MP-4 Flat Surfaced Gas Sensor

Overview

MP-4 flat surfaced sensor is used for flammable gas detection, which adopts advanced flat production technology. The heater and metal oxide semiconductor material on the ceramic substrate of subminiature Al_2O_3 are fetched out by electrode down-lead, encapsulated in metal socket and cap. When the target gas exists, the higher the concentration of target gas in the air, the higher conductivity of sensor is. Use simple electro circuit to convert the variation of conductivity to output signal corresponds to gas concentration.



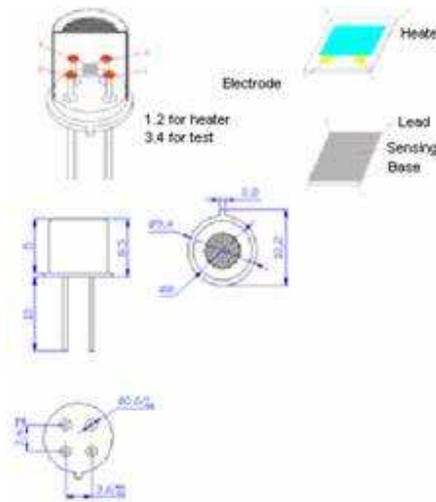
Features

- * High selectivity
- * High sensitivity to Methane
- * Small size
- * 5V rated voltage, low consumption
- * Fast response and resume
- * Good stability and long life
- * Simple drive circuit

Application

Widely used for household harmful gas detection and automatic exhaust, living air device.

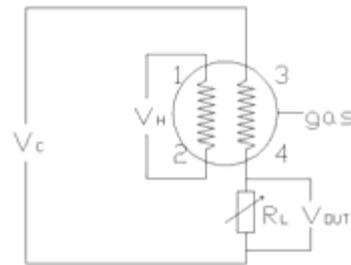
Configuration



Performance parameters

Model		MP-4	
Type		Semiconductor flat surfaced gas sensor	
Standard encapsulation		Metal	
Target gas		CH ₄ , Natural gas	
Detection concentration		300-10000ppm(CH ₄ , Natural gas)	
Standard circuit	Loop voltage	V_c	$\leq 24V$ DC
	Heating voltage	V_H	$5.0V \pm 0.2V$ AC or DC
	Load resistance	R_L	Adjustable
Standard features of sensor	Heating resistance	R_H	$85\Omega \pm 15\Omega$ (Room Tem.)
	Heating consumption	P_H	$\leq 350mW$
	Surface resistance	R_s	$2K\Omega - 20K\Omega$ (in 5000ppm CH ₄)
	Sensitivity	S	$R_s(\text{in air})/R_s(5000\text{ppm CH}_4) \geq 5$
	Concentration slope	α	$\leq 0.6(R_{5000\text{ppm}}/R_{3000\text{ppm}})$
Standard condition of test	Temperature, humidity	$20^\circ C \pm 2^\circ C$; $65\% \pm 5\% RH$	
	Standard testing circuit	$V_c: 5.0V \pm 0.1V$; $V_H: 5.0V \pm 0.1V$	
	Warm-up time	More than 48 hours	

Basic testing circuit



Calculation formula of sensor's consumption:

$$P_s = V_c^2 \times R_s / (R_s + R_L)^2$$

Calculation formula of sensor's resistance:

$$R_s = (V_c / V_{RL} - 1) \times R_L$$

MP-5 Flat Surfaced Gas Sensor

Overview

MP-5 flat surfaced sensor is used for flammable gas detection, which adopts advanced flat production technology. The heater and metal oxide semiconductor material on the ceramic substrate of subminiature Al₂O₃ are fetched out by electrode down-lead, encapsulated in metal socket and cap. When the target gas exists, the higher the concentration of target gas in the air, the higher conductivity of the sensor is. Use simple circuit to convert the variation of conductivity to output signal corresponds to gas concentration.



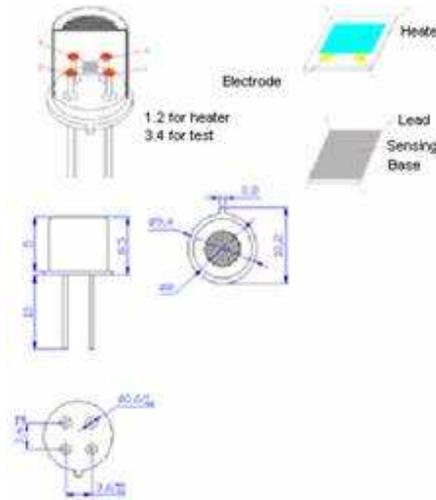
Features

- * High selectivity
- * High sensitivity to Methane
- * Small size
- * 5V rated voltage, low consumption
- * Fast response and resume
- * Good stability and long life
- * Simple drive circuit

Application

Widely used for household harmful gas detection and automatic exhaust, air fresher.

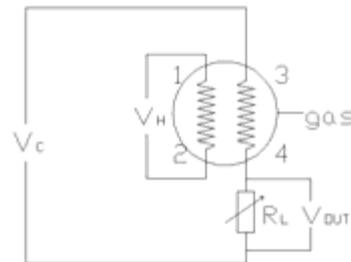
Configuration



Performance parameters

Model		MP-5	
Type		Semiconductor flat surfaced gas sensor	
Standard encapsulation		Metal	
Target gas		Natural gas, Methane	
Detection concentration		300-10000ppm(Natural gas, Methane)	
Standard circuit	Loop voltage	V _c	≤24V DC
	Heating voltage	V _H	5.0V±0.1V AC or DC
	Load resistance	R _L	Adjustable
Standard features of sensor	Heating resistance	R _H	85Ω±15Ω (Room Tem.)
	Heating consumption	P _H	≤300mW
	Surface resistance	R _s	2KΩ-20KΩ (in 2000ppm Propane)
	Sensitivity	S	R _s (in air)/R _s (5000ppm Propane)≥5
	Concentration slope	α	≤0.6(R _{2000ppm} /R _{500ppm Propane})
Standard condition of test	Temperature, humidity	20°C±2°C; 65%±5%RH	
	Standard testing circuit	V _c :5.0V±0.1V; V _H : 5.0V±0.1V	
	Warm-up time	More than 48 hours	

Basic testing circuit



Calculation formula of sensor's consumption:

$$P_s = V_c^2 \times R_s / (R_s + R_L)^2$$

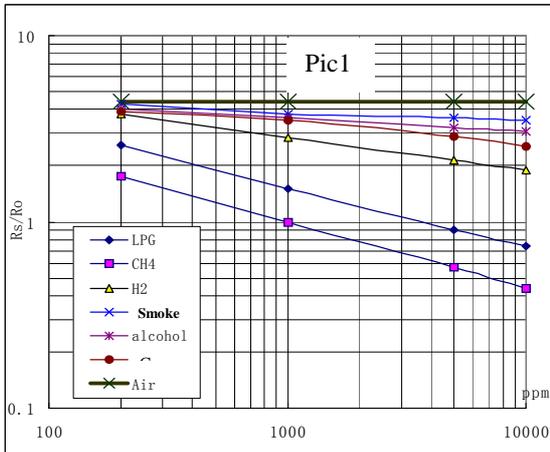
Calculation formula of sensor's resistance:

$$R_s = (V_c / V_{RL} - 1) \times R_L$$

Shock resistance

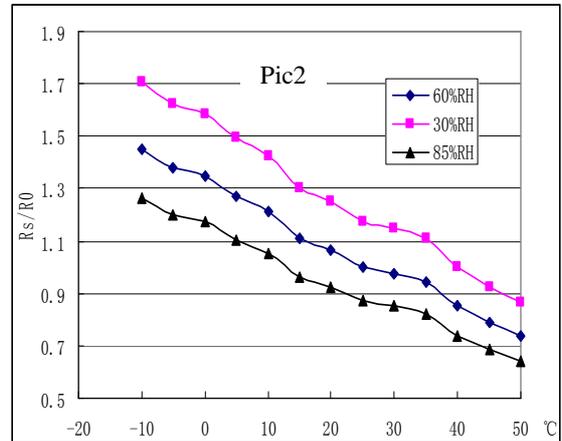
Vibration: frequency-1000 times/min, full swing-4mm, duration time-1 hour, vertical direction
 Impact: acceleration-100G, vertical direction, repeat 5 times

Sensitivity features



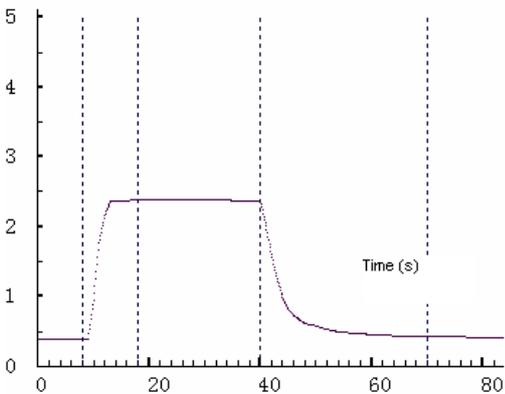
Pic1: R_s means resistance of the sensor in different concentration of gas. R_o means resistance of the sensor in 2000ppm Propane. All the tests in the picture are and all finished under the standard testing condition.

Effects of temperature and humidity

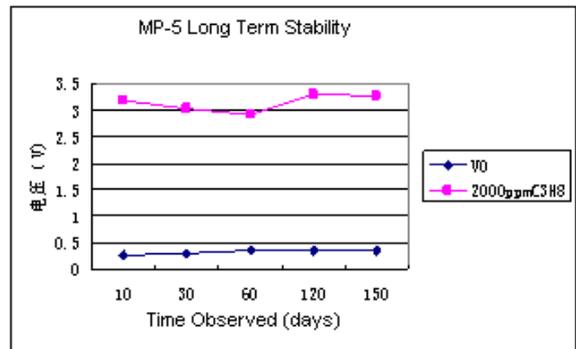


Pic2: R_s means the resistance under 2000ppm Propane and various temperature and humidity conditions. R_o means the resistance under 2000ppm Propane 20°C/65%RH conditions.

Response and resume



Long-term stability



Note

1 Following conditions must be avoided.

1.1 Exposed to organic silicon steam.

If organic silicon steam is adsorbed on the surface of sensor, sensitive material of sensor will be coated, which will restrain sensitivity of sensor and beyond retrieve. The sensor should avoid exposing to where existing of silicon adhesive, fixature, silicon latex, putty or other plastic additive contains silicon.

1.2 High corrosive gas environment

If the sensors exposed to high concentration corrosive gas (such as H_2S , SO_x , Cl_2 , HCl etc), it will not only result in corrosion of sensors structure, also it will make the sensitive materials changed irreversibly.

1.3 Alkali, Alkali metals salt, halogen pollution

The sensors performance will lead to deterioration if sensors are sprayed polluted by alkali metals salt especially brine, or exposed to halogen such as fluorin.

1.4 Exposed to the water

The sensitivity of sensor will be reduced when spattered or dipped in water.

1.5 Freezing

If icing up on surface of sensor, it will lead sensitive material disintegrate then lose sensitivity.

1.6 Applied voltage overhigh

If applied voltage on sensors or heater higher than specified value, it will lead to wire lead and heater broken, and reduce its sensitivity, even if sensors have no physics damage.

2 Following conditions should be possibly avoided

2.1 Condensation water

Under indoor conditions, slight condensation water will effect performance of sensor lightly. However, if condensation water on the surface of sensor and keep a certain period, sensitivy of sensor will decrease.

2.2 Used in high gas concentration

No matter the sensor is electrified or not, if placed in high gas concentration for a long time, it will effect features of sensor.

2.3 Long time storage

If stored for long time without being electrified, the resistance of sensor produces reversible drift, which is related with storage conditions. Sensor should be stored in airproof without silicon gel bag with clean air. For the sensor with long time storage but no electrify, they need long aging time for stability before using.

2.4 Long time exposed to adverse environment

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

2.5 Vibration

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

2.6 Concussion

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

2.7 Usage

For sensors, handmade welding is optional way. If use wave crest welding should meet the following conditions:

2.7.1 Soldering flux: rosin soldering flux contains least chlorine.

2.7.2 Speed: 1-2 Meter/Minute

2.7.3 Warm-up temperature: $100\pm 20^{\circ}\text{C}$

2.7.4 Welding temperature: $250\pm 10^{\circ}\text{C}$

2.7.5 A single pass wave crest welding machine

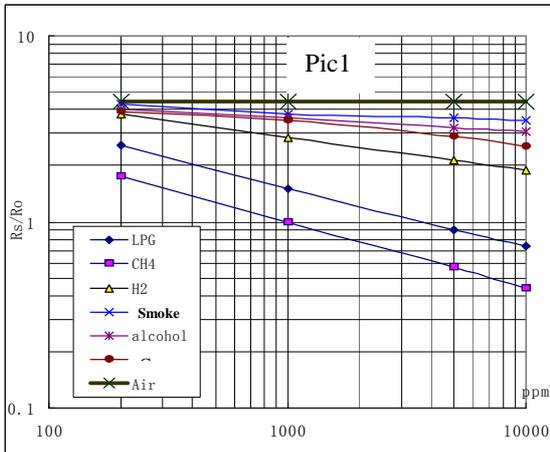
Sensitivity of the sensor will be reduced If disobey the above using terms.

Shock resistance

Vibration: frequency-1000 times/min, full swing-4mm, duration time-1 hour, vertical direction

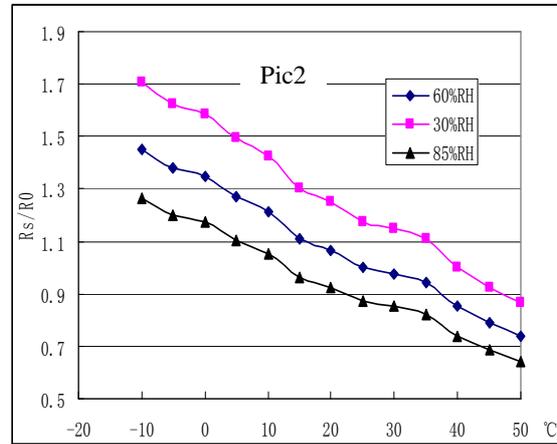
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Sensitivity features



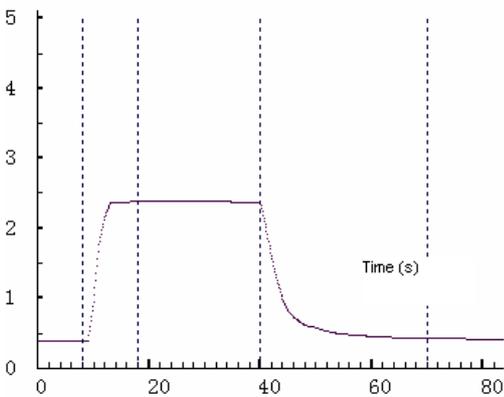
Pic1: R_s expresses the resistance of sensor in different concentration of gas. R_0 expresses the resistance of sensor in 1000ppm CH₄. All the tests in the picture are all finished under the standard testing condition.

Effects of temperature and humidity

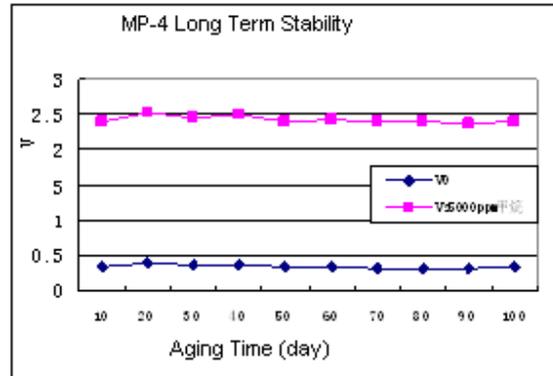


Pic2: R_s expresses the resistance under 1000ppmCH₄ and various temperature and humidity conditions. R_0 expressed the resistance under 1000ppmCH₄ and 20°C/65%RH conditions.

Response and resume



Long-term stability



Note

1 Following conditions must be avoided.

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If organic silicon steam is adsorbed on the surface of sensor, sensitive material of sensor will be coated, which will restrain sensitivity of sensor and beyond retrieve. The sensor should avoid exposing to where existing of silicon adhesive, fixature, silicon latex, putty or other plastic additive contains silicon.

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For sensors, handmade wiewling is optional way. If use wave crest wiewling should meet the following conditions:

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2.7.3 Warm-up temperature: $100\pm 20^{\circ}\text{C}$

2.7.4 Welding temperature: $250\pm 10^{\circ}\text{C}$

2.7.5 A single pass wave crest welding machine

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

TECHNICAL DATA

MP-7 Flat Surfaced GAS SENSOR

MP-7 adopt advanced planar construction production technics, using MOS material formed by micro AL₂O₃ ceramic tube and heater, electro-down-lead be fetched out, and are fixed into a metal base and cover. Adopting low and high temperature circling detection: when low temperature (VH=1.5V) , it detects CO, Conductance of sensor bigger along with CO concentration in air; When high temperature (VH=5.0V) , clean other gases, using simple circuit could change the conductance, change it to be output signal which relatively to the gas concentration.

Character

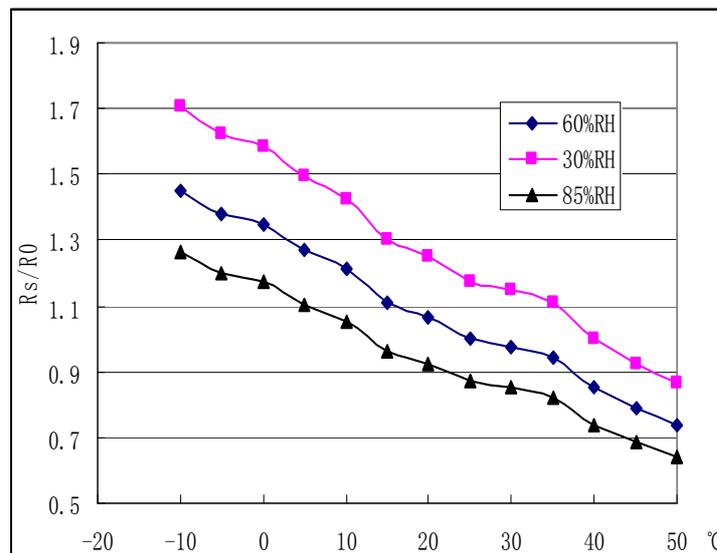
- * High Sensitivity to CO
- * Mini Size
- * 1.5V/5V changeable voltage, low power consumption
- * Fast response and resume character
- * Excellent Stability and long life

APPLICATION

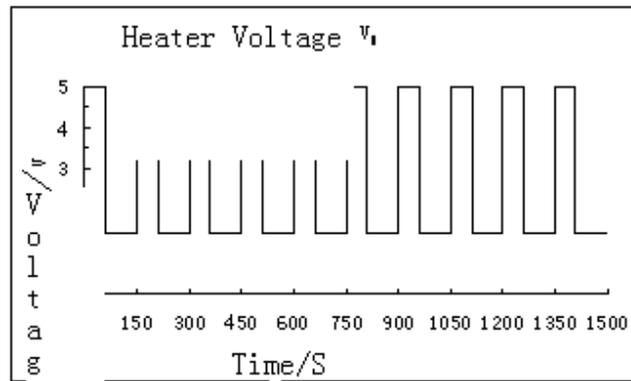
- * They are used in gas leakage detecting equipments in family, industry and commercial field , fire resistance/ safety detection system.
- * CO gas leakage alarm and detector



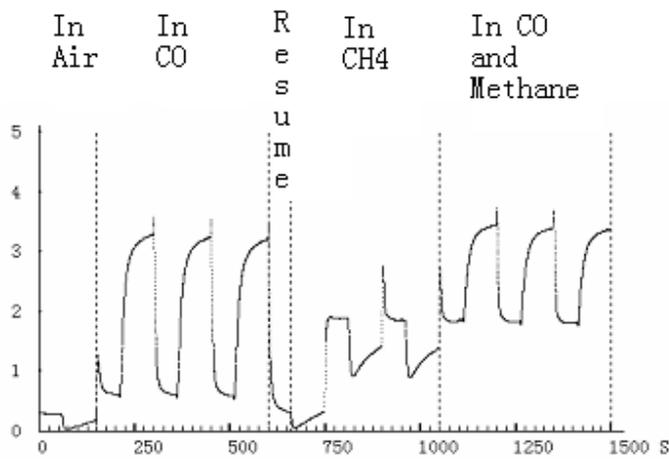
SENSITIVITY CHARACTERISTICS



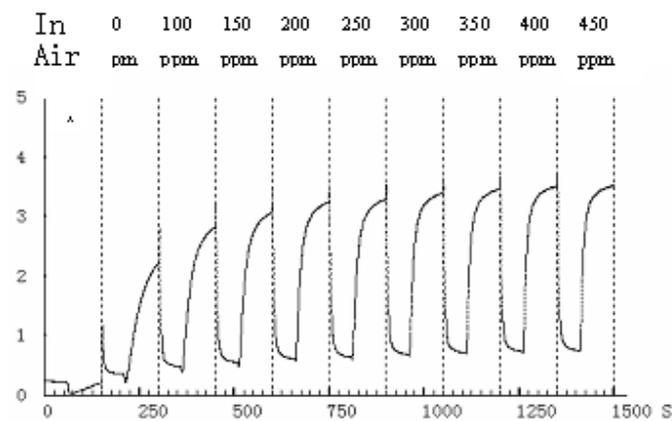
Typical Curve show sensor affected by humidity and temperature (Rs means resistance value at 150ppmCO and different temperature and humidity; R₀ means resistance value in 150ppmCO, 20°C/65%RH)



Cycle heater voltage when working
(Test voltage is 5V)



Output signal for gas sensor in 150ppm
CO and 5000ppm CH4
(Remark: Test data for typical sensor)



Output signal for gas sensor within
different CO concentration
(Remark: Test data for typical sensor)

V _c	Circuit voltage	≤24V	DC
V _H	Heating voltage	1.5V±0.2V /5.0V±0.2V	AC or DC
R _L	Load resistance	adjustable	
R _H	Heater resistance	90Ω±10Ω	Room Tem.
P _H	Heating consumption	≤250mW	

B. Environment condition

Symbol	Parameter name	Technical condition	Remark
T _{ao}	Using Temperature	-10℃ – +50℃	
T _{as}	Storage Temperature	-20℃ – +70℃	
R _H	Related humidity	less than 95%Rh	
O ₂	Oxygen concentration	21%(standard condition)Oxygen concentration can affect sensitivity	minimum value >2%

C. Sensitivity characteristic

Symbol	Parameter name	Technical parameter	Remark
R _s	Sensing Resistance	0.5KΩ-10KΩ (150ppm CO)	Detecting concentration scope: 10-500ppm CO
α	Concentration slope rate	≤0.6	
Standard working condition	V _c :5.0V±0.2V Temp: 20℃±2℃	V _H : 1.5V±0.2V /5.0V±0.2V Humidity: 65%±5%	
Preheat time	Over 48 hour		

Formula of sensitivity power consumption: $P_s = V_c^2 \times R_s / (R_s + R_L)^2$

Formula of sensor resistance: $R_s = (V_c / V_{RL} - 1) \times R_L$

D. Structure and configuration

Structure and configuration of MP-7 gas sensor is shown as Fig. 4, sensor composed by micro AL₂O₃ ceramic tube, Tin Dioxide (SnO₂), sensitive layer, measuring electrode and heater are fixed into a crust made by metal net. The heater provides necessary work conditions for sensitive components. The enveloped MP-7 have 4pins, 2 of them (3#, 4#) are used to fetch signals, and other 2 (1#, 2#) are used for providing heating current.

