

TECHNICAL DATA MQ-9 GAS SENSOR

FEATURES

- * High sensitivity to carbon monoxide and CH₄ , LPG.
- * Stable and long life

APPLICATION

They are used in gas detecting equipment for carbon monoxide and CH₄ , LPG in family and industry or car.

SPECIFICATIONS

A. Standard work condition

Symbol	Parameter name	technical condition	Remark
Vc	circuit voltage	5V ± 0.1	AC or DC
VH (H)	Heating voltage (high)	5V ± 0.1	AC or DC
VH (L)	Heating voltage (low)	1.4V ± 0.1	AC or DC
RL	Load resistance	Can adjust	
RH	Heating resistance	33 ± 5%	Room temperature
TH (H)	Heating time (high)	60 ± 1 seconds	
TH (L)	Heating time (low)	90 ± 1 seconds	
Ps	Heating consumption	Less than 340mw	

b. Environment conditions

Symbol	Parameters	Technical conditions	Remark
Tao	Using temperature	-20 -50	
Tas	Storage temperature	-20 -50	Advice using scope
RH	Relative humidity	Less than 95%RH	
O ₂	Oxygen concentration	21%(stand condition) the oxygen concentration can affect the sensitivity characteristic	Minimum value is over 2%

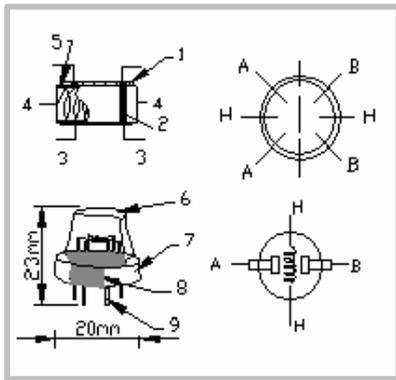
c. Sensitivity characteristic

symbol	Parameters	Technical parameters	Remark
Rs	Surface resistance Of sensitive body	2-20k	In 100ppm Carbon Monoxide
(300/100ppm)	Concentration slope rate	Less than 0.5	Rs (300ppm)/Rs(100ppm)
Standard working condition	Temperature -20 ± 2	relative humidity 65% ± 5%	RL:10K ± 5%
	Vc:5V ± 0.1V VH:5V ± 0.1V VH:1.4V ± 0.1V		
Preheat time	No less than 48 hours	Detecting range:20ppm-2000ppm carbon monoxide 500ppm-10000ppm CH ₄ 500ppm-10000ppm LPG	

D. Structure and configuration, basic measuring circuit

Structure and configuration of MQ-9 gas sensor is shown as Fig. 1(Configuration A or B), sensor composed by micro AL₂O₃ ceramic tube, Tin Dioxide (SnO₂) sensitive layer, measuring electrode and heater are fixed into acrust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-9 have

6 pin ,4 of them are used to fetch signals, and other 2 are used for providing heating current.



Parts	Materials
1 Gas sensing layer	SnO ₂
2 Electrode	Au
3 Electrode line	Pt
4 Heater coil	Ni-Cr alloy
5 Tubular ceramic	Al ₂ O ₃
6 Anti-explosion network	Stainless steel gauze (SUS316 100-mesh)
7 Clamp ring	Copper plating Ni
8 Resin base	Bakelite
9 Tube Pin	Copper plating Ni

Fig.1

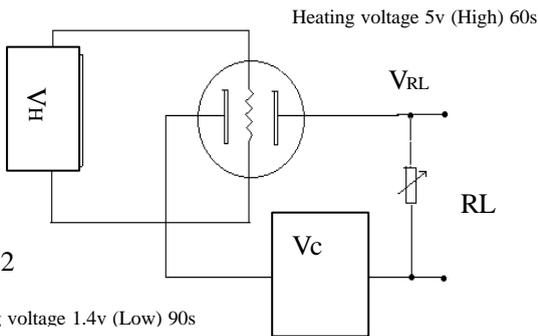
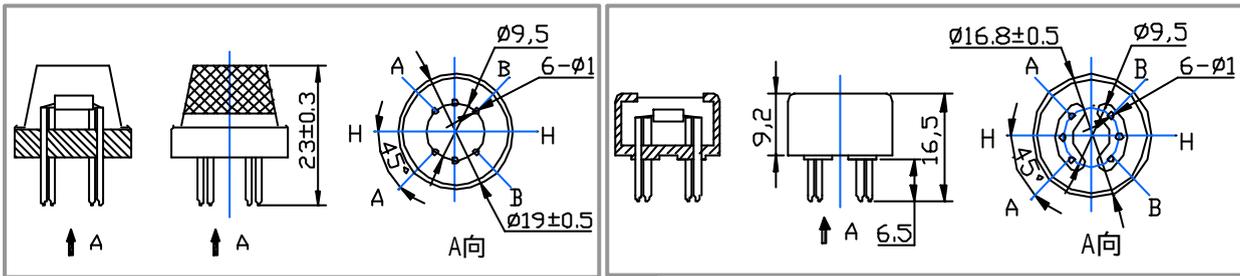


Fig.2

Standard circuit:

As shown in Fig 2, standard measuring circuit of MQ-9 sensitive components consists of 2 parts. one is heating circuit having time control function (the high voltage and the low voltage work circularly). The second is the signal output circuit, it can accurately respond changes of surface resistance of the sensor.

Heating voltage 1.4v (Low) 90s

Electric parameter measurement circuit is shown as Fig.2

E. Sensitivity characteristic curve

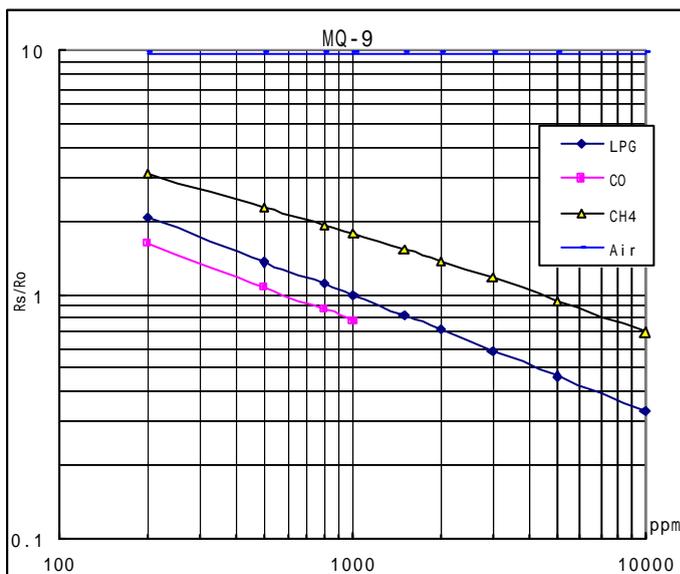


Fig.3 sensitivity characteristics of the MQ-9

Fig.3 shows the typical sensitivity characteristics of the MQ-9 for several gases.

in their: Temp: 20 °C

Humidity: 65%

O₂ concentration 21%

RL=10k

Ro: sensor resistance at 1000ppm

LPG in the clean air.

Rs: sensor resistance at various concentrations of gases.

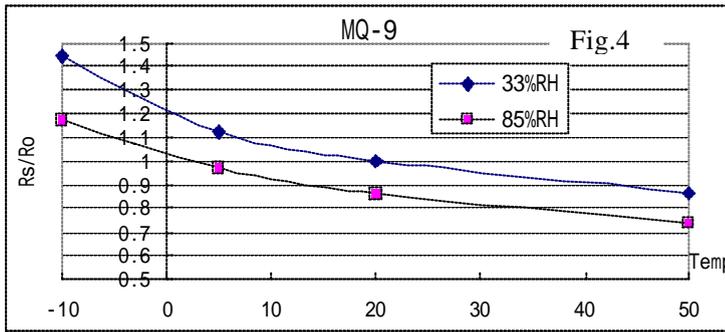


Fig.4 is shows the typical dependence of the MQ-9 on temperature and humidity.
 Ro: sensor resistance at 1000ppm LPG in air at 33%RH and 20degree.
 Rs: sensor resistance at 1000ppm LPG at different temperatures and humidities.

OPERATION PRINCIPLE

. The surface resistance of the sensor R_s is obtained through effected voltage signal output of the load resistance R_L which series-wound. The relationship between them is described:

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

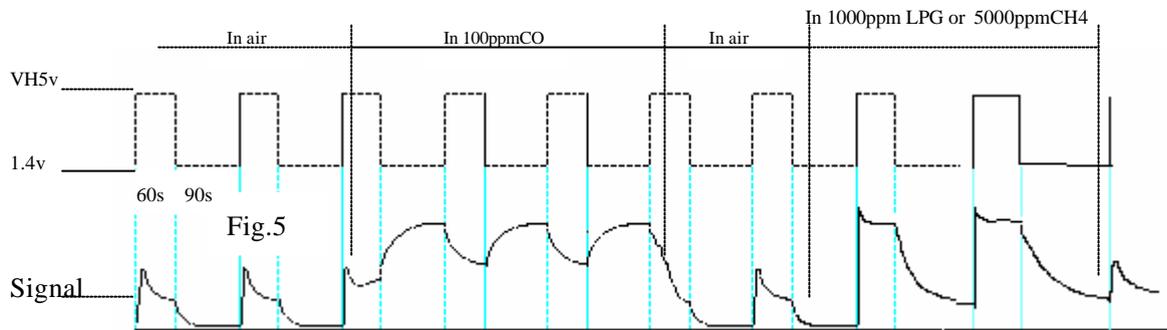


Fig. 5 shows alterable situation of R_L signal output measured by using Fig. 2 circuit output signal when the sensor is shifted from clean air to carbon monoxide (CO) or CH_4 , output signal measurement is made within one or two complete heating period (2.5 minute from high voltage to low voltage).

Sensitive layer of MQ-9 gas sensitive components is made of SnO_2 with stability, So, it has excellent long term stability. Its service life can reach 5 years under using condition.

SENSITIVITY ADJUSTMENT

Resistance value of MQ-9 is difference to various kinds and various concentration gases. So, When using this components, sensitivity adjustment is very necessary. we recommend that you calibrate the detector for 200ppm and 5000ppm CH_4 or 1000ppm LPG concentration in air and use value of Load resistance that(R_L) about 20 K (10K to 47 K).

When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence.

The sensitivity adjusting program:

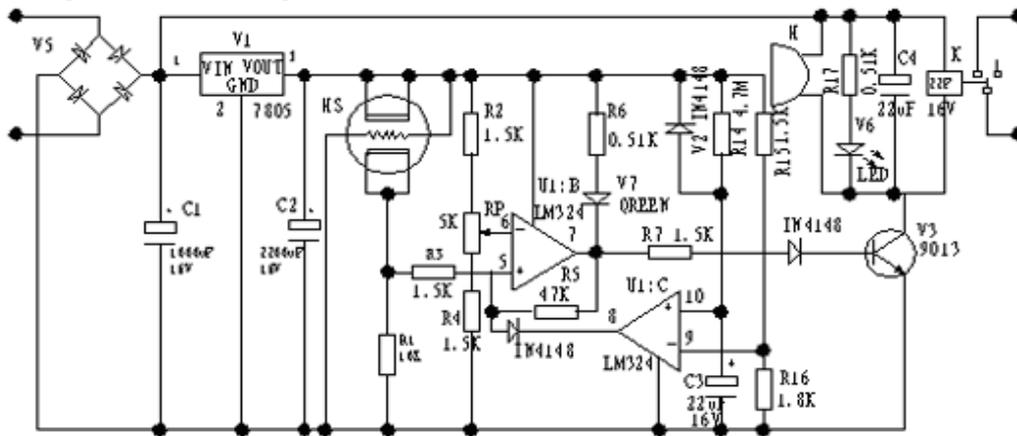
- Connect the sensor to the application circuit.
- Turn on the power, keep time of preheating through electricity is over 48 hours.
- Adjust the load resistance R_L until you get a signal value which is respond to a certain carbon monoxide concentration at the end point of 90 seconds.
- Adjust the another load resistance R_L until you get a signal value which is respond to a CH_4 or LPG concentration at the end point of 60 seconds .

A simple entire circuit solution guide for gas leak alarm

Detecting Gas	Sensor Type	Calibrating Concentration
Combustible gas/Smoke	MQ-2	1000ppm±30%
Natural Gas/Methane	MQ-4	5000ppm±30%
Coal Gas/Methane/LPG	MQ-5	2000/5000/2000ppm±30%
LPG	MQ-6	3000ppm±30%
CO	MQ-7	200ppm±30%
Coal Gas	MQ-8	800ppm±30%

How to use HANWEI MQ semiconductor type gas sensor, here we support you a simple, complete design guide for gas leak alarm, It is a speedy way for you to produce your gas leak alarm conveniently.

Following is the circuit diagram.



Electricity circuit debugging :

Refers to the above circuit, Check all the assemblage, connecting the power supply, the "green" LED should light, When testing, the E1, E2 should be 9V, 5V separately. The pin8 of U1 should be at low voltage (about 0.3v), There is a delay lasting about 5 minutes caused by the delay circuit with IC,U1:C shall prevent the false alarm at first connecting power supply, Introducing R14 of different resistance value or C3 (capacitance) of various capacitance can adjust the delay time. After about 5 minutes, the delay ends, then the pin8 of U1:C should be at a high voltage (about 3.8V). When detecting in clean air, the both sides voltage (Vo) of R1 should be 0.2~1 V, otherwise should make the V0 fall into the above range through change R1 resistance value; Connecting the V0 to 1000 to +5V (E2), adjust the resistance(RP) slightly, the "RED" LED should light accordingly. The Pin 7 of U1:B will become 3.8V from the 0.3V of static state., at the mean time driving the buzzer to sound. If the component assemblage is correct, we can debug the above circuit, Take out the resistance between the E2 and V0, the debugging end.

Testing through Calibration gas

Preheating the gas leak alarm for 10 minutes, Making the calibrating gas concentration according to volume proportion, put the gas leak alarm in the calibrated gas. after 10 seconds, the gas sensor sensing the gas adequately, then adjust the RP slightly to make buzzer sound exactly and RED LED light, the calibration will be completed after repeated it several times.

Installation

If the detected gas is LPG, Butane and propane which is heavier than normal air, Install the gas leak alarm about 1.00 meter above the ground, adversely, For the Natural gas, Methane, coal gas, CO and H2, which is lighter than the normal air, Install gas leak alarm about 1 meter below the roof, Both of them are should be with good air circulation.

- MQ-2: suitable for combustible gas, alcohol, smoke etc
- MQ-3: suitable for alcohol
- MQ-4: suitable for CH₄, CNG, Natural gas
- MQ-5: suitable for town gas, LPG, natural gas
- MQ-6: suitable for LPG, iso-butane, propane
- MQ-7: suitable for carbon-monoxide
- MQ-8: suitable for Hydrogen (H₂)
- MQ-9: suitable for CO and LPG, Natural gas etc
- MQ131: suitable for Ozone
- MQ135: suitable for air polluted gas
- MQ136: suitable for H₂S
- MQ137: suitable for NH₃
- MQ138: suitable for organic solvents like alcohol, benzene, NH₃ etc
- MQ214: suitable for methane, 6V, 20mA
- MQ216: suitable for LPG, iso-butane, propane, 6V, 20mA
- MQ214A: suitable for methane, 12V, 10mA
- MQ216A: suitable for LPG, iso-butane, propane, 12V, 10mA
- MQ303: suitable for alcohol, heater voltage: 3V
- MQ303A: suitable for alcohol, heater voltage: 0.9V
- MQ306: suitable for LPG, heater voltage: 3V
- MQ306A: suitable for LPG, heater voltage: 0.9V
- MQ307: suitable for CO, heater voltage: 3V
- MQ307A: suitable for CO, heater voltage: 0.9V
- MQ309: suitable for CO and combustible gas, heater voltage: 3V
- MQ309A: suitable for CO and combustible gas, heater voltage: 0.9V

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