TGS8410 Gas Sensor for Methane Detection

characteristic：

* low power consumption
* High sensitivity to methane
* Long service life

apply：

Portable, small methane gas detector
* Battery-operated gas alarm
* Natural gas vehicle gas leak detection
* Natural gas pipeline gas leakage detection

The gas-sensitive element consists of a heater integrated on a silicon substrate using MEMS technology and a metal-oxide-semiconductor (MOS) layer formed on the substrate. With an ultra-low power consumption of just 0.087mW (average), it is ideal for energy-efficient battery-powered devices. The sensor detects gases in the air by detecting how their concentration affects its electrical conductivity. A simple circuitry converts these conductivity changes into corresponding voltage signals that directly indicate gas concentration levels.

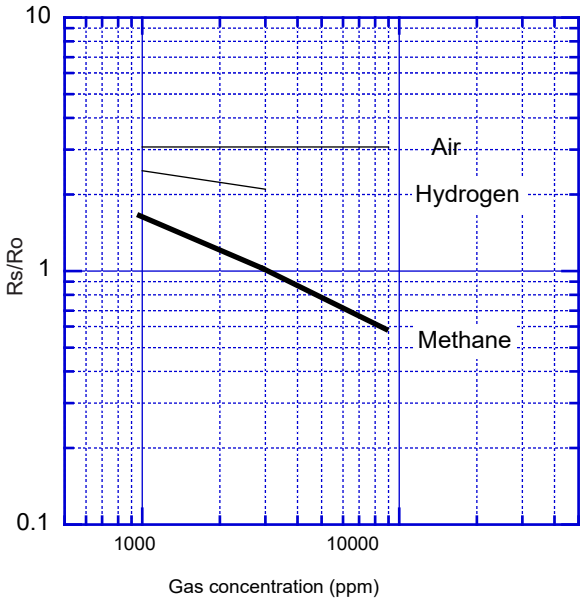
To eliminate the effects of interference from gases such as alcohol, the TGS8410 is equipped with a filter cap to further improve the sensitivity characteristics of high selectivity for methane gas. It is an ideal sensor choice for household gas leak detectors in particularly complex environments.

Sensitivity characteristics:

The representative sensitivity characteristic curve is shown in the figure below under standard test conditions (see back).

The vertical axis indicates the sensor resistance ratio Rs / Ro, where Rs and Ro are defined as follows: Rs = the sensor resistance value in various gas concentrations

Ro = 3,000ppm methane in the resistance value of the sensor



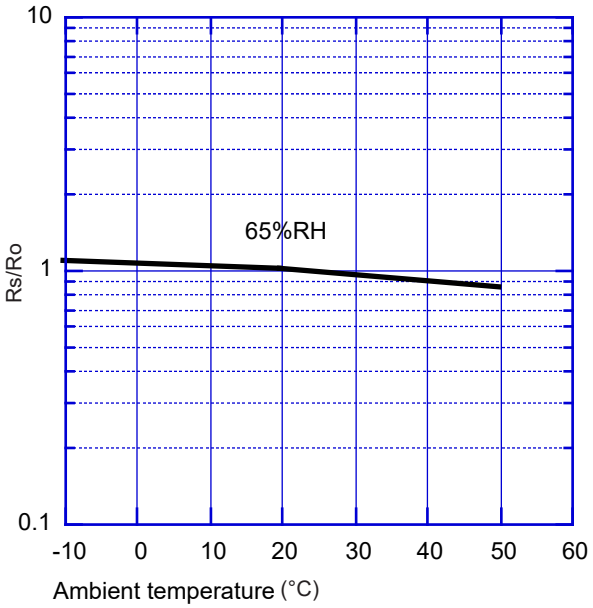
temperature characteristic：

The following figure shows a typical characteristic curve affected by temperature.

The vertical axis shows the sensor resistance ratio Rs / Ro, where Rs and Ro are defined as follows:

Rs = Resistance of the sensor to 3,000ppm methane at various temperatures

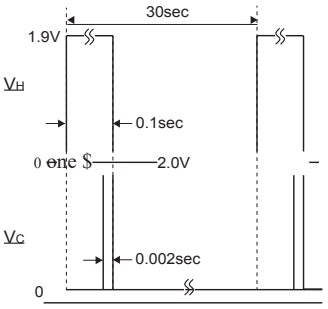
Ro = Sensor resistance at 3,000ppm methane with temperature and humidity of 20°C/ 65%R.H.

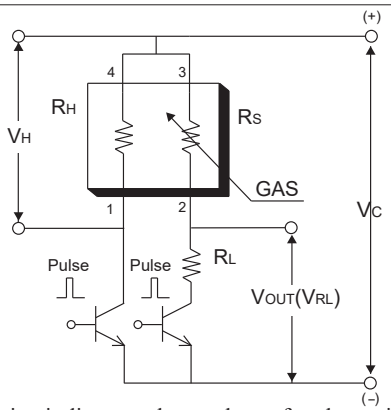


Basic test circuit:

The system applies heater voltage (V H) to pins 1 and 4 of the sensor's built-in heater at 30-second intervals to heat the sensitive element. During each V H application cycle, the initial 0.1 seconds are maintained at 1.9V, followed by a 29.9-second period without voltage application, resulting in a 0V state. Immediately after completing the V H pulse, a 0.002-second circuit pulse voltage (V C, 2.0V) is applied across the series-connected sensor resistor (R S) and load resistor (R L). This 2.0V voltage remains active until the next pulse cycle begins. The sensor's output voltage (V OUT) is measured during the 2-millisecond circuit pulse application phase.

The electrodes of the sensor resistor (R S) are between 2 and 3



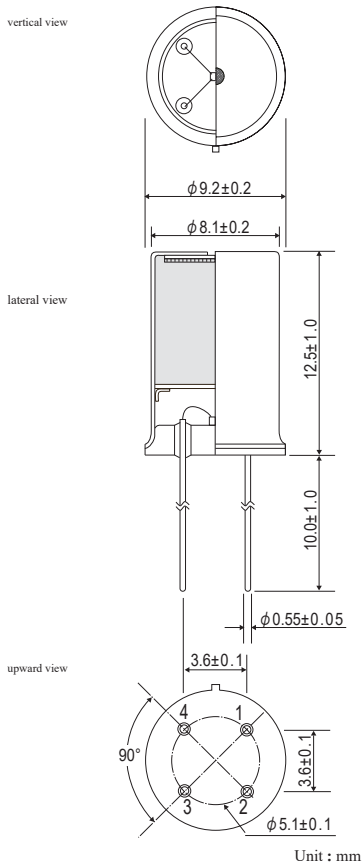


Pin connection(see timing diagram). In the test circuit diagram, the numbers of each terminal in the sensor symbol correspond to the pin numbers marked on the schematic. To keep the maximum power consumption (P S) of the sensing element below its limit value(15mW), the resistance value of R_L needs to be selected. When R_L is exposed to the gas, the power consumption value P S reaches its maximum when its resistance equals that of R S.

specifications：

model			TGS8410
Detection principle			Oxidized semiconductor type
Standard encapsulation			TO-5 Metals
The gas to be detected			methane
Scope of detection			1 ~ 25% LEL
Standard circuit conditions	heater voltage	VH	V H =1.9V±3% DC 0.1秒 V HL =0.0V 29.9秒
	circuit voltage	VC	2.0V±2% DC pulse
	load resistance	RL	Variable (2kΩ min.)
Electrical characteristics under standard test conditions	Heating element resistance	RH	About 60Ω (room temperature)
	Heater current	IH	12.7~15mA (V H =1.9V)
	Heater power consumption	PH	0.087mW (average)
	Sensor resistor	RS	3~160kΩ 3000ppm methane in
	Sensitivity (Rs variation rate)	0.48~0.68	Rs (3000ppm methane) / Rs (1000ppm methane)
standard test conditions	Test gas conditions		Methane gas in the air 20±2. C, 65±5%RH
	Circuit conditions		Same as the above standard conditions
	Test pre-stabilization time		3 Above the sky

Structure and size:



Unit：mm

pin connection：
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

The sensor resistance (R S) can be calculated from the following formula according to the measured value of V OUT (V RL):

$$R_S = \left(\frac{V_C}{V_{RL}} - 1\right) \times R_L$$

The typical characteristics of the sensor are shown in this product specification. The actual characteristics of the sensor vary from product to product. Please refer to the specifications for each sensor.

When purchasing the sensor, please scan the QR code to confirm the limited warranty.

https://www.figaro.co.jp/cn/pdf/Limited_Warranty_cn.pdf

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