TGS 3870-F00 - for the detection of both Methane and Carbon Monoxide

Features:

* **Miniature size and low power consumption**
* **High sensitivity and selectivity to both methane and carbon monoxide (CO)**
* **Low sensitivity to alcohol vapor**
* **Long life and low cost**

Applications:

* **Combination methane and carbon monoxide detectors**

TGS 3870-F00 is a micro-bead type semiconductor gas sensor for the detection of both methane and carbon monoxide. Using a micro-bead gas sensing structure, both methane and carbon monoxide can be detected with a single sensor element by periodic application of two different heater voltages (high and low). Miniaturization of the gas sensing bead results in a heater power consumption of only 38mW (average).
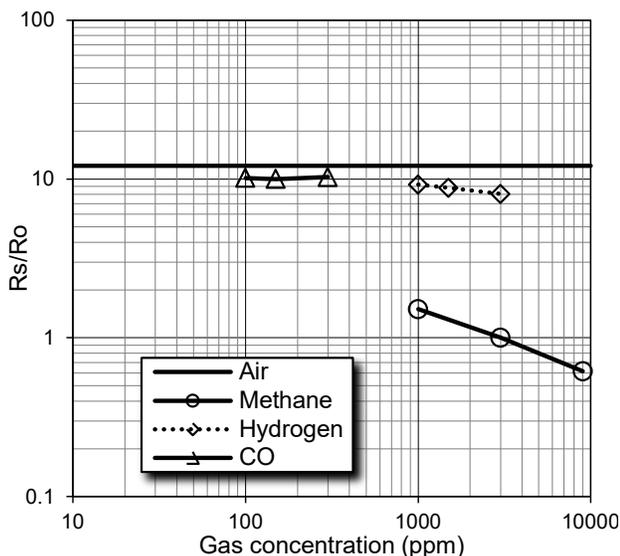
TGS 3870-F00 has low sensitivity to alcohol vapors (a typical interference gas in the residential environment) and has high durability, making the sensor ideal for consumer market gas alarms.

The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis indicates sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in 3000ppm of methane

The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis indicates sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance in displayed gases at various concentrations
Ro = Sensor resistance in 150ppm of CO

Sensitivity Characteristics (methane):


Sensitivity Characteristics (CO):
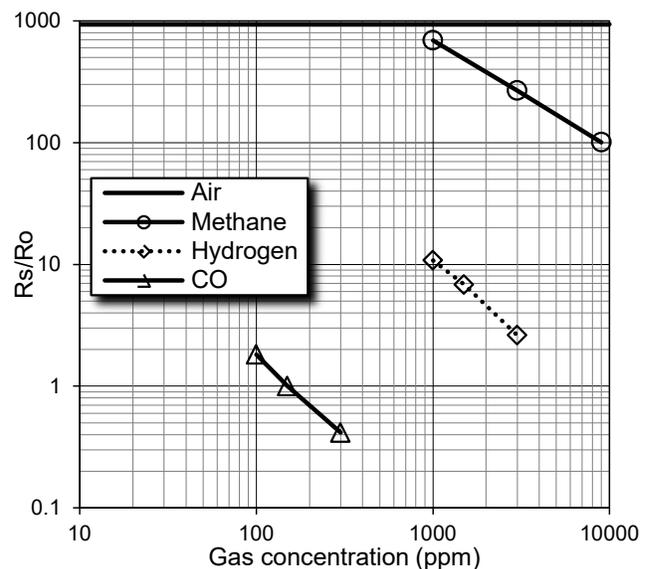
Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The sensor has three pins: Pin #3--heater (+), Pin #2--sensor electrode (+), and Pin #1--common (-). To maintain the sensing element at specific temperatures which are optimal for sensing two different gases, heater voltages of 0.9V and 0.2V are alternately applied between pins #1 and #3 during a 20 second heating cycle.

Circuit voltage (V_C) is applied between both ends of the sensor (Rs) and a load resistor (R_L), which are connected in series, to allow measurement of voltage (V_{RS}).

Circuit voltage (V_C) should be applied only at the moment when the signal is taken from the sensor.

Please refer to the document "Technical Information for TGS3870-F00" for details regarding the timing and application of Vc and V_H.
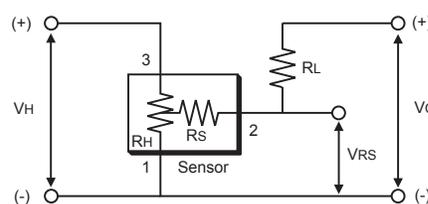
Basic measuring circuit

Caution: Do <u>not</u> apply a constant circuit voltage (5.0V) or the sensor would not exhibit its specified characteristics.

Specifications:

Model number			TGS3870-F00
Sensing principle			MOS type
Standard package			Plastic base and metal can
Target gases			Methane and Carbon Monoxide
Typical detection range			Methane 1~25% LEL Carbon monoxide 50~1,000ppm
Standard circuit conditions	Heater voltage	V_H	V_{HH} = 0.9V±3% for 5 sec. V_{HL} = 0.2V±3% for 15sec.
	Circuit voltage	V_C	5.0±0.2V DC pulse (refer to Technical Information for TGS3870-F00)
	Load resistance	R_L	variable (>0.75kΩ)
Electrical characteristics under standard test conditions	Heater resistance	R_H	3Ω±0.3Ω at room temp.
	Heater power consumption	P_H	120mW → V_{HH} = 0.9V DC 11mW → V_{HL} = 0.2V DC 38mW → average
	Sensor resistance	R_S	0.3kΩ~5.0kΩ in 3000ppm methane 2kΩ~40kΩ in 200ppm CO
	Sensitivity (change ratio of Rs)	β	0.44~0.7 → $\dfrac{Rs (3000ppm CH_4)}{Rs (1000ppm CH_4)}$ 0.3~0.8 → $\dfrac{Rs (300ppm CO)}{Rs (200ppm CO)}$
Standard test conditions	Test gas conditions		Target gas in air at 20±2°C, 65±5%RH
	Circuit conditions		V_{HH} = 0.9V±2% for 5 sec. V_{HL} = 0.2V±2% for 15 sec. Vc = 5.0±0.02V DC pulse (refer to Technical Information for TGS3870-F00)
	Preheating period before test		≥5 days

The value of power dissipation (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_{RS})^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of V_{RS} by using the following formula:

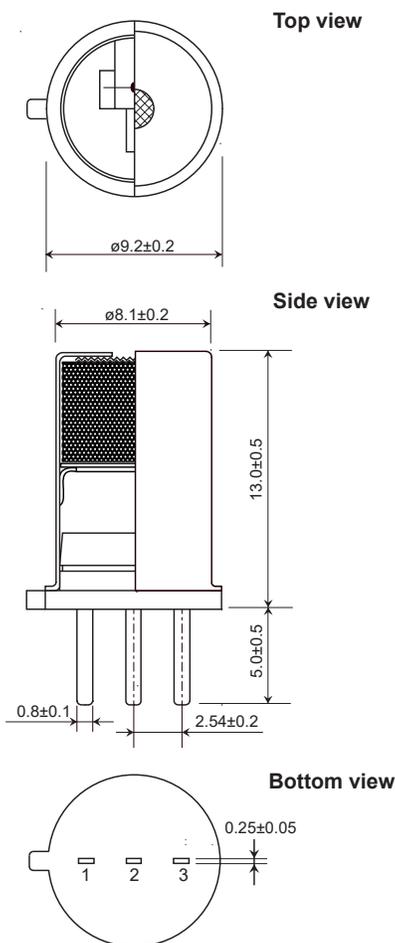$$R_S = \frac{(V_{RS} - 0.5V_H)}{(V_C - V_{RS})} \times R_L$$

Structure and Dimensions:

Top view

ø9.2±0.2

Side view

ø8.1±0.2

13.0±0.5

5.0±0.5

0.8±0.1

2.54±0.2

Bottom view

0.25±0.05

1　2　3

Pin connection: unit:mm

1:Common(-)
2:Sensor electrode (+)
3:Heater(+)

Before purchasing this product, please read the Warranty Statements shown in our webpage by scanning this QR code.

https://figarosensor.com/pdf/Figaro_USA_Sales_T&C.pdf

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