TGS 813 - for the detection of Combustible Gases

Features:

* General purpose sensor with sensitivity to a wide range of combustible gases
* High sensitivity to methane, propane, and butane
* Long life and low cost
* Uses simple electrical circuit

Applications:

* Domestic gas leak detectors and alarms
* Portable gas detectors

The sensing element of Figaro gas sensors is a tin dioxide (SnO_2) semiconductor which has low conductivity in clean air. In the presence of a detectable gas, the sensor's conductivity increases depending on the gas concentration in the air. A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to the gas concentration.

The **TGS 813** has high sensitivity to methane, propane, and butane, making it ideal for natural gas and LPG monitoring. The sensor can detect a wide range of gases, making it an excellent, low cost sensor for a wide variety of applications. Also available with a ceramic base which is highly resistant to severe environments up to 200°C (model# TGS 816).

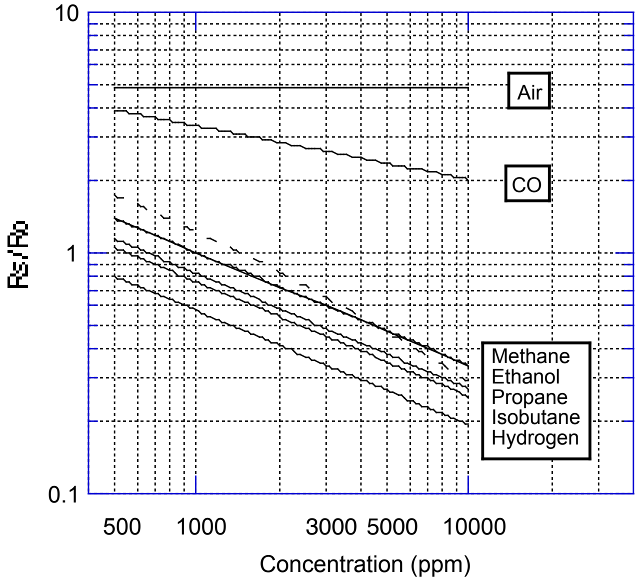
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance in 1000ppm methane

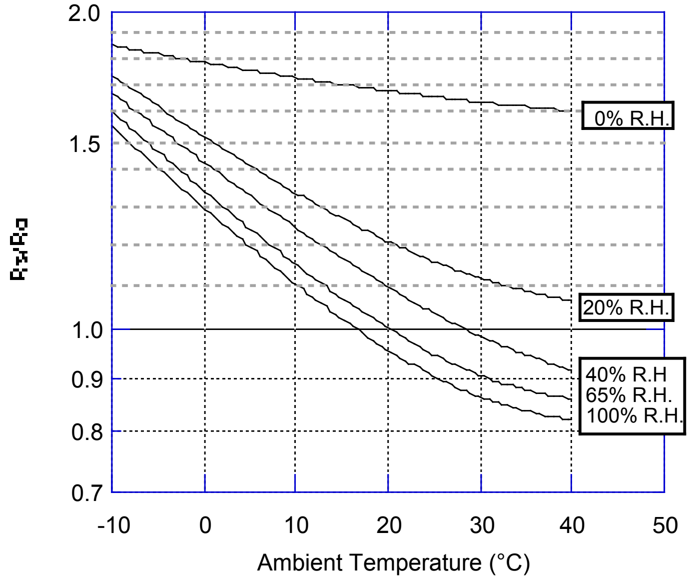
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as sensor resistance ratio (Rs/Ro), defined as follows:

Rs = Sensor resistance at 1000ppm of methane at various temperatures/humidities
Ro = Sensor resistance at 1000ppm of methane at 20°C and 65% R.H.

Sensitivity Characteristics:



Temperature/Humidity Dependency:



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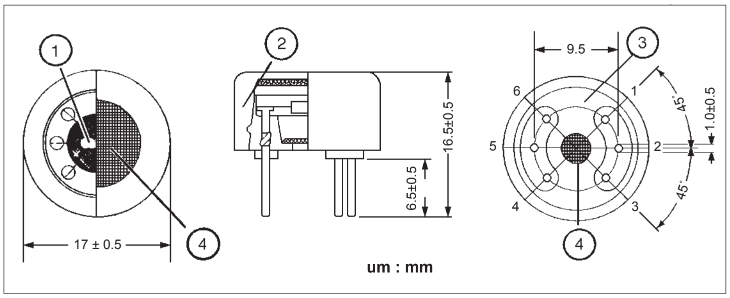
Structure and Dimensions:

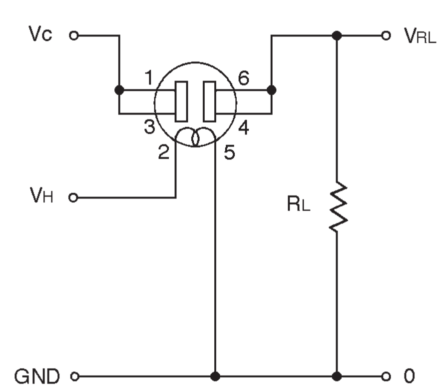


1. Sensing Element:
   SnO_2 is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
2. Cap:
   Nylon 66
3. Sensor Base:
   Nylon 66
4. Flame Arrestor:
   100 mesh SUS 316 double gauze

Pin Connection and Basic Measuring Circuit:

The numbers shown around the sensor symbol in the circuit diagram at the right correspond with the pin numbers shown in the sensor's structure drawing (above). When the sensor is connected as shown in the basic circuit, output across the Load Resistor (V_{RL}) increases as the sensor's resistance (Rs) decreases, depending on gas concentration.

Basic Measuring Circuit:



Standard Circuit Conditions:

Item	Symbol	Rated Value	Remarks
Heater voltage	V_H	5.0±0.2V	AC or DC
Circuit volatge	V_C	max. 24V	DC only Ps≤15mW
Load Resistance	R_L	variable	0.45kΩ min.

Electrical Characteristics:

Item	Symbol	Condition	Specification
Sensor resistance	Rs	Methane at 1000ppm	5kΩ ~ 15kΩ
Change ratio of sensor resistance	Rs/Ro	$\frac{\text{Rs (Methane 3000ppm/air)}}{\text{Rs (Methane 1000ppm/air)}}$	0.60 ± 0.05
Heater resistance	R_H	Room temperature	30.0 ± 3.0Ω
Heater power consumption	P_H	V_H=5.0V	835mW (typical)

Standard Test Conditions:

TGS 813 complies with the above electrical characteristics when the sensor is tested in standard conditions as specified below:

Test Gas Conditions: 20°±2°C, 65±5%R.H.

Circuit Conditions: V_C = 10.0±0.1V (AC or DC),
V_H = 5.0±0.05V (AC or DC),
R_L = 4.0kΩ±1%

Preheating period before testing: More than 7 days

Sensor Resistance (Rs) is calculated by the following formula:

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

Power dissipation across sensor electrodes (Ps) is calculated by the following formula:

$$Ps = \frac{V_C^2 \times Rs}{(Rs + R_L)^2}$$

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