TGS 821 - Special Sensor for Hydrogen Gas

Features:

* High sensitivity and selectivity to hydrogen gas
* Good repeatability in measurement and excellent stability
* Uses simple electrical circuit
* Ceramic base resistant to severe environment

Applications:

* Hydrogen gas detection for:
  - transformer maintenance
  - batteries
  - steel industry usage
  - etc.

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 821** has high sensitivity and selectivity to hydrogen gas. The sensor can detect concentrations as low as 50ppm, making it ideal for a variety of industrial applications.
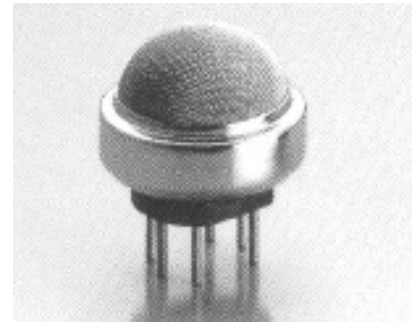
The figure below represents typical sensitivity char-acteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as sensor resistance ratio (Rs/Ro) which is defined as follows:

Rs = Sensor resistance of displayed gases at various concentrations
Ro = Sensor resistance at 100ppm of hydrogen

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 100ppm of hydrogen at various temperatures/humidities
Ro = Sensor resistance at 100ppm of hydrogen at 20°C and 65% R.H.
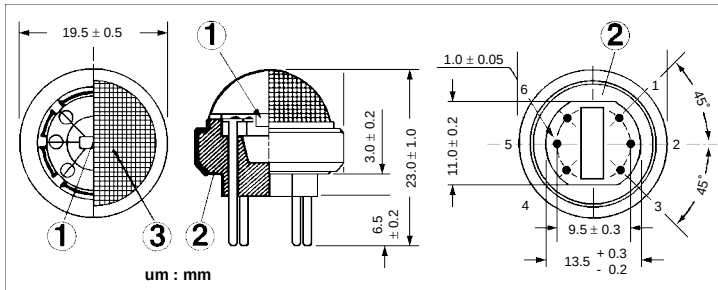
Sensitivity Characteristics:
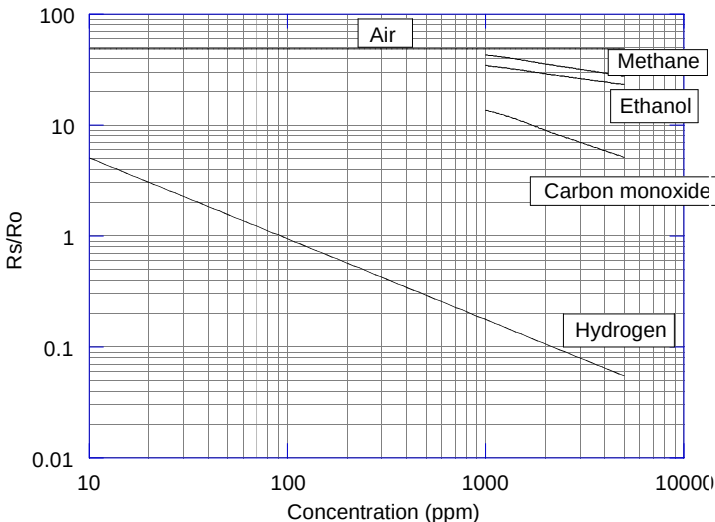
Temperature/Humidity Dependency:
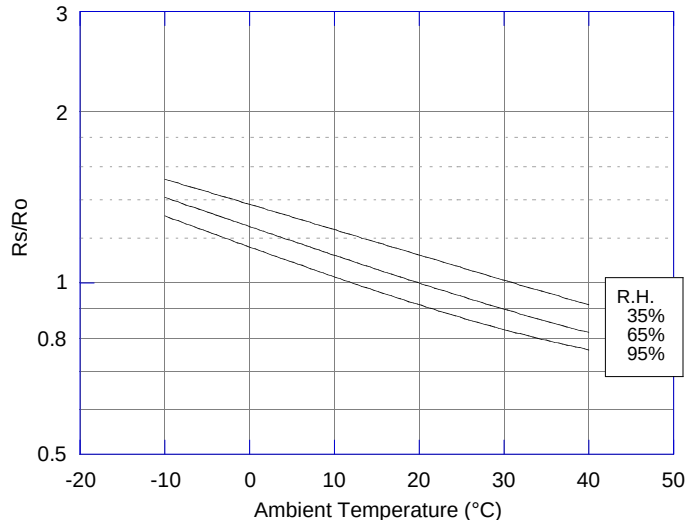
Structure and Dimensions:

um : mm

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. Sensor Base:
   Alumina ceramic
3. 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:
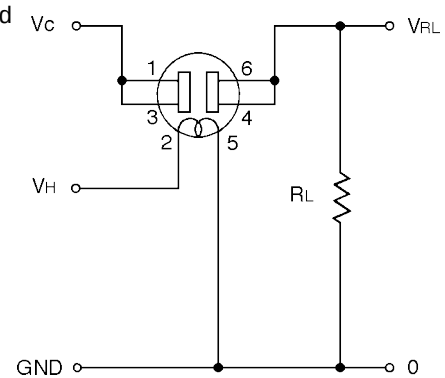
Standard Circuit Conditions:

Item	Symbol	Rated Values	Remarks
Heater Voltage	V$_H$	5.0±0.2V	AC or DC
Circuit Voltage	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	Hydrogen at 100ppm/air	1kΩ ~ 10kΩ
Change Ratio of Sensor Resistance	Rs/R$_0$	$\dfrac{\text{Log[Rs(H}_2\text{ 100ppm)/Rs(H}_2\text{ 1000ppm)]}}{\text{Log (1000ppm/100ppm)}}$	0.60 ~ 1.20
Heater Resistance	R$_H$	Room temperature	38.0 ± 3.0Ω
Heater Power Consumption	P$_H$	V$_H$=5.0V	660mW (typical)

Standard Test Conditions:

TGS 821 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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