

TGS 821 - Special Sensor for Hydrogen Gas

Features:

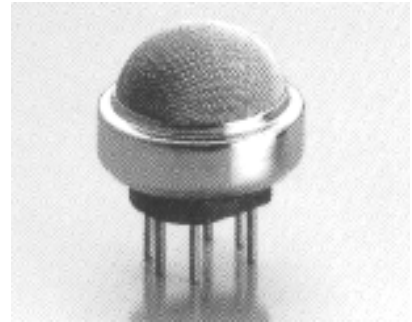
- * High sensitivity and selectivity to hydrogen gas
- * Good repeatability in measurement and excellent stability
- * Uses simple electrical circuit
- * Ceramic base resistant to severe environment

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.



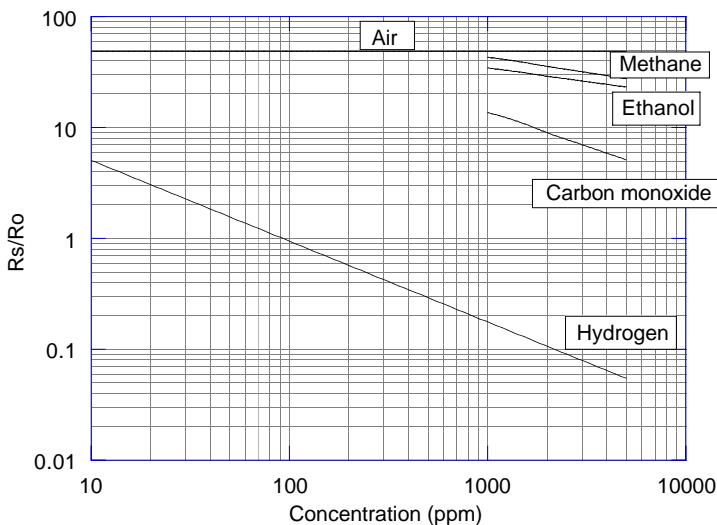
The figure below represents typical sensitivity characteristics, all data having been gathered at standard test conditions (see reverse side of this sheet). The Y-axis is indicated as *sensor resistance ratio* (R_s/R_o) which is defined as follows:

- R_s = Sensor resistance of displayed gases at various concentrations
- R_o = Sensor resistance at 100ppm of hydrogen

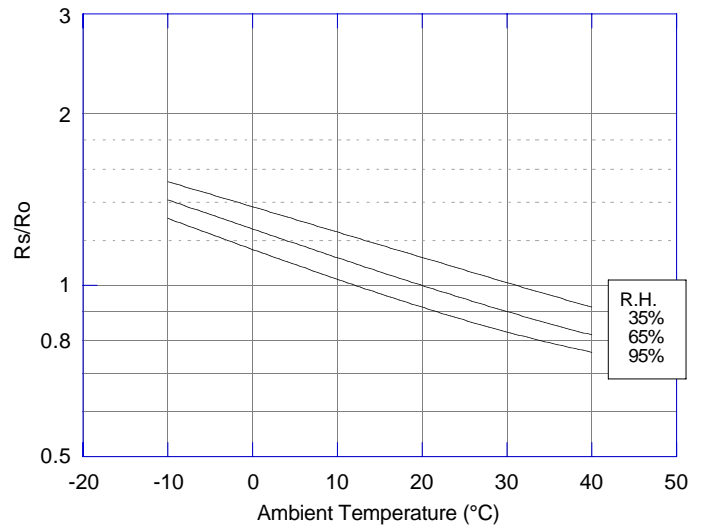
The figure below represents typical temperature and humidity dependency characteristics. Again, the Y-axis is indicated as *sensor resistance ratio* (R_s/R_o), defined as follows:

- R_s = Sensor resistance at 100ppm of hydrogen at various temperatures/humidities
- R_o = Sensor resistance at 100ppm of hydrogen at 20°C and 65% R.H.

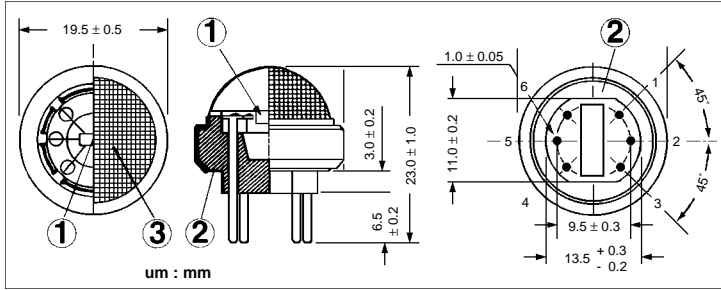
Sensitivity Characteristics:



Temperature/Humidity Dependency:



Structure and Dimensions:

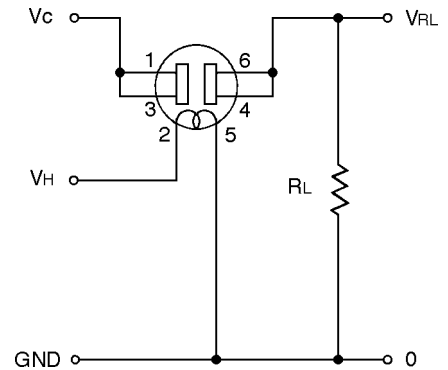


- ① Sensing Element:
SnO₂ is sintered to form a thick film on the surface of an alumina ceramic tube which contains an internal heater.
- ② Sensor Base:
Alumina ceramic
- ③ Flame Arrester:
100 mesh SUS 316 double gauze

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 (R_s) 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 P _s ≤15mW
Load Resistance	R _L	Variable	0.45kΩ min.

Electrical Characteristics:

Item	Symbol	Condition	Specification
Sensor Resistance	R _s	Hydrogen at 100ppm/air	1kΩ ~ 10kΩ
Change Ratio of Sensor Resistance	R _s /R _o	$\frac{\text{Log}[R_s(\text{H}_2 \text{ 100ppm})/R_s(\text{H}_2 \text{ 1000ppm})]}{\text{Log}(1000\text{ppm}/100\text{ppm})}$	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 (R_s) is calculated by the following formula:

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

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

$$P_s = \frac{V_c^2 \times R_s}{(R_s + R_L)^2}$$