

## TGS813 A Sensor Used to Detect Flammable Gases

### characteristic : \_\_\_\_\_

- \* Sensitive to a wide range of flammable gases
- High sensitivity to methane, propane and butane
- :: Long service life and low cost
- \* Use simple circuits

### apply : \_\_\_\_\_

- \* Industrial gas leakage and alarm
- Portable gas detector

The sensor element of the Figaro sensor is composed of tin dioxide ( $\text{SnO}_2$ ) semiconductor. In clean air, it has very low conductivity. When the detected gas is present in the air, the higher the concentration of the gas, the higher the conductivity of the sensor becomes. Using a simple circuit, the conductivity change can be converted into a signal output corresponding to the gas concentration.

The TGS813 sensor demonstrates exceptional sensitivity to methane, propane, and butane gases, making it the optimal choice for monitoring liquefied natural gas (LNG) and liquefied petroleum gas (LPG). Its versatility across multiple gas detection scenarios establishes it as a cost-effective and high-performance solution. Additionally, the TGS816 model features a ceramic base design capable of withstanding extreme temperatures up to  $200^\circ\text{C}$ .

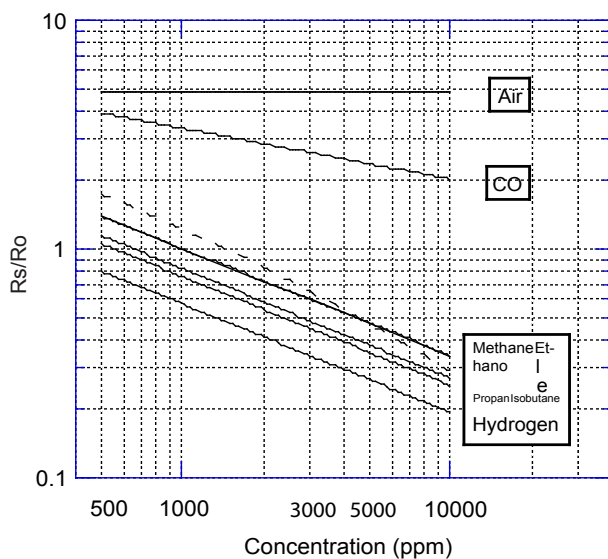


### Sensitivity characteristics: \_\_\_\_\_

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

The vertical axis indicates the ratio of sensor resistance  $R_s / R_o$ , where  $R_s$  and  $R_o$  are defined as follows:  $R_s$  = the resistance value of the sensor in various concentrations of gas

$R_o$  = Sensor resistance value in 1000ppm methane



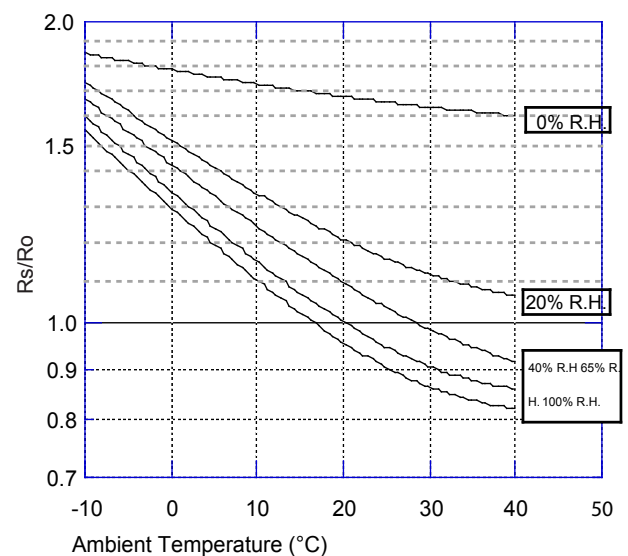
### Temperature and humidity characteristics: \_\_\_\_\_

The following figure shows the representative characteristic curve affected by temperature and humidity.

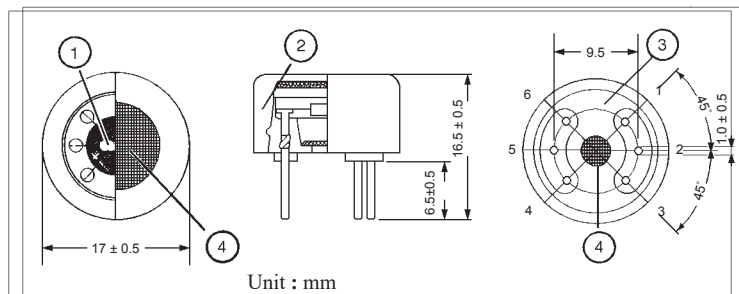
The vertical axis shows the sensor resistance ratio  $R_s / R_o$ , where  $R_s$  and  $R_o$  are defined as follows:

$R_s$  = Resistance value of the sensor at various temperature and humidity containing 1000ppm methane gas

$R_o$  = Resistance of the sensor at 1000ppm methane gas, temperature and humidity  $20^\circ\text{C}$ , 65% R.H



Structure and size:



① Detection element:

An oxidation aluminum ceramic tube with a built-in heating wire and a sintered surface  
A layer of SnO<sub>2</sub> coating

② 外壳: 尼龙 66

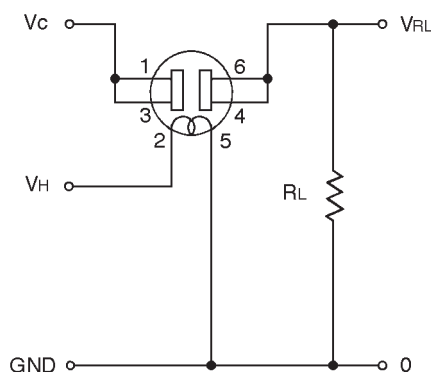
③ 传感器基座: 尼龙 66

④ back-fire relief valve: SUS 316 100 mesh double layer wire mesh

The circuit diagram on the right shows the sensor's symbol code, and the structure above and the size diagram show the sensor's pin numbers.

As shown in the figure, when the sensor is connected to the base circuit, the rise of the load output voltage (V<sub>RL</sub>) and the fall of the sensor resistance (R<sub>s</sub>) will depend on the detection concentration of the object gas.

Pin and basic test circuit:



Standard circuit conditions:

project	symbol	rating	remarks
loop voltage	VH	5.0±0.2V	AC perhaps DC
circuit voltage	Vc	Max 24V	Only DC P s ≤15mW
load resistance	RL	variable	0.45kΩ min.

electrical character :

project	symbol	condition	specifications
Sensor resistor	Rs	Methane 1000ppm	5kΩ ~ 15kΩ
The rate of change of the sensor resistance	Rs/Ro	$\frac{R_s(\text{methane } 3000\text{ppm/air})}{R_s(\text{methane } 1000\text{ppm/air})}$	0.60 ± 0.05
Heating element resistance	RH	room temperature	30.0 ± 3.0Ω
Heater power consumption	PH	VH=5.0V	835mW (typical)

standard test conditions :

When the TGS813 is tested under standard conditions specified below, it must comply with the electrical characteristics in the table above.

Test conditions: 20°C ±2 °C, 65±5%R.H

Circuit condition: V<sub>c</sub> = 10.0±0.1V(AC or DC)

V<sub>H</sub> = 5.0±0.05V(AC or DC)

R<sub>L</sub> = 4.0k Ω ± 1% Circuit

condition: more than 7 days

The power consumption value (P<sub>s</sub>) can be calculated by the following formula:

$$P_s = \frac{(V_c - V_{RL})^2}{R_s}$$

The sensor resistance (R<sub>s</sub>) can be calculated from the following formula according to the measured value of V<sub>OUT</sub> (V<sub>RL</sub>):

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

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