FIGARO

PRODUCT INFORMATION

TGS 2600 - for the detection of Air Contaminants

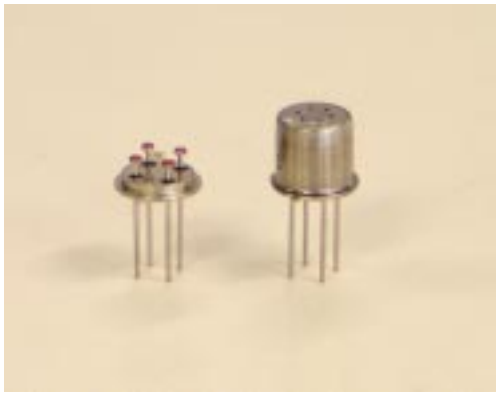
Features:

* Low power consumption
* High sensitivity to gaseous air contaminants
* Long life and low cost
* Uses simple electrical circuit
* Small size

Applications:

* Air cleaners
* Ventilation control
* Air quality monitors

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. 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 2600** has high sensitivity to low concentrations of gaseous air contaminants such as hydrogen and carbon monoxide which exist in cigarette smoke. The sensor can detect hydrogen at a level of several ppm. Figaro also offers a microprocessor (FIC02667) which contains special software for handling the sensor's signal for appliance control applications.

Due to miniaturization of the sensing chip, TGS 2600 requires a heater current of only 42mA and the device is housed in a standard TO-5 package.

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 in displayed gases at various concentrations

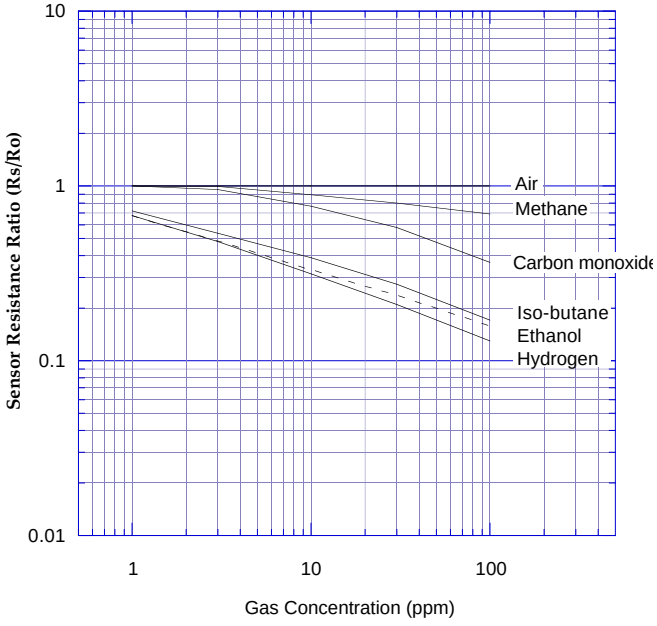
Ro = Sensor resistance in fresh air

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:

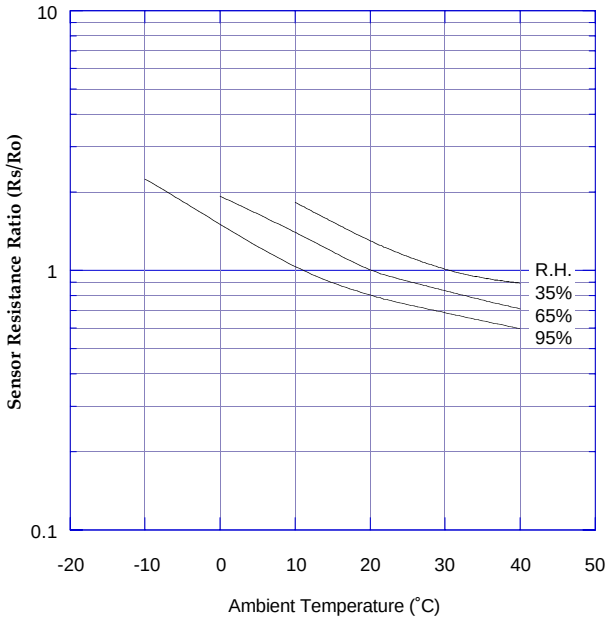
Rs = Sensor resistance in fresh air at various temperatures/humidities

Ro = Sensor resistance in fresh air at 20°C and 65% R.H.

Sensitivity Characteristics:

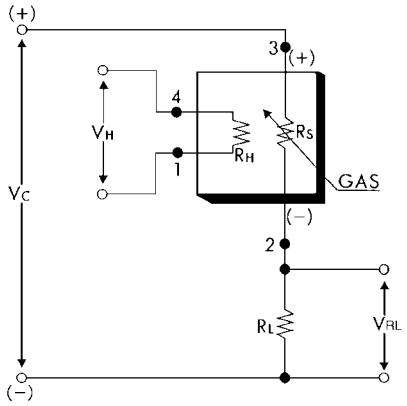


Temperature/Humidity Dependency:



Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (Vout) across a load resistor (R_L) which is connected in series with the sensor. DC voltage is required for the circuit voltage since the sensor has a polarity. A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power consumption (P_S) of the semiconductor below a limit of 15mW. Power consumption (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2600-B00	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Air contaminants	
Typical detection range			1 ~ 30 ppm of H_2	
Standard circuit conditions	Heater voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC	Ps ≤ 15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	approx. 83Ω at room temp. (typical)	
	Heater current	I_H	42±4mA	
	Heater power consumption	P_H	210mW	V_H=5.0V DC
	Sensor resistance	Rs	10k~90kΩ in air	
	Sensitivity (change ratio of Rs)		0.3~0.6	Rs (10ppm of H_2) / Rs (air)
Standard test conditions	Test gas conditions		normal air at 20±2˚C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

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

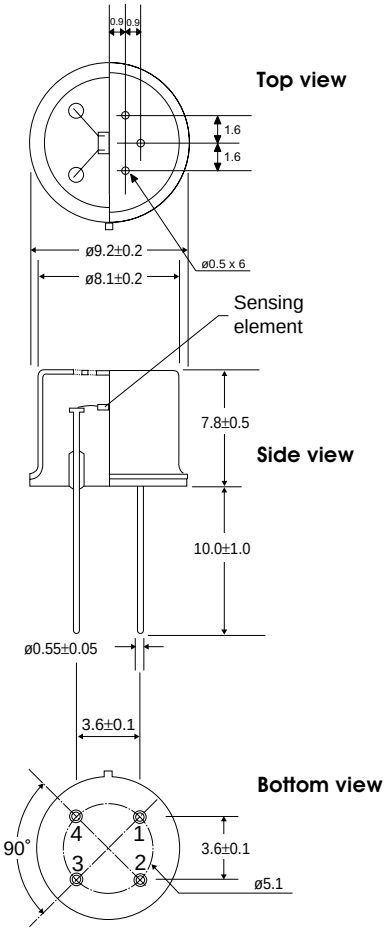
$$P_S = \frac{(V_C - Vout)^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of Vout by using the following formula:

$$R_S = \frac{V_C \times R_L}{Vout} - R_L$$

All sensor characteristics shown in this brochure represent typical characteristics. Actual characteristics vary from sensor to sensor. The only characteristics warranted are those in the Specification table above.

Structure and Dimensions:



Pin connection:
1: Heater
2: Sensor electrode (-)
3: Sensor electrode (+)
4: Heater

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REV: 01/05

FIGARO

PRODUCT INFORMATION

TGS 2602 - for the detection of Air Contaminants

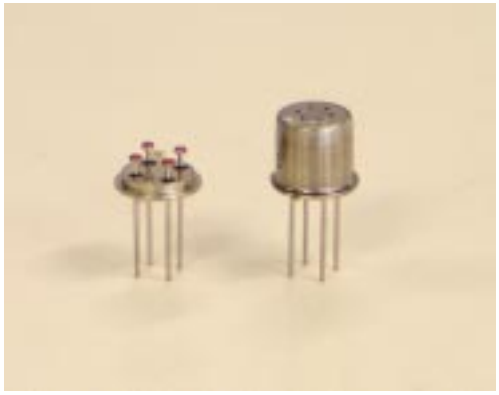
Features:

* **High sensitivity to VOCs and odorous gases**
* **Low power consumption**
* **High sensitivity to gaseous air contaminants**
* **Long life**
* **Uses simple electrical circuit**
* **Small size**

Applications:

* **Air cleaners**
* **Ventilation control**
* **Air quality monitors**
* **VOC monitors**
* **Odor monitors**

The sensing element is comprised of a metal oxide semiconductor layer formed on the alumina substrate of a sensing chip together with an integrated heater. In the presence of detectable gas, sensor conductivity increases depending on 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 2602** has high sensitivity to low concentrations of odorous gases such as ammonia and H_2S generated from waste materials in office and home environments. The sensor also has high sensitivity to low concentrations of VOCs such as toluene emitted from wood finishing and construction products. Figaro also offers a microprocessor (FIC02667) which contains special software for handling the sensor's signal for appliance control applications.

Due to miniaturization of the sensing chip, TGS 2602 requires a heater current of only 42mA and the device is housed in a standard TO-5 package.

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 in displayed gases at various concentrations

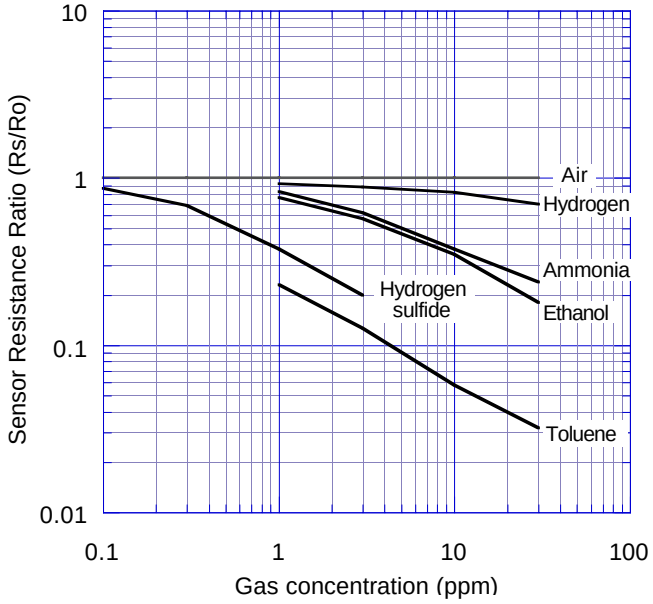
Ro = Sensor resistance in fresh air

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:

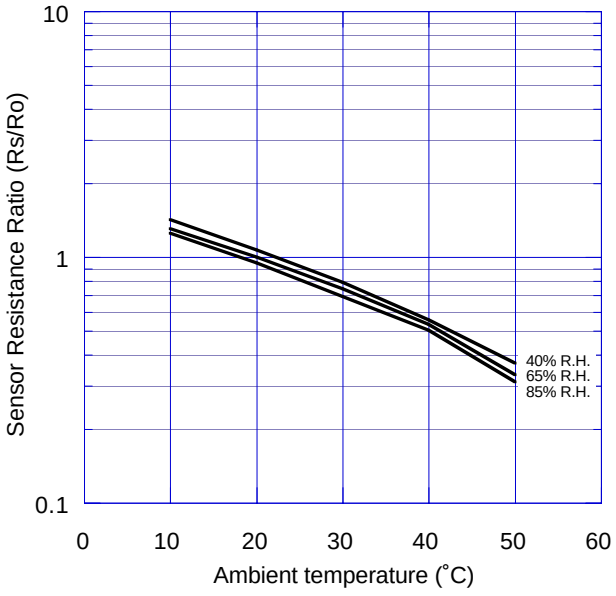
Rs = Sensor resistance in fresh air at various temperatures/humidities

Ro = Sensor resistance in fresh air at 20°C and 65% R.H.

Sensitivity Characteristics:

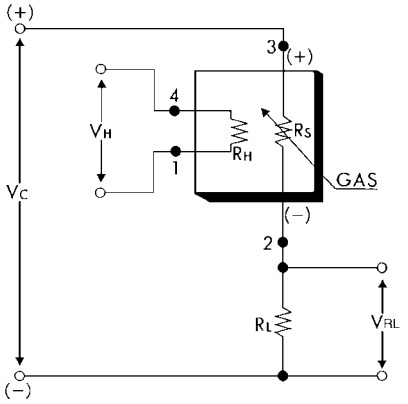


Temperature/Humidity Dependency:



Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (Vout) across a load resistor (R_L) which is connected in series with the sensor. DC voltage is required for the circuit voltage since the sensor has a polarity. A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power consumption (P_S) of the semiconductor below a limit of 15mW. Power consumption (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2602-B00	
Sensing element type			D1	
Standard package			TO-5 metal can	
Target gases			Air contaminants	
Typical detection range			1 ~ 30 ppm of EtOH	
Standard circuit conditions	Heater voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC	Ps≤15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	approx. 59Ω at room temp.	
	Heater current	I_H	56±5mA	
	Heater power consumption	P_H	280mW (typical)	
	Sensor resistance	Rs	10k~100kΩ in air	
	Sensitivity (change ratio of Rs)		0.15~0.5	Rs (10ppm of EtOH) / Rs (air)
Standard test conditions	Test gas conditions		normal air at 20±2˚C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.01V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		7 days	

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

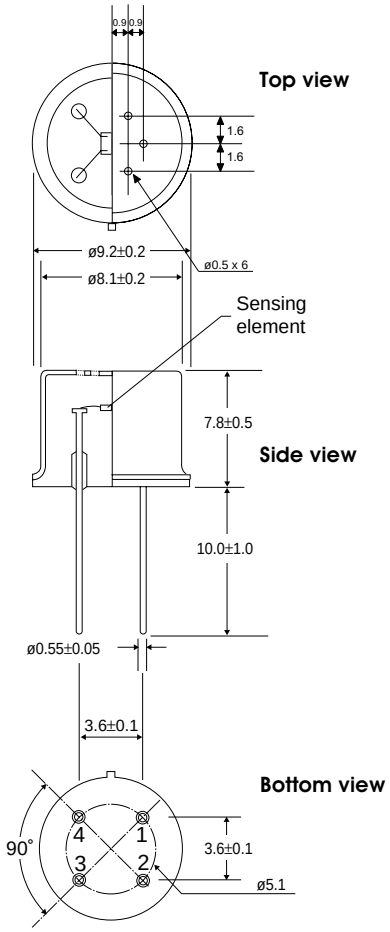
$$P_S = \frac{(V_C - Vout)^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of Vout by using the following formula:

$$R_S = \frac{V_C \times R_L}{Vout} - R_L$$

All sensor characteristics shown in this brochure represent typical characteristics. Actual characteristics vary from sensor to sensor. The only characteristics warranted are those in the Specification table above.

Structure and Dimensions:



Pin connection:

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

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REV: 01/05

FIGARO

PRODUCT INFORMATION

AMS2000-2600 - Precalibrated Gas Sensor Module

Features:

* **High sensitivity to deoxidizing gases in air contaminants**
* **Long life**
* **Maintenance free**

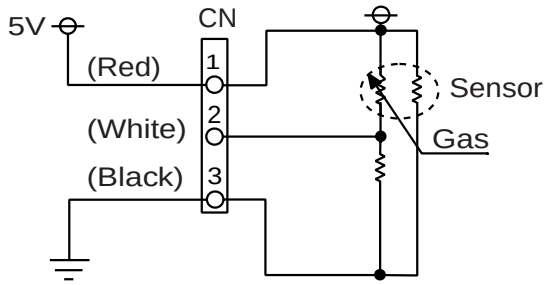
Application:

* **Air quality control device**

The AMS 2000-2600 gas sensor module is factory pre-calibrated for usage in conjunction with system feature control microprocessors FIC93619A or FIC5603.

The module is composed of Figaro Gas Sensor TGS2600 and a load resistor on a PCB, an XHP-3 connector, and three lead wires. Because of its wide sensitivity spectrum and low power consumption, TGS2600 is the ideal sensor for the detection of indoor air pollution which is caused by cigarette smoke, cooking fumes, etc. This module enables users to create a low cost indoor air monitor by eliminating the need for a sophisticated calibration process.

Electronic Circuit



Terminal Connections

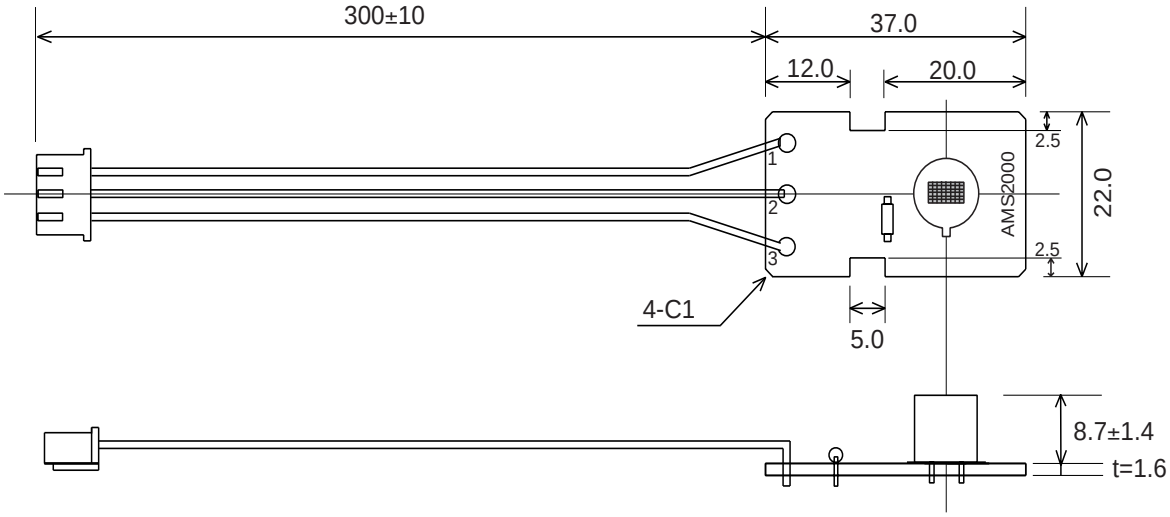
Terminal	Name	Function
1 (red)	Input	heater voltage (V_H) circuit voltage (V_C)
2 (white)	Output	output voltage (Vout)
3 (black)	Common	ground (GND)

Specifications

Item	Specification	
Model No.	AMS2000-2600	
Target gas	deoxidizing gases in air contaminants	
Sensor	TGS2600	
Input voltage	5.0±0.2v DC	
Power consumption	approx. 210mW	
Connector	XHP-3	
Operating temperature	-10 ~ 40˚C	*(avoid condensation on the module)*
Storage tempertature	-20 ~ 60˚C	
Dimensions	PCB : 37 x 22 x 13mm lead wire length : 300±10mm	
Weight	approx. 20g	
Vair (Vout in clean air at 20±2˚C/65±5%RH)	0.7 ~ 2.5v typical value = 1.5	
Sensitivity [Rs(H2 10ppm)/Rs(air)]	0.18 ~ 0.62 typical value = 0.4	

Dimensions

Tolerance of PCB : ±0.2



Unit/mm

Standard Test Conditions

Item	Test Condition
Temperature	20±2˚C
Humidity	65±5%RH
Test gas	Hydrogen > 99% purity
Test gas concentration	10ppm
Input voltage	5.0v DC ± 4%
Sensor preheating prior to test	≥24 hours in clean air
Test chamber capacity	≥ 1 liter per sensor

Notes:

Figaro recommends this product be used in conjunction with Figaro's special microprocessor (FIC93619A or FIC5603) when making an air quality control device.

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REV: 5/99

FIGARO

PRODUCT INFORMATION

TGS 2180 - water vapor detection for automatic control of microwave ovens

Features:

* Low power consumption
* High sensitivity to water vapor
* High temperature durability
* Long life and low cost
* Uses simple electrical circuit
* Small size

Applications:

* Automatic cooking control in microwave ovens

The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. The **TGS 2180** has relatively high sensitivity to water vapor and low sensitivity to organic vapors which may be generated from cooking food. The sensor's conductivity increases depending on absolute humidity. A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to absolute humidity.

Cooking condition can be detected by monitoring changes in sensor resistance ratio, whcih can be uniquely determined depending on the type of food, but independent from the food's weight. With quick response to water vapor and excellent durability in high temperature operation, TGS 2180 is an ideal sensor for automatic cooking time control in microwave ovens.

Due to miniaturization of the sensing chip, TGS 2180 requires a heater current of only 166mA and the device is housed in a standard plastic housing package.

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 in water vapor at various absolute humidities

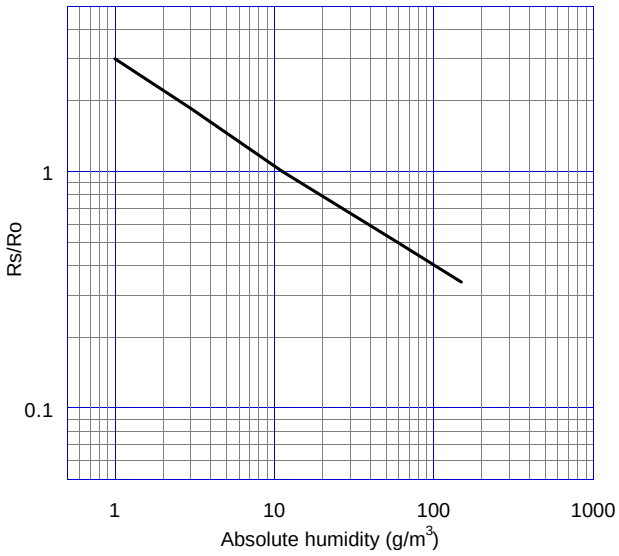
Ro = Sensor resistance in clean air at 11.2g/m^3 of absolute humidity (corresponding to 20˚C/65%RH)

The figure below represents sensitivity to various gases. Again, the Y-axis is indicated as *sensor resistance ratio* (Rs/Ro), defined as follows:

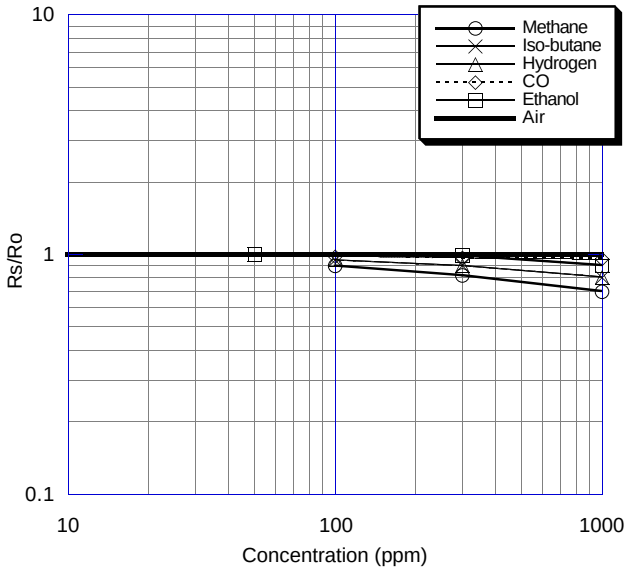
Rs = Sensor resistance in vaious concentrations of gases

Ro = Ro = Sensor resistance in clean air at 11.2g/m^3 of absolute humidity (corresponding to 20˚C/65%RH)

Sensitivity Characteristics to Water Vapor:

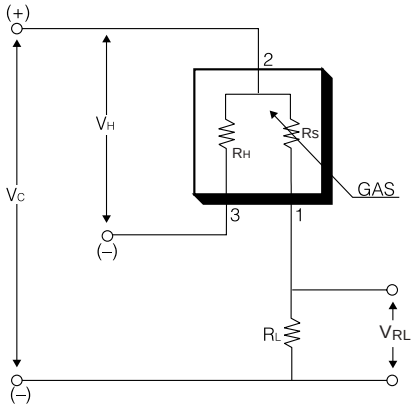


Sensitivity Characteristics to Various Gases:



Basic Measuring Circuit:

The sensor requires two voltage inputs: heater voltage (V_H) and circuit voltage (V_C). The heater voltage (V_H) is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Circuit voltage (V_C) is applied to allow measurement of voltage (Vout) across a load resistor (R_L) which is connected in series with the sensor. DC voltage is required for the circuit voltage since the sensor has a polarity. A common power supply circuit can be used for both V_C and V_H to fulfill the sensor's electrical requirements. The value of the load resistor (R_L) should be chosen to optimize the alarm threshold value, keeping power consumption (P_S) of the semiconductor below a limit of 15mW. Power consumption (P_S) will be highest when the value of Rs is equal to R_L on exposure to gas.



Specifications:

Model number			TGS 2180	
Sensing element type			S1	
Standard package			Plastic	
Target gases			Water vapor	
Typical detection range			1 ~ 150g/m³	
Standard circuit conditions	Heater voltage	V_H	5.0±0.2V DC/AC	
	Circuit voltage	V_C	5.0±0.2V DC	Ps ≤ 15mW
	Load resistance	R_L	Variable	0.45kΩ min.
Electrical characteristics under standard test conditions	Heater resistance	R_H	18±2Ω at room temp. (typical)	
	Heater current	I_H	166mA	
	Heater power consumption	P_H	830mW (typical)	
	Sensor resistance	Rs	23 ~ 145kΩ in air at 20˚C/65%RH	
	Sensitivity to water vapor (change ratio of Rs) *NOTE 1*		0.77 ~ 0.92	Rs air at 25˚C/68%RH / Rs air at 20˚C/65%RH
	Sensitivity to EtOH (change ratio of Rs)		0.83 ~ 1.11	Rs (300ppm EtOH) / Rs air
Standard test conditions	Test gas conditions		normal air at 20±2˚C, 65±5%RH	
	Circuit conditions		V_C = 5.0±0.05V DC V_H = 5.0±0.05V DC	
	Conditioning period before test		2 days	

NOTE 1: absolute humidity at 25˚C/68%RH = 15.6g/m³
absolute humidity at 20˚C/65%RH = 11.2g/m³

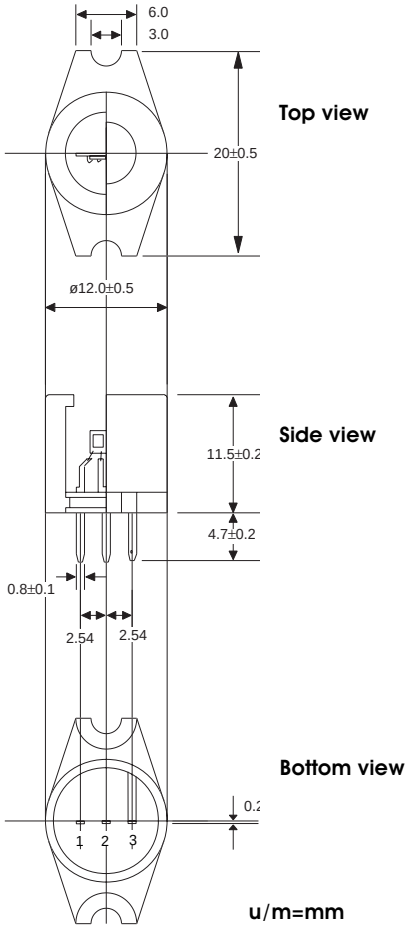
The value of power consumption (P_S) can be calculated by utilizing the following formula:

$$P_S = \frac{(V_C - Vout)^2}{R_S}$$

Sensor resistance (Rs) is calculated with a measured value of Vout by using the following formula:

$$R_S = \frac{V_C \times R_L}{Vout} - R_L$$

Structure and Dimensions:



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

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REV: 04/04