TGS 4161 - for the detection of Carbon Dioxide

Features:

* **High selectivity to CO_2**
* **Compact size**
* **Low dependency on humidity**
* **Long life and low cost**
* **Low power consumption**

Applications:

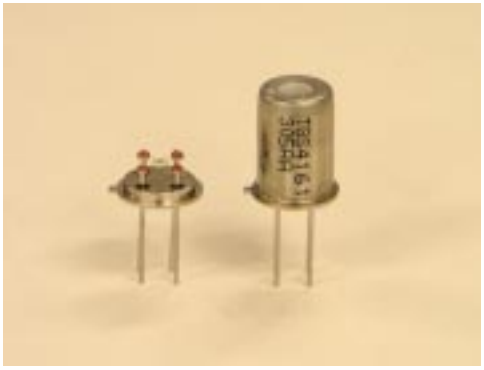
* **Indoor air quality control**
* **CO_2 monitors**

TGS4161 is a new solid electrolyte CO_2 sensor which offers miniaturization and low power consumption. A range of 350~10,000ppm of carbon dioxide can be detected by TGS4161, making it ideal for indoor air control applications.

The CO_2 sensitive element consists of a solid electrolyte formed between two electrodes, together with a printed heater (RuO_2) substrate. By monitoring the change in electromotive force (EMF) generated between the two electrodes, it is possible to measure CO_2 gas concentration.

The top of the sensor cap contains adsorbent (zeolite) for the purpose of reducing the influence of interference gases.

TGS4161 exhibits a linear relationship between ΔEMF and CO_2 gas concentration on a logarithmic scale. The sensor displays good long term stability and shows excellent durability against the effects of high humidity.



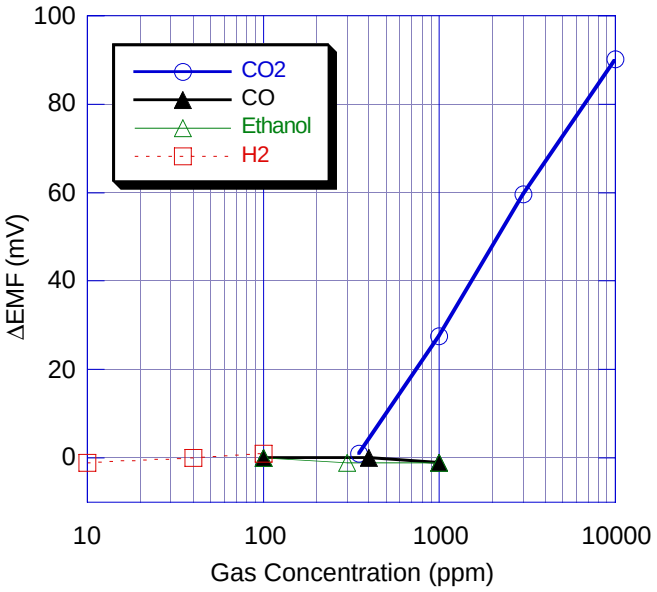
The figure below represents typical sensitivity characteristics of TGS4161. The Y-axis is indicated as ΔEMF which is defined as follows:

ΔEMF=EMF1 - EMF2
where
EMF1=EMF in 350 ppm CO_2
EMF2=EMF in listed gas concentration

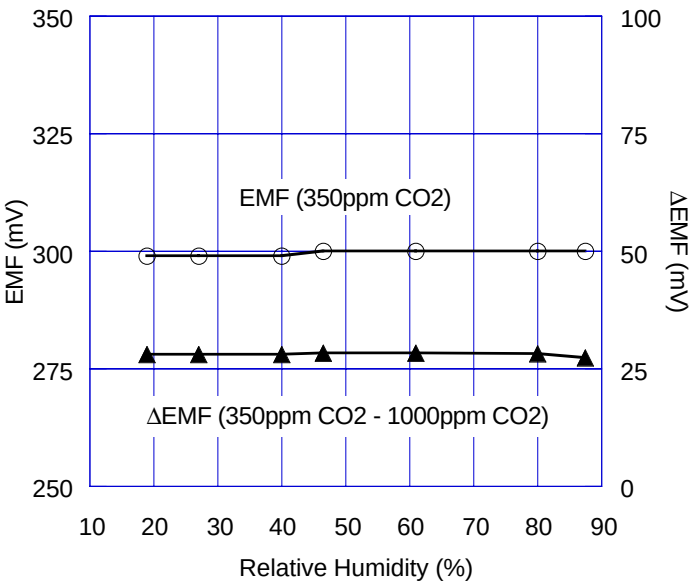
The figure below shows typical humidity dependency of TGS4161. Again, the Y-axis is indicated as ΔEMF which is defined as follows:

ΔEMF=EMF1 - EMF2
where
EMF1=EMF in 350 ppm CO_2
EMF2=EMF in 1000ppm CO_2

Sensitivity Characteristics:

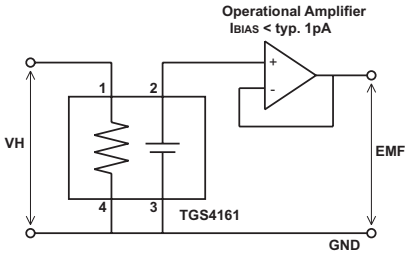


Humidity Dependency:



Basic Measuring Circuit:

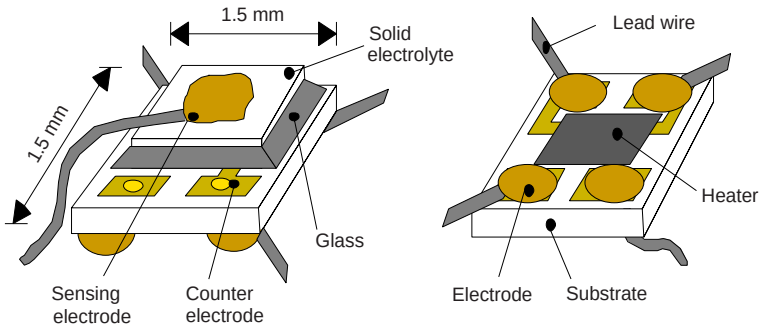
The TGS4161 sensor requires heater voltage (V_H) input. The heater voltage is applied to the integrated heater in order to maintain the sensing element at a specific temperature which is optimal for sensing. Electromotive force (EMF) of the sensor should be measured using a high impedance (>100 GΩ) operational amplifier with bias current < 1pA (e.g. Texas Instruments' model #TLC271). Since the solid electrolyte type sensor functions as a kind of battery, the EMF value itself would drift using this basic measuring circuit. However, the change of EMF value (ΔEMF) shows a stable relationship with the change of CO_2 concentration. Therefore, in order to obtain an accurate measurement of CO_2, a special microprocessor for signal processing should be used with TGS4161. Figaro can provide a special evaluation sensor module (AM-4-4161) for TGS4161.



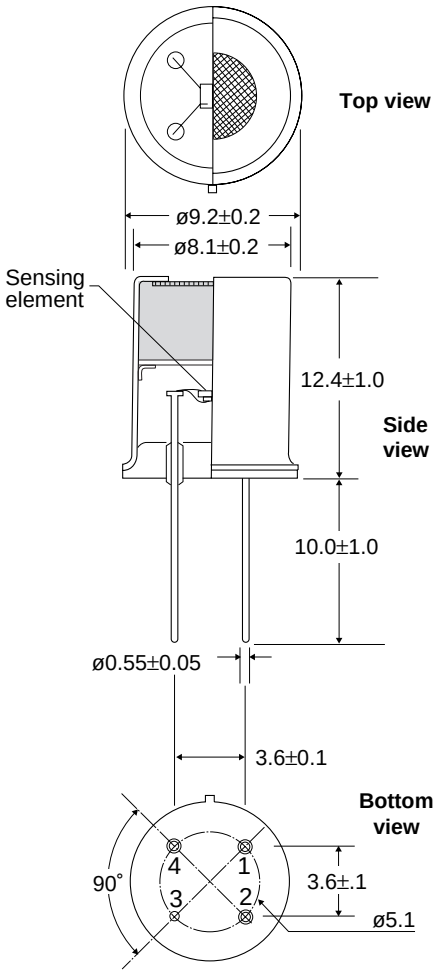
Specifications:

Model number			TGS 4161	
Sensing element type			Solid electrolyte	
Target gases			Carbon dioxide	
Typical detection range			350 ~ 10,000 ppm	
Electrical characteristics	Heater resistance	R_H	70 ± 7Ω at room temp.	
	Heater current	I_H	approx. 50mA	
	Heater power consumption	P_H	approx. 250mW	
	Electromotive force	EMF	220~490mV in 350ppm CO_2	
	Sensitivity	ΔEMF	44~72mV	EMF(350ppm CO_2)-EMF(3500ppm CO_2)
	Heater voltage	V_H	5.0 ± 0.2V (DC)	
Sensor characteristics	Response time		approx. 1.5 min. (to 90% of final ΔEMF value)	
	Measurement accuracy		approx. ±20% at 1,000ppm CO_2	
Operating conditions			-10~50˚C, 5~95%RH	
Strorage conditions			-20~60˚C, 5~90%RH **(store in moisture proof bag with silica gel)**	
Standard test conditions	Test gas condition		CO_2 in air at 20±2˚C, 65±5%RH	
	Circuit condition		V_H = 5.0±0.05V DC	
	Conditioning period before test		12 hours or longer	

Sensing Element Structure:



Structure and Dimensions:



Pin Connection:
1. Heater (+)
2. Counter electrode (+)
3. Sensing electrode (-)
4. Heater (-)

u/m = mm