AIME-GSWO3

Low energy semiconductor gas sensor based on WO_3 nanorods particles

FEATURES

- Detection of Ammonia NH_3, Nitrogen Dioxide NO_2 and Ethanol C_2H_6O
- Two integrated gas sensors
- Temperature sensor
- Thermal resistor
- Low cost
- Low energy consumption
- Easy to use

DESCRIPTION

The AIME-GSWO3 is a semiconductor gas sensor developed by INSA Toulouse students for their 5th year in Innovative Smart System (ISS). It was made in the AIME's labs. This gas sensor uses Tungsten Trioxide WO_3 nanorods particles. It is composed of two sensitive active sides, a wide N-doped Poly-Silicium layer to heat the sensor up to 300°C and an aluminum resistor layer to measure the temperature of the sensor.

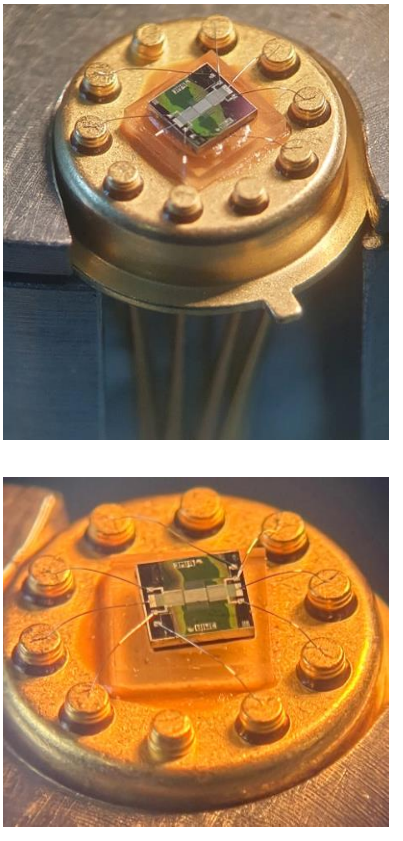

Fig 1: AIME-GSWO3

PIN LAYOUT

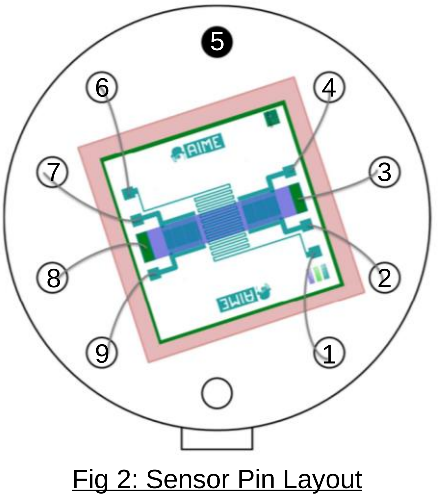

Fig 2: Sensor Pin Layout

Pin number	Function
1 – 6	Temperature sensor (Aluminum resistor)
2 – 4	Gas sensor #1
3 – 8	Thermal resistor (Polysilicon resistor)
7 – 9	Gas sensor #2
5	NC
10	NC

GENERAL CHARACTERISTICS

Type	Chemical sensor
Materials	• Silicon • N-doped poly-silicon (heater) • Aluminum (temperature measurements) • Nanoparticles of Tungsten Trioxide (WO_3)
Sensor Type	Active (power supply required)
Gas Measurement	Resistive measure
Temperature Measurement	Resistive measure
Detectable Gases	• Alcohols (-OH) • Ammonia (NH_3) • Carbon Monoxide (CO) • Dihydrogen (H_2) • Ethanol (C_2H_60) • Hydrogen Sulfide (SO_2) • Methane (CH_4) • Nitrogen Dioxide (NO_2)
Typical Detection Range	> 1 ppm
Package	TO-5-10 (10 pins)
Head Diameter	9.5 mm
Head Height	4.7 mm
Package Height	25 mm
Pin Diameter	0.6 mm
Mounting	Through hole fixed (THT)

GAS SENSOR CHARACTERISTICS

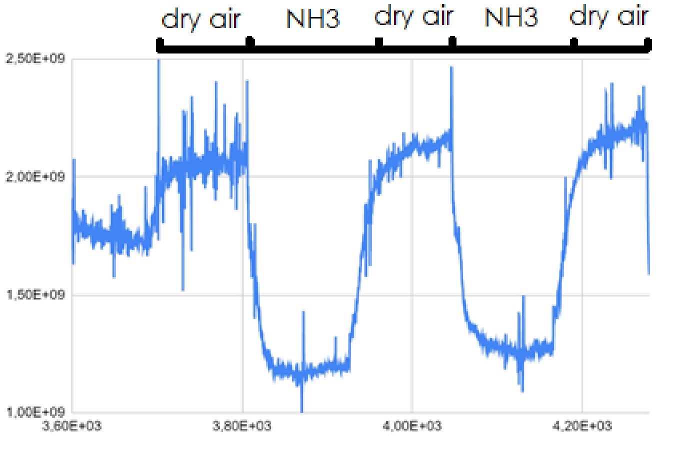

Fig 3:

ELECTRICAL CHARACTERISTICS

		Units	Values		
			Min	Typical	Max
Resistance	Gas Sensor	GΩ	0.01	1	100
	Temperature Sensor	Ω	57	65	-
	Heater	Ω	70	85	-
Voltage	Gas Sensor	V	-	3.3	-
	Temperature Sensor	V	3.3	5	-
	Heater	V	10	15	20

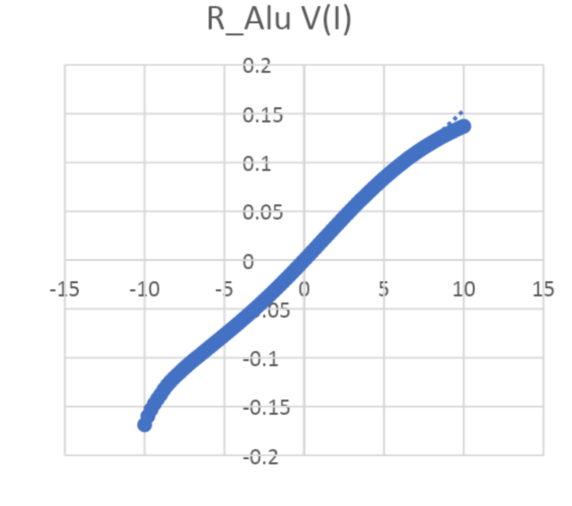

Fig 4: Current/Voltage characteristics of the Aluminum resistor at 20°C

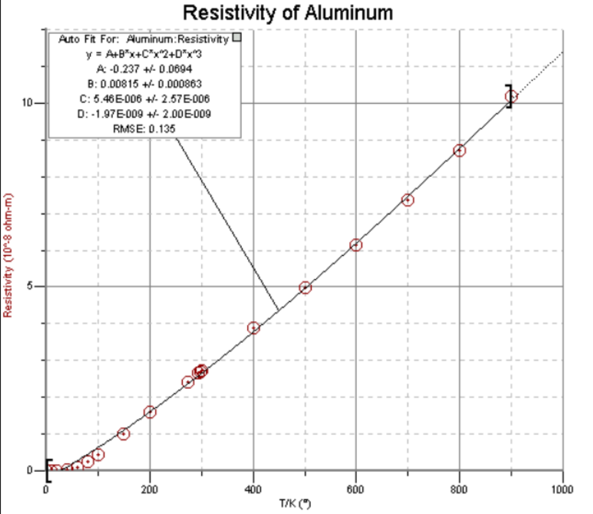

Fig 5: Resistivity of Aluminum, Val Polyakov - 2004

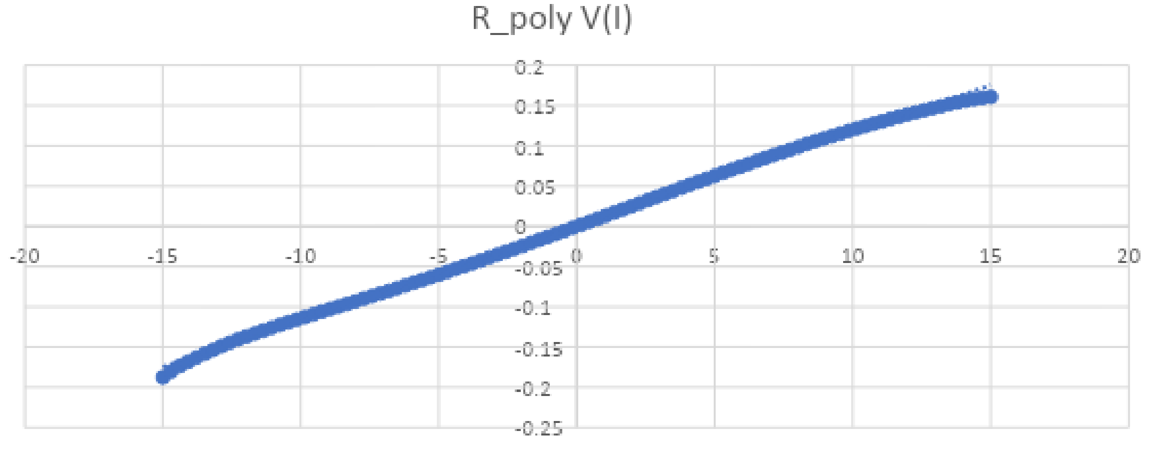

Fig 6: Current/Voltage characteristics of the Poly-silicon resistor at 20°C

CONFIGURATION

The package is a 10-Lead TO-5 metal :

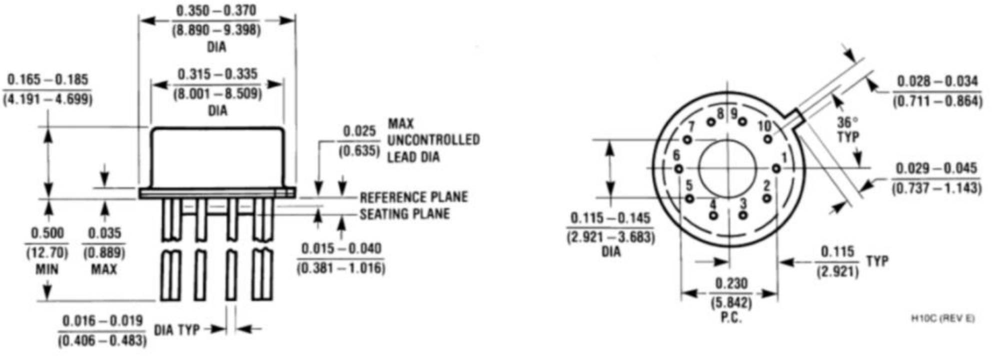

Fig 7: Package configuration

APPLICATION

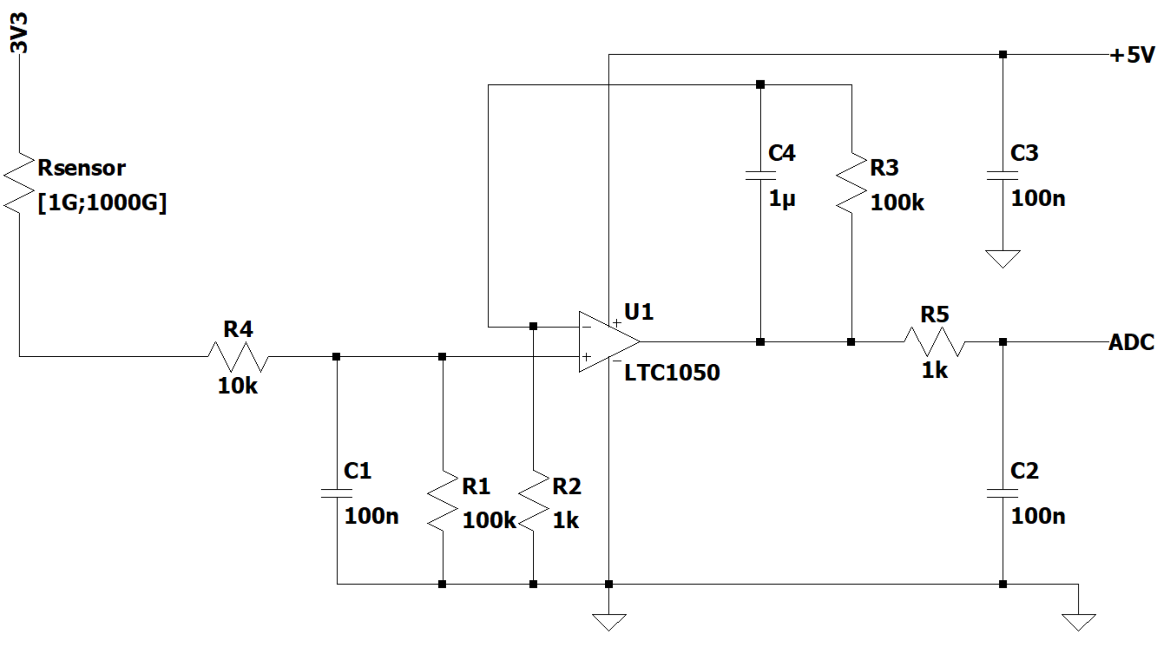

Fig 8: Application example

The resistance of the sensor has a magnitude of Giga Ohm. This means that a voltage divider is not efficient to measure the voltage. The figure shown above shows a circuit that uses an operational amplifier with a low offset voltage Therefore, it is possible to convert the current of the sensor into its resistance using the following formula :

$$R_{sensor} = \left(1 + \frac{R_3}{R_2}\right) \bullet R_1 \bullet \frac{Vcc}{V_{adc}} - R1 - R5$$