Gas Sensor
DATASHEET
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INSA Toulouse

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INNOVATIVE SMART SYSTEMS

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1 Features

- Highly sensitive to NH3 (Ammonia)
- Low-sensitive to C2H60 (Ethanol)

2 Applications

Domains: *medicine, automobile, food industry, etc.*

This gas sensor fits for:

- NH3 detection (for fertiliser manufacture and industrial refrigeration for instance)
- Detection of Ethanol vapour (for ethanol vapour measurement during the process of alcoholic fermentation for instance)

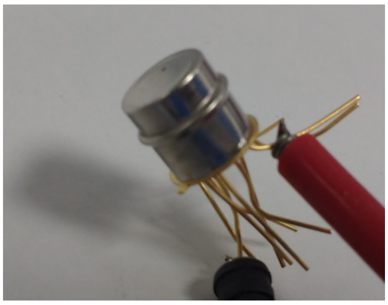

Figure 1: Our sensor with its protective cap

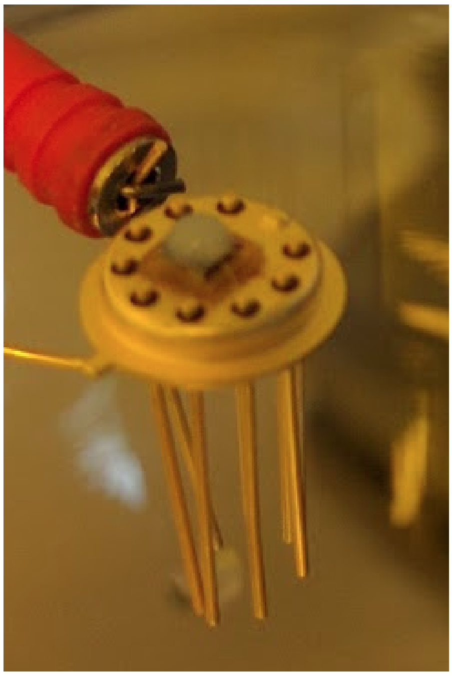

Figure 2: Our sensor without its protective cap (phase of addition of nano-particles)

The sensor is formed on a metal oxide semiconductor layer where the sensible element has been polarized by the use of WO_3 nano particles. There is one poly-silicon heating resistance, and one aluminium resistance to measure the temperature. The sensible element works as a resistance, and the conductivity will change according to the presence of different gases. By using a simple conditioner circuit, the electrical signal can be amplified so that it is readable to a microcontroller.

3 Basic signal conditioner circuit

This circuit can be used to amplify the signal so that the values can be read by a microcontroller. Gas sensor should be connected to the plus side of one of the two sensors.

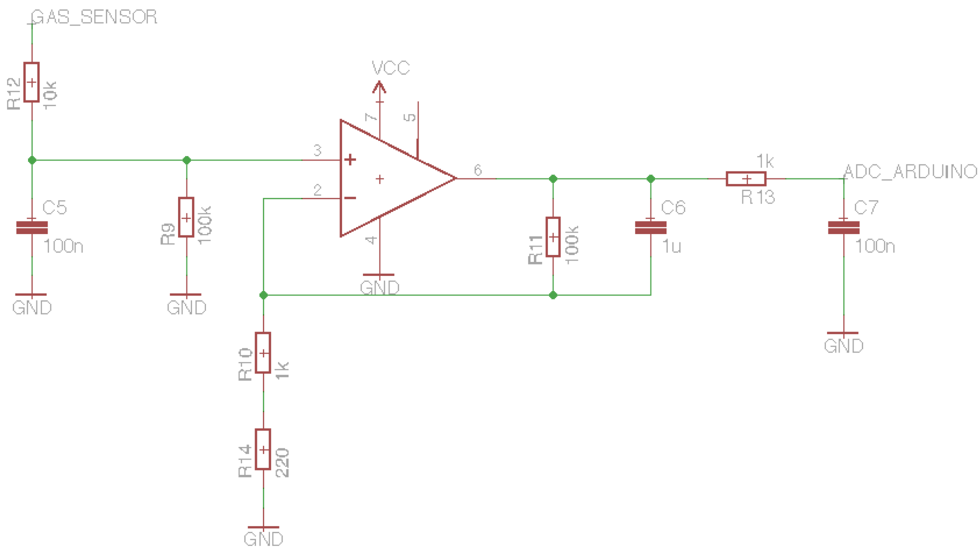

Figure 3: Circuit diagram

4 Pin configuration

Our gas sensor structure is composed of 10 pins, whose two are unused.

- 2 pins (2 & 7) are dedicated to powering the aluminium resistance.
- 2 pins (4 & 9) are dedicated to powering the polysilicium resistance.
- 4 pins (3 & 5 - 8 & 10) are dedicated to powering the 2 sets of nano-particles combs.

Figure 4 schematizes this configuration and Figure 5 lists the role of each pin.

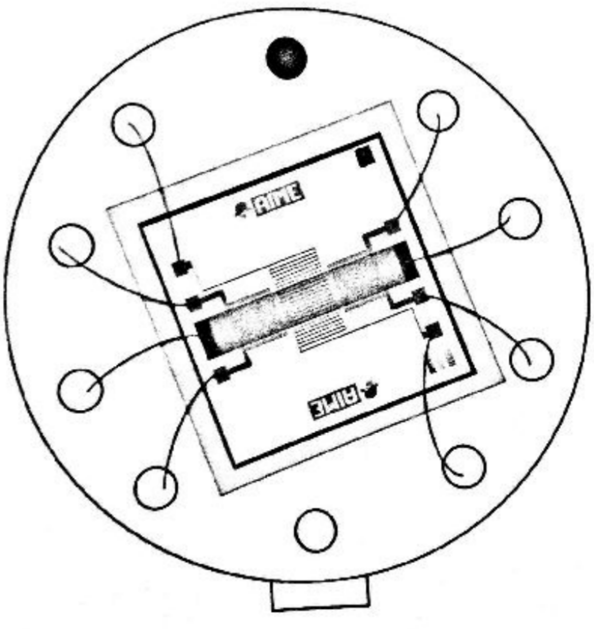

Figure 4: Schema of our pin configuration

1	N.C
2	Alu left
3	Sensor 1 +
4	Resistance left
5	Sensor 1 -
6	N.C
7	Alu right
8	Sensor 2 -
9	Resistance right
10	Sensor 2 +

Figure 5: Table of sensor pins

5 Specifications

Each of three resistances that compose our gas sensor need to be powered within the range we specify for a correct functioning. The maximum tensions to be applied to each resistance are provided in Figure 6.

Max tension	Heating resistance	$\pm 15V$
	Aluminium resistance	$\pm 10V$
	Sensor element	$\pm 20V$

Figure 6: Table of maximum tensions for each resistance

6 Structure and Dimension

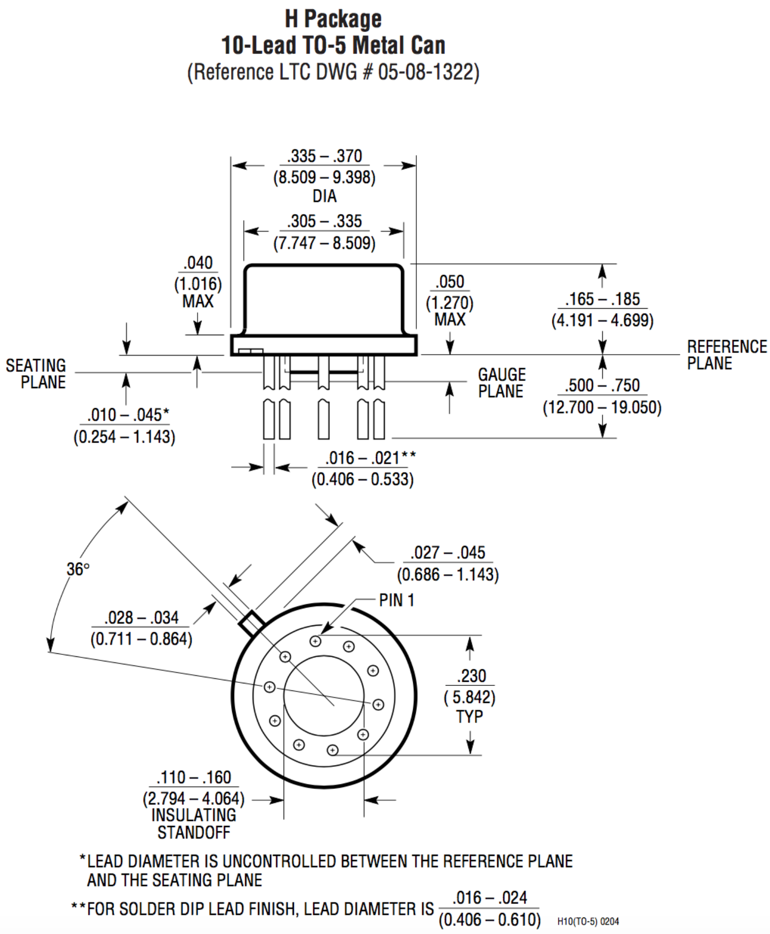

Figure 7: Dimension diagrams

7 Characterisation of the different elements

The resistivity of each part of our gas sensor was measured and the three figures below present the results.

- Figure 8 shows the resistivity of the aluminium resistance
- Figure 9 shows the resistivity of the polysilicium
- Figure 10 shows the resistivity of the nano-particles combs

All measures were done at ambient temperature (21C)

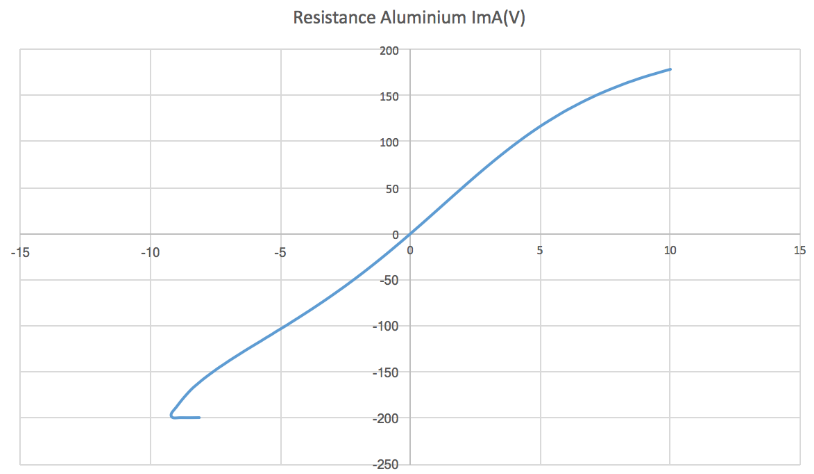

Figure 8: Measurement of the aluminium resistance.

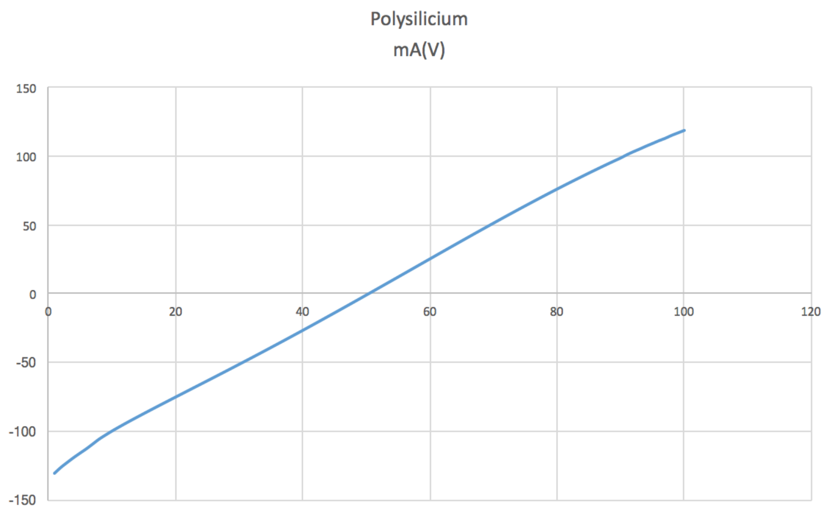

Figure 9: Measurement of the resistance of the polysilicium.

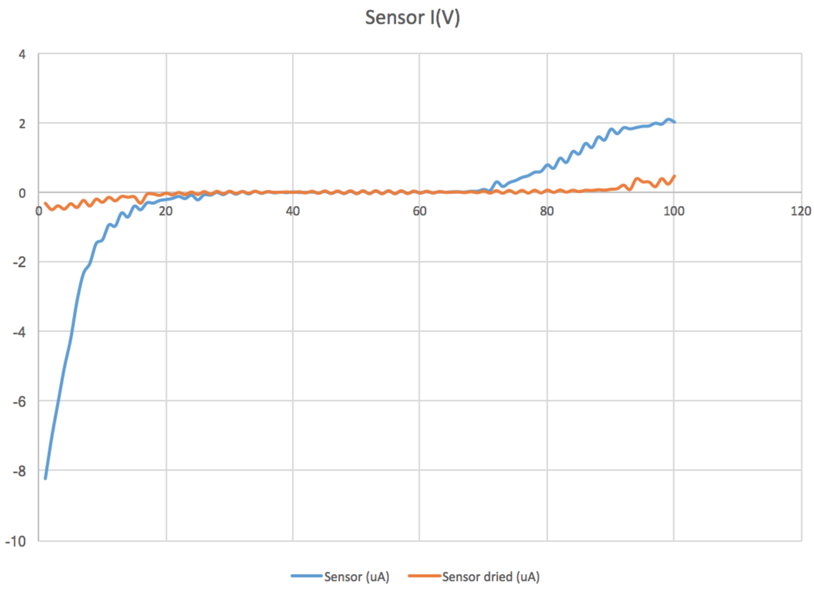

Figure 10: Measurement of the behavior of the nano-particles sensor.

8 Tests and gas sensor responses

This gas sensor has been tested in different atmospheres to check its behaviour. Figure 11 shows the evolution of its resistance in function of time, and with different changes in the air composition. Figure 12 lists this changes.

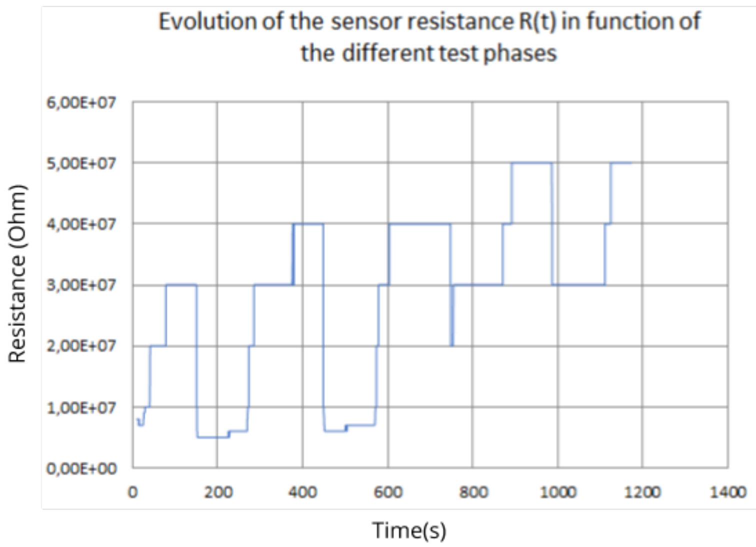

Figure 11: R(t), gas sensor response to the battery of tests.

1	15 sec	Initialisation
2	2 min	Dry air
3	2 min	Ethanol 1000 ppm
4	2 min	Dry air
5	2 min	Ethanol 1000 ppm
6	2 min	Dry air
7	2 min	NH3 1000 ppm
8	2 min	Dry air
9	2 min	NH3 1000 ppm
10	2 min	Dry air

Figure 12: Table of test stages