J & M Co.

Technical Datasheet

GSS-250 Graphite Strain Sensor

1. General Description

This low-tech sensor is made by the students from the Physics Department of INSA Toulouse according to the paper Pencil Drawn Strain Gauges and Chemiresistors on Paper[1]. It was made using pencils so that layers of graphite could be deposed on top of a paper.

By deforming the sensor, the distance between graphite particles is changed, inducing a variation in resistance or conductance, depending of the type of deformation. This property allows purchasers to use the product as a traditional strain gauges.

In order to analyze the signal emitting from the senor, a transimpedance amplifier should be added to the system.

Name	GSS-250
Type	Passive Sensor
Materials	Graphite & Paper
Measurand	Resistance
Application	Strain Gauges

2. Key Features

- Low power consumption (3.3V => 5V)

- Sustainable component

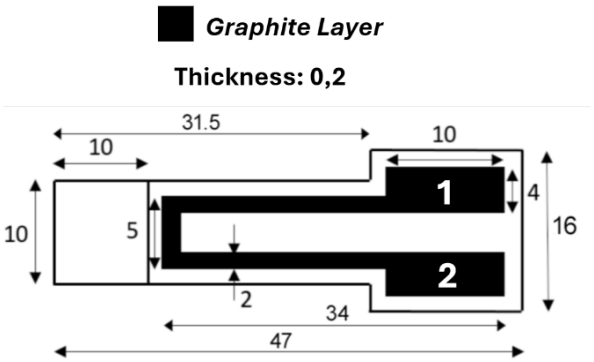
- Low cost

- Plug & Use

- Easily repairable and replaceable

[1] Lin, C.-W., Zhao, Z., Kim, J. & Huang, J. Pencil Drawn Strain Gauges and Chemiresistors on Paper.Sci.Rep. 4, 3812; DOI:10.1038/srep03812 (2014)

3. Dimensional diagram



Pin number	Typical voltage
1	V_{in}
2	$+V_{cc}$*

Vcc is typically a +5V voltage.

Fig.1 Top view of sensor-Dimensions (mm)

4. Technical Specifications

Parameter	Unit	Value		
		Min	Typical	Max
Power Supply	V	3.0	5.0	7.0
F	MΩ	448	1547	2929
HB	MΩ	0.25	132	197
B	MΩ	130	840	1390

6. Ratings

- Total supply voltage……5V

- Temperature……..10°C to 30°C

- Humidity of air……30% to 60%

- Life cycle……6 to 10 usages

- Paper thickness……0.2 mm

- Pencil tone……..4B to 2H

5. Technical performances

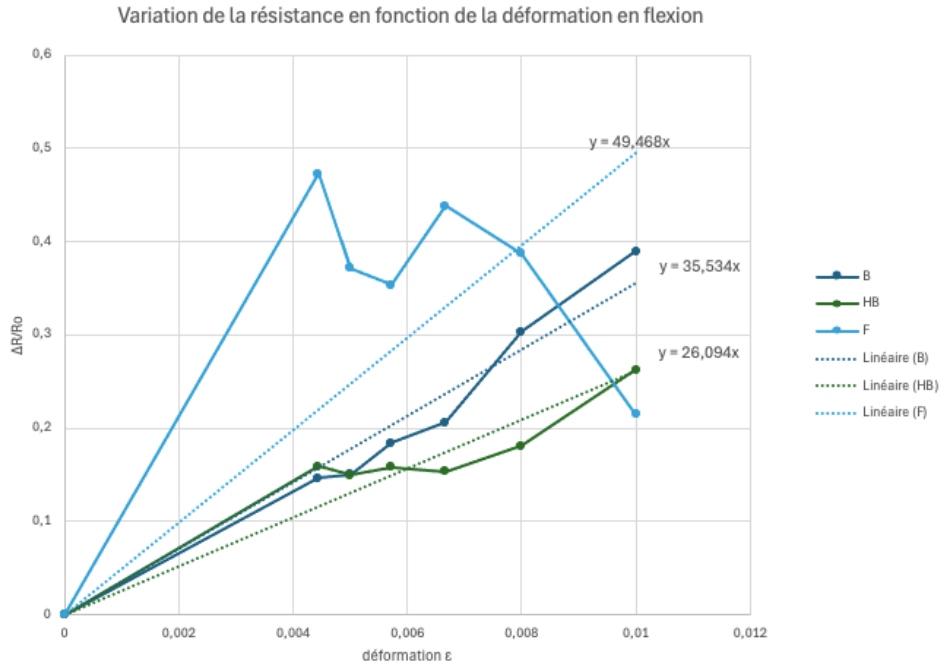


Fig.2 Characteristics in tension

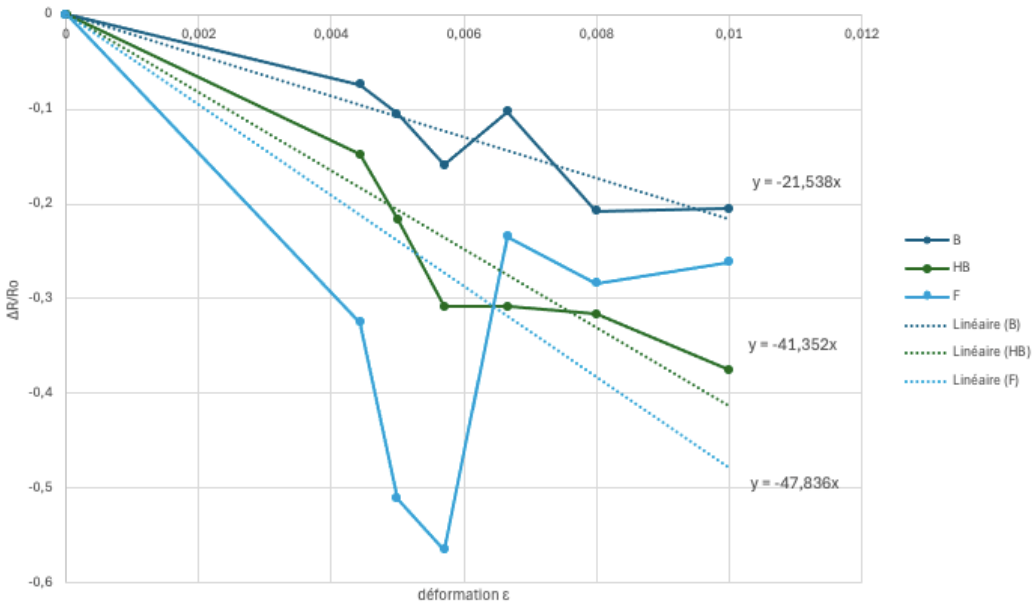


Fig.3 Characteristics in compression

7. Typical Applications

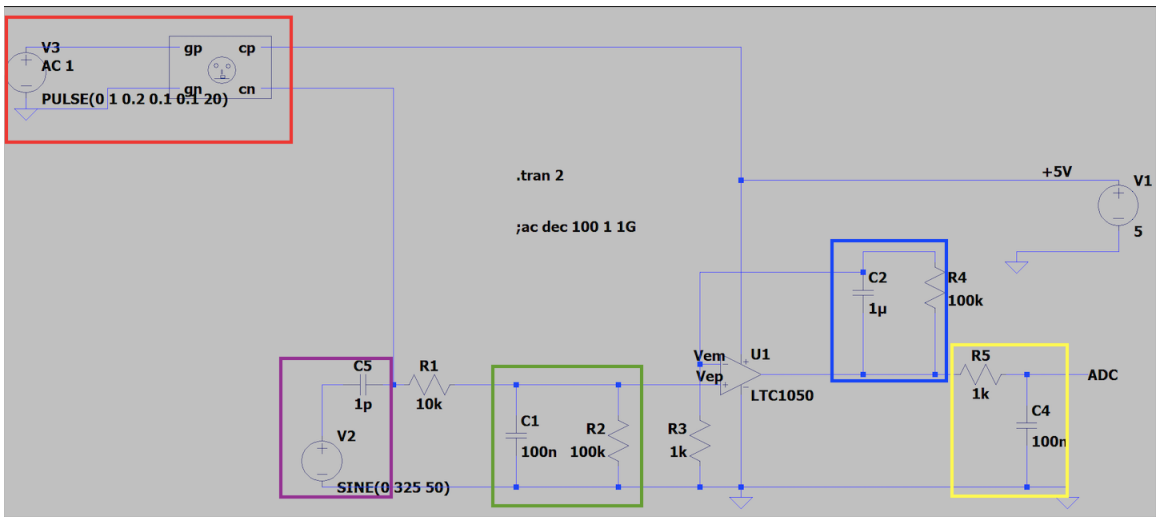


Fig.4 Transimpedance amplifier circuit

The product is connected to an additional amplifier circuit equivalent to a low pass filter that cancels the noise due to the amplification, the current, and the 50Hz waves effects on the signal.

The signal coming from the amplifier circuit can be transmitted to the ADC pin of an Arduino board without saturating it. The R3 resistance can be replaced by a variable one in order to fit the amplification of the circuit for each pencil tone. The global resistance of the resulting circuit using the GSS-250 is known thanks to the following formula :

$$Res = R2 * (1 + \frac{R4}{R3}) * (\frac{Vcc}{Vadc}) - R2 - R1$$