Sensors

🏆 A.1.4 Learning Activity

Objective

Make a temperature measuring sensor through an electronic circuit, using a simulator, and an temperature linear **Transistor TMP36** and an **operational amplifier LM741**.
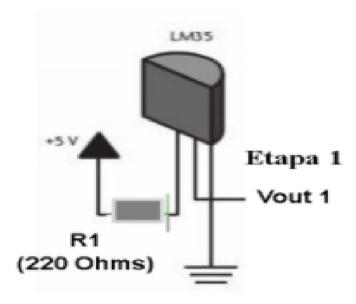
✏️ Development

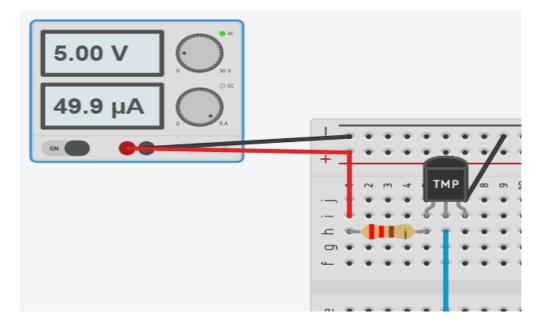1. Use the following list of materials for the elaboration of the activity

Quantity	Description	Reference source
1	Temperature sensor TMP36	Temperature sensor
1	potentiometer 10k	potentiometer
2	resistance of 220 ohms	resistance
1	Amplificador LM741	Amplificador
1	Power supply of 5 Volts.	Power supply

   For more information access the following links:

   - Information and Specifications Sensor TMP36
   - Information and Specifications Opertional Amplifier LM741

2. Based on the image assemble using a simulator the stage 1 electronic circuit, Placing the LM35 in the indicated position.
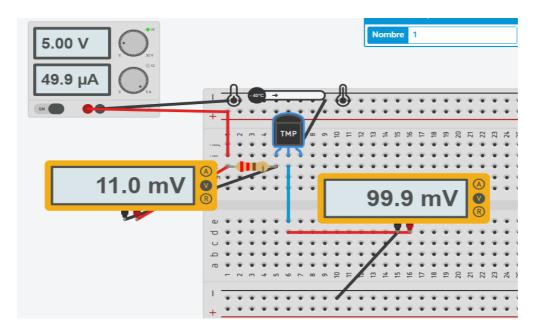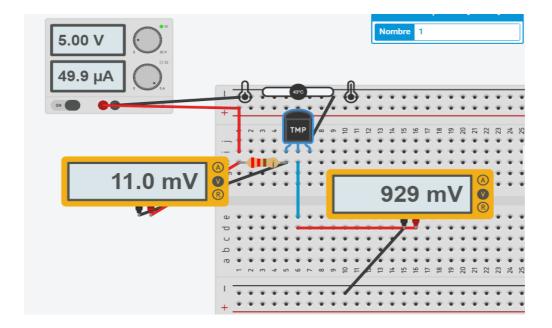

- simulated circuit

3. Calculate, measure and record the requested values for Vout1, under the three specified conditions required in the attached table.

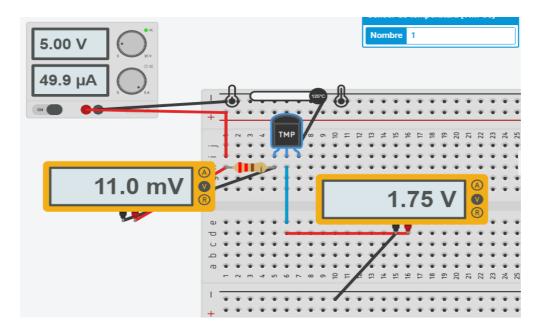| Number	Condition	Voltage Vout1 medium	Voltage in R1 medium	indicated temperature
1	Mínimum	99.9 mV	11 mV	-40 C°
2	Medium	929 mV	11 mV	42 C°
3	Máximum	1.75 V	11 mV	125 C°

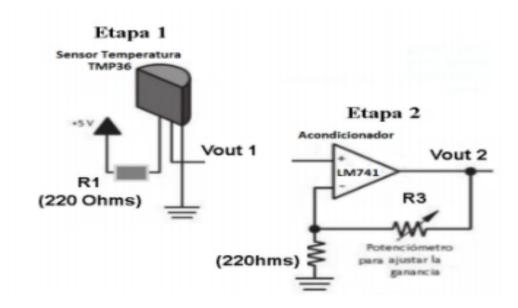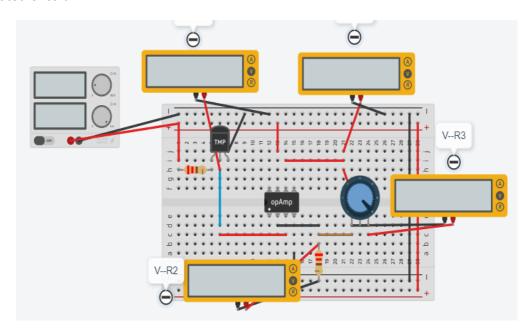- Measurement at minimum condition

- Measurement at medium condition

- Measurement at maximum condition

4. Using the image of the TMP36 transistor from the stage 1, Conect the Vout 1 terminal to non inverting terminal of LM741, and assemble the circuit corresponding to the stage 2.

- simulated circuit

5. **what value should have R3 in the stage 2 circuit, to get Vout2 = 3.3 volts,** for the maximum codition of temperature that the sensor is capable of detecting? as you can see the resistence R3 corresponds to a potentiometer,however resistor arrangments can be made to achive fine tuning. what do you think is the reason for requesting an **adjustment to 3.3 Volts**?

We belive that the reason for that value is because is a standardized value useful for a lot of diferent devices and sensors
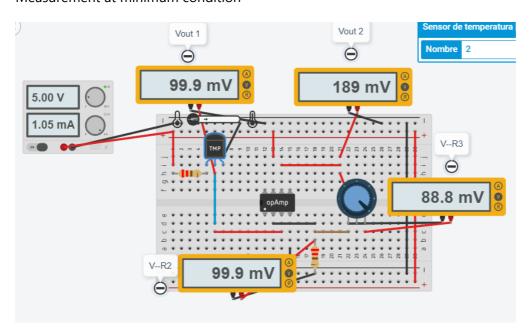
Using the cleared formula of an operational amplificator: R2 = [(Vsal/Vent) - 1] * R1, in this case R2 would be R3 and R1 would be R2

- Calculation for the Maximum Condition
  - R3 = [(Vsal/Vent) - 1] * R2
  - R3 = [(3.3 V/ 1.75V) - 1] * 220 ohms
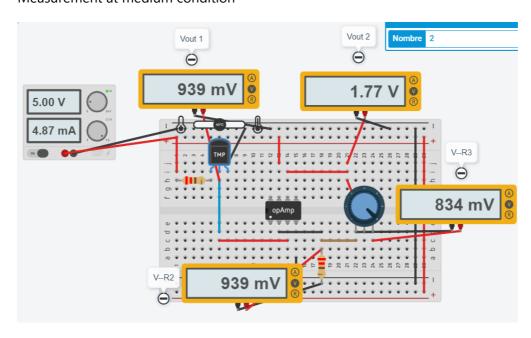 - R3 = 195 ohms

6. Once you have adjust the value of R3 leave it like that and record the requested values for Vout2, for the 3 conditions requested in the following table.

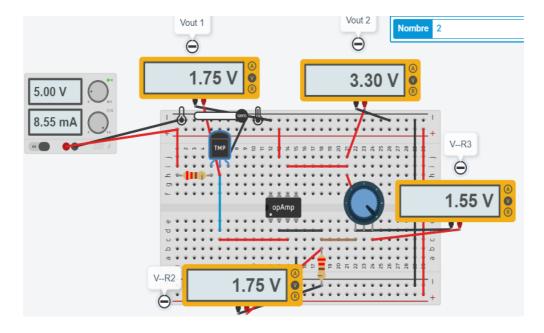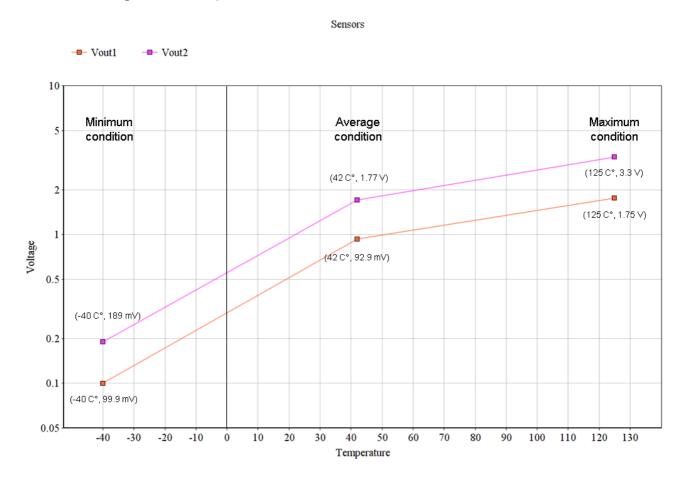| Number	Condition	Voltage in measured R2	Voltage in measured Vout2	Indicated temperature
1	minimum condition	99.9 mV	189 mV	-40 C°
2	medium condition	939 mV	1.77 V	42 C°
3	maximum condition	1.75 V	3.3 V	125 C°

- Measurement at minimum condition

- Measurement at medium condition

- Measurement at maximum condition

7. Plot Vout1 and Vout2 for the three conditions above, Considering in "X" the temperature values and in "Y" the voltage values, and place inside this section.

8. Conclusions

David: Due to the results of observe during the cirucuit we can conclude that as regards of the temperature sensor the higher the temperature it is exposed to, the lower his resistence is gonna be

Axel: To conclude this practice I can say that the use of this sensor allows us to have a measurement of the temperature of our environment, when a temperature is low this sensor throws us a low voltage, and when the temperature is higher, gives us a higher voltage value, and using the array of resistors with the operational amplifier we can make the output voltage 3.3V

Emmanuel: In conclusion, the temperature sensor as its name says helps us to measure temperature and we can demonstrate it according to the previous practice, since when the temperature increased, the voltage also increased and when the temperature decreased, the voltage decreased.

Oscar: With the temperature sensor we can read low voltage output when the sensor detects low temperatura, otherwise when it detects high temperature the output is a higher voltage, combined with the operational amplifier we can have limit the voltage output and have the same beahavior.

Repositories

Axel Go to my repository

David Go to my repository

Emmanuel Go to my repository

Oscar Rojas Got to my repository