A.1.4 Learning Activity

Objective

Carry out a temperature measuring sensor through an electronic circuit, using a simulator, and a **TMP36** linear temperature transistor and an **LM741** operational amplifier.

Development

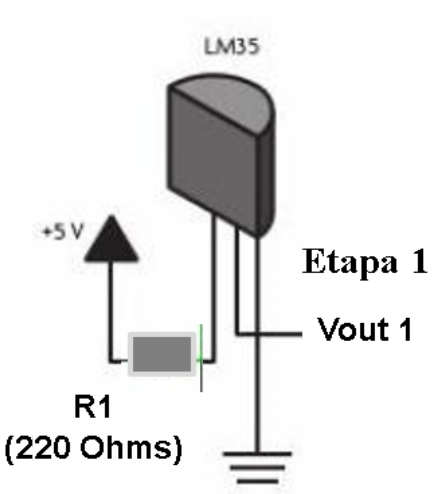
1. Use the following list of materials to prepare the activity

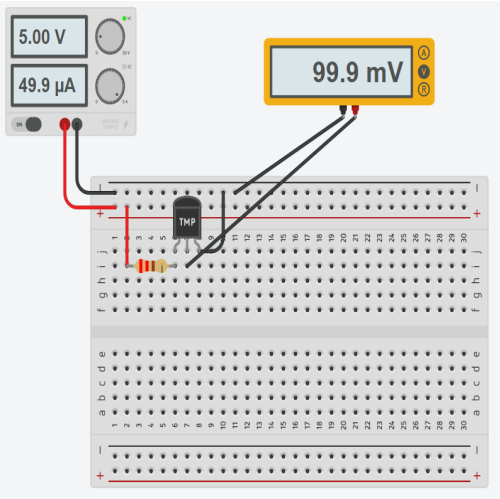
Quantity	Description	Reference source
1	Temperature sensor TMP36	geekbotelectronics
1	10k Potentiometer	tecnopura
2	220 ohm resistors	mvelectronica, tostatronic
1	LM741 Amplifier	carrod
1	5Volts power supply	uelectronics

   For more information access the following links:

   - Information and specifications of Sensor TMP36
   - Information and specifications of the LM741 operational amplifier

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

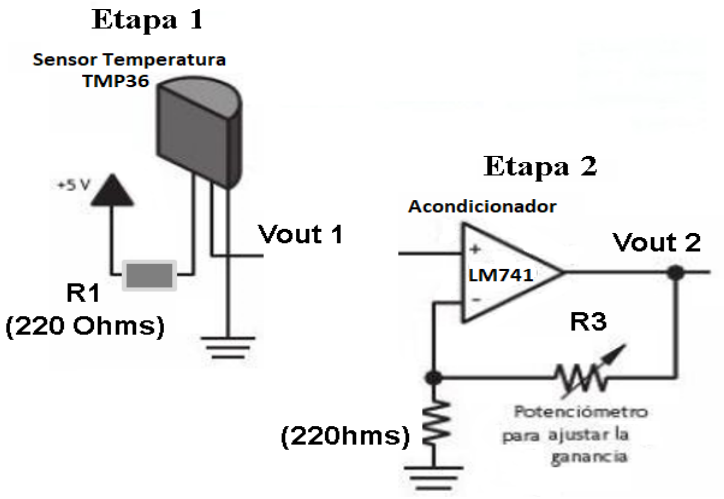




3. Calculate, measure and record the requested values for Vout1, under the 3 conditions required in the attached table.

Number	Condition	Voltage Vout1 measured	Voltage at R1 measured	Indicated temperature
1	Minimum	99.9mV	11mV	-40C
2	Medium	939mV	11mV	43C
3	Maximum	1.75V	11mV	125C

4. Using the image of the TMP36 transistor corresponding to stage 1, connect the Vout1 terminal to the non-inverting terminal of the LM741, and assemble the circuit corresponding to stage 2.

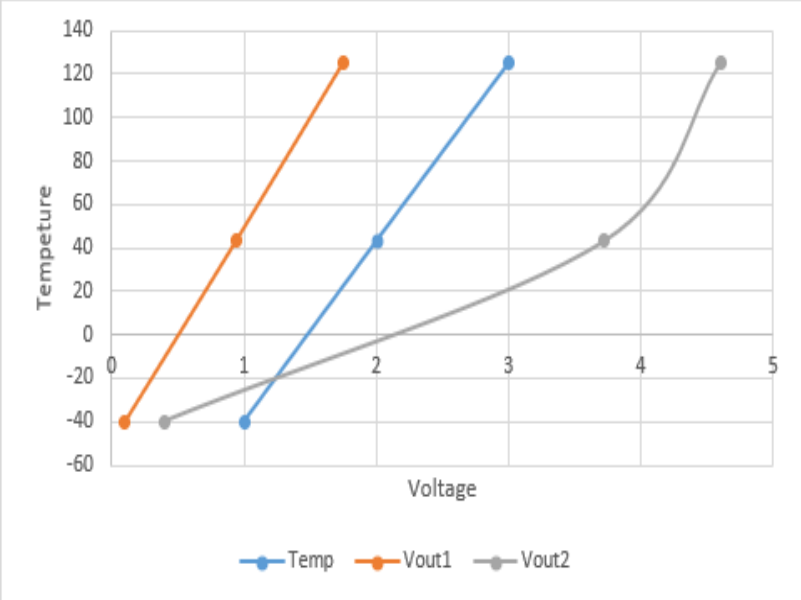


5. **What value should R3 have in the Stage 2 circuit, to obtain Vout2 = 3.3 volts,** for the maximum temperature condition that the sensor is capable of detecting? As can be seen, the resistance R3 corresponds to a potentiometer, however, resistance arrangements can be made to achieve a fine adjustment. What do you think is the reason why you are requesting a **3.3 Volt setting**?

6. Once the R3 value has been adjusted, leave it like that and record the requested values for Vout2, for the 3 required conditions in the attached table..

Number	Condition	Voltage at R2 measured	Voltage in Vout2 measured	Indicated temperature
1	Minimum condition	100mV	396mV	-40C
2	Medium condition	940mV	3.72V	43C
3	Maximum condition	1.16V	4.60V	125C

7. Graph Vout1 and Vout2, for the three previous conditions, considering in "X" the temperature values and for "Y" the voltage values, and place inside this section.



8. Conclusions

Nelly Quino

TMP36 is a precise sensor, it is easy to generate an analog signal that is directly proportional to temperature. Because it use the fact as temperature increases, the voltage across a diode increases at a known rate. Due to that, we use it when want to receive an alert because the temperature has reached an minimum or maximum temperature depend on the necessity of the system we monitor.

José Guzmán

The TMP36 sensor is a sensor with a transistor-like package and also has 3 pins. The TMP36 sensor allows us to measure the temperature, in an operating range from -40 ° C to 150 ° C. This sensor is not particularly accurate,

but usually for simple projects as it is very inexpensive and easy to connect.

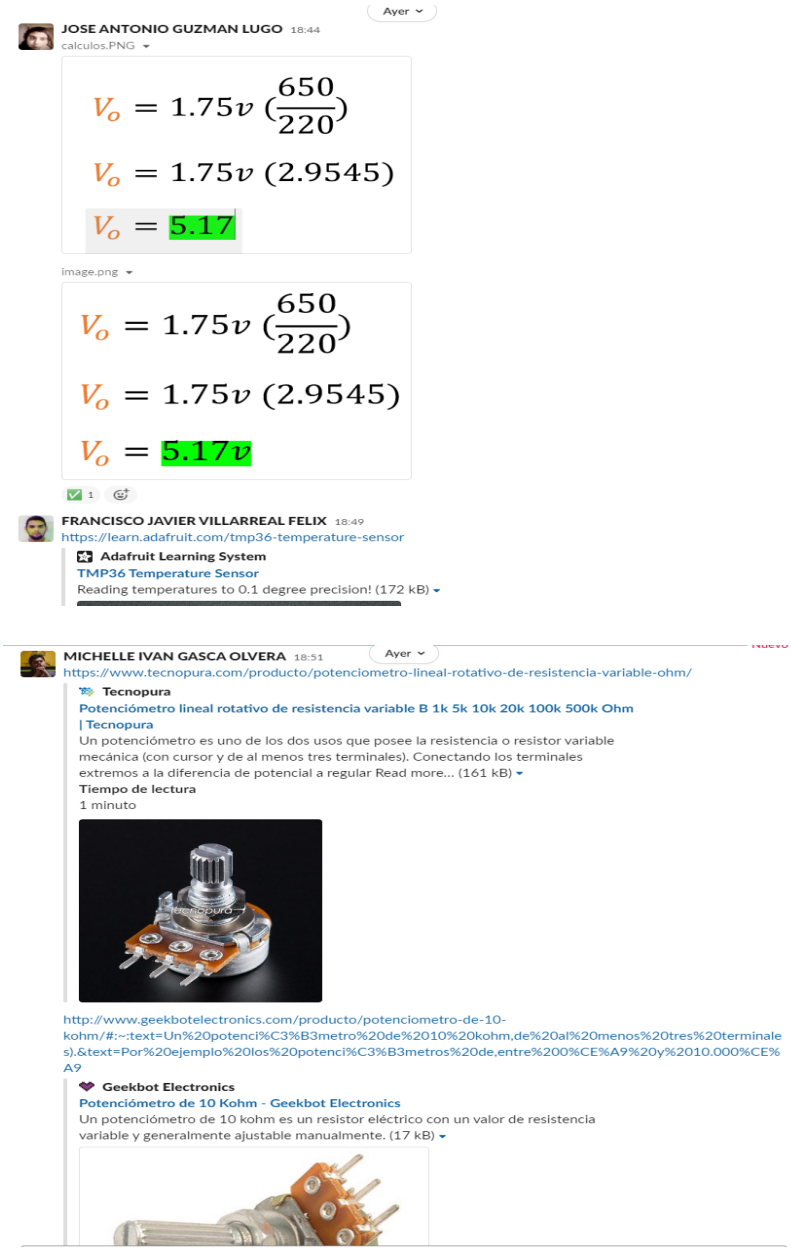
📷 Michelle Gasca

When conducting this investigation and circuit assembly in Tinkercad, we observed that the TMP36 sensor is very easy to use, since it only needs to be connected to ground, with a voltage between 2.7 and 5.5 volts, to later read the output voltage and convert it to temperature

☕ Francisco Villarreal

The TMP36 is a useful temperature sensor when it comes to environmental controls and thermal protection in large or small machines, handling a temperature between -40C and 150C. Something interesting that we found of the TMP36 is that having the output voltage we can calculate the temperature at which, by ossing with this, functions can be programmed depending on the temperature to avoid equipment damage.

9. Participation



Rubric

Criteria	Description	Score
Instructions	Do you fulfill each of the points indicated in the instruction section?	10
Sevelopment	Did you answer each one of the points requested in the development of the activity?	60
Demonstration	Was the student present in the explanation of the functionality of the activity?	20
Conclusions	Se incluye una opinión personal de la actividad por cada uno de los integrantes del equipo?	10

Members repositories

 Nelly Quino

 José Guzmán

 Michelle Gasca

 Francisco Villarreal