EEE - 313 Electronic Circuit Design
Lab - 1

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Section - 2
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1) Introduction

In this lab, we are asked to design the Differential Temperature Sensor circuit in LTspice and integrate it into DipSpace as a schematic.

2) Simulations and Calculations

2.1) Part A

In order to calculate I_s, we need to use following formula;

$$I_d = I_s * (e^{V_d/(n*V_T)} - 1)$$
$$n = 1.752 \text{ and } V_T = \frac{k*T}{q}$$

I_s calculated as $2.52nA$.

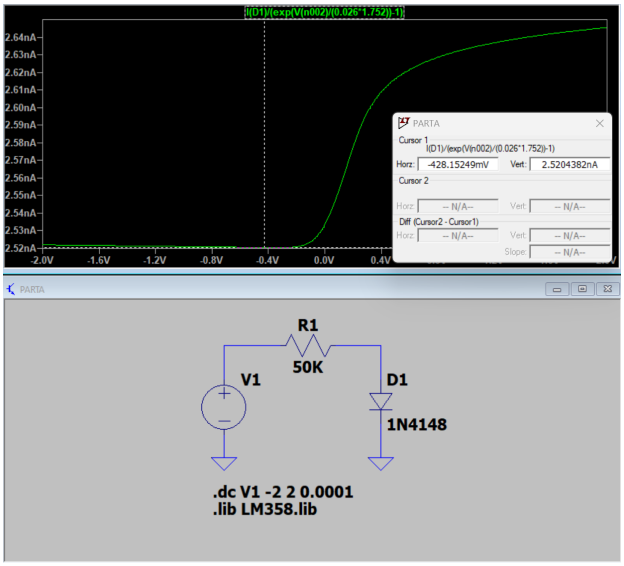

Fig. 1: Schematic and simulation for the I_s

as seen I_s came as expected.

2.2) Part B

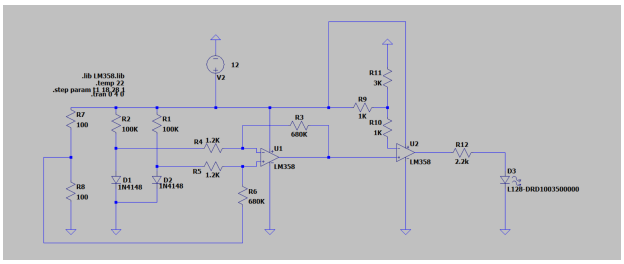

Fig. 2: LTspice schematic

Component list:

- 12 resistor
- 2 diode (1N4148)
- 2 opamp (LM358)
- 1 led
- Power supply and ground (Only for LTspice)

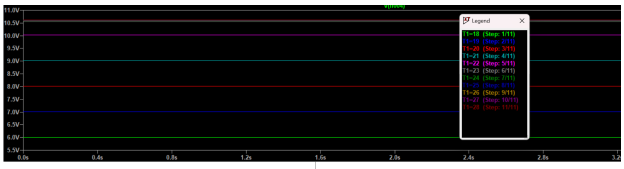

Fig. 3: Output of first Opamp when room temperature is 18 C

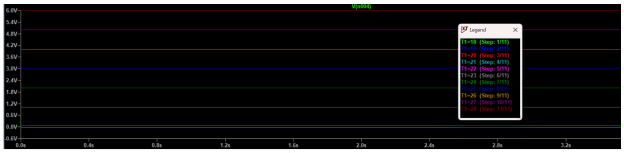

Fig. 4: Output of first Opamp when room temperature is 28 C

It can be seen that at room temperature 18 and 28, output is half of the supply voltage, satisfies the requirements.

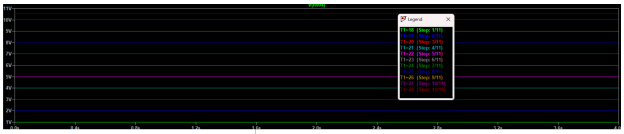

Fig. 5: Output of first Opamp

As seen in the figure, there was a change of 1 volt per degree.

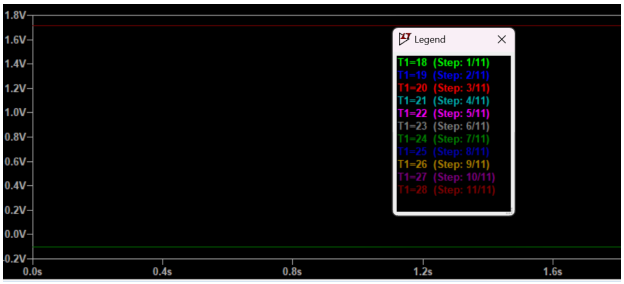

Fig. 6: Voltage on led

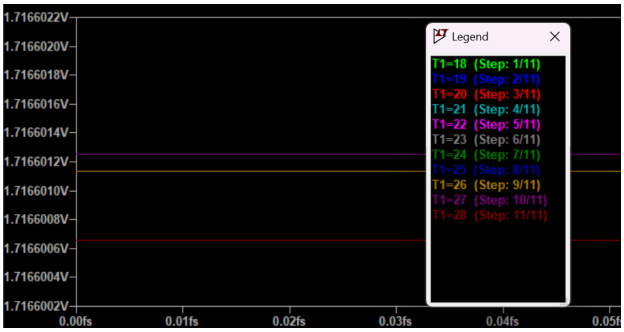

Fig. 7: Led voltage values that led is on closer look

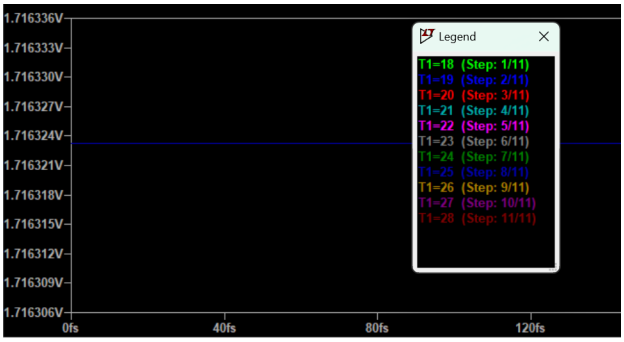

Fig. 8: Led voltage values that led is on closer look

As can be seen, when the room temperature is 22, the LED is on at 25, 26, 27 and 28 C temperature values (the graph was taken closely to show it), and the LED is off at the values that remain on.

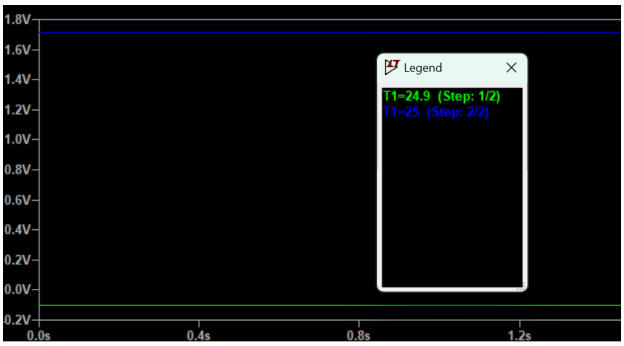

Fig. 9: Led voltage with 24.9 and 25 C

As can be seen, when the room temperature is 22 C, the breaking point is 25 C and the LED turns off at 24.9 C degrees.

2.3) Part C

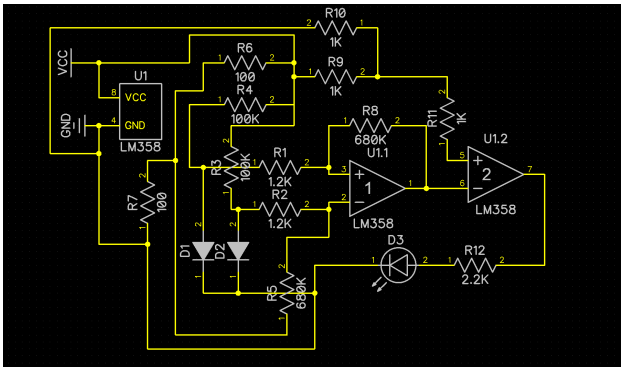

Fig. 10: DipTrace circuit

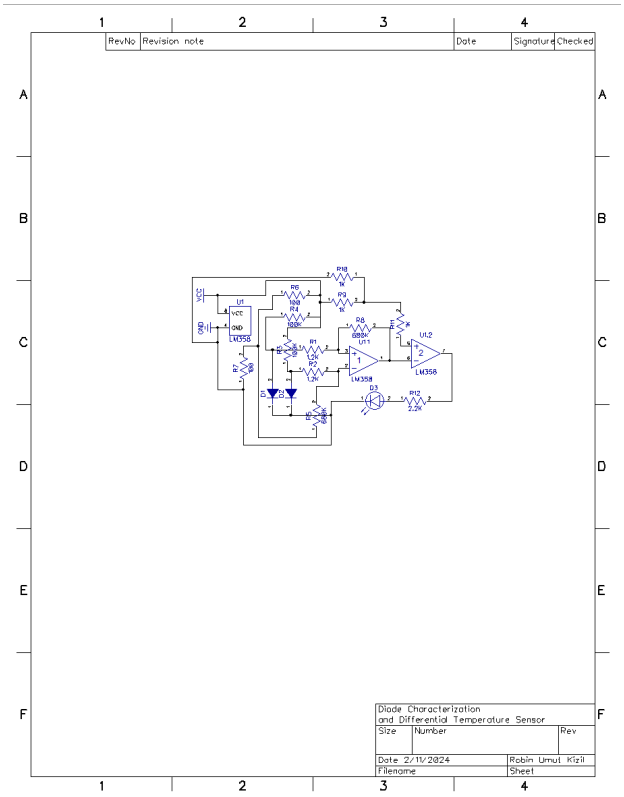

Fig. 11: DipTrace on A4 sheet