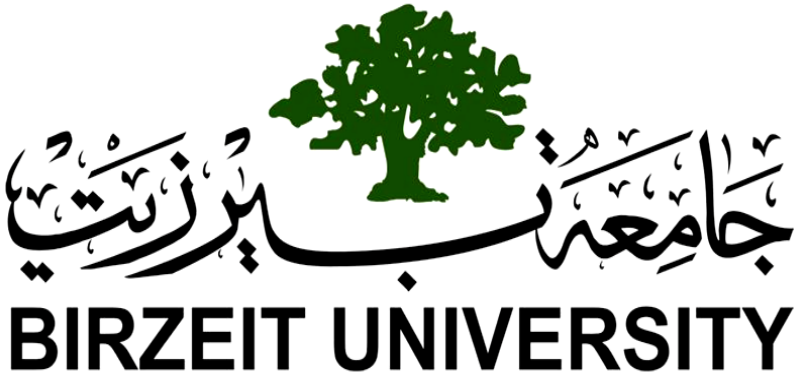

Faculty of Engineering & Technology
Electrical & Computer Engineering Department

Analog Electronics- ENEE2360

Project#1

Temperature Detector

Prepared by:

Abd Khuffash – 1200970

Ahmad Al Khuffash – 1180537

Instructor:
Mohammad Jehad Al Ju'beh

Section:
2

Date:25-6-2023

Abstract/Objectives

The aim of this project is to understand how a circuit with a temperature detection change using a sensor thermistor 20k @25C. This simulations will be done using PSPICE program. The circuit contains LM324 op Ams with multiple resistors and 2 LEDs which will react to temperature.

Table of Contents

Contents

Table Of Figures

PSPICE Simulation

Part 1: Simulation with different Rs values

a) **Replace the Red and Green LEDs with D1N4002**
b) **Simulate the circuit of Fg.(1) for Rs = 22K,25K, and 20K**

Figure 1.Question a&b

The design of the Circuit using Pspice, R10 is RS:

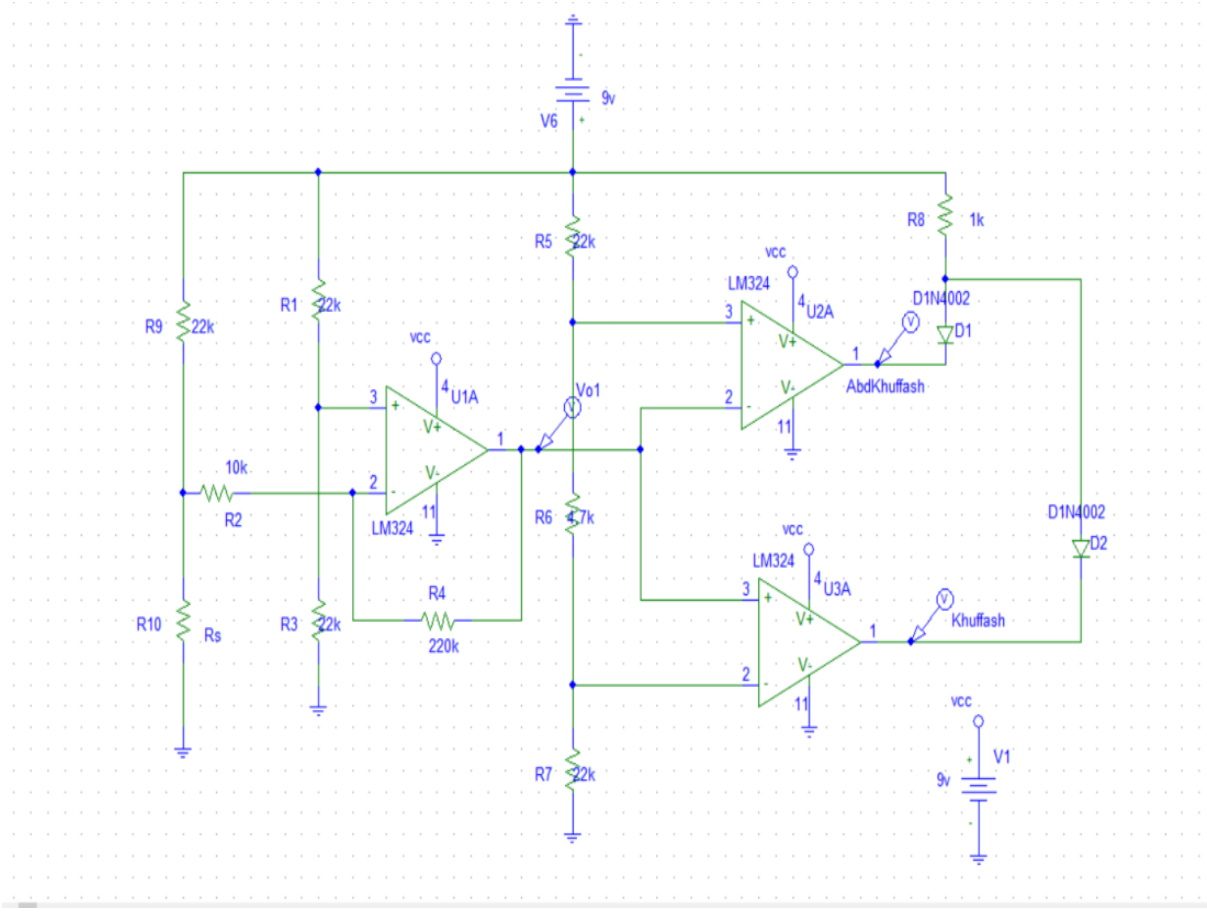

Figure 2.Circuit Design

Assigning values to Rs:

First RS=22k Ohm

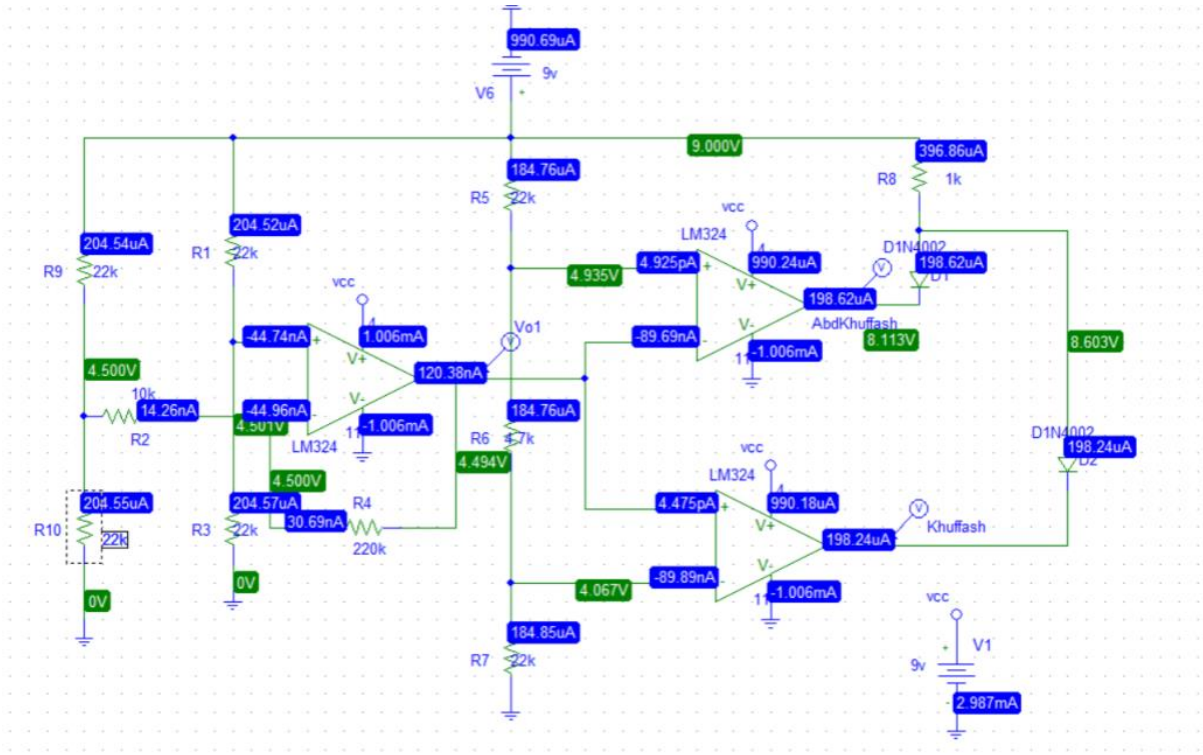

Figure 3.Simulatios RS=22k

Rs= 25k Ohm

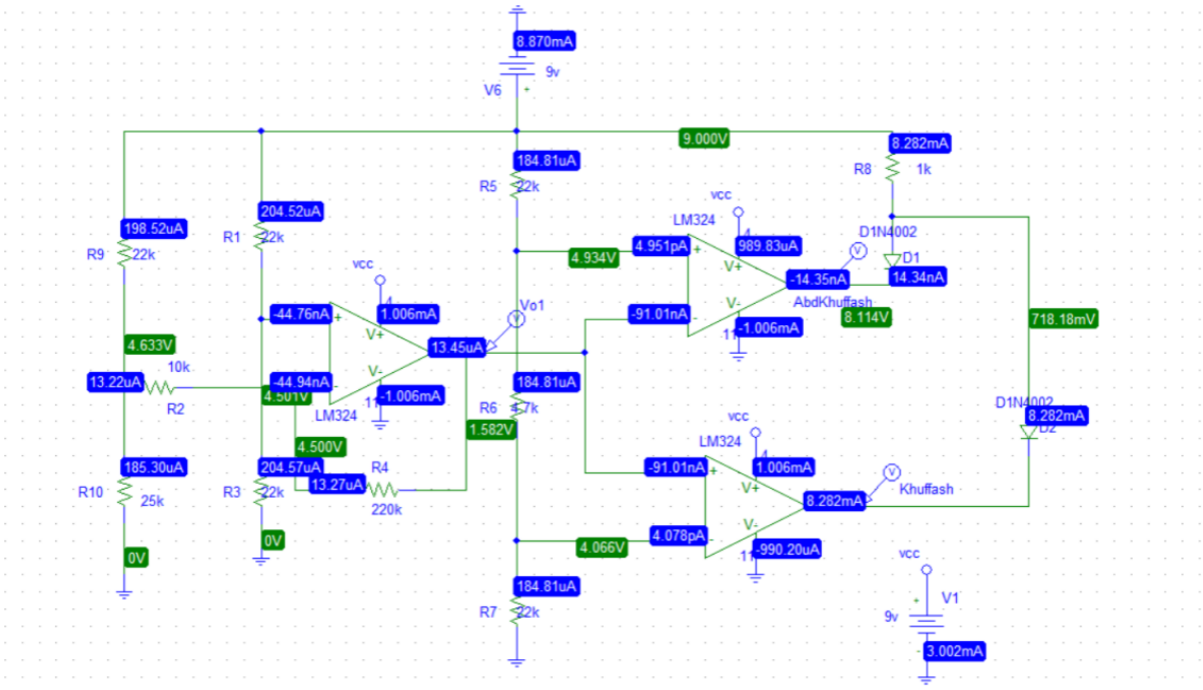

Figure 4.Simulation RS=25k

Rs= 20k ohm

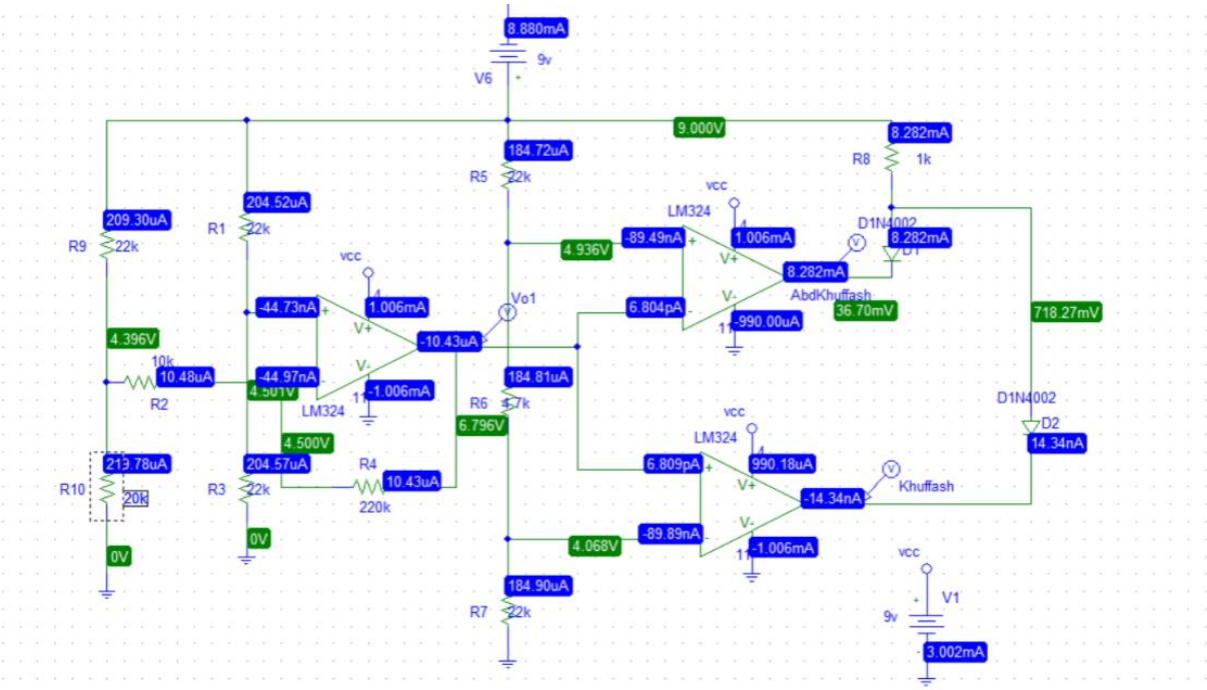

Figure 5.Simulation Rs=20k

Part 2: Replacing The shaded part by a VPWL

c) Replacing the shaded part by a VPWL Voltage source as shown in Fig.(2) , plot Vo1(t),Vo2(t), and Vo3(t).

Figure 6.Question C

After replacing the the shaded part by a VPWL voltage source and configuring its proparites according to fig.2:

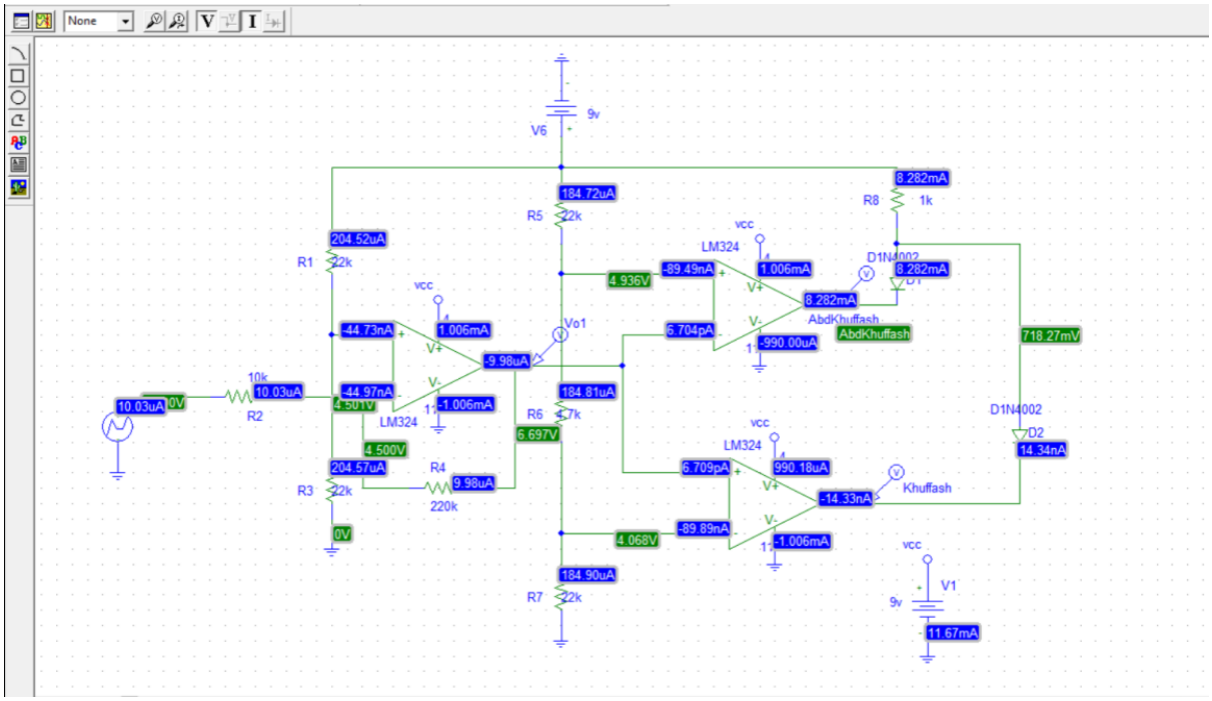

Figure 7.VPWL Circuit

VPWL Settings :

TIME IN MS	VOLTAGE
0	4.4
2	5
4	4.4
6	4.4
8	4.4

Figure 8..VPWL settings

Simulations Settings:

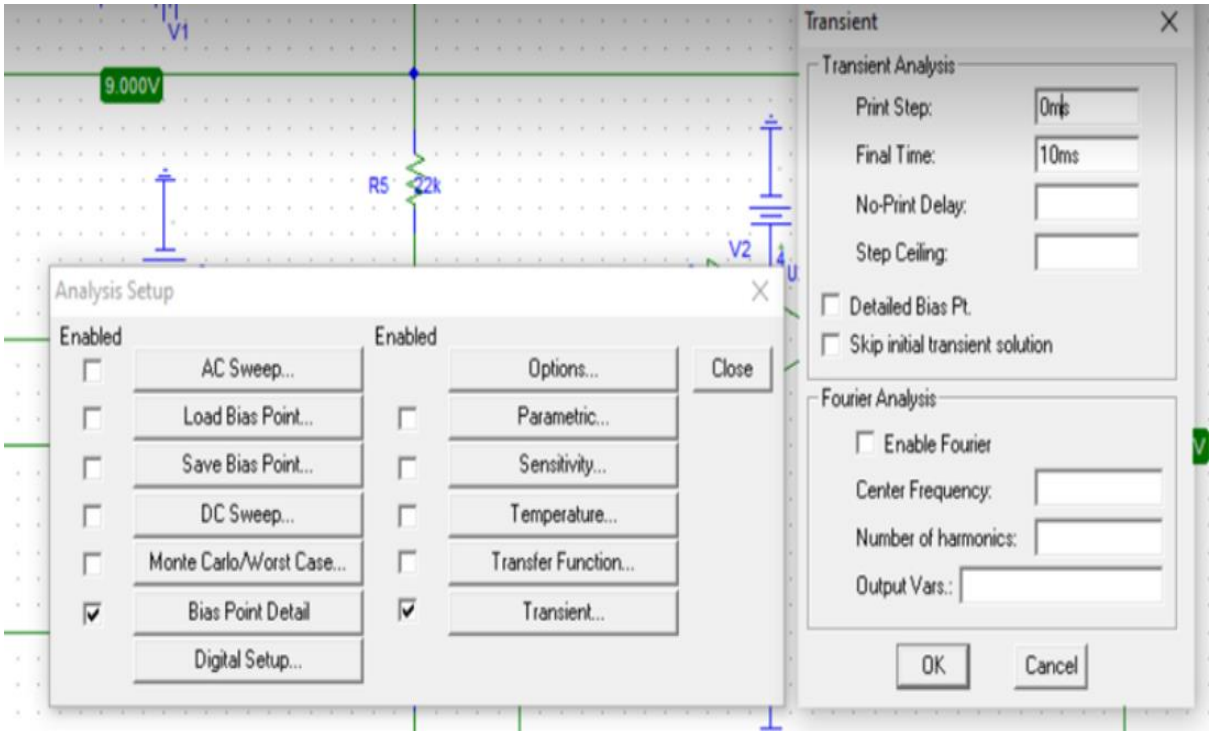

Figure 9.Simulation Settings for VPWM

Results:

The Plot for V01:

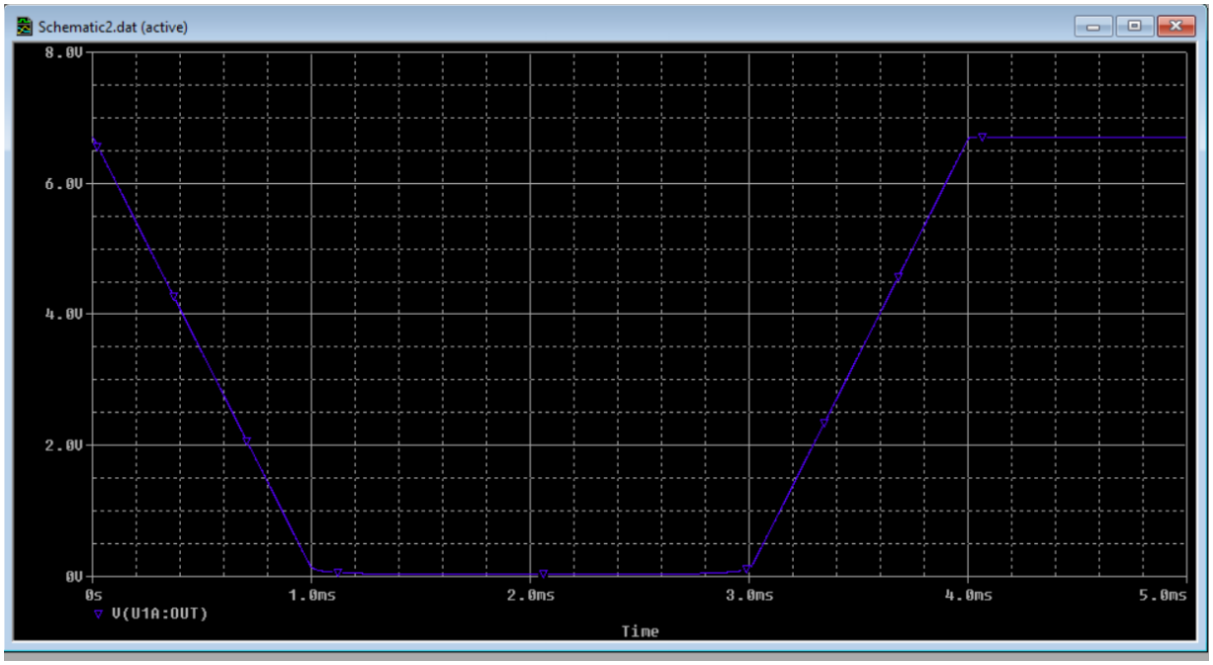

Figure 10.V01 Plot

Plot For V02:

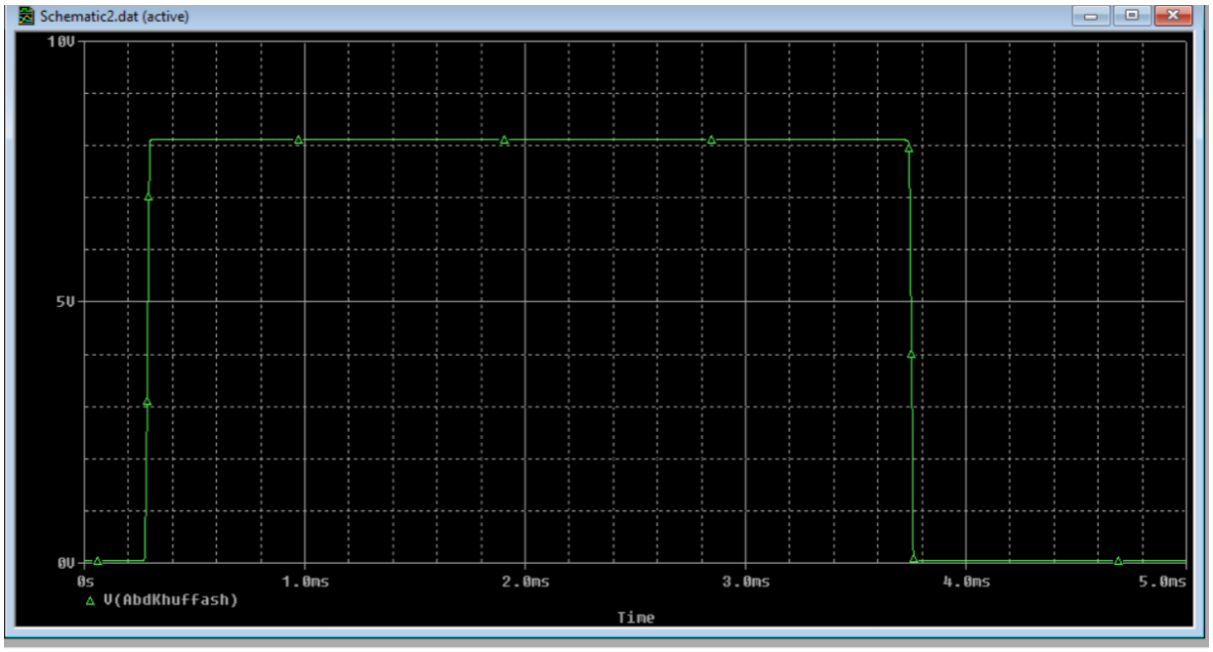

Figure 11.V02 Plot

Plot For V03:

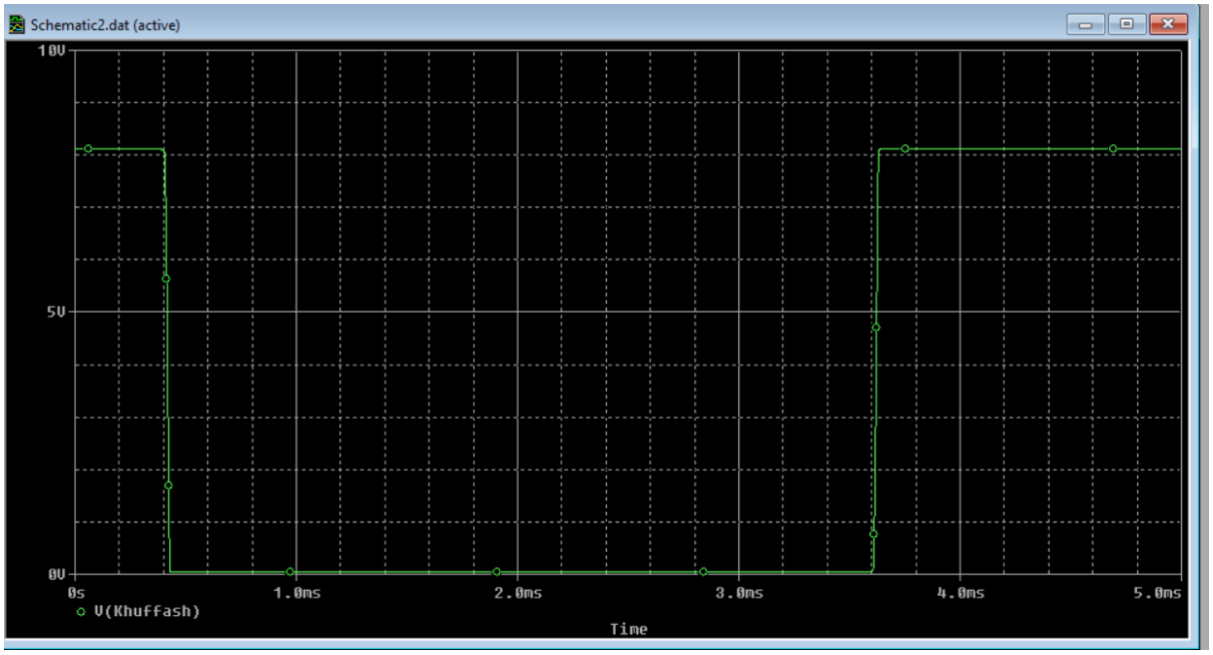

Figure 12.V03 Plot

Part 3: Upper and lower temperatures

d) Estimate the upper limit and the lower limit temperatures fromVo2 and Vo3(t) plots.

Figure 13.Question D

Plot for v02,v03, that shows the intersection points between them. They are approximately the upper and lower limit.

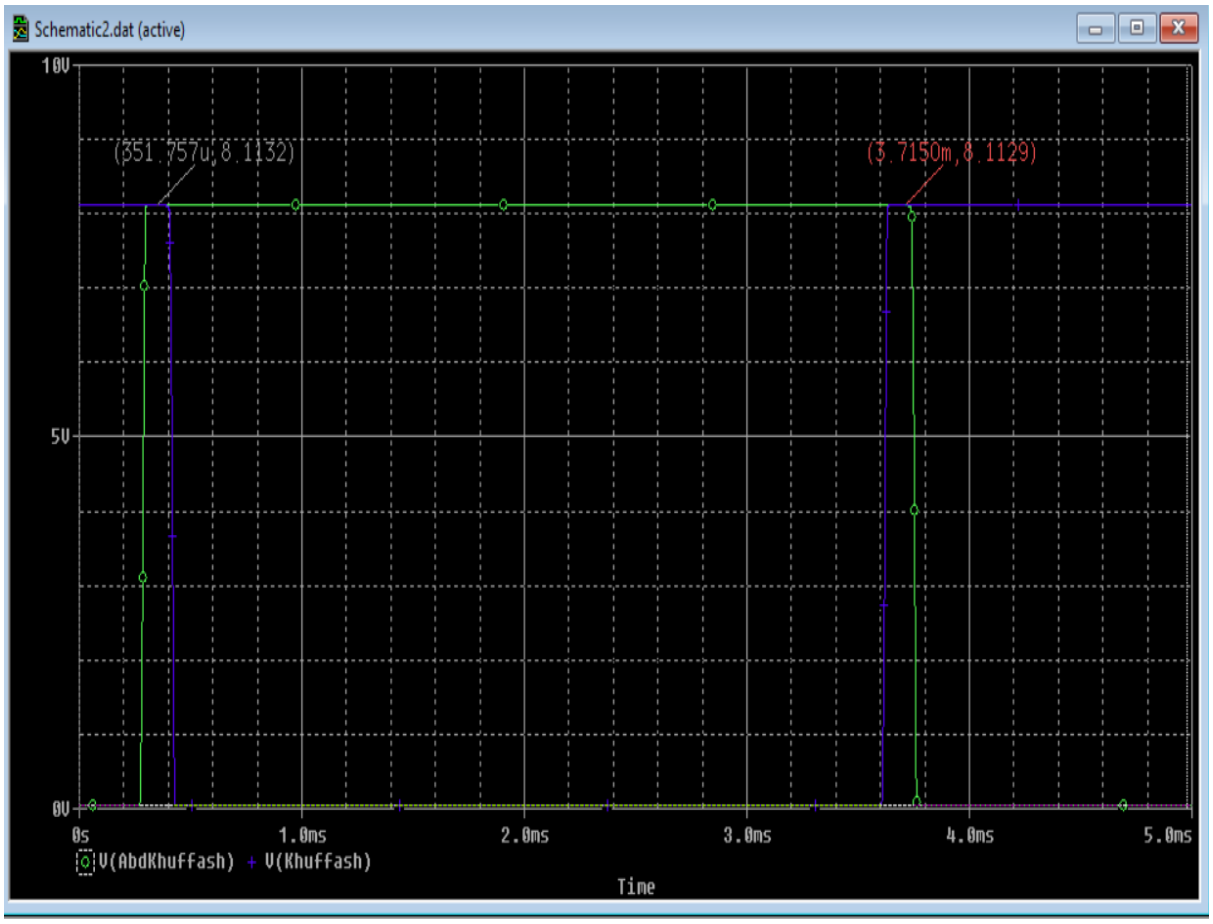

Figure 14.Upper lower Limit

For the calculations in figure 15, we find Rs and then compare with the sheet of tempretures.

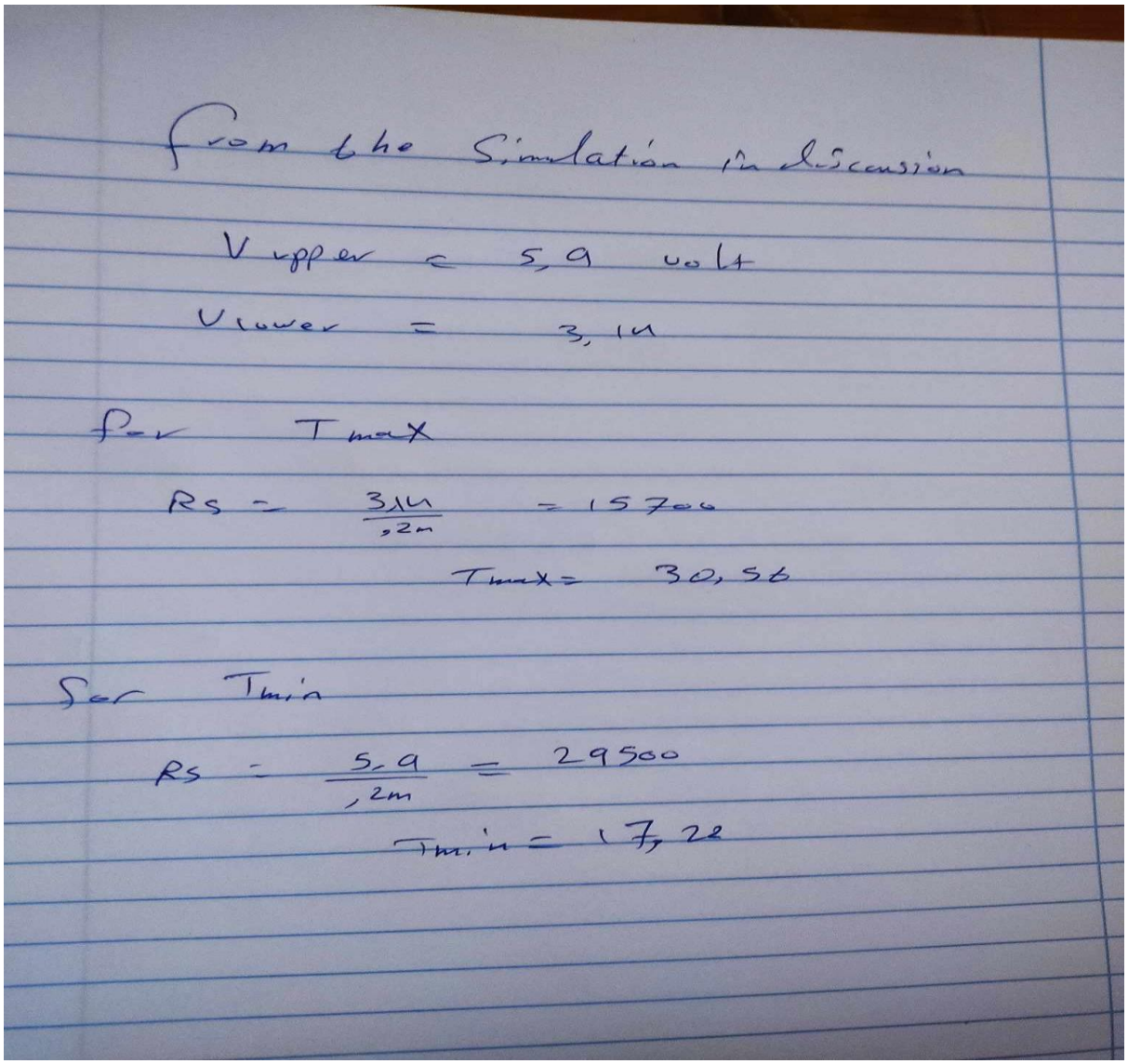

Figure 15.Max and Min Temperatures

Part 4: Hand Calculations

f) Calculate by hand the upper threshold and the lower threshold temperature.

Figure 16.Question F

Finding Vo1:

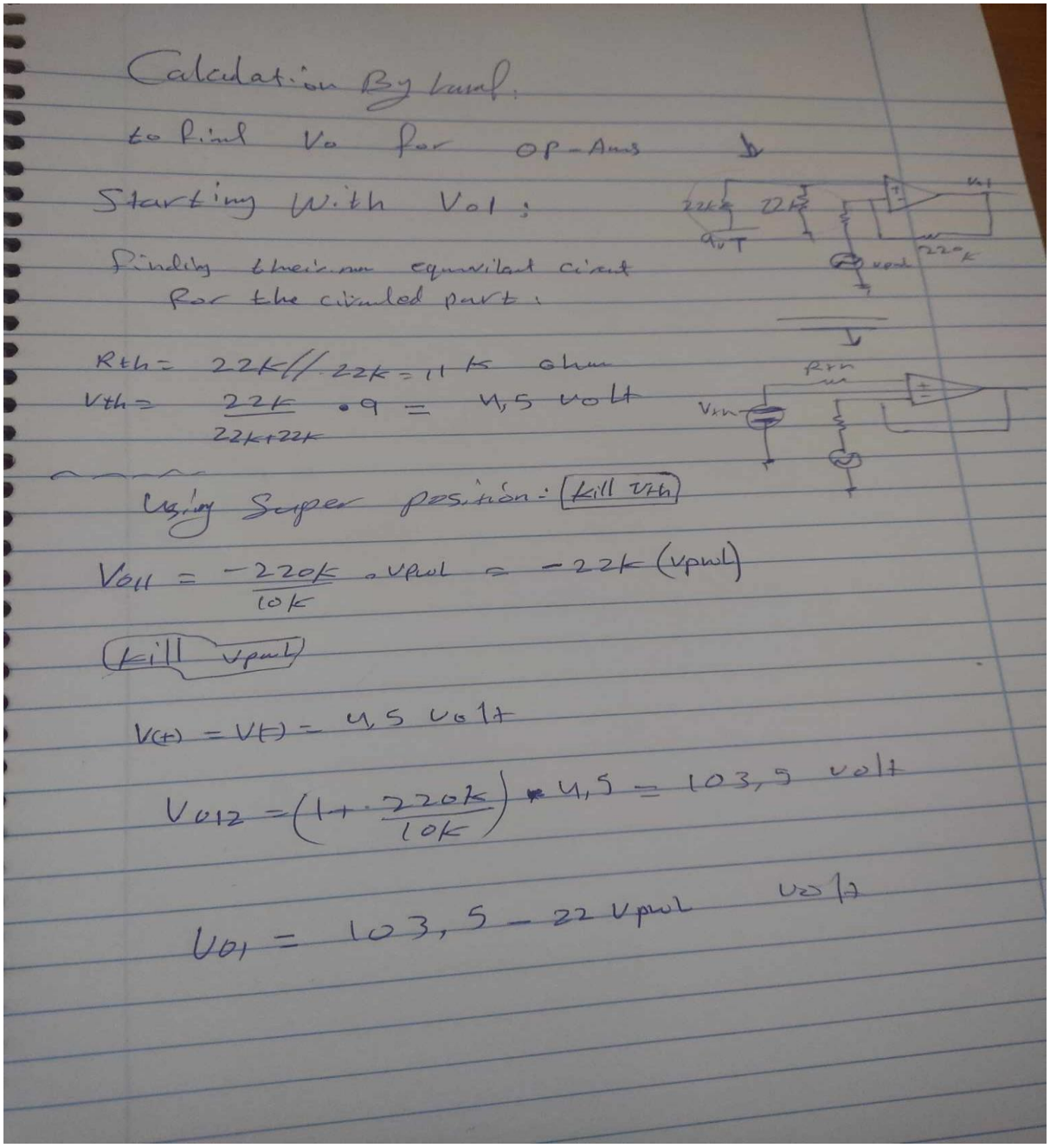

Figure 17.Hand Cacl. VO1

To find Vo2 & Vo3

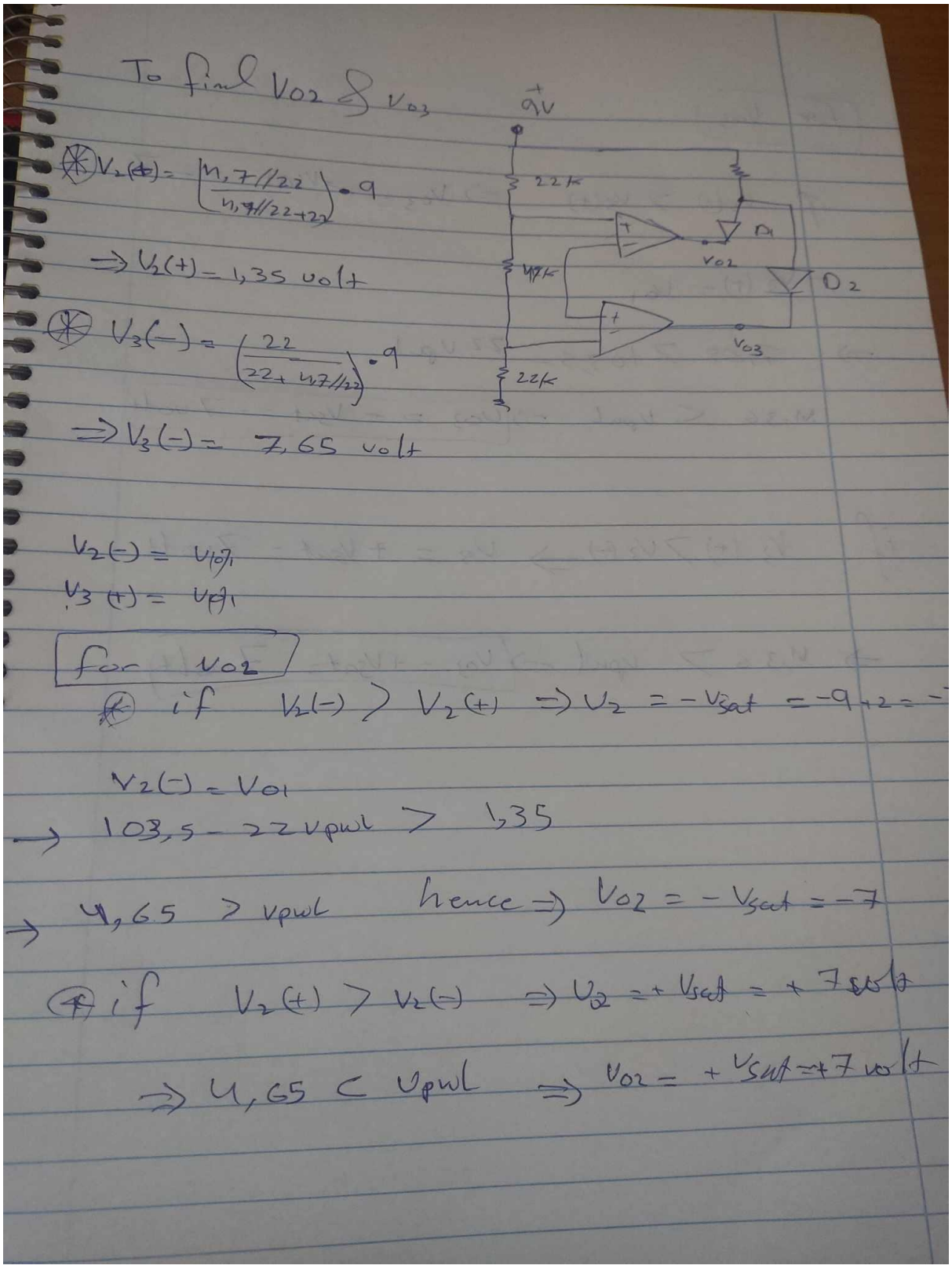

Figure 18.Hand Cacl. VO2

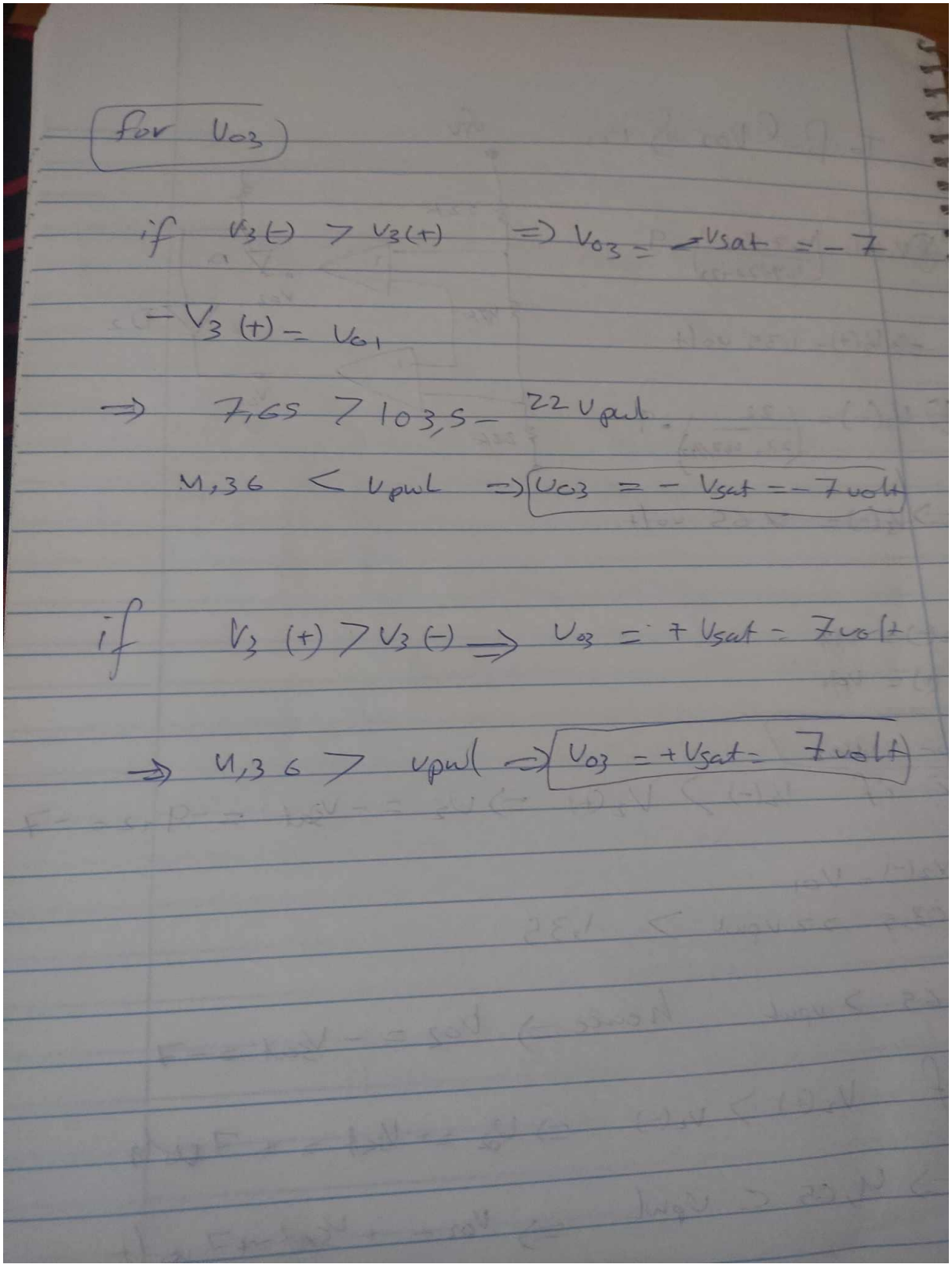

Figure 19.Hand Cacl. VO3

Conclusion

This project focused on exploring a temperature detection circuit using a 20k thermistor and LM324 operational amplifiers. Through PSPICE simulations, we gained insights into the circuit's behavior, accurately monitoring temperature changes with the thermistor and ensuring proper functioning with the amplifiers. The incorporation of LEDs allowed us to visualize the circuit's response to temperature variations, indicating its performance and potential practical applications in electronic systems and environmental control systems. Overall, this project deepened our understanding of temperature detection circuits and provided a foundation for future developments in temperature sensing and control systems.