**Faculty of Engineering and Technology**

**Department of Electrical and Computer Engineering**

**ENEE2360-Analog Electronics**

**Project 2**

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# Abstract

In this project will complete design of circuit. This project to understand the room Thermostat. This circuit consist Schmitt Trigger comparator, BJT transistor and diode.

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# Design calculations

## Calculation of Vo1.

upper threshold and the lower threshold temperature (VUT and VLT)

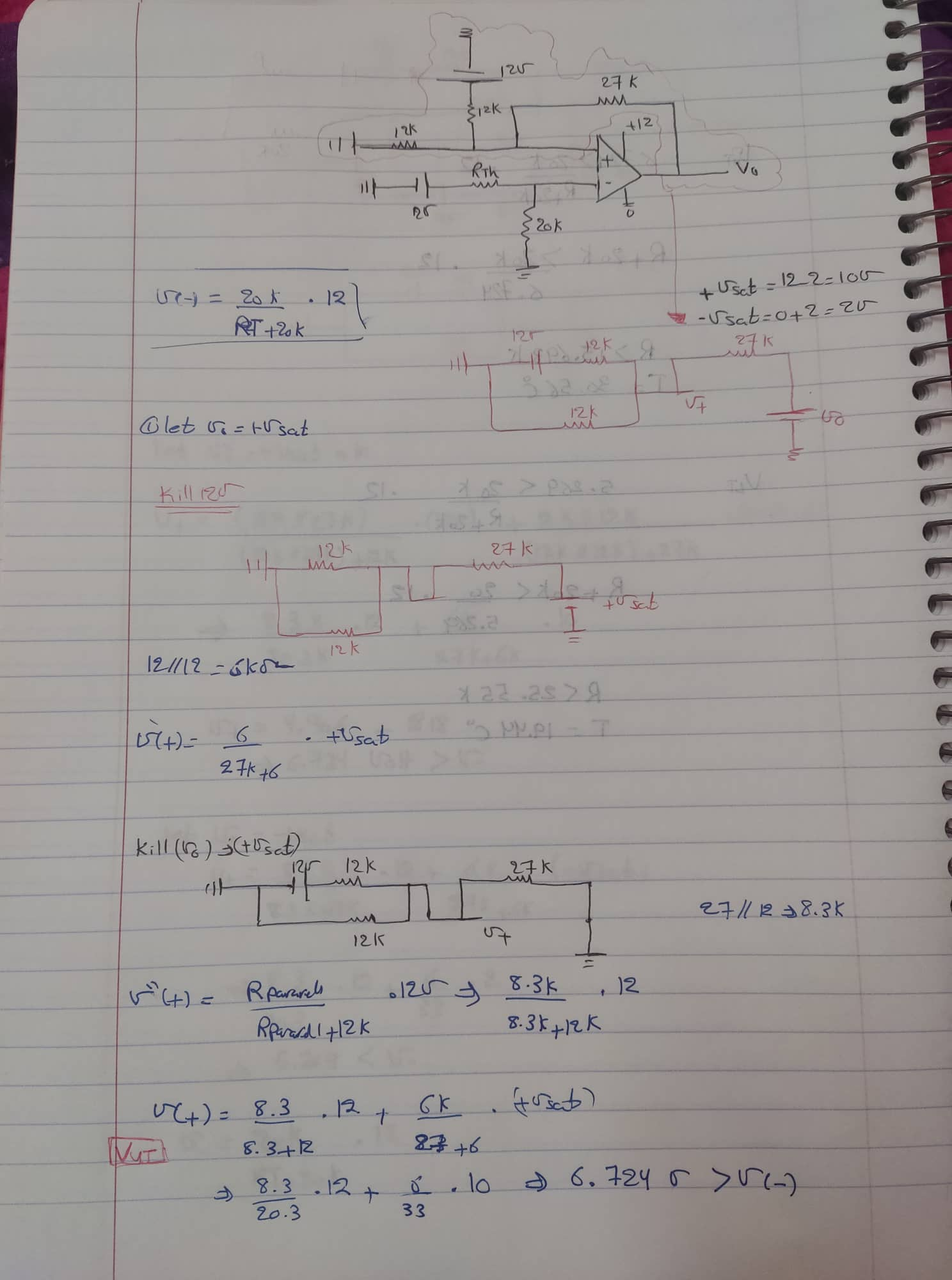


Figure 1:Vo1 calculation

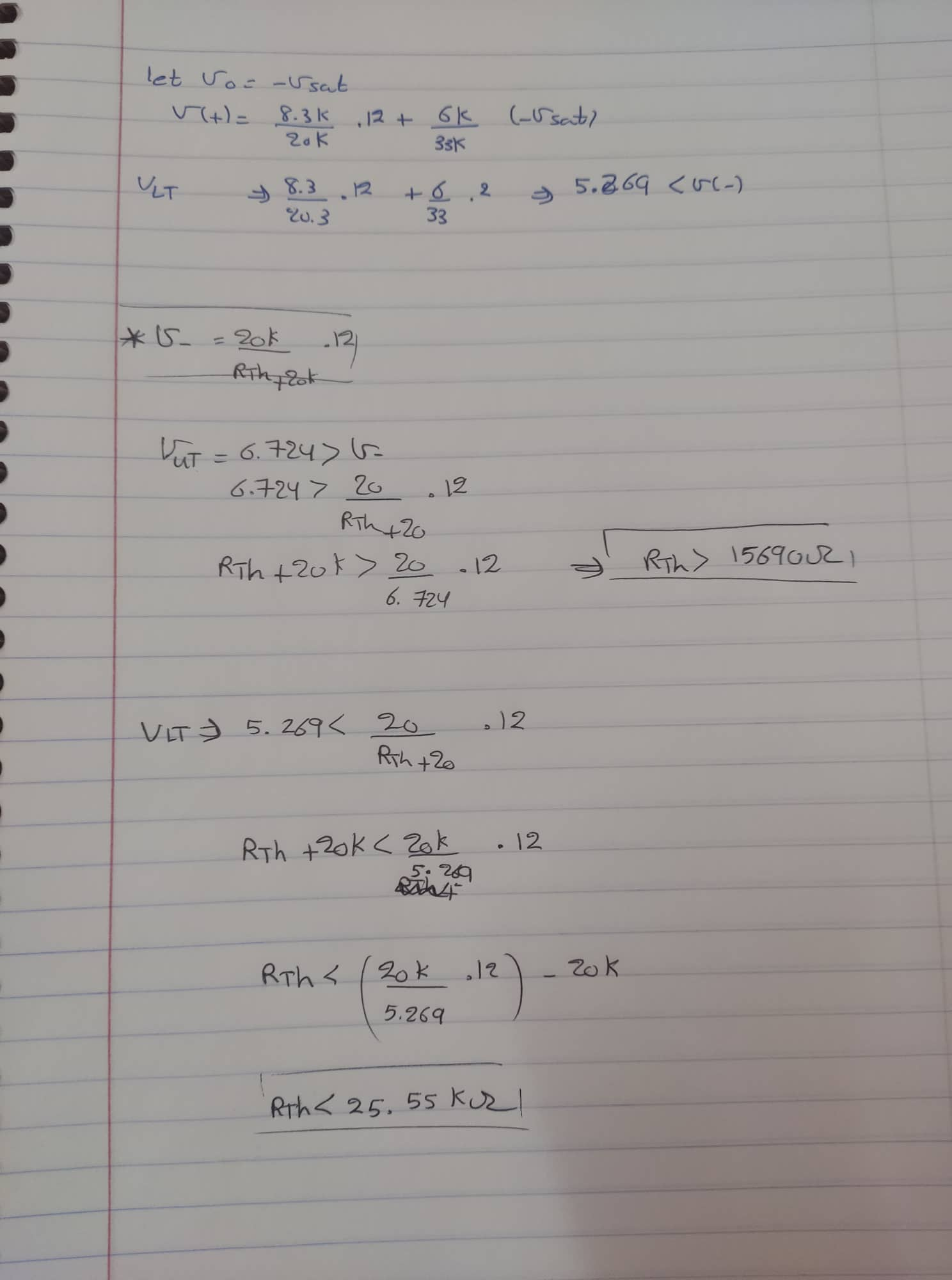


Figure 2 calculation

## 1.3. The circuit

My circuit as shown in Figure 3.

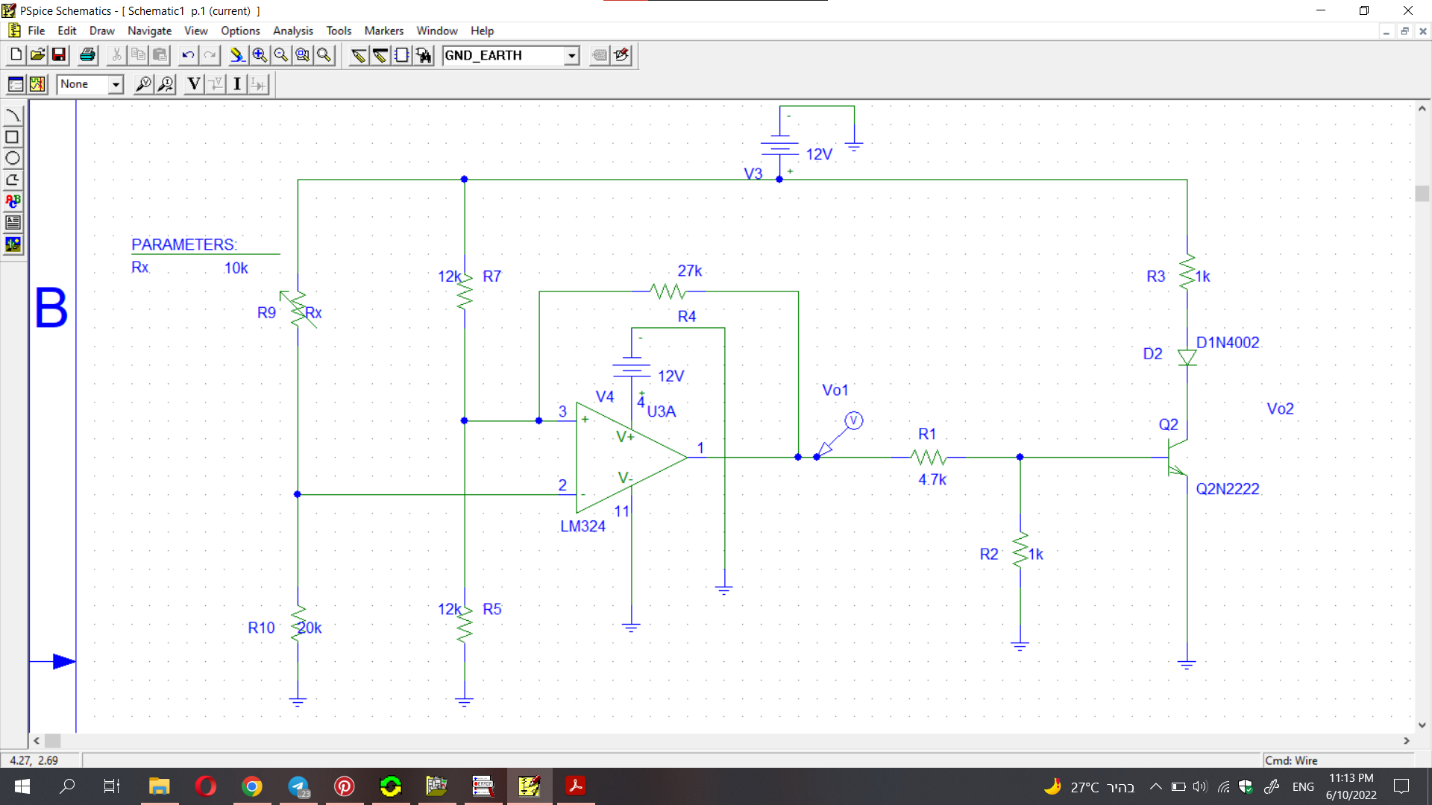


Figure 3:The Circuit

# Simulation results

## 2.1. Part A

Determine the voltages Vo1 When Rx is applied.

### 2.1.1. Vo1

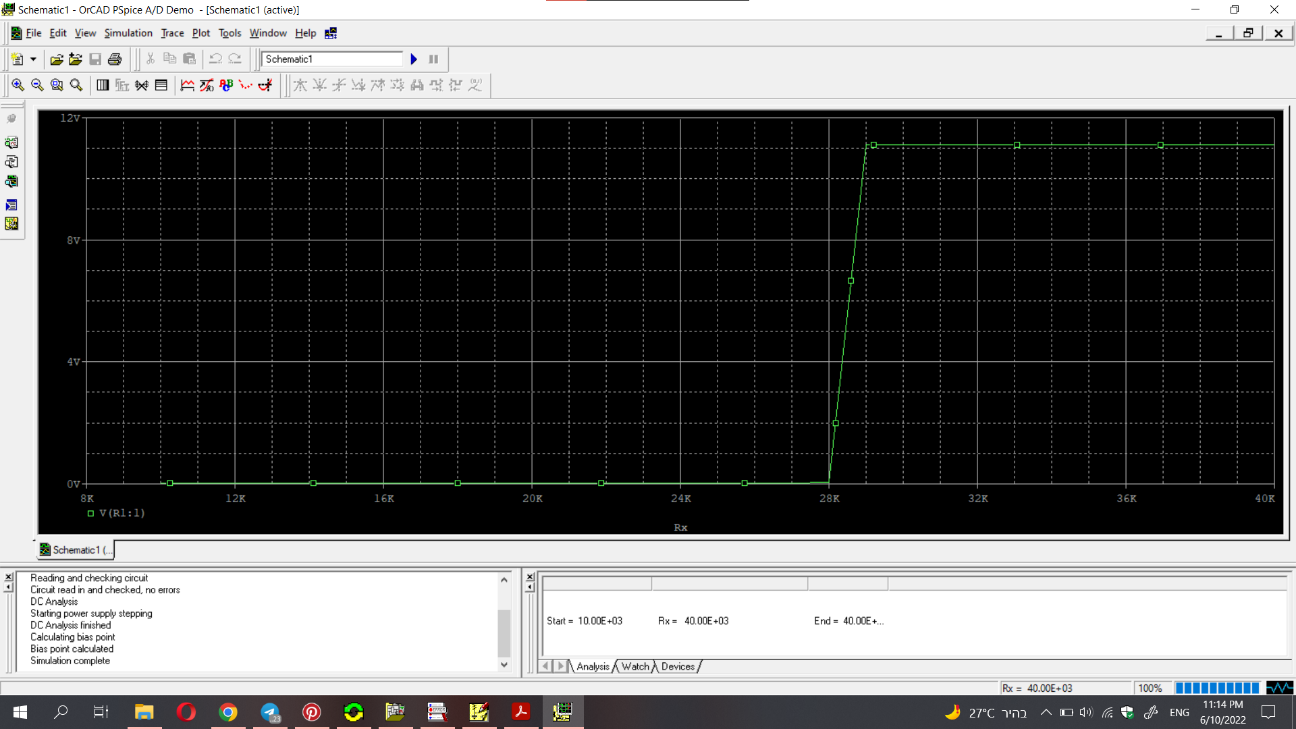


Figure 4 Vo1

### 2.1.2. Vo2

Vo2 when Rx is applied.

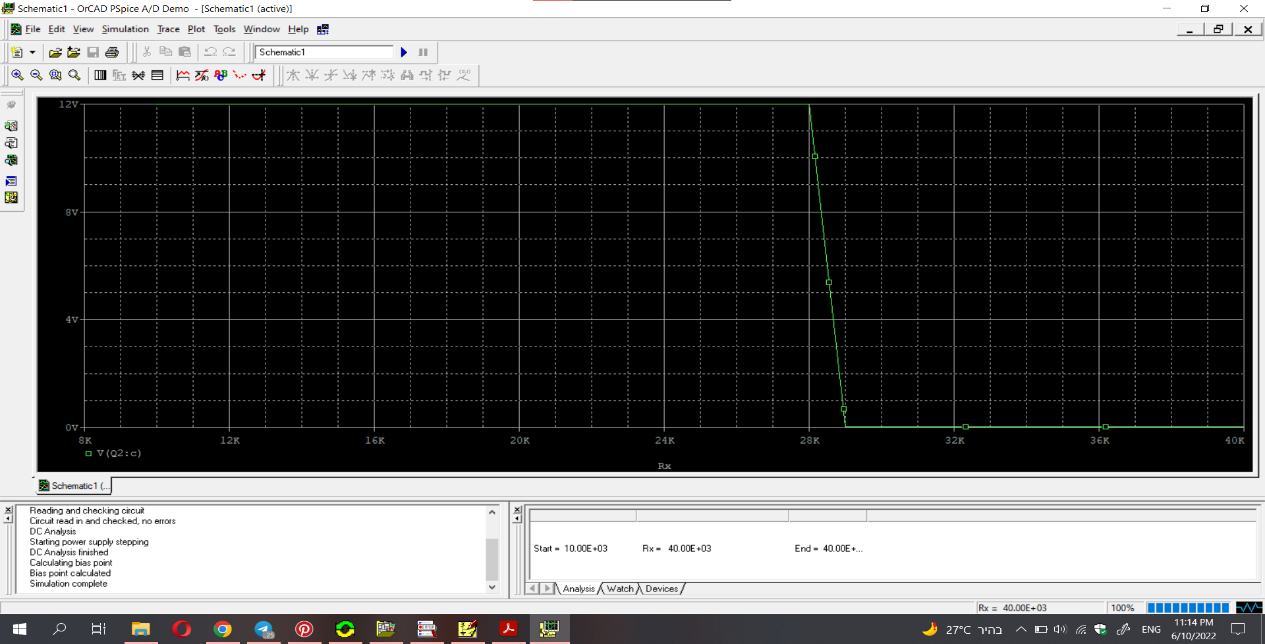


Figure 5 Vo2

### 2.1.3. Vo1 and Vo2:

Vo1 and Vo2 when Rx is applied

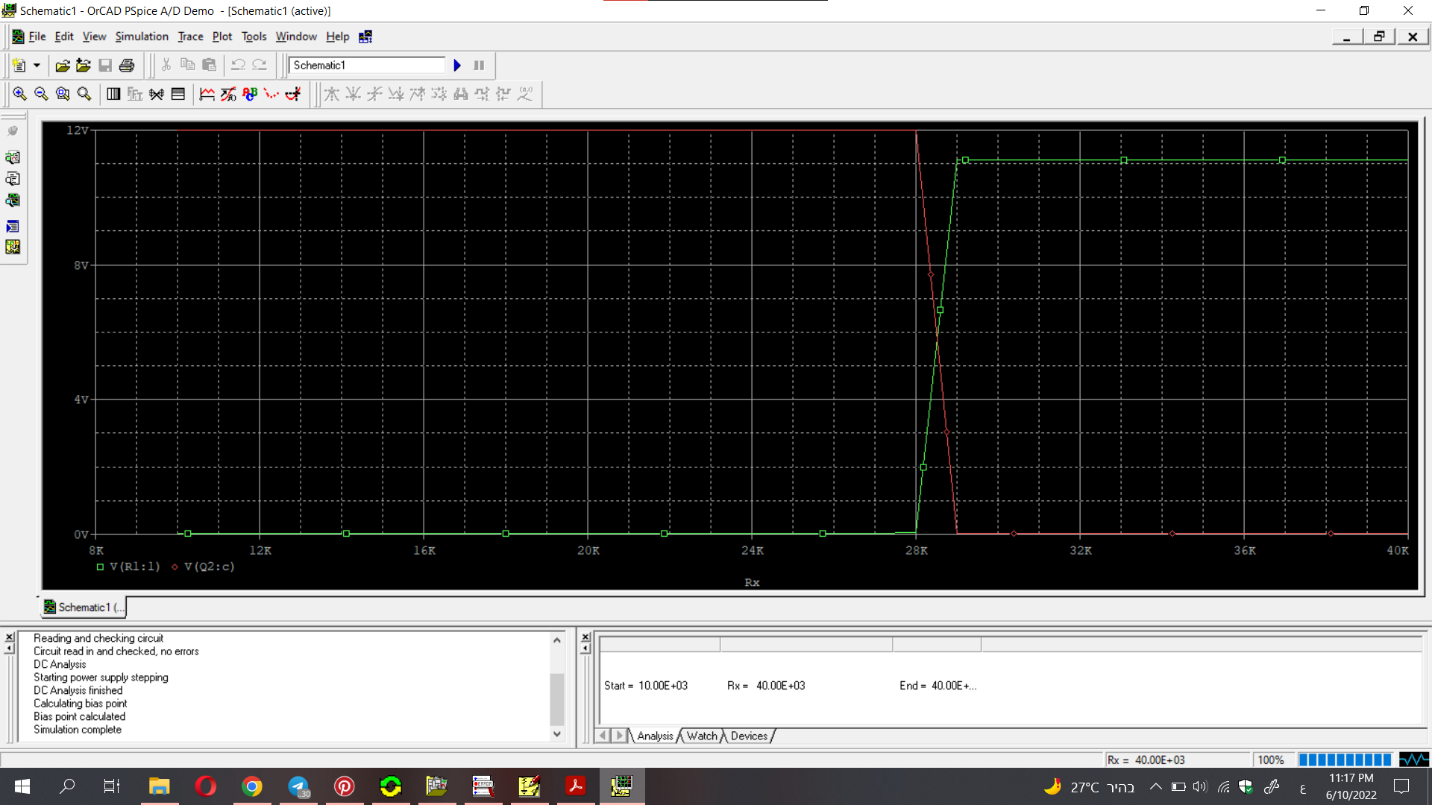


Figure 6 Vo1 and Vo2

## 2.2. Part B

Replacing the thermistor and the 20kΩ by a VPWL Voltage

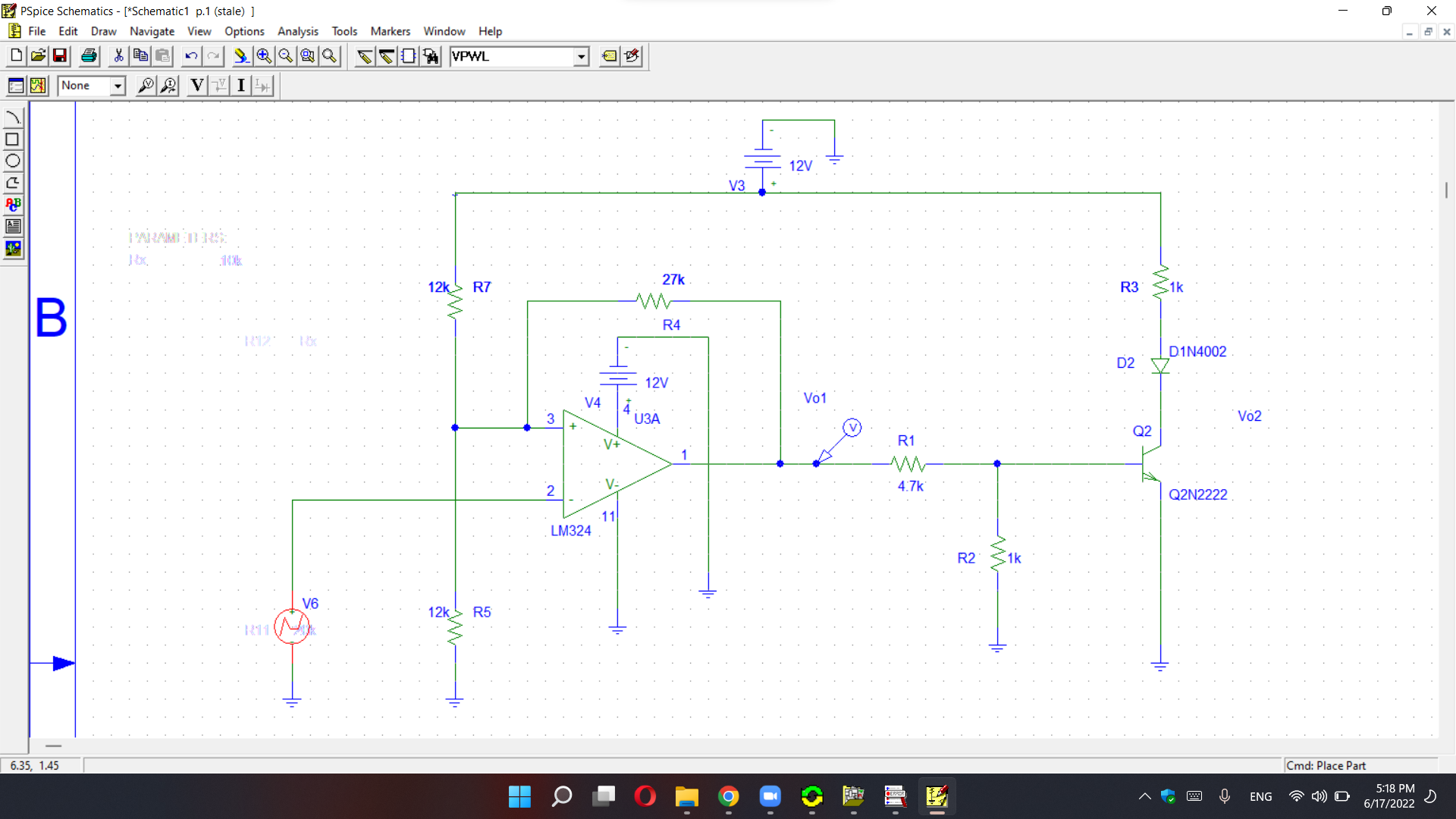
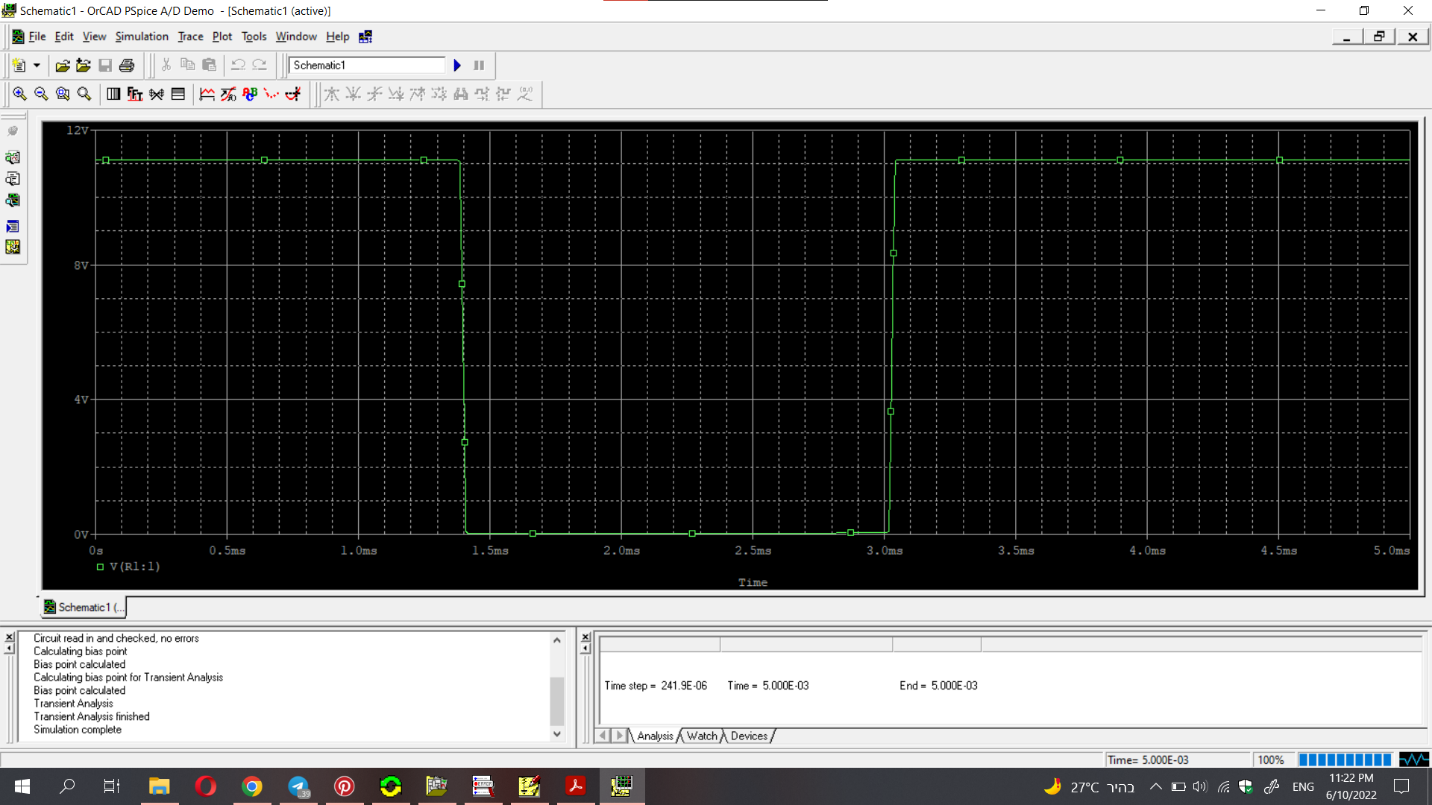


Figure 7 part2 Circuit

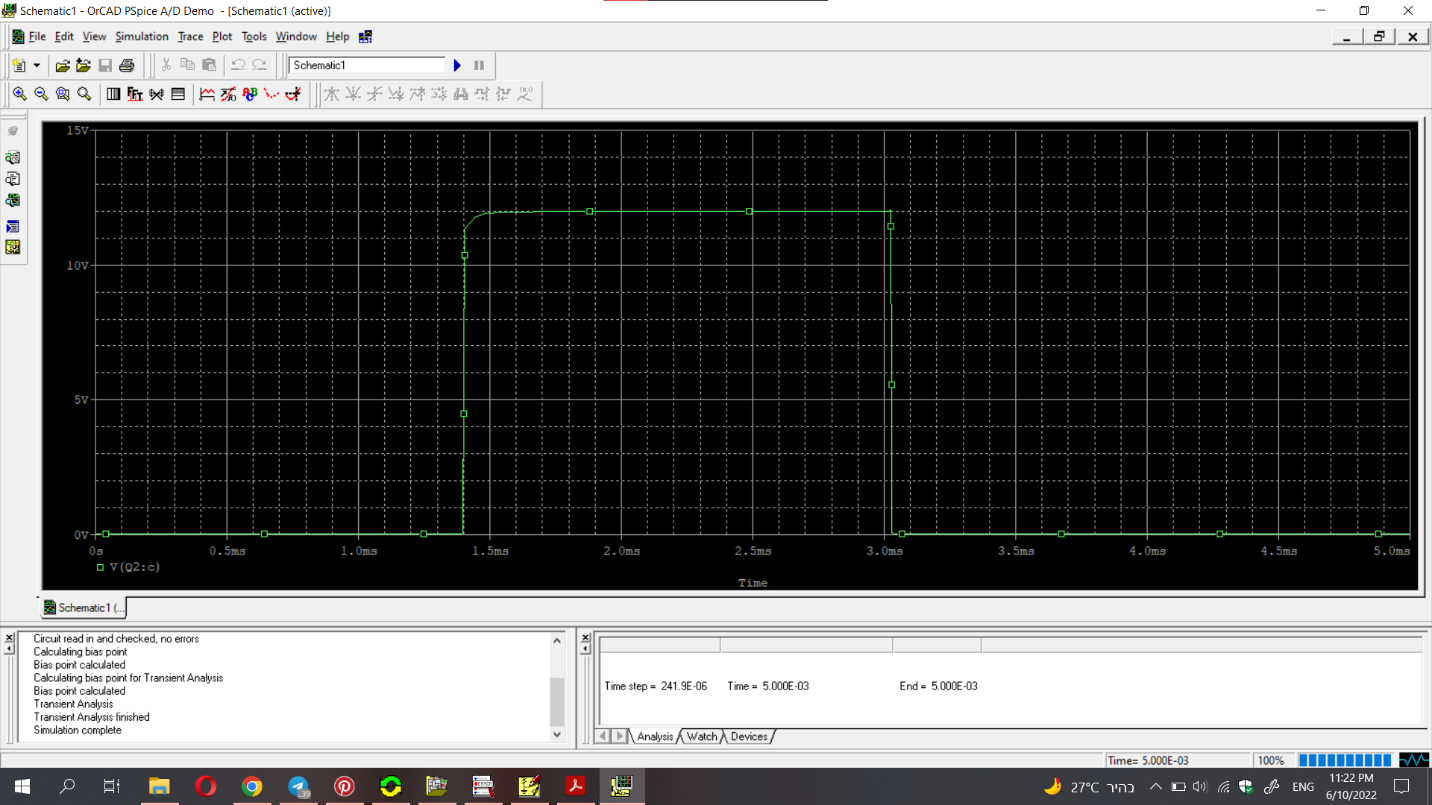
### 2.2.1. Vo1

Vo1 when VPWL is applied



### 2.2.2. Vo2

Vo2 when VPWL is applied



## 2.3. Part C:

upper threshold and the lower threshold temperatures from Vo1

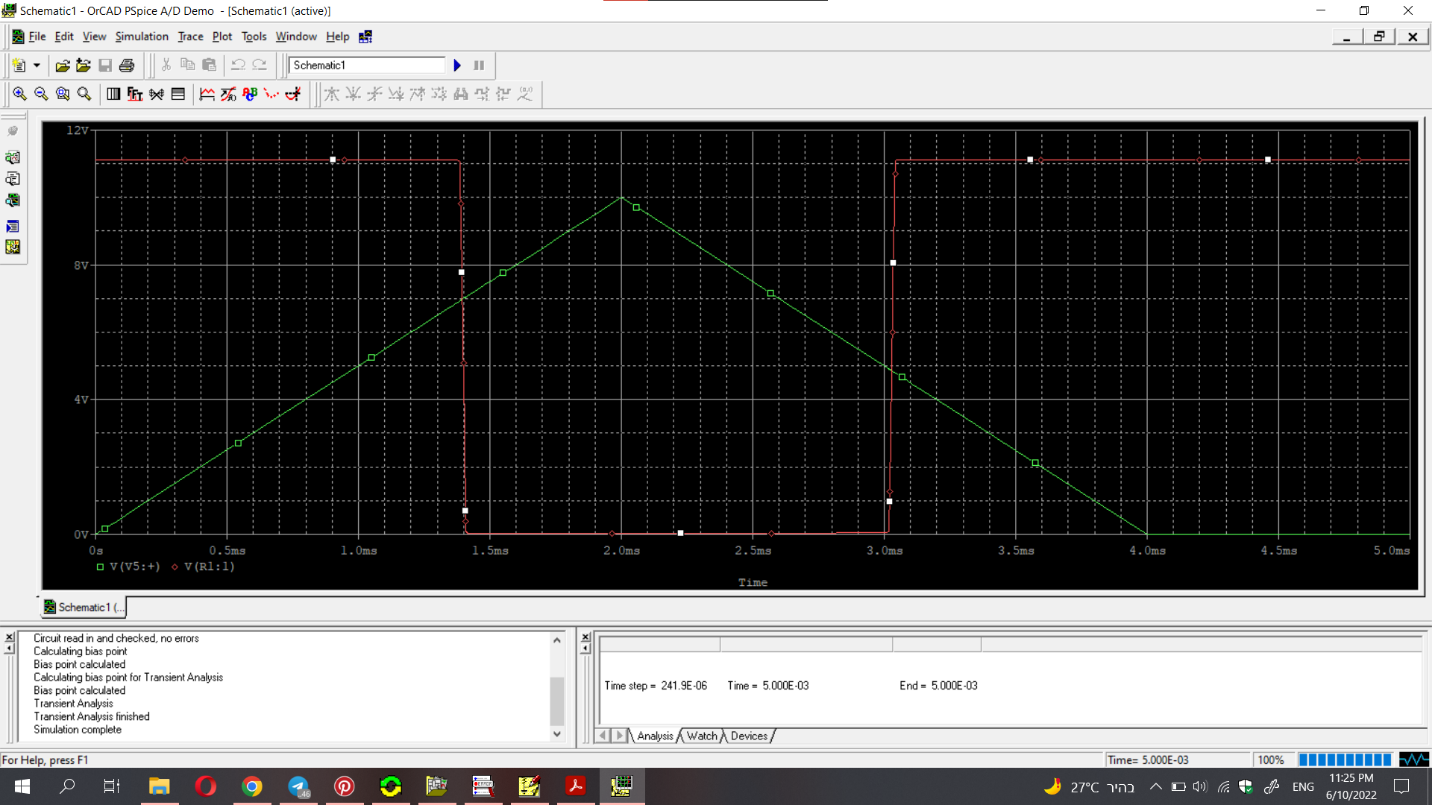


Figure 8 part 3 : Vo1

**Calculate from the graph:**

For the first point:

Vo1=6.9493V (upper)

I(Vo1)=2.2mA

---> R=3.159k ohm (almost R=3163 ohm in the table)

---> upper threshold C=69.44 & F=157

for the second point:

Vo1=4.8764V (lower)

I(Vo1)=2.2mA

---> R=2.216k ohm (almost R=2208 ohm in the table)

---> lower threshold C=79.44 & F=175

# Comparison of simulation result to design

Vo1:

From the calculation Vo1 🡺

VUT =6.724

VLT=5.269

From the graph 🡺

VUT = 6.9493V

VLT=4.8764V

Finally, in this project understand the Schmitt comparator. The actual value from calculation and the value from simulation very soon almost equal.