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EE4035 Electronics Laboratory

Operational Amplifier - Familiarization

Questions

1. What does the letter ‘M’ in the model UA741M represent? **Military**
2. What is the temperature range over which the model UA741C can be used? **0 to 70 Degree Celsius**
3. What is the typical input offset voltage of UA741? **2mV to 6mV (25 Degree Celsius)**
4. What is the open loop gain of the operational amplifier? **200,000 V/V**
5. What is the input impedance? **2 MOhms**

Step 4

Ground pin 2 of the OPAMP and connect pin 3 to the sinusoidal output of a function generator, at its lowest amplitude setting 50mV, the frequency set to about 1kHz. Plot the input waveform as well as output wave form. Repeat the experiment for about 2V.

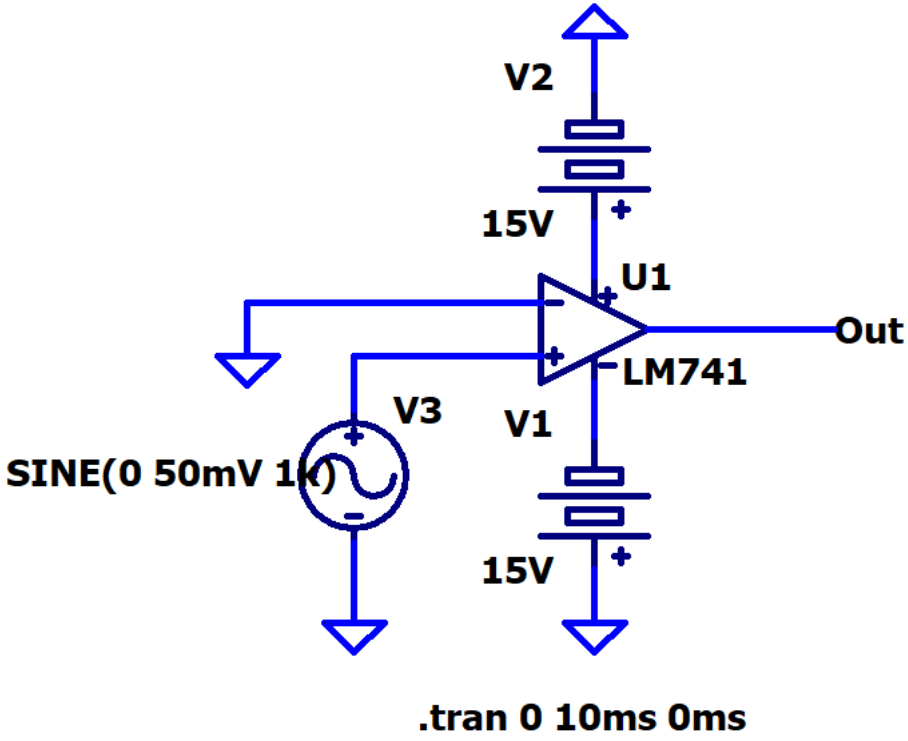

Fig 1. Circuit Diagram (50mV) **PIN 2 Grounded**

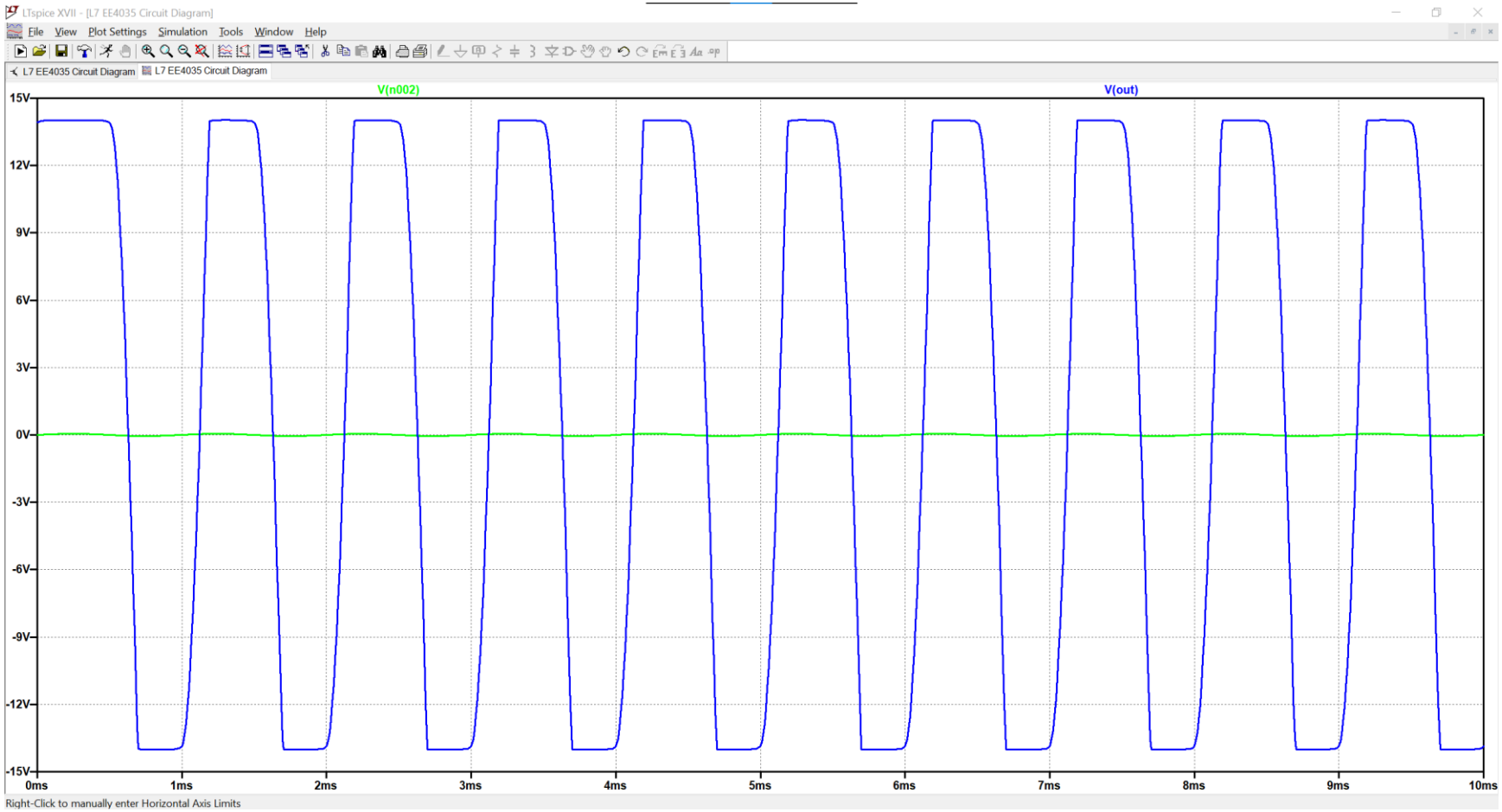

Fig 2. Output Waveform (50mV)

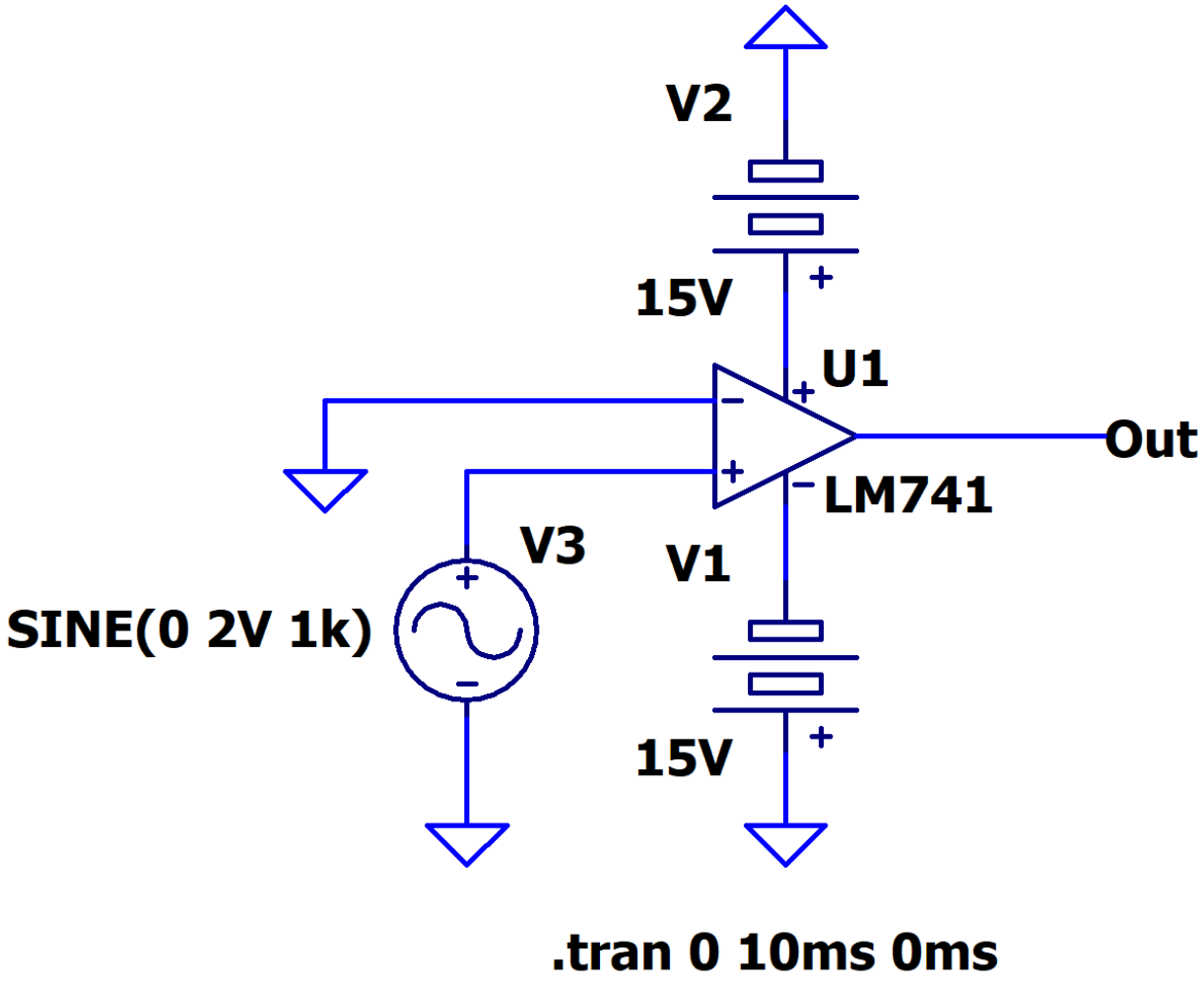

Fig 3. Circuit Diagram (2V) PIN 2 Grounded

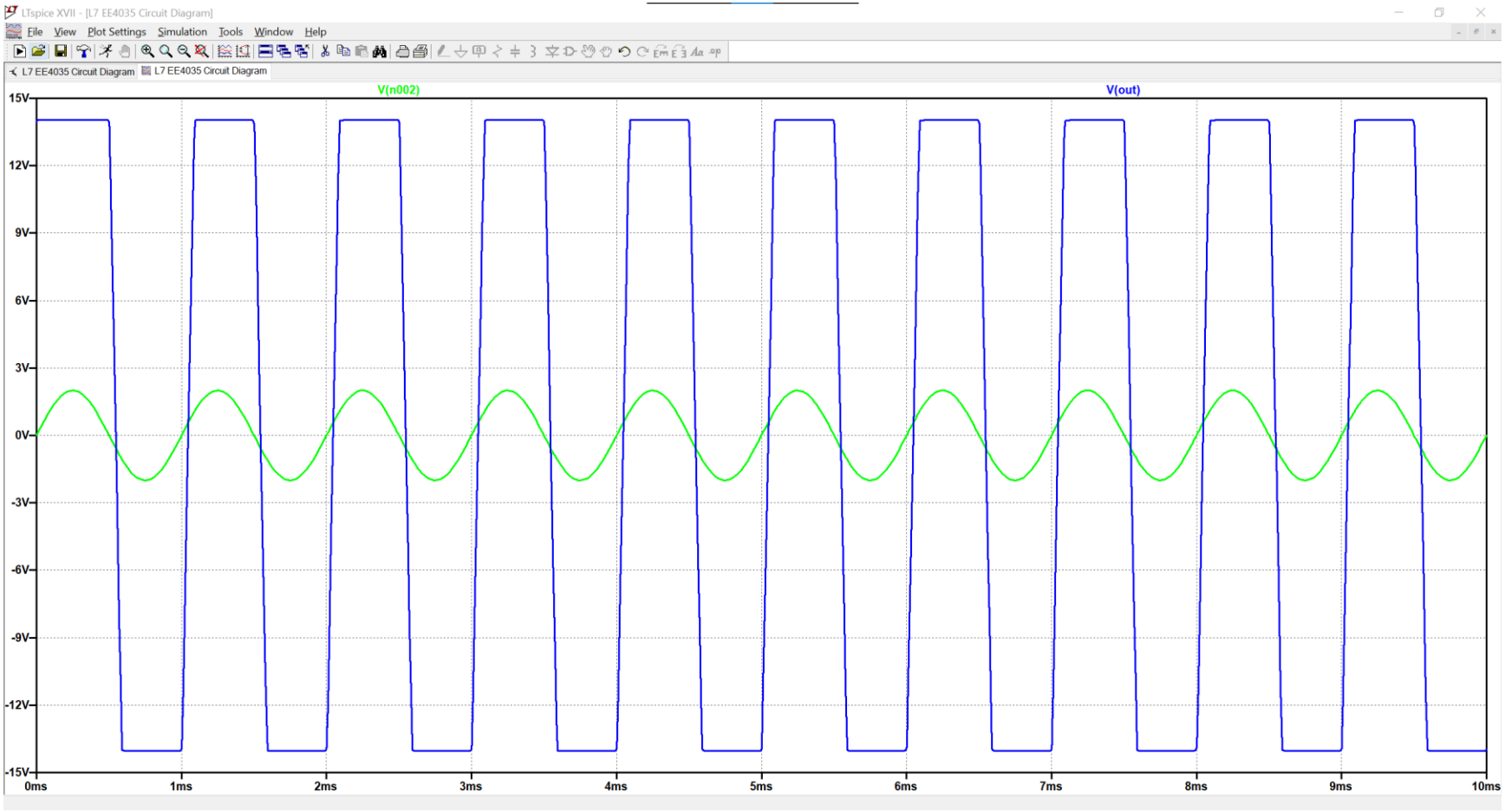

Fig 4. Output Waveform (2V)

Step 5

Repeat 4, with the pin 3 of the OPAMP grounded and the input applied to pin 2.

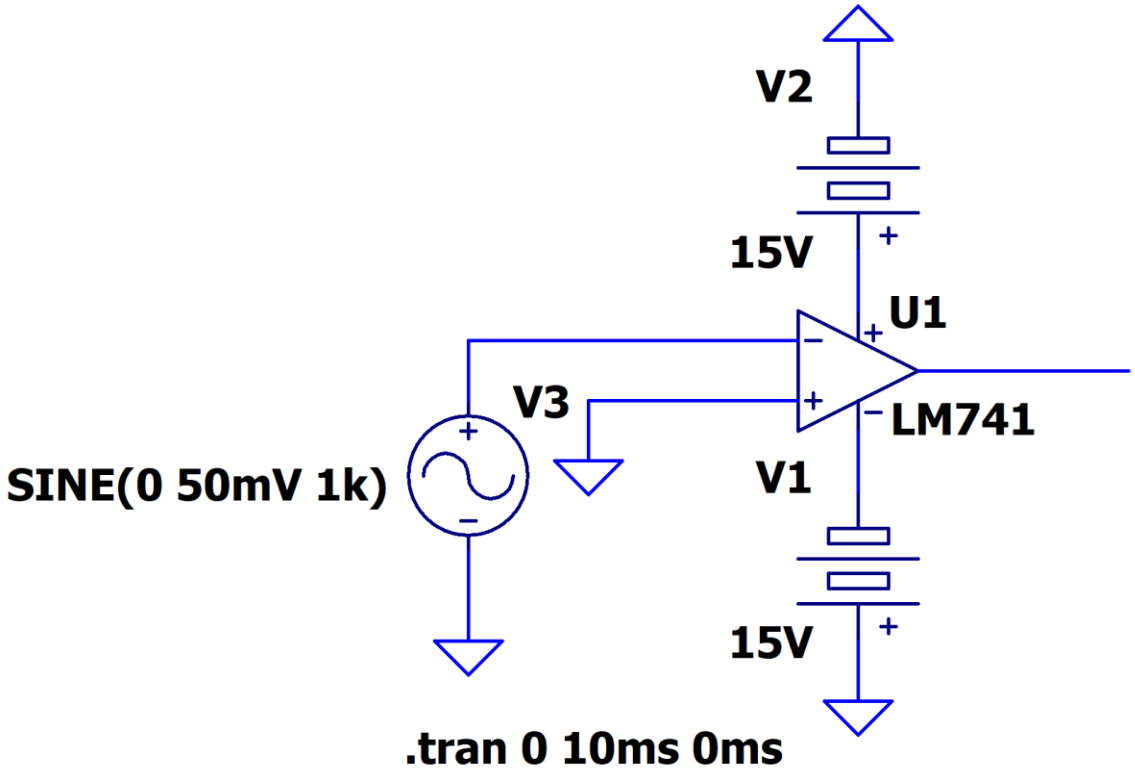

Fig 4. Circuit Diagram (50mV) **PIN 3 Grounded**

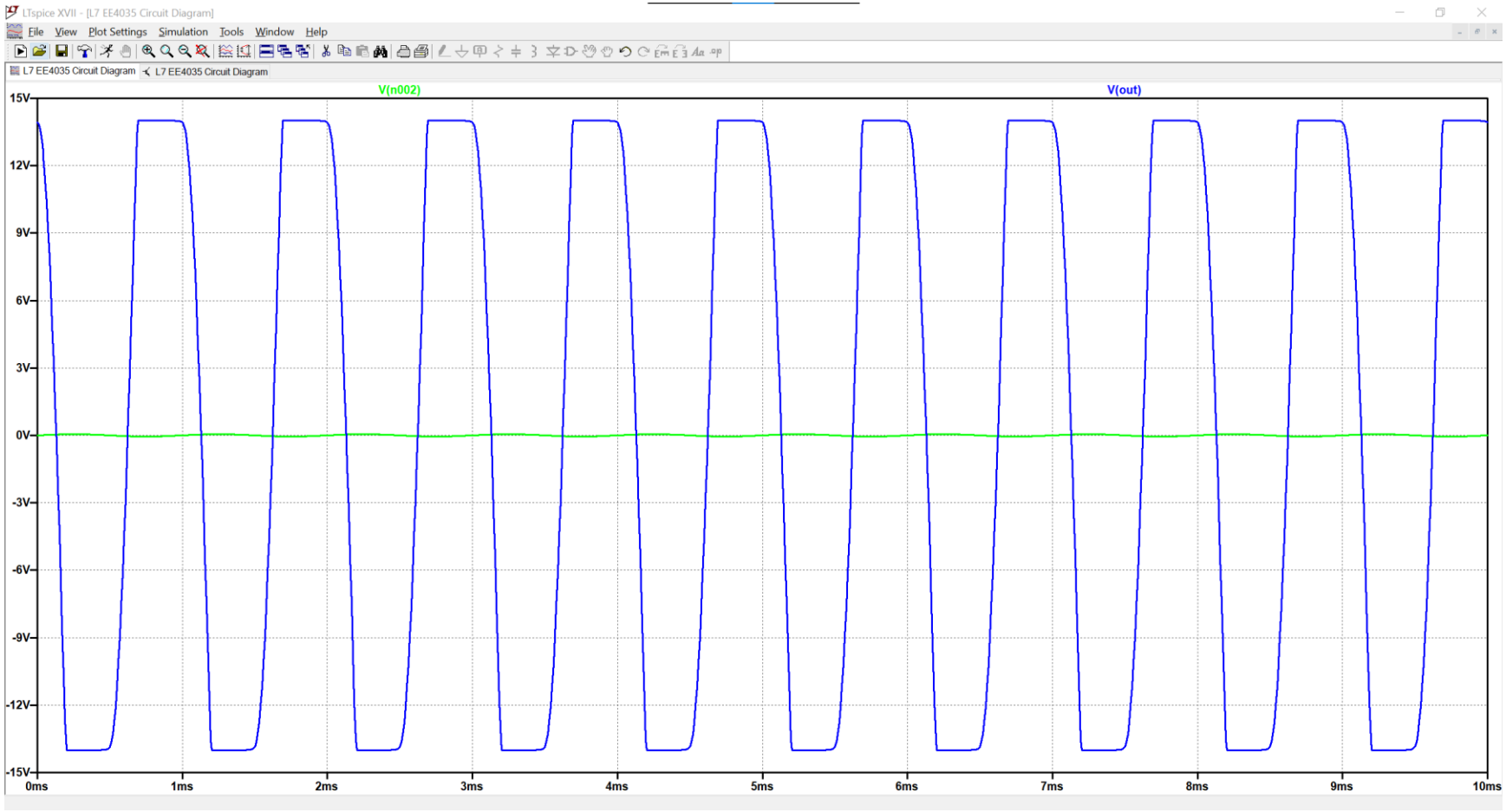

Fig 5. Output Waveform (50mV)

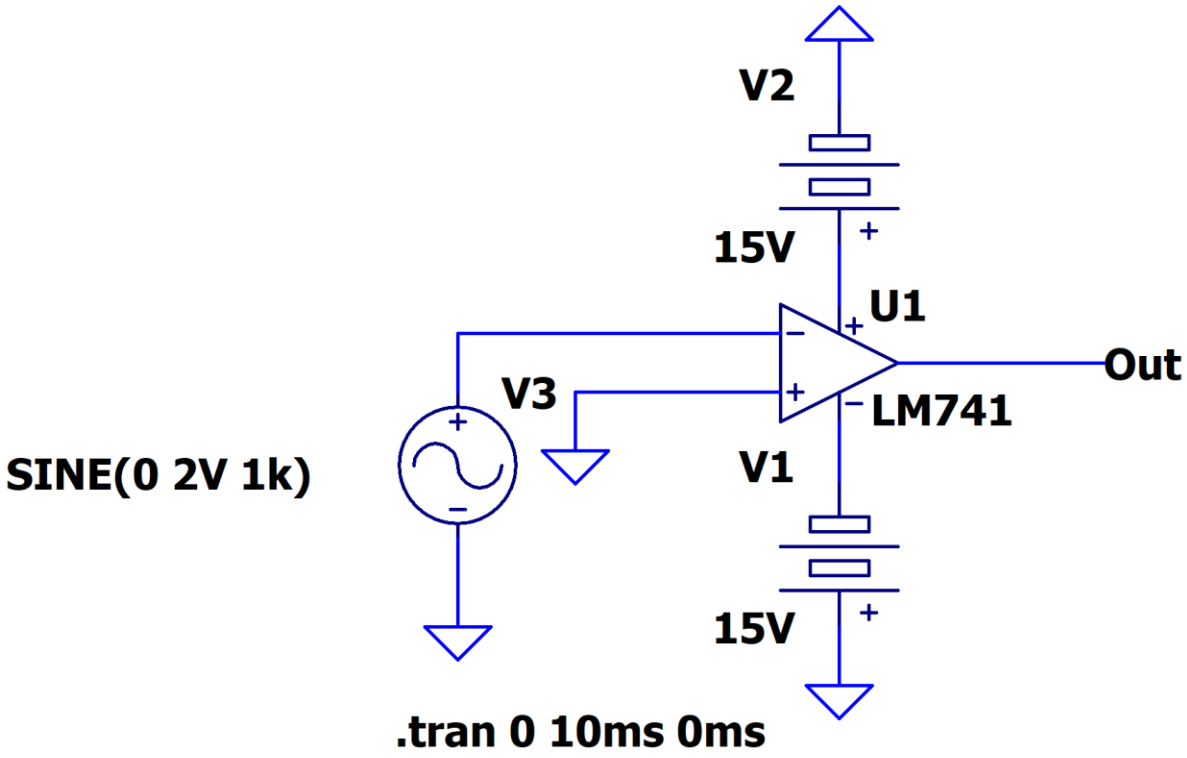

Fig 6. Circuit Diagram (2V)

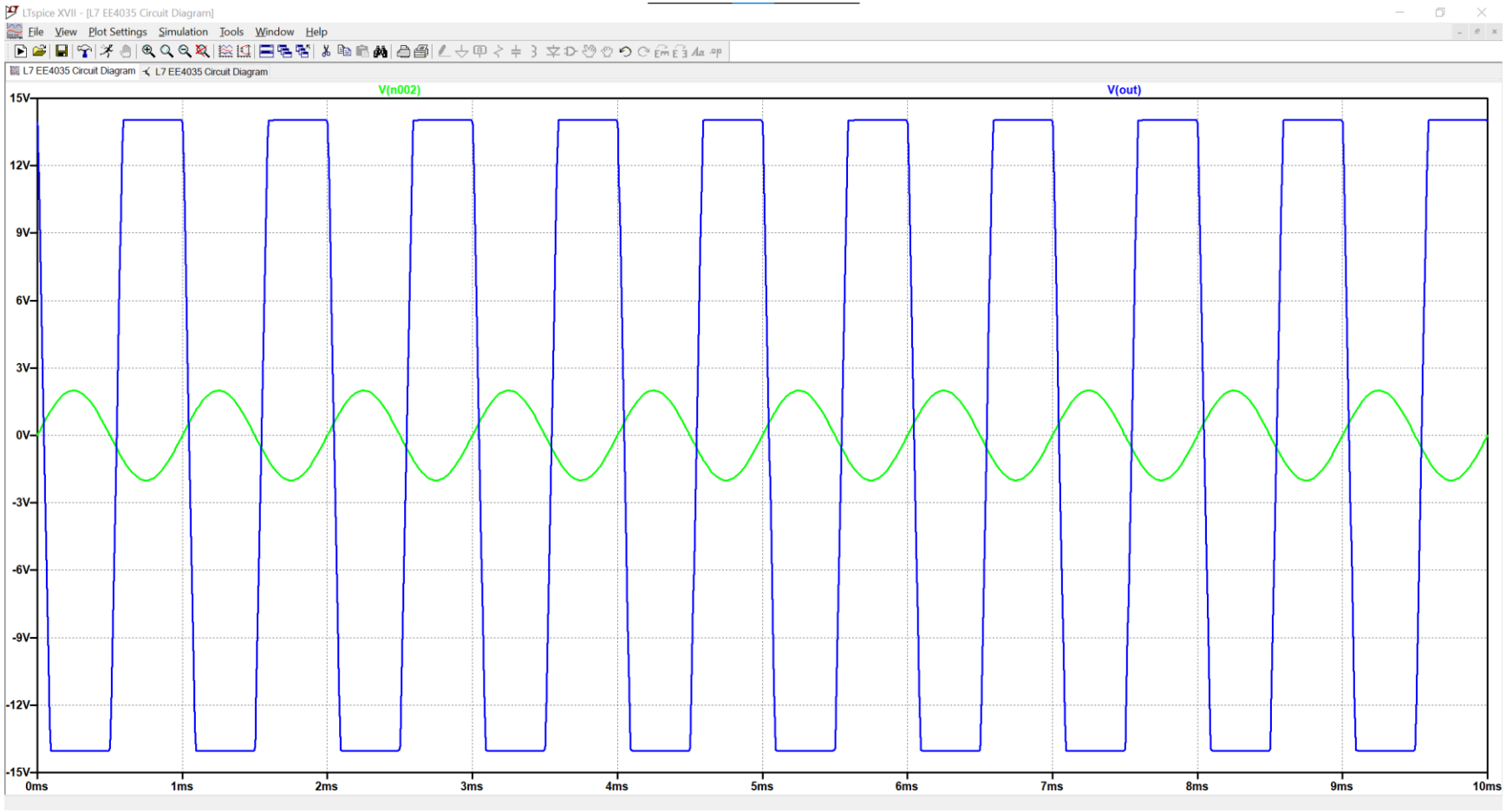

Fig 7. Output Waveform (2V)

Step 6

Ground pin 2 and keep pin 3 open (not connected to any input). Measure the output at pin 6. Repeat with pin 2 and 3 interchanged.

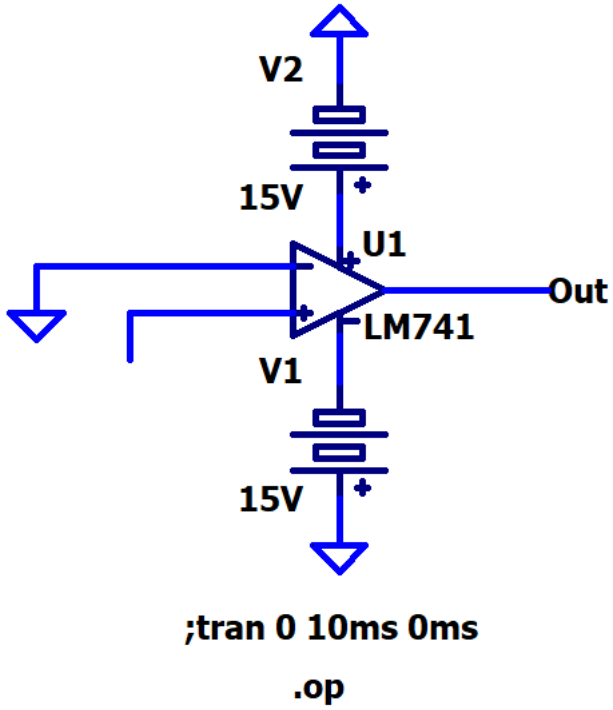

Fig 8. Circuit Diagram **PIN 3 Open Circuit**

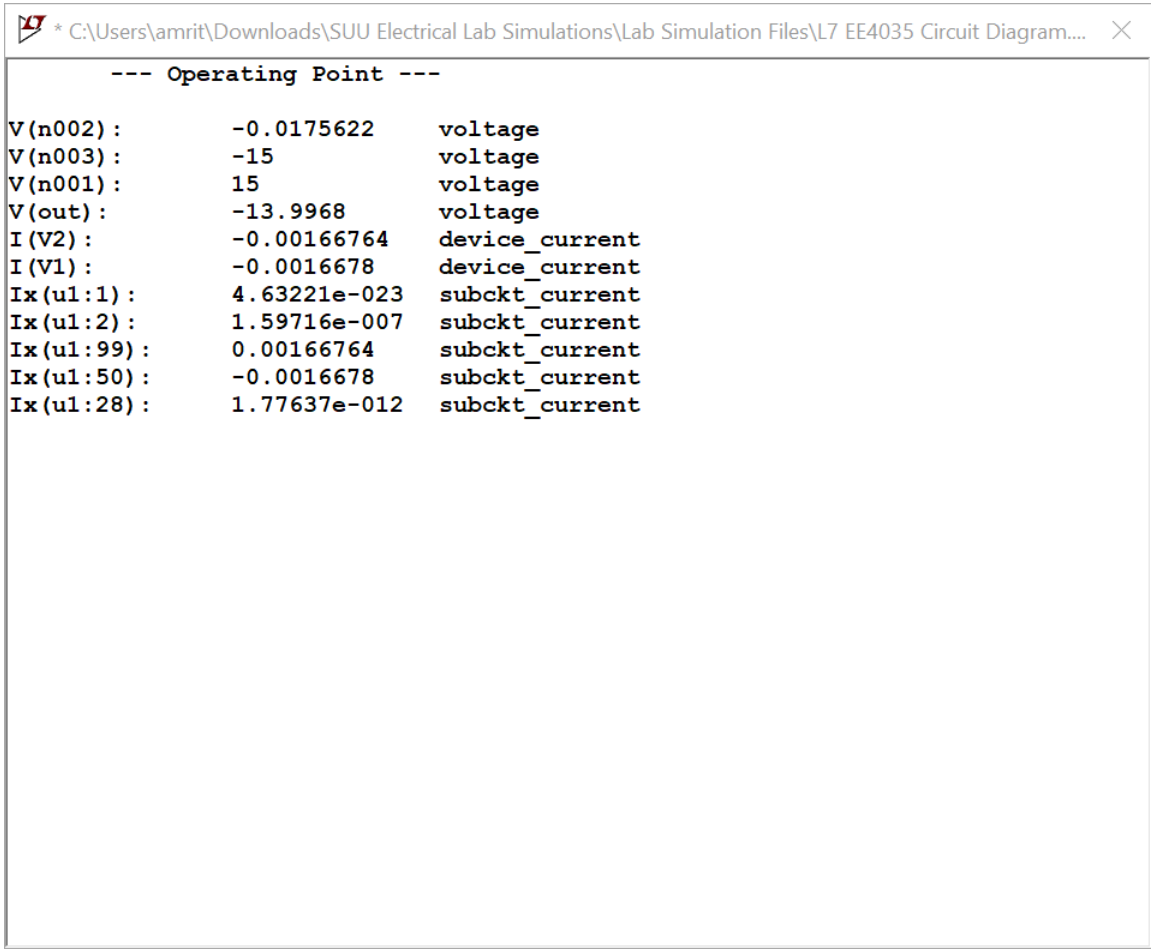

Fig 9. Output DC

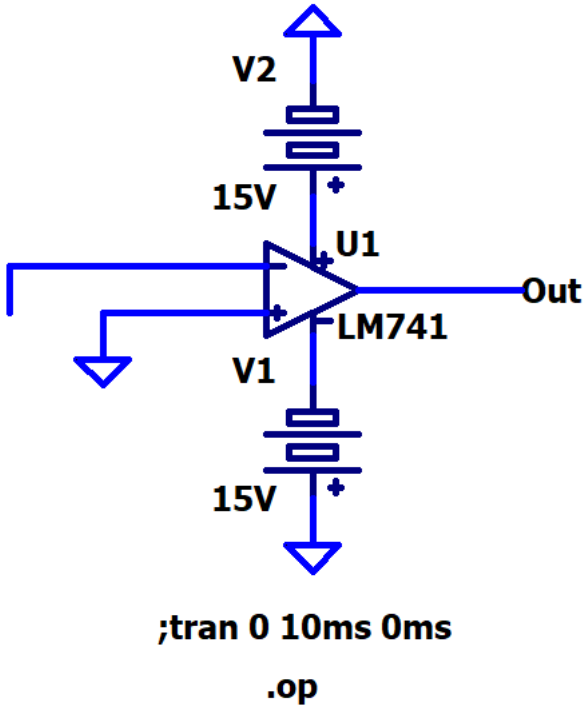

Fig 10. Circuit Diagram

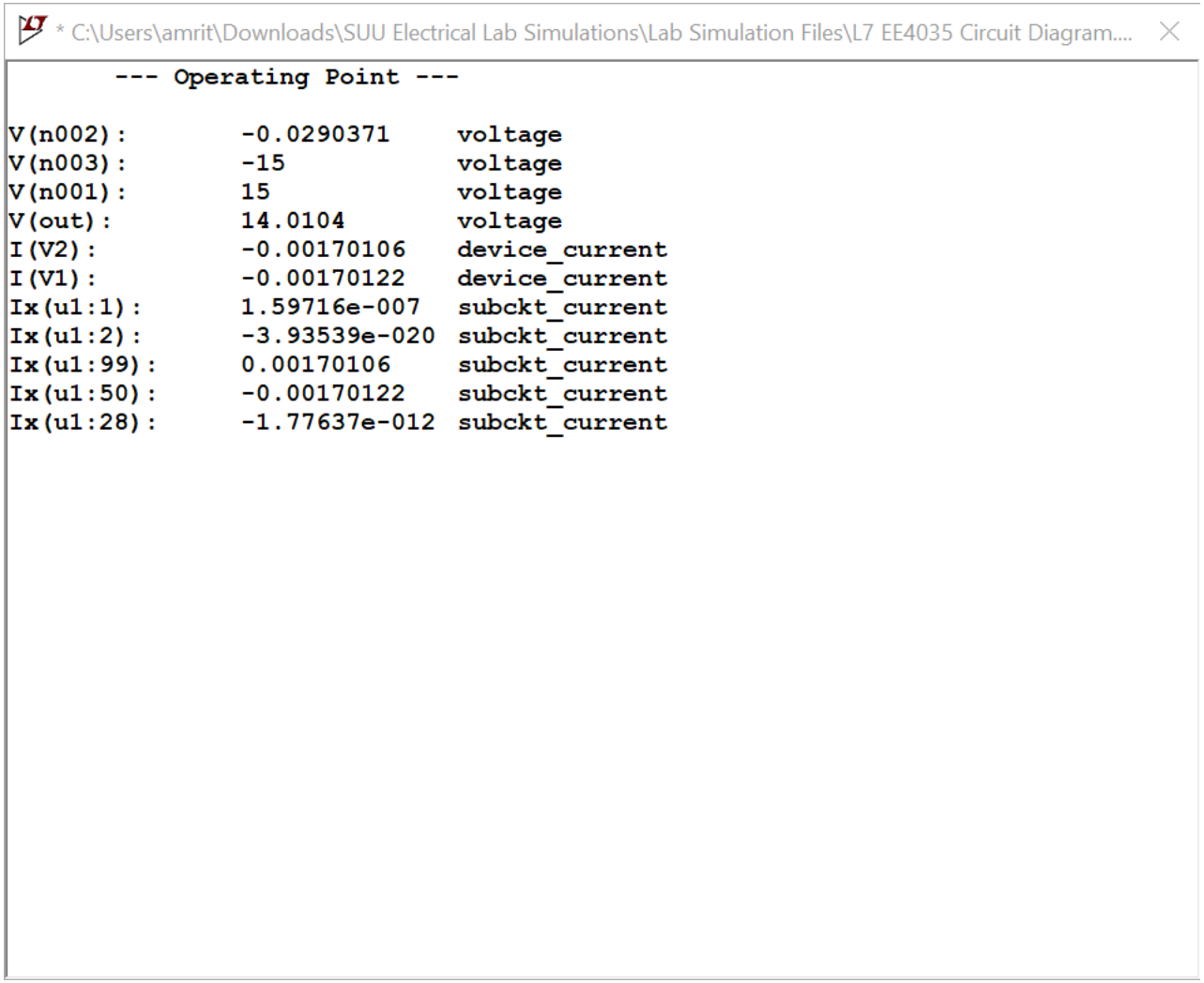

Fig 11. Output DC

Step 7

Ground both pins 2 and 3. Measure the output at pin 6. (You might have to use the microvoltmeter / digital multimeter for this purpose).

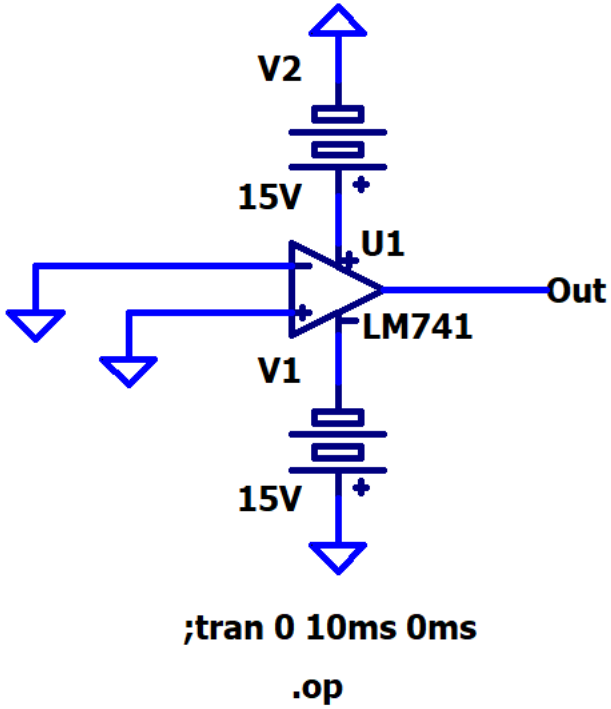

Fig 12. Offset Voltage Measurement Circuit Diagram

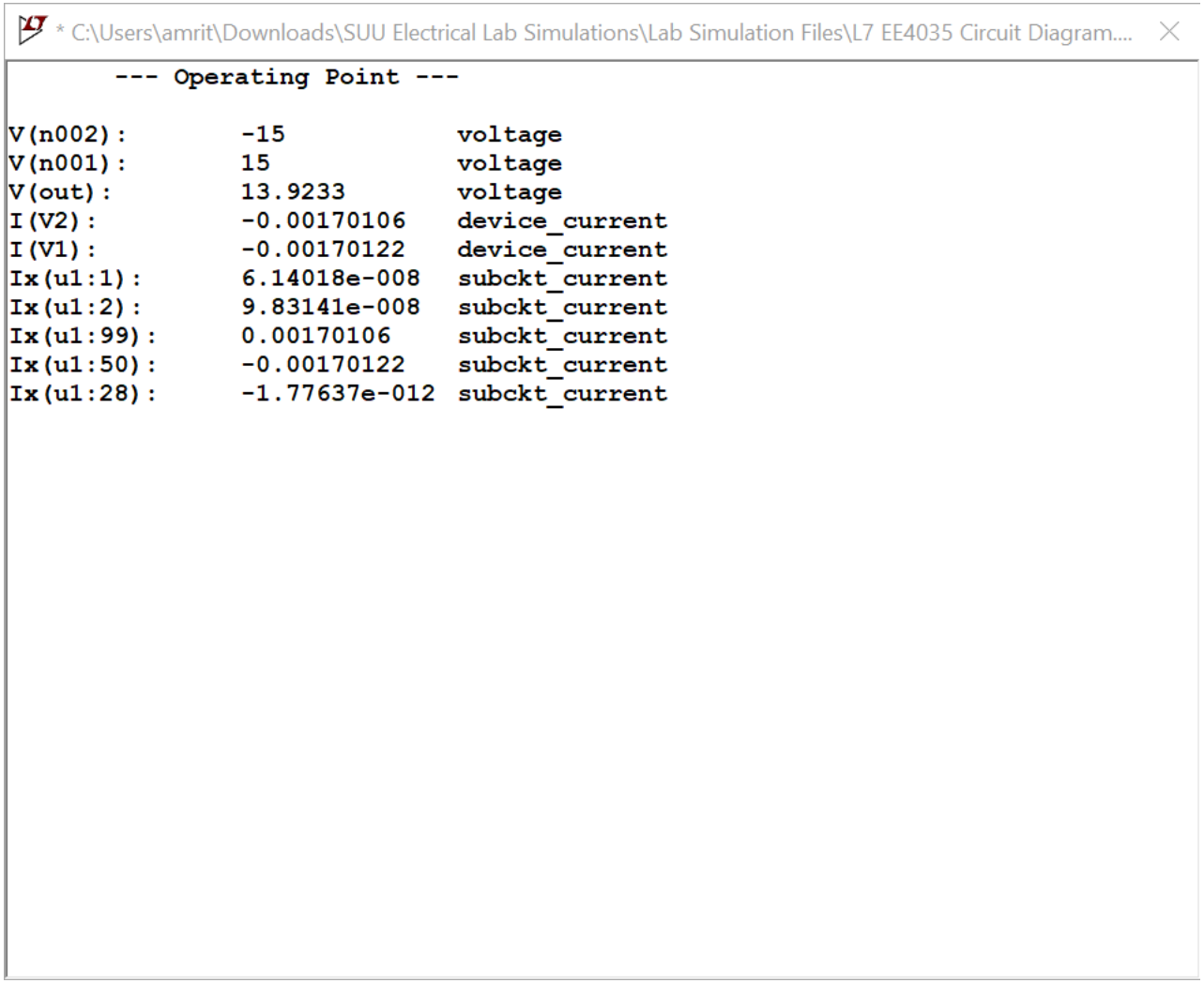

Fig 13. DC Output Offset Voltage

The Offset Voltage is Multiplied by the Open Loop Gain of the Amplifier

Step 8

Now connect pin 4 of the OPAMP to ground (and not to another power supply) Repeat 4. Note down you observation.

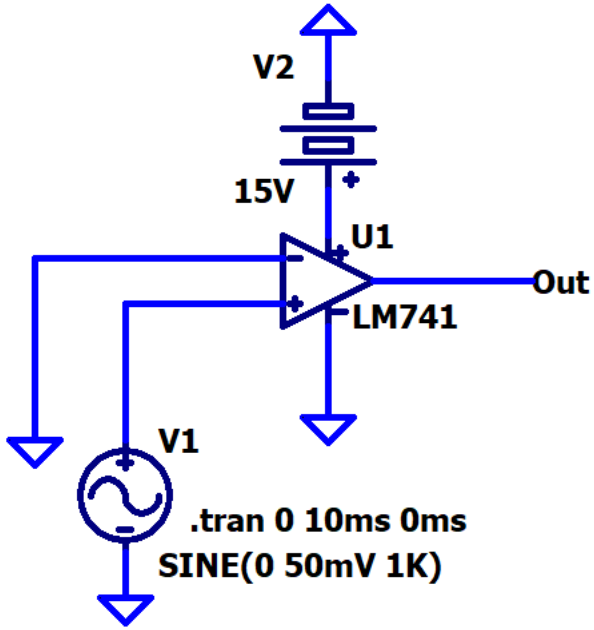

Fig 14. Circuit Diagram (No Room for Negative Swing)

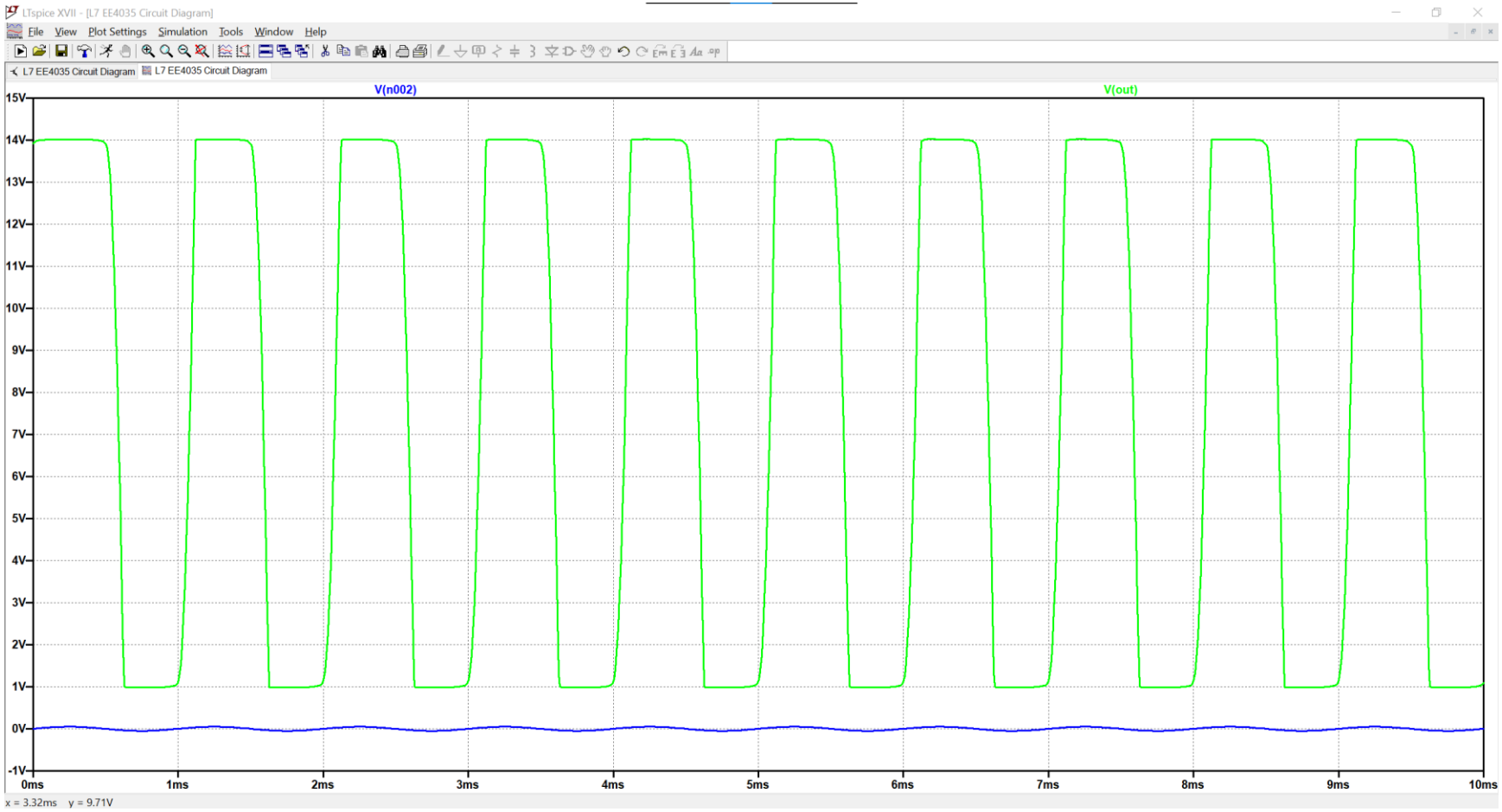

Fig 15. Output Waveform

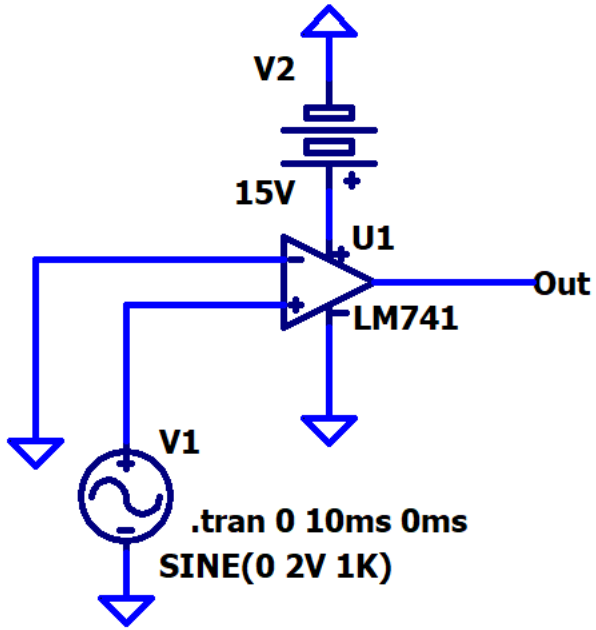

Fig 16. Circuit Diagram (2V)

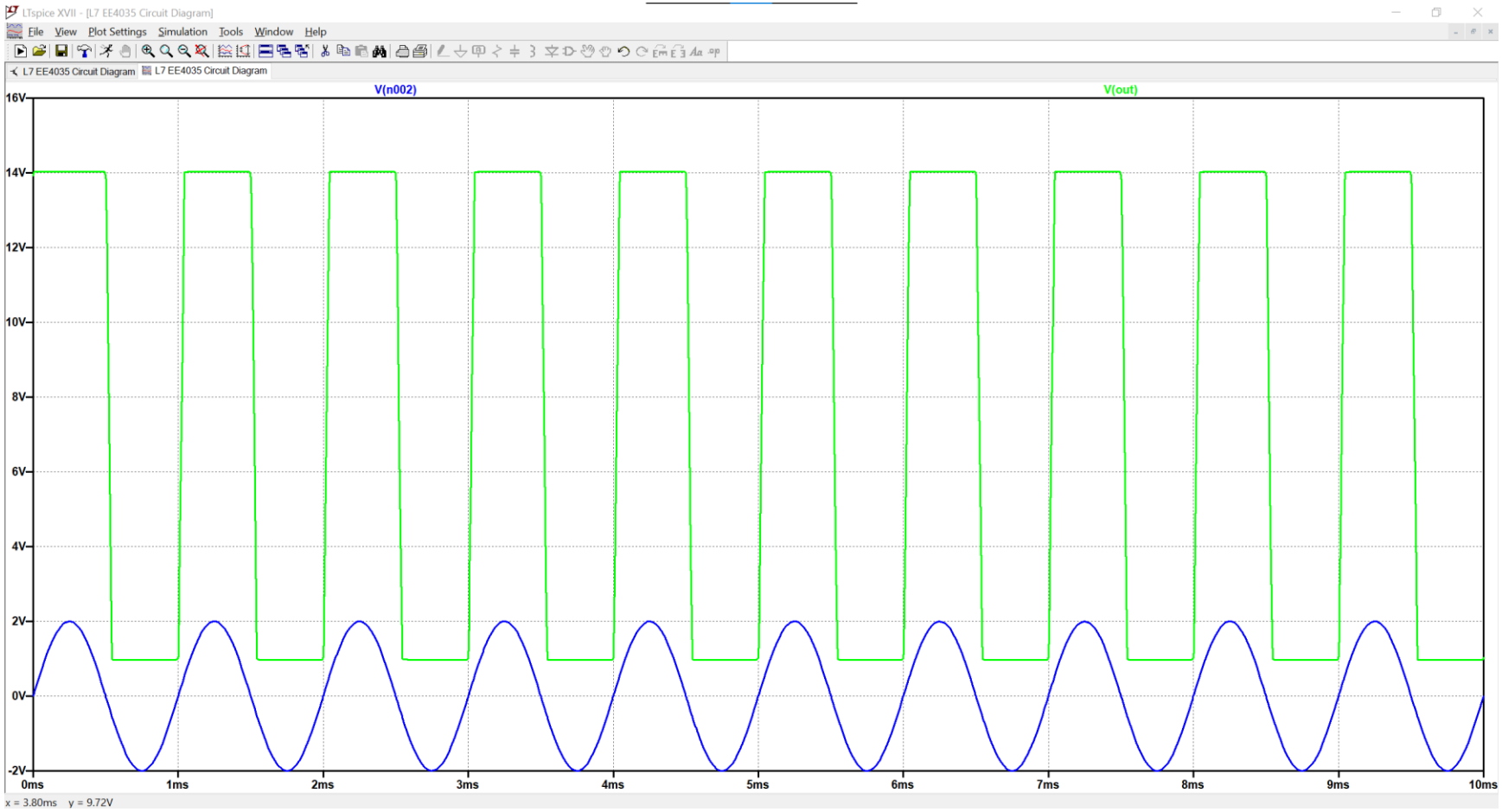

Fig 17. Output Waveform

Answer the Following Questions

1. What difference do you note between the outputs obtained with input amplitude of 50 mV and 2V, at the end of the exercise in **Step 4**? Why?

The OPAMP operates in Open Loop Mode so, the for both cases the output gets saturated and there is no room left for the sinusoidal swing hence signal distortion occurs. In case of 2V the slewing of the amplifier is more.

2. What is the reason for the difference in performance when the input is applied to pin 2?

The OPAMP PIN 2 is said to be inverting, hence for the given input the output would be amplified and shifted by 180 degrees.

3. Why does the OPAMP behave in the wave it does, in **Step 6**?

4. What is quantity that you measure in **Step 7**?

Input offset voltage is the quantity measured in this step.

5. How is the performance of the operation amplifier affected when pin 4 grounded (there is only one power supply)?

Having single power supply limits the OPAMP to have only positive swing because here the negative saturation voltage is zero hence the negative output cannot swing beyond.

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