ECE322: Lab 3

Building a Mini-Op Amp

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Tektronics lab 60-01

Introduction

The main purpose of this lab was to continue the previous lab whereby a differential amplifier was designed, built, and characterized. Also, Building a Mini-Op Amp and include an output stage to lower the output impedance and create a circuit similar to what one could find in a modern op amp integrated circuit. For this experiment, several different styles of output stages were simulated and examined. As high output impedance and large dc offset can be overcome using output stages which was explored in this lab.

Procedure/Experiment:

Part A: Effects of High Output Impedance

This section builds on the differential amplifier circuit from the previous lab. Our next project is to finish the amplifier with an output stage. Afterwards we will simulate the input resistance, output resistance and gain. Once we test the circuit, we will compare the simulation values in the finalized OPAMP with the real world values. The gain is expected to be very high. Things that can limit our project include having mismatched transistors, due to the limited amount provided in the lab kit. They all have the same values, but are from different manufacturers. The next issue will be noise, noise is expected to be large due to the transistor quality and the use of wrapping wires.

Calc1.JPG

Simulations Results

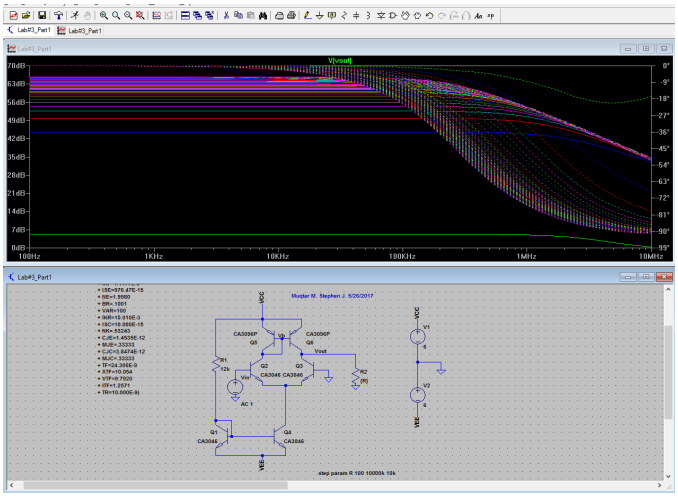


Figure 1: Vout as Rload changes from 100 to 10M

Part B: Effects of High Output Impedance

1) Designing an output stage for the differential amplifier.

2) Run simulations to characterize the mini op-amp. Calculate expected output impedance of amplifier. Repeat for Vout vs. Rload.

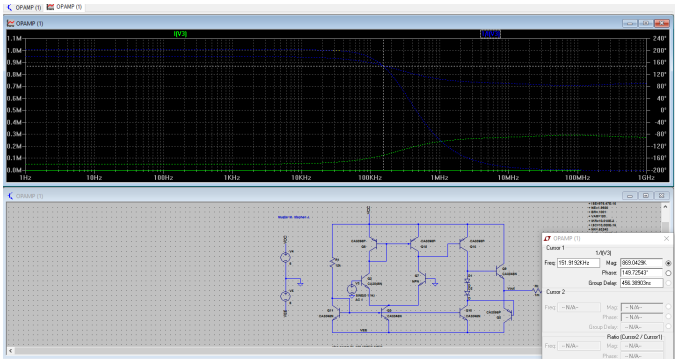


Figure 2: Differential Amplifier with Resistive Loads

Out_imp_vin1.JPG

Figure 3: undistorted LTspice output with

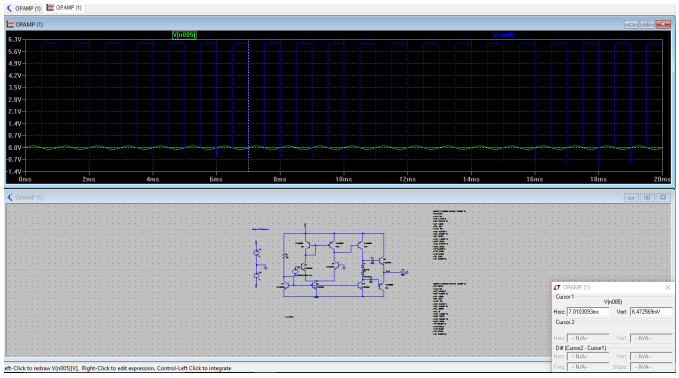
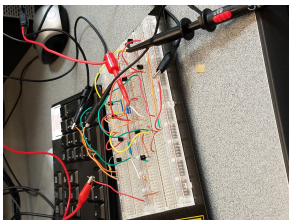


Figure 4:The Transient Output Response of the Circuit

Real world results

Part C: Test and Real world results



Measured amplified values