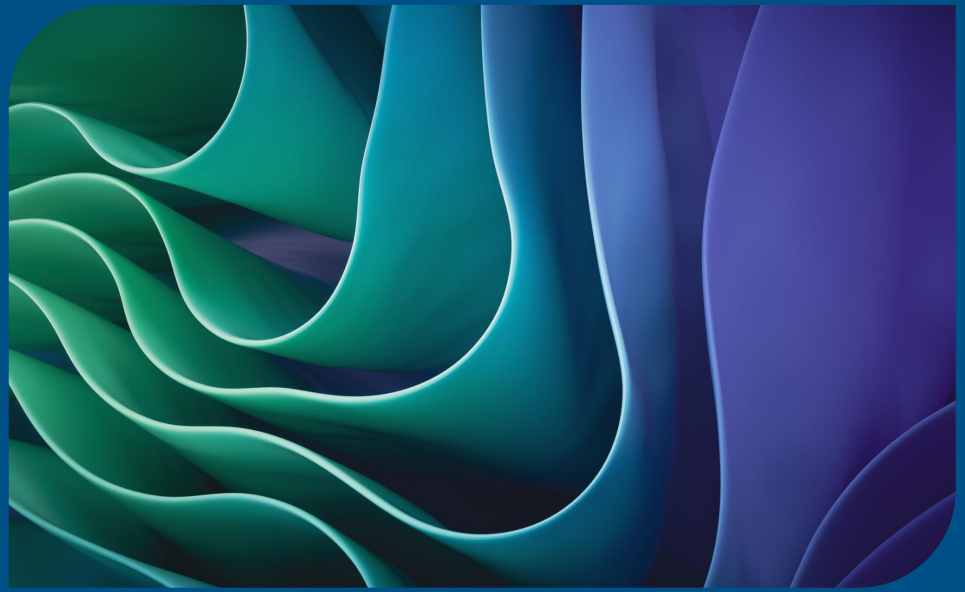
4.8.26

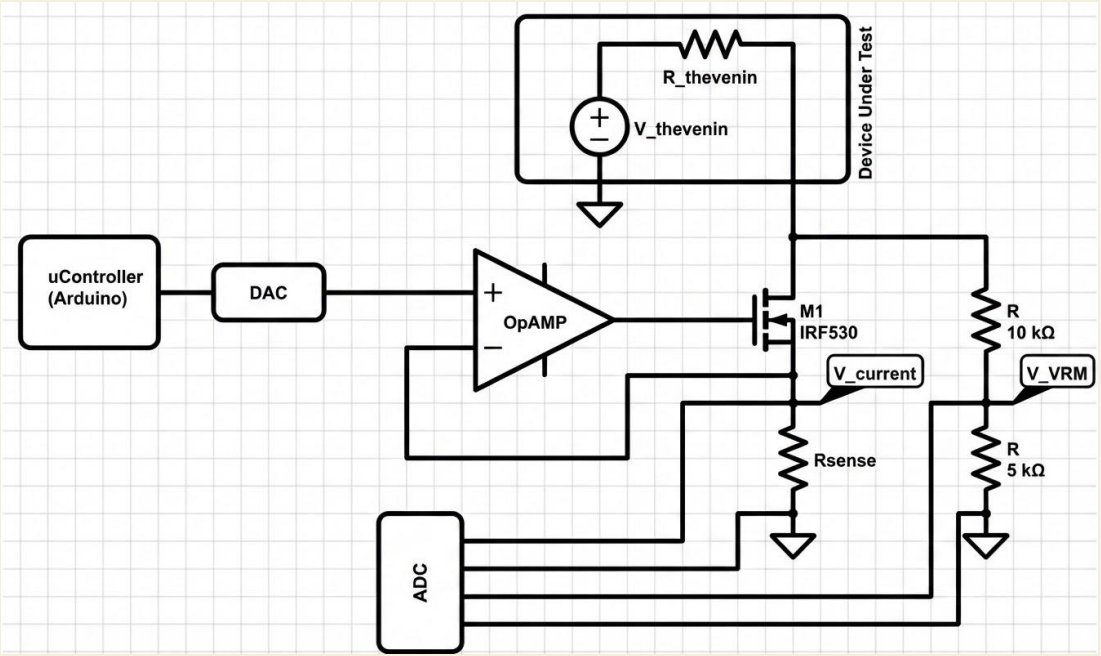
Lab 21 Report

Utkarsh Mandavilli

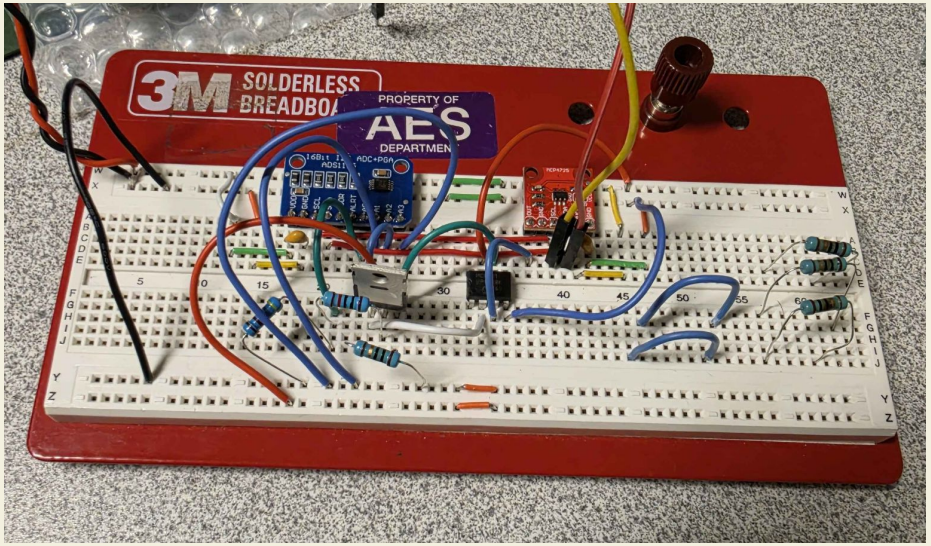


Purpose

Shown on the right is the circuit schematic we followed for this lab. The purpose of this circuit is to act as a programmable constant current sink that draws from the device under test (DUT). It monitors the load current and the voltage supplied by the DUT under different stress levels. This experiment aims to give us an understanding of this circuit before implementing it on a PCB.



Circuit and Devices Under Test



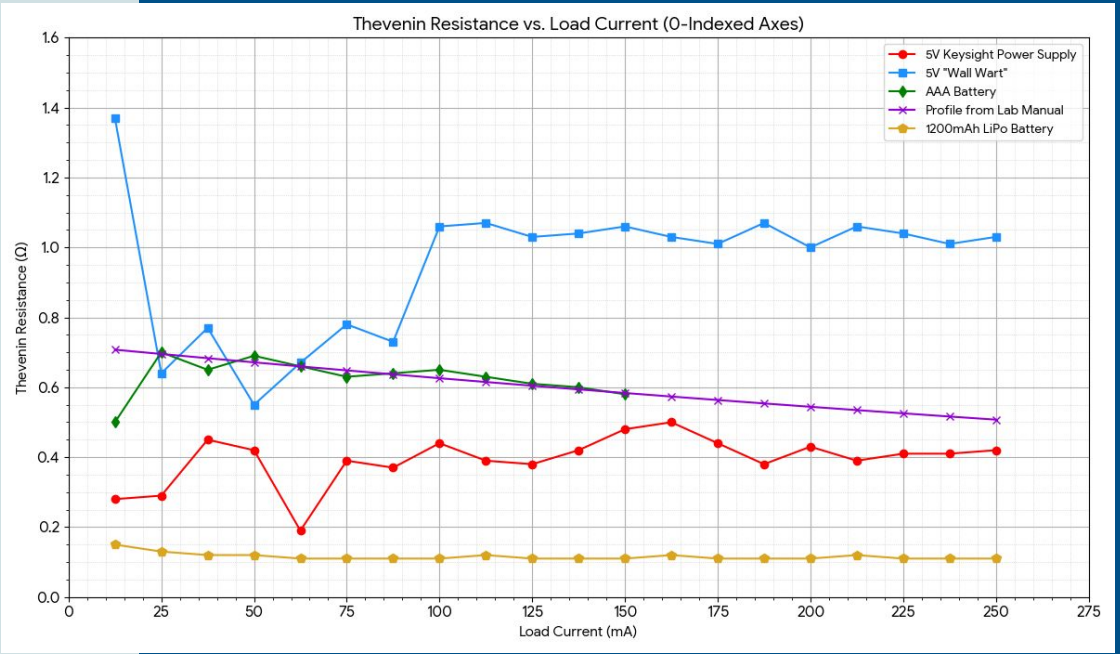
The solderless breadboard version of the circuit is pictured on the left. This circuit required extensive debugging to get working properly. Some of the major issues include having 2 distinct grounds, burning the R_{Sense} resistors (Leftside of board), ensuring that the analog pins were connected to local grounds, making sure the code reflected the correct positions of the pins and our Op-Amp not working as expected.

Some devices that we tested include:

- Keysight E36313A Programmable Power Supply
- Standard Triple A Battery
- 5V Wall Wart
- LiPo Battery

Results

- 5V Keysight Power Supply: This demonstrates the highest stability with the lowest internal resistance, about .3 - .5 Ohms. Indicates excellent voltage regulation.
- 5V "Wall Wart": Shows the poorest performance with high, erratic resistance, peaking over 1 Ohm. Most likely due to low-quality internal switching components.
- AAA Battery: Maintains moderate resistance of .5 - .7 Ohms that follows the ideal profile. It does however cutoff at 150mA due to exceeding the 75% voltage sag limit.
- LiPo Battery: This maintains an extremely low resistance of .15 Ohms and appears as an almost ideal source.



Drawing a Conclusion

Based on the results we can see a few things:

- The type of power supply greatly influences outcomes despite having the same current draws
  - Ensuring that the power supply meets the project requirements is very important which is something this board allows us to test
  - Some supplies have modular resistances whereas other like batteries are generally constant throughout the whole range
- Debugging this circuit made sure that we were aware of changes that needed to be made before designing on a PCB
  - Shows how valuable breadboard prototyping can be for not only understanding circuit/electrical principles but also fixing issues
- Real-world sources are very different from ideal ones
  - Important to understand the reasons for behaviors such as chemical and electrical properties or even the digital logic driving more complex sources.