The Multiplexed Source Measure Unit

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Project Summary: A power source and measurement device that can automatically test devices assemblies

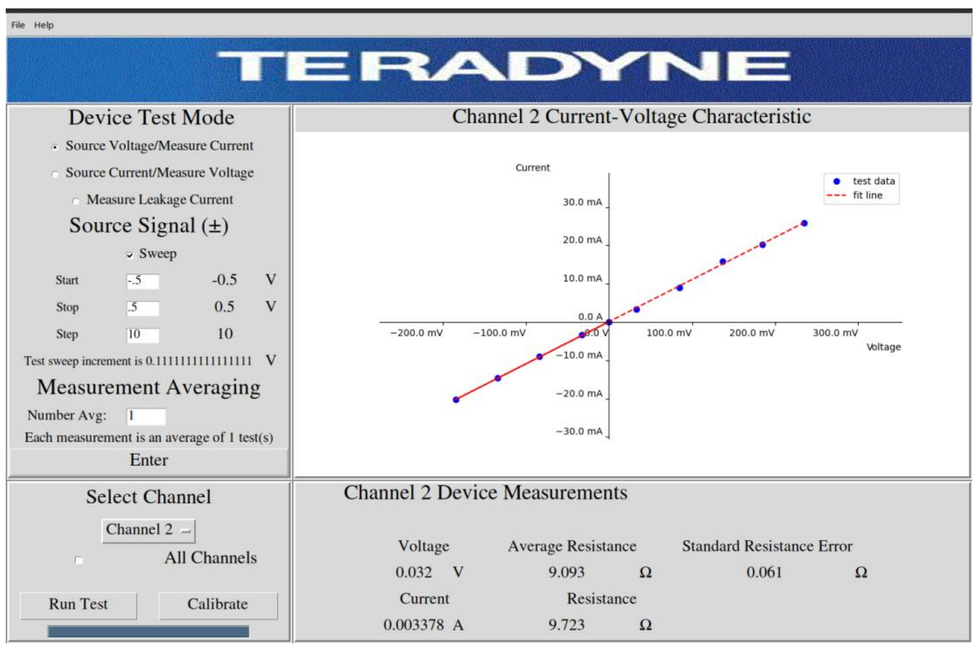
Purpose:

Laboratory testing PCB traces, cables, and other devices can be a huge time sink. For this project our sponsor challenged us to develop an affordable, versatile system that could precisely test 16 devices fully automated from the UI.

Available Products vs The OGCAD SMU

Custom User Interface:

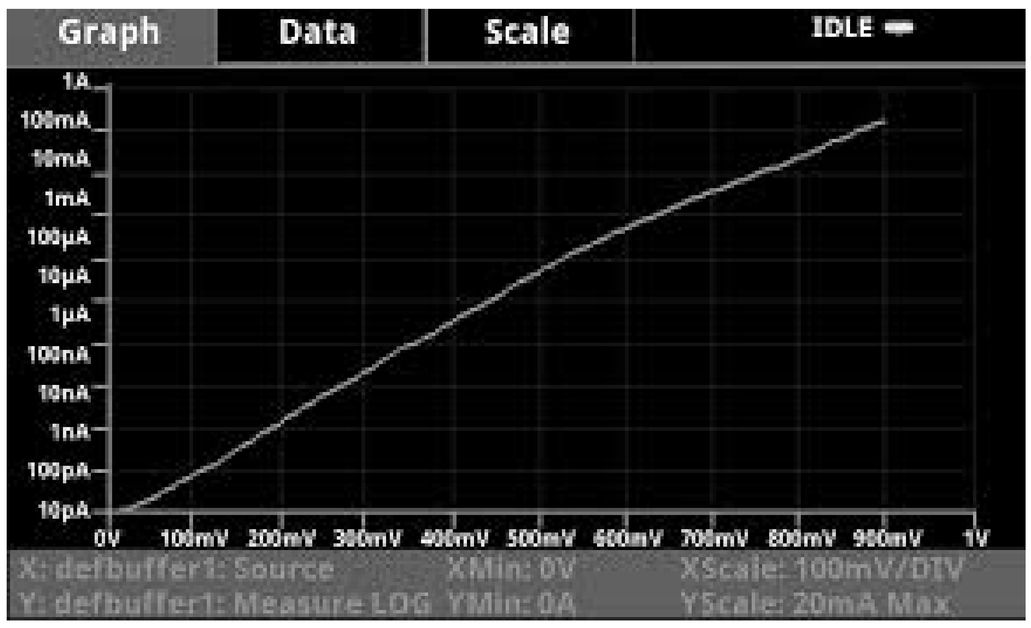
- IV and VI curve capabilities with custom averaging, step size, and calibration mode on up to 16 devices
- Coded in Python using Tkinter package
- Weight: ~4oz, handheld device



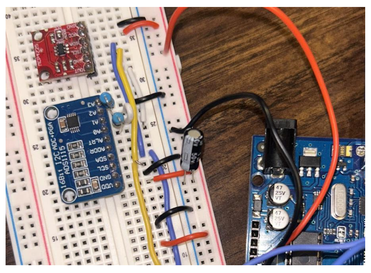
COTS User Interface:

- Keithley SMU resistor characterization curve, cost $4000
- 1-3 devices at a time
- Weight: 10lbs-40lbs

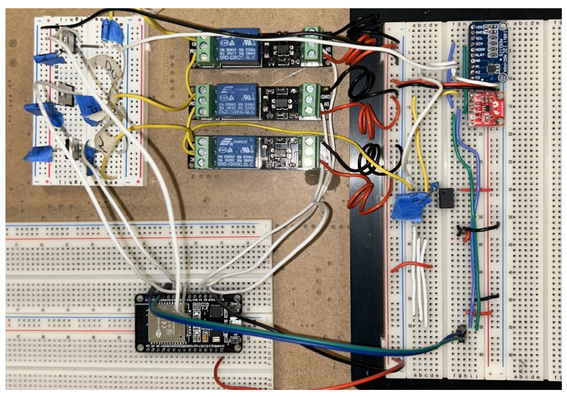
OGCAD offers 85% Price Reduction with 5% Accuracy.



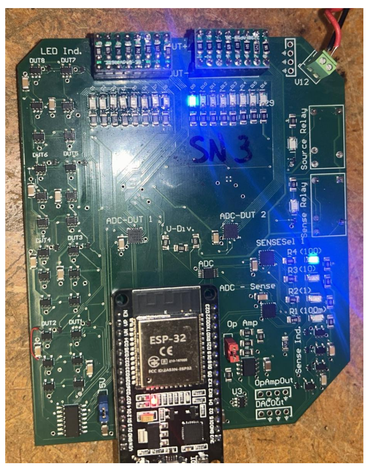
Iterative Process:



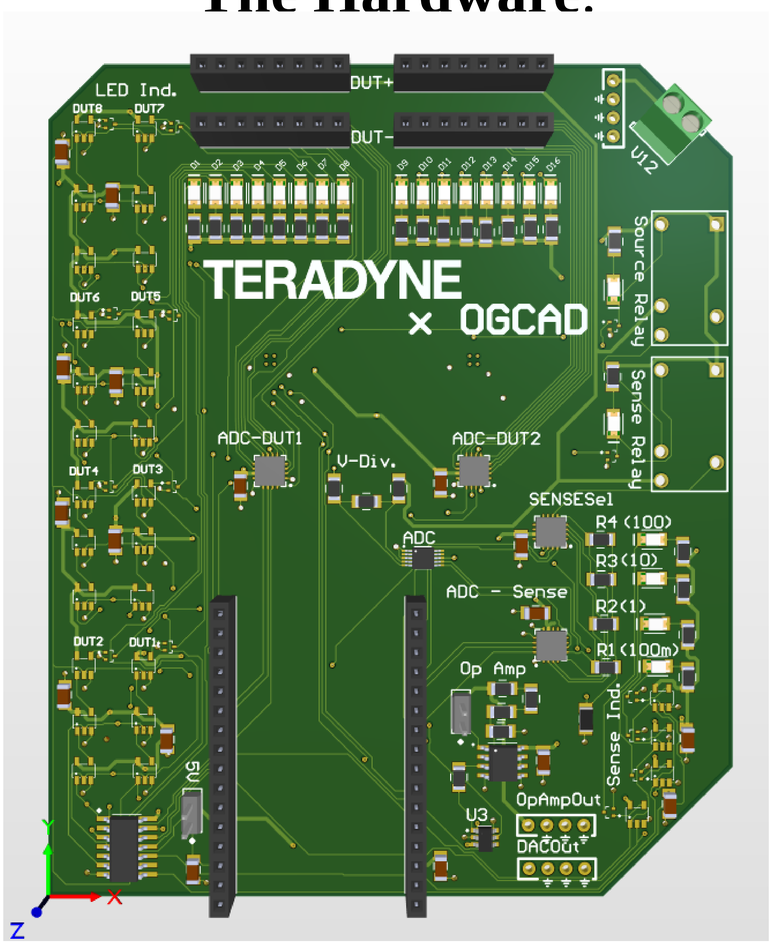
<u>Measurement:</u>
16-bit ADC and PGA (ADS1115)
<u>Source:</u> 12-bit DAC (MC4725)



<u>+/-12V Sourcing:</u>
Relays for polarity switching
<u>Current Ranging:</u>
Sense resistor switching matrix
<u>Wi-Fi Host:</u>
ESP32 WROOM-DA

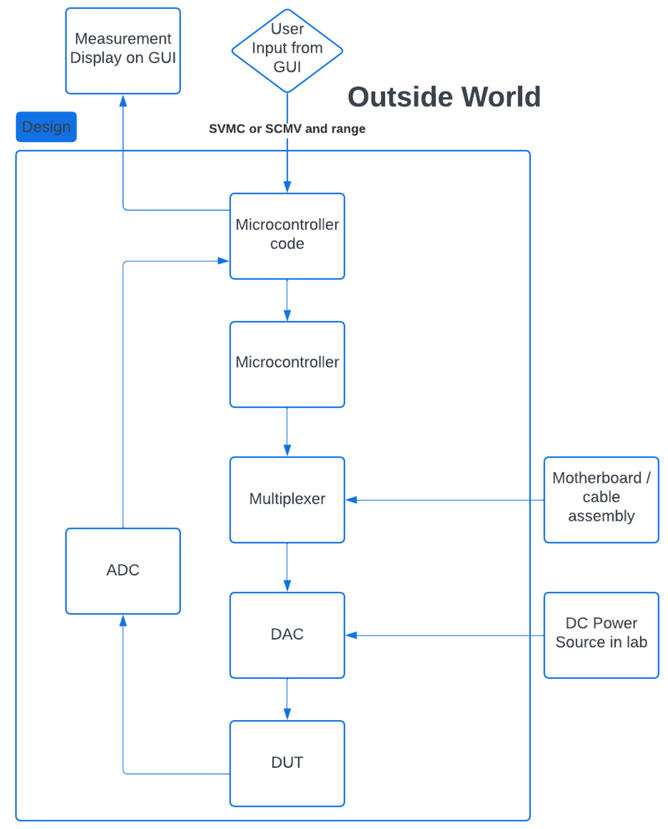


The Hardware:



- Precision is achieved through **automated sense resistor and PGA gain cycling program**.
- Remote control is achieved by hosting a network on the ESP32 allowing custom test protocols to be triggered on any wifi network.

Block Diagram:



Key Learnings: Component selection, switching architecture design, and precision measurement techniques.