

Temperature Controller and IV Characterizer

Group Number: DD 16

Project Guide: Prof. Joseph John

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Abstract

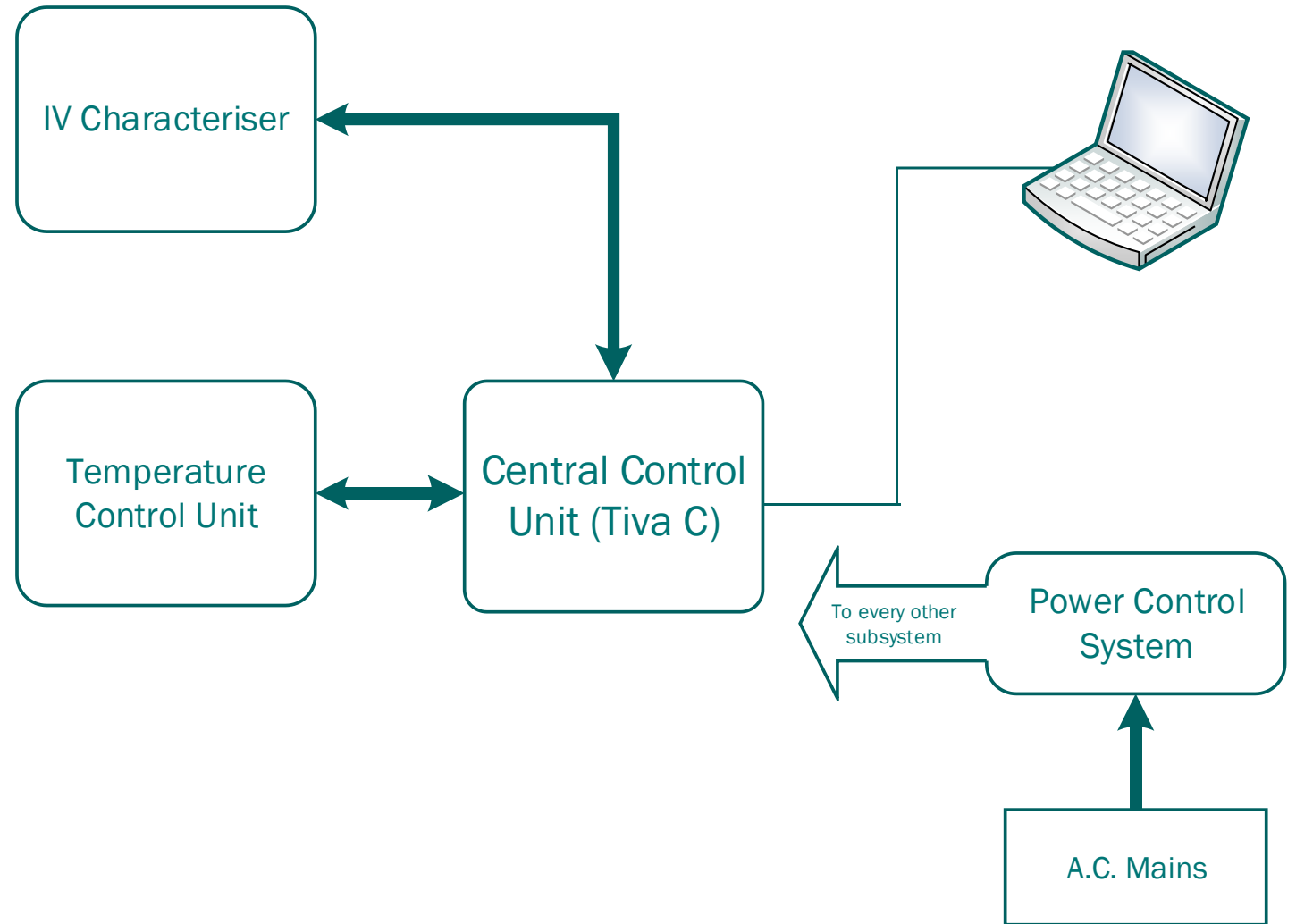
- The aim of the project was to build a wide range temperature controller using a Peltier Cooler
- The set is to be used to plot the IV Characteristics of two terminal devices at various temperatures.
- Along with the temperature controller, the IV Characteriser was also designed as part of the project.

Motivation

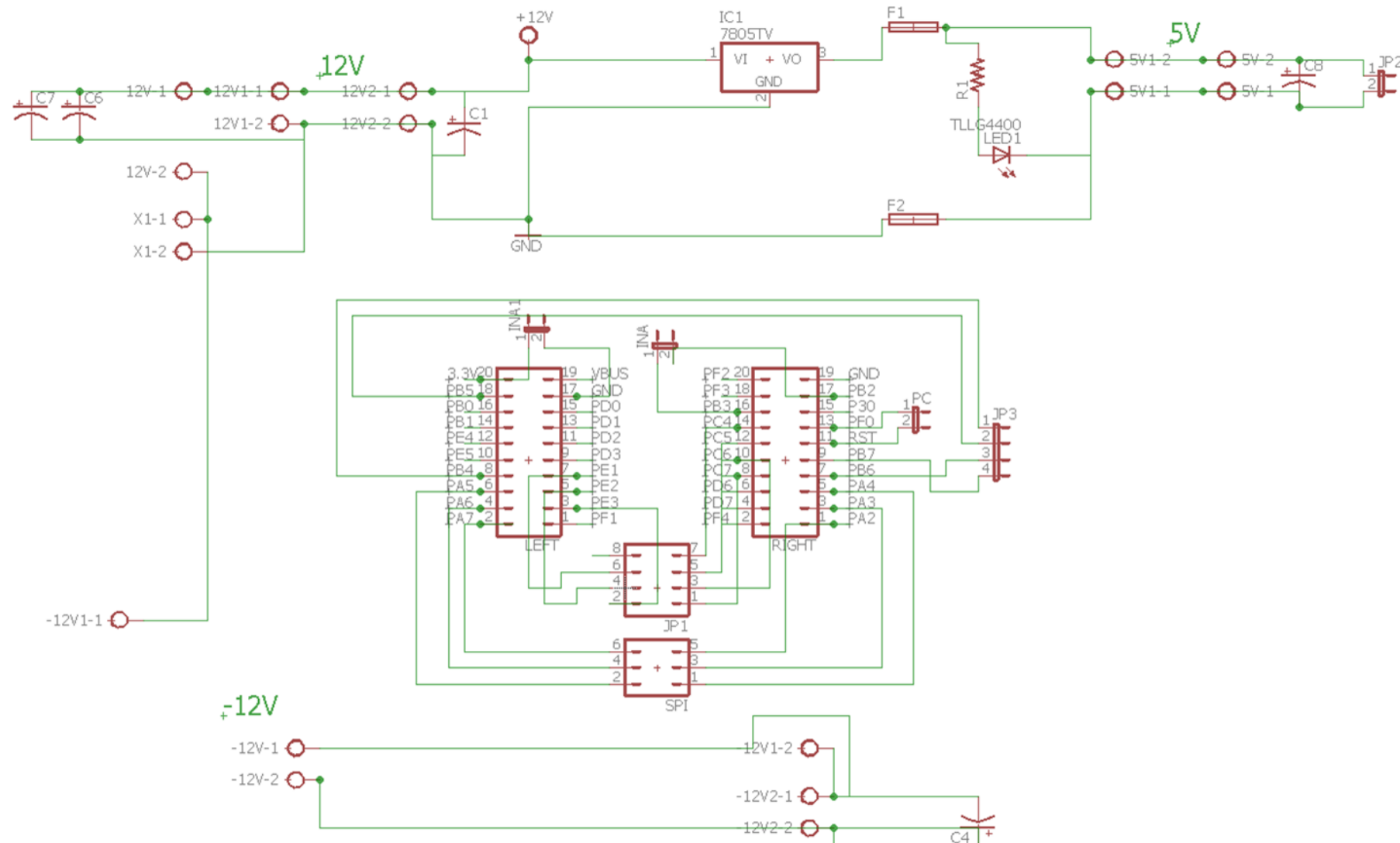
- Not an easy way to quickly characterize a devices' characteristic at various temperatures
- Reduce the manual effort by designing an automated system
- Learn about the Peltier Cooler
- Learn precise low power system design for the IV Characteriser
- Learn coding for new microprocessors and GUI Design

Sub-Systems

- Peltier Temperature Controller
- IV Characteriser
- Power Supply Circuit
- Microcontroller (TIVA-C Launchpad) and Python GUI

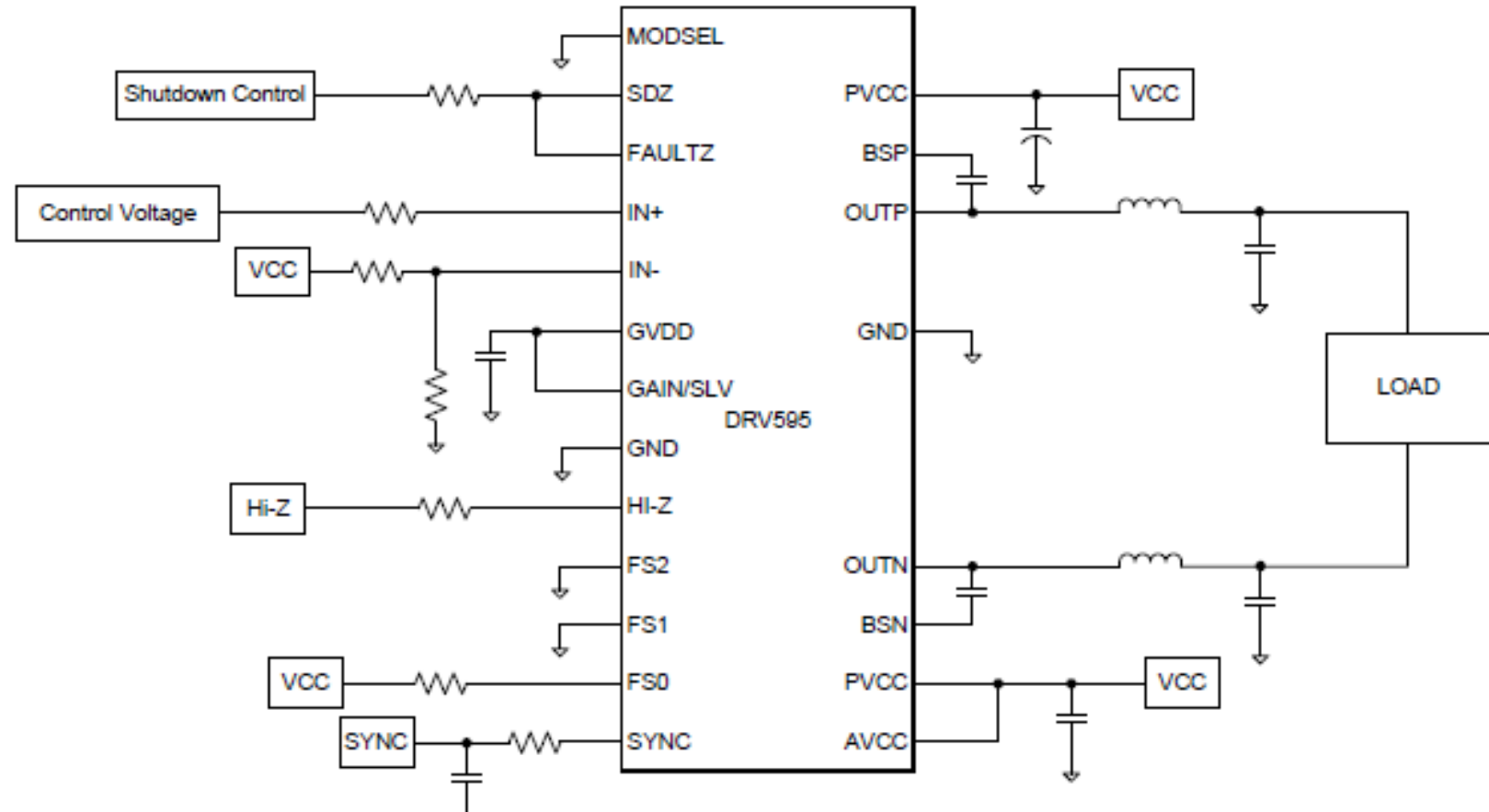


Power Supply Circuit and TIVA Breakout

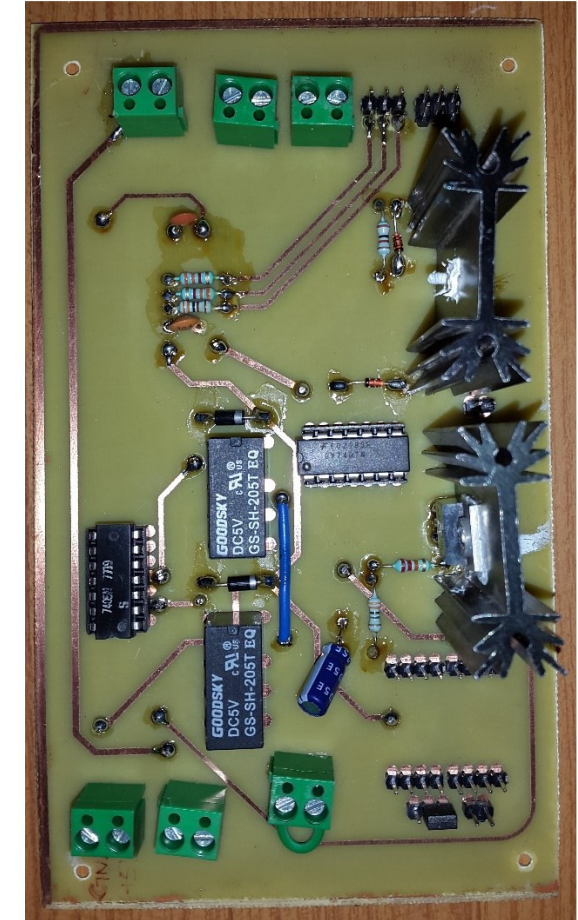
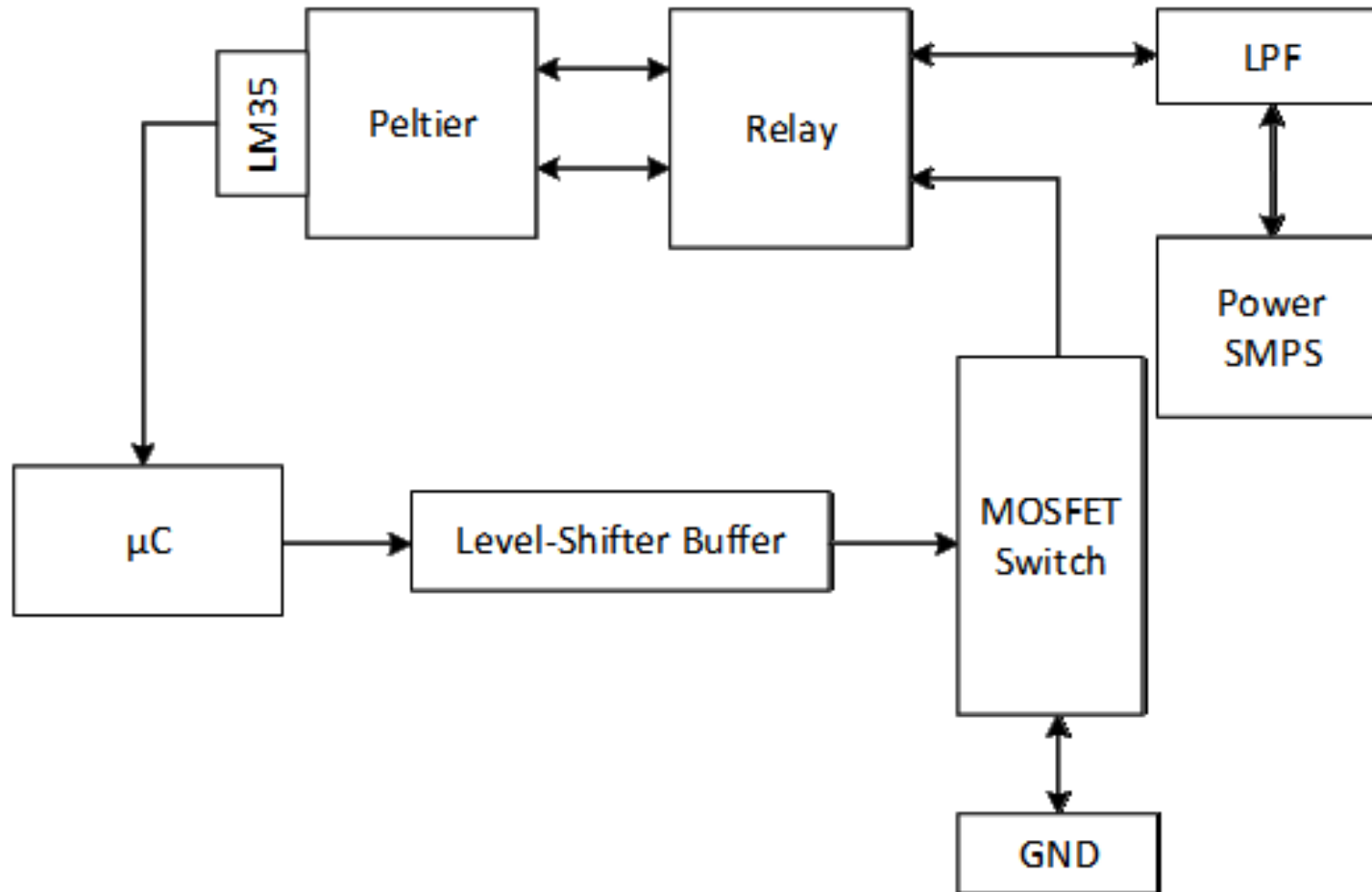


DRV595

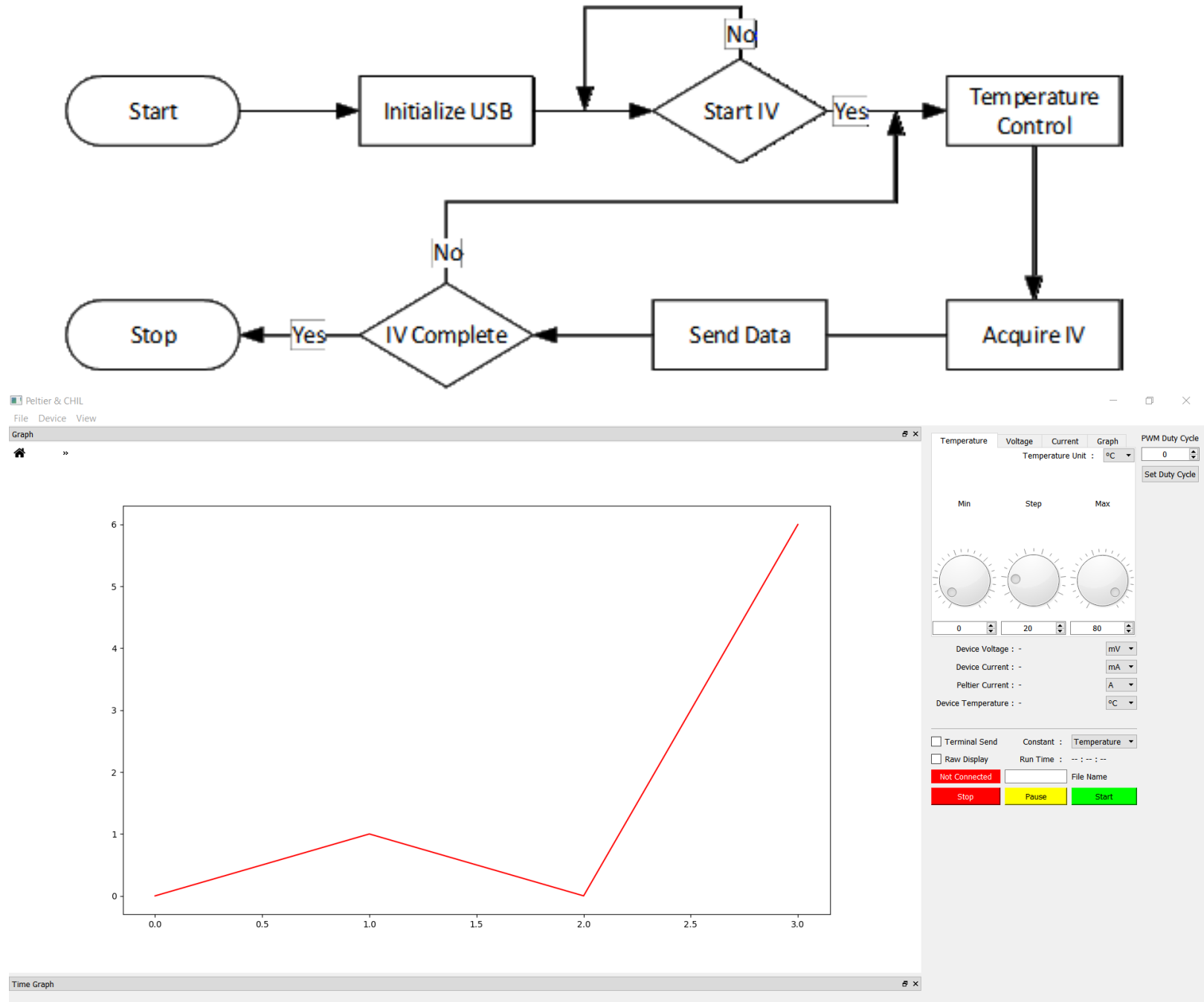
- H Bridge IC
- High Power handling capability and internal direction switching
- Testing Procedure
- Problems Faced



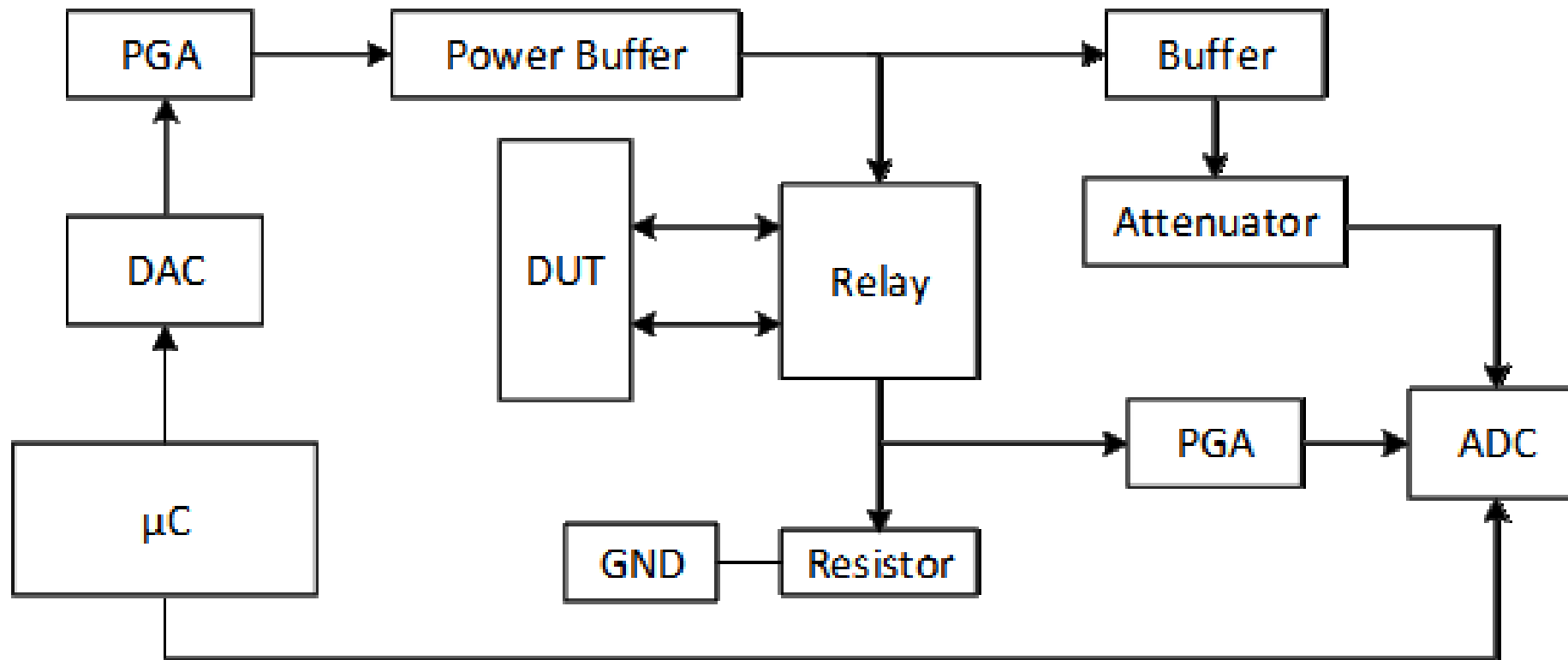
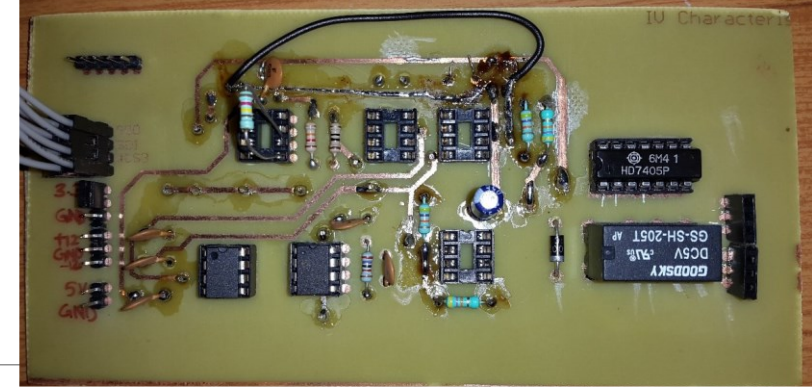
Peltier Temperature Controller



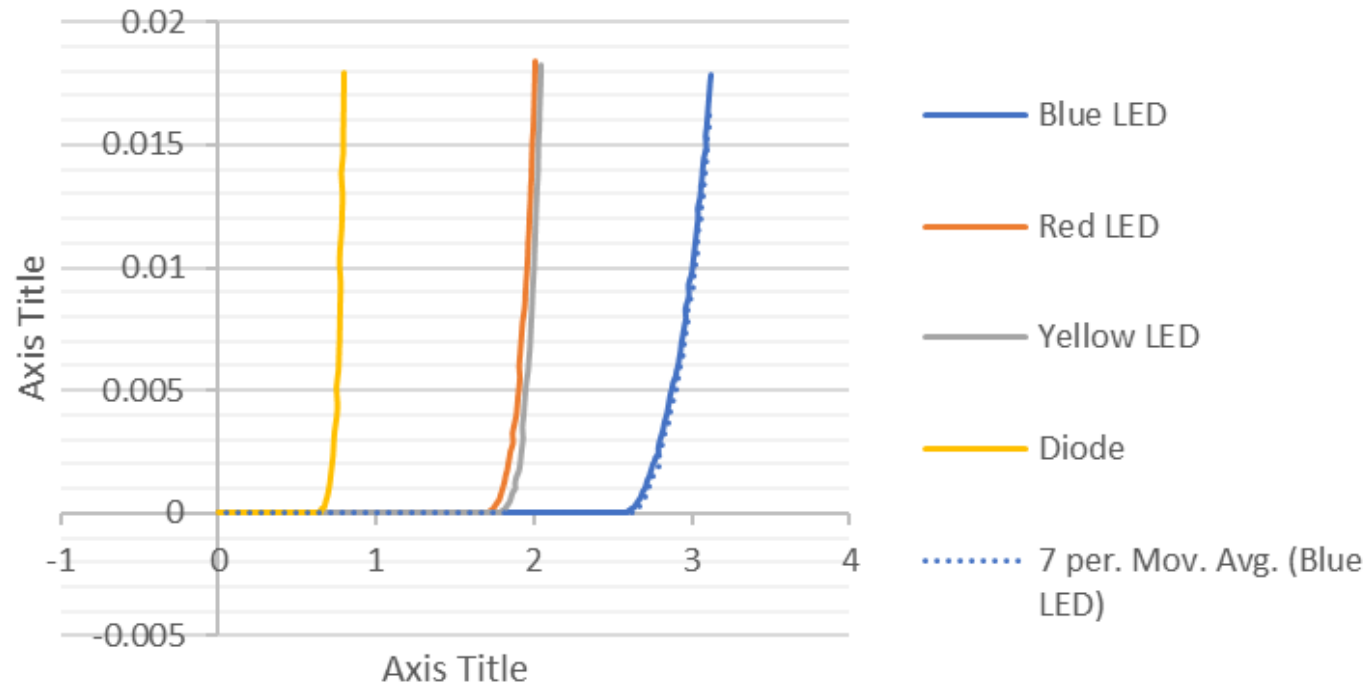
Tiva C and GUI



IV Characteriser



IV Characteristics



Testing Results

- Peltier Temperatures were stabilised in the range of -5 degrees to 80 degrees
- Temperatures around room temperatures showed more oscillations
- IV Characterisation was completed and the following are the results

Demo Details

- IV Characterisation for Diodes and Zener Diodes will be performed
- A few temperatures will be shown to stabilise along with settling time details
- Diode IV Characteristics will be plotted at a few set-point temperatures and the variation would be observed

Future Scope

- Performing the small signal analysis of the two-terminal device
- Extend support to multi-terminal devices by applying bias to the other terminals and performing the IV Characteristics across the remaining terminals
- Temperature Control of the Peltier Cooler can be made more precise by using the double control loop
- More dynamic changes can be introduced in the IV Characteristics to make the control more robust, immune to errors and fine grained to get high standard results.