Evaluation 2: Group DD16
Wide-Range Temperature Control and IV Characteriser

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CURRENT CONTROL LOOP

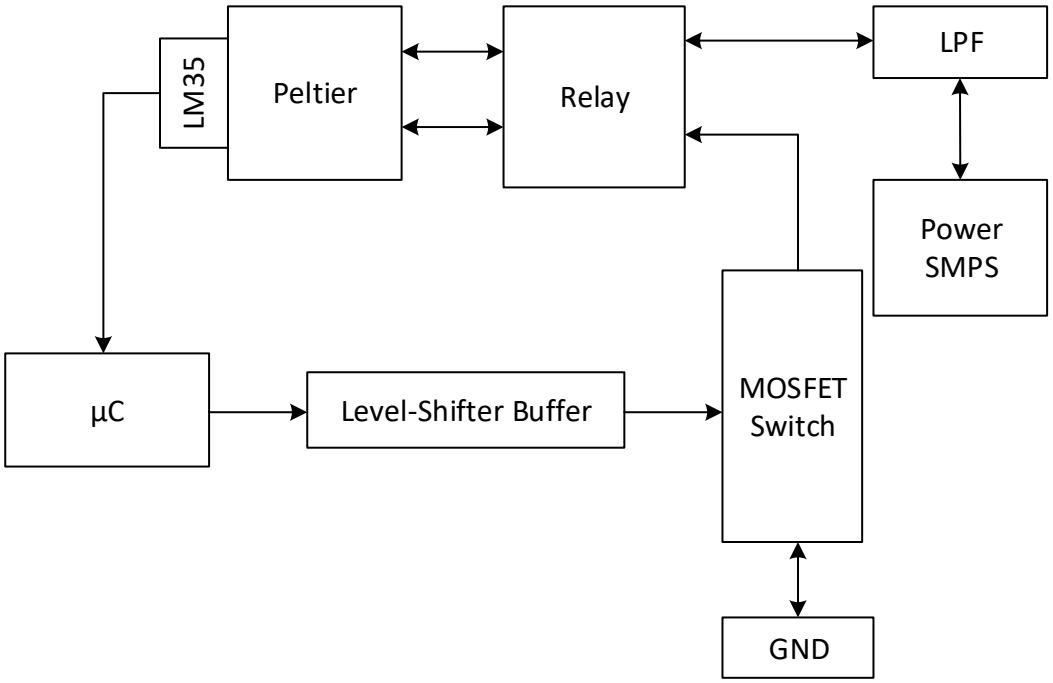
Planned: DRV595

- DRV595 was planned to be used as an H-bridge IC because industry wide use of the IC, easy control and good safety precautions
- Multiple of its test board was printed tested after former failures
- Unfortunately, it didn't work. We weren't able to pull the IC out of the saturation mode.

Due to limited time, we shifted from the use of DRV595 to power MOSFET.

Power MOSFET (IRFZ44N)

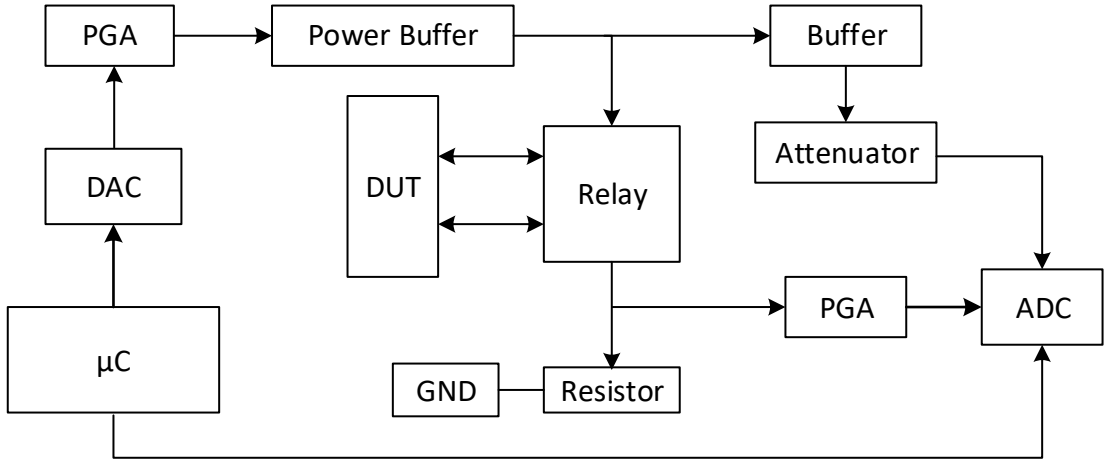
- After the DRV595 based circuit failure we moved to a simple Power MOSFET based circuit



- Here we require a relay to get a reverse polarity onto the Peltier cooler.
- Because of lack of time, we have not been able to completely test this circuit
- But we can show approximate temperature control in the higher temperature range

In the future, we plan to complete the testing by introducing the relay into the circuit to get the lower temperatures. But before that we must also look at unloading the Peltier cooler and acquiring a high capacity heat sink.

IV CHARACTERISTICS



- The IV Characteristics circuit is ready as per what was promised after the first evaluation
- The circuit can obtain the IV Characteristics of any two-terminal device in both directions
- But it still has limitations of only maximum 5V operation and maximum 20mA current range.
- In the future as we can see in the diagram we plan to include a power buffer which can supply up to 250mA of current so that we can measure a wider variety of devices
- Also, we plan to scale the voltage range to 10/15V, with the help of PGAs and Attenuators
- The Resistor being used for now is an approximate one. It must be replaced by a higher accuracy resistor for accurate measurement of currents.

POWER SOURCE

We have also started planning our current source and are planning to use an SMPS as the primary voltage source.

Apart from the Peltier power requirement the other requirements of our system are

- 5V precision voltage reference
- $\pm\ 12V$ voltage source for op-amps
- $3.3V$ for micro-controller
- $5V$ general purpose for Powering up various ICs

These voltage levels are achieved with the help of precision ICs from TI and Buck and Buck-Boost Converters connected in parallel to satisfy required current specifications.

We have designed the test board for the same. But the focus will be first on completing the Peltier circuit and the current loop and only then worry about the power source.

CODES

We are planning to use TivaC because we have multiple ICs which require communication protocols which the Arduino is unable to supply. But for testing purposes we have only written our code for Arduino which can be easily ported to the TivaC Platform later.