E 1.02 – ACTS Project

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Project Overview

Our project is an RC-analog timing circuit that goes into a projectile, with the goal of deploying non-lethal irritants without direct contact with the intended target.

➤ Designed specifically for Non-Lethal Enterprises (NLE)
➤ Features a transformer driven by an H-bridge which generates the voltage pulse that activates the timing circuit.
➤ Controls the release of pepper spray with precise timing.
➤ Our system will offer a safe alternative to traditional tasing methods.

Features and Requirements

Features

➤ Arduino microcontroller and L298N H-Bridge used to simulate transmission and receiving coils.
➤ Coil characterization within physical design parameters.
➤ Functioning timing delay circuit custom PCB.
➤ Strech goal: Achieve constant flux rate of change.

Requirements

➤ Dummy load must reach at least 600mA for 10ms.
➤ Full circuit must fit within 17.27mm diameter envelope.

Results of D1 Semester

➤ Designed & printed coil forms for transformer
➤ Microcontroller controls H-Bridge for transformer
➤ Circuit has been breadboarded
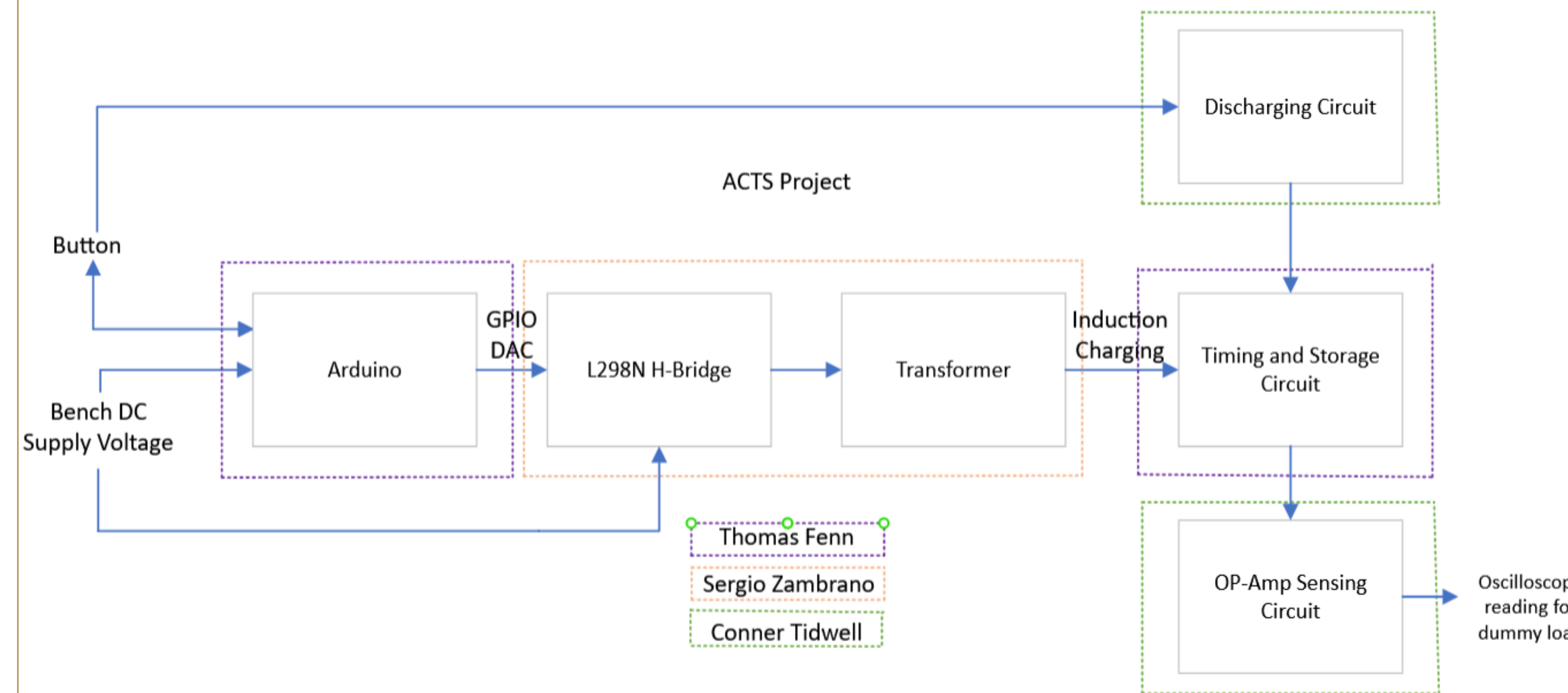➤ Components have been tested for functionality

Acknowledgments

Faculty Advisor: Dr. Karl Stephan

Sponsor: Adam Laubach, Non-Lethal Enterprises

Initial Circuit Design: Dr. Compeau

Top Level Block Diagram

Meet the Team

From L to R: Sergio Zambrano, Thomas Fenn, and Conner Tidwell

Characterization Goals

➤ Precision-timed Discharge: The transmission coil generates a targeted voltage for the timing circuit, charging capacitors for controlled release.
➤ Voltage Dynamics: Voltage output from the receiving coil is proportional to the rate of flux change.
➤ Enhanced Timing Control: Modifying the current timing to the dummy load significantly shifts the release mechanism from immediate to delayed.

Timing And Storage Circuit

This circuit controls the timing of current delivery and manages the storing of charge from secondary or receiving coil from the transformer.
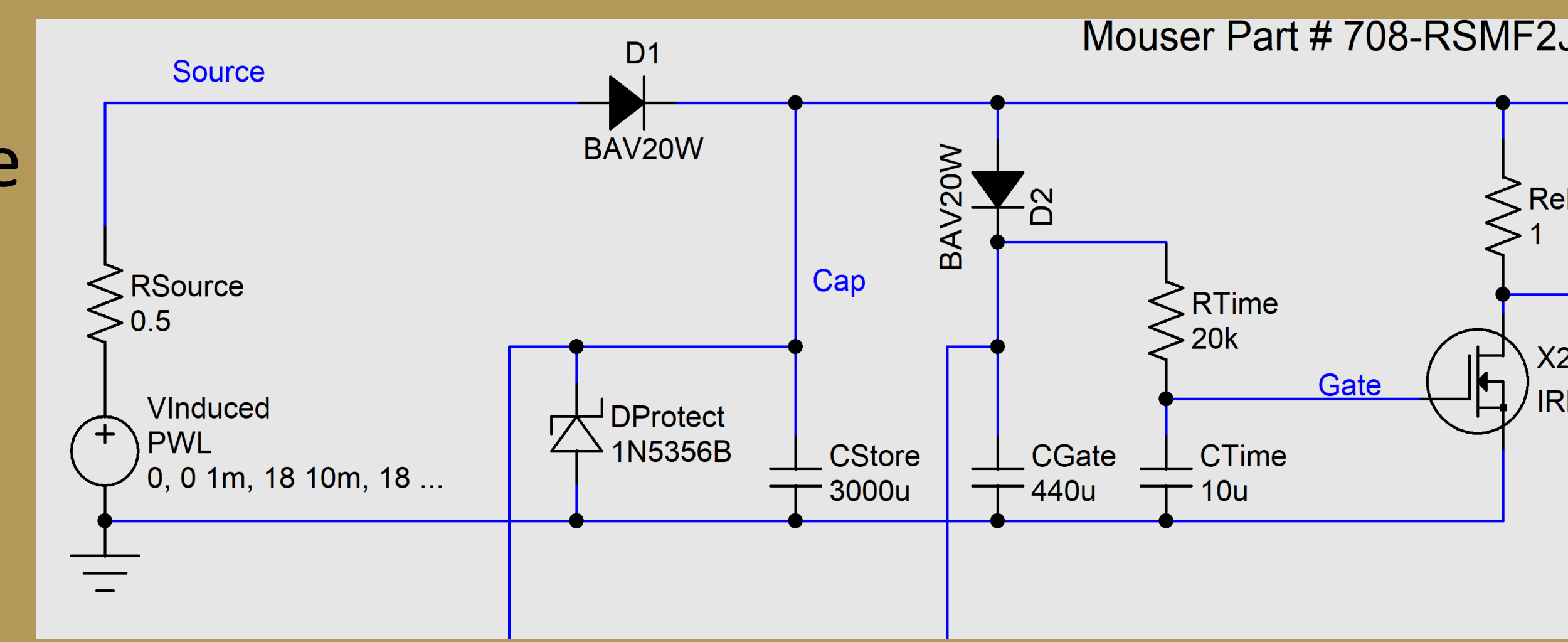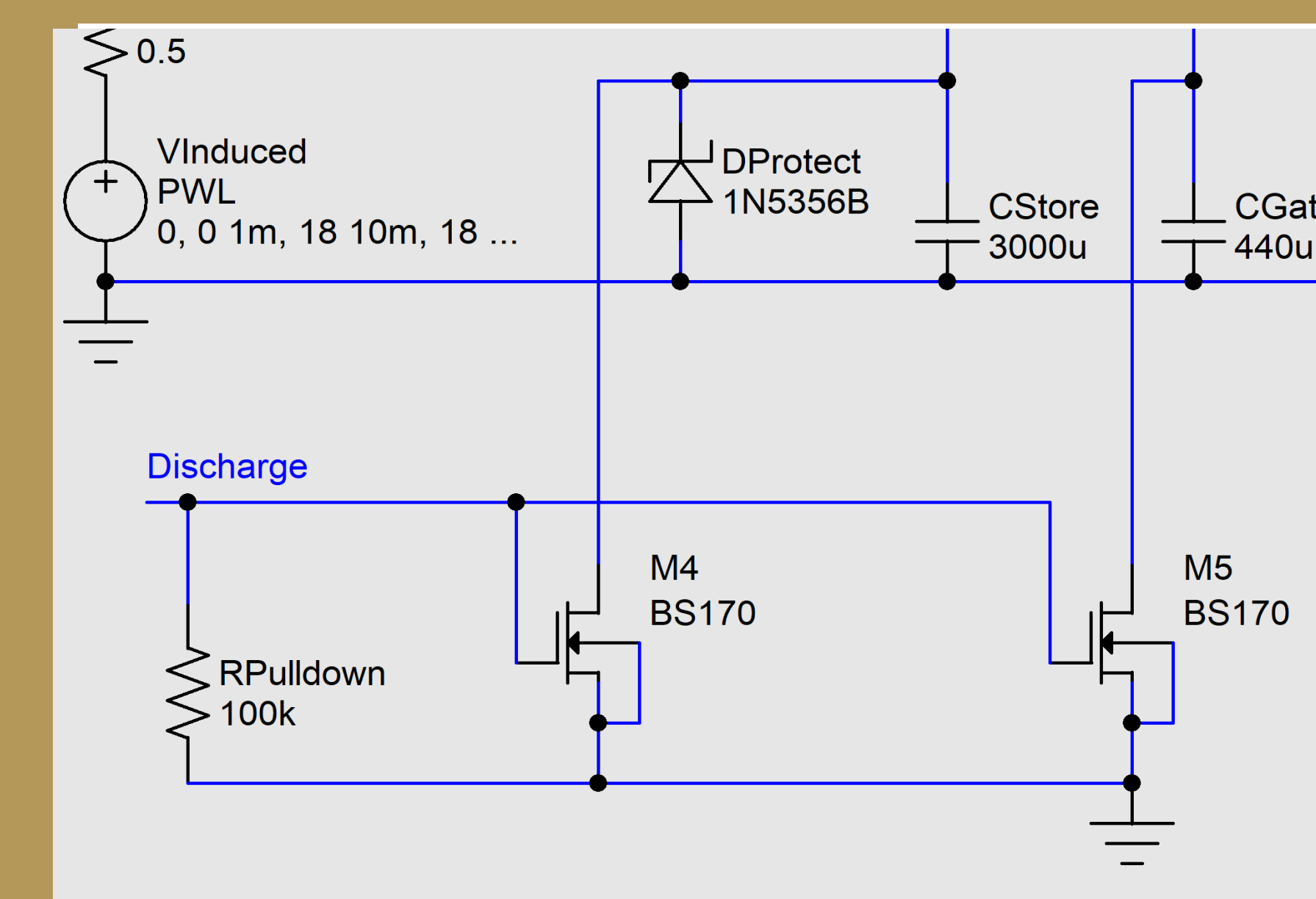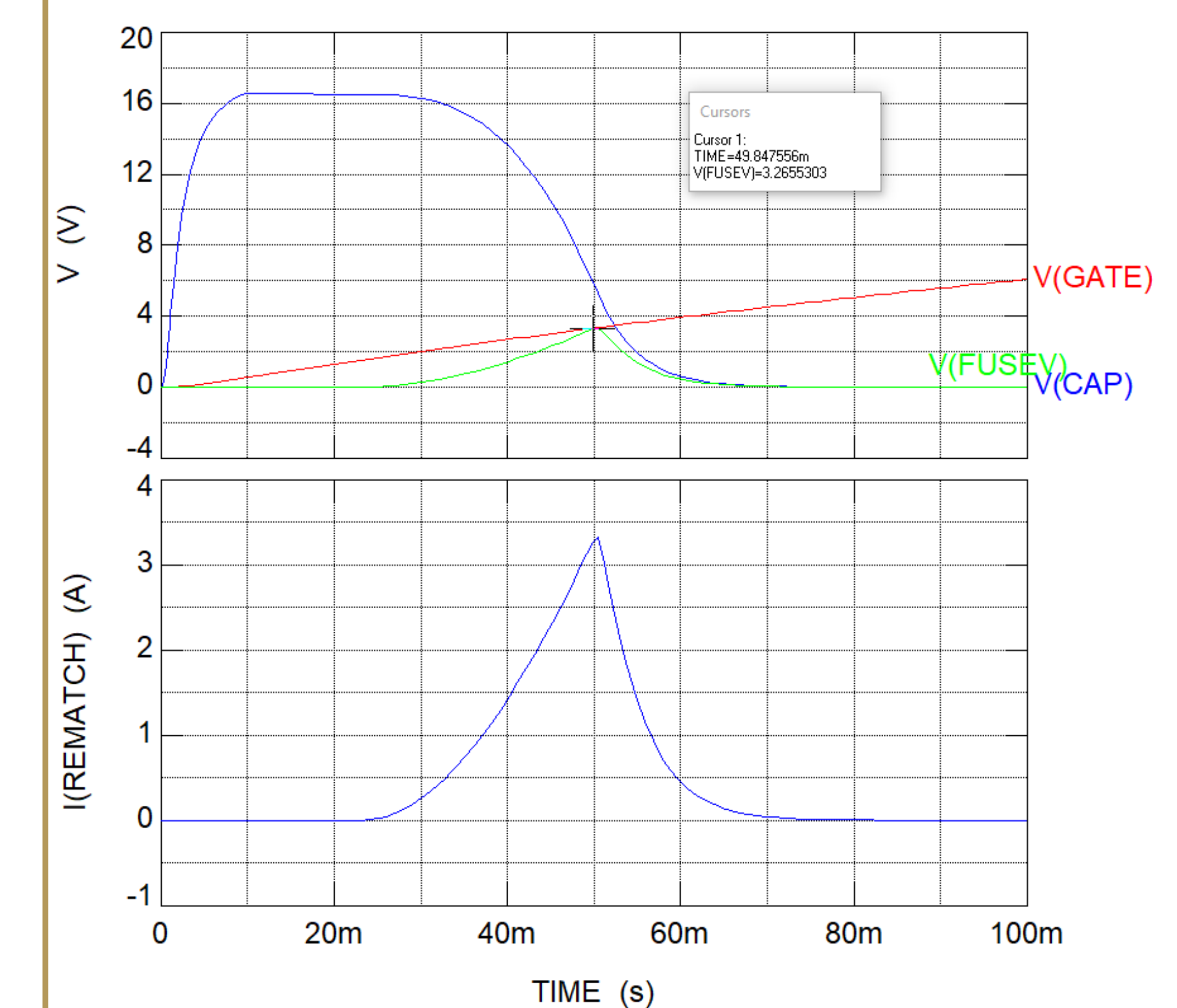

OP-Amp Sensing Circuit
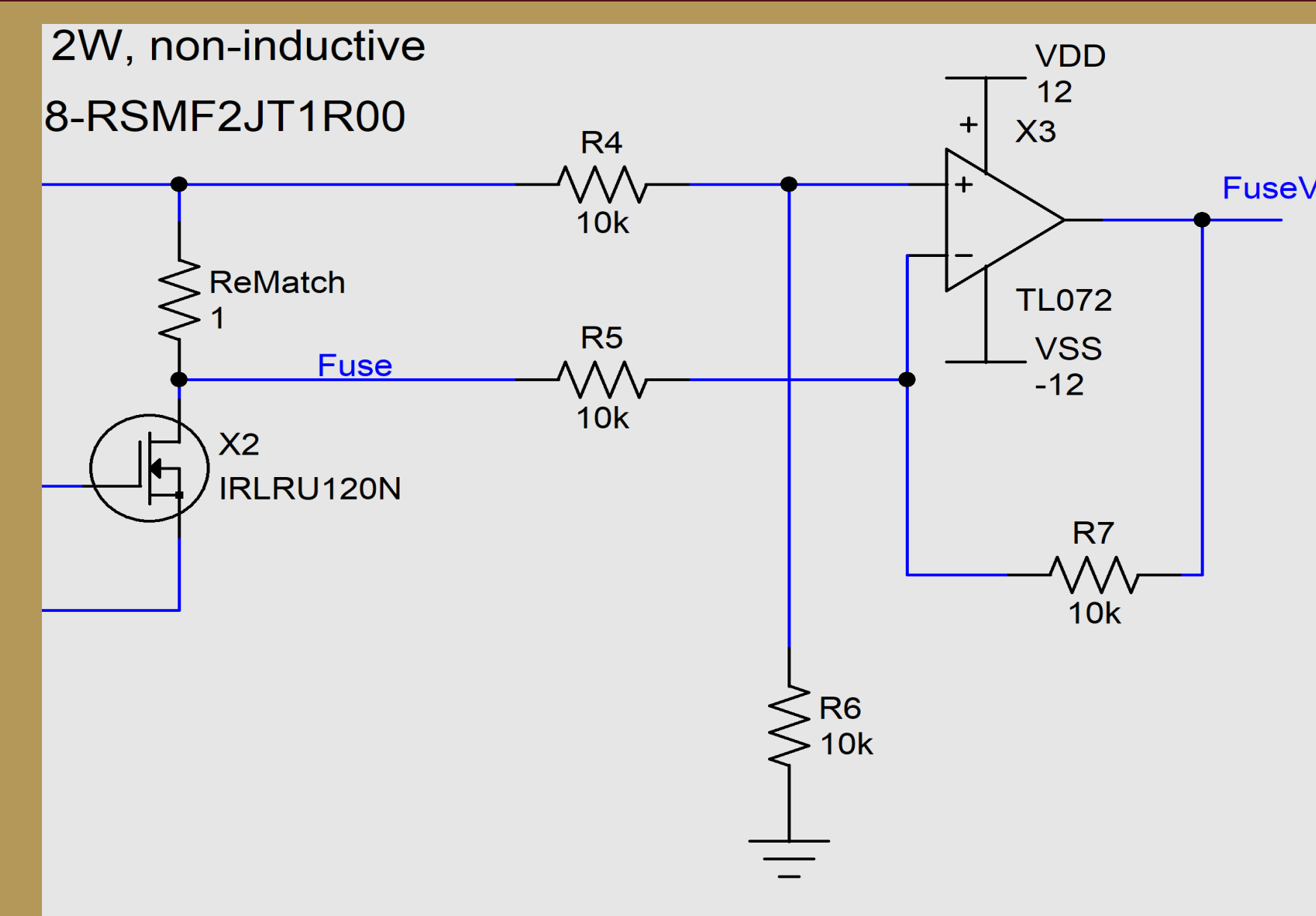
A difference amplifier OP-Amp reads the difference in voltage across a 1 Ohm resistor, which will give us a current reading on our oscilloscope

Discharging Circuit

Circuit for discharging to a zero state.

Simulation Results

Expected results with 20k Time resistor

Microcontroller

We used an Arduino microcontroller in order to send a pulse signal to the H-bridge which drives the primary coil of the transformer.