Scalable Electrosurgical Unit (SESU)

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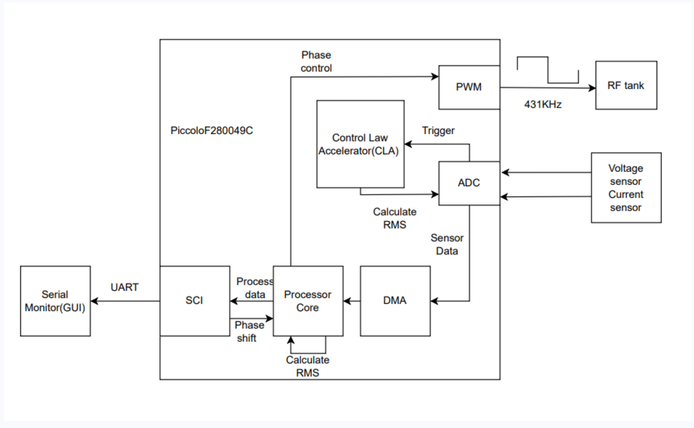
Medtronic

Overview

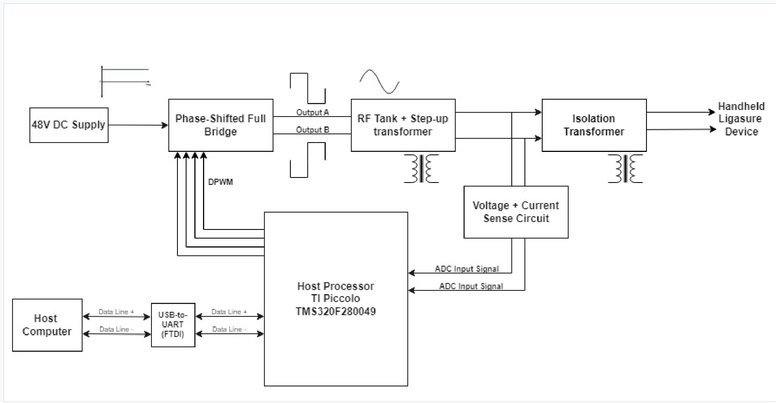
- **Deliver** RF signal (431 kHz) to Bizact device that will incise, cauterize, and seal tissue
- **Develop** software necessary to enable/disable the PWM (pulse width-modulated signals)
- **Display** RMS voltage, RMS current, average power on a guided user interface (GUI)

Software

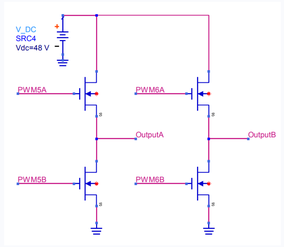


- **PWM**: phase-controlled PWMs to drive the H-bridge
- **CLA:** Accelerate the RMS and average power calculations
- **DMA:** Direct memory access to extract the ADCs sample

System Diagram

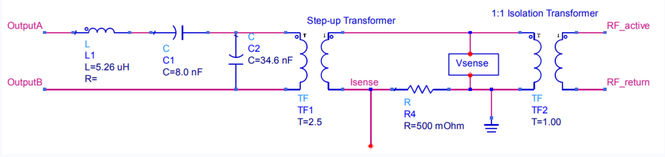


Hardware

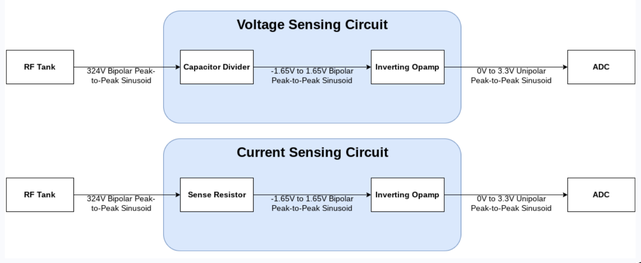


- **Inverter Full-Bridge Topology**: DC-AC converter using PWM driven H-bridge
- **LCC Filter Implementation**: Low pass filter and impedance voltage divider

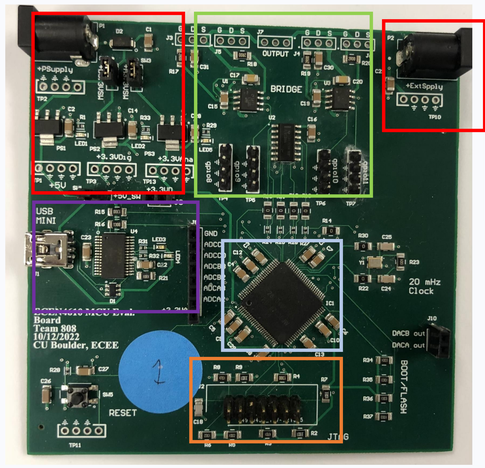
- **Custom Magnetic Components**: Inductor, Step-up and isolation transformer

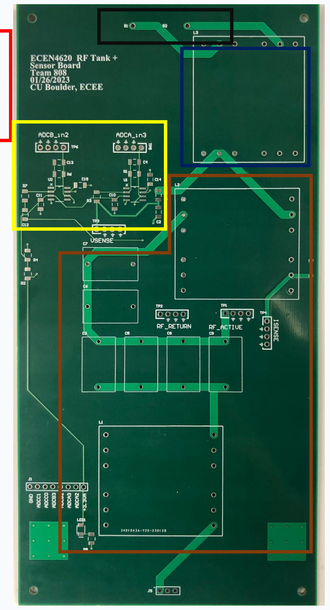


- **I/V Sensors**: Inverting op-amp topology to scale and offset delivered signal at load



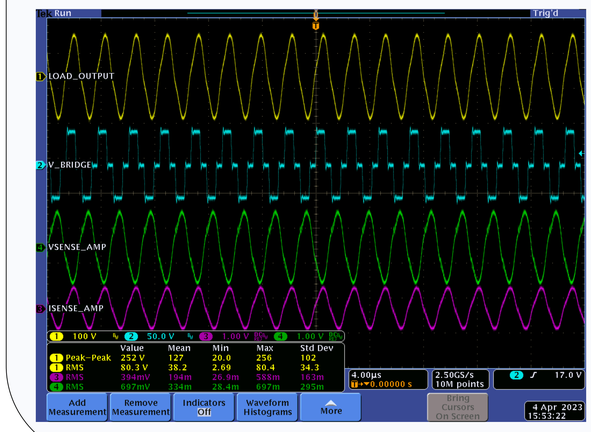
Custom PCBs





- Power Conditioning
- Phase Shifted Full Bridge
- MCU
- FTDI UART
- JTAG Header
- LCC Topology + Step-up XFMR
- I/V Sensors
- Isolation XFMR
- Output

Results



- SESU tested on a 100 Ohm power resistor
- Voltage across the 100 Ohm load (**in yellow**)
- Differential voltage across the H-bridge (**in blue**)
- Output of voltage sensor op-amp (**in green**)
- Output of current sensor op-amp (**in pink**)

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