

Background

- To minimize mortality of traumatically injured persons, coagulopathy must be assessed and addressed nearest to the time of injury. Coagulopathy of trauma is a hypo-coagulable state with increased bleeding and a 4x increased rate of mortality.
- We integrated a temperature control system into Aptitude's coagulopathy measuring process for a chargeable handheld electronic device with future feature expansion.

Overview / Design Specs

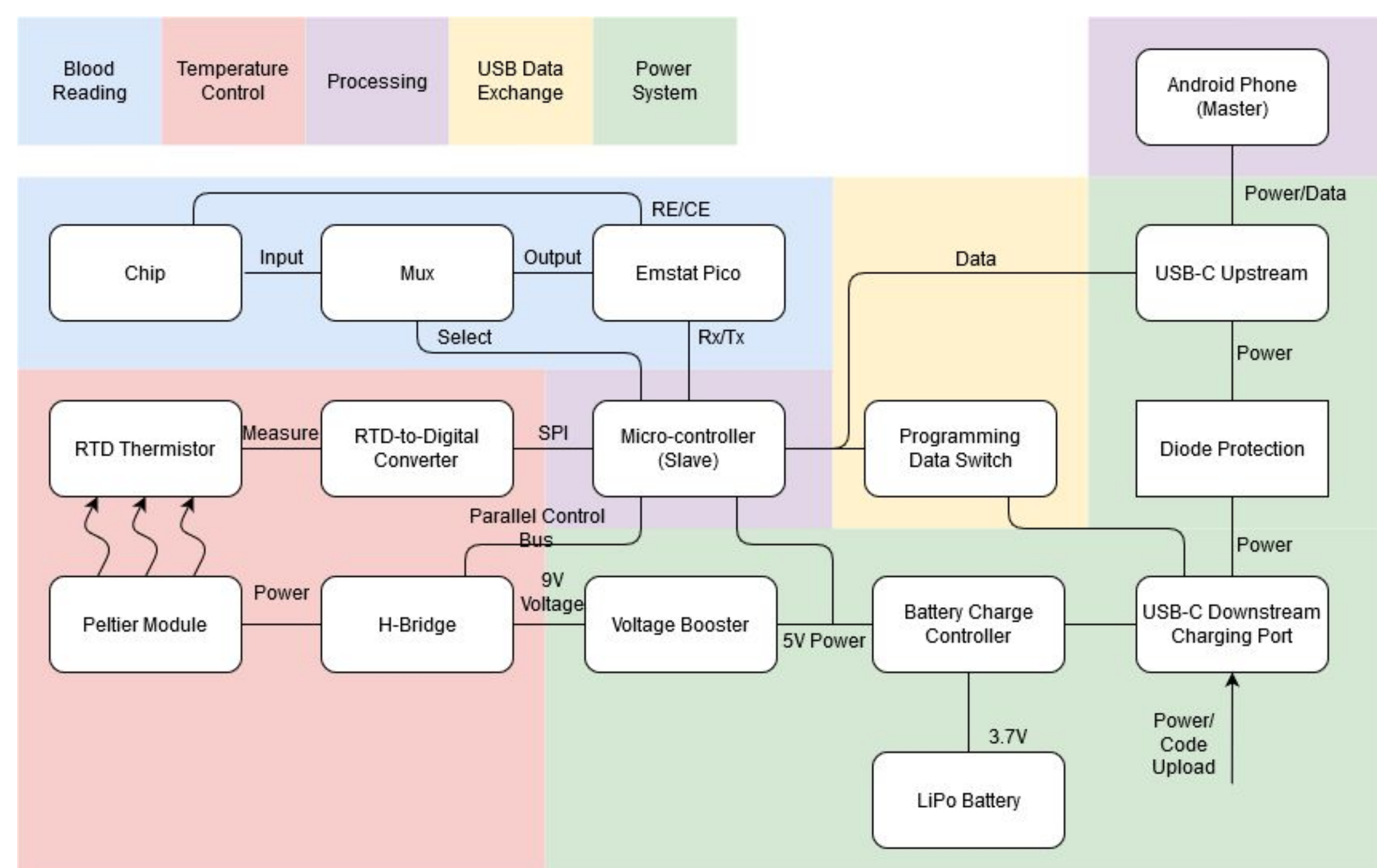
Handheld Device Creation:

- Android Phone as interface to initiate blood readings
- MCU connects peripherals and relays through USB
- PID controlled Peltier module for thermal regulation
- EmStat Pico to interpret blood readings
- USB-C ports, including charging while device in-use

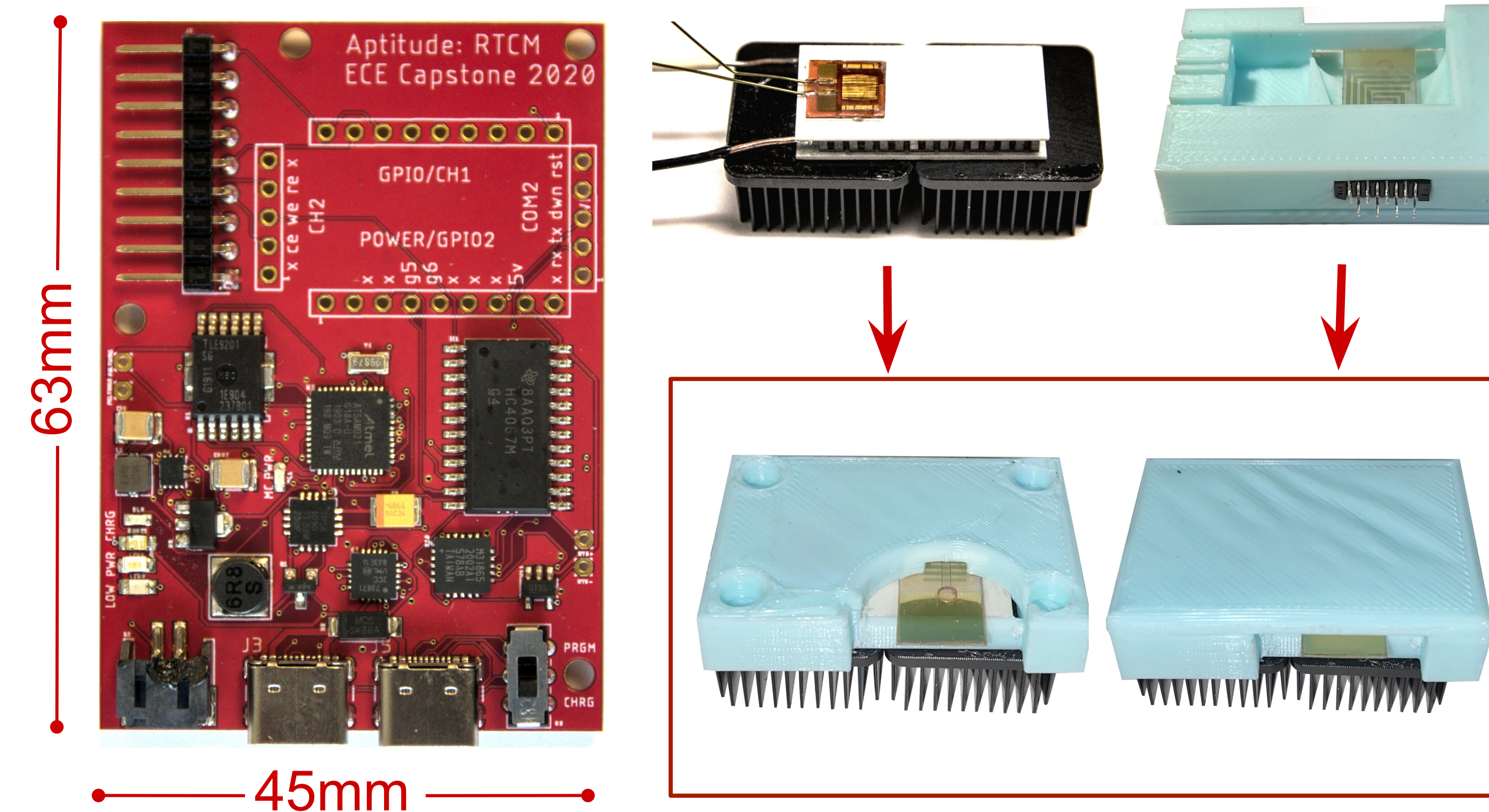
Specs:

- Dimensions: 140mm x 80mm x 30mm
- Weight: 700g
- Battery Life: 5 hours

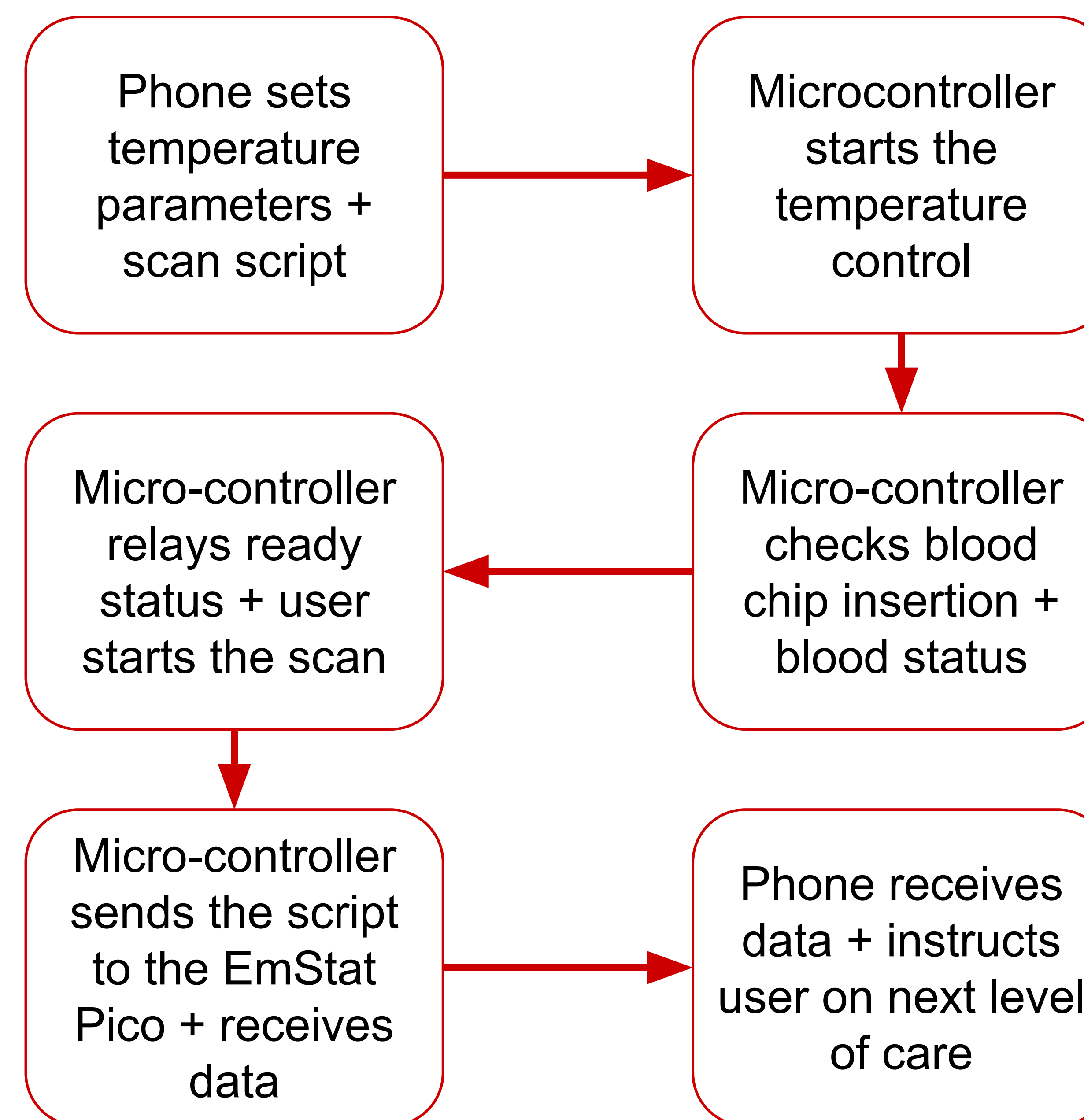
Hardware Block Diagram



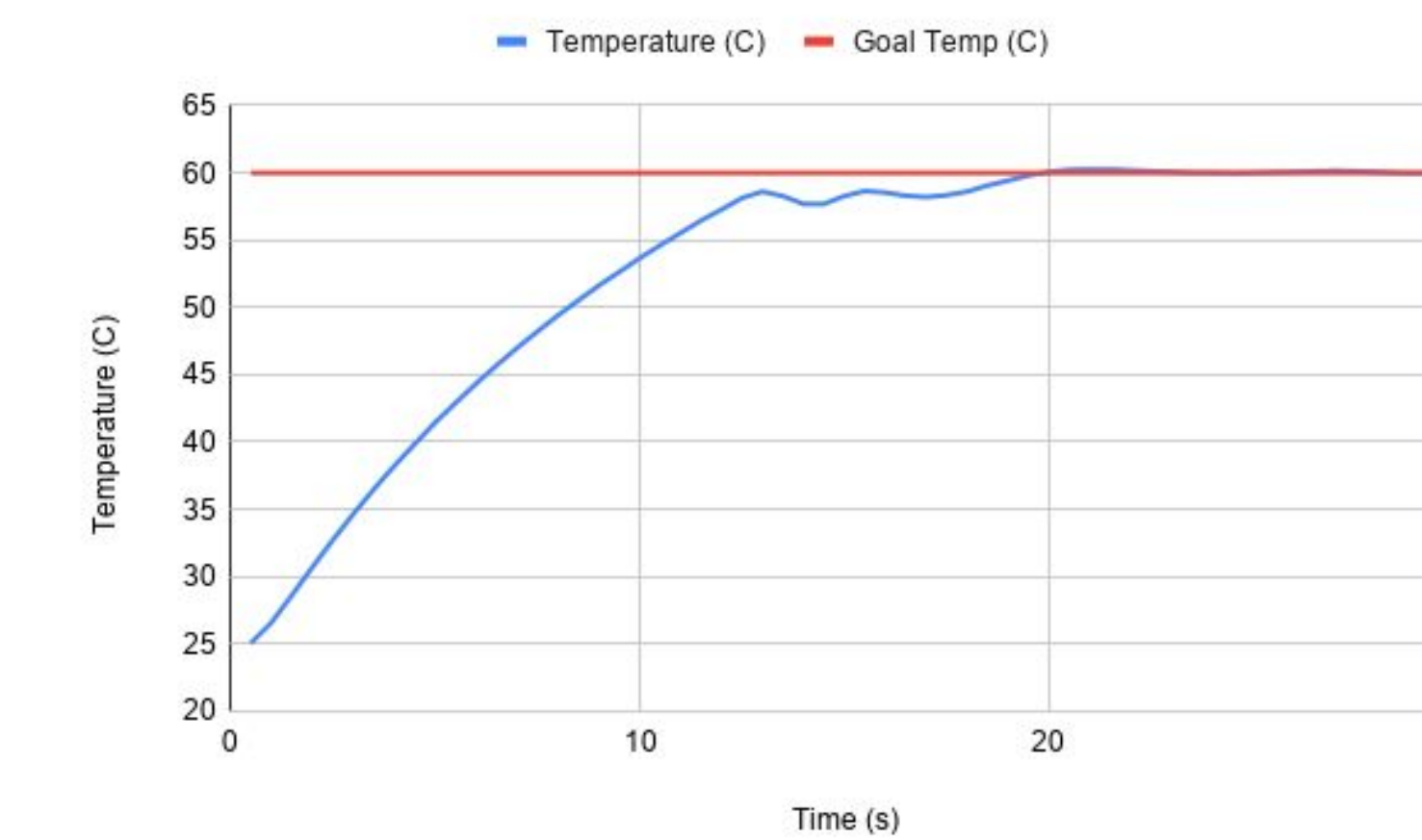
PCB/Enclosure



Functional Flow Diagram



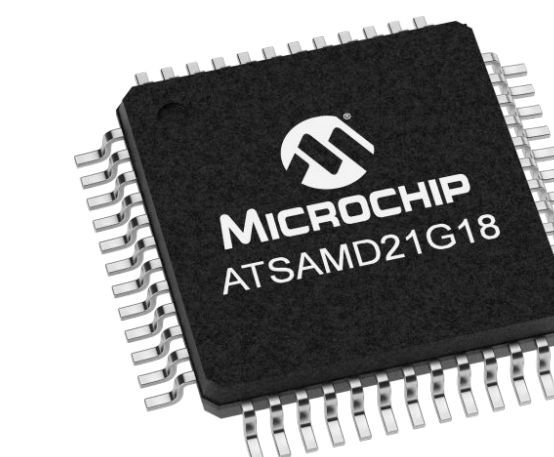
Thermal Test – Blood Sample



- 25°C to 60°C in 20 seconds
- 25°C to 15°C in 25 seconds
- ±0.02°C accuracy

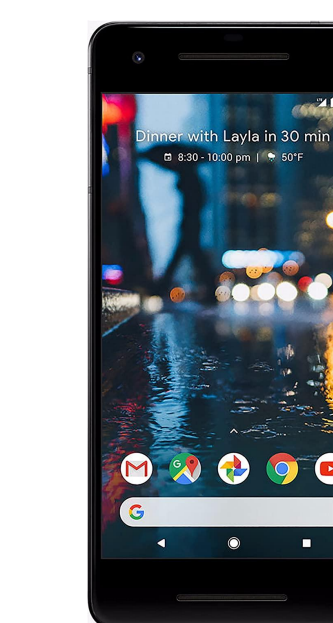
- Hospital measurement time: **1 hour**
- Our total time: **Less than 2 minutes**

Hardware / Key Components



ATSAMD21G18A

- 48 MHz ARM Cortex-M0
- Handles sensor data, peripheral control, and USB communication



Google Pixel 3a

Rooted Android phone provides the user/developer an interface with the blood coagulopathy measuring process.



Peltier Module

Solid state heat pump which transfers heat from one side of the ceramic plate to another. Heat polarity is determined by current direction.



EmStat Pico

The smallest commercially available potentiostat which analyzes the electro-chemical signals from the blood chip.