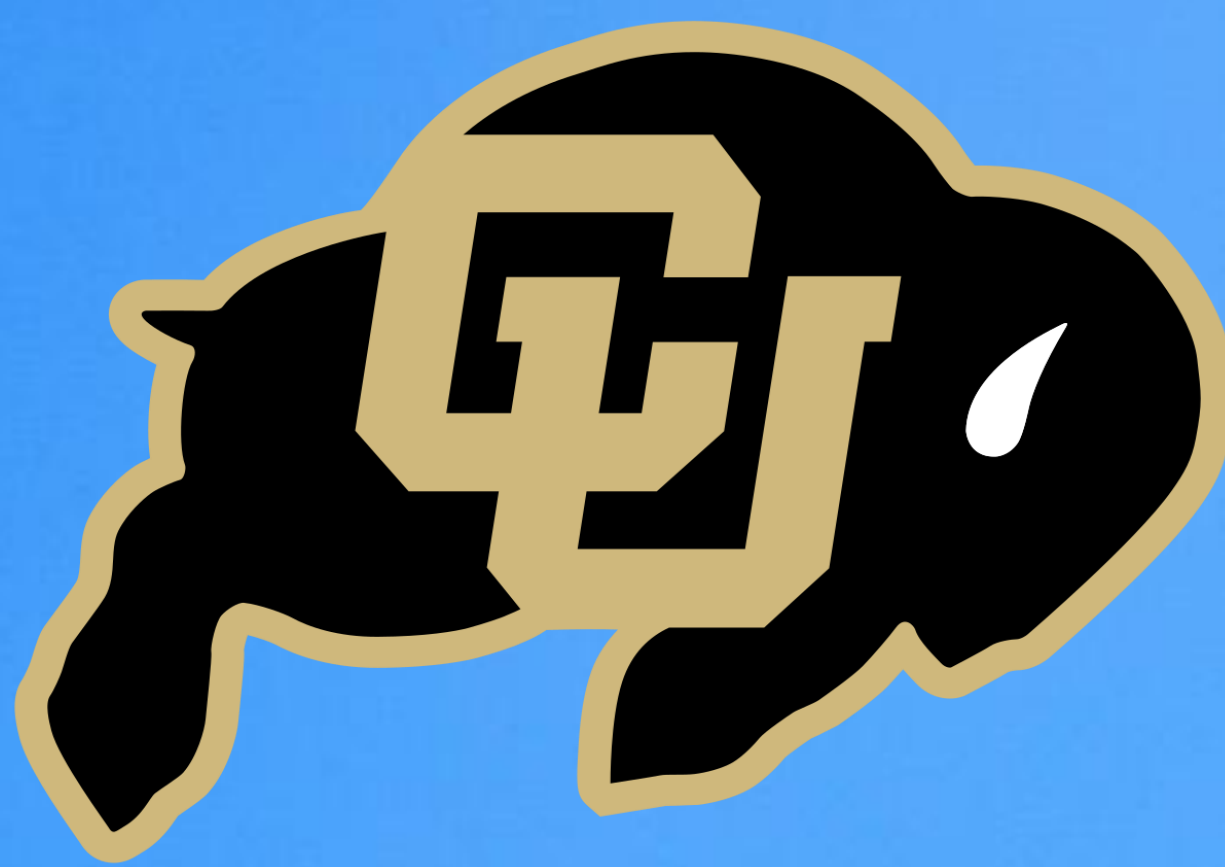




CleanAir

Flexible Indoor Air Quality Control System – Formula 10
 Zach Colleran, Michael Driscoll, Nicholas Haratsaris,
 Tucker Mothersell, Guillermo Rivas, Zachary White
 Sponsor – Dragan Maksimović



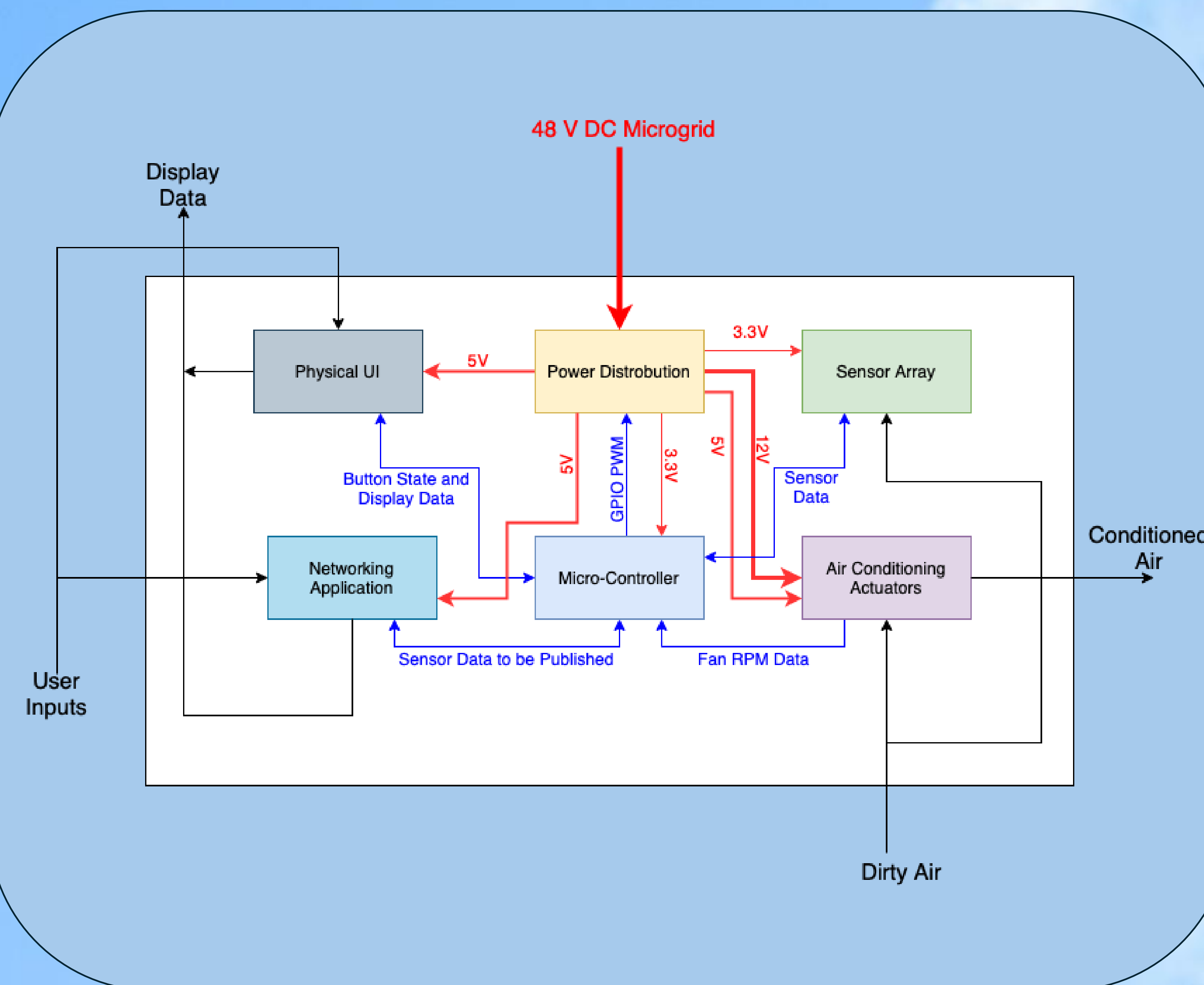
Project Purpose

- **Problem:**
Native American communities have been identified as being disproportionately impacted by the COVID-19 pandemic and poor indoor air quality, and are more likely to have compromised health due to asthma and other respiratory ailments
- **Purpose:**
 - Provide an easy to use, reliable, transportable, and cost effective system to keep indoor air quality high in indoor environments
- This project was done in connection with research done by professors Dragan Maksimovic, Shelly Miller, RACER program, and the National Power Institute

Project Requirements

- Automatically clean indoor space when PM2.5 pollutants exceed $35 \mu\text{g}/\text{m}^3$
- Track air quality parameters of PM2.5 concentration, Carbon Dioxide concentration, Carbon Monoxide presence, Temperature, Humidity, Filter Health
- Allow for automatic control of air cleaner operation with physical button interface
- Track and alert when cleaner filter needs changing
- Display collected air quality data to web portal when able to access internet connection
- Air cleaner must be easy to move

System Design



Project Design

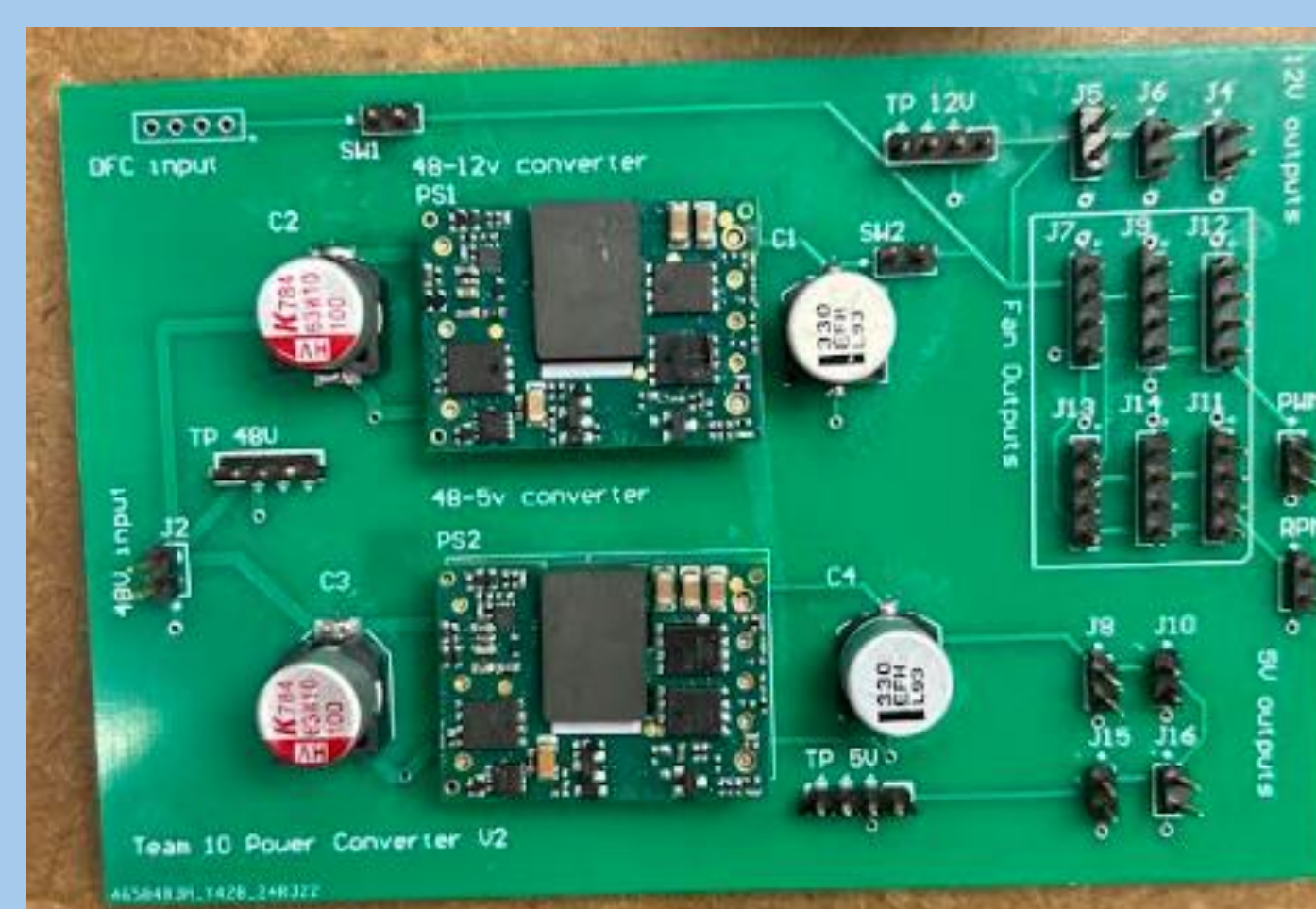


Physical UI, Data Display & Sensor Array

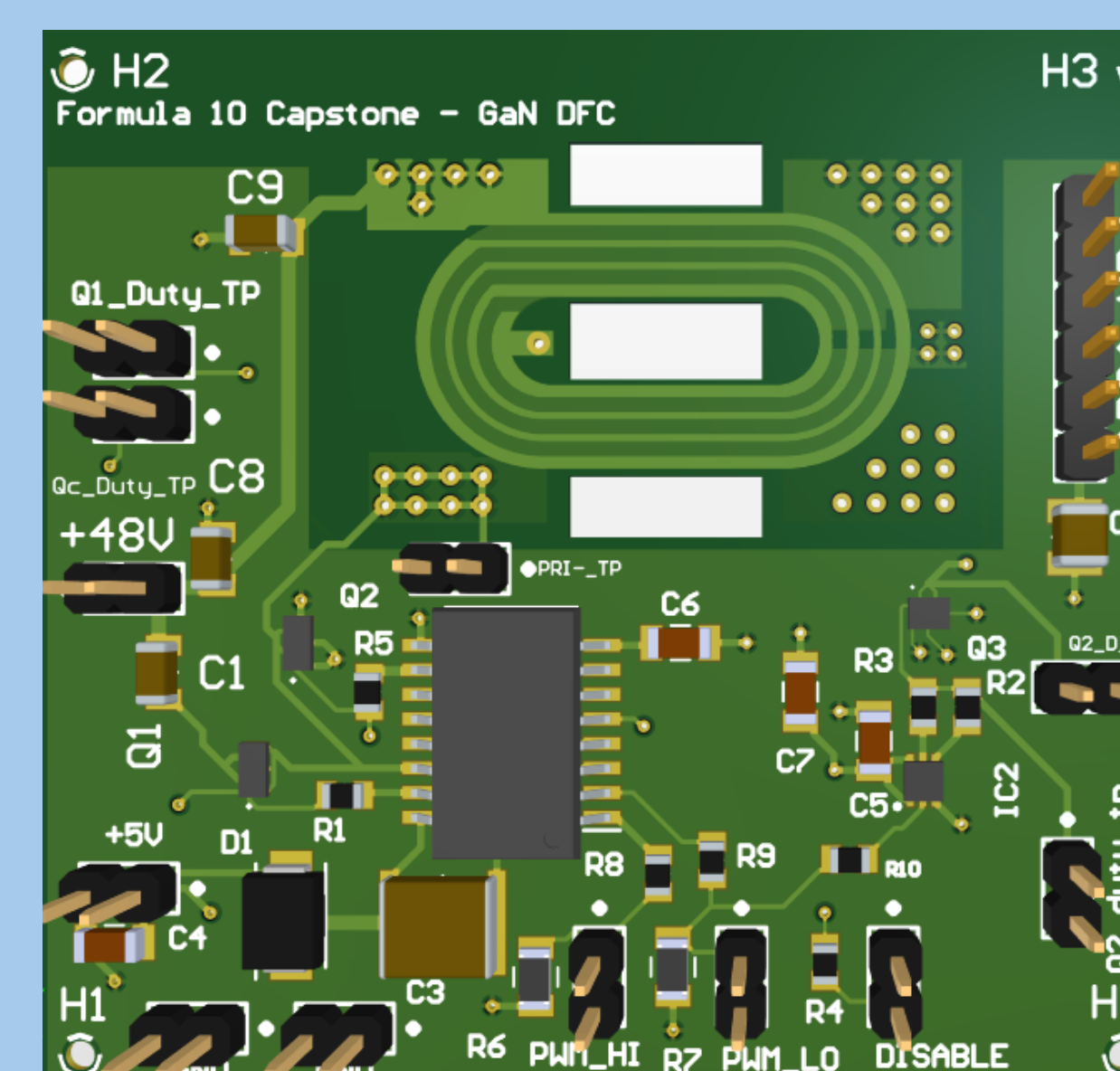
GaN Transistor Power Converter

By using a design which exploits the properties of Gallium Nitride transistors we can increase our efficiency of our fan powering 48V-12V DC-DC converter system from 87% to 93%

COTS Power Converters



Direct Forward Converter



- **Physical User Interface**
 - Set automatic cleaning mode
 - Set manual cleaning mode (3 fan speeds)
 - Check filter health – differential pressure calculation
- **Sensor Array**
 - Houses PM2.5 sensor, CO₂ sensor, CO sensor, Humidity and Temperature sensor, one pressure sensor
- **Data Display**
 - Lights indicating mode on physical interface
 - Data tracked on web portal, can export data to .csv file for analysis

