

Master project

Design, Validation and Testing of an Electrical Power Subsystem (EPS) for CubeSats

The Electrical Power Subsystem (EPS) is a core element of CubeSat platforms, responsible for power regulation and distribution. The EPS must handle unregulated DC input from solar panels, provide stable output voltages (3.3 V, 5 V, 12 V), and interface with, e.g., USB-C and PC/104. It must also integrate protection circuits, telemetry, and power management functions.

This project covers the design, implementation, validation and testing of an EPS for CubeSat. The system will convert solar panel input into regulated outputs, implement overcurrent and overvoltage protection, and include Maximum Power Point Tracking (MPPT) for solar array efficiency. Telemetry will include input/output current, voltage, power, cell voltage, and temperature and system health status. The additional design of a simple, first prototype of a compatible battery / power storage subsystem is desired. The outcome of this project will be a functional EPS prototype on a custom PCB and a compatible battery (subsystem).

Tasks:

- System Requirements and Architecture: Reflect power requirements, select battery technology, and design the EPS architecture.
- Component Selection and Circuit Design: Select solar panels, electrical components (voltage regulators, MPPT controllers, protection components, battery management, ...). Design the PCB layout in KiCAD.
- Telemetry Implementation: Develop hardware and firmware for data acquisition/sensor readout and subsystem communication.
- Prototype Assembly and Testing: Build the EPS prototype and validate performance under simulated LEO conditions, including power cycling and fault scenarios.
- Documentation: Provide scientific background, schematics, test reports, and a final report documenting the design process, results, and recommendations.

Experience in the design of electronics / PCBs is mandatory.

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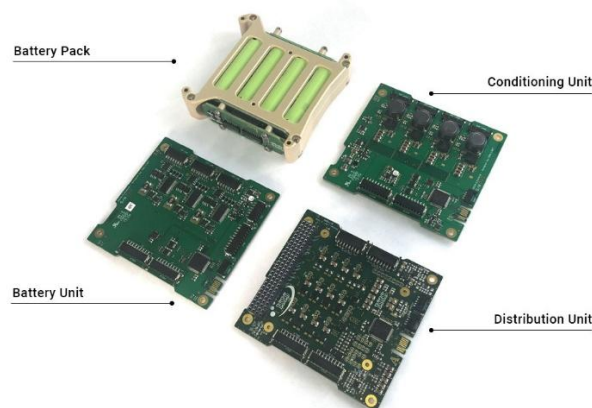


Figure 1: ISISPAC EPS