

Power Distribution System for a CubeSat

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Objective

To design and implement a fully autonomous power generation, storage and distribution system for a CubeSat

System Architecture

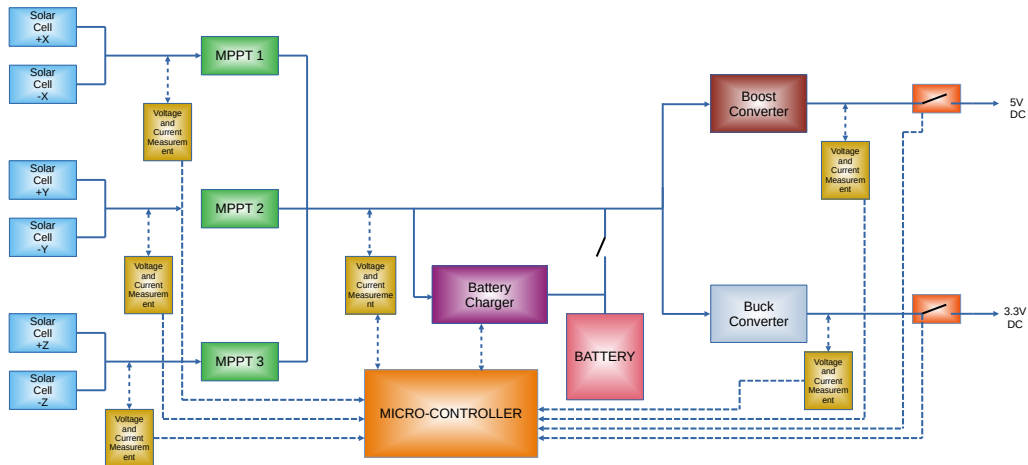


Figure 1: CubeSat EPS Architecture

Hardware Design - Buck and Boost Converters with Monitoring

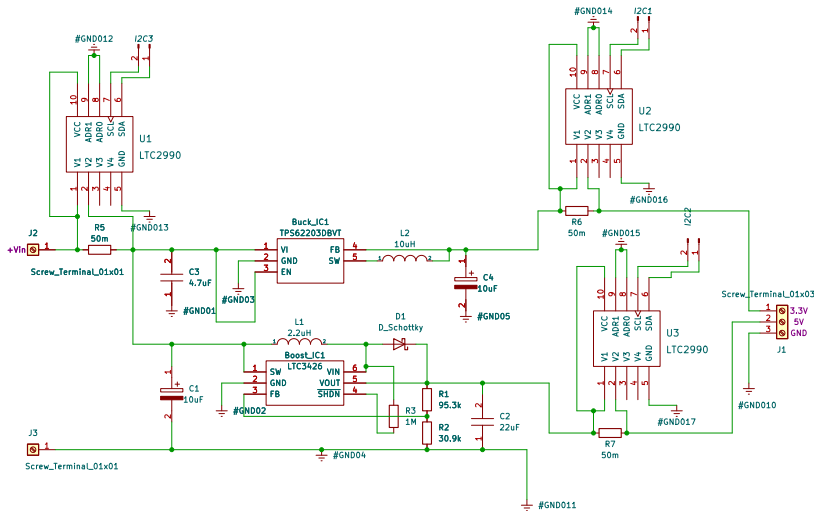


Figure 2: Circuit design of buck and boost converters with monitoring.

Hardware Design - Buck and Boost Converters with Monitoring (Contd.)

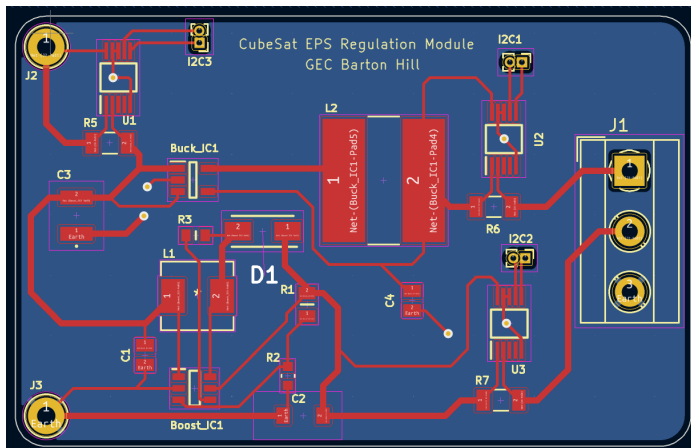


Figure 3: PCB Layout of buck and boost converters with monitoring.

Hardware Design - Buck and Boost Converters with Monitoring (Contd.)

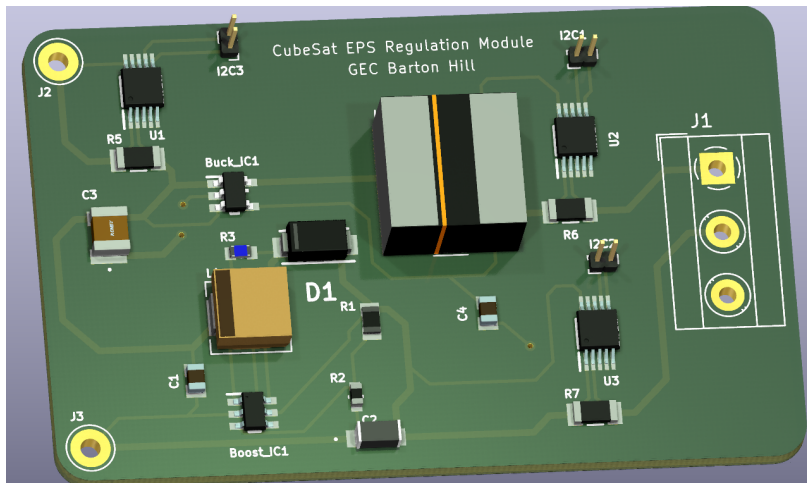


Figure 4: 3-D model of buck and boost converters with monitoring.

Hardware Design - Battery Charger

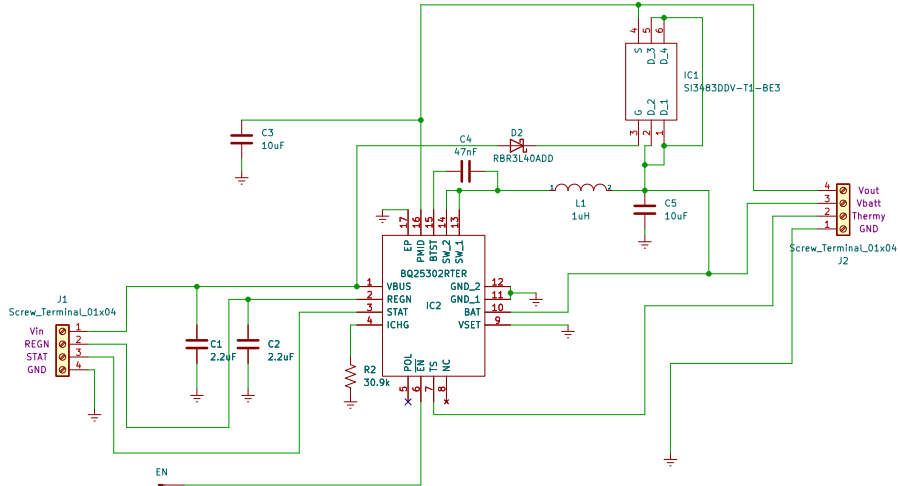


Figure 5: Circuit design of Battery Charger

Hardware Design - Battery Charger (Contd.)

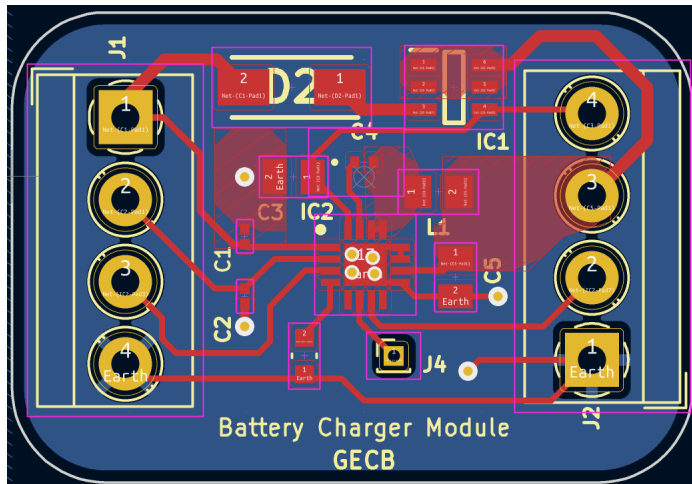


Figure 6: PCB Layout of Battery Charger

Hardware Design - Battery Charger (Contd.)

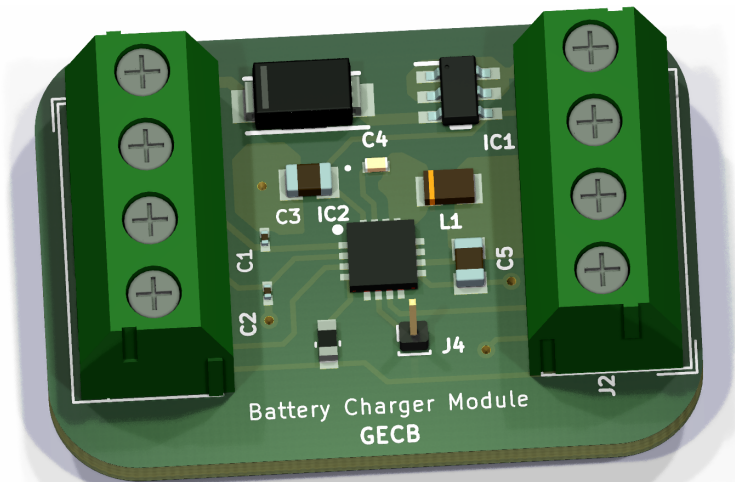


Figure 7: 3-D model of Battery Charger

Hardware Design - MPPT

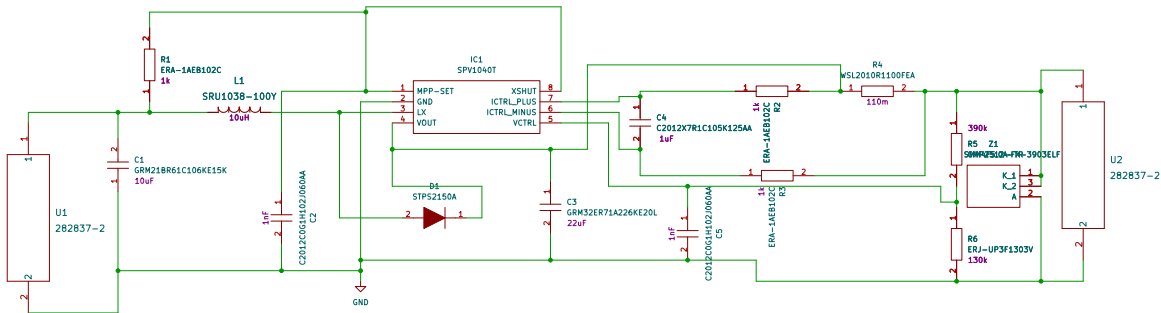


Figure 8: Circuit design of MPPT.

Hardware Design - MPPT (Contd.)

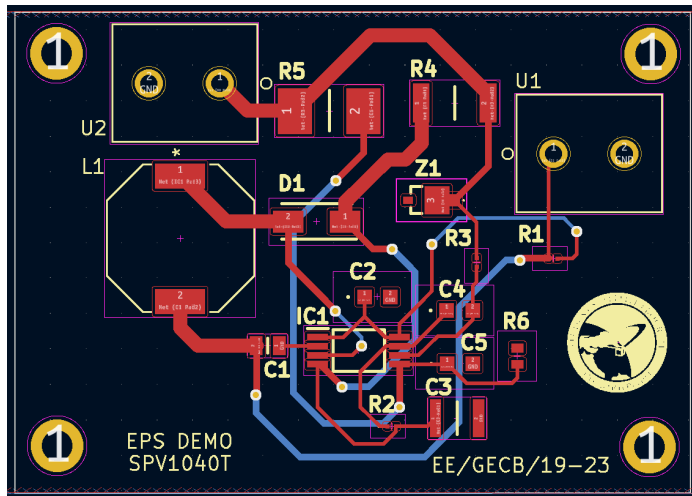


Figure 9: PCB Layout of MPPT.

Hardware Design - MPPT (Contd.)

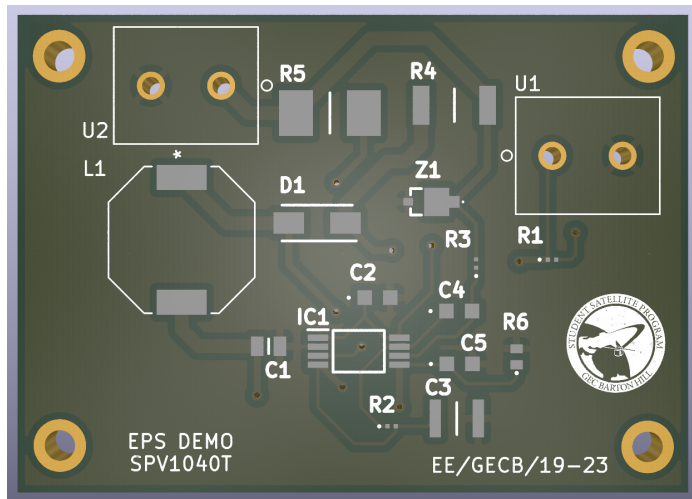


Figure 10: 3-D model of MPPT.

Project Timeline

Activity	Oct week 3-4	Nov week 1-2	Nov week 3-4	Dec week 1-2	Dec week 3-4
Literature Review					
Hardware Design					
Report Writing					
Component selection					
Component Procurement					

References

- [1] Knap, Vaclav & Vestergaard, Lars & Stroe, Daniel-loan (2020)
A Review of Battery Technology in CubeSats and Small Satellite Solutions
Energies, vol. 13
- [2] A. Edpuganti, V. Khadkikar, H. Zeineldin, M. S. E. Moursi and M. Al Hosani (2021)
Comparison of Peak Power Tracking Based Electric Power System Architectures for CubeSats
IEEE Transactions on Industry Applications, vol. 57, no. 3, pp. 2758-2768, May-June 2021
- [3] E. Ayoub and N. Karami (2015)
Review on the charging techniques of a Li-Ion battery
Third International Conference on Technological Advances in Electrical, Electronics and Computer Engineering (TAECE), 2015, pp. 50-55

References (Contd.)

- [4] B. Hussein, A. M. Massoud and T. Khattab (2022)
Centralized, Distributed, and Module-Integrated Electric Power System Schemes in CubeSats: Performance Assessment
IEEE Access, vol. 10, pp. 55396-55407
- [5] A. Edpuganti, V. Khadkikar, M. S. E. Moursi, H. Zeineldin, N. Al-Sayari and K. Al Hosani (2022)
A Comprehensive Review on CubeSat Electrical Power System Architectures
IEEE Transactions on Power Electronics, vol. 37, no. 3, pp. 3161-3177, March 2022
- [6] Aulia Indana, Dharu Arseno, Edwar, and Adilla Safira (2020)
Output Power Analysis of Tel-USat Electrical Power System
AIP Conference Proceedings 2226

Thank You