

SPACE POWER SYMPOSIUM (C3)

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COMPREHENSIVE STUDY ON HIGH POWER DENSITY DIGITAL PWM CONTROL BATTERY
CHARGING AND DISCHARGING REGULATOR**Abstract**

The high power density Battery Charging and Discharging Regulator (BCDR) controlled by Digital PWM (DPWM) is investigated in this paper. Integrating the Super boost and Super buck topology, a BCDR is produced with bidirectional flow of energy. Applying the current ripple cancellation, the volume of the input and output filters reduces. On this basis, the internal parameters of the entire BCDR converter can be collected, analyzed, and controlled in the DPWM control mode. The prototype data shows that the diode voltage and current stress can be reduced significantly and the efficiency can be improved conspicuously by using the synchronous rectification and DPWM control-driven approach. The present charging efficiency and discharge efficiency are up to 97% and 96% respectively, the power density can be increased more than 50% compared to the similar space Battery Charging Regulator (BCR) and the Battery Discharge Regulator (BDR) structure. Due to its excellent performance of controllability and observability, the failure prediction and the system management of battery charge-discharge can be effectively implemented in spacecraft.