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THE DOUBLE LOOP CONTROL DESIGN OF SUPERBUCK CONVERTER WITH A DAMPING
NETWORK**Abstract**

ABSTRACT: Because the input current and output current of superbuck converter are both continuous, superbuck converter is usually considered as a battery charge and discharge regulator (BCDR) in power conditioning unit (PPU) of a satellite. In this paper, superbuck converter was discussed as a battery charge regulator (BCR) under constant output voltage condition. The operating principle and parameter design of superbuck converter with a damping network was analyzed. Moreover, the small signal model of superbuck converter with a damping network was established by using state-space average method. Based on the small signal model, the transfer functions of output voltage to input current $G_{vi}(s)$ and input current to duty ratio $G_{id}(s)$ were derived. According to these derived transfer functions, the double loop control system, including input current control of inner loop and output voltage control of outer loop was proposed and designed in detail. Finally, to prove if the designed double loop control system of superbuck converter with a damping network was right, a prototype was fabricated. The experimental results show that after applying the double loop control system, the superbuck converter with a damping network has the ability of keeping output voltage stable and restricting input current.

KEY WORDS: BCR, superbuck, damping network, the double loop control system