SIBO DC-DC Converter with Current Mode Control Circuit

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This paper describes a high performance of SIBO (Single-Inductor Bipolar-Output) DC-DC converter with CMC (Current Mode Control) , targeted for design of a high efficiency, compact size, fast response DC-DC converter. A SIBO converter provides a pair of constant positive and negative output voltages, using only one inductor, to effectively decrease the area as well as the cost on system board [1]. Advantages with CMC are good line regulation, simple compensation design, inherent current limiting function, and fast response.

Figure1 shows the proposed architecture of SIBO with CMC, and the proposed architecture uses PCCM (Pseudo Continuous Conduction Mode). PCCM reduces output voltage ripples, and improves response speed as well as cross regulation [2]. The proposed SIBO converter realizes high response speed for the change of load current.

We have performed SPECTRE simulation of the proposed converter. Figure2 shows simulation result of the load regulation in the proposed circuit. Figure3 shows load regulation of the conventional architecture with voltage mode control. These simulation results indicate that the proposed converter has shorter response time compared with conventional converter.

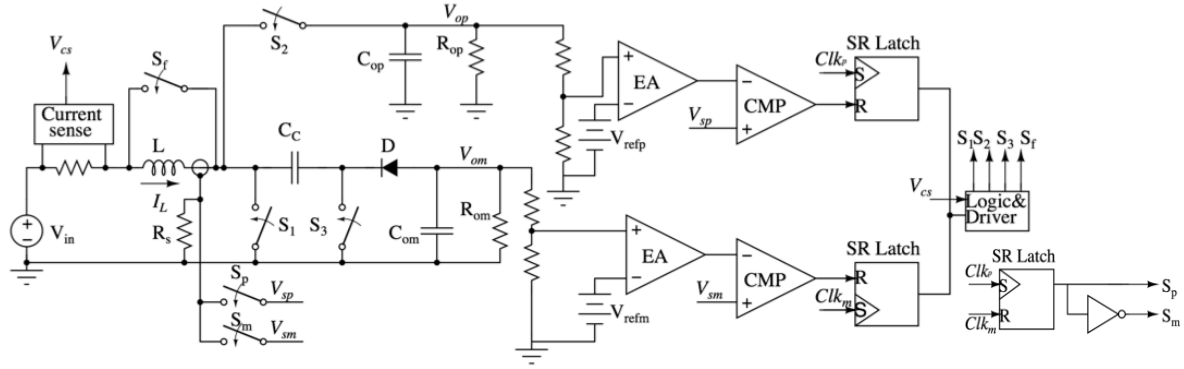

Fig.1 Structure of the proposed converter with current mode control

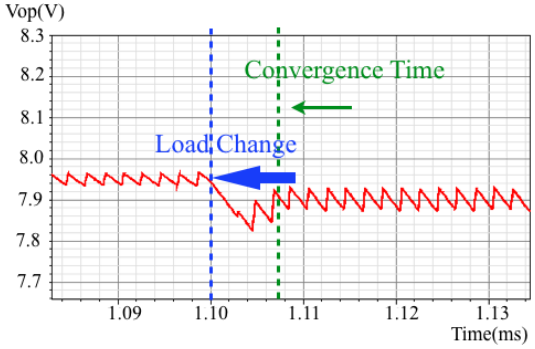

Fig.2 Simulation result of the proposed circuit.

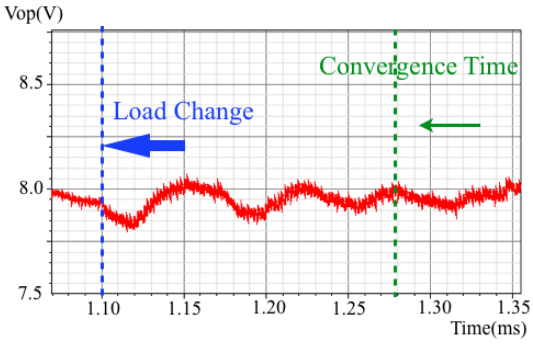

Fig.3 Simulation result of the conventional circuit.

References:[1] Yi Zhang and Dongsheng Ma, "Integrated SIMO DC-DC Converer with On-Line Charge Meter for Adaptive PCCM Operation", IEEE International Symposium on Circuits and Systems (May 2011).

[2] Nobukazu Takai, Kenji Takahashi, et. al, "Single Inductor Bipolar Outputs DC-DC Converter Using Charge Pump", IEEJ International Analog VLSI Workshop, Pavia, Italy (Sept. 2010).