Current Balancing Strategy for Interleaved DC-DC Converters based on Switching-Frequency Ripple

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The parallel operation of power converters creates the challenge of balancing the currents of the individual converters at the paralleled ports. Existing strategies achieve current balancing in parallel and interleaved DC-DC converters using additional current sensing circuitry, which increases cost and complexity, or by measuring the terminal ripple directly, which is susceptible to noise and deteriorates the signal-to-noise ratio (SNR). This paper proposes a current-balancing strategy for interleaved DC-DC converters based on a measurement of the switching-frequency component of the terminal voltage ripple, with substantially improved SNR. The relation between current imbalance and the frequency components of terminal voltage ripple is established analytically for interleaved phase legs. A current balancing strategy for interleaved phase legs, based on the measurement of terminal voltage without requiring current measurements, is proposed based on this. The proposed strategy is validated in simulations and through experiments on a twophase interleaved boost converter.

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