Digital Implementation of Double Integral Quasi-Sliding Mode Control for a Synchronous Buck Converter

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Abstract

This paper describes the use of a fixed frequency Sliding Mode (known as Quasi-Sliding Mode-QSMC) digital controller to stabilize a Synchronous DC-DC Buck Converter using only a voltage loop. A double integral sliding surface is used to eliminate steady state error. The basic theory of Sliding Mode Control and a design procedure for the Double Integral QSMC are presented. A linear PID controller with identical small signal open loop frequency response (in terms of crossover frequency and phase margin) is also developed for comparison with the QSMC controller. Both controllers are designed in the analog domain and translated to the digital domain by use of the bilinear transformation. The resulting power supplies are tested for performances in line regulation, load regulation and reference voltage tracking.

Biography

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