

Chip-implementation of a self-tuning nonlinear function control for DC-DC
converters

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Abstract

The DC-DC converters which convert one level of electrical voltage to the desired level are widely used in many electrical peripherals. This paper proposes a self-tuning nonlinear function control (STNFC) system for a DC-DC converter. Since the STNFC uses a simple fuzzy system with three fuzzy rules base to implement the controller law, the computational loading of the fuzzy inference mechanism is slight. So the proposed STNFC system would be suitable for real-time practical applications. In addition, the adaptation laws of the STNFC system are derived in the sense of Lyapunov function, thus the system can be guaranteed to be stable. Finally, a field-programmable gate array chip is adopted to implement the proposed STNFC scheme for possible low-cost and high-performance industrial applications. The experimental results are provided to demonstrate the proposed STNFC system can cope with the input voltage and load resistance variations to ensure the stability while providing fast transient response.

Keyword : DC-DC converter, fuzzy control