



Modelling and Simulation Analysis of Peak Current Modulated Buck Regulator for Automotive Applications

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Abstract:

Energy conversion is a key requirement in modern automotive systems where electronic devices and charging functions are integrated into the vehicle environment. This paper presents a comprehensive simulation study on the implementation of slope-compensated peak current control for buck converters, designed to address the unique challenges of automotive applications. By incorporating slope compensation, this control scheme reduces subharmonic oscillations that occur due to sudden load changes and adapts to the inherent dynamics of the vehicle's drive system while maintaining transient response and converter stability. A buck converter simulation model is developed using PSIM software. This result highlights the effectiveness of the control scheme in maintaining a stable voltage output, minimizing overshoots and undershoots, and effectively managing dynamic load transients.

Keywords:

Buck converter, peak-current mode control, stability, slope compensation, modelling.