Analysis and design of a fully soft-switched buck-boost converter for ultra-capacitor and battery combined interface circuit

Abstract

A fully soft switched bidirectional converter to interface an ultra capacitor (UC) and a battery is proposed. The proposed converter acts as a Buck ZCT to charge the UC and acts as a Boost ZVT to discharge the UC. The ZVT and ZCT techniques guarantees soft switching condition for all power switches. The proposed converter has high efficiency (above 95%), requires fewer components and has small footprint. The analysis of the switching technique is validated by simulation. In addition, a 100W experimental converter is constructed. The results from simulation and experiment are in good agreement with each other.