A Bidirectional Resonant DC-DC Converter for Electrical Vehicle Charging/Discharging Systems

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Abstract

This paper presents a DC to DC bidirectional resonant converter to be used for bidirectional power transfer applications especially battery charging/discharging applications in electrical vehicles. It is similar to an LLC resonant converter but for bidirectional functionality, an additional inductor and capacitor have been added in the secondary side of the circuit to make the resonant network symmetric for operation in both forward and backward directions.

Zero Voltage Switching (ZVS) of the switches in the inverting stage is ensured. Also, the rectifier diodes in the secondary side turn off under ZCS. ZVS and ZCS result in reduction of losses and allow high frequency operation which leads to a reduction in the size of magnetic elements and filter capacitors thus reducing size, weight, volume and increasing power density.

In this paper, first an equivalent model of the converter is developed for a detailed analysis of the converter voltages and currents. Then simulations of the converter are carried out to verify the validity of the conceptual design.
References


Index Terms

Computer Science
Circuits and Systems

Keywords

Bidirectional DC/DC; CLL-LC, EV Battery Charging/Discharging