

High Efficiency Bidirectional Converter for Smart Grid Applications

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Abstract

The environmental problems caused by energy generation have opened new directions for study in power electronics. The “Smart Grid” concept is one of the emerging solutions that aim to maximize use of green energy sources. Distributed systems convert energy from solar panels, wind turbines, fuel cells etc. and supply DC/AC buses with energy. In order to be able to store energy for later use an efficient bidirectional converter is needed. This article describes a mixed topology consisting of a phase shift converter responsible for transferring energy from the conversion system (solar panel, wind turbines, fuel cells, etc) to the storage element, and an interleaved boost converter responsible for transferring energy from the storage element to the DC bus. The main issues that limit the power capability of such converters are losses in inductive elements and losses on switching elements. The converter described achieves zero voltage switching, drastically reducing heat dissipation. An efficiency of over 92% is obtained for an output power up to 500W.