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DC-DC变换器

一种改进二次型高增益Boost-Sepic变换器

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作者信息

Improved Quadratic High Voltage Gain Boost-Sepic Converter

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History

摘要

高增益DC-DC变换器是可再生能源发电实现高压并网的一个重要环节。提出一种改进二次型高增益Boost-Sepic变换器,既实现在较小占空比的情况下得到较高的电压增益,又降低功率MOS管与二极管的电压应力,同时还具有输入电流连续的优点;且由于二次型Boost变换器与改进Sepic升压变换器的集成,共用一个功率MOS管,变换器的主电路与控制电路均变得简单。对该变换器的工作原理和工作过程进行详细的论述,对变换器增益、功率器件、电容电压应力进行分析,并与目前常用的高增益DC-DC变换器进行对比研究。最后,在理论分析基础上,搭建了一台100 W实验样机进行实验研究,实验结论与理论分析结果一致。

Abstract

The high voltage gain DC-DC converter is an important connection between the high-voltage grid and renewable energy generations. In this paper, an improved quadratic high voltage gain Boost-Sepic converter is proposed, which can not only produce a high voltage gain with a small duty cycle, but also reduce the voltage stress in the power MOSFET and diodes while maintaining the advantage of continuous input current. In addition, owing to the integration of a quadratic Boost converter and an improved Sepic converter, the whole converter shares only one power MOSFET, and its main circuit and control circuit are both simplified. The operating principle and operating process of the proposed converter are discussed in detail, its voltage gain and the voltage stress in power devices and capacitors are analyzed, and it is also compared with the commonly used high voltage gain DC-DC converters at present. Finally, on the basis of theoretical analysis, a 100 W experimental prototype was set up, and the experimental conclusions were highly consistent with the theoretical analysis results.

关键词

可再生能源发电 / 高增益 / 低应力 / 二次型Boost-Sepic变换器

Key words

renewable energy generation / high voltage gain / low voltage stress / quadratic Boost-Sepic converter

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< 上一篇

下一篇 >

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