A New High-gain DC-DC Converter for solar PV Application

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Abstract

The globe is currently seeing an unheard-of drive toward renewable energy due to growing concerns about climate change. Small, distributed types of generation, like solar photovoltaic, played a significant part in shifting to a clean energy future due to economic factors and governmental laws. DC-DC converters are essential in the generation of solar PV electricity because they regulate the output voltage relying on the input voltage. The conventional boost converter (CBC) has minimal output voltage gain, and voltage stress at a switch is typically equivalent to the output voltage. The voltage produced by distribution generation (DG) sources is minimal, necessitating the use of high-gain boost converters. This proposed study is concerned with the development of an improved architecture of non-isolated high-gain DC-DC converters for PV applications, which provides quadratic output voltage gain and reduced voltage stress across a switch. The proposed configuration of the converter is comprised of a conventional quadratic boost converter with a voltage lift cell, which provides a high gain. The topological benefit is the use of a single switch with a lower number of inductors which reduces the circuit bulkiness. The developed topology was contrasted in terms of voltage gain, number of passive components used, and switch stress with other recently presented topologies. The simulation was performed using MATLAB/SIMULINK, and the output voltage gain was verified by prototype experimental results employing the simulation data.

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