



New High Voltage Gain Dual- boost DC-DC Converter for Photovoltaic Power Systems

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Abstract:

This article presents a new circuit topology of a high-voltage step-up boost DC-DC converter for photovoltaic power systems. The converter boosts the low-output voltage of the solar cell to the required voltage for the load. The proposed circuit has various advantages compared to the conventional boost converters, namely a higher boost rate with low duty cycle, lower voltage stress on components, and higher efficiency. The equations of a dual-boost converter are analyzed, highlighting the advantages of the new DC/DC converter circuit topology. The operation principle is explained using the operating intervals equivalent circuits and operation waveforms. Then, mathematical and theoretical analyses of continuous and discontinuous conduction modes of the converter are presented. Losses and thus efficiency of the proposed converter are calculated using MATLAB (The MathWorks, Natick, Massachusetts, USA). Calculations are used to compare the efficiency of the proposed topology with others available in the literature regarding the benefits of decreasing cost and complexity. A photovoltaic system simulation model is developed using PSIM (Powersim Inc., Woburn, Massachusetts, USA) to validate the proposed converter. The proposed high voltage gain boost converter has been implemented for a 100-W load and tested to verify the principle of operation.

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