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Switched Quasi Impedance-Source DC-DC Network for Photovoltaic Systems

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Abstract

The development of renewable energy power systems which are primarily based on solar energy is accelerating as a consequence of the global diminution of fossil fuels. The solar energy is a vast, clean and an inexhaustible resource which can be harnessed by using the photovoltaic (PV) technology. In order to obtain greater voltages from the PV power system for the grid-connected inverters, a DC-DC boost converter might be employed. However, due to the various limitations of the traditional boost converters, many configurations have been proposed to enhance their boost ability. The Quasi impedance-source DC-DC network is one such topology which has been derived from the conventional Z-source DC-DC network by equipping its output ports with a switch and a diode. When compared with the existing Z-source based configurations, it has a lower duty cycle (less than 0.25) which produces a higher boost factor, it has a high voltage gain and it can also avert the instability which is caused due to the saturation of the inductors. It has been developed with a fewer number of energy elements which leads to reduced losses, reduction in cost and enhanced power density. The features of the proposed network along with its working principle in continuous conduction mode for steady state condition, components' voltage and current stresses are assessed. The MATLAB/Simulink findings are offered to back up the theoretical analysis. and attributes listed above.

Full Text:

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