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Akter, K., Motakabber, S.M.A., Alam, A.H.M.Z., Yusoff, S.H.B.

Development of High-Performance Single Inductor Quadratic Multilevel DC-DC Step-Up Converter with MPPT Controller

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International Islamic University Malaysia, Department of Electrical and Computer Engineering 53100 KL, Malaysia

Abstract

Here a new model of single inductor employed quadratic structured multilayer boost converter circuit is developed to be implemented in high-gain renewable energy systems. The study and functioning of a photovoltaic system utilizing a hybrid dc-dc configuration as a high step-up converter along with the incorporation of the Maximum Power Point Tracking (MPPT) technique are elucidated here. The characteristics of the quadratic multi-layered converter circuit have been tuned to provide high voltage gain and efficacy (98%) with minimal ripple contamination in input current. To ensure the adaptability of the proposed circuit, a distinct performance comparison of various topologies has been executed. The proposed circuitry showed improvement across all evaluated aspects compared to other existing topologies. The performance analysis of the recommended structure has been substantiated by PSIM and MATLAB Simulink software. © 2023 IEEE.

Author Keywords

MPPT; Quadratic Multilevel Boost Converter (QMBC); Voltage Gain

Index Keywords

Gain measurement, MATLAB, Maximum power point trackers, Renewable energy resources, Topology; BOOST converter, Converter circuits, High gain, Maximum Power Point Tracking, Multilevels, Performance, Quadratic multilevel boost converter, Step-up converter, Tracking controller, Voltage gain; Boost converter

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