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Performance inspection of high gain chopper designed to extract optimum output of photovoltaic source

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Abstract
In recent years, the demand for power consumption has increased rapidly to fulfill the energy needs of households and industries worldwide. Solar electricity has emerged as the most practical form of renewable energy in this context. Due to its distinctive qualities such as being clean, quiet, and sustainable. Here, the study and analysis of a non-isolated high-gain chopper for solar photovoltaic (PV) systems are presented, which includes a quadratic cell and voltage doubler circuit (VDC). To ensure the utmost power produced by the solar system, the perturb and observe (P&O)-based maximum power point tracking (MPPT) algorithm is utilized. A quadratic VDC and a DC-DC boost converter are used to raise the PV voltage to a higher level (3.6 times higher with an MPPT controller, and 8 times higher with a battery source). The proposed converter exhibits notable improvements in efficiency, achieving an impressive 94%, which outperforms other state-of-the-art topologies. Additionally, the converter showcases a significant boost in voltage conversion gain, thereby substantiating its efficacy and superiority over other advanced topologies. Furthermore, comparatively less voltage stress on the switch with reduced voltage and current fluctuation increased the conversion effectiveness of the proposed configuration. Performance verification of the proposed topology is obtained by employing PSIM and MATLAB/Simulink.

Author Keywords
Continuous conduction mode; High gain chopper; MPPT; Quadratic cell; VDC

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