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An Efficient Step-Up Converter with a Low Switch Stress

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Abstract

A novel approach is proposed for a high step-up and high efficiency converter with a low switch stress. The integrated boost-flyback converter uses coupled-inductor techniques to achieve high step-up voltage with low duty ratio, and thus the slope compensation circuit is disregarded. The proposed circuit topology improving high-gain ratio, increasing efficiency, reducing the secondary side of copper loss, and having an active-clamp effect that can reduce the switch stress on power components and have the energy feedback mechanism. Such a method of high efficiency and simple control can reduce cost which makes production size in increasing demand at present. Therefore, designing converters becomes a challenge when stepping up voltage with high efficiency and high power output. This thesis is a design of a high-efficiency step-up converter with low switch stress. The design is simple in that the circuit requires only a pulse width modulation (PWM) signal output. In addition, at cut-off time, the MOSFET generates a spike by way of a circuit sent to the output. This way can achieve the goal of energy recovery, an active-clamp, and can reduce the switch stress of power switch to improve circuit efficiency. Experimental results have confirmed that the proposed converter possesses high step-up, high efficiency, and low switch stress.

Keywords: step-up, low switch stress, active-clamp

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