Design, Simulation and Implementation of a high step-up DC-DC converter

In this thesis, a novel topology for high step-up DC-DC converters is proposed based on coupled inductors. The operation of the proposed converter is compared with the other similar converters. The operation principles and steady state analysis of continuous, discontinuous and boundary conduction modes are discussed in detail. An optimization process is used to optimize coupled inductor turn ratios which minimizes voltage stresses. To verify the performance of the proposed circuit, the converter is simulated by Orcad Pspice 16 simulation software. A 250W prototype with 400V output voltage is implemented. The results of the new converter are compared with some of the similar topologies presented before, which shows that the new topology has some advantages compared to them. The experimental results are also in a good agreement with the simulation results.

The proposed converter has many features like high conversion ratio, recycling the leakage energy of the coupled inductor, minimizing voltage stress of components, simplicity of the control, and high efficiency. Minimization of the switch voltage stress leads to the use of switches with smaller on-resistance and improvement in overall efficiency.