

PUSH PULL BOOST CONVERTER WITH LOW LOSS SWITCHING

by

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This is to certify that the thesis entitled "*Push Pull Boost Converter with Low Loss Switching*" submitted by Sanjaykumar Limaji Patil for the award of the degree of the **Doctor of Philosophy** to the Indian Institute of Technology, Delhi, is a record of the bonafide research work he has carried out under my supervision. The results contained in this thesis have not been submitted to any other University or Institute for the award of a degree or diploma.

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Abstract

In any power conversion process, low power loss and hence high energy efficiency is very important because of the cost of wasted energy and the difficulty in removing the heat generated due to the dissipated energy. Other important considerations are size, weight and cost of the power processor. Among the different category of power converters, switched mode power converters are now mostly used for power conversion.

In switched mode power converters, as the switching frequency increases, the size of the inductors and capacitors decreases and hence the weight and size of the converter also decreases. However due to increase in the switching frequency, the switching losses in the converter also tend to increase. At high frequencies, the total loss is dominated by the switching loss. Switching losses and device stress can be reduced by connecting simple dissipative snubber circuits consisting of diodes and passive components in series or parallel with the switch. However, these dissipative snubbers shift the switching power loss from the switch to the snubber circuit and therefore do not really result in a reduced in overall power loss.

In contrast to dissipative snubbers in converters, the combination of the proper converter topology with unique switching strategies can alleviate the problem of switching losses. In this work, an attempt has been made to:

- (a) Develop a new pulse width modulated (PWM) push pull boost converter topology with a unique switching sequence to significantly reduce switching losses.
- (b) To embed the above core converter into any control topology, including voltage mode and power factor correction controller.

In the new converter topology that has been developed, switching for all power MOSFET switches is at zero voltage. The zero voltage switching (ZVS) is achieved with the help of a simple auxiliary circuit. An experimental prototype of 800 Watt has been fabricated to illustrate the developed topology. The experimental and simulation results may be useful for engineers interested in the general field of the reduction of switching losses in power converters.

The possibility of embedding the proposed converter core into standard control strategies such as voltage mode control and power factor corrector (PFC) control has also been investigated. Both the control techniques have been implemented successfully and the related experimental results are presented.

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