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High Power Generation based on Modified Full Bridge Converter for Electric Vehicle Application

Dr.R.Venkatesh[1], DR.C.Thangaraju[2], S.Raja[3]

[1,2]Professor, Department of Electrical and Electronics Engineering,
Mahendra Engineering College (Autonomous), Namakkal, Tamilnadu, India

[3]Assistant Professor, Department of Electrical and Electronics Engineering,
Mahendra Engineering College (Autonomous), Namakkal, Tamilnadu, India

Abstract:

A non isolated full bridge converter based bidirectional converter for control the power flow. The high power generation by applying the dc power in full bridge converter to decrease the ripple. The reliable operation of full-bridge converter under such wide load varieties, the converter ought not just work with soft switching from full load to no-load condition with satisfactory efficient for the full range of operation, yet additionally the voltage over the yield diode bridge should be clamped to evade any adverse voltage overshoots increasing during the output diodes as generally found in regular full bridge converters. To attain the high reliability based zero current zero voltage switching converter and high power quality, the converter utilizes a symmetric inactive near lossless auxiliary circuit to give the reactive current to the full-bridge semiconductor switches, which ensures zero voltage switching at turn-ON times for all load conditions. The performance of full bridge circuit is analyzed in MATLAB/Simulink environment.

Keywords: Shoot Through, Zero Voltage Switching (ZVS), Zero Current Switching (ZCS), Full Bridge Converter.

Introduction

The power converters in electric vehicles (EVs) for the most part utilize a high energy battery pack to store energy for the electric application network. This high energy battery pack is ordinarily charged from the utility AC mains [1-2]. Energy conversion based on battery charging is performed by an AC/DC converter. Such AC/DC converters, which are utilized to charge the high-energy battery, generally comprise of two phases: input control factor correction (PFC) for AC/DC converter and DC/DC transformation for battery charging [3-4]. PFC is utilized to enhance the quality of the info current, which is drawn from the utility, and the charger which is a detached DC/DC converter, is utilized to charge the high voltage battery and give galvanic separation between the utility mains and the footing battery [5-6].

Full-bridge topology is the most prevalent topology utilized as a power vary of few kilowatts (1– 5 KW) for DC/DC converters. Since the switch rating is upgraded for the full-bridge topology, this topology is widely utilized as a part of industrial applications. High productivity, high power density, and high dependability are the features of this method. For applications in the scope of a few of kilowatts, MOSFETs are generally used to actualize the full-bridge converters [7-9]. The robust and reliable operation based on MOSFETs should be switched under zero voltage. The function of zero voltage switching (ZVS) has various merits such as decrease of the converter switching losses and a noise free condition for the control circuit. Zero voltage switching is normally accomplished by giving an inductive current streaming out of the full-bridge legs during the switch turn-ON and by putting a snubber capacitor over each switch during the switch off [10].

Proposed Methodology

The proposed topology is based on a current driven rectifier attain the high voltage of the output diode connect and furthermore fulfill ZVZCS operation of the converter functioned for all load conditions. The proposed circuit diagram is shown in fig 1.

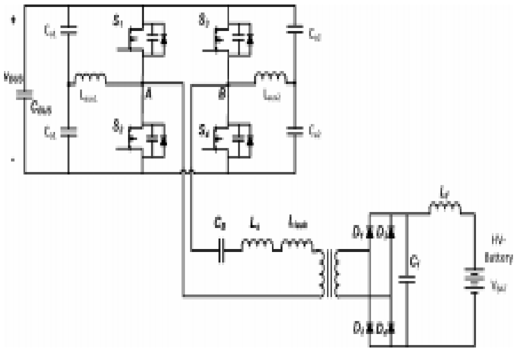

Fig 1: Proposed Full Bridge DC/DC converter

The proposed full bridge converter has diode rectifier at the secondary of bridge circuit. The bridge circuit reduces the switching losses and eliminates the passive elements. The snubber circuit is included in the full bridge inverter. In electric vehicle applications, the power converter ought to be ready to work at definitely no-load condition for long stretches of time. The regular full-connect converters lose ZVS at light loads. This restrains the utilization of the customary full-connect converter in such applications. Two helper circuits are set to give receptive current to ZVS turn– ON of the full-connect switches autonomous of the load condition.

Results and Discussion

The high power density based semiconductors are utilized in power modules. The input full bridge rectifier based interleaved MOSFET drives for enhancing the output voltage. The stage move full bridge converters typically experience the ill effects of the moderate body diodes of the MOSFETs. The moderate body diode causes voltage spikes because of the responsive current moving through MOSFETs amid the exchanging times. The full bridge output circuit is shown in fig 2.

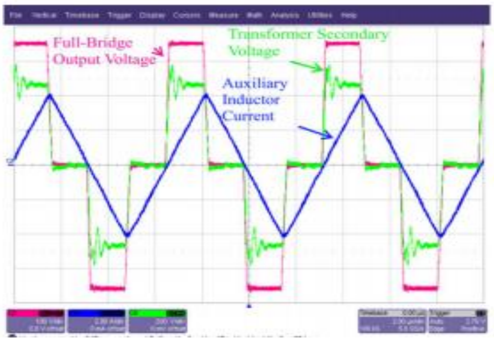

Fig 2: Full Bridge Converter Output

Fig 3: Full Bridge Converter Output Voltage at No load

Fig 3 shows the no load voltage waveform of full bridge converter. Due to the inductive way, utilizing a quick diode parallel to the discrete MOSFET does not take care of the issue. Be that as it may, this issue can be understood utilizing passes on rather than discrete parts; so there are four silicon bridge diodes included parallel to the power MOSFETs in the full-connect control module.

Conclusion

The proposed converter neglect the adverse impacts of the voltage spikes at the auxiliary side of the transformer, as well as the freewheeling method of operation, which are intrinsic to the ordinary full-connect converters. Additionally, the proposed converter based on full bridge converter dependable activity at no load by applying the symmetric auxiliary circuits on the two legs of the full-bridge converter. Trial results and better effectiveness of the proposed converter over full scope of task approve the activity of the converter as well as affirm the predominance of the proposed topology over the ordinary full-connect converter.

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