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ULTRAHIGH-STEP-UPNON-ISOLATEDINTERLEAVEDBOOSTCONVERTER

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***Abstract-** A new non isolated interleaved boost topology with ultra large step voltage ratiobased on coupled inductors (CIs) and switched capacitor is proposed. CI applied in the lowvoltage side along with the interleaved structure and utilizing new topology provide ripplecancelation and considerably reduce the input current ripple and current stress through powerswitches and magnetic elements. In addition, utilizing CIs in the high voltage side provides ahigh-voltage gain with an appropriate duty ratio. Voltage lift capacitors used in this structurenot only alleviate the voltage spikes across the power switches but also increase the voltagegain. Zero current switching (ZCS) turn-on condition for switches and ZCS turn-off conditionfor diodes are achieved by employing CIs without any auxiliary circuit. This feature degradesthe reverse recovery losses and improves the efficiency of the converter. The voltage stress ofthe power switches is noticeably lower than the output voltage, especiallyat high outputvoltages. Therefore, the low- voltage rated switches can be adopted. This topology providesauto-currentsharingwithoutany controller.*

INTRODUCTION

Photovoltaic cells, fuel cells, and wind energy are the number of sources that provide energyfor such systems. High-step-voltage-ratio converters are widely utilized in such systems. Thelow-voltage output of renewable energies and high-voltage dc link requirements in manyapplications have made it necessary to develop power converters with high step-up voltagegain. Duty cycle and turns ratio of transformers or coupled inductors (CIs) are two generalparametersutilizedinconverterstoobtainhigh-voltagegain.High-voltagegaininconventional topologies such as fly back or boost converters is achieved by adopting highturn ratio or high duty ratio for control signals. Efficiency limitation, high voltage stress ofpower switches, reverse problems, high conduction losses due to high-voltage rated switchesapplied,andstabilityproblemsincontrol are typicaldrawbacksofsuchconverters.Inisolated converters, the conductionlosses of isolating transformer are relatively high andalso using large turn ratio results in large leakage inductance which considerably decreasesthe effective duty cycle of converter. Thus, when isolation is not required to overcome thedrawbacks of isolated converters, several non isolated converters are proposed. Applying CIand switched capacitor (SC) structures to non isolated boost converters provide high-stepvoltagegain withappropriateduty cycle. A greatnumber of high step-upconverters basedon CIs are discussed in and their advantages and disadvantages are scrutinized, single phasehigh step-up converters with SC structure combined with CIs are introduced. Alleviatingreverse recovery losses of boosts diodes, reducing the stress voltage of power switches, andappropriatedutycycleforswitchesevenforhighoutputvoltagesareanumberofadvantages of these converters. Unfortunately, due to the large input current ripple in high-power applications, these kinds of converters are not suitable case, a two-phase interleavedCI, an interleaved structure combined with three winding CIs and voltage multiplier cells(VMC)areproposed.

LITERATURESURVEY

AUTHORS: ***Y.P.SiwakotiandF.Blaabjerg.***

Thispaperintroducesanewsingle-switchnon-isolateddc-dcconverterwithveryhighvoltage gain and reduced semiconductor voltage stress. The converter utilizes an integratedauto-transformer and a coupled inductor on the same core in order to achieve a very highvoltage gainwithoutusingextremedutycycle.

AUTHORS:***L.Schmitz, D.C.Martins,andR. F.Coelho.***

High step-up conversion is an indispensable feature for the power processing of low voltagerenewable sources in grid-connected systems. Motivated by this necessity, this paper presentsa study on non-isolated dc-dc converters based on the conventional Boost converter that canprovidesuchfeaturewithhighefficiency.Bythetopologicalvariationandgaincellconcepts, it is demonstrated that these converters can be treated as a unique generalizedconverter,calledBoostConverterwithGainCell(BCGC).thekeywaveformsandthecomponentsstressesoftheBGCGareanalyzedforthecontinuous-conductionmode,independently oftheemployedgaincell.

AUTHORS:***J.AiandM.Lin.***

In this paper, a novel ultra large gain step-up coupled-inductor dc/dc converter with anasymmetric voltage multiplier network is presented for a sustainable energy system. Theproposed converter contains one boost converter, one voltage multiplier network, and onepassive lossless clampedcircuit.

SCOPEOFPROJECT

Switch voltage stress is low and input current ripple is very low. Moreover, the interleavedstructure in both input and output stages of the proposed converter not only decreases the lowvoltage side current ripple and the size of input filter inductors but also due to the currentdistribution between two phases, the conduction losses are reduced and the efficiency isimproved. Also, all capacitors used in this topology are small due to the interleaved structureapplied.Inthistopology,notonlyallmeritsoftheaforementionedconvertersareprovidedbut alsothevoltagegainratiois considerablyimproved.

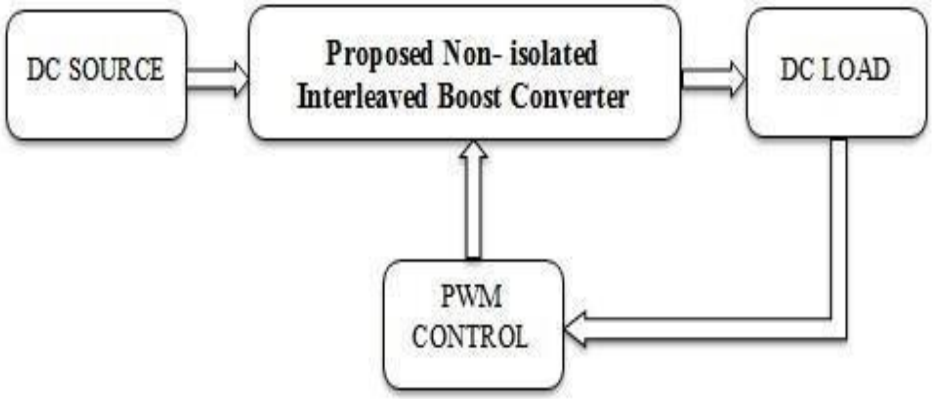
EXISTINGSYSTEM

Inexistingsystematwo-phaseinterleavedCoupledinductor,aninterleavedstructurecombined with voltage multiplier cells.Utilizinginterleavedstructures resolve the inputcurrentrippleofsuchconvertersbutthisconverterhaslowvoltagegainandvoltagemultiplier circuit increased the size and cost of the system .High conduction losses due tohigh-voltage rated switches applied, and stability problems. Conventional boost converterwithdcsourceis used.

PROPOSEDSYSTEM

In these proposed converters, secondary windings of CIs are applied to charge additionalcapacitors that are placed in series with the converter output capacitor. High gain voltageratiowithlowcurrent rippleandinherentautocurrent sharingareprovided,whilepulsating

inputcurrentanddeficiencyofinherentautocurrentsharingarethedrawbacks.

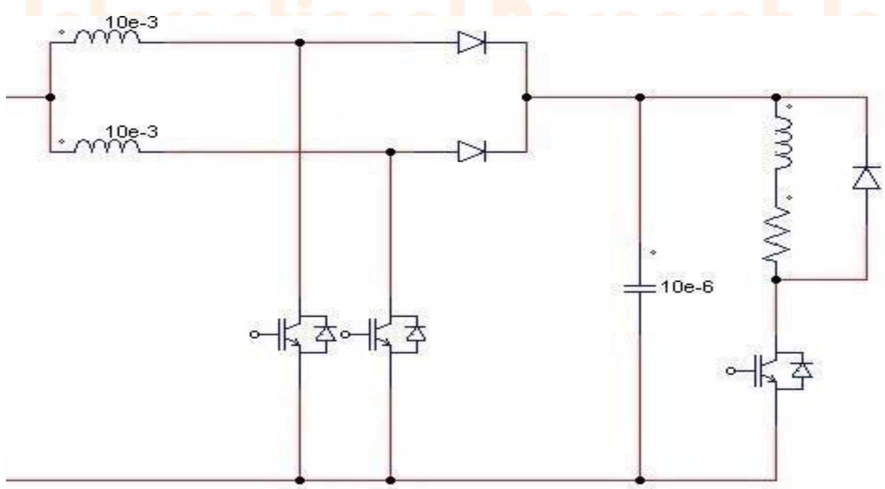


Ultrahighboost converterandNon-isolatedinterleavedconverterisused.Theadvantageouskeyfeaturesoftheproposedconceptaregivenasfollows.

1. *Substantiallylowvoltagestressofpowerswitchescomparedtotheoutputvoltage.*
2. *Simplicityofcontrolalgorithmandgatetriggeringpatternjustlikeconventionalinterleavedconvertersandfullbridgecurrentfedconverters.*
3. *Performanceforallpowerswitchesatturnoffinstantwithoututilizinganyauxiliarycircuitandreverserecoveryproblems.*

CIRCUITDIAGRAM

A switched capacitor is an electronic circuit element implementing a filter .It works by movingchargesintoandoutofcapacitorswhenswitchesareopenedandclosed.Usually,nooverlappingsignalsareusedtocontroltheswitches,sothatnotallswitchesareclosedsimultaneously.

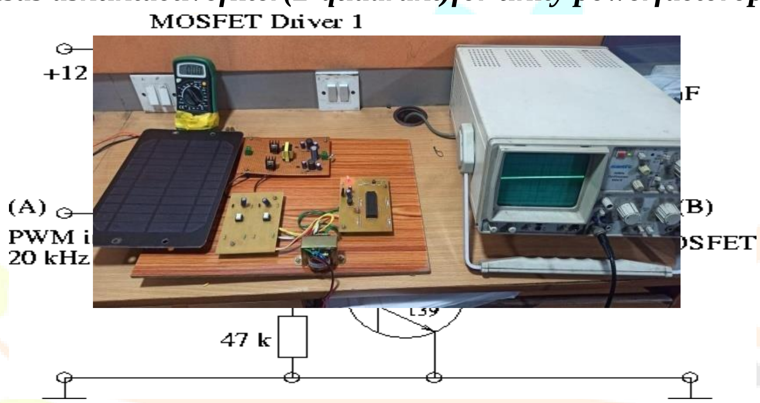


HARDWARE

DESCRIPTIONMOSFETGA

TEDRIVER:

The High and Low Side Driver (IR2112) is a high voltage, high speed power MOSFET andIGBTdriverwithindependenthighandlowsidereferenceoutputchannels.ProprietaryHVICa nd latchimmuneCMOStechnologiesenableruggedizedmonolithicconstruction.Logicinputs are compatible with standard CMOS or LSTTL outputs, down to 3.3V logic. The outputdriversfeatureahighpulsecurrentbufferstagedesignedforminimumdrivercrossconduction. Propagation delays are matched to simplify use in high frequency applications..The driver circuit is used to drive the bi-directional converter switches where in this project theconverteractsas ashuntactivefilter(2-quadrant)for unity powerfactoroperationandthedc.



The dynamicresponse ofthe proposedconverterduringthe loadchange andthephotograph of the implemented prototype converter It should be mentioned that the closed-loopcontrolsystemimplementationissimplesincetheisolatedgatedriversarenotrequiredand the pattern of gate pulses are similar to the current-fed full bridge converter. Theaverage and the ripple currents of the magnetizing inductance of the third CI are almostzero.Moreover,this Cis placedonthelowcurrentside.

RESULT

As a result, the conduction loss of this CI is considerably low. Also, the magnetizinginductances of the first and the second CIs are relatively small. Due to the interleavedstructureandautocurrent-sharingability,halfoftheaverageinputcurrentflowsineachleg.Therefore, the number of CIs in this topology will not deteriorate the efficiency. In addition,the low-voltage stress of power switches, recycling the leakage inductance energy, and thecurrent distribution between legs in both sides of the proposed converter cause to reduce theconductionlosses andimprovetheconverterefficiency.

CONCLUSION

A non-isolated interleaved topology based on CI, VMC, voltage lift capacitor, and SCtechniquesispresented.Thisstructureconsiderablyreducestheinputcurrentrippleand

provides ultrahigh gain ratio with an appropriate duty cycle and low turns ratio of CIs. Thelow voltage rating of power switches achieved soft-switching conditions without any auxiliarycircuits, alleviating the reverse recovery losses and providing auto current sharing and highefficiency are some of the advantages of the proposed topology. This can be used in DC-DCconverters are high-frequency power conversion circuits that use high- frequency switchingand inductors, transformers, and capacitors to smooth out switching noise into regulated DCvoltages.Electricvehicleapplication.SolarPVapplication.Batterystorage application.

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