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MITIGATION OF RIPPLE CONTENT USING COUPLED INDUCTOR BASED KY CONVERTER

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Abstract:

In this paper, a unique voltage-boosting device is given, which mixes one charge pump and one coupled inductance with the turns quantitative relation. The corresponding voltage gain is bigger than that of the prevailing step up converter combining Ky and buck-boost converters. Since the planned device possesses Associate in Nursing output inductance, the output current is non pulsating. when some mathematical deductions, Associate in Nursing experimental setup with 12-V input voltage, 104-V output voltage is employed to effectiveness of the planned device.The KY converter is a recent development which operates in CCM while keeping the output current non-pulsating leading to low output voltage ripples in the order of few mV.To improve this voltage gain , proposed system consist of a coupled inductor based KY converter.The proposed converter enhances the output voltage gain and mitigates the ripple content.

Keywords: Charge pump, coupled inductance, KY converter.

I. Introduction

For the application of the power supply using the low voltage battery, analog circuits, such as radio-frequency amplifier, audio amplifier, etc., often need high voltage to obtain enough output power and voltage amplitude. This is done by boosting the low voltage to the high voltage required .there are some converters needed to supply one boosted voltage or more under a given low voltage, especially for portable communications systems, concerning the standard nonisolated voltage-boosting converters like the standard boost device and buck-boost converter, their voltage gains don't seem to be high enough. Up to now, several varieties of voltage-boosting techniques are given, including many inductors that square measure attractable and so pump the hold on energy into the output with all inductors connected asynchronous coupled inductors with turns ratios voltage superposition supported shift capacitors, auxiliary transformers with turns ratios etc. In and the output terminal is floating, thereby increasing application quality. In these converters contain too several elements, thereby creating the converters comparatively difficult. In the output currents square converter combines one KY converter one synchronously rectified buck-boost device, and one coupled inductance with the turns quantitative relation, that is employed to enhance the voltage gain. Therefore, the voltage gain is on top of that of the measure rhythmical, so inflicting the output voltage ripples to tend to be giant. In though the output currents square measure nonpulsating, their voltage gains don't seem to be high enoughThis the duty cycle and the turns quantitative relation square measure freelance,device in and might be determined by adjusting each the duty cycle and also the turns quantitative relation. Moreoverwhich suggests that calibration the duty cycle doesn't have an effect on the turns quantitative relation and contrariwise, additionally, the planned change of magnitude device has no floating output Associate in Nursing has an output inductance; therefore, the output current is non pulsating. what is more, a part of the outflow inductance energy may be recycled to the output capacitance of the SR buck-boost device. during this paper, a close description, at the side of some experimental results, is given to produce the effectiveness of the planned device.

Proposed System

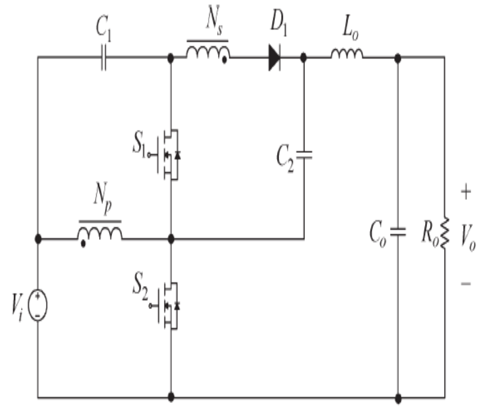


Fig.1 KY converter

II. Overall System Configuration

Fig.1 shows the planned device, that contains 2 MOSFET switches S1 and S2 , one coupled inductance composed of the first winding with Np turns and also the secondary winding with Ns turns, one energy-transferring capacitance C1 , one charge pump capacitance C2 , one diode D1 , one output inductance Lo , and one output capacitance Co . additionally, the input voltage is denoted by Vi , the output voltage is import by Vo , and also the output resistance is painted by Ro .

III. Basic operative principles

Before taking over this section, there square measure some assumptions to be created.

1) The coupled inductance is sculptured as a perfect electrical device except that one magnetizing inductance lumen is connected in parallel with the first winding and one outflow inductance Ll1 is connected in series with the coil. Therefore, coupling constant k is outlined as lumen

2) The planned device operates within the positive current mode. That is, the currents flowing through the magnetizing inductance lumen and also the output inductance Lo square measure continuously positive.

3) The dead times between the 2 MOSFET switches square measure omitted.

4) The MOSFET switches and also the diodes square measure assumed to be ideal elements.

5) The values of all the capacitors square measure giant enough such the voltages across them square measure unbroken constant at some values.

6) The magnitude of the shift ripple is negligible.

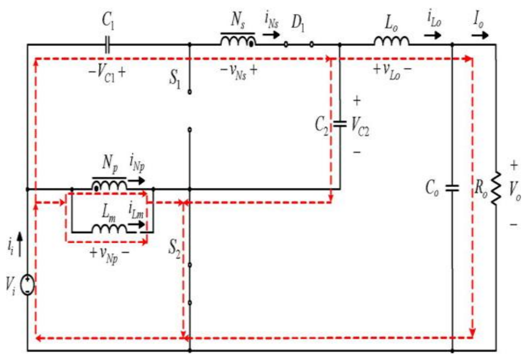
Therefore, the little ripple approximation are going to be adopted herein within the analysis.

The following analysis contains the reason of the ability flow path for every mode, at the side of the corresponding equations and voltage gain. Inherently, there square measure 2 operative modes within the planned device. Moreover, the gate driving signals vgs1 and vgs2 of the 2 switches S1 and S2 have the duty cycles of (1 − D) and D, severally, wherever D is that the dc quiescent duty cycle created from the controller. additionally, the input current is denoted by ii , this through the Np winding is import by iNp , this through the Ns winding is painted by iNs , this through lumen is denoted by iLm , this through Lo is indicated by International Labor Organization , and also the current through Ro is import by Io . On the opposite hand, the voltage across lumen or the voltage across the Np winding is import by vNp , the voltage across the Ns winding is painted by vNs , the voltage across C1 is indicated by VC one , the voltage across C2 is denoted by VC a pair of , and also the voltage across Lo is delineate by vLo .

A.Voltage Gain Considering Coupling constant Equal to One the outflow inductance is omitted.

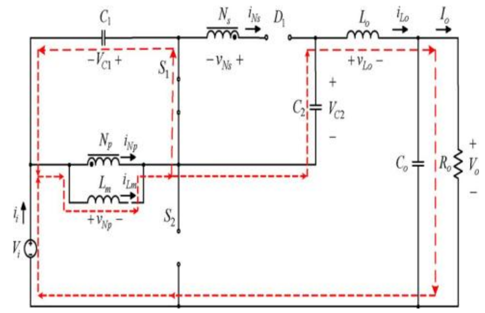
Modes of Operation:

MODE:1 S2 is ON



throughout this interval S1 is turned off however S2 is turned on. Therefore, input voltage Vi is obligatory on Np , therefore inflicting lumen to be attractable and also the voltage across Ns to be induced , adequate to Vi × Ns /Np . In addition, D1 becomes forward-biased; C2 is charged to Vi + VC one + Vi × Ns /Np ; and also the voltage across Lo , i.e., vLo , may be a negative price, adequate to VC a pair of − Vo , therefore creating Lo demagnetized. As a consequence, input voltage Vi ,along sidethe voltage across C1 and the induced voltage on Ns and the voltage across Lo provides the energy to the load. additionally, the associated equations square measure as follows: vNp = Vi vLo = VC a pair of − Vo .

MODE: 2 S1 is ON



throughout this interval S1 is turned on however S2 is turned off. Therefore, the −VC one voltage is obligatory on Np , thereby inflicting the magnetizing inductance lumen

Over all System Configuration:

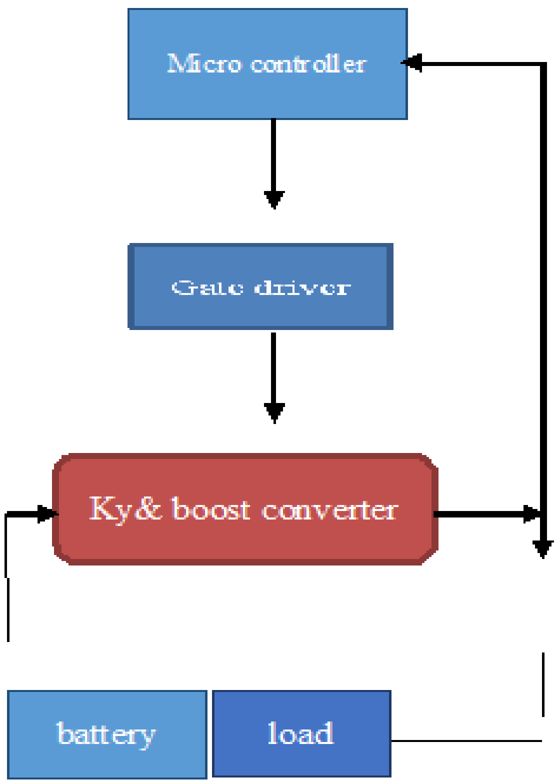
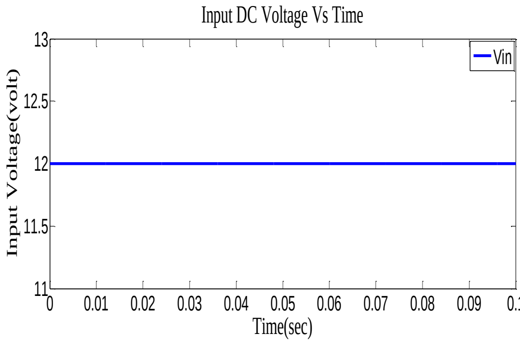


Fig.2 Circuit diagram.

Hardware Components:

1) C2-46uF
2) Co1600uF
3) Switch- mosfet
4) Coupled inductor - 1:1 ratio
5) Pic controller

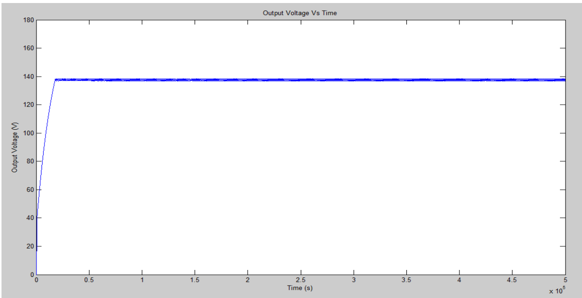
Input Voltage:



Input voltage : 12 Volts.

Fig.3 Input voltage

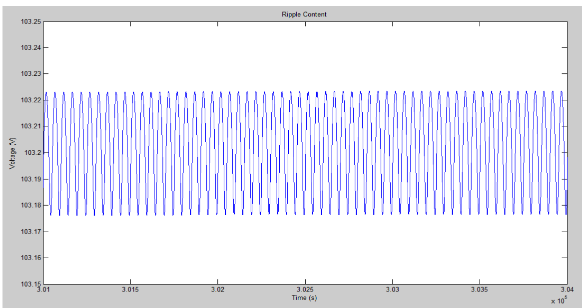
Output Voltage:



Output voltage : 104 Volts.

Fig.4 Output voltage

Ripple Content:



Proposed Ripple Content 103.23-103.19=0.04

PWM Pulse:

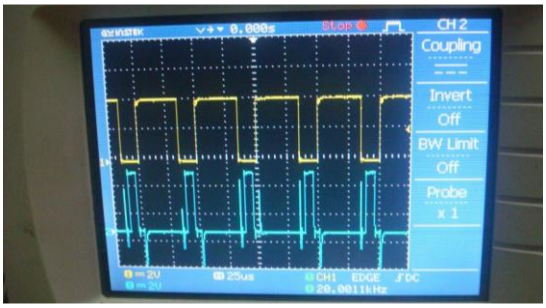


Fig.5 PWM Output.

IV Conclusion:

A novel high step-up converter has been presented herein. By combining the coupled inductor and the switched capacitor,the corresponding voltage gain is higher than that of the existingstep-up converter combining KY and buck-boost converters. Furthermore, the proposed converter has no floating output, and it has one output inductor; hence, the output we get the non pulsating. Moreover, the structure of the proposed converter is quite simple and very suitable for industrial applications.

V References:

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