

Analysis and Implementation of High Voltage Gain Using Reconfigured Dickson Accuse Pump

¹Balaji NV, ^{2*}Sathish S, ³Vishal A, ⁴Panneerselvam G

Dept. of Electrical and Electronics Engineering,

Vel Tech Multi Tech Dr.Rangarajan Dr.Sakunthala Engineering College, Chennai -600 062, TN

^{2*}Indiasathishgautham3@gmail.com, panneerselvam@veltechmultitech.org

Abstract- In this model we incorporate the high step up DC- DC converter along with three state switching and voltage multiplier cells which eventually enhances in producing the continuous input current with low ripples and high voltage. The VM cells which comprises of the diode and capacitors which operates under the resonance principle are cascaded in order to produce increased voltage. Clamping performed in the output capacitor reduces the voltage stresses across each elements in the circuit. Interleaving permits the multiplier stages to operate with decreased current stress through the components and also the input inductors and capacitors size is reduced drastically.

1. INTRODUCTION

A boost converter which gives high voltage gain is used for many applications. Theoretically, a DC-DC boost converter can be used to achieve a high voltage

gain with a very high duty ratio. However, in practice, the operation of stepping up voltage gain is limited due to the effect of power electronic switches, rectifier diodes, and the equivalent series resistance (ESR) of inductors and capacitors. Moreover, the serious reverse-recovery problem is caused due to high duty ratio. A dc-dc ISOLATED converter of very simple structure which has a high step-up voltage gain and an electrical isolation, but the active switch of this particular converter will suffer a high voltage stress due to the inductance leakage of the transformer. An output capacitor is used to smooth the pulsing nature of the high voltage. In conventional method first they used Villard voltage-Doubler it was also called "Greinacher voltage-doubler" first presented by Heinrich Greinacher between 1919 and 1921. This circuit was a simple

combination of the clamper and peak holder circuit which is shown in Fig. In this circuit, the voltage clamper can shift the DC offset in the AC voltage at input side from zero to the maximum value of the volts. Therefore, the output voltage from clamper circuit is oscillating between zero and. Finally, the peak holder circuit captures the peak of its input voltage and holds the DC value of its output. In other words, the presented circuit below can convert an input AC voltage to a doubled DC voltage across its output. Second method was Cockcroft and Walton introduced a complex cascade voltage-doubler that is shown above this circuit could produce a steady potential of about 700 kV that was three times greater than the applied input voltage. However, due to existence of series connected coupling capacitances, the high coupling voltage drop happens in this configuration. This phenomenon causes a small voltage gain for the circuit. Furthermore, series connected output capacitor causes a low output capacitance. High-voltage-gain based on the principle of VM circuit is introduced in this PROJECT. The proposed circuit consists of inductors (L_1 , L_2) and switches (S_1 , S_2), whenever even number of VM cells are used the circuit experiences different current stresses. The proposed model of converter offers

continuous input current and low voltage stress on its switches.

2. IMPLEMENTATION DICKSON CHARGE PUMP

The Dickson pump is a type of DC to DC converter that uses capacitors for energetic charge storage for lower voltage. Charge-pump circuits are capable of high efficiencies, sometimes as high as 91–96%, while being electrically simple circuits. An output capacitor is used to smooth the pulsing nature of the high voltage capacitor voltages. The proposed design has an advantage of condensed capacity, load, and volume of magnetic, which are designed for twice the switching frequency. The current stress along each main switch is same as that to half of the total output current, which allows the use of switches with lower current rating. Losses are distributed among the semiconductors, leading to better heat distribution and consequently more efficient use of the heat sinks.

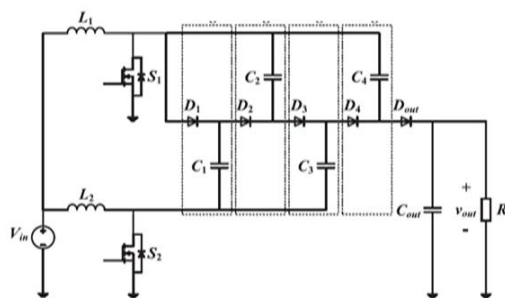


Fig 1.Implementation Model

3. HARDWARE MODEL

The Hardware model consists of inductors (L_1, L_2) and switches (S_1, S_2) experiences a different current stress whenever voltage multiplier cells are used in it. This converter can step up voltages as low. The converter which is proposed in this system can offer continuous input current and low voltage stress at its switches. This hardware model gives the appropriate simulation model of the DC to DC voltage multiplier based on its simulation design and results. The model overcomes its only disadvantage by converting the output DC into AC with the help of an inverter connected at the second stage of the hardware model figure: 2.

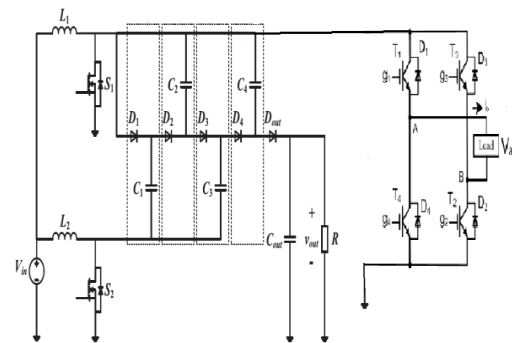


Fig 2.Hardware Model

4. RESULTS

These converters are DC to DC that uses capacitors for charge storage for lowering and raising the voltage. These circuits possess very high efficiency up to 96% and as an added advantage of being a very simple circuit arrangement. These circuits are one form of switching devices which is used to control the supply voltage across the load of the capacitor. There are two stage cycles, in the first stage capacitor is connected in parallel to the supply. In the second stage cycle the circuit is reconfigured that capacitor is connected in series with the supply and load. This results in doubling the voltage across the load which is the sum of supply voltage and the capacitor voltages. The pulsed output voltage is smoothened by

the use of capacitors, the more no of capacitors results in the smoothening of the output voltage.

4.1 CONVENTIONAL METHOD (BOOST CONVERTER)

The **fig 3** shows that the simulation circuit diagram of boost converter.

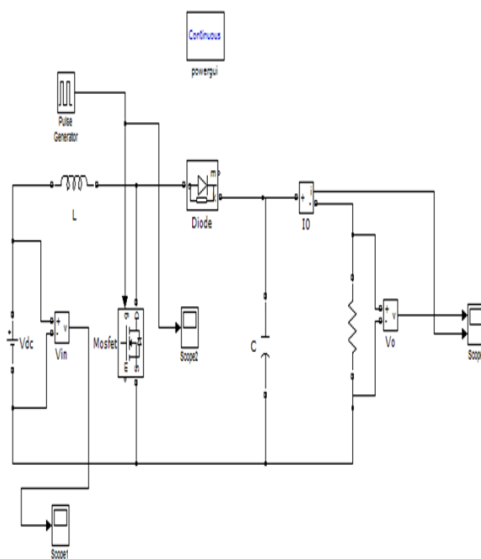


Fig 3.Boost Converter

4.2. INPUT VOLTAGE

The **fig 4** shows that the simulated input voltage of boost converter.

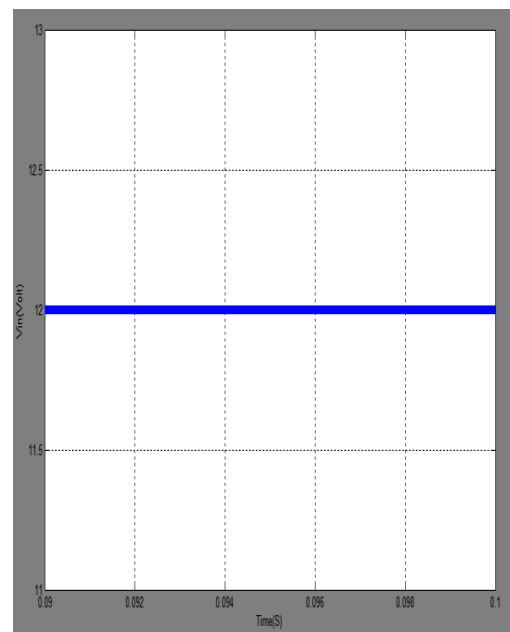


Fig 4. Input Voltage

4.3. VOLTAGE ACROSS SWITCH

The **fig 5** shows that Simulated Voltage across switch of boost converter.

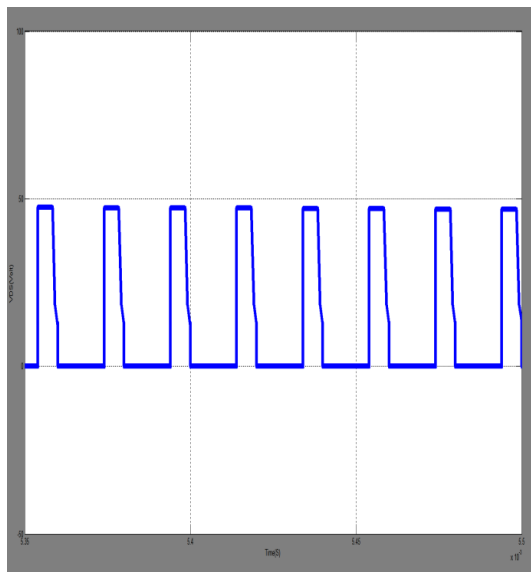


Fig 5. Voltage across Switch

4.4. TRIGGERING PULSE

The **fig 6** shows that the simulated triggering pulse of boost converter.

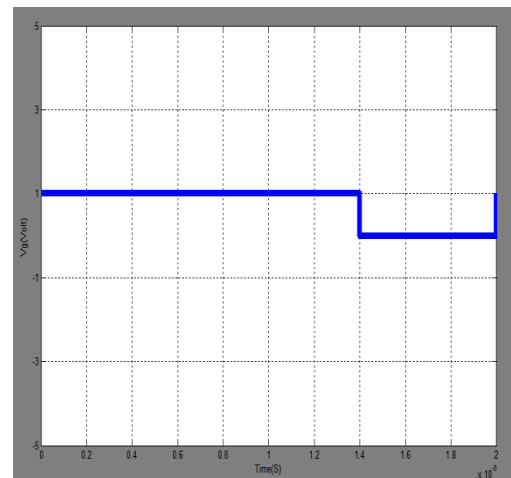


Fig 6. Triggering Pulse

4.5. OUTPUT VOLTAGE AND CURRENT

The **fig 7** shows that the simulated output voltage and output current of boost converter.

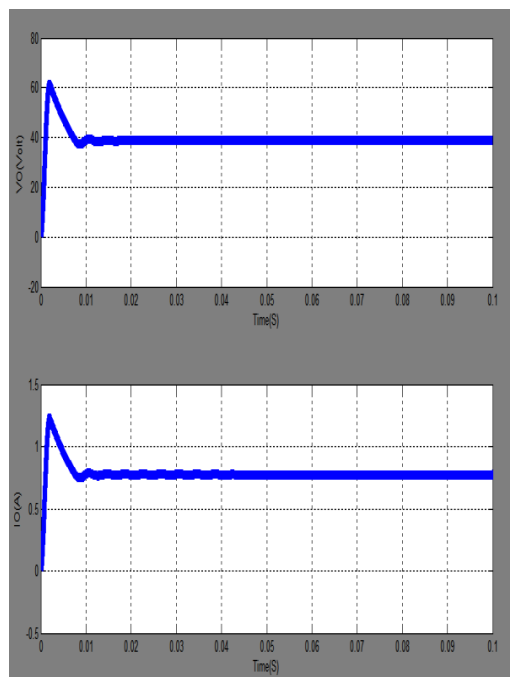
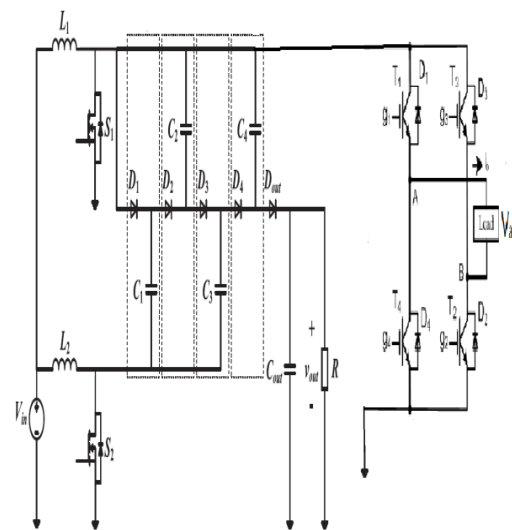


Fig 7. Output Voltage and Current

4.6. SIMULATION CIRCUIT



5. SIMULATION OUTPUT

The **fig 8** shows the simulation output of the Dickson voltage multiplier

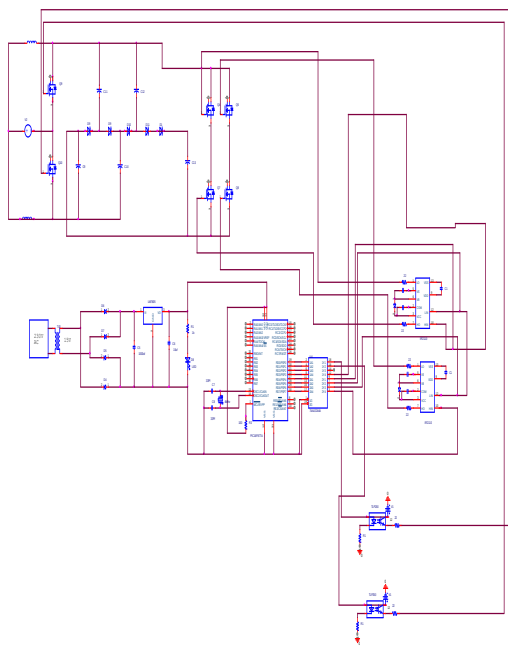


Fig 8. Simulation Output

6. CONCLUSION

This project proposes a new type of voltage multiplier which is capable of generating very high voltage. The prototype can be used for many applications such as photovoltaic cells and UPS which demands very high voltage as output between its input and output voltages. In the experimentation results it is notified that reduced blocking voltages across the switches and very low switching losses

across the MOSFET switches. This charge pump converter achieves very high efficiencies as compared to earlier prototype models. One of the main advantage of this proposed system is that reduced switching losses across the switches as initial starting voltage is null in this converter. In addition to that the converter aggregates the advantages based on the information that,

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