SOLAR ENERGY SYSTEM FOR HIGH STEP UP HIGH EFFICIENCY INTERLEAVED BOOST CONVERTER WITH VOLTAGE MULTIPLIER MODULE

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ABSTRACT:

A high step-up converter suitable for renewable energy system is designed in this paper. Using a conventional interleaved boost converter, accomplished by a voltage multiplier module composed of switched capacitors and coupled inductors, high step-up gain is obtained without operating at extreme duty ratio. The topology of the proposed converter reduces the current stress and input current ripple, hence the conduction loss reduces. The circuit also increases the lifetime of the source. The leakage energy can be recycled to the output terminal. This leads to the reduction in large voltage spikes across the switches and improvement in the overall efficiency. The low voltage stress enables the use of low-voltage-rated MOSFETs for reductions of conduction losses and cost.

Keywords: PV panel, Voltage multiplier module, interleaved boost converter, Micro controller.

1. INTRODUCTION

The output voltage obtained from the renewable energy system is very low. So, for many renewable energy applications like photovoltaic systems, fuel cells, wind power generation high step-up dc/dc converters have been used. Such systems transform the low voltage energy from the renewable resources into high voltage via a step-up converter. A two-stage converter with cascade structure may be required for step-up gain for high step-up conversion. But this will lead to reduction in the efficiency and increase in cost. This indicates that, a high step-up converter is an important stage in the system as it requires sufficiently high step-up converters ion and high efficiency.

2. EXISTING SYSTEM

The conventional interleaved boost converter is suitable for high power applications and power factor correction. But this converter has major drawback of limited step up gain and the high voltage stresses on semi conductor components which is equal to the output voltage. The switched capacitors into interleaved boost converter circuit my make the voltage gain to reduplicate. But the step up voltage gain is limited as coupled inductors are used. Conversely, on integrating coupled inductors into an interleaved boost converter circuit, the voltage gain may increase. But this converter has the major drawback of limited step-up gain and high voltage stresses on semiconductor components which is equal to the output voltage.

3. PROPOSED SYSTEM

The two converters will share the output current so continuous output can get .Coupled inductor and switched capacitors together constitute the voltage multiplier module. The design of the coupled inductors can be used to extend step up gain and high voltage convection ratio is offered by the switched capacitors. High voltage ratio output can get .Efficiency is more than 97%.

ADVANTAGES

The input current is continuous which is very desirable for source like PV (or) battery. The switch used here has the common ground with the source which makes the drive circuit and control circuit arrangement easier. The output voltage is positive opposed to the buck-boost converter which makes the control is easy.

4. BLOCK DIAGRAM

PROPOSED BLOCK DIAGRAM:

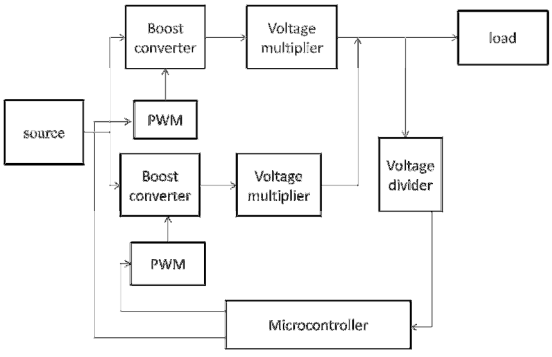

Fig 1: BLOCK DIAGRAM

A boost converter (step up converter) is a dc-dc power converter that step up voltage (while step down current) from its input (supply) to its output load. Pulse with modulation is a term for describing a type of digital signal. Pulse width modulation is used in a variety of application including sophisticated control circuitry. A voltage multiplier is an electrical circuit that converts ac electrical power from a lower voltage to a higher dc voltage typically using a network of capacitor and diodes.

5. CIRCUIT DIAGRAM

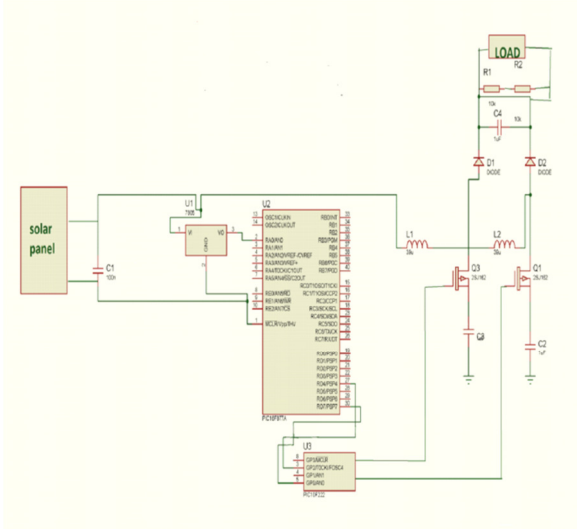

Fig 2: CIRCUIT DIAGRAM

The solar panel is connected to the battery. The 12Vsupply is stored on the battery. The regulated power supply is to provide the 5V DC fixed voltage. Then the 5Vis given to the PIC microcontroller.

The micro controller is connected with gate pulse driver circuit. The gate driver circuit can connect to MOSFET. Then the high voltage is produce from gate pulse driver circuit, which is used to continuously ON and OF the switch.

Here we obtain high AC voltage it can be converted into DC by using rectifier and then stored capacitor. In an output side

voltage divider is used which is used for the output will obtain proper manner. The voltage divider is connected to microcontroller.

6. SYSTEM DESCRIPTION

SOLAR PANEL

A Solar panel is flat construction resembling a window, built with technology that allows it to passively harvest the heat of the sun or create the electricity from its energy through photovoltaic. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

BOOST CONVERTER

A boost converter is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load).

PULSE WIDTH MODULATION

Pulse width modulation or pulse-duration modulation is a modulation technique used to encode a message into a pulsing signal. Although this modulation technique can be used to encode information for transmission, its main use is to allow the control of the power supplied to electrical devices, especially to inertial. Loads such as motors. In addition, PWM is one of the two principal algorithms used in photovoltaic solar battery chargers the other being maximum power point tracking.

The average value of voltage fed to the load is controlled by turning the switch between supply and load on and off at a fast rate. The longer the switch is on compared to the off periods, the higher the total power supplied to the load.

VOLTAGE DIVIDER

Voltage divider (also known as a potential divider) is a passive linear circuit that produces an output voltage that is a fraction of its input voltage (V_{in}). Voltage division is the result of distributing the input voltage among the components of the divider.

Resistor voltage dividers are commonly used to create reference voltages, or to reduce the magnitude of a voltage so it can be measured, and may also be used as signal attenuators at low frequencies. For direct current and relatively low frequencies, a voltage divider may be sufficiently accurate if made only of resistors. In electric power transmission, a capacitive voltage divider is used for measurement of high voltage.

MICROCONTROLLER (PIC 16F877A)

The 40 pins make it easier to use the peripherals as the functions are spread out over the pins. This makes it easier to decide what external devices to attach without worry too much if there are enough pins to do the job. Main advantages are that each pin is only shared between two or three functions so it's easier to decide the pin. Microcontroller is a complete microprocessor system built on single Microcontrollers was developed to meet a need for standard CLOCK, TIMBERS, and it consists also SERIAL Port. Microcontroller developed by Microchip, PIC microcontroller is fast and easy to

implement program when we compare other microcontrollers like 8051. The ease of programming and easy to interfacing with other peripherals PIC became successful microcontroller.

Fig 3: MICROCONTROLLER

VOLTAGE MULTIPLIER

Voltage multipliers are similar in many ways to rectifiers in that they convert AC-to-DC voltages for use in many electrical and electronic circuit applications such as in microwave ovens, strong electric field coils for cathode-ray tubes, electrostatic and high voltage test equipment, etc, where it is necessary to have a very high DC voltage generated from a relatively low AC supply. Generally, the DC output voltage (Vdc) of a rectifier circuit is limited by the peak value of its sinusoidal input voltage. But by using combinations of rectifier diodes and capacitors together we can effectively multiply this input peak voltage to give a DC output equal to some odd or even multiple of the peak voltage value of the AC input voltage.

7. CONCLUSION

This paper has presented the theoretical analysis of steady state, related consideration, hardware results, and experimental results for the proposed converter. The proposed system is continuous output has successfully implemented an efficient high step-up conversion through the voltage multiplier module.

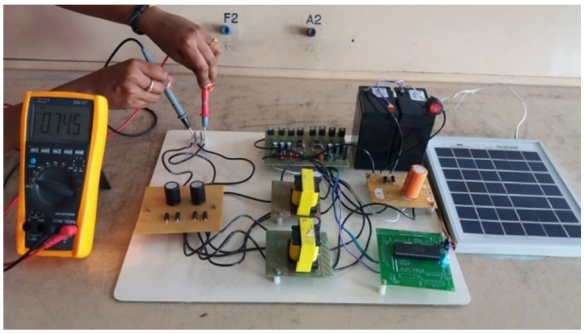

Fig 4: HARDWARE RESULT

8. REFERENCES

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