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# A Review On Comparison between SEPIC and Multi Level SEPIC Convertor for PV Application

**Prof. Dr. Datta Chavan, Shashi Kr. Ranjan, Akash Mishra, Vishal Yadav**

Professor, Department of Electrical, Bharati Vidyapeeth (Deemed To Be University) College of Engineering, Pune, India

Student, Department of Electrical, Bharati Vidyapeeth (Deemed To Be University) College of Engineering, Pune, India

**ABSTRACT:** SEPIC is a DC to DC converter and is capable of operating in either step up or step down mode and widely used in battery operated equipment by varying duty cycle of gate signal of MOSFET. We can step up or stepdown voltage for duty cycle above 0.5 it will step up and below 0.5, it will step down the voltage to required value. Various conversion topologies like buck, boost, buck-boost are used to step up or stepdown voltage. Some limitation like pulsating input and output current, inverted output voltage, in case of buck converter floating switch make it unreliable for different application. So it is not easy for conventional power converter design to maintain high efficiency especially when it step or step down voltage. All these characteristics are obtained in SEPIC DC to DC power conversion. Different designs are used using active andpassive components.Non- inverted output, lowequivalent series resistance (ESR) of coupling capacitor minimize ripple and prevent heat built up which make it reliable for wide range of operation.

-This paper deals with multiplier SEPIC converter with photovoltaic panel as the source. The multiplier SEPIC can achieve high voltage gain with devoid of extreme duty cycle and transformer. It experiences low voltage stress when compared with other buck boost convtr

the voltage gain can be extended with the addition of diode and capacitor to the basic SEPIC structure. The basic SEPIC structure is known as 1x level. The converter works with 22V, 100W as input voltage and input power. The operating switching frequency is 20 kHz. This converter aims for regulating the output voltage to 48V by PI controller for different temperature and irradiation level. The multiplier SEPIC is simulated and the output is validate using MATLAB/SIMULINK

## I. INTRODUCTION

Nowadays, the energy will be produced using both conventional and non conventional energy sources. It is mainly because of the depleting conventional energy resources. Among all renewable energy sources solar energy proves to be the better due its advantages as there is no trenching cost, low maintenance, easy installation, more secure and eco-friendly. Moreover solar energy is the only abundant source available when compared with other renewable sources. The energy produced from the renewable energy source should be either stored or transferred to the electrical grid for the better usage of the power. Since power produced from the renewable energy resource is DC power it is obvious that it is necessary to use DC-DC converter for high voltage gain. Later, the obtained DC output voltage can be given to the gird or ac load application through inverter. There are many DC-DC converters available used for boosting the output voltage. The advantage of SEPIC converter over other buck boost converter is due to its production of non inverted output voltage, response to more short circuit current and capable of true shutdown. Obtaining high voltage gain in traditional DC-DC converter is very difficult due to the following reasons such as parasitic component, requirement of extreme duty cycle , transformers and large sized component. There are solutions to the above problem such as A high voltage gain with low voltage stress can be obtained without high duty ratio. A high frequency transformer isolated AC-DC CUK converter with reduced THD and improved power factor is obtained by voltage follower approach and average current control technique [1]. But the difficulty in winding of the transformers and inductor causes power losses in high frequency range [2]. There were many researches in this area over a decade but there are still emerging topologies in this field. The topologies include voltage lift technique [3], Structures based on multiplier and cascading converters. But the disadvantage of this entire converter is the increase in number of inductor and driven switches. This increases the complexity of the gate driver circuit and the synchronization of the switches. In order to attain high

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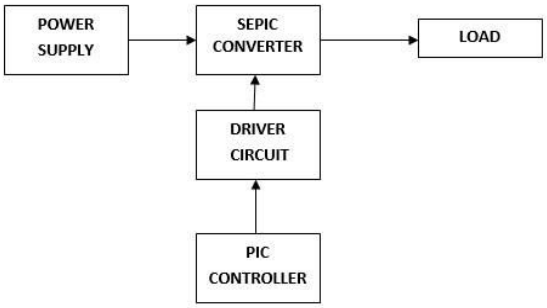
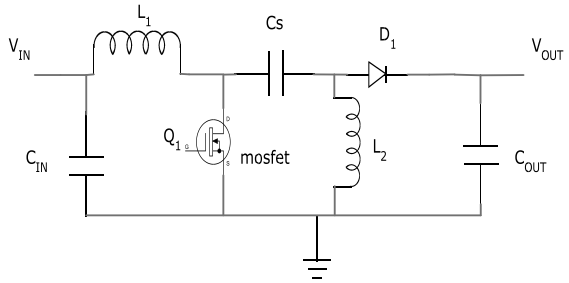
efficiency, the DC-DC converters should be combined with switched capacitors. But they cannot regulate output voltage due to the absence of inductor. The main drawback of the converter is more number of switches and absence of inductor. High voltage gain is achieved through a single phase dual output ac-dc rectifier with unity power factor and it also has less harmonic distortion obtained by employing hysteresis current control and Fuzzy logic control [4]. The proposed configuration of dual output converter provides high voltage gain with several balanced output voltage with the combination of voltage multiplier technique and PWM based DC-DC converter. Some dual output converter are used to increase the output voltage and also used for harmonic reduction in source side. A single phase ac-dc three level converter with improved power quality is obtained [5] which consists of two closed loops one is current control loop and other is voltage control loop. The source current THD is lower than IEEE standard.

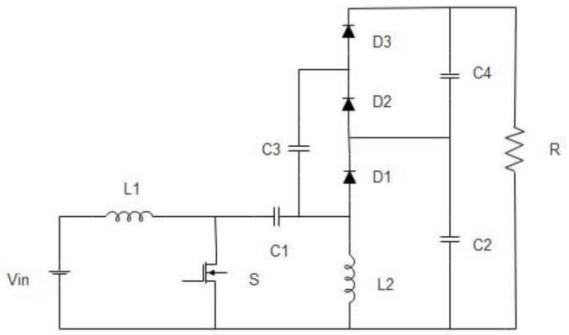



## II. CIRCUIT DIAGRAM OF SEPIC CONVERTOR




Single-ended primary inductor converter (SEPIC) is a type of DC-DC converter, that allows the voltage at its output to be more than, less than, or equal to that at its input.
The output voltage of the SEPIC is controlled by the duty cycle of the MOSFET

## MULTILEVEL SEPIC CONVERTOR




The basic difference between the normal SEPIC converter and multilevel SEPIC is the addition of diodes and capacitors. All converters have same basic operation that is the diode is opened and closed by converter operation. Basically diode is opened by reverse bias voltage this reverse bias voltage is used to charge another capacitor through diode ultimately leading to high voltage gain

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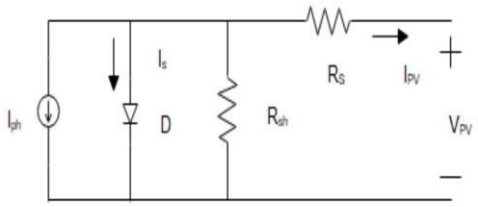
**SOLAR PV CELL**

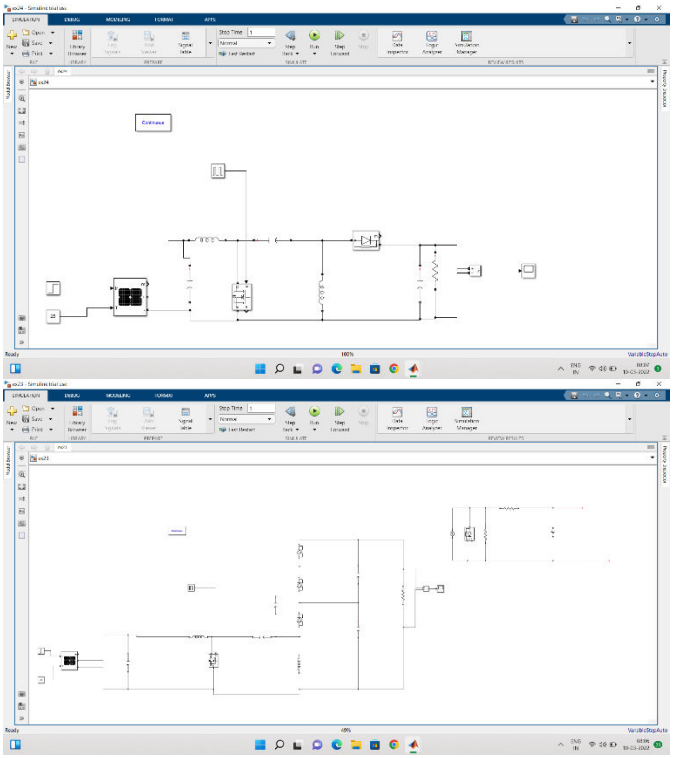



Solar cell works on photovoltaic effect. The photovoltaic effect is a process that generates voltage or electric current in a photovoltaic cell when it is exposed to sunlight. The photons are type of particles that are continuously emitted by the sun. These photons excite the atoms leading to the formation of electron hole pair. As a result, band gap is formed in the material allowing electrons to move in certain predefined path These electron leads to the generation of current in solar cell. A group of solar cell forms module. A group of module forms array. A group of array forms panel. Solar cells are combined in series and parallel to obtain required voltage and current. Basically solar cell is p-n junction semiconductor that generates electricity when exposed to light

**OPERATION OF MULTILEVEL SEPIC CONVERTOR**

Initially when the transistor is closed, inductor L1 gets connected to input voltage Vin, hence current in L1 increases with a constant slope. Next when the transistor is opened, the current in L1 charges capacitor C1 with a positive voltage. When the transistor closes again, inductor L2 gets connected to C1 in parallel manner and gets charged with positive current. When the transistor opens, current in L2 closes diode D1 and the negative side of capacitors C3 and C4 are connected which cause C3 to close diode d3 to charge C4 with a positive voltage. When the transistor closes C1 gets in series connection with C2 and then charge C3 by closing diode d2.

## III. SIMULATION DIAGRAM



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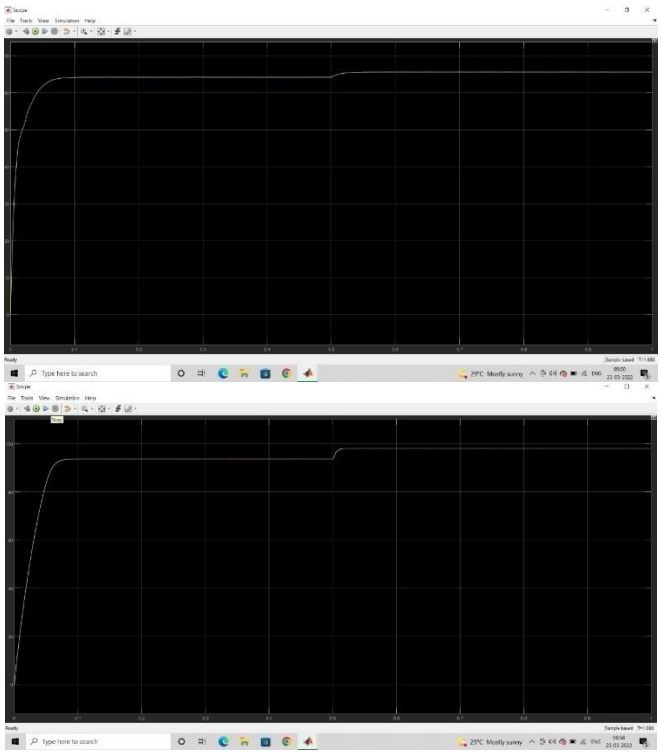
**OUTPUT RESULTS**



## IV. CONCLUSION

The paper focuses that the output voltage for various load level by keeping the irradiation level and temperature as constant was regulated and the results are validated using MATLAB. The PI controller regulates the output voltage at 48V for different irradiation levels and temperature. Theefficiency of the converter is 85-95% .The obtained output voltage is suitable for dc load operating at 48V. This DC voltage can be used for LED drive and battery applications

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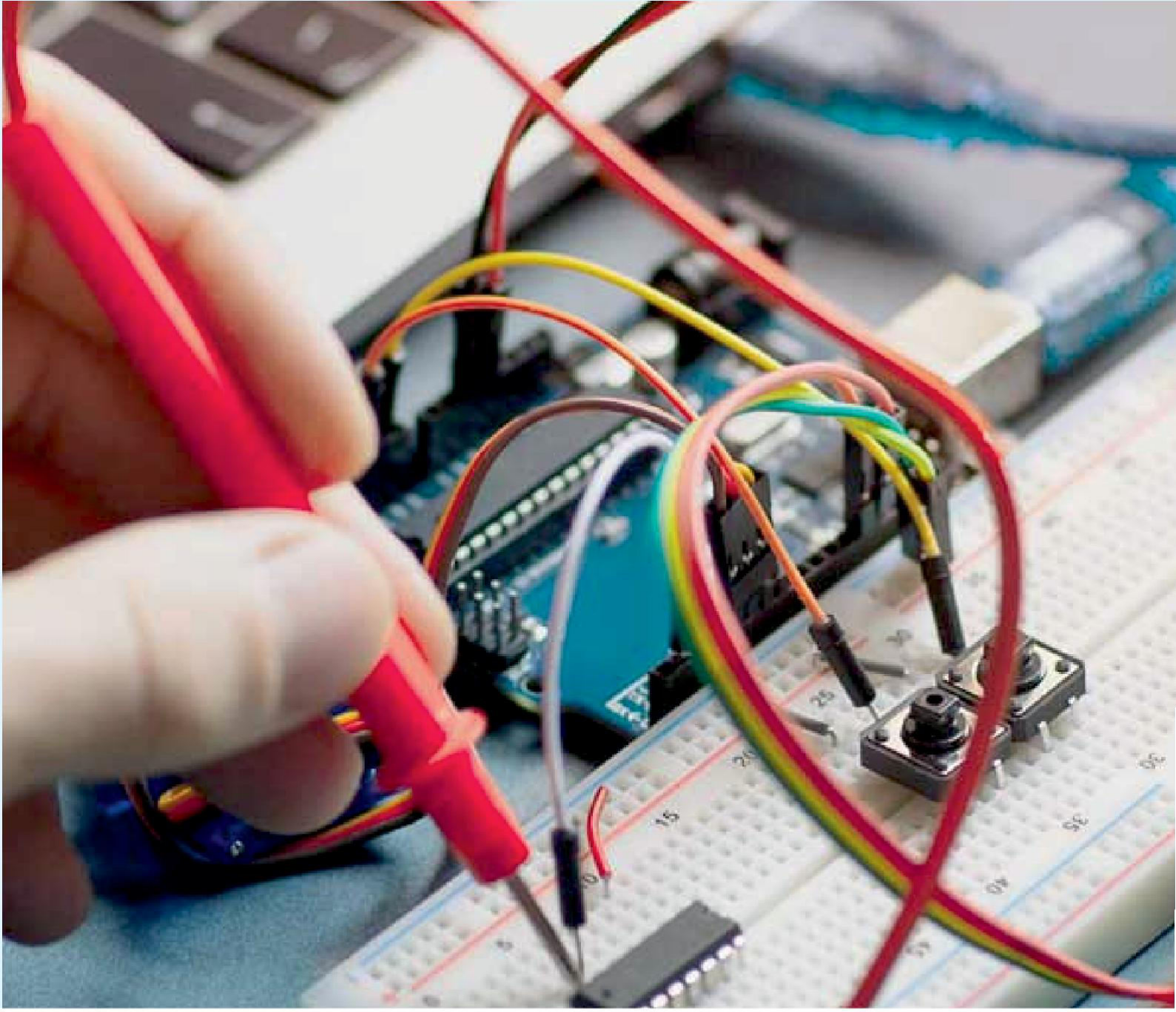

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