DESIGN AND ANALYSIS OF A DC -DC BUCK BOOST CONVERTER

STUDENT NAME - SHWETA UMESH KHUNE

MENTOR NAME - DR. S.M.GUDHE

COLLEGE NAME - SHRI GURU GOBIND SINGHJI INSTITUTE OF ENGINEERING AND TECHNOLOGY, NANDED

ABSTRACT :

This paper proposed a DC-DC buck boost converter which mainly presents the downbeat lower output voltage than the input voltage. It consists of same elements similar to a conventional DC-DC buck converter such as MOSFET switch, paired inductors and switched capacitor. A simulation has been conducted to compare and contrast the efficiency of the proposed DC-DC buck boost converter and conventional DC-DC buck converter. The result shows the efficiency of the proposed DC-DC buck boost converter is higher than the conventional DC-DC buck converter in terms of both switching frequency and load variation.

INTRODUCTION

A DC-DC buck-boost converter is a versatile power converter used to step up or step down voltage levels depending on the load requirements. It combines the characteristics of both buck (step-down) and boost (step-up) converters, allowing the output voltage to be either lower or higher than the input. Achieving high efficiency in such converters requires careful design of switching elements, inductors, and capacitors to minimize power losses. Using topologies that reduce switching and conduction losses while maintaining stable operation under load variation is key to improving efficiency and minimizing voltage gain, making them ideal for applications like renewable energy systems, electric vehicles, and battery management systems.

Circuit Schematic

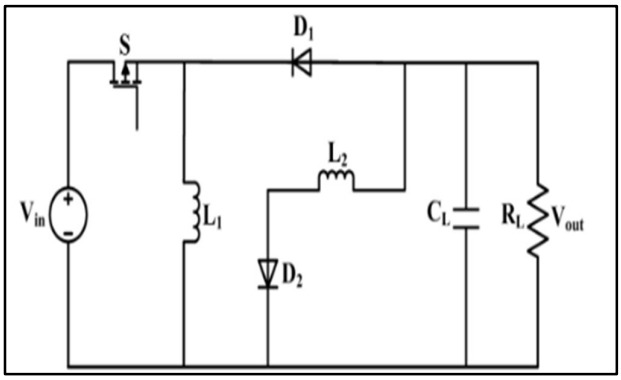

Figure 1: Buck Boost Circuit

eSim Schematic

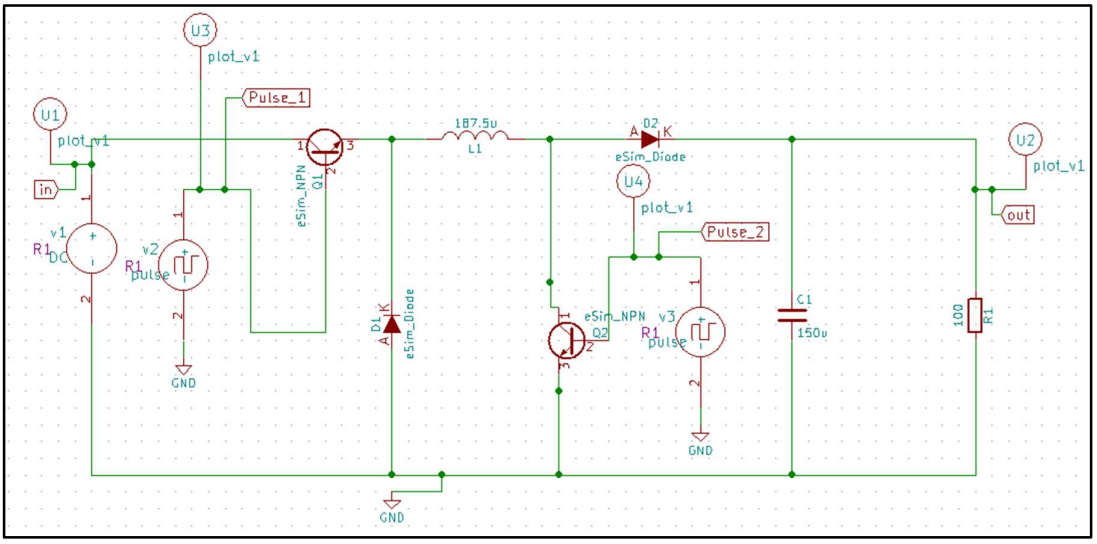

Figure 2: Dc to Dc Buck Boost Schematic

Input Waveform

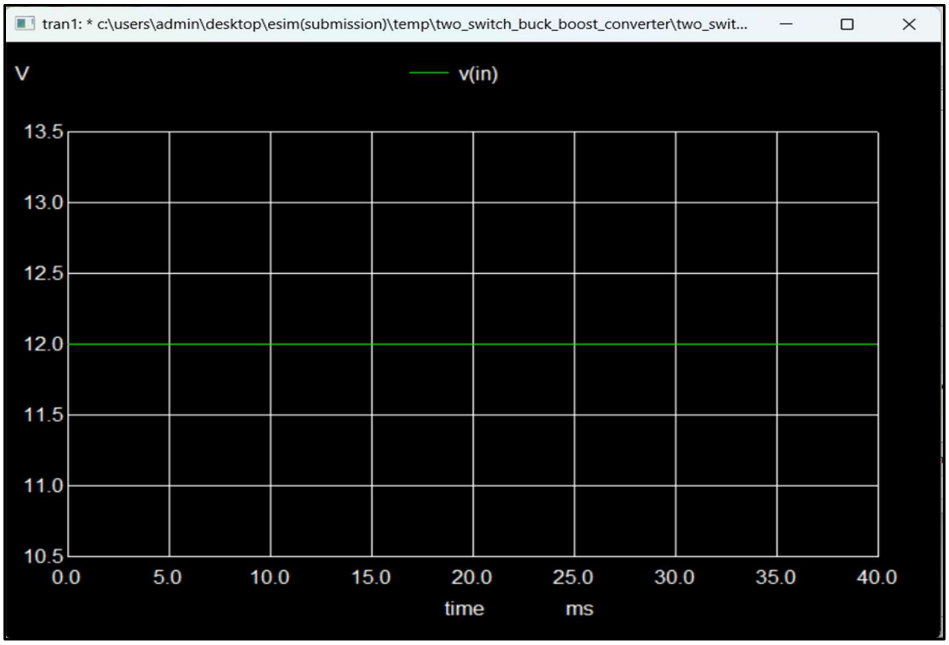

Figure 3: Input Waveform of Boost

Output Waveform

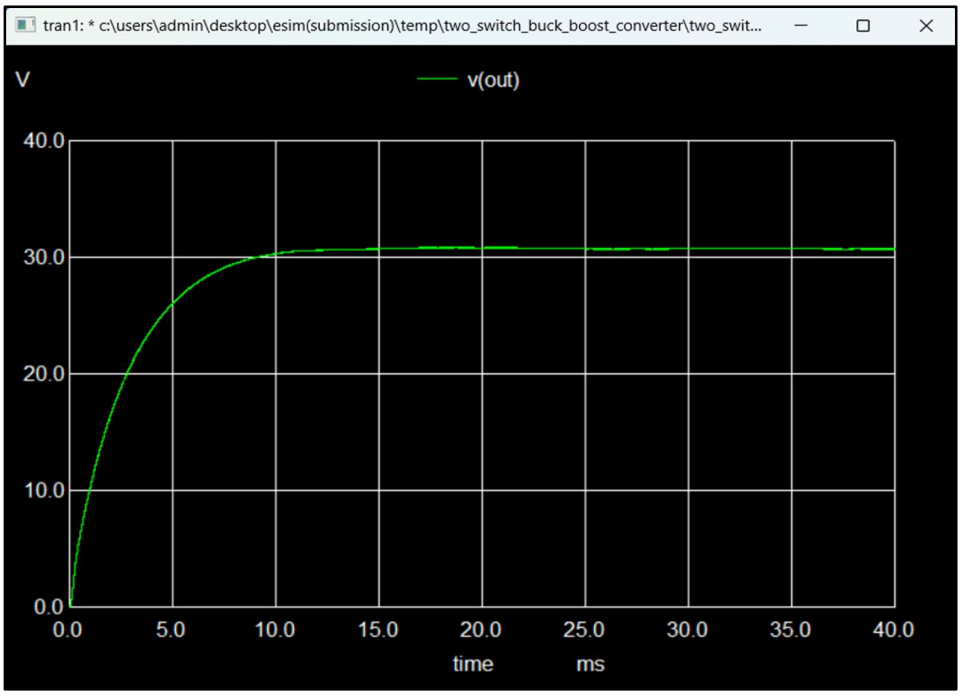

Figure 4: Output Waveform of Boost

Input Waveform

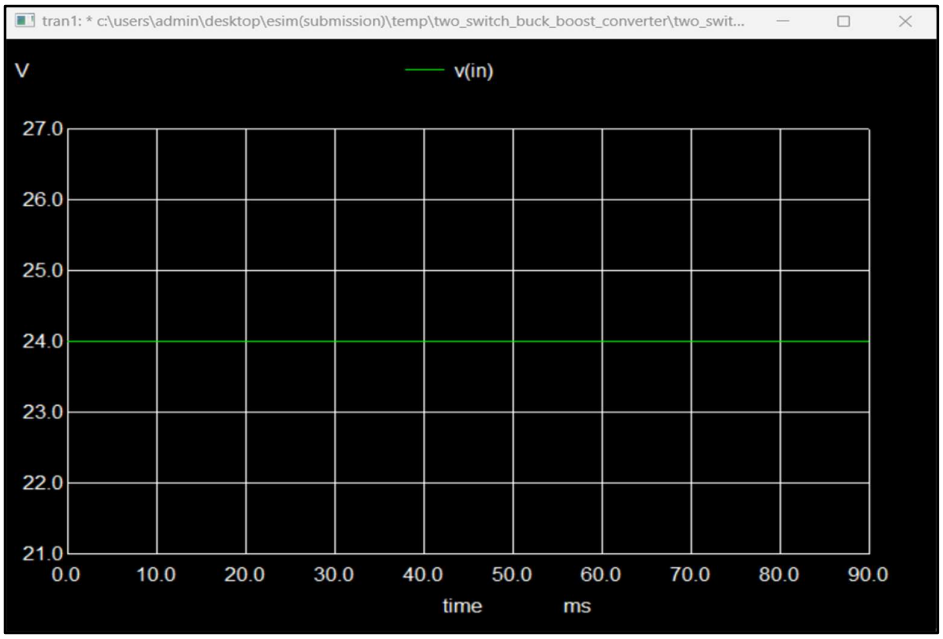

Figure 5: Input Waveform of Buck

Output Waveform

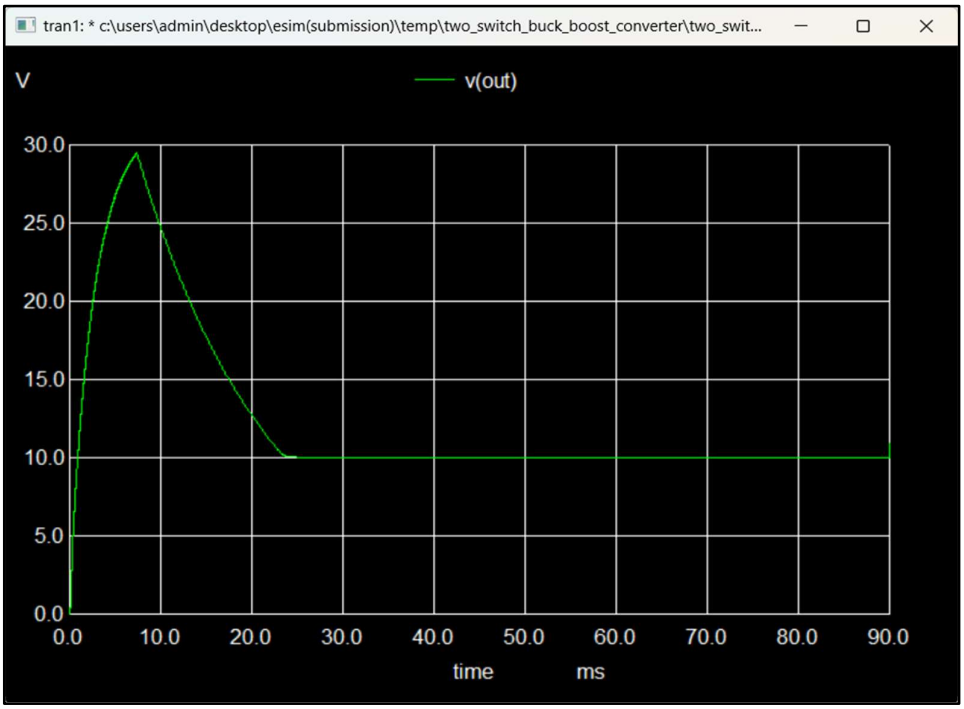

Figure 6: Output Waveform of Buck

CONCLUSION

The DC-DC buck-boost converter is an efficient and flexible power solution that combines the advantages of both buck and boost converters. By allowing for either voltage step-up or step-down, it meets diverse load requirements, making it suitable for applications such as renewable energy systems, electric vehicles, and battery management. Achieving high efficiency in the design is crucial, and this is accomplished through optimized component selection and the reduction of switching and conduction losses, ensuring stable and reliable performance across varying loads and conditions.

REFERENCE

1. A.P. Dancy et al., "High-efficiency multiple-output DC-DC conversion for low-voltage systems", *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, vol. 8, pp. 252-263, 2000.

2. K. Chomsuwan et al., "Photovoltaic grid-connected inverter using two-switch buck-boost converter", *CONFERENCE RECORD IEEE PHOTOVOLTAIC SPECIALISTS CONFERENCE*, pp. 1527-1530, 2002.