

Comparative Analysis of Boost Converter and Interleaved Boost Converter

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Abstract— Now a days boost converters are widely used in applications where dc output voltage is low and we have to boost it. The interleaved boost converter consist of several identical boost converters connected in parallel and controlled by interleaved method. Here we have compared IBC and boost converter. And we have done MATLAB simulation of both.

Key words: Boost Converter, Interleaved Boost Converter, MATLAB

I. INTRODUCTION

As boost converters have low output voltage but we require more amount of voltage than what we are getting, to achieve this we need to boost up the output voltage, therefore we are going to use interleaved boost converter. IBC increases the output voltage and efficiency. It gives good current sharing characteristics and also low ripple in input current.

The current stress on each MOSFET in IBC is somewhat lesser. The output voltage rated voltage input depends on duty cycle. As we increase number of phases ripples present in the output are less. For example- If the voltage input is 60 volts and required output voltage is 120 volts then we have to keep the duty cycle at 0.5.

A. Operation of boost converter

A boost converter is used to increase the output voltage. The voltage source is connected to an inductor. The solid state device which operates as a switch is connected across the source. The second switch used is a diode. The diode is connected to a capacitor, and the load and the two are connected in parallel as shown in diagram below

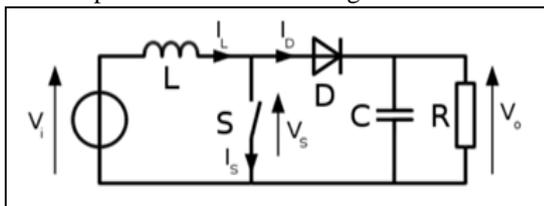


Fig. 1: Boost Converter

In the working of boost converter firstly the switch s is closed, inductor current will start to increase and store energy, and after when the switch is open, the current through inductor starts flowing through diode D , capacitor C , load R . As a result energy stored will be transferred to capacitor.

B. Advantages:

- 1) Higher output voltage than input.
- 2) Switch can be easily driven as compared to other converters.
- 3) Input current is easy to filter as it is continuous.

C. Disadvantages:

- 1) Large value of output capacitor is required.
- 2) Transient response is slower and feedback compensation will be difficult.

D. Interleaved Boost Converter:

The IBC consists of many boost converters which we connect in parallel. And we switch all MOSFETS at a same frequency, has a phase shift of 180 degrees. As we are connecting multiple IBCs efficiency is increased and the losses are reduced. Here we have operated IBC in continuous mode of conduction.

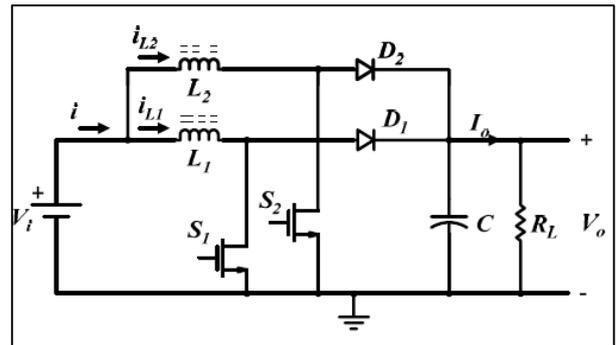


Fig. 2: Interleaved Boost Converter [2]

II. OPERATION

Here we have used two phase IBC, the phase shift between converters is 180 degrees because phase shift is given by 360 divided by n , the principle will be same as that of Boost converter but the steps are more so we will get the output greater than input. Accordingly we will give gate pulse is given to respected inductors, therefore two phases feed the load continuously.

A. Advantages:

- 1) Increased efficiency
- 2) Less input current ripple
- 3) Fast transient response and stability is improved
- 4) It can be used for increasing the solar cell output

B. Disadvantages:

- 1) It has complex circuit.
- 2) Somewhat increase in cost.

III. MATLAB ANALYSIS

We have proposed the MATLAB models of IBC and Boost converter, simulation is also done of both of the converters. The following figures show the diagram of converters.

A. MATLAB model of Boost converter:

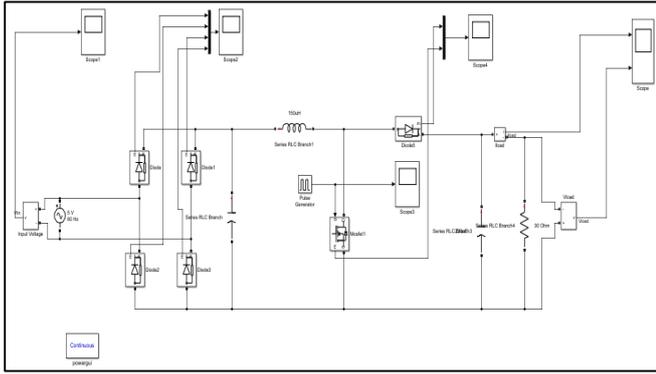


Fig. 3: MATLAB model of Boost converter

B. MATLAB model of Interleaved Boost Converter:

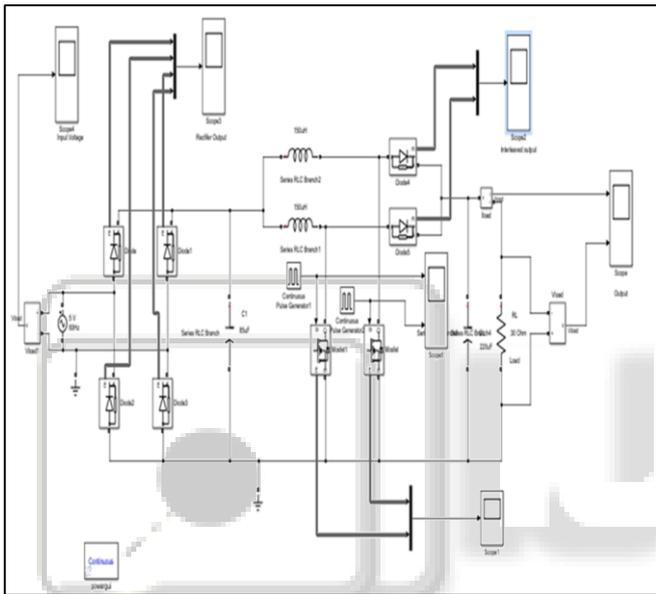
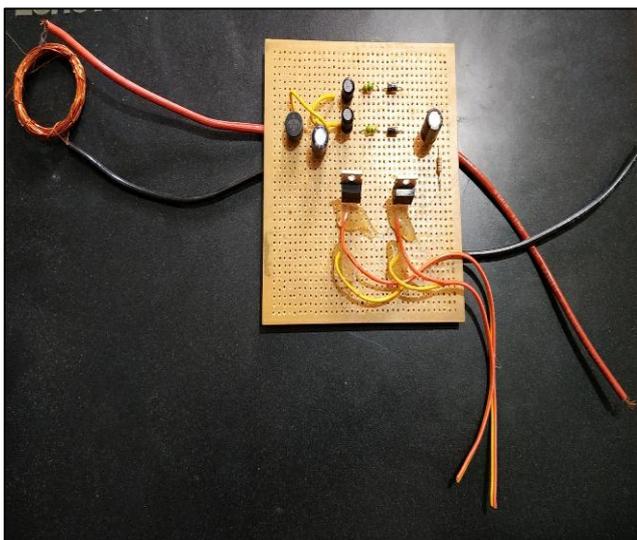


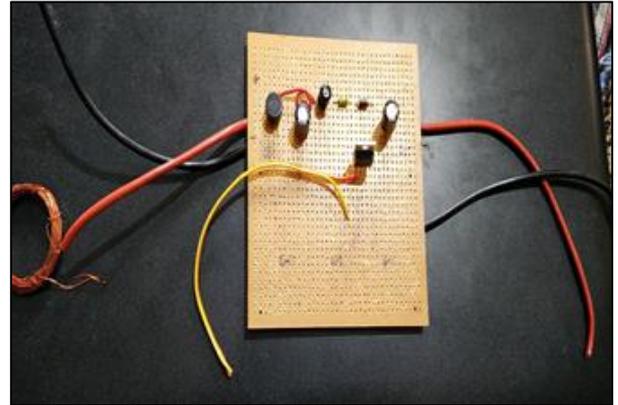
Fig. 4: MATLAB model of interleaved boost converter

IV. EXPERIMENTAL SETUP:

A. Interleaved Boost Converter:



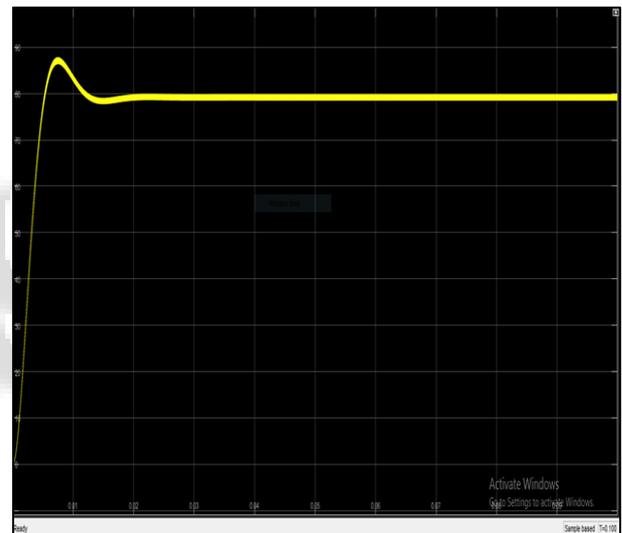
B. Boost Converter



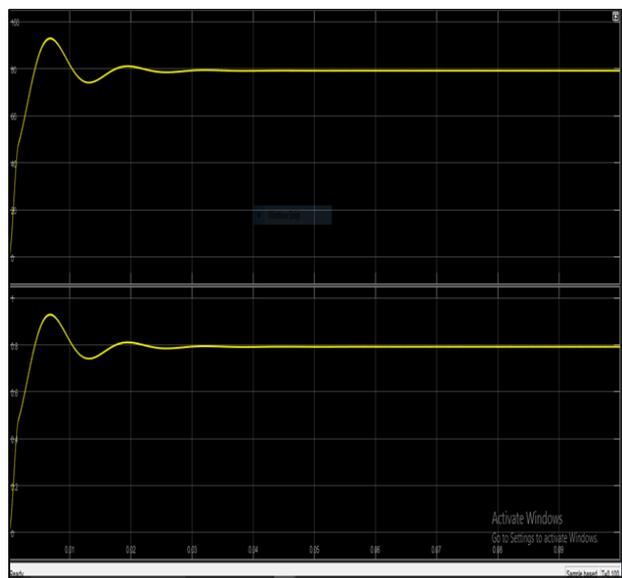
V. RESULTS

The results obtained from simulation are shown below, in that we are showing the waveforms for voltages obtained for Boost converter and Interleaved Boost converter.

A. Boost Converter Waveform:



B. Interleaved Boost Converter Waveform:



VI. CONCLUSION

In this way we have studied concept of interleaved boost converter and boost converter and also we have done the simulation in MATLAB. We can effectively use IBC for increasing solar output.

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