ELECTRIC VEHICLE CHARGING USING BUCK/BOOST CONVERTER DC MICRO GRID

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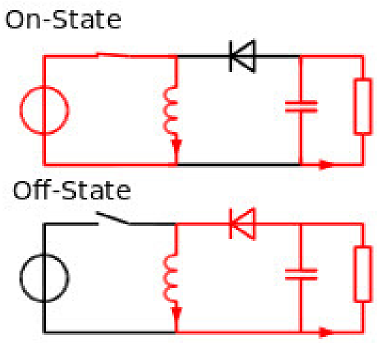
ABSTRACT

Today the demand of electric vehicles are increasing day by day. So, the usage of electricity is also increasing.Non-conventional energy sources are depleting. So the power generated using renewable energy sources are increasing day by day . The usage of micro grids and smart grids are increasing. There is a lot of advantages using microgrids. It reduces cost,size, losses etc.DC Microgrids are being deployed globally as distributed energy, solar PV, energy storage, consumer electronics, and LED lights are inherently DC resources. As these devices make up a large share of generation and demand, it is only natural to string them together on DC Microgrids. There are enormous opportunities for efficiency and system cost gains, as shown by research institutions, industrial facilities, and even DC homes. DCMicro grids DC Home Solar solutions are the primary means of rural electrification for the billion people who do not yet have grid electricity. Efficient DC appliances are enabling small home solar systems and DC micro grids to handle more tasks, effectively leapfrogging the utility grid.

Keywords:DC Micro Grid, PV Cell, Buck Boost Converter, Electric Vehicle

INTRODUCTION

it is a type of DC to DC converter and it has a magnitude of output voltage. It may be more or less than equal to the input voltage magnitude. The buck boost converter is equal to the fly back circuit and single inductor is used in the place of the transformer. There are two types of converters in the buck boost converter that are buck converter and the other one is boost converter. These converters can produce the range of output voltage than the input voltage. The following diagram shows the basic buck boost converter.



Buck Boost Converter

Working principle of Buck-Boost Converter

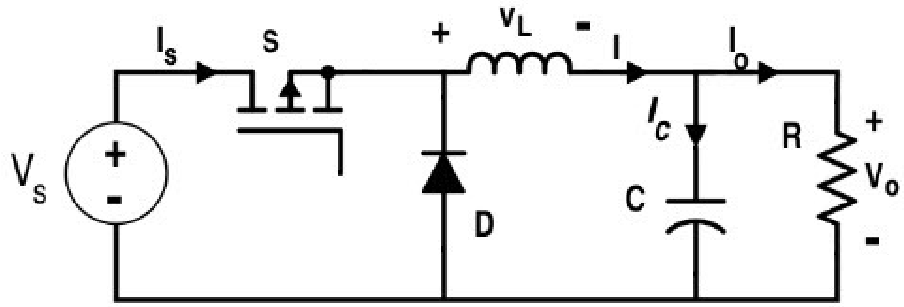
The working operation of the DC to DC converter is the inductor in the input resistance has the unexpected variation in the input current. If the switch is ON then the inductor feed the energy from the input and it stores the energy of magnetic energy. If the switch is closed it discharges the energy. The output circuit of the capacitor is assumed as high sufficient than the time constant of an RC circuit is high on the output stage. The huge time constant is compared with the switching period and make sure that the steady state is a constant output voltage Vo(t) = Vo(constant) and present at the load terminal.

There are two different types of working principles in the buck boost converter.

- Buck converter.
- Boost converter.

Buck Converter Working

The following diagram shows the working operation of the buck converter. In the buck converter first transistor is turned ON and second transistor is switched OFF due to high square wave frequency. If the gate terminal of the first transistor is more than the current pass through the magnetic field, charging C, and it supplies the load. The D1 is the Schottky diode and it is turned OFF due to the positive voltage to the cathode.



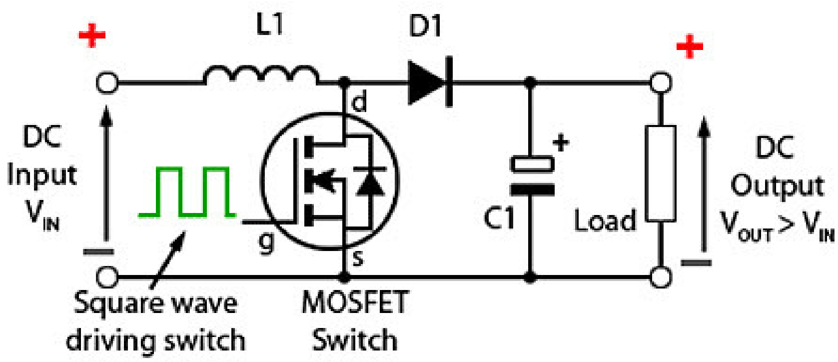
Buck Converter Working

The inductor L is the initial source of current. If the first transistor is OFF by using the control unit then the current flow in the buck operation. The magnetic field of the inductor is collapsed and the back e.m.f is generated collapsing field turn around the polarity of the voltage across the inductor. The current flows in the diode D2, the load and the D1 diode will be turned ON.

The discharge of the inductor L decreases with the help of the current. During the first transistor is in one state the charge of the accumulator in the capacitor. The current flows through the load and during the off period keeping Vout reasonably. Hence it keeps the minimum ripple amplitude and Vout closes to the value of Vs

Boost Converter Working

In this converter the first transistor is switched ON continually and for the second transistor the square wave of high frequency is applied to the gate terminal. The second transistor is in conducting when the on state and the input current flow from the inductor L through the second transistor. The negative terminal charging up the magnetic field around the inductor. The D2 diode cannot conduct because the anode is on the potential ground by highly conducting the second transistor.



Boost Converter Working

By charging the capacitor C the load is applied to the entire circuit in the ON State and it can construct earlier oscillator cycles. During the ON period the capacitor C can discharge regularly and the amount of high ripple frequency on the output voltage. The approximate potential difference is given by the equation below.

$$V0=VS + VL$$

During the OFF period of second transistor the inductor L is charged and the capacitor C is discharged. The inductor L can produce the back e.m.f and the values are depending up on the rate of change of current of the second transistor switch. The amount of inductance the coil can occupy. Hence the back e.m.f can produce any different voltage through a wide range and determined by the design of the circuit. Hence the polarity of voltage across the inductor L has reversed now.

The input voltage gives the output voltage and atleast equal to or higher than the input voltage. The diode D2 is in forward biased and the current applied to the load current and it recharges the capacitors to VS + VL and it is ready for the second transistor.

Modes Of Buck Boost Converters

There are two different types of modes in the buck boost converter. The following are the two different types of buck boost converters.

- Continuous conduction mode.
- Discontinuous conduction mode.

Continuous Conduction Mode

In the continuous conduction mode the current from end to end of inductor never goes to zero. Hence the inductor partially discharges earlier than the switching cycle.

Discontinuous Conduction Mode

In this mode the current through the inductor goes to zero. Hence the inductor will totally discharge at the end of switching cycles.

Applications of Buck boost converter

- It is used in the self regulating power supplies.
- It has consumer electronics.
- It is used in the Battery power systems.
- Adaptive control applications.
- Power amplifier applications.

Advantages of Buck Boost Converter

- It gives higher output voltage.
- Low operating duct cycle.
- Low voltage on MOSFETs

Thus, this is all about the Buck Boost Converter Circuit Working and applications.

Charging of electric vehicles (ev) using buck/boost converter

With the advent of electric vehicles, the charging infrastructure provides the backup for the EV penetration in the current automotive world. Currently, the EV charging is dependent on taking power from the conventional grid and transforming it to be suitable to charge the EV batteries. Using conventional grid beats the purpose of using electric vehicles. Also, the impact of charging large number of EV's from the grid is a topic which is still being studied. EV charging in mass is bound to affect the grid parameters such as voltage profile, power fluctuations, harmonic content and can cause unbalance in the AC system, which can severely affect the operation of the AC system. This paper deals with an approach to try and understand these impacts of EV charging on the conventional grid and AC system.

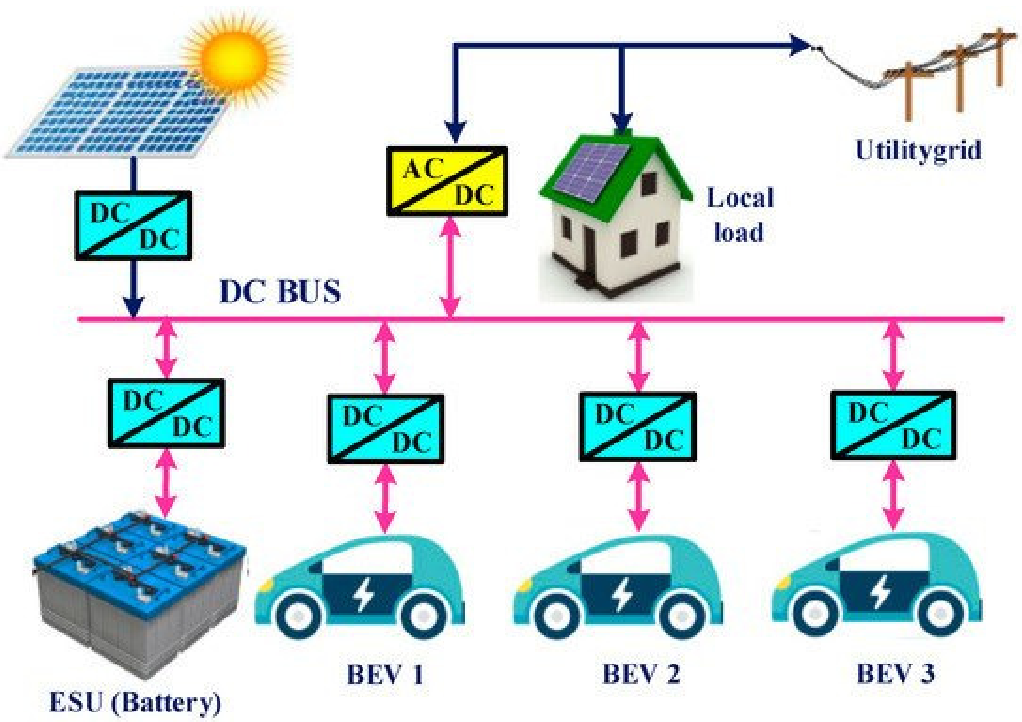


Figure 1. Model of hybrid microgrid battery electric vehicle (BEV) charging station.

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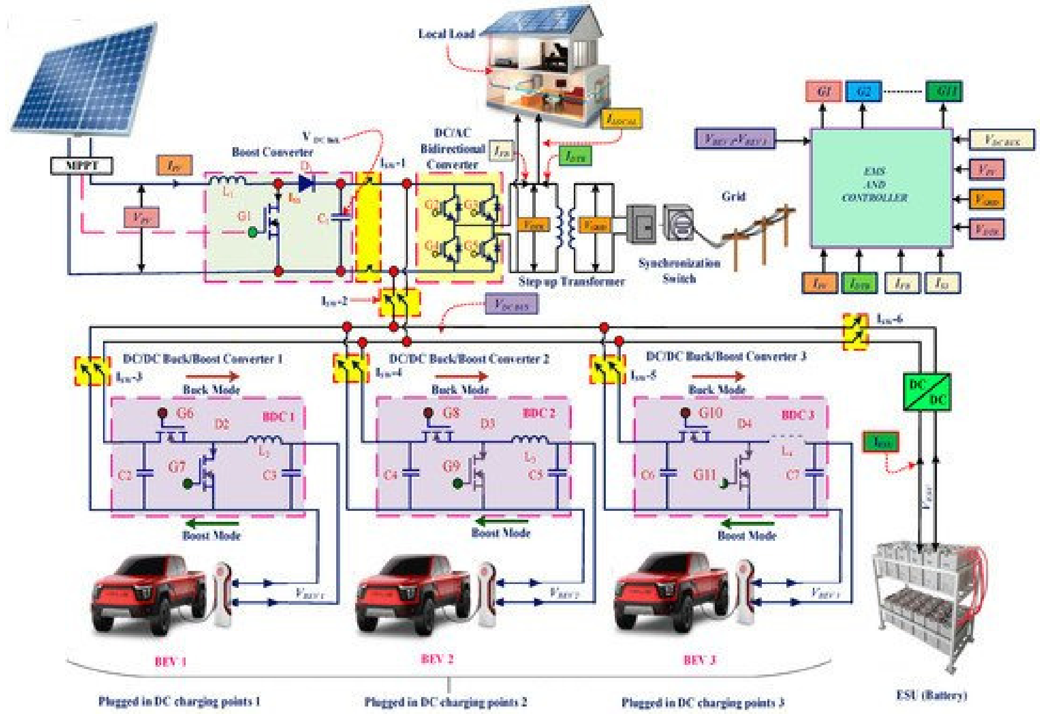


Figure 2 .model of electric vehicle charging using dc microgrid

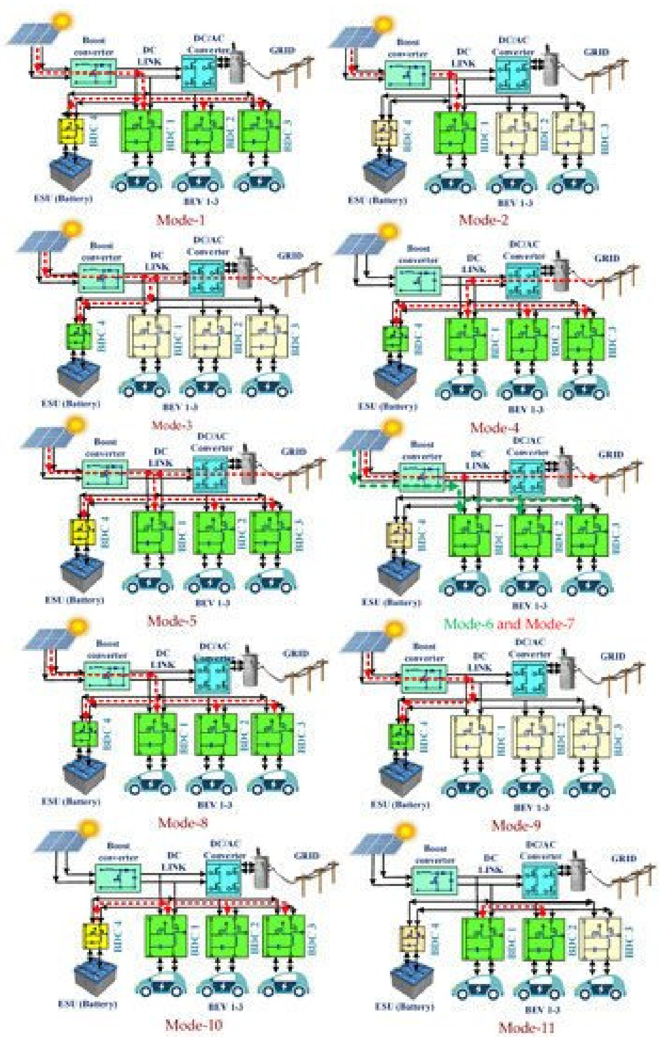


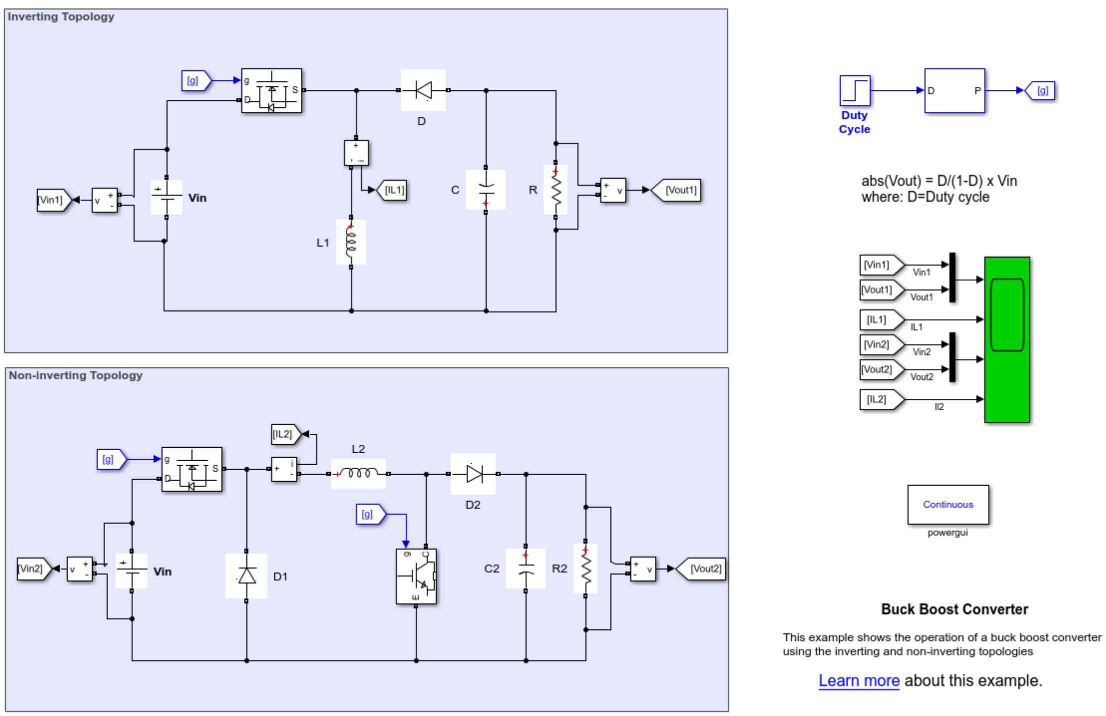
Figure 3 model of electric vehicle charging dc microgrid

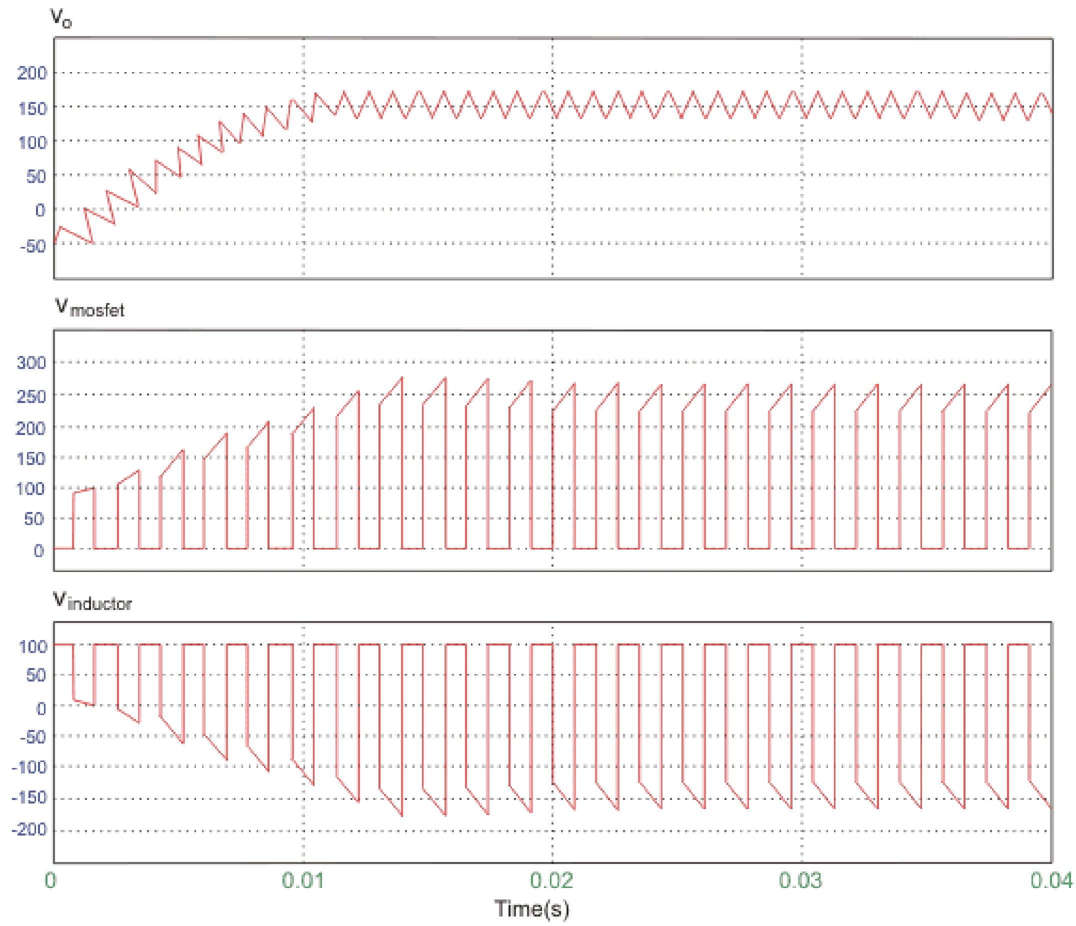
Conclusions

The use of dc micro grid has become more advantageous than A.C. grid.in the A.C. grid we can step up and step down

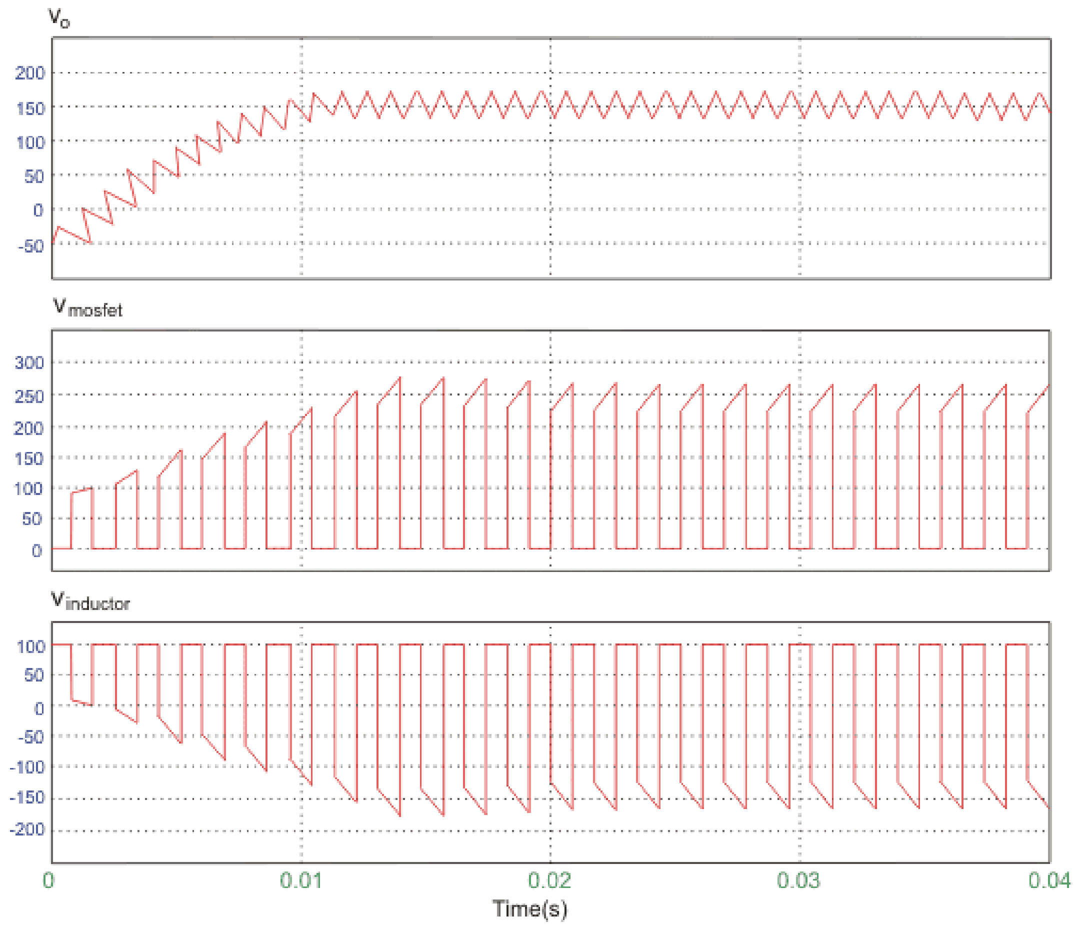
The voltage using transformers. here it is possible through buck/boost converter.and also improves the efficiency.

SIMULATION RESULTS OF BUCK/BOOST CONVERTER



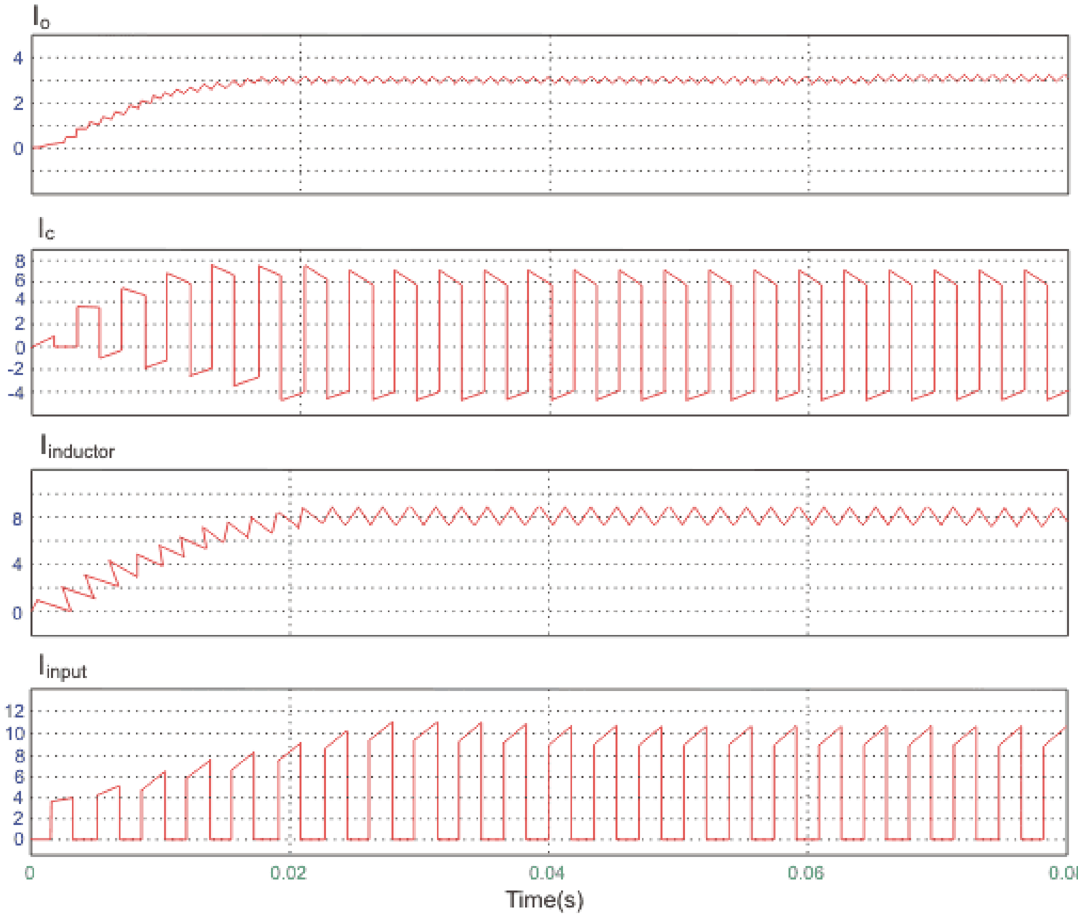


V_o
200
150
100
50
0
-50
V_{mosfet}
300
250
200
150
100
50
0
$V_{inductor}$
100
50
0
-50
-100
-150
-200
0
0.01
0.02
0.03
0.04
Time(s)



The voltage waveforms are as shown above and the current waveforms

Areshown in the figure below.



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