



IOT CONTROLLED DC TO DC CONVERTER

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Abstract— DC-DC converters typically have a very limited functionality and are statically configured for specific voltage levels. In this paper, we propose a new generation of flexible DC-DC converters with software and communication support for remote power monitoring and control. We present a prototype design and implementation of a DC-DC converter including a RASPBERRY PI, a lean operating system, and networking support. With such a DC-DC converter, controlled over the Internet.

Keywords: Converter; RASPBERRY PI; Operating system; Voltage; Internet; Micro controller;

1.INTRODUCTION

The output voltage of the DC to DC converter is less than or greater than the input voltage. The output voltage of the magnitude depends on the duty cycle. These converters are also known as the step up and step down transformers and these names are coming from the analogous step up and step down transformer. The input voltages are step up/down to some level of more than or less than the input voltage.

The buck boost converter is equal to the flyback 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 objectives of this project are i) To create a website through the languages HTML and CSS. ii) To produce pwm for the duty cycle entered in webpage. This value is first stored in database and then this value is fetched from database and corresponding pwm is produced for duty cycle. iii) To design the buck boost converter iv) To update the output of the converter and display in the website.

2.PROPOSED CONFIGURATION

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. Below is the circuit diagram of buck boost converter.

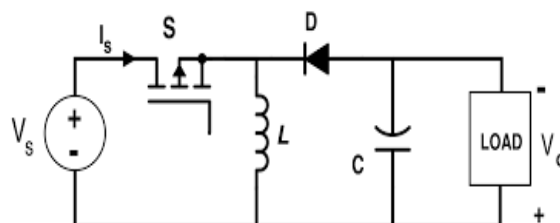


Figure 1 Circuit diagram

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

- Buck converter.
- Boost converter.

2.1. 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.

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 V_{out} reasonably. Hence it keeps the minimum ripple amplitude and V_{out} closes to the value of V_s

2.2. 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.

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.

$$V_s + V_L$$

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 emf 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 emf can produce any different voltage through a wide range and determined by the design of the circuit.

3. SOFTWARE DESCRIPTION

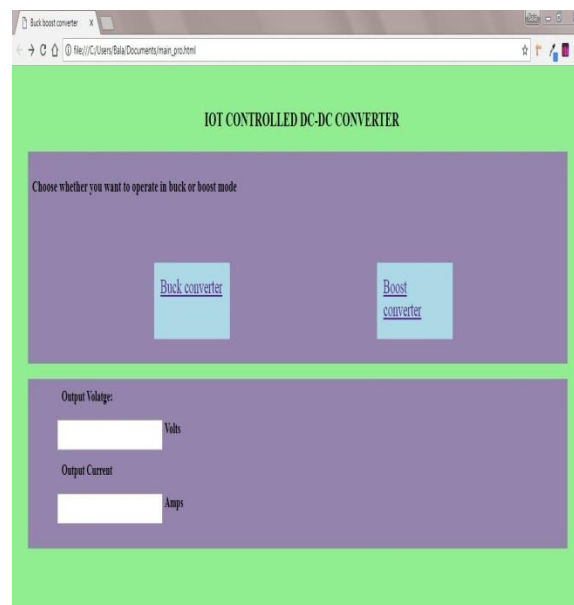


Figure 2 Webpage created

In the webpage, we can choose either buck or boost mode. When a mode is selected, it asks a value for duty cycle from user. When a value is entered, that value is stored in database and the database is updated whenever a value is entered. This value is received by raspberry pi by importing the url of webpage created. When a user changes the value, its corresponding PWM is generated. This is given as input to converter circuit.

When the user selects buck mode, it operates in buck mode.

Buck boost converter operates in buck mode when duty cycle is less than 0.5

Enter duty cycle for Buck Converter:

Figure 3 Buck converter mode in website

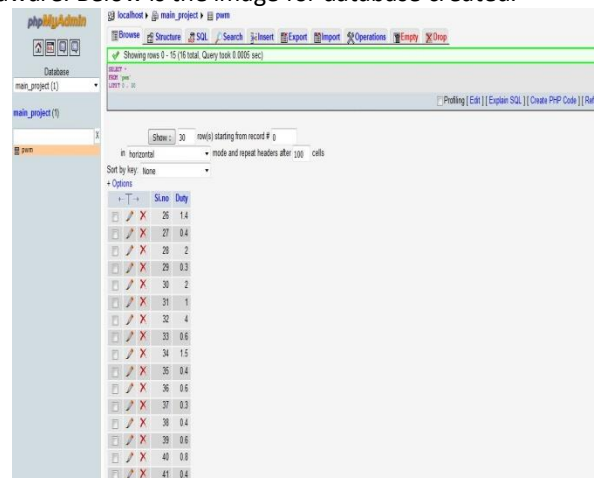
When the user selects boost mode, it operates in boost mode.

Buck boost converter operates in boost mode when duty cycle is more than 0.5

Enter duty cycle for Boost Converter:

Figure 4 Boost converter mode in website

The database is created to store the entered value of duty cycle. Pwm is produced for the entered value and given as input to the hardware. Below is the image for database created.



id	duty	pwm
25	1.4	
27	0.4	
28	2	
29	0.3	
30	2	
31	1	
32	4	
33	0.6	
34	1.5	
35	0.4	
36	0.6	
37	0.3	
38	0.4	
39	0.6	
40	0.8	
41	0.4	

Figure 5 Database created

The website was created using programming languages like HTML, CSS and PHP. The main program used to create front end of webpage is as follows.

3.1.Program

```
<html>
<head>
<title>Buck boost converter</title>
<link rel="stylesheet" type="text/css" href="main_pro.css">
</head>
<body>
<p class="topic">IOT CONTROLLED DC-DC CONVERTER</p>
<div class="cont">
<p class="operate">Choose whether you want to operate in buck or boost mode</p>
<div class="b">
<a href="buck.html">Buck converter</a>
```

```
</div>
<div class="b">
  <a href="boost.html">Boost converter</a>
</div>
</div>
<div class="output">
  <p class="volt">Output Volatge:</p>

  <input type="text" class="box" name="Value">
  <p class="Units">Volts</p>
  <p class="volt">Output Current</p>
  <input type="text" class="box" name="Value">
  <p class="Units">Amps</p>
</div>
</body>
</html>
```

4. HARDWARE RESULT

The output voltage and current of buck boost converter was measured using current and voltage sensor. Arduino uno is the microcontroller used in this project and pwm is also produced using Arduino and given as input to buck boost converter.

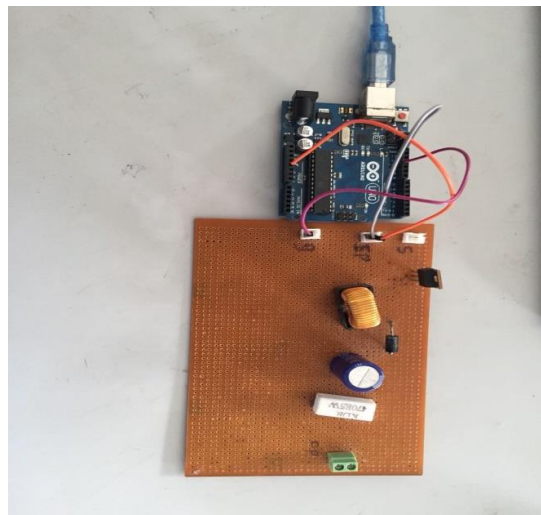


Figure 6 Hardware

This output voltage and current obtained is sent to the website created. So by sending these values to website, we can monitor the operation of device and also make it operate in the required mode by the user.

5. CONCLUSION

Given advancements in today's technologies, it is possible to build a smart DC-DC converter that can be monitored and controlled via cloud. We believe that such kind of devices will play a vital role in emerging DC power transmission networks. Communications will be the key to facilitate innovations and improvements in power distribution networks.

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