HIGH POWER BOOST CONVERTER FOR 1.3KW PORTABLE DC APPLICATION

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ABSTRACT

DC converters are called the buck converters or boost converters, but these depend upon the input and output operating condition.All converters are commonly used in power electronics apparatus for providing faster response and high efficiency. Boost converter is also called the step up converters. In theBoost converters output voltage will be greater than the input voltage.This report is proposed to provide the designer with a method of boosting DC voltage from 220 Volts to 310 Volts,and it also represents the design, modelling and simulation of 1.3 KW boost converter.

Keywords-DC-DC Converter, Modelling Of DC Converter, Boost Converter Design

1. INTRODUCTION

Now days we can see most of electronic equipment are used in power system, because of high response, speed andprovide the high efficiency. These electronic equipments also provide the smooth acceleration. In this paper we calculate the output voltage which will be greater than the input voltage. The circuit diagram of a boost converter using a power MOSFET is shown in the figure (1).The operation of the circuit will be in two modes.The circuit operation is to consider the inductor is an energy storage device. When the switch (Q1) is on, then energy is added to the inductor. When Q1 is off, then the energy will be transferred from the voltage source to capacitor and load. We set the on time of Q1 for controlling the output voltage. If we increase the on time of Q1, the amount of energy delivered to the inductor is increased. During the off time of Q1 we get, the more output voltage, because at the off time of Q1 more energy delivered to the output.

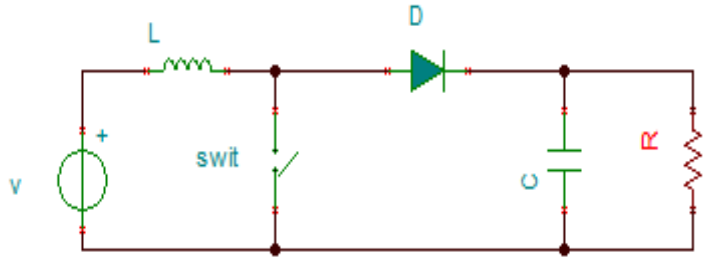

Fig1: Basic Diagram of Boost Converter

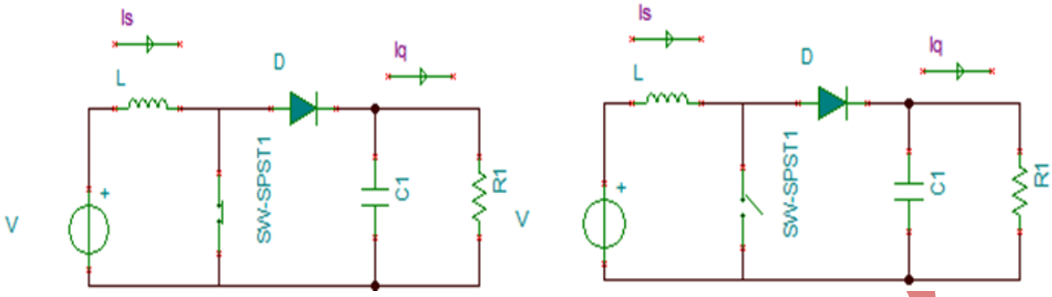

Fig2: On- State of Boost Converter and Off-State of Boost Converter

II MODEL OF 1.3 KW BOOSTCONVERTER

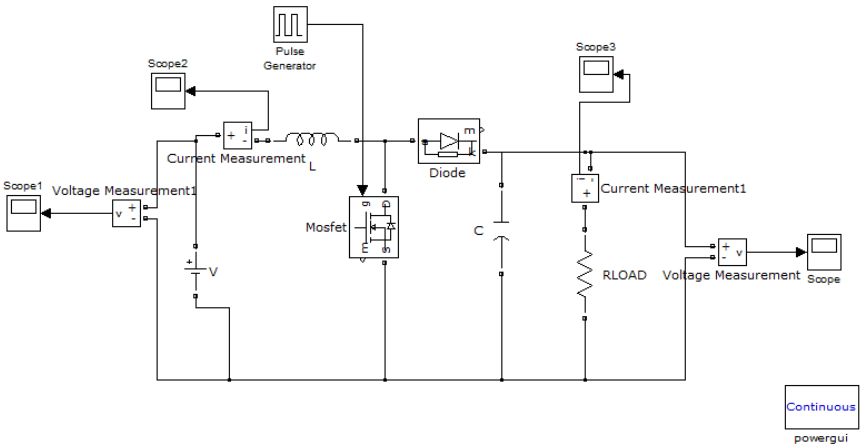

Fig3: Simulation Model of 1.3 KW Boost Converters

III CALCULATION

3.1 Load Resistance

Load Resistance = $\frac{V_0}{I_0}$

Assuming I_{out} to be 4.2A, Vin =220volt, Frequency (fs) =400kHz

Load Resistance = $\frac{310}{4.2}$= 74Ω

3.2 Calculation for Duty (D) Cycle

$$1 - \frac{V_{in}}{V_{out}} \times \eta = 0.4$$

3.3 Calculation for Capacitor(C)

$$C = \frac{I_{out} \times D}{f_s \times \Delta V_{out}} = 0.13\times10^{-6}\ F$$

3.4 Calculation for Inductor (L)

$$L = \frac{V_s \times D}{f_s \times \Delta I_o} = 5.23\times10^{-4}\ H$$

IV SIMULATION RESULT

This simulation completed by using theMATLAB 2010. Firstly, we find all the parameters of this boost converter by the calculation and after that we get the output waveform by using this simulation. It is clearly observed in this simulation result that the boost converter steps up the voltage from 220volt to 310volt in accordance with the parameters derived earlier, fulfilling the desired conditions of output current being 4.2 A at frequency 400kHz. The efficiency of the boost converter is 85%.

Fig4

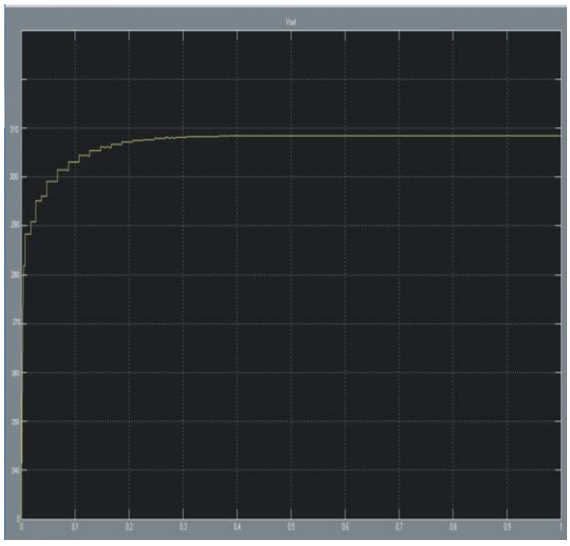

Fig5

Fig4: Input Voltage Vs Time Waveform of Boost Converter Using Matlab.

Fig5: Output Voltage Vs Time Waveform of Boost Converter Using Matlab.

V CONCLUSION

We know that the boost converterhas the higher output voltage than the input voltage. By using this 1.3 KW boost converter simulation, we get the max 1.6% ripple in the system and we get the very low loss in the system. The efficiency of this boost converter will be high. As we know that the function of buck and boost converter depending upon the output and input voltage level, so by using of this simulation we can verify the performance of boost converter.

REFERENCES

[1]Muhammad H. Rashid, "Power Electronics, Circuits, Devices, and Applications", Third Edition, Pearson Education, Inc., 2004.

[2] Carl Nelson & Jim Williams, "Linear Technology, LT1070 Design Manual", 1986.

[3] Marty Brown, "Practical Switching Power Supply Design", New York: Academic Press, Inc., 1990.

[4] Irving M. Gottlieb, "Power Supplies, Switching Regulators, Inverters, & Converters", New York: McGraw-Hill, 1993.

[5] D. M. Mitchell, "DC-DC Switching Regulator Analysis", New York: McGraw-Hill, 1988.

[6]Anita Soni, "DC-DC Switching Boost Converter", ILLINOIS College of Engineering, 1999.

[7]A. Harry, E. Robert and M. Dragan "DC-DC Converter Design for Battery-Operated Systems," 26th Annual IEEE

[8]Power Electronics Specialists Conference, CO 80309-0425 USA, 1998.