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# PFC Power Supply Design for LED Driver based on Current Controlled Buck Boost Converter

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## Abstract

The interleaved buck boost and resonant converter circuit is designed by using sharing switch which can reduce the system cost and enhance the efficiency. In buck boost converter the input voltage is half of the rectified voltage. The power factor correction is attained by two buck boost converter is cascaded with inductor is functioned in discontinuous mode. The LLC resonant circuit is constant and not varied by integrate the switch. The zero voltage switching and zero current switching is to decrease the switching loss and enhance the system efficiency. The LED is used in street lightning, power factor improvement, enhance the system efficiency and reduce the total harmonic distortion. The single stage power conversion is designed and implemented in MATLAB/Simulink environment.

**Keywords:** Zero Voltage Switching (ZVS), Zero Current Switching (ZCS), LLC Resonant Circuit.

## Introduction

The integrated circuit based on dual buck boost converter has becoming the attractive light, high reliability, long life and small size. The power supply consists of Rectifier Bridge, dc-dc converter for voltage regulation [1-2]. The power LED has some demerits because of constant voltage behavior and the supply is not from ac or dc voltage. Some kind of current-constraining device must be utilized, likewise to the stabilizer used to confine the current through a discharging lamp [3-4]. On the other hand, the high adequacy of energy LEDs is just kept up under strict working conditions, which incorporate low direct present and low intersection temperature. All these imply that the advancement of energy supplies that accomplish adjust driving of the LED-based light is an essential in research based on integrating the buck boost and resonant converter. In integrated dual buck boost (IDBB) converter is proposed to supply control LED lights from the alternating current mains, giving high power factor (PF), low LED current swell, and high productivity [5-6]. The function of the converter is identical to two buck– boost converters in cascaded, in which the controlled switch is shared by the two phases. Therefore, the proposed converter incorporates two inductors, two capacitors, three diodes, and one ground-referenced controlled switch, including moderate minimal cost and great reliability for this kind of utilizations [7]. The Buck converter with LC input filter working in DCVM gives continuous input current and fundamental PFC properties. The objective of this paper is to give a more extensive analysis of Buck Boost converter with LLC resonant converter in DCVM. Considering additionally the effectiveness, we introduce the conditions for DCVM activity, the change proportion and switch voltage concern for activity with equalize sinusoid input [8-9].

**Proposed Methodology**

The integrated buck boost converter and LLC resonant converter based circuit diagram is shown in fig 1. The single stage power conversion based on LED driver consists of inductance, two diode, capacitor and switch. The dual converter based circuit has used to generate the efficient power factor correction [10]. The LLC resonant circuit has transformer leakage inductance, magnetizing inductance and resonant capacitor. The voltage controlled oscilloscope is used to tune the frequency of the switch. The proposed circuit working in different modes.

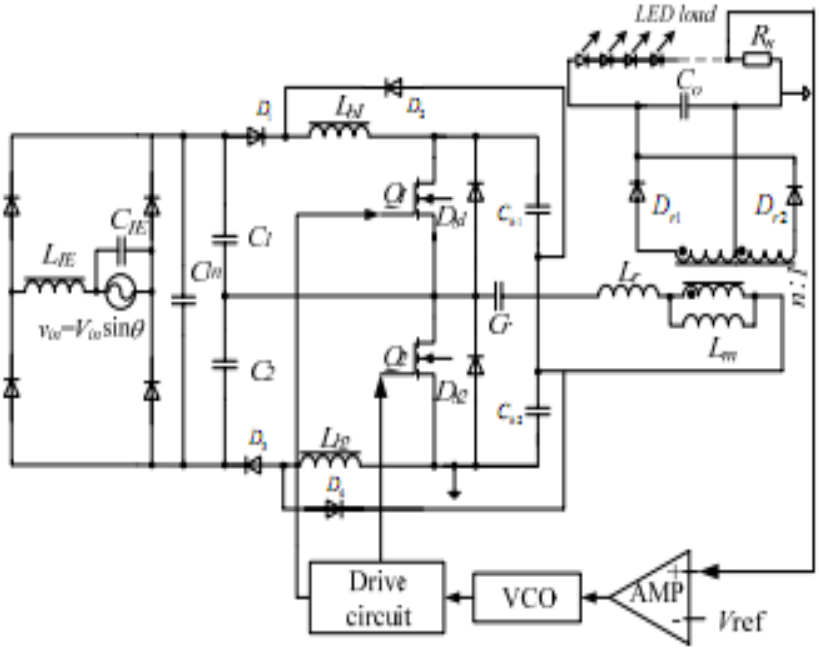


**Fig 1:** Circuit diagram of Three Phase Bridge Inverter

In mode 1 the switch Q2 is switched off and Q1 is not switched on yet and inductor discharges through diode D3. The resonant current discharges to the output of capacitor Q1and drain supply voltage of Q1 starts to decrease. The power factor correction based converter is designed by the interleaved buck boost converter circuit and function in discontinuous modes. The equivalent circuit of LLC resonant circuit is shown in fig 2.

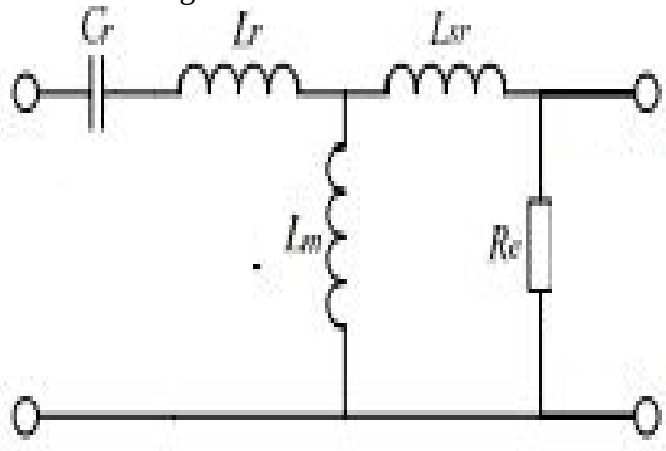

**Fig 2:** LLC Resonant Circuit

**Simulation Result**

The overall simulation circuit of integrated buck boost converter and LLC circuit are shown in figure 3. The LED drive has attained the power factor correction converter based on the input voltage and input current of the circuit.

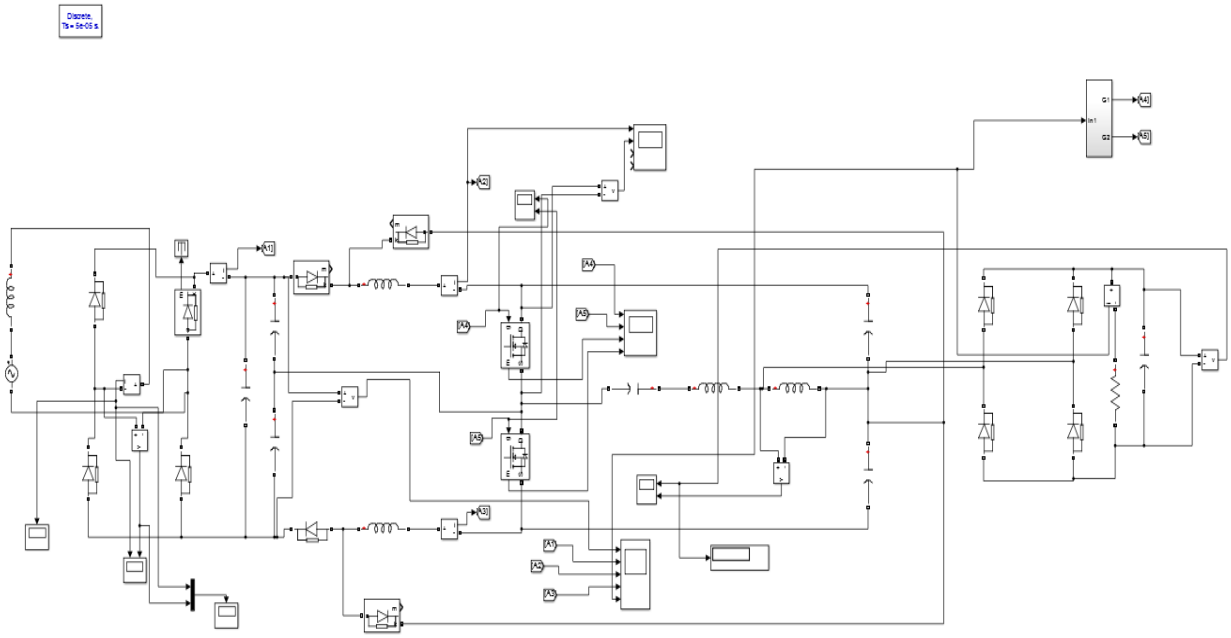

**Fig 3:** Overall Simulation Proposed Circuit

The output voltage of dual converter and LLC resonant circuit is shown in fig 4. The bus voltage is greater than the peak input voltage and reduce the bus voltage effectively.

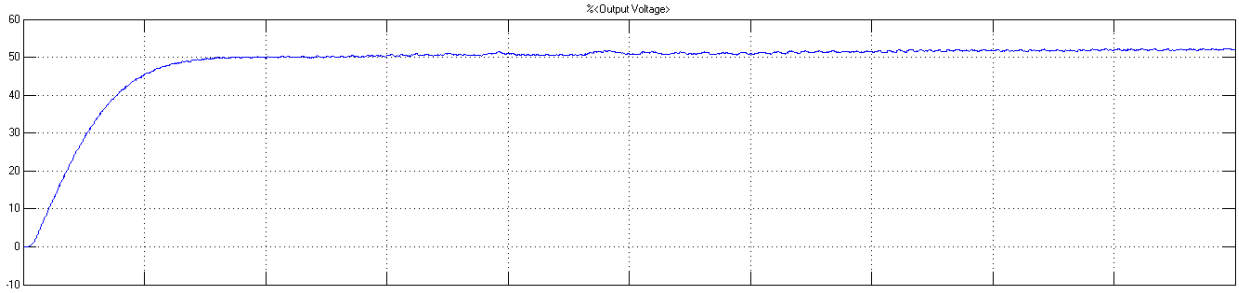


**Fig 4:** Output Voltage of the converter circuit

## Conclusion

The Buck converter with LC input channel working in DCVM offers great inherent power factor rectification correction, continuous input current and the likelihood to acquire a output voltage lower than the peak input voltage. The voltage be concerned of the dynamic switch and the diode is high. The hard switching condition, when turning on the dynamic switch with high voltage across over it, has a negative effect on productivity. A high side dynamic switch is utilized. Variable switching frequency is required for compensating load varieties, while keeping up a satisfactory switch voltage stress. At last, activity in DCVM isn't conceivable at light load. The analysis of Buck boost converter with LLC resonant in DCVM as a power factor correction factor. A powerful factor converter has been calculated and efficiency is improved in MATLAB/Simulink.

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