International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 2 Issue 11, November - 2013

PWM Control Technique of Opto-Isolated Synchronous Buck Converter for Low Power Applications

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Abstract

This paper introduces an approach of PWM control technique of opto-isolated synchronous buck converter for low powered applications. For controlling the critical conduction mode of the inductor current in synchronous buck converter at different frequencies and different powers. For switching of MOSFET's opto-isolated control technique is used because there is no direct electrical connections to your Adina is needed. Here the major drawback is that it produces the heating effect due to presence of internal diodes in the MOSFET's.

Keywords – pwm control , synchronous rectifier, opto-isolator,* Flexi-Force *Sensor, dc-dc converter.

1.Introduction

Fig 1 shows block diagram of proposed PWM control technique of opto-isolated synchronous buck converter for low powered applications. MOSFET makes the switching faster, so the conduction losses are reduced. But the switching losses can be reduced by providing opto-isolated technique to synchronous buck converter because the switching losses may reduce the efficiency and regulation. Now, the controlling of source to gate voltage is responsible for the conduction of current between source and the drain. If the gate voltage exceeds a given value, called the three voltage only then the conduction begins the current equation of MOSFET in diode region is,

$$I_D=U_nCo(W/2)[(V_{gs}-V_{th})V_{ds}-1/2V^2_{ds}] \qquad \ldots(1)$$

U_n= Mobility of the electrons
C_o = Capacitance of the oxide layer
W = Width of the gate area
V_{gs} = Gate to Source voltage
V_{th} = Threshold voltage
V_{ds} = Drain to Source voltage.

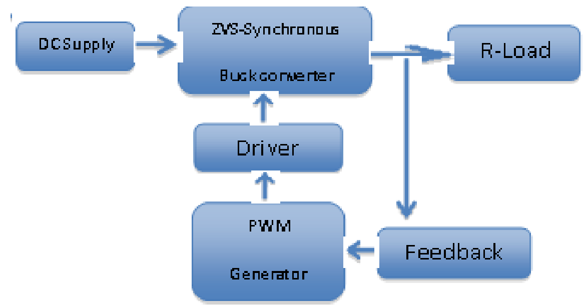

Fig 1 shows block diagram of proposed.

The IC LM324 is that output is going to greater than input that is strengthen the input signals at require level and it is a 14 pin op-amp. Applications of this is used to control the duty cycle of a signals provided by the PWM control technique. I'm not sure about other opto-isolator, but the 4N25 works on the major principal of sinking current. Before actually working with the part, I did not understand that you have to configure the opto-isolator in such a way that when the signal you are trying to reproduce goes low, the opto-isolator should turn ON.

The Flexi-Force sensor acts as a force sensing resistor in an electrical circuit. When the force sensor is unloaded, its resistance is very high. When a force is applied to the sensor, this resistance decreases. The resistance can be read by connecting a multi-meter to the outer two pins, then applying a load to the sensing parameters . The pulses are generated by comparing a triangular carrier waveform to a reference modulating signal. The modulating signals can be generated by the PWM generator itself, or they can be a vector of external signals connected at the input of the block. One reference signal is needed to generate the pulses for a single- or a two-arm bridge, and three reference signals are needed to generate the pulses for a three-phase, single or double bridge. The amplitude (modulation), phase, and frequency of the reference signals are set to control the output voltage (on the AC terminals) of the bridge connected to the PWM Generator block.

In this MOSFET'S turning ON will put voltage Vin on one end of the inductor. This voltage will tend to cause the inductor current to rise. When the MOSFET'S is OFF, the current will continue flowing through the inductor but now flowing through the diode. We initially assume that the current through the inductor does not reach zero, thus the voltage at output will now be only the voltage across the conducting diode during the full OFF time. The average voltage at output will depend on the average ON time of the MOSFET'S provided the inductor current is continuous.

Efficiency can be calculated using by the equation

$ή=(1-P_{loss})/(P_{out}+P_{loss})$ …………..(2)

power can be calculated using by the equation

$P=I^2R$ …………(3)

Where

P_{out}- output power

P_{loss}- power loss

CONCLUSION

PWM control technique of opto-isolated synchronous buck converter for low power applications has better efficiency and regulation than conventional synchronous buck converter here heating effect should be eliminated from the MOSFET'S. the switching will be faster and accurate than conventional systems at zero voltage switching for low power. Instead of using MOSFET'S we can use the other switching devices to get better efficiency and regulation.

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