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Power Converter Using DSPIC

Pradeep R. Taware[1]
Professor, Project Guide
Department of E&TC Engineering
S.B.Patil College of Engineering Indapur, Pune, India

Swati Vishnu Deshmukh[2]
Department of E&TC Engineering
S.B. Patil College of Engineering Indapur, Pune, India

Priyanka Vitthal Gofane[3]
Department of E&TC Engineering
S.B. Patil College of Engineering Indapur, Pune, India

Madhuri Bhimrao Phule[4]
Department of E&TC Engineering
S.B. Patil College of Engineering Indapur, Pune, India

Abstract: This topic is about how power electronics can be implementing on embedded system program. Major in power electronics and controlling using embedded system is the purpose of this project. This power converter is supposed to be the fastest charging time among converters that have nowadays. By using power electronics component that can handle high current and voltage this power converter should be charging battery faster. Methodology that was use is fly-back topology and using MOSFET as switching device. Fly-back converters are mainly used in AC-to-DC power supplies. This power converter is a type of galvanic isolated version of the fly-back converter where the inductor has been replaced by a transformer. A positive output is obtained by an accurate coupling of the transformers windings. The main advantage of this method is greater efficiency .Other advantages include smaller size and lighter weight from the elimination of low frequency transformers and lower heat generation from the higher efficiency.

Keywords: Fly-back converter, dspic microcontroller

I. Introduction

This project is to make a prototype of PIC microcontroller power converter. This is about making a fast power converter than nowadays battery charger. An AC to DC converter is an integral part of any power supply unit used in the all equipments. Also used as an interface between utility and most of the power electronic equipments. These electronic equipments is a major part of load on the utility. To reduce the ripple in the dc output voltage, a large filter capacitor is used at the output of this converter. But due to this large capacitor, the current drawn by this converter is angular in nature. This input current is rich in low order harmonics. power electronics equipments are increasingly used in conversion of power, they inject low order harmonics into the utility. Due to the presence of harmonics, the total harmonic distortion is larger and the input power factor is poor. Due to problems associated with low power factor and harmonics, system will enforce harmonic standards and guidelines which will limit the amount of current distortion allowed into the system and thus the simple diode rectifiers may not in use. So, there is need to achieve rectification near to unity power factor and low input current distortion. Power factor correction schemes have been implemented mainly for larger industrial loads like induction motors, induction heating furnaces etc. which forms a major part of lagging power factor load. The trend is changing as electronic equipments are increasingly being used in everyday life nowadays. This converter will use an forward ac-dc converters due to the high efficiency of the converter. It is because of full-bridge converter that has high frequency transformer. That can be isolate voltage on primary and secondary stage. This is due to the safety of the circuit itself. This converter will give output current that is 5A. In switch mode power converter fly-back converter are very popular because of design is easy, low cost, multiple isolated outputs so high output voltages and current is high. This fly-back converter needs a single controllable switch like MOSFET the usually switching frequency is 100 KHz. In our power converter the aim is design a pure DC supply at output that can be 96V the from a supply voltage of 120V to 230V. The variation in output voltage is obtained by controlling the duty cycle ratio of pulse given to the switch is connected to primary of transformer. Then the pulse is generated using DSPIC microcontroller. Which gives high PWM signal?

II. LITERATURE SURVEY

Power quality issues are relevant research topics and a lot of advanced researches are being carried out in this area. These issues are mainly due to larger use of power electronic devices, nonlinear loads and unbalance in power system. Dynamic loads cause power quality problems usually by voltage or current variations such as fluctuations, momentary interruptions, voltage spikes oscillatory transients, harmonics, harmonic resonance etc. Various publications define power quality in different aspect. According to IEEE Recommended Practice for Monitoring Power Quality (IEEE Std. 1159-1995).The Power quality is concept of powering and grounding of sensitive equipment in a manner that is suitable for operation of that equipment. The definitions and terminology used in conjunction with power quality are follows quality of voltage can be introduced as the quality of voltage delivered by the utility to the consumers and concerned with the deviations of voltage from the ideal one. This ideal voltage is a single frequency sinusoidal wave of constant frequency also constant magnitude. Current quality share with the deviations of the current from the ideal one which should be sinusoidal current of constant frequency, required magnitude and should be in phase with the supply voltage. Voltage quality deals with what the utility sends to the customer and current quality deals with what the customers take from these utilities and are mutually dependent. This Power quality is the combination of voltage as well as current quality. Power quality is related with deviations of voltage and/or current from the ideal. The increasing cost of energy led to the introduction of efficient speed drives using static power converters in 1970s. This brought about a wide change in application of utilization equipment in industrial power systems. To minimize the electrical energy costs, which are made up of KVA demand charges, customers began to apply capacitors in their system to lower the demand charges .Large numbers of power electronic loads installed in power systems generate harmonics. Major sources are as Desktop computers, TVs, Fax Machines, Ovens, Electric vehicle battery chargers, Thyristor converters, UPS,ASDs, Welding machines, Static compensators, Inverters, Switched mode power supply, lighting etc. The switching or commutation of power semiconductor devices generate voltage/current transients that characterized by a spectrum of frequencies.

III. PROPOSED SYSTEM

This paper proposes the IND-OCPA-P model to analyze the security of the proposed EOB and the encryption schemes supporting an efficient range query over encrypted data.

IV. OBJECTIVE

- To fast charge an 5A battery using DSPIC microcontroller.
- By supplying high current in the circuit, we will make time to charge the battery faster.

Block Diagram

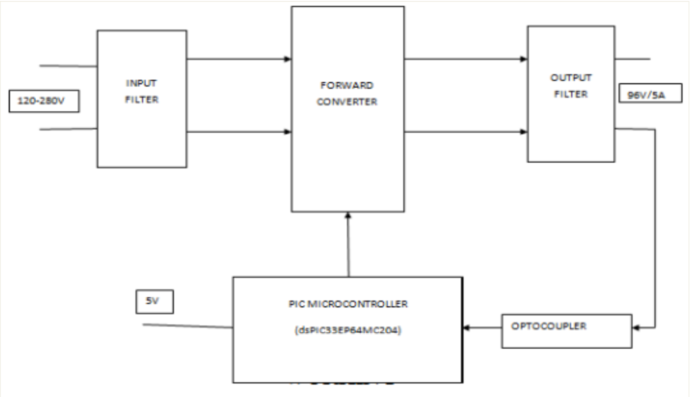

Fig: Block Diagram

V. Working

This is the block diagram of a microcontroller based power converter. In this we provide AC voltage that is 120-280V which gives to input filter. An input filter is used to limit the high starting current, source protection and to avoid ripples in the supply and forwarded it towards the forward converter. Microcontroller dsPIC33EP64MC204 is also interfacing with this converter which is used for AC to DC conversion. The fly-back is a buck-boost converter with the inductor split to form a transformer, so that these voltage ratios are multiplied with an additional advantage of isolation. Input to the circuit may be variable dc voltage derived from the ac supply after rectification and filtering. The ripple in this dc voltage waveform is low frequency and the overall ripple voltage waveform repeats at twice the ac mains frequency. Since the converter circuit is operated at higher frequency in the range of 100 kHz the input voltage may be a constant magnitude during high frequency cycle. A fast switching device that is a MOSFET is used along with fast dynamic control over switch duty ratio (means the ratio of ON time- period to switching time-period) to operate the desired output voltage. The transformer using in circuit is for voltage isolation as well as for better combination between input voltage and output voltage also current requirements. Primary and secondary windings of the transformer are wound to have better coupling so that they are linked by nearly same magnetic flux. The primary and secondary windings of the fly-back transformer don't carry current simultaneously. DSPIC is used for the controlling and protection purpose.PIC gives PWM pulse to control the switching of MOSFET output voltage. PIC will be programmed all the stage of charging the battery and the PWM switching.7.14 ns PWM resolution. In this we use the Optocoupler which is connected to the DSPIC. They are mainly used to prevent the damage of electronic components from the high voltages. DSPIC controls the MOSFET. When Battery is completely charge it gives feedback to dsPIC then it OFF the MOSFET otherwise it turn on it. Output of this is 96V and 5A.

5.1Forward Converter (using fly-back topology)

The fly-back converter is used in both AC to DC and DC to DC conversion with galvanic isolation between the input and any outputs. The fly-back converter is similar to buck-boost converter with the inductor split to form a transformer, so that the ratios of voltage are multiplied with an additional advantage of isolation. When driving for example a plasma lamp or a voltage multiplier is rectifying diode of boost converter is left out and the device is called a fly-back transformer.

5.1.1Basic Topology of Fly-Back Converter

The fly-back is a basic topology. Input to the circuit may be unregulated dc voltage derived from the circuit ac supply after rectification also filtering. The noise in dc voltage waveform is generally of low frequency and the ripple voltage waveform repeats at two times the ac mains frequency. So the converter circuit is operated at higher frequency which has range 100 kHz. Input voltage in spite of being unregulated, may be considered to have a constant magnitude at high frequency. A MOSFET is a switch which used for fast switching control over switch duty ratio (ratio of ON time period to switching time-period) to maintain the desired output voltage. The transformer, in is used for voltage isolation, for better matching between input and output as well as voltage and current requirements. Primary and secondary windings are wound to transformer have good coupling so that they are attached by nearly same magnetic flux. The both windings of the fly-back transformer do not carry current simultaneously and fly-back transformer works differently from a normal transformer. In a normal transformer primary and secondary windings conducts simultaneously such that ampere turns of first winding is nearly balanced by opposing ampere turns of the secondary winding.Since primary and secondary windings of the fly-back transformer do not conduct simultaneously more like two magnetically coupled inductors and they may be the more approppriate for fly-back transformer as inductor transformer. Related the magnetic circuit design of the fly-back transformer is similar to an inductor. The details of inductor-transformer design are haIn normal transformer primary and secondary windings conduct simultaneously such that the ampere turns of first winding is nearly balanced by opposing ampere turns of the secondary windings. (Small difference in ampere turns is required to establish flux in the non-ideal cores). From primary and secondary windings of the fly-back transformer do not conduct simultaneously they are more like two magnetically coupled inductors and it may be more appropriate for the fly-back transformer is as inductor transformer. Accordingly the magnetic circuit design of a fly-back transformer is similar to an inductor. The details of the inductor-transformer design are handling with separately in some later lesson. The output section fly-back transformer which consists voltage rectification is considerably simpler than in most other switched mode power supply circuits. From the circuit we can be seen, the secondary winding voltage is rectified and filtered using the diode and capacitors. Voltage across this filter capacitor is the converter output voltage handle separately in some lesson. The output section of fly-back transformer which consists of voltage rectification is considerably simpler than most other switched mode power supply circuits. From the circuit we can be seen, secondary winding voltage rectified and filtered using the diode and a capacitors. Voltage across this filter capacitor is the converter output voltage.

VI. Conclusion

A fixed DC power supply is designed using flyback principle. Here for a variable input of 120V-280V a fixed DC output of 96V and 5A is obtained. This is a model of designing a power supply. Depending on the applications and input conditions, power supply can be designed. Fly-back transformer can be designed for any required output.PWM signal can be generated using dsPIC microcontroller.

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