Renewable Energy Based High Step Up Multi Resonant DC- DC Convertor For Battery Charging

V.Vengatesan
Assistant professor
Electrical And Electronics Engineering
SRM TRP Engineering College
Trichy India-05
vengatesanv@gmail.com

V. Priyanka
Electrical And Electronics Engineering
SRM TRP Engineering College
Trichy India-05
vlpriyanka1258@gmail.com

P. SujaNanthini
Electrical And Electronics Engineering
SRM TRP Engineering College
Trichy India -05
sujananthini21@gmail.com

B. Suvitha
Electrical And Electronics Engineering
SRM TRP Engineering College
Trichy India -05
suvithams24@gmail.com

I. Vinola princy
Electrical And Electronics Engineering
SRM TRP Engineering College Trichy
India -05
vinolaprincy33@gmail.com

Abstract:- A high efficiency high step-up dc-dc converter is proposed for renewable energy harvesting where the sustainable power sources such as PV panels and fuel cells are characterized by low-voltage, high-current output.A multi-resonant tank is used to provide high voltage gain, absorb the parasitic parameters of the transformer and create zero-current switching (ZCS) condition for all primary switches. Maximize the benefits of residential and commercial solar energy systems, both to the systems owners and to the utility distribution network as a whole. It can be used with low power as well as high power photo-voltaic system. Efficiency of the proposed architecture is demonstrated for the photo-voltaic system installed in educational institution. The value of the energy provided by these solar systems will increase through advanced communication interfaces and control.

Keywords— Photo voltaic panel, multi resonant converter soft switching techniques.

I INTRODUCTION:

Renewable energy in recent year become more and more common due to pollution in level of fuels, also, the growing interest in environmental issues and the climate changes leads to alternative sources of energy. The demand of electrical energy is growing constantly.

The conventional sources of energy like thermal etc.., having serious issues of having limited reservoirs this may decades next few days, so carbon emission from power plant using conventional sources are adding serious threat to the environment.

To overcome the above concerns the researches now attention on renewable energy sources in the past few years. Among all renewable energy sources solar energy is the most acceptable solution and free of cost worldwide solar photovoltaic (PV) is used to convert solar energy into electrical energy.

Isolated dc-dc converter has also dc path between its input and output but Non-isolated dc-dc converter designs usually employ ICS specifically intended for that purpose.

The above isolated and non-isolated system, the isolation necessary for system power sources for safety considerations there must isolation between input ac and dc output.If suppose any fault in the primary side of the transformer, the fault can be protected by primary side itself and allow the constant voltage to the secondary side of the transformer and further process can takes place.

The non-isolated converters are boost converters, coupled inductors and switched inductors and capacitors. Here the input PV voltage is given about 30-50 volt dc battery means, we get fixed output voltage 400 volt dc only.

This converter does not fixed for EV application. This is also does not able to prevent required galvanic isolation between PV and high voltage battery pack. In boost converter, charging current of the output capacitor is discontinuous resulting in larger capacitor size and EMI issues similar to the buck-boost converter efficiency is poor for high gain very large duty cycle.

Therefore high again operation cannot be achieved with this converter. Also the following converters, the capacitors have high ripple current mainly the use of L3C resonant converter, capacitors by raising in its internal temperature degrades the component. Maximum heat occurs in the winding so we only get very low efficiency. These are all disadvantage of their converters.

Finally experimental results are the z-source network regulate the system output voltage and adding semiconductor devices, the soft switching technology ie) zero current switching can properly achieve the voltage and current and the multi resonant converter gets maximum power without any compromise and gets DC output voltage, the multi resonant converter can track all input voltages related to maximum input power(VPV=12voltDC,while regulating the battery voltage from 50-60VDC)and gets maximum power from the PV panel without any limitations.

II. BLOCK DIAGRAM:

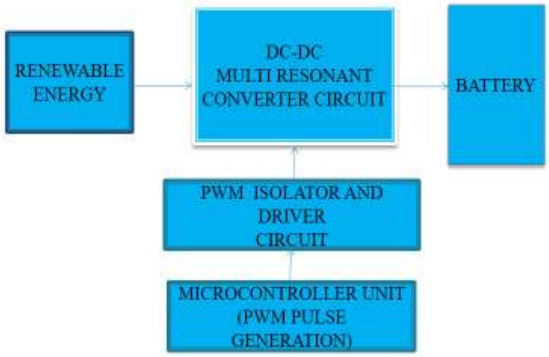


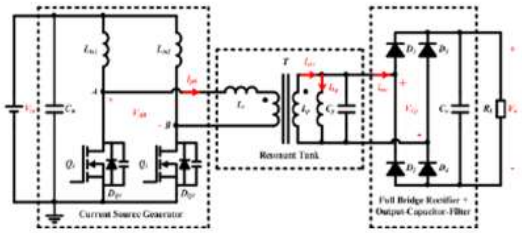
Fig no 1 Block Diagram Of Multi Resonant Converter.

The renewable energy of solar dc input is given to the process, the controller can generate the pulse width modulation generation, the controller have, diode, Resistor and PWM can process takes place in the isolator and driver circuit basically isolator means common ground between controller and converter, and basically this can be used to isolate the common ground between controller and ground. Suppose any fault in the controller this can be prevented itself this can be given to the resonant converter this converter can produce load output voltage and gets maximum power output.

III. PROPOSED SYSTEM:

A multi-resonant tank and a full bridge rectifier with single capacitor output filter. The current fed half-bridge structure is adopted as the square wave current source generator with its inherent merits of low input current ripple, low primary current of the transformer, high step-up capability and common ground gate driving.

The multi-resonant tank offers high voltage gain to reduce the turns-ratio of the transformer. Meanwhile, the multi resonant tank absorbs both the self-winding capacitances of the transformer and the junction capacitances of the rectifying diodes into its resonant capacitor thus the current spikes within the circuit are well suppressed.



IV . CIRCUIT DIAGRAM EXPLANATION:

Fig no 2 Circuit Diagram Of Multi Resonant Converter

The complete solar energy conversion system consists of solar PV, power electronics converters and this can be control to regulate the power extracted from solar PV.

In order to extract maximum power from solar PV cells are proposed bypass diode, also PV module with integrated dc-dc converters. Basically isolation describes the electrical separation between input and output of dc-dc converter and this isolated dc-dc converter uses a transformer to eliminate dc path between input and output.

First part of current source generator. This is part of converter which converts (DC to AC) normally converter means voltage and current constant increases and decreases but the resonant converter means voltage and current zero level proper achieving so there is no losses so this is called resonant converter, so mainly soft switching technique can be used ie)zero current switching to avoid fault in future .here topology of half bridge rectifier can be used discuss by the following, the initial high period of the high frequency square wave applied to the MOSFET gate. The high voltage MOSFET ie)IRF840 and inductor T-25, In ON stage current flows through the inductor and return backs to the input terminal and vice versa. In OFF stage current flows inductor through diode, capacitor and load terminal and flows through the voltage source. During ON time MOSFET conducts placing short circuit from the right hand side of L1 to negative input supply terminal current flows between positive and negative supply terminals through L1 which stores energy in the magnetic field. Virtually no current flowing in the remainder of the circuit combination of diode and capacitance and load represent much higher impedance than path. MOSFET is rapidly turned off sudden drop in current causes inductance to produce back EMF in opposite polarity.The output of the converter is given to the high frequency transformer working principal on Indian standard transformer Ie) high frequency transformer use frequencies from 20 KHz to over 1 MHZ the benefits of the transformer is smaller in size less copper wire is needed reducing losses and helping to transformer more efficiently. here the transformer is made up of ferrite core and efficiently step up voltage and number of windings are wounded many in the inductor so called multi resonant converter .this output of transformer if given to the rectifier side we get pulsating DC,using capacitance we get pure DC output voltage.

V. HARDWARE COMPONENTS:

In order to control the output voltage of the converter, the controller is designed to change the duty cycle of the converter. In this converter MOSFET switch is digitally controlled by PIC microcontroller.

Circuit diagram of multi resonate dc to dc converter is given in fig 2. Diode D1 should be selected according to average load current. For example average load current is 0.5 Ampere. So D1 should have at least 1 ampere. Similarly MOSFET should also be selected according to voltage and current rating of our design requirement. Circuit diagram of multi resonate DC to DC converter MOSFET is used as a low side configuration because load is connected to drain of MOSFET. A voltage divider is used to lower voltage to less than 5 volt and then fed to microcontroller ADC pin. Because microcontroller cannot read voltage more than 5volt. This voltage measurement is used to set duty cycle in case of voltage fluctuation at the output. Microcontroller (DSPICFC2010) is used to generate PWM.Pulse width modulation process can takes place in the isolator and driver circuit OPTO isolator also called OPTO coupler (TLP250). The function of OPTO isolator means used to the common ground between controller and ground. Isolator and drive circuit can split into two parts, controller part and converter part. Controller 5v input is given into the isolator and driver. The output from the driver of the controller 12v is given to the MOSFET. The source can be grounded. The drain terminal is directly connected to the solar dc input. The gate terminal is interconnected to the solar dc input. This OPTO isolator is given to the resonant converter.
Here ZCS soft switching process can takes place and voltage can be boosted this can be given to the battery load.

Fig no 3 Hard Ware

VI. HARDWARE RATINGS:

Solar panel rating: 12 volt, 10 watts
Battery rating: 12 volt, 4 amp hour
Battery voltage: 40 volt
MOSFET rating: IRF 840, 40 amp hour
Diode rating: 1N 4007

VII. ADVANTAGES:

Multi resonant converter isolated system can be followed, here the ripple current can be low, so we maximum power output same time number of windings are wounded largely in the multi resonant converter. The minimum heat occurs in the winding so we get high efficiency of the dc output.

If suppose any fault in the primary side of the transformer, the fault can be protected by primary side itself and allow the constant voltage to the secondary side of the transformer and further process can takes place.

VIII. CONCLUSION:

This paper introduced the multi resonant converter with extreme regulation capability, which can be employed for solar battery charger applications. High, efficiency step up dc-dc converter is proposed for interfacing the renewable power sources. With unique combination of a current fed half bridge, a MULTI resonant tank and a full bridge rectifier with C-type output filter we get pulsating pure DC output and get maximum power from the solar panel with no energy losses. The merit of the proposed converter was verified with maximum power watts. A peak efficiency of was achieved at an input voltage of 12v.

IX. REFERENCE

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