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# Driver Pulses of MOSFET in a Single-Stage Solar Based DC-DC Converter

KEYWORDS: solar model, MOSFET, single-stage, full-bridge converter, zero-voltage switching (ZVS), Cathode ray oscilloscope (CRO), Bipolar (BP), unipolar (UP).

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**ABSTRACT** *This paper presents driver pulses of MOSFET in a Single-stage solar based DC-DC converter. Hardware Implementation of Single-Stage Solar Based DC-DC Converter for Inductive Load Application was done and from that hardware circuit driver pulses was obtained. The hardware circuit contains controlled converter, power supply unit, control circuit and uncontrolled converter. The controlled converter connected in source side and uncontrolled converter connected in load side. While the first converter is controlled converter acts as an inverter, the second converter is uncontrolled converter functions as a rectifier in-between connected step-up transformer. Un Controlled converter is used in the load side besides a capacitive filter being connected. Finally inductive load is connected to output side. Driver pulses, switching pulses, voltage across drain to source of MOSFET are measured.*

## INTRODUCTION

Photovoltaic sources are one of the important renewable sources at the same using smart grid infrastructure at industrial applications. Advantages of future renewable electric energy delivery and management (FREEDM) system are (i) Not using phase locked loop, regulator and anti-islanding controller. (ii) This converter works also in single power stage.

The module – integrated converter (MIC) method is used. Resonant converters system is implemented for parallel connected dc MICs there by getting more efficiency. Depends on the panel operation, modes of operation of the converter was changed. Complexity and cost of the converter is less as compared to LLC Resonant converter. Converter getting more efficiency [1]. A large number of inverters are utilized PV power into the transmission grid, which is changing the voltage level and other parameters. BP-PWM method prevents the leakage ground current but producing more switching loss and current ripple. After that time, transformers less inverters with unipolar PWM circuit are used. The transformer less inverter with UP-PWM circuit has, low switching loss and removes the leakage current and gives unity power factor on grid. But current distortion at negative power side is present. This type of inverters operated UP-PWM is in positive power side and BP-PWM is in negative power side. The new combined unipolar and bipolar PWM inverter circuit, current distortion is increasing due to that THD is decreasing getting more efficiency [2].A new fly back converter is formed from group of soft-transition converters is called as active-clamp converters. The following advantage of converters,

PWM period using constant frequency, smooth switching and less voltage stress at components is obtained from clamping action. The resonant-load converters generate the small-single models. Dynamic behaviors of active-clamp converter at under current control time are discussed. At the time of analysis resonant components is connected in this converter circuit [3]. Basic converter circuit is either improving the voltage or decreasing the voltage but in two switch buck-boost converter is improving the voltage and decreasing the voltage. Low voltage stress giving more efficiency in this converter. At first mode control method, output voltage of converter circuit is less as compared to input voltage and second mode control method output voltage of converter circuit high as compared to input voltage. The two-mode control method having less conduction loss so efficiency of converter is more. Only one voltage regulator is control the two mode control method using automatic mode switching. Output voltage oscillating is minimized. A small-signal model in input voltage feed-forward method is combine with two-mode control method was implemented [4]. At bipolar DC networks, power converter is applied. Power converter is help to balancing the current and stability at a same time less loss is obtained and also components cost was less [5]. The proposed converter uses solar energy as input source. The proposed converter's block diagram, Driver pulses, switching pulses, voltage across drain to source of MOSFET are discussed in this paper.

## PROPOSED BLOCK DIAGRAM

In a proposed black diagram Solar model is connected to the input side with the solar model getting some DC voltage. That voltage is converted to AC with help of a source side I bridge circuit [6]. AC voltage is applied to isolation transformer; step up AC voltage is passes to a load side bridge circuit. Here step-up AC voltage is converted to DC voltage. Filter is filtered DC voltage that voltage is applied to the RL load. Control circuit is giving to the triggering pulses to the two bridge circuit. Based on controlling signals only bridge circuit is working and output voltage was producing.

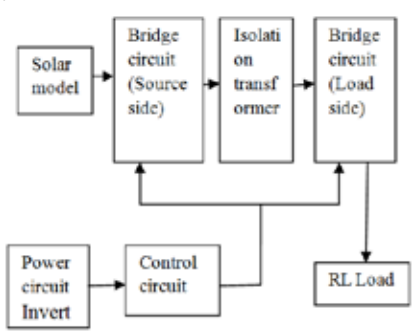


**Figure 1: Proposed block Diagram**

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**PROPOSED CIRCUIT CONFIGURATION**

Hardware implementation of single-stage solar based DC-DC converter for inductive load application was implemented [7]. The name and range of some components used in the hardware circuit are specified.

**TABLE – 1**
**HARDWARE COMPONENTS DETAILS**

| Name of components | Range of components |
|---|---|
| Transformer | 230/18V |
| Power supply circuit | |
| Voltage | 50V |
| Capacitance | 2200µF |
| Control circuit | |
| Capacitance | 47µF,63V |
| Capacitance | 1µF,63V |
| Driver | IR2110-14Pin IC-2 Numbers |
| Controller –PIC Microcontroller | 16F84A-18PinIC |
| I Bridge circuit ( Source side) | |
| MOSFET | IRF840,8A,0-500V, N-Channal-4 Numbers |
| Diode | IN4007 |
| Inductance | 40mH |
| Capacitance | 100pF |
| II Bridge circuit ( Load side) | |
| MOSFET | IRF840,8A,0-500V, N-Channal-4 Numbers |
| Diode | IN4007 |
| Inductance | 1.6µF |
| Capacitance | 100pF |
| Resistance | 10K,10W |
| Isolation transformer | 1:2 |
| Load | |
| Resistance | 10KΩ,10W |
| Inductance | 1.6µF |

**DRIVER PULSES AND SWITCHING PULSES OF MOSFET**

In those hardware circuit driver pulses of MOSFET is measured via CRO. The amplitude of driver pulses is 10 voltages.

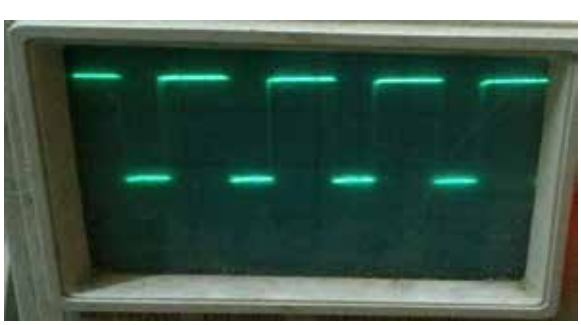

**Figure 2: Driver pulses of MOSFET**

Sumultanesly switching pulses and voltage across drain to source of MOSFET are measured, the amplitude of switching pulses is 5 volt and voltage across drain to source of MOSFET is 24 volts. The switching pulses were applied to the driver circuit; the amplified switching pulse is called driver pulse.

**Figure 3: Switching pulses of MOSFET and voltage across drain to source of MOSFET.**

In figure 4 transformer primary voltage is 40 volts which is displayed.

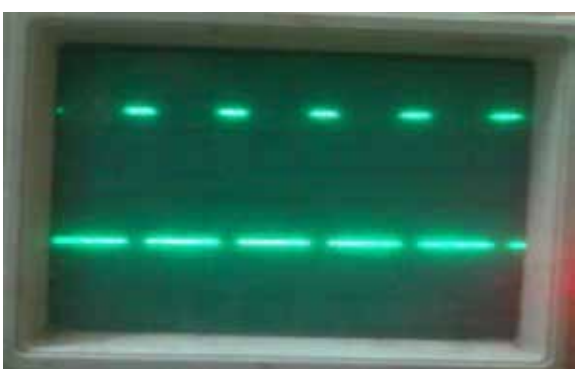

**Figure 4:Transformer primary voltage**

**CONCLUSION**

The driver pulses of MOSFET at Single-stage solar based DC-DC converter were measured. Based on the triggering pulses output voltage was present. In the paper, Driver pulses, switching pulses, voltage across drain to source of MOSFET have been explained. The proposed circuit is got by integrating two boost PFCs resonant converter.

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