International Journal of Electrical and Electronics Engineers
Vol. No.7 Issue 02, July-December 2015
www.arresearchpublication.com
IJEEE
ISSN 2321 - 2055

DESIGN AND SIMULATION OF NEW PUSH_PULL TYPE INVERTER FOR PHOTOVOLTAIC SYSTEM

Mr. Ritesh ojha[1], Mr. Ajay yadav[2], Mr.K. Srinivasarao[3]

[1]M. Tech Scholer, [3]Assistant Professor, ECE Department, Mewaruniversity, Chittorgarh, (India)

[2]Assistant Professor, ECE Department,C.E.R.T.(U.P.70), Meerut, (India)

ABSTRACT

In this paper proposed new type push _pull based inverter for PV system and which were compared with previous existing puss _pull inverter circuit. The proposed inverter is play important role to controlflow ofelectricity between the modules, battery and loads in any PV based System. The Proposed circuit showing effective Result as compared with existing.Simulation has done using NIMultisim software. Therefore it can effectively implementing for home appliances as well as Laboratory etc.

Keywords: New Type Push_Pullinverter ,NI Multisim Software , PV System, Battery.

I. INTRODUCTION

Recently, the need of renewable energy has become important contribution in energy consumed such as solar, wind, biomass and geothermal. Among them, solar energy is one of the important renewable energy sources because it is inexhaustible. Besides, its conversion free from the emission of air or water pollutions or the generation of solid waste [1]. Malaysia is one of the countries that receive abundant of sun light in average mostly in northern side of Peninsular Malaysia where Perlis, Kedah and Penang have high potential in applying solar energy [2]. The output of photovoltaic (PV) is in DC form. Therefore, it requires sophisticated conversion techniques to make them usable because the power utilization is mostly in AC form.This conversion can be done by using inverter that converts DC input into AC output. The inverter is a critical component responsible for the control of electricity flow between the modules, battery and loads in any PV based system.[2]

This paper is classified into five section , section II describes block diagram of pv system , section III describes Push _pull inverter section IV describes proposed puss_pull inverter and V describes All about simulation Result.

II. BLOCK DIAGRAM OF PV SYSTEM

This photovoltaic system consists of three main subsystem which are PV devices (modules, panel or arrays), balance of system (BOS) and AC load. PV devices collect solar radiation from the sun and actively convert that energy to electric dc power. The BOS typically contains structures for mounting the PV arrays or modules and the power conditioning equipment that converts the electricity to the proper form and magnitude required by load. The BOS in this system consists of charger, battery and inverter [2].

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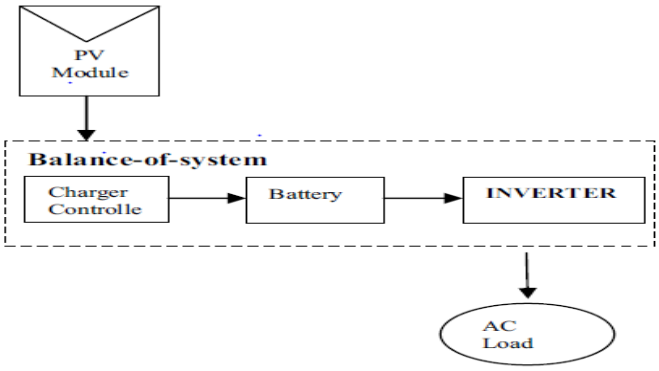

Fig.1block Diagram Representation of Photovoltaic System

III. PUSH_PULL INVERTER

The design of the inverter circuit was implemented using push-pull topology as shown in Figure 2.and it is successfully simulated as depicted in Fig. 4, 5&6.The push-pull topology is suitable for producing square and modified square wave inverter. This design will convert the 12 VDC to 12VAC and use step-up transformer to step-up the voltage to 240VAC.

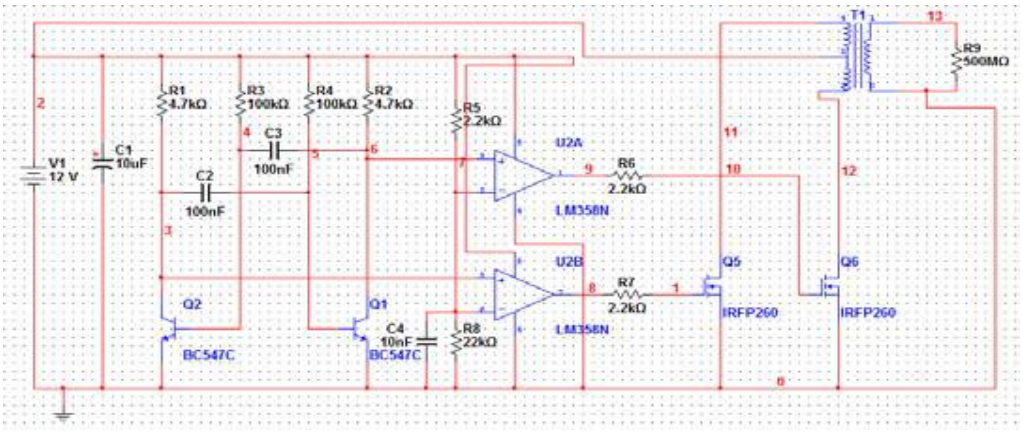

Fig.2 Simulation Layout Using Multisim

This circuit used a simple multi-vibrator oscillator, Q1 and Q2 which is BC547. The frequency is determined by the100nF capacitor and 100k.Ohm resistors, R3 and R4 which is 60Hz operating frequency. It is common to choose either MOSFET or IGBT as a switching device. They offer several advantages over the BJTs which are very high input impedance, very high switching frequency and low switching loss. The power transistor use in this circuit design is a MOSFET IRFP260 [3].

IV. PROPOSED NEW TYPE PUSH_PULL INVERTER

In this paper I proposed push-pull topology inverter fig. 3 which were successfully simulated as depicted output result in Fig.7, 8&9. To generate square and modified square wave push-pull topology is batter technology. This design will convert the 12 VDC to 12VAC and use step-up transformer to step-up the voltage to 250VAC.

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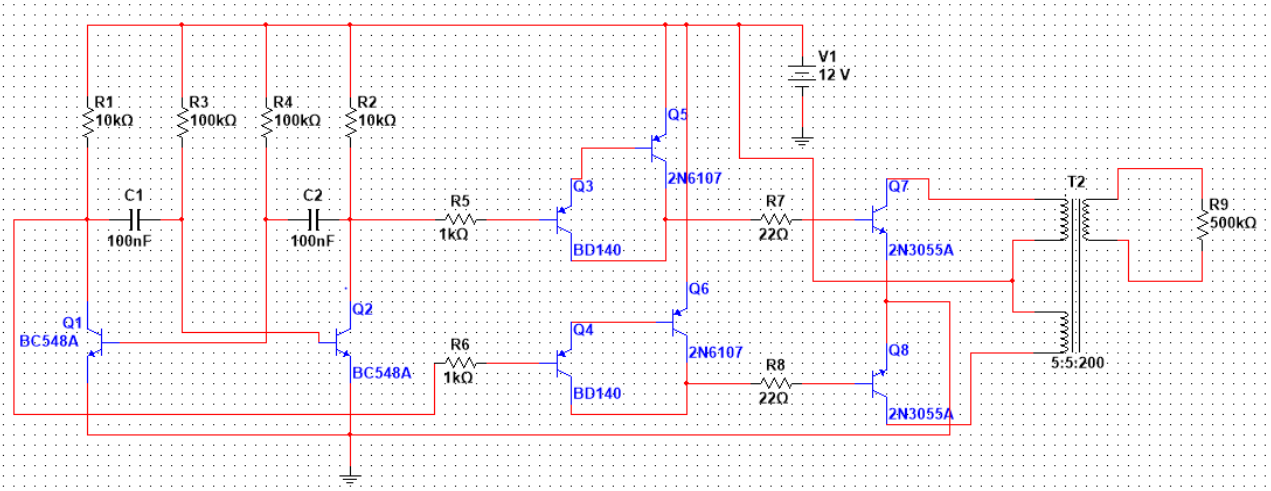

Fig.3Proposed New Type Push_Pull Inverter

This circuit used a simple multi-vibrator oscillator, Q1 and Q2 which is BC548A . The frequency is determined by the 100nF capacitor and 100k. Ohm.resistors, R3 and R4 which is 60Hz operating frequency. Ihave chosen NPN Transistor 2N3055A as a switching device. They offer several advantages such as very high input impedance, high switching frequency and low switchingloss.

V. SIMULATION RESULTS AND CONCLUSION

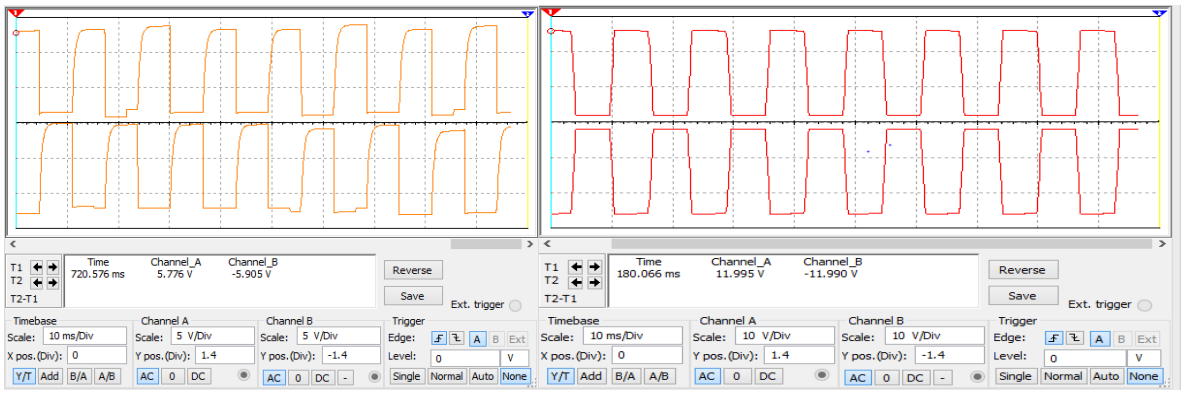

Fig. 4.The Output Waveform of Q1 and Q2 Transistors.Fig. 5.The Output Waveform of Q5 and Q6 MOSFETs.

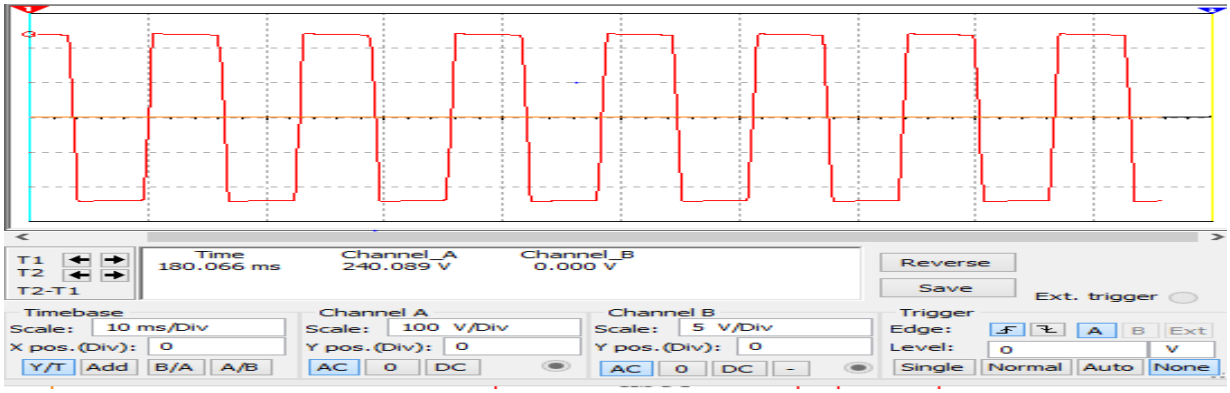

Fig. 6.The Output Waveform of Simulated Push-Pull Inverter Circuit.

The multi-vibrator output of Q1 and Q2 could be fed directly to the gates of NPN Transistors but it needs to be turned 100% ON or 100% OFF for best efficiency. From the Figure 4, it shows that the Q1 and Q2 not generate a nice and clean square wave. It has a problem on the positive slope. There will be dissipation of power if the Transistors are only ½ ON. The time interval between OFF and ON may be small but it is enough to cause the output of Transistor to dissipate power. However, this slope can be use to cause a delay. So, there is a moment of pause between the two Transistors ON time and this will avoid overlap.

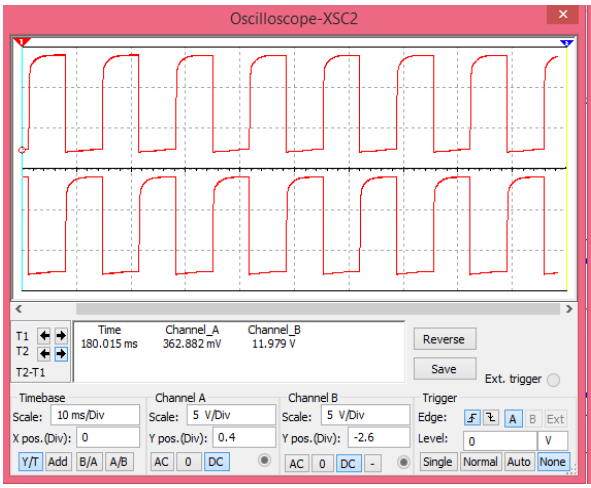

Fig.7.The output waveform of transistors Q1&Q2 in the proposed circuit.

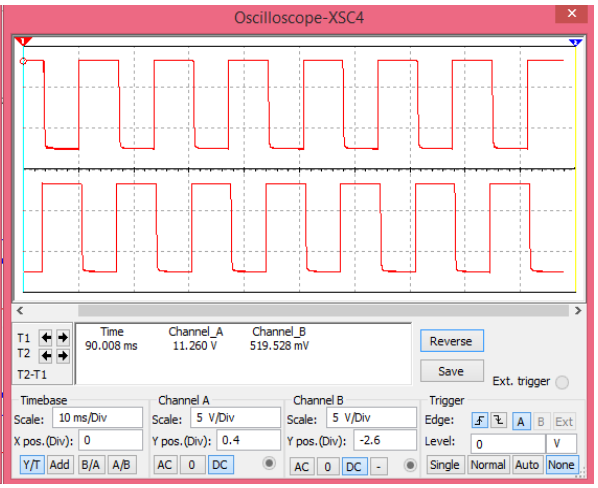

Fig.8.The output waveform of switching transistors Q7 & Q8 in the proposed circuit.

The PNP Transistor switching circuit is use to switch ON andOFF cleanly and also act as a level detector. When thetransistors Q1 and Q2 have reached about 11 Volt, the BD140 and 2N6107 will change the state with clean 0-12 Volt square waves to Q7 and Q8 NPN Transistors.

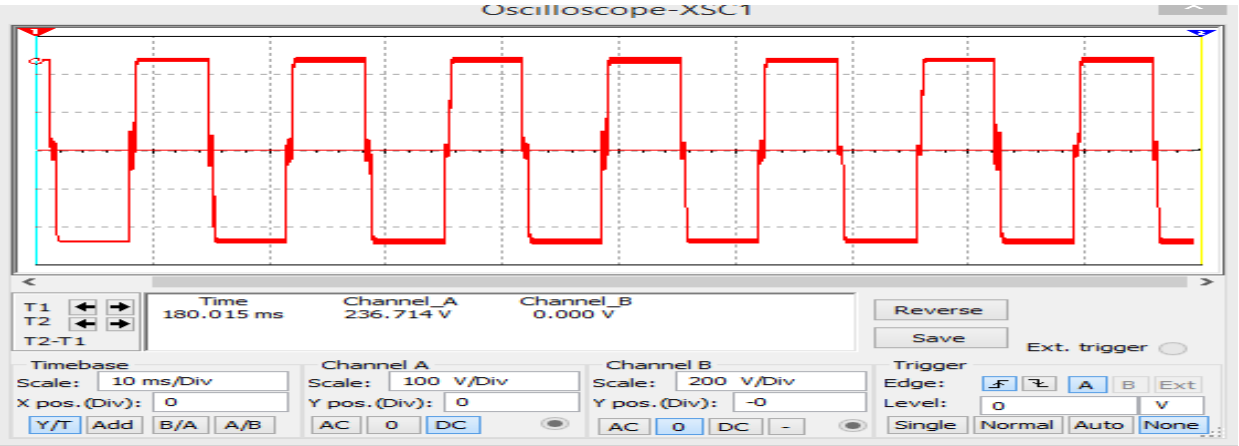

Fig.9.The Output Waveform of Proposed New Push-Pull Inverter Circuit.

VI. CONCLUSION

As from the Results, A Proposed Newpush-pull type inverter is successfully converting 12 volt DC , into 230v A.C , it overcomes the drawback of previous existing circuit with less cost . So it is strong validation for PV system and home appliances

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