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Single Phase MOSFET Inverter Using PWM Technique

Deepa B[1], Soumya D[2], Suhas Havinal[3], Swathi Hoogar[4], Srinidhi B V[5]
[1, 2, 3, 4, 5]*Department of Electrical and Electronics Engineering, Roa Bahadur Y Mahabaleshwarappa Engineering College, Ballari, Karnataka, India*

Abstract: Electricity has two types which are DC (Direct Current) electricity and AC (Alternating Current) electricity. Electricity which generally used for household components is utilized AC electricity. AC power can be generated from DC electricity by using an inverter tool. The inverter has various methods of converting DC power to AC power. In this research, inverter built using full bridge configuration. Using the full bridge configuration, it is obtained more efficient results by using other configurations. The inverter designed using voltage source 12 volt battery with a capacity of 7.5 Ah. The maximum power capacity which generated by the inverter is 100 watts. To control this inverter, Arduino uno R3 microcontroller is used.

I. INTRODUCTION

Technology advancement in both industrial and home appliances will not be separated from the use of AC power. AC power is the most important requirement to power in all household electronic devices. AC-type electricity can be generated through DC (Direct Current) power. The stages to obtain AC power from generating using DC electricity which use a reversing system of the pole of the DC electrical output which connected to the load is called as an inverter. Inverter is a device that can convert alternating voltages into direct voltages with adjustable frequency and level of voltage (Rashid, 1993). The inverter circuit consists of three parts, the first part of a circuit formed from the converter circuit which converts the alternating voltage source of the mesh into a direct voltage and eliminates the ripple at direct voltage output.

The second part is a circuit of inverters that convert a direct voltage into a one-phase alternating voltage phase with the various frequencies. These two circuits are called the main circuit. The third part is a control circuit which functioned as the main circuit controller. The overall combination of the circuit is called an inverter unit. Pulse width modulation or PWM is a commonly used control technique that generates analog signals from digital devices such as microcontrollers.

The signal thus produced will have a train of pulses, and these pulses will be in the form of square waves. Thus, at any given time, the wave will either be high or low. PWM reduces the average power delivered by an electrical signal by converting the signal into discrete parts.

II. CIRCUIT DIAGRAM

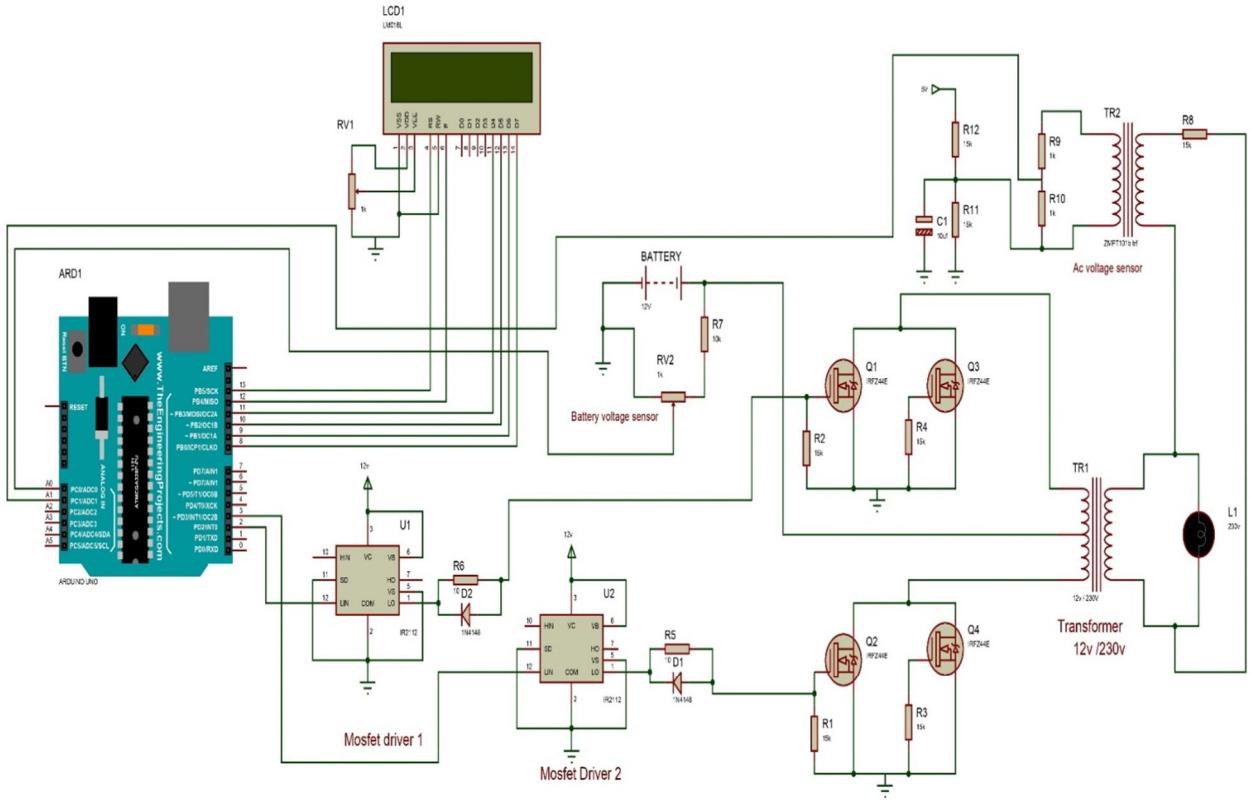
A. Connection

A 12V battery is connected to the boost converter.
The two output of boost converter is connected to Arduino and MOSFET drivers.
MOSFET drivers are connected to the four MOSFETS.
The output of MOSFETS is connected to primary side of the Centre tapped transformer.
The secondary of transformer connected to load.

B. Working

A 12V battery is connected to the boost converter, boost converter boost the voltage and it is connected to MOSFET drivers. These MOSFET drivers are connected to MOSFETs. There are 4 MOSFETs, where 2 MOSFETs are connected in parallel. From a battery is connected to Arduino. The Arduino has timer which is set for 10ms each pulse. MOSFET drivers are connected to MOSFETs and are used to trigger the MOSFETs. During first half cycle MOSFETs will turn on(Q1) and other two MOSFETs will turn off(Q2). Then positive pulse is generated. During another half cycle, Q1 will turn off and Q2 will turn on, then negative pulse is generated. The output of the MOSFETs is connected to Centre tapped transformer. Output is taken out from the transformer. Waveforms are observed in the oscilloscope.

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Circuit Diagram Of Single Phase Inverter Using Pwm Technique

III. ADVANTAGES

1) It improves switching speed.
2) It improves dynamic performance that requires even less power from the driver.
3) It had a highest frequency application and long duty cycle.
4) It has low voltage application .
5) It can be energy efficient way of charging.

IV. CONCLUSION

An Arduino-based PWM inverter is designed and implemented using power MOSFET, which generates 230V square signals at its output from a 12V battery. The system is verified in different ways and proven functional, and useful in the microgrid system. The designed system is also practically constructed and tested to be operational as per the concept. The system takes 12V of voltage from a battery for the inversion process, while the Arduino operates on 10V through a separate voltage regulator. The system uses a total of 4 power MOSFETs .The designed system produce 230V of voltage single-phase. The designed inverter can be applied in a microgrid system or sustainable-powered household and small industrial facility where most electrical tools require single-phase connections.

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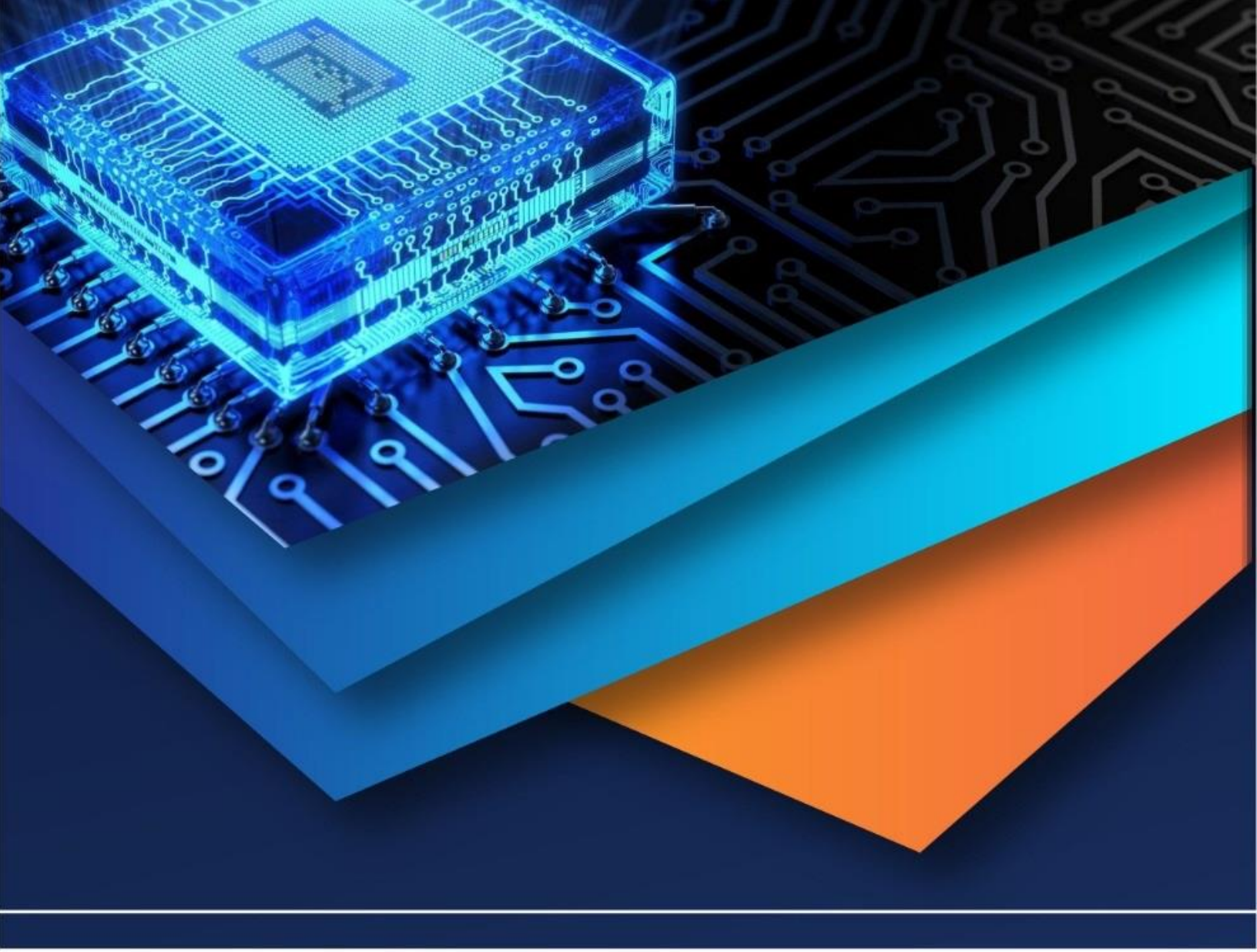
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