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A Survey on Sine wave Inverter with Automatic Changeover Relay

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ABSTRACT: This project is to develop an inverter circuit using electronic components. This project combines the knowledge of electrical and electronics. The objective of this project is to develop an inverter circuit which will convert the direct current voltage from the battery to alternate current voltage. The direct current voltage will be break into pulses through an Integrated Circuit of SG 3524 before it flows through the switching components to obtain the alternate current voltage. The output voltage 12V will be increase to 240V using a step-up transformer to supply the electrical equipments. The inverter circuit will be connected to battery charger circuit to produce a unit of Uninterrupted Power Supply. The components that will be use are low cost and easy to obtain.

KEYWORDS: Introduction, Block diagram, Working, Internal diagram, Applications

I.INTRODUCTION

This report focused on DC to AC power inverters, which aim to efficiently transform a DC power to a high voltage AC power source, similar to power that would be available at an electrical wall outlet. Inverters are used for many applications, as in situations where low voltage DC source such as batteries, solar panels or fuel cells must be converted so that devices can run off of AC power. One example of such a situation would be converting electrical power from a car battery to run a laptop, TV or cell phone. The method in which the low voltage DC power is inverted, is completed in two steps. The first being the conversion of the low voltage DC power to a high voltage DC source, and the second step being the conversion of the DC source to an AC waveform using pulse width modulation. Another method to complete the desired outcome would be to first convert the low voltage DC to AC power, and then use a transformer to boost the voltage to 240V. This project focused on the second method described and specifically the transformation of a low voltage DC source to an AC output. Today there are two different forms of AC output generated: modified sine wave and pure sine wave. A modified sine wave can be seen as more of a square wave than a sine wave; it passes the high DC voltage for specified amounts of time so that the average power and RMS voltage are the as if it were a sine wave. These type of inverters are much cheaper than pure sine wave inverter and therefore are attractive alternatives. Pure sine wave inverters, on the other hand, produces a sine wave output identical to the power coming out of an electrical outlet. These devices are able to run more sensitive devices that a modified sine wave may cause damage to such as: laser printers, laptops, power tools, digital clocks and medical equipments. This form of AC power also reduces audible noise in devices such as fluorescent lights and runs inductive loads, like motors, faster and quieter due to the harmonic distortion.

II. BLOCK DIAGRAM

This is the block diagram of PWM controlled DC to AC inverter. It consist of battery, SG 3524 IC, Transistor or Switching device, Transformer and Load. Here we are using 12V battery source. It provide 12V dc supply to the circuit. In this circuit 12V dc is converted to 230V ac by using PWM control. The 12V dc is supplied to SG 3524 IC by using a 12V 7AH battery. The IC is used to produce PWM pulse for switch ON the transistors. 11 and 14 are the two

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output pins of the IC, The output of the IC is two square pulses with 180° phase difference, it is connected to the base terminal of the two transistors for switch ON the transistors. At a time only one transistor is at ON state and the other one in OFF state. The collector of these two transistors are connected to the primary side of a 12V to 230V center tapped transformer and it step up the 12V ac to a 230V ac with 50Hz frequency.

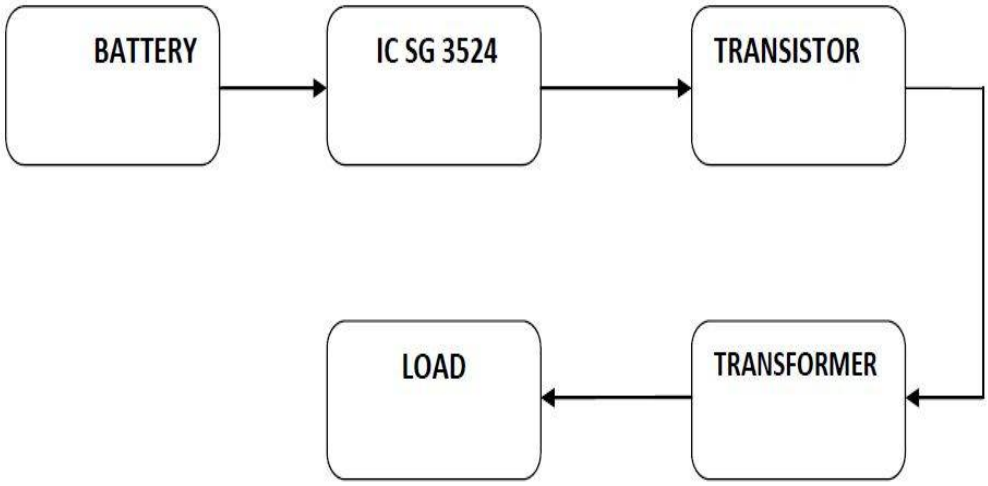

Fig. 1 Block diagram

III. WORKING

The IC SG3524 operates at a fixed frequency, the oscillation frequency is determined by one timing resistor RT and one timing capacitor CT. RT set up a constant charging current for CT. So there exists a linear ramp voltage at CT, which is connected to the comparator. Comparator provides a linear control of the output pulse width (duration) by the error amplifier. The SG3524 contains an inbuilt 5V regulator that supplies as a reference voltage, also providing the SG3524 internal regulator control circuitry. The inside reference voltage is divided on the outside by a resistor network to give a reference to inbuilt error amplifier. The output is sensed by a subsequent resistor divider network and the error signal is amplified. This voltage is then compared with the linear voltage ramp at timing capacitor CT, thus producing a pulse width modulation (PWM) pulse. The resultant PWM pulse from the comparator is passed to the corresponding output pass transistor (Q1, Q2 refer block diagram) using the pulse steering flip flop, which is synchronously toggled by the oscillator output.

IV. INTERNAL BLOCK DIAGRAM OF PWM CHIP SG3524

The oscillator output pulse also acts as an inhibiting pulse to make sure that both the transistors are never turned ON simultaneously. The duration of this pulse is determined by the value of CT. The pin 11 and 14 are connected to the TIP transistor for driving the transformer. T1 is a 12-0-12 V primary, 220V secondary, 300VA transformer.

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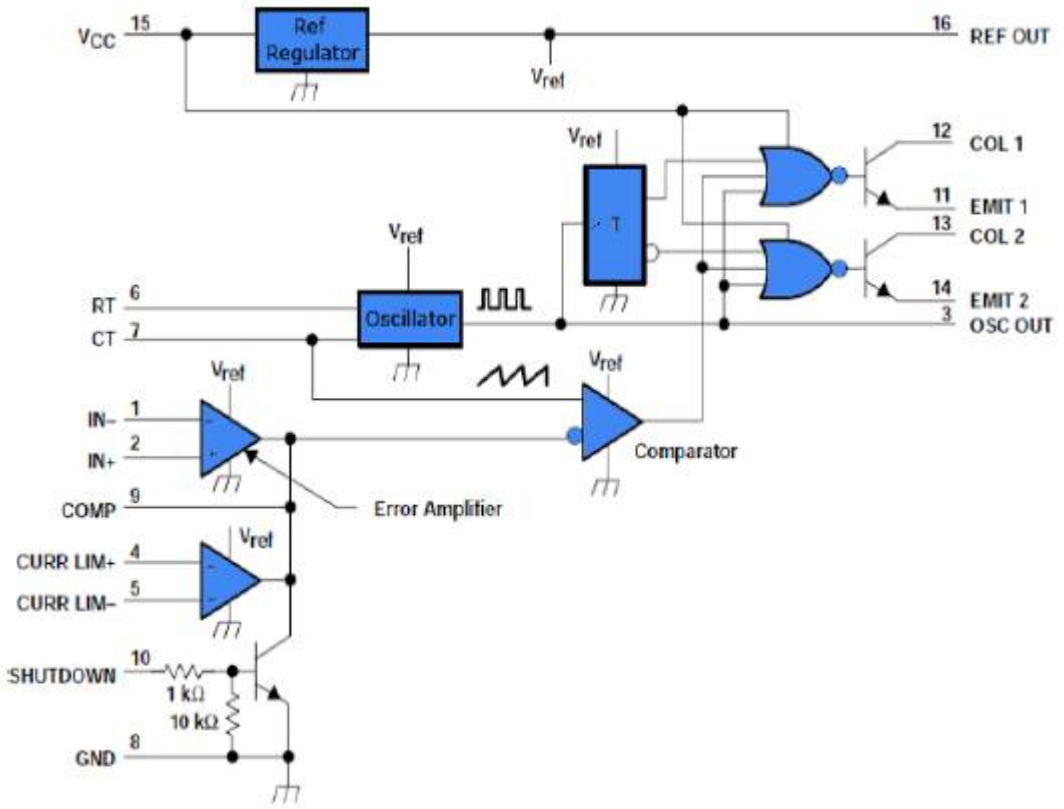

Fig. 2 Internal block diagram of PWM chip SG3524

When signal at pin 14 is high, upper transistor is switched ON and current flows from the +12V source via the upper half of the transformer to the ground. When 11 of the IC pin goes high, lower transistor gets switched ON and current flows from the +12V source via the lower half of the transformer primary and sinks to the ground. Thus we got positive and negative half cycles of 220V AC supply.

V. APPLICATIONS

It can applicable many power applications like electric tube light, kitchen appliances, power tools, TVs, radios, computers and many more electronics gadgets we are using. Various inverters may have different features making them better suited for different specific applications. Very small inverters are available that connect to a car cigarette lighter, with a single three-prong AC outlet as the output. Large inverters are generally designed to be hardwired into a building electrical system. Some inverters offer 240 volts output. The right inverter for any specific use can be found with the help of an experienced inverter dealer. It's will be useful in all electronic applications, when using pure sine wave power. True sine wave inverters will produce AC power as well as a better than utility power, Ensuring that even the most sensitive equipment will run properly.

VI. ADVANTAGES

- The output wave-form is a sine-wave with very low harmonic distortion and clean power like utility supplied electricity.
- Inductive loads like microwaves and motors run faster, quieter and cooler.
- Reduces audible and electrical noise in fans, fluorescent lights, audio amplifiers, TV, fax and answering machines.
- Pure Sine Wave output is the most compatible AC power from an inverter, and it is the best waveform for all AC electrical appliances.

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- Pure Sine Wave output eliminates interference, noise, and overheating.
- Reduces audible and electrical noise in fans, fluorescent lights, electronics gear and magnetic circuit breakers.
- Prevents glitches and noise in monitoring equipment.
- It can be efficiently electronically protected from overload, over voltage, under voltage, and over temperature conditions.
- Inductive loads like microwave ovens and variable-speed motors operate properly, quieter and cooler. Some appliances will not produce full output if they do not use Pure Sine Wave power.
- Some appliances, such as variable speed drills and bread makers, will not work properly without Pure Sine Wave power.

VII. DISADVANTAGES

- More expensive than Modified Sine Wave power inverters.
- Physically larger than Modified Sine Wave inverters.

VIII. CONCLUSION

In general, this project has been successfully carried out and satisfies the overall aim and objectives of the project. PWM dc to ac voltage inverter circuit based on IC SG 3524. The built in circuitries inside the SG3524 include pulse width modulator, oscillator, voltage reference, error amplifier, overload protection circuit, output drivers etc..SG3524 forms the heart of this PWM inverter circuit which can correct its output voltage against the variations in the output load. In this project we learned PWM control and team work. We also learned PWM techniques. Using PWM theory if greater the control voltage wider is the resultant pulse. Using sinusoidal frequency as the control voltage for PWM circuit, it is likely to generate a high power waveform whose average voltage varies with sine waveform, which is suitable for driving ac loads.

IX. ACKNOWLEDGEMENT

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