



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 9, Issue 10, October 2020

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

Single-Phase Counter Driven Inverter with Less Number of Power Elements

Harishankar G Nair¹

Lecturer, Department of Electrical and Electronics Engineering, SCMS College of Polytechnics, Perumbavoor, Kerala, India¹

ABSTRACT: Need for a new type of inverter is very essential in the present scenario. Existing inverter topologies are expensive and go beyond the budget for home application. Common drawbacks associated with existing low cost inverters are square-wave output, bulky size, noisy output voltage and poor efficiency. The main disadvantage of the present day inverters are, large number of required power semiconductor switches and related gate driver circuits. This may cause the overall system to be more expensive and complex. So in practical implementation, reducing the number of switches and gate driver circuits have become an essential point.

Here a low cost inverter with less number of switches and thus less gate driver circuits and less circuit layout complexity is implemented. Instead of using Power MOSFET as a static switch, here the analog operation is used. Gating signals to the MOSFET are generated by a decade Johnson counter. Thus a pure sine wave output is obtained.

KEYWORDS: Johnson Counter; Power MOSFET.

I. INTRODUCTION

Now a day we are facing the difficulties of power cuts in our day – to –day life. In this scenario we are forced to find out other power sources for our daily life. The easy way is to use the solar power stored in batteries. We know that all our electrical/electronic gadgets need AC power sources, whereas the solar cells or batteries generate DC power. Thus we need an efficient DC to AC converter to make our equipments run safely.

This project focuses on DC to a high voltage AC power inverters, which aim to efficiently transform a DC power source to a high voltage AC source, similar to power that would be available at an electrical wall outlet.

A power inverter, or inverter, is an electrical power converter that changes direct current to alternating current; the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching and control circuits. Solid-state inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power.

There are mainly two methods available for converting DC power into AC. In the first method, the low voltage DC power is converted to a high voltage DC source, and in the second step this high voltage DC power to an AC waveform using pulse width modulation. Another method to attain the desired outcome is that, first convert the low voltage DC power to AC, and then uses a transformer to boost the voltage to 230 volts.

This paper focuses on the second method described in a special way. Of the different DC-AC inverters available in the market today, there are essentially 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 same as that of a sine wave. These types of inverters are much cheaper than the pure sine wave inverters and therefore are attractive alternatives.

Pure sine inverters on the other hand, produce a sine wave output identical to the power coming out of an electrical outlet. These devices are able to run more sensitive devices on the contrary a modified sine wave may cause damage to such as laser printers, power tools, and medical equipment. 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 low harmonic distortion. This project is developed as a low cost inverter with less number of switches and gate driver circuits. So the circuit layout is simple yet power full. Instead of using Power MOSFET as a static switch, here the analog operation is used. Gating signals to the MOSFET are generated by a decade Johnson counter and resistive network. A small bipolar transistor is used to drive the mosfets. An LC filter circuit is used to generate the pure sine wave. In any mode comparison, this inverter is cheaper than the other pure sine wave inverters in the market, and it is the specialty of this project.

II. BLOCK DIAGRAM

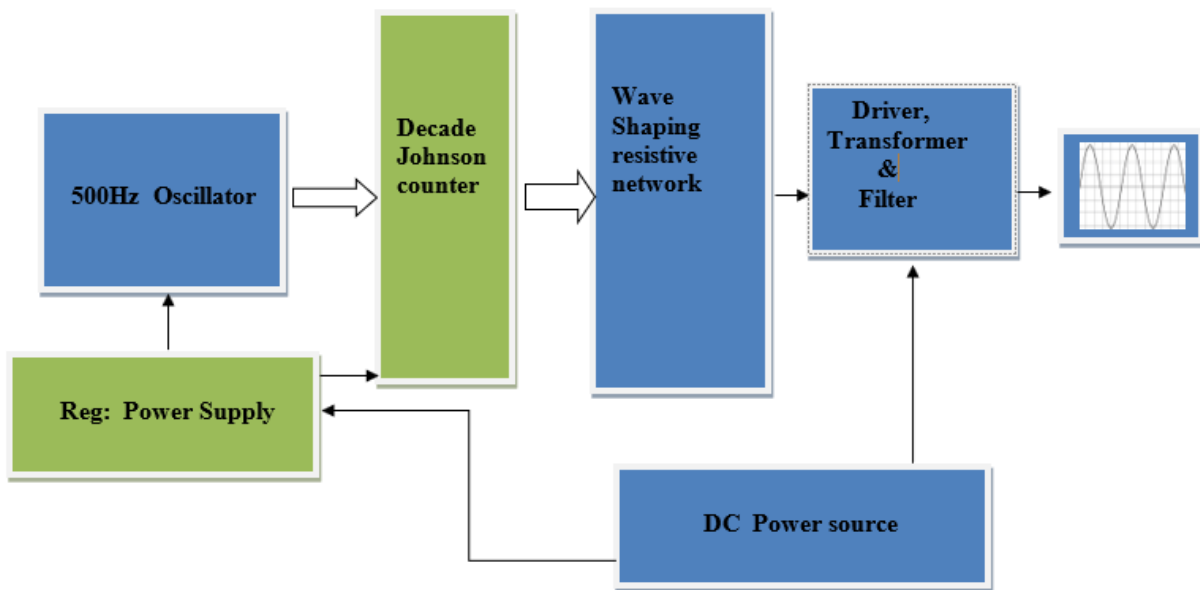


Fig1:Block diagram

The block diagram of the Single-Phase Counter Driven Inverter With Less Number of Power Elements is as shown above. It consists of the following blocks.

- 500Hz oscillator with 70% duty cycle.
- Decade Johnson counter.
- Wave shaping resistive network circuits cum adder.
- Driver Switching devices and Transformer with filter.
- Power supply regulator for oscillator and counter.
- DC power source.

Each and every blocks of this inverter do different duty to produce a fine sine wave at the power output.

500 Hz Oscillator With 70% duty Cycle.

This block is the heart of the inverter, where the accurate and precise wave form is generated. For this purpose the 555 timer chip is used in astable mode with 70% duty cycle. This block needs a perfect power supply for its operation without any shift in frequency so a regulated power is given to it from the main DC power source using regulator

Decade Johnson counter.

A level shifted wave form is used to generate the sine wave in the output of this inverter. Here a simple technique is used to generate such a wave form. As we know that the half wave period of a 50Hz signal is 10ms. A decade Johnson



counter divides the input frequency in to ten, so each output has 2ms duration. Here a three level voltage wave form with five steps is used to drive the MOSFETs through the driver stage. So the five pulses from the counter are used to drive the first half cycle of the main output and another five pulses for the remaining half cycle. These two half cycles are added in the transformer to give a 50Hz sine wave.

Wave shaping resistive network circuits and Driver

The stepped waveform for driving the MOSFETs is generated in this module by this block. This is simply a voltage divider network. A regulated six volt is equally divided in to three levels. These voltages are summed up to get a single wave form with five steps using diodes as voltage adder circuit. The voltage thus generated is not at all powerful to drive the driving elements directly. After necessary filtering this signal is powered by the driver stage and finally which drives the MOSFETs. The final output stage of the inverter use a push pull circuit wired around MOSFETs and a step up transformer, here the wave forms added and filtered to generate the early described sine wave for powering the equipment.

Power supply regulator for oscillator and counter.

The power for the operation the inverter is provided by the high capacity tubular batteries for long use. Protues ISIS Professional software is used in the design and simulation of this inverter, after successful simulation the hardware unit is built and tested with load. The results were positive and satisfactory.

III. WORKING

Working of the inverter is simple and straight forward. The astablemultivibrator produces a square wave at a frequency of 500Hz with duty cycle of 50%. The components are selected with the lowest tolerance to give a frequency as stable as possible. This square wave signal is send to the clock input of the decade Johnson counter, divide it by ten to give ten pulses with a time period of 2ms. Five of these pulses are added with resistive network to get a five step stair case signal with three levels having a time period of 10ms to drive the first MOSFET and another five pulses are grouped for the second MOSFET. The signals from the resistive network are not enough power full to drive the mosfets directly, so that they are boosted to the required level by a driver stage.

The drains of the MOSFETs are connected to the primary winding of the step up transformer. The center tap of this transformer is connected to the positive terminal of the DC source. The voltage at the secondary is filtered with a capacitor and the secondary winding itself to give pure sine wave. The power to the oscillator and other parts of this circuit is given by using static regulators. All the wave forms taken from CRO is shown in the respective figures.

IV. SIMULATION AND RESULTS

Simulation diagram

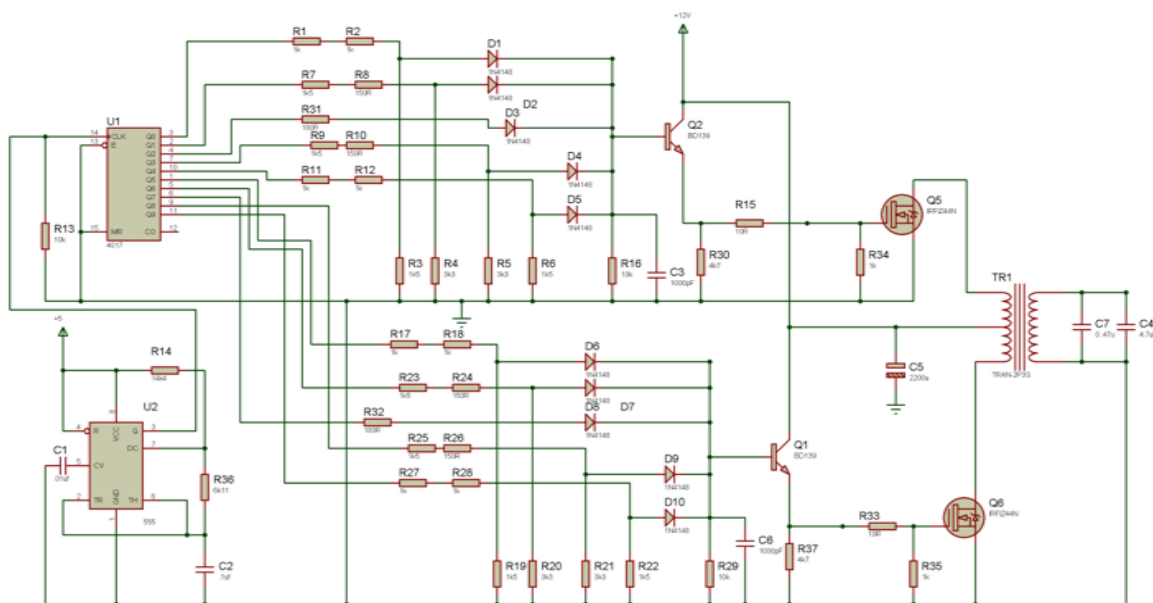


Fig2:Simulation Diagram

Figures shows the results of text detection from an image and inpainting by using exemplar based Inpainting algorithm. Figs. 2, 3, 4 (a) shows the original image. (b) is the image obtained by applying first set of criteria. All objects whose area greater than 10000 and filled area greater than 8000 are eliminated and major axis lengths are in between 20 to 3000 are considered to be text. Still, some small non-text objects are detected.

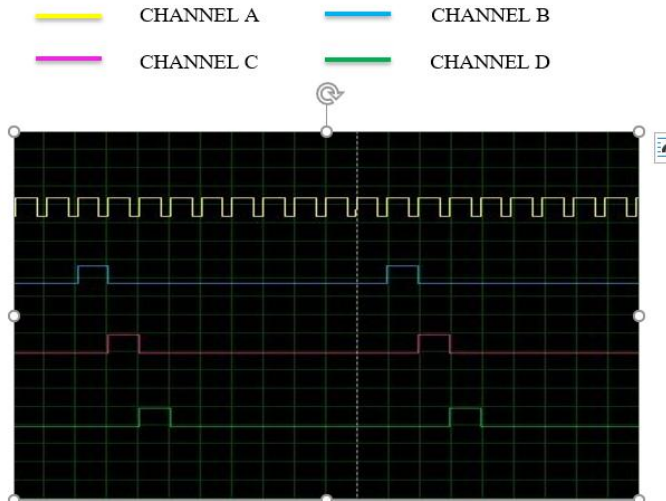


Fig 3. A: 500 Hz Clock Signal ,B, C, D – Q0 Q1 Q2 outputs of decade Johnson counter respectively



Fig4. A,C - Five step output wave forms of voltage divider network



Fig5.A Clock signal, B, C- five step output waveforms of voltage divider network



V. CONCLUSIONS

The topology used in this paper has a lot of advantages compared to conventional methods and also the number of switches used is less. This can reduce the cost of the system

REFERENCES

- [1] DIGITAL FUNDAMENTALS - Thomas Floyd
- [2] Z SOURCE INVERTERS,IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS -F.Z PENG



INNO  **SPACE**
SJIF Scientific Journal Impact Factor

**Impact Factor:
7.512**

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



www.ijirset.com

Scan to save the contact details