



Transformer Less Invertors: A Detailed Review

¹ SANJU GOTHWAL, ² APURVA VASHISHTH

¹Research Scholar, ²Assistant Professor

^{1,2}Department of Electrical Engineering, Rajasthan College of Engineering for Women

Abstract : Transformer less technology is one of the innovations that the tech industry solves a problem for the collective community, and offers utility and IFO owners unlimited power distribution, while reducing complexity. This means that typical commercial PV installations can modify their power delivery, which means they'll be more efficient and less costly. If you are considering transformer less inverters instead of the more traditional versions, you may also want to take into consideration that they are lighter and smaller than their transformer counterparts.

Index Terms: Transformer less Invertors, Power Systems, Invertors

I. INTRODUCTION

Transformers are used in traditional inverters to convert low voltage AC to high voltage. Transformers less inverters don't need a standard transformer because they use a unique electronic circuit. Transformers are not needed in transformer less inverters since they use DC input from solar panels or batteries, which is inverted to standard 120VAC or 230VAC output using three stages: oscillator, boost converter and H-bridge. A boost stage in a converter will take as input a low voltage DC and output a higher voltage. The output of this phase is inverted to produce standard 50/60Hz AC by the H-bridge phase, which then feeds it into your home.

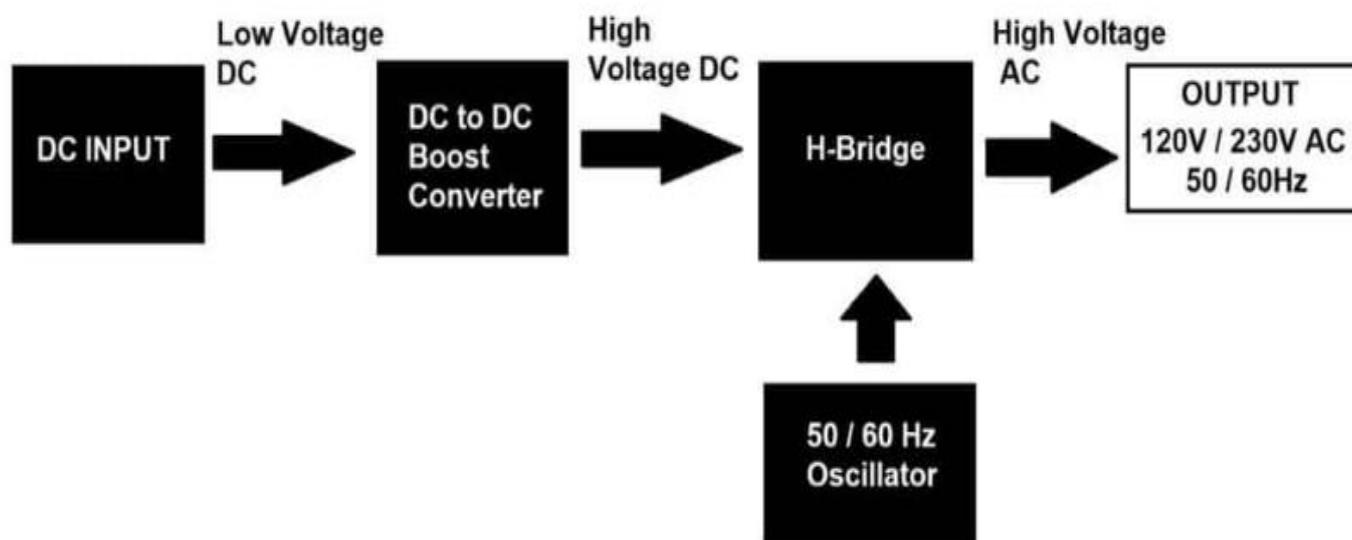


Fig 1.1 Transformer Less Invertor

The small size of the high-efficiency DC to DC boost converter is what allows us to eliminate the bulky transformer. The boost converter circuit takes up little space and it can be built into the main PCB. This is because an H-bridge and boost converter do not produce losses that are as large as those of an iron-core transformer.

If you don't have a power outlet nearby, a power inverter can come in handy. It transforms lower-voltage direct current (DC) electricity to higher-voltage alternating current (AC) for your appliances. Transformers can be difficult and expensive to install, so a transformer less inverter is an option for those who don't want Transformers. The electronic components inside a transformerless inverter change low-frequency DC power to high-frequency AC power. There are three steps in this process: one sends power to the inverter, one changes the electricity from AC to DC, and the third converts back from DC to standard AC voltage.

II. DIFFERENCE IN TRANSFORMER LESS AND TRANSFORMER BASED

The difference between transformer less and transformer based ,

Parameters	Transformerless Inverter	Transformer based Inverter
Input / output isolation	No galvanic isolation exist between input and output.	Galvanic isolation exist between input and output due to the transformer.
Efficiency	Best efficiency, greater than 95%.	Reasonably (good) efficiency, above 85%.
Voltage step-up by?	DC to DC boost converter.	Iron core step-up transformer.
Power	Typically used where power demand is low, less than 10KVA.	Used where power demand is high 100KVA or more.
Size	Overall smaller dimension.	Bulkier than transformerless type.
Weight	Light weight.	Heavy & can get heavier if power requirement is high.
Cost	Cheaper than transformer based.	Expensive than transformerless type.
Applications	Commonly used in solar farms, solar roof installations for best efficiency and data-center's backup system where space is luxury.	Commonly used in line interactive backup UPS (uninterruptible power supply).

III. CIRCUIT FOR TRANSFORMER LESS INVERTORS

The three best circuits for transformer less inverters are the IC 4047, a 200-watt compact design, and solar inverter circuits. They are small, relatively simple, and rely on external battery power or solar energy - instead of construction with an internal transformer.

3.1 IC 4047

The IC 4047 is a simple transformer less inverter circuit that doesn't require bootstrapping and special driver ICs. It's a good choice for hobbyists who won't be using it in professional or commercial applications because of two key shortcomings: two to three times larger than comparably sized N-channel inverters with a decreased temperature tolerance and increased current ratings. It's an inexpensive, configurable chip that offers both single and multi-vibrator modes. The IC is perfect for use in a wide range of applications. In the single mode, it can be triggered by an external input or its own natural oscillation. When you use it in the multi-vibrator mode, there are several triggers to choose from: you can use true gating or negative gating to your advantage. The program is able to wait for your determined duration in order to create a cycle. The RF433-R contains a built-in oscillator that allows you to choose between a variety of frequency options.

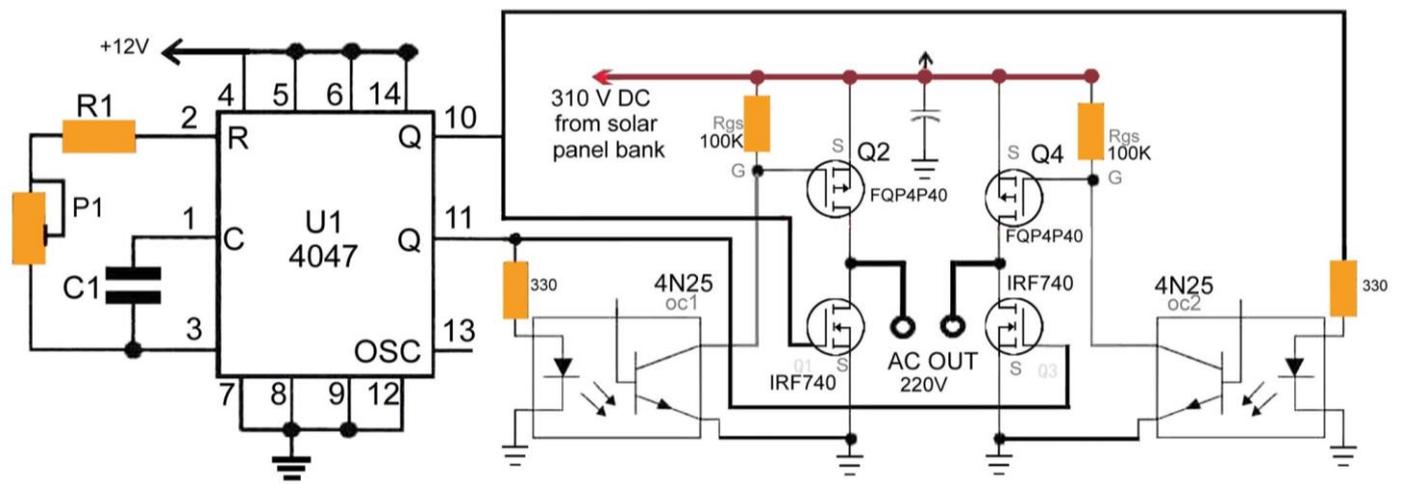


Fig 1. IC 4047

3.2 200-Watt Compact Design

The 200-watt configuration is simple and powerful, requiring no big transformer. The batteries that power it don't take up much space and output 110 V AC at 200 watts. The 200-Watt inverter circuit needs an input voltage of at least 18v to work. This can come from 18 12-volt batteries, one of which will power the circuit.

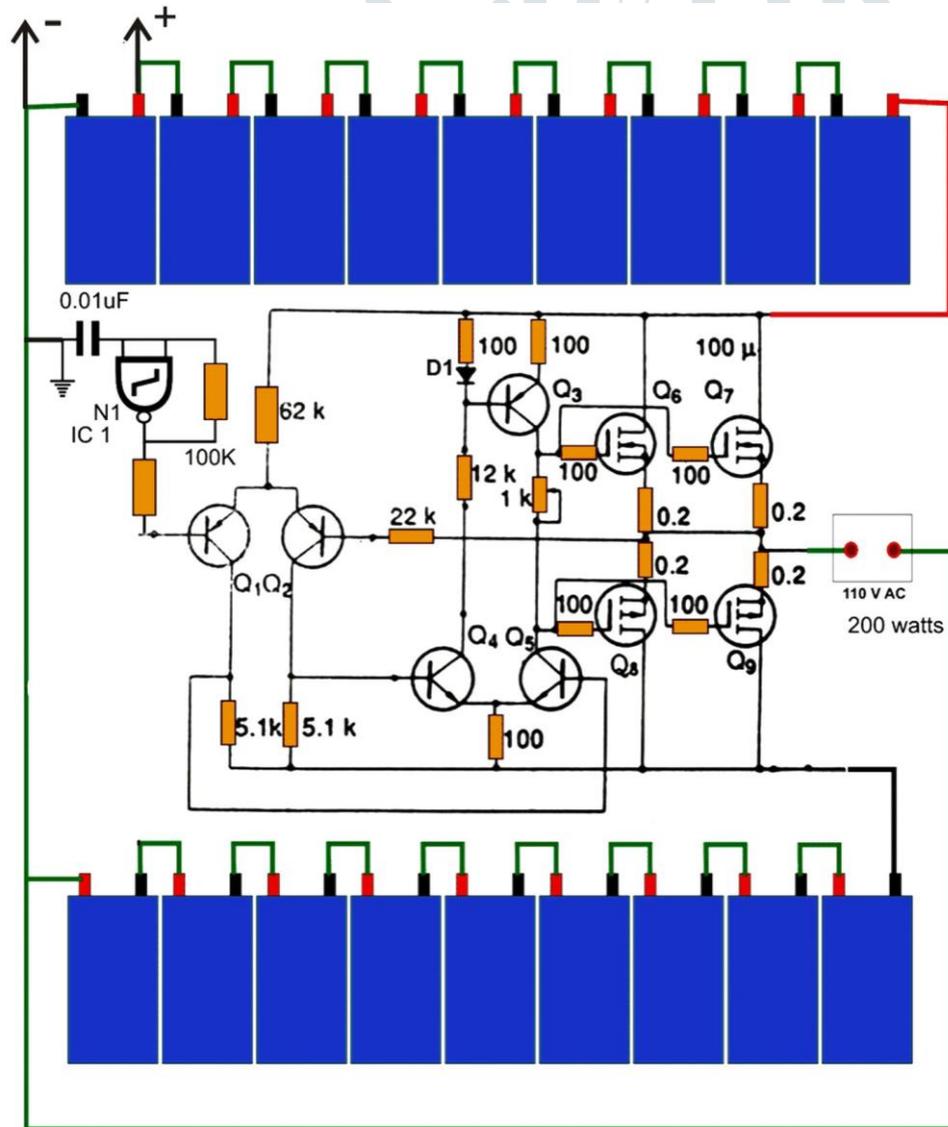


Fig 2. 200-Watt Design

3.3 Transformer less Solar Inverter Circuit

Transformers in traditional solar inverter circuits can be eliminated by using high-voltage MOSFETs. A voltage regulator is often a helpful addition who regulates power fluctuations based on the fluctuation between power loss and gain that happens based

on sunlight intensity changes. Transformers play an important role in inverter circuits. For solar inverters, these are transformerless circuits which convert solar energy into AC electricity. The three stages of this type of circuit are the oscillator stage, the power delivery stage, and the output stage. A transformer less solar inverter circuit design is created by employing high voltage MOSFETs that are designed to harness solar energy. A voltage regulator can help regulate power fluctuations, which can be based on power loss and gain from sunlight fluctuations.



Fig 3. Solar Inverter Circuit

IV. CONCLUSION

Transformers can be found in two different styles of inverters: separately or combined with the semiconductor. Transformer less models are cost-effective, because of the fewer and more efficient electrical components. This makes for a lot more versatility with circuits, but the key advantage to transformer less models is their versatility. One way to maintain a lower cost is by using smaller appliances and electronics. And in many cases, this also helps to reduce the environmental impact. Depending on the DC output needed, there are different kinds of circuits and transformers. Alternatively, the transformer less ones give you the advantage of speed and efficiency. This technology has been developing for decades, with promising advancements in recent years.

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