

A project report
on
MINI INVERTER 12V TO 220V

Submitted by

Virat varma 180060006

B.Ajaykumar 180069035

Sai kiran.G 180069036

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IN
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This is to certify that **Mr.Viratvarma -18006006, Mr..Ajay kumar-180069035, Mr. Saikiran.G-180069036** of section 1 studying II/IV B.Tech in **EEE** has satisfactorily completed project **MINI INVERTER 12V TO 220V** in the semester **II** during the academic year 2019-2020

Signature of Course Instructor

Signature of Course Coordinator

Signature of HOD

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Virat varma 180060006

B.Ajaykumar 180069035

Sai kiran.G 180060036

ABSTRACT

This power electronics device which converts DC power to AC power at required output voltage and frequency level is known as inverter. First of all, This project aims to produce a 12V DC power supply into 240V AC output, Using a transformer to step up the power. It is also can capable of producing 1000 watt of output power.

An inverter circuit is use to invert the DC energy into AC. This circuit Needed to apply to the home electronics equipments. The circuit is to produce Sine wave output with low noise with applies up to 220-240 AC. This circuit is At the last stage of the report, we give some suggestion and recommendation About the future development and make it becomes more technology.

In the future, we want target to commercialize and go through world Market for our project. As we know, every one of it project has their advantage And disadvantage.

Beside of that, we have to reduce the entire disadvantage as much as Very well, we can to make it useful and easy to use for another people.

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1.1 Introduction of project

Project is one of the thing which obligatory be taken by each final year Student whose had taken diploma in E.C. Engineering to fulfill condition to be Bestowed diploma. For this section, we will be exposed to our research; on What kind of method have been used by us in order to get information and the Data for our project that is **Inverter single phase**. Some theoretical Background about inverter single phase is basically on how the it our self Operates and how it could possibly be done. The main components that we

Have implemented in the construction of inverter single phase will also be Provided. This project is can use for the small places, camping area and Other a place is same thing it. So, that why we develop this project. By do this Project also we can learn many more about a new thing.

This report focuses on DC to AC power inverter, 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. Inverters are used For many applications, as in situations where low voltage DC sources 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 high voltage DC source, and the second step being the conversion of the high 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 power to AC, and then use a transformer to boost the voltage to 240 volts. This project focused on

the first method described and specifically the transformation of a high voltage DC source into an AC output. Of the different DC-AC inverters on 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 if it were a sine wave. These types of inverter are much cheaper than pure sine wave inverters and therefore are attractive alternatives.

Pure sine wave 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 that a modified sine wave may cause damage to such as: Laser printer, laptop, 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 low harmonic distortion.

CHAPTER-2

LITERATURE SURVEY

PROCESS OF PROJECT SELECTION

AC electrical power supply can be used most electronic devices. It will be difficult to use these devices that electric goes off. This problem can be solved by the use of inverter.

DC to AC converter known as an inverter. This function of inverter is to change DC input voltage to a symmetrical AC output voltage of desired magnitude and frequency. There are various kind of watt in the inverter according to $P=VI$. Watt is dependent on the current. The using of watt gets form transformer, coil wire depending on the ampere.

There are various types of inverter, and they are classifies according to the No. of the phases. Use of power of semiconductor devices, communication principles and output waveforms. We will first look single phase inverter. Secondly, we will discuss voltage source inverter(VSI) and current source inverter(CSI). Inverter are used many different industrial applications including the speed control of induction and synchronous motors, induction heating, aircraft power supplies, uninterruptible power supplies(UPS) and high voltage DC transmission.

Town and countries which have no sufficiently light use inverter. It is an essential device to increase for lives. So, we study inverter and then we can know electrical and electronic knowledge.

WORKING PROCESS OF PROJECT

Here is a 100 Watt inverter circuit using minimum number of components. I think it is quite difficult to make a decent one like this with further fewer components. Here we can use CD 4047 IC from Texas instruments for generating the 100Hz pulses and four 2N3055 transistors for driving the load.

The IC CD 4047 wired as an Astable multivibrator produces two 180 degree out of phase 100Hz pulse trains. These pulse trains are preamplified by two TIP122 transistors. The outputs of the TIP122 transistors are amplified by four 2N 3055 transistors (two transistors for each half cycles) to drive the inverter transformer

The 220V AC will be available at the secondary of the transformer. Nothing complex just the elementary inverter principle and the circuit works great for small loads like a few bulbs or fans. If you need just a low cost inverter in the region of 100W, then this is the best.

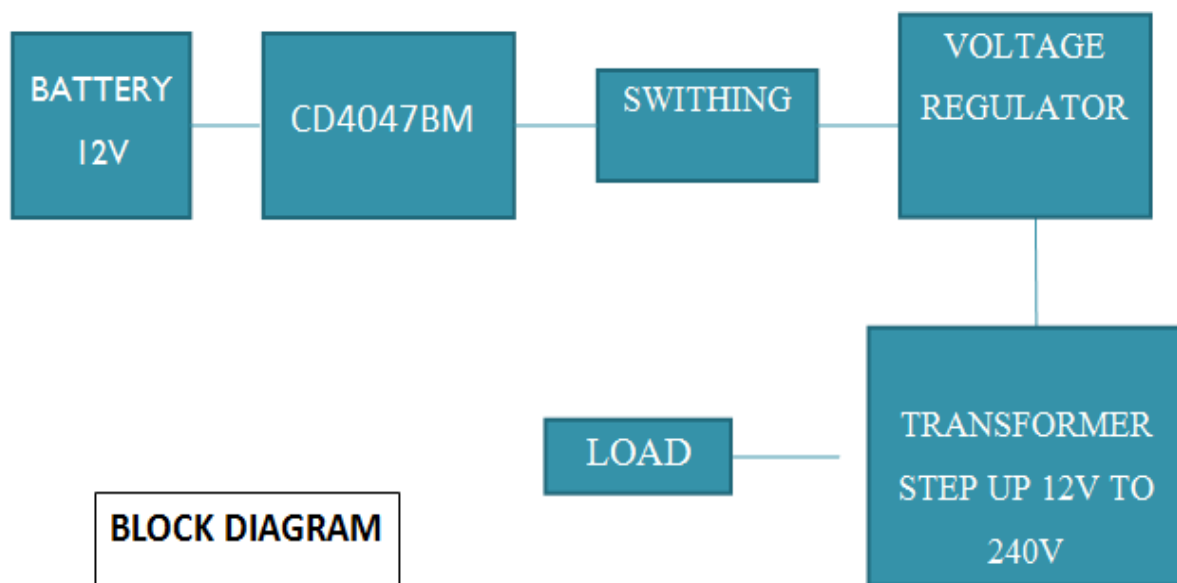
NOTES:

- A 12V car battery can be used as the 12V source.
- Use the POT R1 to set the output frequency to 50Hz.
- For the transformer get a 12-0-12V, 10A step down transformer. But here the 12-0-12V winding will be the primary and 220V winding will be secondary.
- If you could not get a 10A rated transformer, don't worry a 5A one will be just enough. But the allowed output power will be reduced to 60W.
- Use a 10A fuse in series with the battery as shown in circuit.
- Mount the IC on an IC holder.
- Remember, this circuit is nothing when compared to advanced PWM inverters. This is a low cost circuit meant for low scale applications.

CHAPTER3

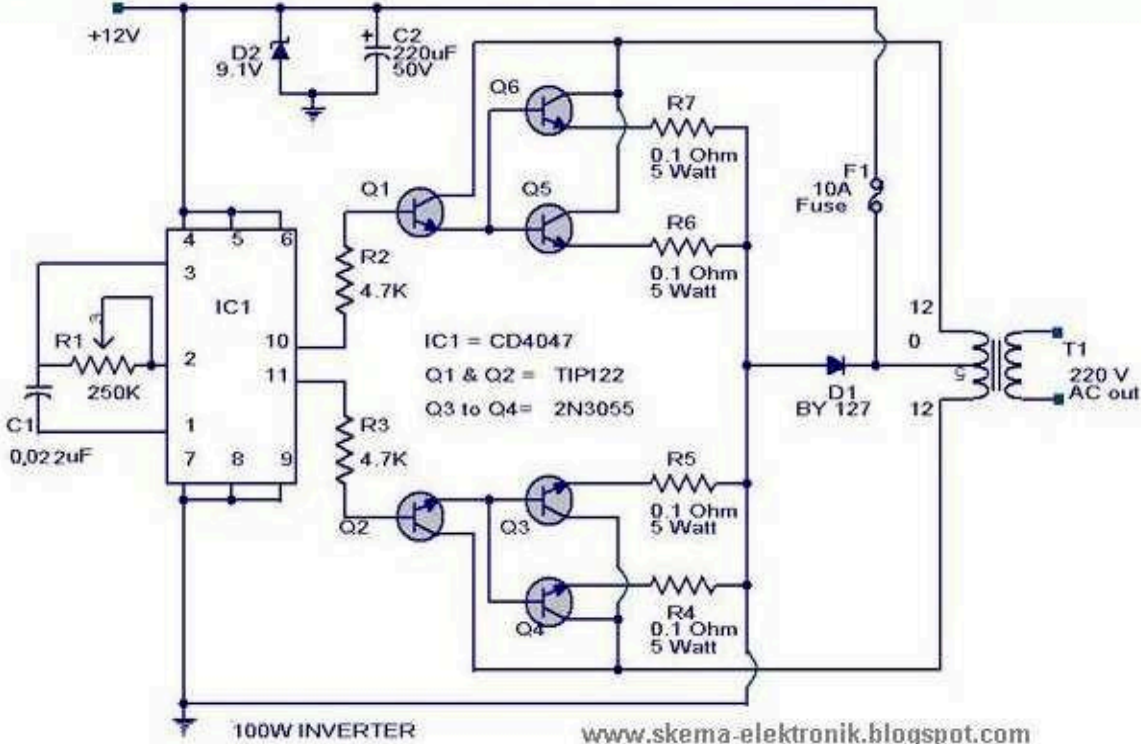
INVERTER

BLOCK DIAGRAM FOR INVERTER

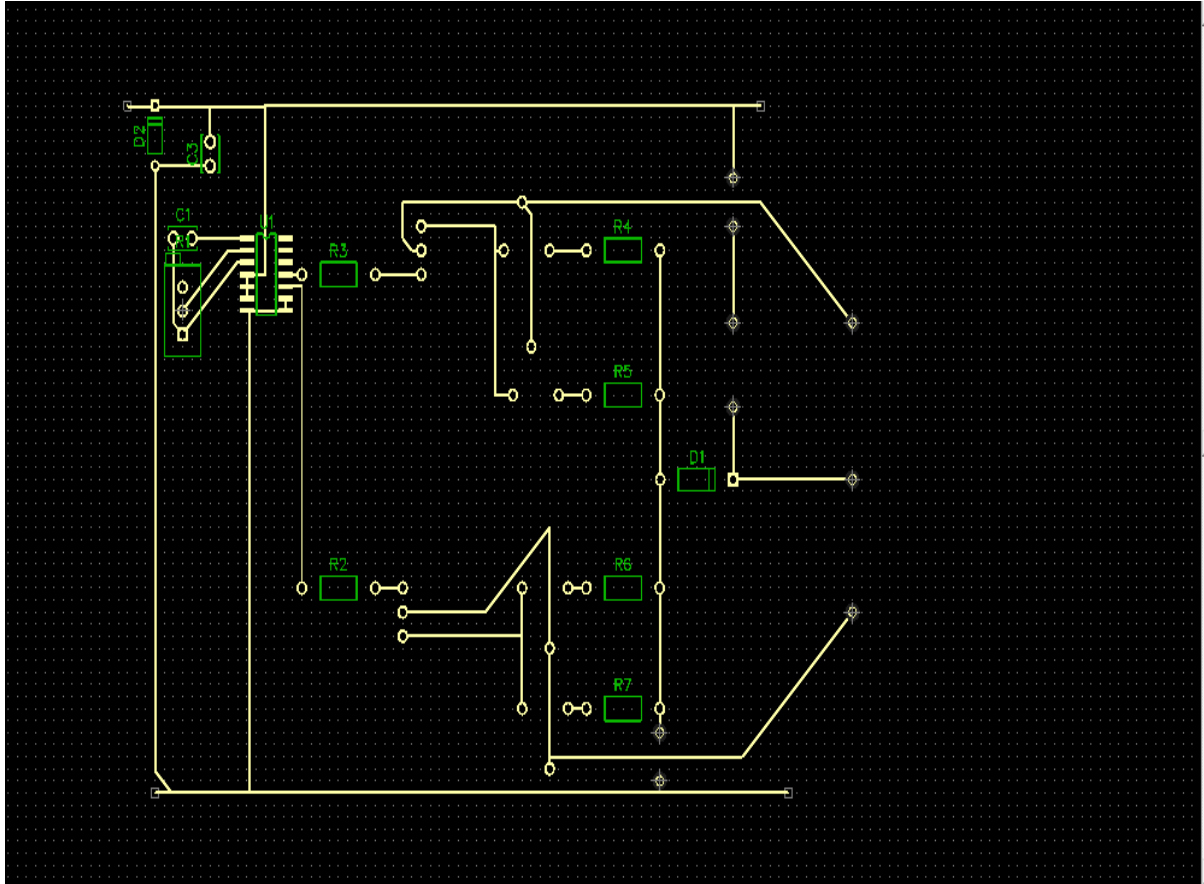


In this block diagram we show that we give 12V supply to complimentary MOS astable/bistablemultivibrater.Then we take output 180 in phase and 180 outphas.And it given to switching transistor TIP 122 transistor given in it base.And collector supply is given to high power level tranistor TIP3055.We used TIP3055 in place of 2N3055 complimentary high power tranistor. It goes to voltage regulator. It is regulate the voltage level. Through the zenor diode and capacitor. And step-up transformer converts 12V to 240V and it is give toload.

CIRCUIT DIAGRAM FOR 100W INVERTER



LAYOUT OF 100W INVERTER





SCHEMATICS - PCB LAYOUT - AUTOROUTING

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We use the DIP TRACE software for the designing the layout.

In PCB layout make reference designators visible: select “View/Pattern marking/refdes”. This command allows a global refdes visibility and shows all reference designators on the screen(except for the components with individual setting).If the marking justification doesn’t look acceptable, select “View/Pattern marking/main justify in the submenu select “Auto” or another mode you want. To define the individual parameters for the selected components: Right-click one of the components, Properties-Marking. Also remember that you can use“F10”or”View/Pattern Marking/Move Tool” to move designators.

Probably the configuration of connections after the placement is not convents if you plan to route the design manually, so select “View/connections/optimize” from main menu to optimize theconnections.

CHAPTER-4

COMPONENTS

LIST OF COMPONENTS

❖ IC

- CD4047BC

❖ OTHER COMPONENT

- BATTERY 12V
- TRANSISTOR
 - 1) TIP 122
 - 2) TIP 3055
- PLUG 5A
- SWITCH MCB
- TRANSFORMER (STEP UP)
- RESISTOR
- DIODE
- VARIABLE RESISTOR (250K)
- CAPACITOR
- FUSE (10A)
- WIRES
- CMOS PLASTIC PACKAGED DIODE
- HEAT SINK

COMPONENT DISCRIPTION

CD4047BC

The CD4047B is capable of operating in either the monostable or astable mode. It requires an external capacitor (between pins 1 and 3) and an external resistor (between pins 2 and 3) to determine the output pulse width in the monostable mode, and the output frequency in the astable mode. Astable operation is enabled by a high level on the astable input or low level on the astable input. The output frequency (at 50% duty cycle) at Q and Q outputs is determined by the timing components. A frequency twice that of Q is available at the oscillator output; a 50% duty cycle is not guaranteed.

Monostable operation is obtained when the device is triggered by LOW-to-HIGH transition at +trigger input or HIGH-to-LOW transition at – trigger input. The device can be retriggered by applying a simultaneous LOW-to-HIGH transition to both the +trigger and retrigger inputs. A high level on reset input resets the outputs Q to LOW, Q to HIGH.

FEATURES

- Wide supply voltage range 3.0V to 15V
- High noise immunity 0.45VDD(typ.)
- Low power TTL compatibility: fan out of 2 driving 74L or 1 driving 74LS

Monostable multivibrator features

- Positive or negative edge trigger.
- Output pulse width independent of trigger pulse duration.
- Retriggerable option for pulse width expansion.
- Long pulse widths possible using small RC components by means of external counter provision.
- Fast recovery time essentially independent of pulse width.
- Pulse width accuracy maintained at duty cycles approaching 100%

Astable multivibrator features

- Free-running or gettable operating modes.
- 50% duty cycles.
- Oscillator output available
- Good astable frequency stability typical = $\pm 2\% + 0.03\%/^{\circ}\text{C}$ @ 100 kHz
- Frequency = $\pm 0.5\% + 0.0015\%/^{\circ}\text{C}$ @ 10 kHz VDD
- Deviation (circuits trimmed to frequency)

Applications

- Frequency discriminators
- Timing circuits
- Time-delay applications
- Envelope detection
- Frequency multiplication
- Frequency

PLUG SOCKET

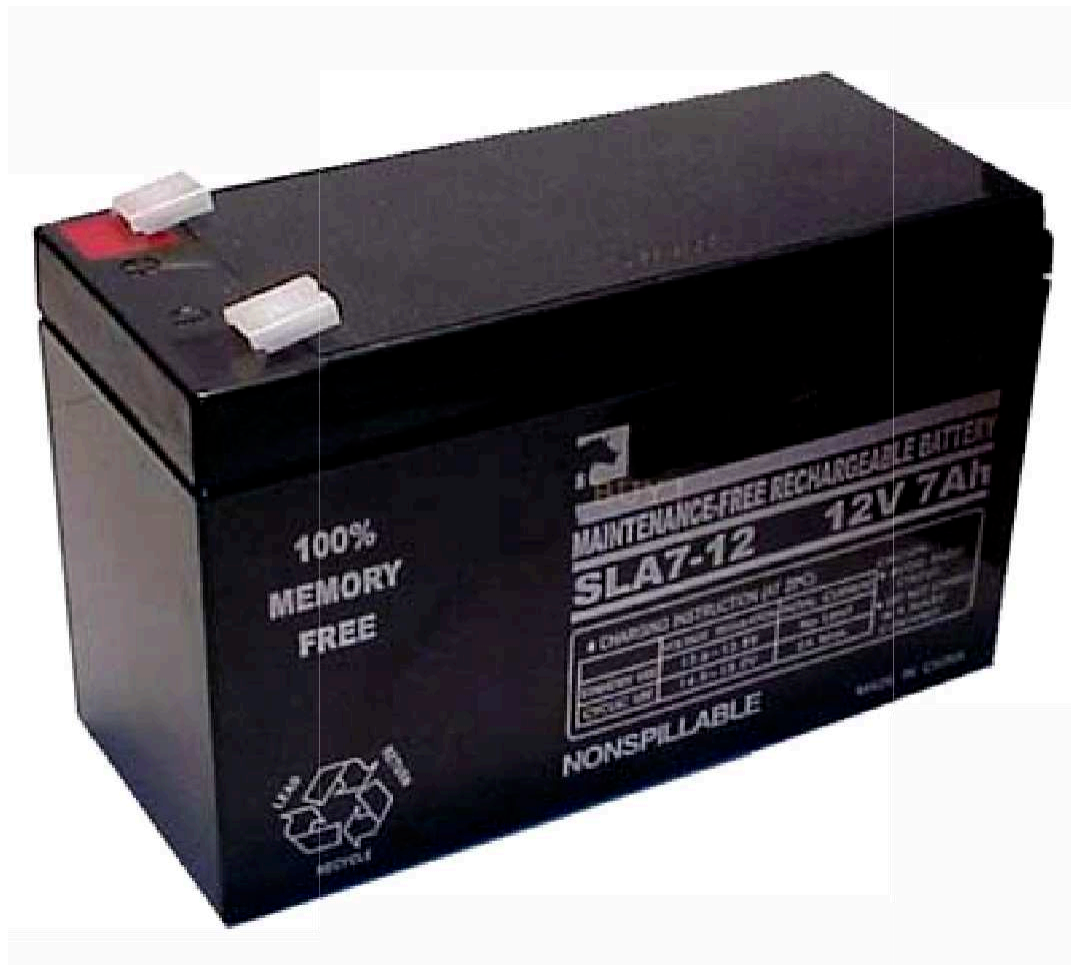
For this part to give an electrical supply single phase for running the single phase motor as supply current to prime mover. To instigated the establishment of a series of committees to investigate and report on the problems likely to affect the peace time rebuilding of Britain. One of these, the Electrical installations committee, was charged with the study of all aspects of electrical installations in building. Convened in 1942, they reported in 1944. one of the most far reaching recommendations, still in effect in the 21st century, was the introduction of the ring circuit systems (often informally called “ring man”), where instead of each socket being individually wired, a cable was brought from the fuse or circuit breaker in the distribution board and wired in sequence to a number of sockets before being taken back to the distribution board and wired to the same fuse or circuit breaker. This provided considerable savings in the copper required to wire the circuit. Since the fuse or circuit breaker had to be rated for the maximum current the ring could carry (30A or 32A for breaker), it was required that the plugs used to connect ring each other contained their own fuse rated for the appliance that it connected. The plug and socket systems defined in BS 1363 is a result of another of the reports recommendations.

MCB (MINIATURE CIRCUIT BREAKER)



A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Its basic function is to detect a fault condition and, by interrupting continuity, to immediately discontinue electrical flow. Unlike a fuse, which operates once and then has to be replaced a circuit can be reset (either manually or automatically) to resume normal operations. Circuit breakers are made in varying sizes, from small devices that protect an individual household appliance up to large switch gear designed to protect high voltage circuits feeding an entire city.

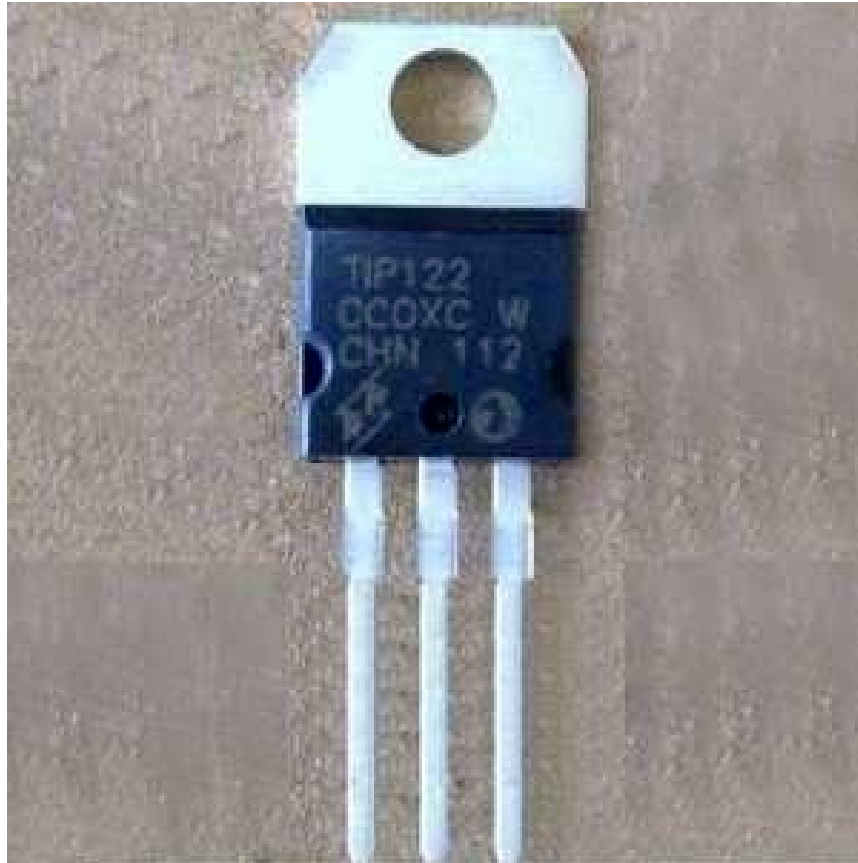
BATTERY 12V



The power input for the inverter circuit is from the 12V rechargeable battery. When 12V rechargeable battery supply is fed to the control circuit through the relay, then the input power to the circuit will be ON. The transistor (TR3) from the circuit with the Light Emitting Diode (LED) display whether the power from the rechargeable battery to the relay is pass through to circuit or not. If the power is passing through the circuit, the zener diode of 5.1V will apply to turn on the transistor CRR3 and then pass through and turn ON the LED.

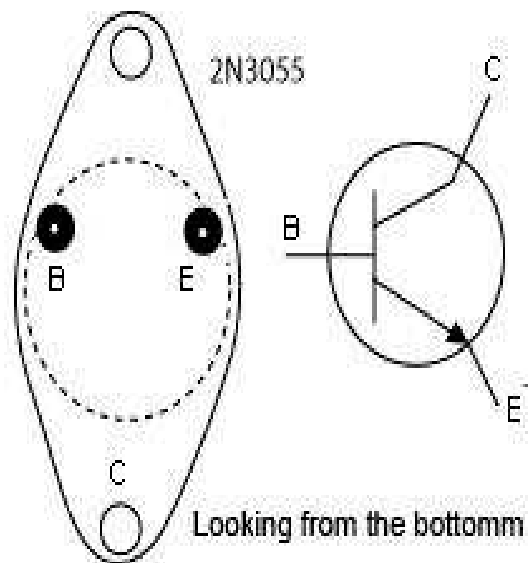
CMOS TRANSISTOR

- **TIP122**



- Medium power linear switching applications.
- Complementary to TIP125/126/127

TIP 3055/2N3055



The 2N3055 transistor is a silicon NPN power transistor intended for general purpose application. It was introduced in the early 1960's by RCA using their "hometaxial" power transistors process. It was one of the first silicon power transistors, offered unrivalled second breakdown immunity and found many applications particularly in audio power amplifiers and linear power supplies.

The exact specs depend on the manufacture, it is important to reference the datasheet for the exact device and brand you are dealing with.

Packaged in a TO3 can, it is a 15A amp, 60V volt, 115W watt power transistor with a beta of 20 to 70 at a collector current of 4A. It gained popularity because it had 100% safe-operating-area (SOA), meaning that it could dissipate 115W at a collector voltage of 60V($I_C=1.9A$), provided the case temperature did not exceed 25°C. It was designed for medium current and high

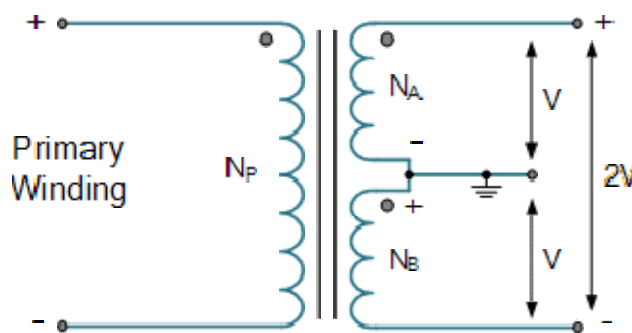
power circuits. Commercially, it was used in many linear power supplies, audio amplifiers and low frequency power converters. One limitation was that its frequency response was rather slow (typically the unity-gain frequency was 1 MHz). The 2N3055 power transistor was the first multi-amp silicon transistors to sell for less than one dollar! It was a huge success in the power supply market.

With changes to the technology, the original process became uneconomical and a similar device, now using the name 2N3055 transistors, was supplied using epitaxial base technology. The maximum voltage and current ratings of this devices are the same as the original, but the power handling is limited at the high voltage to a lower current than the original. However the cut-off frequency is higher, so allowing the newer type of 2N3055 transistors to be more efficient in switching power supplies. Also the higher frequency response improves the performance when used in audio amplifiers. Some supplies offer a high safe-operating-area version of the 2N3055 power transistor using the “H” suffix.

The 2N3054 transistor is a lower version of the 2N3055 power transistors rated at 25W, 55W and 4A, but became almost obsolete about the late 1980’s when many to-66 devices were withdrawn from mainstream manufacturer’s lists. In many cases a TO-220 packaged version, such as MJE3055T, can be used as applications. An MJ2955 is complementary (PNP) transistors for the 2N3055 transistor, which is also manufactured using the epitaxial processtoday.

TRANSFORMER

The inverter used in this work was designed to power a typical residential or small business site. Standalone power sources such as a fuel cell, micro turbine, or solar cells could provide the power. As mentioned in a single-phase three-wire output should be adopted because this is the standard practice for home connection to the grid. In a typical utility system a single-phase from the three-phase high voltage available at the pole is down converted to 120/240V with a center-tapped transformer.



This type of transformer is used by utility companies to interface a single phase of the grid voltage to a single-phase three-wire setup used in residential systems.

The single-phase three wire approaches are used for several reasons. First, it allows the consumer two separate voltage levels. 100V for smaller devices, 240V for larger appliances and HV AC systems. Secondly, it offers twice the load capacity with only 1.5 times the conductors. To fit the existing systems the inverters designed will need a single-phase three-wire output. One important item to note is that, many power sources stages may be required. The first option would be to design a standard single phase stages may be required.

The turns ratio may be adjusted to step- up the voltage, see figure. While this approach is well established the use of the 60Hz transformer adds

cost, size, and inefficiency to the system. There are also issues with voltage regulation and no possibility to tie the inverter to the grid. Additionally, most distributed systems have a DC output and would not directly connect to the inverter. The second approaches are to use a DC which steps-up the voltage and then an inverter that directly generates both 120V outputs, V1 and V2.

The top system uses a 60Hz transformer to make the step from low voltage to high voltage. The lower system uses a high frequency transformer or DC to form a high voltage bus.

Socket outlet 5A

Socket outlet 5A for present the output current from inverter. Socket outlet as one of us has a load that will be connected to any load that is needed to show the supply may be from the socket outlet.

Bulb 100 watt Philips

For this part we use a bulb 10x100 watt. These lights play an important role to show circuits we have the right or not and also the output supply from the battery systems that we do. It will go with a lights how with a load through it.

CHAPTER5

EXTRA

TROUBLESHOOTING

For the firstly testing our project, we do the test circuit to ensure it can use with safely. For the circuits, we do continuity test use a multi-meter digital to get this test is safe and can use to connect with supply 240V. After that when the test circuit, we test the load is same tester like a check circuit. But for the load, we will use a lamp 100 watt, and socket outlet 13A. When have done put the load, we will test circuits using protection systems on the MCB (Miniature Circuit Breaker) to ensure the all circuits which use is guarantee safety when the input supply in circuit.

Besides that, when our get ready to test our project we going to supervisor offices to get the verify from him. Before we test this project in front supervisor, we show the all about circuits and also component electrical which use. Before our get input supply on the circuits, we sure about battery, because it is not long time to use this battery. The battery 12V only we use, after that it is produce burn in the inverter single phase. The test load and circuits we ensure the breaker is OFF before the current is input the circuit. We show the test our project in front supervisor and we show the step from battery to on the inverter circuits, after that we know that input. When the our ON the each MCB to our switch a load, and we get the load is light for the lamp and weuse.

CONCLUSION

The first to create this project, we search all about already existing inverter systems in world. For example an inverter is an electrical device that converts direct current (DC) to alternating current (AC) 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. Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries. The inverter performs the opposite function of a rectifier.

The major skill or we are learning about this project is inverter to generates the outputs supply and get the output voltage. What we get from this is electronic soldering and wiring, single phase wiring circuits in connection, size cable use.

APPLICATIONS

Power inverters are used today for many tasks like powering appliances in a car such as cell phones, radios and televisions. They also come in handy for consumers who own camping vehicles, boats and at constructing sites where an electric grid may not be as accessible to hook into. Inverters allow the user to provide AC power in areas where only batteries can be made available, allowing portability and freeing the user of long power cords.

On the market today are two different types of power inverters, modified sine wave and pure sine wave generators. These inverters differ in their outputs, providing varying levels of efficiency and distortion that can affect electronic devices in different ways. A modified sine wave is similar to a square wave but instead has a “stepping” look to it that relates more in shape to a sine wave. The waveform is easy to produce because it is just the product of the product of switching between 3 values at set frequencies, thereby leaving out the more complicated circuitry needed for a pure sine wave. The modified sine wave. The modified sine wave inverter provides a cheap and easy solution to powering devices that need AC power. It does have some drawbacks as not all devices work properly on a modified sine-wave, products such as computer and medical equipment are not resistance to the distortion of the signal and must be run off a pure sine wave power source.

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