IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Hybrid inverter with solar battery charger

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Abstract

Although solar and wind energy are two of the most viable renewable energy sources, little research has been done on operating both energy sources alongside one another in order to take advantage of their complementary characters. In this paper, we develop an optimal design for a hybrid solar-wind energy plant, where the variables that are optimized over include the number of photovoltaic modules, the wind turbine height, the number of wind turbines, and the turbine rotor diameter, and the goal is to minimize costs. Here the generated energy is stored in a battery . An inverter is used to generate 230 v ac.

INTRODUCTION

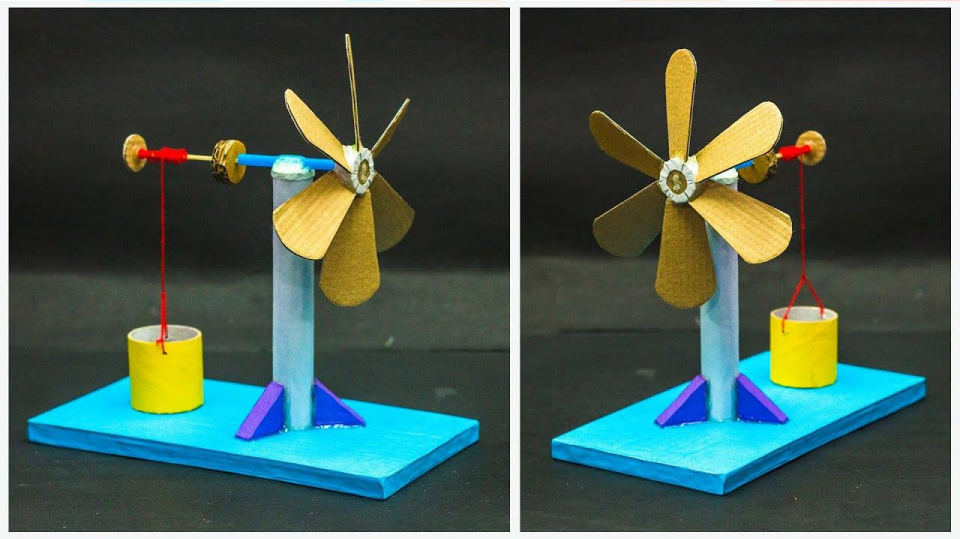
Among the wide range of problems facing our world today, there is global consensus that greenhouse gas(GHGs) emissions have the largest negative impact on our environment. GHGs include carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydro fluorocarbons and perfluorocarbons. These gases help maintain the temperature of the earth at comfortable levels for organisms, and a decrease in their levels would result in a temperature that could be too low for us tosurvive. However, because GHGs allow sunlight to enter the atmosphere, but trap the heat radiated off the earth's surface, an increase in these emissions would result in an increase of the planet’s temperature, or global warming, to levels that could be fatal to living organisms. Many scientists also believe that the increase in natural disasters is fueled by climate change, since atmospheric and oceanic patterns shift as the Earth’s temperature increases. The Kyoto protocol, a part of the United Nations Framework Convention on Climate Change, was negotiated as part of a global effort to reduce GHG emissions. The protocol establishes legally binding commitme

nts on all member nations to reduce their GHG emissions. To allow economies to meet their emissions restrictions, the protocol introduced three “flexible mechanisms”: the Joint Implementation mechanism allows countries to carry out emissions reduction projects in other countries to gain emission credits, the Clean

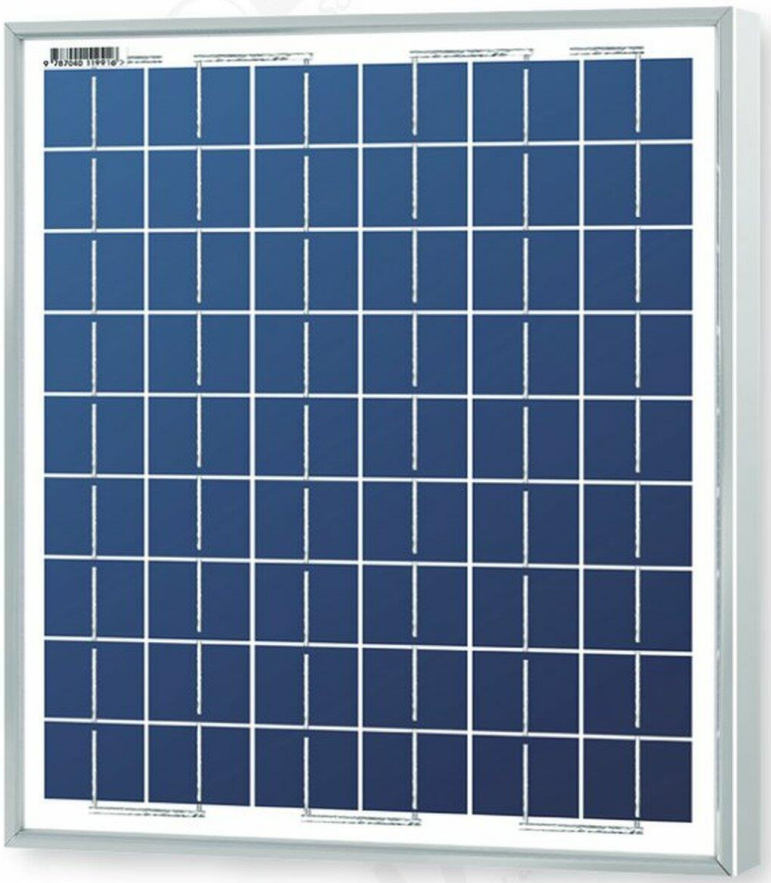
Development mechanism also allows countries to gain emissions credits by financing emissions reduction projects in developing countries, while the third mechanism, Emissions Trading (also known as carbon trading), provides an incentive for governments and companies to reduce their emissions. The financial incentives, along with carbon-emission limits, are not the only factors pushing governments in the direction of renewable and clean energy. The scarcity of fossil fuels and their rapid depletion worldwide has made it necessary to search for alternative energy sources that would meet the current levels of demand. In addition, much of the world's population lives in remote or rural areas, which are sparsely populated and geographically isolated. Due to the low demand, such regions are not connected to the grid. To develop such areas, an efficient as well as financially feasible method

Hardware:

Windmill

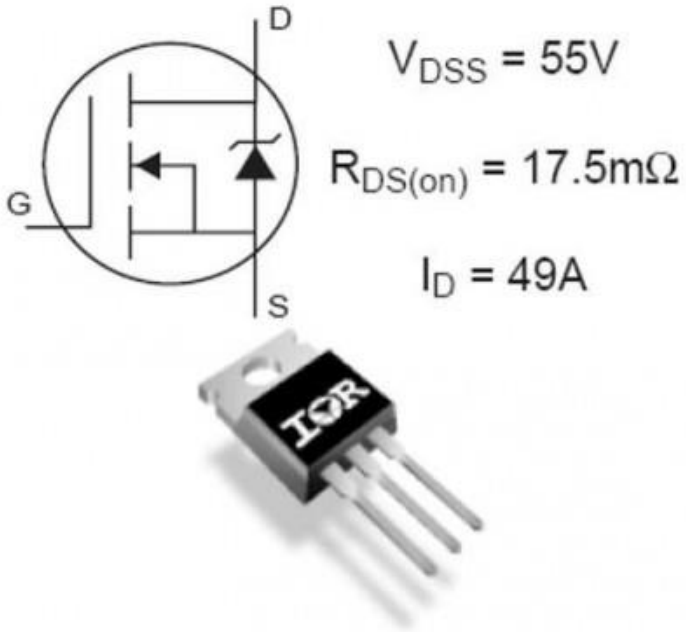


Solar panel



Specification:

- 5Watts / 9Volts
- Dimension: 230*200*17mm
- Poly Solar Panel with Aluminum Framing
- Output/ Current: 0.40 Ampere



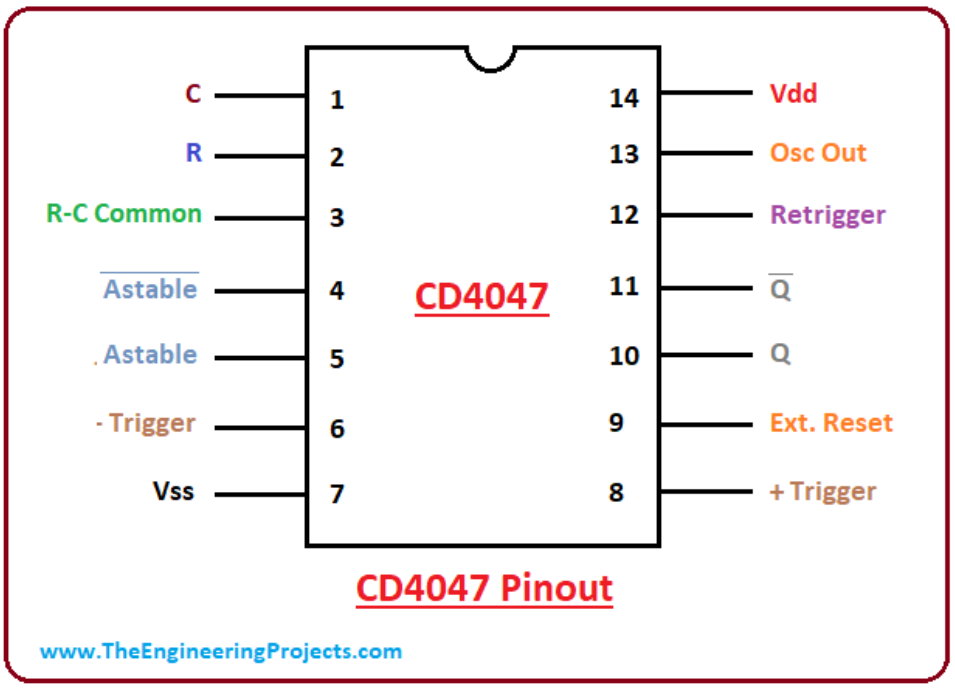
TO-220AB

The **IRFZ44N** is a **N-channel MOSFET** with a high drain current of 49A and low Rds value of 17.5 mΩ. It also has a low threshold voltage of 4V at which the MOSFET will start conducting. Hence it is commonly used with microcontrollers to drive with 5V. However a driver circuit is needed if the MOSFET has to be switched in completely.

Features and Specifications

- Small signal N-Channel MOSFET
- Continuous Drain Current (ID) is 49A at 25°C
- Pulsed Drain Current (ID-peak) is 160A
- Minimum Gate threshold voltage (VGS-th) is 2V
- Maximum Gate threshold voltage (VGS-th) is 4V
- Gate-Source Voltage is (VGS) is ±20V (max)
- Maximum Drain-Source Voltage (VDS) is 55V
- Rise time and fall time is about 60ns and 45ns respectively.
- only used with Arduino, due to its low threshold current.
- Available in To-220 package

IC4047



The CD 4047 IC is one kind of multivibrator including a high voltage. The operating of this IC can be done in two modes like Monostable &Astable. This IC requires an exterior resistor & capacitor to decide the output pulse width within the monostable mode & the o/p frequency within the astable mode. This IC operates at 5Volts, 10Volts, 15Volts & 20Volts.

What is 4047 IC?

The 4047 IC is a CMOS multivibrator that works in two modes like monostable & astable. The 4047 IC applications include a wide range like generation of the pulse wave, sine wave, and DC signal to AC signal conversion, etc.

4047 IC

This IC is arranged very easily in both modes & they use few exterior components to function. The voltage range of this IC is 3V to 15V however works most excellent at 5V. The o/p of this IC comes always in TTL so that it is very simple to work through other microcontrollers & TTL devices.

4047 IC Pin Configuration

The monostable or astable multivibrator IC like 4047 includes 14-pins, the mounting type used is through-hole, and the package used is PDIP-14. For all the packages, the pin configuration is the same. This pin includes three output pins that provide pulse width modulation outputs like Q, ~Q, and Osc_{out}. We can describe each pin working in the below section.

4047 IC Pin Configuration

- **Pin1 (Cap timing):** This pin is used to connect exterior capacitors in between Rcc & Res
- **Pin2 (Res timing):** This pin is used to connect the exterior resistor in between Rcc & cap timing (C).
- **Pin3 (RC common or RCC)**: This pin acts as a common terminal point among C & Rc
- **Pin4 (~Astable):** This is low once used in Astable mode
- **Pin5 (Astable):** This is high once used in Astable mode
- **Pin6 (-Trigger):** When this used in Monostable mode then we provide High to Low change to this trigger pin
- **Pin7 (Vss):** This is a GND pin of the IC
- **Pin8 (+Trigger**): Once the signal is activated at this input by low to high then the monostable operation is allowed
- **Pin 9 (External Reset):** Once the input of RST connects through the HIGH level, then it resets the o/p from Q to 0 & the non-inverting o/p (Q) to 1.
- **Pin10 (Q):** This pin is a Non-inverting output
- **Pin11 (~Q):** This pin is an inverting output
- **Pin12 (Retrigger):** This pin is mainly used to activate both pins 7 & 8 concurrently within a monostable mode
- **Pin13 (OSC Output):** This pin provides oscillated o/p within the astable mode.
- **Pin14 (Vdd):** This is a +ve power supply pin

4047 IC Specifications

The **specifications of 4047 I**C include the following.

- Input supply is a wide range from 3v – 18v
- Range of storage temperature ranges from -65°C to +150°C
- The temperature of soldering lead is 260°C
- Operating range of temperature ranges from -55°C to +125°C

Transformer

12-0-12 3Amp Center Tapped Step Down Transformer is a general purpose chassis mounting mains transformer. Transformer has 230V primary winding and center tapped secondary winding. The transformer has flying colored insulated connecting leads (Approx 100 mm long). The Transformer act as step down transformer reducing AC - 230V to AC - 12V.

The Transformer gives outputs of 12V, 12V and 0V. The Transformer's construction is written below with details of Solid Core and Winding.

The transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary winding. This varying magnetic flux induces a varying electromotive force (E.M.F) or voltage in the secondary winding. The transformer has cores made of high permeability silicon steel. The steel has a permeability many times that of free space and the core thus serves to greatly reduce the magnetizing current and confine the flux to a path which closely couples the winding.

Specifications of 12-0-12 3 Ampere Center Tapped Transformer:-

- Input Voltage: 230V AC
- Output Voltage: 12V, 12V or 0V
- Output Current: 3 Amp
- Mounting: Vertical mount type
- Winding: Copper

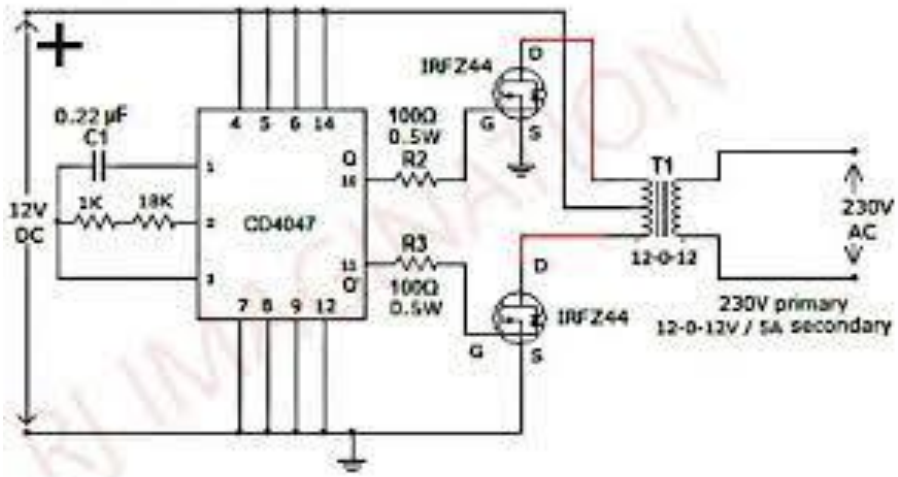
Features of 12-0-12 3 Ampere Center Tapped Transformer:-

- Soft Iron Core.
- 3 Amp Current Drain.
- 100% Copper Winding

Applications of 12-0-12 3 Ampere Center Tapped Transformer:-

- DIY projects Requiring In-Application High current drain.
- On chassis AC/AC converter.
- Designing a battery Charger.

Circuit diagram



Project development stages

1. Prepare schematic
2. Purchase of components
3. Make connections
4. Check solar panel output voltage
5. Check windmill output voltage
6. Make make inverter schematic as per circuit diagram.
7. Apply power to inverter.
8. Check output of ic 4047. It should read exactly half of the supply voltage

   That is 6 to 6.5 v while multimeter is set to 12 v dc reading .

9. Set multimeter to 700 v ac reading .

10. Check output of transformer. It should read 210 to 240 V ac

Advantages

- The system is low cost.
- It saves energy

Future scope

- We can use a pwm chip for required signals.
- We can use a microcontroller for this system .
- We can use a piezo electric sensor to generate energy.
- We can use a turbine to generate energy from sea tides.
- of climatic conditions .

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