



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 7, July 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

SOLAR BASED UPS

Prof. Swapnil Namekar, Satyam Raj, Shobhit Singh, Harshdeep

Assistant Professor, Department of Electrical Engineering, Bharati Vidyapeeth (Deemed to be university), Pune,
Maharashtra, India

Bachelor of Technologies, Under graduate, Department of Electrical Engineering, Bharati Vidyapeeth (Deemed to be
University), Pune, Maharashtra, India

Bachelor of Technologies, Under graduate, Department of Electrical Engineering, Bharati Vidyapeeth (Deemed to be
University), Pune, Maharashtra, India

Bachelor of Technologies, Under graduate, Department of Electrical Engineering, Bharati Vidyapeeth (Deemed to be
University), Pune, Maharashtra, India

ABSTRACT: This research paper provides the study, working, significance and future scope on Solar Based unprecedented power supply. There are various devices used to accomplish this task and through enough research we tended to find out about the working, construction and observations of a soft/open constructed Solar Based UPS. Various circuit simulations have been performed which opened new and innovative ways of various solar, electrical processes. We also find out about the advantages about the co-existence and usage or consumption of energy through solar and electrical processes.

KEYWORDS: Battery, Transformer, Solar Panel, Load, Microcontroller

I. INTRODUCTION

Here we proposed and worked on an idea where solar energy is used to charge battery and then the DC battery is used to power an AC load using inverter. Our solar panel is used to constantly charge the 12V DC battery using charge controller circuitry. And once we turn on the load switch the battery charge is inverted and stepped up from 12V DC to 220VAC. This is now provided to the AC load. Thus, this system successfully powers AC load using a solar panel and battery. The system can be used as a UPS in case of emergency power cuts and various power outages and has the capacity to work as a standalone system without the need of any external electricity supply. Many problems in various significant areas can be solved using this device. This also has minimal impact on the environment or the ecosystem.

Advantages

Solar panels are incredibly effective at capturing the most sunlight when used in the proper location and manner. The real benefit of solar energy comes from its capacity to absorb or seize light energy and produce electrical energy, which may be utilized as both an independent energy source and an online energy source (on-grid) in the event of a power outage (off-grid). The user's home gains value as a result of solar energy. Solar energy can be used in isolated and rural locations where grid power cannot be reached because it is not distributed unevenly like fuel. Finally, solar technology is beneficial for the environment. Eventually, the investment of end user gets resurged and the system becomes profitable within few years. There is no pollution in atmosphere due to nitrogen oxide, carbon dioxide or various other pollutants. It is an unlimited source of power which is free, unlike deleterious fossil fuels which are expensive as well.

Solar UPS Solution

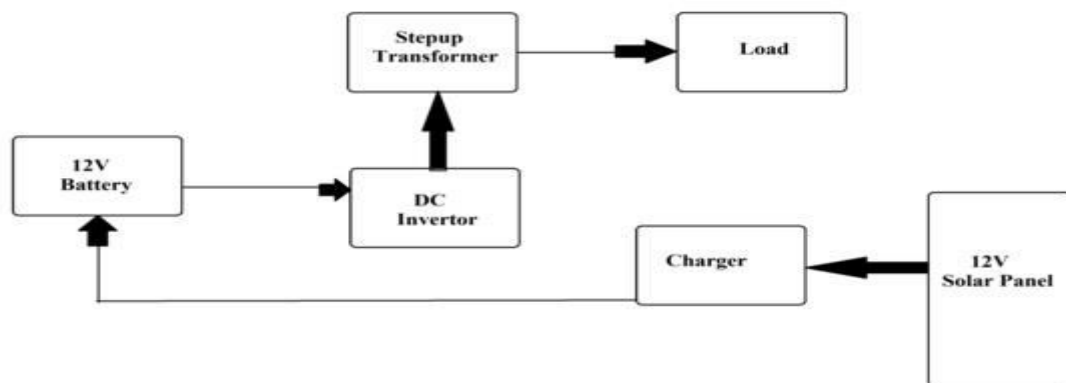
India is still experiencing an unprecedented energy crisis in rural and suburban areas. During the summer, the problems worsen. However, winter was no exception, with an average power outage of 3-4 hours per day. Those without generators or UPS had a difficult time during the outages. Prices for both have risen as a result of a significant increase in demand. We are not using solar UPS as a replacement, but it can be used as a backup. It also has no negative effects on the environment. Throughout the year, the sun shines bright. Estimates of global solar radiation have been made for

most parts of the world, as well as major cities in India which plays a major role in designing the optimum model for these systems.

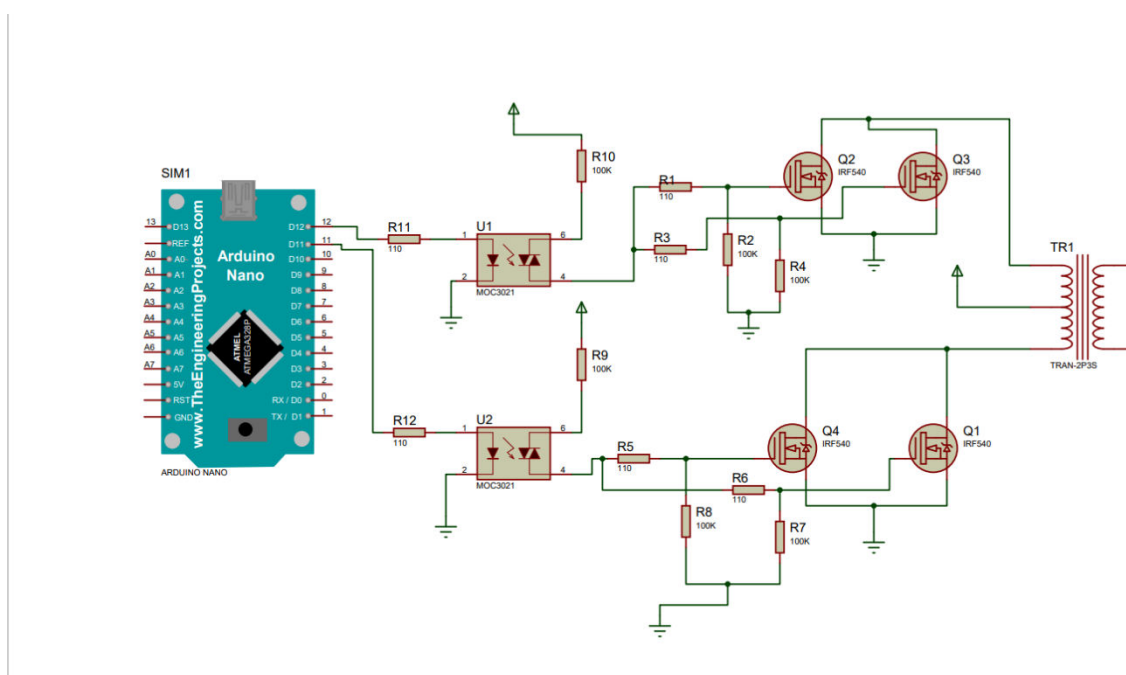
II. SYSTEM DESIGN

In this project, we have used a solar panel of 18V that is used for charging a battery of 12V/7.5Ah. When the system is turned on, the solar panels absorb the sunlight and after various photovoltaic processes, the energy is converted into AC and which is then stored into the battery. To negate several current, revert back problems, we use a couple of optocouplers, which basically works on photovoltaic phenomenon, thus creating a one-way path for our current. Several resistances are used to get the desired output and put the control in hand throughout the process. Thus, the system can be successfully used as a UPS in various power related emergencies.

Block Diagram



Circuit Diagram



When grid-connected AC power is unavailable, inverter circuits are frequently used. An inverter circuit converts DC power to AC power and can be classified as either Pure Sine Wave Inverters or Modified Square Wave Inverters.

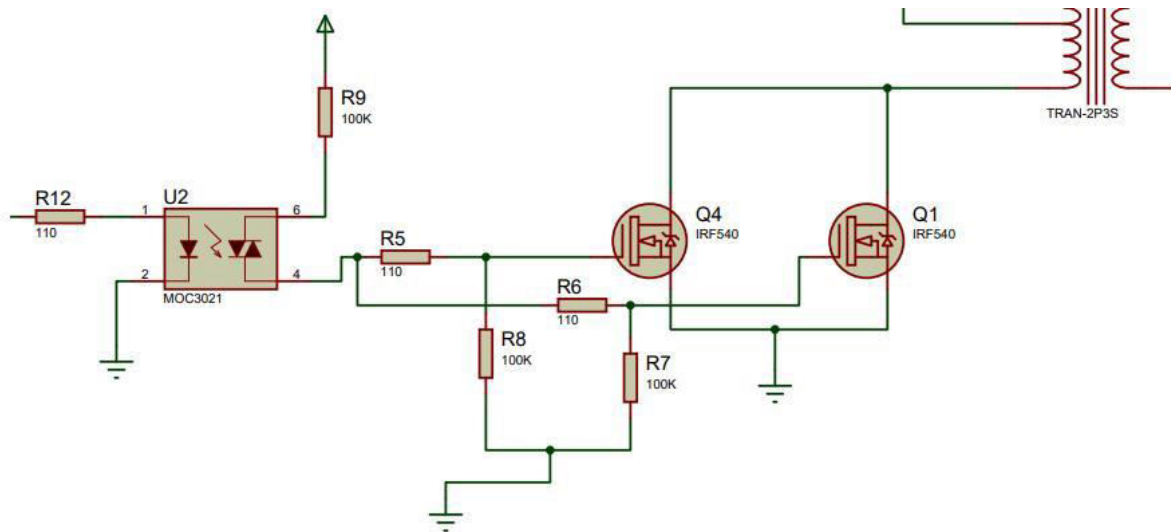
Components used

- 12V/7.5A DC battery
- Step-up transformer
- MOSFETs (IRF 540)
- 817Opt coupler
- Relay Module
- Arduino nano
- 12V Sugar cube relay
- Solar Panel
- Switchboard
- Resistors

The circuit's main goal is to convert 12VDC to 220VAC. To accomplish this, we must first convert 12VDC to 12VAC, then 12VAC to 220VAC using a step-up transformer. PWM signal is a signal in which the frequency of the pulse, as well as the on-time and off-time, or duty cycle, can be changed.

There basically 3 parts of the circuit,

- 1) The Arduino Micro controller board is the first stage of this circuit, and it is programmed to give SPWM (Sinusoidal Pulse Width Modulation)
- 2) The output pulse from the Arduino digital pins is sent into the switching power MOSFET IRF540 in the second stage.
- 3) The third stage is an output stage that is built with a centre tapped transformer (230 VAC primary / 12-0-12 VAC secondary) and is wired in reverse with the driver circuit, with the secondary stage (12-0-12 VAC) connected to the power MOSFET and the primary side of the transformer providing output. When the battery connected to this circuit voltage regulator 7812 powers up the Arduino board and it begins to produce output pulses based on the sketch, the pulses drive the 2 power MOSFET IRF540 for each cycle, and the transformer secondary winding connected to the MOSFET receive discrete energy and mutually induce the large number of primary winding, which generates high voltage AC output due to the large number of winding and changing magnetic field.

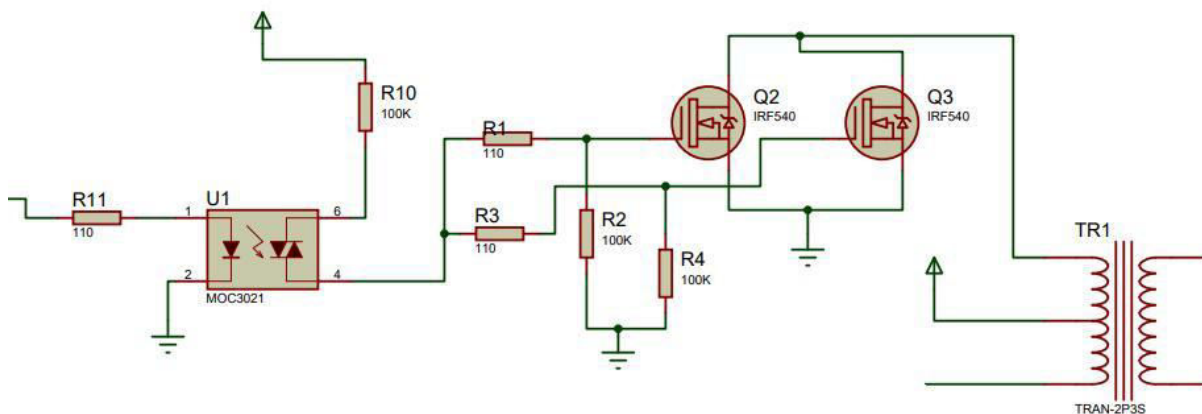


The main driving part of the SPWM inverter is shown above, we used two N-channel MOSFETs in half-bridge configuration to drive the transformer in this circuit. We used 110-ohm resistors to prevent any potentially dangerous spikes created in the gate region. Finally, because the MOSFET has a very high gate capacitance and requires a minimum of 10V at the base to switch on properly, the PC817 opt coupler is used for each wave to power up the gate of MOSFTE. This opt coupler also protects the controller from reverse current.

When the MOSFET is turned on, the current flows through the transformer and then through the MOSFET, causing a magnetic flux to be induced in the direction of the current flow, which is passed through the secondary winding by the core of the transformer, giving us the positive half cycle of the sinusoidal signal at the output.

In the next cycle, the bottom part of the circuit is on the top part of the circuit is off. The current now flows in the opposite direction, generating a magnetic flux in that direction, reversing the magnetic flux direction in the core.

Magnetic flux alterations drive the operation of a transformer. So, turning both MOSFETs on and off 50 times in a second, one inverted to the other, will generate a good oscillating magnetic flux within the transformer core, and the changing magnetic flux will induce a voltage in the secondary coil, as we know from faraday's law. The fundamental inverter operates in this manner.





III. CONCLUSION

Because of its numerous benefits, photovoltaic power generation is gaining popularity as a renewable energy source. These benefits include an everlasting pollution-free energy production scheme, ease of maintenance, and direct conversion of solar energy to electricity. However, the high cost of PV installation remains an impediment to this technology. Furthermore, the output power of a PV panel varies depending on weather conditions, such as isolation level and cell size.

REFERENCES

1. Solar Electricity Handbook- 2021 edition
2. Micheal Boxwell, 2021
3. DIY Solar Power- How to power everything
4. Micah Toll, 2017
5. Solar Power for Beginners
6. Paul Holmes, 2020
7. Seia.org
8. Solarelectricpower.org
9. Energy.gov



INNO  SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



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