Inverter cum Ups with a Display of Standby Time

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Abstract: ***Electricity is the crucial factor of our day to day life without elctricity our life become cumbersome.so in this paper basically focus on the conservation of electricity as well as use of renewable energy sources. Here we are using monolithic solar panel for the utilisation of energy from sun. also we are providing display which shows the standby time of inverter, load status of inverter. Because of this facility we can avoid problem we have to face about unawareness due to unavailability of battery status. Because all our inverter operation depends upon battery.***

Keywords: inverter.ups,stand by time, integrated circuits

1. Introduction

An inverter is a device which can convert the DC supply required most of the electrical/electronic equipment. The process through which these inverters convert DC into AC supply is called “inversion”. This inversion process is reverse of the rectification process, where the AC power is converted into DC power. Generally when one talks about the “Inverter”, he talks about a combination of inverter circuit, charger circuit and a battery. The charger circuit keeps the battery charged when the mains power supply is available and when the mains AC. Supply fails; the inverter circuit takes the DC power stored in the battery and converts it into 220v/50Hz AC supply, which can be used to power any common electrical/electronic equipment.

2. Basic Working Principle of the Inverter

An Inverter is used to provide uninterrupted 220V AC supply to the load connected at its output socket. Inverter provides constant AC supply at its output socket, even when the AC mains supply is not available. Let us see how the Inverter does this. To understand the working of inverter, we shall consider inverter in the following situations:

1) When the AC mains supply is available
2) When the AC mains supply is not available (Inverter operating on battery supply)

When the AC main supply is available.

When the AC mains supply is available, this AC mains supply goes to the AC mains sensor, Relay, and Battery charging section of the inverter. AC mains sensor informs the relay about availability of the AC menus supply. When this relay receives AC mains available signal from the AC mains sensor, it directly passes the AC mains signals to the inverter output socket .The battery charging section converts this AC mains supply into DC supply this DC supply s then regulated to provide required voltage and current to charge the inverter battery.

When the AC mains supply is not available

When the AC mains supply is not available, an oscillator section inside the inverter generates 50Hz frequency MOS drive signal. This MOS drive signal is amplified by driver section and sent to the output section. Output section used MOSFET devices for switching operation. These MOSFETs are connected to the primary winding of the inverter transformer. When these MOSFETs receive the MOS drive signal from the driver section, they start to switch on/off at the speed of 50Hz.

This switching on/off of MOSFET starts an alternating current with 50Hz frequency at the primary winding of the inverter transformer. This results in a 220V AC supply (with 50Hz frequency) at the secondary winding of the inverter transformer. This 220V AC supply at the secondary winding is sent to the output socket of the inverter though a changeover relay.

3. Inverter and UPS

The inverter and UPS generally do the same job of providing uninterrupted AC supply, when the AC supply, when the AC mains fail. An Inverter contains the following sections

1) Charging Section
2) Inverter Section
An UPS has the following sections
1) Charging Section
2) Inverter Section
3) AVR (Automatic Voltage Regulation) Section

The AVR section is an additional section in the UPS. When the AC mains is available, the inverter sends the AC mains to its output socket, without any correction. For example, if the input AC supply is 180V, it will be directly sent to the output socket by the inverter, and if the input AC supply is 260V, this will also be directly sent to the output socket. No correction is done by the inverter on the input AC supply to bring it into 220230V range. In the UPS when the AC mains are available, the AVR section regulates the incoming AC supply and provides a regulated output at its output socket. This AVR section regulates the incoming AC mains supply (varying from 140V to 270V) and provides a supply in the range of 220V to 240V at its output socket If sensitive

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equipment such as a computer is operated on inverter output, the fluctuation in the input AC mains supply will reach the output and could damage the equipment. If the same equipment is operated on UPS, a regulated output by the UPS makes sure that the equipment works without any trouble.

Another difference between the UPS and inverter is in the changeover time, i.e. in the time taken by the UPS or inverter to switch between the AC mains supply to battery mode and from battery mode to AC mains supply. In an inverter, this changeover time is not very small, these results in a reboot of the computer connected to the inverter output. In an UPS this changeover time is so small that the load connected to the UPS output works without any interruption. Generally in a low battery or overload condition the inverter shuts down without any indication or warning. UPS uses buzzer and LEDs to inform the user about these conditions, before shutting down.

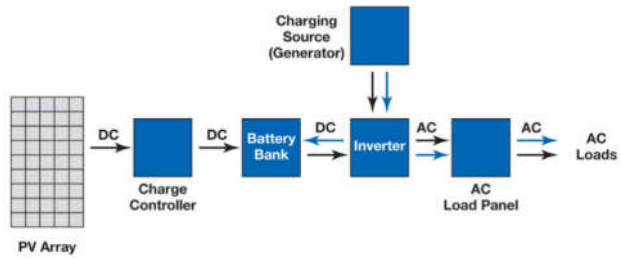

Figure 1: Block diagram of inverter cum ups

4. Main Section of Our Inverter cum UPS

Solar panel there are three types of solar panel are available. They are as follows:

1) Mono-crystalline
2) Polycrystalline
3) Thin film

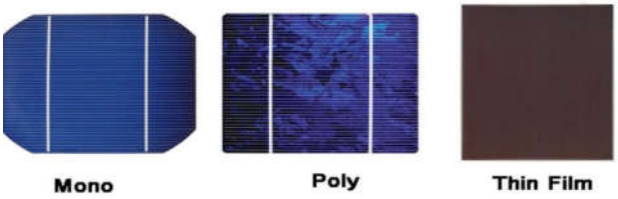

Figure 2: Types of solar panel

Out of this three types of solar panel mono-crystalline type solar panel has highest space efficiency. So we used mono-crystalline solar panel for our project.

Solar charge controller

Solar charge controller gives us a constant DC output voltage and increase life of battery.

There are two types of solar charge controller
1) Pulse width modulation
2) Maximum power point tracking(MPPT)

Out of this two solar charge controller MPPT solar charge controller has fewer losses. It gives us full utilization of solar energy.

5. Inverter Circuit

In every inverter circuit this are the must section

1) Oscillator section
2) Output section
3) Protection section
4) Mains/inverter sensing section
5) Battery charging section
6) Battery charging controller section
7) Display section

6. Used IC's

For our project work we use following ic's

1) LM350K (voltage regulator ic)

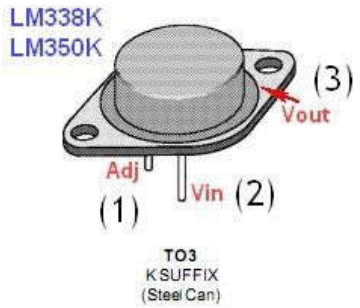

Figure 3: LM350K (Voltage Regulator).

2) LM324N

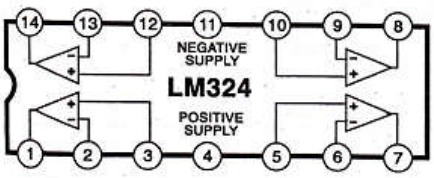

Figure 3: LM324N

3) SG3524N (oscillator IC)
4) This ic provide us a 50HZ output frequency through its pin3 and two transistor inside it at pin11 and 14 gives us a switching pulse for triggering gate of MOSFET.

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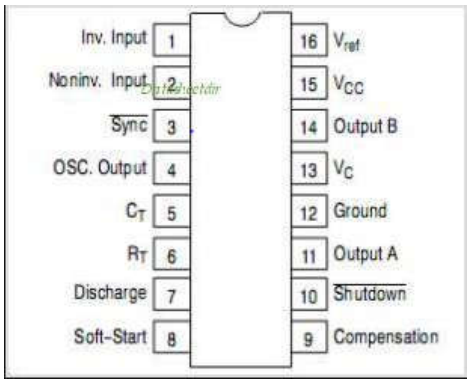


5) MOC3021 (sensor IC)

The MOC3021 series consists of Gallium Arsenide infrared emitting diode coupled with a light activated silicon bilateral switch, which functions like a triac in a dual in line package. These devices are especially designed for triggering power triacs while maintaining dielectric isolation from the trigger control circuit. They are mounted in dual in line packages. These devices are also available in surface mount packaging.

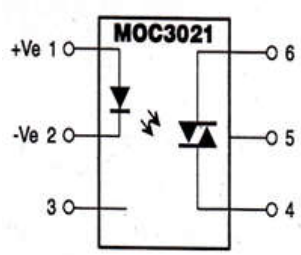
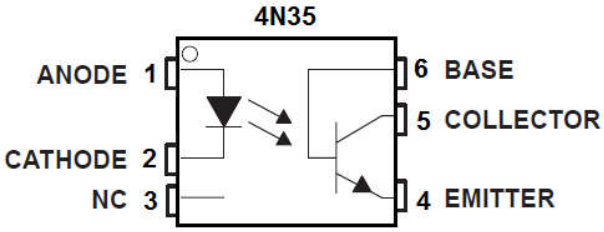


Figure 4:MOC3021

6) IC 4N35 (mains/inverter sensing ic)



7. Used Transformer

Our inverter gives us a 24V ac output at the heat sink. But our standard single phase ac supply required is 230v ,50HZ so we use step up center tapped transformer 24V/300V. it is also called as "main inverter transformer". Another transformer required is driver transformer. The use of driver transformer only in mains mode to give signal to relay of mains sensing. We use 12-0-12 driver transformer.

8. Formulae

Battery backup formula:
Battery ampereAH * battery voltage* no. of batteries
Load in watt
Solar charging time:
Ampere- hour per day
solar panel current(amp) * total sun radiation time(hour)*charger efficiency

9. Result

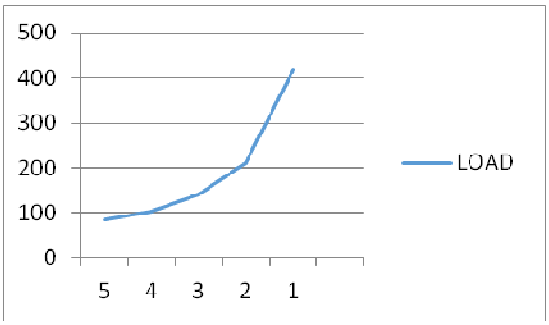


Figure 5: LOAD vs TIME

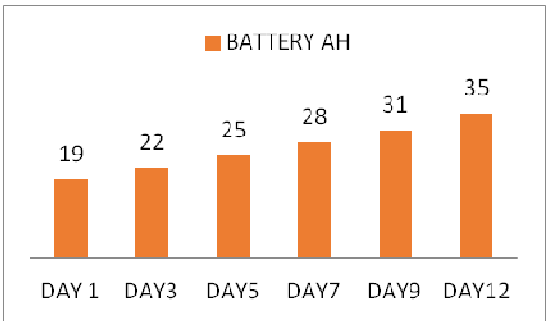


Figure 6: BATTERY CHARGING

10. Conclusion

So from this project we can visualize that we can avoid the inconvinience which happens due to unawareness about the load and battery status. So by using this type of inverter we can see battery as well as load status. It is cost effective but it is more flexible because here there is no use of microprocessor and controller. For e.g. if any institution conducting exam.

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