

# Solar mobile phone charger

## **ABSTRACT**

Solar energy is the energy produced directly by the sun and collected elsewhere, normally the Earth. The sun creates its energy through a thermonuclear process. The process creates heat and electromagnetic radiation. Only a very small fraction of the total radiation produced reaches the Earth. The radiation that does reach the Earth is the indirect source of nearly every type of energy used today. The exceptions are geothermal energy, and nuclear fission and fusion. Even fossil fuels owe their origins to the sun; they were once living plants and animals whose life was dependent upon the sun. Coming 21st century, we have come a long way in developing solar cells which are the devices powering our future, converting sun's energy into electricity. This work is about using non conventional energy i.e. solar energy for mobile battery charging. Solar chargers are simple, portable and ready to use devices which can be used by anyone especially in remote areas. Solar panels don't supply regulated voltage while batteries need so for charging. Hence, an external adjustable voltage regulator is used to have the desired constant voltage.

**KEYWORDS:** - Amorphous silicon panel, crystalline solar panels, photovoltaic cell

## **CHAPTER 1** **INTRODUCTION**

Solar energy is the energy produced directly by the sun and collected elsewhere, normally the Earth. The sun creates its energy through a thermonuclear process. The process creates heat and electromagnetic radiation. Only a very small fraction of the total radiation produced reaches the Earth. The radiation that does reach the Earth is the indirect source of nearly every type of energy used today. The radiation that does reach the Earth is the indirect source of nearly every type of energy used today. The exceptions are geothermal energy, and nuclear fission and fusion. Even fossil fuels owe their origins to the sun; they were once living plants and animals whose life was dependent upon the sun.

Much of the world's required energy can be supplied directly by solar power. More still can be provided indirectly. The practicality of doing so will be examined, as well as the benefits and drawbacks. In addition, the uses solar energy is currently applied to will be noted. Due to the nature of solar energy, two components are required to have a functional solar energy generator. These two components are a collector and a storage unit. The collector simply collects the radiation that falls on it and converts a fraction of it to other forms of energy (either electricity and heat or heat alone). The storage unit is required because of the non-constant nature of solar energy; at certain times only a very small amount of radiation will be received. At night or during heavy

cloud cover, for example, the amount of energy produced by the collector will be quite small. The storage unit can hold the excess energy produced during the periods of maximum productivity, and release it when the productivity drops. In practice, a backup power supply is usually added, too, for the situations when the amount of energy required is greater than both what is being produced and what is stored in the container.

### **What is solar mobile phone charger?**

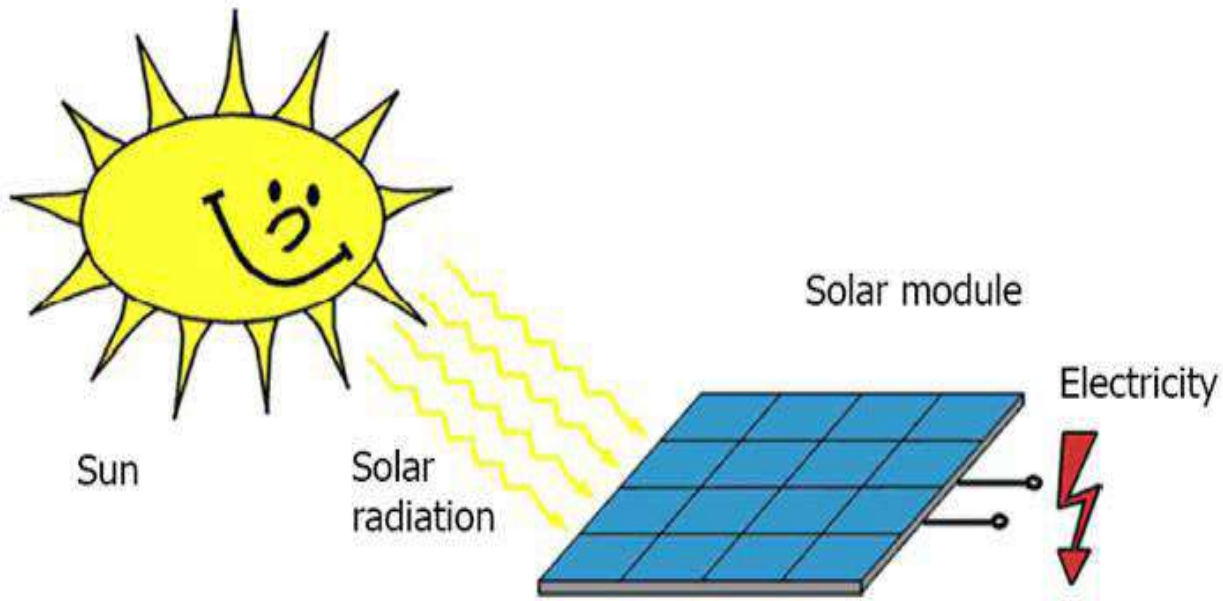
A Solar mobile charger is a cost effective small scale generator used to charge mobile Phone with the help of solar energy.



**Fig.1 solar mobile charger**

- The small solar panel are installed inside the solar charger.
- These solar cells are made up of silicon.
- The solar cells work on the principal of photovoltaic effect

### **Solar process:-**



Source: A. Poruba

Photos in sunlight are expose to solar cell |

After absorption energy is transmitted to electrons

Displacement of electrons generates current in wire

Fig. 2 solar process

## CHAPTER2

### LITERATURE REVIEW

- The research of photovoltaic energy (solar cells) started way back in 1876.
- In the early 1970's a way to lower cost of solar cells was discovered.
- Today we see solar cells in a wide variety of places.

## CHAPTER 3

### ARCHITECTURE

#### 3.1 Blocks in solar mobile phone charger

Solar mobile phone charger basically made up of three blocks

- A. Solar panel
- B. Voltage regulator
- C. Charger

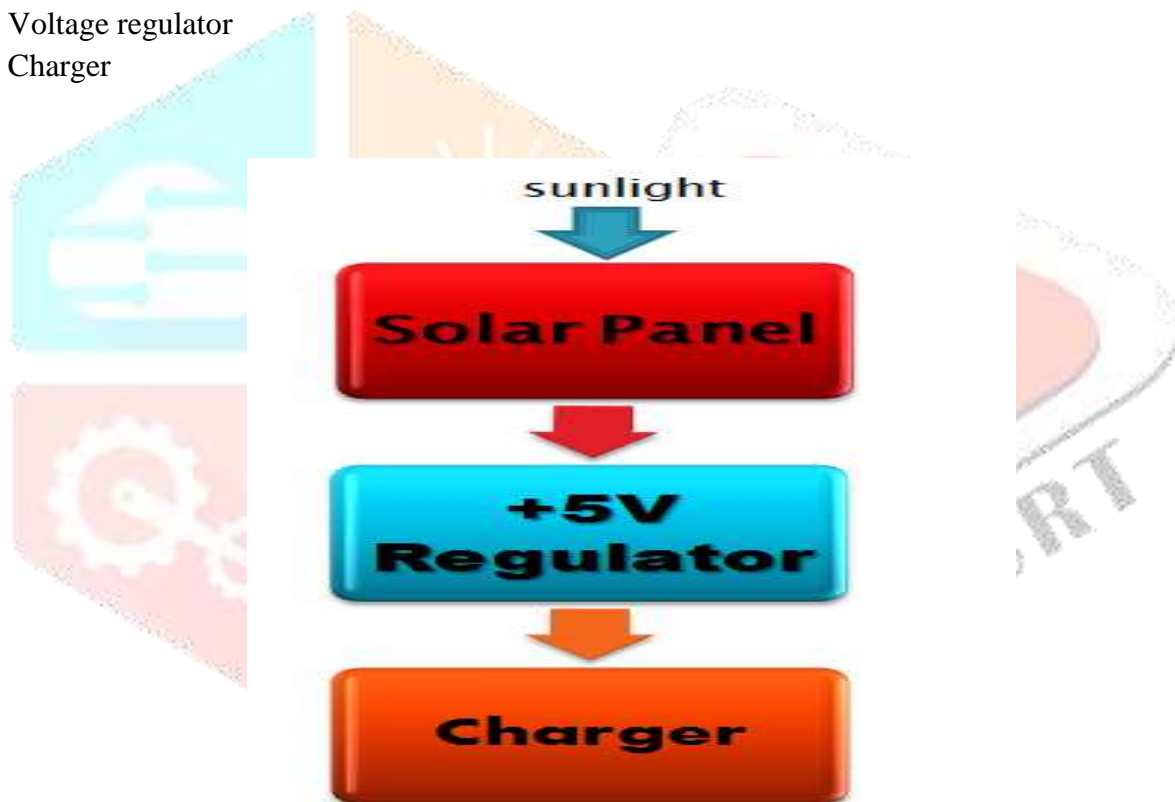


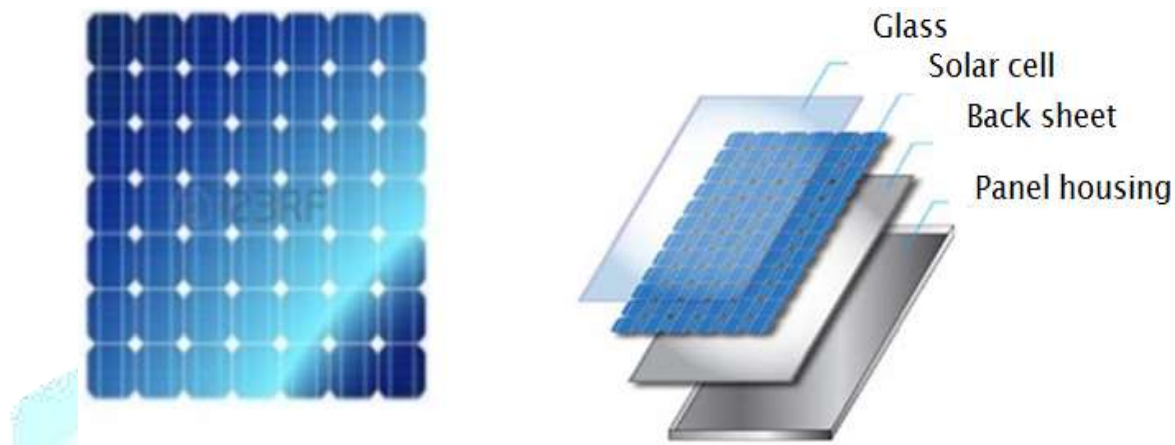
Fig.3 Block diagram of solar mobile charger

#### Solar panel:

##### a) How solar panels made

In order to understand how this is possible we need to understand how solar panels are made. There are two basic types of solar panels, first is the crystalline solar panels made of crystalline silicon and other is amorphous silicon panel which is made from amorphous silicon. In order to make Crystalline solar panels, thin disks are cut from silicon in its crystalline form which are .8 cm thick. These disks are then subjected to a careful polishing and repairing process to ensure that no damage occurred during the cutting process has remained unattended. The thickness of these disks is so less that

they appear to be wafer like disks which gives them the name “silicon wafers”. Now for the main part of the process, adding the “dopants”. Dopants are materials that are added to these silicon wafer disks so that they get electrically charged. The positive and the negative charges are added accordingly in these silicon disks and then are joined together so that electrons when subjected to sunlight can flow and conduct electricity. These disks now with the do pants in them are aligned horizontal and vertical manner to form a matrix pattern forming a solar panel. These solar panels are then covered with glass plate in order to protect them from any physical damage or scratches.



**Fig.4 Structure of solar panel**

#### **b) How electricity produces from solar panel**

The principle used to generate electricity from the solar panels is the photovoltaic effect that used to generate electricity for battery. The basic working of solar panels depends on the semiconductor property of silicon. The silicon is a unique substance that has revolutionized the way electronic appliances work. This property is used to generate electricity from the solar panels. In order to understand how solar panels work we need to understand how silicon works at an atomic level. Silicon in its pure form i.e. when all the impurities have been removed a silicon atom is bonded with another silicon atom. Since the valency of silicon atom is 8 which means that there are 8 electrons in its outermost orbit. However in its natural state there are only 4 electrons bounded in the outermost orbit. Hence these 4 electrons are able to bond with another 4 electrons with 4 silicon atoms around it. The 4 free electrons that can move around throughout the substance. During the absence of electric potential these free electrons tend to remain close to their parent atoms so that they are at minimum energy level. However when the electric potential is applied across the substance these free electrons receive energy and move direction of the potential difference applied thus producing electric current. However the current produced in a pure semiconductor is quite less because these free electrons want to remain at minimum energy level possible.



### Photovoltaic cell:

The term "photovoltaic" comes from the Greek (photo) means "light", and "voltaic", means electric. The sun is a star made up of hydrogen and helium gas and it radiates an enormous amount of energy every second.

A photovoltaic cell is an electrical device that converts the energy of light directly into electricity by photovoltaic effect.

- The operation of a photovoltaic (PV) cell requires 3 basic attributes:
- The absorption of light generating either electron-hole pairs or exactions.
- The separation of charge carriers of opposite types.
- The separate extraction of those carriers to an external circuit.

### Principal of PV cell:

Solar cell works on the principle of photovoltaic effect. Sunlight is composed of photons, or "packets" of energy. These photons contain various amounts of energy corresponding to the different wavelengths of light. When photons strike a solar cell, they may be reflected or absorbed. When a photon is absorbed, the energy of the photon is transferred to an electron in an atom of the cell (which is actually a semiconductor). With its new found energy, the electron is able to escape from its normal position associated with that atom to become part of the current in an electric.

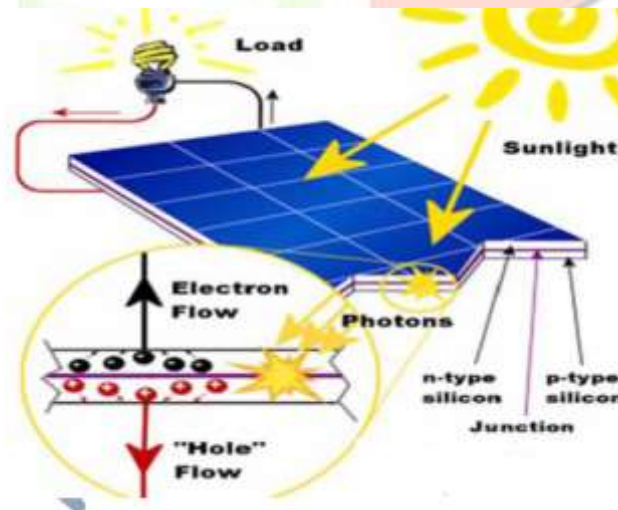


Fig.5 PV Cell

### B. Voltage regulator:-

Voltage regulator IC LM7805 is mainly used in the circuit to maintain the exact voltage which is followed by the power supply.

The voltage regulator is three pin IC which is used to stop the fluctuation in output as well as input.

A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator.

When the sunlight is maximum the module can generate current to IC7805.

IC 7805 give +5V to all batteries.

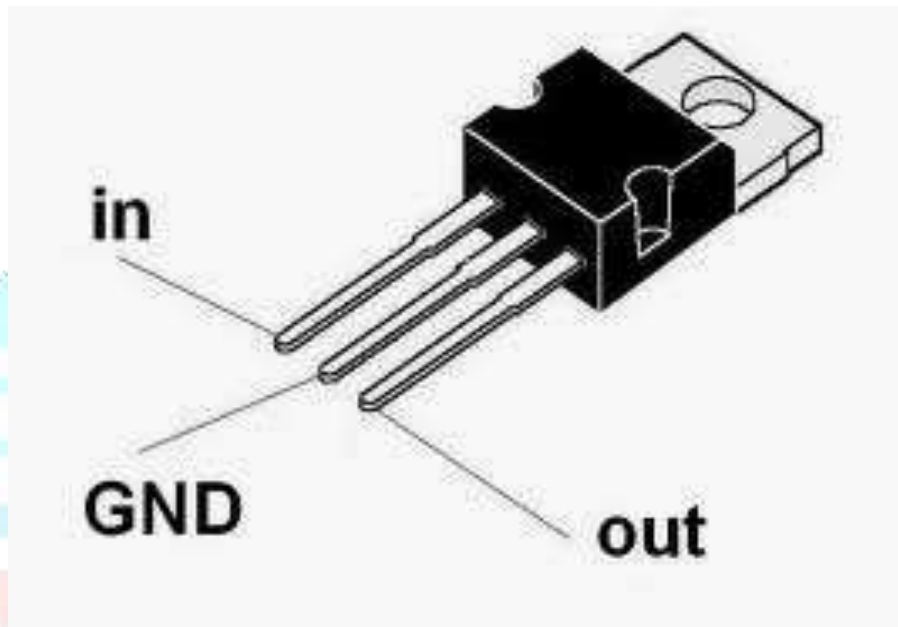


Fig. 6 IC7805

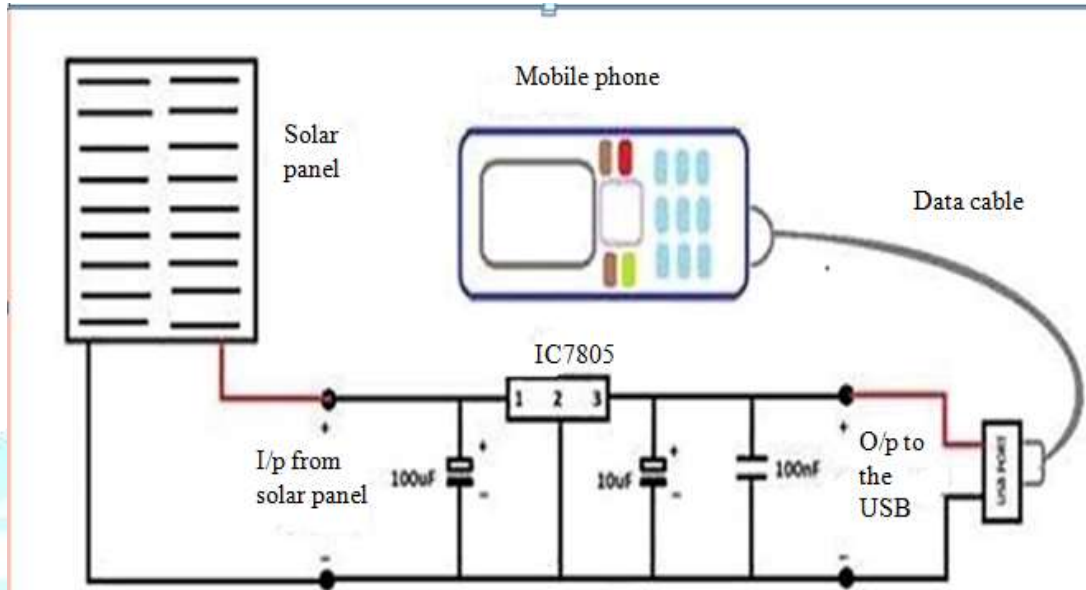
### C. Charger

Charger is used to charge our mobile phone using data cable.

### 3.2 Circuit diagram:

- Fig 7.shows block diagram & overview of the solar charger. There are one main input source like AC input from solar panel.
- Here in both C1 and C2 capacitors are used for to remove the ripples and act as filter capacitor.( To remove AC components) .
- ICs regulator is mainly used in the circuit to maintain the exact voltage which is followed by the power supply.
- A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator.

- For the checking of gigantic alterations in the input as well as in the output filter, capacitors are used.
- While the bypass capacitors are used to check the small period spikes on the input and output level.
- Bypass capacitors are mainly of small values that are used to bypass the small period pulses straight into the Earth.



**Fig. 7 Circuit diagram of solar mobile phone charger**

**Specification of solar mobile phone charger**

- Uses high efficiency mono crystalline silicon.
- Solar panel:5.5V/1000mA
- Output Voltage:5.5V
- Output Current:300-550mA
- Time taken to charge mobile phone using the charger: about 60 minutes for typical mobile

**3 Traditional charger Vs Solar charger**

Condition	Traditional charger	Solar charger
Electricity consumption	High	Not require



Environment friendly	No	Yes
Security	Weak	Strong

## CHAPTER4 ADVANTGES, DISADVANTAGES & LIMITATION

### 4.1 ADVANTAGES:-

- **Cost Effective:** Compared to the other mobile chargers, the solar chargers are cost effective as it absorbs power from the sun. It does not require electric power.
- **Versatile:** It is also known to be versatile as it can be used for all types of mobile phones.
- **Uninterrupted Power Supply:** One of the greatest advantages of solar mobile phone charger is that it can be used to charge mobiles even during power outages.
- **Emergency Purposes:** Another benefit is that it hardly requires any electrical outlet. It can therefore be used during emergencies and outdoor purposes.
- **Compact Design:** Solar mobile phone chargers are compact in size and easy to carry around.

### 4.2 DISADVANTAGE:

- Solar charger needs light to work.
- The efficiency of the photo-voltaic panels has increased greatly over the last decade or so, reaching the point where they do not need direct sunlight to work but will now create a satisfactory current even under overcast conditions. But it is still something we should be aware of depending where in the world we are based.
- Charging a device by solar charger is much slower than the main charger. □ This is due to the current generated by the solar panels being a lot less than what you would find at home

**4.3 LIMITATIONS:**

- **Quite expensive:** One of the most important drawbacks is its price compared to the ordinary mobile phone chargers; it is quite expensive as it utilizes solar energy captivators.
- **Charging time large:** Another significant drawback is the time frame required by the chargers to charge mobile phones. It can take six to eight hours to charge mobile phones compared to the other.

**CHAPTER 5****APPLICATION**

- ▶ Small models designed to charge a range of different mobile phones, cell phones, iPods or other portable audio equipment.
- ▶ Public solar chargers permanently installed in public places, such as parks, squares and streets, which anyone can use for free.
- ▶ It is use to charge phone while travelling without depending on electricity.
- ▶ It is applicable in remote area.
- ▶ In other situations, such as solar battery chargers, watches, and flashlights the photovoltaic array is used to generate electricity that is stored in batteries for later use.
- ▶ Using over voltage protection circuit we can protect our battery from over charging.  
Charge discharge control circuit contain two-way Switch. It gets active when voltage exceeds above threshold voltage level.

**CHAPTER 6****CONCLUSIONS & FUTURE SCOPE****6.1 CONCLUSIONS**

To make sure we have plenty of energy in the future, it's up to all of us to use energy wisely. We must all conserve energy and use it efficiently. It's also up to those who will create the new energy technologies of the future. All energy sources have an impact on the environment. Concerns about the greenhouse effect and global warming, air pollution, and energy security have led to increasing interest and more development in renewable energy sources such as solar, wind, geothermal, wave power and hydrogen. In solar mobile charger ripples will not be there as we use DC power directly to charge the mobile. Battery life is more as high voltages are not developed. Versatility of Solar mobile charger is high. Life of the battery will be high as we use solar mobile charger. Adaptability is high.

## 6.2 FUTURE SCOPE

Basically the solar mobile charger is designed for charging mobile battery. But in future, by making some modifications we can use this charger to charge batteries used in different portable devices like laptop, walky-talky, i-POD, digital camera etc.

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