

CHAPTER 01

INTRODUCTION

Remember those days when we feel looking at the sun and curse our self for being out on hot sunny day. Be proud very soon we will be walking energy station with people asking us to charge our batteries with this renewable free source of energy.

It is a simple application of solar cells. We can convert solar energy to electrical energy which is smaller and cheaper. Every hour the energy which is available from the sun is more than what humans require for year. Diesel, petrol, kerosene and all those fossil fuels are nothing but sun's energy never degrade and concentrate over years and years.

Solar isn't a new topic for us. People used sun for preserving things. Vedic literatures used sun for flying objects. Coming to 21st century we developed solar cells which are the devices powering our futures by converting into thermal energy or electrical energy.

Solar panels are the solar cells which are lined up together in series and parallel so, to get sufficient voltage and p-n junction semiconductor devices with the pure silicon wafer doped with the n-type phosphorous on the top and p-type boron at the bottom. If the PV cell is placed under the sun then photons of the light strike the electrons in the p-n junction and energize them knocking them free of their atoms. These electrons are attracted to positive charge in the n-type silicon and repelled by the negative charge of the p-type silicon. Connecting wires across the junction will be having the current in them.

Solar cells have 6% efficient chunks which have come from long bulky to thin film which is as much as 30% efficiency. They are selling items like hot cakes today given their utility and necessity. And there is a reason for being good chaps unlike oil which is more precious, coal which has polluted the air. Solar panels have many applications. Now-a-days we have mono crystalline, polycrystalline and amorphous thin film panels.

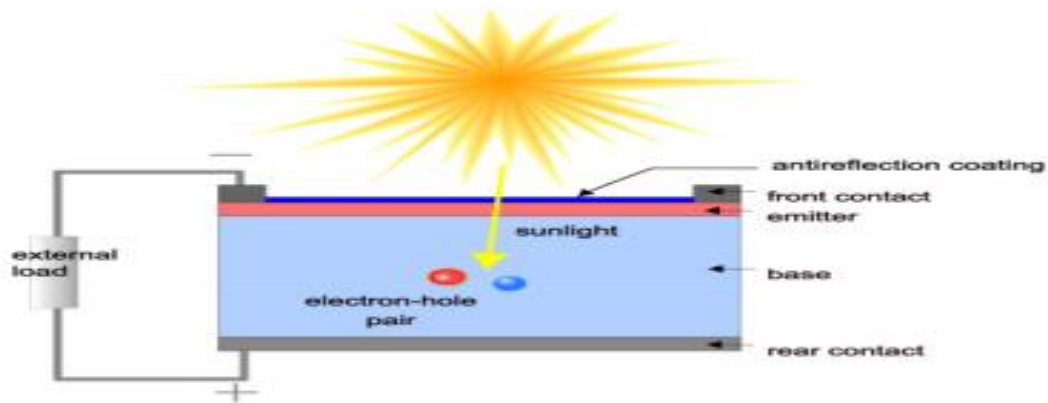


Fig1.1-Solar cell activity

Mono-crystalline is the more efficient, and they have the maximum silicon in a unit area so more current for the same number of photons. They are made up of single silicon crystal as a continuous lattice. For the polycrystalline panels separate boundaries can be seen due to pouring the molten silicon into molds. The quantity of silicon area is less efficiency of production of electricity will also be less. Amorphous thin panels are the layers of a silicon on the top of the glass surface is least expensive. Hence, they are used in the applications due to efficiency for lowering the cost.

Solar panels are really useful in the daylight, but we need energy when sun is not present. That's the reason we require solar panels to store energy in the rechargeable batteries. This project aim is to make a solar battery charger through IC LM317 to charge a lead-acid battery with the constant output voltage. Today there are many options for doing such solar projects. But this is an IC with embedded MPPT (Maximum power point algorithm). MPPT means IC gets the maximum possible power from the solar panel by sampling the output and applying the proper load resistance. This small chip simplifies life with maximum efficiency is always assured.

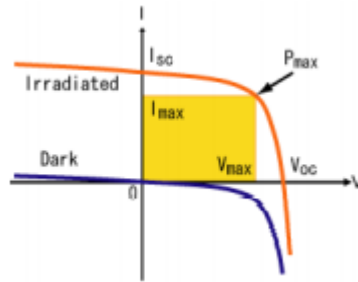


Fig 1.2- Graph of dark vs ir-radiation

New technology is being developed through solar energy. In India we are definitely headed towards a cleaner future. 15% efficient solar panels installed across the world is also producing enough clean energy to the mankind.

Reducing the dependence on fossil fuels and cutting down trees and burning coal which is responsible for carbon emissions is one of the most important aspects of the solar energy another point is it can make any country especially tropical country like India, self-sufficient in energy. With ambitious project like National solar missions aiming to produce 20GW (India's energy consumption on 2012 is among 100GW 1GW is solar energy) by 2021 it will become a big step towards progress. Rural areas are now aware of solar lamps and now utilizing it. Now in almost everyone are using solar energy for their needs. Solar parks are also becoming trend with Pavagada solar park, Karnataka producing 2000MW of energy. Government is also encouraging public to make utilize of solar energy by subsidizing electricity bills for those who is utilizing solar energy. So, if you make more energy than you use you will end up in profit without burning a single calorie!

Solar is an exciting topic but some challenges also need to be discussed. Space constraints, weather constraints and expensive technology is being involved to hinder the process. But with the increase in production and development of technology, safer environment, prices will fall, making the energy we need. Sustainable development can ensure by the renewable sources of energy. Economic growth of a country Standard of living of people also can be increased by utilizing renewable sources; the only thing we need to focus is to glare rather than evading it.

CHAPTER-02

LITERATURE REVIEW

The literature review of this thesis is divided into three parts. First part of the literature review begins with the introduction to the solar power as a renewable source of energy. Second part of the literature review tells about history of a solar cell and its chemical composition. The third part is a benefits of battery charger and explain how it can be developed.

2.1: Solar Energy

Solar energy is a form of heat and light which comes from the sun. Energy from the sun travels to the earth in the form of electromagnetic radiation with wide spectrum of frequency range. Solar energy is expressed in units of energy per time. The amount of energy which is available from sun to the outside earth's atmosphere is approximately 1367 W/m^2

At any time available of solar energy depends upon sky, weather, cloud conditions and also location. It also depends on location.

2.1.1: Solar energy as a power source

Electrical generation using the solar cells is a particular interest for most of the people for a long time and also gaining popularity across the countries that lie near equator because, they have huge facility of solar energy. Malaysia, as a country which is close to the equator, possesses a daily peak solar hours more than the 4 hours. This is much higher than those countries like America, Japan, Germany where solar energy is the alternative energy has been supported by their government. The solar energy in Malaysia makes it as a source for the power generation.

Solar energy demand has grown at about 25% per annum over the past 20 years. This form of energy is accepted by the world wide as an alternative energy as of current research have shown that the solar photovoltaic (PV) is the most promising renewable energy and fastest growing for the electricity generation.

To know how this solar energy can be fully utilized we need to know how to utilize an old well-known, physical phenomenon that is photovoltaic effect, where the sunlight is transferred directly into the electricity.

A photovoltaic solar cell is a semiconductor which can generate as electric potential when ionized by the radiation. This solar cell can convert radiant energy into electricity with long life cycle.

2.1.2: Benefits of solar energy

Photovoltaic systems or solar cells can be utilized in many ways. Solar batteries have been used for many applications in aerospace industries, communication and electric vehicles. Many different applications of PV systems are possible and it is vary from water pumps and satellite power systems. In Malaysia, utilization of solar energy has begun in a wide range of applications like agriculture, lighting and many in urban areas also.

There are many benefits to be gained by utilizing the solar energy as a source of power. Photovoltaic technology has been proven to be a exciting energy source and the conversion method is unique. Photovoltaic power system do not contain any moving objects and no need of any fluids and gases to be used and no need of fuel to activate the system. It is a non-polluting and quick responding mainly a power source. Solar energy does not give risk to the environment concern and which contribute to the dangerous chemical emissions. On the other hand photovoltaic array can be made up of silicon.

2.1.3: Solar cell

The solar panel can be called as solar cell or photovoltaic cell is a device which converts light directly into the electricity by the photovoltaic effect. Sometimes solar cell is reserved to capture energy from the sunlight. Combination of this cells are used to make solar panels, photovoltaic arrays. These arrays are used when the energy conversion is done.

2.1.4: History of the Solar cell

The photovoltaic was first reported in 1839 by the scientist called Edmund Bequerel who observed the action of the sunlight on a electrode which is submerged in a conductive solution which would create a electric current. Forty years later the first solid state photovoltaic device was created and discovered as the photoconductivity of selenium. In 1894, Charles Fritts prepared a first solar cell which has large area by pressing a layer of selenium between the gold and other metal. This made a way to observe every cell which is thin film Schottky barrier devices where a semi transparent layer is deposited on the top of the semiconductor.

Photoconductivity was given more importance because the fact is that current produced was proportional to the intensity of the incident light and this is related to the wavelength of light. In 1950's they developed good quality of silicon wafer which has useful quantities of power were produced by the photovoltaic devices.

Further development in the silicon electronics which leads to the manufacturing of p-n junctions with silicon, the first silicon solar cell is first made in 1954 which have converted with 6 times efficient than the selenium. Low weight silicon solar cells are widely developed for the space application and power generation for the remote areas are also delivered where no fuel is available. In 1970's all of a sudden the growth of interest in alternative source of energy is being increased and been explored.

Crystalline means that the material in the PV has regular ordered within the each grain. The boundaries between the grains affected the electrical properties of PV. PV modules are made up of mono crystalline silicon of higher efficiencies because they don't have boundaries. During this current period, the economics of the photovoltaic is continuously expanding and has become competitive with the conventional electricity.

2.1.5: How a Solar cell works

Solar photovoltaic conversion is a one step conversion process which converts light energy into electrical energy. Light is made up of packets of the energy called photons. This relies to the quantum theory. The energy of the visible photons is enough to excite the electrons. They bound into solids where they can move freely to the higher energy levels. Normally, light is absorbed by the matter photons will be given to excite the electrons to the higher energy states within the material. But the excited ones come back to relax in the ground state.

This action can be described in the form of diagram and photoelectric effect where this ultra violet light liberates electrons from the surface of the metal.

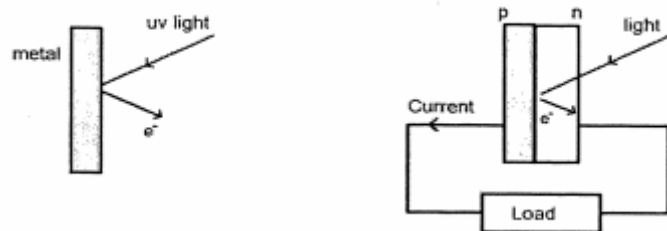


Fig 2.1- Photovoltaic device

Photovoltaic device is seen on the right where electrons are knocked loose from their atoms. On the whole, the effectiveness of the photovoltaic device is depended on the choice of light absorbing materials.

2.1.6: Battery Charger

Battery charger chargers are generally used to recharge the rechargeable batteries like Nickel cadmium (Ni-Cd), and lithium ion (Li-ion), in some cases, disposable alkaline batteries also can be charged. This recharging of alkaline batteries are not new for us, it is done for many years in households but not endorsed by manufacturers.

Recharging these batteries is only effective one, if the cell has been discharged up to less than 50% that of its total capacity. The number of times that the cell can be recharged is depends on the manufacture factories. This depends on the load, frequency and length of time it discharged and depth of discharge in its discharged state. Temperature and conditions is also considered. With every recharge the holding capacity of the cell is reduced.

Rechargeable batteries reduce the economic impact and also 32 times less impact on the environment than the disposable batteries. When the batteries are disposed improperly in some work place or ground it releases heavy metals such that it mix into the surface water which is very dangerous to environment. When the batteries are incinerated certain metals will be exposed into the air and ashes which is to be disposed.

Heavy metals like mercury can damage the food chain which was used in the batteries. So, in 1996 mercury was phased out with signing the battery act. But, metals like Cadmium is still using which is very toxic in nature. Battery charger combines with the solar panel for the power supply it creates an environment eco-friendly battery charger.

One evident strength of the sun powered battery charger is that we needn't bother with a electrical plug for it to work. The sun powered battery charger completely depends on the sun alone for its charging energy and can be utilized in any area where daylight is accessible. Since an outer electrical source isn't needed to revive batteries, the sunlight based battery charger offers opportunity of development.

Nonetheless, most sunlight based chargers require a more drawn out timeframe to charge a set of batteries contrasted with other customary chargers. This is on the grounds that indeed, even in splendid daylight, most sunlight based cells right now underway are just around 10 percent proficient, which makes them slow than chargers that plug into a divider source.

CHATER-03

EXISTING SYSTEM AND PROBLEM STATEMENT

The solar panel which is being used has the output voltage and current near about 17 V and 0.3 A respectively. We use LM317T voltage regulator IC instead of the traditional voltage regulator family since the output voltage of the LM317T IC can be easily set to the desired voltage from 1.25 V to 37 V with the maximum current of 1.5 A.

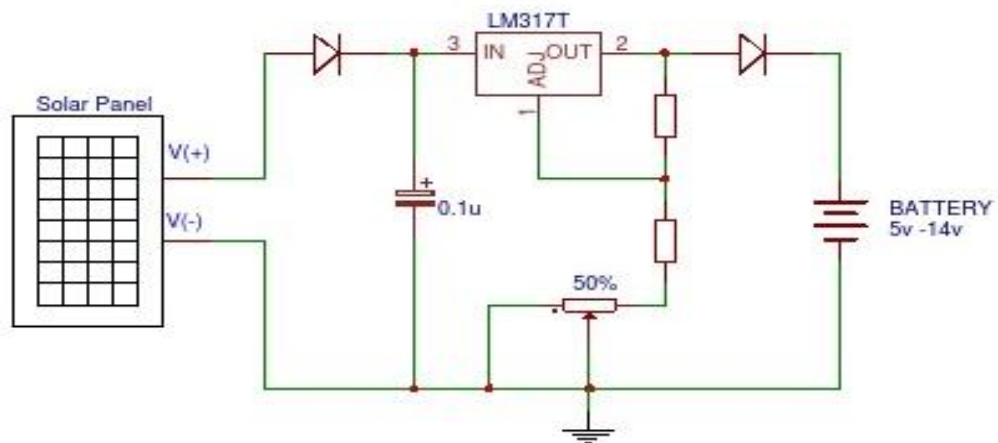


Fig3.1- Solar voltage controller circuit

3.1: Problem statement

The plan of a solar charger circuit is a significant driver for the mass, size, and capacity of the shuttle. Each and every other rocket subsystem is influenced by the force subsystem, and specifically, significant issues, for example, correspondences transmission capacity, warm guideline, and underlying model are generally impacted by the capacities and constraints of the force framework.

The inspiration for this issue is the expansive appropriateness of a force framework configuration device to a wide scope of future plan issues. Prerequisites given time narratives of the force burden and force source, plan a force subsystem that streamlines regarding some predetermined cost work. The force source profile can be indicated straightforwardly, or decided from constituent data, for example, time chronicles of the daylight force and the changing point of a sunlight based board as a shuttle pivots with regard to the sun. The plan space for the force subsystem ought to contain a few kinds of intensity age gadgets, for example, photovoltaic exhibits and radioisotope thermoelectric generators; and a few kinds of energy stockpiling gadgets, for example, batteries furthermore, flywheels. From this plan space, a framework that limits the cost capacity ought to be chosen.

3.2: Issue Arrangement

The methodology taken to the issue is to make a bunch of measured capacities that are joined to accomplish an answer. The essential favorable position to utilizing this methodology is that little, basic squares of code can be approved more effectively than enormous, complex squares.

Information sources

Required client inputs incorporate the accompanying amounts:

- Burden power as a component of time in Watts, examined at consistent time steps.
- Source power as a component of time in Watts, test at consistent time steps. This can be provided either straightforwardly as a force profile, or in a roundabout way as constituent information, for example, the time chronicles of occurrence daylight force and point of sun oriented cluster with deference to the sun.
- The length of the time step right away.

- The underlying life portion of the energy stockpiling gadget.
- The energy at first put away in the energy stockpiling gadget, in Joules. Yields from the plan module incorporate the accompanying amounts:
- The mass of the force framework in kilograms, including the mass of the energy stockpiling framework (batteries or flywheel) and force age framework (sunlight based cluster or RTGs). This mass does exclude different segments of the framework, for example, power molding gadgets.
- The expense of the energy stockpiling and force age frameworks in huge number of dollars.
- The time history of the condition of charge of the energy stockpiling framework, in Joules.
- The time list at which the energy stockpiling limit was inadequate to meet request, if this has happened.
- The time history of overabundance warm energy that should be scattered, in Joules.
- The leftover life in the capacity framework as a small amount of the first life expectancy.

There are a few key highlights for high utilization of charge regulators. To start with, the multistage charging of batteries which are saving battery from being harmed. Second, the capacity to change the force set to the batteries while thinking about the charge. This is huge to keep the battery more beneficial. Third, the opposite current insurance capacity keeps the sun oriented board from depleting charge of the battery banks in the night when there is no force from the board. Furthermore, it likewise separates the heap when the battery is low and associates when it charges once more. At last, it shows the voltage of the battery bank and furthermore the measure of charge from the board. However, having a sun based accuse regulator of these highlights and high effectiveness is extravagant to buy, around \$100-\$200.

Accordingly, the objective of this venture is to plan a sun based charge regulator with a higher proficiency and a lower spending plan.

3.3: Client requirements

In view of the elements of the gadgets being utilized and their specialized details, the prerequisite of the task can be separated into two sections: gadget capacity and gadget specialized determination. Every one of these necessities is summed up beneath

3.3.1: Device function

- Based on MPPT algorithm
- LED indication for the state of charge
- LCD display for displaying voltages, current, and power
- USB charger port 5 V
- Automatic battery voltage recognition (12 V/24 V)

3.3.2: Device technical specification

- Battery: 55 AH
- Maximum load current: 10 A
- Open circuit voltage between 0 -12.5 V for 12 V system and 12.5 – 24.5 V for 24 V system
- Solar panel power 80 W
- Battery charge current = 5 A
- USB charge current: 0.5 A

3.3.3: Optional display features on LCD

- Charge time
- Battery charging percentage

CHAPTER-04

PROPOSED METHODOLOGY

4.1: Solar Powered Battery Charger Development

A basic sun powered battery charger is by and large comprised of four sections. A normal sunlight based fueled battery charger is appeared in Figure, with the different potential subsystems that involve it.

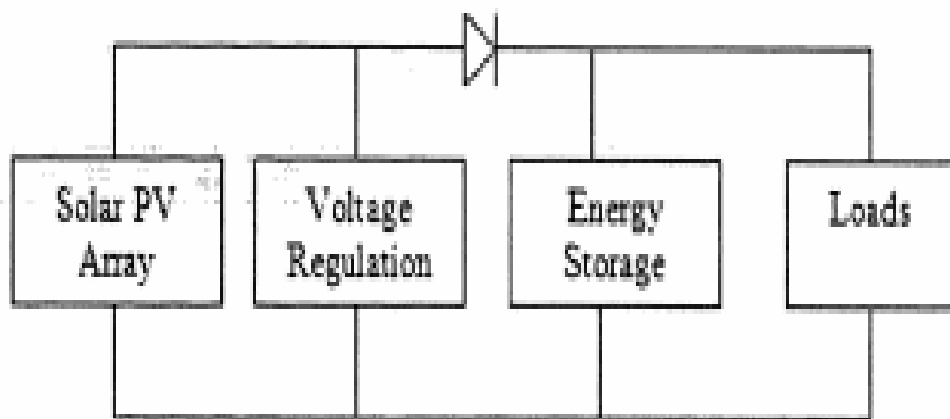


Fig 4.1- Subsystem of a solar powered battery charger

The sunlight based PV cluster is the source which produces power when presented to daylight, accordingly creating DC power. The sunlight based cluster is made with products of sun based cells. The sun based cells are associated in an arrangement equal setup to coordinate the necessary sun oriented voltage and force rating.

The sun based PV exhibit is then associated with the voltage guideline subsystem. The voltage controller keeps up the framework's voltage among low and high voltage limits when force is accessible the exhibit and makes a consistent current steady voltage charge.

To comprehend the idea of a steady current consistent voltage charge, we should initially understand that there are a few strategies utilized in the ordinary way to deal with charging a battery. The first and the most well-known in buyer items is the consistent current stream charge. These chargers give a very low, consistent current rate to the battery and depend on the client to stop the charge at the point when the battery has gotten back to full limit.

A deviation on the steady current charge approach is the consistent current steady voltage charge profile. Under this plan, a steady current is applied until battery voltage ascends to a foreordained worth, at which point the charging voltage is held consistent and the current is decreased. When the current has arrived at least worth, the charging stops

In certain applications, the sun based battery charger is an independent framework which incorporates a force converter which is utilized to control the sun based exhibit voltage into wanted voltage. This force regulator is generally either a buck converter which ventures down the info voltage or a lift converter that means up the voltage. To put it plainly, the force converter assumes a significant job in the voltage guideline of the charger.

The voltage from the controller at that point is diverted to a diode as appeared in the obstructing diode controls the course of the progression of energy between the exhibit and the framework to forestall release of the energy stockpiling framework through the sun based cluster and ensuing loss of energy or harm to the exhibit.

CHAPTER 05

PROJECT DESCRIPTION

5.1: Solar panel:



Fig 5.1-Solar panel

A Sun powered Board of 12V/5W is chosen with the end goal of charge age. Its light weight makes it a convenient gadget. Photovoltaic modules utilize light energy (photons) from the Sun to create power through the photovoltaic impact. Most modules use wafer-based glasslike silicon cells or flimsy film cells. The primary (load conveying) individual from a module can be either the top layer or the back layer. Cells should be shielded from mechanical harm and dampness. Most modules are unbending, yet semi-adaptable ones dependent on dainty film cells are likewise accessible. The phones are associated electrically in arrangement, to each other to the ideal voltage, and afterward in corresponding to build amperage. The wattage of the module is the numerical result of the voltage and the amperage of the module. The assembling particulars on sun oriented boards are gotten under standard condition which isn't the genuine working condition the sun powered boards are presented to on the establishment site

.

5.2: Battery:



Fig 5.2- lead acid battery

A battery of 12V 7.5Ah is required in order to store the sun oriented energy and give it to the heaps at the yield. A battery is a gadget comprising of atleast one electrochemical cells with outside connections for controlling electrical gadgets, for example, spotlights, cell phones, and electric vehicles. At the point when a battery is providing electric force, its positive terminal is the cathode and its negative terminal is the anode. The terminal checked negative is the wellspring of electrons that will move through an outer electric circuit to the positive terminal. At the point when a battery is associated with an outer electric burden, a redox response changes high-energy reactants over to bring down energy items, and the free-energy contrast is conveyed to the outside circuit as electrical energy. Generally the expression "battery" explicitly alluded to a gadget made out of numerous phones, anyway the use has advanced to incorporate gadgets made out of a solitary cell.

LM317:

Fig 5.3- IC LM317

The LM317T is a movable 3-terminal positive voltage controller fit for providing distinctive DC voltage yields other than the fixed voltage power supply of +5 or +12 volts, or as a variable yield voltage from a couple of volts up to some most extreme worth all with flows of about 1.5 amperes. With the guide of a little piece of extra hardware added to the yield of the PSU we can have a seat power supply fit for a scope of fixed or variable voltages either sure or negative in nature. Indeed this is more basic than you may might suspect as the transformer, amendment and smoothing has just been finished by the PSU previously we should simply interface our extra circuit to the +12 volt yellow wire yield. However, initially, let us consider a fixed voltage yield.

A voltage controller is a framework intended to naturally keep a consistent voltage level. A voltage controller may utilize a basic feed-forward plan or may incorporate negative input. It might utilize an electromechanical instrument, or electronic parts. Contingent upon the plan, it could be utilized to manage at least one AC or DC voltages.

5.4: Transistor:



Fig 5.4-Transistor

A transistor is a semiconductor gadget used to intensify or switch electronic signs and electrical force. It is made out of semiconductor material normally with in any event three terminals for association with an outer circuit. A voltage or current applied to one sets of the semiconductor's terminals controls the current through another pair of terminals. Since the controlled (yield) force can be higher than the controlling (input) power, a semiconductor can intensify a sign. Today, a few semiconductors are bundled independently, yet a lot more are discovered implanted in coordinated circuits.

Austro-Hungarian physicist Julius Edgar Lilienfeld proposed the idea of a field-impact semiconductor in 1926, however it was unrealistic to really develop a working gadget at that time. The primary working gadget to be assembled was a point-contact semiconductor designed in 1947 by American physicists John Bardeen and Walter Brattain while working under William Shockley at Chime Labs. The three shared the 1956 Nobel Prize in Material science for their achievement. The most generally utilized semiconductor is the MOSFET (metal–oxide–semiconductor field-impact semiconductor), otherwise called the MOS semiconductor, which was imagined by Mohamed Atalla with Dawon Kahng at Chime Labs in 1959. The MOSFET was the primary genuinely minimal semiconductor that could be scaled down and mass-created for a wide scope of uses.

5.5: Zener diode:



Fig 5.5-Zener diode

Zener diode is essentially similar to a common PN intersection diode yet ordinarily worked backward one-sided condition. Yet, common PN intersection diode associated backward one-sided condition isn't utilized as Zener diode basically. A Zener diode is an uncommonly planned, exceptionally doped PN intersection diode.

5.6: Diode:



Fig 5.6-1N4007 Diode

A diode is a gadget which permits current course through just a single bearing. That is the current ought to consistently move from the Anode to cathode. The cathode terminal can be recognized by utilizing a dark bar as appeared in the image above.

For 1N4007 Diode, the most extreme current conveying limit is 1A it withstand tops up to 30A. Thus we can utilize this in circuits that are intended for under 1A. The opposite current is 5uA which is irrelevant. The force dispersal of this diode is 3W.

5.7: Resistor:



Fig 5.7-Resistor

A resistor is a detached two-terminal electrical part that actualizes electrical opposition as a circuit component. In electronic circuits, resistors are utilized to lessen current stream, change signal levels, to separate voltages, inclination dynamic components, and end transmission lines, among different employments. High-power resistors that can scatter numerous watts of electrical force as warmth, might be utilized as a component of engine controls, in force conveyance frameworks, or as test loads for generators. Fixed resistors have protections that lone change somewhat with temperature, time or working voltage. Variable resistors can be utilized to change circuit components, (for example, a volume control or a light dimmer), or as detecting gadgets for heat, light, dampness, power, or synthetic action.

Resistors are normal components of electrical organizations and electronic circuits and are omnipresent in electronic hardware. Functional resistors as discrete segments can be made out of different mixes and structures. Resistors are additionally actualized inside incorporated circuits.

The electrical capacity of a resistor is determined by its obstruction: regular business resistors are made over a scope of in excess of nine significant degrees. The ostensible estimation of the obstruction falls inside the assembling resilience, shown on the part.

5.8: Wires:



Fig 5.8-wires

A wire is a solitary typically barrel shaped, adaptable strand or pole of metal. Wires are utilized to bear mechanical burdens or power and media communications signals. Wire is normally framed by attracting the metal through an opening a pass on or draw plate. Wire checks come in different standard sizes, as communicated regarding a measure number. The term 'wire' is likewise utilized all the more freely to allude to a heap of such strands, as in "multistranded wire", which is all the more effectively named a wire rope in mechanics, or a link in power.

Wire comes in strong center, abandoned, or twisted structures. Albeit normally roundabout in cross-area, wire can be made in square, hexagonal, smoothed rectangular, or other cross-areas, either for embellishing purposes, or for specialized purposes, for example, high-effectiveness voice loops in amplifiers. Edge-wound loop springs, for example, the Smooth toy, are made of uncommon straightened wire.

5.9: Schematic diagram:

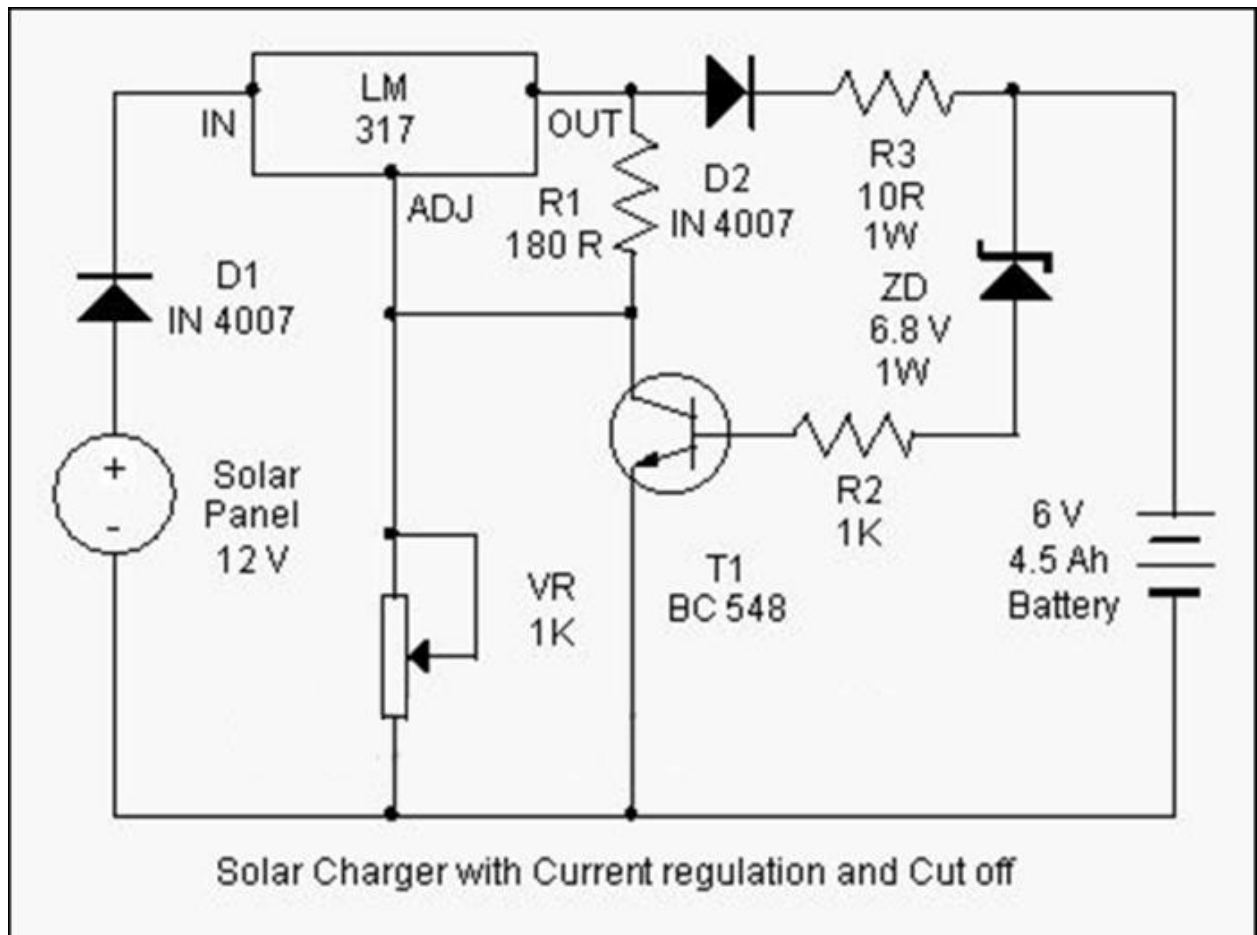


Fig 5.9

5.9.1: Schematic diagram description:

Sun based boards are tantamount to control supplies of a normal of 12V in brilliant daylight. The solitary issue is unregulated voltage because of variety in force of light. IC LM 317 takes care of the issue by directing the yield voltage however it again dispersed 2V across it which makes the framework less productive. Sun powered charger circuits need voltage controllers in order to charge the batteries at steady voltage. The battery is in this manner charged at steady voltage and at wanted rate contingent upon the measure of current provided.

Batteries are the most straightforward approach to store energy. Consequently sunlight based charger circuits target charging batteries as opposed to driving segments. The battery charging cycle should be halted once it is completely energized and this is guaranteed utilizing a zener which will begin directing at the cut off voltage. The charger circuit is a basic, prepared to utilize lead corrosive battery charger and is a decent method to tap sun's energy in a hurry.

During the sunlight hours the sun based board identifies the Sun based Radiation occurrence on it and produces the voltage beats. The voltage beats are corrected by a diode and afterward given to the flexible voltage controller. At that point it creates a steady yield voltage independent of information voltage. At that point it is given to the control circuit, the control circuit comprises of diodes and semiconductor. Diodes (1N4007) these are essentially hindering diodes which guarantee that the current streams just in one manner so the battery doesn't release when the yield from sun based board is low.

Zener Diode (1N4736) and the Transistor (BC548): This piece of circuit guarantees that once the charging cut off voltage is reached by the battery, the charging stops. The Zener is evaluated at 6.8V as breakdown. This permits all the voltage to drop across the Zener and the semiconductor turns on due to biasing of the Base-Producer intersection. The semiconductor demonstrations like a switch and once the battery is charged, it draws all the current subsequently ensuring the battery.

CHAPTER-06

RESULTS & DISCUSSION

Table 6.1-To study how solar panels behave to different intensities of light Conditions

Conditions	Open circuit voltage across the panel
Covered with cardboard	0.263V
Facing the desk	0.468V
Covered with Paper	2.5V
At the window(11am)	14.72V
In the lab	7.62V
At the desk	5.2V
Using a torchlight at distance 15cm	11.22V
At the terrace(2pm)	21.2V(maximum Voc=21.4V)

6.1: Observation

Solar panel is highly dependent on light falling and intensity to produce any kind of voltage. The outputs varies from the 0.2V to 21.2V

6.1.2: Conclusion

Sunlight matters a lot. So to make out a fixed best solar panel we need to have a solar tracking system to produce a maximum power.

To study the working of IC LM317 (using power supply) Conditions: $R_1=180\Omega$, $R_2=500\Omega$

6.1.3: Solar panel rating:

- 20W (12V) or 10W (6V)

- Vout range: 5 to 14V
- Maximum power dissipation: 10W (includes power dissipation of schottky diode)
- Typical drop out value: 2 to 2.75V (depends on load current)
- Max current: 1.5A (internally it limited to 2.2A)
- Voltage regulation: +/- 100mV

Table 6.2-IC LM317 conditions: R1=180Ohm,R2=500Ohm

Vin	Vref	Vout	VinVout	Iref (mA)	Iadj (uA)
6.85V	1.225V	4.64V	2.12V	6.81	19
8.30V	1.225V	4.657V	3.67V	6.815	53
10.59V	1.224V	4.65V	4.65V	6.815	46.6
12.16V	1.225V	4.667V	4.667V	6.81	73
15.68V	1.225V	4.68V	11.00V	6.81	99
23.67V	1.225V	4.651V	18.19V	6.817	41

Table 6.3-Using Solar panel Conditions: R1=180Ohm, R2=500ohm

Vin	Vref	Vout	Iref (mA)	Iadj (uA)
4.85V	1.225V	4.64V	6.81	19
6.30V	1.225V	4.657V	6.815	53
7.59V	1.224V	4.65V	6.815	46.6
8.16V	1.225V	4.667V	6.81	73
10.68V	1.225V	4.68V	6.81	99

Results: IC LM 317 gives a regulated output for a particular range of input voltage.

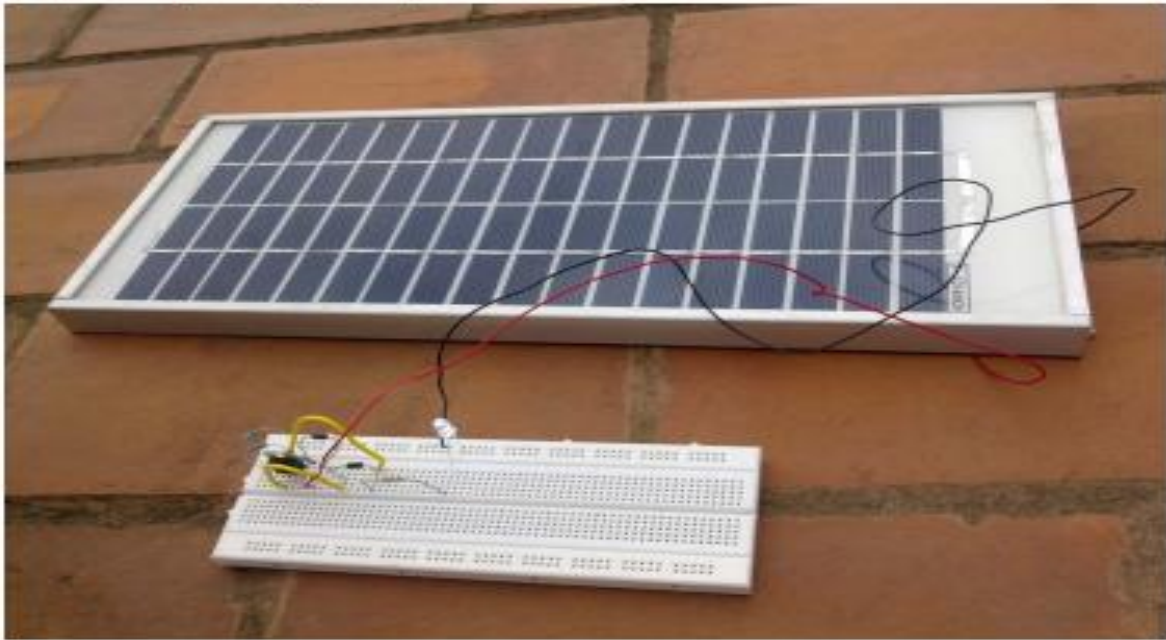


Fig-6.1-Final output

6.2: Applications:

- The solar battery charger can be used to charge the electronics while travelling.
- It can be used as a backup power supply and can keep in our backpack.
- While camping the backup battery charged by solar charger can be used for lighting purpose

CHAPTER-07

7.1: Future scope:

I am keen on figuring out how to make simple, versatile and prepared to utilize gadgets which run on sun-based force. The extent of creative mind is huge as sunlight-based force can run anything on DC voltage. In particular, I need to investigate sun-oriented chargers in more noteworthy detail and see how to build proficiency of intensity age (IC LM317 drops the valuable 3V across it hence squandering energy). Another zone of interest is investigating various advances accessible in making sun powered cells (Mono-glasslike, Polycrystalline, Slight Movies) and have the option to clarify why their effectiveness changes such a huge amount by understanding their gem structures.

7.2: Conclusion:

The "Sun powered cell phone Charger" is effectively tried and actualized. Through the execution of this in Real time, we can utilize plentiful accessibility of Solar Energy and furthermore store it for additional necessities.

7.3: Advantages:

There are end quantities of preferences of utilizing these battery-powered battery circuits. Advantages of this circuit are referenced beneath:

- This secures our current circumstance as well as doesn't make an opening in our pockets. In this way, these circuits are moderate and simple to utilize.
- One can undoubtedly change the yield voltage of these circuits according to the necessity of their machine.
- For setting up this circuit no greetings tech apparatuses are utilized. Straightforward and effectively parts are needed for setting up the circuit for sun-oriented battery charger.

- The battery release is practically equivalent to zero when there is no utilization, so the energy stay saved.

REFERENCES

- www.main.org/polycosmos/glxywest/vimanas.htm - Indian Flying Machines
- <http://www.triplepundit.com/2011/08/solar-farming-potential-india/> - Solar Farming
- http://en.wikipedia.org/wiki/Solar_cell
- http://www.planetarypower.com.au/solar_panels.html
- <http://www.earthtimes.org/energy/solar-cells-future/1403/>
- Element14 – to look up devices, ICs
- Physics of Solar Cells- A Text for Undergraduates, J Nelson

