A Mini-Project Report

On

"SOLAR BACKPACK"

SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE AWARD OF A DEGREE OF

BACHELOR OF ENGINEERING

IN

ELECTRONICS & COMMUNICATION ENGINEERING

BY

KODATI AKSHITHA (1608-20-735-012)

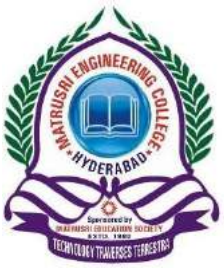
JAHANAVI. N (1608-20-735-308)

T. HARSHAVARDHAN (1608-20-735-020)

Under the guidance of

Mr P. Ravi Kumar Reddy

Assistant Professor (M.Tech,Ph.D)



Department of Electronics and Communication Engineering

(NBA Accredited)

MATRUSRI ENGINEERING COLLEGE

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#16-1-486,Saidabad, Hyderbad, Telangana-500 059

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Matrusri Engineering College
(Sponsored by : MATRUSRI EDUCATION SOCIETY, Estd: 1980)
(Approved by AICTE, Affiliated to Osmania University)
16-1-486, Saidabad, Hyderabad - 500 059. Ph : 040-24072764
Email : matrusri.principal@gmail.com , www.matrusri.edu.in
NATIONAL BOARD OF ACCREDITATION

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Date: 2/01/2023

Certificate

This is to certify that the Mini-project report entitled "**SOLAR BACKPACK**" being submitted by **Ms KODATI AKSHITHA (1608-20-735-012) Ms JAHANAVI . N (1608-20-735-308)Mr T HARSHAVARDHAN (1608-20-735-020)** in partial fulfilment for the award of the Degree of Bachelor of Engineering in Electronics and Communication Engineering of the Osmania University, Hyderabad, during 2022-23, is a record of bonafide work carried out under our guidance and supervision.

The results presented in this project report have not been submitted to any other University or Institute for the award of any Degree or Diploma.

Mini Project Coordinator

Dr Pallavi Khare

A Abhishek Reddy

Name of the Guide

Mr P Ravi Kumar Reddy

Dr. N. Srinivasa Rao

HOD-ECE

DECLARATION

This is to declare that the work submitted in the present Mini- project work report titled **"SOLAR BACKPACK"** is a record of bonafide work done by me in the Department of Electronics & Communication Engineering, Matrusri Engineering College, Saidabad, Hyderabad.

No part of the report is copied from books, journals, the internet and wherever the subject content is taken; the same has been duly referred to in the text. The report generated is based on the project work we carried out and is not copied from any other source.

Ms KODATI AKSHITHA (1608-20-735-012)

Ms JAHANAVI . N (1608-20-735-308)

Mr T HARSHAVARDHAN (1608-20-735-020)

Place: Hyderabad,

Date: 2/ 01 /2023.

ACKNOWLEDGEMENT

We would like to take this opportunity to place it on the record, that this Mini-project would never have taken shape but for the cooperation extended to us by certain individuals. Though this is not possible to name all of them, it would be pardonable on our part if we don't mention some of the very important persons Sincerely, we acknowledge our deep sense of gratitude to the project guide, **Mr. P RAVI KUMAR**, Assistant Professor for his constant encouragement, help and valuable suggestions. we wish to thank him for his constant motivation and help throughout the Mini-project.

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Last but not least we would thank all those people directly or indirectly associated with the Mini-project.

Ms KODATI AKSHITHA (1608-20-735-012)
Ms JAHANAVI . N (1608-20-735-308)
Mr T HARSHAVARDHAN (1608-20-735-020)

ABSTRACT

Energy drives all economic sectors. It could be very frustrating to have a mobile device with no power to charge it. Due to the erratic nature of power supply available during the day as well as a night in Nigeria, most importantly in rural areas necessitated the construction of solar-powered backpack mobile chargers. Solar backpack mobile chargers would store energy from solar cells which would then be utilized to charge electronic gadgets, such as mobile phones, LEDs and Bluetooth devices. The mobile charger was constructed by connecting 6V maximum output solar PV voltage to a series feedback voltage regulator. This was also connected to the comparator, to the rechargeable battery and finally to a regulator. During testing of the device, it was observed that the solar panel supplied 9 V maximum output voltage at no load and 7.25 V under load conditions. The voltage at the USB port of the charger varies between 4.00 V and 5.10 V with the highest current of about 240 mA. The construction of devices such as this is one of the approaches to applying green innovation to solve energy issues. The study hereby recommended that the Nigerian Government should create enabling environment so that these devices can be fabricated locally on a large scale to boost our economy, at the same time will also reduce the rate of unemployment among the youth. Thus with this project, we can achieve a smart bag which is multipurpose by power charging, switch-base LED, and Bluetooth speakers.

Keywords*:* Backpack, mobile Charger, Solar Energy, Modules, LED, Bluetooth Speakers

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Chapter 1

INTRODUCTION

1.1 Introduction

Solar energy, is radiation from the sun capable of producing heat, causing chemical reactions, or generating electricity. The total amount of solar energy incident on Earth exceeds the world's current and anticipated energy requirements. If suitably harnessed, this highly diffused source has the potential to satisfy all future energy needs. In the 21st century, solar energy is expected to become increasingly attractive as a renewable energy source because of its inexhaustible supply and its nonpolluting character, in stark contrast to the finite fossil fuels coal, petroleum, and natural gas. We can now use this source as a medium to charge our electronic devices, Bluetooth devices and switch-based LED light with solar panels.

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 reaches the Earth is the indirect source of nearly every type of energy used today . The radiation that does reach theEarth 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 canbe 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 ofsolar 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 theradiation 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-constantnature of solar energy; at certain times only a very small amount of radiation will be received. At night or during heavy cloudcover, for example, the amount of energy producedby 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. Inpractice, 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.

1.2 Problem specification

The purpose of the project is to develop a different prototype of a solar-powered chargingbackpack that is capable of charging a mobile phone, switch-based LED light along with Bluetooth speakers. The design would have to meet certain criteria including durability,reliability, practicality and low cost. For this to be achieved successfully, research, design, testing and analysis are carried out. We should design it so that there are various options for using one backpack.

1.3 Objectives

The solar backpack has the following objectives:

- To make use of renewable resources
- To use electronic devices whenever and anytime needed
- Making it portable and lightweight to carry anywhere
- Making it work as a multipurpose backpack

1.4 Layout of the thesis

- Literature Survey
- Hardware components
- Block Diagram
- Explanation of components
- Solar Panel
- Power Module
- USB
- Bluetooth Module
- Audio Amplifier
- Battery
- LED
- SPST Switch
- Bluetooth SpeakersTP 4056
- Circuit Diagram
- Working Principe
- Results
- Conclusion
- References

Chapter 2

LITERATURE SURVEY

Harvinder Singh Gambhir, Dattatray Sawant, Abhishek Basu, "IIoT Based Automation In Doorstep Fuel Delivery System": The long-range solution to the energy woes of the world does not lie in any one particular approach and several avenues should be explored simultaneously, with particular emphasis on the exploitation of solar energy in its various manifestations such as heat, winds, tides, and ocean thermal gradients. Research and development over the past thirteen years at Oklahoma State University have resulted in the evolution of several components required to engineer a continuous-duty power system running on nonexpendable energy sources, namely the sun and the wind. This paper presents the system and discusses its applicability to the energy systems of the future.

.Energy shortage in various parts of the world has an adverse impact on people's qualityof life and the overall development of these areas. Pakistan is among the world's energy- deficient countries, with a 7000 MW (Mega-Watt) energy deficit due to higher energy demandand lower energy production. Because of its hot climate, Pakistan has great potential to meet its energy needs using renewable energy (RE) sources, particularly solar photovoltaic (PV) technologies, to boost clean energy production. Considering this, the current study investigatesthe factors influencing households' purchase intentions of solar PV technology in Pakistan. This research has developed a comprehensive research model by integrating the Technology Readiness Index (TRI) and Theory of Planned Behaviour (PTB). Data from households were collected using a questionnaire survey method.

This was a cross-sectional study that used a non-probability sampling technique. In fourprovincial capitals (Karachi, Lahore, Quetta, and Peshawar) and the federal capital (Islamabad), 420 questionnaires were distributed to household heads. Smart PLS 3.0 was used to test the hypotheses proposed by decomposing personal traits (product knowledge, environmental concern, ecological lifestyle, and perceived benefits) and technological factors(technology innovativeness and technology optimism) and examining their impact on consumers' attitudes toward solar photovoltaic products. This study also examined the role of perceived consumer effectiveness as a moderator between consumers' attitudes toward solar photovoltaic products and purchase intentions. The empirical findings showed that product knowledge, ecological lifestyle, perceived benefits, innovativeness, and optimism positively and significantly impact consumers' attitudes toward solar photovoltaic products. Likewise, consumer attitude has a positive and significant impact on purchase intention of solar PV products. Subsequently, the moderating role of perceived consumer effectiveness in therelationship between consumer attitudes and purchase intentions of solar PV products was alsosignificantly correlated. Finally, the theoretical and

practical implications of the study, as wellas its limitations and future directions, are discussed.

G. H. Raghunandan, Ambika Rani Subhash, Akanksha V. Ghat, D Swetha, Chandana Nagaraj, R Hema, "Quantitative Analysis of Sustainable Energy BasedCharging Systems": The Sun provides Earth with a staggering amount of energy—enough to power the great oceanic and atmospheric currents, the cycle of evaporation and condensation that brings fresh water inland and drives river flow, and the typhoons, hurricanes, and tornadoes that so easily destroy the natural and built landscape. The San Francisco earthquake of 1906, with magnitude 7.8, released an estimated 10^{17} joules of energy, the amount the Sun delivers to Earth in one second. Earth's ultimate recoverable resource of oil, estimated at 3 trillion barrels,contains 1.7×10^{22} joules of energy, which the Sun supplies to Earth in 1.5 days. The amount of energy humans use annually, about 4.6×10^{20} joules, is delivered to Earth by the Sun in onehour. The enormous power that the Sun continuously delivers to Earth, 1.2×10^{5} terawatts, dwarfs every other energy source, renewable or nonrenewable. It dramatically exceeds the rateat which human civilization produces and uses energy, currently about 13 TW.

Nowadays, the growth of population and business activities in a city is creating a new problem, which is the movement of the people itself. Mass Rapid Transit (MRT), which included in public transportation with a dedicated lane continues to prove that this kind of public transportation is effective and efficient to solve that problem by reducing congestion and creating a greener environment. However, MRT requires electrical power in a relatively big number. To meet this requirement and support a greener environment, a study is conducted.The method of this study is to simulate on how much potentially a solar power plant can be built on Jakarta MRT facility and conduct an analysis on engineering, economic, regulation, and strategic of the Company itself. The result is a 451.2 kWp Solar Power Plant could be builton the Workshop Building on Jakarta MRT, has NPV of US$ 44,706.70, and payback period in 12.82 years if the implementation in year 2022. The Cost of Capacity Charge could be avoided by giving the Power Utility Company of Indonesia a Business to Business (B2B) scheme

Chapter 3

HARDWARE/ SOFTWARE IMPLEMENTATION

3.1Introduction

We used hardware components like Solar panels, power bank modules, switches, and LLEDs All these relate to the help of coils, wires, cardboard, tapes, and glue. We implemented the whole design inside the backpack securely. We made sure to make it as simple as possible to reduce the complications which may occur during the operation and to use limited circuitry asthe main aim of this model is to be portable so that it can be carried anywhere. Solar is one of the most abundant sources of renewable energy with the potential capability of generating enough power to meet the demands of the entire planet. It was calculated theoretically that the amount of sun received on earth for one day has the capability to meet thedemand of the world for more than 20 years . Despite the huge potential, solar photovoltaic only provides 1.2% of the world's electricity . The harnessing of solar energy is still very much ongoing with the advancements in solar technology constantly improving. There are many applications where solar energy is utilized - from the very big application, such as generating electricity for homes and industry from solar fields, to the very small applications like powering the calculators. The possibilities are extensive. One of the products that utilises the solar energy is solar powered backpack.

3.1 System Design, Block diagrams, Individual blocks explanation

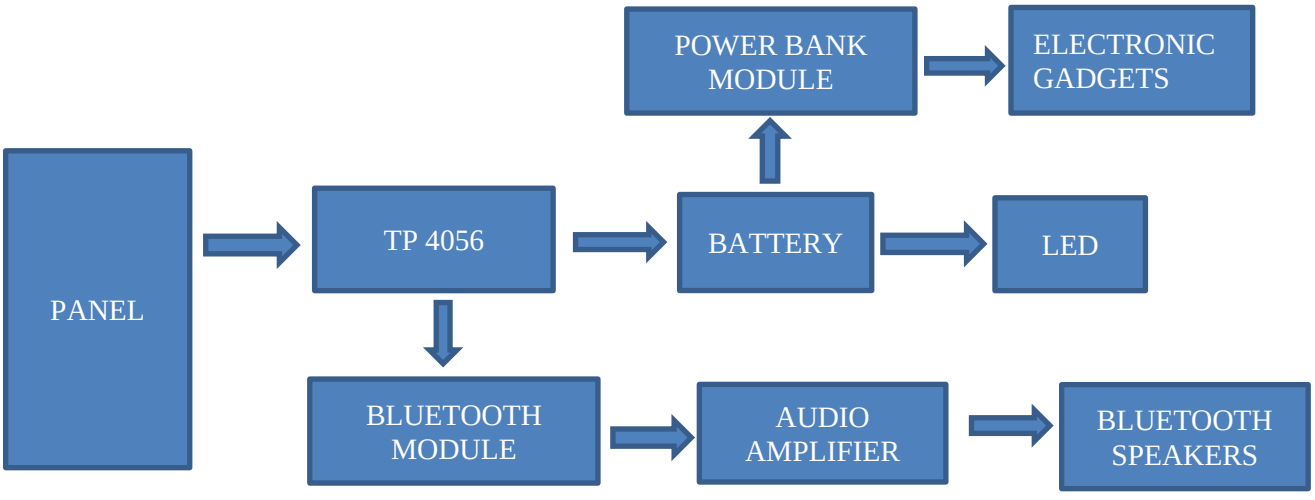

Fig 3.1.Block diagram

3.2 Components:

SOLAR PANEL (6V,70*70):

A solar panel is actually a collection of solar (or photovoltaic) cells, which can be usedto generate electricity through photovoltaic effect. These cells are arranged in a grid-like pattern on the surface of solar panels.Thus, it may also be described as a set of photovoltaicWhen it comes to wear-and-tear, these panels are very hardy. Solar panels wear out extremely slow. In a year, their effectiveness decreases only about one to two per cent Most solar panels are made up using crystalline silicon solar cells. Installation of solar panels in homes helps in combating the harmful emissions of greenhouse gases and thus helps reduce global warming. Solar panels do not lead to any form of pollution and are clean. They also decrease our reliance on fossil fuels (which are limited).These days, solar panels are used in wide-ranging electronic equipments like calculators, which work as long as sunlight is available.However, the only major drawbackof solar panels is that they are quite costly. Also, solar panels are installed outdoors as theyneed sunlight to get charge.

POWER MODULE (50 to 60 Hz):

The power bank is a portable rechargeable device, used to power up different gadgetslike mobiles, tabs, laptops, etc. A power bank can be easily fit into your pocket and available in different capacities based on the requirement. In a very less time, they have used everywhere&. intended to change the battery with a single-use. The Power Bank Module like T6845C is mainly designed for providing power to mobiles, devices, etc. It comprises different modules like load management, discharge management, protection & and LED indication.

This module is available like a mini-board & compatible with Li-ion battery ranges from 3.7Vto 4.2V. This module includes a port like micro USB for charging the battery & USB type A female o/p port supports 5V DC 1A input & 5V 1A o/p. Once this module is connected to a battery then a portable power bank can be made.This module has less fixed current thus entirecircuit can simply use 0.1mA of current without uniting to load, so there is no requirement of physical operation because if there is no load then it will standby & simply uses 0.1mA of current.

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USB CONNECTION:

Universal Serial Bus (**USB**) is an industry-standard that establishesspecifications for cables, connectors and protocols for connection, communication and power supply (interfacing) between computers, peripherals and other computers.[2] A broad variety of USB hardware exists, including 14 different connector types, of which USB-C is the most recent and the only one not currently deprecated. The Universal Serial Bus was developed to simplify and improve the interface between personal computers and peripheral devices, such as cell phones, computer accessories, and monitors, when compared with previously existing standard or *ad hoc* proprietary interfaces.

BLUETOOTH MODULE (2.45 GHz) :

Wireless communication is swiftly replacing the wired connection when itcomes to electronics and communication. Designed to replace cable connections HC- 05 uses serial communication to communicate with the electronics. Usually, it is usedto connect small devices like mobile phones using a short-range wireless connectionto exchange files. It uses the 2.45GHz frequency band. The HC-05 module can be operated within 4-6V of power supply. It supports baudrate of 9600, 19200, 38400, 57600, etc. Most importantly it can be operated in Master-Slave mode which means it will neither send or receive

data from external sources.It has 6 pins,

Key/EN: It is used to bring Bluetooth module in AT commands mode. If Key/EN pin is setto high, then this module will work in command mode. Otherwise by default it is in data mode.The default baud rate of HC-05 in command mode is 38400bps and 9600 in data mode.

HC-05 module has two modes,

1. **Data mode:** Exchange of data between devices.

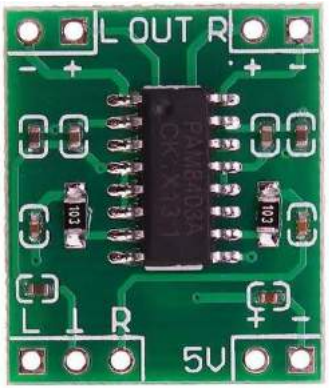
2. **Command mode:** It uses AT commands which are used to change setting of HC-05.To send these commands to module serial (USART) port is used.
2. **VCC:** Connect 5 V or 3.3 V to this Pin.
3. **GND:** Ground Pin of module.
4. **TXD:** Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)
5. **RXD:** Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
6. **State:** It tells whether module is connected or not.

HC-05 module Information

- HC-05 has **red LED** which indicates **connection status**, whether the Bluetooth is connected or not. Before connecting to HC-05 module this red LED blinks continuouslyin a periodic manner. When it gets connected to any other Bluetooth device, its blinkingslows down to two seconds.
- This module **works on 3.3V**. We can connect 5V supply voltage as well since the module has on board 5 to 3.3 V regulator.
- As HC-05 Bluetooth module has **3.3V level for RX/TX** and microcontroller can detect

  3V level, so, no need to shift transmit level of HC-05 module. But we need to shift the transmit voltage level from microcontroller to RX of HC-05 module. The data transfer rate of HC-05 module can vary up to **1Mbps** is in the **range of 10 meters**.

AUDIO AMPLIFIER (PAM8403,GAIN=24dB):-



PAM8403 is an Amplifier Board which can be powered using simple 5V input and could drivetwo **3W + 3W stereo speakers**. It is an excellent choice, who wants a **Class-D stereo audio amplifier** in small board space. This Amplifier allows the user to achieve high-quality audio reproduction from a stereo input. Additionally, it has a special feature that is, it can drive speakers directly from its output. The PAM8403 amplifier board is a dual-channel (stereo)amplifier that produces **6W** (3W+3W) output. As any major amplifier system needs to have short circuit protection, PAM8403 has inbuilt short circuit protection that is essential for trouble-free operations. PAM8403 Amplifier IC itself does not require any kind of heat sink, so this will be a perfect choice for custom speaker projects. It can directly drive **4Ω or8Ω** speakers. It is mandatory to use a proper speaker with not more than a 3W output rating.As this is a stereo amplifier board, the input section has two input L (Left) and R (Right) witha common ground in between them. Use any kind of audio input that needs to be amplified andit will produce **3W + 3W** audio output.This amplifier module provides a maximum gain of **24 dB** with **10% THD** at 5V DC input and4 Ohms load output. It does not require heatsink which also saves additional board space. Irrespective of the heatsink, it could also provide thermal protection which is another essentialfeature for such a small wattage amplifier module.

Features of PAM8403 Amplifier Board

- Operating Voltage: Wide power supply ranges from 2.5V to 5.5V DC
- Dual-channel stereo with high output power (3W+3W Output at 10% THD with a4Ω Load @5v DC)
- Max Gain 24 dB.
- Filterless architecture
- Low Quiescent Current and Low EMI
- Operating Temperature: -40 to +85°C
- Short Circuit Protection
- Thermal Shutdown

- Superior Low Noise
- Efficiency up to 90%
- Dimensions (LxWxH) in cm 2.1 x 1.8 x .3

BATTERY(18650):-

A battery typically consists of two electrodes, namely, anode and cathode. Cathode forms the positive terminal of the battery and anode is dedicated as the negative terminal. The cathode of a lithium-ion battery is mainly composed of a lithium compound, while the prime element of the anode is graphite. When the batteryis plugged in with an electric supply, the lithium ions tend to move from the cathode to the anode, i.e., from the positive electrode to the negative electrode. This is known as charging the battery. During the discharge phase of the battery, the movement of the lithium ions gets reversed from anode to cathode, i.e., from negative electrode to positive electrode, and the electrical energy gets transmitted to the attached load.

Items		Specifications	Notes
5.1 Rated Capacity (Minimum)		3200mAh	0.65A discharge at 20℃
5.2 Nominal Capacity (Minimum)		3250mAh	0.65A discharge at 25℃
5.3 Nominal Capacity (Typical)		3350mAh	Reference only
5.4 Nominal Voltage		3.6V	0.65A discharge
5.5 Discharging End Voltage		2.5V	
5.6 Charging Current (Std.)		1.62A	
5.7 Charging Voltage		4.20 ± 0.03V	
5.8 Charging Time (Std.)		4.0 hours	
5.9 Continuous Discharging Current (Max.)※1		4.87A	0 ~ +40℃
5.10 Internal Resistance		less than 100mΩ	AC Impedance 1 kHz
5.11 Weight		less than 48.5g	
5.12 Operating Temperature	Charge	0 ~ +40℃	
	Discharge	-20 ~ +60℃	
5.13 Storing Conditions	less than 1 month	-20 ~ +50℃	Percentage of recoverable capacity 80%※2
	less than 3 months	-20 ~ + 45℃	
	less than 1 year	-20 ~ + 20℃	

LED:-

A **light-emitting diode** (**LED**) is a semiconductor device that emits light when current flows through it. Electrons in the semiconductor recombine electron holes, releasing energy in the form of photons. The color of the light (corresponding to the energy of the photons) is determined by the energy required forelectrons to cross the band gap of the semiconductor. White light is obtained by usingmultiple semiconductors or a layer of light-emitting phosphor on the semiconductor device.

LEDs have many advantages over incandescent light sources, including lower power consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. In exchange for these generally favorable attributes, disadvantages ofLEDs include electrical limitations to low voltage and generally to DC (not AC) power, inability to provide steady illumination from a pulsing DC or an AC electrical supply source, and lesser maximum operating temperature and storage temperature.

Voltage: 3.4v-3.7v**Typical:** 3.6v **Current:** 150mA

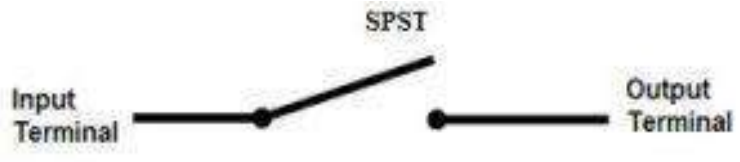
Power Dissipation: 0.5 watt **Peak Pulsed Current:** 200mA**Colour Freq:** 6000-6500K **Viewing Angle:** 140º

Lens Shape: Straw Hat **Lens Color:** Water Clear**Style:** Round 8mm **Intensity:** 16,000mcd

SPST SWITCH (Rated voltage= 250 VAC):

The term “SPST” in an SPST switch stands for “Single Pole Single Throw” which includesa single input and a single output. Here, a single input is directly connected to a single output. The main function of this

switch is to control the circuit by turning ON/OFF.Oncethe switch in the circuit is closed, then the circuit will be turned ON whereas the switch is not closed or open, then the circuit will be turned off. The **SPST switch example** is the 25KV railway DC voltage system & a household lamp switch. The schematic **symbol ofthe SPST switch** is shown below.



The connections of this switch are two types like the Normally Open (NO) & the common (C).Once the switch is enabled, then the circuit is closed. So the flow of current will be from the common (C) terminal to the normally open (NO) terminal. When the switch is disabled, the circuit will be an open circuit, so there is no flow of current within the circuit. This switch works like a one-way switch to ON/OFF the circuit. Once a user pushes the switch button, thenthe switch plates will be connected. So that current starts flowing within the circuit.

For example, The light in the room generally uses this switch. Once the switch is turned "OFF",the circuit will break to turn off the light. Similarly, once the switch is turned ON then the lightwill be turned ON.

The **applications of the SPST switch** include the following.

- Advanced process control systems can use these switches in place of two-wire sensors. As is commonly done, one can use two of the three contacts of a standardSPDT switch to mimic an SPST.
- This is an ON/OFF switch, used to break or connect the terminal connection. Sothis switch provides a power supply for the entire circuit.
- These switches are used in applications that only require ON/OFF state
- These switches are used in simple electronic projects.

BLUETOOTH SPEAKERS:-

An amplifier and loudspeaker with Bluetooth wireless connectivity that is paired (pre- associated) with one or more smartphones, tablets, iPods or computers. Available in all sizes, including replaceable battery and rechargeable models, as well as wall-powered units, the Bluetooth speaker receives digital audio streams from the host device, which are typically compressed. It then decompresses, decodes and amplifies the audio through the built-in speakers. A flexible metal wire, known as a voice coil, is attracted to a strong magnet that's built inside the speaker. As the coil moves, the diaphragm moves alongside it. The strength ofthis vibration will affect the frequency, also known as the pitch. These sound waves are then amplified through the cone/surround and into your listening ears.

The sound of the speaker is ultimately affected by the size of the cone/surround. The bigger the cone, the bigger the speaker and the louder the volume. The smaller the cone, the smallerthe speaker and the quieter the volume.

TP 4056 :

A flexible metal wire, known as a voice coil, is attracted to a strong magnet that's built insidethe speaker. As the coil moves, the diaphragm moves alongside it. The strength of this vibrationwill affect the frequency, also known as the pitch. These sound waves are then amplified through the cone/surround and into your listening ears.The sound of the speaker is ultimately affected by the size of the cone/surround. The bigger the cone, the bigger the speaker and the louder the volume. The smaller the cone, the smaller the speaker and the quieter the volume.

The TP4056 is a complete constant-current/constant-voltage linear charger for single cell lithium-ion batteries. Its SOP package and low external component count make the TP4056 ideally suited for portable applications. The TP4056 can work with USB and wall adapter.No blocking diode is required due to the

internal PMOSFET architecture and have prevent to negative Charge Current Circuit. Thermal feedback regulates the charge current to limit the dietemperature during high power operation or high ambient temperature. The charge voltage isfixed at 4.2V, and the charge current can be programmed externally with a single resistor. TheTP4056 automatically terminates the charge cycle when the charge current drops to 1/10th theprogrammed value after the final float voltage is reached.TP4056 Other features include current monitor, under voltage lockout, automatic recharge and two status pin to indicate charge termination and the presence of an input voltage.

TP4056 module Features

- Include Current Monitor
- Under Voltage Lockout
- Automatic Recharge
- Charger and Protection Circuit in One Module
- Two Status Pin to Indicate Charge Termination
- Indicate the Presence of an Input Voltage
- Preset 4.2V Charge Voltage with 1.5% Accuracy

ABSOLUTE MAXIMUM RATINGS :

- Input Supply Voltage(VCC)：-0.3V～8V ·TEMP：-0.3V～10V ·CE：-0.3V～10V
- BAT Pin Current：1200mA
- PROG Pin Current：1200uA
- Maximum Junction Temperature：145℃ ·
- Operating Ambient Temperature Range：-40 ℃～85℃
- Lead Temp.(Soldering, 10sec)：260℃ ·
- Charging Docks and Cradles ·Digital Still Cameras, Portable Devices

3.3. Circuit Diagram

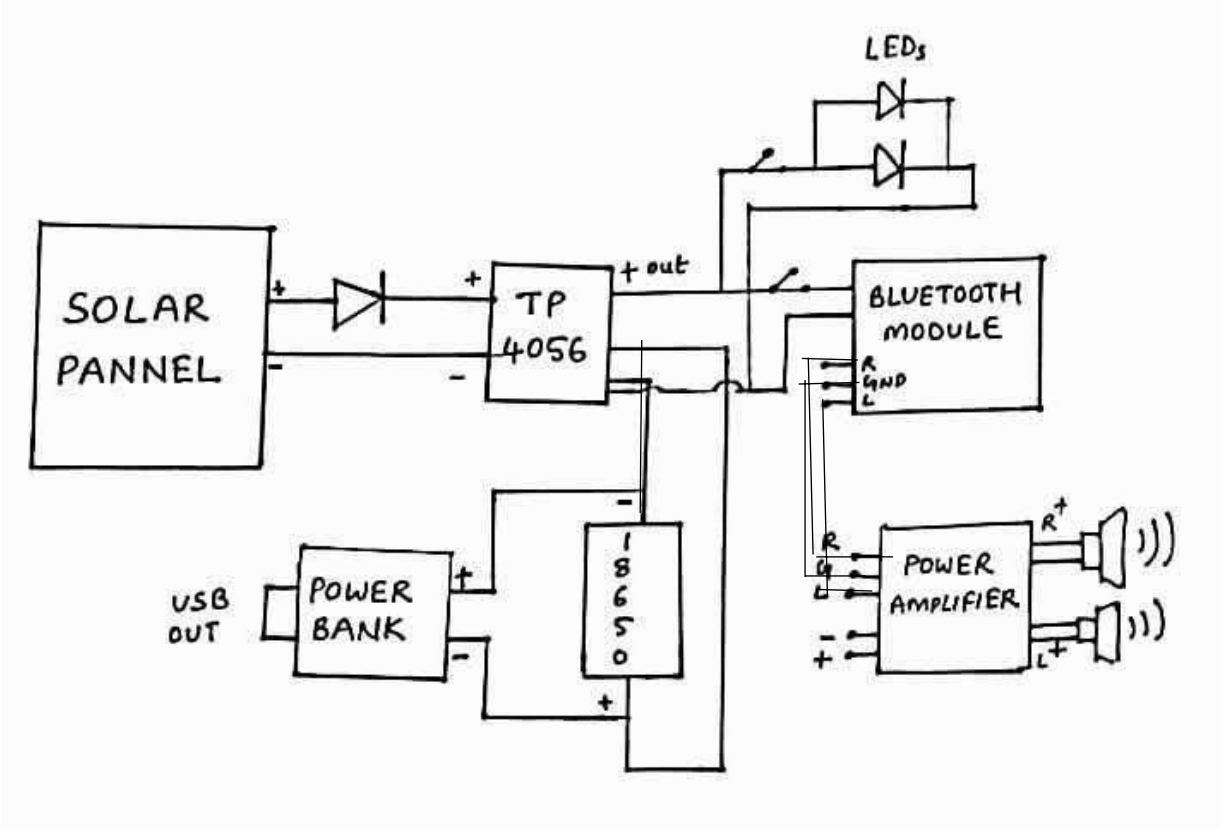


Fig.3.3 Circuit diagram

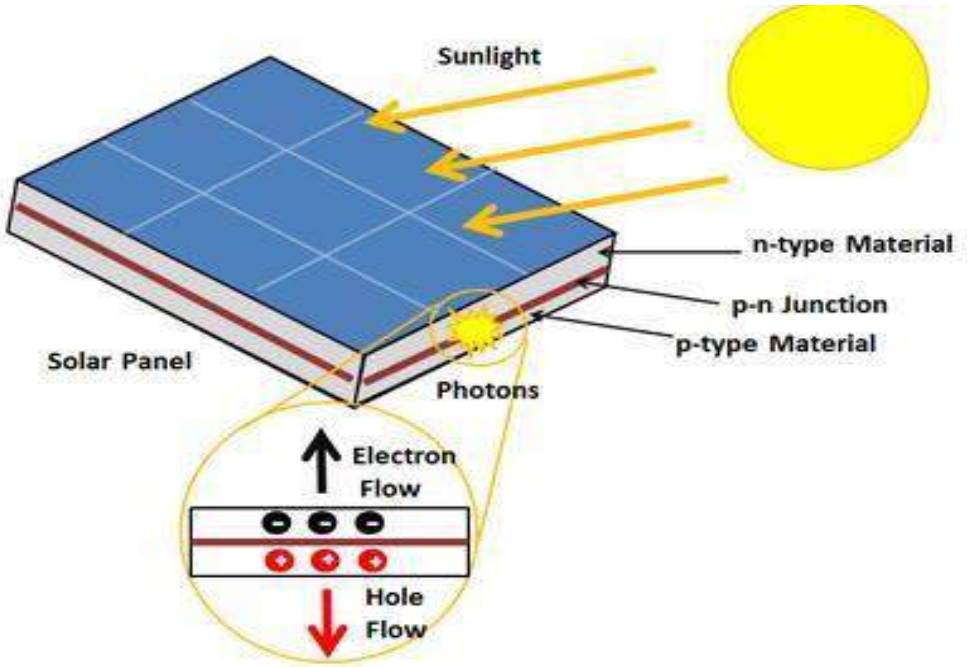
Components used in the circuit diagram:

- SOLAR PANEL

- TP 4056
- POWER MODULE
- BLETOOTH MODULE
- PAM 8943 AUDIO AMPLIFIER
- 18650 BATTERY
- LED

3.4 WORKING PRINCIPLE:

To figure out how a solar-powered backpack works, we need to understand a little bit about the mechanics of the solar-powered backpack, or solar technology. It may seem complicated, but it's really pretty simple -- photovoltaic (PV) cells are what make it all happen. The cells, grouped together as modules or panels, collect light from the sun and convert it to usable electricity. They're able to do so with the help of something called a semiconductor. These are substances that can conduct electricity. In the case of solar cells, silicon is the semiconductor of choice. When sunlight hits a solar panel, the silicon semiconductor absorbs a portion of the light and its energy. When this happens, electrons inthe silicon are knocked loose and they begin to flow freely. Electric fields in the photovoltaic cells wrangle those electrons and force them to flow in one direction like a cattlerancher guiding his head. This creates an electric current that can be harnessed by attachingmetal contact points at the top and bottom of the PV cell. Once the energy is collected, it can be used immediately as electricity or stored in a battery or series of batteries for later use.



If we go the actual working of the solar backpack then we have to discuss in detail.When the sunlight falls on the solar panel photovoltaic effect occurs as discussed above and because of using a diode there is reverse voltage which occurs goes intlo TP 4056 .In this way the the current always flows until it crosses a cut in voltage of 2,4 V then the current stops flowing into the module. This charge is stored in battery and given to power module .We can use this battery even when there is no sunlight as the charge is already stored in it.We can tell that as there is an LED on TP 4056 which shows red on charging and shows blue when completed thecharging.TP 4056 prevents the overload conditions which occur during the charging process.The TP 4056 module is further connected to 5V Bluetooth module for positive and negative poles. So that the Blue2.tooth speakers are charged and there is a connected with soldering for all the connection including the LED and PAM 8043with Bluetooth module.ThisPAM is connected directly to 3w speakers for music purpose. Finally there are LEDs with switch based mechanism connected with TP 4056 . Power bank is available with the help of USB cable in the power charge module.So, when change the set up with sun light there a red light visible showing that charging is taking place .Then, we can switch on the LED lights whenever necessary. When we want to listen to music then we have switch on the Bluetooth module and connect it with our mobile phone and play music,also when the battery of electronicgadgets are turning down we can use the power bank which is available with help of USB cableof preferred gadgets. This the working of solar backpack as a multipurpose backpack.The advantages of solarbackpack are:

- Uses renewable energy
- Wide range of applications
- Easy to figure out
- It is portable ,can be carried anywhere
- Access to many gadgets anytime

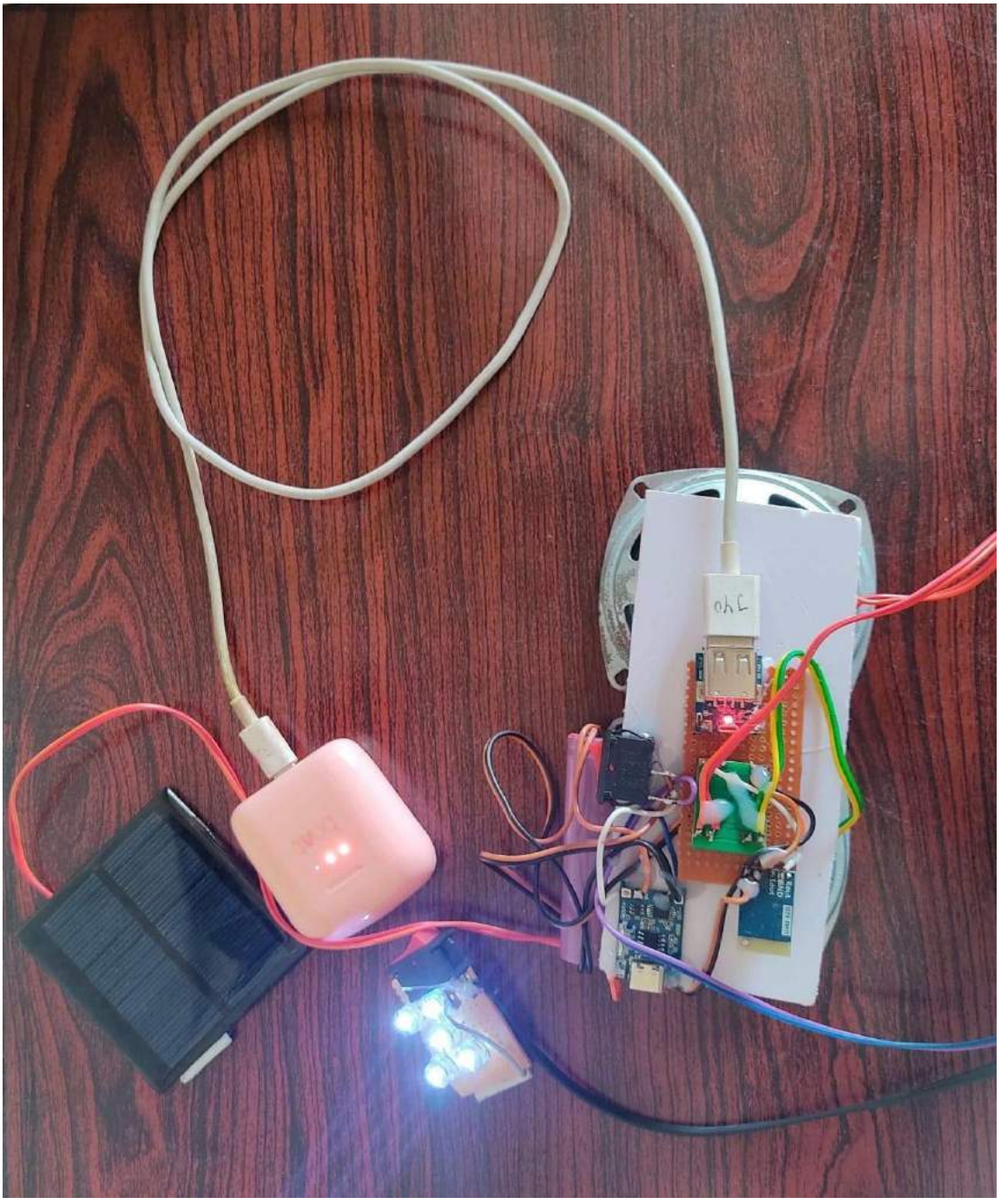
The applications of solar back[pack are as follows:

- Powering a GPS system
- A travel lamp
- A digital camera
- A palm pilot
- LED switching and rechargable devices

Chapter 4

RESULTS

Solarc backpack has multiple purpose functions as a power bank charging ,LED switch lights and Bluetooth speakers respectively . This prototype is inserted into the backpack hence the name solar backpack.



Chapter 5

CONCLUSION

5.1. Conclusions

Solar Backpacks can be used in multiple ways suchas a charger, Bluetooth speakers and switch-based LEDs achieving qualities like portability, lightweight and ease to use making a step ahead in sustainable developmentwith the help of renewable resources like solar energy.

5.2. Future scope

We can include many more applications like GPS tracking, and a Heartbeat sensor attached to the backpack making it more useful and reliable so that it can be carried anywherewith ease. In this way with, simplified components and developments we can achieve the above-mentioned requirements in fut

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