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SOLAR MOBILE CHARGER

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Abstract

In recent years, the need for efficient and sustainable energy solutions has become increasingly important. One potential solution is the use of solar power for battery charging systems. In this project, an Arduino-based solar-powered battery charging system is designed and implemented. The system consists of a solar panel that collects energy from the sun, an Arduino microcontroller that regulates the battery's charging, and a battery that stores the energy for later use. The solar panel converts sunlight into DC electrical energy, which is then fed to the battery through a charging circuit. The implementation of this system is fairly straightforward. The solar panel is connected to an input pin of the Arduino microcontroller, which then controls the charging of the battery through a charging circuit connected to an output pin. The charging circuit is designed to limit the charging current and voltage to prevent damage to the battery.

Introduction

In today's world, where mobile devices are essential for communication, work, and entertainment, the need for efficient charging solutions is paramount. Traditional chargers often rely on grid electricity, which may not be readily available in all locations or may contribute to carbon emissions. To address these challenges, we introduce a Solar Mobile Charger equipped with Arduino display technology. Overview: This project integrates solar power harnessing with Arduino-based control and monitoring to create a sustainable and user-friendly mobile charging solution. By utilizing renewable solar energy, users can charge their devices even in remote areas or during power outages, reducing reliance on conventional electricity sources.

This paper presents the solar charge controller circuit for controlling the overcharging and discharging from solar panel. This circuit regulates the charging of the battery in a solar system by monitoring battery voltage and switching the solar or other power source off when the battery reaches a present voltage. This circuit is low

voltages disconnect circuit. A charge controller circuit can increase battery life by preventing over charging which can cause loss of electrolyte. The flow chart is also provided. Solar energy and convert at in to electric energy and used for domestic purpose. A solar charger employs solar energy to supply electricity to device or charger batteries. They are generally portable. In a stationary location a series of solar cells are installed and can be connected to a battery bank to store energy for off-peak usage. Most portable chargers can obtain energy from the sun only.

Components

- Solar Panel:

Fig: Solar Panel

Solar panel featured in our solar power bank is designed to harness sunlight efficiently, converting it into electrical energy. With an output of 18 volts, this high efficiency solar panel ensures rapid charging of the internal lithium-ion battery, providing a sustainable and renewable power source for your devices. Our solar panel utilizes advanced photovoltaic technology to maximize energy conversion, allowing for optimal charging performance even in varying light conditions. • Constructed from durable materials, the solar panel is built to withstand outdoor elements such as rain, snow, and UV exposure, ensuring long-term reliability and durability. Despite its robust construction, the solar panel remains lightweight and portable, making it easy to transport and deploy in various outdoor settings, from camping trips to emergency situations. Equipped with mounting holes or straps, the solar panel can be easily attached to backpacks, tents, or other surfaces to capture sunlight efficiently while on the move.

- Charge Controller:

Fig: Charge Controller

TP5100 is a step down double 8.4V/4.2V single lithium battery charge management module. It has in-built overcurrent, under voltage, short circuit protection. Along with this it also provides over temperature, and reverse battery shutdown protection.

The TP5100 Module can charge either single or double lithium ion cell battery. It has wide input voltage range of 5V to 18V. It has Maximum charging current of 2A.

- Relay:

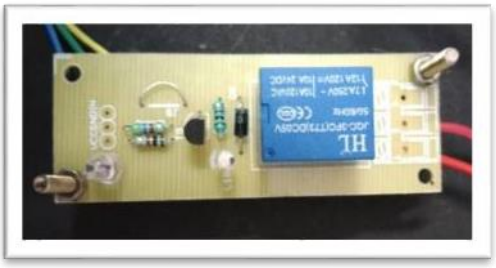

Fig: Relay

Relays are the switches that aim at closing and opening the circuits electronically as well as electromechanically. It controls the opening and closing of the circuit contacts of an electronic circuit. When the relay contact is open (NO), the relay isn't energized with the open contact. However, if it is closed (NC), the relay isn't energized given the closed contact. However, when energy (electricity or charge) is supplied, the states are prone to change.

An electromagnetic relay is an electrically operated switch that is used to control a circuit by an electromagnetic mechanism. It consists of a coil of wire, a movable armature, and one or more sets of contacts. When a current flow through the coil, it creates a magnetic field that activates the armature and moves it to open or close the contacts, allowing or interrupting the flow of current in the circuit. Electromagnetic relays are commonly used in control systems and electrical circuits to isolate, amplify, and switch electrical signals

- Battery:

Fig: Battery

The 5V 10,000mAh battery is the energy storage powerhouse within our solar power bank, providing ample capacity to keep your devices charged and ready for use, whether you're on a weekend camping trip or facing an emergency situation. With a capacity of 10,000 milliamp ere-hours (mAh), this lithium-ion battery offers substantial energy storage, capable of charging smartphones, tablets, and other devices multiple times before needing a recharge.

The high-quality lithium-ion chemistry ensures long-lasting performance, retaining its charge over numerous charging cycles. This reliability is essential for extended outdoor adventures or emergency situations where access to power may be limited. The battery supports fast charging technology, allowing connected devices to charge quickly and efficiently.

- Dual Port Charging Module:

Fig: Charging Module

The charging Module with Dual Ports offers versatile charging capabilities, providing two 5V output ports with a current rating of 1A each. This module serves as the intermediary between the energy stored in the lithium- ion battery and the devices being charged, offering convenience and flexibility for users who need to charge multiple devices simultaneously. Equipped with two output ports, this module allows users to charge two devices simultaneously, doubling the charging capacity and efficiency of the charger.

- Display:

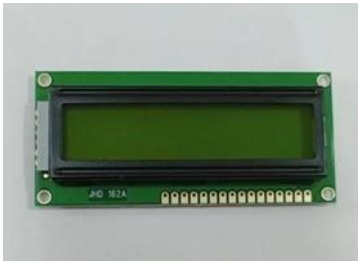

Fig: LCD Display

A display is made up of millions of pixels. The quality of a display commonly refers to the number of pixels; for example, a 4K display is made up of 3840 x2160 or 4096x2160 pixels. A pixel is made up of three subpixels; a red, blue and green commonly called RGB. When the subpixels in a pixel change colour combinations, a different colour can be produced. With all the pixels on a display working together, the display can make millions of different colours. When the pixels are rapidly switched on and off, a picture is created

- Arduino:

Fig: Arduino

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analogy input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C++ programming languages (Embedded C), using a standard API which is also known as the Arduino Programming Language, inspired by the Processing language and used with a modified version of the Processing IDE. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool developed in Go.

Block Diagram

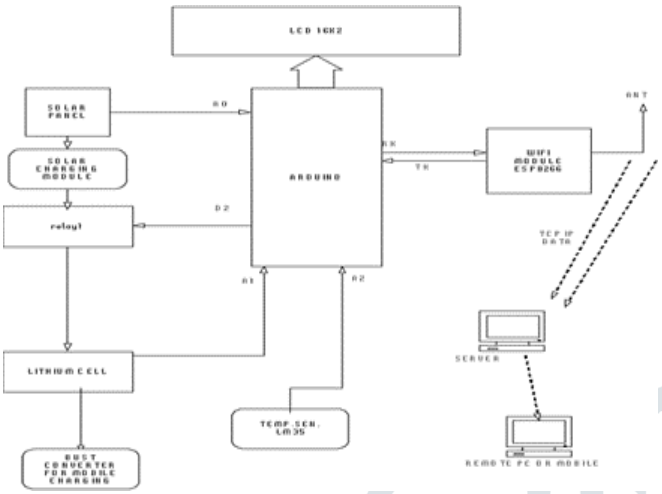

Fig: Block Diagram of Solar Mobile Charger

Results and Conclusion

- Maximum output of solar panel = 10v
- Charge Controller
  1. Input Voltage= 10v
  2. Output Voltage= 4.2v
- Battery Rating = 10,000mah
  1. Output of Battery= 4.2v
- Charging Module =
  2. Output 1= 5v 1 Amp(max)
  3. Output 2 = 5v 1Amp(max)
- Time Required to get from solar panel = Immediately
- Battery Charging Time = Depends on solar Intensity
- Voltage needed to charge the battery = 4.2v
- Mobile charged with percentage = 50%
- Time Duration for charging mobile 50% = 30min

- Mobile Charge by Using Electricity and Solar Charger

Sr No	Content	Mobile charging using Electricity	Mobile Charging using Solar Charger
1	Time	25 min	20min
2	%of Charge	50	50
3	Cost	10-15rs	5-8rs

- Li-ion Battery of Charging of Solar Charger

Sr no	Content	Solar	Electricity
1	Time	1hour	2-3hours
2	% of battery charge	100%	100%
3	Cost	4-7rs	10-12rs

Solar cell phone chargers can be a better alternative to electrical cell phone chargers. It will make the running cost of mobile phone reduced. For that purpose, designed an eco-friendly solar powered charger for mobile charging which utilizes an effective converter topology to ensure effective utilization of solar energy. A solar charger can accommodate almost any model cell phone. It can use the sun's energy to recharge a cell phone.

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.

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