e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

International Journal Of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 4, April 2024 |

| DOI:10.15680/IJMRSET.2024.0704116 |

High Efficiency Solar Based Mobile Charger

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ABSTRACT: Today charging of mobile phone is became a big problem. When travelling too long distance we don't have charge in our mobile. So we go for an alternative method of non-conventional energy called "solar energy". Even we have alternative methods to charge the mobile it is so expensive. We can use solar energy instead which is highly efficient and economical to use. This charger is used also in travelling, power cut and non-availability of power in some remote areas. solar charger is economical to use. © 2016, International Journal of Pharmacy and Technology. All rights reserved.

KEYWORDS: Earth planet, Solar Pannel, Solar Energy

I. INTRODUCTION

Solar cell phone chargers use solar panels to charge cell phone batteries. They can be used when no electricity supply is available either mains or, for example, a vehicle battery and are sometimes suggested as a way to charge phones without consuming mains electricity, unlike electrical cell phone chargers. Some can also be used as a conventional charger by plugging into an electrical outlet. Some chargers have an internal rechargeable battery which is charged in sunlight and then used to charge a phone; others charge the phone directly. There are also public solar chargers for mobile phones which can be installed permanently in public places such as streets, park and squares. One such is the Strawberry Tree public solar charger. One cell phone model was reported in 2010 to have a built in solar charger. Solar chargers are commercially available for cell phones.

Solar cell phone chargers come in different shapes and configurations including folding (Goal Zero, Endless Sun Solar) and types that unfold like petals (Solio). They also come in the form of straps, with solar cells on the outer surface and a rechargeable battery inside. Solar cell technology limits the effectiveness and practicality of phone solar chargers for everyday use. Phone charge times vary depending on the solar panel size and efficiency, or the battery capacity of models with batteries, further extending the charge times of solar chargers. The fold-out design provides a larger solar panel, hence higher charge current, and is compact when not in use.

Solar chargers can be used to charge other rechargeable devices with requirements similar to a mobile phone, such as Bluetooth headsets and music players. Solar chargers used to charge a phone directly, rather than by using an internal battery, can damage a phone if the output is not well-controlled, for example by supplying excessive voltage in bright sunlight. In less bright light, although there is electrical output it may be too low to support charging, it will not just charge slower.

II. METHODOLOGY

The method used in realizing this device is in terms of modular design and implementation and carried out in the laboratory in the year 2016. This system consists of units and blocks which make up the entire solar charging device. Figure 1 shows a well simplified block diagram of the system. The power source of this system is solar radiation that is converted into electricity by a solar panel. The supply chopper is used to provide the regulated power to the mobile phone. The backup system consists basically of two lithium ion batteries. Figure shows the Flowchart.

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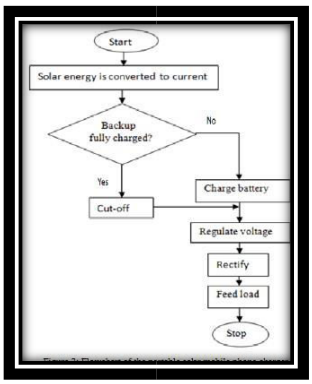

Materials and Software used- Solar panel, LM358 Operational amplifier, 1N4007 diode, Light emitting diodes, Universal serial bus connector, Zener diode, 7805 voltage regulator, Resistors, lithium ion batteries and Proteus software for simulation.

Solar Module- The solar module consists of two 5.5V operating voltage solar panels connected in series to give 11V operating voltage. A current value of 160mA is obtained and used to charge the back-up Li-ion batteries. For current to flow from source to sink, the source voltage must be higher than the sink voltage. Therefore, 11V at source pushes 160mA current to charge battery rated 8V. D1 is a Red LED that indicates that solar panel is receiving and converting solar energy into electrical energy and charging the back-up

Back-Up Module- The back-up module consists of two 3.7V Lithium-ion batteries connected in series to give a total voltage of 7.4V and 8V when fully charged. As one 3.7V Li-ion battery gets to 4.2V when fully charged. The blocking diode,
D2 ensures current delivery to the back-up. The switch on the right hand side is used to deliver power or not to deliver power to the regulator circuit

Voltage Regulation Unit- The voltage regulation unit consists basically of U1 (LM7805 voltage regulator) that regulates the voltage from the back-up and gives an output of 5V as shown in fig 3.18. C1 is a 10uF capacitor that filters the output from the back-up before feeding the D5 (a blue LED) used to indicate when load is charging. When mobile phone is charging, D5 is ON. C2 is a 47uF polarised capacitor that further filters the output from the regulator before feeding the load.

III. 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 solar energy can only be harnessed when it is daytime and sunny. to overcome this, solar panels can be coupled with back-up battery which can store the excess power generated during the day and use it to provide energy to system in the absence of sunlight. the large size of the solar panel makes the device bulky and non-portable. the solar panel should be fabricated to cover the entire device, which can effectively reduce the size of the entire device. for low-power portable electronics, like calculators or small fans, a photovoltaic array may be a reasonable energy source rather than a battery. solar chargers can charge lead acid or ni-cd battery bank up to 48 v and hundreds of ampere-hours (up to 400 ah) capacity.

IV. DC- DC CONVERTER

DC – DC Converter Transformers are used in step-up or step-down converters. These transformers can be used in self-saturated or square wave driven applications and have input voltage ranges of 5V, 12V, 24V, and 48V and output Voltage up to 300 VDC.
The power rating is up to 7.5 W for surface mount and up to 40W for thru-hole transformers.

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LM2596 DC to DC step down regulator, adjustable +1.23 to 35vdc output, 2A. Ideal for battery operated projects requiring a regulated power supply.

SPECIFICATIONS

Regulator Type:	Step Down (Non Isolated input to Output
Input Voltage:	+4 to 40vdc
Output Voltage:	+1.23 to 35vdc
Output Current:	2A rated, (3A maximum with heat sink)
Efficiency:	Up to 92% (when output voltage is set high
Switching Frequency:	150kHz
Dropout Voltage:	2vdc minimum
Protection:	Short circuit current limiting
Load Regulation:	+/- 0.5%
Voltage Regulation:	+/- 2.5%
Temperature:	-40 to +85 degree C (output power less than 10Watts)
Board Size:	43.6mm L x 21mm W x 14mm H
Data Sheet:	National LM2596

V. COMOPNENTS OF CONTROLLER

1) BUZZER
2) LED
3) RESISTER
4) CAPACITOR
1. CERAMIC CAPACITORS
2. ELECTROLYTIC CAPACITORS
5) VOLTAGE REGULATOR
6) RELAY UNIT
7) RESET BUTTON
8) MICRO CONTROLLER IC ATMEGA-8

LCD

The liquid crystal display (LCD) panel is designed to project on-screen information of a microcomputer onto a larger screen with the aid of a standard overhead projector, so that large audiences may view on-screen information without having to crowd around the TV monitor.

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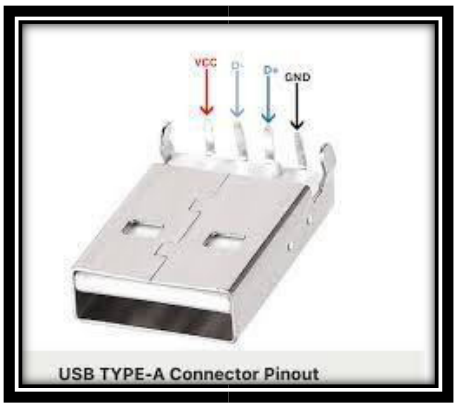
LI-ION BATTERY

A lithium-ion or Li-ion battery is a type of rechargeable battery that uses the reversible intercalation of Li+ ions into electronically conducting solids to store energy. In comparison with other commercial rechargeable batteries, Li-ion batteries are characterized by higher specific energy, higher energy density, higher energy efficiency, a longer cycle life, and a longer calendar life. Also noteworthy is a dramatic improvement in lithium-ion battery properties after their market introduction in 1991: within the next 30 years, their volumetric energy density increased threefold while their cost dropped tenfold.

USB

USB stands for Universal Serial Bus, an industry standard for short-distance digital data communications. USB ports allow USB devices to be connected to each other with and transfer digital data over USB cables. They can also supply electric power across the cable to devices that need it. The USB port is a standard interface for connecting cables to PCs and consumer electronics devices. Users can connect a specially designed wire called the USB cable to this port. One end of the cable connects to the host and the other to the peripheral, and depending on the type of USB, the two ends may or may not be symmetrical. USB cables may transmit both power and information. To accomplish this, any USB cable has two types of wires. One set transports current, while the other transmits data signals.



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COSTING

SR.NO.	RESOURCE NAME	COST (₹)	REMARK
1	SOLAR PANAL	1500/-	Ok
2	MICROCONTROLLER	400/-	Ok
3	RESISTOR	60/-	Ok
4	CAPACITOR	200/-	Ok
5	INDUCTOR	100/-	Ok
6	RESET BUTTON	90/-	Ok
7	BUZZER	70/-	Ok
8	RELAY UNIT	80/-	Ok
9	TRANSISTOR	100/-	Ok
10	LCD	150/-	Ok
11	LI-ION-BATTERY	750/-	Ok
12	USB	40/-	OK
13	DC/DC CONVERTRR	200/-	OK
14	LED BULB	160/-	OK
15	REGULATOR	150/-	OK
16	FOAMSHEET	500/-	OK
17	PIN	500/-	OK

TOTAL COSTING – 5050 Rupees.

ADVANTAGES

1. 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
2. Versatile: It is also known to be versatile as it can be used for all types of mobile phones
3. 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.
4. Emergency Purposes: Another benefit is that it hardly requires any electrical outlet. It can therefore be used during emergencies and outdoor purposes.

DISADVANTAGE

1. Every technology has its own cons, a major drawback for the device is that it may not be quite effective in colder regions or where there is no sunlight. But advancements are being made on daily bases introducing new technology to cater to the drawback. Hybrid chargers are one such option.
2. However, considering the larger picture, a solar mobile charger should anyhow be the desired option as with convenience it also proves to be an eco-friendly solution.
3. There are plenty of solar mobile chargers available in the market of all kinds and capacity. But while buying a solar mobile charger, do keep in mind that there are always convenient and cheaper options available. These cheap devices usually have smaller panels that store very less energy so please be cautious of the panel capacity while buying one. I am sure it is better to pay an extra penny than to compromise on quality.

APPLICATIONS

1. For low-power portable electronics, like calculators or small fans, a photovoltaic array may be a reasonable energy source rather than a battery.
2. 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.
3. By using over voltage protection circuit we can protect our battery from over charging. Charge discharge control
4. circuit contain two-way Switch. It gets active when voltage exceeds above threshold voltage level.

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VI. CONCLUSION

We can conclude that this system is effectively used for charging of mobile phones having low cost. We can use this system at any public place. This system can be more useful in rural areas which are suffered because of electricity problems Solar act as good power supplies in bright sunlight. The only problem is the unregulated voltage due to the variation in intensity of light. Voltage regulator is used to solve this problem by regulating the output voltage. The charge so obtained is stored in the battery and is given to the respective loads. The charge present in this battery is analysed and displayed on an LCD.

Solar powered 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 (SPC) for mobile charging which utilizes an effective converter topology and microcontroller to ensure effective utilization of solar energy. A SOLAR POWER MOBILE CHARGER can accommodate almost any model cell phone. It can use the sun's energy to recharge a cell phone

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