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SOLAR POWER BANK WITH INDUCTIVE CHARGING

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Abstract: The charging of a mobile phone is the most important function to operate mobile by charging the battery. Unfortunately, the process of charging a mobile phone battery will take a very long time because many operations need to be handled. This is especially true for smartphones. So that the battery would drain fast while the mobile device is doing many operations. Backup power banks help to solve this issue, If we have a long-lasting power backup, we may add additional features to mobile devices This alternative power can be supplied by Photovoltaic (PV) cells and the possibility is to insert the PV cells on the battery.

I. INTRODUCTION

Mobile phones are indispensable in times of need. A mobile phone is a convenient tool for long-distance communication. A cell phone is now considered to be one of life's essentials. Mobile phones' essential duty in our lives is to facilitate quick and simple communication. A mobile phone is a convenient tool for long-distance communication This process leads to being switched off the mobile This problem is reduced by backup power banks.

II. ADDRESSING SAFETY CONCERNS

Because the main application of our approach combines inductive power transmission for charging and ambient illumination indoors for the solar panels, safety issues have been significantly addressed. We were no longer concerned about the health hazards associated with a far field. approaches for transferring power utilizing radiation. We don't introduce any more light sources that people wouldn't otherwise be exposed to because the majority of our lighting is indoors, even though different light wavelengths and intensities might cause skin damage or other health issues.[4] This concern grows if our product is intended for outdoor usage, however, sunburns are caused by UV radiation, not just because the sun is already out. Using our product in the sun results in no increased exposure. product is intended for outdoor usage, however, sunburns are caused by UV radiation, not just because the sun is already out. Using our product in the sun results in no increased exposure..

II. MATCHING NETWORKS / COIL MATCHING

The inductive coupling has several key characteristics, one of which is the requirement for a matching network to be built between the transmitting and receiving coils to correctly "tune" the system. Considering the Maximum Power Transfer Theorem[5], it is possible to understand why these matching networks were developed. According to the theorem, two circuit parts must have an impedance that is a complex conjugate pair to transmit the most power between them. The peak power amplitude is possible when the two components are tuned properly, causing them to resonate at the same frequency

IV. COIL FREQUENCY

We settled on a coil provided by Digikey after giving our planned application for the coil for our circuits a lot of thought. We first intended to create and utilize our coil, but this proved to be a difficult and time-consuming undertaking in and of itself[6]. You must have a reliable method for winding the coil securely when creating your coil, especially a pancake coil, which is the coil type that our system employs.

Initially, we tried to create a device that would aid us in coil wrapping and enable us to create coils of various diameters for testing with our system. Figure 8 illustrates how to do this. After 3D printing two of these circles, you would next insert a screw into each one.

V. SHIELDED CABLES

It is crucial to consider interference because of the nature of coils (wire coiled to propagate an electric field). Using shielded cables to link the solar cells to the charge controller, the charging controller to the battery, the battery to the inductive charging circuit, and lastly the charging circuit to the transmission coil is a simple technique to reduce interference. The transmitting circuit's wires carrying a lot of power and current and being close to the transmission coil make them by far the most crucial for shielding.

In this circumstance, it's crucial to take losses into account as well. Fortunately, the rebuilt coil we bought had a somewhat sturdy design and excellent permeability shielding. The connections are open to interference and losses since the shielding covers the coil's whole length but terminates there. We chose an MMCX (Micro-miniature coaxial) connection type after considering several connector types that may be used. These connections can transfer signals up to 6 GHz and include a snap-like locking mechanism that yet permits 360 degrees of rotation[8]. In choosing a cable/connector type, we sought to avoid using conventional coaxial cables by making them as thin as possible.

VI. SOLAR CHARGING

The key goal, when considering the difficulty of solar charging, was to gather light, transform it into electrical energy, then store this energy before it was transmitted to the inductive charging component of our device. When doing our study on solar cells, it was crucial to take into account the cells' capacity for power output, longevity, and durability.

To optimally produce the 12V required to turn on the charge controller, the wiring for each solar panel and the system as a whole was mathematically planned, taking parallel and series configurations into account. Our battery needed the charge charge controller to prevent overcharging or energy discharge as light levels changed.

VII. HARDWARES

1. SOLAR PANEL

- 12 Volt 10-watt poly crystalline solar panel
- Good low light effect.
- High-efficiency output.
- High transmittance tempered glass.
- High conversion speed

The 10W 12Volts 36-cell Solar Panel for DIY Projects (41 x 30 cm) is ready to use and doesn't need a frame or any other additional adjustments. Because they are Laser cut to the right size and enclosed in unique sun and weather-resistant materials that give them distinctive qualities[11], we have decided to sell these Poly crystalline solar cells.

2.BATTERY

Six single cells are connected in series to form a 12-volt battery, which has an output voltage of 12.6 volts when completely charged. A battery cell is made up of two lead plates: a sponge lead negative and a positive plate covered in lead dioxide paste, separated by an insulating layer. This is a 12-volt, 1.2 AH sealed lead acid battery that is rechargeable. Our sealed lead acid Power-Sonic or equivalent batteries require no maintenance and are portable, durable, and cost-effective. It has a high discharge rate, a wide working temperature range[12], a long service life, and deep discharge recovery as characteristics. Absorbent Glass Mat (AGM) technology is used in this product to provide excellent performance

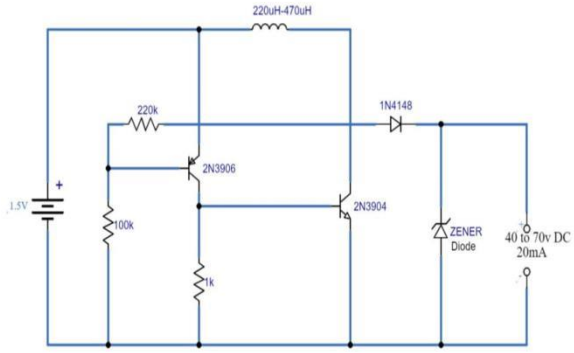
3.CHARGING COIL

Coils used for wireless charging produce an alternating electromagnetic field that is utilized to inductively transfer energy to other coils that are parallel to one another and nearby. The energy is utilized to power the equipment that receiving the batteries charge[8]. The coils may include one or more coils, and many layers of winding, and be configured as transmitters, receivers, or for dual use. Their inductance, self-resonant frequency, saturation current, and Q factor at a specific frequency are used to rank them.

When you set another compatible device, like a smartphone, next to this pad with another coil implanted inside, a magnetic field is formed between both devices as a result of the electric current flowing through this coil. Your smartphone's receiving coil can now receive an electric current..

4.VOLTAGE BOOSTER IC

A DC voltage booster circuit amplifies a 1.5V to 3V low-level DC signal to a much greater DC level. they frequently function in applications demanding an input of substantially higher DC power (about 60V to 80V DC). Therefore, utilizing transistors, we will create a straightforward and affordable voltage booster circuit in this project.DC-DC converters and boosters are essentially electronic circuits that increase or decrease the DC voltage to achieve the desired voltage level. Changing a fixed voltage DC source into a variable DC source is common in industrial applications. The DC equivalent of an AC transformer with a continuously changeable turn ratio is a DC converter[4]. Similar to a transformer, it can step up or down a DC voltage.



5.CHARGING CIRCUIT

A power supply that is designed to connect to the capacitor, as well as the battery, makes up a charging circuit for a battery and capacitor. An electronic switch joined to the power source is part of the circuit. The electronic switch can go from a conducting state, which permits current passage, to a non-conducting state, which inhibits the current flow. The switch is part of a circuit that also has a control device that can generate a control signal to switch the electronic switch between the conducting and non-conducting states to continue to charge the battery

6. PCB BOARD

In electrical and electronic engineering, a printed circuit board (PCB, also known as a printed wiring board or PWB) is a media used to carefully connect electronic components. It has the appearance of a laminated sandwich structure with conductive and insulating layers, with each of the conductive layers having a pattern of traces, planes, and other features (like wires on a flat surface) [6]etched from one or more copper sheet layers laminated onto and/or between sheet layers of a non-conductive substrate. Electrical components can be mechanically and electrically connected to conductive pads on the outer layers in the shape intended to accept the component's terminals by soldering them to them.

7.DIODES

A diode is a two-terminal electrical component that preferentially conducts current in one direction (asymmetric conductance); it has low resistance in one direction (preferably zero resistance) and high resistance in the other direction (ideally infinite resistance).

A thermionic diode, also known as a diode vacuum tube, is a vacuum tube having two electrodes—a heated cathode and a plate—in which electrons can only flow from cathode to plate

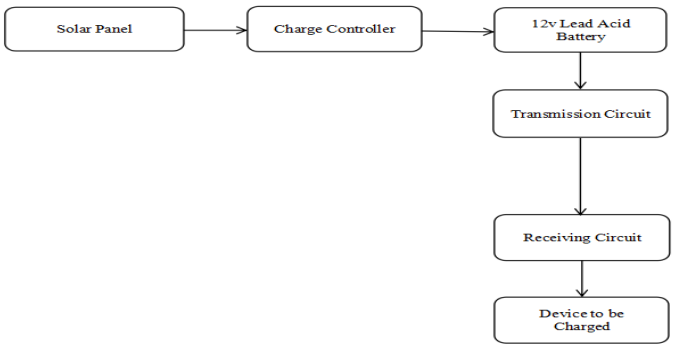
8.TRANSISTOR

The semiconductor device known as a transistor is used to switch or amplify electrical impulses. The transistor is one of the fundamental components of contemporary electronics. It has at least three terminals for connecting to an electronic circuit and is made of semiconductor material. The current flowing through another pair of the transistor's terminals is controlled by the voltage or current provided to one set of those terminals. A transistor can magnify a signal because the regulated (output) power can be greater than the controlling (input) power[9]. Although many more transistors are found embedded in integrated circuits, some are packaged individually.

9.RESISTOR CAPACITANCE

A body's capacity to hold electrical energy in the form of electrical charge is known as capacitance (Q). Capacitance always appears as a parasitic feature in real resistors. Resistor capacitance may be easily overlooked depending on the application, particularly in DC circuits. The capacitive parasitic effect is the desired effect in some applications, such as snubber resistors. However, in high-frequency *AC* applications, parasitic resistor capacitance can play a substantial role and have an unfavorable impact.

VIII. BLOCK DIAGRAM



We produced and used numerous schematics and diagrams at the outset of the physical design phase. This is a crucial component of assemble since these images and texts can provide as clear directions for assembly. Our system's top-level block diagram, which displays the fundamental connectivity and power levels of each component in the system, was the first to be created. The process

of putting this together helped us to clearly see and delineate each component of the system and ensure that they would all function as a unit.

IX. CONCLUSION

Photovoltaic cells are used to charge the mobile device's battery. The sun irradiation will affect the voltage of PV systems. Therefore, a DC-to-DC buck-boost converter is attached to control the voltage to protect mobile batteries from harm caused by voltage fluctuations from PV caused by variations in irradiance. The full Matlab simulation results are displayed and supported by the outcomes of experiments.

X. RESULTS

An inventive method of charging phones has resulted from the creation of the wireless solar cell mobile phone charger project. Both using a wireless technique and solar energy to charge the battery have several advantages and benefits. There are, however, always opportunities to get better in the future.

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