



ECEN316
Electric machine

Wireless Power Transmitter

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Abstract

This project focuses on developing a wireless charger that utilizes electromagnetic induction principles. The aim is to create a convenient and efficient charging solution for electronic devices without the need for physical connections.

The wireless charger operates by generating an alternating magnetic field through a transmitter coil. When a compatible device with a receiver coil is placed close to the transmitter, the magnetic field induces an alternating current in the receiver coil. This current is then rectified and used to charge the device's battery.

The project aims to make a functional and efficient wireless charger. Factors such as coil design and power management techniques will be explored to maximize the power transfer efficiency and minimize energy losses during charging.

The project will involve practical experimentation to validate the effectiveness of the proposed wireless charger. By successfully developing a reliable and efficient charging solution, this project aims to contribute to the advancement of wireless charging technology and its widespread adoption in various industries, including consumer electronics and automotive.

In conclusion, this project aims to apply the principles of electromagnetic induction to create a wireless charger that offers convenience, efficiency, and safety in charging electronic devices wirelessly.

Introduction

In today's rapidly advancing world, the demand for innovative technologies continues to grow. One such groundbreaking advancement is wireless power transmission, a revolutionary concept that has captured the attention of researchers, engineers, and consumers alike. With the ability to efficiently transmit electrical energy without the need for physical connections, wireless power transmitters have emerged as a significant change in various industries and everyday life.

Why Wireless Power Transmitter?

The conventional method of powering devices and systems involves the use of wired connections, which often restrict mobility, limit design possibilities, and pose potential safety hazards. However, wireless power transmission eliminates these limitations by enabling the transfer of electrical energy over the air, without the need for physical cables or direct contact. This wireless approach offers numerous advantages, making it an attractive solution in several scenarios.

Importance of Wireless Power Transmitter:

Convenience and Flexibility: Wireless power transmission liberates users from the constraints of tangled cords and limited reach. It enables the seamless charging of devices by simply placing them within the range of a wireless power transmitter. This convenience extends to various applications, including smartphones, wearables, electric vehicles, and even medical implants, enhancing user experience, and simplifying daily routines.

Design Freedom: Wireless power transmitters provide designers with unparalleled freedom to create sleek and sophisticated products. The elimination of physical connections allows for more aesthetically

pleasing and compact designs, enabling the integration of power transfer capabilities into various form factors. This newfound design flexibility has the potential to revolutionize industries such as architecture, automotive, and consumer electronics.

How Wireless Power Transmitters Work?

Wireless power transmitters operate on the principle of electromagnetic induction or resonant coupling. These systems consist of two main components: a transmitter and a receiver. The transmitter generates an alternating current, which is converted into a high-frequency electromagnetic field. The receiver, equipped with a compatible coil or antenna, captures the electromagnetic field and converts it back into electrical energy, which can be used to power the target device or recharge its batteries.

To achieve efficient wireless power transmission, careful design considerations are necessary, including optimizing the transmitter and receiver configuration, managing resonant frequencies, and minimizing energy losses during the transfer process. Ongoing research and development in this field aims to enhance efficiency, increase transfer distances, and broaden compatibility across a wide range of devices and power requirements.

Methodology

1. Coil wire:

- For the transmitter coil: We use 10 meters of insulated copper wire with a thickness of around 0.4mm. SWG28 copper insulated wire is a good choice for its insulation. 30 turns in total



- For the receiver coil: Use the same type and thickness of wire as the transmitter coil,

2. Resistors:

- Two resistors are needed for the current circuit. Their values will depend on the specific transistor. We use one resistors of 10K and another of 1K.



Resistor

3. Transistor:

- A small signal transistor is needed to amplify the oscillating signal from the circuit. A general-purpose NPN transistor like the 2N2222

Transistor 2N2222

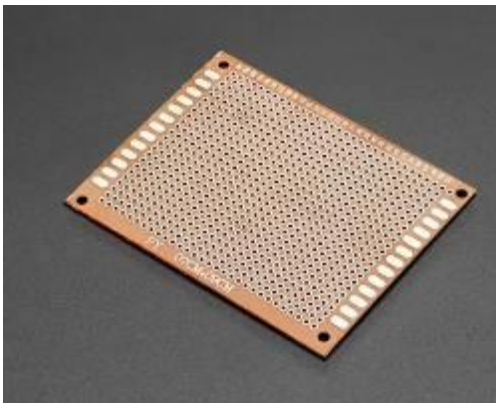


4. Battery:

Two batteries 1.5V for each

5. Soldering board:

- To connect the electronic components on it.



6. LED:

- An LED will be used as a visual indicator to show that the receiver coil is receiving power.

LED

Additional components:

- Multimeter: A multimeter will be helpful for measuring voltages and currents in the circuit.

Transmitter Circuit:

Transmitting Coil:

Rotate the coil wire 15 turns then make a loop and then make another 15 turns form the transmitting coil. Connect the loop on the coil to the positive terminal of the battery.

Connect the other end of the coil to the collector of the transistor.

connect the third to the resistor.

Transistor Connections:

Connect the emitter of the transistor to the negative terminal of the battery.

Connect the base of the transistor to the resistor.

Resistors:

Use one resistor in series with the base of the transistor for current limiting.

Use the other resistor in parallel with the base-emitter junction for biasing.

Power Supply (Battery):

Connect the negative terminal of the battery to the ground reference of your circuit.

Soldering Board:

Use the soldering board to securely mount and interconnect the components.

Ensure proper spacing and layout to accommodate the coil and other components.

Link of the video:

https://drive.google.com/file/d/1Z3ySB50hGaTK3h3_xXAJXNXCc22lidxD/view?usp=sharing

References

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