

EE322 -- Homework 6: Functional Descriptions

Wireless Charger

Group Leader:

Jiuxiang Liu #10377574

Group Members:

Shan Jiang #10377573

Qing Zhao #10377569

We pledge our honor that we have abided by the Stevens Honor System!

Section 1 – Team Member Contribution

For this week's group report, every group member contributes for the functional description work. During the group meeting, we discussed the basic functionalities needed for the whole wireless charging process. The group assigned each member a particular part to do the research and describe its functionality. Jingxiang was assigned to search the transmitter components. Shan was allocated to find out the implementation on the receiver side. And Qing was asked to draw the block diagrams based on the information collected by Jingxiang and Shan.

Below is a table of team member contribution.

	Jingxiang Liu	Shan Jiang	Qing Zhao
Percentage of effort towards this assignment	33.3%	33.3 %	33.3 %

Section 2 – Project Description

2.1 Project Overall Functionality

As described in the previous reports, the group are going to implement a wireless charger, which consists of two major components: transmitter and receiver. The block diagram below indicates a general idea of the charger.



Figure 1 – Block Diagram of the General Idea

Considering the fact that a cellphone charger may be used in different regions of the world with different standard output voltage, the group decided to design the charger with a wide input voltage range. The transmitter works as a converter that can convert electrical power into magnetic power. Then, the receiver on the cellphone will convert the magnetic power into direct current to charge the battery. Through this process, the wireless charging is realized. The following parts of the report will provide more details of the internal design of the transmitter and the receiver.

2.2 Transmitter Design

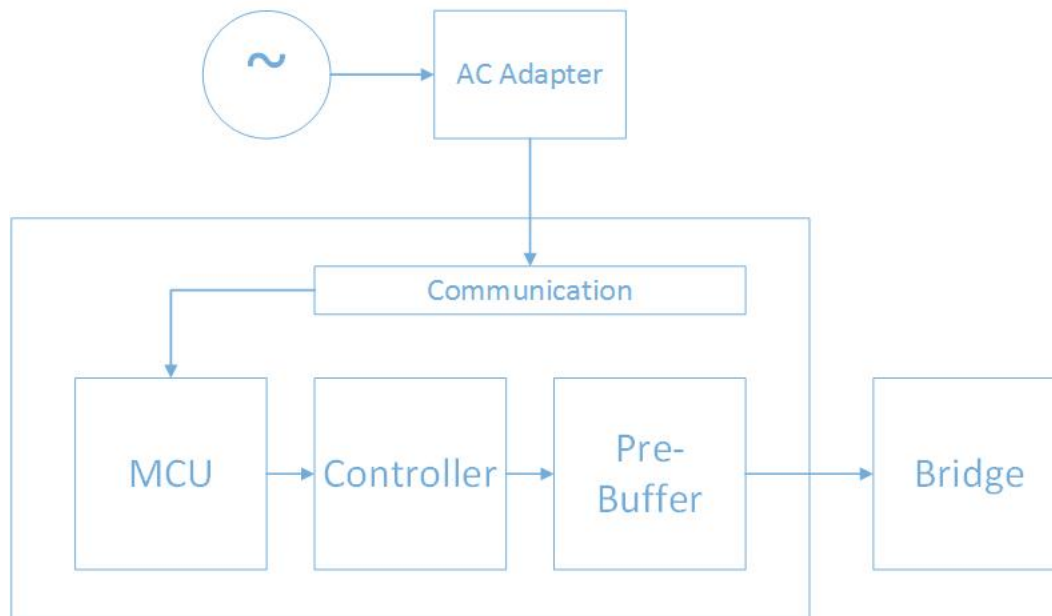


Figure 2 – Transmitter Block Diagram

As shown in the block diagram, the transmitter consists of several components for the purpose of power convention.

- AC Adapter

When the charger is plugged into the socket, the AC voltage will first be converted to direct voltage with fixed value, which can supply the work of different components in the circuit.

- Communication

This part is designed for the pairing between the transmitter and the receiver. When the communication component in the transmitter side detected the signal from the receiver, it would start the power transmission. It can also cut off the power if a “fully-charged” signal is received. Several LEDs with various color combinations will be used to indicate different status of the charging process.

- Microcontroller Unit (MCU)

The microcontroller unit is the core hardware of the charger. Its main function is to handle the data collected from the communication component and the feedback of other parts so as to make sure the charger work well.

- Controller

Associated with the MCU, the controller in the charger is designed to control the current for the magnetic coils.

- Pre-Buffer

This component will play a role of energy storage for the transmitter. AC voltage will be transferred to the bridge through the pre-buffer.

- Bridge

This is the physical part, which produces changing magnetic field for the charger.

2.3 Receiver Design

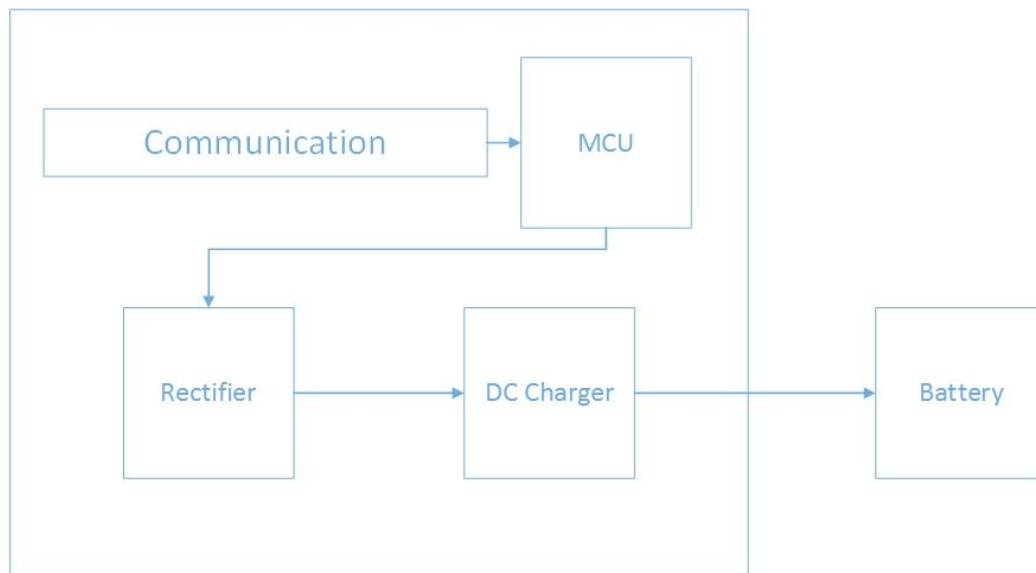


Figure 3 – Receiver Block Diagram

As shown in the block diagram, the receiver is relatively smaller than the transmitter. Because the receiver is designed to embed in the cellphone, it must be compact enough so that it won't affect the weight and shape of the cellphone so much.

- Communication

Worked with the communication component in the transmitter, this part is responsible for the information exchange, including the pairing information and the charging status.

- MCU

Similar with the MCU component in the transmitter, this part will deal with the data collected from different components and decide the charging status.

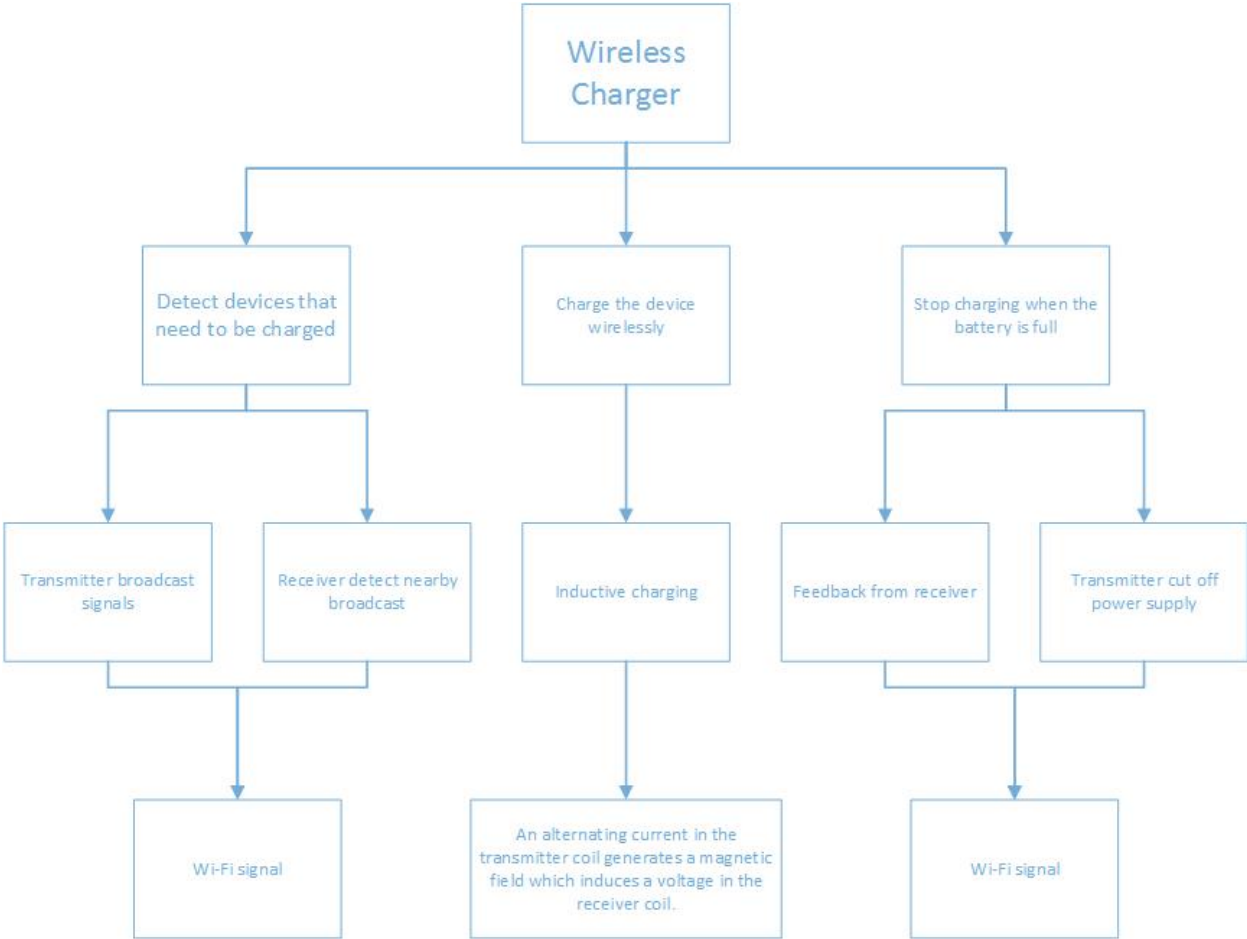
- Rectifier

Cooperating with the bridge in the transmitter, the rectifier is the coil used for the power conversion from magnetic power to electrical power.

- DC Charger

This component is designed to convert the received AC voltage into DC voltage that is suitable for the battery.

2.4 Function-Means Tree Diagram



Section 3 – Reference

1. "AC-DC Forward Power Supplies." 東芝 セミコンダクター&ストレージ社. N.p., n.d. Web.
2. "Low-Power Design." *Low-Power Design*. N.p., n.d. Web.
3. "Semiconductor & Storage Products Company." *Wireless Charging*. N.p., n.d. Web.