

Designing & Development of a Mobile Charger Using PCB

Associate Prof. Dr. Miska Prasad, G. Umesh Chandra Yadav,
D. Saikiran, B. Sravankumar Reddy

Department of Electrical & Electronics Engineering
ACE Engineering College Ghatkesar, Telangana

Abstract. The printed circuit board is the platform upon which microelectronic components such as semiconductor chips and capacitors are mounted. It provides the electrical interconnections between components and is found in virtually all electronics products. PCB designing is important for all kinds of power converters especially for usage in industrial applications. The parameters impacting the design and robustness of PCB are strain inductance associated with the circuit. In order to make the PCB design reliable, reduction of strain inductance along with maintaining the simplicity, modularity, compactness and better cooling management is required. These parameters are key for designing PCBs with precision, performance, attainment of low power consumption and high-power converters at fast manufacturing speed.

Keywords: PCB Board, Transformer, Bridge Circuit, Diode

1. Introduction

A mobile cell phone charger is a device that can automatically recharges a cell phone battery when the stored energy is used up and reduces down. Battery chargers come as simple, trickle, timer based, intelligent, universal battery charger-analysers, fast, pulse, inductive, USB based, solar chargers and motion powered chargers. While traveling charging mobile battery is a great problem in places where power supply source is not generally accessible. In that case, we can use a simple power bank by using the components as we did in our project. This is affordable and sufficiently durable. There is also much scope for improving its operation and efficiency as well as the durability. However, as the simplest device it is very much convenient to use it for emergency cases to recharge our cell phone battery

2. Literature Survey

A multidisciplinary examination of charging technologies, battery types, and charger design is included in a literature review of mobile chargers. It explores the development of charging standards, covering wireless charging technologies and USB Power Delivery. Safety concerns and regulatory compliance are crucial, and research highlights how crucial it is to follow set criteria. Analyzing user behavior and preferences helps to understand charging habits, and environmental impact evaluations draw attention to the requirement of producing chargers that are both sustainable and energy-efficient. The adoption of mobile chargers is a dynamic environment that is shaped by customer tastes and market trends, which will influence future developments in this vital technology.

2.1 Hardware Requirements

1. Transformer



FIG:3.1 Transformer

A transformer is an electrical device that consists of two or more coils of wire wrapped around a common iron core. It operates on the principle of electromagnetic induction, allowing it to transfer electrical energy between its coils at different voltage levels. Transformers are essential in power distribution, stepping up voltage for efficient long-distance transmission and stepping down voltage for safe use in homes and businesses

2. Rectifier

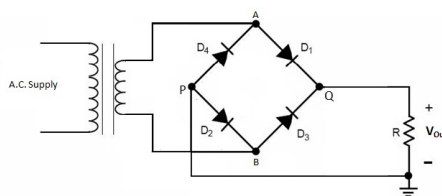


FIG:3.2 Rectifier Circuit

A rectifier circuit is an electronic device that converts alternating current (AC) into direct current (DC). It uses diodes to allow current flow in only one direction, effectively "rectifying" the AC waveform. Half-wave rectifiers conduct current during only one half of the AC cycle, resulting in pulsating DC. Full-wave rectifiers conduct during both halves, providing smoother DC output. Bridge rectifiers are a common type of full-wave rectifier. Rectifier circuits are fundamental in power supply units, converting household AC into the DC needed to power electronic devices like computers and mobile phones.

3. Filter

A filter circuit is often used in conjunction with a rectifier to smooth out the pulsations, providing a more stable and continuous DC voltage. Capacitors are commonly

used in filter circuits to store and release electrical energy, reducing voltage fluctuations. Inductors may also be employed to further smooth the output by resisting rapid changes in current. Together, a rectifier and filter circuit work to provide steady and reliable DC power for electronic devices.

4. Regulator Circuit

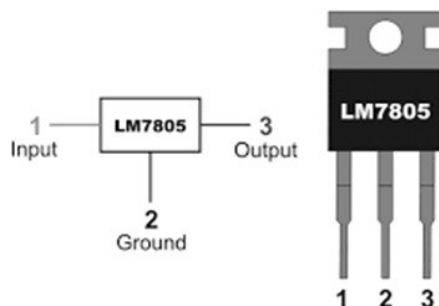


FIG:3.3 7805 Regulator

The LM7805 is a popular linear voltage regulator integrated circuit that is part of the 78xx series. It is designed to provide a stable and regulated output voltage of +5 volts. The device can accept an input voltage ranging from 7V to 35V, making it suitable for a wide range of applications. The LM7805 is widely used to power microcontrollers, integrated circuits, and other electronic components that require a reliable +5V source

3. Block Diagram

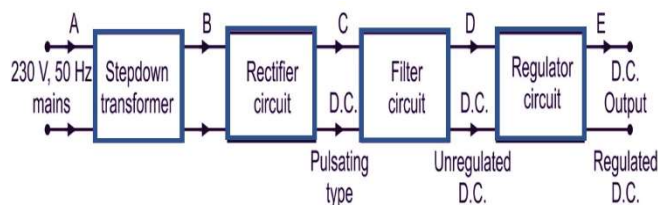
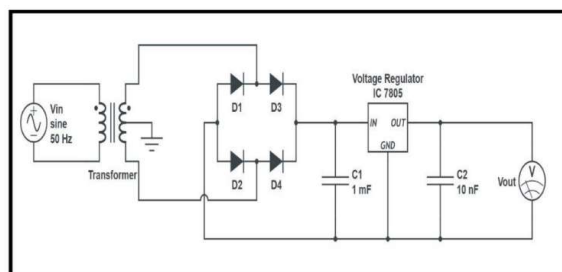


FIG:4.1 Block diagram of charger circuit

4. Circuit Diagram



5. Working

The working of circuit can be divided into 4 steps. Step down transformer rectifier unit, filter and regulator circuit. The working start with the stepdown transformer it has the input from supply system i.e.230v from the secondary of transformer having output of 12V. The output voltage from transformer is connected to the bridge rectifier then it converts into full wave rectifier output. The ripples in the output voltage can be removed by using filter circuit. The output of filter circuit is constant DC source. The by connecting voltage regulator of IC 7805 the output voltage will fixed 5V at the output terminal. The output of 5V will be used for charging purposes.

6. Results



Fig7.1: Hardware rectifier circuit



Fig 7.2: circuit showing output of 5V



Fig7.3:circuit showing output of 1A



7. Conclusion

Thus in this paper we developed and designed 5V&1A mobile charger kit using PCB by bridge rectifier circuit using diodes. In this design we developed prototype mobile charger of 5v&1A which is used for charging mobile phones & smart appliances. We developed this kit on pcb which is used for wide range of designs.

8. Future Scope

Charging stations will become more compact and able to charge multiple devices simultaneously. This technology will change the way we charge our phones and make it easier and more convenient for users. In conclusion, the future of phone charging stations is bright like Fast Charging Technologies, Wireless Charging, USB-C Integration, Energy Efficiency etc.

References

1. The International Journal of Advanced Manufacturing Technology, 25 (2005), pp. 350-360
2. Jadidian and D. Katabi, "Magnetic MIMO: how to charge your phone in your pocket,"in Proc. of the annual international conference on Mobile computing and Networking(Mobi Com '14), Sept. 2014.
3. S. Kondo and H. Meguro : "Feasibility Study on Square-wave-voltage power Distribution System",Trans. IEEJ, Vol. 116-D, No. 5, pp. 556-562 (1996)
4. Q. W. Lin and X. Y. Zhang, "Differential rectifier using resistance compression network for improving efficiency over extended input power range", IEEE Trans. Microw. Theory Techn., vol. 64, no. 9, pp. 2943-2954, Sep. 2016.
5. C. R. Valenta, M. M. Morys and G. D. Durgin "Theoretical energy-conversion efficiency for energy harvesting circuits under power-optimized waveform excitation", IEEE Trans. Microw. Theory Techn., vol. 63, no. 5, pp. 1758-1767, May 2015.