Laptop and Smart Phone Battery Protection Technique

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Abstract: **This paper describes a circuit design for protection of laptop and smart phone batteries. On long use of laptop and smart phones while connecting the charger to mains supply the battery gets degraded at fast rate. So a timer circuit is added to the charger of appliances in series to control the rate of charging.**

Keywords: **ATMEGA16, Potentiometer, relay.**

I.   INTRODUCTION

The advent of embedded systems in to electronic devices has made intelligent operation of devices. The commonly used technique is implementing a timer to control the device operation. Laptops have a rechargeable LI-ON battery which has battery life of 2 to 3 hours. While watching a movie, playing game or downloading huge files on laptop and smart phones we need to connect the battery to the charger continuously. This will degrade the battery and reduce it's efficiency and battery life. So a mechanism is implemented to charge the battery at required intervals using the timer of ATMEGA16 microcontroller. In this mechanism the duration of charging and discharging can be selected using a potentiometer and knob arrangement.

II.   BLOCK DIAGRAM
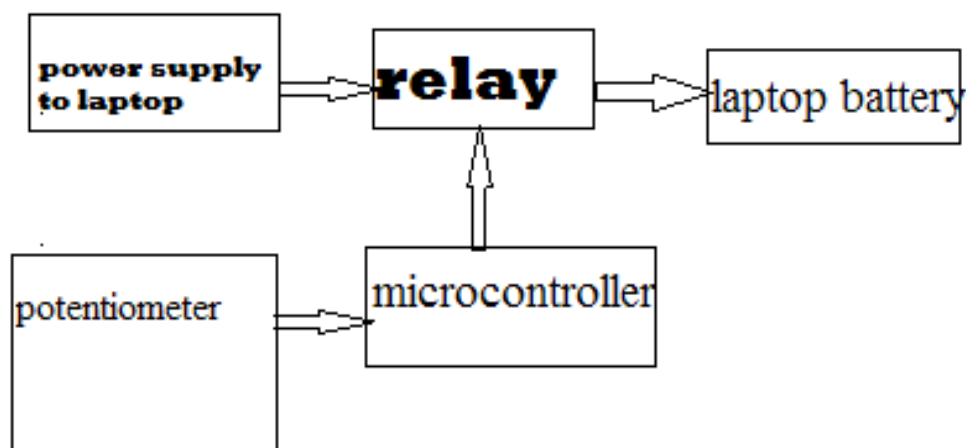
A. Microcontroller

Microcontroller has inbuilt peripherals that reduce the number of external components to design a circuit. The features it has are flash memory, general purpose input/output, serial IO, and communication protocols like I^{2C} bus and timers. The microcontroller used in this circuit is ATMEGA16. Timer0 of atmega16 is used to set the delay for the operation of relay.
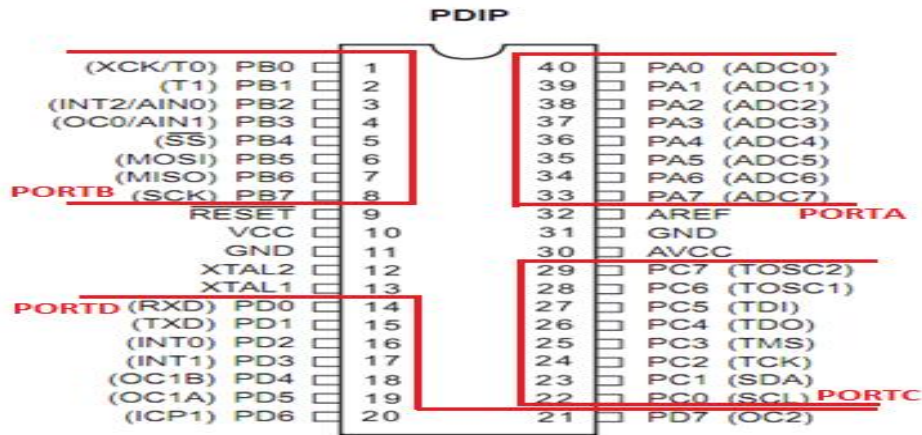
Fig.1. Pin diagram of ATMEGA16

B. Potentiometer

Potentiometer is a three terminal resistor with an sliding contact that forms as a voltage divider. A 100k ohm and 10k ohm potentiometers are connected to the analog pins PA0 and PA1 of the atmega16 respectively. The two ends are connected to the Vcc and Ground terminals. The sliding end is connected to the microcontroller.
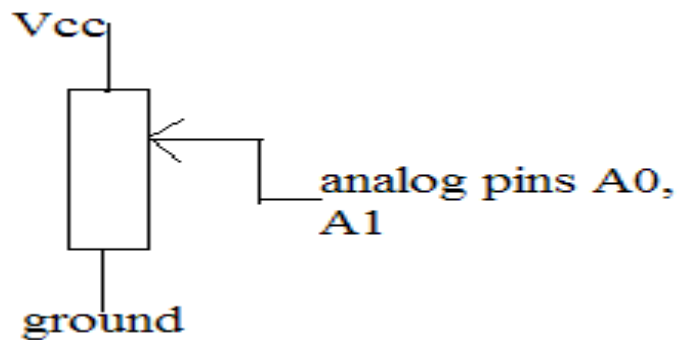

Fig.2. Terminal connections of potentiometer

C. Relay

Relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch. The relay used for this circuit is 5V, 250V AC relay. A free wheeling diode is connected to short the back emf of relay coil.
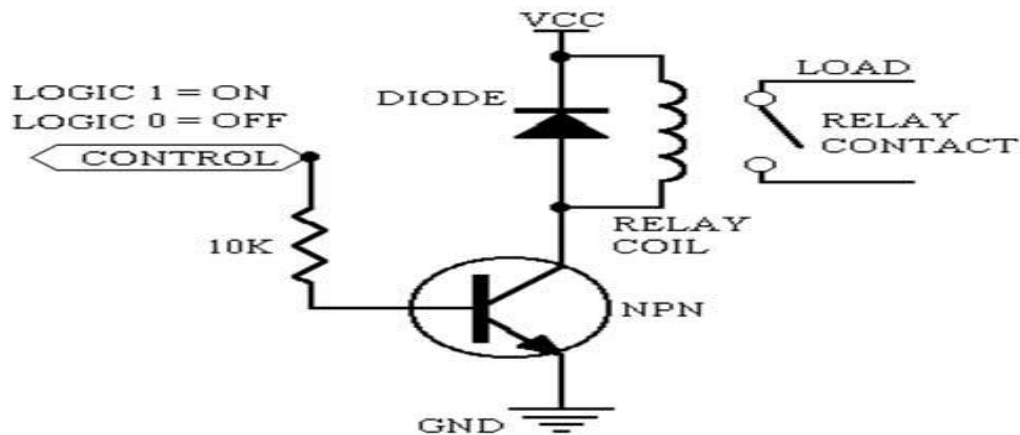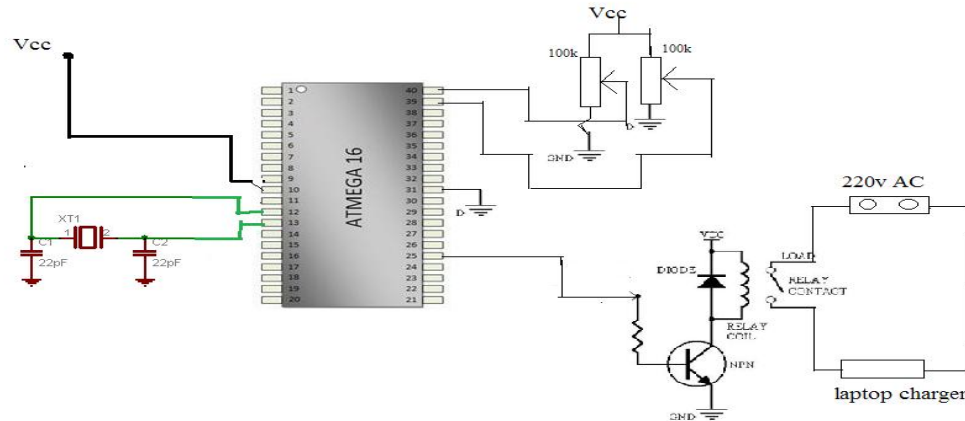

Fig.3 Operation of relay

III. CIRCUIT DIAGRAM

D. Operation of circuit

The ON and OFF time of the relay is given with the potentiometers. The 100k ohm resistor is divided in to 3 equal intervals 30k ohm, 60k ohm and 100kohm which corresponds to 30 minutes,1 hour and 2 hours respectively. Here the ON and OFF times can be selected separately according to the requirement. The logic to the relay is given in pulse mode. The logic is alternated to keep on constantly change the charging to the battery. A 16 mhz crystal is used to give the clock pulses for the operation of timer0 of atmega16. An inverter circuit is placed between relay and pin 25 of the atmega16. The general purpose NPN transistor BC547 is used to design inverter.
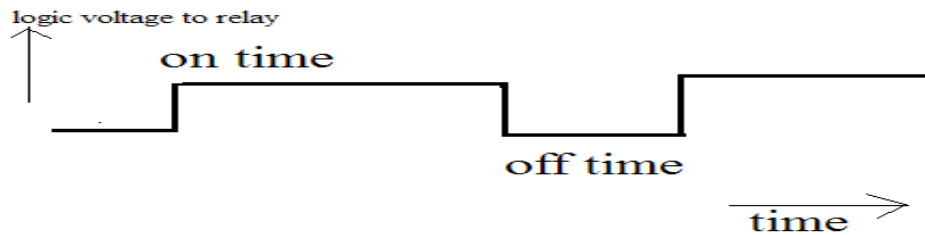
Fig.4. Graph of voltage versus time

IV. CONCLUSION

This paper shows the technique to protect the laptop and smart phone battery from over degrading. The major advantage of using microcontroller is to reduce the circuitry. The output from the microcontroller is in the pulse mode, where it is used to drive the relay through a NPN transistor. The battery life time can be improved by constantly enabling and disabling the power supply to the battery. By implementing this circuit we can play games, watch movies and download huge files of about 5GB for longer periods.

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