

# Smart Charger

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## Abstract

According to the problems of lithium battery, which has abroad application prospects, in the process of charging, by using of the constant current to constant voltage charging method, this paper designs a smart fast charging system based on the ATMEGA128 microcontroller and LTC4100 battery charging controller. The core modules of the MCU control and charging circuit are mainly designed to achieve the efficient and fast charging. During the process of charging, the system can automatically track the acceptable charging current of lithium battery, and monitor the charging current, voltage and temperature to realize the intelligent and precise control for the whole charging process, which can guarantee that lithium battery is neither over-charge nor less-charge. As overcharging of lithium batteries affect the efficiency and life of the battery, our project aims to overcome this problem by introducing 3 mode charger and this charger will allow the user to know about the charging periods and also turnoff the supply input to the device. Along with this operation the charger is able to perform conventional mode of charging with the charging circuits which can overcome current or voltage fluctuations. Another mode is to step up or step down voltage to charge various other devices than mobile battery. In order to achieve this goal several tasks need to be performed.

**Keyword-** ATMEGA128, LTC4100

## I. INTRODUCTION

A battery charger, or recharger is a device used to put energy into a secondary cell or rechargeable battery by forcing an electric current through it. Many types of battery have overcharging problems and we can charge by connecting a constant voltage or constant current source. Simple chargers of this type must be manually disconnected at the end of the charge cycle, and some battery types absolutely require, or may use a timer, to cut off charging current at some fixed time, approximately when charging is complete. Other battery types cannot withstand over-charging, being damaged or overheating or even exploding. The charger may have temperature or voltage sensing circuits and a microprocessor controller to safely adjust the charging current and voltage. Slow battery chargers may take several hours to complete a charge. High-rate chargers may restore most capacity much faster, but high rate chargers can be more than some battery types can tolerate. Such batteries require active monitoring of the battery to protect it from overcharging.

Batteries play an irreplaceable role in various electronic equipment's from the satellite and the spacecraft to mobile terminals, razors and other equipment's. With the widespread use of digital products such as mobile phones, laptop computers and other products, lithium battery is widely used in such products due to its many outstanding performances. Many practices show that the charging process of lithium battery may largely affect its life. Therefore, it is very necessary for us to investigate a fast and efficient charging system for lithium battery, which does not affect the life of the lithium battery smart charging device. The lithium battery smart charging system designed in this paper can be able to accurately measure various impact factors during the battery charging process, such as battery temperature, the temperature of external environment, the battery current and voltage.

## II. SYSTEM DESCRIPTION

Smart charger is entirely different from conventional smart phone charger. Our project deals with a charger which has multiple operations. The main difference from conventional charger is that in order to protect the device from overcharging we are introducing timer mode for charging devices other than that this timer mode can be setup on devices with different voltages as a demo we are doing this in 3.5v, 7.1v and 13.5v, other than timer we can provide mA method for charging that is once we know the mA of the battery, the smart charger will set the timer automatically and after the timing period the supply to the device will cut off but this mA mode is only applicable to devices other than smart phone. Another important feature is that voltage/current fluctuations from the supply will not affect the charging of the phone.

### A. ARDUINO

It is a single chip microcontroller combines 32Kb ISP flash memory with read-while-write capabilities, 1Kb EEPROM, 2Kb SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counter with compare modes, internal and external interrupts, serial programmable USART, a byte oriented 2 wire-serial interface.

**B. Current Sensor (ACS712)**

The Allegro ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switched-mode power supplies, and overcurrent fault protection.

**C. Voltage Regulator**

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation.

**D. LCD Display**

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.

**E. Buzzer**

A buzzer or beeper is audio signaling device may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

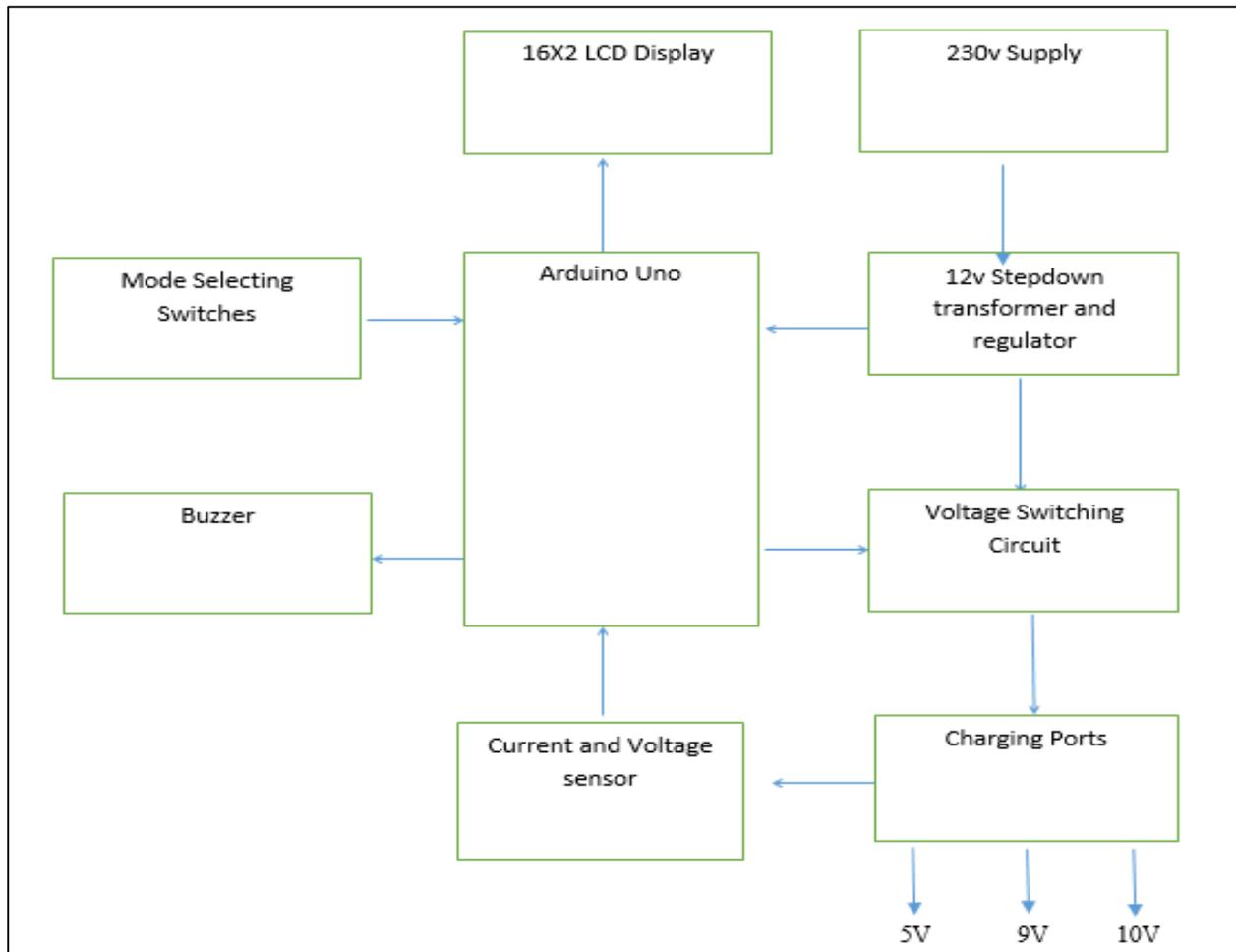
**F. Voltage Switching Circuits**

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently

**G. Power Supply**

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

**III. BLOCK DIAGRAM**



## IV. CONCLUSION

The battery charging system designed in this paper can improve the battery life effectively. We take both the system's functionality and designing cost into account, and strive to achieve the highest letter bid. A combination of a variety of analytical methods for smart charging of the battery is applied such that the system performance is not only stable but also easy to be used. On one hand, the charging battery is neither be less-charged nor over-charged, which extends the life of the lithium battery, on the other hand, the designed cost is significantly reduced, which leads to the associated reduction of the environment pollution. Thus the efficiency of battery can be increased by this 3mode Charger. Besides increasing the efficiency of battery by providing timing circuits for charging another mode of operation of this charger is stepping up/down the voltage according to the voltage specified for particular device, this voltage can be adjusted manually by the user. Thus 3mode charger is capable of charging various devices with different voltage specification. The proposed charger has wide range of importance in the modern society and user will be able to charge various devices from a single charger without causing damages to batteries.

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