e-ISSN: 2349-9745
p-ISSN: 2393-8161
Scientific Journal Impact Factor (SJIF): 1.711
International Journal of Modern Trends in Engineering and Research
www.ijmter.com

Era of Super-Capacitors

Prof P.B.Arote[1],Ghumre Deelasha[2], Pawar Sarika[3], Shinde Prachi[4], Yadav Jyotsna[5]
[1,2,3,4,5]*Department of Electronics and telecommunication, SIER (Agaskhind)*

Abstract—Keeping in mind the increasing demands of today's generation regarding gadgets and their efficiency .Here we have focused on one of the very primary factor that is charge of these gadgets with long backup options to achieve this we have tried to make LC tank circuit with proper estimation of inductor ,capacitor which constitute together as a coil ,with the help of this estimations we have also reduced number of turns of the coil making coil less bulky as a medium for wireless transmission of power. Our project also concentrates on one of the emerging research in various fields that is super-capacitors which will compete efficiently with batteries in eco-friendly manner.

Keywords- Power supply, coil, LC tank circuit, AVR mega 16 controller, ultra-capacitor.

I. INTRODUCTION

Mobile phones are designed to operate on a DC voltage source, the main technical difficulty lies in matching the non-fixed super-capacitor cell voltage to the required 3.7V.There is a solution to power mobile phones, combining the use of a DC-DC converter with a super-capacitor stacking scheme, assuring that most of the energy stored in the capacitors is usable, which taking the most of the DC-DC converters efficiency. This paper intends to experimentally validate that solution. Since 1990's and research of the scientist invented many software like playing "MP3 player" for watching movies, videos and personal information like email due to which there occurs a problem of power. So to over-come these problems we have used super-capacitors as appose to batteries which are like other capacitors, which have enormous power storage capabilities. A typical capacitor has capacitance about 0.0001 farads, which is large. A super-capacitor charges between 1 to 3000 farads. We are going to charge 2x400 farad capacitors in series up to 4.5VDC, and feed to DC-DC booster circuit.

II. PROPOSED SYSTEM

A. ULTRA- CAPACITORS.

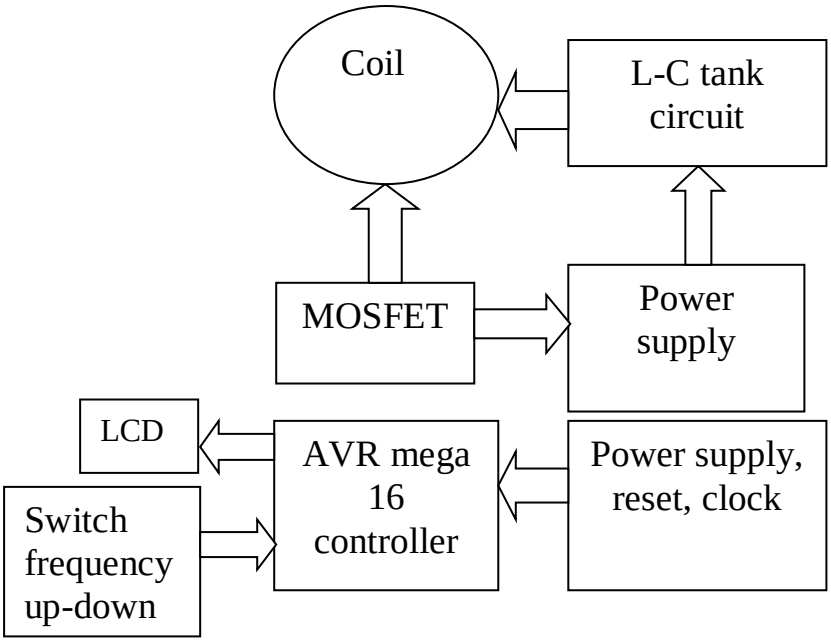
The super-capacitor is also known as ultra-capacitor, which is different from a regular capacitor which has a very high capacitance. As compare to other batteries the ultra-capacitor has a wide range of charging current and can be fully charged within few minutes. As compared to ultra- capacitor the common batteries which has current transducers and closed loop circuits due to which the circuit becomes complicated. The proposed system has a very less components require. It does not require any voltage or current control circuit. It is just a simple open loop circuit which is applicable for the charging of mobile it is free stable and protects itself from overloading. Ultra-capacitor is simple for charging and also presents some unique challenges. As compared to other batteries ultra-capacitor may be charged and discharge at same rate. It is very useful for energy recovery .The battery can get damaged if connected directly for charging. So charging with constant current, constant voltage control is applicable for refueling the ultra-capacitor .Ultra-capacitor have low series inductance for allowing easy stabilizing with switch mode charger. Lets us see the comparison of ultra-capacitor and lithium-ion

Table 1. Performance comparison between super-capacitor and Li-ion

Function	Super-capacitor	Lithium-ion(general)
Charge time	1–10 seconds	10–60 minutes
Cycle life	1 million or 30,000h	500 and higher
Cell voltage	2.3 to 2.75V	3.6 to 3.7V
Specific energy (Wh/kg)	5 (typical)	100–200
Specific power (W/kg)	Up to 10,000	1,000 to 3,000
Cost per Wh	$20 (typical)	$0.50-$1.00 (large system)
Service life (in vehicle)	10 to 15 years	5 to 10 years
Charge temperature	–40 to 65°C (–40 to 149°F)	0 to 45°C (32°to 113°F)

III. HARDWARE REQUIREMENT

A. Transmitter Section.



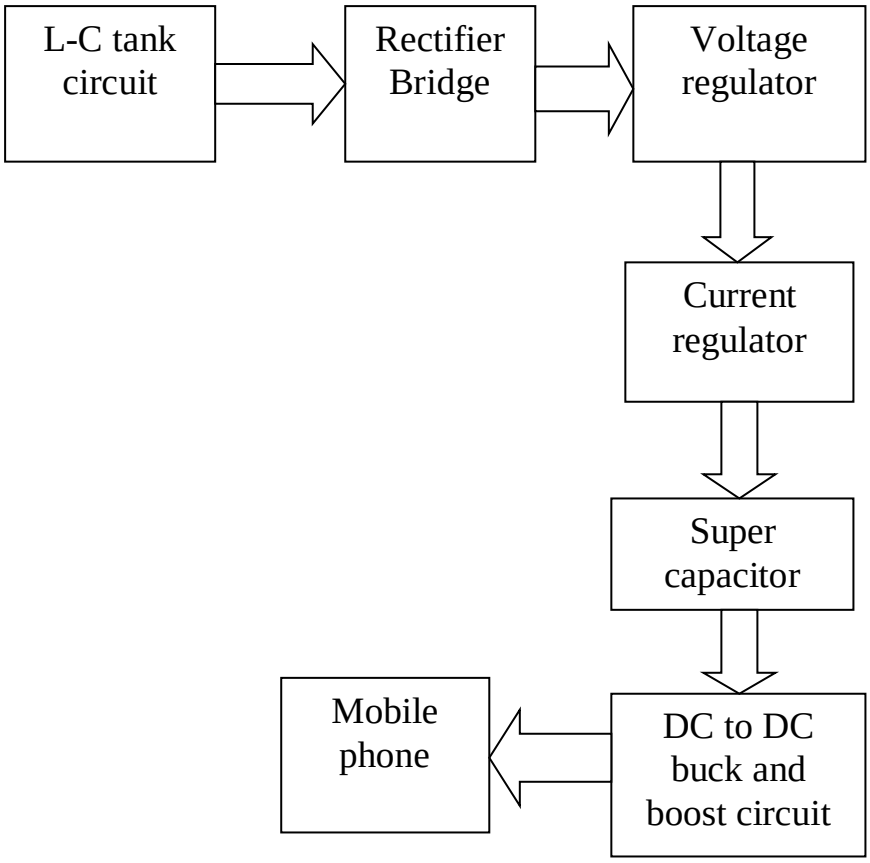
"Figure 1. Block diagram for transmitting power wirelessly"

Explanation of block diagram of transmitter

For wirelessly transmission of power we have chosen a standard frequency of 40khz.This frequency will be produced digitally through micro-controller .Port D of controller will produce this digital wave and also the output is measured from the current limiting resistor. As the coil is designed manually there are chances of error that is we can obtain the frequency either 39.0 or 38khz .so to obtain the frequency we have connected switch buttons to Port A of the controller to adjust the frequency. Instead of going again and again to the program and changing frequency it will be easier to change frequency from these switch buttons .Changed frequency will be displayed on the LCD connected to the Port C .The waveform generated to the controller has an 5V,5mA of current which

is insufficient to charge our mobile. So we need to convert this signal into power by using MOSFET that is power MOSFET .Gate of MOSFET is connected to microcontroller and LC circuit is connected to MOSFET through which power is transmitted.

B. Receiver Section.



"Figure 2. Block diagram for receiving power wirelessly"

Explanation of receiver diagram

For wireless reception of power from the charging pad we have used L-C tank circuit which will absorb the Ac power from the charging pad wirelessly. The transmitted power by the charging pad is of 12-18V which is a very high voltage due to which there are some kind of losses which takes place during transmission .So out of 12-18V we require only 11V.So to obtain 11V we need to connect bridge rectifier after L-C tank circuit so that it will convert the AC to DC. Further it is connected to the voltage regulator to convert the incoming voltage 12V to the 11V .Then this voltage is further given to the current regulator which regulates the current to avoid it from damaging the capacitor as super-capacitor absorbs power quickly. As mobile requires minimum 3.7V operating voltages as we are obtaining 11V at the out-put of the current regulator but mobile cannot take 11V.So in order to get 3.7V we have connected DC to DC buck and boost circuit which will help to drop the voltage from 11V to 3.7V.Then further it is applied to the cell phone which will operate on 3.7V.

IV. ADVANTAGES

Advantages

a) Charging of cell phone wirelessly.
b) Within 2 to 3 minutes our cell phone will be fully charged.
c) One of the advantage of ultra-capacitors is its high power capability, which are applicable for high rate of charging and discharging operation.

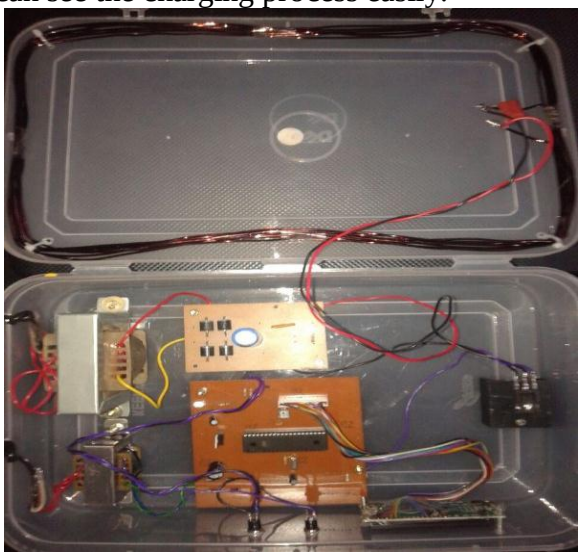
d) Long operating life-do not needs replacing.
e) Rapid charge -ready to provide backup in seconds.

V. FUTURE SCOPE

This technique which we have researched will be applicable for charging IPODS, laptops batteries, rather than cell phones. It can be used any electronic devices which is to be charged wirelessly at home or office so we can charge it by making a small circuit of wireless charging pad and can hang it on the wall or can be placed below the desk in the office so that it can charge the cell phone or laptops etc. Our NANO-GENERATOR will be very helpful in future for the coming generation due to very busy schedule. So within no time these NANO-GENERATORS will charge the electronic gadgets which will be beneficial for the upcoming generation .Which will save time also. Instead of placing these circuits under the table we can also develop a portable charger with help of super-capacitor so that it can be charged within 2-3 minutes with appropriate back up for our usage.

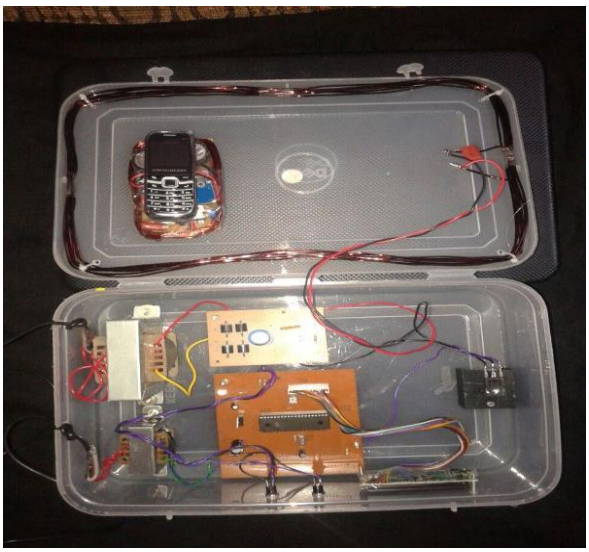
VI. RESULT

Figure 3 below shows our transmitting circuit which includes a coil made up of L-C tank circuit at the rim of the box and mobile circuitry is a receptor circuit .After placing this receptor circuit on the box and applying mains supply accordingly power will be transmitted wirelessly ,by holding switch on button of the mobile we can see the charging process easily.



"Figure 3.Transmitter"

"Figure 4.Receiver"



"Figure5 .Charging Mobile Phone"

VII. CONCLUSION

The ultra-capacitor plays an important role in the EV industry. A new charging circuit with component count has been developed, which highly reduce the production cost as well as circuit failure rate .Based on the equations, optimal inductance and pulse width can be determined. The chargers can fully charges up 680f ultra-capacitor in 15 minutes. The circuit does not consist of complicated closed loop control and is free of stability problem .It favors the application of ultra-capacitor battery combination system for EV's.

REFERENCES

[1] Farouk Balouchi and Bob Gohn, "Wireless Power: Mobile Devices, Consumer Electronics, Industrial Devices, Wireless Power Infrastructure, and Wireless Charging of Electric Vehicles: Technology Analysis, Environmental Impact, and Market Forecasts," Pike Research Report, Published 2Q 2012.

[2] A.Schneuwly,R.Gallay, "Properties and application of super-capacitors: from the start-of-the art to future trends", proceedings of PCIM ,2000.

[3] R.Signorelli,D.Ku,1.Kassakian,1.Schindall,"Electrochemical double layer capacitors using carbon nano-tube electrode structures", proceedings of the IEEE,vol.97,No.II,November 2009.

[4] J.Monterio,N.Garrido ,R.Fonseca," Efficient super-capacitor energy usage in mobile phones " ,IEEE ICCE-Berlin,2011,in press

