

“THERMO-ELECTRIC PALM CHARGER”

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Abstract : This paper is based on the principles of thermo electricity using which we are going to charge small electronic devices using our body heat. Thermo-couple is heart of this project due to which we are able to convert our body heat into electricity. This paper is also about the boosting of power we get from thermocouple up to a sufficient value so that the device can charge effectively without any harm.

IndexTerms - Thermocouple, Body Heat, LTC3108, Energy Harvesting, Flyback Transformer

I. INTRODUCTION

The obligation for electronic devices that helps the human being in every day, now a days growing features and possibility of modern mobile terminal devices. One last constraint is the demand for power supplies that allow unrestrained operating and stand-by time. [1]

In the current scenario, technology has allowed the cellular phone to shrivel not only in the size of the ICs, but also in terms of batteries. However, as technology has advanced and made our phone smaller and simple to use, we still have one of the major problems that we still need to plug the electronic devices installed into walls in order to recharge the battery. Most of people admits this reality as there is no other option to this problem so they need to carry external energy storing devices like power banks with them while travelling. Every time it's not possible to charge mobile batteries everywhere at any time so we have designed this prototype for charging not only mobile batteries but other smaller devices too anywhere at any time.[1]

Thus, inexhaustible energy is an attractive & substitute way for generation of electricity, as it will also provide an eco- friendly environment for future generations. Currently, there are many great solutions to renewable energy, but some are unachievable. In this proposed paper, a device will be created to introduce an effective way for humans to create in exhaustible energy using thermoelectric devices. [3][8]

Renewable energy can be construct by many arrangements; for example, solar energy, wind energy, hydro energy, nuclear energy, and many more. For each of these different forms of creating electricity, there are certain limitations. [3][8]

II. LITERATURE REVIEW

I would like to highlight some paper that has been already published and its somehow related to our research paper like we have mentioned about (TEC12706) thermoelectric module so this module has already been used for practical performance forecast and analysis of thermoelectric module from macro to micro level .[1] It has been used for automated cooling/heating mechanism for garments so here they are using body temperature and `according to the body temperature clothing temperature is maintained. [8] As I have also `mentioned about (LTC-3108) using this device one can easily made hollow flash light with the help of our body temperature.[2] This device has also been used for low voltage DC-DC conversion without magnetic components for energy harvesting.[3] This device has also been used in autonomous multi-sensor system.[4] It has been also used for ambient wi-fi system to run low power electronic devices wireless.[5] Electrical energy generation from exhaust body heat.[6]

III. PROPOSED WORK

III.I Circuit Description

Block diagram: -

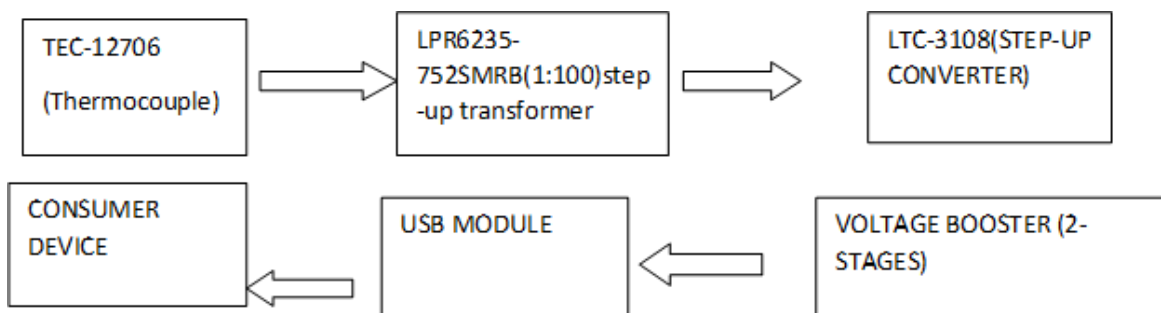


Figure 1- Block Diagram of thermo-electric palm charger

III.II Working Principle

This (TEC-12706) is connected with our body which radiates heat & this radiated heat is transferred to the (TEC-12706) which works on the principle of seebeck effect in which temp difference is created which results in the flow of electron from N to P region leading to generation of current. The value obtained from (TEC- 12706) is very low which needs to be boosted and this is done by (LTC-3108) which is connected to thermocouple with the help of flyback DC/AC transformer of LPR series having 1:100 turns. Output of this transformer is attached to the pins of LTC-3108-(C₁ & C₂) with the help of capacitor. Thus (LTC-3108) boost this generated output value obtained from LPR according to its specified programmable pins i.e. V_{S1} & V_{S2} when both of the pins goes high (means attached 1 μ F capacitance) this device has a tendency to give 5V output as it has been already specified by the linear technologies and to maintain this regulated voltage we use V_{LDO} pin which helps in maintaining the regulated voltage in the output. This V_{LDO} pin is connected with the another capacitor of 2.2 μ F which has a optimum threshold value of approximately 2.5 V for activation of this pin. The obtained value of this device does not give enough power to charge electronic device like mobile phones but smaller devices which needs low power can operate easily.[2][9] So for charging operation of mobile phones we need more stages to reach that optimum value that is needed to charge a phone so we are using a voltage booster in two stages which operates in the range of 3.3 V to 5V and boost the current value 8 times of its input value observed as per our testing. This same process is repeated in one more stage and thus we get the required value and finally we transfer this resultant output to the phone for charging purpose with the help of USB modules which has a tendency to give stabilized value & maintain the optimum value required to charge a phone device.

IV. COMPONENTS USED

IV.I TEC12706:-As shown in fig.2 It is basically called as thermocouple which works on the principle of seebeck effect in this basically it consists of pair of wires (such as copper and iron) which are add to this module where as other side is left open for external connection In this we have two side basically known as hot & cool plate which build a kind of small temperature difference which leads to the movements of electrons from n to p region which is filled inside of it thus it leads to the flow of current.



Figure 2- TEC12706 thermocouple

IV.II LPR (Flyback Transformer):- As shown in fig.3 It is a flyback transformer also known a line output transformer (LOPT) is a special category of electrical transformer. It was initially designed to generate high voltage saw tooth signals at a relatable high frequency. The reason it is called a flyback transformer is because the primary winding uses a relatively low-voltage saw tooth wave. The wave gets enhance first and then gets switched off unexpectedly, this causes the beam to fly back from right to left. This flyback can be used to generate a DC output from either an AC or DC input. The flyback converter uses a single magnetic, although generally referred to as a transformer actually behaves as a coupled inductor.

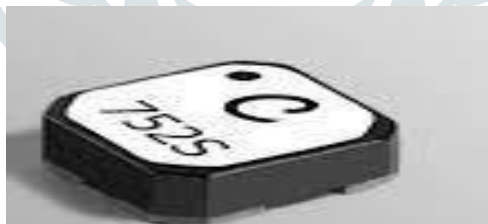


Figure 3- LPR6235- 752SMRB (Flyback Transformer)

IV.III Ultralow Voltage Step-up Converter (LTC-3108):- This device is developed by Linear Technologies basically known as ultralow voltage step up converter & power manager as shown in fig.4 which is designed to operate from as low input it can easily take input from thermocouple with the help of flyback transformer to its specified pins thus it gives the desired output that is programmed by the linear technologies. This device does not require any external pulse to operate thus with the help of some defined capacitors in datasheet it easily gives the specific value. This device is basically designed to operate for low power application like wireless sensors etc. So as we know that power which it provides in its output pin is not sufficient to charge our phone so we require more stages to get the desired result. This (LTC3108) basically comes in two packages 16-pin (SSOP) & 12-pin (DFN) package If more research is brought regarding this device than it is assumed that 100-watt bulb can generate from our body heat. So, this device can play vital role in near future as it can help in the conservation of energy & make our environment eco-friendly.

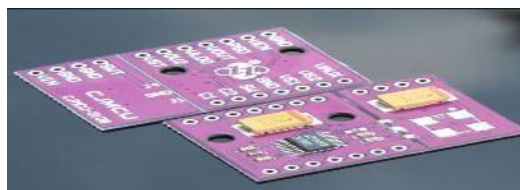


Figure 4- LTC-3108

IV.IV 4150WDC-DC Boost Converter: -This is another type of voltage booster as shown in fig.5 which is basically used to increase the efficiency of LTC3108 values according to our tested result it operates from 3.5 V to 5 V which boost 8 times of input value but still we are not getting the optimum value required so we need one more stage to get the optimum value. This booster uses UC-3843 is basically a current mode pulse width modulation (PWM) controller having fixed frequency. It requires minimum external components & comes in three different packages. It uses less external component due to its unique feature including current sensing, high gain amplifiers, high-current totem-pole out for the control of MOSFET. This has 8-pins as you can see in figure. After getting the desired value its connected.



Figure 5- DC-DC converter

IV.V USB (TPS2540EVM-6230.9V-5V DC step-up converter): - As shown in fig.6 Universal Serial Bus this is used to transfer electrical signal that we are getting from the voltage booster to the charging port. This USB has high efficiency conversion. It can easily operate in the range of 0.9V to 5V dc. It provides the stability in its output value. Hence, we are in a position to charge our phone.



Figure 6- USB module

V. RESULT, CONCLUSION & FUTURE SCOPE

V.I Result of LTC-3108(ultra-low voltage step-up converter)

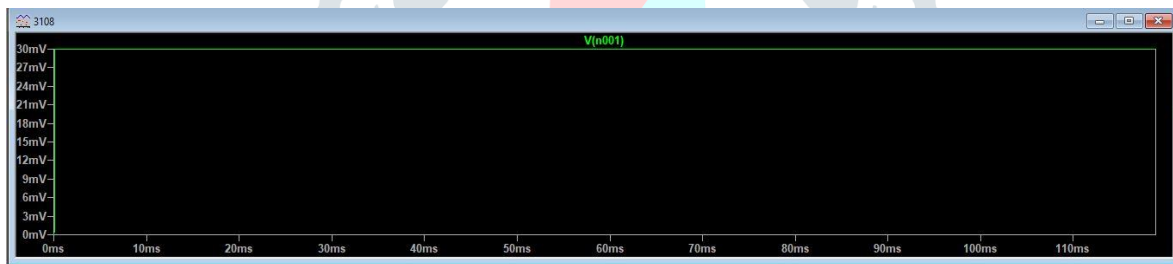


Figure 7- simulated result input 30mV

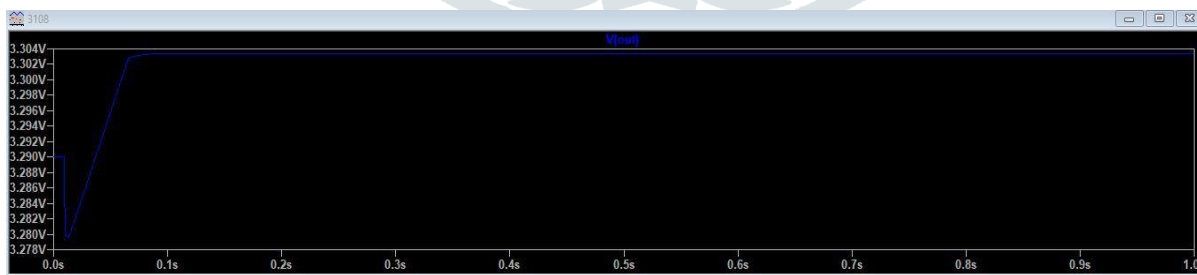


Figure 8- simulated result LTC-3108 output 3.28V



Figure 8- tested result 79 mV approx. one module (tested result)

V.II Conclusion

We have obtained this desired result using LTspice software for (LTC3108) & simetrix has been used for 150WDC_DC booster which uses IC (UC-3843) which is giving efficient value as per our requirement. TEC12706 is giving the required value from our palm need to start the (LTC3108).

V.III Future Scope

In future it will open many more areas of application in charging or power supply of electronic devices making us independent on electricity through switch board. If we go for advancement in our prototype than we can make it wireless in upcoming modification by attaching Bluetooth module. Our project is also eco-friendly and is no harm to the nature. We would also clarify that since we are using our body heat as a source of energy. it has not any direct as well as indirect harm to our body.

VI. ACKNOWLEDGMENT

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