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A Smart Energy Harvesting System from Human Body Heat using Temperature Sensor and Boost Converter

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Abstract: ***This proposed system represents a Heat sense-based energy harvesting system composed of a compact electromagnetic pulse generator and highly efficient full-wave interface electronics in a system-on-package. The increased utilization of the portable, implantable and need for compact and efficient energy harvesting devices to power of the systems has use frequent battery replacement would be impractical. Temperature sensor senses our body heat and to convert normally wasted body heat in the form of temperature into useable electrical energy. Here we used LCD for displaying the voltage or current which is the output energy of temperature sensor. The main aim of this system is to implement the new energy generation for reducing the power demand using small resources. It can be used in smart mobile phones and also in personal computers to use the current or voltage for its operation by itself.***

I. INTRODUCTION

Bio Mechanical energy harvesting from human heat presents a promising clean alternative to electrical power supplied by batteries for portable electronic devices and for computerized technology. So the energy can be converted into useful form using light weight designing is the increasing utilization of the portable battries, implantable and need for compact and efficient energy harvesting devices to power of the systems are uses as frequent battery replacement that would be impractical. The reduced power demand in the new generation integrated circuits has been allowed the use of energy harvesters as primary power sources in small systems. Storage of the energy in such systems are which are continuously to being charged by using the ambient energy sources like our body heat. Temperature sensor is used to sense our body heat and to convert normally wasted body heat in the form of temperature into useable electrical energy. Here we used LCD for displaying the voltage or current which is the output energy of temperature sensor.

II. POWER SUPPLY

A power supply is a device that supplies electrical energy to one or more electric loads. The term is most commonly applied to devices that convert one form of electrical energy to another, though it may also refer to devices that convert the another form of energy to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.

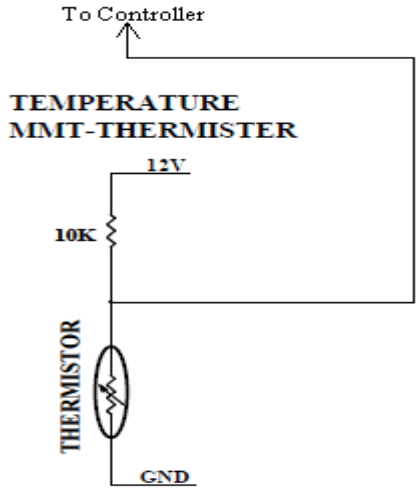
Every power supply must obtain the energy it supplies to its load, as well as any energy it consumes when it performing that task from an energy source. It depends on its design, a power supply may obtain energy from,

- Electrical energy transmission systems. Common examples of this include power supplies that convert AC line voltage to DC voltage.

The ac voltage, typically 220V rms has been connected to a transformer which steps that ac voltage down the level of the required dc output. A diode rectifier provides a full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation.

III. TEMPERATURE SENSOR

Thermistors are special solid temperature sensors that behave like temperature-sensitive electrical resistors. No surprise then that their name is a contraction of "thermal" and "resistor". There are basically two broad types, NTC-Negative Temperature Coefficient, used mostly in temperature sensing and PTC-Positive Temperature Coefficient, used mostly in electric current control.



Thermister Circuit

3.1 DESCRIPTION

A thermistor is a thermally sensitive resistor that exhibits a change in electrical resistance with a change in the temperature. Resistance is a measured by passing a small, measured direct current (dc) through it and measuring the voltage drop produced. The standard reference temperature is the thermistor body temperature at which nominal zero-power resistance is specified, usually 25°C. The thermistor acts as the temperature sensor and it is placed on the body whose temperature is to be measured. It is also connected in the electric circuit. When the temperature of the body changes, the resistance of the thermistor also changes, which is indicated by the circuit directly as the temperature since resistance is calibrated against the temperature. The thermistor can also be used for some control which is dependent on the temperature.

IV. DC-DC CONVERTER

A DC-to-DC converter is an electronic circuit which converts a source of direct current (DC) from one voltage level to another. It is a class of power converter. The LM358 series consists of two independent, high gains; internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages.

4.1 DESCRIPTION

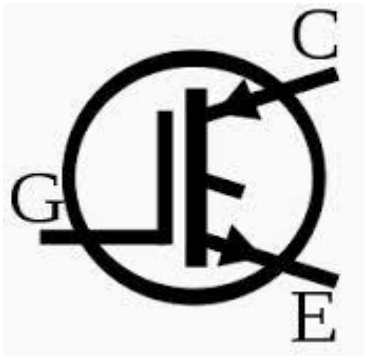
In the linear mode the input common-mode voltage range includes ground and the output voltage can also swing to ground, even though operated from only a single power supply voltage. The unity gain cross frequency is temperature compensated. The input bias current is also temperature compensated.

The LM358 series are op amps which operate with only a single power supply voltage, have true-differential inputs, and remain in the linear mode with an input common-mode voltage of 0 VDC. These amplifiers operate over a wide range of power supply voltage with little change in performance characteristics. At 25°C amplifier operation is possible down to a minimum supply voltage of 2.3 VDC.

V. IGBT

The **insulated-gate bipolar transistor** (**IGBT**) is a three-terminal power semiconductor device primarily used as an electronic switch and in newer devices is noted for combining high efficiency and fast switching. It switches electric power in many modern appliances: Variable-Frequency Drives (VFDs), electric cars, trains, variable speed refrigerators, air-conditioners and even stereo systems with switching amplifiers.

An IGBT features a significantly lower forward voltage drop compared to a conventional MOSFET in higher blocking voltage rated devices. As the blocking voltage rating of both MOSFET and IGBT devices increases, the depth of the n- drift region must increase and the doping must decrease, resulting in roughly square relationship decrease in forward conduction vs. blocking voltage capability of the device. By injecting minority carriers (holes) from the collector p+ region into the n- drift region during forward conduction, the resistance of the n- drift region is considerably reduced. However, this resultant reduction in on-state forward voltage comes with several penalties.



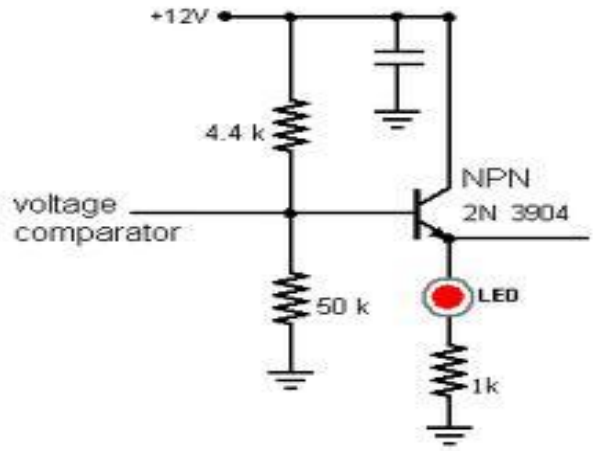
IGBT Symbol

5.1 DRIVER

In electronics, a driver is an electrical circuit or other electronic component used to control another circuit or other component, such as a high-power transistor.

They are usually used to regulate current flowing through a circuit is used to control the other factors such as other components, some devices in the circuit. The term is often used, for example, for a specialized integrated circuit that controls high-power switches in switched-mode power converters. An amplifier can also be considered a driver for loudspeakers, or a constant voltage circuit that keeps an attached component operating within a broad range of input voltages.

Typically the driver stage(s) of a circuit requires different characteristics to other circuit stages. For example in a transistor power amplifier, typically the driver circuit requires current gain, often the ability to discharge the following transistor bases rapidly, and low output impedance to avoid or minimize distortion.



Circuit diagram of Driver Circuit

5.2.1 DESCRIPTION

Simple bench pulse generators usually allow control of the pulse repetition rate (frequency), pulse width, delay with respect to an internal or external trigger and the high- and low-voltage levels of the pulses. More-sophisticated pulse generators may allow control over the rise time and fall time of the pulses. Pulse generators are available for generating output pulses having widths (duration) ranging from minutes down to under 1 pico second. Pulse generators are generally voltage sources, with true current pulse generators being available only from a few suppliers. Pulse generators may use digital techniques, analog techniques, or a combination of both techniques to form the output pulses. For example, the pulse repetition rate and duration may be digitally controlled but the pulse amplitude and rise and fall times may be determined by analog circuitry in the output stage of the pulse generator. With correct adjustment, pulse generators can also produce a 50% duty cycle square wave. Pulse generators are generally single-channel providing one frequency, delay, width and output.

5.2 PULSE GENERATOR

A pulse generator is either an electronic circuit or a piece of electronic test equipment used to generate rectangular pulses. This article describes the test equipment.

5.2.1 DESCRIPTION

Simple bench pulse generators usually allow control of the pulse repetition rate (frequency), pulse width, delay with respect to an internal or external trigger and the high- and low-voltage levels of the pulses. More-sophisticated pulse generators may allow control over the rise time and fall time of the pulses. Pulse generators are available for generating output pulses having widths (duration) ranging from minutes down to under 1 pico second. Pulse generators are generally voltage sources, with true current pulse generators being available only from a few suppliers. Pulse generators may use digital techniques, analog techniques, or a combination of both techniques to form the output pulses. For example, the pulse repetition rate and duration may be digitally controlled but the pulse amplitude and rise and fall times may be determined by analog circuitry in the output stage of the pulse generator. With correct adjustment, pulse generators can also produce a 50% duty cycle square wave. Pulse generators are generally single-channel providing one frequency, delay, width and output.

VI. BOOST CONVERTER

A **boost converter** (**step-up converter**) is a DC-to-DC power converter with an output voltage greater than its input voltage. It is a class of switched-mode power supply (SMPS) containing at least two semiconductor switches (a diode and a transistor) and at least one energy storage element, a capacitor, inductor, or the two in combination. Filters made of capacitors (sometimes in combination with inductors) are normally added to the output of the converter to reduce output voltage ripple. Efficiency, size, and cost are the primary advantages of switching power converters when compared to linear converters.

Switching power converter efficiencies can run between 70-80%, whereas linear converters are usually 30% efficient. The DC-DC Switching Boost Converter is designed to provide an efficient method of taking a given DC voltage supply and boosting it to a desired value.

VII. INVERTER

An inverter is an electrical device that converts direct current (DC) to alternating current (AC) the converted AC can be at any required voltage and frequency with the use of appropriate, switching, and the control circuits. The solid state inverters have no moving parts and are used in a various range of applications in small switching power supplies in computers to the large electric utility direct current applications that transport bulk power.

A power inverter is entirely electronic or may be a combination of mechanical effects and electronic circuitry.

VIII. RELAY

Relays are switching device. It is the heart of industrial electronic system. Every industrial electronic system required some type of switching device (or) relay. For the simplest photo-electric relay to the most advanced.

Depending up on the basic force available for relay contact closing and opening there is several types of relays. Some of them are listed below:

- Electromagnetic or electrodynamics relays
- Gas or compressed air operated pneumatic relays
- Heat sensitive bimetallic.

Electronic relays can be made of vacuum tubes, gas tubes solid state devices and saturable core reactions.

Electromagnetic relays is form of electromagnets in which the coil current produces a magnetic effect to pull or push flat soft iron armatures of strips carrying relay contacts. Relays may be classified in many ways, but there are two large groups defined by their use. One is a general purpose relay and the other is a special purpose relay designed for specific applications demanding high sensitivity and high speed with large current carrying capacity etc.

General purpose relays or telephone relays of read type relays from the largest group of electromagnetic power presented by the switching device.

IX. CONCLUSION

The progress in science and technology is a continous process. New things and new technology are being invented. Our designed system will generate only the less amount of output in terms of either voltage or current. Then after that this will be boost up by using switching, this project can be extended in future for further applications and research purposes.

References

1. J. A. Paradiso and T. Starner, “Energy scavenging for mobile and wireless electronics,” IEEE Pervasive Comput., vol. 4, no. 1, pp. 18–27,Jan./Mar.2005
2. J. Kymissis, C. Kendall, J. Paradiso, and N. Gershenfeld, “Parasitic power harvesting in shoes,” in 2nd Int. Symp. Wearable Comput,DiG Papers,1988, pp. 132–139.
3. A. Khaligh, P. Zeng, and C. Zheng, “Kinetic energy harvesting using piezoelectric and electromagnetic technologies—State of the art,” IEEE Trans. Ind. Electron., vol. 57, no. 3, pp. 850–860, Mar. 2010.
4. P. D. Mitcheson, E. M. Yeatman, G. K. Rao, A. Holmes, and T. C. Green,“Energy harvesting from human and machine motion for wireless electronic devices,” Proc. IEEE, vol. 96, no. 9, pp. 1457–1486, Sep. 2008.
5. L. C. Rome, L. Flynn, E. M. Goldman, and T. D. Yoo, “Generating electricity while walking with loads,” Science, vol. 309, pp. 1725–1728, 2005.
6. J. M. Donelan, Q. Li, V. Naing, J. A. Hoffer, D. J. Weber, and A. D. Kuo,“Biomechanical energy harvesting: generating electricity during walking with minimal user effort,” Science, vol. 319, pp. 807–810, 2008.
7. S. Priya and D. J. Inman, Energy Harvesting Technologies. NewYork:Springer, 2009.

8. N. G. Elvin and A. A. Elvin, "A general equivalent circuit model for Piezo electric generators," J. Intell. Mater. Syst. Struct., vol. 20, pp. 3–9, 2009.

9. T. R. Derrick, J.Hamill, and G. E.Caldwell, "Energy absorption of impacts during running at various stride lengths," Med. Sci. Sports Exercise, vol.30, pp. 128–135, 1998.

