STRESS METER BASED ON HUMAN STRESS

[1]I.SINDHU, [2]P. SAI SRUTHI, [3] S.S MAHA LAKSHMI, [4] V. SATYAVATHI

[1]Student, [2]Student, [3]Student, [4]Student

[1]sindhu21101999@gmail.com

[2]lakshmisaisruthi7@gmail.com

[3]mahalakshminaidu405@gmail.com

[4]sakhivennapu@gmail.com

Department of Electrical and Electronics Engineering, Pragati Engineering College (A), Andhra Pradesh, India

Abstract

The purpose of stress meter is to assess the emotional pain of human being. The stress can cause hair to fall, acne to break out and many other problems. These manifestations of stress can cause even more anxiety. This stress monitor lets you assess your emotional pain. If the stress is very high, it gives visual indication through a light-emitting diode LED display along with warning beep. The gadget is small enough to be worn around the wrist. The LM3915 is a monolithic integrated circuit that senses analog voltage levels and drives ten LED's, LCD's or vacuum fluorescent displays, providing a logarithmic 3db/step analog display.

Stress is the very common condition of every human being socially. This Stress meter allows assessing the emotional pain. If the stress is very high, it gives visual indication on a LED display along with a beep.

***Keywords**: Piezo Buzzers, IC LM3915, BC548 Transistor*

1. Introduction

This stress monitor lets you assess your emotional pain. If the stress is very high, it gives visual indication through a light-emitting diode (LED) display along with warning beep. The gadget is small enough to be worn around the wrist. The LM3915 is a monolithic integrated circuit that senses analog voltage levels and drives ten LED's, LCD's or vacuum fluorescent displays, providing a logarithmic 3dB/step analog display.

The gadget is based on the principle that the resistance of the skin varies in accordance with your emotional states. If the stress level is high the skin offers less resistance, and if the body is relaxed the skin resistance is high. The low resistance of the skin

During high stress is due to an increase in the blood supply to the skin. This increases the permeability of the skin and hence the conductivity for electric current. This property of the skin is used here to measure the stress level, the touch pads of the stress meter sense the voltage variations across the touch pads and convey the same to the circuit.

The circuit is very sensitive and detects even a minute voltage variation across the touch pads. In an article "Stress and Mind Control", 21/03/2008, Roberto Bonomi stated that "When we speak of the fabulous relaxation capacity that mind control gives us, the first thing that comes to our mind, is that we will be able to take off, the excesses of nervous tension, the stress; and this is a great benefit. Because suppose that you could measure stress in inches, and that you have stress zero when the meter is located in zero."Neuroscientists have begun to learn that even acute, everyday stress can turn off the brain's command-and-control center, the prefrontal cortex. Without our mental executive, we feel helpless and out of control. The more we learn about stress, the more we realize that monitoring stress and taking steps to keep it under control is an important preventive health measure.

2. Materials Employed

Resistors (470, 1.2, 1K, 47Ohms)

Variable Resistors (1M, 47K)

Capacitors

Semi – Conductors

PZ1 – Piezo Buzzer

Switch

Zener Diode

Light Emitting Diodes

Battery

Switch

Touch Pads

IC LM 3915:

It is Monolithic integrated circuit that senses analogue voltage levels and displays them through LEDs providing a logarithmic analogue display. It can drive up to ten LEDs one by one for each increment of 125mV in the input.

Figure 1: IC LM3915

Light Emitting Diodes:

The Light Emitting Diodes (LED_s) is a forward biased P-N junction which emits visible light when energized. The color of light emitted depends on the material and for example, emits infrared radiation or invisible light, emits red or green light and emit red or yellow radiation or amber light. To choose LEDs for a particular application, one or more of the following points have to be considered; wavelength of light emitted the required input power efficiency, turn-on and turn-off time of the switching devices, circuit construction, light intensity, brightness, among others. The uses of LEDs include. They are also used in image sensing circuits. LEDs are used for numeric displays in hand-held portals.

Figure 2: LEDs

Resistors:

Resistors are used in the circuits to limit current, set bias levels, control gain in switching components, fixing time constant, impedance matching and loading, voltage division and sometimes heat generation. Resistors used in the circuit are (470, 1.2k, 1k, 47 ohms)

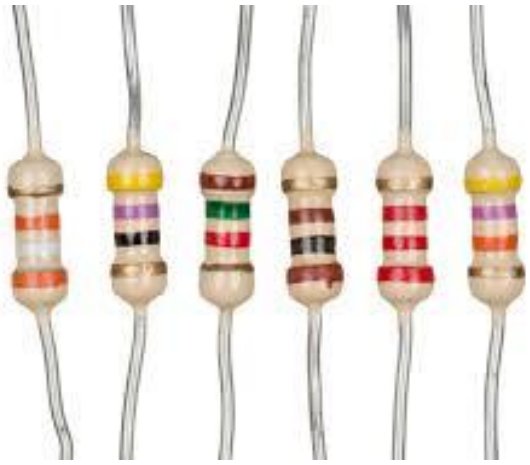


Figure 3: Resistors

Capacitors:

The capacitor in figure 10 is use in the circuit to store charges as element of frequency selectivity circuits and filters for coupling AC signals from one circuit to another and for shunting unwanted signals to ground (decoupling).

Figure 4: Capacitors

Battery:

There are primary and secondary batteries. Secondary batteries use renewable power systems where as primary batteries allow the chemical process that provide the electrical energy to occur once and then it is discharged.

Figure 5: Battery

BC 548 Transistor:

The BC548 is a general-purpose NPN bipolar junction transistor commonly used in European and American electronic equipment. It is notably often the first type bipolar transistor hobbyist's encounter and is often featured in designs in hobby electronics magazines where a general-purpose transistor is required.

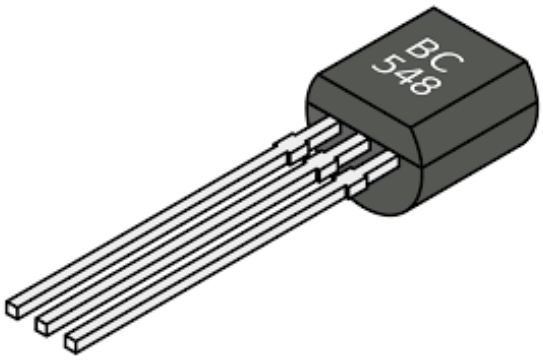


Figure 6: Transistor BC548

3. Hardware Implementation

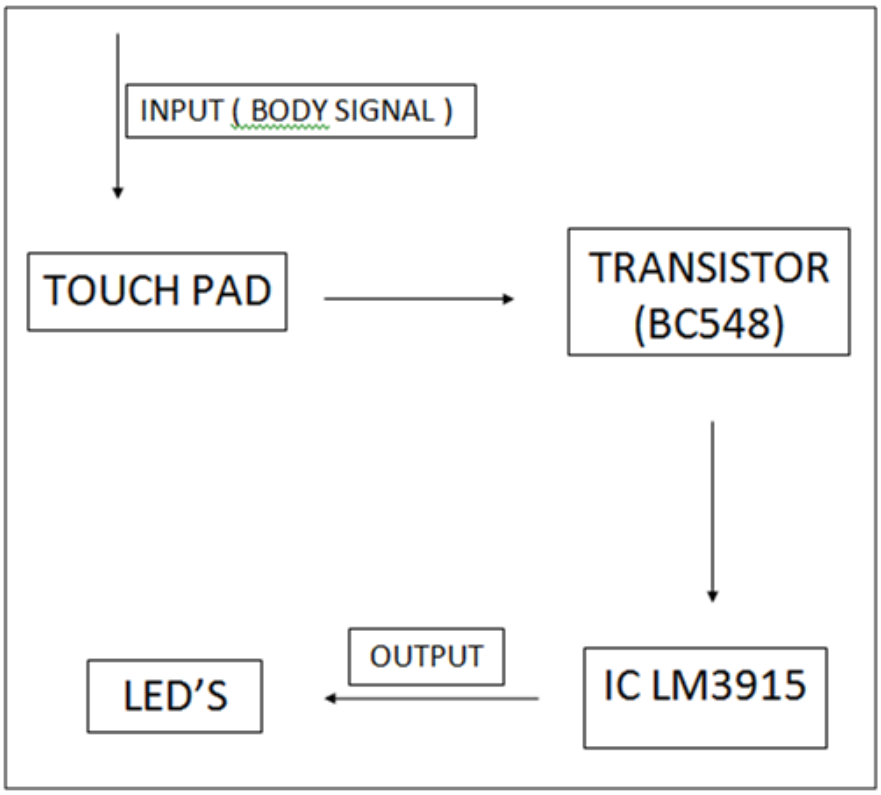


Figure 7: Block Diagram of Stress Meter

Figure above shows a block diagram of the Stress Indicator device. The touch pads of the stress meter sense the voltage variations across the touch pads and convey it to the signal amplifier, followed by LED display for visual indication and a warning beep. The circuit is very sensitive and detects even a minute voltage variation across the touch pads.

- Touch pad- detects the changes on the skin resistance.

- Transistors BC548- amplify the signal produced at skin surface obtain from the touchpad.

- IC LM3915- is use to sense the analogue voltage level at pin 5 obtain from the transistor.

- LED- indicates the level of pain produce from the galvanic skin response.

The main principle of stress meter is that the variations in the resistance of the skin due to blood pressure of one's body can be directly converted and transmitted into analog voltage levels to give the visual indication of human stress using a proper circuitry.

4. Circuit Operation

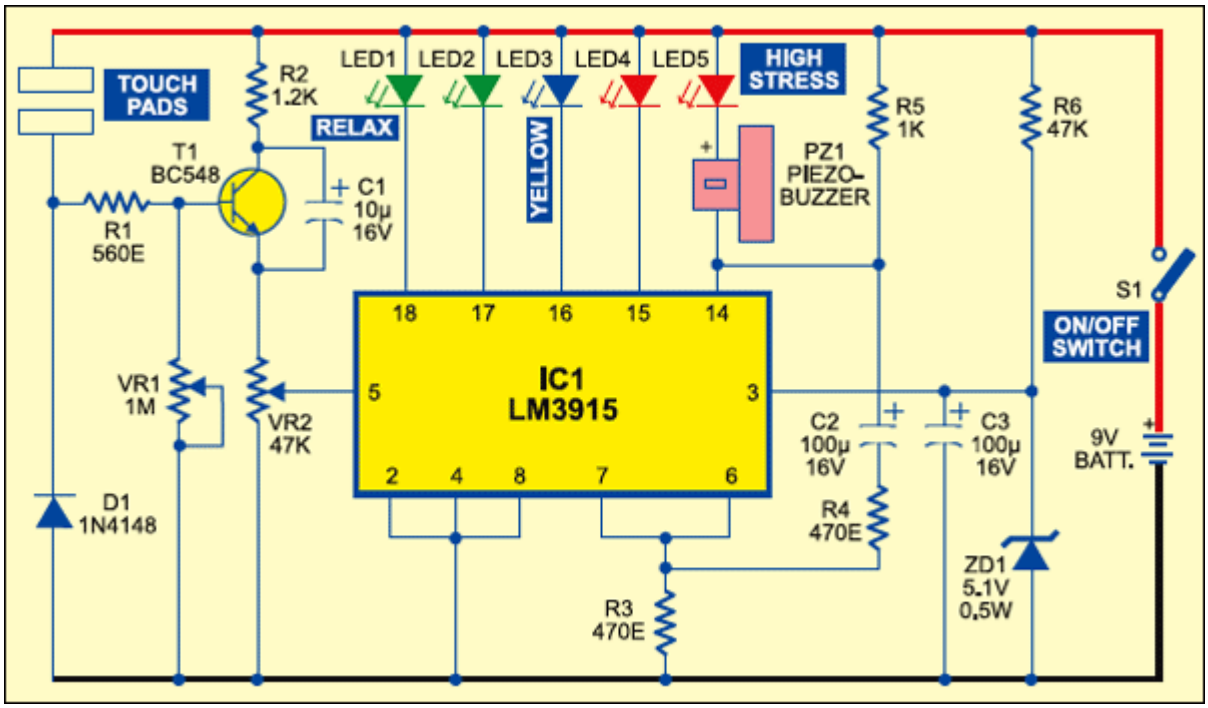


Figure 8: Circuit Diagram of Stress Meter

This stress monitor lets you assess your emotional pain. If the stress is very high, it gives visual indication through a light-emitting diode (LED) display along with a warning beep. The gadget is small enough to be worn on the fingers.

The gadget is based on the principle that the resistance of the skin varies in accordance with your emotional states. If the stress level is high the skin offers less resistance, and if the body is relaxed the skin resistance is high. The low resistance of the skin during high stress is due to an increase in the blood supply to the skin.

This increases the permeability of the skin and hence the conductivity for electric current. This property of the skin is used here to measure the stress level. The touch pads of the stress

meter sense he voltage variations across the touch pads and convey the same to the circuit. The circuit is very sensitive and detects even a minute voltage variation across the circuit.

The circuit comprises signal amplifier and analogue display sections. Voltage variations from the sensing pads are amplified by transistor BC548 (T1), which is configured as a common-emitter amplifier. The base of T1 is connected to one of the touch pads through resistor R1 and to the ground rail through potentiometer VR1.

The sensitivity of T1 can be adjusted to the desired level. Diode D1 maintains proper biasing of T1 and capacitor C1 keeps the voltage from the emitter of T1 steady.

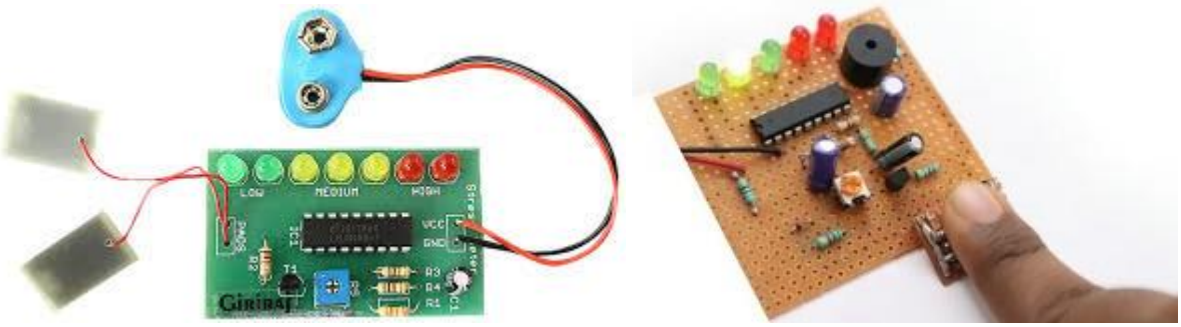
The amplified signal from transistor T1 is given to the input of IC LM3915 (IC1) through VR2. IC LM3915 is a monolithic integrated circuit that senses analogue voltage levels at its pin 5 and displays them through LEDs providing a logarithmic analogue display. It can drive up to ten LEDs one by one in the dot/bar mode for each increment of 125 mV in the input. Here, we've used only five LEDs connected at pins 14 through 18 of IC1. LED1 glows when input pin 5 of IC1 receives 150 mV. LED5 glows when the voltage rises to 650 mV and LED5 flashes and piezobuzzer PZ1 beeps when the stress level is high.

R4 and R5 and capacitor C2 form the flashing elements. Resistor R3 maintains the LED current at around 20 mA. Capacitor C3 should be placed close to pin 3 for proper functioning of the IC. Zener diode ZD1 in series with resistor R6 provides regulated 5V to the circuit.

The circuit can be assembled on a small piece of perforated board. Use transparent 3mm LEDs and a small piezobuzzer for audio-visual indications. Enclose the circuit in a small plastic case with touch pads on the back side. Two self-locking straps can be used to tie the unit around your wrist.

After wearing touch pads on fingers (with touch pads in contact with the skin), slowly vary VR1 until LED1 glows (assuming that you are in relaxed state). Adjust VR2 if the sensitivity of IC1 is very high. The gadget is now ready.

5. Result And Analysis



The stress meter thus detects the resistance of skin which is according to one's mental stress and gives a visual indication on a LED display. The LED's on the stress meter can be observed as stress level indicators from zero to 5 stress levels on a scale of FIVE. The high stress of a person is indicated through a warning beep.

Resistance varies inverse proportional to the stress. If the stress level is high the skin offers less resistance, and if relaxed resistance is high. The low resistance of the skin during high stress is due to an increase in the blood supply to the skin. This increases the permeability of the skin and hence the conductivity for electric current.

The LED 1 glows by default when the circuit is on. When a person touches the touch pad of the stress meter with his finger, it senses the skin resistance and hence the stress. On a scale of ten, stress levels from 0 to 5 can be observed, where the LED 5 when on gives a warning beep for high stress indication.

6. Future Scope

Stress meter can be further developed to design equipment like lie detectors; skin response meters; skin resistance meters; fitness meters; grip scopes etc. therefore this model, if further developed can be used in medical field, forensic department and it even helps in improving the body fitness.

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