Department of Computer Science and Engineering (CSE)

Faculty of Sciences and Engineering
Semester: Fall, Year: 2021, B.Sc. in CSE (Day)

PROJECT REPORT

Course Title	**:**	**Digital Logic Design Lab**
Course Code	**:**	**CSE 204**
Section	**:**	**203DB**

Lab Project Name: Fire Alarm Security System

Student Details

	Name	ID
1.	Joy Pal	201002418
2.	Ratul Islam	202002078

Submission Date	**:**	**29th December, 2021**
Course Teacher's Name	**:**	**Md. Abdullah Al Arif**

[For Teachers use only: Don't Write Anything inside this box]

Lab Project Status

Marks: …… **Signature: .....**

Comments: ..... **Date: .....**

Table of Contents

Introduction

Fire Alarm Circuit is a simple circuit that detects the fire and activates the Siren Sound or Buzzer. Fire Alarm Circuits are very important devices to detect fire in the right time and prevent any damage to people or property.

Fire Alarm Circuits and Smoke Sensors are a part of the security systems which help in detecting or preventing damage. Installing Fire Alarm Systems and Smoke Sensors in commercial buildings like offices, movie theatres, shopping malls and other public places is compulsory.

There are many expensive and sophisticated Fire Alarm Circuit in the form of stand-alone devices, but we have designed five very simple Fire Alarm Circuits using common components like Thermistor, LM358, Germanium Diode, LM341 and NE555.

Objectives

- To learn the various use of tools in a circuit.
- To buzz an alarm when it detect fire or smoke.
- Provide an immediate alarm and so prevent loss of life

Elements

1. Thermistor

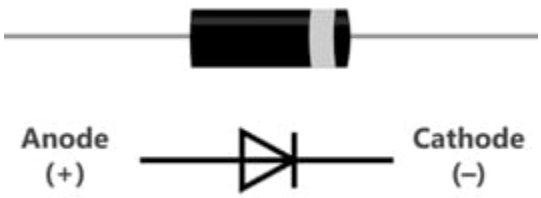
A thermistor is a type of resistor whose resistance is strongly dependent on temperature, more so than in standard resistors. The word is a combination of thermal and resistor.

2. Variable resistor(POT)

The potentiometer is the most common variable resistor. It functions as a resistive divider and is typically used to generate a voltage signal depending on the position of the potentiometer.

3. Diode

A diode is a two-terminal electronic component that conducts current primarily in one direction; it has low resistance in one direction, and high resistance in the other.



4. Capacitor

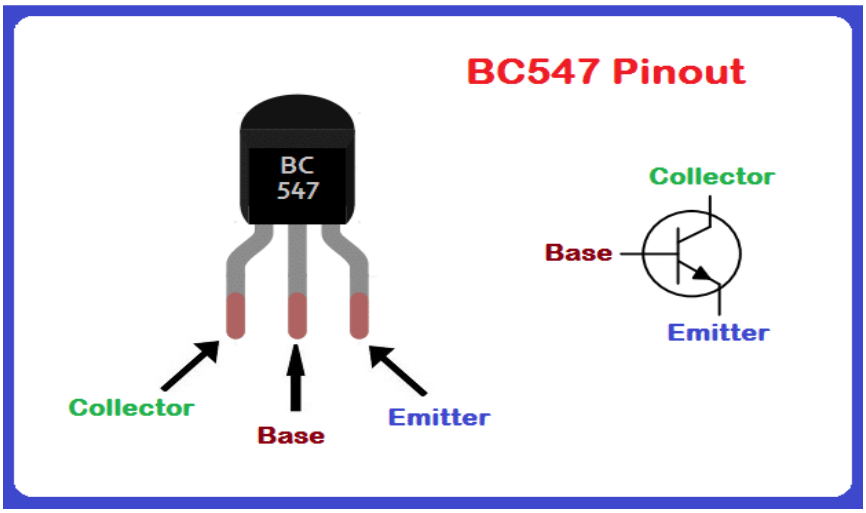
A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of a capacitor is known as capacitance.

5. Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses

6. BC547 Transistor

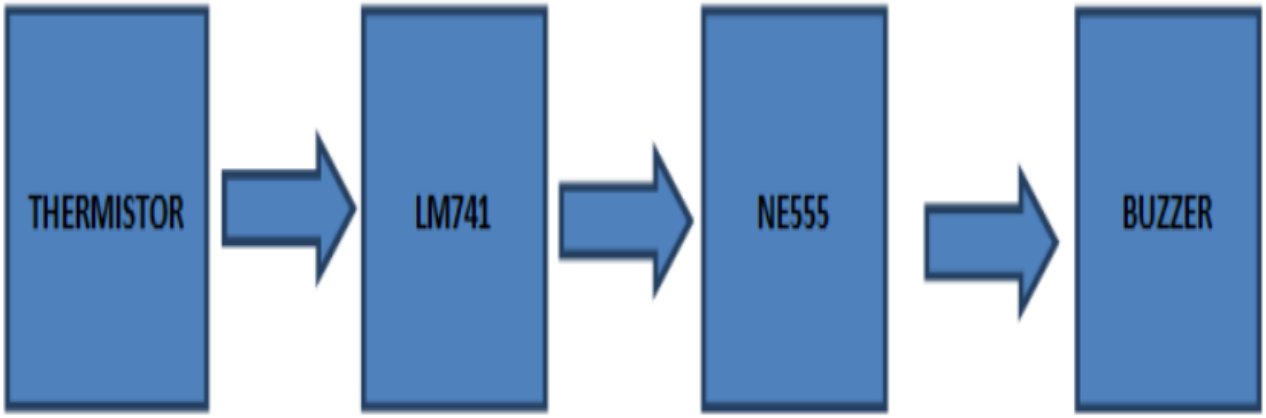
A transistor is a semiconductor device used to amplify or switch electrical signals and power. The transistor is one of the basic building blocks of modern electronics. It is composed of semiconductor material, usually with at least three terminals for connection to an electronic circuit.



7. Buzzer

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

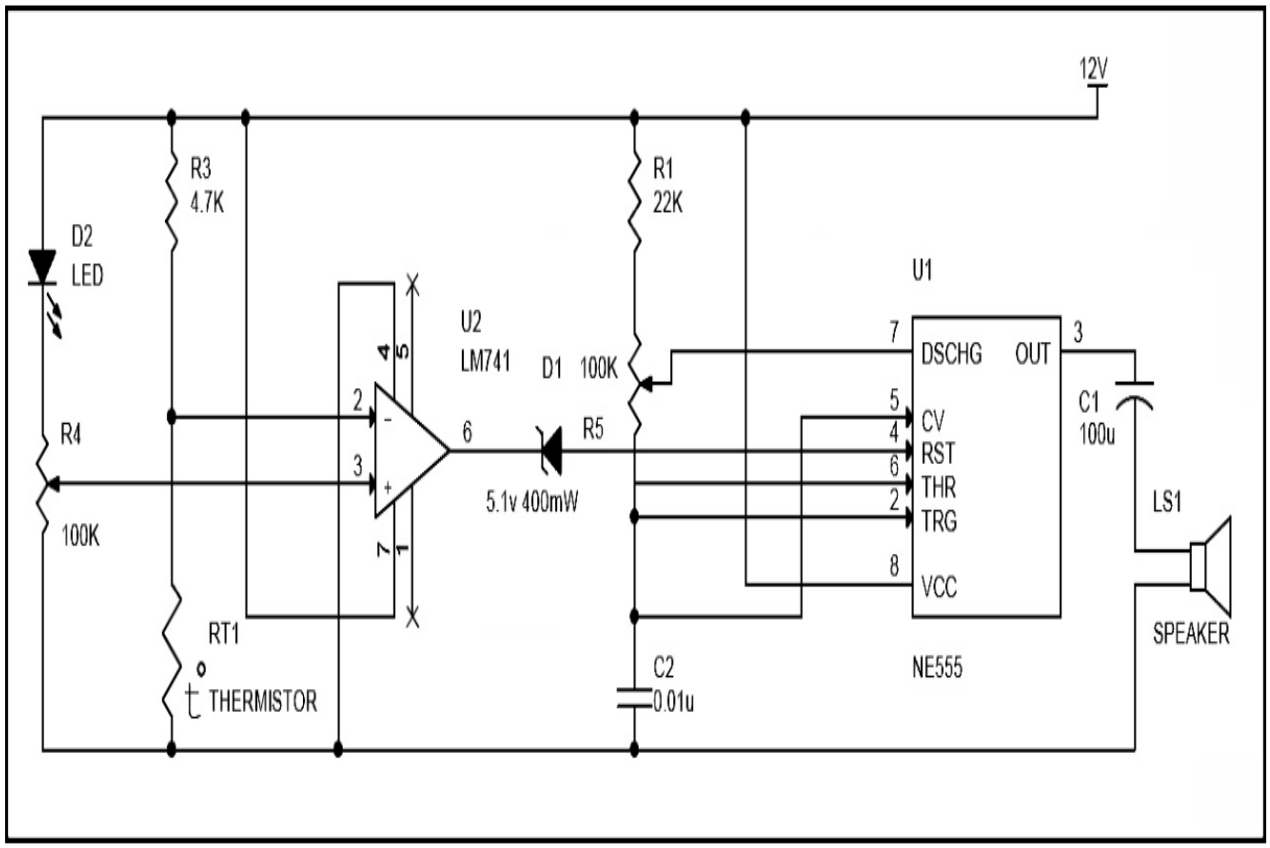
Block Diagram



The thermistor is the main component which detects the fire by sudden change in the room temperature because of the heat generated by the fire. The thermistor will detect the heat and give the information to the LM741 OP-AMP. The op-amp will make the NE555 to generate pulse which has been given to a buzzer to buzz.

LM741: LM741 is an operational amplifier which will work according to the difference in the input voltages. LM741 has following features like high current driving, voltage gain, noise amplification and also provide low output impedance. LM741 can also use as a short circuit protection.

Circuit Diagram

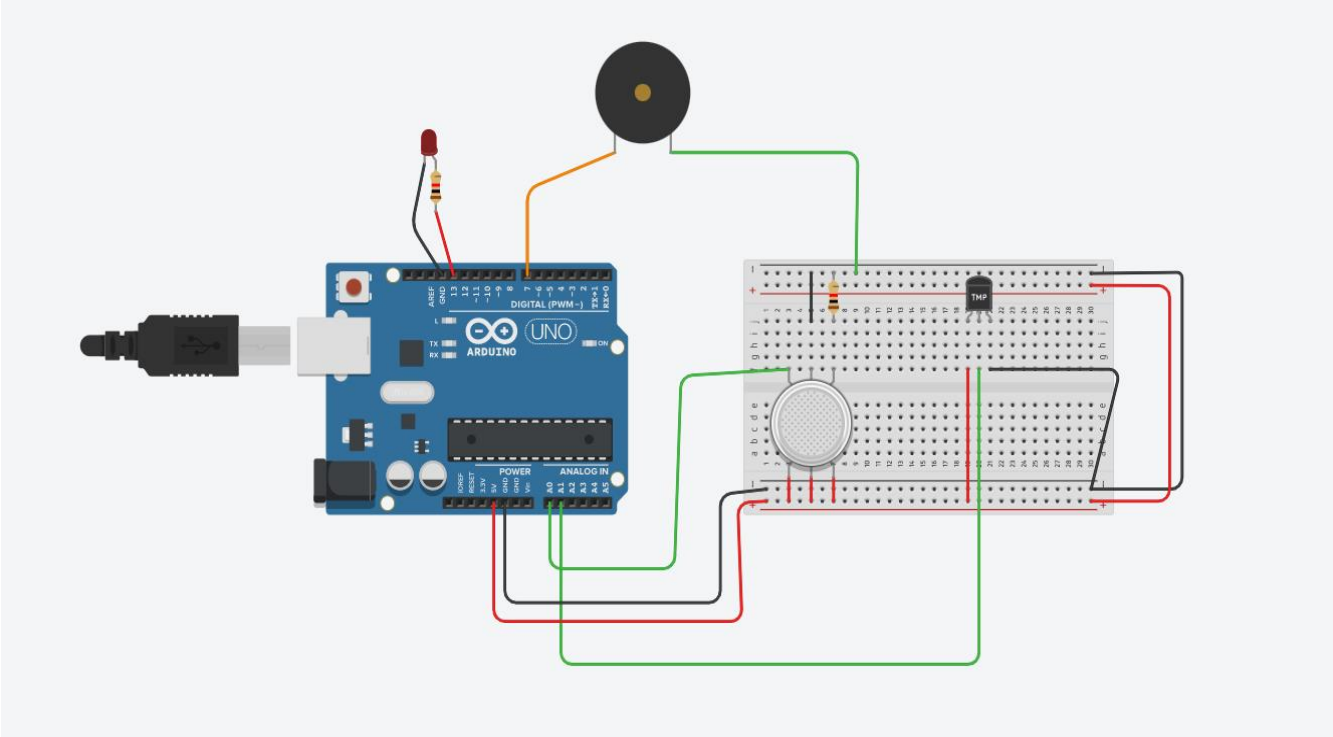


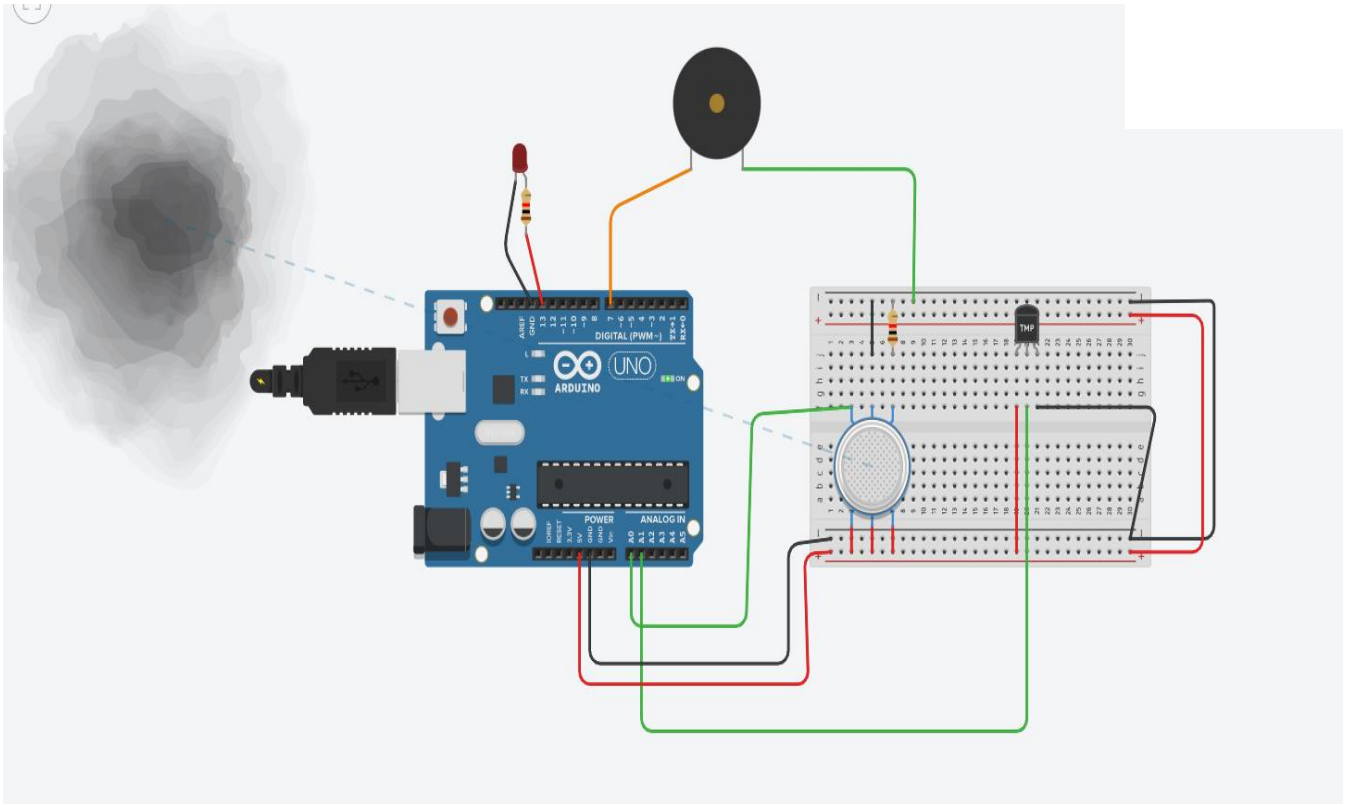
Circuit working:

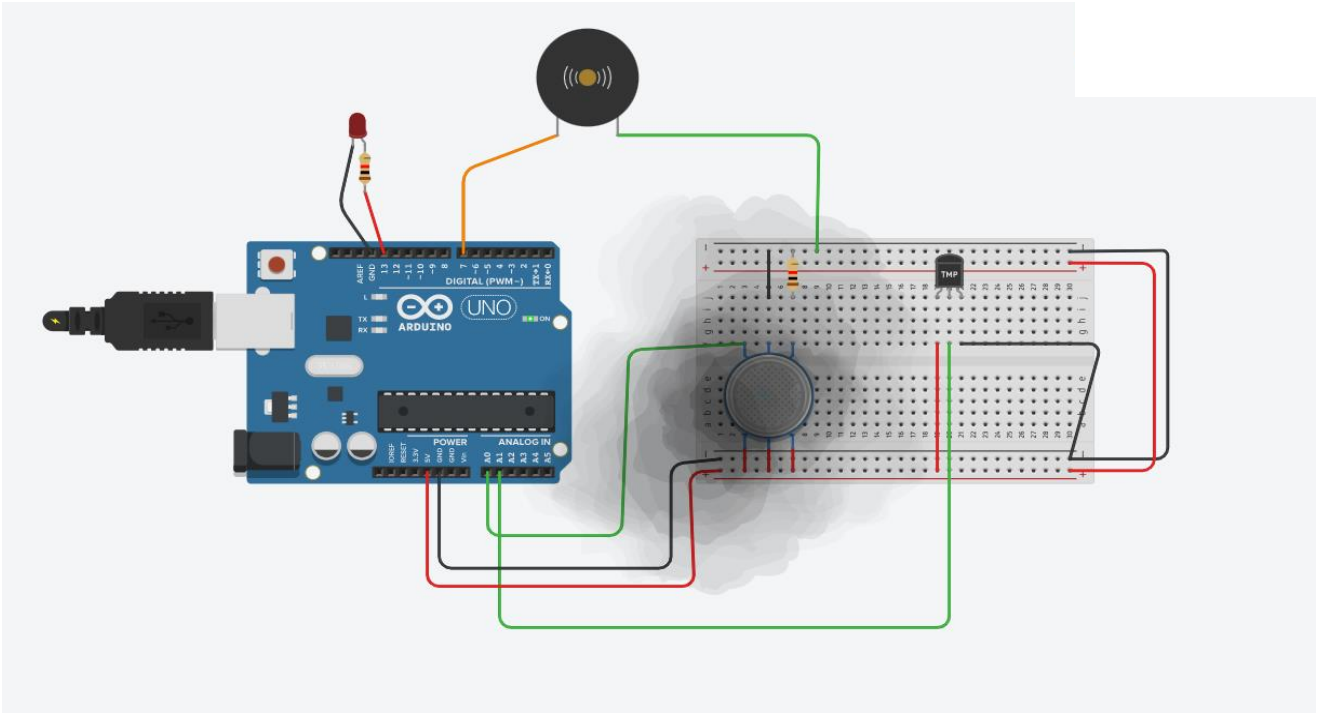
Circuit principle is similar to the first circuit i.e. Thermistor is used to sense the raise in temperature. But it rises only after a fixed temperature.
Here op amp acts as non-inverting comparator i.e. Vout is positive only if Vin (voltage at pin 2) < VRef (voltage at pin3).
When there is no any fire, voltage at pin 2 of the comparator is greater than the voltage at pin3.
When there is no fire resistance of thermistor is 10k. So 10K and 4.7k forms voltage divider circuit.
Voltage at pin2 is calculate using formula. V= (100*12) / (100+4.7) =11.4
Voltage at pin 3 =50*12/100=6v (Variable pin of the pot is at 50% of total resistance.)
When there is any fire thermistor temperature raises and its resistance

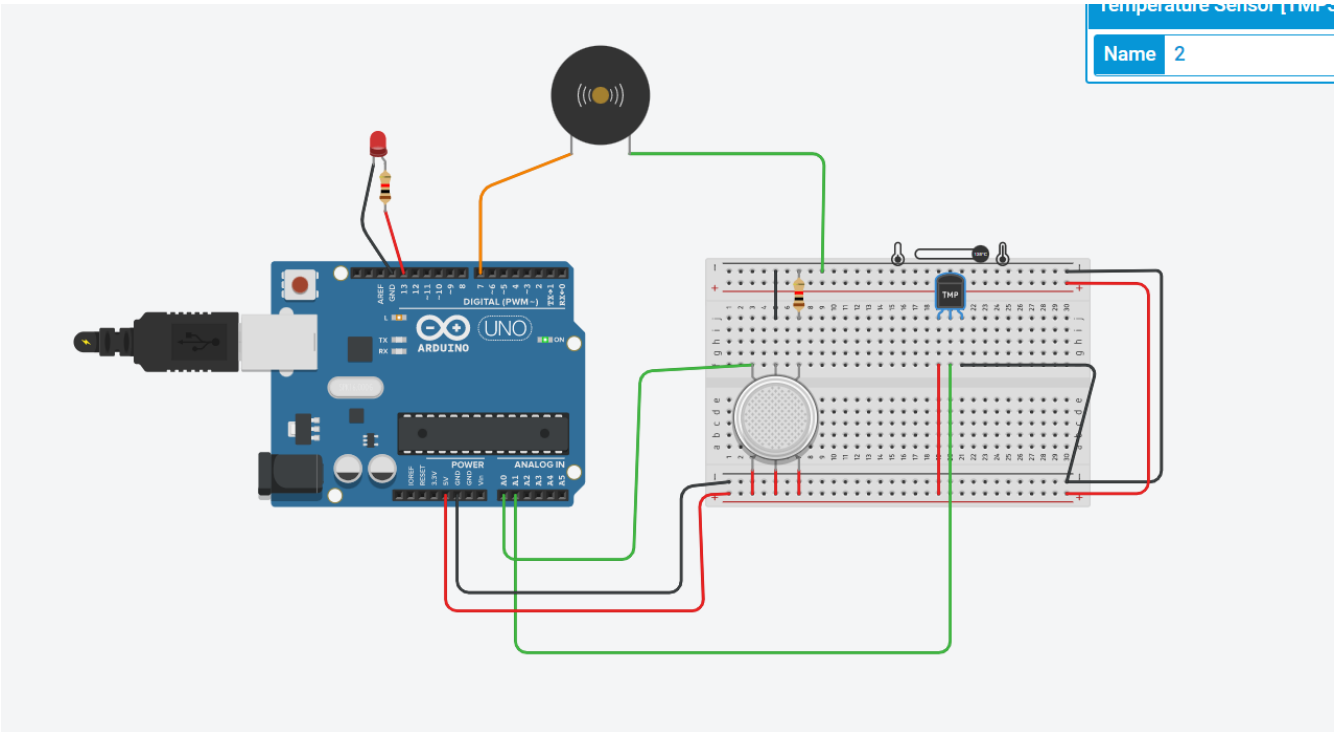
decreases. So voltage at pin2 starts decreasing. Thus Vout is goes to positive i.e. it is equal to Vcc.
Here reference voltage selected is 6v.Fire alarm starts only if the input voltage is less than 6v.To increase the reference voltage decrease the resistance of pot.

Implement on Tinkercad




DIGITAL (PWM~)
UNO
ARDUINO
POWER
ANALOG IN
TMP


DIGITAL (PWM~)
UNO
ARDUINO
POWER
ANALOG IN
TMP



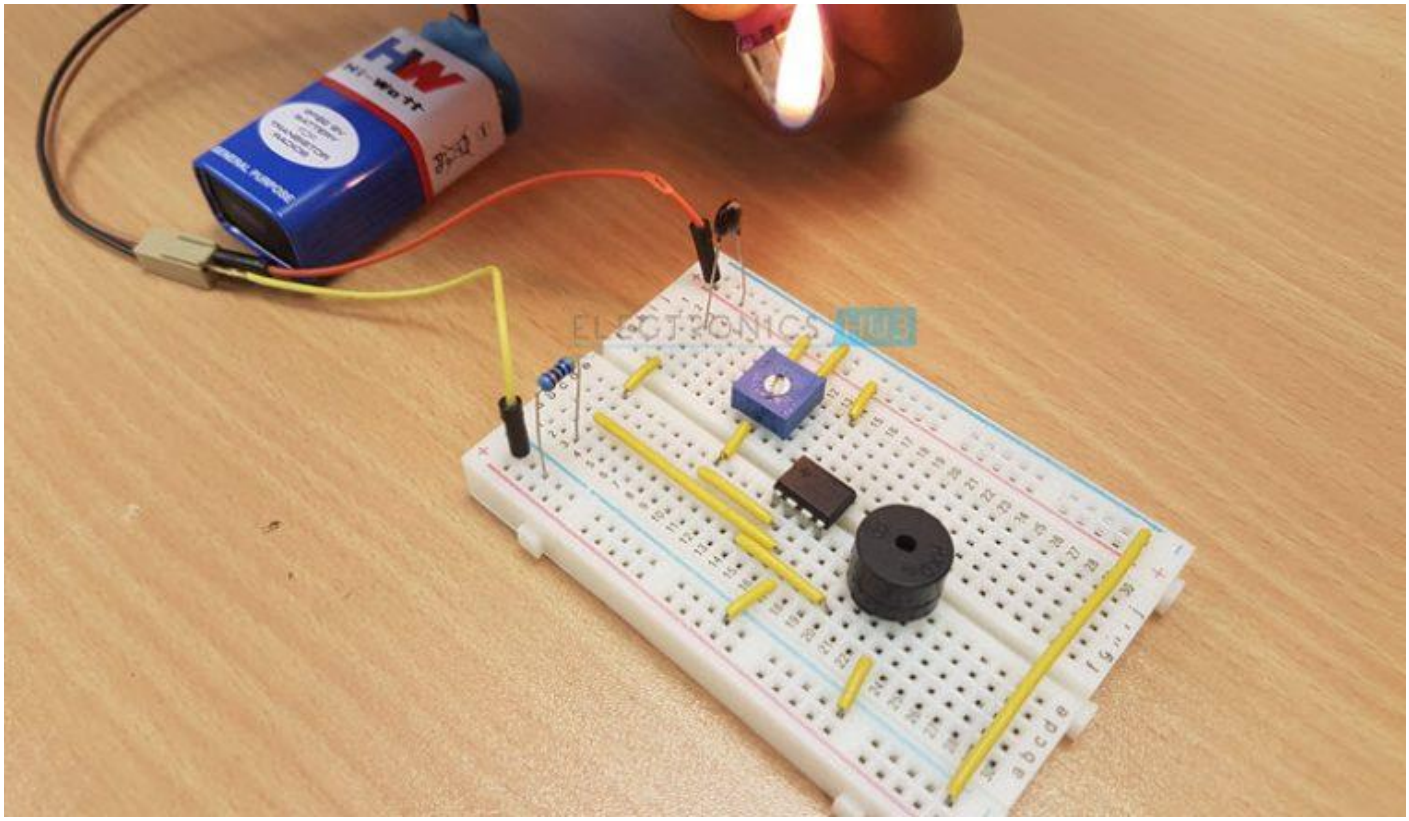
Advantages

- Avoid Smoke Inhalation
- Early Detection
- Every moment monitoring
- Easy & Affordable
- Cheaper than other types of smoke alarms

Disadvantages

- Very high temparetures are not acceptable
- May be slow to respond slow smoldering fires.
- Contain a very small amount of radioactive material.

Device



Application

Fire Alarm Circuits are very useful in homes, offices, schools, labs, etc. to detect and prevent any disasters due to fire.
Fire Alarm Systems can work as a stand – alone devices or be a part of a complex home security system with other security features like smoke detection, intruder alert, motion detection, etc.

Conclusion

Hence electronic circuits can be designed for the fire based alarms and they provide very high efficiency and can be used for the security reasons. Early fire detection is best achieved by the installation and maintenance of fire detection equipment in all rooms and areas of the house or building.

Reference

https://www.electronicshub.org/simple-fire-alarm-circuit/#Circuit_Design

Tinkercad:

https://www.tinkercad.com/things/8cp4mUeble7-frantic-habbi/editel?sharecode=84-LQs8dX1JF9X2wExBl0gJkhOek5NH_d5mMMG6qoBE