

# GSM Based Fire Sensor Alarm Using Arduino

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**Abstract:** Security and automation is prime concern in our day to day life. The approach to home and industrial automation and security system design is almost standardized nowadays. In this paper, we have tried to increase this standard by combining new techniques and developed a low cost home and industrial automated security systems. Everyone wants to be as much as secure as possible. The design of simple hardware circuit enables every user to use this fire sensor, temperature sensor, gas sensor, smoke sensor at home and industries.

**Keywords:** Fire sensor, Gas sensor, Temperature sensor, Smoke sensor.

## 1. Introduction

Fire Alarm Systems are very essential for security purpose. Whatever field we choose for our survey we can get a clear view of fire hazards in a system. Fire Alarm and protection system is a combination of Electrical and Electronics Instruments. Now by using power electronics switches we have increase the efficiency of this system a lot. Thermistors are the most use sensing device which is used in fire detection and prevention systems. For this, we have to have a clearer view thermochemistry which is used for our resistances. Along with this project we will be able to know about fire, fire system protection and precaution.

## 2. TYPES OF TEMPERATURE DETECTOR

1. Resistance Temperature Detector
2. Thermistors
3. Thermocouples

The main concern of this report are Resistance Temperature Detector (RTD) and Thermistors, so they will be discuss in detail, which both falls into the category of ELECTRICAL RESISTANCE SENSOR. Whereas the working principle of a thermocouple is related with change in EMF generated due to the use of two dissimilar wires.

## 3. ARCHETECTURE OF THE SYSTEM

It can be implemented to any levels of the security system. The architecture mainly consists of three components which are Arduino Uno, GSM Modem and the sensor device which is the main detectors. The main function of the GSM MODEM is the remote

communication between the user and the controller through the RS 232 serial communication standard. The function of the controller is to continuously check the inputs coming from the sensor device and send message through the GSM network in case of emergency. The microcontroller is connected with different device like Resistance temperature sensor, thermistors etc. The GSM modem is connected to the user, police station and fire brigade through the mobile cellular network. An interference circuit has been designed which includes sensor as input device. Then the programmed of microcontroller device has been connected to the interface circuit and the GSM modem through the serial port of the GSM MODEM.

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### *SENSING DEVICES FOR DETECTOR*

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## 4. SENSING DEVICE

There are two sensing devices mainly used for this report which are discuss in details.

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### *Resistance Temperature detector*

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Resistance Thermometers, also called Resistance Temperature Detectors or Resistive thermal devices(RTDs), are temperature sensor that exploit the predictable change in electrical resistance of some materials with changing temperature. As they are almost invariably made of platinum,

they are often called platinum resistance thermometers (PRTs). They are slowly replacing the use of thermocouples in many that governs resistance thermometry is given by

$$R_t = R_0 (1 + \alpha \Delta t + \beta \Delta t^2 + \dots)$$

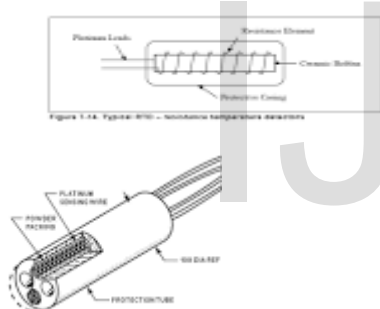
Where  $R_0$  = resistance at reference temperature (usually ice point,  $0^\circ\text{C}$ )

$R_t$  = resistance at temperature  $t$ ,  $\Omega$

$\alpha$  = temperature coefficient of resistance,  $\Omega/\Omega (^\circ\text{C})$

$\beta$  = coefficient calculated on the basis of two or more known resistance temperature (calibration) points

The RTD consist of pure metals or certain alloys whose resistance increase as temperature increase and decrease as temperature decrease. RTDs act like an electrical transducer, converting changes in temperature to voltage signal by the measurement of resistance. The metals that are best matched for use as RTD sensors are pure, of consistent quality, secure a given range of temperature.



### THERMISTOR

The name Thermistor is derived from thermally sensitive resistor, as the resistance of thermistor vary as a function of temperature. While the fundamental principle of thermistors is well known several decades ago, industrial and commercial utilization of thermistors as temperature measurement was very slow in developing.

A thermistor is an electrical device made of a solid semiconductor with a high temperature coefficient of resistivity which would exhibit a linear voltage current characteristic if its temperature were held constant. When a thermistor is use as a sensing element, the relationship between resistance and temperature is primary concern. The approximate relationship applying to most thermistor is

$$R_t = R_0 \exp \beta (1/T - 1/T_0)$$

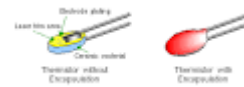
Where  $R_0$  = resistance value at reference temperature  $T_0$  k,  $\Omega$

$R_t$  = resistance at temperature  $T$ ,  $\Omega$   
 $\beta$  = constant over temperature range, dependent on manufacturing process and construction characteristics

$$\beta = E/K$$

Where  $E$  = electron volt energy level

$K$  = Boltzmann's constant  $8.625 \times 10^{-5}$  eV/k.



### OTHER DEVICES

#### SIM-900 GSM module

GSM (global system for mobile communication) is a cellular network. GSM network operate in four different frequency ranges. Most GSM network operate on 900 MHz or 1800MHz bands. The transmission power limited to a maximum of 2 watts GSM 850/900/300 and 1 watt in 1800 /1900. The longest the GSM specification supports in practical use is 35km(2mi). In this project we have use a SIM 900a based GSM modem to receive and send short message to user and system.



#### ARDUINO-UNO

The Arduino microcontroller is an easy to use yet power full single board computer has gained considerable traction in the hobby and professional market. The Arduino is open souse Software.

The Arduino Project was started in ITALY to develop a low cost hardware for interaction design. A Duemilanove board features an Atmel ATmega328 microcontroller operating at 5v with 2Kb of RAM and 32Kb of flash memory for storing programs and 1Kb of EEPROM for Storing parameters. The clock speed is 16 MHz, which

translates to about executing about 300,000 line of c source code per second. The board has 14 digital I/O pins and 6 analog input pins. There is a USB connector for talking to the host computers an DC power jack for connecting an external 6- 20 power source. For example a 9v battery, when running a program while not connected to host computer. Headers are provide for interfacing to the I/O pins using 22g solid ware and header connection.



Arduino-Uno

### LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of application. A 16×2 LCD display is very basic module and very commonly used in various device and circuits. This module is preferred over seven – segments and other multi segment LEDS. The reason being, LCD are economical and easily programmable, have no limitation of displaying special and even custom characters (unlike in seven segments,) animation and so on.

### Working of The System

The system is fully controlled by the microcontroller and the microcontrollers then continuously monitors the sensor, detector and GSM modem. If the voltage level of sensor input pins goes to zero then it will send the 'AT+CMGS='USER MOBILE NUMBER' to GSM modem through serial port. The GSM modem will response with the character '>'. After receiving '>' microcontroller again send the type of security problem SMS+CTRL Z to GSM modem. Then GSM modem will send this type of problem to the user.

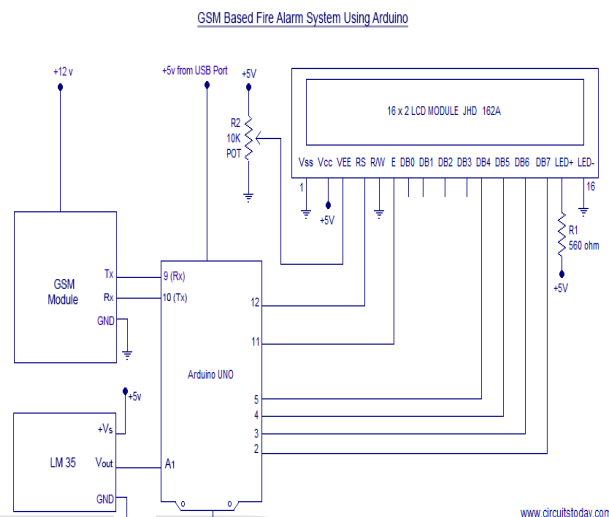


For Example, any moment detected in security area at the time of microcontroller pin number 39 goes to logical zero. Microcontroller sensed and immediately send the problem to

the GSM modem. When GSM modem sensed the problem it will send to the user.

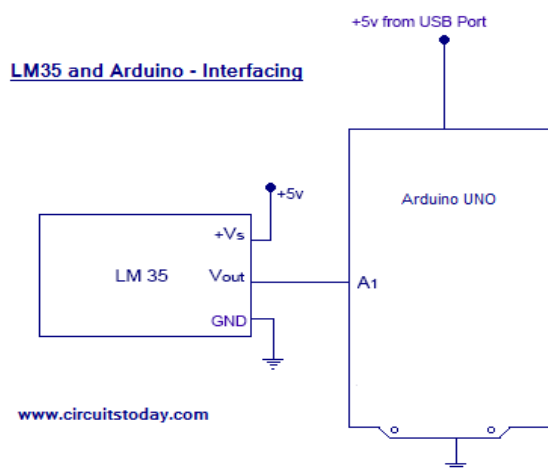
### MAIN CIRCUIT DIAGRAM OF FIRE SENSOR ALARM

The main diagram of this project can derive all the essential part which is used for better technical aspect.

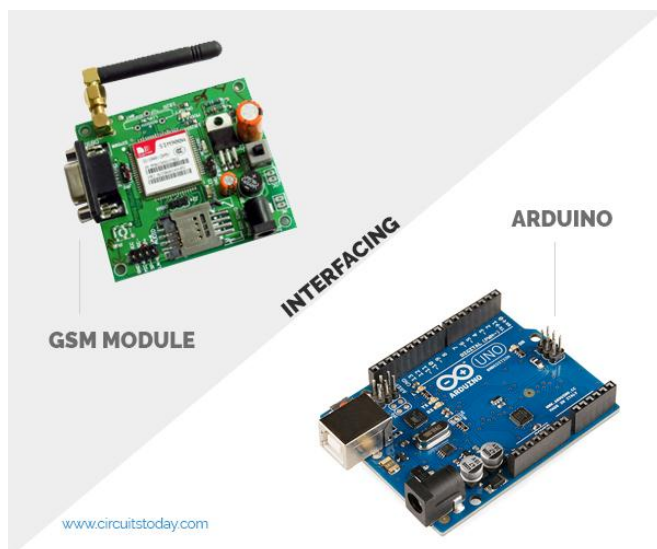


- 1.LM35 TEMPERATURE SENSOR AND ARDUINO
2. GSM MODULE AND AURDINO UNO
- 3.LCD AND ARDUINO

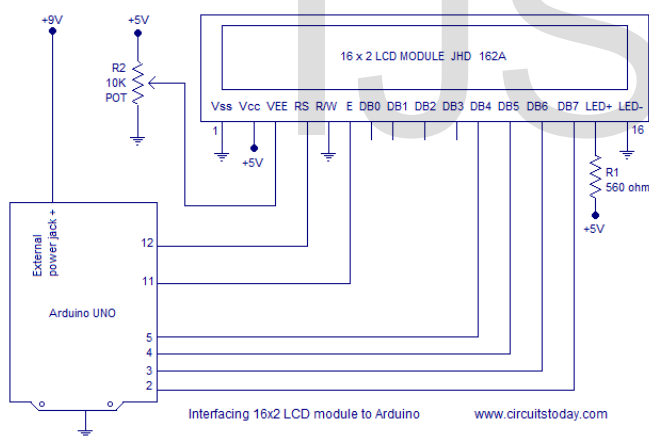
The LM35 is the main temperature sensor. It connected to the Arduino UNO. The Arduino can sense the increasing temperature.



The GSM Module is also connected with this ARDUINO UNO. When any problem arise or temperature is increase the after sensing this problem Arduino send this problem to the GSM module.



When GSM get the problem it sends the problem to the user. In other side the Arduino also connected with the LCD screen. As a result the problem can be detect in the LCD screen through programming.



In this way the increasing temperature can be sensed using Arduino and GSM Module

### CONCLUSION AND FUTURE WORK

The paper present user friendly and Low cost home and industrial security systems. It's a real time security purpose system developed with simple hardware which simplifies the possibility of error free security system. The system can be easily implemented with maximum reliability and the high security with the low cost is a special enhancement from the existing systems for home security.

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