

# DOOR ALARM USING HALL EFFECT SENSOR

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**Abstract:** A magnetic door alarm for use in conjunction with normally unlocked emergency exit doors of a type in which a buzzer is produced when the door is opened. The device includes the Hall Effect sensor, 7805 voltage regulator, bar magnet and IC 555 timer. These components are normally housed on an inner surface of the door. One end of the circuit is mounted on the door and on the other end a large magnet is placed. Where, polarity of the magnet is opposite to the Hall Effect sensor in the circuit. So that whenever the door is opened, Buzzer can produce sound and LED is ON. When door is closed Buzzer will not produce sound because magnet is very close to the Hall Effect sensor. Based on the Magnetic effect towards the Hall Effect sensor the buzzer produces sound.

**Keywords:** Buzzer, Hall Effect Sensor, 7805 Voltage Regulator, IC555 Timer, Magnet.

## I. INTRODUCTION

Door alarm is a very common and useful device for security purpose. They are used to detect whether the door is opened or closed. When we put the magnet near to the wall or door frame. When the door is closed then the buzzer remains OFF and LED is OFF. When we open the door the door goes far from the magnet then the buzzer turned ON and LED ON. Then it will produces an alarm. This door alarm technique provides more security to the homes. Also, the installation process is simple and it can be easily affordable. Hence, this project can be arranged in each and every house. The components that are used in the circuit are discussed below in detail.

**IC 555 TIMER:** The 555 Timer IC an integrated circuit used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator and as a flip-flop. The 555 IC has following operation modes



Fig. 1 IC 555

- 1.Free-running (Astable) mode – the 555 timer can operate electronic oscillator. Uses include LED and lamp flashers, pulse generation, logic clocks, tone generation, security alarms, pulse position modulation and so on. The 555 can be used as a simple ADC, converting an analog value to a pulse length. The use of a microprocessor-based circuit can then convert the pulse period to temperature, linearize it and even provide calibration means.
- 2.one-shot mode (Monostable) – in this mode, the 555 functions as a "one-shot" pulse generator. Applications include timers, missing pulse detection, bounce-free switches, touch switches, frequency divider, capacitance measurement, pulse width modulation (PWM) and so on.
- 3.Flip-flop(Bistable)mode – the 555 operates as a SRflipflop. Uses include bounce-free latched switches.
- 4.Schmitt trigger (inverter) mode - the 555 operates as a schmitt trigger inverter gate which converts a noisy input into a clean digital output. In astable configuration, the 555 timer puts out a continuous stream of rectangular pulses having a specific frequency. The astable configuration is implemented using two resistors, and one capacitor. In this configuration, the control pin is not used, thus it is connected to ground through a 10nF decoupling capacitor to shunt electrical noise.

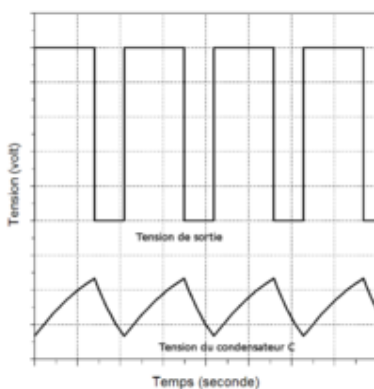


Fig. 2 Waveforms of Astable mode

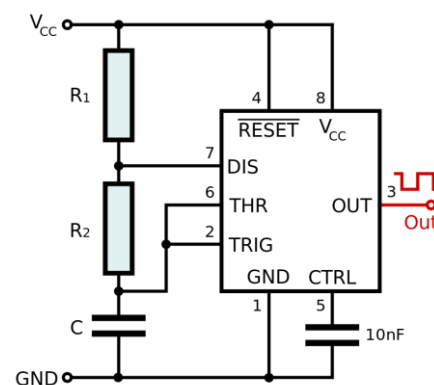


Fig. 3 Schematic of Astable mode

**RESISTORS:** Resistors are used to reduce current flow, adjust signal levels, to divided voltages, bias active elements and terminate transmission lines, among other uses.

**LED:** A light emitting diode is a semi conductor light source that emits light when current flow through it.



Fig. 4 LED



Fig. 5 BC 547

**TRANSISTOR:** BC 547 is an NPN bi-polar function transistor. A transistor stands for transfer of resistance, is commonly used to amplify current. A small current circuit at its base controls a large current at collector and emitter terminals. BC 547 is mainly used for amplification and switching purpose.

**CAPACITOR:** A capacitor is a device that stores electrical energy in an electronic field. It is a passive electronic components with two terminas.

**3144 HALL EFFECT MAGNENT SENSOR:** A Hall sensor is a device which can detect the presence of a magnet based on the polarity. It is a transducers which generates a signal according to magnetic field present near it.



Fig: 6 Magnet



Fig: 7 3144 Hall Effect Magnet Sensor

**II. CIRCUIT DIAGRAM**

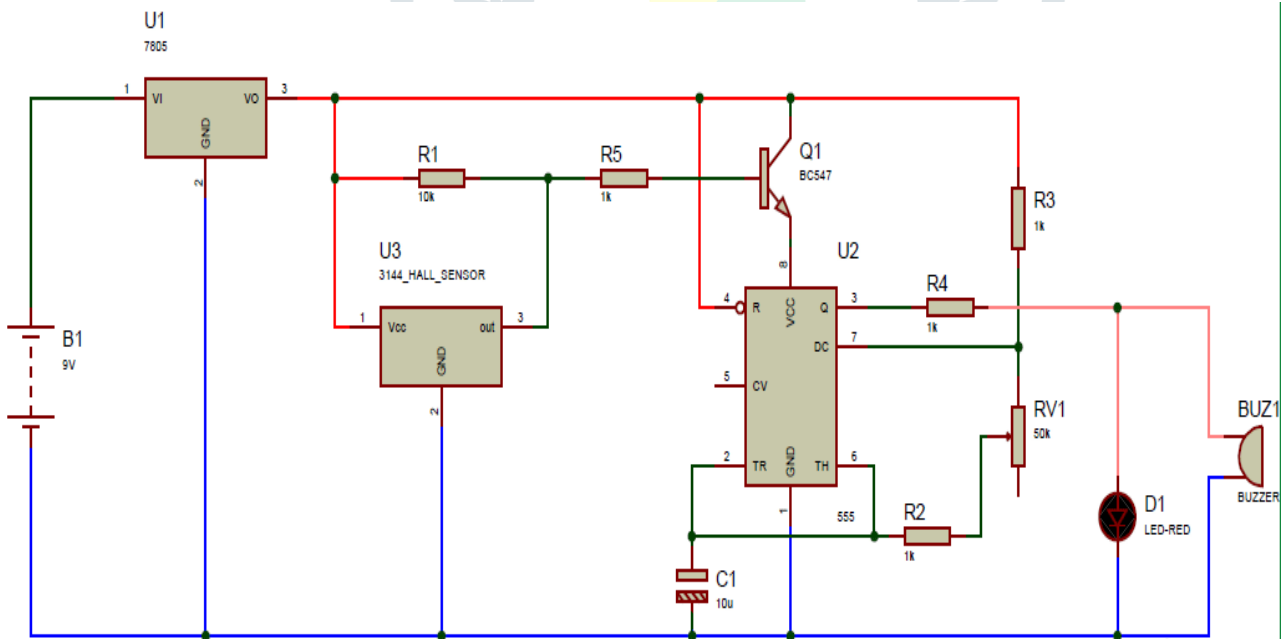


Fig: 8 Magnetic Door Alarm Circuit

In this **Magnetic Door Alarm circuit**, IC 555 timer in Astable mode of operation is used to generate a tone as an alarm; frequency of tone can be adjustable by using an attached RV1 potentiometer. Here a 1k ohm (R1) potentiometer is used in between Vcc and 7th pin of 555 Timer (U2) and a 1k (R4) resistor & 50k Pot (RV1) between pin 7 and 6. Pin 2 shorted with pin 6 and a 10uf C1 capacitor is connected to pin 2 with respect to ground. Pin 1 is connected to ground and pin 4 directly connected to VCC and pin 8 as well by using a transistor. A **Hall Effect Sensor or magnet sensor** is used to detect if the door is open and close. It's output connected to the base of the transistor BC547 which is responsible to provide a path to 555 timer IC. A buzzer and an LED are connected on Pin 3 of 555 for indication of alarm. Finally, we have connected a 9v Battery to power the circuit.

### III. CIRCUIT OPERATION

Working on this Magnetic Door Alarm is tricky. Here we have made a 555 astable multi-vibrator for generating alarm signal as we already mentioned. But we are controlling this astable multi-vibrator U2 by using **Hall Sensor** U3 through an NPN transistor Q1 BC547

When we put magnet near **Hall Sensor** then hall sensor senses the magnetic field and generates a Low signal as an output. This output goes to the base of the transistor. Due to Low signal, transistor remains turned off and power is not supplied to 555 timer IC and buzzer remains silent with LED turned off. Now when we take magnet far from the hall sensor then hall sensor generates a High signal which goes to the base of the transistor. Due to high signal transistor gets turned on and make a path for astable multi-vibrator supply. And when astable multi-vibrator has supply then it starts working and generates an alarm tone and flashing LED as well. The user can change the frequency of tone by moving RV1 potentiometer.

### IV. RESULTS

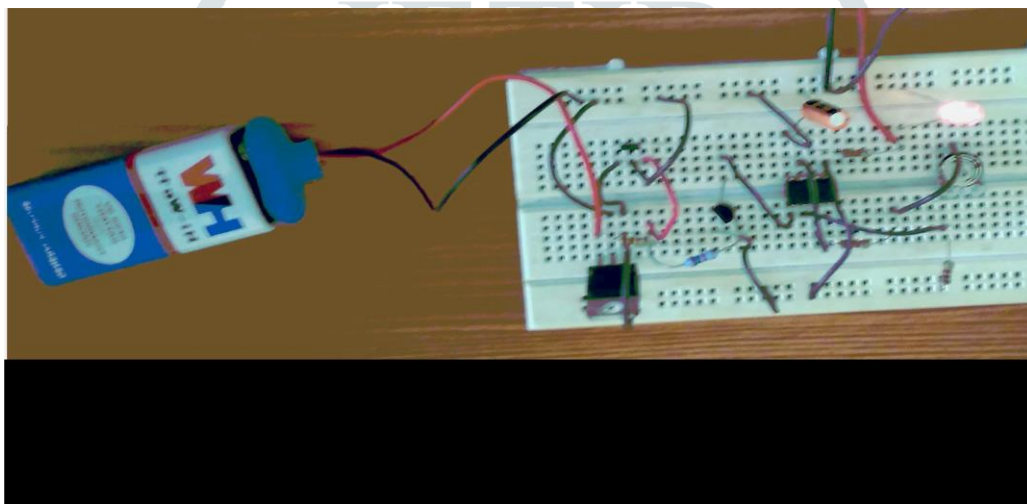


Fig: 9 Practical Circuit of magnetic Door Alarm

### V. CONCLUSION

So now we can **attach this circuit in Door frame and a magnet in the Door**, now when the gate is closed magnet (door) and hall sensor (Door Frame) will remain near and the alarm will remain off. Whenever someone opens the door, the magnet will get away from the Hall sensor and it will make the hall sensor High and trigger the LED and alarm connected to 555 IC.

### VI. FUTURE SCOPE

In the proposed work the circuit is designed to produce alarm and to show LED indicator. But in future, it can be extended to give an alert message to the User's mobile number by using GSM Technology.

### REFERENCES

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