



PIR Motion Sensor Based Security Alarm

SUBMITTED TO

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OVERVIEW OF THE PROJECT

Project Title:

PIR Motion Sensor Alarm System

Objective:

To design a low-cost security system that detects human movement using a PIR sensor and triggers an alarm (like a buzzer or siren) when motion is detected.

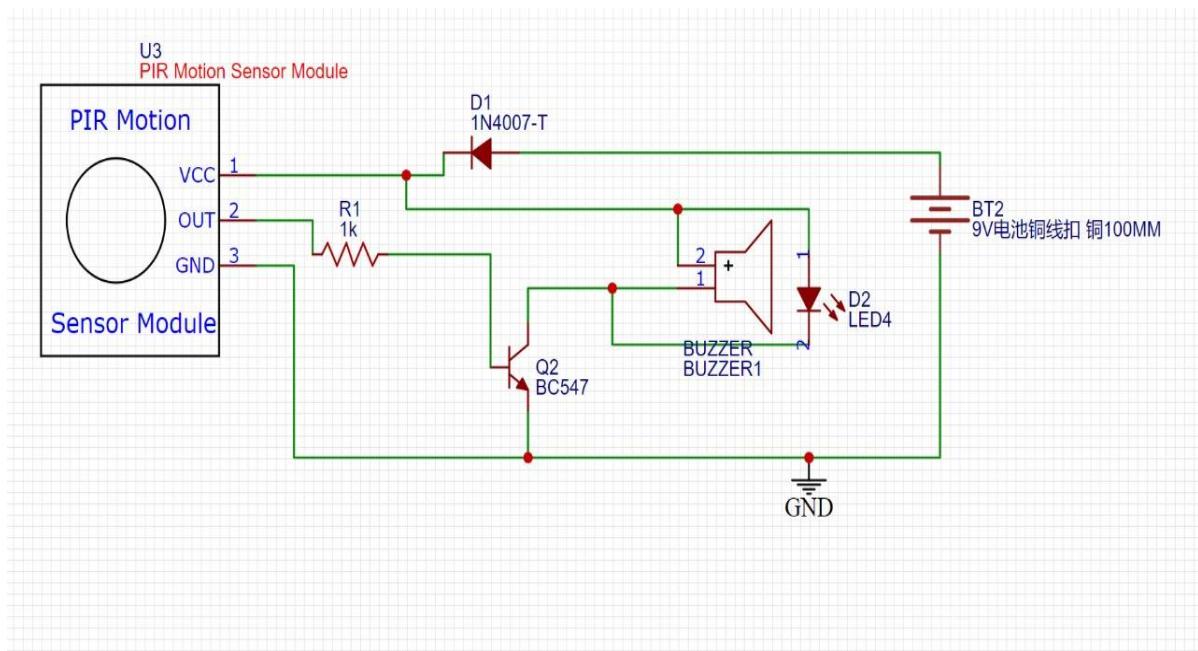
Components Required:

1. PIR Motion Sensor Module
2. Resistor (R1 - 1k Ohm)
3. Transistor (Q2 - BC547)
4. Diode (D1 - 1N4007)
5. BUZZER
6. LED (D2 - LED4)
7. Battery (BT2 - 9V)

Applications:

- Home security systems
- Automated lighting control
- Intruder alert systems
- Office or garage monitoring

CIRCUIT DIAGRAM



PROCEDURES

1. Designing the Circuit Layout

Eagle (a PCB design software) is used to create the circuit schematic and convert it to a layout.

This layout is then printed on glossy paper for transferring the circuit to PCB.

2. Preparing the Copper-Clad Board

The copper-clad board is cut to size.

The board is cleaned thoroughly with fine sandpaper or a scouring pad to remove oxidation and ensure good adhesion.

3. Transferring the Circuit Pattern

The printed design is placed onto the copper board.

A hot iron is used to transfer the toner onto the copper.

The board is then soaked in water and paper is removed which leaves the ink(circuit pattern) on the copper board.

4. Etching Process

The board is immersed in an etching solution (commonly a mixture of 60:40 w/v of ferric chloride and hydrogen peroxide solution).

The chemical reacts with and dissolves the exposed copper, leaving only the copper protected by the toner or resist.

Once etching is complete and only the desired copper tracks remain, the board is removed from the solution and rinsed thoroughly with water to stop the etching reaction.

Ink is removed from the board using wet cloth exposing tracks of copper.

7. Drilling Holes

Holes are drilled for placing the components using a small drill bit. The board is cleaned to remove residues dust particles).

8. Soldering

The components are inserted into their designated positions.

Soldering iron is heated. Solder is applied to the joints using soldering wire after applying flux to obtain shiny, cone shaped joints which covers the holes properly.

Excess lead of components is clipped off and the board is cleaned with a brush.

9. Testing of circuit

The circuit is visually inspected for loose or misplaced components, soldering faults or cracked solder joints.

Power is supplied to the circuit using battery to ensure everything works as expected.

Detailed Explanation of Each Component

PIR Motion Sensor Module

- Function: Detects infrared radiation (motion of warm objects like humans).
- Pins:
 - - VCC: Power supply (connected to 9V)
 - - OUT: Sends HIGH signal when motion detected
 - - GND: Ground connection
- Working: Senses motion and sends a signal to activate the circuit.



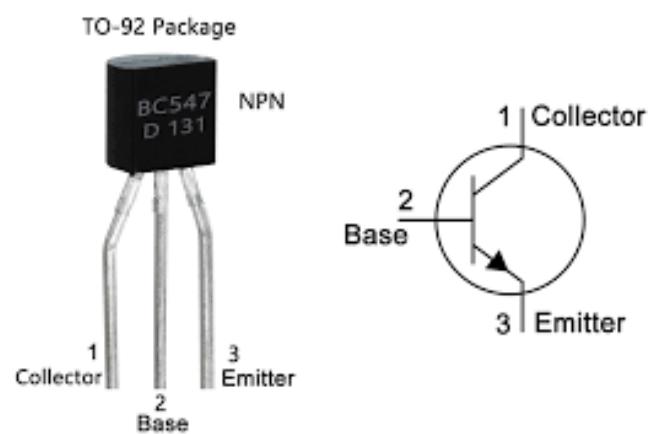
Resistor (R1 - 1k Ohm)

- Function: Limits the current to the base of the transistor.
- Why needed: Prevents damage to the transistor by avoiding excess current.



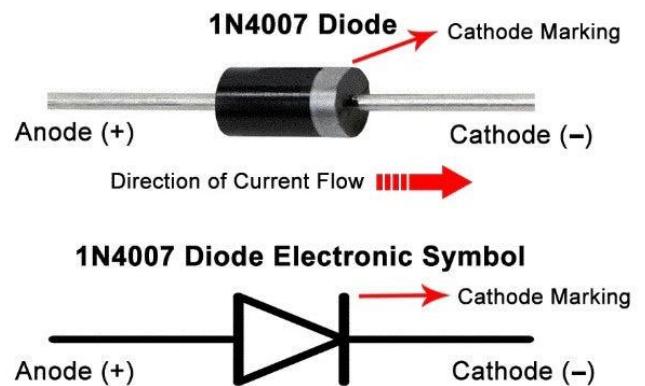
Transistor (Q2 - BC547)

- Function: Works as a switch.
- Type: NPN transistor
- Working:
 - When PIR sends HIGH to base via resistor, transistor turns ON.
 - Allows current to flow from collector to emitter completing circuit for buzzer & LED.



Diode (D1 - 1N4007)

- Function: Protects the circuit from reverse voltage.
- Why needed: Ensures that the current flows only in one direction to protect sensitive components.



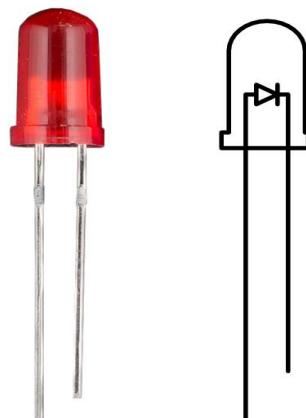
BUZZER

- Function: Produces sound alarm when motion is detected.
- Type: Piezoelectric Buzzer
- Connected to: Collector side of the transistor, gets activated when transistor conducts.



LED (D2 - LED4)

- Function: Provides visual indication when motion is detected.
- Working: Lights up simultaneously with the buzzer.



Battery (BT2 - 9V)

- Function: Powers the entire circuit.
- Why 9V: Suitable for the PIR sensor, transistor, buzzer, and LED.
- Portable & easy to use.



Working Summary



Possible Add-ons:

- LCD display or LED indicators.
- Wi-Fi alert (via ESP8266/ESP32).
- SMS notification (using GSM module).
- Camera capture on motion detection.