Smoke/Gas Detector Circuit

By

Group (3)

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Submitted to

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1- Project Objectives:

The main objective of this project is to design and implement a smoke detector circuit that provides an early warning system for fire hazards.

2- Introduction:

Smoke detectors are essential devices used to detect smoke and warn people about potential fires. They are widely used in homes, offices, and industries to improve safety and reduce the risks of property damage, injuries, and loss of life. This project focuses on building a simple and cost-effective smoke detector circuit that can quickly sense smoke and trigger an alarm. The circuit uses a smoke sensor, such as the MQ-2, to detect smoke particles in the air. When smoke is detected, the sensor activates an alarm, like a buzzer or LED, to alert users. This project is useful for situations where expensive fire alarm systems may not be practical. This report will cover the components used, how the circuit works, the steps to build it, and the results of testing.

3- Experimental Work:

3.1. Used Electrical Components/Equipment:

- MQ-2 Gas Sensor
- 10k ohm Potentiometer
- Red LED
- Buzzer
- Push Button
- DC 9V-2A Adaptor
- LM741 OP AMP
- LM7805 5V Regulator
- Resistors (10k ohm , 680 ohm)
- Capacitor (100uF , 100V)

3.2. Circuit Working Principle:

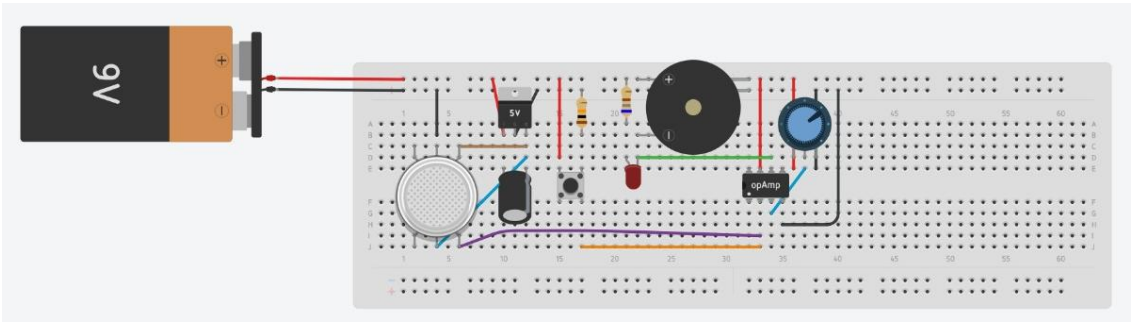
The smoke detector circuit uses a smoke sensor, like the MQ-2, to detect smoke in the air. When smoke is present, the sensor sends an electrical signal to the circuit. The circuit checks if the smoke level is high enough and, if it is, turns on an alarm like a buzzer or LED to warn people.

The circuit stays off when no smoke is detected and quickly responds when smoke is found, making it useful for fire safety.

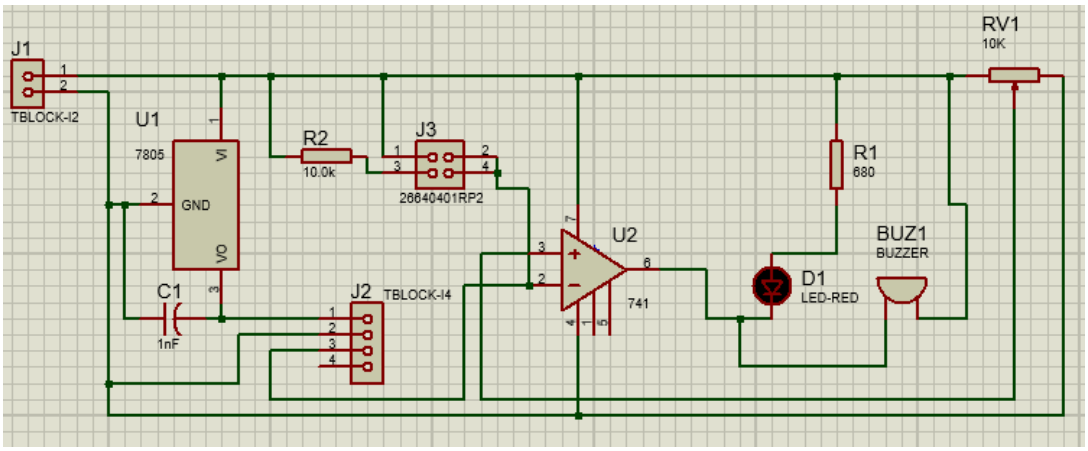
3.3. Simulation / Schematic / PCB Layout:

The smoke detector circuit was tested using Tinkercad and Proteus software to ensure it works correctly. All components were connected according to the circuit diagram. A simulated smoke input was used to test the sensor. The schematic and PCB Layout of the circuit were also made using Proteus.

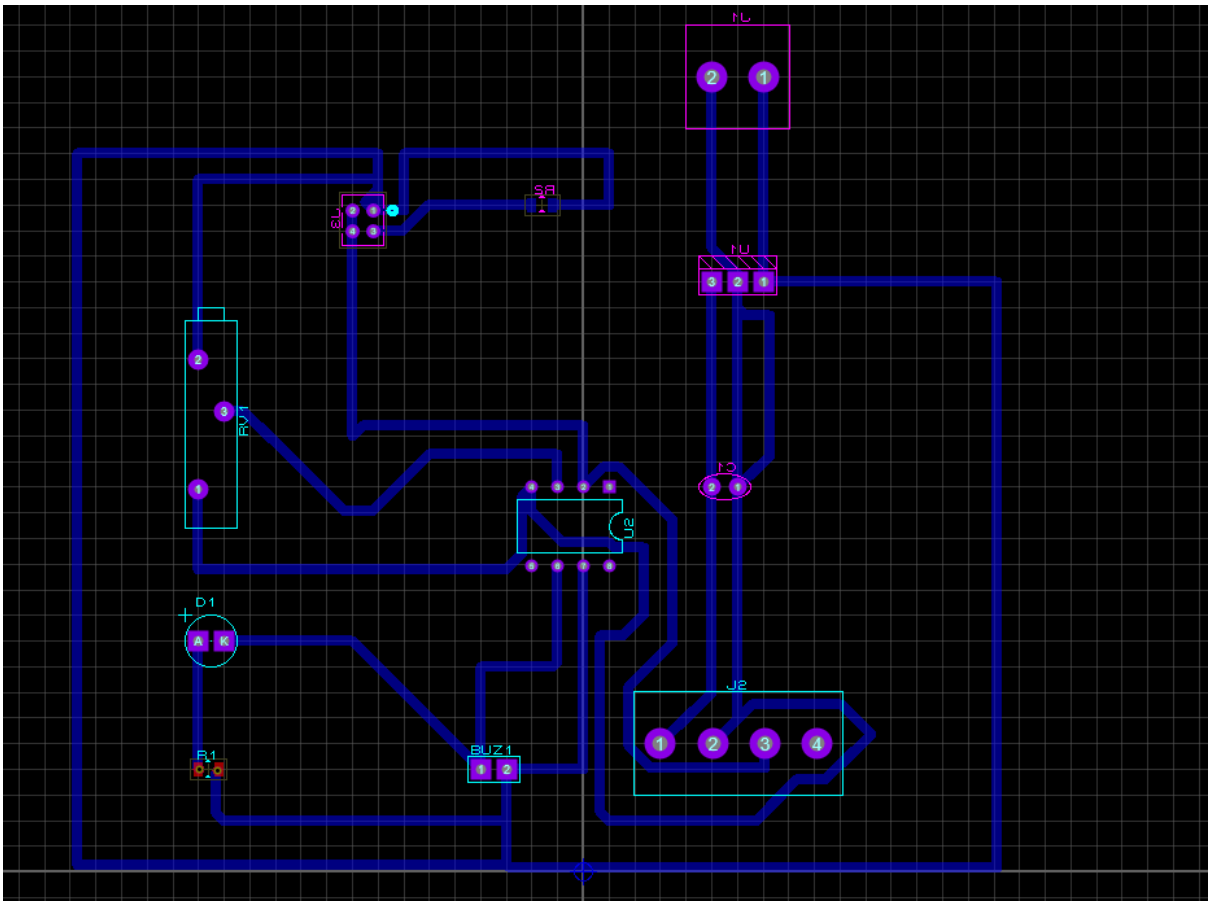
Simulation:



Schematic:



PCB Layout:



3.4. Experimental Steps:

1. Collect all components (sensor, resistors, capacitors, LED, buzzer, etc.).
2. Connect the components following the circuit diagram.
3. Power the circuit with a DC power supply.
4. Test the circuit without smoke to ensure the alarm stays off.
5. Test with smoke to confirm the LED and buzzer activate.
6. Repeat tests to ensure consistent performance.

4- Experimental Results:

The smoke detector circuit was tested successfully, and the following results were observed:

1. **No Smoke**:
   - The circuit remained inactive, with the LED and buzzer turned off.
   - The sensor accurately ignored normal air conditions.

2. **With Smoke**:
   - The sensor detected smoke, triggering the LED and buzzer immediately.
   - The response time was quick, demonstrating the circuit's reliability.

5- Conclusion:

The smoke detector circuit functioned as intended, accurately detecting smoke and activating the LED and buzzer alarm.
This project successfully met its goal of creating an efficient and affordable smoke detection system.

6- References:

1. Datasheets
2. Simulation Tools (Tinkercad / Proteus)
3. https://www.electronicsforu.com/electronics-projects/optical-smoke-alarm