

Project

Thermo Fan

The Team

Class: E2D Branch: E&TC Engineering



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1



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Thermo Fan

What is meant by a Thermo Fan?

As the name suggests, a Thermo Fan is a device or circuit, which is used to control the temperature of the device, room, etc. It turns on automatically when there is a rise in temperature. Any temperature controlling device or circuit consists of three main parts: Temperature sensor, main controller/comparator, and the switch.



Today's Focus

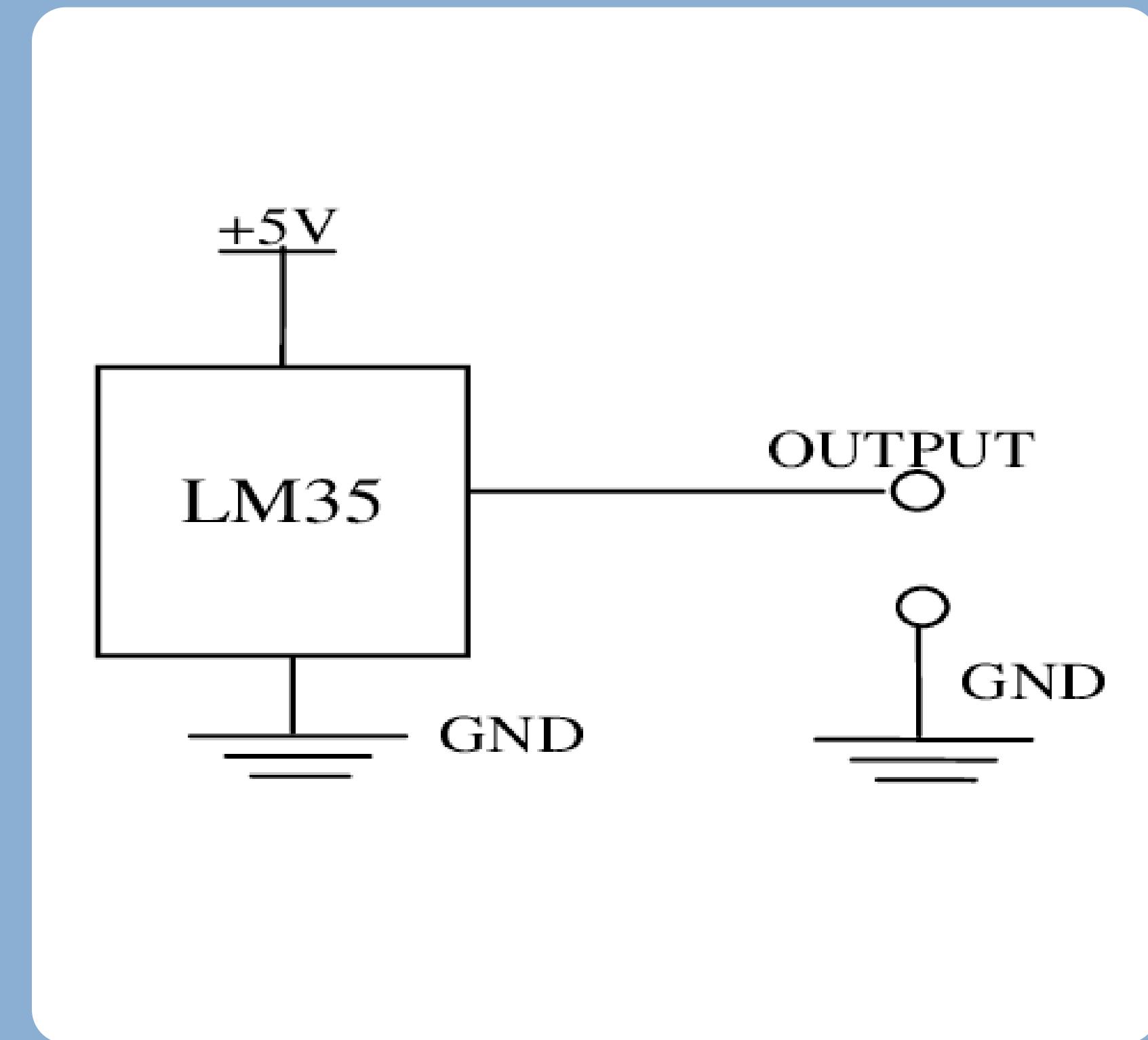
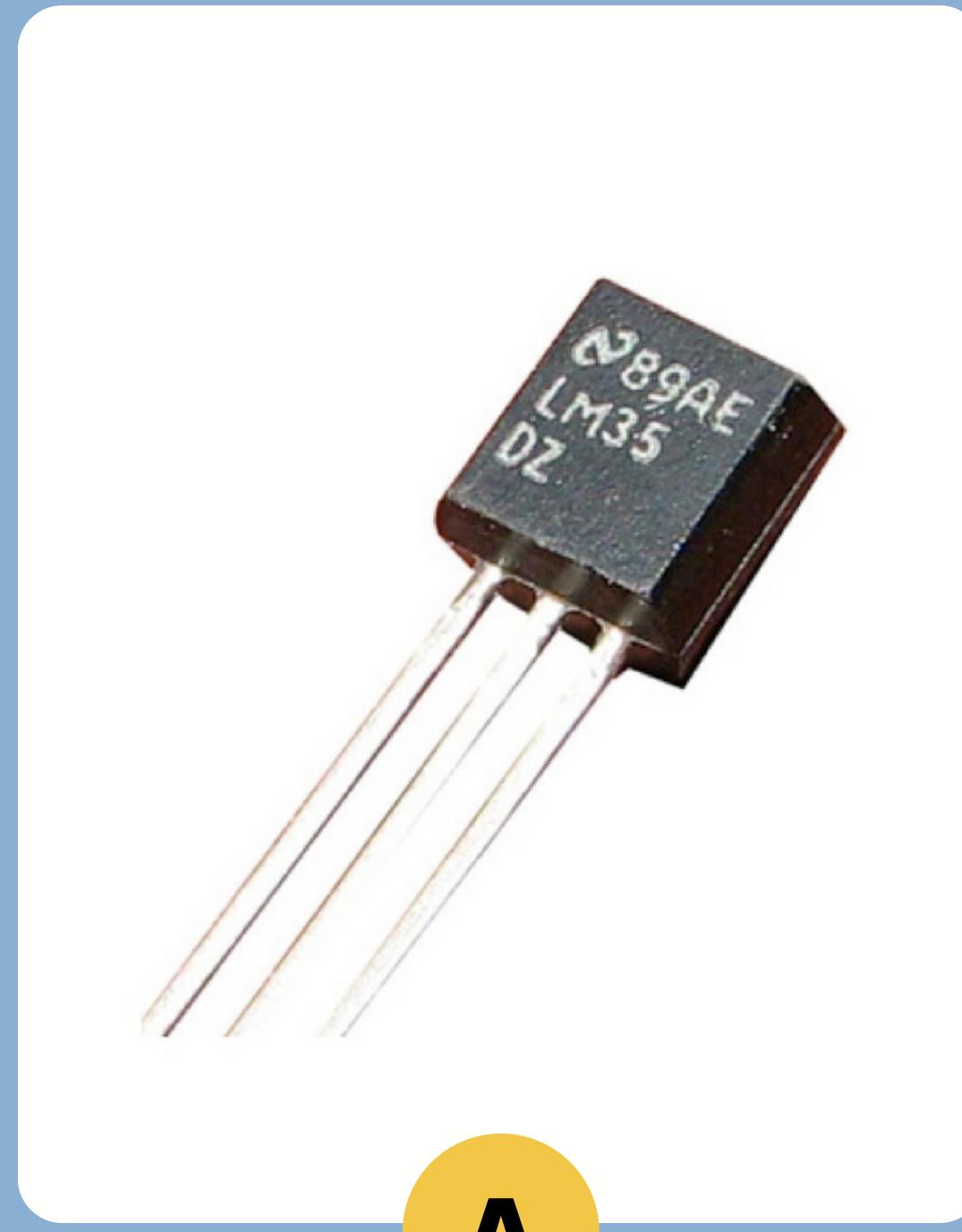
- Understanding the use of the electric circuit/project
- Components used to build
- Datasheets of every component
- Working of the circuit with block diagram and simulation
- Breadboard Testing
- PCB Design

Use

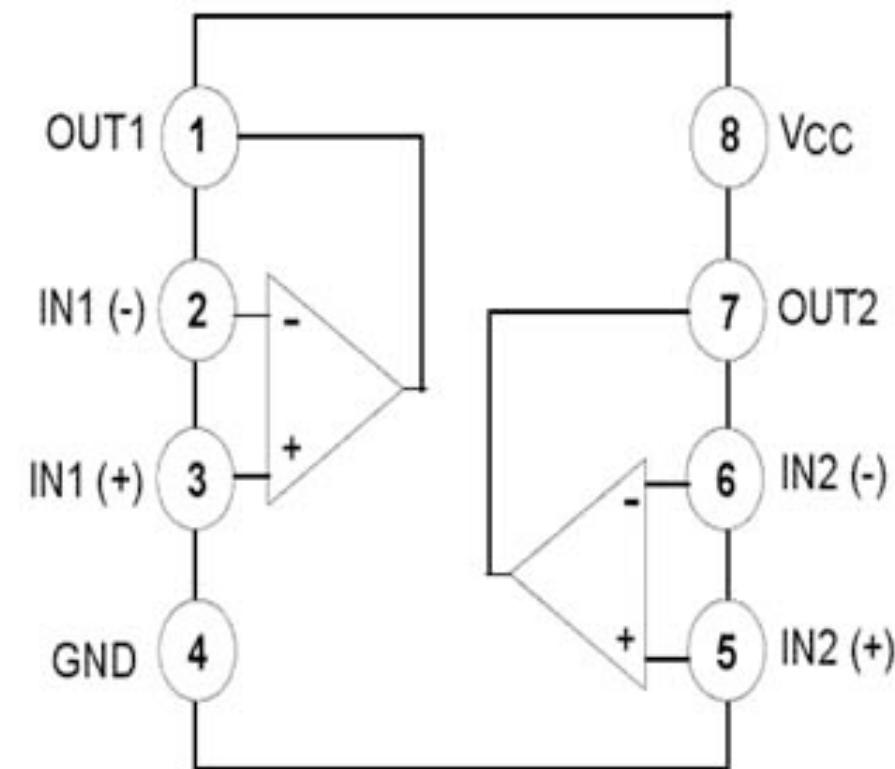
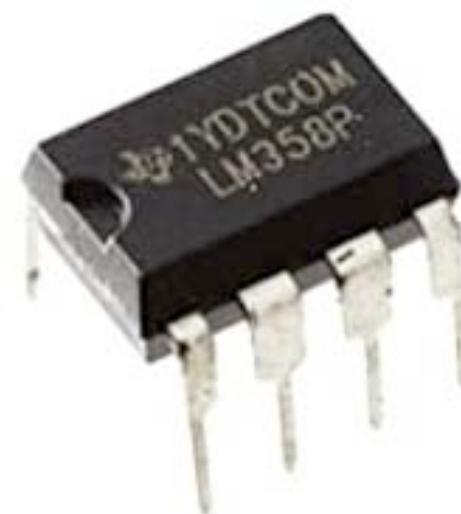
- This thermo fan circuit can be useful in many ways.
- **In a kitchen, temperatures can rise due to cooking. The thermo fan can be placed strategically to activate and help ventilate the kitchen when cooking generates excess heat.**
- It can work as a temperature indicator or it can trigger any device like a fan or alarm beyond a particular temperature.
- It can also work as a fire alarm if you set the threshold temperature very high like 100 Degrees Celsius.
- It can also work as a temperature control fan to reduce the temperature of laptops/computers to prevent overheating.
- It can be also used in microwave ovens to prevent from causing excess heat.



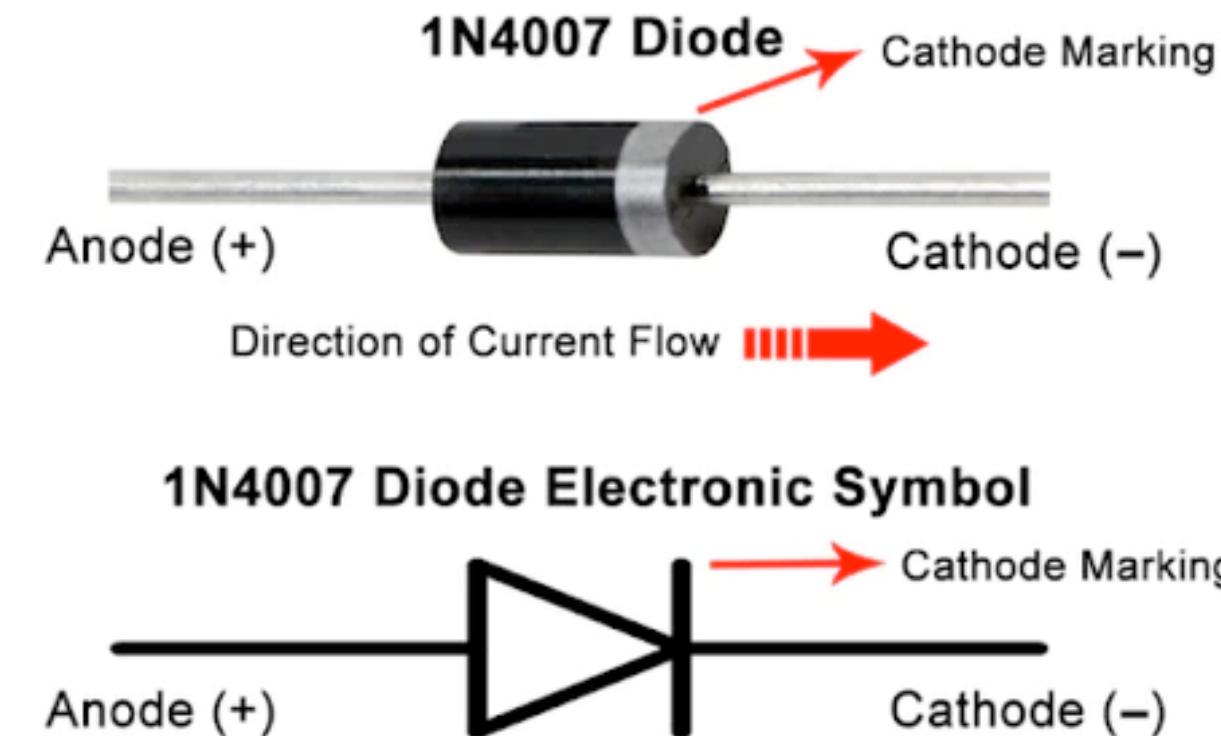
LM35 Temperature Sensor



IC/Diode



LM 358

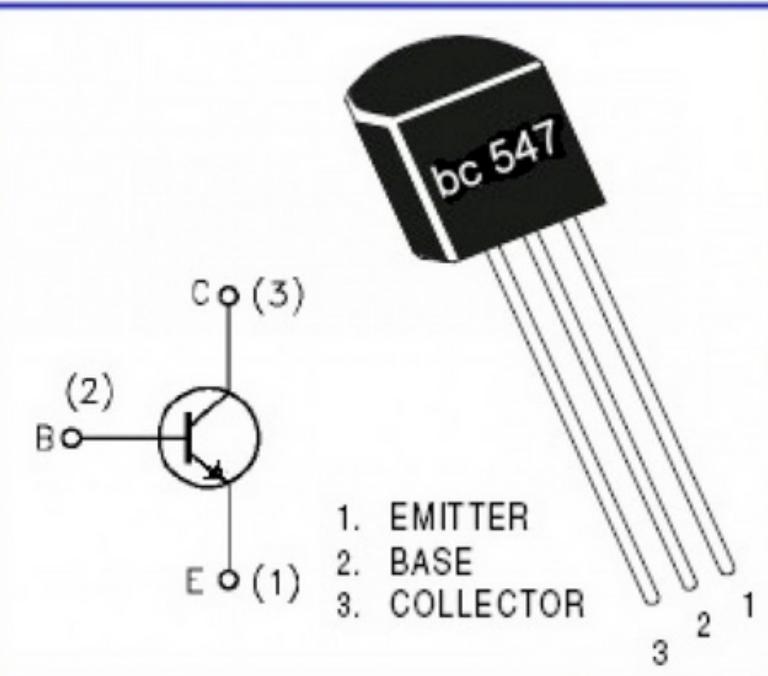


1N4007 Diode

Other Components



24V Relay

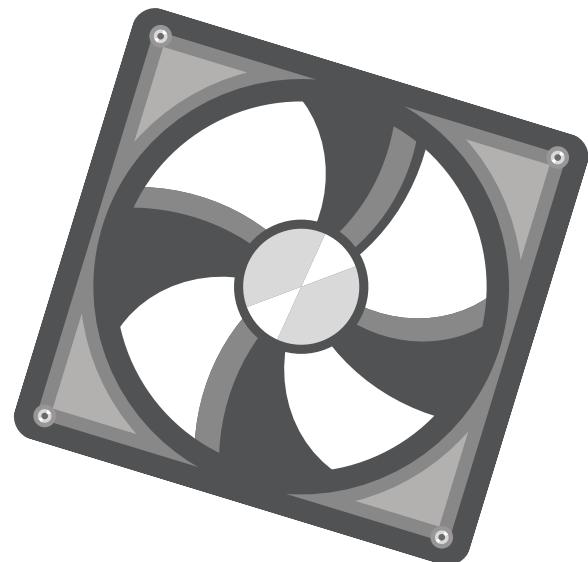


BC 547 Transistor



10k ohm POT

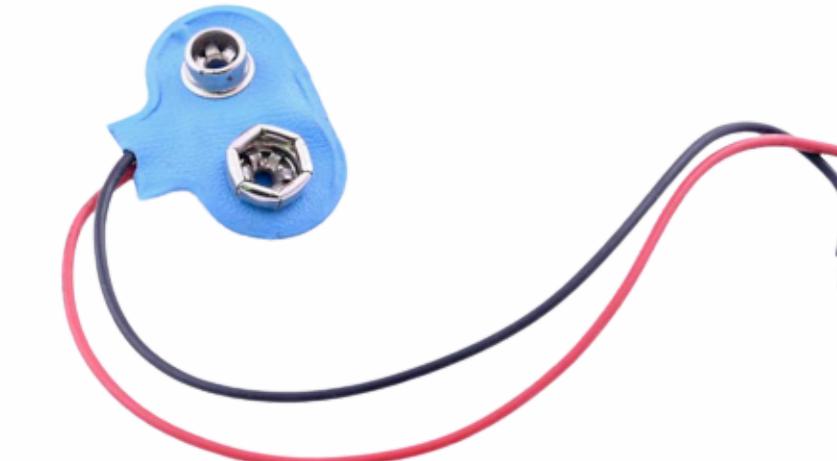
Other Components



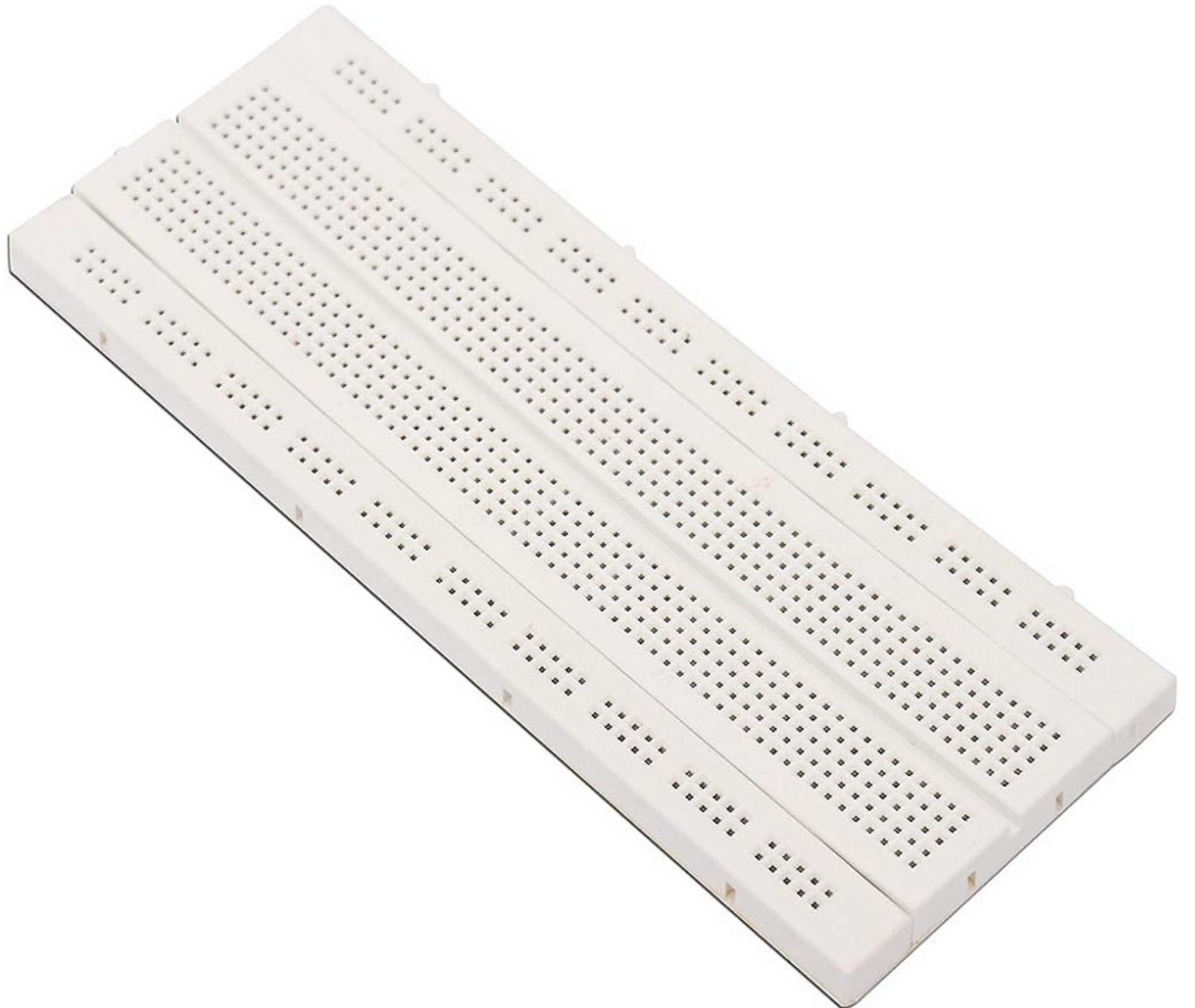
Fan



12 Battery X 2



Battery Connector

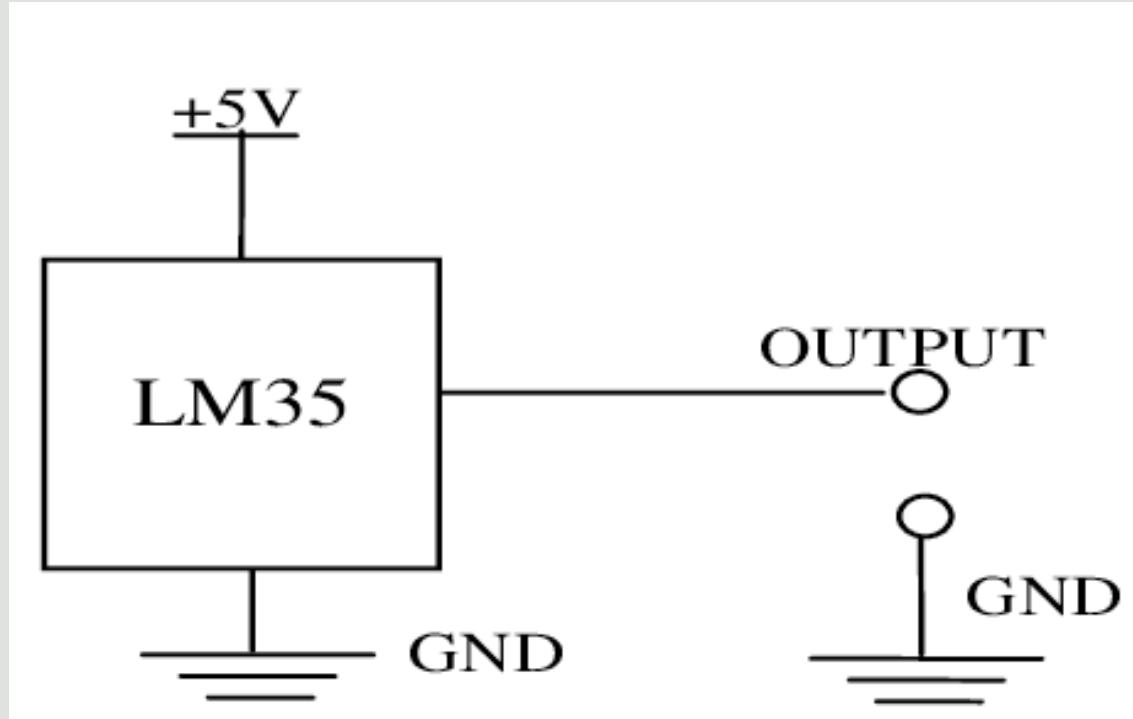


Breadboard



Copper Clad for PCB Design

Simple Datasheets



LM35 Sensor

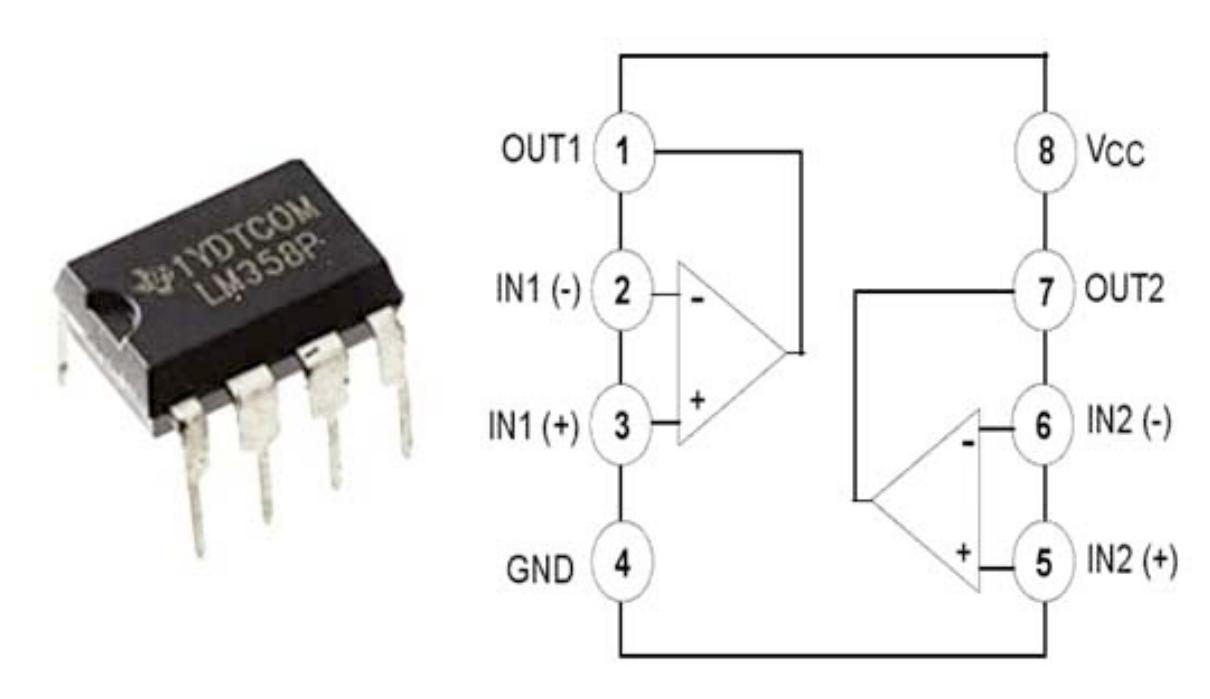
Electrical Characteristics:

- **Temperature Range:** -55°C to 150°C
- **Output Voltage (at 0°C):** 250 mV
- **Output Voltage (at 25°C):** 750 mV
- **Output Voltage Change per °C:** 10 mV/°C

Features:

- Linear output voltage proportional to temperature.
- Wide temperature range.
- High accuracy and linearity.
- Low power consumption.
- Easy to interface with analog circuits.

Simple Datasheets

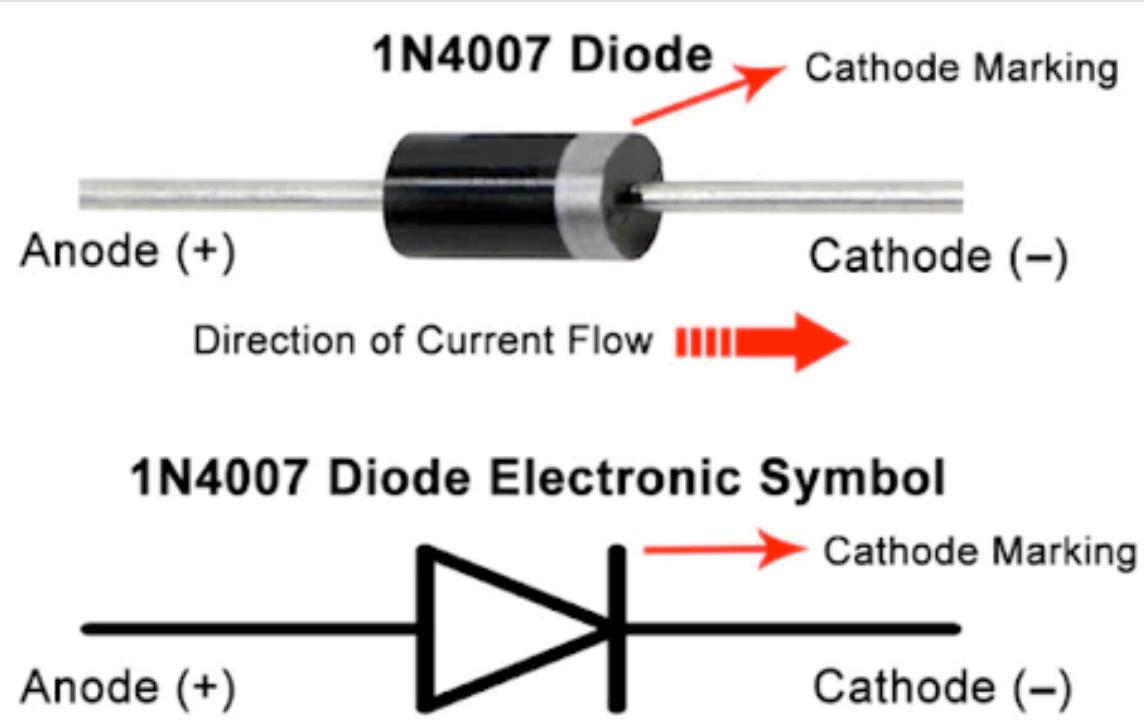


LM358
IC/OPAMP/Comp
arator

Electrical Characteristics:

- **Number of Amplifiers:** 2
- **Supply Voltage (Single Supply):** 3V to 32V
- **Supply Voltage (Dual Supply):** $\pm 1.5V$ to $\pm 16V$
- **Input Offset Voltage (V_{IO}):** 2 mV
- **Input Bias Current (I_b):** 45 nA
- **Input Offset Current (I_{OS}):** 25 nA
- **Common-Mode Rejection Ratio (CMRR):** 70 dB
- **Open-Loop Voltage Gain (A_{VO}):** 100 dB
- **Bandwidth (Unity Gain):** 1 MHz
- **Slew Rate:** 0.3 V/ μ s
- **Output Current (Sink/Source):** 20 mA
- **Input Voltage Range (Common Mode):** 0 V to $V_{CC} - 1.5V$
- **Operating Temperature Range:** 0°C to 70°C

Simple Datasheets

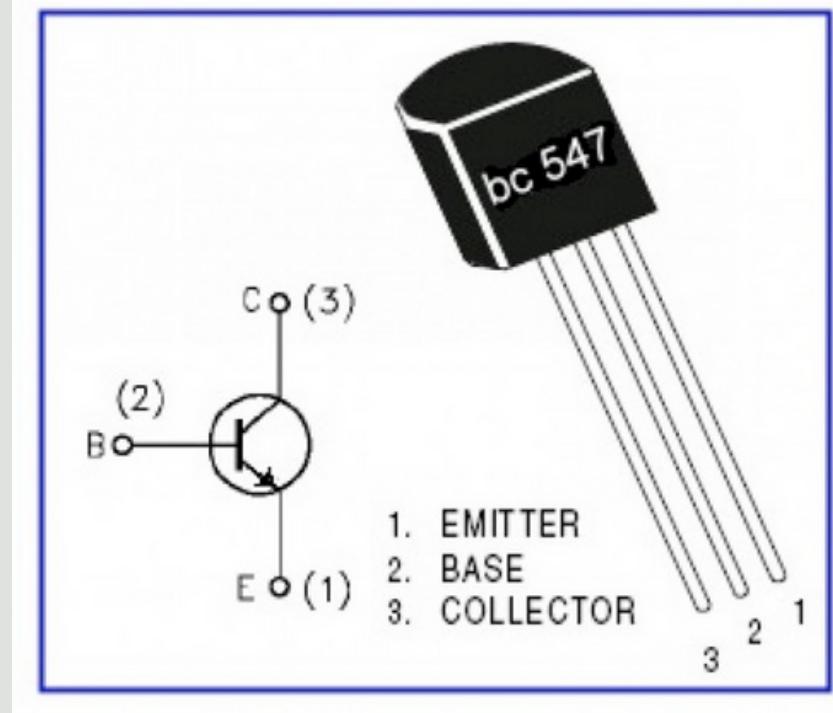


1N4007 Diode

Electrical Characteristics:

- **Peak Repetitive Reverse Voltage (V_{RRM}):** 1000 volts
- **Average Rectified Forward Current (I_{AVR}):** 1.0 ampere
- **Non-repetitive peak Forward Surge Current (I_{FSM}):** 30 amperes (8.3 ms, half-sine wave)
- **Forward Voltage Drop (V_F):** Typically around 1.1 volts at 1.0 ampere
- **Reverse Leakage Current (I_R):** Typically less than 5 μ A (microamperes) at the rated peak reverse voltage
- **Operating Temperature Range:** -65°C to +175°C
- **Storage Temperature Range:** -65°C to +175°C

Simple Datasheets



BC547
Transistor NPN

Electrical Characteristics:

- **Type:** NPN
- **Collector-Base Voltage (VCBO):** 50V (Maximum)
- **Collector-Emitter Voltage (VCEO):** 45V (Maximum)
- **Emitter-Base Voltage (VEBO):** 6V (Maximum)
- **DC Current Gain (hFE):** Typically 200 to 450
- **Collector Current (IC):** 100 mA (Maximum)
- **Power Dissipation (PD):** 500 mW (Maximum)
- **Transition Frequency (ft):** 150 MHz (Typical)

Simple Datasheets



10k ohm POT
(Potentiometer)



1.6k ohm Resistor

Electrical Characteristics:

- **Resistance (R):** 10,000 ohms ($10\text{k}\Omega$)
- **Tolerance:** Typically $\pm 10\%$
- **Power Rating:** Generally 0.125 watts or higher

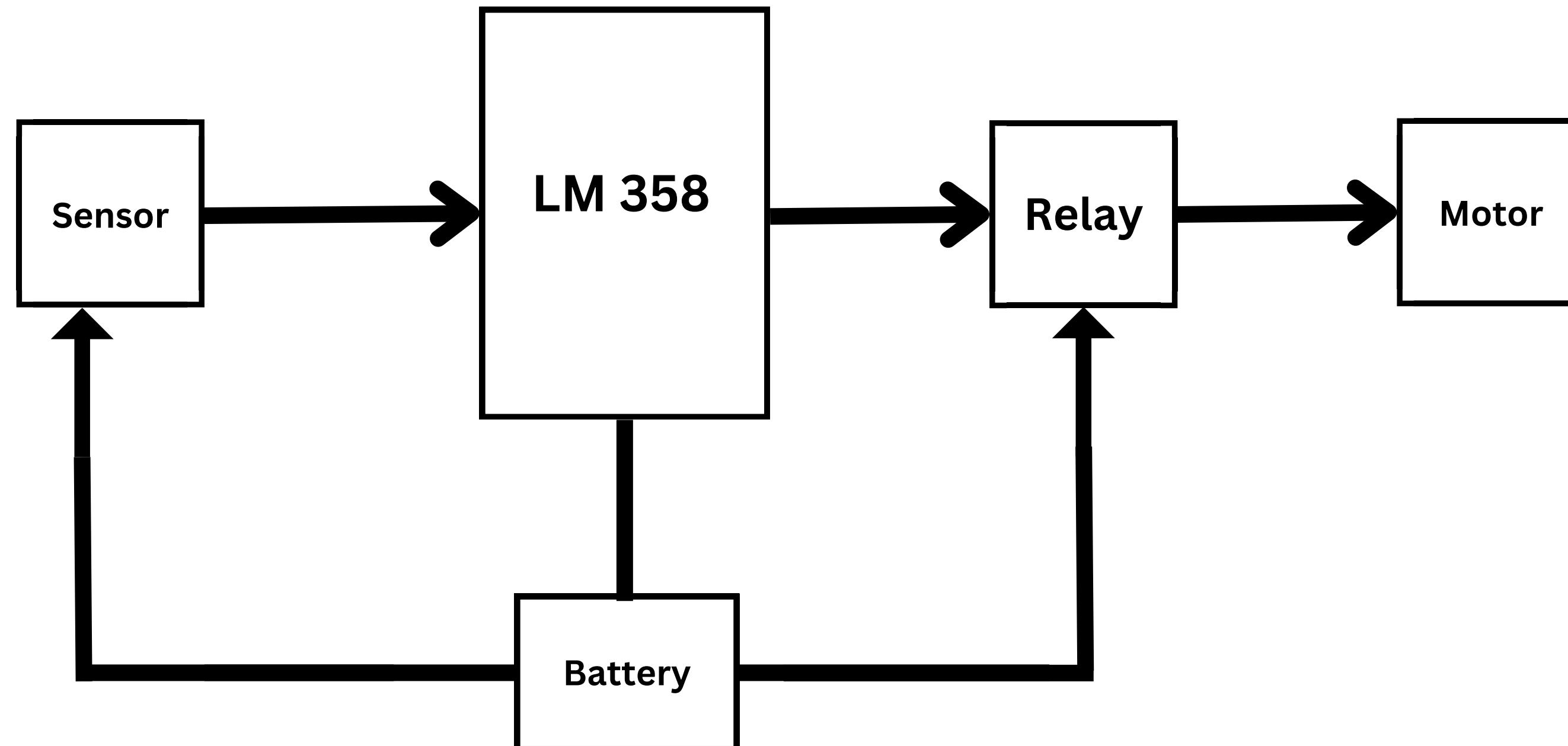
Electrical Characteristics:

- **Resistance (R):** 1,600 ohms ($1.6\text{k}\Omega$)
- **Tolerance:** Typically $\pm 1\%$, $\pm 5\%$
- **Power Rating (P):** Typically 0.125 watts ($1/8\text{W}$), 0.25 watts ($1/4\text{W}$), or higher

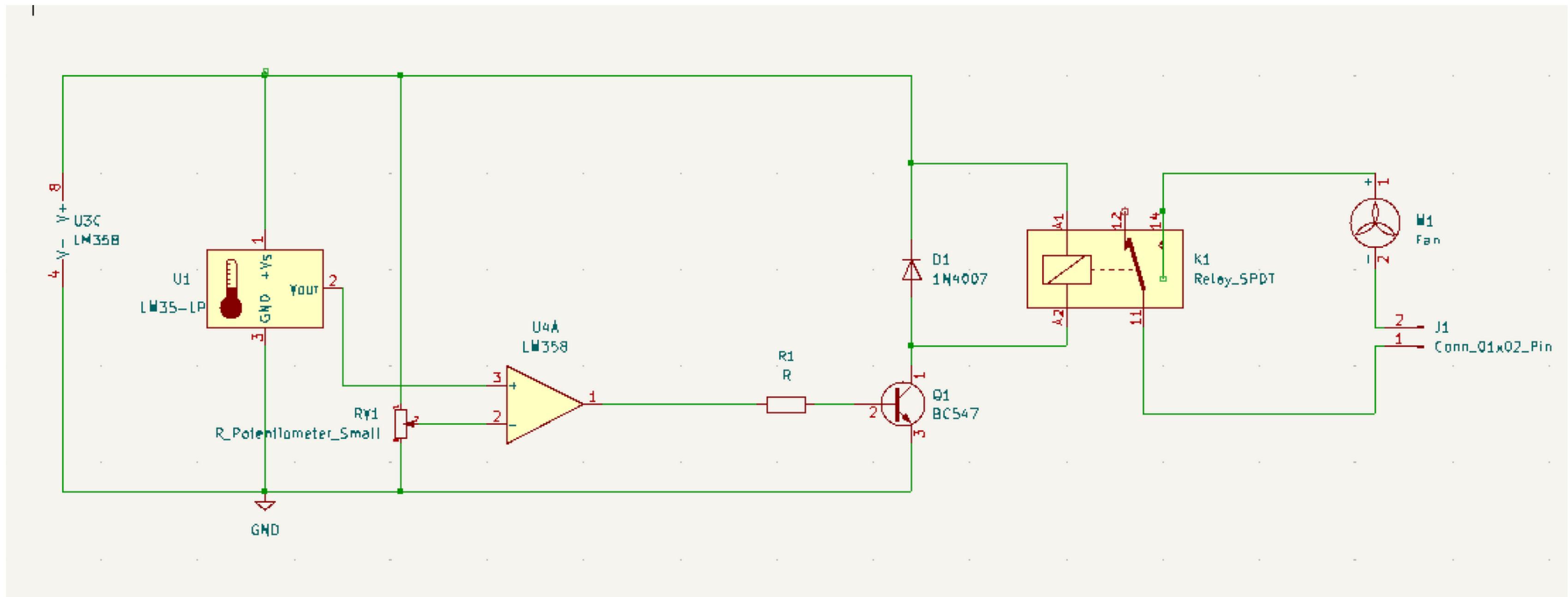
Working

1. The circuit uses an LM358 operational amplifier configured as a comparator, along with an LM35 temperature sensor, a potentiometer, and a relay.
2. In normal conditions (temperature below a set threshold), the Op Amp output is low, keeping the relay off.
3. As temperature rises, the LM35 output increases. When it surpasses the set threshold, the Op Amp output goes high.
4. The high output activates the relay, allowing control of external devices like a fan based on temperature.

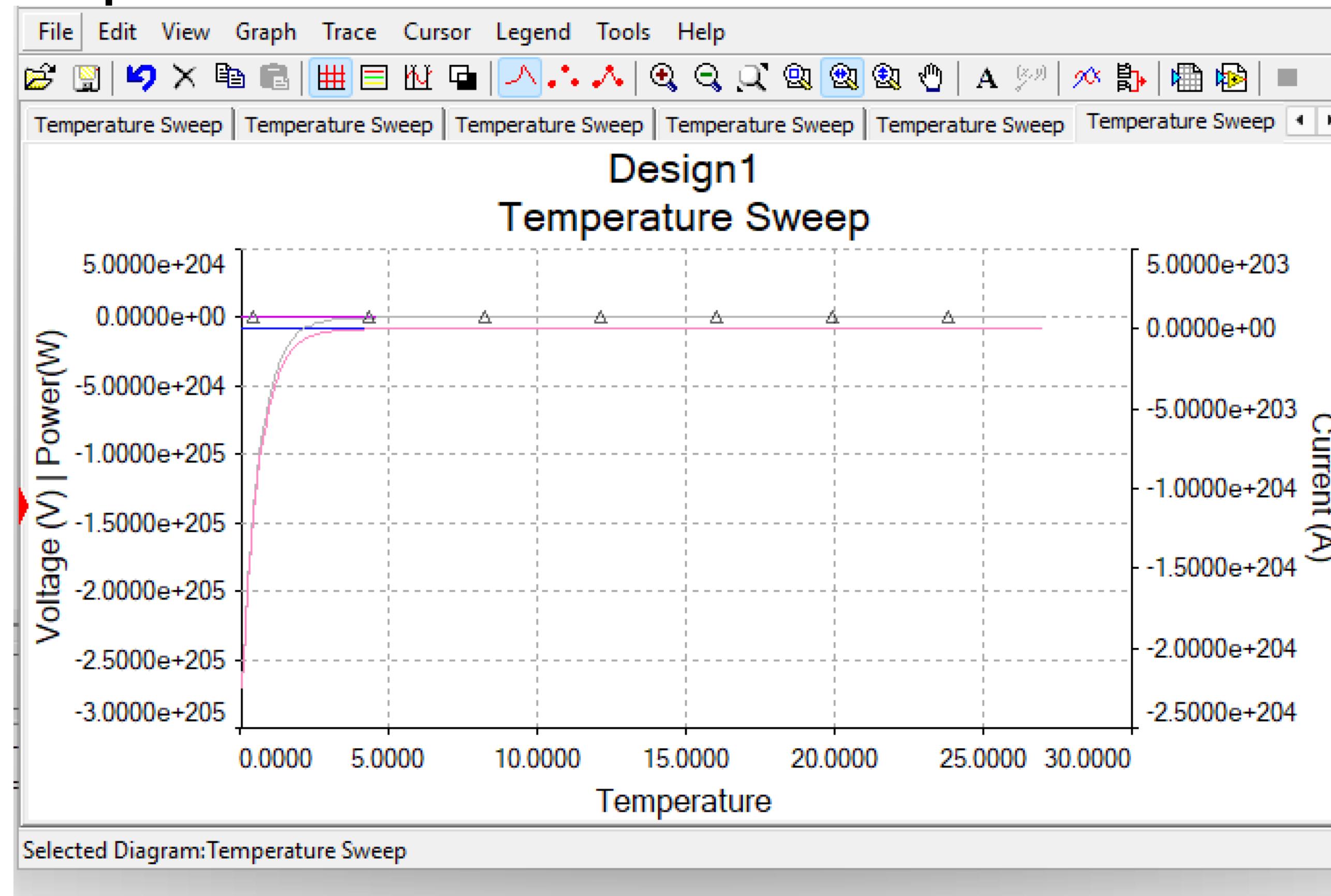
Block Diagram



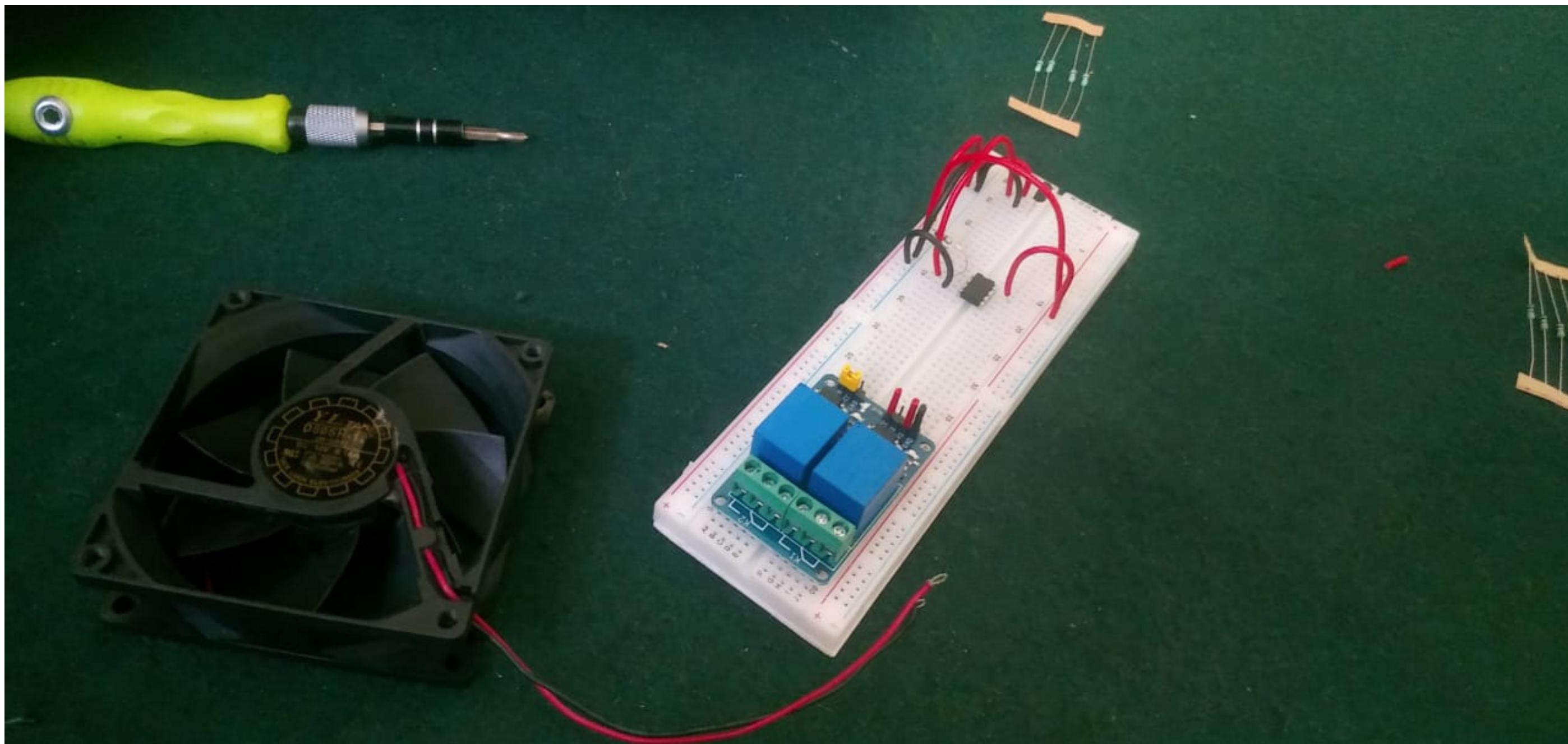
Circuit Simulated on Multisim



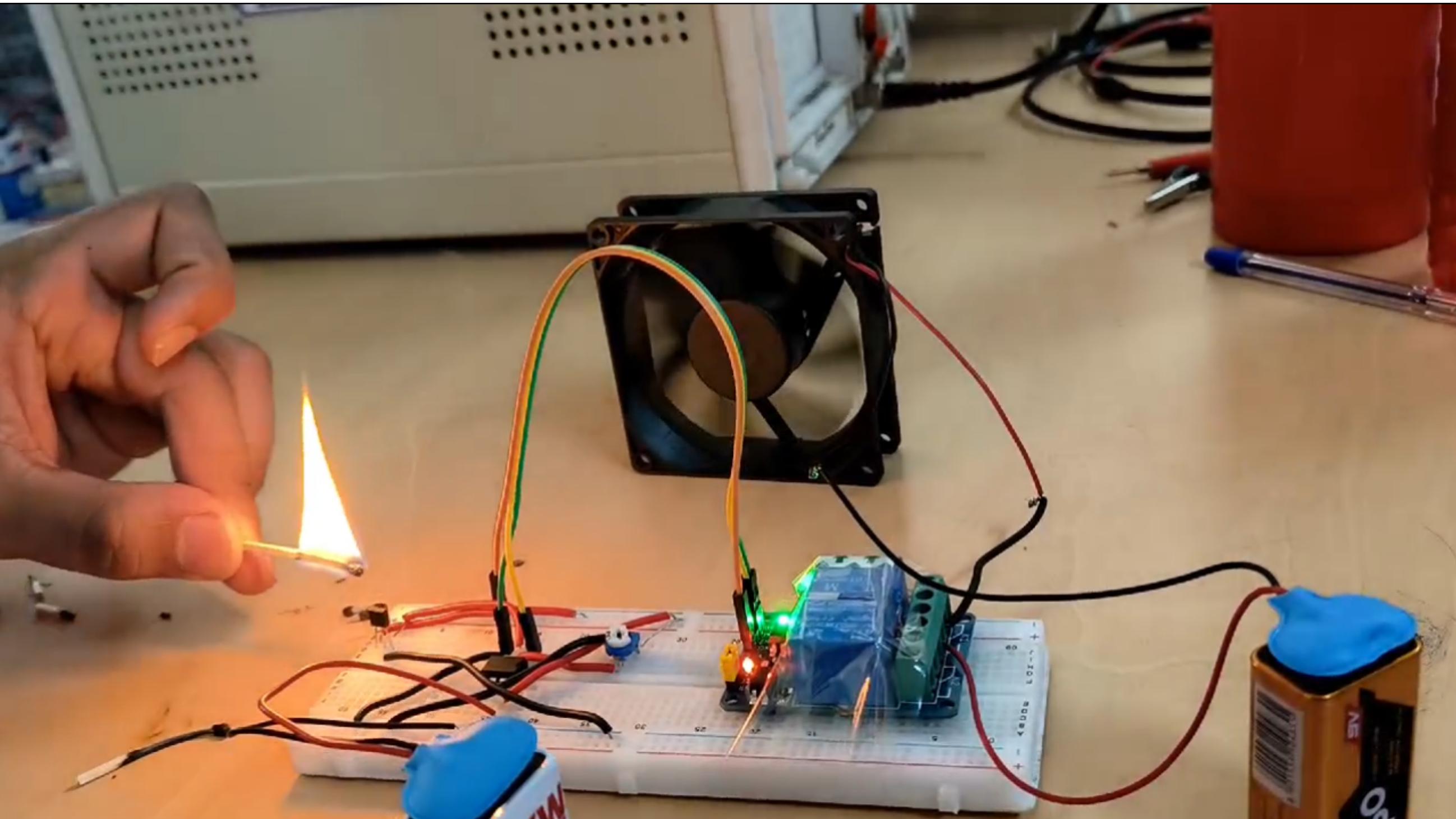
Output from Multisim Simulation



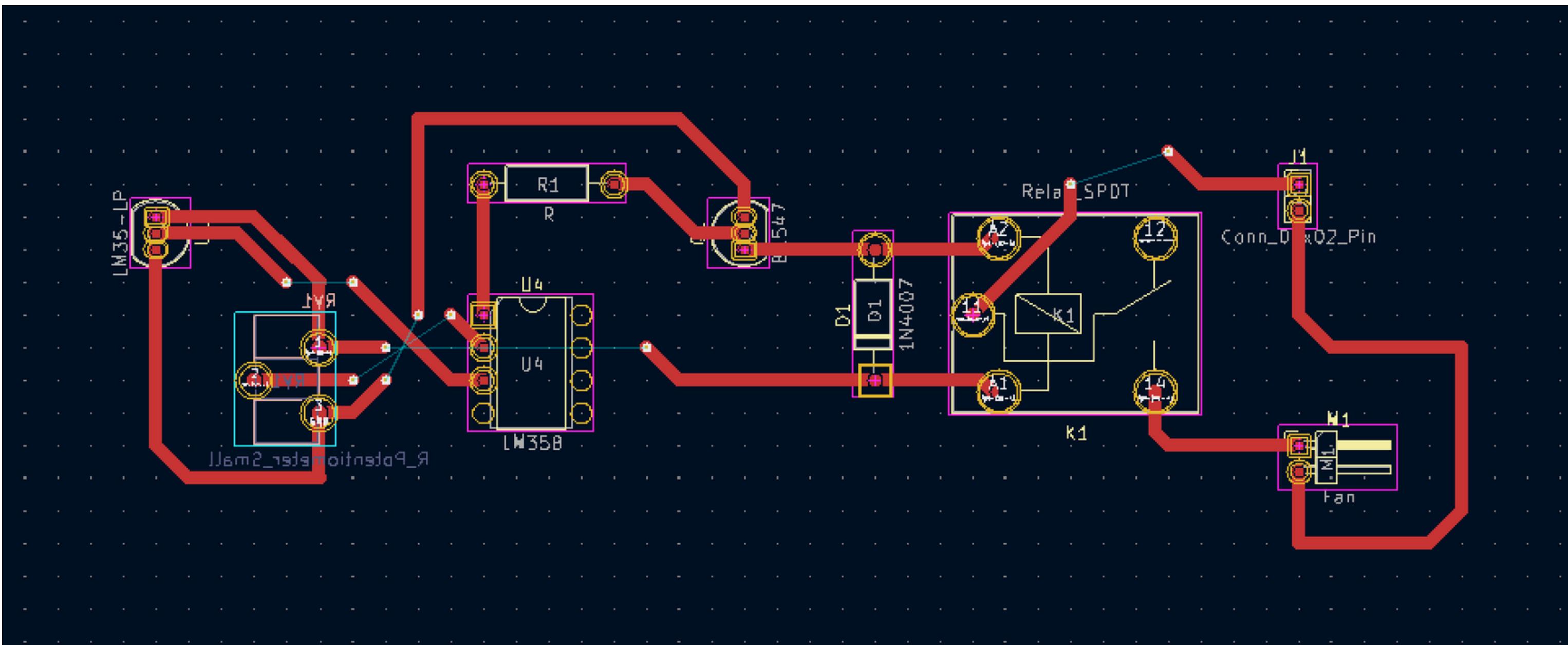
Breadboard



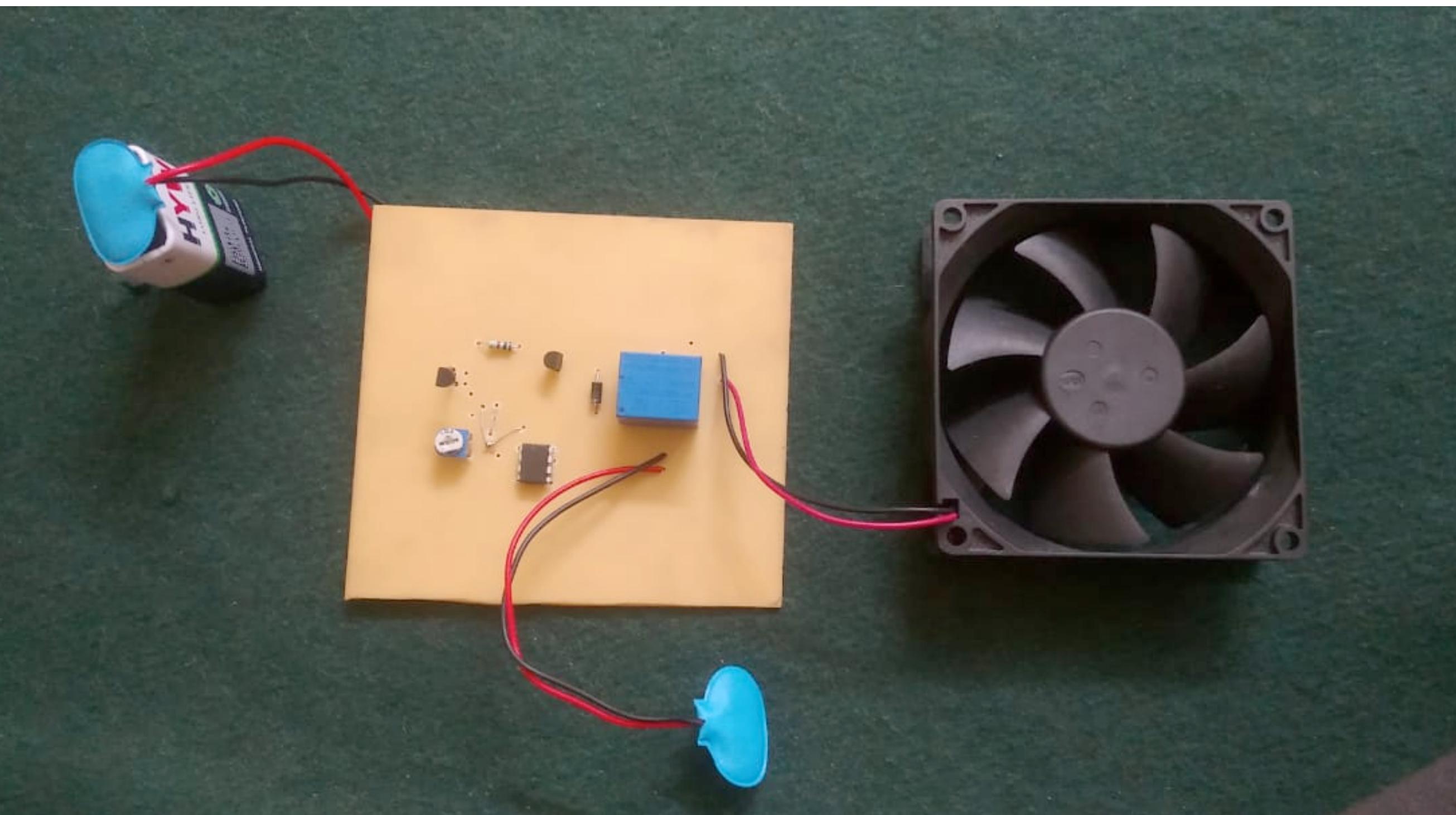
Breadboard Testing



PCB Schematic



PCB Design





**Thank
you**