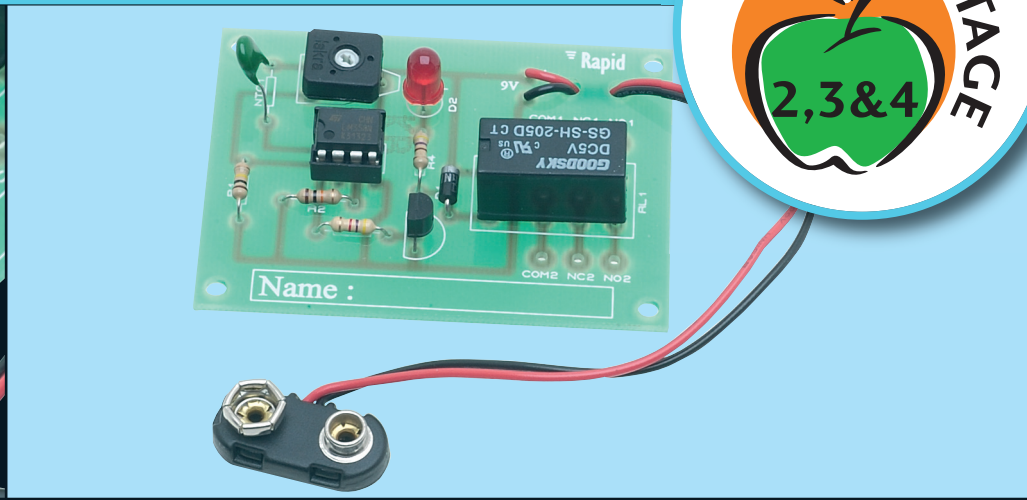
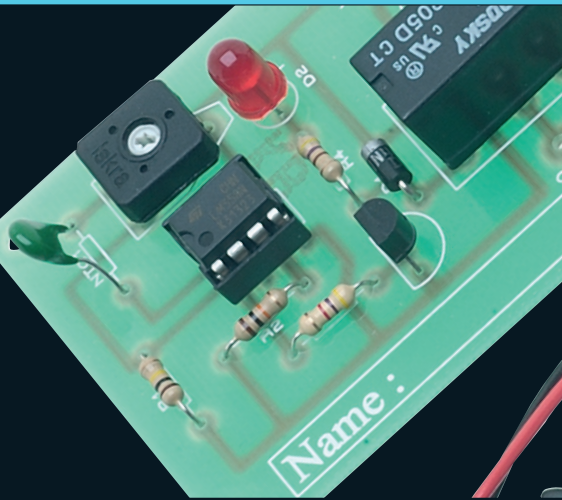
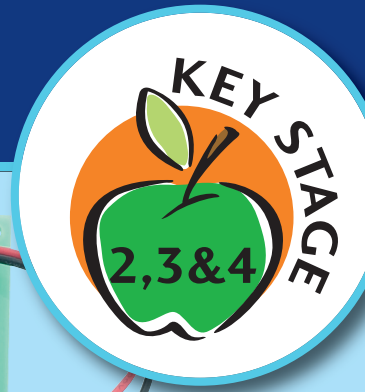


Thermistor temperature sensor project



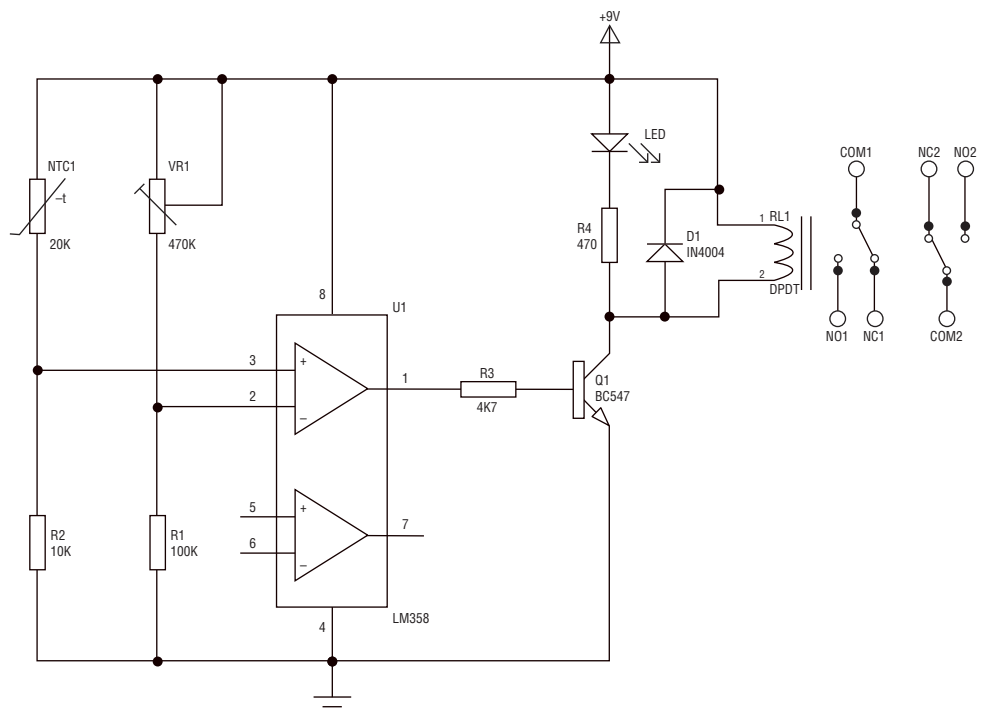
Basic circuit

A thermistor's resistance changes with temperature. If an increase in temperature results in an increase in resistance the thermistor has a **Positive Temperature Coefficient** and is called a **PTC** thermistor.

These are not common. If an increase in temperature results in a decrease in resistance the thermistor has a **Negative Temperature Coefficient** and is called a **NTC** thermistor. These are the normal types.

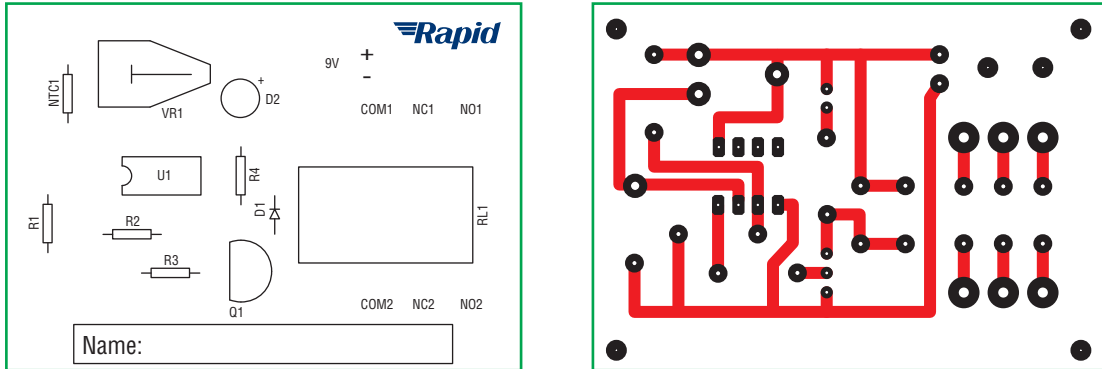
Thermistors have their value given in ohms based on a temperature of 25°C, the NTC1 that is used in this circuit is 20kΩ @ 25°C.

The operational amplifier (op-amp) is used as a voltage comparator. When the voltage on pin 3 is more positive than the voltage on pin 2 the output will be high (9V). When the voltage on pin 3 is less positive than the voltage on pin 2 the output will be low (0V). This op-amp can be used to switch something on or off.



Circuit description

The voltage on pin 3 will increase with a rise in temperature. When this voltage is greater than the voltage on pin 2 the output voltage on pin 1 will quickly rise to 9V. With pin 1 at 9V base current to the transistor will flow and the transistor will be switched on, The LED will be on and the relay energised. When pin 3 voltage falls below that of pin 2 then the output of pin 1 will fall to 0V and the LED will be off and the relay de-energised. Changing the voltage at pin 2 by changing VR1 or R1 will result in the circuit responding to different temperatures.



Assembly. To assemble this circuit follow the procedure below.

Procedure

1. Identify all the components you will use.
2. Place and solder resistors R1, R2, R3 and R4.
3. Now place and solder VR1 and the IC socket.
4. Place and solder D1 and LED D2.
5. Place and solder the relay RL1. Connect the battery clip.
6. Place and solder the thermistor NTC1 and Q1.
7. Now insert the IC into the socket.
8. Check the circuit works by connecting the battery. Adjust VR1 until the LED just goes out. If the temperature now increases the LED will come on. Warm the thermistor by touching it with your hand for a few seconds. The LED should come on.

Note. You need warm hands to do this, if your hands are cold rub them together until they are warm.

Components list

Reference	Description	Order code
R1	100kΩ 0.25W	62-0418
R2	10kΩ 0.25W	62-0394
R3	4.7kΩ 0.25W	62-0386
R4	470Ω 0.25W	62-0362
U1	LM358	82-0258
IC socket	8-pin DIL	22-0150
D1	1N4004	47-3136
D2	Red LED	55-0117
NTC1	20kΩ disc thermistor	61-0415
VR1	470kΩ preset	47-0255
Q1	BC547	81-0468
RL1	5V 70Ω DPDT relay	60-4690
PCB	Thermistor PCB	70-0240
Battery clip	PP3 clip	18-0094