# Relay: Interfacing with Arduino

Relay:----- An Introduction

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays.

Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal.

Relay:----- 1-Channel Relay Module
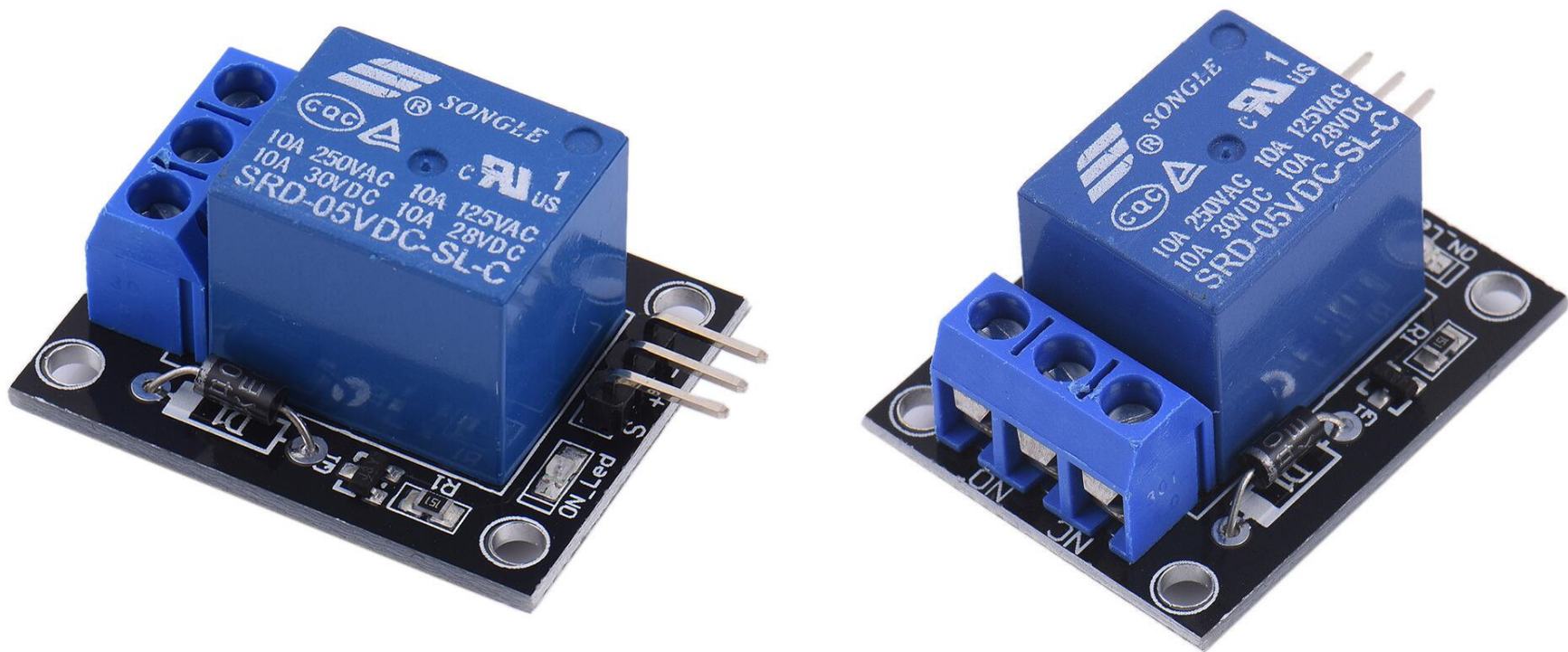
Relay:----- FEATURES

The features of 1-Channel Relay module are as follow:

1. Good in safety. In power system and high voltage system, the lower current can control the higher one.

2. 1-channel high voltage system output, meeting the needs of single channel control

3. Wide range of controllable voltage.

4. Being able to control high load current, which can reach 240V, 10A

5. With a normally-open (NO) contact and a normally-closed (NC) contacts

Relay:----- Basic construction

- A relay contains an induction part which can reflect input variable like current, voltage, power, resistance, frequency, temperature, pressure, speed and light etc.

- It contains an actuator module (contacts) which can energize or de-energize the connection of controlled circuit.

- There is an intermediary part between input part and output part that is used to coupling and isolate input current, as well as actuate the output.

- When the rated value of input (voltage, current and temperature etc.) is above the critical value, the controlled output circuit of relay will be energized or de-energized.

Relay:----- Advantages

1. lower inertia of the moving

2. Stability

3. Long-term reliability and small volume.

4. It is widely adopted in devices of power protection, automation technology, sport, remote control, reconnaissance and communication, as well as in devices of electromechanics and power electronics.

How does the relay work?

The working of a relay can be explained with this diagram
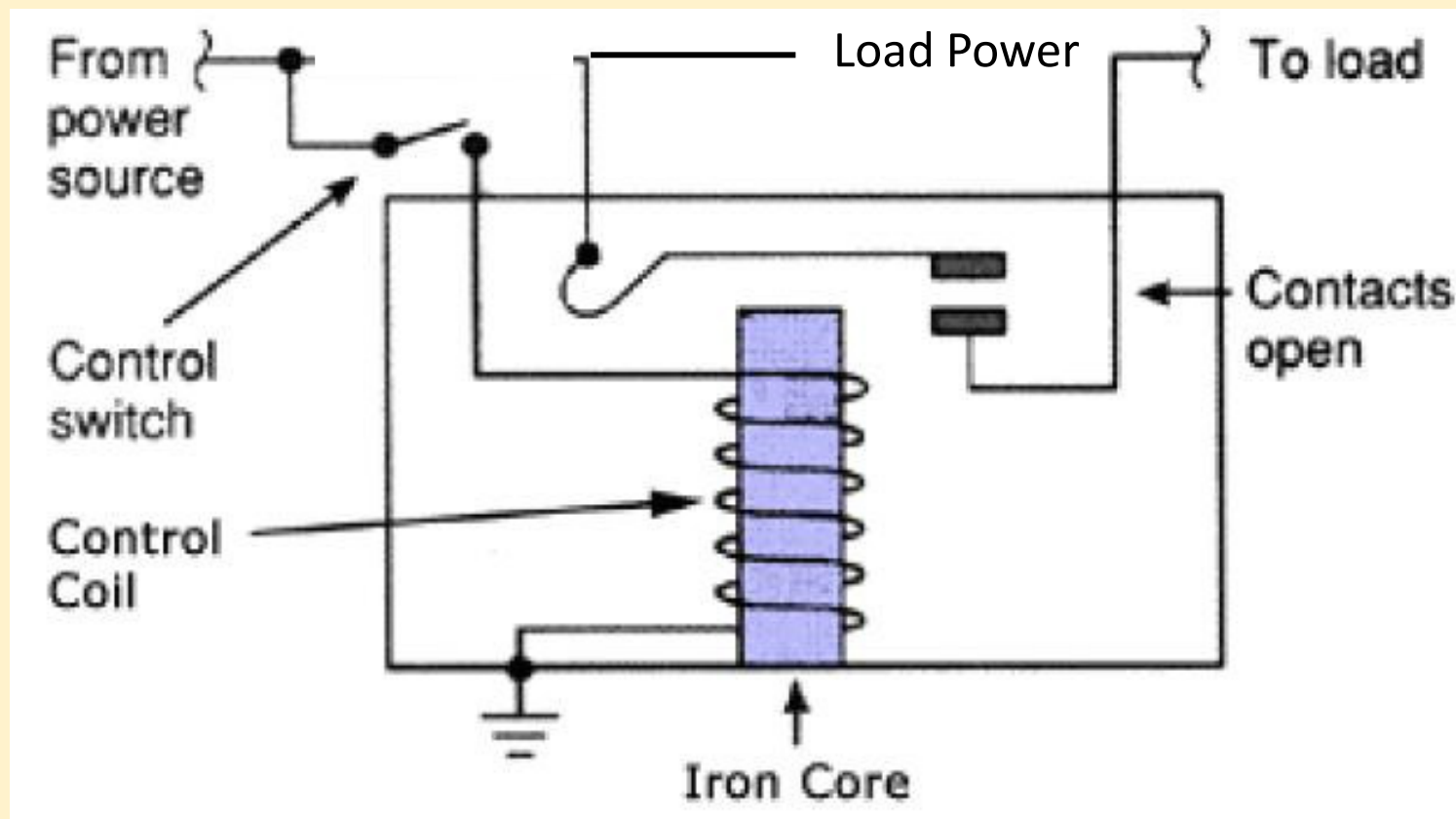
Relay:- Construction
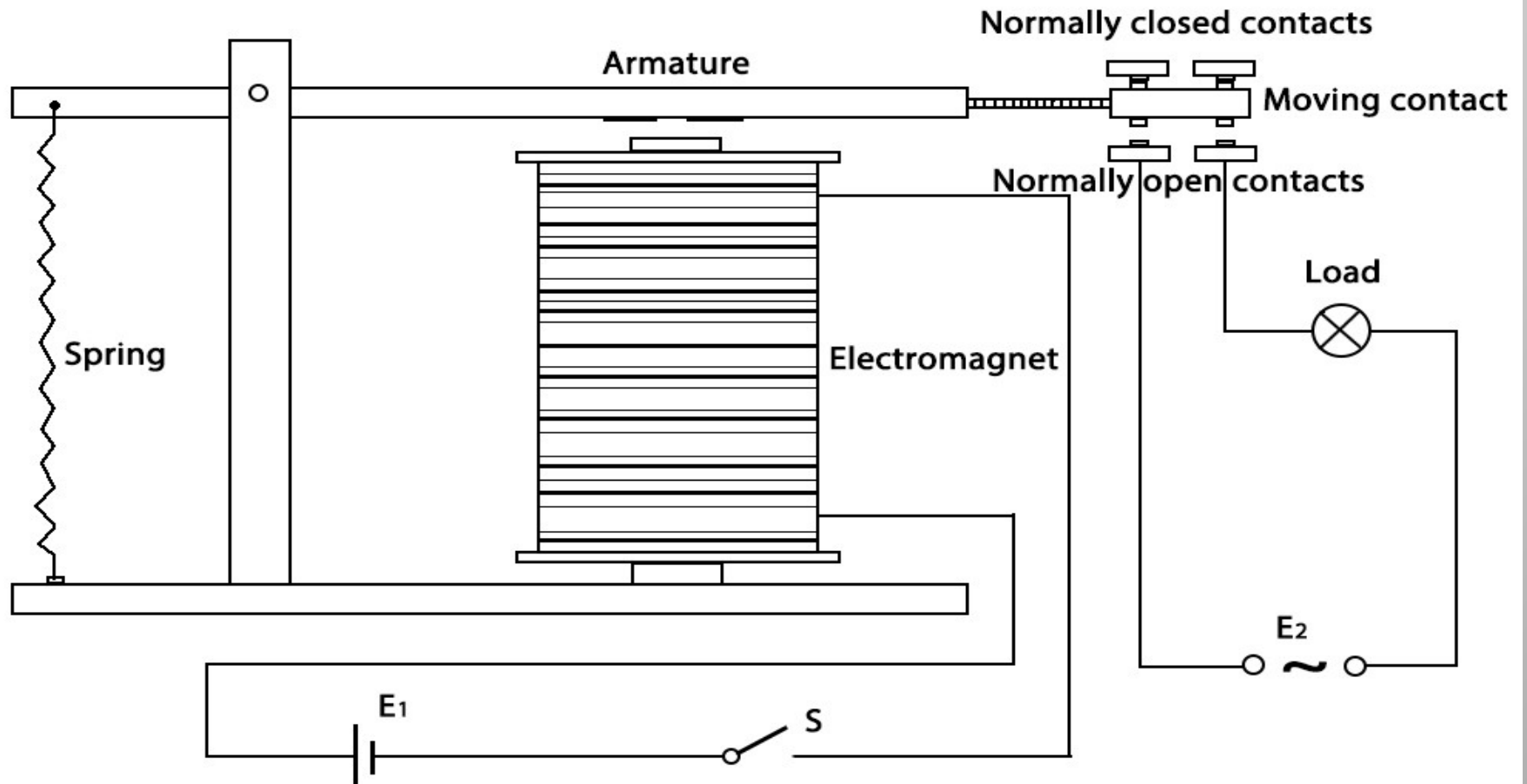
Relay:- Construction

1. **Electromagnet** – It consists of an iron core wounded by coil of wires. When electricity is passed through, it becomes magnetic. Therefore, it is called electromagnet.

2. **Armature** – The movable magnetic strip is known as armature. When current flows through them, the coil is it energized thus producing a magnetic field which is used to make or break the normally open (N/O) or normally close (N/C) points. And the armature can be moved with direct current (DC) as well as alternating current (AC).

Relay:- Construction

3. **Spring** – When no currents flow through the coil on the electromagnet, the spring pulls the armature away so the circuit cannot be completed.

4. Set of electrical **contacts** – There are two contact points:

- Normally open – connected when the relay is activated, and disconnected when it is inactive.
- Normally close – not connected when the relay is activated, and connected when it is inactive.

5. Molded frame – Relays are covered with plastic for protection.

Relay:-----Working principle

1. The diagram shows an inner section diagram of a relay. An iron core is surrounded by a control coil.

2. The power source is given to the electromagnet through a control switch and through contacts to the load.

3. When current starts flowing through the control coil, the electromagnet starts energizing and thus intensifies the magnetic field.

4. The upper contact arm starts to be attracted to the lower fixed arm and thus closes the contacts causing a short circuit for the power to the load.

5. On the other hand, if the relay de-energizes when the contacts are closed, the contact move oppositely and make an open circuit.

Relay:-----Working principle

6. As soon as the coil current is off, the movable armature will be returned by a force back to its initial position.

7. This force will be almost equal to half the strength of the magnetic force. This force is mainly provided by two factors. They are the spring and also gravity.

8. Relays are mainly made for two basic operations. One is low voltage application and the other is high voltage.

9. For low voltage applications, more preference will be given to reduce the noise of the whole circuit.

10. For high voltage applications, they are mainly designed to reduce a phenomenon called arcing.

Relay applications

1. Relays are used to protect the electrical system and to minimize the damage to the equipment connected in the system due to over currents/voltages.

2. They are used to control the high voltage circuit with low voltage signal in applications audio amplifiers and some types of modems.

3. These are used to control a high current circuit by a low current signal in the applications like starter solenoid in automobile.

4. These can detect and isolate the faults that occurred in power transmission and distribution system.

Relay applications

6. Typical applications of relays in automation include

- Lighting control systems
- Telecommunication
- Industrial process controllers
- Traffic control
- Motor drives control
- Protection systems of electrical power system
- Computer interfaces
- Automotive
- Home appliances

Relay module :-----Pin details
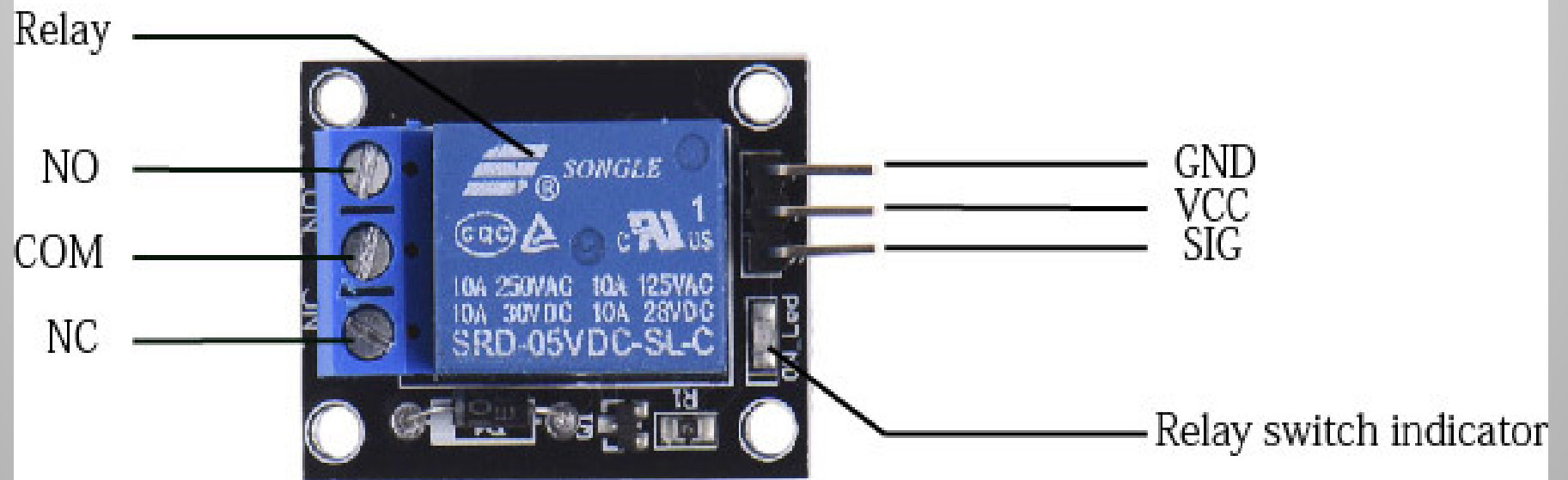
Relay module connections:-----Input pins

It has a 1×3 (2.54mm pitch) pin header for connecting power (5V and 0V), and for controlling the relay. The pins are marked on the PCB:

1. GND – Connect 0V to this pin.

2. SIG – Controls this relay, **active Low**! Relay will turn on when this input goes below about 2.0V

3. VCC – Connect 5V to this pin. Is used to power the opto couplers

Relay module connections:-----Output pins

The 1 channel relay module could be considered like a series switches: 1 normally Open (NO), 1 normally closed (NC) and 1 common Pins (COM).

1. COM- Common pin

2. NC- Normally Closed, in which case NC is connected with COM when INT1 is set low and disconnected when INT1 is high

3. NO- Normally Open, in which case NO is disconnected with COM1 when INT1 is set low and connected when INT1 is high

Relay module:-Arduino interfacing
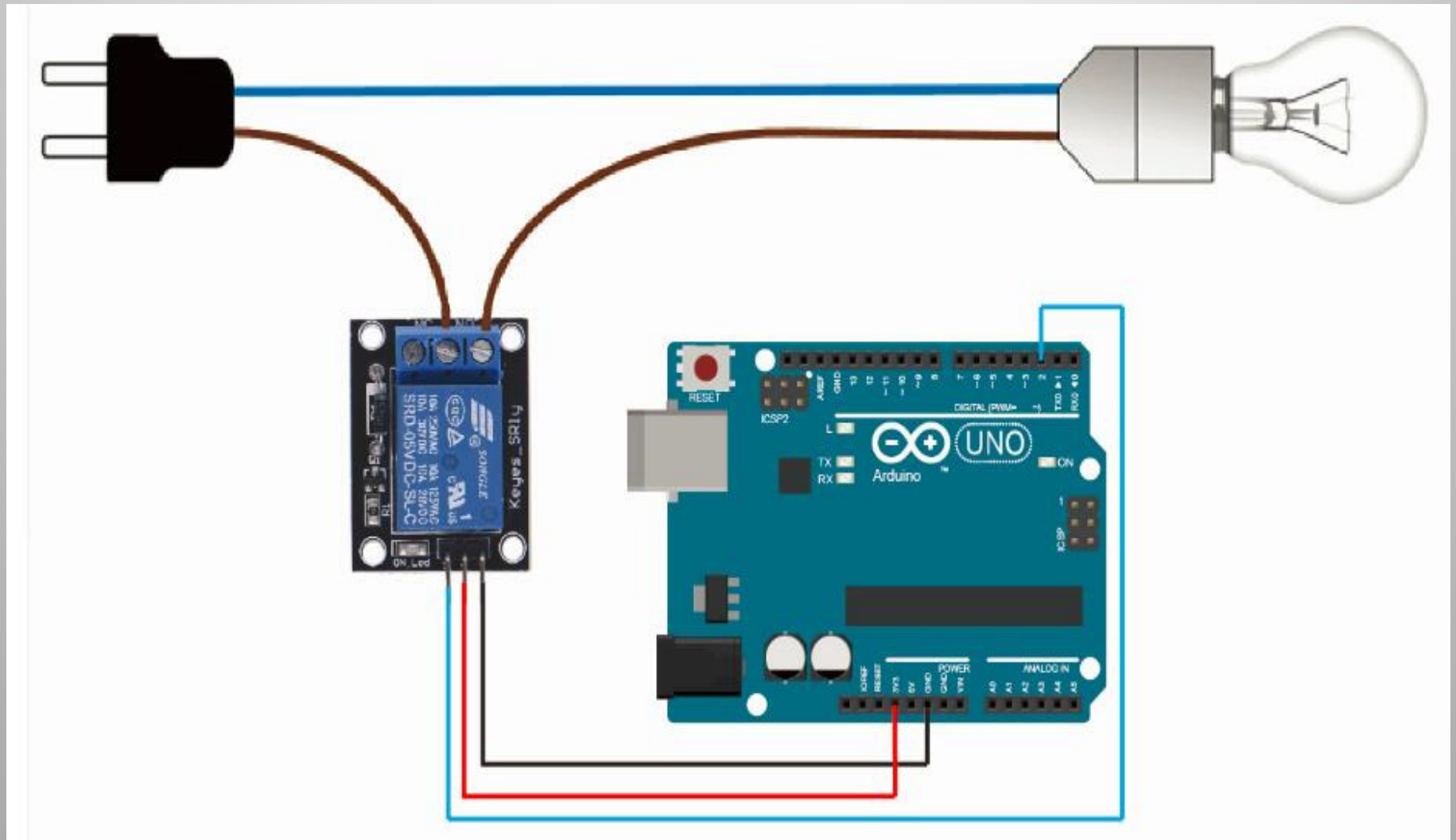
Sketch: Relay

- Complete the connections as shown in diagram, connect the Arduino board to computer using the USB cable.

- The green power LED (labelled **PWR**) will be on.

- Open the Arduino IDE and choose corresponding board type and port type for you project.

- Then load up [the following sketch](#) on Arduino.

Sketch: Relay

```
const int relayPin = 2; //the base of the transistor attach to
String comdata = "";
int lastLength = 0;

void setup()
{
        pinMode(relayPin, OUTPUT);  //initialize the LED as
                                                 output
        Serial.begin(9600);  // start serial port at 9600 bps:
        while (! Serial);
        Serial.println("Please input your command to control
        this Lamp:");
        //print message on serial monitor
}
```

Sketch: Relay

```
void loop() {                          //read string from serial monitor
      if(Serial.available()>0) {      // data sent from computer
      comdata = "";
      while (Serial.available() >0) {
              comdata += char(Serial.read());
              delay(2);    }
Serial.println(comdata);
}

      if(comdata == "on")    {
              digitalWrite(relayPin, HIGH); }  //turn the lamp on
      else if(comdata == "off")  {
              digitalWrite(relayPin, LOW); } //turn the lamp off
      else    {
      Serial.println("Please input correct command !");
      delay (20000);    }
}
```

Different relay modules- 2 channels, 4 channels

VCC
IN2
IN1
GND

GND
VCC
JD-VCC

NO
COM
NC
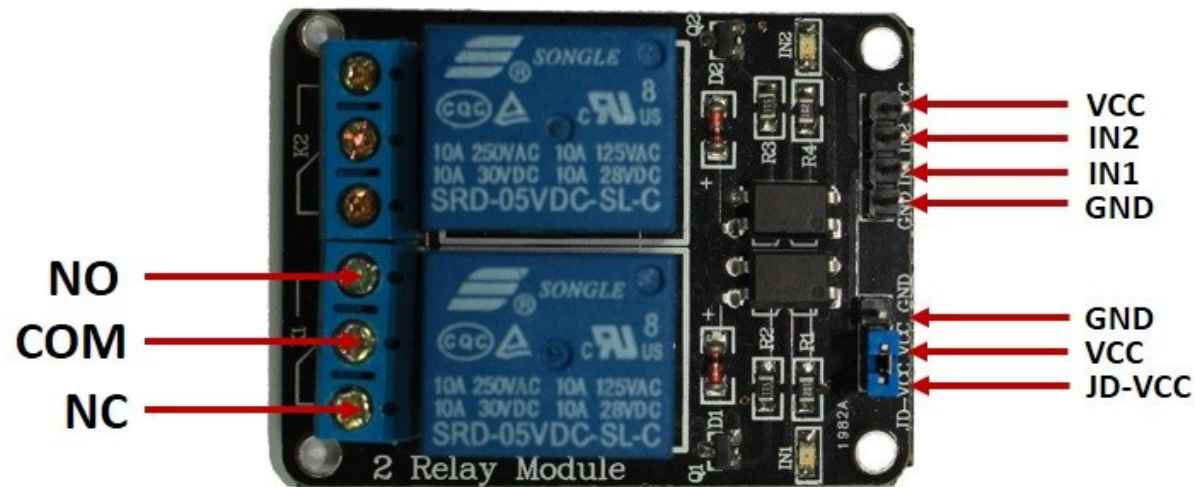
Relay modules are available in different options like, 2 channels, 4 channels, 8 channels etc.
Based on need designer can select these modules.