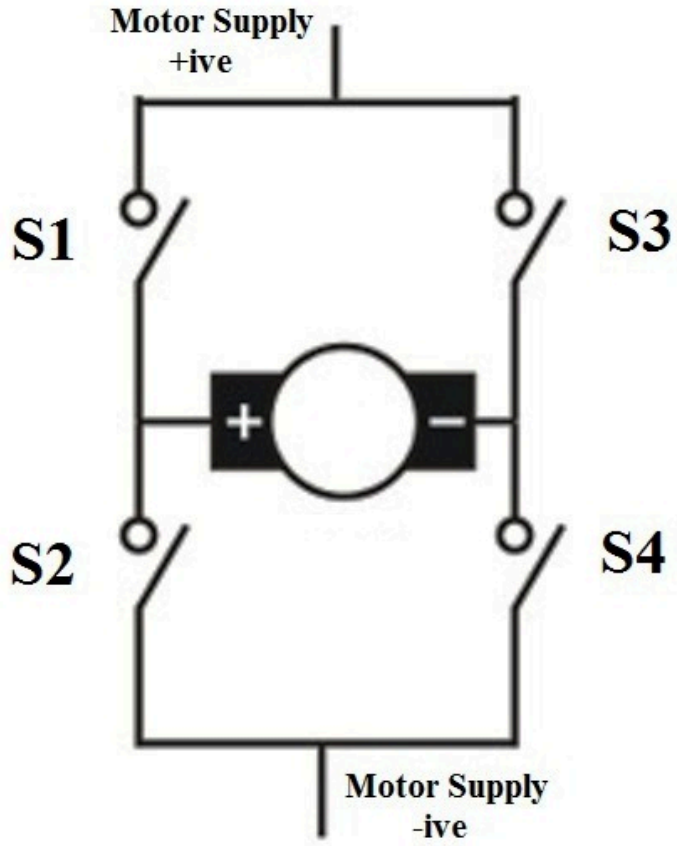
ROCO222: Intro to sensors and actuators

Lecture 1

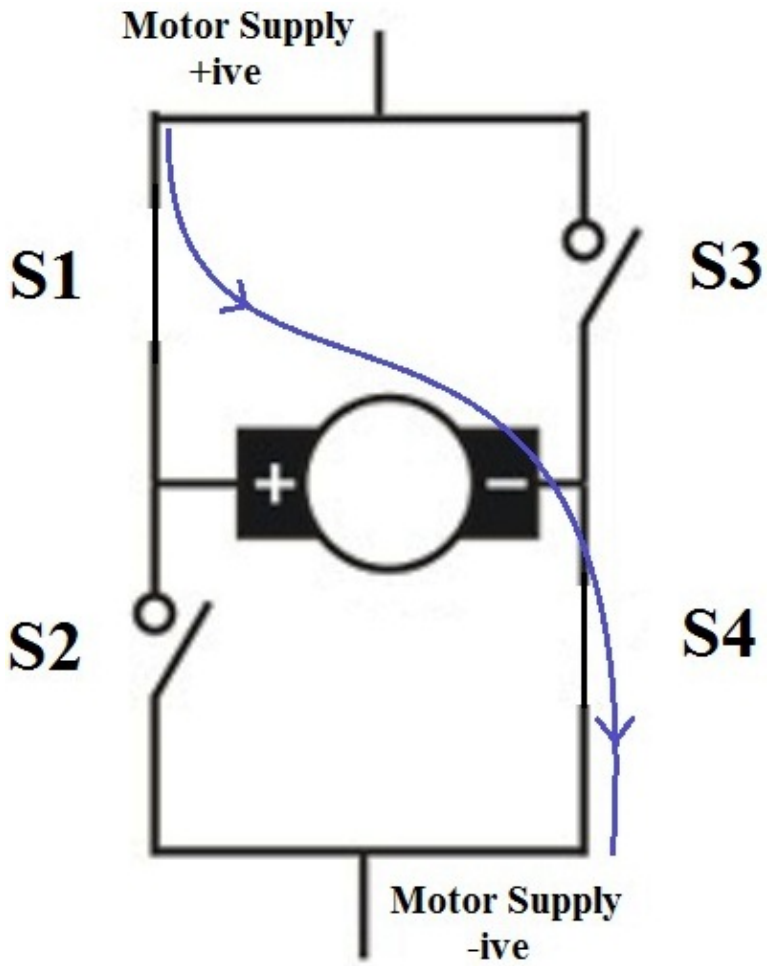
H-bridge

The H-bridge

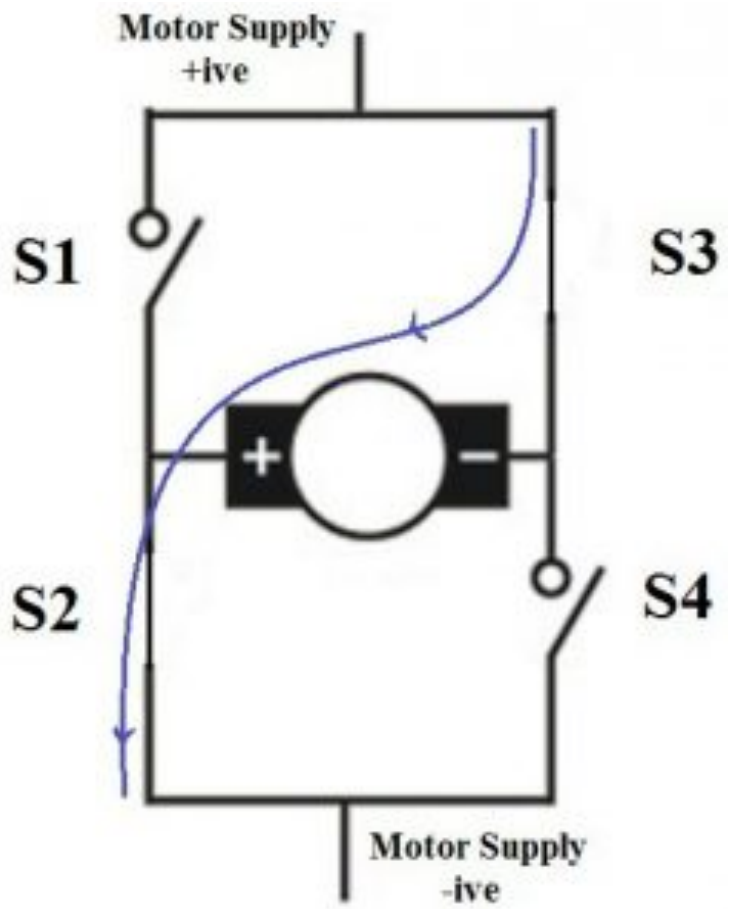
- The H-bridge is an electronic switching circuit
- Enables a voltage to be applied across a motor (or anything else) in either direction



H-bridge control motor direction

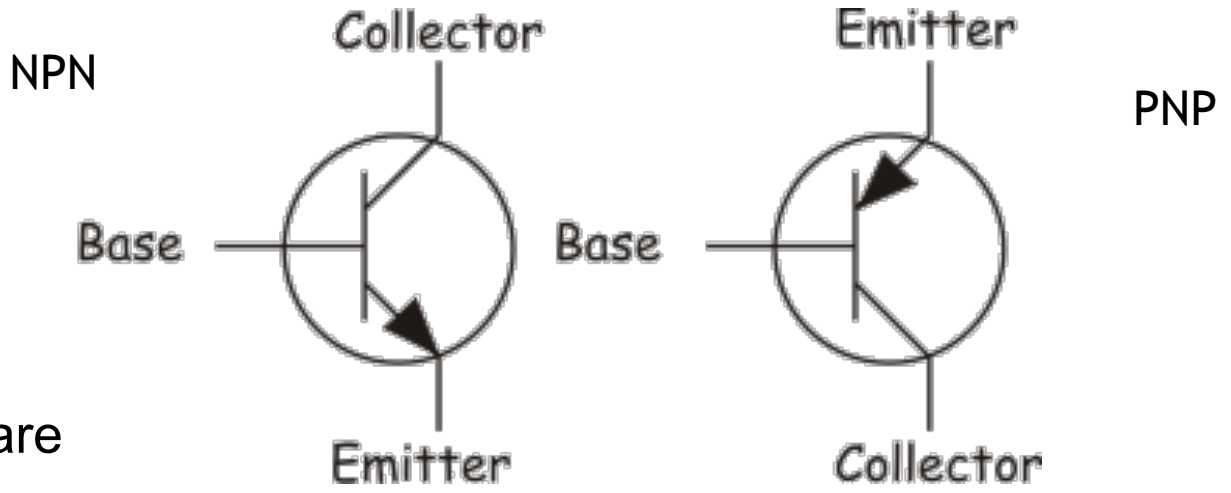


When switches S1 and S4 are switched on, motor runs in, say, clockwise direction

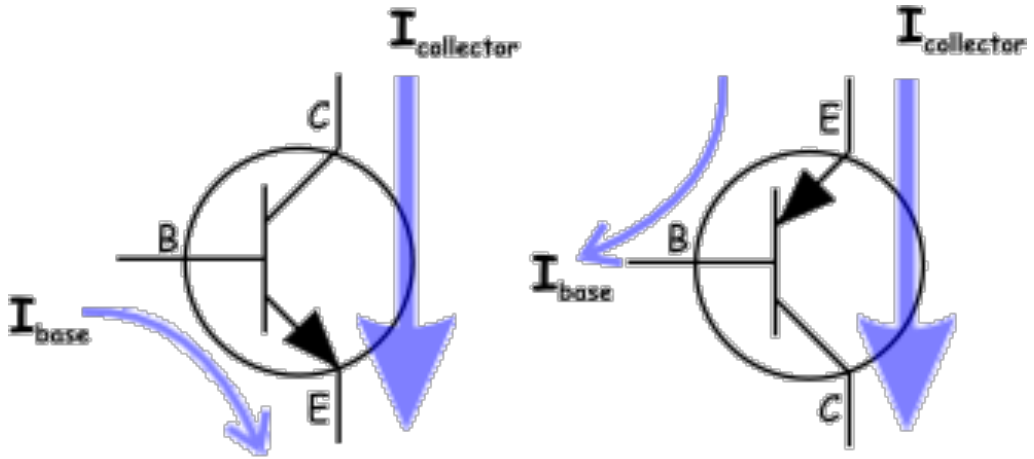


When S2 and S3 are switched on, motor runs in anticlockwise direction.

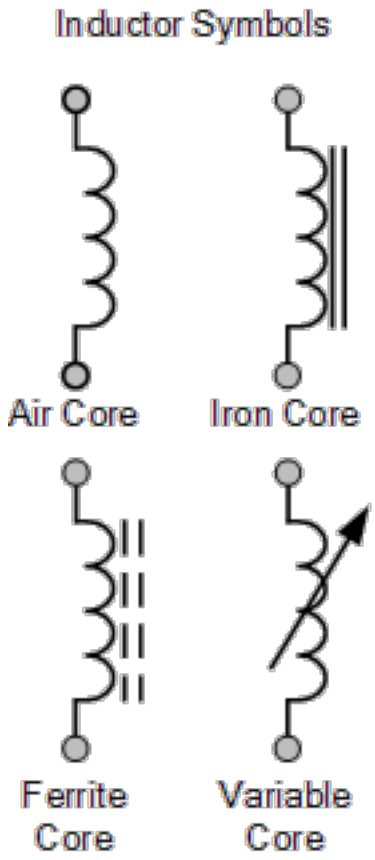
Using junction transistors as switches

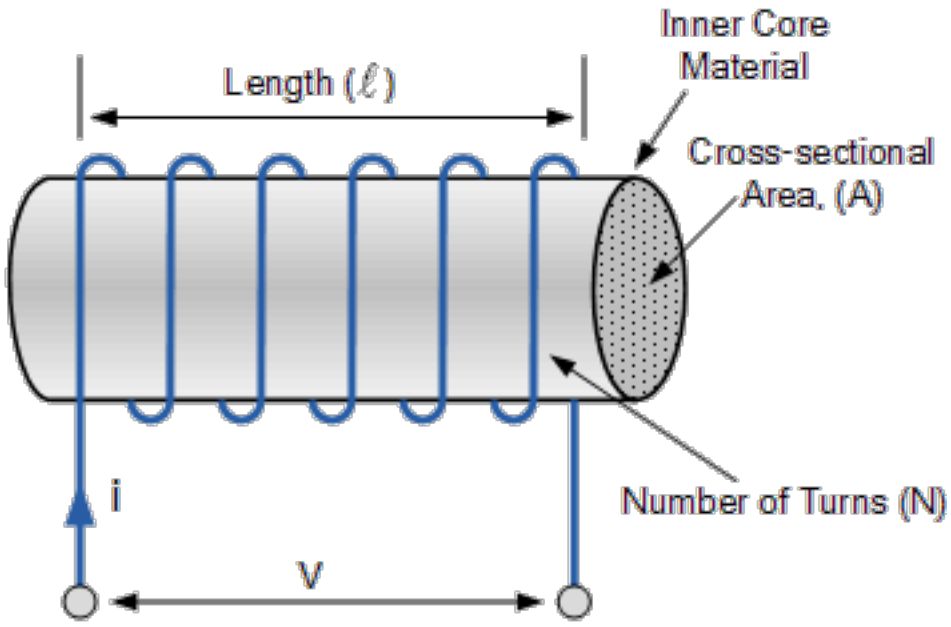


- In practice the switched are realized using transistors
- Either BLTs or FETs



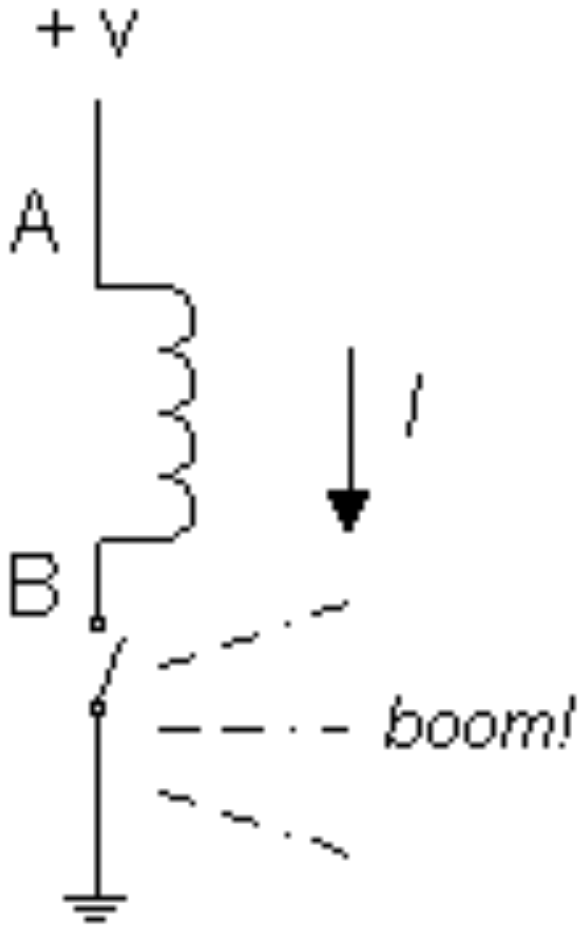
Motor inductance



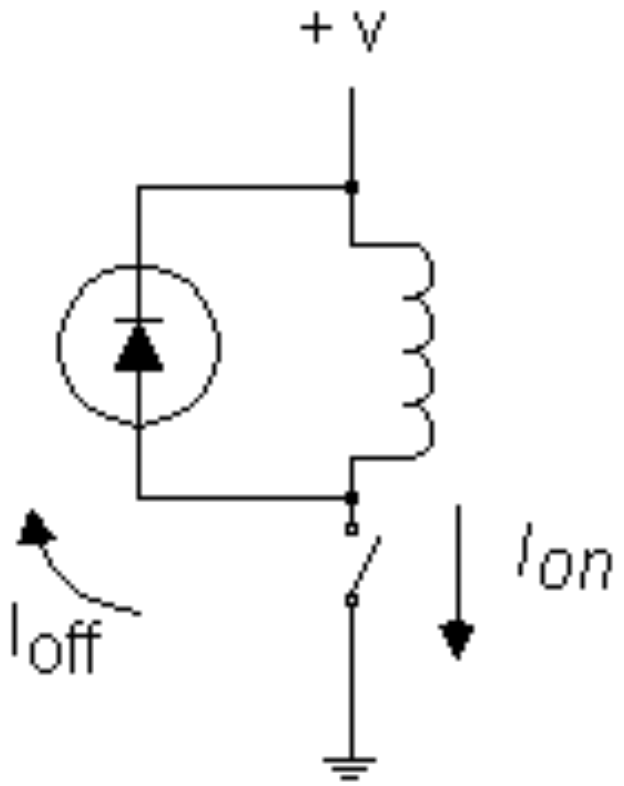


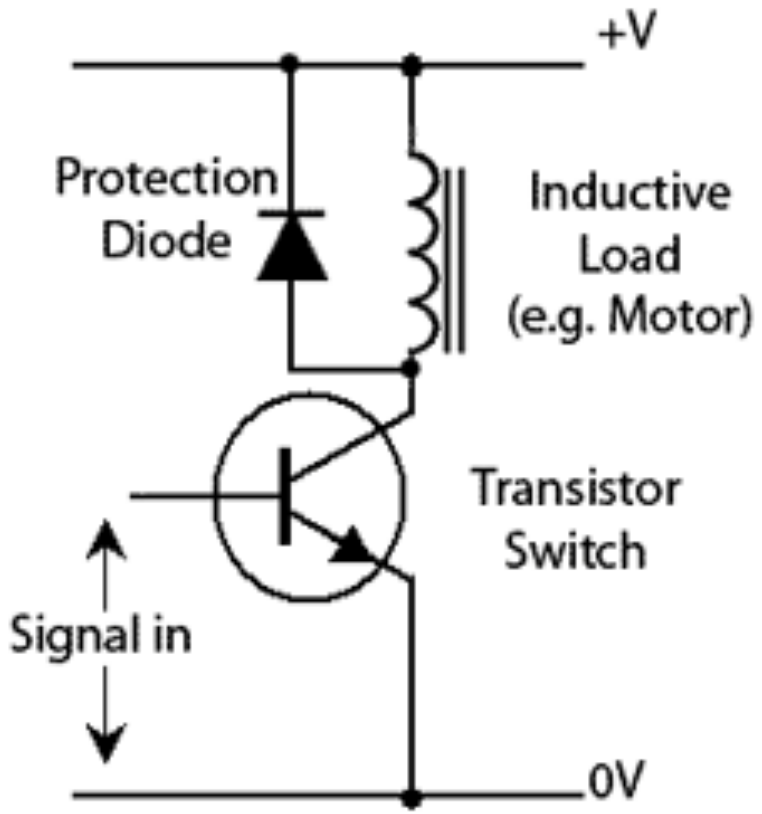
Back EMF when current abruptly switched off

- We must take care switching inductive loads – such as those arising from the coils in motors
- If we have inductance present then:
  $V = L \, di/dt$
- If a current i is flowing flows through an induction we abruptly switch it off, di/dt will be large
- Therefore we will experience a large back induced voltage



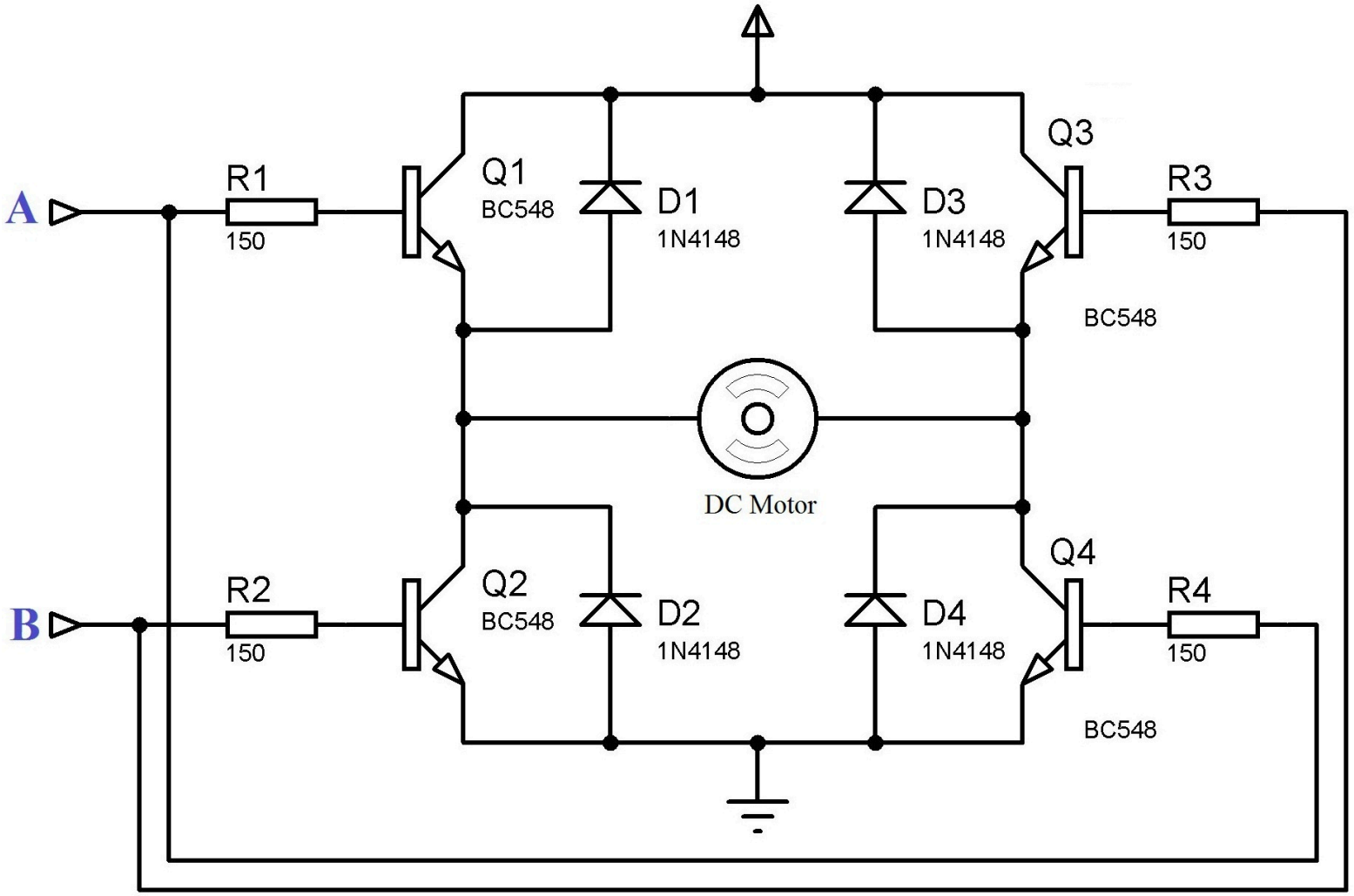
Diode protection against back EMF





- Need to protect the drive circuit using a diode across the inductive load
- This shorts out the coil when we which it off and keeps the reverse voltage across the coil to a low and safe value

Simple transistor H-Bridge



H-Bridges are available off-the shelf

- You don’t need to build your own circuits from transistors etc.
- There are many commercially available hobby motor driver controller

- These are suitable for microcontrollers such as Arduino

- This H-bridge uses the L298 dual H-bridge motor driver