

# Relays



Mechanical relay



Miniature relay



Reed relay

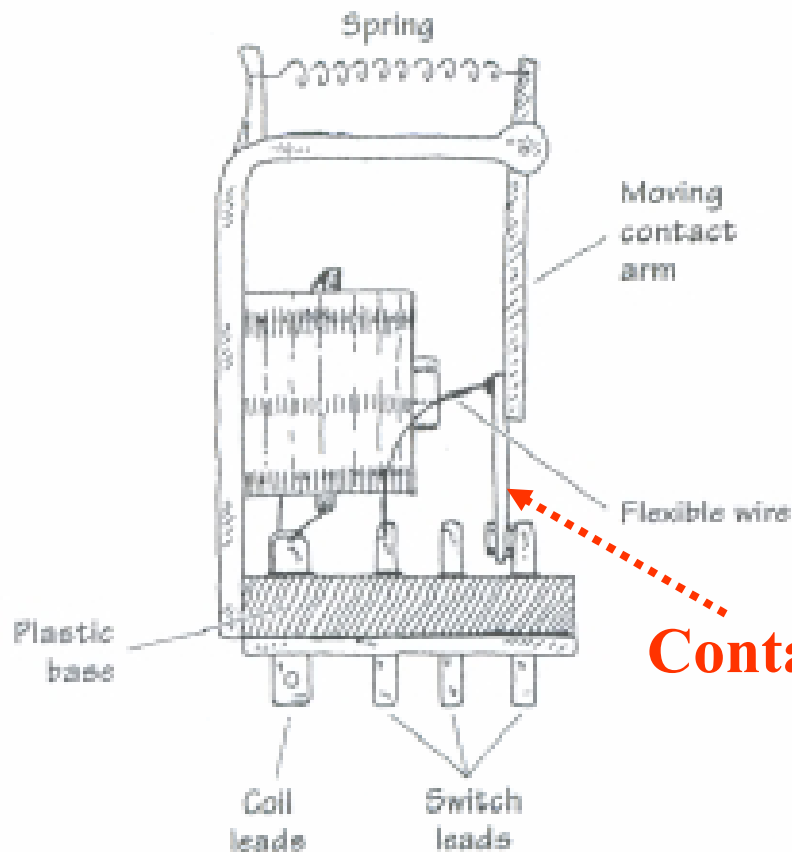
- Relays are electrically actuated switches
  - Mechanical relays
  - Reed relays
  - Solid-state relays
- A relay consists of an electromagnetic coil and one or more pairs of contacts



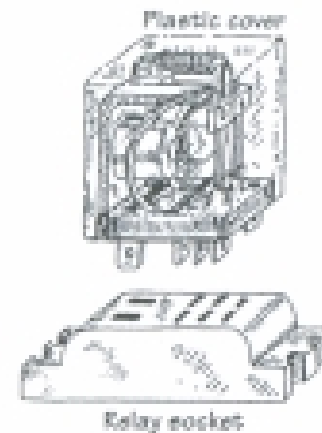
Solid-State relay

# Mechanical Relays

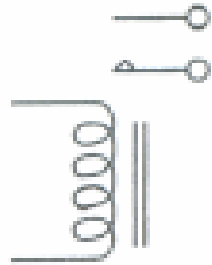
- Designed for high currents
  - Typically from 2A to 15A
- Relatively slow switching
  - 10ms to 100ms



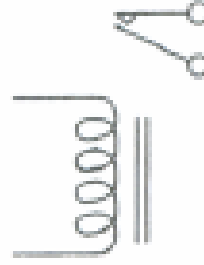
**Contact switch**



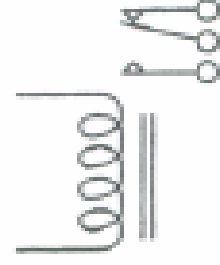
# Common Symbols for Relays



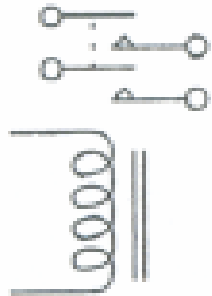
SPST (normally open)  
Single Pole, Single Throw



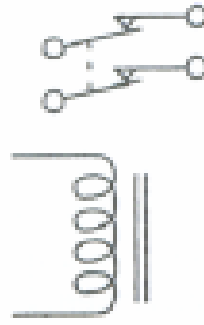
SPST (normally closed)



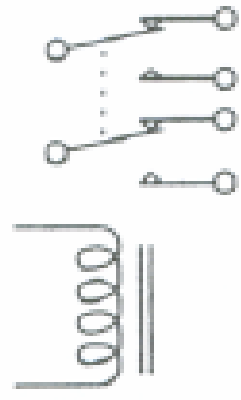
SPDT



DPST (normally open)



DPST (normally closed)

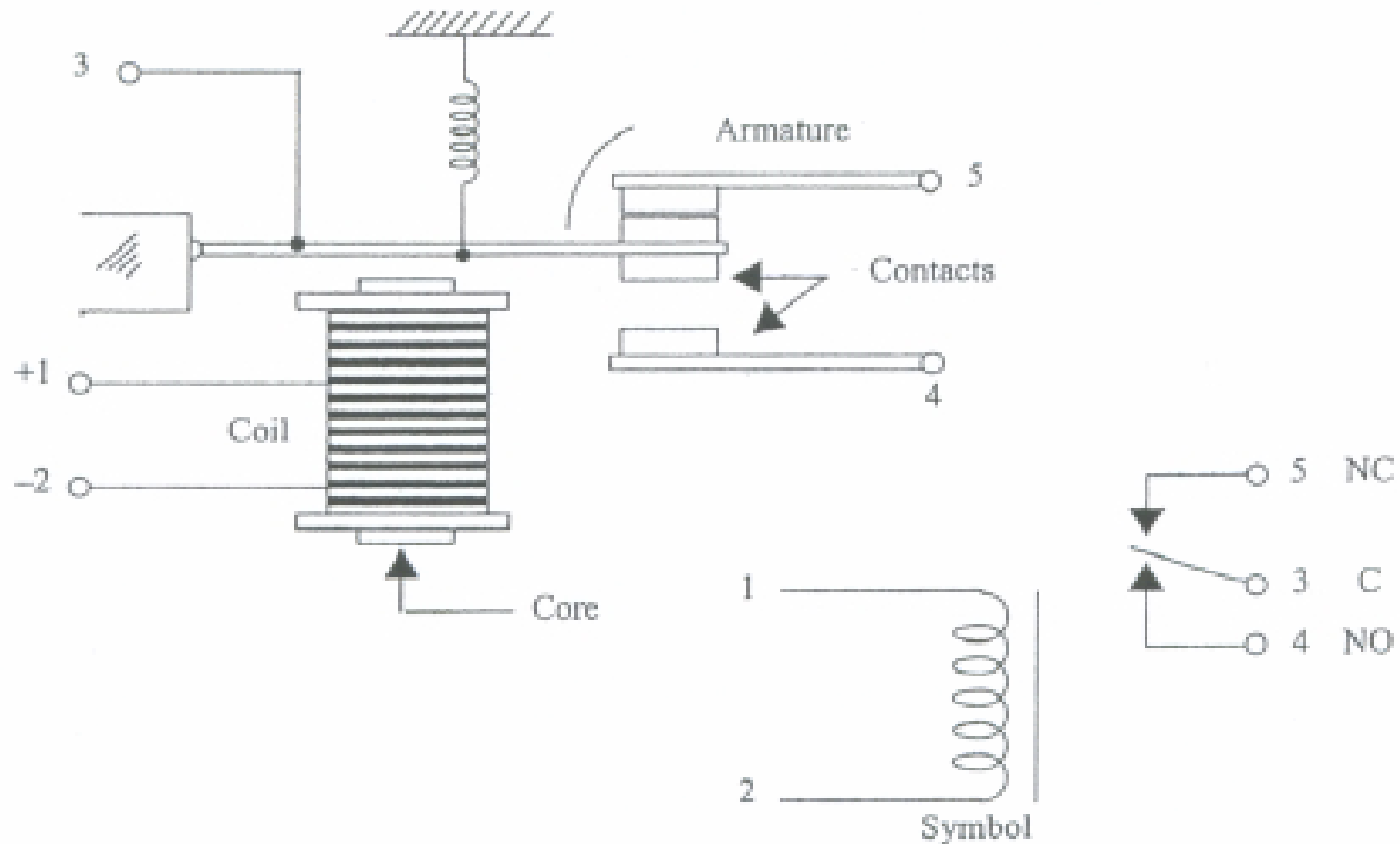


DPDT

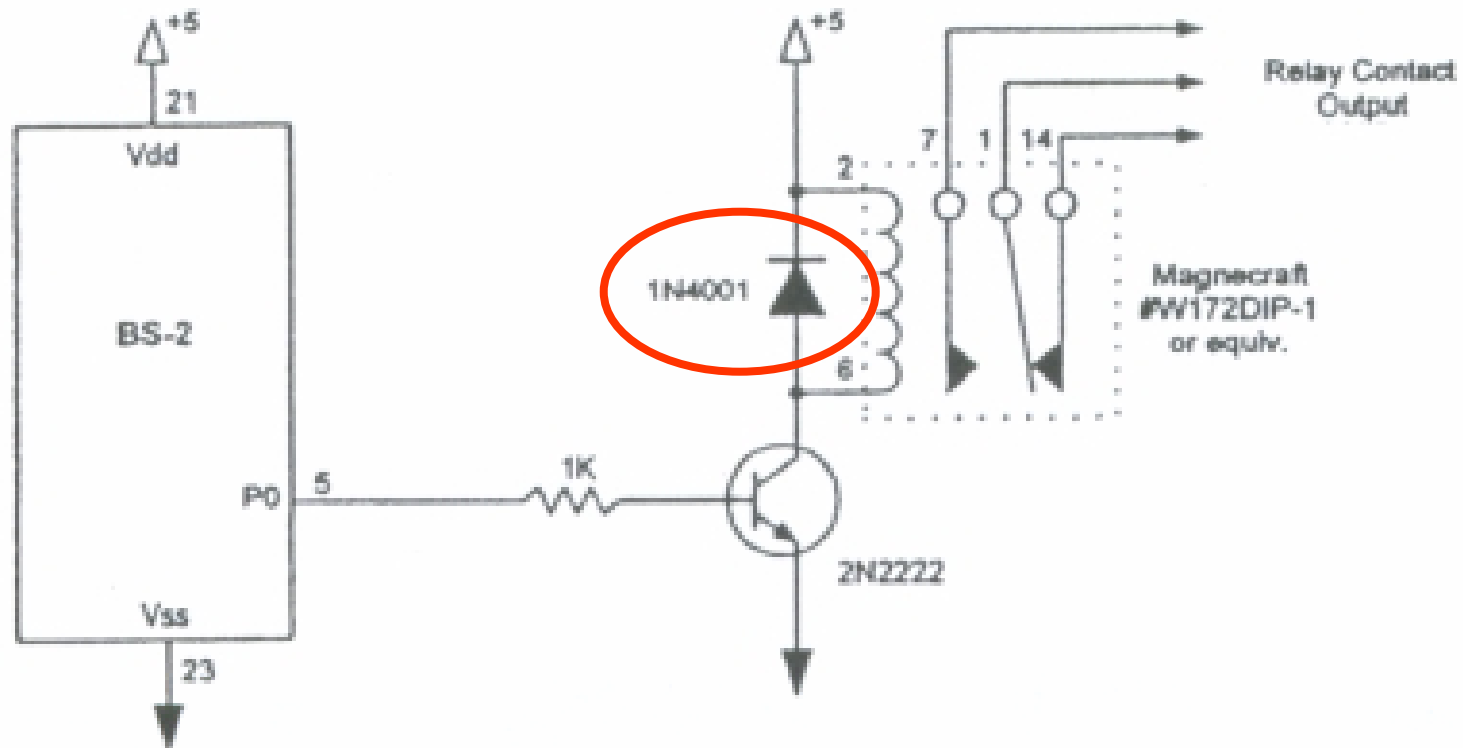
# Notes About Relays

- To make a relay change states, the voltage across of its magnetic coil should be at least within  $\pm 25$  percent of the relay's specified control voltage rating ( $V_c \pm 0.25 \times V_c$ )
- Sudden changes in current will create voltage spike, to avoid this is to use transient suppressors

# Electromechanical Relay

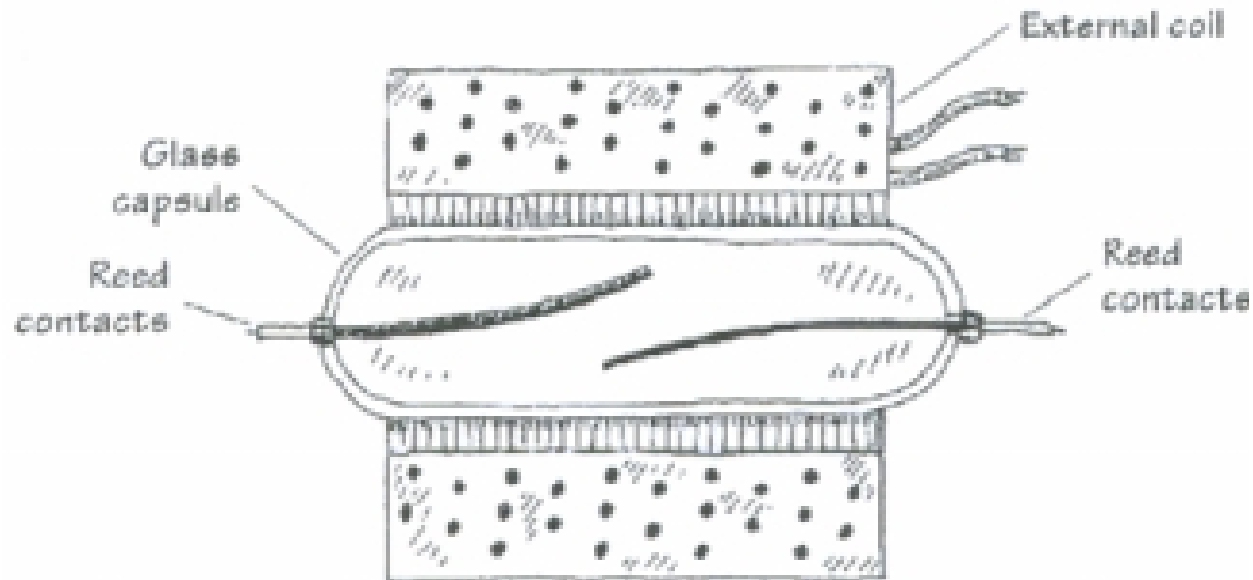


# Relays with BS2

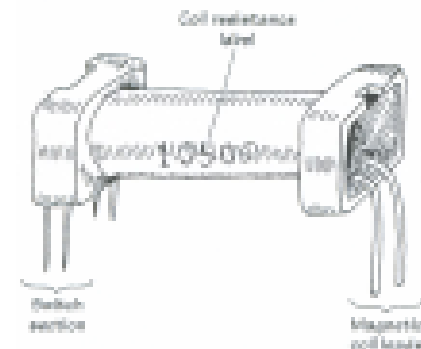


Using an NPN transistor to drive a relay

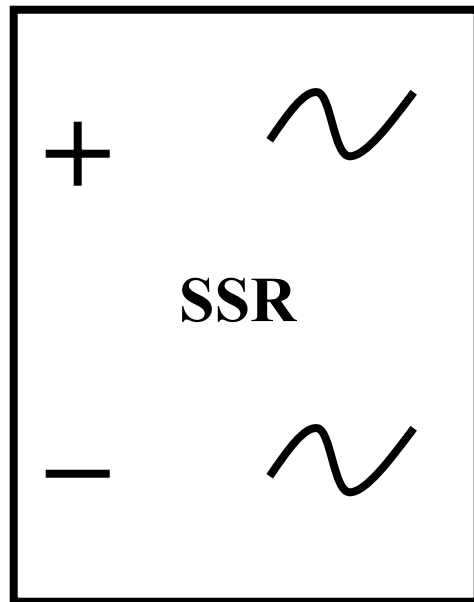
# Reed Relays



- Designed for moderate currents
  - Typically from 500mA to 1A
- Moderately fast switching
  - 0.2ms to 2ms



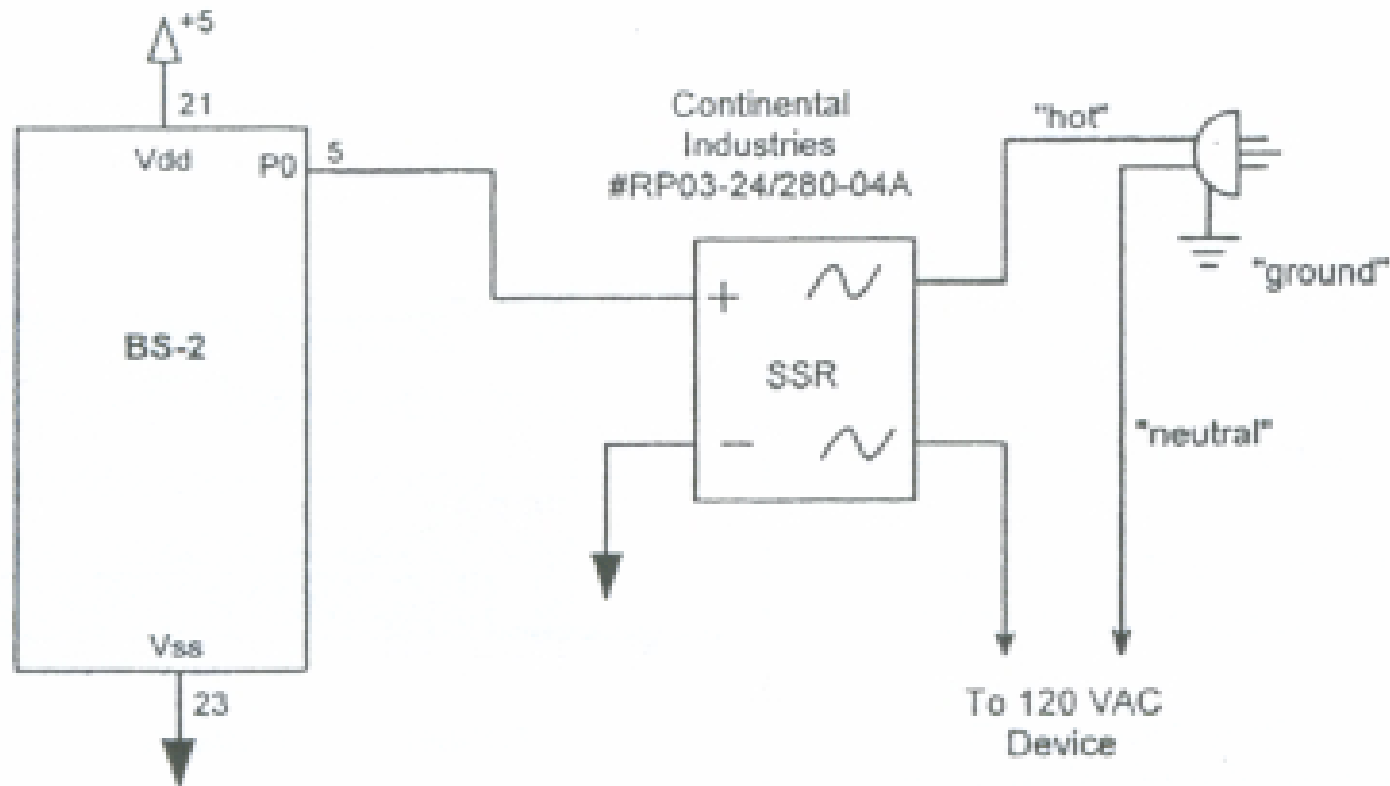
# Solid State Relays



- Wide range of current ratings
  - from a few  $\mu\text{A}$  to 100A
- Extremely fast switching
  - 1 to 100 ns



# Solid State Relay with AC



**Extremely caution with 120V AC !!**