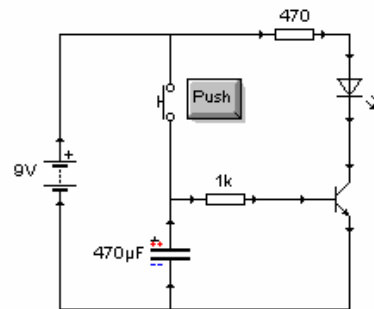


# Capacitors

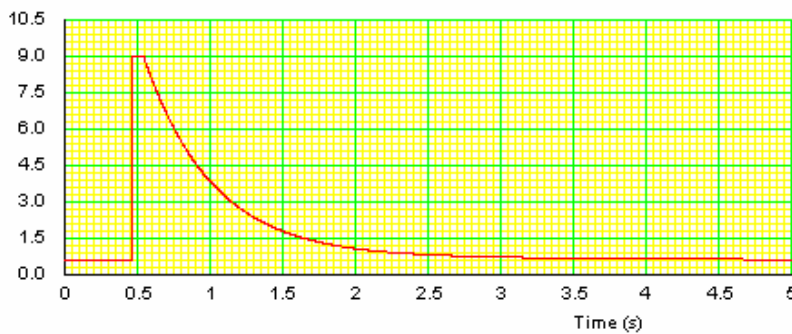
Capacitors store charge – a 1 Farad capacitor charged to 1volt holds enough charge to supply 1amp current for 1second (at 1volt). In practice 1 Farad is very large and we use capacitors with values measured in microfarads uF, nanofarads nF, and picofarads pF. 1uF=1000nF and 1nF=1000pF.

Capacitors basically consist of two conductors separated by an insulator. The insulator can be all sorts of things resulting in lots of different types of capacitors. Large value capacitors are generally electrolytic and so are polarized – must be used the correct way round.

We can use a capacitor to change an instantaneous push switch into a timed switch. The capacitor will charge quickly when the switch is pressed and the high voltage will turn the transistor on. When the switch is released the capacitor will discharge slowly through the transistor's base resistor. When the capacitor has discharge sufficiently the transistor will turn off again.



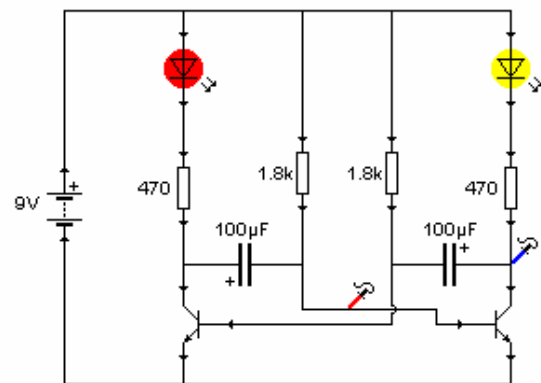
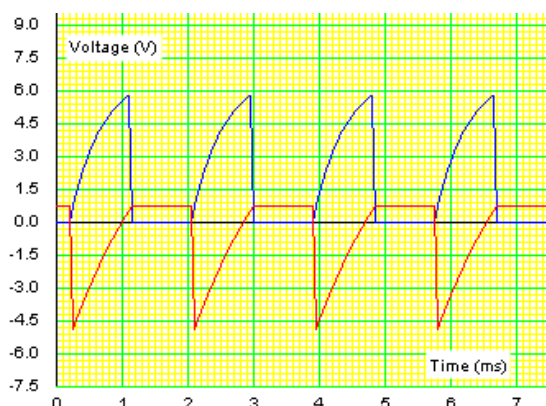
Voltage (V)



The voltage across the capacitor will look like this. This shows the typical discharge curve.

The time constant for the capacitor and base resistor is  $T=R \times C$  and so is about 0.5 seconds. We reckon the capacitor will be fully discharged after 5 time constants (2.5s here).

You can use this charging and discharging to make an oscillator as shown here. The capacitors and 1.8k resistor set the charging rate and hence the period and frequency of the oscillator.



Transistor astable