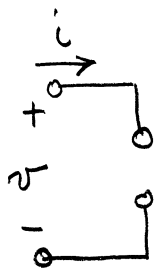
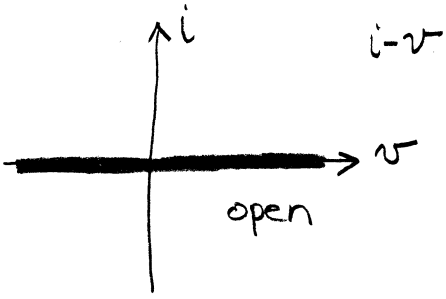
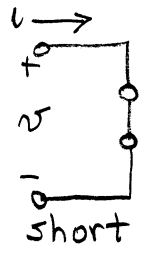
Open and short circuits, switches



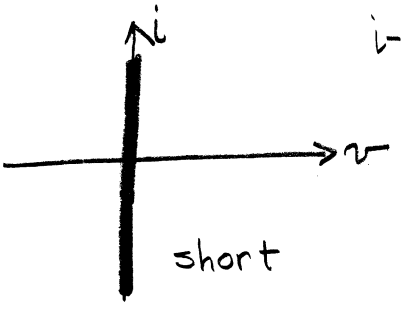
open



i-v characteristic

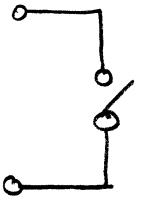


short



i-v characteristic

ideal switch



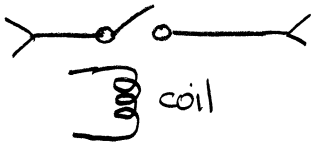
open position
(OFF)

closed position
(ON)

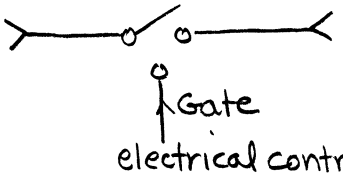
Actual switches have limitations

- maximum current
- maximum voltage
- mechanical actuation (pressure, force)
- operating cycles

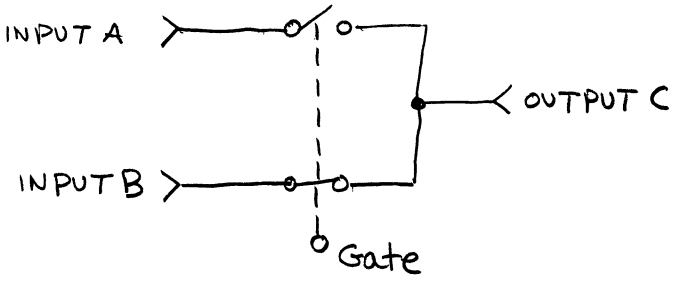
controlled switches
computer controlled switches



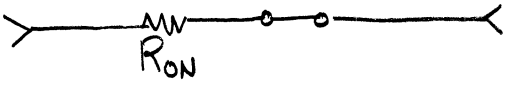
RELAY



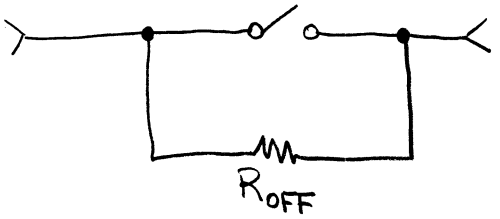
ANALOG SWITCH



MULTIPLEXER (MUX)



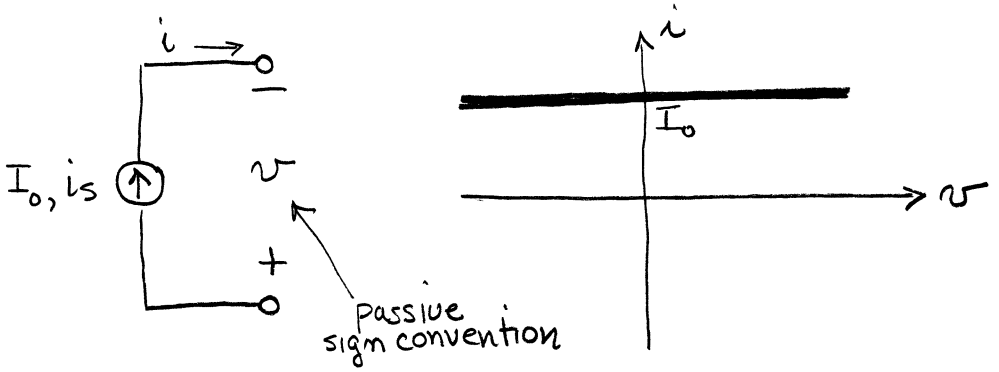
switch model with finite ON resistance



switch model with finite OFF resistance

IDEAL SOURCES

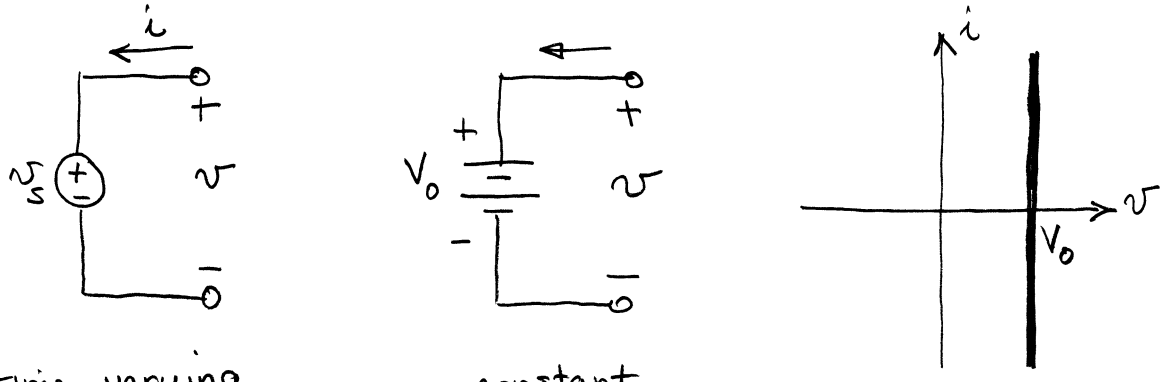
Ideal current source $i(t) = i_s$, v = any value



i_s time varying current source

I_o constant current source

Ideal voltage source



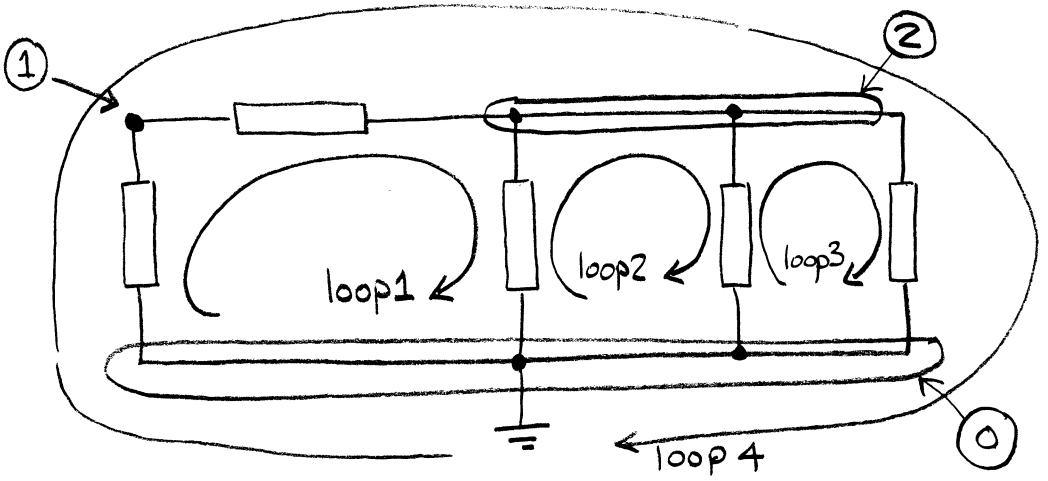
time-varying voltage source

constant voltage source

output from a time varying source is called a forcing function or a driving function

2-2 Connection constraints

- circuit – interconnection of electrical devices
- node – electrical junction of two or more devices
- loop – closed path formed by tracing through an ordered sequence of nodes without passing through any node more than once



This circuit has three nodes. We always number the ground node ø.

There are many possible loops. Four are shown.

symbols