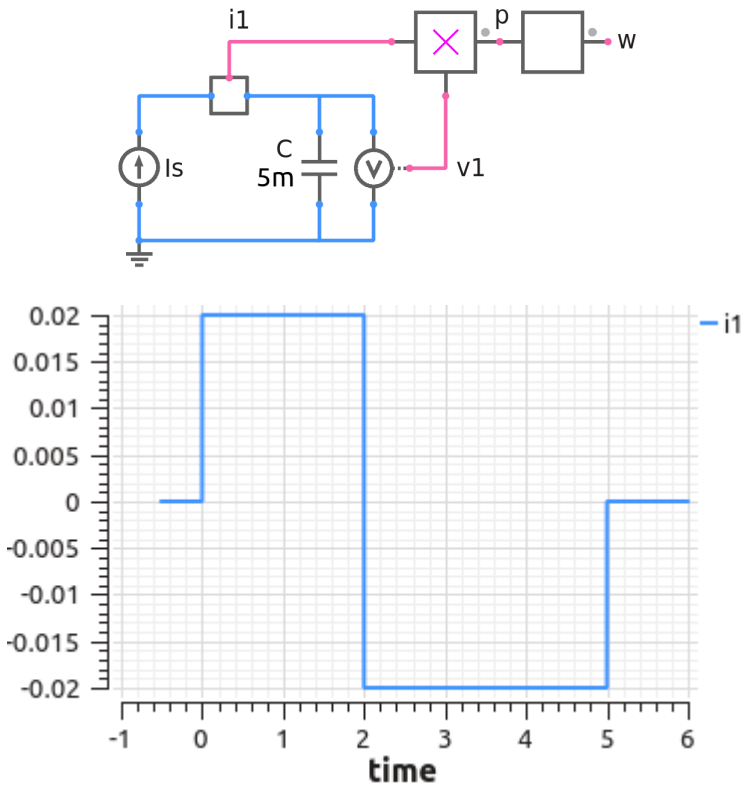
ee101_cap_power.sqproj



This example is meant to illustrate the governing relationship for a capacitor, viz.,

$$i(t) = C\,\frac{dV}{dt}\,, \tag{1}$$

which can be rewritten as

$$V(t) = \frac{1}{C}\int i(t)\,dt\,. \tag{2}$$

The capacitor current $i(t)$ is specified, as shown in the figure. Apart from the current source and the capacitor, other elements are included in the circuit in order to make the capacitor power and energy available for plotting.

Exercise Set

1. Use Eq. 2 to plot $V(t)$, assuming that the capacitor is initially uncharged.

2. Plot the power absorbed by the capacitor $p(t) = v(t) \times i(t)$. Mark regions in which the capacitor is absorbing or delivering power.

3. From $p(t)$, plot the energy stored in the capacitor versus time using $E(t) = \int p(t)\, dt$. Compare with $E(t) = \frac{1}{2} C\, [V(t)]^2$.

4. Compare your plots with simulation results.