
Switched Capacitor Equivalent Resistance

The switch between a capacitor C and two voltage nodes, V_1 and V_2 , can be expressed as an equivalent resistance. The charge in a capacitor is given in:

$$q = CV \tag{D.1}$$

As the capacitor's voltage is switched between values V_1 and V_2 , the charge changes as:

$$\Delta q = C(V_1 - V_2) \tag{D.2}$$

If the charge changes periodically at a period $T = 1/f$, the change in charge over time is:

$$\frac{\Delta q}{T} = \frac{C(V_1 - V_2)}{T} \tag{D.3}$$

Change in charge over time is equivalent to current, so that $I = \frac{\Delta q}{T}$. Because current and change in voltage are known, the equivalent resistance is found as:

$$R = \frac{V_1 - V_2}{I} = \frac{1}{fC} \tag{D.4}$$