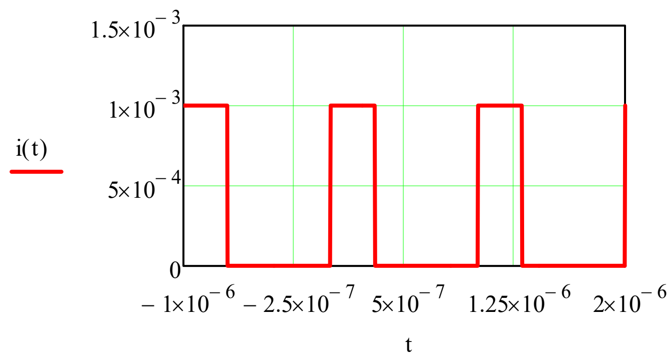
$T_s := 10^{-6}$ $D := 0.3$ $I_{peak} := 10^{-3}$

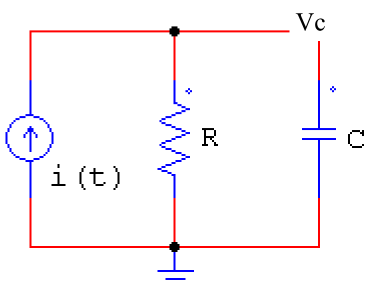
$(0 < D < 1)$

$$i(t) := \begin{array}{|l} \tau \leftarrow \mathrm{mod}(t, T_s) \\ \tau \leftarrow \tau + T_s \;\; \text{if } \tau < 0 \\ i \leftarrow I_{peak} \;\; \text{if } 0 \le \tau < D T_s \\ i \leftarrow 0 \;\; \text{if } D \cdot T_s \le \tau < T_s \\ i \end{array}$$

mod(x, y) Returns the remainder on dividing x by y (x modulo y). Result has the same sign as x.



The current i(t) defined above is used as excitation source for the circuit



$R1 := 1000$

$C1 := 10^{-8}$

Define a voltage for the unknown node Vc(t).
Current in the resistor can be calculated i.R(t)

$$i_{r1}(t) = \frac{V_c(t)}{R1}$$

Kirchoffs current law will give the charging current for the capacitor

$$i_{c1}(t) = i(t) - i_{r1}(t)$$

which then defines an ODE that mathcad can solve

$$\frac{d}{dt}V_c(t) = \frac{1}{C1} \cdot i_{c1}(t)$$

Note that mathcad struggles with units so may be easier to set up without them, but the final result is much easier to understand & modify with them
Also for presentation purposes it is 'neater'

$$t_{end} := 20 \cdot T_s$$

Given

$$\frac{d}{dt}V_c(t) = \frac{1}{C1} \cdot \left(i(t) - \frac{V_c(t)}{R1} \right)$$

$V_c(0) = 0$ Assume capacitor initial voltage is 0V

$$V_c := \text{Odesolve}(t, t_{end})$$