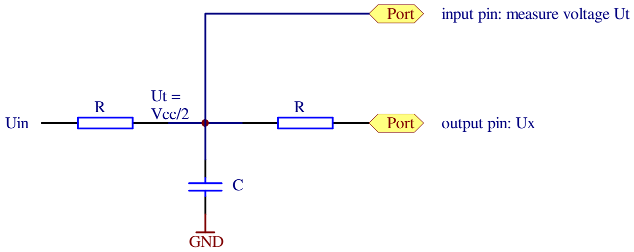
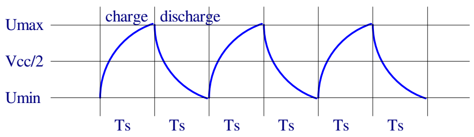


Ut charge/discharge



Umax-Umin = Vcc/(2^N)   N is resolution   Ts is interrupt cycle time

charge (Ux = Vcc)

$Ut(0) = Umin$

$Ut(Ts) = Umin*e^{-K} + (Uin/2 + Vcc/2)*(1 - e^{-K}) = Umax$ (I)

discharge (Ux = 0)

$Ut(0) = Umax$

$Ut(Ts) = Umax*e^{-K} + (Uin/2)*(1 - e^{-K}) = Umin$ (II)

$K = Ts / (C*R/2) = (2^N)*Ti / (C*R/2)$

Calculating I - II

$(Umin - Umax)*e^{-K} + (Vcc/2)*(1 - e^{-K}) = Umax - Umin$

Naming Umax - Umin to Uripple

$(Vcc/2)*(1 - e^{-K}) = Uripple*(1 + e^{-K})$

$e^{-K} = (Vcc/2 - Uripple)/(Vcc/2 + Uripple)$

substituting K and solving for RC

$R*C = 2*Ts / \ln((Vcc/2 + Uripple)/(Vcc/2 - Uripple))$

Optimum value for R*C

We want Uripple to be less than Vcc/(2^N)

Substituting Uripple = Vcc/(2^N)

$R*C = 2*Ts / \ln((2^N + 2)/(2^N - 2))$

N	1 / ln((2^N + 2)/(2^N - 2))
8	64
9	128
10	256
11	512
12	1024
13	2048
14	4096
15	8192

From the table follows

$1 / \ln((2^N + 2)/(2^N - 2)) = 2^{(N-2)}$

$R*C = Ts*2^{(N-1)}$