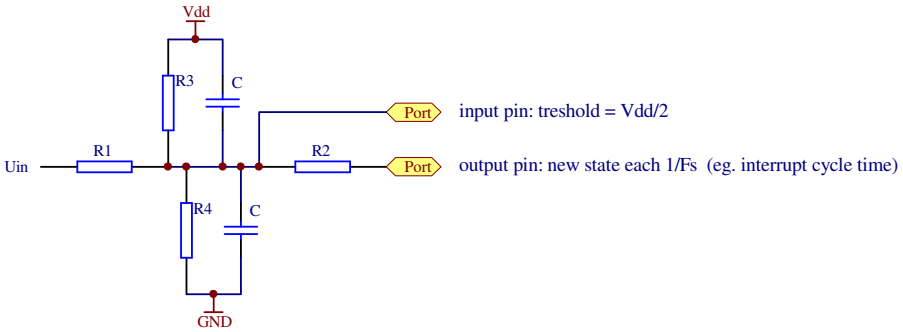

Design Equations

$$Uinmax = \frac{Vdd}{2} * \left[1 + \frac{R1}{R2} - \frac{R1}{R3} + \frac{R1}{R4}\right]$$

$$Uinmin = \frac{Vdd}{2} * \left[1 - \frac{R1}{R2} - \frac{R1}{R3} + \frac{R1}{R4}\right]$$

$$Uinmax - Uinmin = Vdd * \frac{R1}{R2}$$

Step 1

Select Uinmax, Uinmin and R1 and calculate R2

$$R2 = \frac{Vdd}{Uinmax - Uinmin} * R1$$

$$Uinmax + Uinmin = Vdd * \left[1 - \frac{R1}{R3} + \frac{R1}{R4}\right]$$

Step 2

If (Uinmax + Uinmin) > Vdd

$R3 = \infty$ (eg. leave R3 out)

$$R4 = \frac{Vdd}{(Uinmax + Uinmin) - Vdd} * R1$$

$$Rp = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R4}} = \frac{Vdd}{2*Uinmax} * R1$$

If (Uinmax + Uinmin) < Vdd

$R4 = \infty$ (eg. leave R4 out)

$$R3 = \frac{Vdd}{Vdd - (Uinmax + Uinmin)} * R1$$

$$Rp = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}} = \frac{Vdd}{2*Vdd - 2*Uinmin} * R1$$

If (Uinmax + Uinmin) = Vdd

$R3 = \infty$ (eg. leave R3 out)

$R4 = \infty$ (eg. leave R4 out)

$$Rp = \frac{1}{\frac{1}{R1} + \frac{1}{R2}} = \frac{Vdd}{Vdd + Uinmax - Uinmin} * R1 = \frac{Vdd}{2*Uinmax} * R1$$

Step 3

Check Uinmax and Uinmin for bit resolution N

Uinmax must comply to :

$Uinmax < 2^{N-1} * (Uinmax - Uinmin)$

Uinmin must comply to :

$Uinmin > Vdd - 2^{N-1} * (Uinmax - Uinmin)$

Step 4

Calculate C for sample frequency Fs and bit resolution N

$$C = \frac{2^N}{4 * R2 * Fs} * \frac{1}{1 + \frac{1}{3} * k^2}$$

$$k = \frac{R2}{2^N * Rp}$$ (note: k < 1 if step 3 succeeded)

Step 5

Calculate total conversion time Tc

$$Tc = \frac{2^N}{Fs}$$