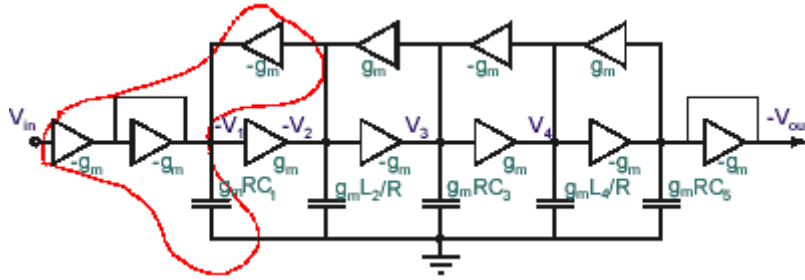


# gm-C Filter Design Sheet

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[sunshadow.co.uk/chris.htm](http://sunshadow.co.uk/chris.htm)



This sheet is used to design the gm-C filter shown above, called a leapfrog realisation. This filter is a 5th order filter. The method I have used is to design from the filter g-coefficients, which can be obtained from a variety of methods including a program freely available from my web page. I have included some simulation results at the end.

The design equations are from the IEE book "design of high frequency analog filters" Y. Sun, and lecture notes from Saska Lindfors, Aalborg university

Yellow is user input, Green is output

## Main user input area:

First get the g values, these are for a filter with 0.2dB ripple, Chebychev, N = 5. This design works only for odd values of N.

$$g := (1 \quad 1.339 \quad 1.337 \quad 2.166 \quad 1.337 \quad 1.339 \quad 1) \quad F_c := 20 \cdot \text{MHz} \quad g_m := 0.1 \frac{\text{mA}}{\text{V}}$$

## Calculate Values

The maths for this filter turns out to be remarkably easy.  
 For smaller capacitors you need to use a lower gm,  
 but this means the load impedance needs to be higher

$$N := \text{cols}(g) \quad n := 1, 2 \dots N - 2$$

$$C_n := \begin{cases} g_m \cdot \frac{g_{0,n}}{2 \cdot \pi \cdot F_c} & \text{if } \left( n - 2 \cdot \text{trunc}\left(\frac{n}{2}\right) \right) > 0.5 & \text{Odd.} \\ g_m \cdot \frac{g_{0,n}}{2 \cdot \pi \cdot F_c} & \text{if } \left( n - 2 \cdot \text{trunc}\left(\frac{n}{2}\right) \right) < 0.5 & \text{Even.} \end{cases}$$

$C_n =$	
1.066	pF
1.064	
1.724	
1.064	
1.066	

