Diseñar un filtro pasa bajos de segundo orden Chebyshev 3 dB con una ganancia unitaria y una frecuencia de corte de 1 Hz.

Chebyshev 3 dB

n	
1	$(s+1.002)$
2	$(s^2+0.645s+0.708)$
3	$(s+0.299)(s^2+0.299s+0.839)$
4	$(s^2+0.411s+0.196)(s^2+0.170s+0.903)$
5	$(s+0.178)(s^2+0.287s+0.377)(s^2+0.110s+0.936)$
6	$(s^2+0.285s+0.089)(s^2+0.209s+0.522)(s^2+0.07s+0.955)$
7	$(s+0.126)(s^2+0.228s+0.204)(s^2+0.158s+0.627)(s^2+0.056s+0.966)$
8	$(s^2+0.217s+0.050)(s^2+0.184s+0.321)(s^2+0.123s+0.704)(s^2+0.043s+0.974)$

Para n=2, se obtiene que: a = 0.645 y b = 0.708

$$C_{1n} = \frac{a \pm \sqrt{a^2 + 8\,b\,(k-1)}}{4\,b} = \frac{0.645 + \sqrt{(0.645)^2 + 8\,0.708\,(1-1)}}{4\,(0.708)} = 0.45\,F$$

$$C_{2n} = \frac{1}{b\,C_1} = \frac{1}{(0.708)\,0.45} = 3.1\,F$$

Renormalización:

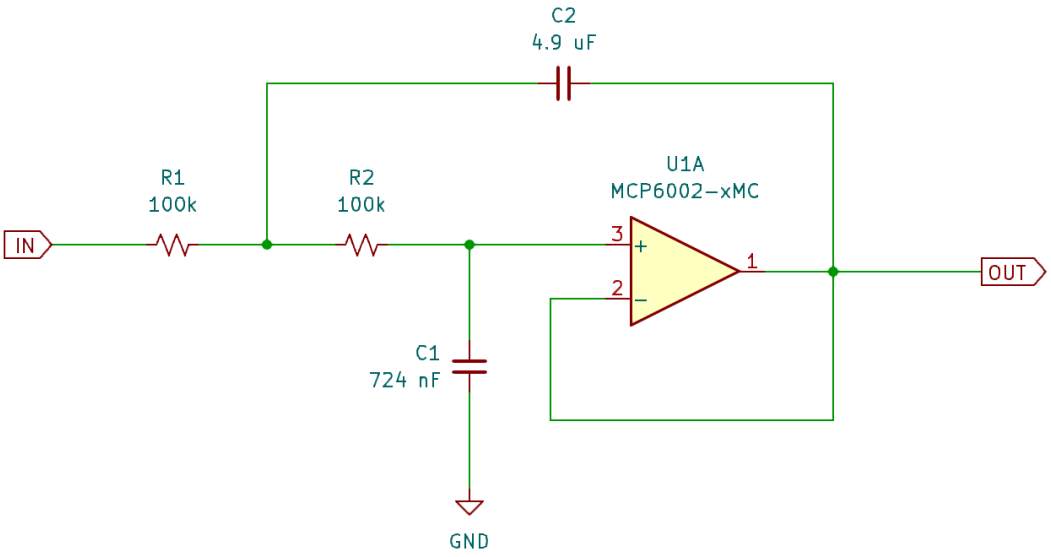
$$ISF = 10^5$$

$$FSF = \frac{\omega_1}{\omega_n} = \frac{2\,\pi\,f_1}{1} = 2\,\pi\,1 = 2\,\pi$$

$$R = ISF\,R_n = 10^5\,1\Omega = 100\,\text{k}\Omega$$

$$C_1 = \frac{C_{1n}}{ISF\,FSF} = \frac{0.45\,F}{2\,\pi\,10^5} = 724.15\,nF$$

$$C_2 = \frac{C_{2n}}{ISF\,FSF} = \frac{3.1\,F}{2\,\pi\,10^5} = 4.93\,\mu F$$



Diseñar un filtro pasa bajos de segundo orden Bessel con una ganancia unitaria y una frecuencia de corte de 1 Hz.

Bessel

n	
1	$(s+1.000)$
2	$(s^2+3.000s+3.000)$
3	$(s+2.322)(s^2+3.678s+6.459)$
4	$(s^2+4.208s+11.488)(s^2+5.792s+9.140)$
5	$(s+3.647)(s^2+4.649s+18.156)(s^2+6.704s+14.272)$
6	$(s^2+5.032s+26.514)(s^2+7.471s+20.853)(s^2+8.497s+18.801)$
7	$(s+4.972)(s^2+5.371s+36.597)(s^2+8.140s+28.937)(s^2+9.517s+25.666)$
8	$(s^2+5.678s+48.432)(s^2+8.737s+38.569)(s^2+10.410s+33.935)(s^2+11.176s+31.977)$

Para n=2, se obtiene que: a = 3 y b = 3

$$C_{1n} = \frac{a \pm \sqrt{a^2 + 8\,b\,(k-1)}}{4\,b} = \frac{3 + \sqrt{(3)^2 + 8\,3\,(1-1)}}{4\,(3)} = 0.5\ F$$

$$C_{2n} = \frac{1}{b\,C_1} = \frac{1}{(3)\,0.5} = 0.67\ F$$

Renormalización:

$$ISF = 10^5$$

$$FSF = \frac{\omega_1}{\omega_n} = \frac{2\,\pi\,f_1}{1} = 2\,\pi\,1 = 2\,\pi$$

$$R = ISF\;R_n = 10^5\;1\Omega = 100\;\text{k}\Omega$$

$$C_1 = \frac{C_{1n}}{ISF\;FSF} = \frac{0.5\;F}{2\,\pi\;10^5} = 795.77\;nF$$

$$C_2 = \frac{C_{2n}}{ISF\;FSF} = \frac{0.67\;F}{2\,\pi\;10^5} = 1.06\;\mu F$$