General filter theory:

Normalized and real filters:

Normalized filters have cut-off pulsation ω_c=1rad/s at –3dB and impedance Z_c=1Ω. The following equations allow de-normalizing filters to a given frequency and to a given impedance.

Frequency de-normalization:

$$C' = \frac{C}{\omega} \;;\; L' = \frac{L}{\omega} \;;\; R' = R$$

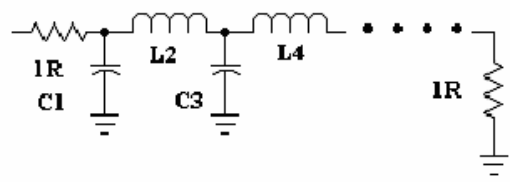
Impedance de-normalization:

$$C'' = \frac{C'}{Z} \;;\; L'' = ZL' \;;\; R'' = ZR'$$

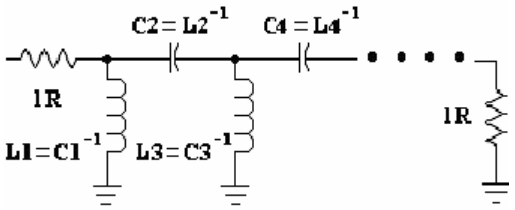
Low-pass to high-pass transformation:

To transform a normalized low-pass filter into a normalized high-pass filter (ω_c=1rad/s at –3dB and Z_c=1Ω) just replace every capacitor with an inductance, and every inductance with a capacitor, using the equations below.

$$C_{hp} = \frac{1}{L_{lp}} \;;\; L_{hp} = \frac{1}{C_{lp}} \;;\; R_{hp} = R_{lp}$$

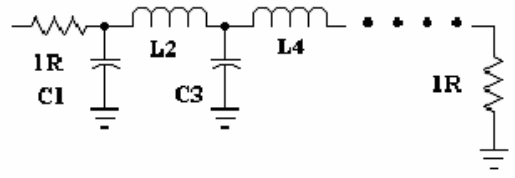


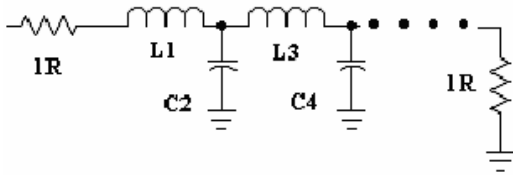
Normalized low-pass filter.



Normalized high-pass filter.

Butterworth normalized filter:





N	C1	L2	C3	L4	C5	L6	C7
N	**L1**	**C2**	**L3**	**C4**	**L5**	**C6**	**L7**
2	1.414	1.414					
3	1.000	2.000	1.000				
4	0.765	1.848	1.848	0.765			
5	0.618	1.618	2.000	1.618	0.618		
6	0.518	1.414	1.932	1.932	1.414	0.518	
7	0.445	1.247	1.802	2.000	1.802	1.247	0.518