π Filter Has Notch Just Outside Passband

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Some applications such as anti-aliasing could benefit from a low pass filter with a notch just outside the passband. The filter shown in Figure 1 is a Cauer or Elliptic type but with a source impedance of zero. Normally these filters as given in texts have a normalized source impedance which results in a –6dB voltage gain. Through trial and error I came up with the coefficients as shown – which is why I call it a π filter.

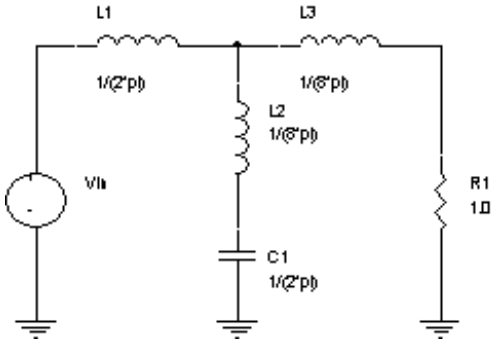

Figure 1. Normalized passive π filter.

This filter has some useful properties as seen in Figure 2.:

- Dc gain is exactly 0dB with no offset and is independent of component tolerances
- Passband is flat with a 1dB peak at about $0.8*f_{ref}$
- Corner frequency f_{ref} is at –0dB
- Notch frequency is exactly $2* f_{ref}$

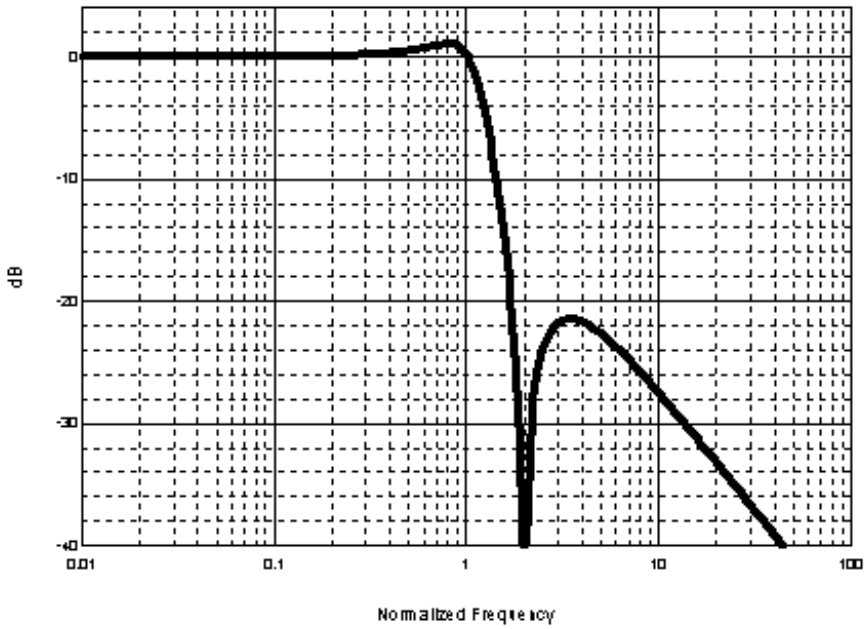

Figure 2. Normalized frequency response.

The “T” configuration was chosen to accommodate conversion to an opamp active filter. The filter is first transformed by multiplying all components by 1/s. Inductors become resistors, resistors become capacitors, and capacitors become frequency dependent negative resistors (FDNR). An FDNR is easily implemented with two opamps. The final filter schematic is shown in Figure 4. Component values and corner frequency are scaled in the normal fashion. All capacitors are equal valued. An output buffer may be needed since the output impedance is high.

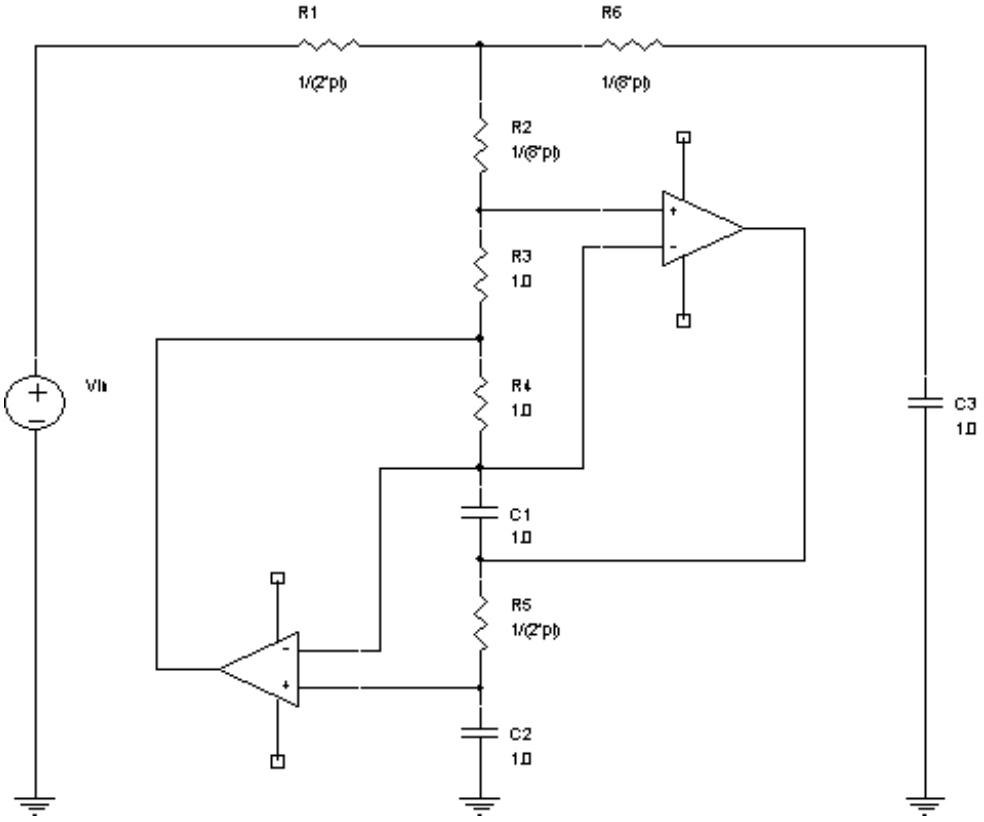

Figure 4. Normalized active filter schematic.