

High-Pass / Low-Pass Continuous Time Filter Module - TAF002-0

- 2nd/ 3rd Order Butterworth, Chebyshev or Bessel Responses

This module, shown in fig. 1, is a Sallen and Key circuit configuration with unity gain in the pass-band. It can be used to realise 3rd order low-pass filters up to 100kHz and 2nd order low-pass filters up to 1MHz with appropriate choice of op-amp. When used as a 2nd order low-pass filter, the 1st R-C stage can be used as a 1st order “roofing” filter to prevent high frequency components getting into the op-amp which are beyond its capability to suppress. This is a single amplifier design with no buffering between the 1st and 2nd order stages (buffered version available on request).

Features

- ▶ Uses a standard SOT23-5 surface mount op-amp, giving a wide and growing choice from low power to high bandwidth / slew rate.
- ▶ Cascadable to form higher order filters when used as 2nd order building blocks (not recommended beyond 6th order with the Sallen & Key realisation)

APPLICATIONS

- Anti-aliasing filter on its own or in conjunction with a higher order switched capacitor filter - for example, our module based on the LTC 1569, 10th order, low-pass, switched capacitor filter chip.
- Reconstruction filter following a digital filter or a switched capacitor filter.

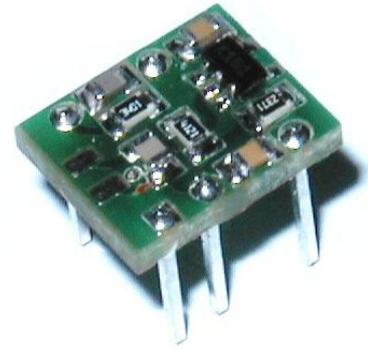


Figure 1: Tirna Electronics 2nd/3rd order Filter Module.

APPLICATION NOTES

Choosing between Butterworth, Bessel and Chebyshev Low-pass filter types

If your main requirement is for a narrow transition band between pass-band and stop-band (sharp cut-off) then you should consider the Chebyshev response. Unfortunately, this sharp cut-off comes at the expense of amplitude ripple in the pass-band and overshoot in the step and pulse responses of the filter. A broad family of Chebyshev filters are obtainable from 0.1dB to 3dB ripple, permitting trade-off between pass-band ripple and overshoot on one hand and corner frequency “sharpness” on the other.

If your main requirement is to preserve pulse shape and / or prevent overshoot in response to a step, then your best choice may be the Bessel filter. Unfortunately the Bessel filter has a poor “knee” shape round the cut-off frequency. Thus its ability to discriminate between a signal just inside its pass-band and one just outside it is poor compared with Chebyshev.

The Butterworth filter is widely accepted a good “all-round” compromise between the extremes of Bessel and Chebyshev.

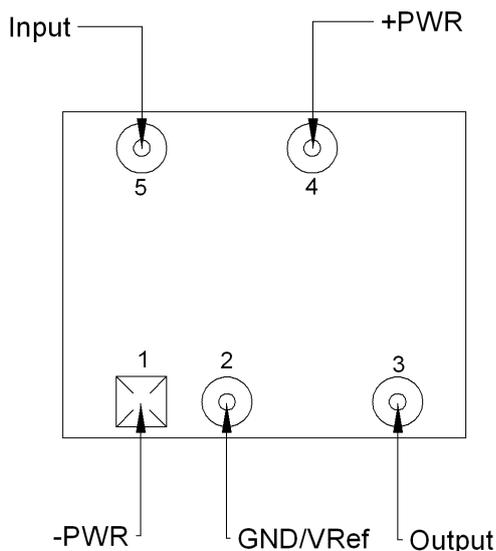
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Pin layout



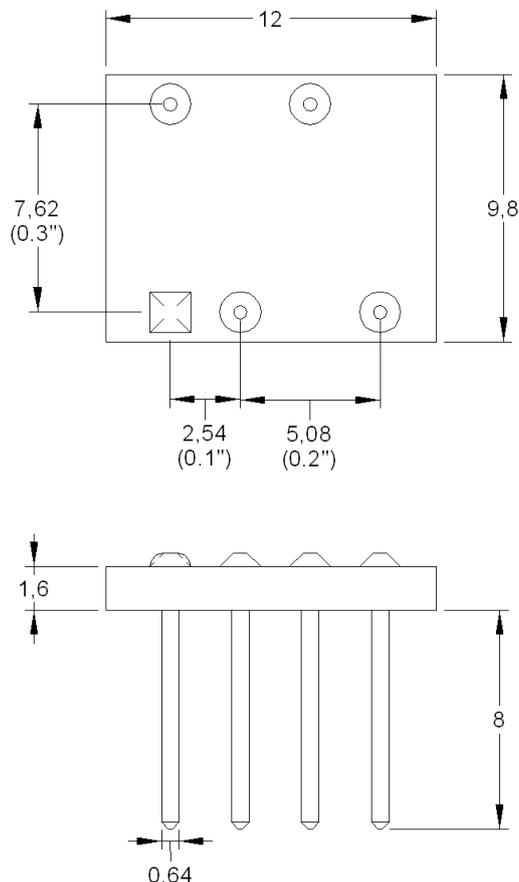
- Pin 1: Negative supply in a dual supply configuration (maximum and minimum values depends on the chosen op-amp.). 0V in single supply configuration.
- Pin 2: Normally ground (0V) with dual supplies but could be connected to a reference voltage other than ground. In the high-pass case this is the voltage at which the output will sit when there is no input so it should be in the middle of the supply range for maximum signal amplitude at the output. However, it could be at any DC voltage you wished to impose your high-pass filtered output, within the limitations imposed by your choice of power supply voltages.
- Pin 3: The filter output. Drive capability depends on the chosen op-amp.
- Pin 4: Positive supply for both single and dual supply configurations. Maximum and minimum values depend on the chosen op-amp.
- Pin 5: Filter Input. DC resistance high – depends on chosen op-amp.

Electrical Specs

Absolute Maximum Ratings

The absolute maximum ratings depend on the components used. In particular, observe op-amp maximum ratings and capacitor maximum DC working voltages.

Dimensions



Dimensions	12 x 9.8 mm
Material	FR4
Thickness	1.6mm
Copper Thickness	35µm (1oz)
Finish	Green Soldermask

Pins:

Material	Phosphor Bronze
Finish	Tin on Nickel
Length (below board)	≈8.00mm
Height (above board)	≈0.5mm
Diameter	0.635mm
Cross-section	Square

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