



AAF-3F

Programmable, 2-Channel Low-Pass Filter Module

Compatible with the AAF-3, AAF-3PCI, and OEM Data Acquisition Systems

Features

- Filter types, 8 pole
 - Elliptic (Cauer)
 - Linear phase
- $\pm 5V$ Input and Output
- Continuously tunable bandwidths from 1Hz to 100kHz
- Active DC compensation
- DC Offset 0.5mV typical

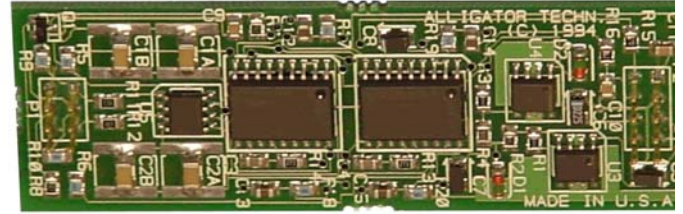
Description

The AAF-3F is designed for use with the AAF-3M and AAF-3MPCI filter boards. The AAF-3F can be used effectively in time domain as well as frequency domain processing. The filter characteristics can be switched from elliptic to linear phase in software making it ideally suited for multiple applications without changing the hardware or the cabling. The AAF-3F is single-ended in and out but when combined with an AAF-3G instrumentation amplifier in an AAF-3 system, differential or single-ended inputs can be accommodated. The AAF-3F supports a wide range of corner frequencies and the standard model can be tuned to any frequency from 10Hz to 50kHz in Linear Phase mode or 10Hz to 100kHz in Elliptic mode. A factory implemented optional modification can broaden the bandwidth down to corner frequencies as low as 1Hz. In the time domain where a small DC offset is critical, the AAF-3F filters include Automatic DC offset correction.

Bandpass filters can be created on an AAF-3 system by combining an AAF-3F low pass filter and the AAF-HP high pass filter.

Filter Types

The AAF-3F can switch between elliptic and a linear phase response on the fly. The bandwidth of the elliptic mode is up



to 100kHz while the bandwidth of the linear phase mode is up to 50kHz. The AAF-2F module when combined with the AAF-3 or AAF-3PCI is suitable for a large range of applications where data is processed in the time domain, frequency domain, or both.

Elliptic (Cauer): The Elliptic filter has ripple in both the pass band and stop band, but provides the fastest transition of any filter type. It has the largest phase non-linearity, especially near the corner frequency. The step response has the largest overshoot and ringing.

Linear Phase: The Linear Phase filter approximates a maximally flat frequency response. The Linear Phase filter's transition band is faster than the Bessel. At $2f_c$ the Bessel filter has 12dB of attenuation, while the Linear Phase has 34dB, and at $3f_c$, the Bessel has 30dB, and the Linear Phase 68dB. The Linear Phase filter is optimized for constant group delay out to about $2f_c$. The time domain response has approximately 5% overshoot with no ringing. The Linear Phase filter is a good choice for a compromise filter that works well in both the time domain and frequency domain. One drawback to the Linear Phase filter is at higher cutoff frequencies the filter amplitude response has up to 1dB of gain. To maintain a given distortion level, the input signal level must be reduced at high cutoff frequencies.

Filter Specifications

	Cutoff Frequency	Passband Performance	Stopband Rejection	Total Wideband Noise	Phase Matching
Elliptic	10 Hz - 100 kHz standard 1 Hz - 100 kHz optional	+0.4dB -0.2dB max, to 0.85 Fc	90 dB Typ.	110 μ VRMS Typ.	$\pm 0.75^\circ$ max up to 0.75Fc
Linear Phase	10 Hz - 50 kHz standard 1 Hz - 50 kHz optional	Group delay $\pm 0.5\%$ max and -1dB droop max at 0.75 Fc, low-freq gain +0.4dB -0.2dB max	90 dB Typ.	90 μ VRMS Typ.	$\pm 0.6^\circ$ max up to 0.75Fc

Alligator Technologies

Input Amplifier

DC offset $\pm 0.4\text{mV}$ typ, $\pm 1.9\text{mV}$ max
 DC offset vs. temperature $< \pm 4 \mu\text{V}/^\circ\text{C}$ typ
 Common-mode rejection 80 dB min, 96 dB typ
 Input voltage $\pm 5\text{V}$ max
 Input protection $\pm 14\text{V}$ max
 Input impedance $10^{12}\Omega$ analog ground
 Input bias current $\pm 7\text{pA}$ type, $\pm 75\text{pA}$ max
 Input offset current $\pm 4\text{pA}$ type, $\pm 50\text{pA}$ max
 Amplifier bandwidth 5MHz typ
 Amplifier slew rate 14 V/ μsec typ, $V_o = \pm 5\text{V}$

Filter Specifications

DC offset, Automatic $< \pm 0.5\text{mV}$ typ. 3.0mV max
 Elliptic Mode Gain $+0.4\text{dB} - 0.2\text{dB}$ max, $+0.25\text{dB} - 0.05\text{dB}$ typ
 Linear Phase Mode Gain $+0.4\text{dB} - 0.2\text{dB}$ max, $+0.25\text{dB} - 0.05\text{dB}$ typ
 Output voltage $\pm 5\text{V}$ max
 Load resistance 1K Ω min
 Output impedance $27 \pm 3 \Omega$

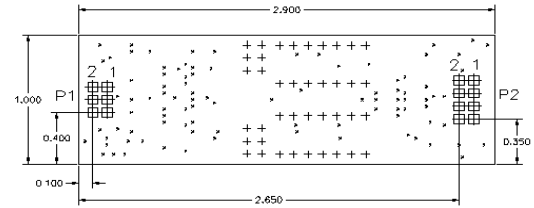
Miscellaneous

Power consumption 60mA at $\pm 12\text{V}$
 Operating temperature 0°C to 70°C

Options

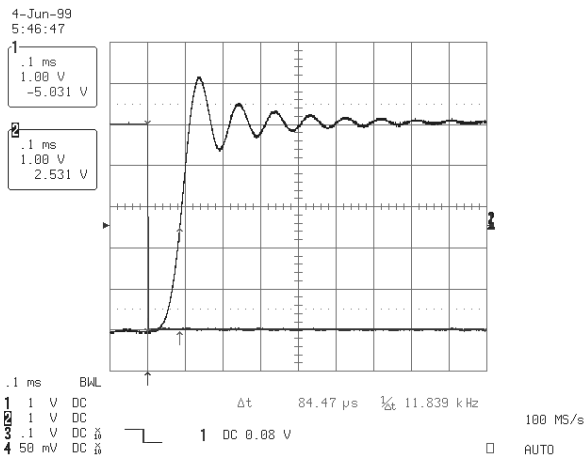
-100 for use with $F_c = 1\text{Hz}$ to 10Hz

Physical Dimensions

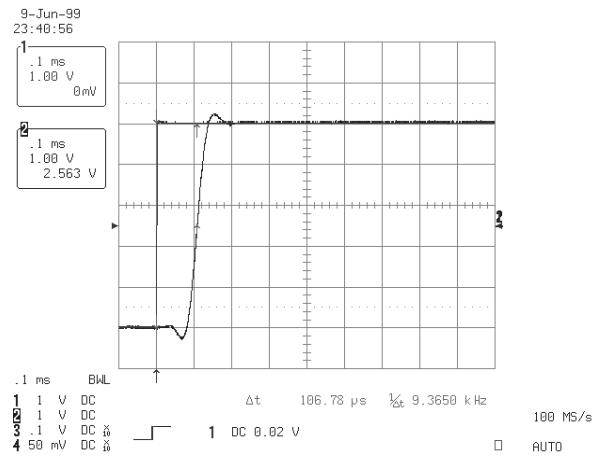


Pin Description

Pin #	Input Connector 0.1" pin	Output Connector
1	In_A_Hi	Agnd
2	In_A_Lo	Out_A_Hi
3	Agnd	Agnd
4	Mode Selection	Out_B_Hi
5	In_B_Hi	+12V
6	In_B_Lo	-12V
7		Filter Clock
8		DGnd



Step Response Elliptic $F_c = 10\text{kHz}$



Step Response Linear Phase $F_c = 10\text{kHz}$

Alligator Technologies