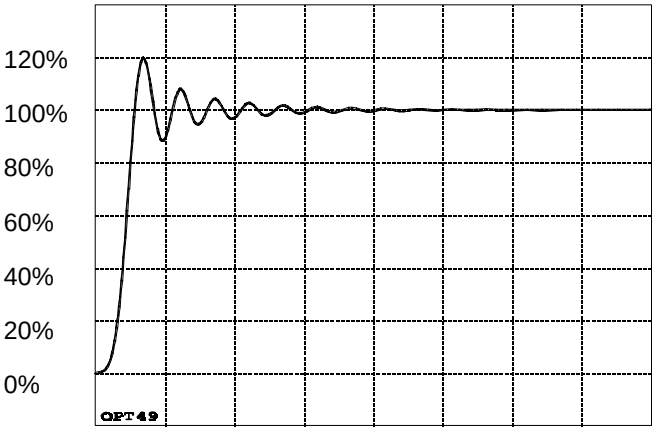
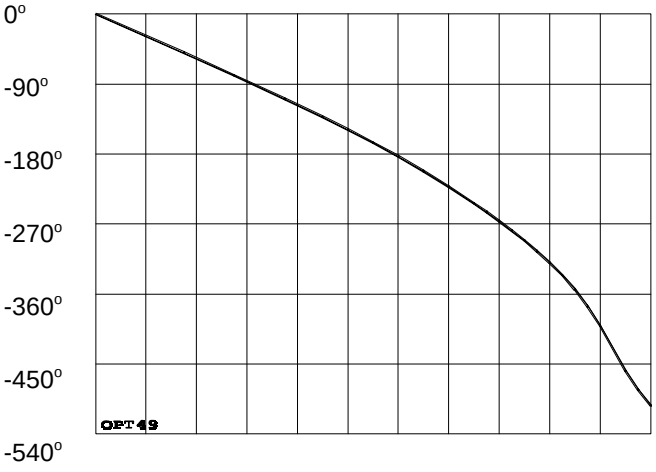
Filter Response: Opt49LP

Figure 1: step response vs. time



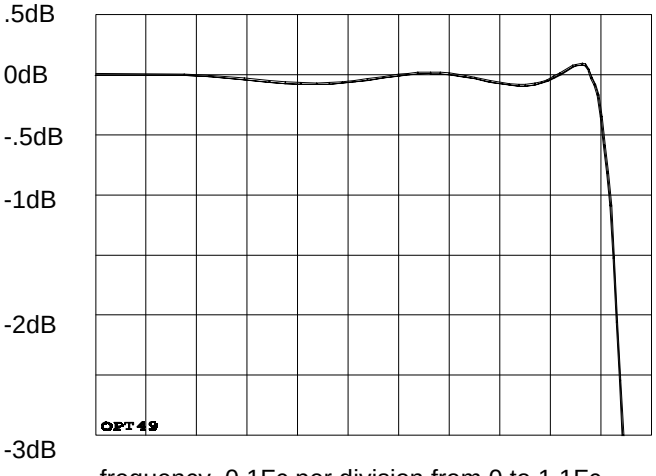
time, 2/Fc per division from 0 to 16/Fc

Figure 2: passband phase response



frequency, 0.1Fc per division from 0 to 1.1Fc

Figure 3: passband amplitude response



frequency, 0.1Fc per division from 0 to 1.1Fc

filter order and type:	n=8 lowpass
basic stopband:	-77dB at 1.5 times Fc
document number:	KT70180
this issue dated:	23 October 1997

Description

The Option 49LP response is a modified elliptic filter; it has a flat passband with ripple of less than ±0.1dB up to the cutoff frequency, and a stopband of -77dB starting at 1.5 times cutoff (figures 3 and 4). The phase response of such filters is quite non-linear (shown in figures 2,6,7 and 9). See figures 1 and 5, and the table overleaf, for details of overshoot and settling behaviour.

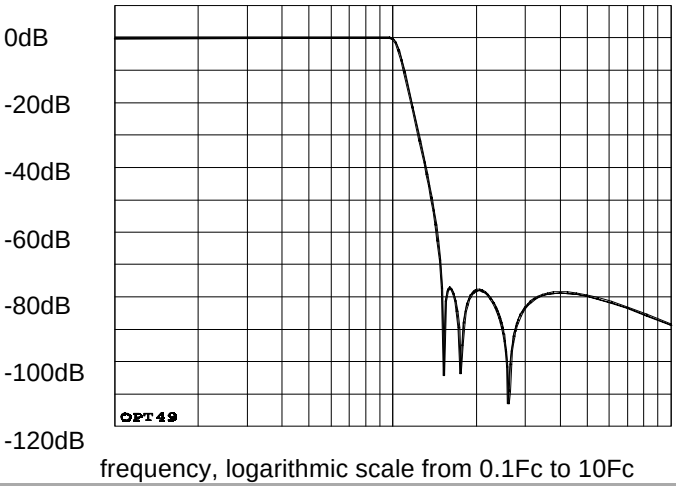
Applications

This response shape has found wide acceptance as an alias protection filter for applications where analysis is carried out in the frequency domain (e.g. FFT analysis), and wide sampled bandwidth is more important than the time history of the waveform. Minimum suggested sample rate is 2.5 times the filter cutoff frequency.

Availability

Option 49LP was designed for, and is primarily used on the VBF10M laboratory filter instrument and the VBF35 multichannel system, though it can be supplied on some other Kemo products. For a similar, industry-standard response on most multi-channel Kemo products, see Option 01LP (document number KT70086).

Figure 4: overall frequency response



frequency, logarithmic scale from 0.1Fc to 10Fc

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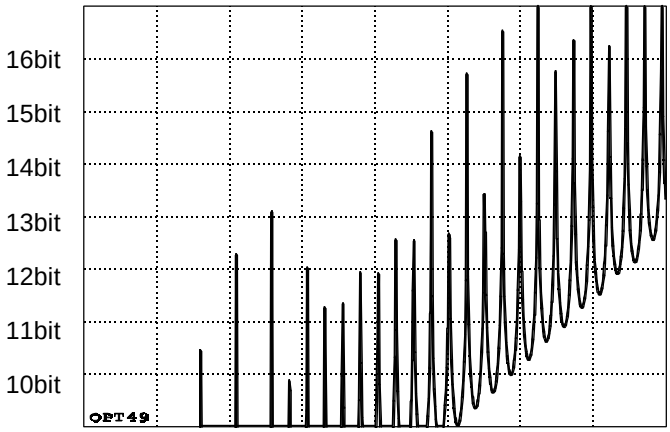
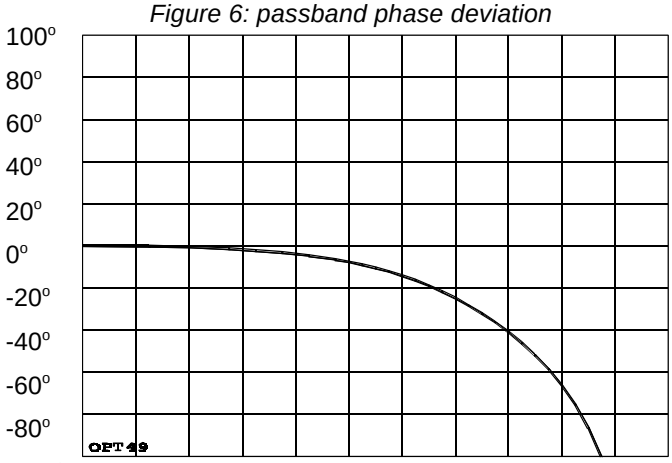
Filter Response

Figure 5: accuracy vs. time



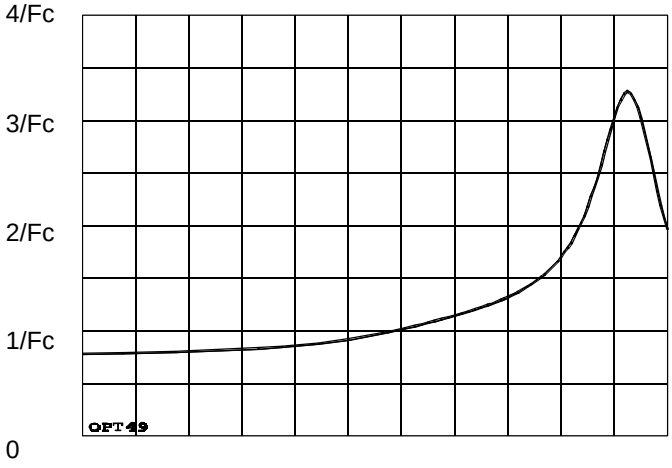
time, 2/Fc per division from 0 to 16/Fc

Figure 6: passband phase deviation



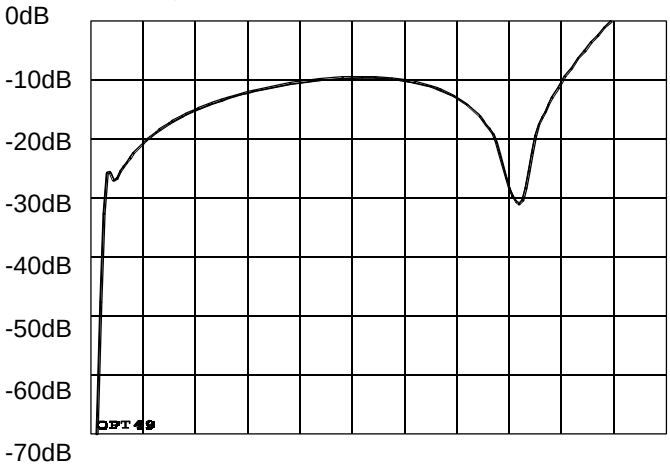
frequency, 0.1Fc per division from 0 to 1.1Fc

Figure 7: passband group delay



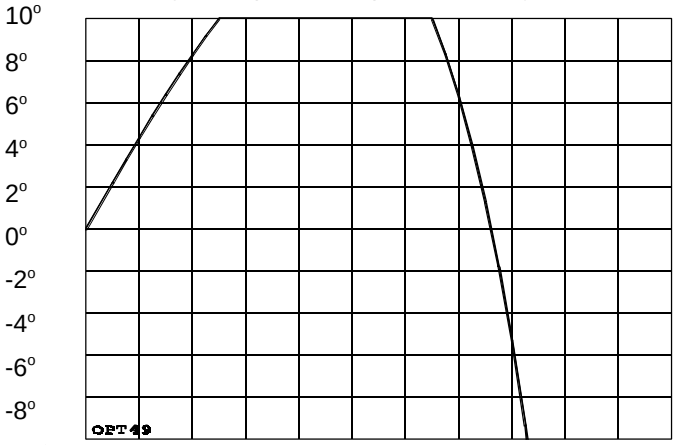
frequency, 0.1Fc per division from 0 to 1.1Fc

Figure 8: vector error



frequency, 0.1Fc per division from 0 to 1.1Fc

Figure 9: passband phase linearity



frequency, 0.1Fc per division from 0 to 1.1Fc

Response information for:	OPT49
stopband response	-77.23dB at 1.525Fc
equivalent attenuation slope	126.84 dB per octave
zero frequency delay	0.7831/Fc
z.f. phase line (used in Figure 6)	-281.92deg x f/Fc
mean phase line (used in Figure 9)	-326.32deg x f/Fc
best phase line (used in Figure 8)	-335.64deg x f/Fc
attenuation: 0.1dB	0.989Fc
0.25dB	0.996Fc
0.5dB	1.005Fc
1dB	1.016Fc
3dB	1.042Fc
6dB	1.068Fc
12dB	1.11Fc
18dB	1.151Fc
24dB	1.194Fc
36dB	1.282Fc
48dB	1.366Fc
60dB	1.438Fc
72dB	1.487Fc
84dB	[2.367Fc]
96dB	[2.544Fc]
overshoot	19.81% at 1.4/Fc
risetime to 0.996Vin	1.142/Fc
approximate settling time to 9 bits	9.9/Fc
add on for each subsequent bit:	1.427/Fc