LP8F & LP8P

PRECISION FILTERS, INC.

8-POLE, 8-ZERO FLAT/PULSE LOW-PASS FILTER

DESCRIPTION

The LP8F and LP8P 8-pole, 8-zero Low-Pass filters together provide the user with the versatility to address applications in either the time or frequency domain. The choice of LP8F or LP8P is programmable in most Precision Filters products that offer this filter characteristic.

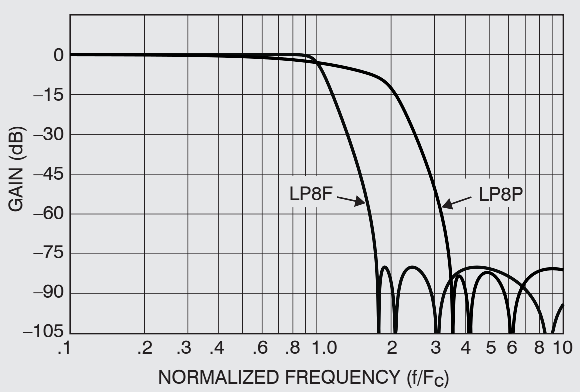
The LP8F is specified to have outstanding pass-band flatness and very sharp roll-off characteristics. The pass-band characteristic is nearly identical to an 8-pole Butterworth yet the LP8F has a much sharper roll-off. The LP8F is a good choice as an anti-aliasing filter and for applications such as spectral analysis. The LP8P has excellent transient response and phase linearity making it an ideal filter for time domain applications including transient (shock) measurements and time domain waveform analysis. The LP8P has frequency domain characteristics superior to the 8-pole Bessel filter. Like the Bessel, the LP8P has a broadly rounded amplitude response that is a consequence of the LP8P's linear phase property.

Cascade an HP8F with an LP8F to form a band-pass filter. If the filters are set with the –0.1 dB frequencies overlapping, the resulting band-pass filter will have 0.2 dB of insertion loss and will provide more than 80 dB of attenuation below 0.487 F_C and above 2.05 F_C.

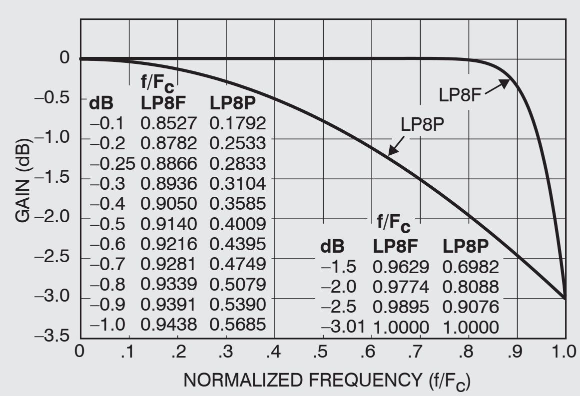
SPECIFICATIONS

	LP8F Maximally Flat Low-Pass Filter	**LP8P Constant Time Delay Low-Pass Filter**
Cutoff Frequency Amplitude	**–3.01 dB**	**–3.01 dB**
DC Gain	**0.00 dB**	**0.00 dB**
Pass-Band Ripple	**0.00 dB**	**0.00 dB**
Stop-Band Frequency:	**1.7479 F_C**	**3.4688 F_C**
Cutoff Frequency Phase	**–360.0°**	**–161.9°**
Phase Distortion (DC to F_C)	**<102.0°**	**<0.05°**
Zero Frequency Group Delay	**0.7197/F_C**	**0.4496/F_C**
Percent Overshoot	**18.9%**	**1.1%**
1% Settling Time	**4.03/F_C**	**1.25/F_C**
0.1 % Settling Time	**7.02/F_C**	**2.25/F_C**
–0.1 dB Frequency	**0.8527 F_C**	**0.1792 F_C**
–1 dB Frequency	**0.9438 F_C**	**0.5985 F_C**
–2 dB Frequency	**0.9774 F_C**	**0.8088 F_C**
–3.01 dB Frequency	**1.0000 F_C**	**1.0000 F_C**
–20 dB Frequency	**1.2152 F_C**	**2.2342 F_C**
–40 dB Frequency	**1.4443 F_C**	**2.7556 F_C**
–60 dB Frequency	**1.6391 F_C**	**3.2016 F_C**
–80 dB Frequency	**1.7479 F_C**	**3.4688 F_C**

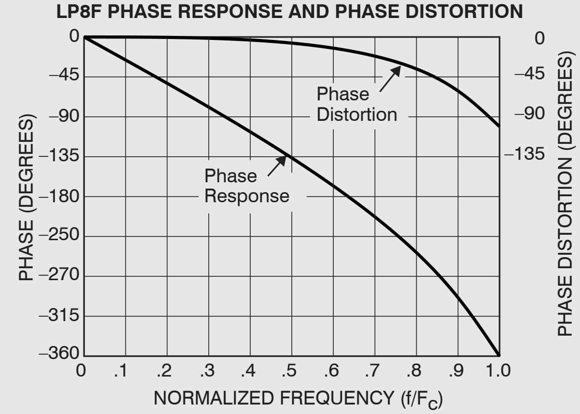
LP8F & LP8P AMPLITUDE RESPONSE



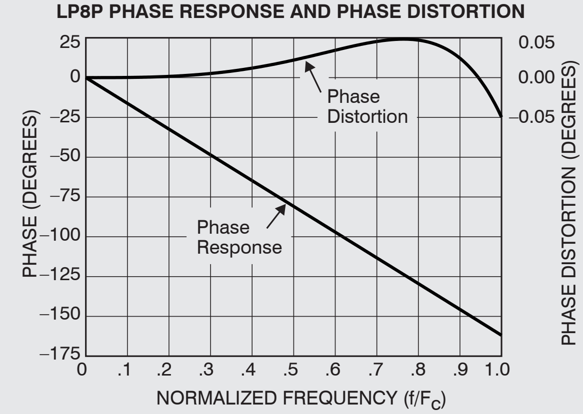
LP8F & LP8P PASS-BAND AMPLITUDE RESPONSE



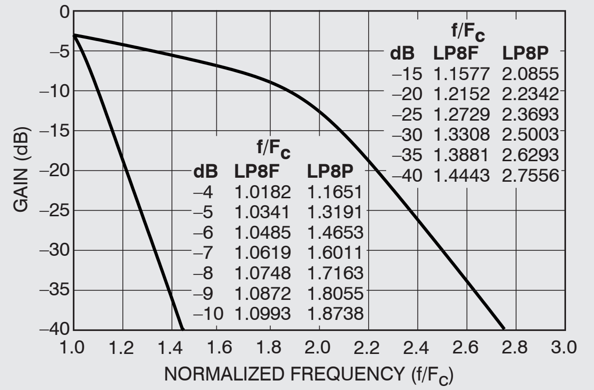
LP8F PHASE RESPONSE AND PHASE DISTORTION



LP8P PHASE RESPONSE AND PHASE DISTORTION



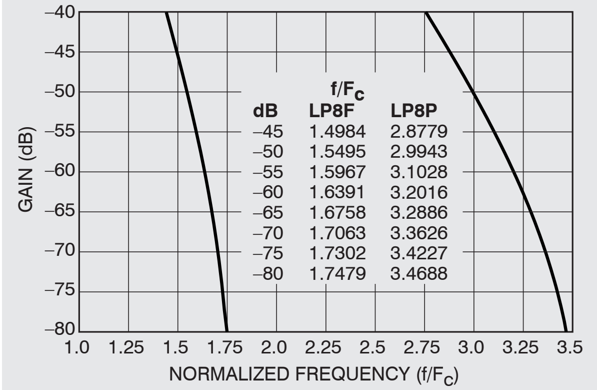
LP8F & LP8P TRANSITION REGION AMPLITUDE RESPONSE



dB	LP8F f/F_c	LP8P f/F_c
–4	1.0182	1.1651
–5	1.0341	1.3191
–6	1.0485	1.4653
–7	1.0619	1.6011
–8	1.0748	1.7163
–9	1.0872	1.8055
–10	1.0993	1.8738

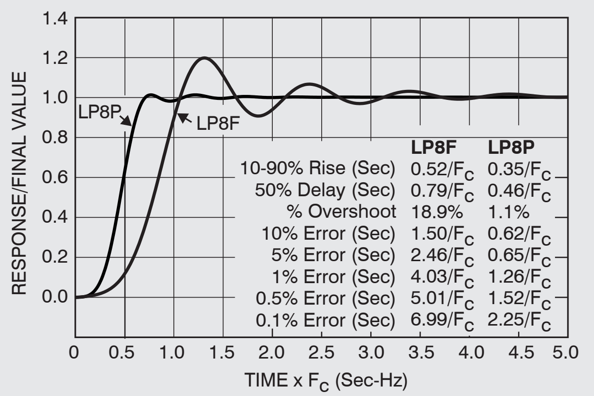
dB	LP8F f/F_c	LP8P f/F_c
–15	1.1577	2.0855
–20	1.2152	2.2342
–25	1.2729	2.3693
–30	1.3308	2.5003
–35	1.3881	2.6293
–40	1.4443	2.7556

LP8F & LP8P TRANSITION REGION AMPLITUDE RESPONSE



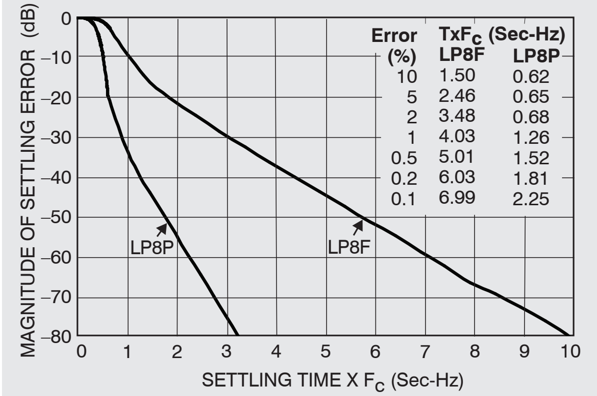
dB	LP8F f/F_c	LP8P f/F_c
–45	1.4984	2.8779
–50	1.5495	2.9943
–55	1.5967	3.1028
–60	1.6391	3.2016
–65	1.6758	3.2886
–70	1.7063	3.3626
–75	1.7302	3.4227
–80	1.7479	3.4688

LP8F & LP8P STEP RESPONSE



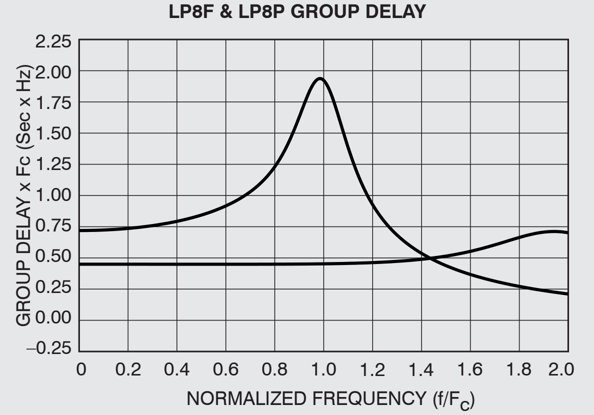
	LP8F	LP8P
10-90% Rise (Sec)	0.52/F_C	0.35/F_C
50% Delay (Sec)	0.79/F_C	0.46/F_C
% Overshoot	18.9%	1.1%
10% Error (Sec)	1.50/F_C	0.62/F_C
5% Error (Sec)	2.46/F_C	0.65/F_C
1% Error (Sec)	4.03/F_C	1.26/F_C
0.5% Error (Sec)	5.01/F_C	1.52/F_C
0.1% Error (Sec)	6.99/F_C	2.25/F_C

LP8F & LP8P SETTLING TIME

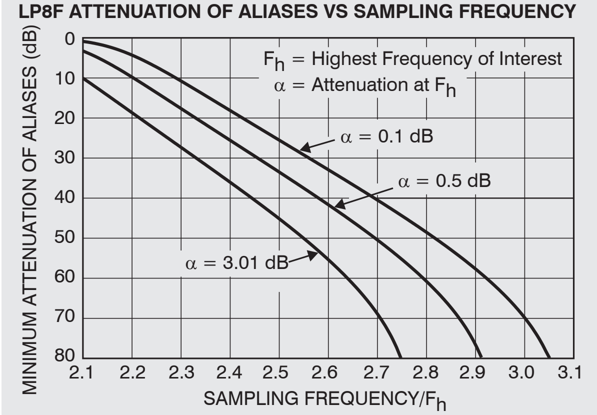


Error (%)	TxFc (Sec-Hz) LP8F	LP8P
10	1.50	0.62
5	2.46	0.65
2	3.48	0.68
1	4.03	1.26
0.5	5.01	1.52
0.2	6.03	1.81
0.1	6.99	2.25

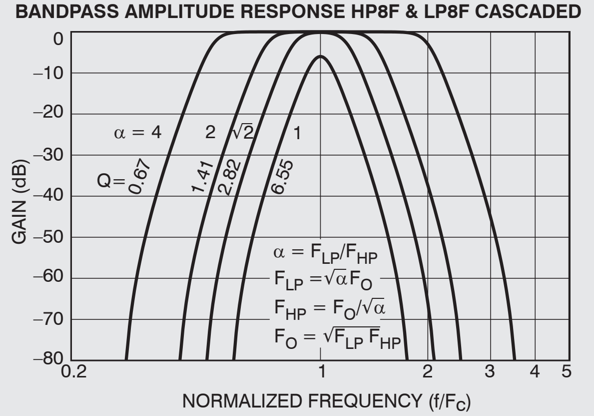
LP8F & LP8P GROUP DELAY



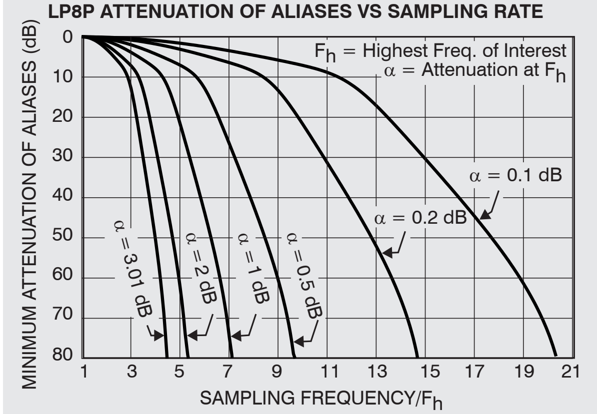
LP8F ATTENUATION OF ALIASES VS SAMPLING FREQUENCY



BANDPASS AMPLITUDE RESPONSE HP8F & LP8F CASCADED



LP8P ATTENUATION OF ALIASES VS SAMPLING RATE



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