FREQUENCY DEVICES™, INC.

5BAF Series

Lowpass & Highpass

Differential Fixed Frequency Filters

Description

The 5BAF Series are differential-input low-pass and high-pass filters that are pin-out and package compatible with industry-standard 5B Series signal conditioning modules. Each filter comes factory tuned to a user specified corner or center frequency from 1 Hz to 100 kHz. These filters are ideally suited to sharply limit A/D converter bandwidth to eliminate unwanted signals and noise.

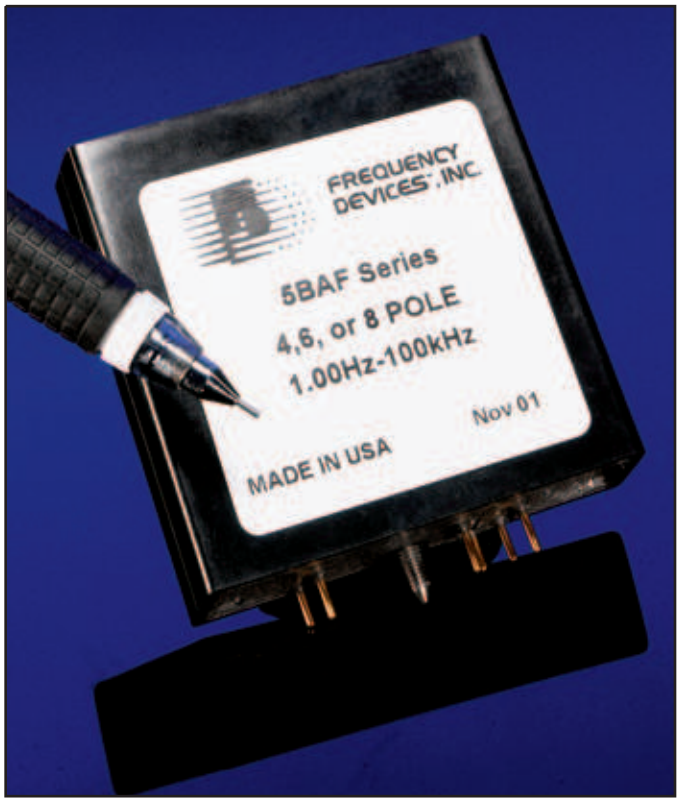
To serve real-world applications, all 5BAF Series filters are configured with a differential input having a common mode rejection ratio of <-70 dB (min.) at 1 kHz. A self contained dc-to-dc converter enables the 5BAF filters to operate from a non-critical +5, ±10% volt power source, key in many systems since +5V logic power is readily available.

Features/Benefits:

- The 10 volt input range with overall gain of 1 provides an excellent match to both the transducer output and the data acquisition board input.
- 5BAF modules allow for partitioning between system segments providing a means to minimize ground loops.
- 5B plug-in compatible provides quick and easy insertion.
- Factory tuned, no external clocks or adjustments needed.
- Broad range of corner or center frequencies to meet a wide range of applications.

Applications

- Vibration analysis
- Industrial and process control
- Noise reduction
- Signal reduction
- Test systems



Available Low-Pass Models: Page

5BAF-LPBE8 8-Pole Bessel 2
5BAF-LPBU8 8-Pole Butterworth 2
5BAF-LPBE6 6-Pole Bessel 2
5BAF-LPBU6 6-Pole Butterworth 2
5BAF-LPBE4 4-Pole Bessel 3
5BAF-LPBU4 4-Pole Butterworth 3

Available High-Pass Models:

5BAF-HPBU8 8-Pole Butterworth 4
5BAF-HPBU6 6-Pole Butterworth 4
5BAF-HPBU4 4-Pole Butterworth 4

General Specifications:

Pin-Out/Package Data/Order Information 5

Note: Contact factory for lower frequency, noise or distortion options.

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Low-Pass Butterworth

Model	5BAF-LPBU8	5BAF-LPBU6	5BAF-LPBU4	
Product Specifications				
Transfer Function	8-Pole Butterworth	6-Pole Butterworth	4-Pole Butterworth	
Size	Std. 5B	Std. 5B	Std. 5B	
Range f_c	1.00 Hz to 100 kHz	1.00 Hz to 100 kHz	1.00 Hz to 100 kHz	
Theoretical Transfer Characteristics	Appendix A Page 9	Appendix A Page 8	Appendix A Page 7	
Passband Ripple (theoretical)	0.0 dB	0.0 dB	0.0 dB	
DC Voltage Gain (non-inverting)	0 ± 0.1 dB typ	0 ± 0.1 dB typ	0 ± 0.1 dB typ.	
Differential Gain	1 ± 0.3%	1 ± 0.3%	1 ± 0.3%	
Stopband Attenuation Rate	48 dB/octave	36 dB/octave	24 dB/octave	
Accuracy f_c	± 2% max.	± 2% max.	± 2% max.	
Phase	-360°	-270°	-180°	
Filter Attenuation (theoretical)	0.12 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 2.37 f_c 80.0 dB 3.16 f_c	0.29 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 3.16 f_c 80.0 dB 4.46 f_c	0.67 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 5.62 f_c 80.0 dB 10.00 f_c	
Impedance	1.0 MΩ min.	1.0 MΩ min.	1.0 MΩ min.	
Com. Mode Voltage Range	± 20 V	± 20 V	± 20 V	
Com. Mode Rejection Ratio @ 1 kHz	<-70 dB min.	<-70 dB min.	<-70 dB min.	
Linear Voltage Range	± 10 V peak	± 10 V peak	± 10 V peak	
Max. Safe Voltage (Power ON or OFF)	± 40 V	± 40 V	± 40 V	
Narrow Band Noise (5 Hz – 100 kHz)	50 µVrms max.	50 µVrms max.	50 µVrms max.	

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Low-Pass Bessel

Model	5BAF-LPBE8	5BAF-LPBE6	5BAF-LPBE4	
Product Specifications				
Transfer Function	8-Pole Bessel	6-Pole Bessel	4-Pole Bessel	
Size	Std. 5B	Std. 5B	Std. 5B	
Range f_c	1.00 Hz to 100 kHz	1.00 Hz to 100 kHz	1.00 Hz to 100 kHz	
Theoretical Transfer Characteristics	Appendix A Page 4	Appendix A Page 3	Appendix A Page 2	
Passband Ripple (theoretical)	0.0 dB	0.0 dB	0.0 dB	
DC Voltage Gain (non-inverting)	0 ± 0.1 dB typ	0 ± 0.1 dB typ	0 ± 0.1 dB typ.	
Differential Gain	1 ± 0.3%	1 ± 0.3%	1 ± 0.3%	
Stopband Attenuation Rate	48 dB/octave	36 dB/octave	24 dB/octave	
Accuracy f_c	± 2% max.	± 2% max.	± 2% max.	
Phase	-182°	-155°	-121°	
Filter Attenuation (theoretical)	1.91 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 4.52 f_c 80.0 dB 6.07 f_c	1.89 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 5.41 f_c 80.0 dB 7.99 f_c	1.86 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 8.48 f_c 80.0 dB 15.12 f_c	
Impedance	1.0 MΩ min.	1.0 MΩ min.	1.0 MΩ min.	
Com. Mode Voltage Range	± 20 V	± 20 V	± 20 V	
Com. Mode Rejection Ratio @ 1 kHz	<-70 dB min.	<-70 dB min.	<-70 dB min.	
Linear Voltage Range	± 10 V peak	± 10 V peak	± 10 V peak	
Max. Safe Voltage (Power ON or OFF)	± 40 V	± 40 V	± 40 V	
Narrow Band Noise (5 Hz – 100 kHz)	50 µVrms max.	50 µVrms max.	50 µVrms max.	

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High-Pass Butterworth

Model	5BAF-HPBU8	5BAF-HPBU6	5BAF-HPBU4	
Product Specifications				
Transfer Function	8-Pole Butterworth	6-Pole Butterworth	4-Pole Butterworth	
Size	Std. 5B	Std. 5B	Std. 5B	
Range f_c	1.00 Hz to 100 kHz	1.00 Hz to 100 kHz	1.00 Hz to 100 kHz	
Theoretical Transfer Characteristics	Appendix A Page 29	Appendix A Page 28	Appendix A Page 27	
Passband Ripple (theoretical)	0.0 dB	0.0 dB	0.0 dB	
DC Voltage Gain (non-inverting)	0 ± 0.1dB to 100kHz	0 ± 0.1dB to 100kHz	0 ± 0.1dB to 100kHz	
Differential Gain	1 ± 0.3%	1 ± 0.3%	1 ± 0.3%	
Stopband Attenuation Rate	48 dB/octave	36 dB/octave	24 dB/octave	
Small Signal Bandwidth	(-6 dB) 1 MHz	(-6 dB) 1 MHz	(-6 dB) 1 MHz	
Power Bandwidth	120 kHz	120 kHz	120 kHz	
Accuracy f_c	± 2% max.	± 2% max.	± 2% max.	
Phase	-360°	-270°	-180°	
Filter Attenuation (theoretical)	80.0 dB 0.31 f_c 60.0 dB 0.42 f_c 3.01 dB 1.00 f_c 00.0 dB 2.00 f_c	80.0 dB 0.21 f_c 60.0 dB 0.32 f_c 3.01 dB 1.00 f_c 00.0 dB 2.50 f_c	80.0 dB 0.10 f_c 60.0 dB 0.18 f_c 3.01 dB 1.00 f_c 00.0 dB 4.00 f_c	
Impedance	1.0 MΩ min.	1.0 MΩ min.	1.0 MΩ min.	
Com. Mode Voltage Range	± 20 V	± 20 V	± 20 V	
Com. Mode Rejection Ratio @ 1 kHz	<-70 dB min.	<-70 dB min.	<-70 dB min.	
Linear Voltage Range	± 10 V peak	± 10 V peak	± 10 V peak	
Max. Safe Voltage (Power ON or OFF)	± 40 V	± 40 V	± 40 V	
Narrow Band Noise (5 Hz – 100 kHz)	100 µVrms max.	100 µVrms max.	100 µVrms max.	

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Specifications

Pin-Out, Package Data And Order Information

Analog Input Characteristics[1]
See transfer function specifications.

Analog Output Characteristics[1,2]

Impedance (Closed Loop)	<1 Ω typ. 10 Ω max.
Linear Operating Range	±10V pk
Maximum Current	±2.0mA
Offset Voltage	±3mV typ.
Offset Temp. Coeff.	±100 µV/°C
Gain Drift	± 30 ppm/°C
Output Load[3]	**See note 3**

Power Supply (±Vs)

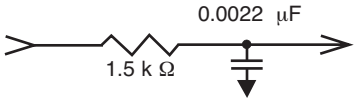
		Typ.	Max.
Rated Voltage		+ 5V ± 0.5 Vdc	
Quiescent Current	8P	113mA	150mA
	6P	101mA	127mA
	4P	75mA	98mA

Temperature

Operating	-25 to + 85°C
Storage	-40 to + 85°C

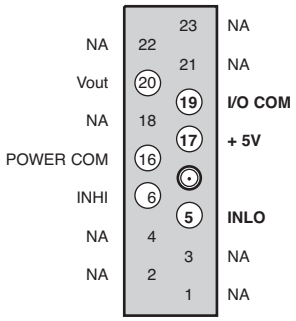
Notes:

1. Input and output signal voltage referenced to I/O COM.
2. Output is short circuit protected to common. DO NOT CONNECT TO +5V or POWER COM.
3. Output can drive a series 1.5 kΩ resistor and 0.0022 µF capacitor without slew rate limiting with a ± 10 V square wave input.



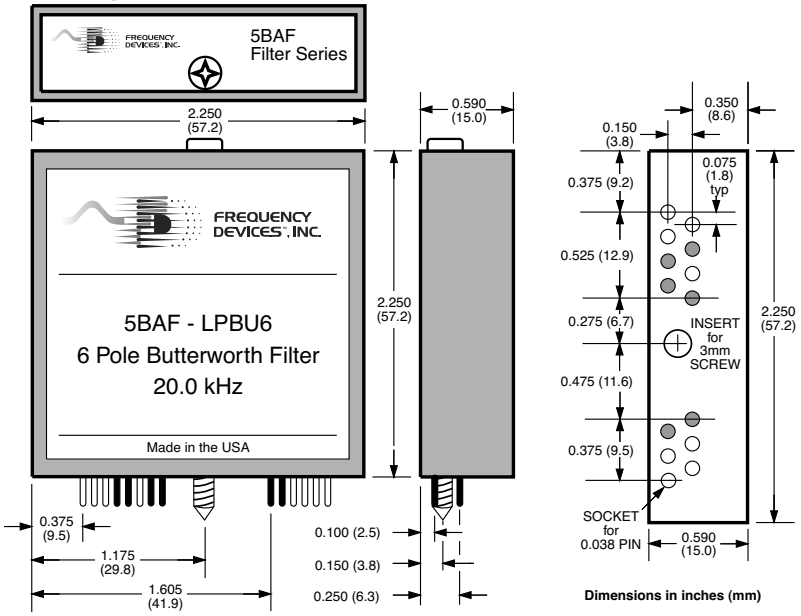
4. How to specify Corner Frequencies: Corner frequencies are specified by attaching a three digit frequency designator to the basic model number. Corner frequencies can range from 1 Hz to 50 kHz.

Pin Designations



Bottom View

Package Data



Ordering Information

BE - Bessel-LP Only
BU - Butterworth

Corner Frequency[4]
1 Hz to 100 kHz

5BAF-LPBE6-f$_c$

# of Poles
4, 6, 8

LP - Lowpass
HP - Highpass

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