FREQUENCY DEVICES™, INC.

D72 & DP72 Series

1.0 Hz to 100 kHz Fixed Frequency

16 Pin DIP 2-Pole Filters

Description

The D72 and DP72 Series of low-power, fixed-frequency, linear active filters are high performance, 2-pole filters in a compact package. These Butterworth and Bessel low-pass and Butterworth high-pass filters (D72 only) combine linear active filter design with the space savings of a 16-pin dual in-line package (DIP). Each model comes factory tuned to a user-specified corner frequency between 1 Hz and 100 kHz (DP72, 1 Hz to 5kHz). These fully self-contained units require no external components or adjustments and operate with dynamic input voltage range from non-critical ±5V to ±18V power supplies.

Features/Benefits:

- Low cost solution for low frequency signal conditioning
- Compact DIP design minimizes board space requirements
- Plug-in ready-to-use, reducing engineering design and manufacturing time
- Factory tuned, no external clocks or adjustments needed saving time and labor of other discrete assembly solutions
- Low harmonic distortion and wide signal-to-noise ratio to 12 bit resolution

Applications

- Anti-alias filtering
- Vibration & shock analysis
- Automatic test equipment
- Aerospace, navigation and sonar
- Communication systems
- Medical electronics
- Sound and vibration testing
- Noise elimination
- Process control

Available Low-Pass Models:

Available High-Pass Models:

General Specifications:

25 Locust St, Haverhill, Massachusetts 01830 • Tel: 800/252-7074, 978/374-0761 • FAX: 978/521-1839
e-mail: sales@freqdev.com • Web Address: http://www.freqdev.com

Fixed Frequency 2-Pole Low-Pass and High-Pass Filters

Model	D72L2B & DP72L2B	D72L2L & DP72L2L	Model	D72H2B
Product Specifications	**Low-Pass**	**Low-Pass**		**High-Pass**
Transfer Function	2-Pole, Butterworth	2-Pole, Bessel	**Transfer Function**	2-Pole, Butterworth
Size	0.88" x 0.46" x 0.375"	0.88" x 0.46" x 0.375"	**Size**	0.88" x 0.46" x 0.375"
Range f_c **D72** **DP72**	 1 Hz to 100 kHz 1 Hz to 5 kHz	 1 Hz to 100 kHz 1 Hz to 5 kHz	**Range f_c**	1 Hz to 100 kHz
Theoretical Transfer Characteristics	Appendix A Page 6	Appendix A Page 1	**Theoretical Transfer Characteristics**	Appendix A Page 26
Passband Ripple (theoretical)	0.0 dB	0.0 dB	**Passband Ripple** (theoretical)	0.0 dB
DC Voltage Gain (non-inverting)	0 ± 0.1 dB typ.	0 ± 0.1 dB typ.	**Voltage Gain** (non-inverting)	0 ± 0.1 dB to 100 kHz
Stopband Attenuation Rate	12 dB/octave	12 dB/octave	**Stopband Attenuation Rate**	12 dB/octave
			Power Bandwidth	120 kHz
			Small Signal Bandwidth	(-6 dB) 1 MHz
Cutoff Frequency f_c ± 2% max. **Stability** ± 0.03% /°C **Amplitude** -3 dB **Phase** -90°		**Cutoff Frequency** f_c ± 2% max. **Stability** ± 0.03% /°C **Amplitude** -3 dB **Phase** -74.3°	**Cutoff Frequency** f_c ± 2% max. **Stability** ± 0.03% /°C **Amplitude** -3 dB **Phase** -90°	
Filter Attenuation (theoretical)	1.49 dB 0.80 f_c 3.01 dB 1.00 f_c 30.0 dB 5.62 f_c 40.0 dB 10.0 f_c	1.91 dB 0.80 f_c 3.01 dB 1.00 f_c 30.0 dB 7.10 f_c 40.0 dB 12.75 f_c	**Filter Attenuation** (theoretical)	40 dB 0.10 f_c 30 dB 0.18 f_c 3.01 dB 1.00 f_c 0.02 dB 4.00 f_c
Total Harmonic Distortion @ 1 kHz **D72** **DP72**	 <-70 dB <-70 dB	 <-70 dB <-70 dB	**Total Harmonic Distortion @ 1 kHz** **D72**	 <-70 dB
Wide Band Noise (5 Hz - 2 MHz)	200 µVrms typ.	200 µVrms typ.	**Wide Band Noise** (5 Hz - 2 MHz)	400 µVrms typ.
Narrow Band Noise (20 Hz - 100 kHz)	50 µVrms typ.	50 µVrms typ.	**Narrow Band Noise** (20 Hz - 100 kHz)	100 µVrms typ.
Filter Mounting Assembly	FMA-01A	FMA-01A	**Filter Mounting Assembly**	FMA-01A

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Specification

(25°C and Vs ± 15 Vdc)

Analog Input Characteristics[1]

Impedance	10 kΩ min.
Voltage Range	± 10 Vpeak
Max. Safe Voltage	± Vs

Analog Output Characteristics

Impedance	1 Ω
Linear Operating Range	± 10 V
Maximum Current[2]	
D72	± 10 mA
DP72	± 5 mA
Offset Voltage	10 mV max. 3 mV typ.
Offset Temp. Coeff.	20 µV / °C

Power Supply (±V)

Rated Voltage	± 15 Vdc
Operating Range	± 5 to ± 18 Vdc
Maximum Safe Voltage	± 18 Vdc
Quiescent Current **D72**	5 mA max. 3 mA typ.
Quiescent Current **DP72**	1 mA max. 600 µA typ.

Temperature

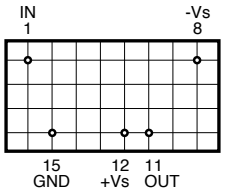
Operating	0 to + 70 °C
Storage	- 25 to + 85 °C

Notes:

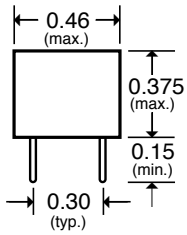
1. Input and output signal voltage referenced to supply common.
2. Output is short circuit protected to common. DO NOT CONNECT TO ±Vs.

Pin-Out and Package Data
Ordering Information

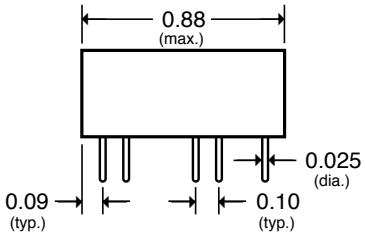
All dimensions are in inches
All case dimensions ± 0.01"
Grid Dimensions 0.1" x 0.1"



BOTTOM VIEW



FRONT VIEW



SIDE VIEW

Filter Mounting Assembly-See FMA-01A

Ordering Information

Filter Type

L - Low Pass
H - High Pass

Transfer Function

B - Butterworth
L - Bessel

D72L2B-849 Hz

Power Level

D – Standard Power
DP – Low Power

- 3 dB Corner Frequency[3]

e.g., 849 Hz
2.50 kHz
33.3 kHz

3. How to Specify Corner Frequency:
Corner frequencies are specified by attaching a three digit frequency designator to the basic model number. Corner frequencies can range from 1 Hz to 100 kHz.

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FREQUENCY DEVICES™, INC.

Low-Pass

2-Pole

Bessel

Appendix A

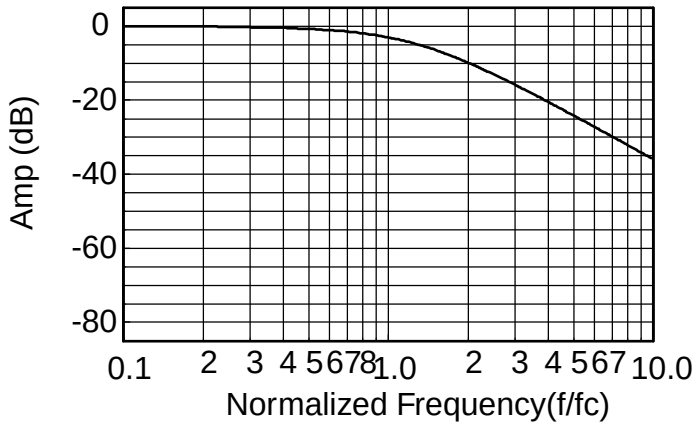
Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay[1] (sec)
0.00	0.00	0.00	.217
0.10	-0.027	-7.79	.216
0.20	-0.108	-15.6	.216
0.30	-0.248	-23.4	.216
0.40	-0.448	-31.1	.215
0.50	-0.712	-38.8	.212
0.60	-1.044	-46.4	.208
0.70	-1.443	-53.8	.202
0.80	-1.907	-60.9	.195
0.85	-2.161	-64.4	.190
0.90	-2.430	-67.7	.185
0.95	-2.71	-71.0	.180
1.00	-3.01	-74.2	.175
1.10	-3.63	-80.3	.164
1.20	-4.28	-86.0	.153
1.30	-4.95	-91.3	.141
1.40	-5.65	-96.2	.130
1.50	-6.35	-101	.120
1.60	-7.05	-105	.110
1.70	-7.75	-109	.101
1.80	-8.44	-112	.093
1.90	-9.13	-115	.085
2.00	-9.80	-118	.079
2.25	-11.4	-125	.064
2.50	-12.9	-130	.053
2.75	-14.4	-134	.045
3.00	-15.7	-138	.038
3.25	-17.0	-141	.033
3.50	-18.2	-144	.028
4.00	-20.3	-148	.022
5.00	-24.0	-155	.014
6.00	-27.1	-159	.010
7.00	-29.7	-162	.007
8.00	-32.0	-164	.005
9.00	-34.1	-166	.004
10.0	-35.9	-167	.004

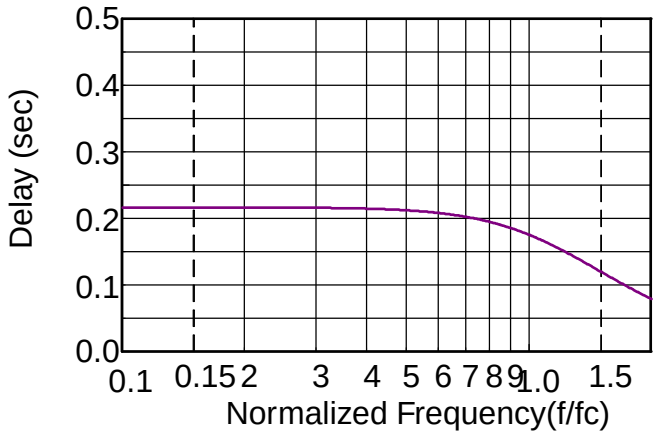
1.**Normalized Group Delay:**
The above delay data is normalized to a corner frequency of 1.0Hz.The actual delay is the normalized delay divided by the actual corner frequency (fc).

$$\text{Actual Delay} = \frac{\text{Normalized Delay}}{\text{Actual Corner Frequency (fc) in Hz}}$$

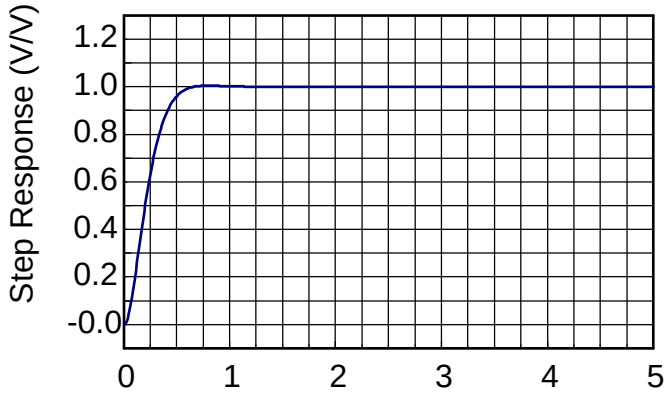
Frequency Response



Delay (Normalized)



Step Response



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FREQUENCY DEVICES™, INC.

Low-Pass

2-Pole

Butterworth

Appendix A

Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay[1] (sec)
0.00	0.00	0.00	.225
0.10	0.00	-8.13	.227
0.20	-0.01	-16.4	.234
0.30	-0.035	-25.0	.243
0.40	-0.110	-34.0	.255
0.50	-0.263	-43.3	.265
0.60	-0.529	-53.0	.271
0.70	-0.935	-62.7	.270
0.80	-1.491	-72.3	.262
0.85	-1.824	-77.0	.255
0.90	-2.191	-81.5	.246
0.95	-2.59	-85.8	.236
1.00	-3.01	-90.0	.225
1.10	-3.92	-97.7	.202
1.20	-4.88	-105	.179
1.30	-5.86	-111	.157
1.40	-6.85	-116	.138
1.50	-7.83	-121	.121
1.60	-8.78	-125	.106
1.70	-9.71	-128	.094
1.80	-10.6	-131	.083
1.90	-11.5	-134	.074
2.00	-12.3	-137	.066
2.25	-14.3	-142	.051
2.50	-16.0	-146	.041
2.75	-17.6	-149	.033
3.00	-19.1	-152	.027
3.25	-20.5	-154	.023
3.50	-21.8	-156	.020
4.00	-24.1	-159	.015
5.00	-28.0	-164	.009
6.00	-31.1	-166	.006
7.00	-33.8	-168	.005
8.00	-36.1	-170	.004
9.00	-38.2	-171	.003
10.0	-40.0	-172	.002

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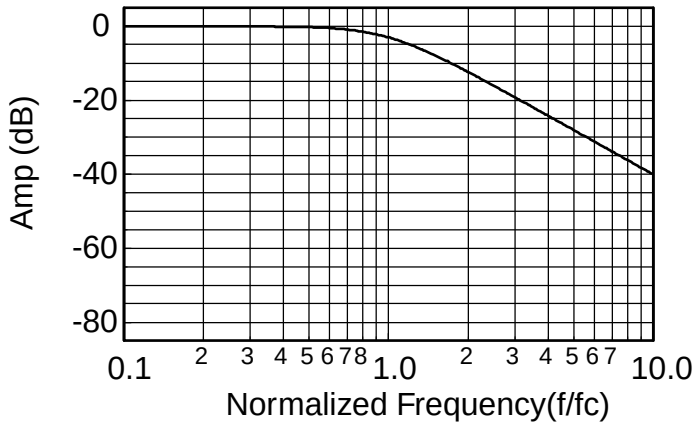
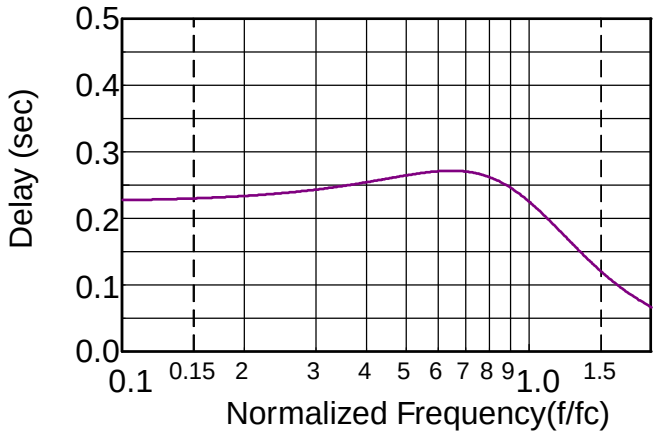
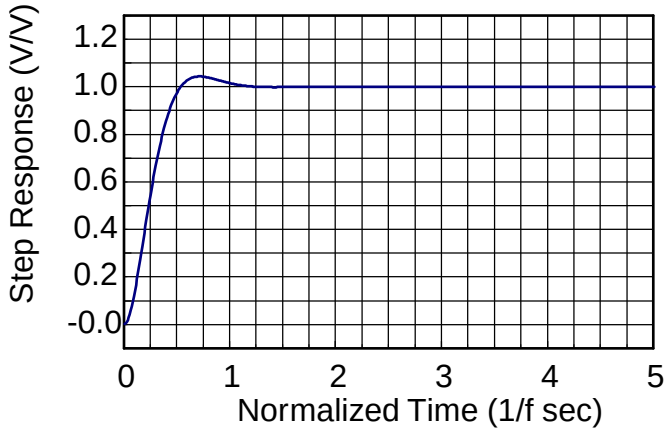
Frequency Response



Delay (Normalized)



Step Response



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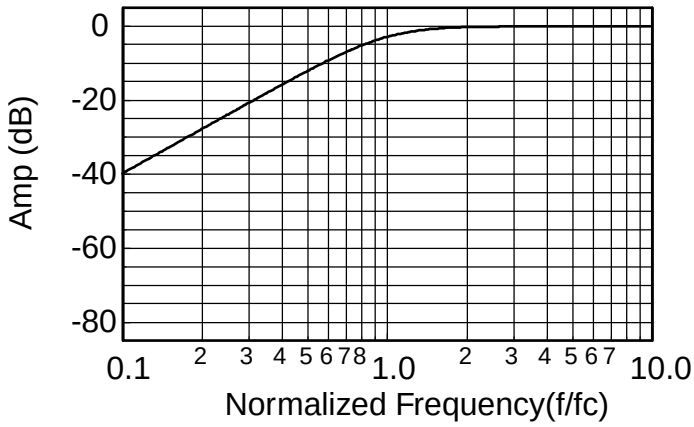
0.10	-40.00	172	.227
0.20	-27.97	164	.234
0.30	-20.95	155	.243
0.40	-16.03	146	.255
0.50	-12.31	137	.265
0.60	-9.40	127	.271
0.70	-7.13	117	.270
0.80	-5.37	108	.262
0.85	-4.65	103	.255
0.90	-4.02	98.5	.246
0.95	-3.48	94.2	.236
1.00	-3.01	90.0	.225
1.20	-1.71	75.5	.179
1.40	-1.01	64.1	.138
1.60	-0.62	55.4	.106
1.80	-0.40	48.7	.083
2.00	-0.26	43.3	.066
2.50	-0.11	34.0	.041
3.00	-0.05	27.9	.027
4.00	-0.02	20.7	.015
5.00	-0.01	16.4	.009
6.00	-0.00	13.6	.006
7.00	-0.00	11.7	.005
8.00	-0.00	10.2	.004
9.00	-0.00	9.04	.003
10.0	-0.00	8.13	.002

Frequency Response



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