

**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 $\pm 5V$ to $\pm 18V$ 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:**

D72L2B	2-pole Butterworth		.2
DP72L2B	2-pole Butterworth (Low Power)		.2
D72L2L	2-pole Bessel		.2
DP72L2L	2-pole Bessel (Low Power)		.2

Available High-Pass Models:

D72H2B	2-pole Butterworth		.2
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General Specifications:

Pin-out/package data & ordering information	3
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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 Stability Amplitude Phase	f_c ± 2% max. ± 0.03% /°C -3 dB -90°	f_c ± 2% max. ± 0.03% /°C -3 dB -74.3°	Cutoff Frequency Stability Amplitude Phase	f_c ± 2% max. ± 0.03% /°C -3 dB -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 μ Vrms typ.	200 μ Vrms typ.	Wide Band Noise (5 Hz - 2 MHz)	400 μ Vrms typ.
Narrow Band Noise (20 Hz - 100 kHz)	50 μ Vrms typ.	50 μ Vrms typ.	Narrow Band Noise (20 Hz - 100 kHz)	100 μ Vrms typ.
Filter Mounting Assembly	FMA-01A	FMA-01A	Filter Mounting Assembly	FMA-01A



Specification

(25°C and $V_s \pm 15$ Vdc)

Analog Input Characteristics¹

Impedance	10 k Ω min.
Voltage Range	± 10 Vpeak
Max. Safe Voltage	$\pm V_s$

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 μ V / °C

Power Supply ($\pm V$)

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 μ A typ.

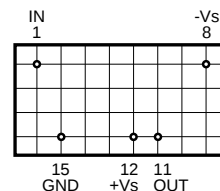
Temperature

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

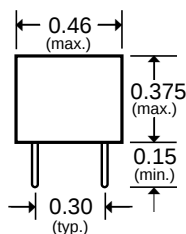
Notes:

1. Input and output signal voltage referenced to supply common.
2. Output is short circuit protected to common.
DO NOT CONNECT TO $\pm V_s$.

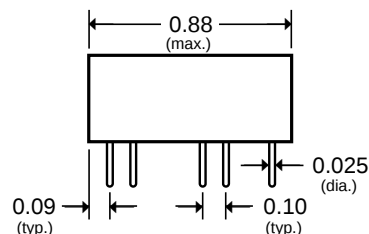
All dimensions are in inches
All case dimensions ± 0.01 "
Grid Dimensions 0.1" x 0.1"



BOTTOM VIEW



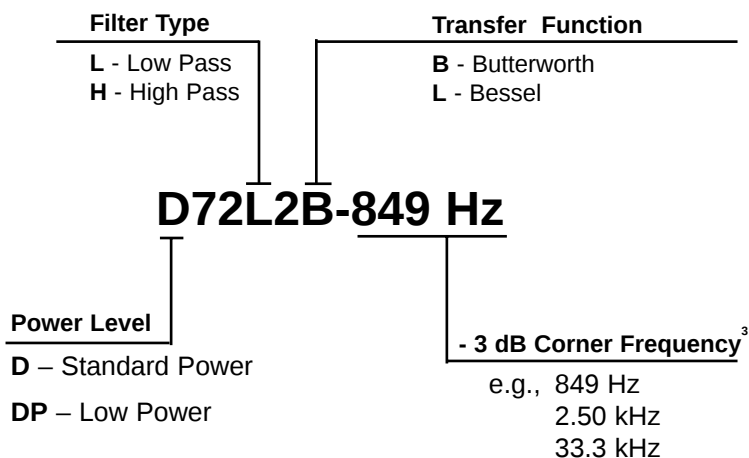
FRONT VIEW



SIDE VIEW

Filter Mounting Assembly-See FMA-01A

Ordering Information



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.



Theoretical Transfer Characteristics

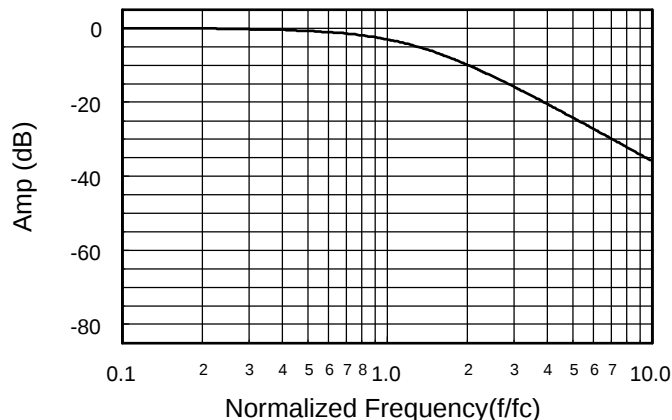
f/f_c (Hz)	Amp (dB)	Phase (deg)	Delay¹ (sec)
0.00	0.00	0.00	.217
0.10	-0.027	-7.79	.216
0.20	-0.108	-15.6	.216
0.30	-0.248	-23.4	.216
0.40	-0.448	-31.1	.215
0.50	-0.712	-38.8	.212
0.60	-1.044	-46.4	.208
0.70	-1.443	-53.8	.202
0.80	-1.907	-60.9	.195
0.85	-2.161	-64.4	.190
0.90	-2.430	-67.7	.185
0.95	-2.71	-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:

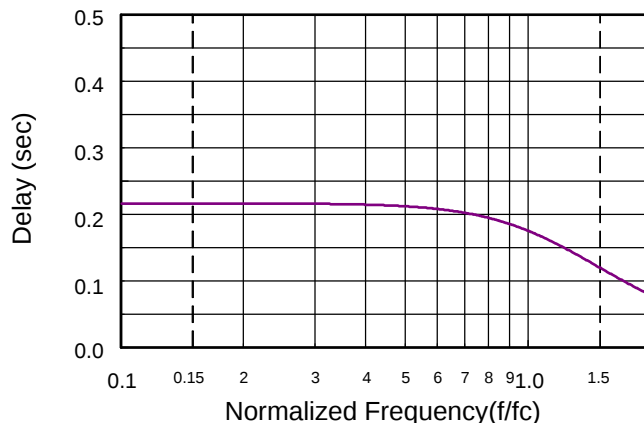
The above delay data is normalized to a corner frequency of 1.0Hz. The actual delay is the normalized delay divided by the actual corner frequency (fc).

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

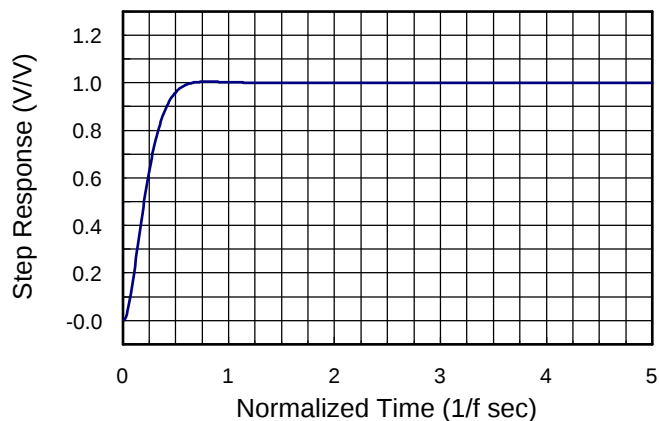
Frequency Response



Delay (Normalized)



Step Response





Theoretical Transfer Characteristics

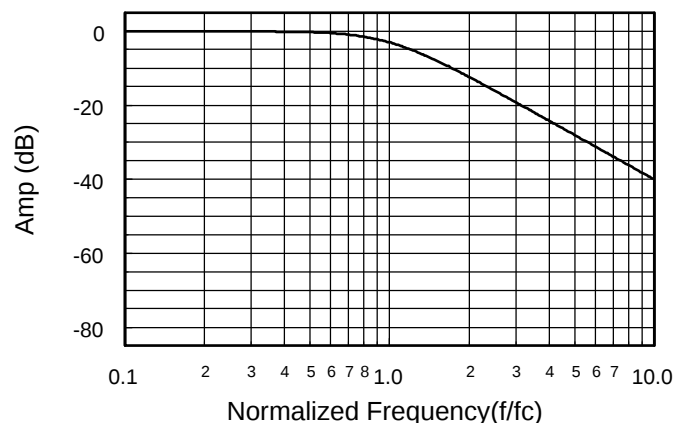
f/f_c (Hz)	Amp (dB)	Phase (deg)	Delay¹ (sec)
0.00	0.00	0.00	.225
0.10	0.00	-8.13	.227
0.20	-0.01	-16.4	.234
0.30	-0.035	-25.0	.243
0.40	-0.110	-34.0	.255
0.50	-0.263	-43.3	.265
0.60	-0.529	-53.0	.271
0.70	-0.935	-62.7	.270
0.80	-1.491	-72.3	.262
0.85	-1.824	-77.0	.255
0.90	-2.191	-81.5	.246
0.95	-2.59	-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

1. Normalized Group Delay:

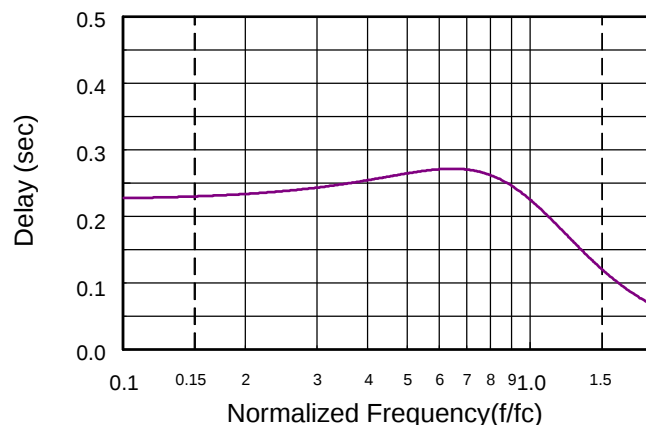
The above delay data is normalized to a corner frequency of 1.0Hz. The actual delay is the normalized delay divided by the actual corner frequency (fc).

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

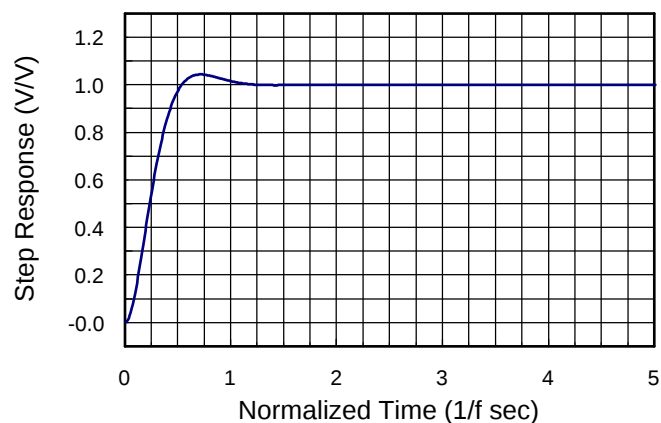
Frequency Response



Delay (Normalized)



Step Response

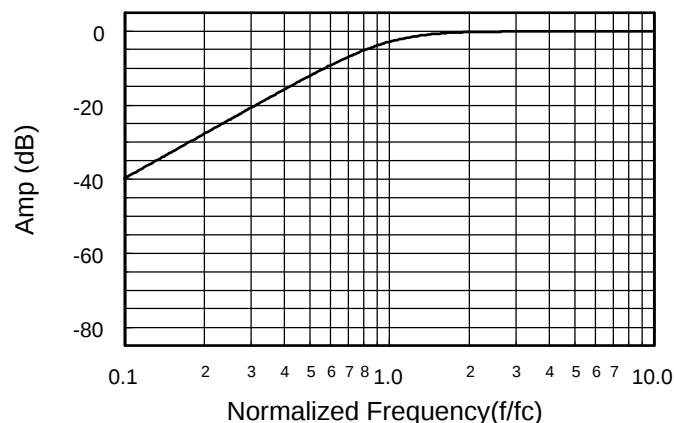




Theoretical Transfer Characteristics

f/f _c (Hz)	Amp (dB)	Phase (deg)	Delay ¹ (sec)
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



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).

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