IN-00 D74-00

FREQUENCY DEVICES™

# D74 & DP74 Series

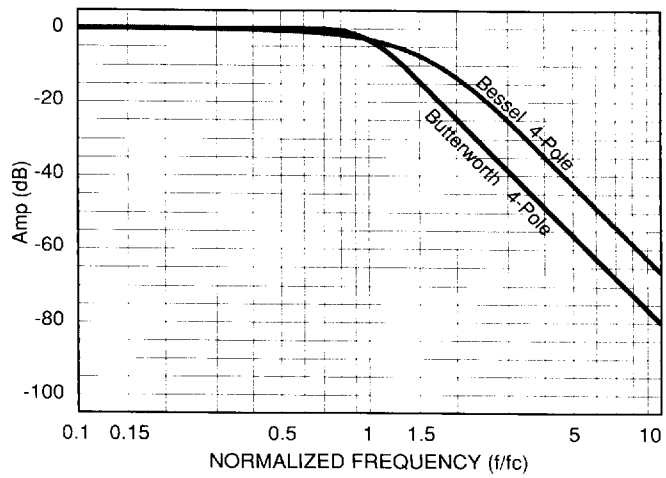
## 1 Hz to 50 kHz 16-Pin DIP Filters

## Anti-Alias Filters

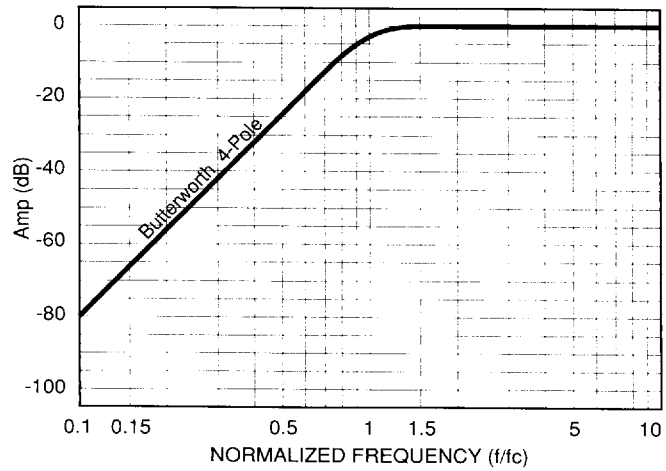
### Description

The D74 and DP74 Series of low-power, fixed-frequency, linear active filters are high performance, 4-pole filters in a compact package. These Butterworth and Bessel low-pass and Butterworth high-pass filters (D74 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 50 kHz (DP74, 1Hz 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.

### Low-Pass Frequency Response




### High-Pass Frequency Response




### Features/Benefits:

- 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
- Low harmonic distortion and wide signal-to-noise ratio to 12 bit resolution
- Broad range of corner frequencies to meet a wide range of applications

### 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 High-Pass Models:



### Available High-Pass Models:




3731130 0002750 131

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# Model D74L4B & DP74L4B

## Linear Active DIP Filters

## 4-Pole Butterworth Low-Pass Filter

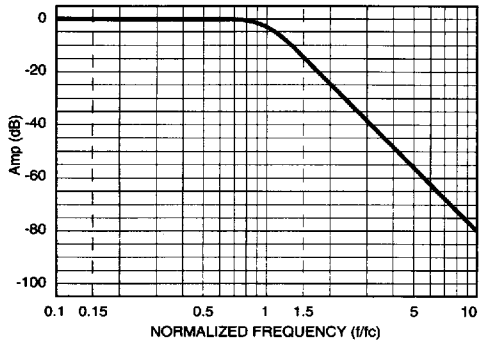
### Description

The D74L4B and DP74L4B are a 4-pole low-pass Butterworth transfer function, are maximally flat, have no ripple in the pass-band, and have a monotonic roll-off at the rate of 24 dB/octave in the stopband.

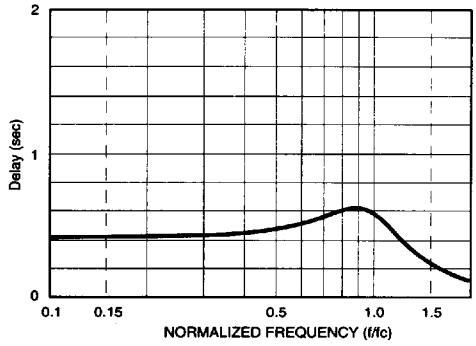
### Specifications

| | |
|---|---|
| Transfer Function | 4-pole Butterworth Low-Pass |
| Size | 0.88" x 0.46" x 0.375" |
| Range $f_c$ | |
| D74 | 1 Hz to 50 kHz |
| DP74 | 1 Hz to 5 kHz |
| Passband Ripple (theoretical) | 0.0 dB |
| DC Voltage Gain (non-inverting) | 0 ± 0.1 dB typ. |
| Stopband Attenuation Rate | 24 dB/octave |
| Cutoff Frequency $f_c$ (-3 dB) | |
| Accuracy | ± 2 % max. |
| Stability | ± 0.03 % / °c |
| Phase Shift | – 180° |
| Filter Attenuation | (theoretical) |
| 0.67 dB | 0.80 $f_c$ |
| 3.01 dB | 1.00 $f_c$ |
| 60.0 dB | 5.62 $f_c$ |
| 80.0 dB | 10.0 $f_c$ |
| Total Harmonic Distortion @ 1 kHz | < – 70 dB |
| Wide Band Noise (5 Hz - 2 MHz) | 200 µVRMS typ. |
| Narrow Band Noise (5 Hz - 50 kHz) | 50 µVRMS typ. |

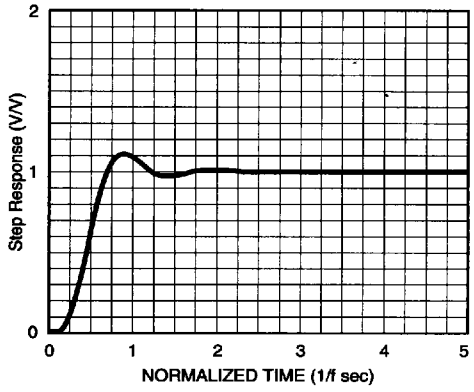
### Frequency Response




### Delay (Normalized)




### Step Response




### Theoretical Transfer Characteristics

| f/fc (Hz) | Amp (dB) | Phase (deg) | Delay [1] (sec) |
|---|---|---|---|
| 0.00 | 0.00 | 0.00 | .416 |
| 0.10 | 0.00 | -15.0 | .418 |
| 0.20 | 0.00 | -30.1 | .423 |
| 0.30 | -0.00 | -45.5 | .433 |
| 0.40 | -0.003 | -61.4 | .449 |
| 0.50 | -0.017 | -78.0 | .474 |
| 0.60 | -0.072 | -95.7 | .511 |
| 0.70 | -0.243 | -115 | .558 |
| 0.80 | -0.674 | -136 | .604 |
| 0.85 | -1.047 | -147 | .619 |
| 0.90 | -1.555 | -158 | .622 |
| 0.95 | -2.21 | -169 | .612 |
| 1.00 | -3.01 | -180 | .588 |
| 1.10 | -4.97 | -200 | .513 |
| 1.20 | -7.24 | -217 | .427 |
| 1.30 | -9.62 | -231 | .350 |
| 1.40 | -12.0 | -242 | .289 |
| 1.50 | -14.3 | -252 | .241 |
| 1.60 | -16.4 | -260 | .204 |
| 1.70 | -18.5 | -266 | .175 |
| 1.80 | -20.5 | -272 | .152 |
| 1.90 | -22.3 | -277 | .134 |
| 2.00 | -24.1 | -282 | .119 |
| 2.25 | -28.2 | -291 | .091 |
| 2.50 | -31.8 | -299 | .072 |
| 2.75 | -35.1 | -304 | .059 |
| 3.00 | -38.2 | -309 | .049 |
| 3.25 | -41.0 | -313 | .041 |
| 3.50 | -43.5 | -317 | .035 |
| 4.00 | -48.2 | -322 | .027 |
| 5.00 | -55.9 | -330 | .017 |
| 6.00 | -62.3 | -335 | .012 |
| 7.00 | -67.6 | -339 | .009 |
| 8.00 | -72.2 | -341 | .007 |
| 9.00 | -76.3 | -343 | .005 |
| 10.0 | -80.0 | -345 | .004 |

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

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



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# Model D74L4L & DP74L4L

## Linear Active DIP Filters

## 4-Pole Bessel Low-Pass Filter

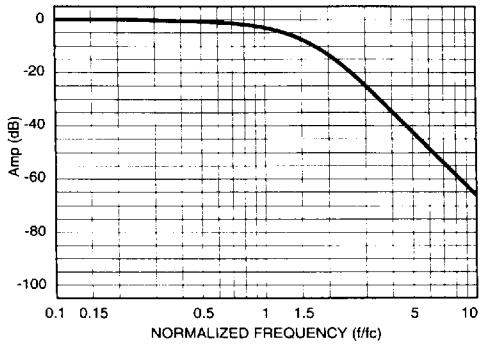
### Description

The D74L4L & DP74L4L are a 4-pole low-pass Bessel transfer function, have a monotonic roll-off in the passband and the stopband, and a final roll-off rate of 24 dB/ octave in the stopband. They exhibit a constant delay in the passband and have an over-shoot free step response.

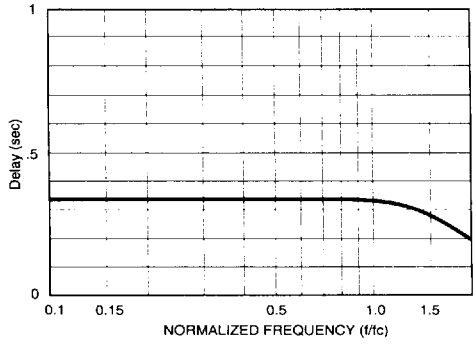
### Specifications

| | |
|---|---|
| Transfer Function | 4-pole Bessel Low-Pass |
| Size | 0.88" x 0.46" x 0.375" |
| Range $f_c$ | |
| D74 | 1 Hz to 50 kHz |
| DP74 | 1 Hz to 5 kHz |
| Passband Ripple (theoretical) | 0.0 dB |
| DC Voltage Gain (non-inverting) | 0 ± 0.1 dB typ. |
| Stopband Attenuation Rate | 24 dB/octave |
| Cutoff Frequency $f_c$ (-3 dB) | |
| Accuracy | ± 2 % max. |
| Stability | ± 0.03 % / °c |
| Phase Shift | – 121° |
| Filter Attenuation | (theoretical) |
| 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 $f_c$ |
| Total Harmonic Distortion @ 1kHz | < – 70 dB |
| Wide Band Noise (5 Hz - 2 MHz) | 200 µVRMS typ. |
| Narrow Band Noise (5 Hz - 100 kHz) | 50 µVRMS typ. |

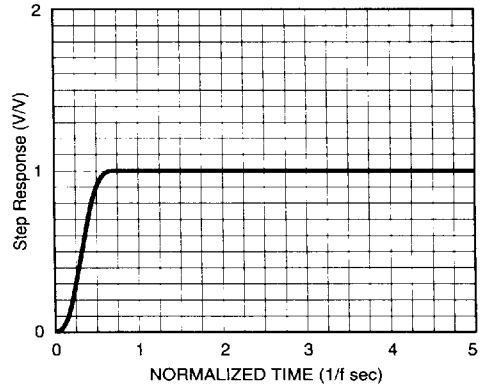
### Frequency Response




### Delay (Normalized)




### Step Response




### Theoretical Transfer Characteristics

| f/fc (Hz) | Amp (dB) | Phase (deg) | Delay [1] (sec) |
|---|---|---|---|
| 0.00 | 0.00 | 0.00 | .336 |
| 0.10 | -0.028 | -12.1 | .336 |
| 0.20 | -0.111 | -24.2 | .336 |
| 0.30 | -0.251 | -36.3 | .336 |
| 0.40 | -0.448 | -48.4 | .336 |
| 0.50 | -0.705 | -60.6 | .336 |
| 0.60 | -1.02 | -72.7 | .336 |
| 0.70 | -1.41 | -84.8 | .336 |
| 0.80 | -1.86 | -96.8 | .335 |
| 0.85 | -2.11 | -103 | .334 |
| 0.90 | -2.40 | -109 | .333 |
| 0.95 | -2.69 | -115 | .332 |
| 1.00 | -3.01 | -121 | .330 |
| 1.10 | -3.71 | -133 | .325 |
| 1.20 | -4.51 | -144 | .318 |
| 1.30 | -5.39 | -156 | .308 |
| 1.40 | -6.37 | -166 | .295 |
| 1.50 | -7.42 | -177 | .280 |
| 1.60 | -8.54 | -187 | .263 |
| 1.70 | -9.71 | -195 | .246 |
| 1.80 | -10.9 | -204 | .228 |
| 1.90 | -12.2 | -212 | .211 |
| 2.00 | -13.4 | -219 | .194 |
| 2.25 | -16.5 | -235 | .158 |
| 2.50 | -19.5 | -248 | .129 |
| 2.75 | -22.4 | -259 | .107 |
| 3.00 | -25.1 | -267 | .089 |
| 3.25 | -27.6 | -275 | .076 |
| 3.50 | -30.0 | -281 | .065 |
| 4.00 | -34.4 | -291 | .049 |
| 5.00 | -41.9 | -305 | .031 |
| 6.00 | -48.1 | -315 | .021 |
| 7.00 | -53.4 | -321 | .016 |
| 8.00 | -58.0 | -326 | .012 |
| 9.00 | -62.0 | -330 | .009 |
| 10.0 | -65.7 | -333 | .008 |

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

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



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Linear Active DIP Filters

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# Model D74H4B

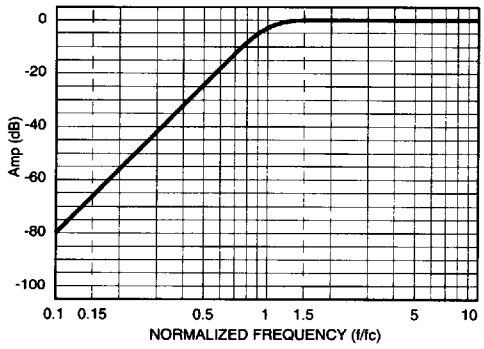
## Linear Active DIP Filters

## 4-Pole Butterworth High-Pass Filter

### Description

The D74H4B is a 4-pole high-pass Butterworth transfer function, is maximally flat, has no ripple in the passband, and has a monotonic roll-up at the rate of 24 dB/octave in the stopband.

### Frequency Response




### Specifications

| | |
|---|---|
| Transfer Function | 4-pole Butterworth High-Pass |
| Size | 0.88" x 0.46" x 0.375" |
| Range $f_c$ | 1 Hz to 50 kHz |
| Passband Ripple (theoretical) | 0.0 dB |
| Voltage Gain (non-inverting) | 0 ±0.1 dB to 100 kHz |
| Power Bandwidth | 120 kHz |
| Small Signal Bandwidth | (-6 dB) 1 MHz |
| Stopband Attenuation Rate | 24 dB/octave |
| Cutoff Frequency $f_c$ (-3 dB) | |
| Accuracy | ±2 % max. |
| Stability | ±0.03 % / °c |
| Phase Shift | – 180° |
| Filter Attenuation | (theoretical) |
| 80 dB | 0.10 $f_c$ |
| 60 dB | 0.18 $f_c$ |
| 3.01 dB | 1.00 $f_c$ |
| 0.00 dB | 4.00 $f_c$ |
| Total Harmonic Distortion @ 1 kHz | < – 70 dB |
| Wide Band Noise (5 Hz - 2 MHz) | 400 $\mu V_{RMS}$ typ. |
| Narrow Band Noise (5 Hz - 50 kHz) | 100 $\mu V_{RMS}$ typ. |

### Theoretical Transfer Characteristics

| f/fc (Hz) | Amp (dB) | Phase (deg) | Delay [1] (sec) |
|---|---|---|---|
| 0.10 | -80.0 | 345 | .418 |
| 0.20 | -55.9 | 330 | .423 |
| 0.30 | -41.8 | 314 | .433 |
| 0.40 | -31.8 | 299 | .449 |
| 0.50 | -24.1 | 282 | .474 |
| 0.60 | -17.8 | 264 | .511 |
| 0.70 | -12.6 | 245 | .558 |
| 0.80 | -8.43 | 224 | .604 |
| 0.85 | -6.69 | 213 | .619 |
| 0.90 | -5.22 | 202 | .622 |
| 0.95 | -3.99 | 191 | .612 |
| 1.00 | -3.01 | 180 | .588 |
| 1.20 | -0.908 | 143 | .427 |
| 1.40 | -0.285 | 118 | .289 |
| 1.60 | -0.100 | 100 | .204 |
| 1.80 | -0.039 | 87.6 | .152 |
| 2.00 | -0.017 | 78.0 | .119 |
| 2.50 | -0.003 | 61.4 | .072 |
| 3.00 | -0.001 | 50.7 | .049 |
| 4.00 | 0.00 | 37.8 | .027 |
| 5.00 | 0.00 | 30.1 | .017 |
| 6.00 | 0.00 | 25.1 | .012 |
| 7.00 | 0.00 | 21.4 | .009 |
| 8.00 | 0.00 | 18.8 | .007 |
| 9.00 | 0.00 | 16.7 | .005 |
| 10.0 | 0.00 | 15.0 | .004 |

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

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



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FREQUENCY DEVICES™

# D74 & DP74 Series

## Pin-Out and Package Data Ordering Information

## Specification

(@ +25°C and Vs ±15V)

**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] | |
| D74 | ± 10 mA |
| DP74 | ± 5 mA |
| Offset Voltage | 10 mV max.<br>3 mV typ. |
| Offset Temp. Coeff. | 20 µV / °C |

**Power Supply (±Vs)**

| | |
|---|---|
| Rated Voltage | ± 15 Vdc |
| Operating Range Vdc | ± 5 to ± 18 |
| Maximum Safe Voltage | ± 18 Vdc |
| Quiescent Current **D74** | 5 mA max.<br>3 mA typ. |
| Quiescent Current **DP74** | 1 mA max.<br>600 µA typ. |

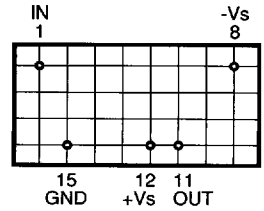
**Temperature**

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

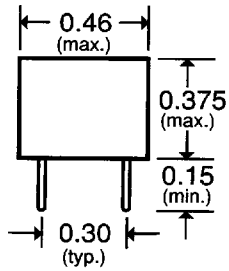
Notes:

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

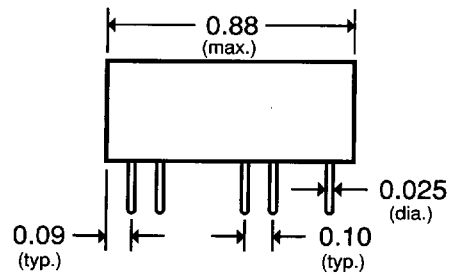
All dimensions are in inches
All Case Dimensions ± 0.01"
Grid Dimensions 0.1" x 0.1"




BOTTOM VIEW




FRONT VIEW




SIDE VIEW

## Ordering Information

**Filter Type**
**L** - Low Pass
**H** - High Pass

**Transfer Function**
**B** - Butterworth
**L** - Bessel

**D74L4B-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 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.



0396-2.5K

3731130 0002755 713

88054

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