D66 & DP66 Series

1.0 Hz to 100 kHz
Fixed Frequency

32 Pin DIP
6-Pole Filters

Description

The D66 and DP66 Series of small 6-pole fixed-frequency, precision active filters provide high performance linear active filtering in a compact 32-pin DIP package, with a broad range of corner frequencies and a choice of transfer functions. Individual D66 filters can serve in low-pass or high-pass applications (DP66, low-pass only) or be combined to create custom band-pass or band-reject filters. These fully self-contained units require no external components or adjustments. Each model comes factory tuned to a user-specified corner frequency between 1 Hz and 100 kHz (DP66, 1 Hz to 5 kHz) and operate with low total harmonic distortion over a wide dynamic input voltage range from non-critical +/-5V to +/-18V power supplies.

Features/Benefits:

- Low harmonic distortion and wide signal-to-noise ratio to 16 bit resolution.
- Compact 1.8"L x 0.8"W x 0.3"H minimizes board space requirements.
- Plug-in ready-to-use, reducing engineering design and manufacturing cycle time.
- Factory tuned, no external clocks or adjustments needed
- Broad range of transfer characteristics and corner frequencies to meet a wide range of applications.

Applications

- Anti-alias filtering
- Data acquisition systems
- Communication systems and electronics
- Medical electronics equipment and research
- Aerospace, navigation and sonar applications
- Sound and vibration testing
- Acoustic and vibration analysis and control
- Noise elimination
- Signal reconstruction

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D66 & DP66 Series

6-Pole Low-Pass and High-Pass Filters

Fixed Frequency

Model	D66L6B & DP66L6B	D66L6L & DP66L6L	Model	D66H6B
Product Specifications	**Low-Pass**	**Low-Pass**		**High-pass**
Transfer Function	6-Pole, Butterworth	6-Pole, Bessel	**Transfer Function**	6-Pole, Butterworth
Size	1.8" x 0.8" x 0.3"	1.8" x 0.8" x 0.3"	**Size**	1.8" x 0.8" x 0.3"
Range f_c **D66** **DP66**	 1 Hz to 100 kHz 1 Hz to 5 kHz	 1 Hz to 100 kHz 1 Hz to 5 kHz	**Range f_c** **D66** **DP66**	 1 Hz to 100 kHz Not Available
Theoretical Transfer Characteristics	Appendix A Page 8	Appendix A Page 3	**Theoretical Transfer Characteristics**	Appendix A Page 28
Passband Ripple (theoretical)	0.0 dB	0.0 dB	**Passband Ripple** (theoretical)	0.0 dB
DC Voltage Gain (non-inverting)	0 ± 0.1 dB max. 0 ± 0.05 dB typ.	0 ± 0.1 dB max. 0 ± 0.05 dB typ.	**Voltage Gain** (non-inverting)	0 ± 0.1 dB to 100 kHz 0 ± 0.05 dB to 120 kHz
Stopband Attenuation Rate	36 dB/octave	36 dB/octave	**Stopband Attenuation Rate**	36 dB min.
			Power Bandwidth	(-6dB) 1 MHz
			Power Bandwidth	120 kHz
Cutoff Frequency **Stability** **Amplitude** **Phase**	f_c ± 1% max. ± 0.01% /°C -3dB -270°	f_c ± 1% max. ± 0.01% /°C -3dB -155°	**Cutoff Frequency** **Stability** **Amplitude** **Phase**	f_c ± 1% max. ± 0.01% /°C -3dB -270°
Filter Attenuation (theoretical)	0.29 dB 0.80 f_c 3.01 dB 1.00 f_c 60.0 dB 3.16 f_c 80.0 dB 4.64 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	**Filter Attenuation** (theoretical)	80.0 dB .21 f_c 60.0 dB .32 f_c 3.01 dB 1.00 f_c 0.00 dB 2.5 f_c
Phase Match[1]	0 - 0.8 f_c ± 2° max. ± 1° typ. 0.8 f_c - 1.0 f_c ± 3° max. ± 1.5° typ.	0 - f_c ± 2° max. ± 1° typ.	**Phase Match**[1]	f_c - 100 kHz ± 3° max. ± 1.5° typ.
Amplitude Accuracy (theoretical)	0 - 0.8 f_c ± 0.2 dB max. ± 0.1 dB typ. 0.8 f_c - 1.0 f_c ± 0.3° dB max. ± 0.15° dB typ.	0 - f_c ± 0.2 dB max. ± 0.1 dB typ.	**Amplitude Accuracy** (theoretical)	1.0 - 1.25 f_c ± 0.3 dB max. ± 0.15 dB typ. 1.25f_c-100kHz ± 0.2 dB max. ± 0.1 dB typ.
Total Harmonic Distortion @ 1 kHz **D66** **DP66**	 <-100 dB typ. <-80 dB typ.	 <-100 dB typ. <-80 dB typ.	**Total Harmonic Distortion @ 1 kHz** **D66**	 <-88 dB typ.
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

1. Unit to unit match for the same transfer function, set to the same frequency and operating configuration, and from the same manufacturing lot.

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D66 & DP66 Series

FREQUENCY DEVICES™, INC.

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

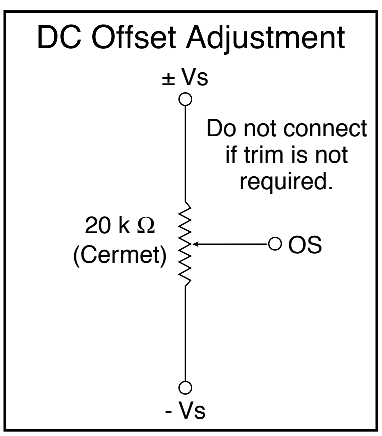
Impedance(Closed Loop)	1 Ω typ. 10 Ω max.
Linear Operating Range	± 10 V
Maximum Current[2]	± 2 mA
Offset Voltage[3]	2 mV typ. 20 mV max.
Offset Temp. Coeff.	50 µV / °C

Power Supply (±V)

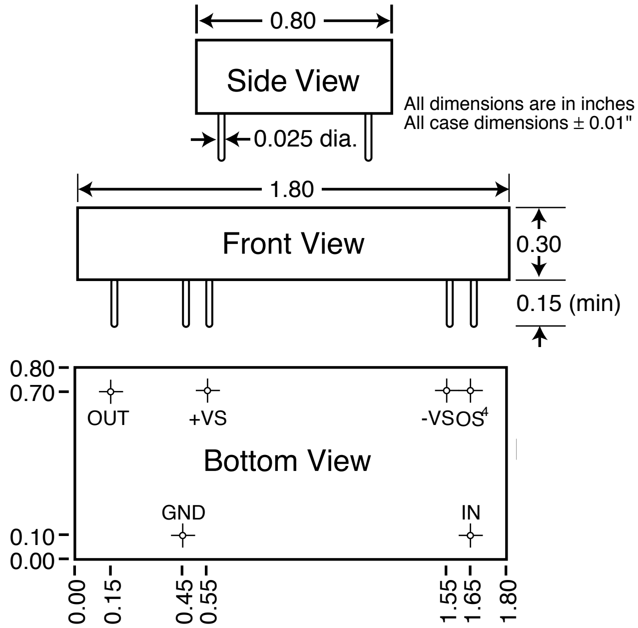
Rated Voltage	± 15 Vdc
Operating Range	± 5 to ± 18 Vdc
Maximum Safe Voltage	± 18 Vdc
Quiescent Current D66	± 19 mA typ. ± 30 mA max.
Quiescent Current DP66	± 7.0 mA typ. ± 8.0 mA max.

Temperature

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



Pin-Out and Package Data
Ordering Information



Filter Mounting Assembly-See FMA-01A

Ordering Information

Filter Type
L - Low Pass
H - High Pass

Transfer Function
B - Butterworth
L - Bessel

D66L6B-849 Hz

Power Level
D – Standard Power
DP – Low Power

- 3 dB Corner Frequency[5]
e.g., 849 Hz
2.50 kHz
33.3 kHz

Notes:

1. Input and output signal voltage referenced to supply common.
2. Output is short circuit protected to common. DO NOT CONNECT TO ±Vs.
3. Adjustable to zero.
4. Units operate with or with out offset pin connected.
5. 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 1.00 Hz to 100 kHz.

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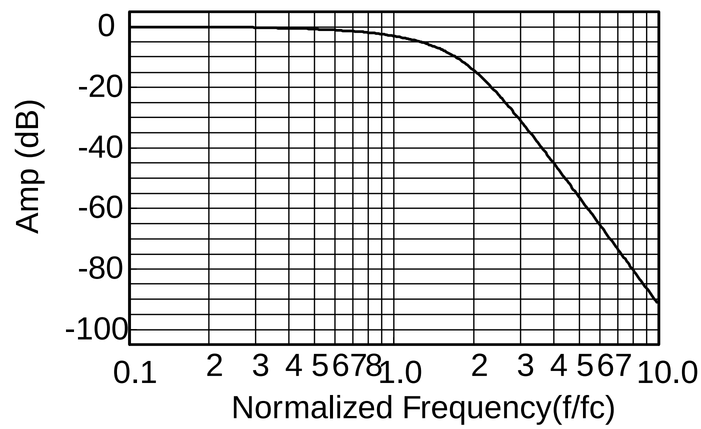
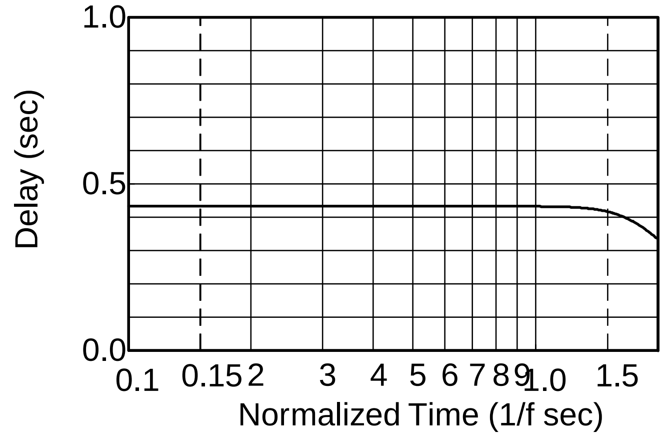
Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay[1] (sec)
0.00	0.00	0.00	.430
0.10	-0.029	-15.5	.430
0.20	-0.116	-31.0	.430
0.30	-0.261	-46.5	.430
0.40	-0.465	-62.0	.430
0.50	-0.728	-77.4	.430
0.60	-1.05	-92.9	.430
0.70	-1.44	-108	.430
0.80	-1.89	-124	.430
0.85	-2.15	-132	.430
0.90	-2.42	-139	.430
0.95	-2.70	-147	.430
1.00	-3.01	-155	.430
1.10	-3.68	-170	.429
1.20	-4.44	-186	.428
1.30	-5.29	-201	.426
1.40	-6.23	-216	.422
1.50	-7.29	-232	.416
1.60	-8.46	-246	.401
1.70	-9.74	-261	.393
1.80	-11.1	-275	.376
1.90	-12.6	-287	.357
2.00	-14.2	-300	.335
2.25	-18.3	-328	.279
2.50	-22.6	-351	.228
2.75	-26.7	-369	187
3.00	-30.7	-385	.156
3.25	-34.5	-398	.131
3.50	-38.1	-408	.111
4.00	-44.7	-426	.083
5.00	-55.9	-449	.052
6.00	-65.2	-465	.036
7.00	-73.2	-476	.026
8.00	-80.1	-484	.020
9.00	-86.2	-490	.015
10.0	-91.6	-495	.013

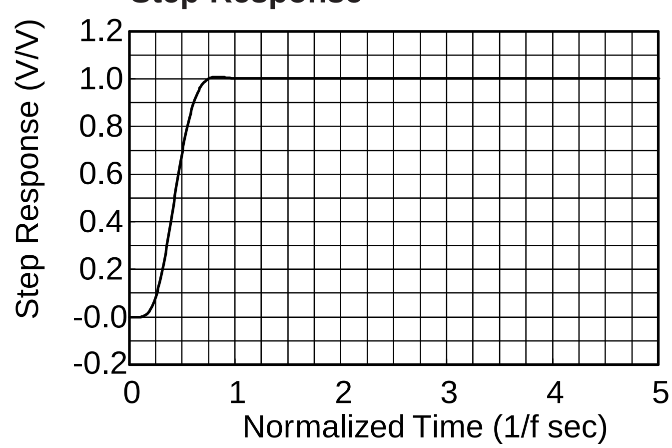
Frequency Response



Delay (Normalized)



Step 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).

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

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FREQUENCY DEVICES™, INC.

Low-Pass

6-Pole

Butterworth

Appendix A

Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay[1] (sec)
0.00	0.00	0.00	.615
0.10	0.00	-22.2	.617
0.20	0.00	-44.5	.624
0.30	0.00	-67.2	.637
0.40	0.00	-90.4	.656
0.50	-0.001	-115	.685
0.60	-0.009	-140	.731
0.70	-0.060	-167	.803
0.80	-0.289	-198	.911
0.85	-0.578	-215	.970
0.90	-1.080	-233	1.02
0.95	-1.88	-252	1.03
1.00	-3.01	-270	1.00
1.10	-6.17	-304	.845
1.20	-9.96	-331	.660
1.30	-13.9	-352	.518
1.40	-17.6	-368	.417
1.50	-21.2	-382	.345
1.60	-24.5	-393	.291
1.70	-27.7	-403	.251
1.80	-30.6	-412	.219
1.90	-33.5	-419	.193
2.00	-36.1	-425	.171
2.25	-42.3	-439	.132
2.50	-47.8	-450	.105
2.75	-52.7	-458	.086
3.00	-57.3	-465	.071
3.25	-61.4	-471	.060
3.50	-65.3	-476	.052
4.00	-72.2	-484	.039
5.00	-83.9	-496	.025
6.00	-93.4	-503	.017
7.00	-101	-508	.012
8.00	-108	-512	.0097
9.00	-115	-515	.0076
10.0	-120	-518	.0062

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).

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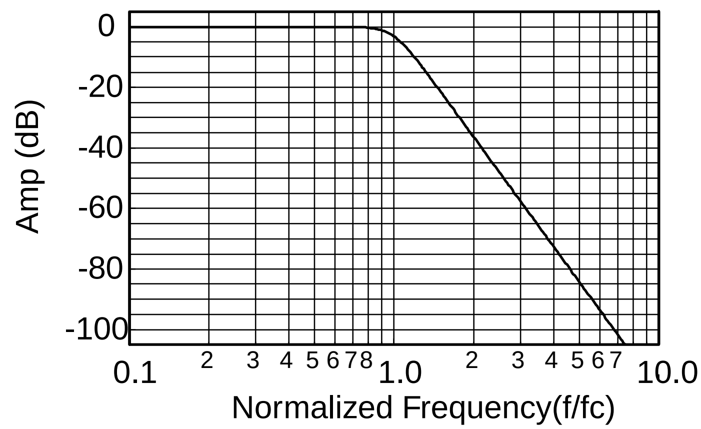
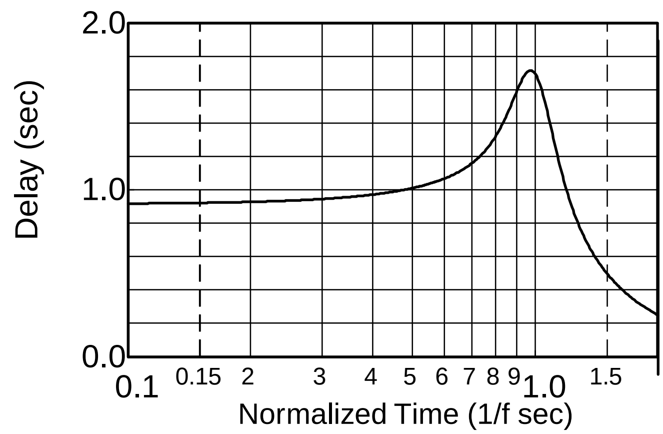
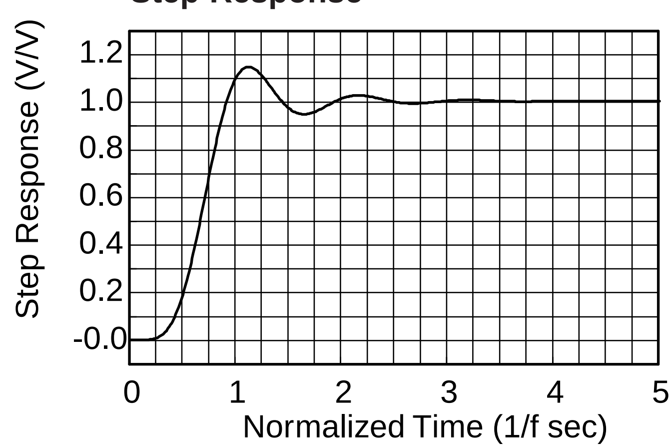
Frequency Response



Delay (Normalized)



Step Response



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High-Pass

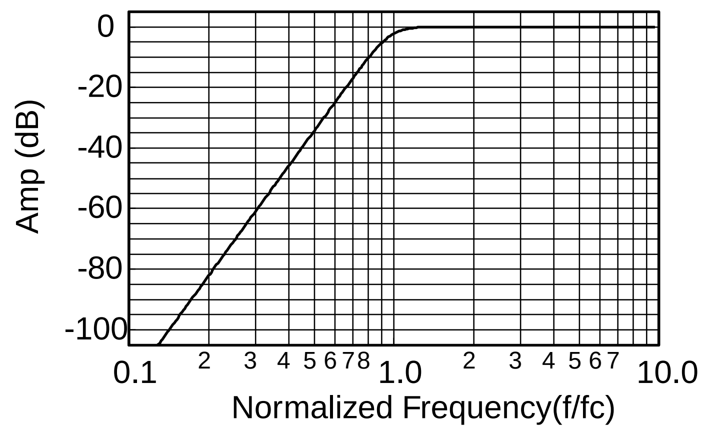
6-Pole

Butterworth

Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay[1] (sec)
0.10	-120	518	0.617
0.20	-83.9	496	0.624
0.30	-62.7	473	0.637
0.40	-47.8	450	0.656
0.50	-36.1	425	0.685
0.60	-26.6	400	0.731
0.70	-18.6	373	0.803
0.80	-11.9	342	0.911
0.85	-9.05	325	0.970
0.90	-6.57	307	1.017
0.95	-4.55	288	1.033
1.00	-3.01	270	1.005
1.20	-0.46	209	0.660
1.40	-0.08	172	0.417
1.60	-0.02	147	0.291
1.80	-0.00	128	0.219
2.00	-0.00	115	0.171
2.50	-0.00	90.4	0.105
3.00	-0.00	74.8	0.071
4.00	0.00	55.8	0.039
5.00	0.00	44.5	0.025
6.00	0.00	37.0	0.017
7.00	0.00	31.7	0.013
8.00	0.00	27.7	0.010
9.00	0.00	24.6	0.008
10.0	0.00	22.2	0.006

Frequency Response



1. **Normalized Group Delay:**
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