IN-00854-00

FREQUENCY DEVICES™

854 Series

Programmable Active Filters

Anti-Alias Filters

Description

The 854 Series are digitally programmable low-pass and high-pass active filters that are tunable over a 256:1 frequency range. 854 filters are available with any one of six standard factory-set tuning ranges up to 102.4 kHz. These units contain 8 CMOS logic inputs that can be operated in a transparent or latching mode.

All 854 Series models are convenient, low profile, easy to use fully finished filters which require no external components or adjustments. They feature low harmonic distortion, and near theoretical phase and amplitude characteristics. 854 filters operate from non-critical ± 12 to ± 18 Vdc power supplies, have a 10 kΩ (min.) input impedance, a 10 Ω (max.) output impedance and offer dc voltage offset adjustment.

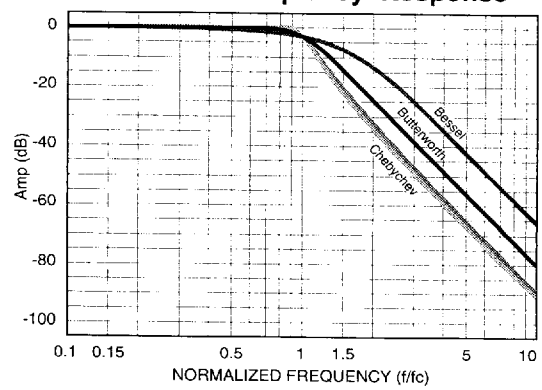
Features/Benefits:

- Digitally programmable corner frequency allows selecting cut-off frequencies specific to each application
- Plug-in ready-to-use, reducing engineering design and manufacturing cycle time
- Factory-set tuning range, no external clocks or adjustments needed
- Broad range of transfer characteristics and corner frequencies to meet a wide range of applications
- Low profile design, ideal for rack mount installations

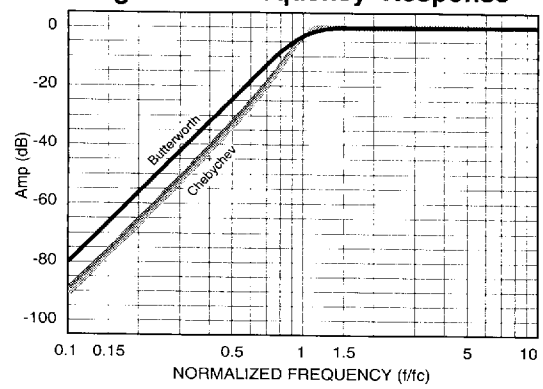
Applications

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

Low-Pass Frequency Response



High-Pass Frequency Response



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Programmable Filters

Digital Tuning Characteristics

The digital tuning interface circuits are two 4042 quad CMOS latches which accept the following CMOS-compatible inputs: eight tuning bits (D_0 - D_7), a latch strobe bit (C), and a transition polarity bit (P).

Filter tuning follows the tuning equation given below:

$$f_c = (f_{max}/256) [1 + D_7 \times 2^7 + D_6 \times 2^6 + D_5 \times 2^5 + D_4 \times 2^4 + D_3 \times 2^3 + D_2 \times 2^2 + D_1 \times 2^1 + D_0 \times 2^0]$$

where D_1 - D_7 = "0" or "1", and
f_{max} = Maximum tuning frequency;
f_c = corner frequency;
Minimum tunable frequency = $f_{max}/256$ (D0 thru D7 = 0);
Minimum frequency step (Resolution) = $f_{max}/256$

Data Control Specifications

Data Control Lines

Functions	Latch Strobe (C) Transition Polarity (P)

Data Control Modes

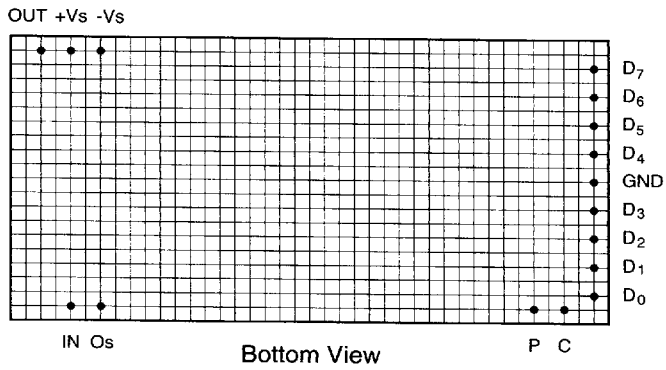
Mode 1	P = 0; C = 0	frequency follows input codes
	P = 0; C = 0⇑	frequency latched on rising edge
Mode 2	P = 1; C = 1	frequency follows input codes
	P = 1; C = 1⇓	frequency latched on falling edge

Input Data Levels	**(CMOS Logic)**	
Input Voltage (Vs = 15 Vdc)		
Low Level In	0 Vdc min.	4 Vdc max.
High Level In	11 Vdc min.	15 Vdc max.
Input Current		
High Level In	- 10^{-5} µA typ.	-1 µA max..
Low Level In	+10^{-5} µA typ.	+1 µA max.
Input Capacitance	5 pF typ	7.5 pF max.
Latch Response		
Data Set Up Time[1]	25 nS	
Data Hold Time[2]	50 nS	
Strobe Pulse Width	80 nS min.	
Input Data Format	**Frequency Select Bits**	
Positive Logic	Logic "1" = +Vs Logic "0" = Gnd	
Bit Weighting	(Binary-Coded)	
D_0	LSB (least significant bit)	
D_7	MSB (most significant bit)	
Frequency Range	256 : 1, Binary Weighted	

Notes:
1. Frequency data must be present before occurence of strobe edge.
2. Frequency data must be present after occurence of strobe edge.

Pin-Out Key

IN	Analog Input Signal	D_7 Tuning Bit 7 (MSB)
OUT	Analog Output Signal	D_6 Tuning Bit 6
GND	Power and Signal Return	D_5 Tuning Bit 5
"P"	Transition Polarity Bit	D_4 Tuning Bit 4
"C"	Tuning Strobe Bit	D_3 Tuning Bit 3
+Vs	Supply Voltage, Positive	D_2 Tuning Bit 2
-Vs	Supply Voltage, Negative	D_1 Tuning Bit 1
Os	Optional Offset Adjustment	D_0 Tuning Bit 0 (LSB)



Bottom View

MSB	---	---	---	---	---	---	LSB	Bit Weight
2^7 D_7	2^6 D_6	2^5 D_5	2^4 D_4	2^3 D_3	2^2 D_2	2^1 D_1	2^0 D_0	fc Corner Frequency
0	0	0	0	0	0	0	0	$f_{max}/256$
0	0	0	0	0	0	0	1	$f_{max}/128$
0	0	0	0	0	0	1	1	$f_{max}/64$
0	0	0	0	0	1	1	1	$f_{max}/32$
0	0	0	0	1	1	1	1	$f_{max}/16$
0	0	0	1	1	1	1	1	$f_{max}/8$
0	0	1	1	1	1	1	1	$f_{max}/4$
0	1	1	1	1	1	1	1	$f_{max}/2$
1	1	1	1	1	1	1	1	fmax

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FREQUENCY DEVICES™

Model 854L8B

Programmable Filters

4-pole Butterworth Low-Pass Filter

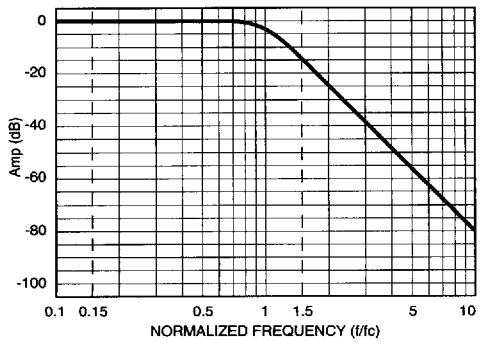
Description

The 854L8B is a digitally programmable filter, with a 4-pole low-pass Butterworth transfer function, is maximally flat, has no ripple in the pass band, and has a monotonic roll-off at the rate of 24 dB/octave in the stop band.

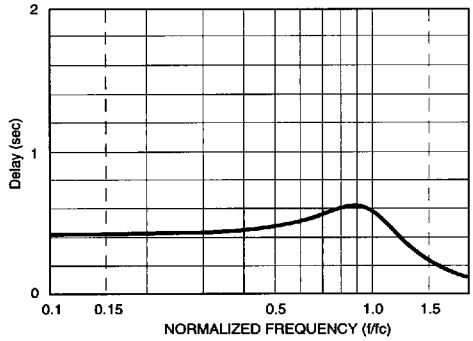
Specifications

Transfer Function	4-pole Butterworth Low-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple (theoretical)	0.0 dB
DC Voltage Gain (non-inverting)	0 ± 0.1 dB max. 0 ± 0.05 dB typ.
Stopband Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	± 2 % max.
Stability	± 0.01 % / °c
Phase	– 180°
Filter Attenuation	(theoretical)
0.67 dB	0.80 f_c
3.01 dB	1.00 f_c
30.0 dB	2.37 f_c
40.0 dB	3.16 f_c
Phase Match[2]	
0 - 0.8 f_c	± 2° max. ± 1° typ.
0.8 f_c - 1.0 f_c	± 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.
Total Harmonic Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise (5 Hz - 2 MHz)	200 µVRMS typ.
Narrow Band Noise (5 Hz - 100 kHz)	50 µVRMS typ.

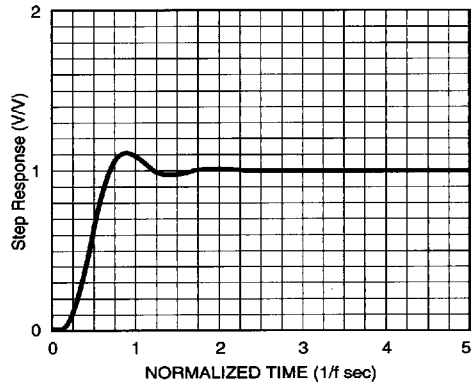
Frequency Response



Delay (Normalized)



Step Response



Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay [1] (sec)
0.00	0.00	0.00	.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

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

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™

Model 854L8L

Programmable Filters

4-pole Bessel Low-Pass Filter

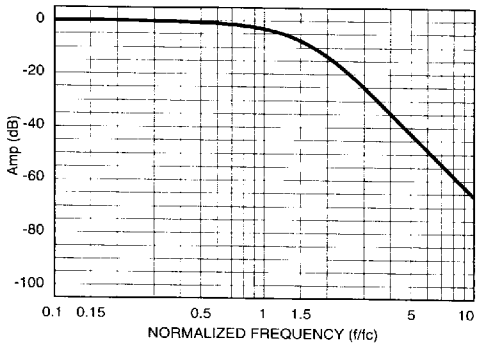
Description

The 854L8L is a digitally programmable filter, with a 4-pole low-pass Bessel transfer function, has a monotonic roll-off in the pass band and the stop band, and its final roll-off is 24 dB/octave in the stop band. It exhibits a constant delay in the pass band and has an over shoot free step response.

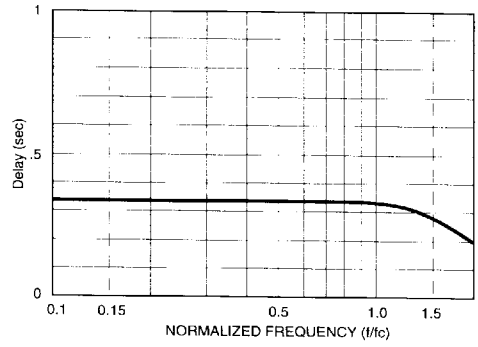
Specifications

Transfer Function	4-pole Bessel Low-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple (theoretical)	0.0 dB
DC Voltage Gain (non-inverting)	0 ± 0.1 dB max. 0 ± 0.05 dB typ.
Stopband Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	± 2 % max.
Stability	± 0.01 % / °C
Phase	– 121°
Filter Attenuation	(theoretical)
1.86 dB	0.80 f_c
3.01 dB	1.00 f_c
30.0 dB	3.50 f_c
40.0 dB	4.72 f_c
Phase Match[2] 0 - f_c	± 2° max. ± 1° typ.
Amplitude Accuracy 0 - f_c	(theoretical) ± 0.2 dB max. ± 0.1 dB typ.
Total Harmonic Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise (5 Hz - 2 MHz)	200 µVRMS typ.
Narrow Band Noise (5 Hz - 100 kHz)	50 µVRMS typ.

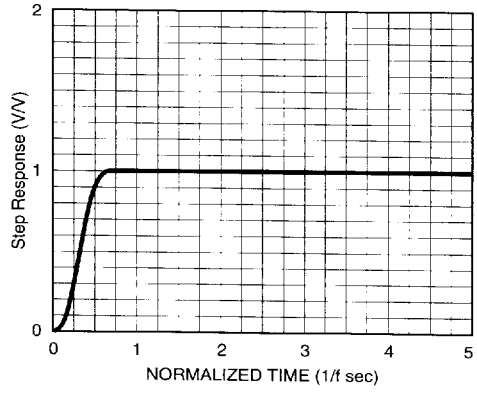
Frequency Response



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

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

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™

Model 854L8Y2

4-pole Chebychev 0.2 dB Ripple Low-Pass Filter

Programmable Filters

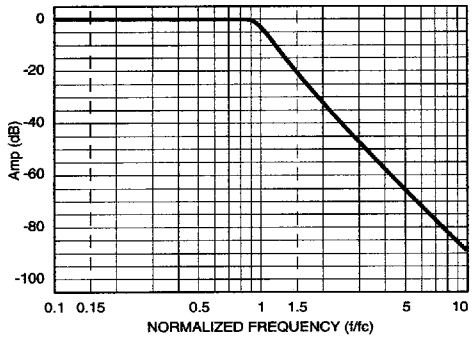
Description

The 854L8Y2 is a digitally programmable filter, with a 4-pole low-pass Chebychev transfer function and 0.2 dB of ripple in the pass band. It has a monotonic roll-off at the rate of 24 dB/octave in the stop band.

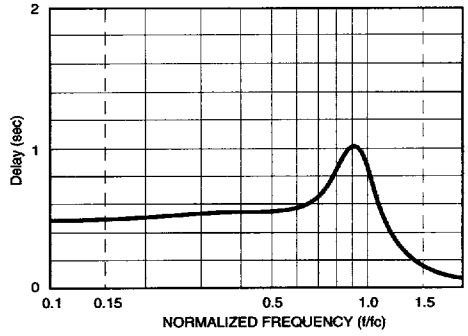
Specifications

Transfer Function	4-pole Chebychev 0.2 dB Ripple Low-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple	(theoretical)
0 - f_c	0.20 dB
DC Voltage Gain	0 ± 0.1 dB max.
(non-inverting)	0 ± 0.05 dB typ.
Stopband Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	± 2 % max.
Stability	± 0.01 % / °C
Phase	– 231°
Filter Attenuation	(theoretical)
-0.20 dB	0.80 f_c
3.01 dB	1.00 f_c
30.0 dB	1.89 f_c
40.0 dB	2.46 f_c
Phase Match[2]	
0 - 0.8 f_c	± 2° max.
	± 1° typ.
0.8 f_c - 1.0 f_c	± 3° max.
	± 1.5° typ.
Amplitude Accuracy	(theoretical)
0 - 0.8 f_c	± 0.2 dB max.
	± 0.1 dB typ.
0.8 fc - 1.0 f_c	± 0.3 dB max.
	± 0.15 dB typ.
Total Harmonic Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise (5 Hz - 2 MHz)	200 µVRMS typ.
Narrow Band Noise (5 Hz - 100 kHz)	50 µVRMS typ.

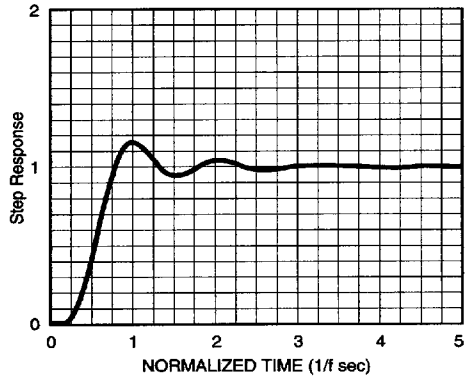
Frequency Response



Delay



Step Response



Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay [1] (sec)
0.00	0.000	0.00	.478
0.10	0.040	-17.3	.487
0.20	0.129	-35.2	.509
0.30	0.200	-54.0	.533
0.40	0.174	-73.4	.547
0.50	0.074	-93.2	.553
0.60	0.000	-113	.575
0.70	0.075	-135	.654
0.80	0.200	-162	.836
0.85	0.063	-178	.947
0.90	-0.443	-196	1.02
0.95	-1.47	-214	.989
1.00	-3.01	-231	.873
1.10	-6.89	-257	.583
1.20	-10.8	-274	.385
1.30	-14.5	-286	.271
1.40	-17.7	-294	.202
1.50	-20.7	-300	.158
1.60	-23.4	-306	.128
1.70	-25.8	-310	.107
1.80	-28.1	-313	.090
1.90	-30.2	-316	.078
2.00	-32.2	-319	.068
2.25	-36.7	-324	.051
2.50	-40.6	-328	.039
2.75	-44.1	-331	.032
3.00	-47.3	-334	.026
3.25	-50.2	-336	.022
3.50	-52.8	-338	.018
4.00	-57.6	-341	.014
5.00	-65.5	-345	.009
6.00	-71.9	-347	.006
7.00	-77.3	-349	.004
8.00	-82.0	-351	.003
9.00	-86.1	-352	.003
10.0	-89.8	-352	.002

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

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™

Model 854L8Y5

4-pole Chebychev 0.5 dB Ripple Low-Pass Filter

Programmable Filters

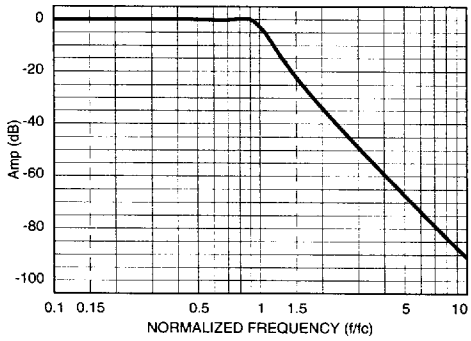
Description

The 854L8Y5 is a digitally programmable filter, with a 4-pole low-pass Chebychev transfer function and 0.5dB of ripple in the pass band. It has a monotonic roll-off at the rate of 24 dB/octave in the stop band.

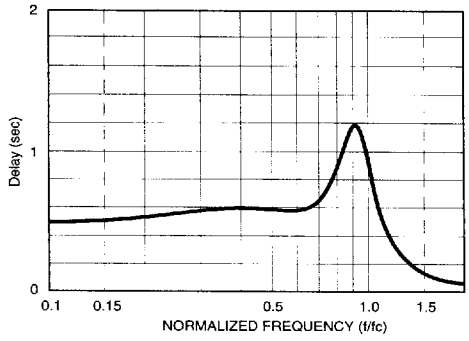
Specifications

Transfer Function	4-pole Chebychev 0.5 dB Ripple Low-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple	(theoretical)
0 - f_c	0.50 dB
DC Voltage Gain	0 ± 0.1 dB max.
(non-inverting)	0 ± 0.05 dB typ.
Stopband Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	±2 % max.
Stability	±0.01 % / °C
Phase	– 245°
Filter Attenuation	(theoretical)
-0.43 dB	0.80 f_c
3.01 dB	1.00 f_c
30.0 dB	1.80 f_c
40.0 dB	2.33 f_c
Phase Match[2]	
0 - 0.8 f_c	±2° max.
	±1° typ.
0.8 f_c - 1.0 f_c	±3° max.
	±1.5° typ.
Amplitude Accuracy	(theoretical)
0 - 0.8 f_c	±0.2 dB max.
	±0.1 dB typ.
0.8 fc - 1.0 f_c	±0.3 dB max.
	±0.15 dB typ.
Total Harmonic Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise (5 Hz - 2 MHz)	200 µVRMS typ.
Narrow Band Noise (5 Hz - 100 kHz)	50 µVRMS typ.

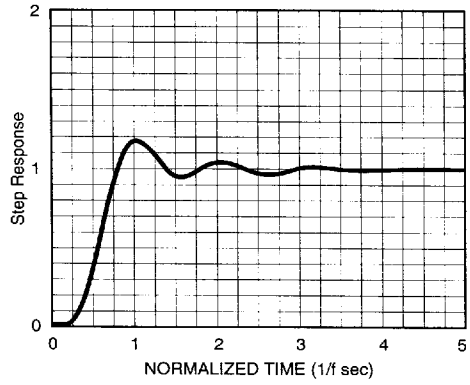
Frequency Response



Delay



Step Response



Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay [1] (sec)
0.00	0.00	0.00	.476
0.10	0.088	-17.3	.492
0.20	0.296	-35.7	.533
0.30	0.475	-55.7	.577
0.40	0.464	-76.9	.596
0.50	0.249	-98.2	.583
0.60	0.026	-119	.578
0.70	0.073	-141	.647
0.80	0.433	-168	.881
0.85	0.483	-185	1.06
0.90	0.063	-205	1.18
0.95	-1.12	-226	1.13
1.00	-3.01	-245	.946
1.10	-7.61	-272	.559
1.20	-12.0	-288	.345
1.30	-15.9	-298	.235
1.40	-19.3	-305	.173
1.50	-22.3	-311	.134
1.60	-25.1	-315	.108
1.70	-27.6	-318	.089
1.80	-29.9	-321	.075
1.90	-32.1	-324	.065
2.00	-34.1	-326	.057
2.25	-38.6	-301	.042
2.50	-42.6	-334	.033
2.75	-46.1	-336	.026
3.00	-49.3	-339	.021
3.25	-52.2	-340	.018
3.50	-54.9	-342	.015
4.00	-59.6	-344	.011
5.00	-67.6	-347	.007
6.00	-74.0	-350	.005
7.00	-79.4	-351	.004
8.00	-84.1	-352	.003
9.00	-88.2	-353	.002
10.0	-91.9	-354	.002

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

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™

Model 854H8B

Programmable Filters

4-pole Butterworth High-Pass Filter

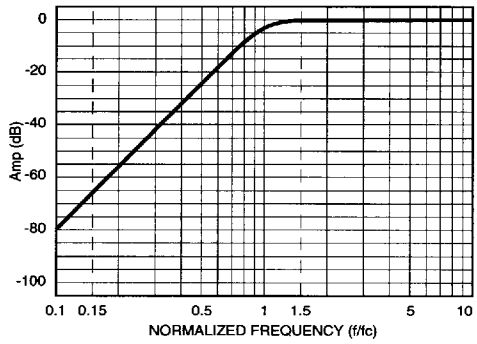
Description

The 854H8B is a digitally programmable filter, with a 4-pole high-pass Butterworth transfer function, is maximally flat, has no ripple in the pass band, and has a monotonic roll-off at the rate of 24 dB/octave in the stop band.

Specifications

Transfer Function	4-pole Butterworth High-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple (theoretical)	0.0 dB
DC Voltage Gain (non-inverting)	0 ±0.2 dB to 100 kHz 0 ±0.5 dB to 120 kHz
Power Bandwidth	120 kHz
Small Signal Bandwidth	(-6 dB) 1 MHz
Stopband Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	±2 % max.
Stability	±0.01 % / °C
Phase	180°
Filter Attenuation	(theoretical)
40 dB	0.31 f_c
30 dB	0.42 f_c
3.01 dB	1.00 f_c
0.02 dB	2.00 f_c
Phase Match[2] f_c - 100 kHz	±3° max. ±1.5° typ.
Amplitude Accuracy	(theoretical)
1.0 - 1.25 f_c	±0.30 dB max. ±0.15 dB typ.
1.25 f_c - 100 kHz	±0.20 dB max. ±0.10 dB typ.
Total Harmonic Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise (5 Hz - 2 MHz)	400 μV_{RMS} typ.
Narrow Band Noise (5 Hz - 100 kHz)	100 μV_{RMS} typ.

Frequency Response



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
0.90	-5.22	202	.622
1.00	-3.01	180	.588
1.20	-.908	143	.427
1.50	-.166	108	.241
1.70	-.062	93.5	.175
2.00	-.017	78.0	.119
2.50	-.003	61.4	.007
3.00	-.001	50.7	.005
4.00	.000	37.8	.003
5.00	.000	30.1	.002
6.00	.000	25.1	.001
7.00	.000	21.4	.001
8.00	.000	18.8	.001
9.00	.000	16.7	.001
10.0	.000	15.0	.000

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

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™

Model 854H8Y2

4-pole Chebychev 0.2 dB Ripple High-Pass Filter

Programmable Filters

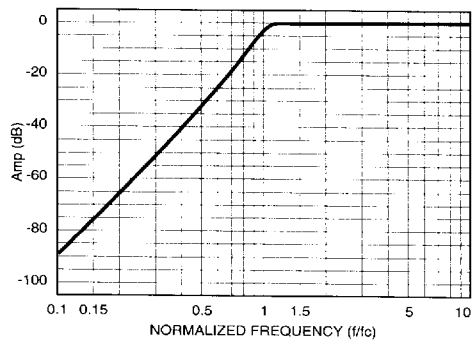
Description

The 854H8Y2 is a digitally programmable filter, with a 4-pole high-pass Chebychev transfer function and 0.2 dB of ripple in the pass band. It has a monotonic roll-off at the rate of 24 dB/octave in the stop band.

Specifications

Transfer Function	4-pole, Chebychev 0.2 dB Ripple High-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple	(theoretical)
0 - f_c	0.20 dB
DC Voltage Gain	0 ±0.2 dB to 100 kHz
(non-inverting)	0 ±0.5 dB to 120 kHz
Power Bandwidth	120 kHz
Small Signal Bandwidth	(-6 dB) 1 MHz
Stopband Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	±2 % max.
Stability	±0.01 % / °C
Phase	231°
Filter Attenuation	(theoretical)
40.0 dB	0.41 f_c
30.0 dB	0.53 f_c
3.01 dB	1.00 f_c
-0.07 dB	2.00 f_c
Phase Match[2]	
f_c - 100 kHz	±3° max.
	±1.5° typ.
Amplitude Accuracy	(theoretical)
1.00 - 1.25 f_c	±0.3 dB max.
	±0.15 dB typ.
1.25 f_c - 100 kHz	±0.2 dB max.
	±0.1 dB typ.
Total Harmonic Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise (5 Hz - 2 MHz)	400 μV_{RMS} typ.
Narrow Band Noise (5 Hz - 100 kHz)	100 μV_{RMS} typ.

Frequency Response



Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay [1] (sec)
0.10	-89.8	352	.212
0.20	-65.1	345	.218
0.30	-51.1	337	.228
0.40	-40.6	328	.245
0.50	-32.2	319	.272
0.60	-25.0	308	.314
0.70	-18.6	296	.383
0.80	-12.7	280	.500
0.90	-7.34	259	.686
1.00	-3.01	231	.873
1.20	.140	172	.633
1.50	.031	128	.275
1.70	.003	111	.197
2.00	.074	93.2	.138
2.50	.174	73.4	.088
3.00	.200	60.4	.060
4.00	.170	44.5	.033
5.00	.129	35.2	.020
6.00	.098	29.2	.014
7.00	.076	24.9	.010
8.00	.060	21.7	.008
9.00	.048	19.3	.006
10.0	.040	17.3	.005

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

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™

Model 854H8Y5

4-pole Chebychev 0.5 dB Ripple High-Pass Filter

Programmable Filters

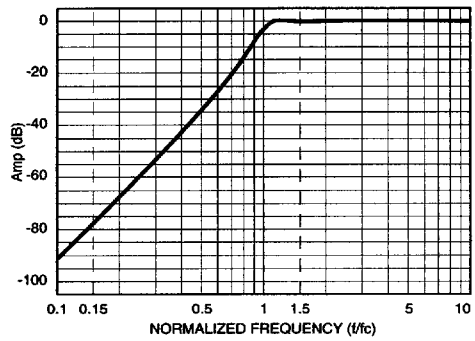
Description

The 854H8Y5 is a digitally programmable filter, with a 4-pole high-pass Chebychev transfer function and 0.5 dB of ripple in the pass band. It has a monotonic roll-off at the rate of 24 dB/octave in the stop band.

Specifications

Transfer Function	4-pole, Chebychev 0.5 dB Ripple High-Pass
Size, Model 1 & 2	4.0" x 2.0" x 0.6"
Model 3 thru 6	4.0" x 2.0" x 0.4"
Range f_c	0.1 Hz to 102.4 kHz
Passband Ripple	(theoretical)
0 - f_c	0.50 dB
DC Voltage Gain	0 ±0.2 dB to 100 kHz
(non-inverting)	0 ±0.5 dB to 120 kHz
Power Bandwidth	120 kHz
Small Signal Bandwidth	(-6 dB) 1 MHz
Stopband	
Attenuation Rate	24 dB/octave
Cutoff Frequency f_c (-3dB)	±2 % max.
Stability	±0.01 % / °C
Phase	245°
Filter Attenuation	(theoretical)
40.0 dB	0.43 f_c
30.0 dB	0.56 f_c
3.01 dB	1.00 f_c
-0.25 dB	2.00 f_c
Phase Match[2]	
f_c - 100 kHz	±3° max.
	±1.5° typ.
Amplitude Accuracy	(theoretical)
1.00 - 1.25 f_c	±0.3 dB max.
	±0.15 dB typ.
1.25 f_c - 100 kHz	±0.2 dB max.
	±0.1 dB typ.
Total Harmonic	
Distortion @ 1 kHz	< – 88 dB typ.
Wide Band Noise	400 µVRMS typ.
(5 Hz - 2 MHz)	
Narrow Band Noise	100 µVRMS typ.
(5 Hz - 100 kHz)	

Frequency Response



Theoretical Transfer Characteristics

f/fc (Hz)	Amp (dB)	Phase (deg)	Delay [1] (sec)
0.10	-91.9	354	.174
0.20	-67.6	347	.179
0.30	-53.1	341	.188
0.40	-42.6	334	.203
0.50	-34.1	326	.226
0.60	-26.8	317	.263
0.70	-20.2	307	.326
0.80	-14.0	293	.440
0.90	-8.13	274	.651
1.00	-3.01	245	.946
1.20	.500	179	.693
1.50	.014	133	.271
1.70	.043	117	.199
2.00	.249	98.2	.146
2.50	.469	76.9	.095
3.00	.498	62.7	.065
4.00	.401	45.5	.035
5.00	.296	35.7	.021
6.00	.221	29.4	.014
7.00	.169	25.0	.010
8.00	.133	21.8	.008
9.00	.107	19.3	.006
10.0	.088	17.3	.005

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

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™

854 Series

Pin-Out and Package Data Ordering Information

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 (±Vs)

Rated Voltage	± 15 Vdc
Operating Range	± 12 to ± 18 Vdc
Maximum Safe Voltage	± 18 Vdc
Quiescent Current 4 Pole	± 13 mA typ. ± 20 mA max.

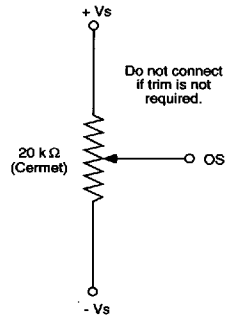
Temperature

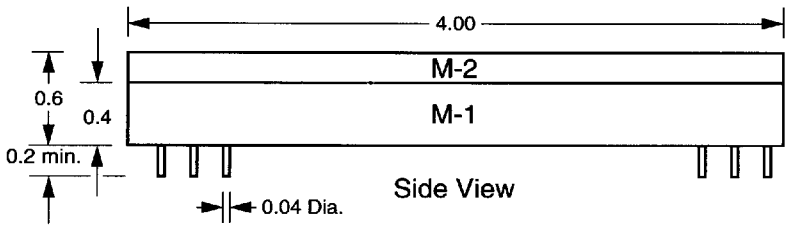
Operating	0 to + 70 °C
Storage	- 25 to + 85 °C

Notes:

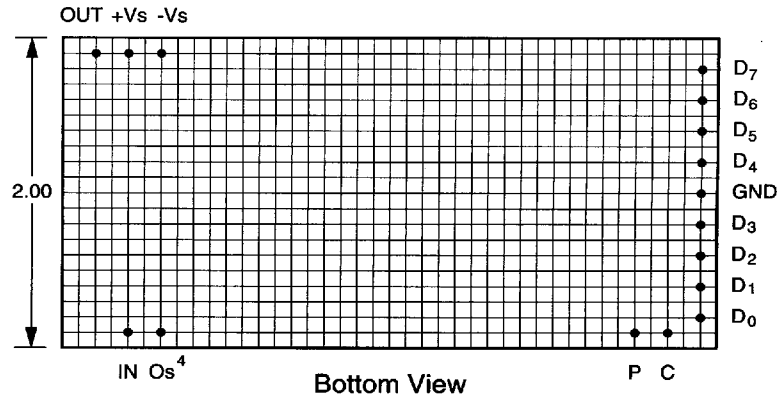
1. Input and output signal voltage referenced to supply common.
2. Output is short circuit protected to common. DO NOT CONNECT TO ±Vs.
3. Adjustable to zero.
4. Units operate with or without offset pin connected.

DC Offset Adjustment





All dimensions are in inches
All Case Dimensions ± 0.02"
Grid Dimensions 0.1" x 0.1"



Ordering Information

Filter Type
L - Low Pass
H - High Pass

Transfer Function
B - Butterworth
L - Bessel
Y2 - Chebychev (0.2 dB Ripple)
Y5 - Chebychev (0.5 dB Ripple)

854L8B-3

Model Number

e.g., Model Number	Tuning Range (Hz)	Minimum Step(Hz)	Case
1	0.1 to 25.6	0.1	M-2
2	1.0 to 256	1.0	M-2
3	10 to 2560	10	M-1
4	100 to 25.6k	100	M-1
5	200 to 51.2k	200	M-1
6	400 to 102.4k	400	M-1

854/1194/2.5

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