Tubular Bandpass Filters — B Series

Features:

- Economical Design Yields High Performance Results
- 100 MHz to 6000 MHz Frequency Range*
- 3 dB BW; 4-40%
- Design Available in 3-8 Sections
- 0.05 dB Chebychev Design Response
- Ruggedized Package Designs

Specifications:

Model	Diameter (Inches/mm)	Frequency (MHz)	3 dB % BW	VSWR	Average Power (Watts)	Impedance (Ohms)	No. of Sections	Shock	Vibration	Temp.	Relative Humidity
B250	.25/6.35	1000-6000	4-40	1.5:1	2	50	3-8	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz-2000 Hz	-55 to +85 °C	0-95%
B120**	.50/12.7	100-2500	4-40	1.5:1	18						
B340	.75/19.05	100-1000	4-40	1.5:1	40						
B110	1.25/31.7	70-600*	4-40	1.5:1	200						

** Model B120 fits most applications and is the most cost effective choice.

Attenuation:

The following curves are used in determining the out-of-band attenuation. The curves show minimum stopband in dB as multiples of the 3 dB bandwidth.

To determine which series of curves to use, first calculate the percentage 3 dB bandwidth from the following formula:

$$\% \text{ BW} = \left(\frac{\text{3 dB BW}}{\text{Center Frequency}} \right) \times 100$$

To determine the number of bandwidths (3 dB) from center frequency, use the following formula:

$$\text{No. \% BW} = \frac{\text{Reject Frequency-Center Frequency}}{\text{3 dB BW}}$$

Example:

Center Frequency = 300 MHz
3 db Bandwidth = 50 MHz
Number of Sections = 6

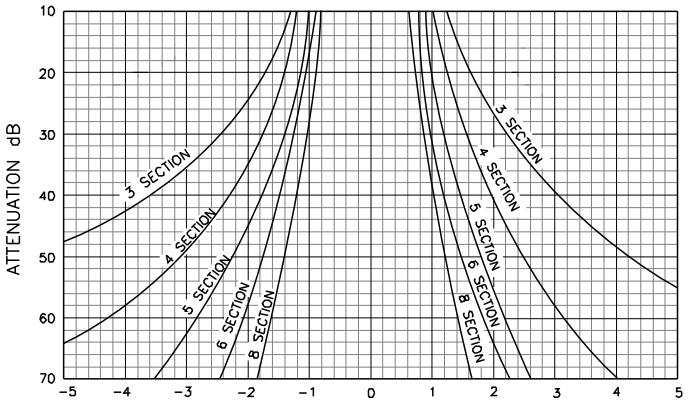
Determine attenuation at 200 MHz and 400 MHz:

1. Calculate % BW = $\frac{50 \times 100}{300}$ = 17%
2. -3 dB BW = $\frac{200-300}{50}$ = -2 BW's
3. +3 dB BW = $\frac{400-300}{50}$ = +2 BW's

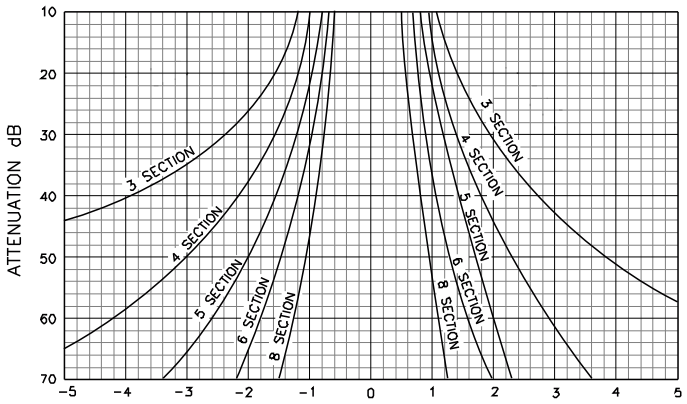
Referring to the curve for a 15%-30% bandwidth, a 6 section response -2 BW yields 64 dB, and +2 BW yields greater than 70 dB.

Tubular Bandpass Filters — B Series

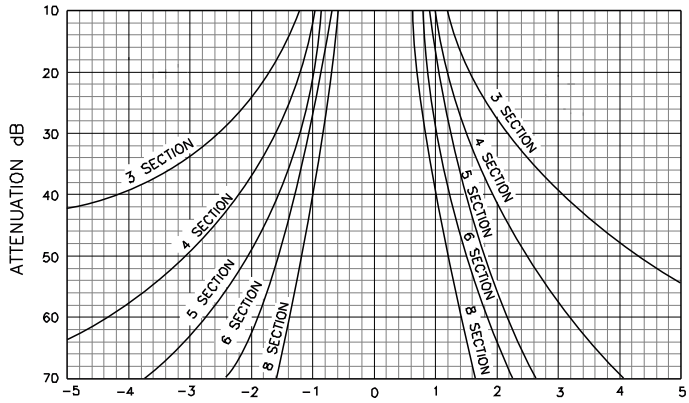
For Bandwidths 4 to 5%



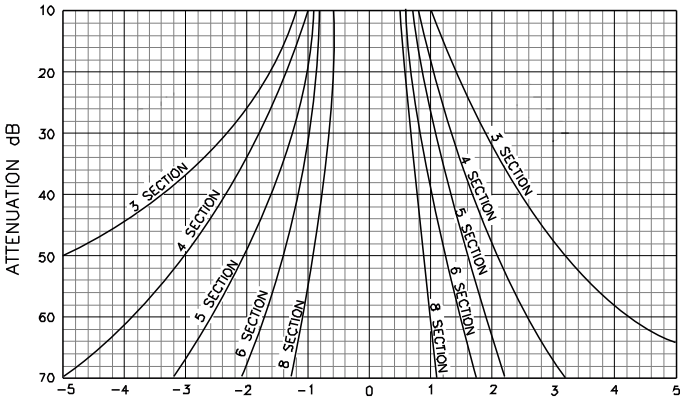
For Bandwidths 15 to 30%



For Bandwidths 5 to 15%



For Bandwidths 30 to 40%



Mechanical/Connectors- See page 44.

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Insertion Loss:

The maximum insertion loss at center frequency can be determined by using the following formula:

$$\text{Insertion Loss at Center Frequency} = \left(\frac{(\text{Loss Constant})\ (\text{No. of Sections} + 1/2)}{\%\ 3\ \text{dB BW}}\right) + 0.2$$

Example:

Filter Model = B120
Center Frequency = 500 MHz
3 dB Bandwidth = 80 MHz
Number of Sections = 5

Determine the insertion loss at center frequency:
From the table, the loss constant is shown to be 2.0.

$$\%\ 3\ \text{dB BW} = \frac{(3\ \text{dB BW})\ (100)}{\text{Center Frequency}} = \frac{80 \times 100}{5000} = 16\%$$

By substituting in the formula we find the insertion loss =

$$\left(\frac{(2)\ (5+1/2)}{16}\right) + 0.2 = 0.9\ \text{dB}$$

Loss Constant vs. Frequency vs. Model:

Model	Center Frequency (MHz)						
	100	101 200	201 400	401 1000	1001 2000	2001 4000	4001 6000
B250					3.5	3.0	2.5
B120		3.0	2.5	2.0	1.8	1.6	
B340	2.2	2.0	1.6	1.4	1.2		
B110	1.8	1.6	1.3	1.2			

To Order:

5 B 120 — 500 / T 80 — O / O
1 2 3 4 5 6 7 8

Code	Description
1	Number of Sections
2	B- Bandpass
3	Model 250-.25"- 6.35mm 120-.50" - 12.7mm 340-.75" - 19.05mm 110-1.25" - 25.4mm
4	Center Frequency (MHz)
5	Supplemental Codes (See Page 13)
6	Bandwidth (MHz)
7	Input Connector
8	Output Connector

Tubular Lowpass Filters — L Series

Features:

- Economical Design Yields High Performance Results
- Covers the 100 MHz to 20000 MHz Frequency Range
- Design Available in 2-8 Sections
- 0.05 dB Chebychev Design Response
- Ruggedized Package Design

Specifications:

Model	Diameter (Inches/mm)	Frequency (MHz)	VSWR	Average Power (Watts)	Impedance (Ohms)	No. of Sections	Shock	Vibration	Temp.	Relative Humidity
L250	.25/6.35	400-20000	1.5:1	2	50	2-8	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz-2000 Hz	-55 to +85 °C	0-95%
L120**	.50/12.7	100-3000	1.5:1	18						
L340	.75/19.05	100-2000	1.5:1	40						
L110	1.25/31.7	100-1000*	1.5:1	200						

** Model L120 fits most applications and is the most cost effective choice.

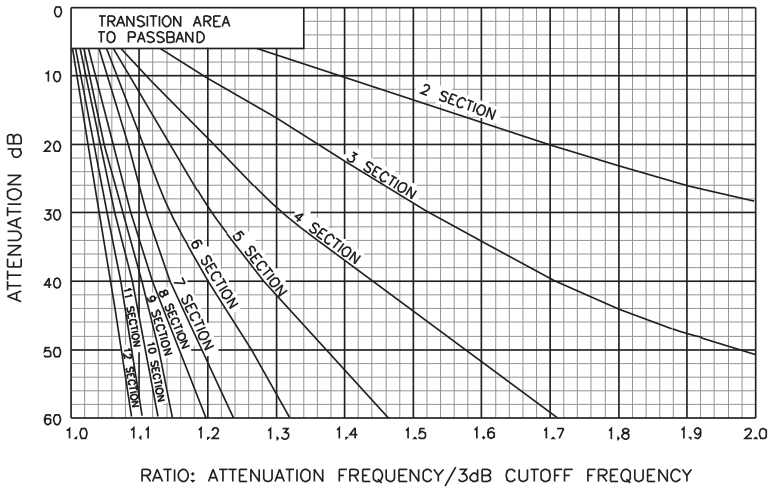
Attenuation:

The following curves are used in determining the out-of-band attenuation. This is determined by first finding the ratio of attenuation frequency / 3 dB cut-off frequency. Once the ratio is determined, the attenuation versus number of sections can be read directly from the curve.

Example:

Reject Frequency = 200 MHz
3 dB Cut-off Frequency = 125 MHz
Number of Sections = 4
The Ratio of Attenuation Freq./3 dB Cut-off Freq. =
Reject Frequency = 200
3 dB Cut-off Freq. 125

Ratio = 1.6
From the curve, a 4 section response = 52 dB



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Insertion Loss:

The insertion loss specification at 90% of the 3 dB cut-off frequency can be determined by using the following formula:

Insertion Loss = (Loss Constant x No. of Sections)

The result is always rounded up to the next 1/10th of a dB.

Example:
Part Number = 5L121-2250/T3000-O/O
Insertion Loss = 0.10 x 5 =0.5 dB

Loss Constant vs. Frequency vs. Model

	Frequency (MHz)					
Model	100	101 400	401 1000	1001 2000	2001 4000	4001 20000
L250			.25	.20	.18	.1
L120	.18	.16	.13	.11	.1	
L340	.14	.13	.12	.11		
L110	.09	.08	.07			

Mechanical/Connectors- See page 44.

To Order:

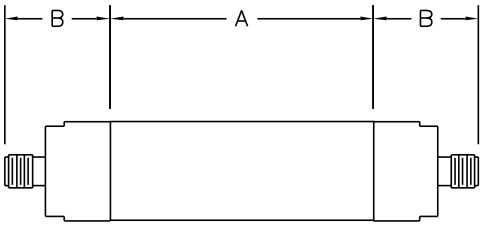
5 L 120 — 350 / E 3000 — O / OP
1 2 3 4 5 6 7 8

Code	Description
1	Number of Sections
2	L-Lowpass
3	Model 250-.25″- 6.35mm 120-.50″ - 12.7mm 340-.75″ - 19.05mm 110-1.25″ - 25.4mm
4	Cut-off Frequency (MHz)
5	Supplemental Codes (See Page 13)
6	Upper Frequency Stopband Limit (MHz)
7	Input Connector
8	Output Connector

Tubular Mechanical

The length of a tubular filter is determined by adding the "A" and "B" dimensions. The "B" dimension is obtained from the table below, and the " A" dimension is obtained from the Length vs. Frequency tables on the following page.

Example:
A 3-section bandpass filter Model B120 with a center frequency of 300 MHz and with SMA connectors has an "A" dimension of 2 inches and a "B" dimension of 0.8 inches. The total length is 3.6 inches.



Connector Style	Connector Code	"B" Dimension (Inches)			
		.25 Diameter	.50 Diameter	.75 Diameter	1.25 Diameter
"N" Female	N	NR*	1.28	1.4	1.7
"N" Male	NP	NR*	1.23	1.31	1.65
BNC Female	B	NR*	1.0	1.35	1.42
BNC Male	BP	NR*	.93	1.45	1.35
TNC Female	T	NR*	1.0	1.35	1.42
TNC Male	TP	NR*	.93	1.45	1.35
SMA Female (Standard)	O	.6	.8	.8	.8
SMA Female (Right Angle)	DO	NR*	.6	.6	.6
SMA Female (Right Angle Square)	EO	.55	.65	.65	.65
SMA Male (Standard)	OP	.73	.85	.85	.85
SMA Male (Right Angle)	DP	NR*	.6	.6	.6
SMA Male (Right Angle Square)	EP	.55	.65	.65	.65

NR*- Not recommended
For PC mount, contact factory
Standard connector dimensions are in inches, please use 25.4 to convert to metric.

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Approximate* Dimension "A" (Inches) - Length vs. Frequency

B250

No. of Sections	Frequency (MHz)			
	400-1000	1000-3000	3000-4000	4000-6000
2	.90	.80	.70	.50
3	1.40	1.20	1.00	.70
4	1.90	1.70	1.30	.90
5	2.40	2.10	1.60	1.10
6	2.90	2.5	1.90	1.30
7	3.40	2.90	2.20	1.60
8	3.90	3.30	2.50	1.90

B120

No. of Sections	Frequency (MHz)				
	100-130	130-180	180-350	350-700	700-2500
2	2.00	1.60	1.30	1.10	.90
3	3.15	2.60	2.00	1.65	1.40
4	4.30	3.60	2.70	2.20	1.95
5	5.45	4.55	3.40	2.70	2.45
6	6.60	5.55	4.10	3.25	3.00
7	7.75	6.55	4.80	3.80	3.50
8	8.90	7.55	5.50	4.35	4.00
9	-	8.55	6.20	4.90	4.55
10	-	9.50	6.90	5.40	5.00

B340

No. of Sections	Frequency (MHz)			
	100-140	140-230	230-500	500-1700
2	2.00	1.50	1.30	1.10
3	3.00	2.25	1.85	1.60
4	3.95	3.00	2.40	2.10
5	4.90	3.75	2.95	2.60
6	5.90	4.50	3.50	3.10
7	6.85	5.25	4.10	3.60
8	7.80	6.00	4.60	4.10
9	8.80	6.75	5.15	4.60
10	-	7.50	5.70	5.10

B110

No. of Sections	Frequency (MHz)		
	100-200	200-400	400-600
2	2.40	2.00	1.60
3	3.20	2.80	2.30
4	4.00	3.60	3.00
5	5.20	4.40	3.80
6	5.60	5.20	4.60
7	6.40	6.00	5.40
8	7.20	6.80	6.20
9	8.60	7.60	7.00
10	-	8.50	7.80

* Length shown at left is less connectors. Dimensions and weight are approximate.

L250

	400-600	600-1000	1000-1300	1300-1700	1700-2300	2300-3000	3000-5000	5000-20000
2	.65	.55	.40	.50	.45	.40	.40	Contact factory for exact size at higher frequencies.
3	1.00	.90	.70	.85	.75	.70	75	
4	1.45	1.25	1.00	1.20	1.10	1.00	1.50	
5	1.90	1.65	1.30	1.55	1.40	1.30	1.40	
6	2.30	2.00	1.60	1.95	1.70	1.55	1.75	
7	2.75	2.40	1.90	2.30	2.00	1.85	2.10	
8	3.20	2.75	2.20	2.65	2.35	2.15	2.45	
9	3.65	3.10	2.50	3.00	2.70	2.45	2.80	
10	4.10	3.50	2.80	3.35	3.00	2.75	3.10	

L120

No. of Sections	Frequency (MHz)				
	100-150	150-200	200-400	400-800	800-3000
2	1.80	1.55	1.10	.75	.65
3	2.80	2.45	1.80	1.20	1.10
4	3.85	3.40	2.55	1.70	1.50
5	4.85	4.30	3.25	2.15	1.95
6	5.90	5.20	3.95	2.60	2.40
7	6.95	6.15	4.70	3.00	2.80
8	7.95	7.00	5.40	3.50	3.25
9	8.95	8.00	6.10	3.95	3.70
10	-	8.90	6.80	4.40	4.10

L340

No. of Sections	Frequency (MHz)				
	100-200	200-400	400-600	600-1000	1000-2000
2	2.00	1.20	1.00	.90	.80
3	3.15	2.00	1.60	1.35	1.25
4	4.30	2.70	2.15	1.80	1.65
5	5.40	3.40	2.70	2.25	2.00
6	6.50	4.10	3.25	2.70	2.45
7	7.65	4.90	3.85	3.15	2.85
8	8.75	5.55	4.40	3.60	3.30
9	-	6.40	5.00	4.00	3.70
10	-	7.00	5.50	4.50	4.10

L110

No. of Sections	Frequency (MHz)		
	100-200	200-600	600-1000
2	2.00	1.30	1.00
3	2.85	2.00	1.55
4	3.70	2.60	2.00
5	4.55	3.25	2.60
6	5.40	3.90	3.10
7	6.25	4.55	3.65
8	7.10	5.20	4.20
9	7.95	5.85	4.70
10	8.80	6.50	5.20

Weight (Ounces)

B250	B120	B340	B110
1/4 oz. per inch	3/4 oz. per inch	3/4 oz. per inch	1 1/2 oz. per inch

Weight (Ounces)

L250	L120	L340	L110
1/4 oz. per inch	3/4 oz. per inch	3/4 oz. per inch	1 1/2 oz. per inch