

Catalog #985


FILTEK

RF & Microwave Filters
















RF & Microwave Filters

FILTEK

Contents

Terms and Conditions of Sale
General Ordering Information

How to order:
If ordering a standard filter, a part number is all that is necessary. Contact application engineering at Filtek or the local Filtek representative for any special requirements. For more information on part numbers see page 4.

Ordering Address:
Orders should be made out to:

Filtek
1955 Plaza Real
Oceanside, CA 92056

Phone (760) 630-4868

Facsimile (760) 630-1445

e-mail: sales@filtekfilters.com

Internet: www.filtekfilters.com

Orders by phone or facsimile will be accepted and processed pending receipt of your confirming purchase order.

Prices:
Prices will be quoted upon request by the marketing department at Filtek or any authorized Filtek representative. Prices do not include state or local sales, excise or use taxes. These taxes will be added when applicable. Prices are subject to change without prior notice.

Product information:
Information relating to Filtek products is current at the time of publication. However, as part of continous improvement programs, Filtek reserves the right to change specifications and designs without prior notice.

Terms and Conditions:
Unless customer specifications state otherwise and are quoted as such by Filtek, all sales and quotations are subject to Filtek standard terms and conditions of sale as stated herein. Terms are net 30 days, F.O.B. Factory. Unless credit has already been established, shipments will be made C.O.D. or upon receipt of payment in advance.

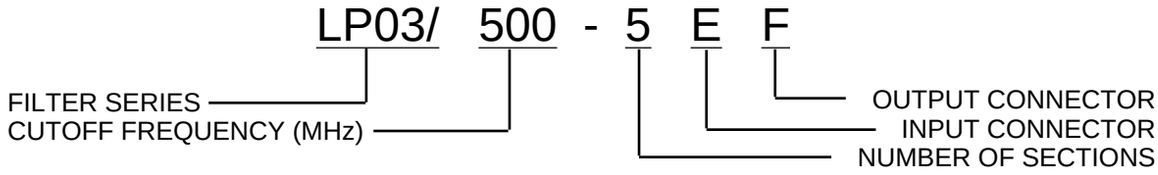
Packaging and Delivery:
Prices include standard packing, but not shipping. Unless specific instructions are included as part of order, shipment is normally made by U.P.S. or parcel post.

Warranty

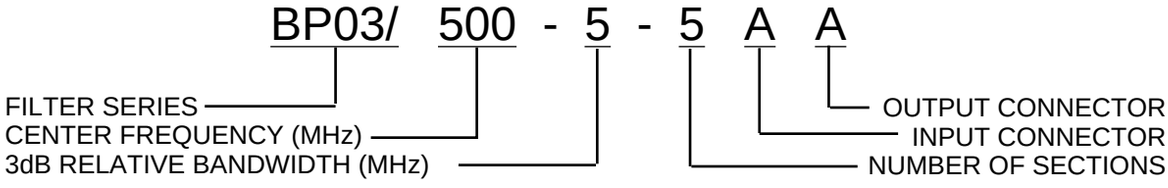
Filtek warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use for a period of one year. If, within one year after delivery to the original owner, and after prepaid return by the original owner any Filtek product is found defective, Filtek shall at its option repair or replace the defective item. This warranty does not apply to products which have been disassembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation or liability assumed by Filtek with respect to its products and no other warranty or guarantee is either expressed or implied. In no event does Filtek assume liability for installation labor or for consequential damages.

Model Numbering System

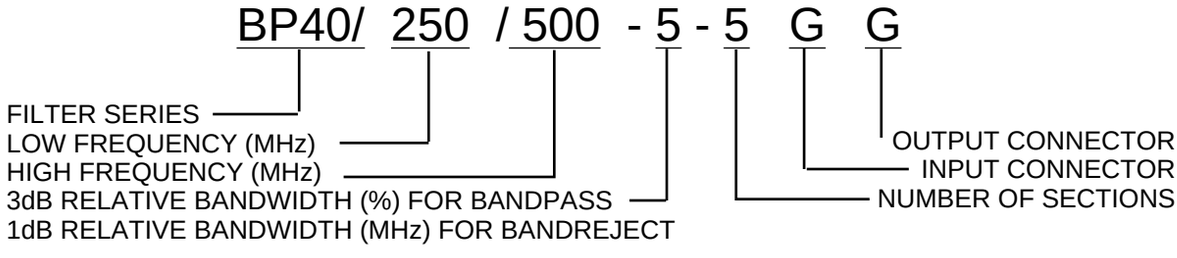
Lowpass (LP) / Highpass (HP) Filters



Bandpass (BP) / Bandreject (BR) Filters



Tunable Bandpass (BP) / Bandreject (BR) Filters



A Filtek model number describes the principle characteristics for that device. Configuration, frequency, power, insertion loss and size can be determined by the formulas and charts found on each filter series page. Number of sections can be determined by the formula and attenuation curves referenced on these pages. Connector letter designations, dimensions, and availibility for individual filter series can be found on page 12.

Glossary

Attenuation — Loss of signal in transmission through a filter, usually referring to signal amplitude or signal power. Generally measured in decibels (dB).

Band Reject Filter — A filter that rejects one band of frequencies and passes both higher and lower frequencies. Sometimes called a notch filter.

Bandpass Filter — A filter that passes one band of frequencies and rejects both higher and lower frequencies.

Bandwidth — The width of the passband of a bandpass filter. Usually expressed as the frequency difference between lower and upper 3dB relative points.

Bessel Function — A mathematical function used to yield a maximally constant time delay in a filter with no consideration for amplitude response. This function is very close to a Gaussian function.

Butterworth Function — A mathematical function used to yield a maximally constant amplitude response in a filter with no consideration for time delay, or phase response.

Center Frequency (Fc) — The arithmetic mean frequency normally calculated using the 3dB relative band edges (F1 & F2).

$$Fc = (F1 + F2)/2$$

Where F1 and F2 are lower and upper frequencies respectively at which a particular signal attenuation occurs, usually taken as 3dB relative attenuation. An important parameter of bandpass and bandstop filters.

Cut-off Frequency (Fco) — The upper passband edge in lowpass filters or the lower passband edge in highpass filters. The passband edge closest to the stop band. Filtek normally uses the point at which the VSWR equals 1.5:1.

Decibel (dB) — A unit used to express the ratio between two amounts of power P1 and P2 existing at two points. By definition:

$$dB = 10 \log_{10} (P1/P2)$$

It can also be used to express voltage and current ratios but only when the voltage or current is measured at places having identical impedance.

Dissipation — Energy losses in a filter due to resistive or core losses.

Distortion — Generally speaking, the modification of signals which produce an undesirable end effect. These modifications can relate to phase, amplitude, delay, etc. The distortion of a sine wave is usually defined as the percentage of signal power remaining after the fundamental sine wave component has been removed.

Elliptic Function — A mathematical function used to yield the squarest possible amplitude filter response with a given number of circuit elements. The elliptic function has a Tchebycheff response in both the passband and the stopband. The elliptic function filter has a poorer phase response and transient response than any of the classical transfer functions.

Envelope Delay — The propagation time delay of the envelope of an amplitude modulated signal as it passes through a filter. Sometimes called time delay or group delay. Envelope delay is proportional to the slope of the phase shift response versus frequency curve. Envelope delay distortion occurs when the delay is not constant at all frequencies in the passband area.

Highpass Filter — A filter which passes high frequencies and rejects low frequencies.

Input Impedance — The impedance measured at the input terminal of a filter when it is properly terminated at its output.

Insertion Loss — The loss of signal caused by a filter being inserted in a circuit. It can be expressed in many forms and is usually measured in dB. In general, it is the ratio of voltage delivered to the load (at peak frequency response) with the filter in the circuit, to the voltage in the load if a perfect lossless matching transformer replaced the filter. When a filter is inserted between two circuits whose impedance differs widely, it is sometimes more practical to specify insertion loss by some other method.

Linear Phase Filter — A filter that exhibits a constant change in degrees per unit of frequency. The resultant plot of frequency vs. phase is a straight line. This type of filter ideally displays a constant delay in its passband.

Load Impedance — The impedance that normally must be connected to the output terminal of the filter in order to meet filter specifications; The filter output will drive this load.

Lowpass Filter — A filter which passes low frequencies and rejects high frequencies.

Overshoot — The amount in percent by which a signal exceeds its steady-state output on its initial rise.

Passband — The frequency range passed by a filter.

Passband Ripple — Variations of attenuation with frequency within the passband of a filter.

Phase Shift — The changing of phase of a signal as it passes through a filter. A delay in time of the signal is referred to as phase lag and in normal networks , phase lag increases with frequency, producing a positive envelope delay (see envelope delay).

Q — The figure of merit of a capacitor or inductor. The ratio of its reactance to its equivalent series resistance. Also in bandpass filters “loaded Q” is a term used to define the percentage of 3 dB bandwidth.

Loaded Q = Center Frequency (Fc) / 3 dB Bandwidth

Relative Attenuation — Attenuation measured with the point of minimum attenuation taken as zero dB, or: (Relative Attenuation = Attenuation minus Insertion Loss.)

Return Loss — The ratio in dB of maximum power sent down a transmission line to the power returned toward the source. Also equal to 20 times the log of the reciprocal of the reflection coefficient. If return loss is infinite, all power is absorbed in the circuit.

Ringing — The tendency of a filter to oscillate for a time when a transient waveform is applied to it.

Ripple — Generally referring to the wavelike variations in the amplitude response of a filter. Tchebycheff and elliptic function filters ideally have equi-ripple characteristics, which means that the difference in peaks and valleys of the amplitude response in the passband are always the same. Butterworth, Gaussian, and Bessel functions have no ripple. Ripple is usually measured in dB.

Rise Time — The length of time it takes a step-function at the output of a filter to move from 10% to 90% of its steady state value on the initial rise.

Shape Factor — An important parameter of all filters:

Bandpass:	SF = Attenuation Bandwidth/ 3 dB Bandwidth
Bandstop:	SF = 3 dB Bandwidth/ Attenuation Bandwidth
Lowpass:	SF = Attenuation Frequency / Fco
Highpass:	SF = Fco / Attenuation Frequency

Source Impedance — The output impedance of the circuit that drives the filter. The impedance of the circuit the filter must work from or be tested in.

Step Function — A signal change in amplitude from one level to another which occurs in zero time. Usually refers to a rectangular front waveform used in testing transient response.

Stopband — The area of frequency where it is desirable to reject or attenuate all signals as much as practical.

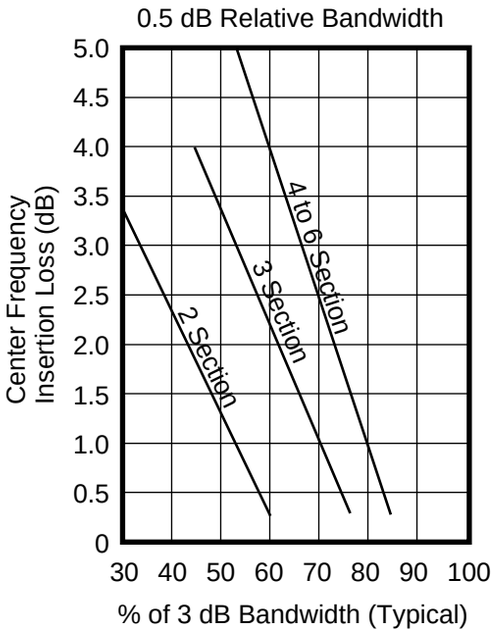
Tchebycheff Function — A mathematical function that produces a curve that defines ripples within certain bounds (see ripple). This function produces a squarer amplitude response than the Butterworth function but with less desirable phase, and time delay characteristics. There is a whole family of Tchebycheff functions (0.1 ripple, 0.5 ripple, etc.).

Time Delay — The amount of time it takes for certain signals to pass through a filter.

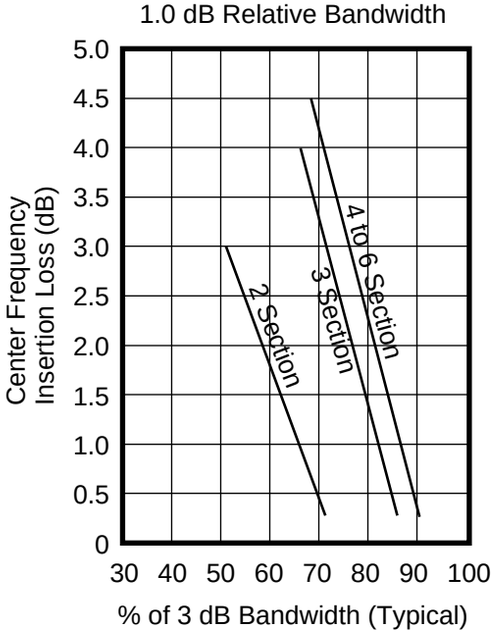
Transient Response — The response of a lowpass filter to a step function, or very low frequency square wave. If a sudden voltage rise is applied to a lowpass filter the output will respond some time later. Transient response can also apply to a bandpass filter responding to a sudden burst of signal within its passband.

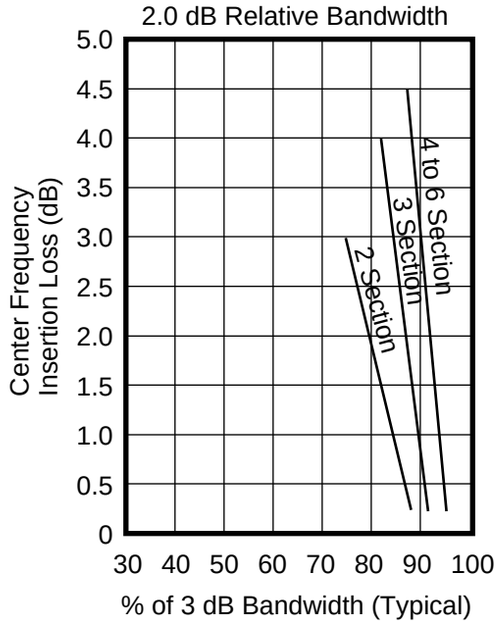
Voltage Standing Wave Ratio (VSWR) — The ratio between the peak and valley of standing waves on a transmission time.

General Performance Specifications



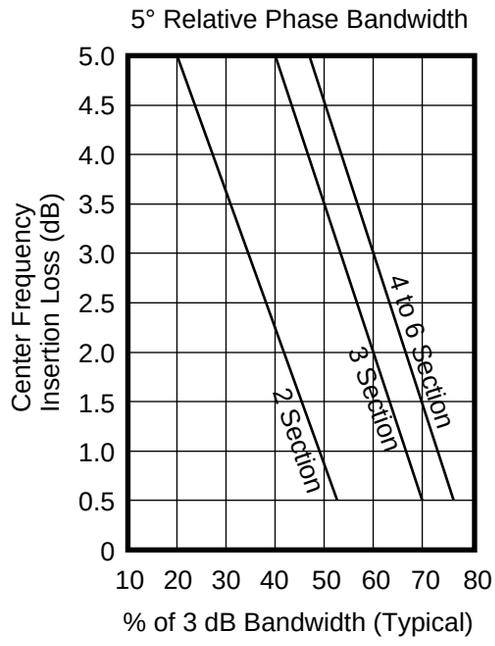
It is often advantageous to know more about the passband of a filter than its center frequency loss and its 3 dB bandwidths. The graphs on this page show the approximate relationships of the 0.5, 1.0 and 2.0 dB relative bandwidths to the 3 dB relative bandwidth. They also serve to illustrate how the number of sections and the insertion loss affect these relationships.

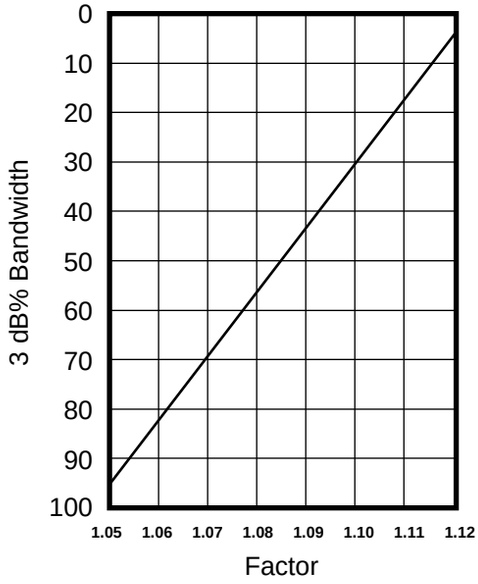




General Performance Specifications

5° phase bandwidth vs. 3 dB bandwidth: This graph should serve as a general guide for filter requirements regarding phase linearity. As an example, a four section filter with an insertion loss of 3.0 dB at center frequency should exhibit ± 5° linearity over 60% of the bandwidth.



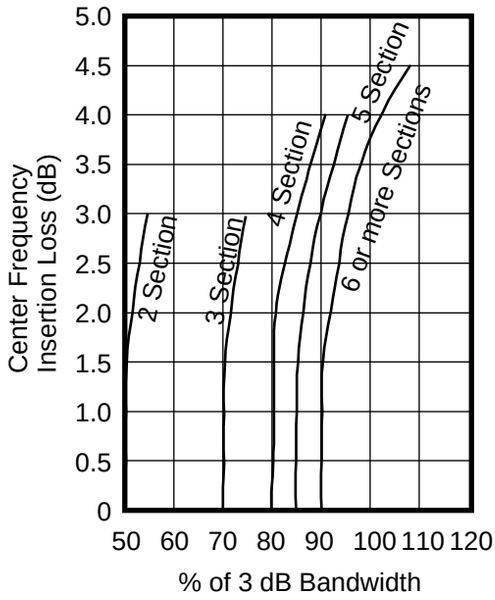


Since the 3 dB bandwidth is a minimum bandwidth, the typical maximum bandwidth may be of some concern. This graph defines the typical variation incurred in the manufacturing process.

For example, in a bandpass filter:
Center Frequency = 100 MHz
3 dB Bandwidth = 30 MHz
3 dB % Bandwidth = 30%

From the chart at 30%, the factor = 1.10, therefore the 3 dB relative bandwidth could vary from 30 MHz to 33 MHz.

General Performance Specifications



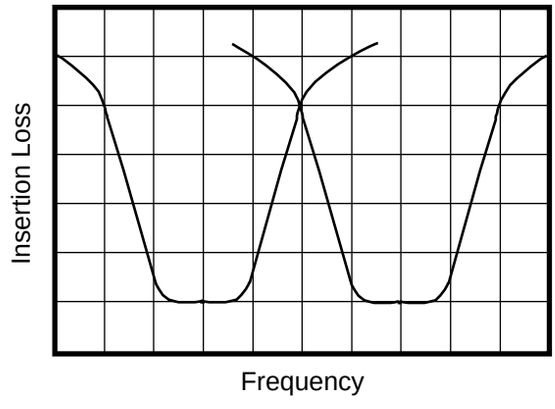
This graph shows the approximate relationship of the 1.5:1 VSWR bandwidth to the 3 dB relative bandwidth. It also serves to illustrate how the number of sections and the insertion loss affect these relationships.

Diplexers and Multiplexers

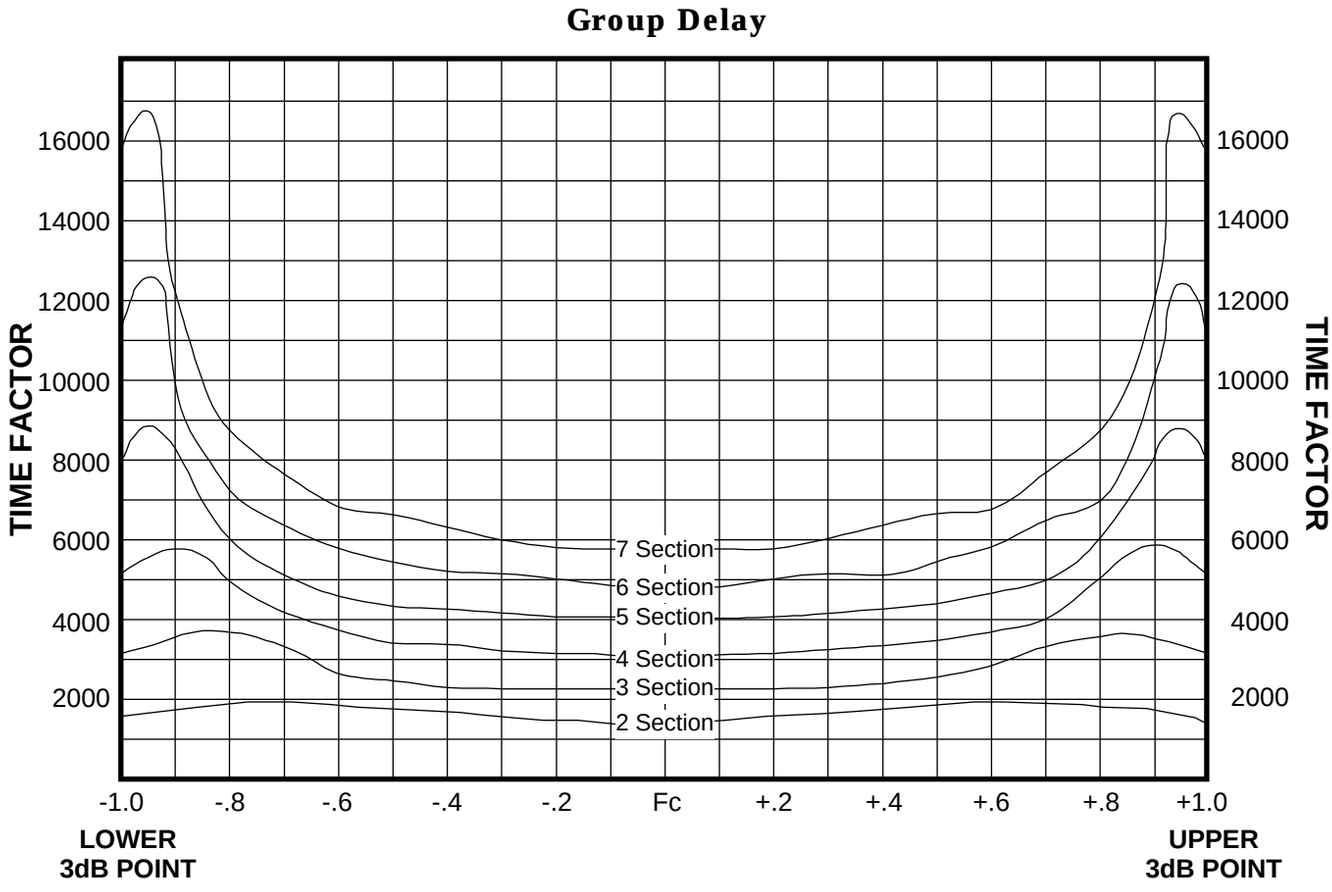
Filters within any of the bandpass series or combinations of different series may be used to form the basic networks of diplexers or multiplexers.

One terminal of each filter network is common to the assembly, the other terminals remain separate and are isolated from each other. Thus signals applied to the common terminal are separated in accordance with the passband frequencies of the filter networks; Signals applied to the isolated terminals are combined at the common terminal.

The passband of the individual network may be contiguous or separated by overlapping stopbands. For information regarding your specific applications contact Filtek.



General Performance Specifications



The approximate Group Delay of a FILTEK bandpass filter can be calculated as follows:

$$\frac{\text{Time Factor}}{\text{3dB BW (MHz)} \times \pi} = \text{Delay in nSec}$$

Example:

The approximate Group Delay at Fc for a four section filter with 3dB BW equal to 200 MHz would be:

$$\frac{3000}{200 \times 3.14} = \frac{3000}{628} = 4.8 \text{ nSec}$$

This same filter would have an approximate Group Delay of 9.4 nSec at +/- 90 MHz (+/- 90% of the 3dB bandwidth)

$$\frac{5800}{200 \times 3.14} = \frac{5800}{628} = 9.3 \text{ nSec}$$

Connectors

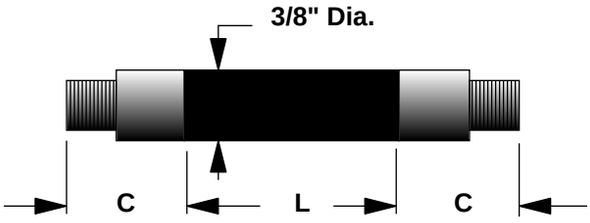
General

This chart shows the availability and and sizes of various connectors for Filtek filters. The configuration letter associated with each connector type (A thru S) should be used as a part of the part number when ordering. See page 4 for part number detail. Contact Filtek for your special requirements which are not shown here.

Configuration ☛	A SMA Jack	B SMA Plug	C TNC Jack	D TNC Plug	E BNC Jack	F BNC Plug	G N Jack	H N Plug	J C Jack	K C Plug	L Solder Pin Axial	M Solder Pin Radial	N Cable RG 188	S Special
Bandpass														
BP02	0.800	0.965	1.000	0.935	1.000	0.935	1.275	1.235			0.300	0.300	❊	❊❊
BP03	0.800	0.965	1.000	0.935	1.000	0.935	1.275	1.235	1.125	1.218	0.300	0.300	❊	❊❊
BP04	0.800	0.965	1.350	1.280	1.350	1.280	1.650	1.625	1.125	1.218	0.300	0.300	❊	❊❊
BP11	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825	0.750	0.875	0.125	0.125		❊❊
BP12	0.310	0.465									0.125	0.125		❊❊
BP13												0.125		❊❊
BP15	0.375	0.465									0.125	0.125	❊	❊❊
BP21	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825						❊❊
BP22	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825						❊❊
BP23	0.375	0.510	0.750	0.845			0.750	0.825						❊❊
BP24	0.375	0.510	0.750	0.845			0.750	0.825						❊❊
BP25	0.375	0.510	0.750	0.845			0.750	0.825						❊❊
BP26	0.375	0.510	0.750	0.845			0.750	0.825						❊❊
BP30	0.375	0.510	0.750	0.845			0.750	0.825						❊❊
BP31	0.375	0.510	0.750	0.845			0.750	0.825						❊❊
BP32	0.310	0.465									0.125			❊❊
BP40	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825						❊❊
Lowpass														
LP02	0.800	0.965	1.000	0.935	1.000	0.935	1.275	1.235			0.300			❊❊
LP03	0.800	0.965	1.000	0.935	1.000	0.935	1.275	1.235	1.125	1.218	0.300	0.300	❊	❊❊
LP04	0.800	0.965	1.350	1.280	1.350	1.280	1.650	1.625	1.125	1.218	0.300	0.300	❊	❊❊
LP11	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825	0.750	0.875	0.125	0.125	❊	❊❊
LP12	0.310	0.465									0.125	0.125		❊❊
LP13												0.125		❊❊
Highpass														
HP11	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.819	0.750	0.875	0.125			❊❊
HP12	0.310	0.465									0.125	0.125		❊❊
HP13												0.125		❊❊
HP35	0.375	0.510									0.125	0.125		❊❊
Bandreject														❊❊
BR11	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825			0.125	0.125		❊❊
BR21	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825						❊❊
BR22	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825						❊❊
BR30	0.375	0.510												❊❊
BR40	0.375	0.510	0.750	0.845	0.750	0.875	0.750	0.825						❊❊
Configuration ☛	A	B	C	D	E	F	G	H	J	K	L	M	N	S

❊ Per Customer Requirements

❊❊ Per Customer Requirements; Contact Filtek for Feasibility



The approximate length of a FILTEK BP02 series filter can be determined by adding the 'C' dimensions found on page 12 to the 'L' dimension found in the table at the right. Please contact the factory if exact dimensions are required.

The approximate weight is .50 ounce per inch.

Number of Sections	Center Frequency (MHz)				
	250 to 300	301 to 350	351 to 750	751 to 1250	1251 to 4000
3	**3.00**	**2.75**	**2.37**	**2.00**	**1.75**
4	**3.75**	**3.50**	**3.00**	**2.50**	**2.12**
5	**4.50**	**4.25**	**3.62**	**3.00**	**2.50**
6	**5.25**	**5.00**	**4.25**	**3.50**	**2.87**
7	**6.00**	**5.75**	**4.87**	**4.00**	**3.25**
8	**6.75**	**6.50**	**5.50**	**4.50**	**3.62**

Specifications

Electrical

	STANDARD	***SPECIAL***
Center Frequency (Fc)	250 to 4000 MHz	100 to 5000 MHz
3 dB Relative Bandwidth (% of Fc)	2 to 40	1 to 100
Number of Sections Available	3 to 8	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 16	See Curve Page 16
Average Power (Watts Max to 10K Feet)	(2 x % BW) / Loss Factor	
Peak Power (Watts Max to 10K Feet)	1.5 x % BW	7500

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections + 0.5)}}{\text{\% 3 dB Bandwidth}} + 0.2$$

Example:
The maximum loss for a 5 Section BP02 Series filter with a center frequency of 750 MHz and a 3 dB Bandwidth of 150 MHz is

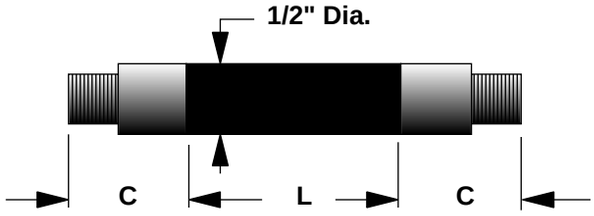
(2.9 x 5.5) / 20 + 0.2 = 0.99 dB

Center Frequency (MHz)	250 to 300	301 to 350	351 to 750	751 to 1250	1251 to 4000
Loss Factor	**3.4**	**3.1**	**2.9**	**2.6**	**2.4**

Environmental

	STANDARD	***SPECIAL***
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +100° C.
Non-Operating Temperature	-25° to +75° C.	-54° to +125° C.

Tubular Bandpass BP03 Series 50 to 4000 MHz



The approximate length of a FILTEK BP03 series filter can be determined by adding the 'C' dimensions found on page 12 to the 'L' dimension found in the table at the right. Please contact the factory if exact dimensions are required.

The approximate weight is .75 ounce per inch.

Number of Sections	Center Frequency (MHz)				
	100 to 200	201 to 400	401 to 1000	1001 to 1500	1501 to 2500
3	**3.75**	**2.75**	**2.37**	**2.00**	**1.75**
4	**4.75**	**3.50**	**3.00**	**2.50**	**2.00**
5	**5.75**	**4.00**	**3.50**	**3.00**	**2.50**
6	**6.75**	**4.75**	**4.25**	**3.50**	**3.00**
7	**7.75**	**5.50**	**4.87**	**4.00**	**3.50**
8	**8.75**	**6.00**	**5.50**	**4.50**	**4.00**

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	100 to 2500 MHz	50 to 4000 MHz
3dB Relative Bandwidth (% of Fc)	2 to 40	1 to 100
Number of Sections Available	3 to 8	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 16	See Curve Page 16
Average Power (Watts Max to 10K Feet)	(3 x % BW) / Loss Factor	
Peak Power (Watts Max to 10K Feet)	3 x % BW	10,000

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections + 0.5)}}{\text{\% 3 dB Bandwidth}} + 0.2$$

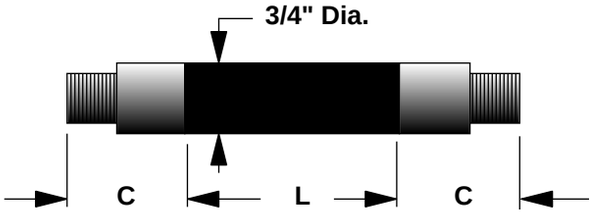
Example:
The maximum loss for a 4 Section BP03 Series filter with a center frequency of 500 MHz and a 3 dB Bandwidth of 25 MHz is:

(2.2 x 4.5) / 5 + .2 = 2.18 dB

Center Frequency (MHz)	100 to 200	201 to 400	401 to 1000	1001 to 1500	1501 to 2500
Loss Factor	**3.0**	**2.5**	**2.2**	**2.0**	**1.9**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +100° C.
Non-Operating Temperature	-25° to +75° C.	-54° to +125° C.



The approximate length of a FILTEK BP04 series filter can be determined by adding the 'C' dimensions found on page 12 to the 'L' dimension found in the table at the right. Please contact the factory if exact dimensions are required.

The approximate weight is 1.0 ounce per inch.

Number of Sections	Center Frequency (MHz)				
	50 to 65	66 to 80	81 to 150	151 to 1000	1001 to 1500
3	**6.50**	**5.25**	**4.00**	**2.50**	**2.00**
4	**8.00**	**6.50**	**5.00**	**3.25**	**2.50**
5	**9.50**	**8.00**	**6.00**	**4.00**	**3.00**
6	**12.00**	**9.25**	**7.00**	**4.75**	**3.50**
7	**13.50**	**10.75**	**8.00**	**5.25**	**4.00**
8	**15.00**	**12.00**	**9.00**	**6.00**	**4.50**

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	50 to 1500 MHz	30 to 2000 MHz
3 dB Relative Bandwidth (% of Fc)	2 to 40	1 to 100
Number of Sections Available	3 to 8	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 16	See Curve Page 16
Average Power (Watts Max to 10K Feet)	(5 x % BW) / Loss Factor	
Peak Power (Watts Max to 10K Feet)	4 x % BW	10,000

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections + 0.5)}}{\text{\% 3 dB Bandwidth}} + 0.2$$

Example:
The maximum loss for a 4 Section BP04 Series filter with a center frequency of 100 MHz and a 3 dB Bandwidth of 5 MHz is:

(2.1 x 4.5) / 5 + .2 = 2.09 dB

Center Frequency (MHz)	50 to 65	66 to 80	81 to 150	151 to 1000	1001 to 1500
Loss Factor	**2.6**	**2.4**	**2.1**	**1.7**	**1.4**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	30 G
Shock (11 mSec)	15 G	75 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +100° C.
Non-Operating Temperature	-25° to +75° C.	-54° to +125° C.

The graphs on the following pages define the normal specification limits of attenuation for FILTEK Tubular bandpass filters. The minimum level of attenuation in dB is shown as a "Number of 3dB Bandwidths from Center Frequency." Since the filter characteristics vary for differing bandwidths, it is necessary to establish specifications for each bandwidth of filter. The different graphs represent the various 3dB percentage bandwidths. The 3dB percentage bandwidth is defined as follows:

$$\frac{\text{3dB Bandwidth (MHz)} \times 100}{\text{Center Frequency (MHz)}} = \%\ \text{Bandwidth}$$

The exact relationship is as follows:

1. 3dB bandwidth from center frequency=

$$\frac{\text{Rejection Frequency (MHz)} - \text{Center Frequency (MHz)}}{\text{3dB Bandwidth (MHz)}}$$

Example:

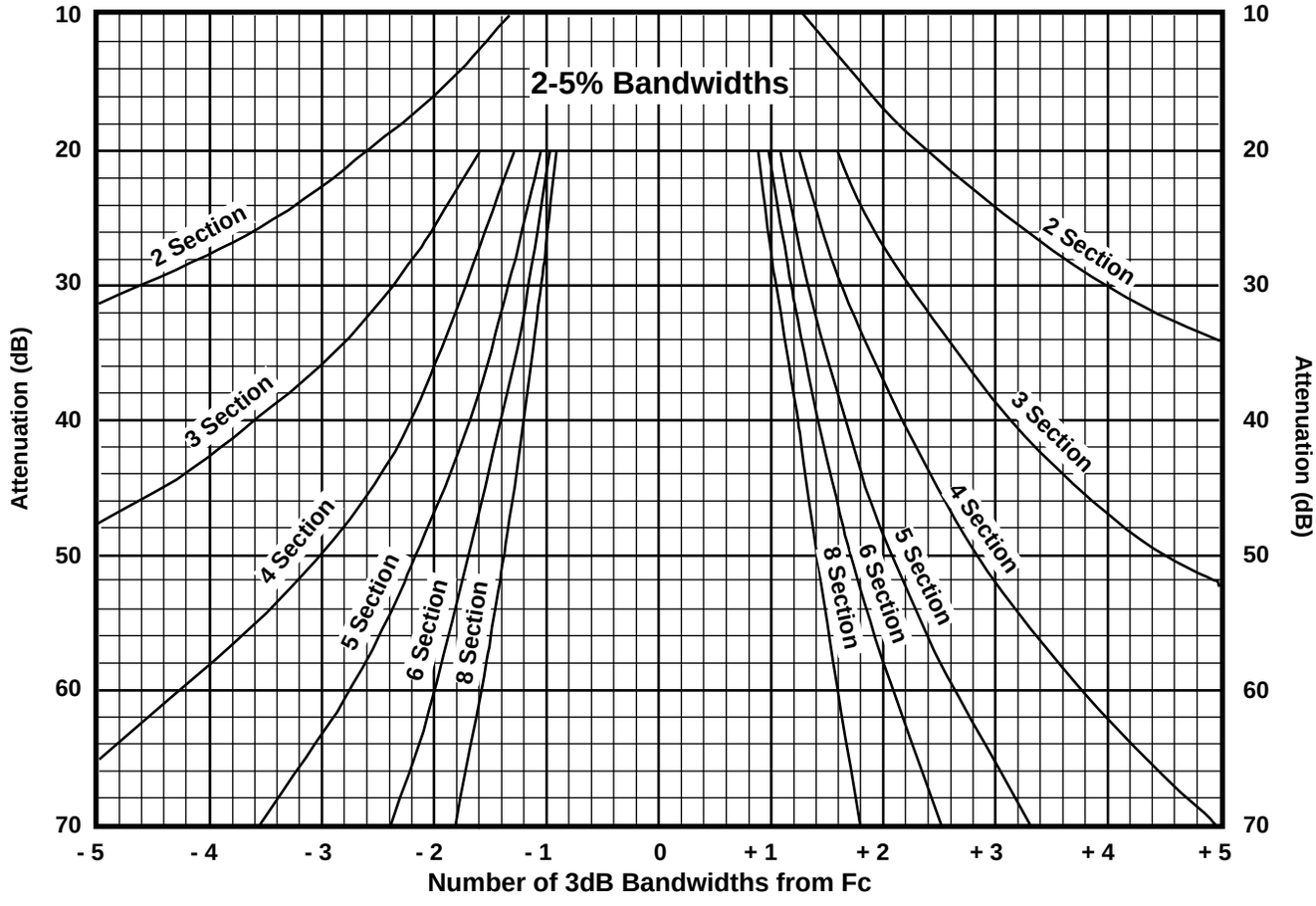
2. Center Frequency = 500 MHz
   Minimum 3dB Bandwidth= 50 MHz
   Number of section = 5

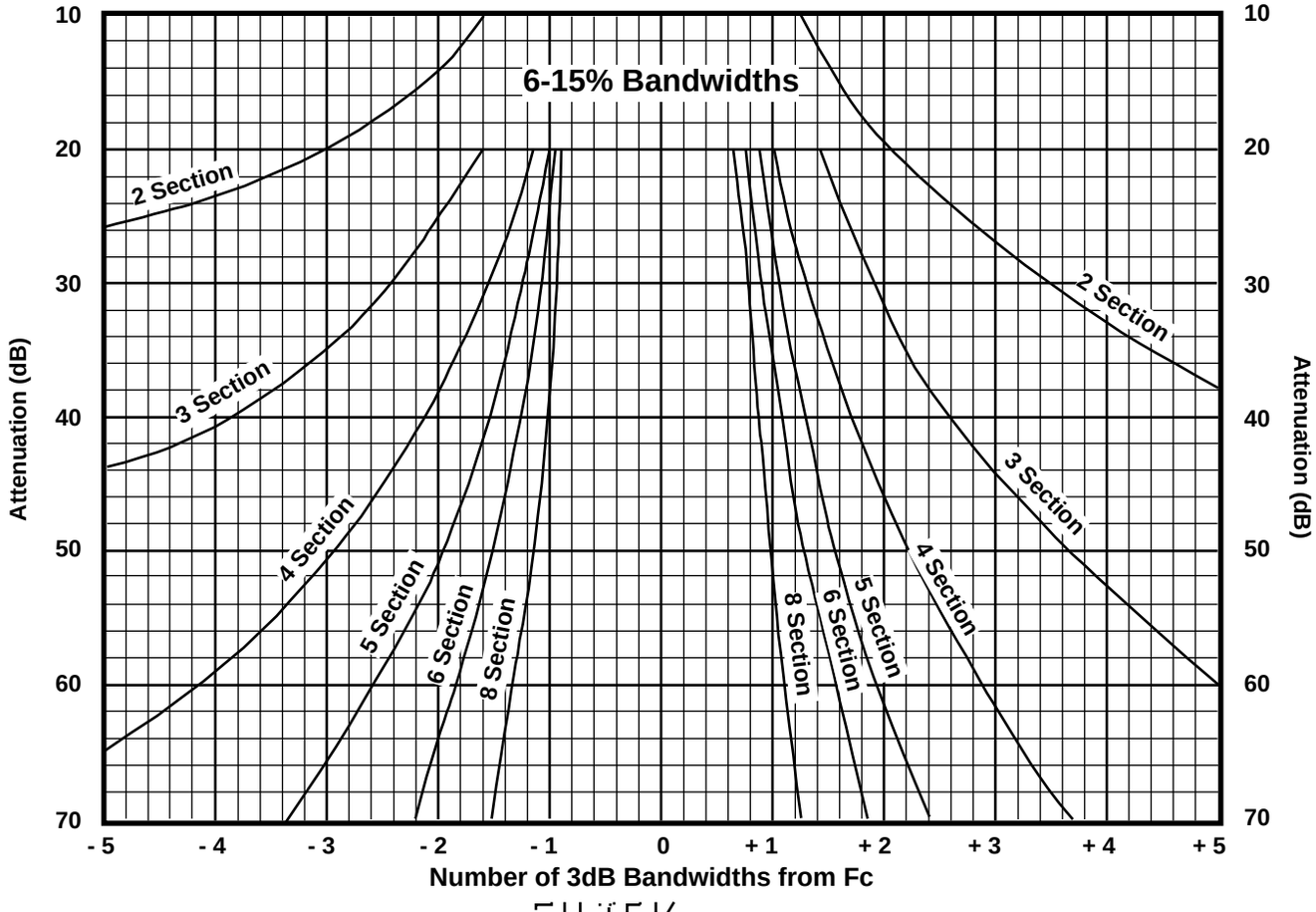
   Find: Minimum attenuation levels at 425 MHz and 580 MHz.

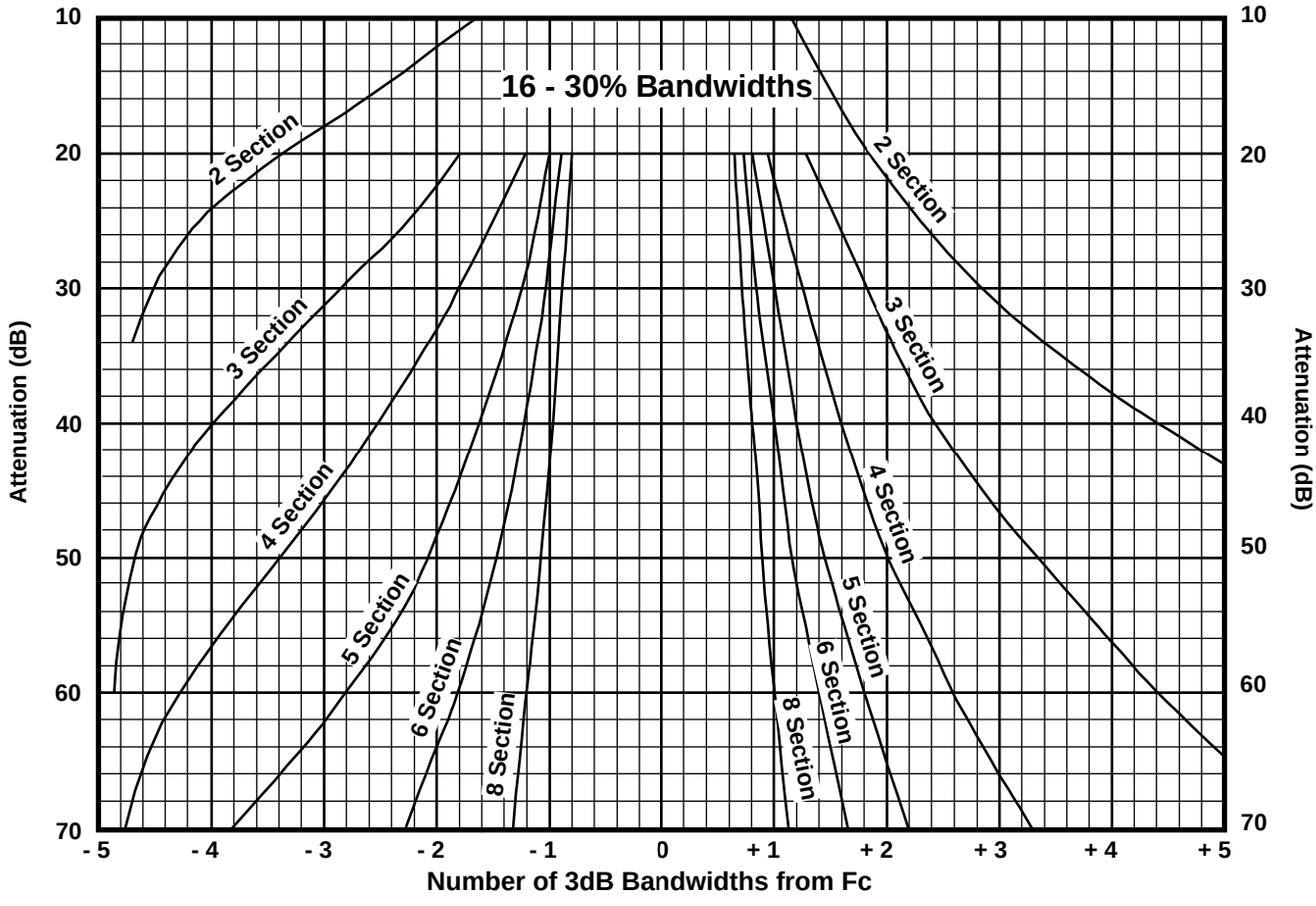
   3dB bandwidths from Fc; (425-500)/50=-1.5 and (580-500)/50=+1.6

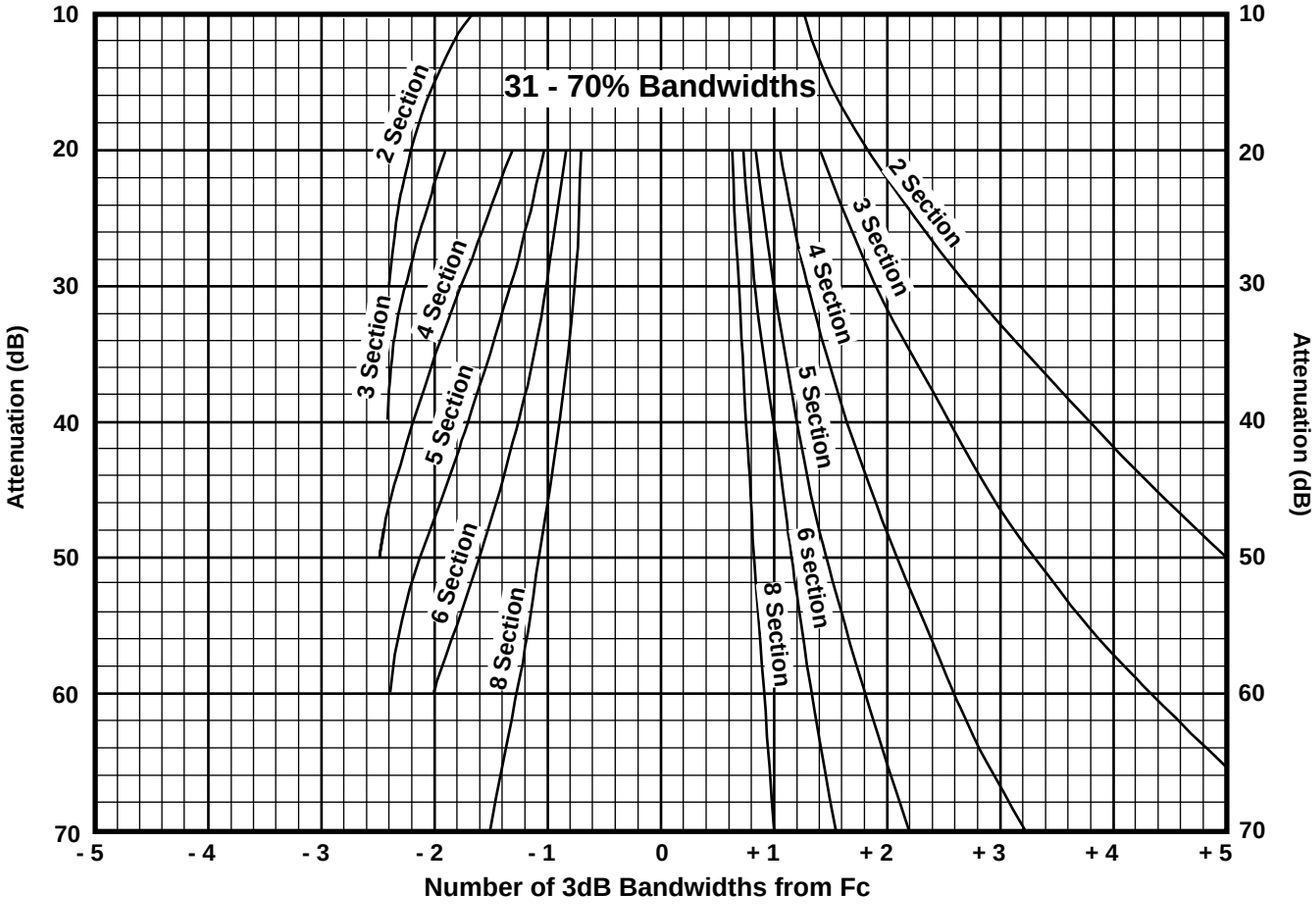
As the 3dB Bandwidth is exactly 10% of the center frequency, the answer can be read directly from the 6-15% graph. Using the 5 section curve at the point -1.5 (425 MHz), the minimum level of attenuation is 40dB. At +1.6 (580 MHz), the minimum level of attenuation is 51dB.

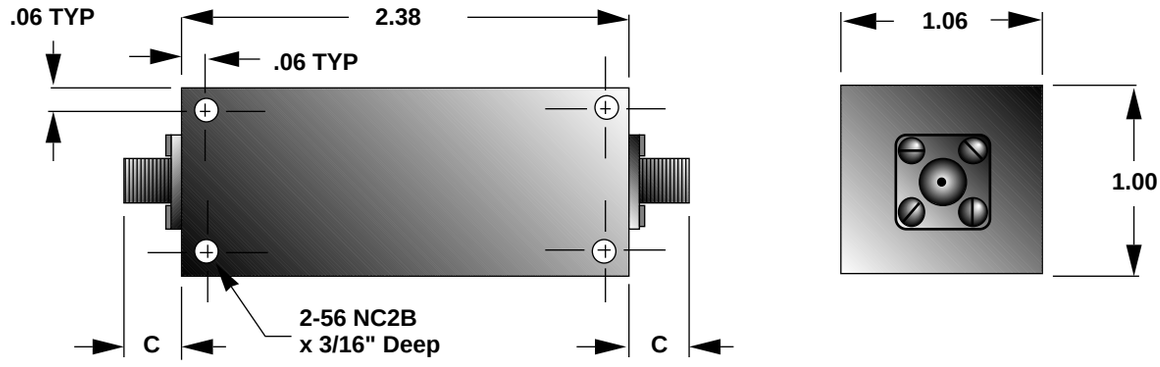
Stopband Attenuation — Tubular Bandpass











See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	10 to 150 MHz	10 to 250 MHz
3dB Relative Bandwidth (% of Fc)	2 to 60	1 to 100
Number of Sections Available	3 to 6	2 to 10
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 22	See Curve Page 22
Average Power (Watts Max to 10K Feet)	1	5
Peak Power (Watts Max to 10K Feet)	5	15

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections + 0.5)}}{\text{\% 3 dB Bandwidth}} + 0.2$$

Example:
The maximum loss for a 3 Section BP11 Series filter with a center frequency of 90 MHz and a 3 dB Bandwidth of 9 MHz is:

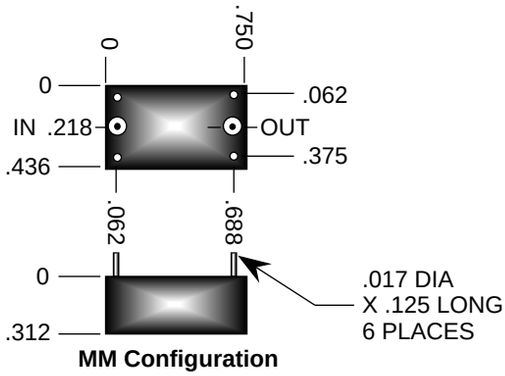
(4.9 x 3.5) / 10 + 0.2 = 1.91dB

Center Frequency (MHz)	10 to 15	16 to 20	21 to 30	31 to 50	51 to 150
Loss Factor	**6.0**	**5.5**	**5.2**	**5.0**	**4.9**

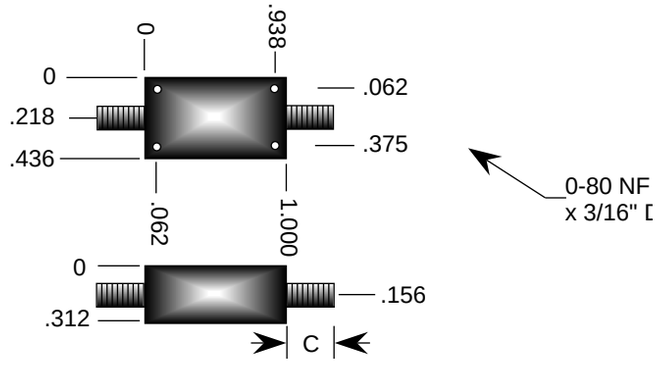
Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	10 G
Shock (11 mSec)	15 G	30 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +125° C.
Non-Operating Temperature	-25° to +75° C.	-62° to +150° C.

Lumped Element Bandpass BP12 Series 100 to 5000 MHz



MM Configuration



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	250 to 2500 MHz	100 to 5000 MHz
3 dB Relative Bandwidth (% of Fc)	5 to 20	3 to 100
Number of Sections Available	3 to 6	2 to 10
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 22	See Curve Page 22
Average Power (Watts Max to 10K Feet)	2	4
Peak Power (Watts Max to 10K Feet)	10	20

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections + 0.5)}}{\text{\% 3 dB Bandwidth}} + 0.2$$

Example:
The maximum loss for a 3 Section BP12 Series filter with a center frequency of 1000 MHz and a 3 dB Bandwidth of 200 MHz is:

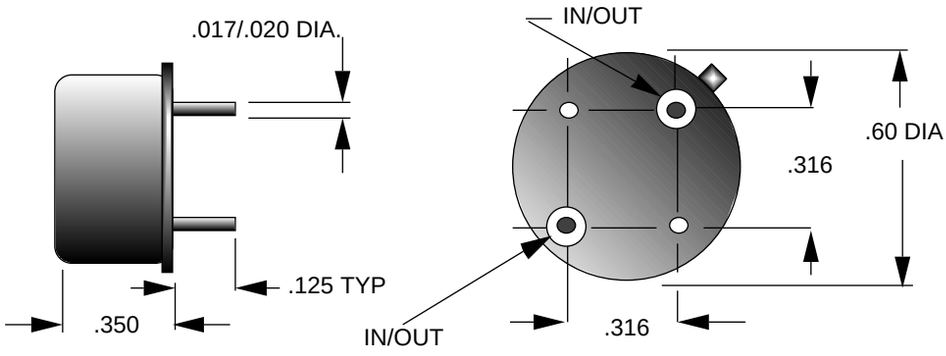
(4.0 x 3.5) / 20 + .2 = 0.9 dB

Center Frequency (MHz)	250 to 300	301 to 400	401 to 500	501 to 1000	1001 to 2500
Loss Factor	**6.0**	**5.5**	**4.7**	**4.0**	**3.3**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to + 75° C.	-62° to +150° C.

Lumped Element Bandpass BP13 Series 100 to 5000 MHz



DEEP

The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	250 to 2500 MHz	100 to 5000 MHz
3 dB Relative Bandwidth (% of Fc)	5 to 20	3 to 100
Number of Sections Available	3 to 5	2 to 6
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 22	See Curve Page 22
Average Power (Watts Max to 10K Feet)	2	4
Peak Power (Watts Max to 10K Feet)	10	20

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections + 0.5)}}{\text{\% 3 dB Bandwidth}} + 0.2$$

Example:
The maximum loss for a 3 Section BP13 Series filter with a center frequency of 1000 MHz and a 3 dB Bandwidth of 100 MHz is:

(4.0 x 3.5) / 10 + .2 = 1.6 dB

Center Frequency (MHz)	250 to 301	301 to 400	401 to 500	501 to 1000	1001 to 2500
Loss Factor	**6.0**	**5.5**	**4.7**	**4.0**	**3.3**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to + 75° C.	-62° to +150° C.

Stopband Attenuation — Lumped Element Bandpass

The graph below defines the normal specification limits of attenuation for FILTEK Lumped Element Bandpass filters. The minimum level of attenuation in dB is shown as a "Number of 3dB Bandwidths from Center Frequency."

The exact relationship is as follows:

1. 3dB bandwidths from center frequency = $\frac{\text{Rejection Frequency (MHz) - Center Frequency (MHz)}}{\text{3dB Bandwidth (MHz)}}$

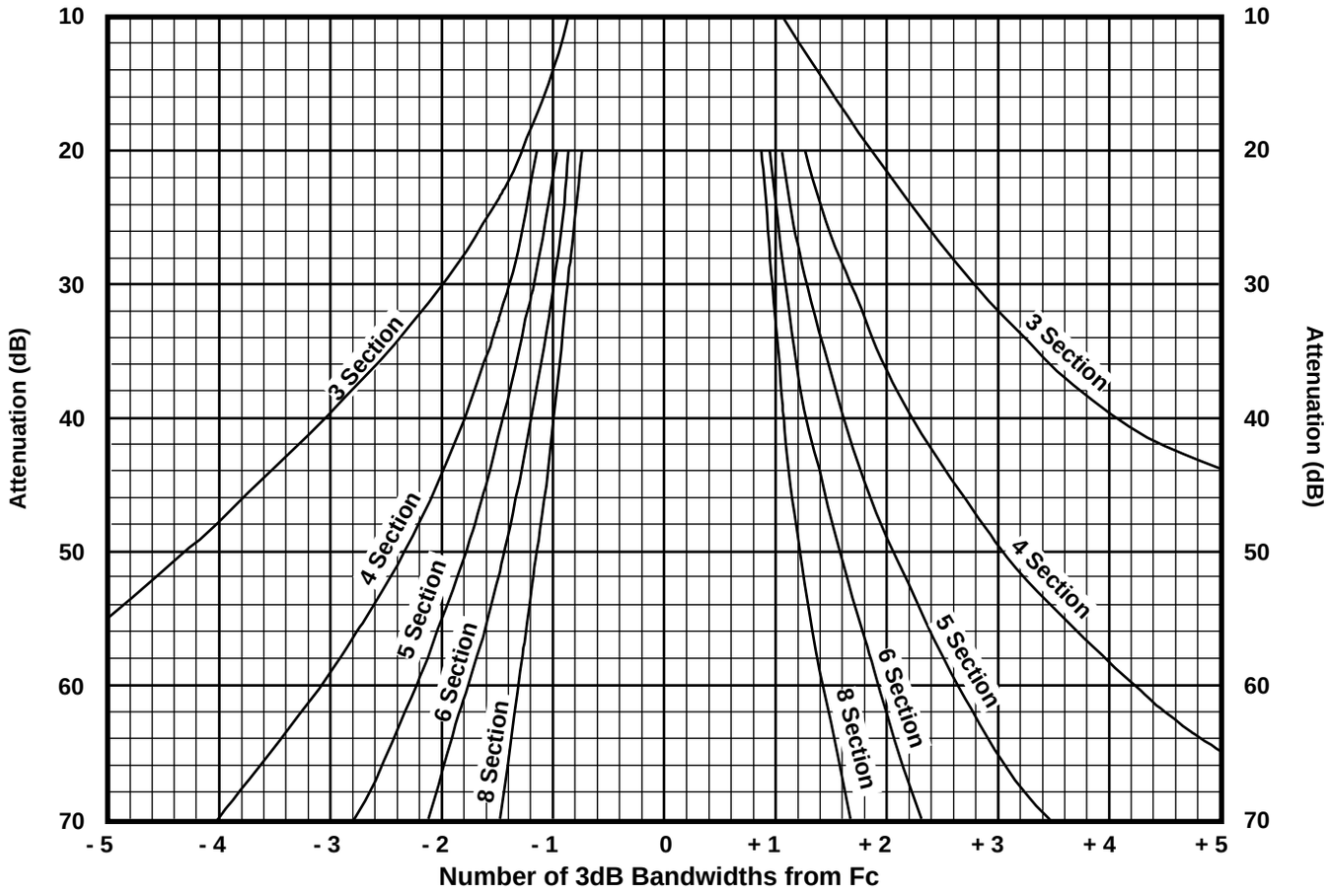
Example:

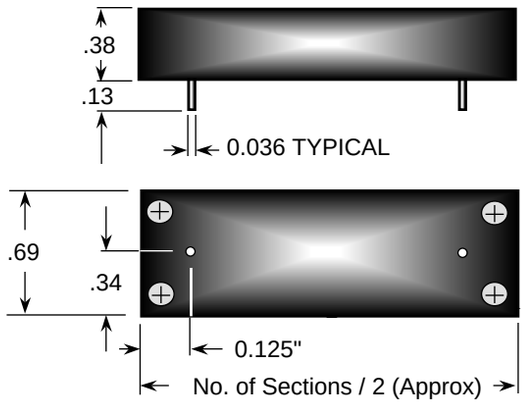
2. Center Frequency = 750 MHz
   Minimum 3 dB Bandwidth = 75 MHz
   Number of sections = 5

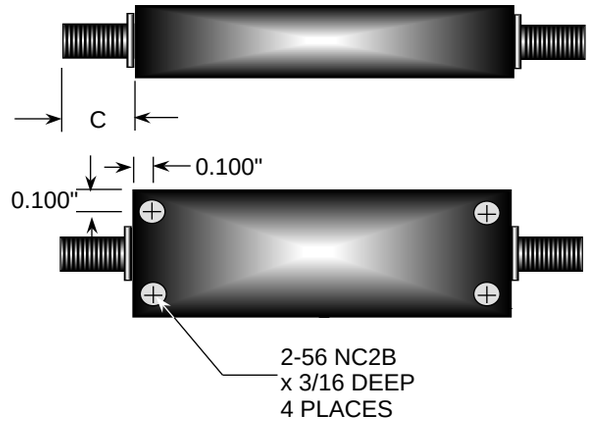
   Find: Minimum attenuation levels at 600 MHz and 885 MHz.

   3 dB bandwidths from Fc = (600-750) / 75 = - 2.0 and (885-750) / 75 = + 1.8

The answer can be read directly from the graph. Using the 5 section curve at the point - 2 (600 MHz), the minimum level of attenuation is 55dB; at + 1.8 (885 MHz), the minimum level of Attenuation is 45dB







See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	200 to 750 MHz	100 to 1000 MHz
3 dB Relative Bandwidth (% of Fc)	3 to 15	1 to 20
Number of Sections Available	3 to 6	2 to 10
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See curve Page 24	See curve Page 24
Average Power (Watts Max to 10 K Feet)	% BW/Loss Factor	5
Peak Power (Watts Max to 10 K Feet)	% BW	15

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections +.5)}}{\text{\% 3 dB Bandwidth}} + 0.1$$

Example :

The maximum loss for a 3 Section BP15 Series filter with a center frequency of 350 MHz and a 3 dB Bandwidth of 35 MHz is:

(3.6 x 3.5) / 10 + 0.1 = 1.36 dB

Center Frequency (MHz)	250 to 300	301 to 400	401 to 600	601 to 800	801 to 1000
Loss Factor	**4.2**	**3.6**	**3.4**	**3.1**	**3.0**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	15 G
Shock (11 mSec)	15 G	30 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to + 125° C.
Non-Operating Temperature	-25° to + 75° C.	-62° to + 150° C.

The graphs on the following pages define the normal specification limits of attenuation for FILTEK Miniature Helical Bandpass filters. The minimum level of attenuation in dB is shown as a "Number of 3dB Bandwidths from Center Frequency." Since the filter characteristics vary for differing bandwidths, it is necessary to establish specifications for each bandwidth of filter. The different graphs represent the various 3dB percentage bandwidths. The 3dB percentage bandwidth is defined as follows:

$$\frac{\text{3 dB Bandwidth (MHz) x 100}}{\text{Center Frequency (MHz)}} = \%\ \text{Bandwidth}$$

The exact relationship is as follows:

1. 3 dB bandwidths from center frequency =

$$\frac{\text{Rejection Frequency (MHz) - Center Frequency (MHz)}}{\text{3 dB Bandwidth (MHz)}}$$

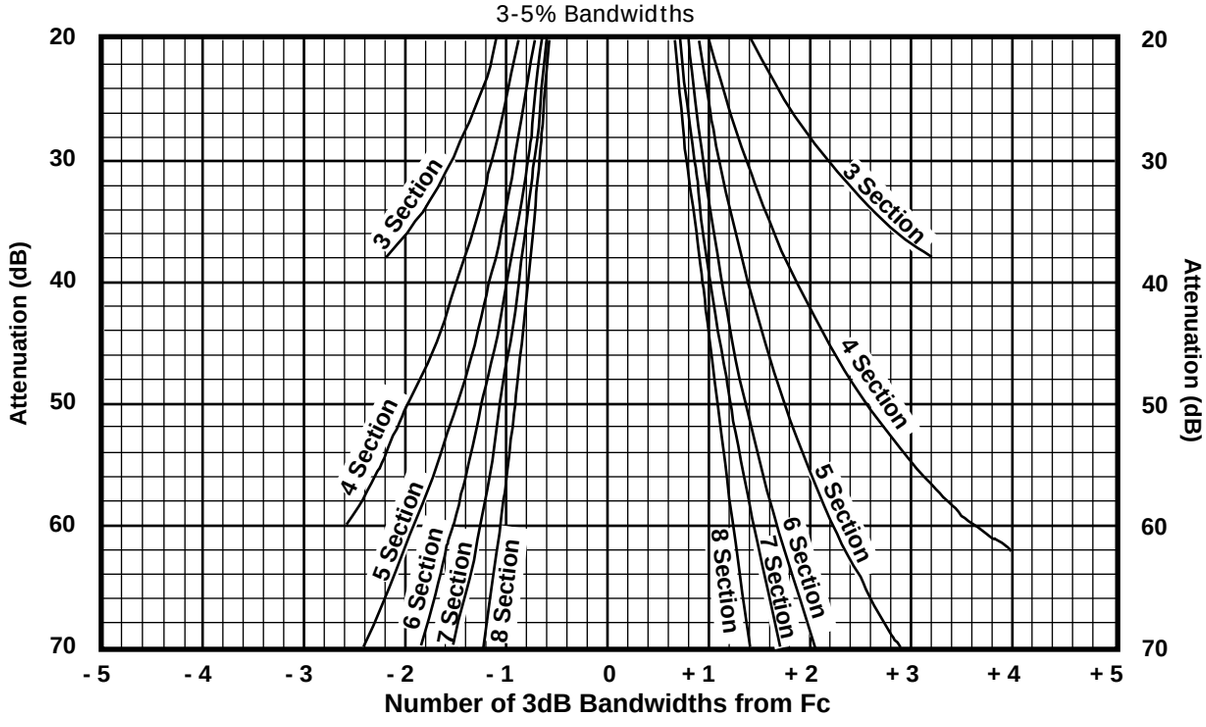
Example:

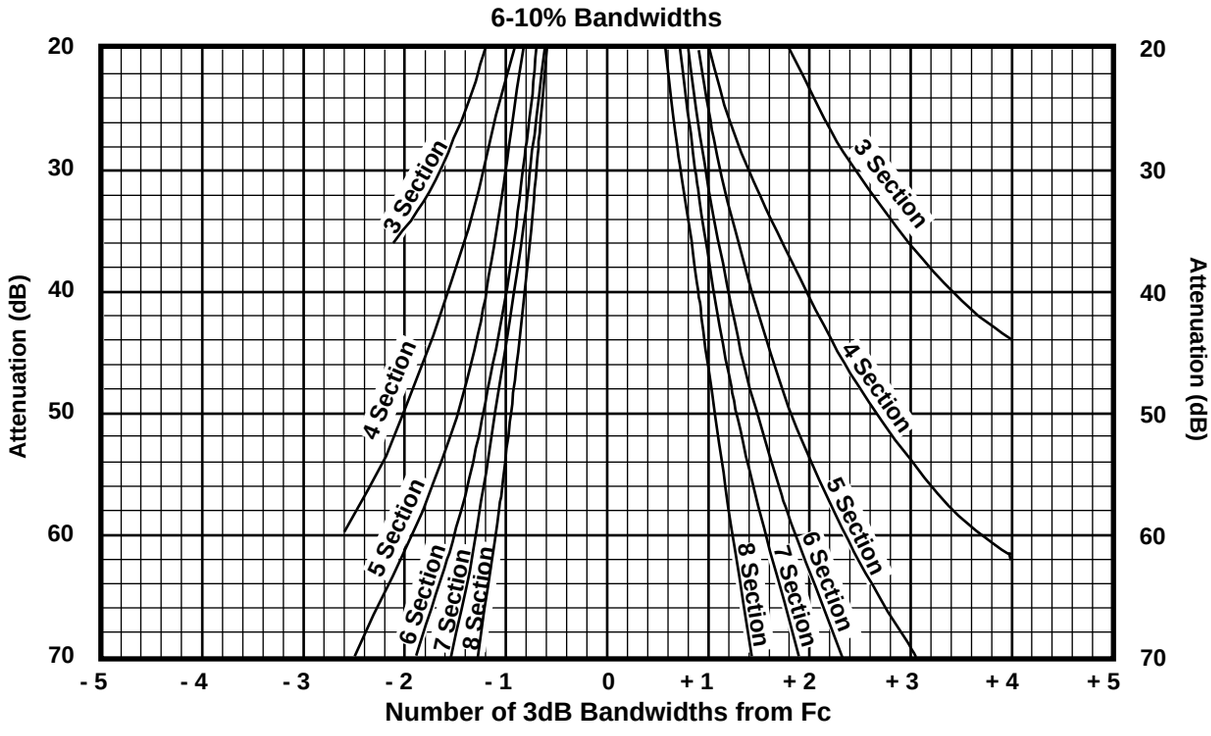
2. Center Frequency = 500 MHz
   Minimum 3 dB Bandwidth = 50 MHz
   Number of sections = 5

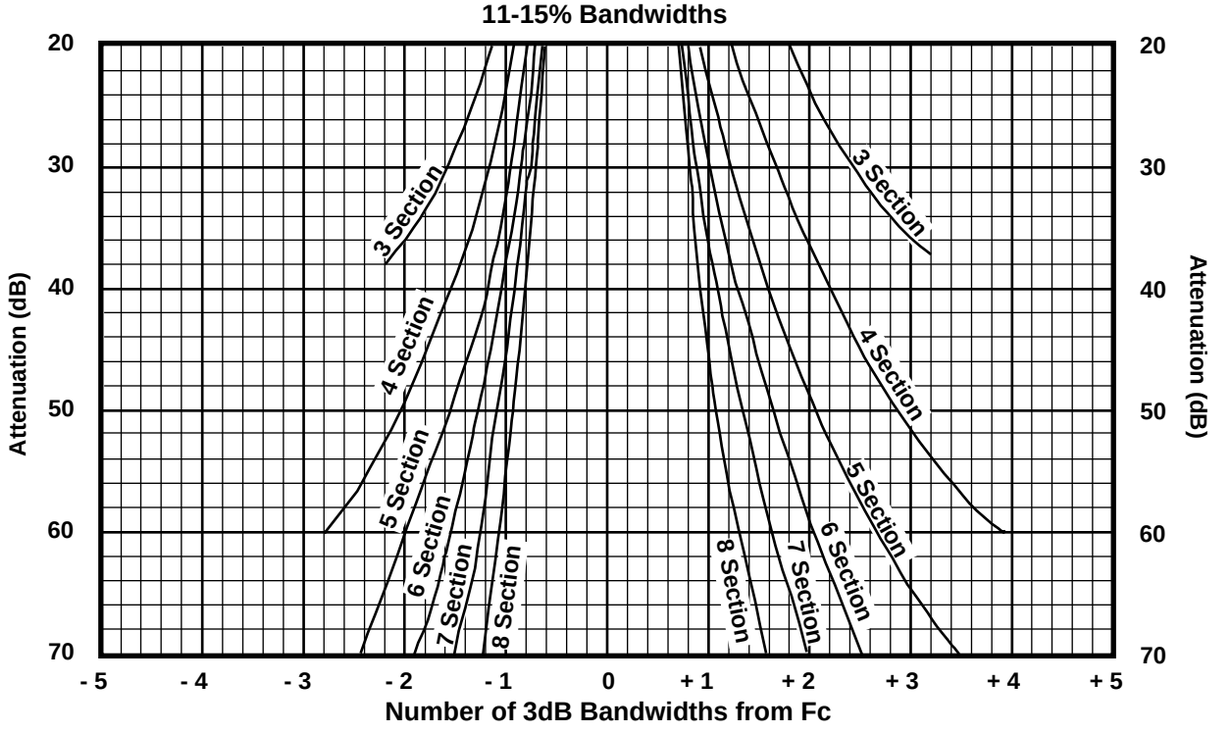
   Find: Minimum attenuation levels at 400 MHz and 600 MHz.

   3 dB bandwidths from Fc = (400-500) / 50 = - 2.0 and (600-500) / 50 = + 2.0

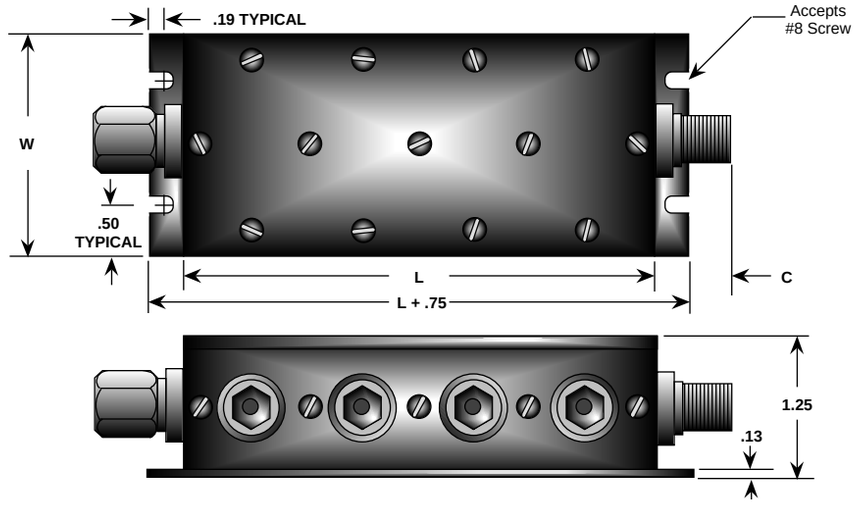
As the 3dB Bandwidth is exactly 10% of the center frequency, the answer can be read directly from the 6-10% graph. Using the 5 section curve at the point -2.0 (400 MHz), the minimum level of attenuation is 63dB; at + 2.0 (600 MHz), the minimum level of attenuation is 54dB.







Cavity Bandpass BP21 Series 20 to 600 MHz



Sections	L Dimension
2	2.50
3	3.62
4	4.75
5	5.87
6	7.00

Frequency	W Dimension
30-50 MHz	3.87
50-65 MHz	2.87
65-100 MHz	2.37
100-450 MHz	1.87

See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	30 to 450 MHz	20 to 600 MHz
3 dB Relative Bandwidth (% of Fc)	1 to 3	0.2 to 4
Number of Sections Available	3 to 6	2 to 7
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See curve Page 32	See curve Page 32
Average Power (Watts Max to 10 K Feet)	(3 x % BW)/Loss Factor	20
Peak Power (Watts Max to 10 K Feet)	15 x % BW	100

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections +.5)}}{\text{\% 3 dB Bandwidth}} + 0.1$$

Example

The maximum loss for a 3 Section BP21 Series filter with a center frequency of 200 MHz and a 3 dB Bandwidth of 4 MHz is:

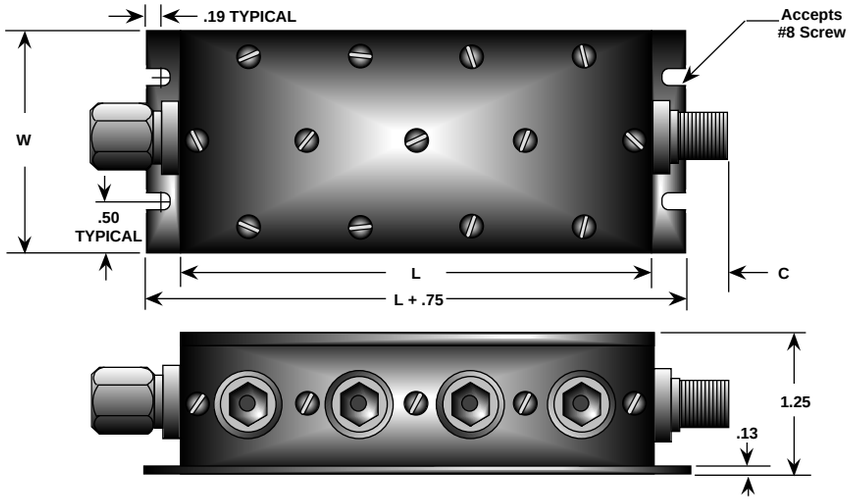
(1.4 x 3.5) / 2 + 0.1 = 2.55 dB

Center Frequency (MHz)	30 to 50	51 to 70	71 to 100	101 to 300	301 to 450
Loss Factor	**1.8**	**1.6**	**1.5**	**1.4**	**1.0**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	15 G
Shock (11 mSec)	5 G	15 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to + 100° C.
Non-Operating Temperature	-25° to + 70° C.	-54° to + 125° C.

Cavity Bandpass — BP22 Series — 250 to 4000 MHz



Sections	L Dimension
2	2.50
3	3.62
4	4.75
5	5.87
6	7.00

Frequency	W Dimension
400-600 MHz	4.87
600-900 MHz	3.87
900-1300 MHz	2.87
1300-1800 MHz	2.37
1800-3000 MHz	1.87

See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	400 to 3000 MHz	250 to 4000 MHz
3 dB Relative Bandwidth (% of Fc)	0.3 to 3	0.2 to 5
Number of Sections Available	3 to 6	2 to 7
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See curve Page 32	See Curve Page 32
Average Power (Watts Max to 10K Feet)	See Peak	See Peak
Peak Power (Watts Max to 10K Feet)	15 x % BW	200

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{\text{Loss Factor (Number of Sections +.5)}}{\text{\% 3 dB Bandwidth}} + 0.1$$

Example:

The maximum loss for a 3 Section BP22 Series filter with a center frequency of 750 MHz and a 3 dB Bandwidth of 15 MHz is:

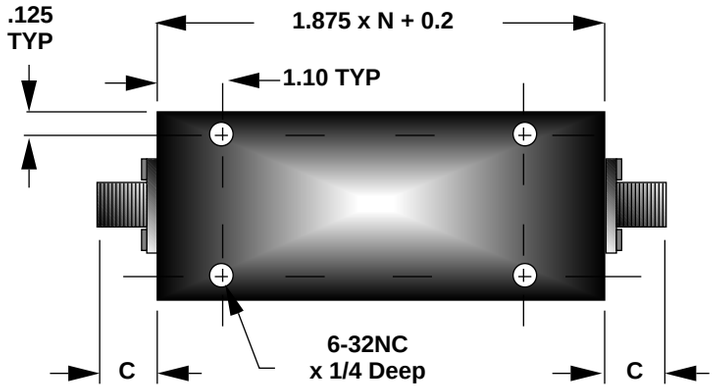
(0.5 x 3.5) / 2 + 0.1 = 0.98 dB

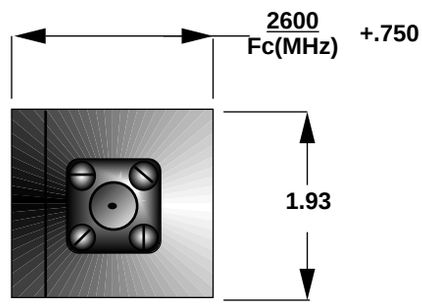
Center Frequency (MHz)	400 to 500	501 to 800	801 to 900	901 to 1300	1301 to 3050
Loss Factor	**0.6**	**0.5**	**0.4**	**0.35**	**0.3**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	15 G
Shock (11 mSec)	5 G	15 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to + 100° C.
Non-Operating Temperature	-25° to + 70° C.	-54° to + 125° C.

Cavity Bandpass BP23 Series 400 to 2500 Mhz





See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	500 to 2000 MHz	400 to 2500 MHz
3 dB Relative Bandwidth (% of Fc)	0.3 to 3.0	0.1 to 3.5
Number of Sections Available	3 to 6	2 to 8
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 32	See Curve Page 32
Average Power (Watts Max to 10K Feet)	25 % of Peak	1000
Peak Power (Watts Max to 10K Feet)	100 x %BW	1000

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ \text{3dB Bandwidth}} + 0.1$$

Example:
The maximum loss for a 5 Section BP23 Series filter with a center frequency of 1000 MHz and a 3 dB Bandwidth of 10 MHz is:

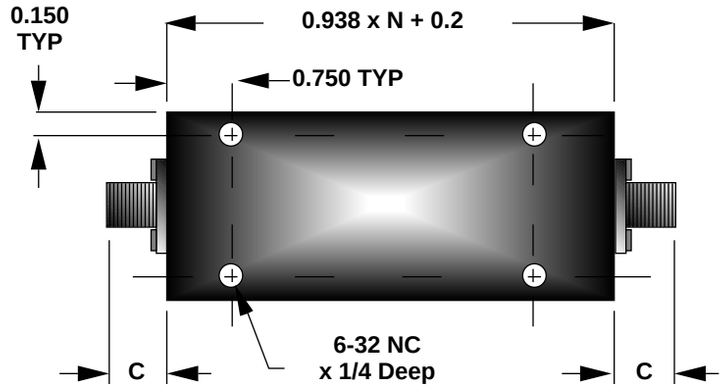
(0.143 x 5.5) / 1 + 0.1 = 0.89 dB

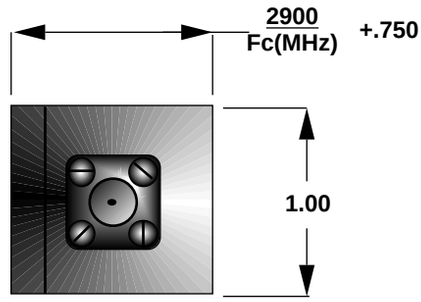
Center Frequency (MHz)	500 to 600	601 to 700	701 to 800	801 to 1000	1001 to 2000
Loss Factor	**.155**	**.150**	**.145**	**.143**	**.140**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	30 G
Shock (11 mSec)	25 G	75 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to +70° C.	-62° to +150° C.

Cavity Bandpass BP24 Series 800 to 5000 Mhz





See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	1000 to 3000 MHz	800 to 5000 MHz
3 dB Relative Bandwidth (% of Fc)	0.3 to 3.0	0.3 to 3.5
Number of Sections Available	3 to 6	2 to 7
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 32	See Curve Page 32
Average Power (Watts Max to 10K Feet)	25 % of Peak	75
Peak Power (Watts Max to 10K Feet)	15 x %BW	300

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ \text{3dB Bandwidth}} + 0.1$$

Example:
The maximum loss for a 5 Section BP24 Series filter with a center frequency of 2000 MHz and a 3 dB Bandwidth of 20 MHz is:

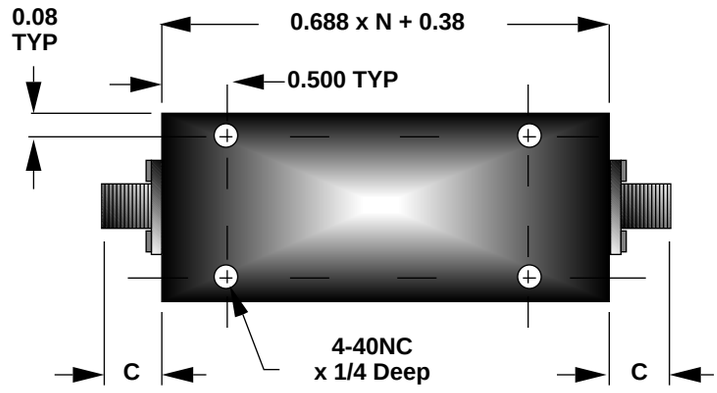
(0.20 x 5.5) / 1 + 0.1 = 1.2 dB

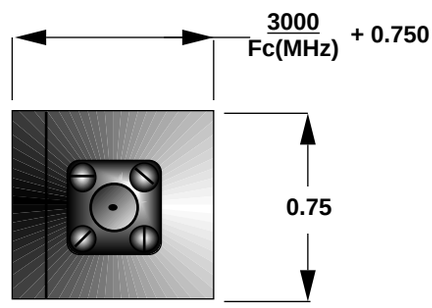
Center Frequency (MHz)	800 to 900	901 to 1000	1001 to 1500	1501 to 2000	2001 to 5000
Loss Factor	**.28**	**.26**	**.24**	**.22**	**.20**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	30 G
Shock (11 mSec)	25 G	75 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to + 50° C.	- 54° to +125° C.
Non-Operating Temperature	- 25° to + 70° C.	- 62° to +150° C.

Cavity Bandpass BP25 Series 1500 to 14000 Mhz





See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	2000 to 6000 MHz	1500 to 14000 MHz
3 dB Relative Bandwidth (% of Fc)	0.3 to 2.0	0.2 to 3.0
Number of Sections Available	3 to 6	2 to 7
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 32	See Curve Page 32
Average Power (Watts Max to 10K Feet)	25 % of Peak	75
Peak Power (Watts Max to 10K Feet)	15 x %BW	300

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ 3\ \text{dB Bandwidth}} + 0.1$$

Example:
The maximum loss for a 5 Section BP25 Series filter with a center frequency of 3000 MHz and a 3 dB Bandwidth of 30 MHz is:

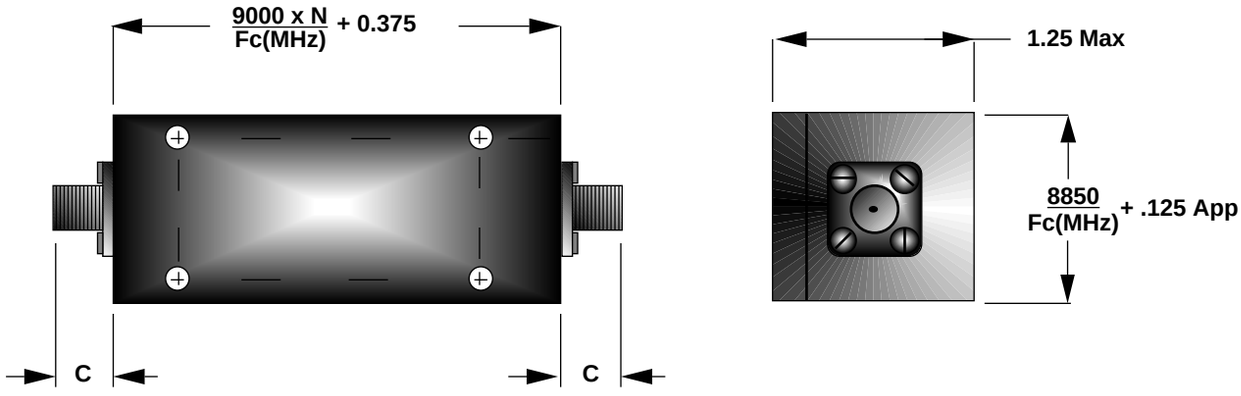
(0.43 x 5.5) / 1 + 0.1 = 2.5 dB

Center Frequency (MHz)	1500 to 1750	1751 to 2000	2001 to 3000	3001 to 4000	4001 to 6000
Loss Factor	**.47**	**.43**	**.43**	**.43**	**.43**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	30 G
Shock (11 mSec)	25 G	75 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	- 54° to +125° C.
Non-Operating Temperature	- 25° to +70° C.	- 62° to +150° C.

Cavity Bandpass BP26 Series 5000 to 18000 Mhz



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	6000 to 12400 MHz	5000 to 18000 MHz
3 dB Relative Bandwidth (% of Fc)	0.1 to 1.0	0.1 to 2.0
Number of Sections Available	3 to 4	2 to 7
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.5:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 32	See Curve Page 32
Average Power (Watts Max to 10K Feet)	10 % of Peak	200
Peak Power (Watts Max to 10K Feet)	150 x % BW	5000

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ 3\ \text{dB Bandwidth}} + 0.1$$

Example:
The maximum loss for a 4 Section BP26 Series filter with a center frequency of 8000 MHz and a 3 dB Bandwidth of 60 MHz is:

(0.22 x 4.5) / 0.75 + 0.1 = 1.4 dB

Center Frequency (MHz)	6000 to 12400
Loss Factor	**0.22**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	30 G
Shock (11 mSec)	25 G	75 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to + 50° C.	- 54° to +125° C.
Non-Operating Temperature	- 25° to +70° C.	- 54° to +150° C.

The graphs on the following pages define the normal specification limits of attenuation for FILTEK Cavity Bandpass filters. The minimum level of attenuation in dB is shown as a "Number of 3dB Bandwidths from Center Frequency."

The exact relationship is as follows:

1. 3dB bandwidths from center frequency =

$$\frac{\text{Rejection Frequency (MHz) - Center Frequency (MHz)}}{\text{3 dB Bandwidth (MHz)}}$$

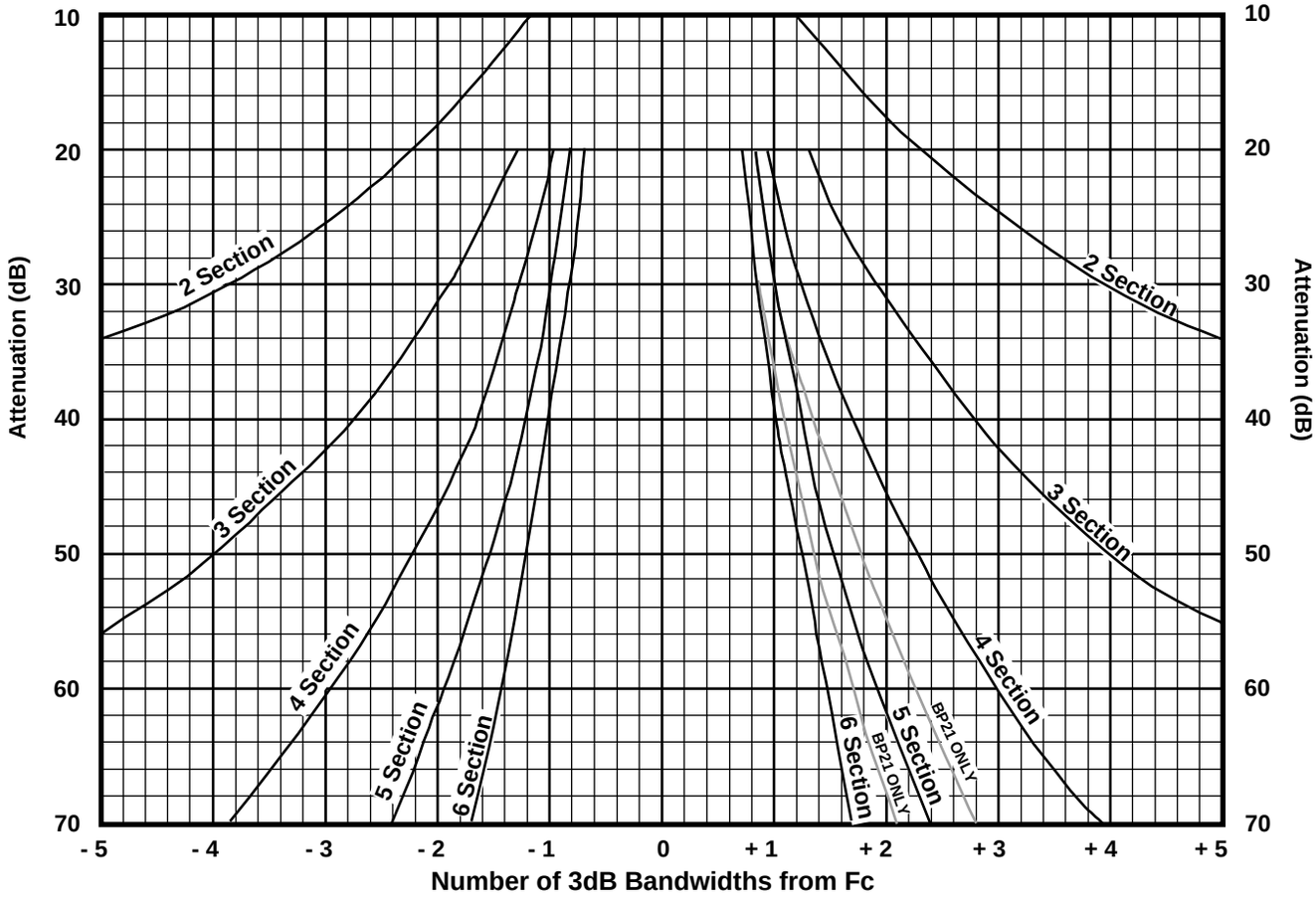
Example:

2. Center Frequency = 1000 MHz
   Minimum 3dB Bandwidth = 10 MHz
   Number of sections = 4

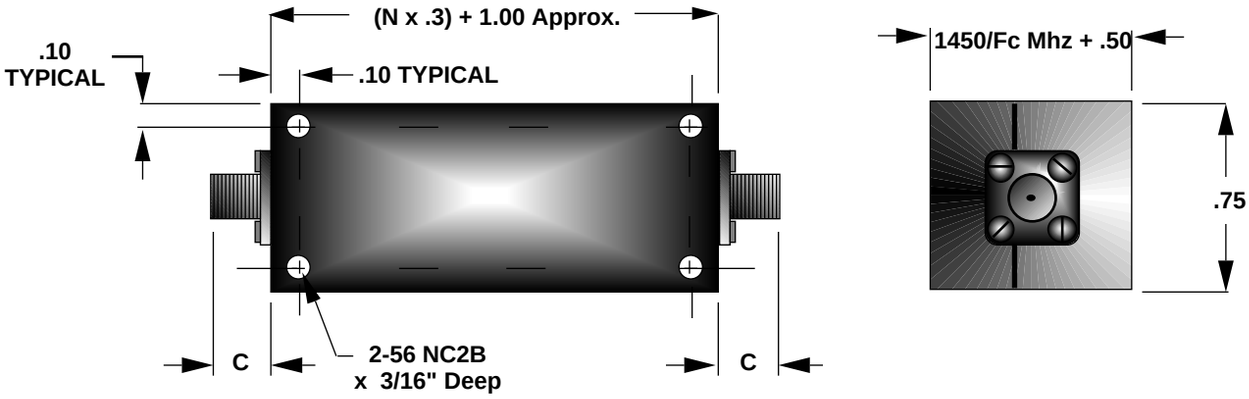
   Find: Minimum attenuation levels at 980 MHz and 1020 MHz.

   3dB bandwidths from Fc = (980-1000) / 10 = - 2.0 and (1020-1000) / 10 = + 2.0

The answer can be read directly from the graph. Using the 4 section curve at the point - 2.0 (980 MHz), the minimum level of attenuation is 46 dB; at + 2.0 (1020 MHz), the minimum level of attenuation is 46 dB.



Combline Bandpass BP30 Series 500 to 22500 MHz



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	1000 to 18000 MHz	500 to 22500 MHz
3 dB Relative Bandwidth (% of Fc)	3 to 30	2 to 70
Number of Sections Available	3 to 10	3 to 20
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 36	See Curve Page 36
Average Power (Watts Max to 10K Feet)	10% of Peak	50
Peak Power (Watts Max to 10K Feet)	10 x % BW	100

Insertion Loss

The Maximum Insertion Loss at Center Frequency isequal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ \text{3dB Bandwidth}} + 0.1$$

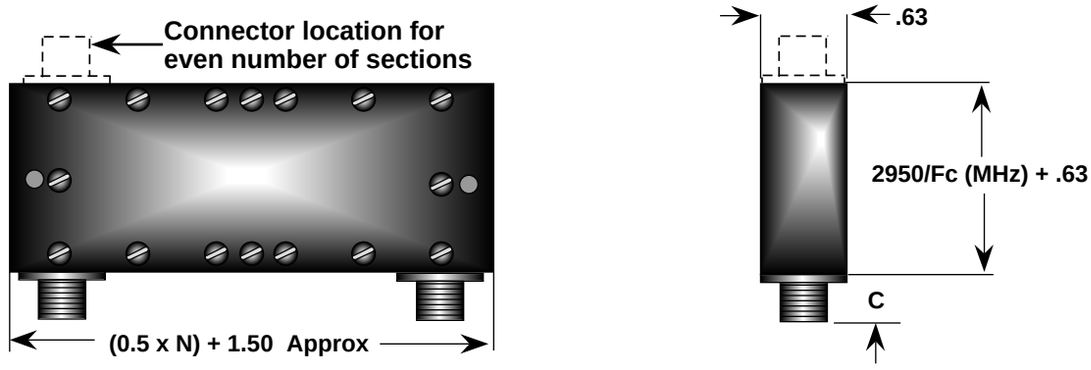
Example:
The maximum loss for a 5 Section BP30 Series filter with a center frequency of 7500 MHz and a 3dB Bandwidth of 375 MHz is:

(.95 x 5.5) / 5 + 0.1 = 1.2dB

Cutoff Frequency (MHz)	1000 to 1250	1251 to 1500	1501 to 2000	2001 to 3000	3001 to 12000
Loss Factor	**2.0**	**1.7**	**1.5**	**1.2**	**.95**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	20 G
Shock (11 mSec)	30 G	50 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-54° to + 85° C.	-62° to +150° C.



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	1000 to 12000 MHz	500 to 18000 MHz
3 dB Relative Bandwidth (% of Fc)	3 to 30	2 to 70
Number of Sections Available	3 to 12	3 to 20
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 36	See Curve Page 36
Average Power (Watts Max to 10K Feet)	(3 x % BW) / Loss Factor	100
Peak Power (Watts Max to 10K Feet)	15 x %BW	1000

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ \text{3dB Bandwidth}} + 0.1$$

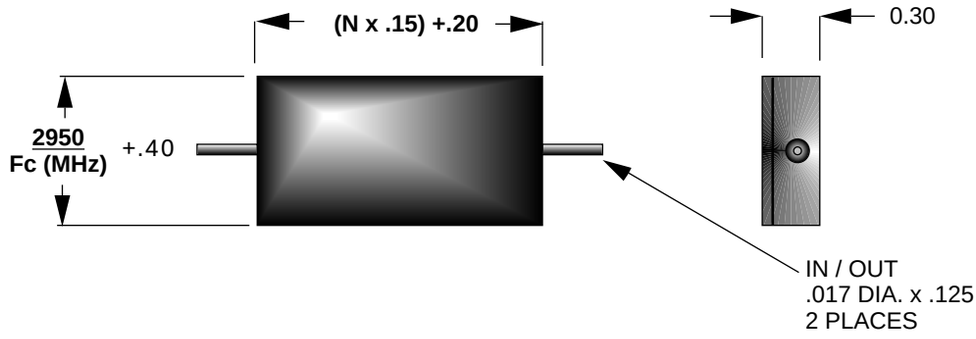
Example:
The maximum loss for a 10 Section BP31 Series filter with a center frequency of 3000 MHz and a 3 dB Bandwidth of 450 MHz is:

(1.2 x 10.5) / 15 + 0.1 = .94 dB

Center Frequency (MHz)	1000 to 2000	2001 to 3000	3001 to 4000	4001 to 5000	5001 to 9000
Loss Factor	**1.7**	**1.2**	**.95**	**.85**	**.80**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	2 G	15 G
Shock (11 mSec)	5 G	15 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-54° to +85° C.	-62° to +150° C.



The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Center Frequency (Fc)	4000 to 12000 MHz	3000 to 18000 MHz
3 dB Relative Bandwidth (% of Fc)	5 to 20	3 to 30
Number of Sections Available	3 to 6	3 to 10
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 36	See Curve Page 36
Average Power (Watts Max to 10K Feet)	2	20
Peak Power (Watts Max to 10K Feet)	10	100

Insertion Loss

The Maximum Insertion Loss at Center Frequency is equal to:

$$\frac{(\text{Loss Factor})\ (\text{Number of Sections} + .5)}{\%\ \text{3dB Bandwidth}} + 0.1$$

Example:
The maximum loss for a 5 Section BP32 Series filter with a center frequency of 5000 MHz and a 3 dB Bandwidth of 500 MHz (10%) is:

(2.0 x 5.5) / 10 = 1.1 dB

Center Frequency (MHz)	4000 to 5000	5001 to 6000	6001 to 8000	8001 to 10000	10001 to 12000
Loss Factor	**2.0**	**1.9**	**1.8**	**1.7**	**1.6**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	25 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to +75° C.	-62° to +150° C.

The graphs on the following pages define the normal specification limits of attenuation for FILTEK Combline and Interdigital Bandpass filters. The minimum level of attenuation in dB is shown as a "Number of 3dB Bandwidths from Center Frequency." Since the filter characteristics vary for differing bandwidths, it is necessary to establish specifications for each bandwidth of filter. The different graphs represent the various 3dB percentage bandwidths. The 3dB percentage bandwidth is defined as follows:

$$\frac{\text{3dB Bandwidth (MHz)} \times 100}{\text{Center Frequency (MHz)}}$$

The exact relationship is as follows:

1. 3dB bandwidths from center frequency =

$$\frac{\text{Rejection Frequency (MHz)} - \text{Center Frequency (MHz)}}{\text{3dB Bandwidth (MHz)}}$$

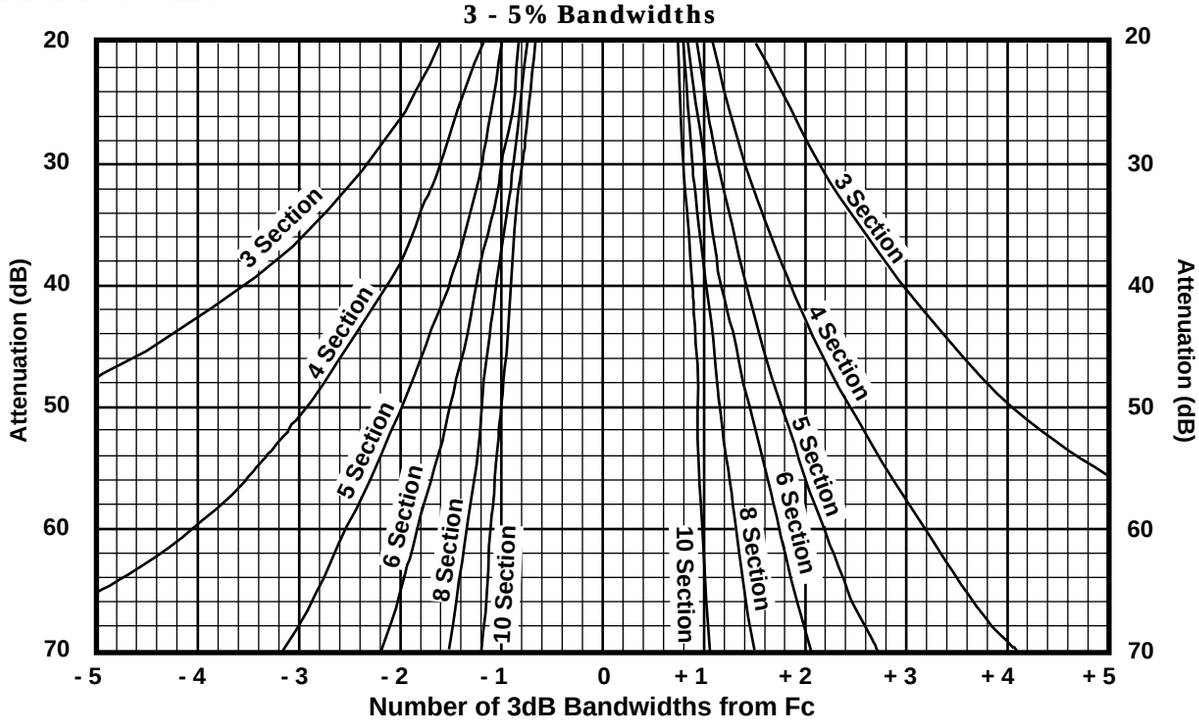
Example:

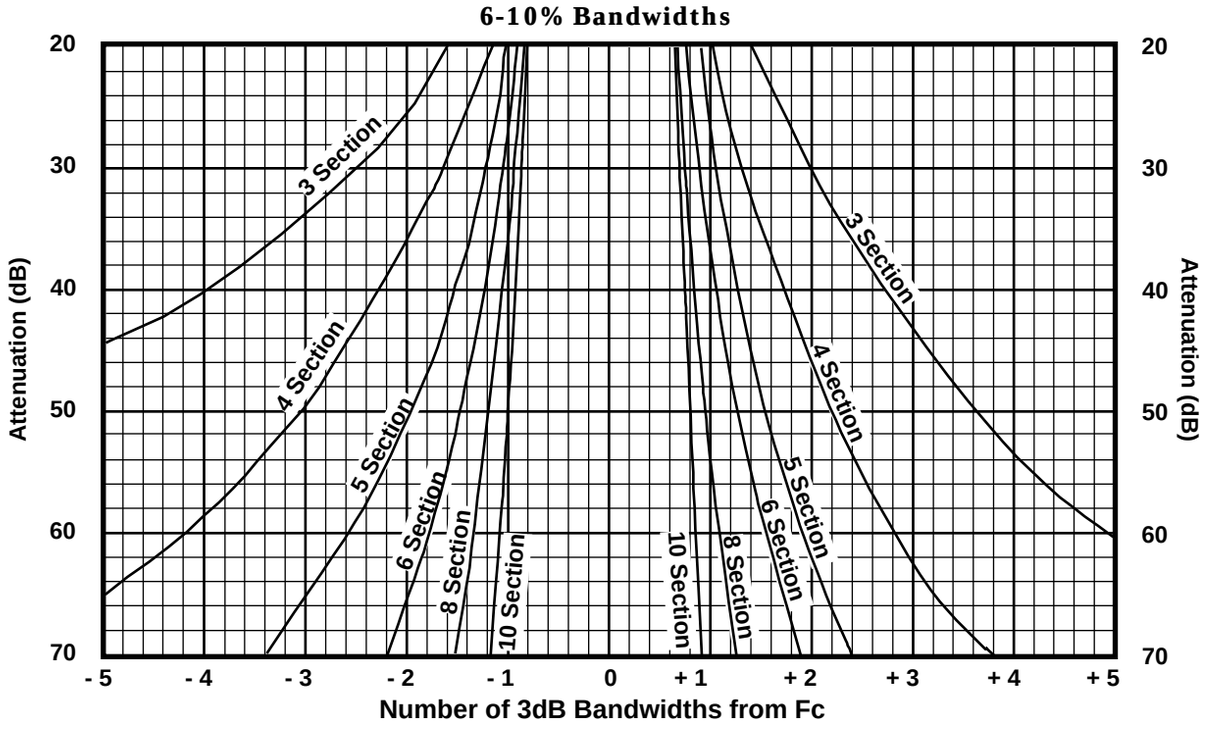
2. Center Frequency = 5000 MHz
   Minimum 3 dB Bandwidth = 500 MHz
   Number of sections = 5

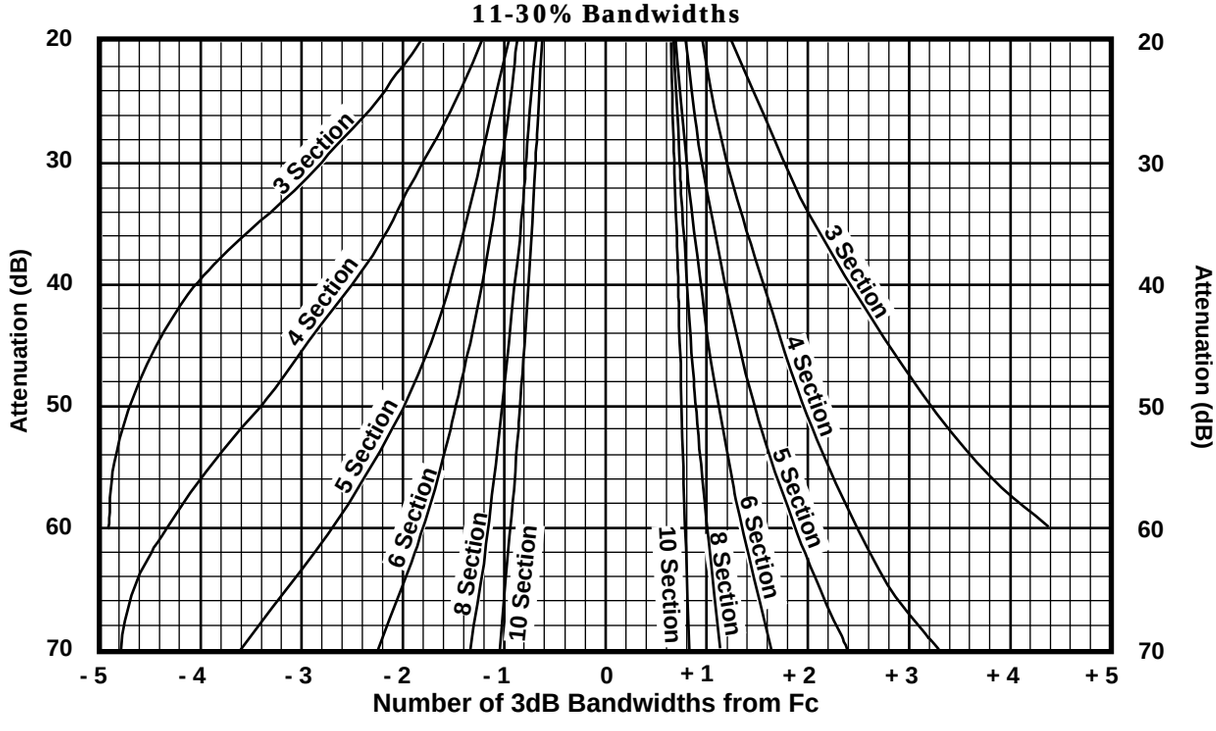
   Find: Minimum attenuation levels at 4250 MHz and 5800 MHz.

   3 dB bandwidths from Fc = (4250 - 5000) / 500 = - 1.5 and (5800 - 5000) / 30 = + 1.6

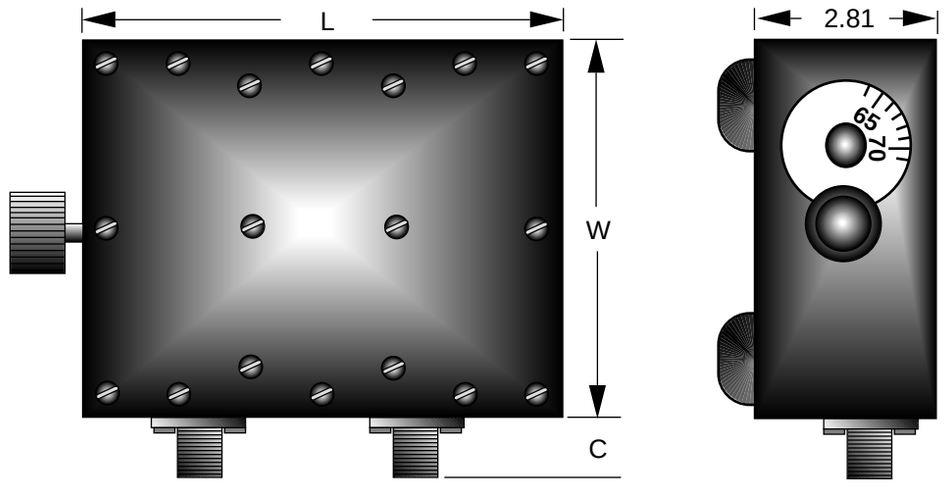
As the three dB Bandwidth is exactly 10% of the center frequency, the answer can be read directly from the 10% graph. Using the 5 section curve at the point -1.5 (4250 MHz), the minimum level of attenuation is 40 dB. At + 1.6 (5800 MHz), the minimum level of attenuation is 50 dB.







Tunable Bandpass BP40 Series 31 to 2000 MHz



Type 'N' female connectors are standard for this series. **See Page 12 for 'C' dimension.** The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application. The filters are supplied with a direct reading dial calibrated in frequency to ± 0.5%.

Specifications

Electrical

Mechanical

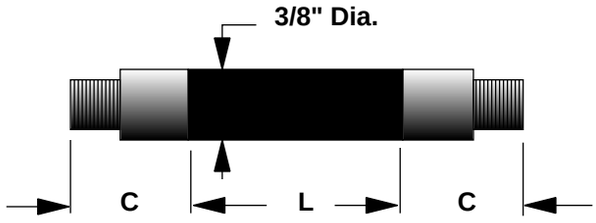
Tuning Range	% BW (3 dB Rel.)	Fc Insertion Loss (dB Max)			Power (Watts)	L (Inches)			W (Inches)
		3 Section	4 Section	5 Section		3 Section	4 Section	5 Section	
31 to 62 MHz	2% ± 1/2%	2.2	2.5	2.8	35	5.987	7.612	9.237	5.437
	5% ± 1%	1.2	1.5	1.8	60				
62 to 125 MHz	2% ± 1/2%	2.2	2.5	2.8	35	5.987	7.612	9.237	5.437
	5% ± 1%	1.2	1.5	1.8	60				
125 to 250 MHz	2% ± 1/2%	2.2	2.5	2.8	35	5.987	7.612	9.237	5.437
	5% ± 1%	1.0	1.2	1.5	60				
250 to 500 MHz	2% ± 1/2%	2.0	2.3	2.6	35	5.987	7.612	9.237	5.437
	5% ± 1%	0.9	1.0	1.3	60				
500 to 1000 MHz	2% ± 1/2%	2.0	2.3	2.6	35	5.987	7.612	9.237	5.437
	5% ± 1%	0.9	1.0	1.3	60				
1000 to 2000 MHz	2% ± 1/2%	2.0	2.3	2.6	35	4.500	5.625	6.750	3.625
	5% ± 1%	0.9	1.0	1.3	60				

Shape Factor			
Sections	30 dB Bandwidth / 3dB Bandwidth	40 dB Bandwidth / 3dB Bandwidth	50 dB Bandwidth / 3dB Bandwidth
3	3.5 Max	N/A	N/A
4	2.8 Max	3.5 Max	N/A
5	2.2 Max	2.8 Max	3.5 Max

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	2 G	5 G
Shock (11 mSec)	5 G	10 G
Humidity	Lab Environment	Lab Environment
Operating Temperature	Lab Environment	0° to + 50° C.
Non-Operating Temperature	0° to + 50° C.	- 10° to + 70° C.

Tubular Lowpass LP02 Series 100 to 5000 MHz



The approximate length of a FILTEK LP02 series filter can be determined by adding the 'C' dimensions found on page 12 to the 'L' dimension found in the table at the right. Please contact the factory if exact dimensions are required.

The approximate weight is .50 ounce per inch.

Number of Sections	Cutoff Frequency (MHz)				
	250 to 300	301 to 350	351 to 750	751 to 1250	1251 to 4000
3	**2.00**	**1.75**	**1.50**	**2.25**	**1.50**
4	**2.75**	**2.25**	**2.00**	**3.00**	**1.75**
5	**3.50**	**2.75**	**2.50**	**3.50**	**2.25**
6	**4.25**	**3.25**	**3.00**	**4.00**	**2.50**
7	**5.00**	**3.75**	**3.50**	**4.50**	
8	**5.76**	**4.25**	**4.00**	**5.00**	

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	250 to 4000 MHz	100 to 5000 MHz
Number of Sections Available	3 to 8	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR (.4 Fco to Fco)	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 45	See Curve Page 45
Average Power (Watts Max to 10 K Feet)	3/Loss Factor	5/Loss Factor
Peak Power (Watts Max to 10 K Feet)	250	3000

Insertion Loss

The Maximum Insertion Loss in the passband is equal to:

(Loss Factor x Number of Sections) +.05 dB

Example:
The maximum loss for a 3 Section LP02 Series filter with a cutoff frequency of 400 MHz is:

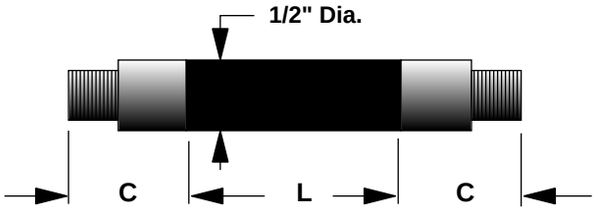
(.2 x 3) + .05 = 0.65dB

Cutoff Frequency (MHz)	250 to 300	301 to 350	351 to 750	751 to 1250	1251 to 4000
Loss Factor	**.22**	**.21**	**.20**	**.18**	**.17**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +100° C.
Non-Operating Temperature	-25° to +75° C.	-54° to +125° C.

Tubular Lowpass LP03 Series 50 to 4000 MHz



The approximate length of a FILTEK LP03 series filter can be determined by adding the 'C' dimensions found on page 12 to the 'L' dimension found in the table at the right. Please contact the factory if exact dimensions are required.

The approximate weight is .75 ounce per inch.

Number of Sections	Cutoff Frequency (MHz)				
	100 to 250	201 to 400	401 to 1000	1001 to 1500	1501 to 2500
3	**3.50**	**2.25**	**2.00**	**1.50**	**1.25**
4	**4.50**	**3.00**	**2.50**	**1.75**	**1.50**
5	**5.50**	**3.75**	**3.00**	**2.00**	**2.00**
6	**6.50**	**3.50**	**3.50**	**2.50**	**2.50**
7	**7.50**	**4.00**	**4.00**	**3.00**	**3.00**
8	**8.50**	**5.00**	**4.25**	**4.75**	**3.50**

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	100 to 2500 MHz	50 to 4000 MHz
Number of Sections Available	3 to 8	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR (.4 Fco to Fco)	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 45	See Curve Page 45
Average Power (Watts Max to 10K Feet)	6/Loss Factor	12/Loss Factor
Peak Power (Watts Max to 10K Feet)	500	7500

Insertion Loss

The Maximum Insertion Loss in the passband is equal to:

(Loss Factor x Number of Sections) +.05 dB

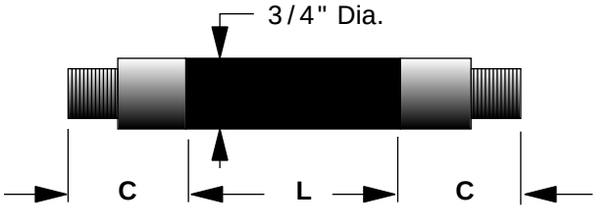
Example:
The maximum loss for a 4 Section LP03 Series filter with a cutoff frequency of 250 MHz is:

(.2 x 4) + .05 = 0.85dB

Cutoff Frequency (MHz)	100 to 200	201 to 400	401 to 1000	1001 to 1500	1501 to 2500
Loss Factor	**.24**	**.20**	**.17**	**.15**	**.14**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +100° C.
Non-Operating Temperature	-25° to +75° C.	-54° to +125° C.



The approximate length of a FILTEK LP04 series filter can be determined by adding the 'C' dimensions found on page 12 to the 'L' dimension found in the table at the right. Please contact the factory if exact dimensions are required.

The approximate weight is 1.0 ounce per inch.

Number of Sections	Cutoff Frequency (MHz)				
	50 to 65	66 to 80	81 to 150	151 to 1000	1001 to 1500
3	**5.50**	**4.50**	**3.50**	**2.25**	**3.00**
4	**7.75**	**6.50**	**4.00**	**3.00**	**3.50**
5	**10.00**	**8.50**	**4.50**	**3.75**	**4.00**
6	**12.75**	**10.00**	**5.75**	**4.50**	**5.00**
7	**15.25**	**11.00**	**6.50**	**5.25**	**6.00**
8	**18.00**	**12.50**	**7.25**	**6.00**	**6.75**

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	50 to 1500 MHz	30 to 2000 MHz
Number of Sections Available	3 to 8	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR (.4 Fco to Fco)	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 45	See Curve Page 45
Average Power (Watts Max to 10K Feet)	10/Loss Factor	20/Loss Factor
Peak Power (Watts Max to 10K Feet)	500	7500

Insertion Loss

The Maximum Insertion Loss in the passband is equal to:

(Loss Factor x Number of Sections) +.05 dB

Example:
The maximum loss for a 4 Section LP04 Series filter with a cutoff frequency of 100 MHz is:

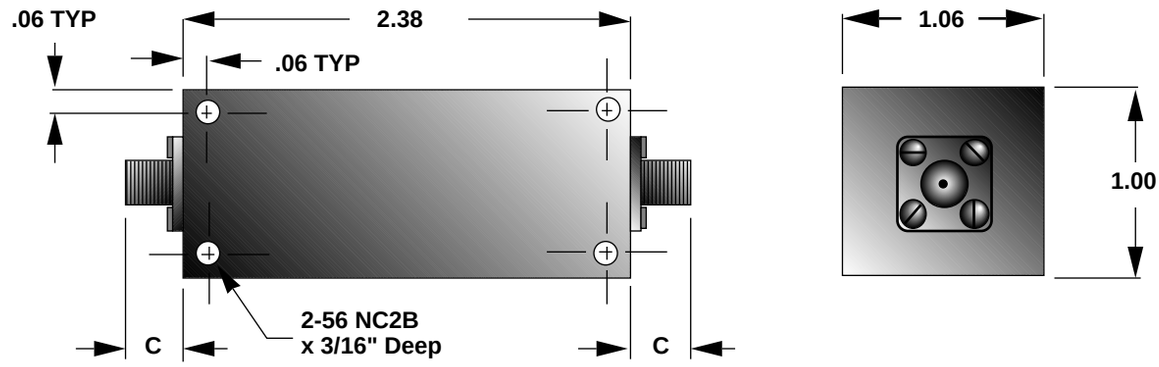
(.14 x 4) + .05 = 0.61dB

Cutoff Frequency (MHz)	50 to 65	66 to 80	81 to 150	151 to 1000	1001 to 1500
Loss Factor	**.16**	**.15**	**.14**	**.13**	**.12**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	30 G
Shock (11 mSec)	15 G	75 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-25° to +100° C.
Non-Operating Temperature	-25° to +75° C.	-54° to +125° C.

Lumped Element Lowpass LP11 Series 10 to 500 MHz



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	10 to 150 MHz	10 to 500 MHz
Number of Sections Available	3 to 6	2 to 10
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR (.4 Fco to Fco)	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 45	See Curve Page 45
Average Power (Watts Max to 10K Feet)	1	10
Peak Power (Watts Max to 10K Feet)	5	50

Insertion Loss

The Maximum Insertion Loss in the passband is equal to:

(Loss Factor x Number of Sections) +.05 dB

Example:
The maximum loss for a 3 Section LP11 Series filter with a cutoff frequency of 100 MHz is:

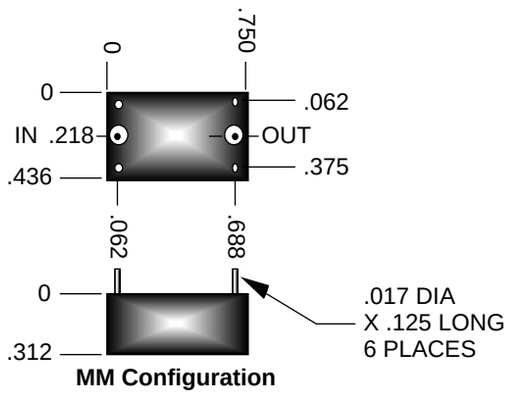
(.22 x 3) + .05 = 0.71dB

Cutoff Frequency (MHz)	10 to 15	16 to 20	21 to 30	31 to 50	51 to 150
Loss Factor	**.26**	**.25**	**.24**	**.23**	**.22**

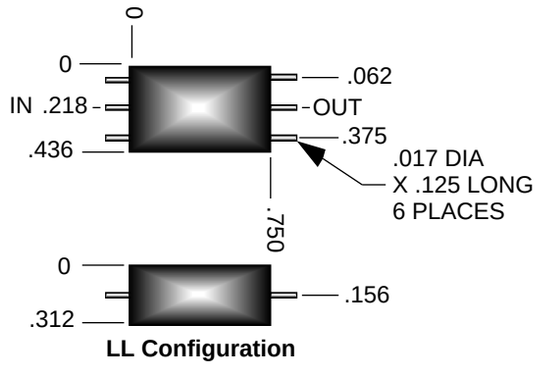
Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to + 85° C.	-62° to +150° C.

Lumped Element Lowpass LP12 Series 10 to 5000 MHz



MM Configuration



LL Configuration

See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	250 to 2500 MHz	10 to 5000 MHz
Number of Sections Available	3 to 5	2 to 10
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR (.4 Fco to Fco)	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 45	See Curve Page 45
Average Power (Watts Max to 10K Feet)	1	5
Peak Power (Watts Max to 10K Feet)	5	25

Insertion Loss

The Maximum Insertion Loss in the passband is equal to:

(Loss Factor x Number of Sections) +.05 dB

Example:
The maximum loss for a 3 Section LP12 Series filter with a cutoff frequency of 1000 MHz is:

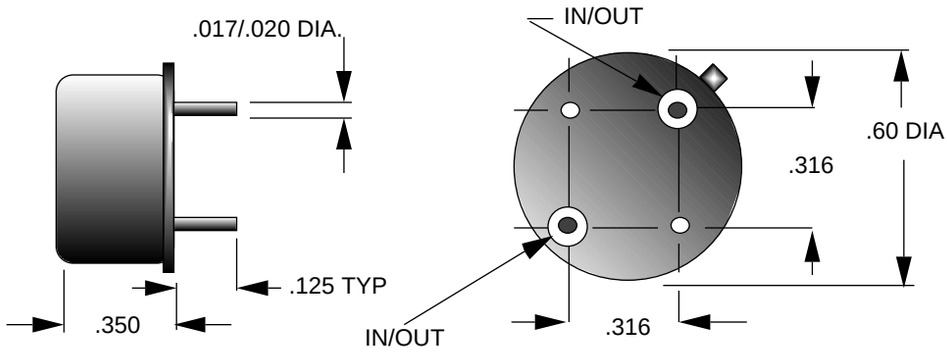
(.26 x 3) + .05 = 0.83dB

Cutoff Frequency (MHz)	250 to 300	301 to 400	401 to 500	501 to 1000	1001 to 2500
Loss Factor	**.42**	**.36**	**.32**	**.26**	**.24**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to +75° C.	-62° to +150° C.

Lumped Element Lowpass LP13 Series 10 to 5000 MHz



The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	250 to 2500 MHz	10 to 5000 MHz
Number of Sections Available	3 to 5	2 to 6
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR (.4 Fco to Fco)	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 45	See Curve Page 45
Average Power (Watts Max to 10K Feet)	1	5
Peak Power (Watts Max to 10K Feet)	5	25

Insertion Loss

The Maximum Insertion Loss in the passband is equal to:

(Loss Factor x Number of Sections) +.05 dB

Example:
The maximum loss for a 3 Section LP12 Series filter with a cutoff frequency of 1000 MHz is:

(.28 x 3) + .05 = 0.89dB

Cutoff Frequency (MHz)	250 to 301	301 to 400	401 to 500	501 to 1000	1001 to 2500
Loss Factor	**.44**	**.38**	**.34**	**.28**	**.26**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	50 G
Shock (11 mSec)	30 G	100 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to +75° C.	-62° to +150° C.

The graph below defines the normal specification limits of attenuation for FILTEK Lowpass filters. The minimum level of attenuation in dB is shown as a function of the relative frequency.

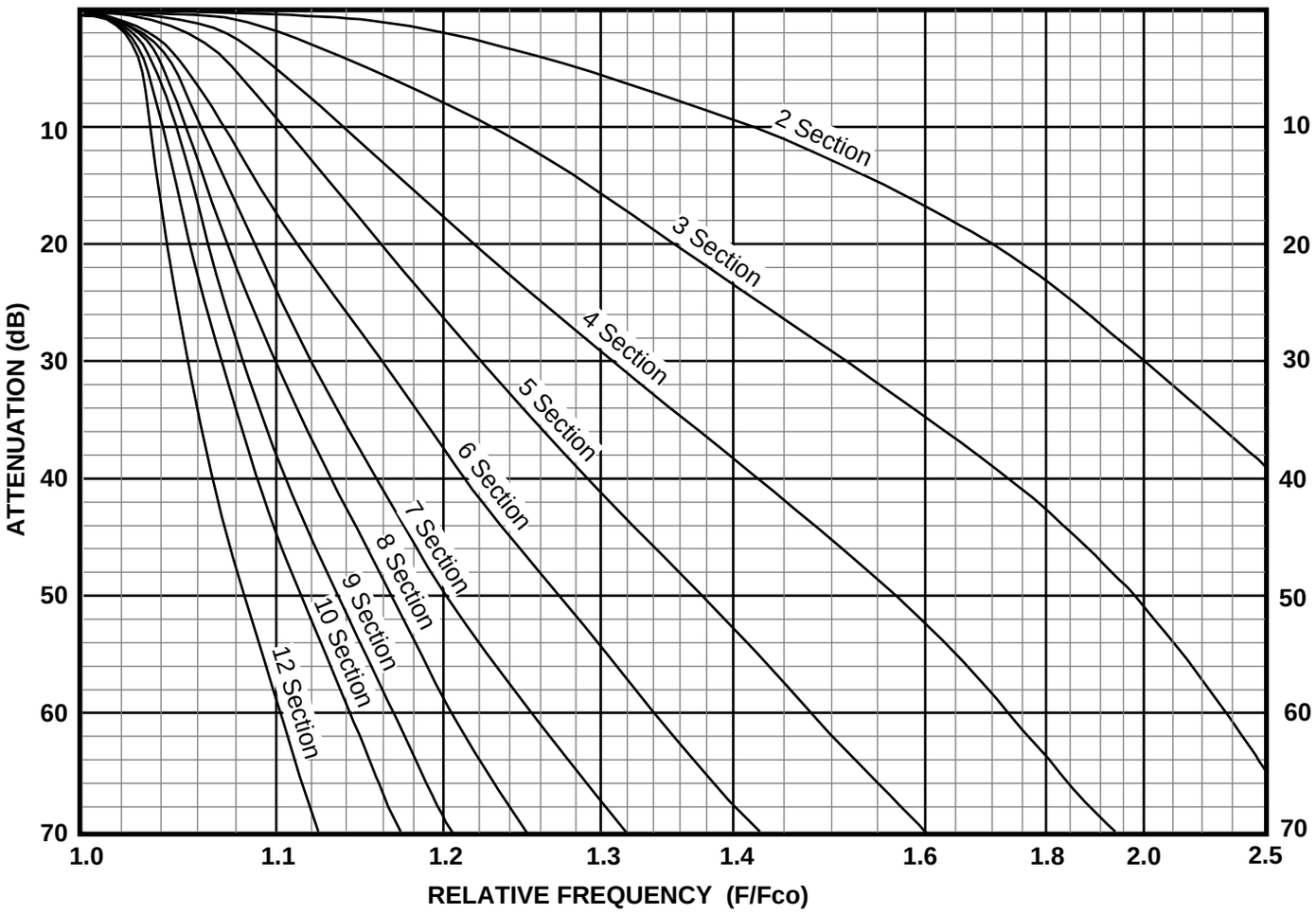
a) Fco is defined as the 1.5/1 VSWR cutoff frequency.

b) Relative frequency is the frequency to be attenuated divided by the nominal Fco.

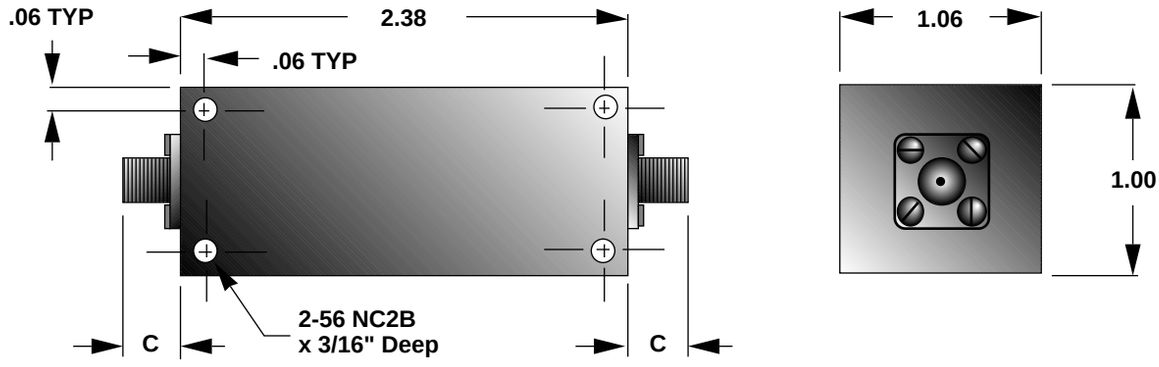
Example: Specify a lowpass filter to pass 1250 MHz and attenuate 1750 MHz by a minimum of 50dB.

1. 1750 MHz is at a relative frequency of 1.4 (1750/1250 = 1.4)

2. Reading from the curve at a relative frequency of 1.4, we find that a five section filter has a normal specification limit of 52dB. Therefore a lowpass filter with five or more sections would be required to meet the 50dB attenuation specification.



Lumped Element Highpass HP11 Series 10 to 450 MHz



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	10 to 140 MHz	10 to 450 MHz
Number of Sections Available	3 to 6	2 to 12
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 50	See Curve Page 50
Average Power (Watts Max to 10K Feet)	1	5
Peak Power (Watts Max to 10K Feet)	5	25

Insertion Loss

The Maximum Insertion Loss at Cutoff Frequency is equal to:

Loss Factor (Number of Sections) + 0.05

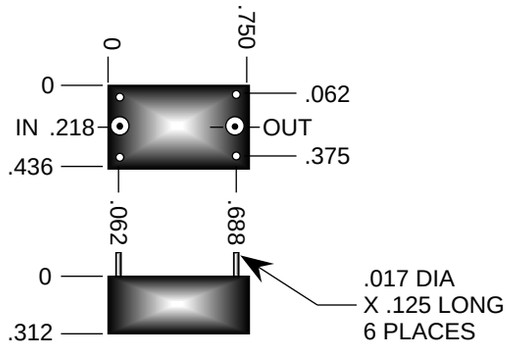
Example:
The maximum loss for a 3 Section HP11 Series filter with a cutoff frequency of 30 MHz is:

(0.2 x 3) + 0.05 = 0.7dB

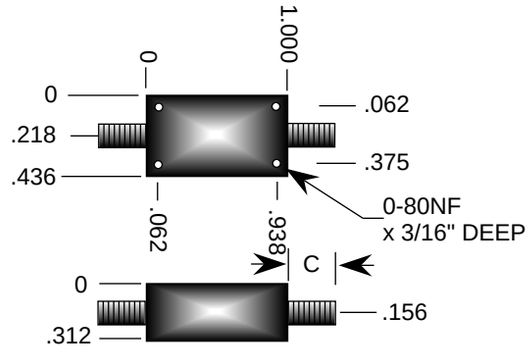
Cutoff Frequency (MHz)	10 to 15	16 to 20	21 to 30	31 to 50	51 to 150
Loss Factor	**0.22**	**0.21**	**0.20**	**0.20**	**0.20**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	10 G
Shock (11 mSec)	15 G	30 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to +75° C.	-62° to +150° C.



MM Configuration



AA Configuration

See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	300 to 2000 MHz	250 to 3500 MHz
Number of Sections Available	3 to 5	2 to 8
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 50	See Curve Page 50
Average Power (Watts Max to 10K Feet)	1	5
Peak Power (Watts Max to 10K Feet)	5	25

Insertion Loss

The Maximum Insertion Loss at Cutoff Frequency is equal to:

Loss Factor (Number of Sections) + 0.05

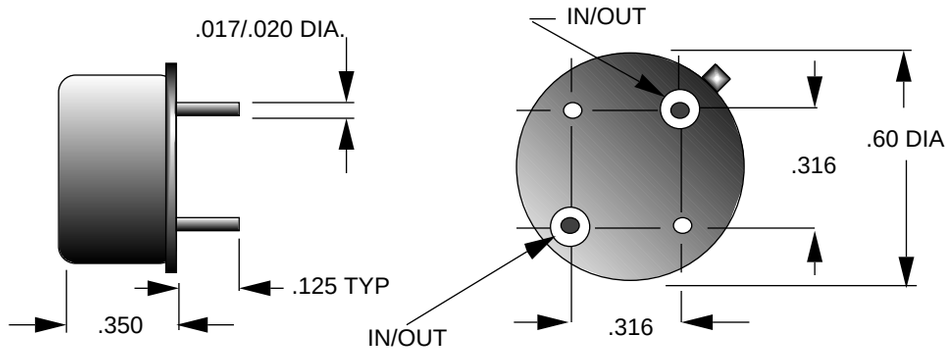
Example:
The maximum loss for a 3 Section HP12 Series filter with a cottoff frequency of 500 MHz is:

(0.50 x 3) + 0.05 = 1.6 dB

Cutoff Frequency (MHz)	250 to 300	301 to 400	401 to 500	501 to 1000	1001 to 2500
Loss Factor	**0.64**	**0.56**	**0.50**	**0.42**	**0.37**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	10 G
Shock (11 mSec)	15 G	30 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to +50° C.	- 54° to +125° C.
Non-Operating Temperature	- 25° to + 75° C.	- 62° to +150° C.



The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	300 to 2000 MHz	250 to 3500 MHz
Number of Sections Available	3 or 4	2 to 5
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 50	See Curve Page 50
Average Power (Watts Max to 10K Feet)	1	5
Peak Power (Watts Max to 10K Feet)	5	25

Insertion Loss

The Maximum Insertion Loss at Cutoff Frequency is equal to:

Loss Factor (Number of Sections) + 0.05)

Example:
The maximum loss for a 3 Section HP13 Series filter with a cutoff frequency of 500 MHz is:

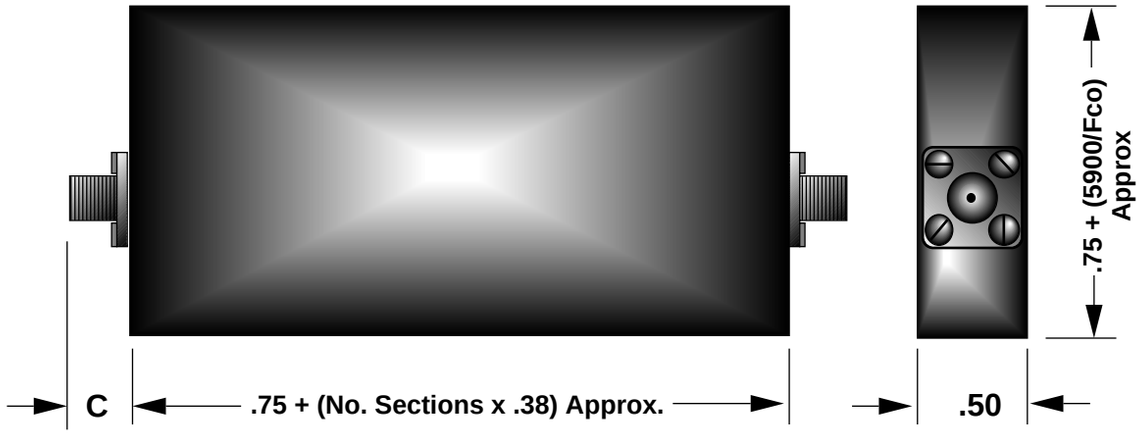
(0.50 x 3) + 0.05 = 1.6 dB

Cutoff Frequency (MHz)	250 to 301	301 to 400	401 to 500	501 to 1000	1001 to 2500
Loss Factor	**0.64**	**0.56**	**0.50**	**0.42**	**0.36**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	10 G
Shock (11 mSec)	15 G	30 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to + 75° C.	-62° to +150° C.

Suspended Substrate Highpass HP35 Series 3500 to 10000 MHz



See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

	STANDARD	*SPECIAL*
Cutoff Frequency (Fco)	4000 to 8000 MHz	3500 to 10000 MHz
Number of Sections Available	4	2 to 6
Nominal Impedance	50 Ohms	75 or 100 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss	See Chart Below	See Chart Below
Stopband Attenuation	See Curve Page 50	See Curve Page 50
Average Power (Watts Max to 10 K Feet)	2	4
Peak Power (Watts Max to 10 K Feet)	10	50

Insertion Loss

The Maximum Insertion Loss at Cutoff Frequency is equal to:

Loss Factor (Number of Sections) + 0.05

Example:
The maximum loss for a 4 Section HP35 Series filter with a cutoff frequency of 4500 MHz is:

(0.24 x 4) + 0.05 = 1.0 dB

Cutoff Frequency (MHz)	2000 to 3000	3001 to 4000	4001 to 5000	5001 to 6000	6001 to 8000
Loss Factor	**0.30**	**0.26**	**0.24**	**0.23**	**0.22**

Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	30 G
Shock (11 mSec)	15 G	75 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	- 54° to +125° C.
Non-Operating Temperature	- 25° to +75° C.	- 62° to +150° C.

The graph below defines the normal specification limits of attenuation for FILTEK highpass filters. The minimum level of attenuation in dB is shown as a function of the relative frequency.

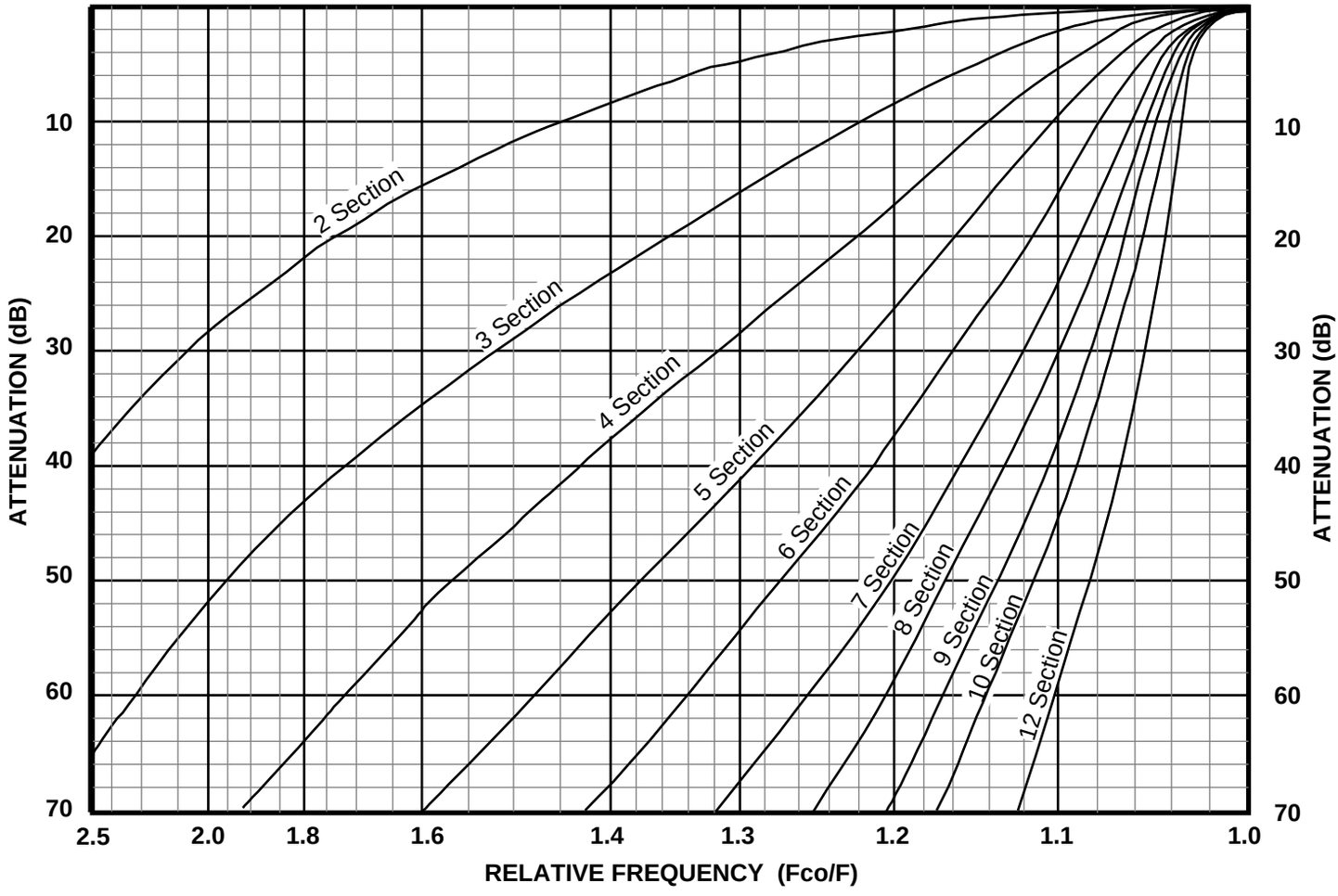
a) Fco is defined as the 1.5/1 VSWR cutoff frequency.

b) Relative frequency is the nominal Fco divided by the frequency to be attenuated.

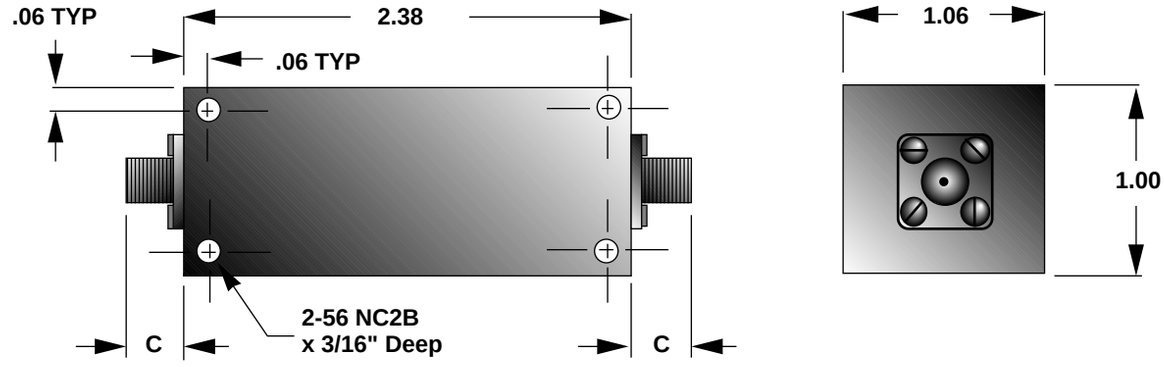
Example: Specify a Highpass filter to pass 30 MHz and attenuate 21 MHz a minimum of 50 dB.

1. 21 MHz is at a relative frequency of 1.43 (30/21 = 1.43)

2. Reading from the curve at a relative frequency of 1.43, we find that a five section filter has a normal specification limit of 54 dB. Therefore a highpass filter with five or more sections would be required to meet the 50 dB attenuation specification.



Lumped Element Bandreject BR11 Series 10 to 130 MHz

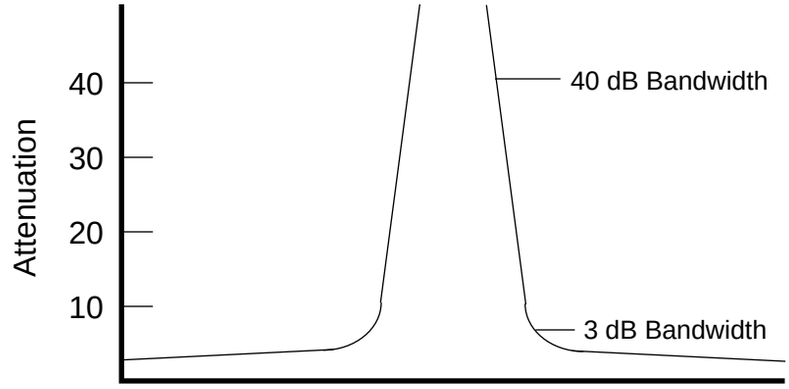


See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

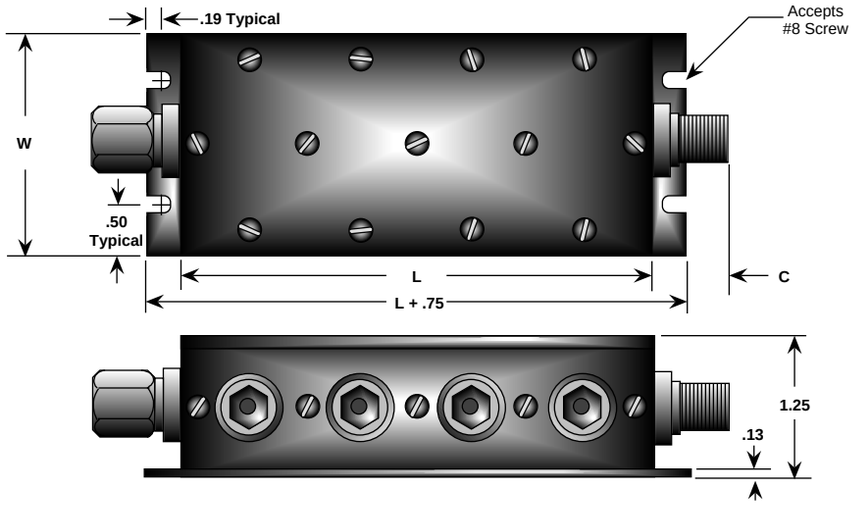
	STANDARD	*SPECIAL*
Center Frequency (Fc)	10 to 100 MHz	10 to 130 MHz
3dB Relative Bandwidth (% of Fc)	5 to 20	3 to 30
Number of Sections Available	4	2 to 6
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss (± 20% Fc)	1 dB	1 dB
40 dB/ 3 dB Form Factor	1:4	Contact Filtek
Notch Attenuation (Ultimate)	50 dB Typ.	Contact Filtek
Input Power (Watts Max to 10K Feet)	1	5



Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	15 G
Shock (11 mSec)	5 G	30 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to +100° C.
Non-Operating Temperature	- 25° to + 75° C.	-62° to +125° C.

Cavity Bandreject BR21 Series 20 to 600 MHz



Sections	L Dimension
2	2.50
3	3.62
4	4.75
5	5.87
6	7.00

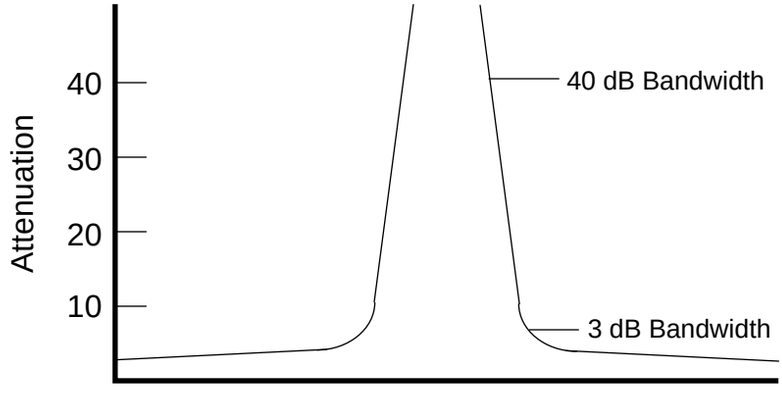
Frequency	W Dimension
30-50 MHz	4.87
50-65 MHz	3.87
65-100 MHz	3.37
100-450 MHz	2.87

See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

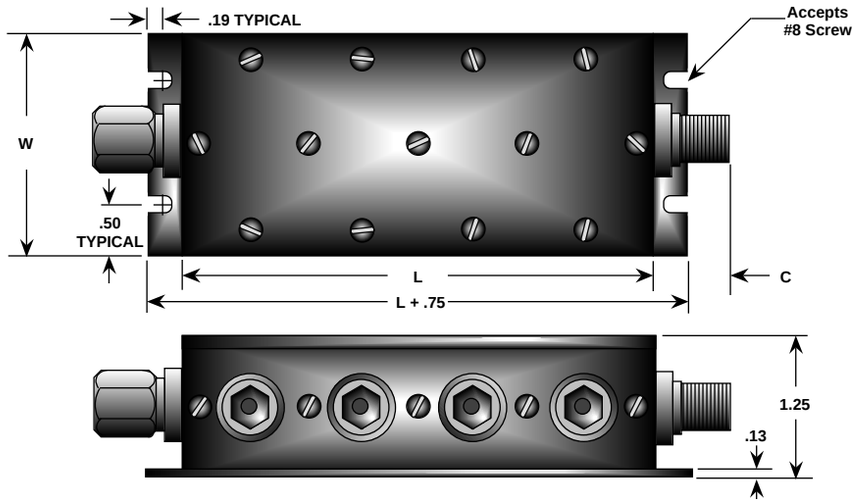
	STANDARD	*SPECIAL*
Center Frequency (Fc)	30 to 450 MHz	20 to 600 MHz
3dB Relative Bandwidth (% of Fc)	1 to 5	0.5 to 10
Number of Sections Available	4	2 to 6
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss (± 20% Fc)	1 dB	1 dB
40 dB/ 3 dB Form Factor	1:4	Contact Filtek
Notch Attenuation (Ultimate)	50 dB Typ.	Contact Filtek
Input Power (Watts Max to 10K Feet)	1	5



Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	15 G
Shock (11 mSec)	5 G	15 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to + 100° C.
Non-Operating Temperature	-25° to + 75° C.	-54° to + 125° C.

Cavity Bandreject BR22 Series 250 to 2750 MHz



Sections	L Dimension
2	2.50
3	3.62
4	4.75
5	5.87
6	7.00

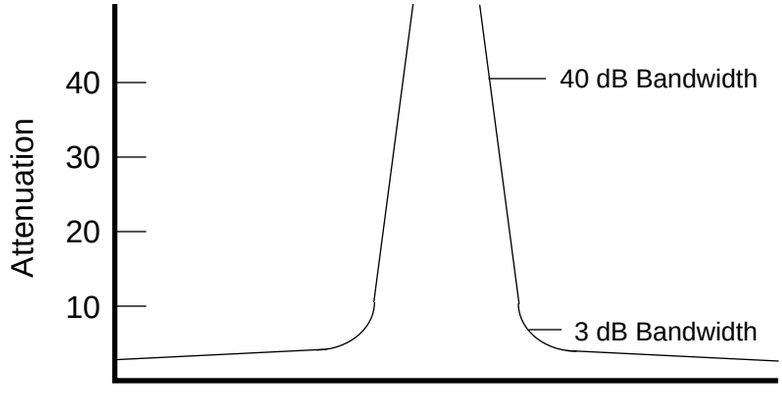
Frequency	W Dimension
400-600 MHz	5.87
600-900 MHz	4.87
900-1500 MHz	3.87

See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

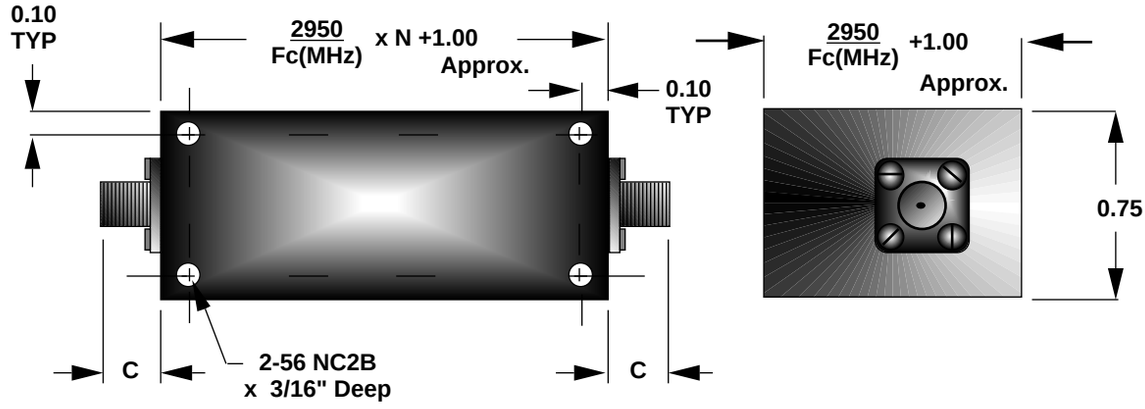
	STANDARD	*SPECIAL*
Center Frequency (Fc)	400 to 2500 MHz	250 to 2750 MHz
3dB Relative Bandwidth (% of Fc)	1 to 5	0.5 to 10
Number of Sections Available	4	2 to 6
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss (± 20% Fc)	1 dB	1 dB
40 dB/ 3 dB Form Factor	1:4	Contact Filtek
Notch Attenuation (Ultimate)	50 dB Typ.	Contact Filtek
Input Power (Watts Max to 10K Feet)	1	5



Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	5 G	15 G
Shock (11 mSec)	5 G	15 G
Humidity	90 % Relative	100 % Relative
Operating Temperature	0° to + 50° C.	-54° to + 100° C.
Non-Operating Temperature	-25° to + 75° C.	-54° to + 125° C.

Cavity Bandreject BR30 Series 2000 to 12000 MHz

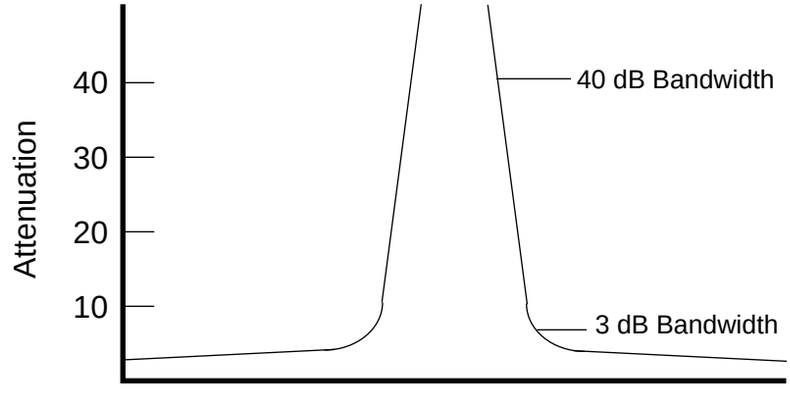


See Page 12 for 'C' dimensions and other connector configurations. The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application.

Specifications

Electrical

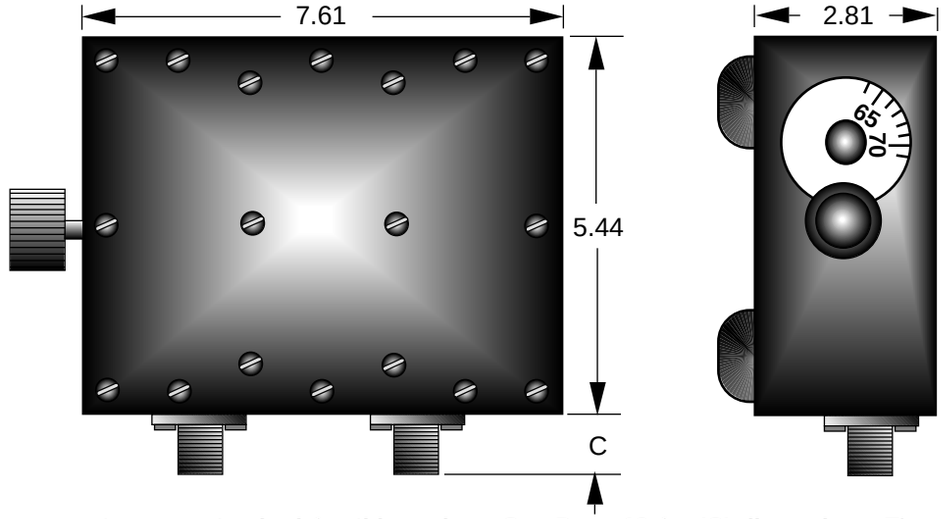
	STANDARD	*SPECIAL*
Center Frequency (Fc)	2500 to 8000 MHz	2000 to 12000 MHz
3dB Relative Bandwidth (% of Fc)	1 to 5	0.5 to 10
Number of Sections Available	4	2 to 6
Nominal Impedance	50 Ohms	50 Ohms
Maximum VSWR	1.5:1	1.2:1
Maximum Insertion Loss (± 20% Fc)	1 dB	1 dB
40 dB/ 3 dB Form Factor	1:4	Contact Filtek
Notch Attenuation (Ultimate)	50 dB Typ.	Contact Filtek
Input Power (Watts Max to 10K Feet)	5	20



Environmental

	STANDARD	*SPECIAL*
Vibration (10 to 2000 Hz)	10 G	20 G
Shock (11 mSec)	25 G	50 G
Humidity	90% Relative	100 % Relative
Operating Temperature	0° to +50° C.	-54° to +125° C.
Non-Operating Temperature	-25° to + 75° C.	-62° to +150° C.

Tunable Bandreject BR40 Series 31 to 1000 MHz



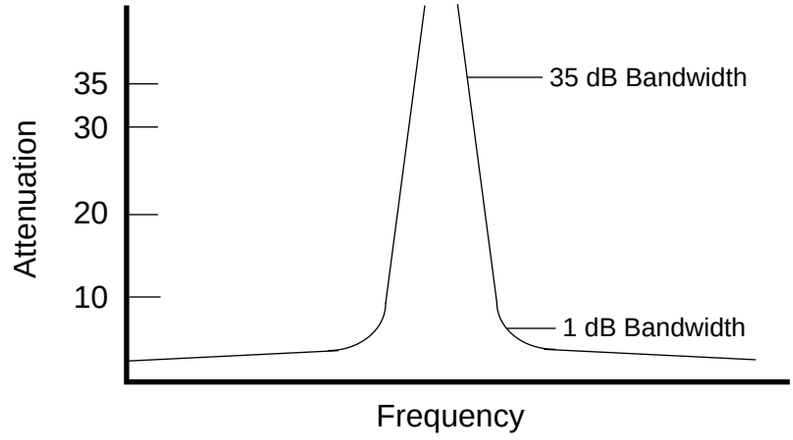
Type 'N' Female connectors are standard for this series. **See Page 12 for 'C' dimension.** The size shown is a standard used by FILTEK to facilitate a low cost, easily reproducible unit. Should you require another size, please submit all of your requirements - both electrical and mechanical. This will enable FILTEK to quote the optimum design for your application. Tunable Bandreject filters are supplied with a direct reading dial calibrated in frequency to ± 0.5%.

Specifications

Electrical

	STANDARD
Passband and Tuning Range	See Chart
1dB Bandwidth Nominal	See Chart
35 dB Bandwidth	40 kHz Minimum
Number of Sections Available	3
Nominal Impedance	50 Ohms
Maximum VSWR (Passband)	1.5:1
Maximum Insertion Loss (Passband)	1 dB
Maximum Input Power (Watts)	5

Passband and Tuning Range	1 dB Bandwidth Nominal
31 to 62 MHz	**2.5 MHz**
62 to 125 MHz	**3.5 MHz**
125 to 250 MHz	**5.0 MHz**
250 to 500 MHz	**10 MHz**
500 to 1000 MHz	**20 MHz**



Environmental

	STANDARD	***SPECIAL***
Vibration (10 to 2000 Hz)	2 G	5 G
Shock (11 mSec)	5 G	10 G
Humidity	Lab Environment	Lab Environment
Operating Temperature	Lab Environment	0° to + 50° C.
Non-Operating Temperature	0° to + 50° C.	- 10° to + 70° C.

Notes

FILTEK

1955 Plaza Real
Oceanside California 92056
Phone (760) 630-4868 • Fax (760) 630-1445
e-mail: sales@filtekfilters.com
Internet: www.filtekfilters.com

SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销 、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一,是一家专业代理和分銷世界各大品牌 IC 芯片和電子元器件的连锁经营綜合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商,已在全国范围内建成强大统一的供货和代理分销网络。 我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件： 晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子元器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适 配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

更多产品请看本公司产品专用销售网站:

商斯达中国传感器科技信息网：http://www.sensor-ic.com/

商斯达工控安防网：http://www.pc-ps.net/

商斯达电子元器件网：http://www.sunstare.com/

商斯达微波光电产品网:HTTP://www.rfoe.net/

商斯达消费电子产品网://www.icasic.com/

商斯达实业科技产品网://www.sunstars.cn/ 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 （0）13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:szss20@163.com QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持: 0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘 ；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL：010-81159046 82615020 13501189838 FAX：010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL：021-28311762 56703037 13701955389 FAX：021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL：029-81022619 13072977981 FAX:029-88789382