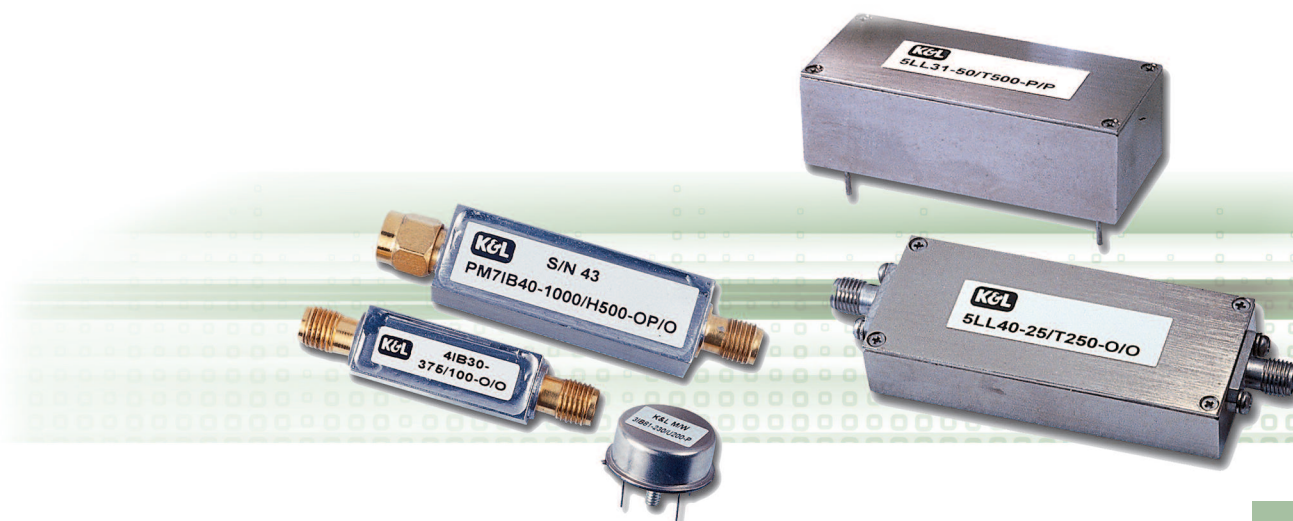


Lumped Components

K&L Microwave offers Lumped Component filters with a broad selection of frequencies, topologies, and mechanical configurations. Use of standard packages has enabled K&L to provide custom units while keeping design time to a minimum. Packages available include the LB series, which cover the 0.5 to 200 MHz frequency range, as well as the IB series, which cover the 30 to 10,000 MHz frequency range. The topologies are offered in highpass, lowpass, bandpass, bandreject and multiplexer designs.

Special design capabilities include, but are not limited to, elliptical, pseudo-elliptical, amplitude equalization, group delay equalization, bessel, gaussian, and highpower requirements.

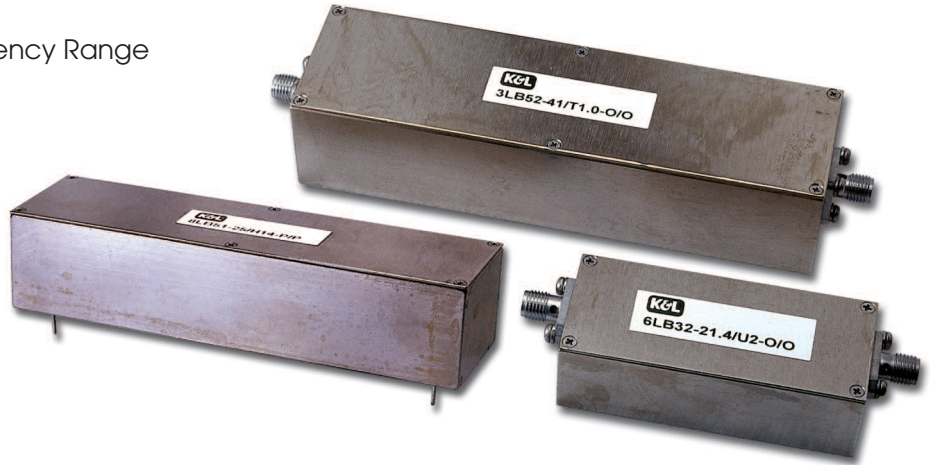
Each model can be packaged to withstand severe environmental stresses including temperature, humidity, shock, vibration, and acceleration.



LB Series

◆ Features:

- Covers the 0.5 MHz to 200 MHz Frequency Range
- 3 dB BW Available from 1-200%
- Designs Available in 3-10 Sections
- Low Insertion Loss
- 0.05 dB Chebyshev Response
- Small, Ruggedized Package
- Custom Designs Available



◆ Specifications:

Model	Frequency (MHz)	3 dB % BW	VSWR	Average Power (Watts)	Impedance (Ohms)*	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
LB30	5-150	3-50 / 50-200	1.5:1 / 1.7:1	15	50	3-10	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz- 2000 Hz	-55 to +85 °C	0-95%
LB40	15-200	3-50 / 50-200	1.5:1 / 1.7:1	10	50	3-10				
LB50	0.5-200	3-50 / 50-200	1.5:1 / 1.7:1	20	50	3-10				

* 75 ohms also available.

◆ Attenuation:

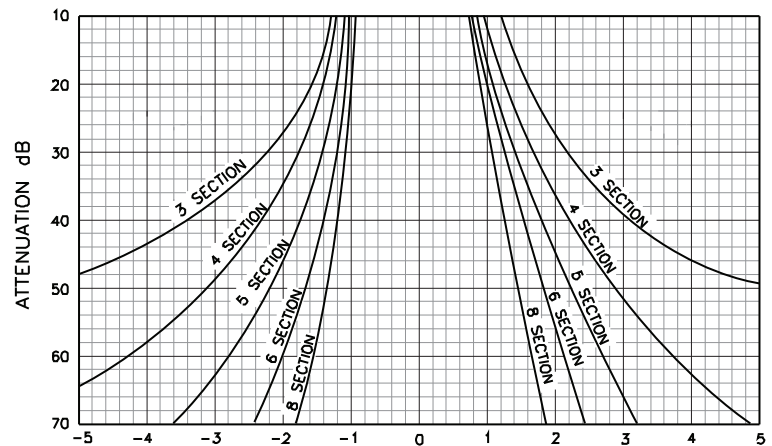
The adjacent curve shows the attenuation as multiples of the bandwidth for filters with 2-8 sections. The following formula is used:
3 dB bandwidths from center frequency =

$$\frac{\text{Reject Frequency} - \text{Center Frequency}}{3 \text{ dB Bandwidth}}$$

Example:

Center Frequency = 21.4 MHz
3 dB Bandwidth = 2
Number of Sections = 6

Find the attenuation at 17.4 and 25.4 MHz by substituting in the formula 3 dB bandwidth from center frequency = $\frac{17.4-21.4}{2} = -2 \text{ BW's}$ and



3 dB bandwidth from center frequency = $\frac{25.4-21.4}{2} = +2 \text{ BW's}$

From the curve, we find the attenuation in dB for a 6-section response -2 bandwidths from center frequency to yield 60 dB, and +2 bandwidths from center frequency to yield 58 dB.

◆ **To Order:**

6 L B 30 — 21.4 / U 2 — O / O
1 2 3 4 5 6 7 8 9

<u>Code</u>	<u>Description</u>	<u>Code</u>	<u>Description</u>
1	Number of Sections	5	Center frequency (MHz)
2	Series (L-lumped)	6	Supplemental Codes (See Page 13)
3	B-Bandpass	7	Bandwidth (MHz)
4	Package Designator - Style 3	8	Input Connector
		9	Output Connector

◆ **Insertion Loss**

The following formula is used to determine the maximum insertion loss at center frequency. For specification purposes, the result is always rounded up to the next tenth of a dB.

$$\text{Insertion Loss} = \left(\frac{(\text{Loss Constant}) (\text{No. of Sections} + 0.5)}{\% \text{ 3 dB BW}} \right) + 0.4$$

Example:

Bandpass Model = 6LB30-30/T3-O/O

$$\text{Insertion Loss} = \left(\frac{(5.5)(6.5)}{10} \right) + 0.4 = 4.0 \text{ dB}$$

Model	Loss Constant
LB30	5.5
LB40	6
LB50	4.75

◆ **Connectors:**

Connector Style	Connector Code	LH30	LH40	LH50
N Female	N	.75" / 19.05mm	*NR	.75" / 19.05mm
N Male	NP	*NR	*NR	.79" / 20.06mm
BNC Female	B	.72" / 18.29mm	*NR	.72" / 18.29mm
BNC Male	BP	.88" / 22.35mm	*NR	.88" / 22.35mm
TNC Female	T	.75" / 19.05mm	*NR	.75" / 19.05mm
TNC Male	TP	.85" / 21.59mm	*NR	.85" / 21.59mm
SMA Female	O	.38" / 9.65mm	.38" / 9.65mm	.38" / 9.65mm
SMA Male	OP	.50" / 12.7mm	.50" / 12.7mm	.50" / 12.7mm
Cable	C	6" RG 188	6" RG 188	6" RG 188
PC Mounting	P	See pg. 24	See pg. 24	See pg. 24
Sealelectro Female	S	.38" / 9.65mm	.38" / 9.65mm	.38" / 9.65mm
Special	X	Contact Factory	Contact Factory	Contact Factory

*NR = Not Recommended



LH Series

◆ Features:

- Covers the 0.1 MHz to 250 MHz Frequency Range
- Designed for Both Narrowband Low Frequency and Broadband High Frequency Applications
- Low Insertion Loss
- 0.05 dB Chebyshev Response
- Small, Ruggedized Package
- Custom Designs Available



◆ Specifications:

Model	Frequency (MHz)	VSWR	Average Power (Watts)	Impedance (Ohms)*	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
LH30	2-150	1.5:1	15	50	2-10	20 G's,	10 G's,	-55 to +85 °C	0-95%
LH40	10-250	1.5:1	10	50	2-10	1/2 Sine,	10 Hz-		
LH50	0.1-10	1.5:1	20	50	2-10	11 Ms	2000 Hz		

* 75 ohms also available.

◆ Attenuation:

The adjacent curve shows the attenuation as multiples of the 3 dB cutoff frequency. The following formula is used:

$$\frac{3 \text{ dB Cut-off Frequency}}{\text{Reject Frequency}}$$

Example:

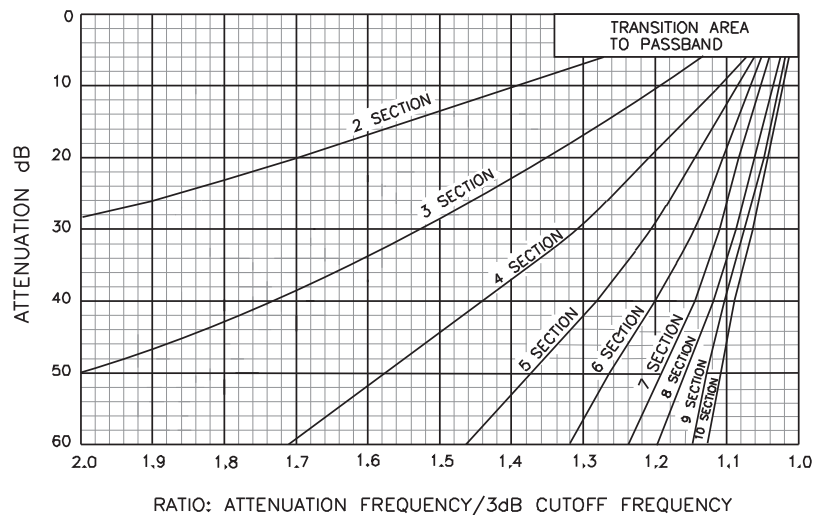
Model = 5LH30-50/T150-0/0

Reject Frequency = 35 MHz

3 dB Cut-off = 50 MHz

Number of Sections = 5

By substituting in the formula the multiples of the 3 dB Cut-off = $\frac{50}{35} = 1.4$



From the curve, a 5-section filter response 1.4 multiples away yields 54 dB.

◆ **To Order:**

5 L H 30 — 50 / T 150 — O / O
1 2 3 4 5 6 7 8 9

<u>Code</u>	<u>Description</u>	<u>Code</u>	<u>Description</u>
1	Number of Sections	5	3 dB cut-off frequency (MHz)
2	Series (L-lumped)	6	Supplemental Codes (See Page 13)
3	H-Highpass	7	Upper Passband Frequency (MHz)
4	Package Designator - Style 3	8	Input Connector
		9	Output Connector

◆ **Insertion Loss**

The following formula is used to determine the maximum insertion loss at 90% of the 3 dB cut-off frequency. For specification purposes, the result is always rounded up to the next tenth of a dB.

$$\text{Insertion Loss} = (\text{Loss Constant}) (\text{No. of Sections} + 0.5) + 0.25$$

Example:

Highpass Model = 5LH30-50/T150-O/O
 Insertion Loss = (0.12)(5.5) + 0.25 = 1.0 dB

Model	Loss Constant
LH30	0.12
LH40	0.14
LH50	0.09

◆ **Connectors:**

Connector Style	Connector Code	LH30	LH40	LH50
N Female	N	.75" / 19.05mm	*NR	.75" / 19.05mm
N Male	NP	*NR	*NR	.79" / 20.06mm
BNC Female	B	.72" / 18.29mm	*NR	.72" / 18.29mm
BNC Male	BP	.88" / 22.35mm	*NR	.88" / 22.35mm
TNC Female	T	.75" / 19.05mm	*NR	.75" / 19.05mm
TNC Male	TP	.85" / 21.59mm	*NR	.85" / 21.59mm
SMA Female	O	.38" / 9.65mm	.38" / 9.65mm	.38" / 9.65mm
SMA Male	OP	.50" / 12.7mm	.50" / 12.7mm	.50" / 12.7mm
Cable	C	6" RG 188	6" RG 188	6" RG 188
PC Mounting	P	See pg. 24	See pg. 24	See pg. 24
Sealelectro Female	S	.38" / 9.65mm	.38" / 9.65mm	.38" / 9.65mm
Special	X	Contact Factory	Contact Factory	Contact Factory

*NR = Not Recommended



LL Series

◆ **Features:**

- Covers the 0.1 MHz to 2500 MHz Frequency Range
- Designs Available in 2-10 Sections
- Low Insertion Loss
- 0.05 dB Chebyshev Response
- Small, Ruggedized Package
- Custom Designs Available



◆ **Specifications:**

Model	Frequency (MHz)	VSWR	Average Power (Watts)	Impedance (Ohms)*	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
LL30	2.5-150	1.5:1	15	50	2-10	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz- 2000 Hz	-55 to +85 °C	0-95%
LL40	10-200	1.5:1	10	50	2-10				
LL50	0.1-10	1.5:1	20	50	2-10				

* 75 ohms also available.

◆ **Attenuation:**

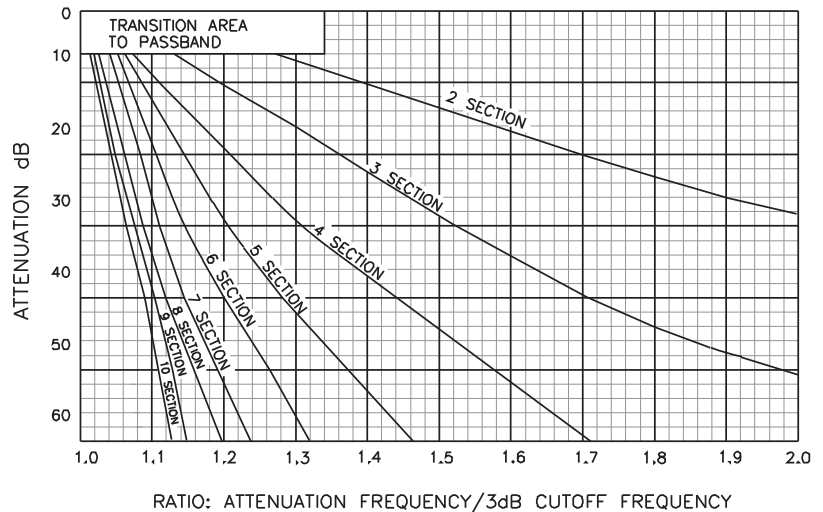
The adjacent curve shows the attenuation as multiples of the 3 dB cutoff frequency. The following formula is used:

$$\frac{\text{Reject Frequency}}{3 \text{ dB Cut-off Frequency}}$$

Example:

Model = 5LL31-50/T500-0/0
 Reject Frequency = 70 MHz
 3 dB Cut-off = 50 MHz
 Number of Sections = 5
 By Substituting in the formula the multiples of the 3 dB Cut-off = $\frac{70}{50} = 1.4$
 50

From the curve, a 5 section filter response 1.4 multiples away yields 54 dB.



◆ **To Order:**

5 L L **30** — **50** / T **500** — O / O
 1 2 3 4 5 6 7 8 9

Code	Description	Code	Description
1	Number of Sections	5	3 dB cut-off frequency (MHz)
2	Series (L-lumped)	6	Supplemental Codes (See Page 13)
3	L-Lowpass	7	Upper Passband Frequency (MHz)
4	Package Designator - Style 3	8	Input Connector
		9	Output Connector

◆ **Insertion Loss**

The following formula is used to determine the maximum insertion loss at 90% of the 3 dB cut-off frequency. For specification purposes, the result is always rounded up to the next tenth of a dB.

$$\text{Insertion Loss} = (\text{Loss Constant}) (\text{No. of Sections} + 0.5) + 0.25$$

Example:

Lowpass Model = 5LL30-50/T500-O/O
 Insertion Loss = (0.12)(5.5) + 0.25 = 1.0 dB

Model	Loss Constant
LL30	0.12
LL40	0.14
LL50	0.09

◆ **Connectors:**

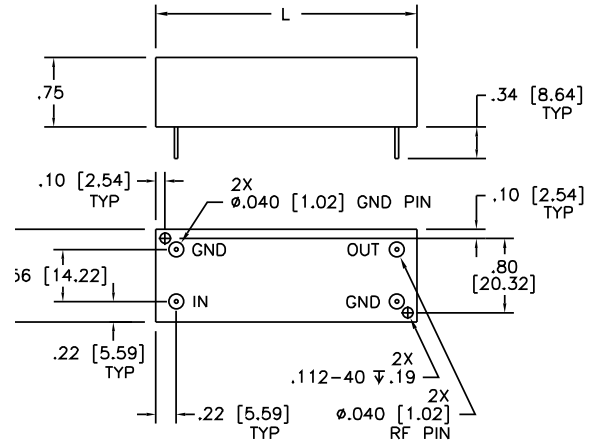
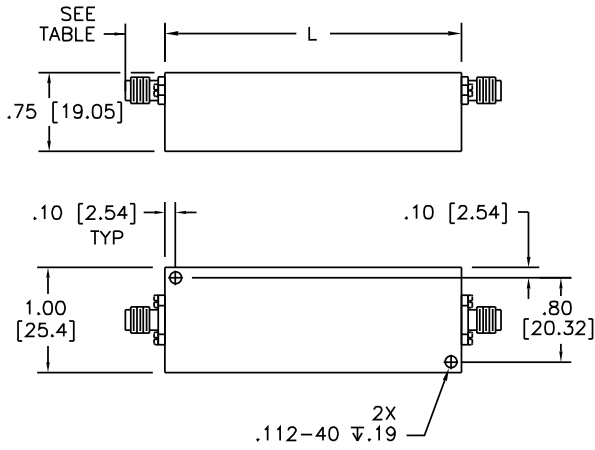
Connector Style	Connector Code	LH30	LH40	LH50
N Female	N	.75"/19.05mm	*NR	.75"/19.05mm
N Male	NP	*NR	*NR	.79"/20.06mm
BNC Female	B	.72"/18.29mm	*NR	.72"/18.29mm
BNC Male	BP	.88"/22.35mm	*NR	.88"/22.35mm
TNC Female	T	.75"/19.05mm	*NR	.75"/19.05mm
TNC Male	TP	.85"/21.59mm	*NR	.85"/21.59mm
SMA Female	O	.38"/9.65mm	.38"/9.65mm	.38"/9.65mm
SMA Male	OP	.50"/12.7mm	.50"/12.7mm	.50"/12.7mm
Cable	C	6" RG 188	6" RG 188	6" RG 188
PC Mounting	P	See pg. 24	See pg. 24	See pg. 24
Sealelectro Female	S	.38"/9.65mm	.38"/9.65mm	.38"/9.65mm
Special	X	Contact Factory	Contact Factory	Contact Factory

*NR = Not Recommended

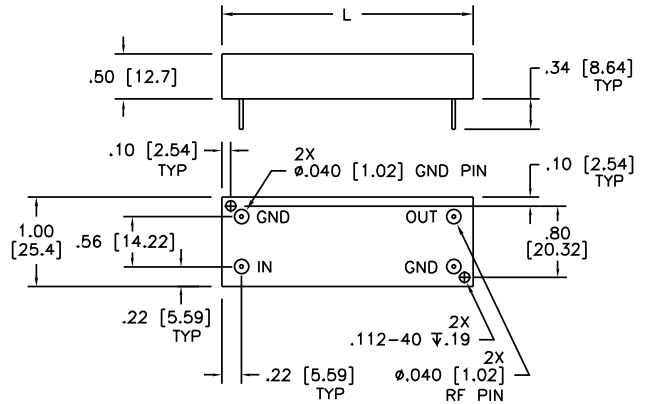
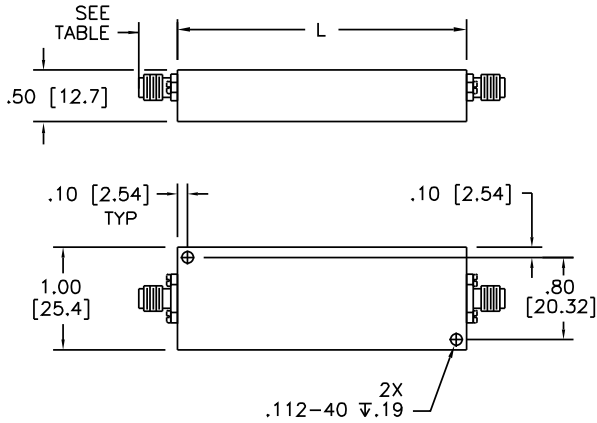


LB, LH, LL Series Outlines

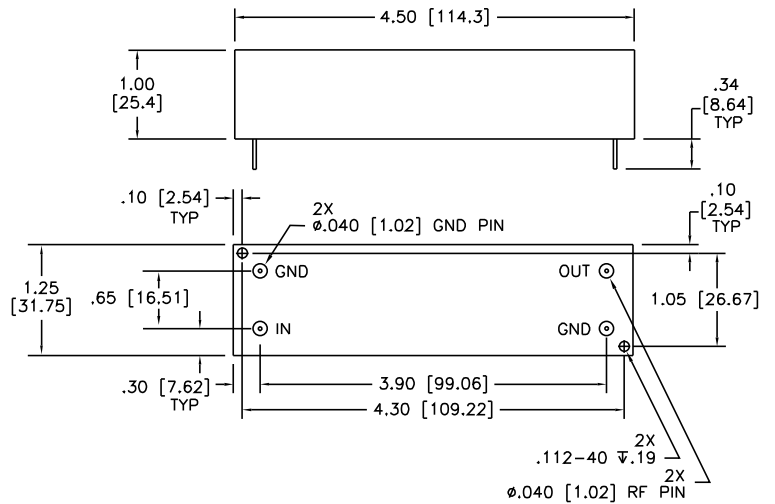
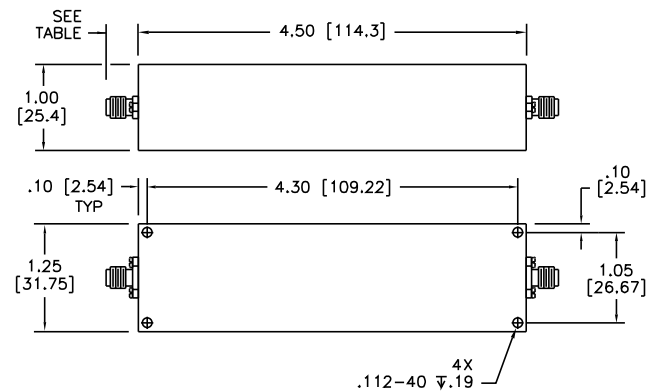
◆ Package Style 3:



◆ Package Style 4:



◆ Package Style 5:



Sect.	L-inches	mm
2-6	2.38	60.45
7-10	3.58	90.93

Microminiature Bandpass — IB Series

◆ Features:

- Small, Compact Package
- Covers the 30 MHz to 6 GHz Frequency Range
- Standard 3 dB BW Available from 3-15%
- 3 dB BW also Available up to 70% (Contact Factory)
- Designs Available in 3-10 Sections
- 0.05 dB Chebyshev Design
- Ruggedized Package
- Custom Designs Available



◆ Specifications:

Frequency (MHz)	3 dB % BW	VSWR	Average Power (Watts)	Impedance (Ohms)	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
30-6000*	3-70	1.5:1	1	50	2-10	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz- 2000 Hz	-55 to +85 °C	0-95%

* Certain combinations of frequency and bandwidth are not practical. Contact Factory with your requirements. All packages can be provided to full MIL-SPEC environmental requirements.

◆ Insertion Loss:

The insertion loss at the center frequency of the filter is determined by the equation:

$$\text{Loss} = \left(\frac{(\text{Loss Constant}) (\text{No. of Sections} + 0.5)}{\% \text{ 3 dB BW}} \right) + 0.3$$

Where the loss constant is frequency dependent and may be found from the table to the side.

Example:

At 500 MHz, 5 sections, 60 MHz BW

$$\text{Loss} = \left(\frac{(4.4)(5.5)}{12} \right) + 0.3 = 2.3 \text{ dB}$$

◆ Loss Constant:

Center Frequency (MHz)	Constant
30-159	8.8
160-199	7.8
200-299	6.8
300-399	5.7
400-499	4.9
500-599	4.4
600-699	4.0
700-799	3.7
800-899	3.5
900-999	3.25
1000-6000	3.0

Microminiature Bandpass — IB Series

◆ Attenuation:

These curves show the attenuation normalized to the 3 dB bandwidth for filters with 2-8 sections. The following formula is used: 3 dB bandwidths from center frequency =

$$\frac{\text{Reject Frequency} - \text{Center Frequency}}{3 \text{ dB BW}}$$

Example:

Center Frequency = 500 MHz
 3 dB Bandwidth = 60 MHz
 Number of Sections = 5

Find the attenuation at 400 and 600 MHz by substituting in the formula 3 dB bandwidths from center frequency = $\frac{400-500}{60} = -1.67 \text{ BW's}$

and 3 dB bandwidths from center frequency = $\frac{600-500}{60} = +1.67 \text{ BW's}$

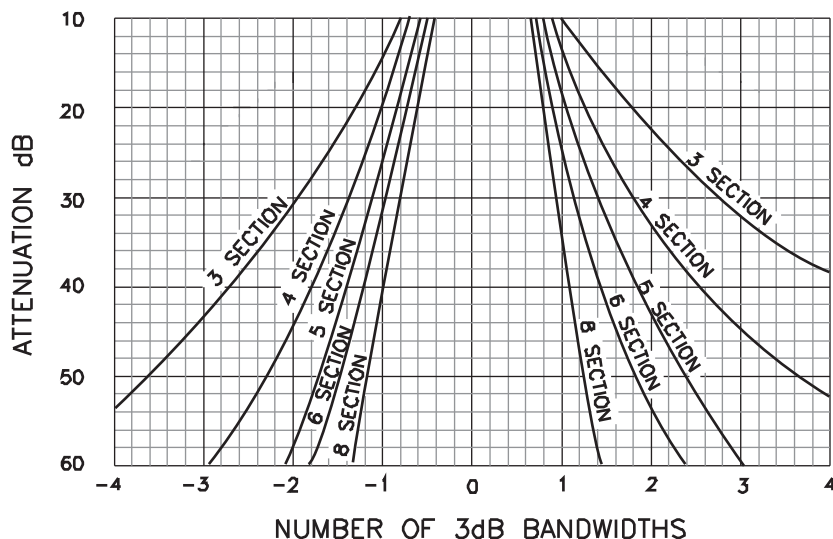
From the 7 to 15 % curve we find the attenuation in dB for a 5-section response -1.67 BW's from center frequency yields 60 dB, and +1.67 BW's from center frequency yields 34 dB.

◆ To Order:

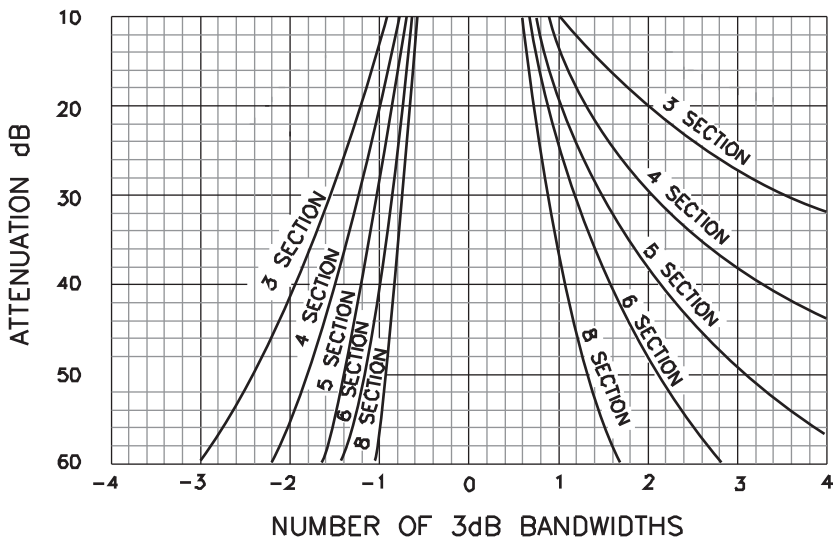
5 1 B 30 — 500 / T 60- P / P
1 2 3 4 5 6 7 8 9

Code	Description
1	Number of Sections
2	Series (I - Microminiature)
3	B - Bandpass
4	Package Designator - Style 3
5	Center Frequency (MHz)
6	Supplemental Codes (See Page 13)
7	Bandwidth (MHz)
8	Input Connector
9	Output Connector

◆ For Bandwidths 3 to 7%



◆ For Bandwidths 7 to 15%

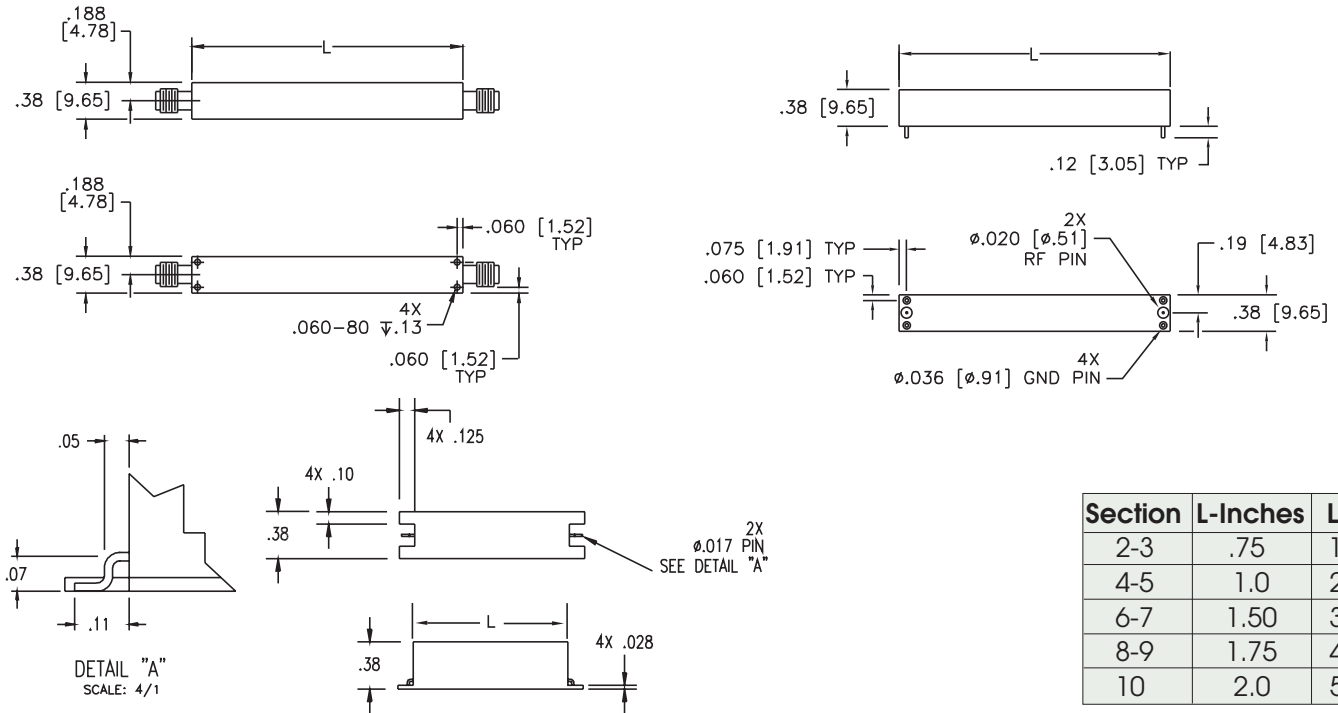


◆ Connectors:

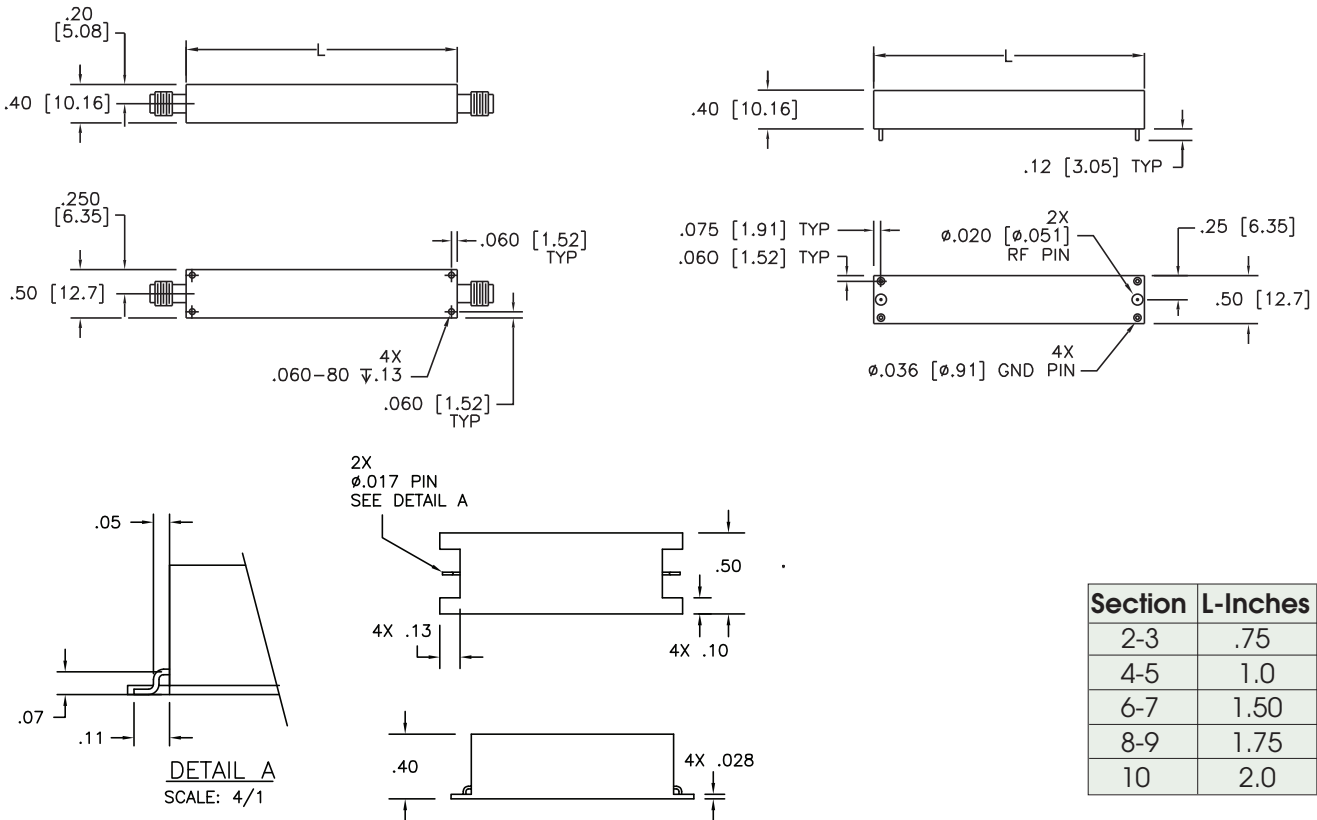
Connector	Code
SMA Female	O
SMA Male	OP
PC Pins	P

Microminiature Bandpass — IB Series

◆ Package Style 3:



◆ Package Style 4:



Ultra-Miniature — UB Series

◆ Features:

- Extremely small size
- Bandpass, Lowpass Options
- Highpass and Band Stop Options to be added
- Surface mount configuration

◆ Specifications:

- Frequency Range 300 to 2500 MHz
- 5 to 15% Bandwidth for $f_0 < 1000$ MHz
- 10 to 20% Bandwidth for $f_0 \geq 1000$ MHz
- 2 to 5 Resonant Sections
- Power Handling 1 Watt CW
- Typical Size 0.45" L x 0.25" W x 0.14" H Surface Mount for 2 and 3 Sections
- Typical Size 0.65" L x 0.25" W x 0.14" H Surface Mount for 4 and 5 Section

◆ To Order:

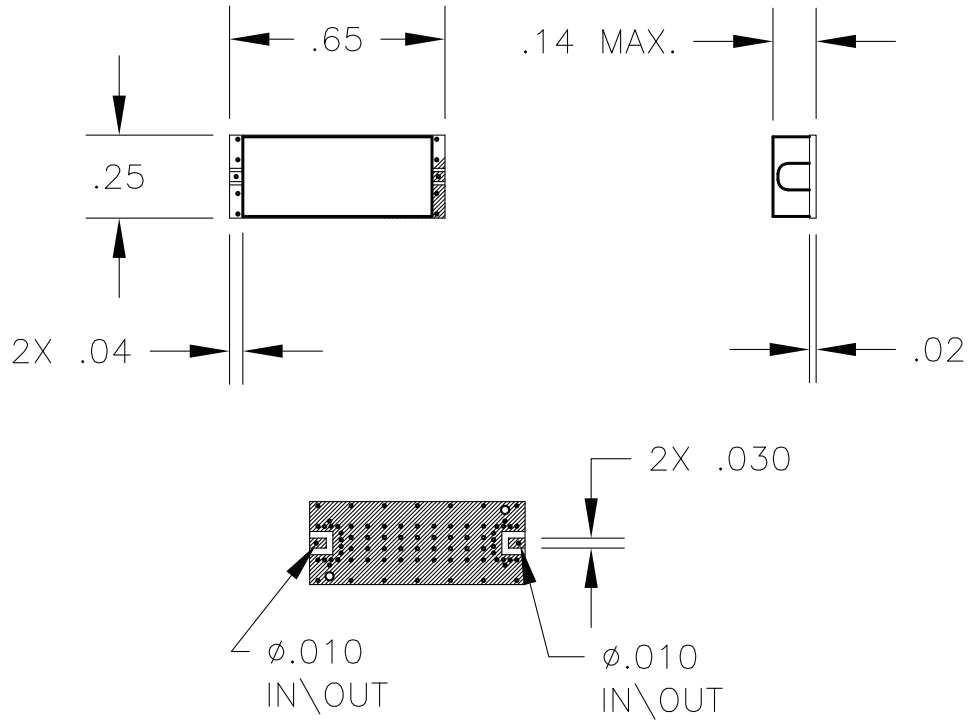
5 UB 20-310 / T 30 - SM/SM

1 2 3 4 5 6 7

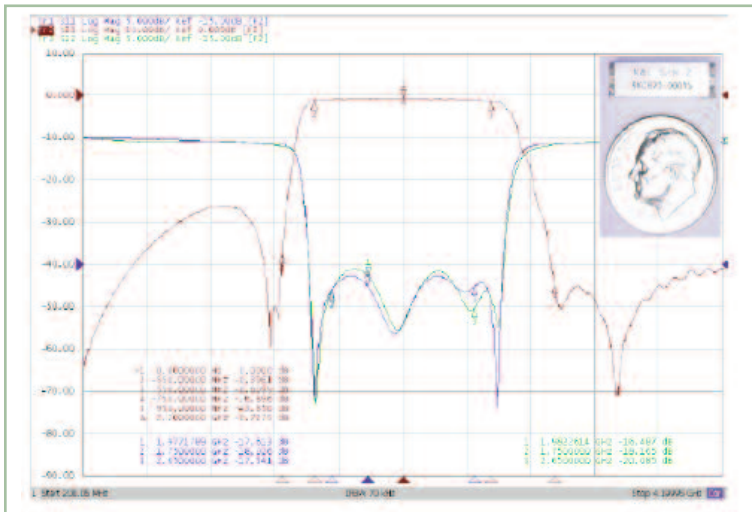
<u>Code</u>	<u>Description</u>
1	Number of Resonant Sections
2	Ultra-Miniature Bandpass Filter (UL for Lowpass, UH for Highpass, UN for Band Stop)
3	Package Designator
4	Center Frequency (MHz)
5	Supplemental Codes (See Page 13)
6	Bandwidth (MHz)
7	Input/Output Connector, Currently only Surface Mount Available



◆ Outline Drawings:



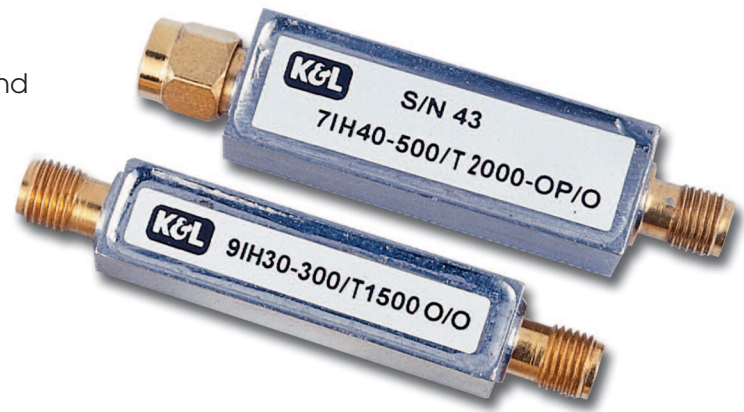
◆ Sample Performance Data:



Microminiature Highpass — IH Series

◆ Features:

- Covers the 30 MHz to 2 GHz Frequency Range
- Designed for Both Narrowband Low Frequency and Broadband High Frequency Applications
- 0.05 dB Chebyshev Design
- Ruggedized Package
- Custom Designs Available



◆ Specifications:

Cutoff Frequency (MHz)	VSWR	Average Power (Watts)	Impedance (Ohms)	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
30-2000	1.5:1 *Typ.	1	50	2-10	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz-2000 Hz	-55 to +85 °C	0-95%

* To Upper Passband Frequency

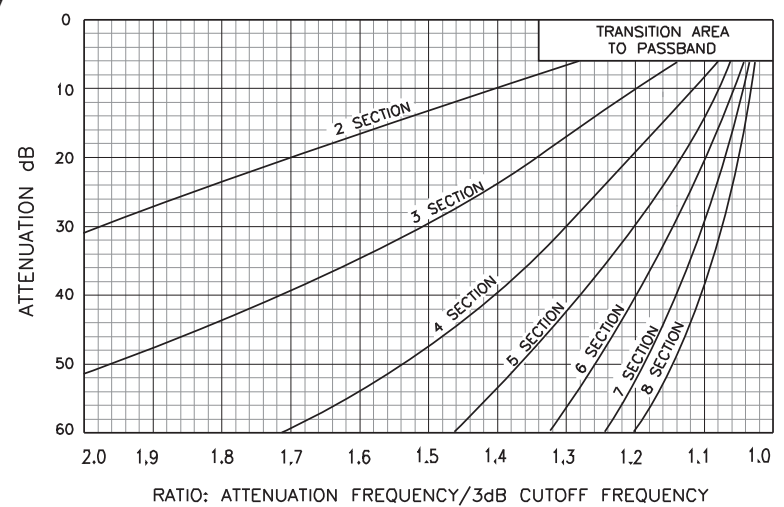
◆ Attenuation:

This curve defines the out-of-band attenuation, in dB, for K&L standard highpass filters. The ratio is determined by dividing the out-of-band frequency by the 3 dB frequency. Once the ratio is determined, the attenuation versus the number of sections can be read directly from the curve.

Example:

Reject Frequency = 925 MHz
 3 dB cut-off frequency = 1250 MHz
 Number of Sections = 5
 The ratio equals = $\frac{3 \text{ dB cut-off frequency}}{\text{Reject Frequency}} = \frac{1250}{925}$
 Ratio = 1.35

From the curve, a 5 section filter response equals 47 dB.



◆ **Insertion Loss:**

The insertion loss specification at 110% of the 3 dB cut-off frequency is determined by the formula:

$$\text{Loss} = (\text{Loss Constant}) \times (\text{Number of Sections})$$

For specification purposes, the result is always rounded up to the next tenth of a dB.

Example:

Highpass Model = 5IH30-1250/T3750-O/O
 Insertion Loss = (0.10)(5) = 0.5 dB

◆ **Loss Constant:**

Center Frequency (MHz)	Constant
10-499	0.25
500-999	0.15
1000-2000	0.10

◆ **To Order:**

5 | H 30 — 1250 / T 3750- O / O
1 2 3 4 5 6 7 8 9

Code	Description
1	Number of Sections
2	Series (I - Microminiature)
3	H-Highpass
4	Package Designator - Style 3
5	Cut-off Frequency (MHz)
6	Supplemental Codes (See Page 13)
7	Upper Passband Frequency (MHz)
8	Input Connector
9	Output Connector

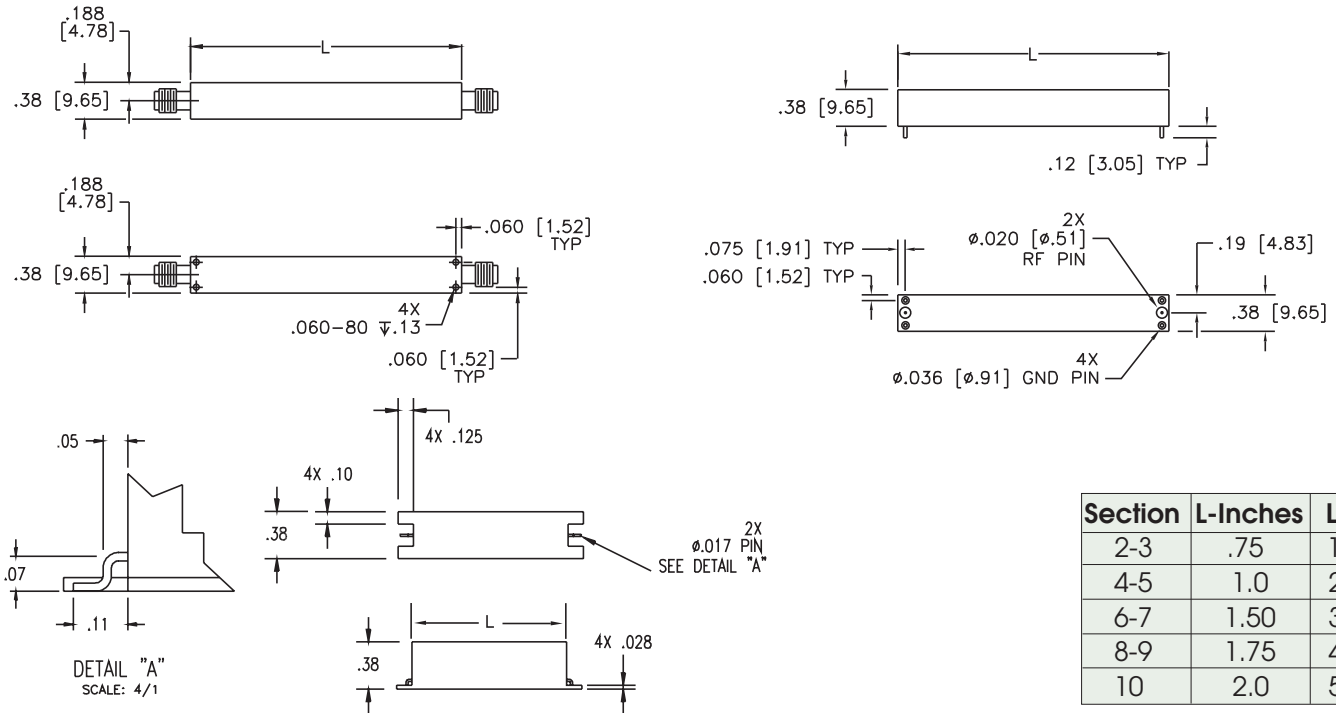
◆ **Connectors:**

Connector	Code
SMA Female	O
SMA Male	OP
PC Pins	P



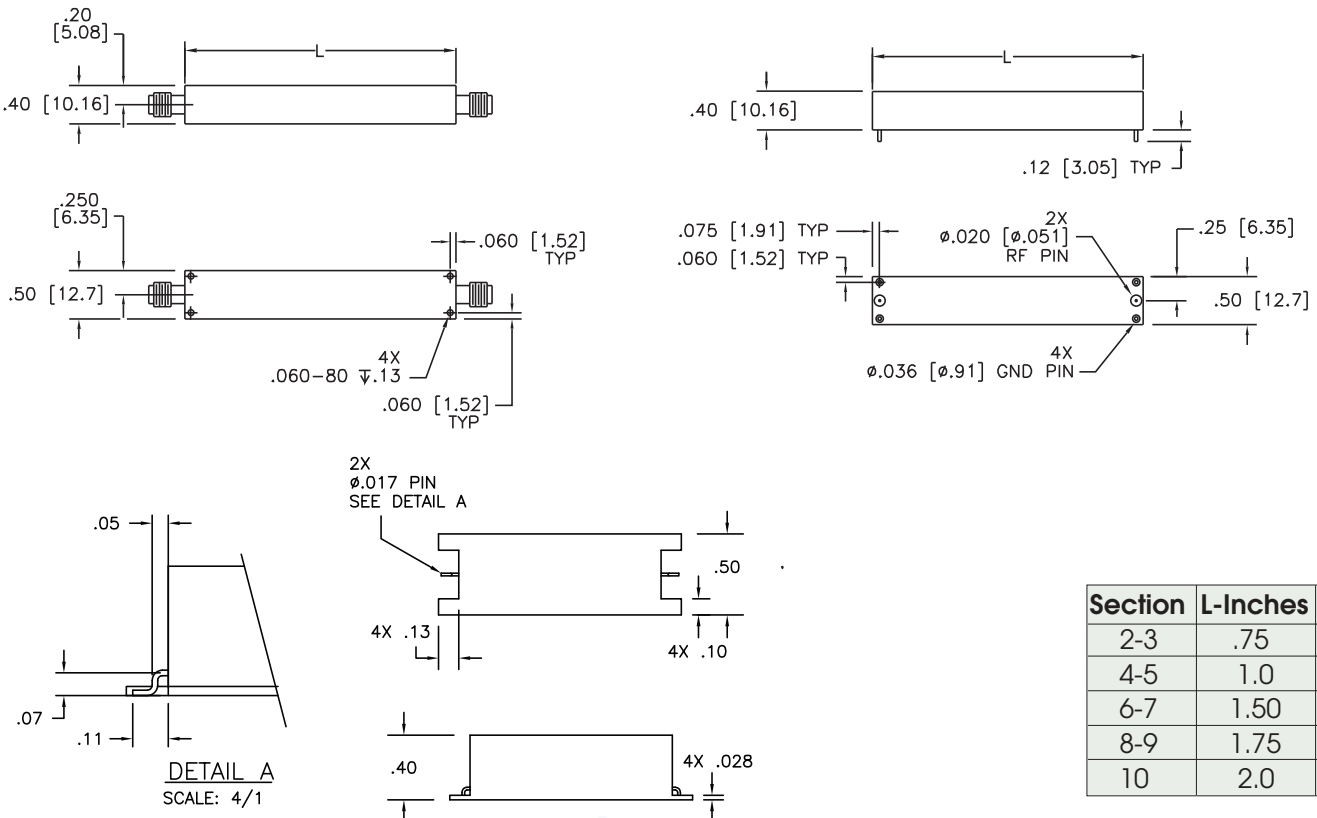
Microminiature Highpass — IH Series

◆ Package Style 3:



Section	L-Inches	L-mm
2-3	.75	19.05
4-5	1.0	25.40
6-7	1.50	38.10
8-9	1.75	44.45
10	2.0	50.80

◆ Package Style 4:



Section	L-Inches	L-mm
2-3	.75	19.05
4-5	1.0	25.40
6-7	1.50	38.10
8-9	1.75	44.45
10	2.0	50.80

Microminiature Lowpass — IL Series

◆ Features:

- Small, Compact Package
- Covers the 10 MHz to 6 GHz Frequency Range
- Designs Available in 2-10 sections
- 0.05 dB Chebyshev Design Response
- Ruggedized Package Design
- Custom Package Designs Available



◆ Specifications:

Frequency (MHz)	VSWR	Average Power (Watts)	Impedance (Ohms)	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
10-6000	1.5:1	1	50	2-10	20 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz-2000 Hz	-55 to +85 °C	0-95%

◆ Attenuation:

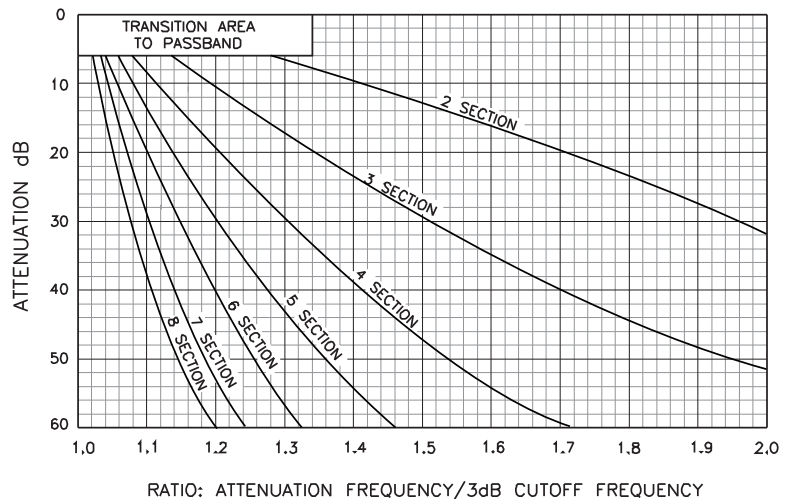
This curve defines the out-of-band attenuation, in dB, for K&L standard lowpass filters. The ratio is determined by dividing the out-of-band frequency by the 3 dB frequency. Once the ratio is determined, the attenuation versus the number of sections can be read directly from the curve.

Example:

Reject Frequency = 3000 MHz
 3 dB cut-off frequency = 2250 MHz
 Number of Sections = 5
 The ratio equals = $\frac{\text{Reject Frequency}}{\text{3 dB cut-off frequency}} = \frac{3000}{2250}$

Ratio = 1.33

From the curve, a 5 section filter response equals 47 dB.



Microminiature Lowpass — IL Series

◆ **Insertion Loss:**

The insertion loss specification at 90% of the 3 dB cut-off frequency is determined by the formula:

$$\text{Loss} = (\text{Loss Constant}) \times (\text{Number of Sections})$$

For specification purposes, the result is always rounded up to the next tenth of a dB.

Example:

Lowpass Model = 5L31-2250/T3000-O/O
 Insertion Loss = (0.10)(5) = 0.5 dB

◆ **Loss Constant:**

Center Frequency (MHz)	Constant
10-499	0.25
500-999	0.15
1000-6000	0.10

◆ **To Order:**

5 L 30 — 2250 / T 3000- O / O
1 2 3 4 5 6 7 8 9

<u>Code</u>	<u>Description</u>
1	Number of Sections
2	Series (I - Microminiature)
3	L-Lowpass
4	Package Designator - Style 3
5	Cut-off Frequency (MHz)
6	Supplemental Codes (See Page 13)
7	Upper Frequency Stopband Limit
8	Input Connector
9	Output Connector

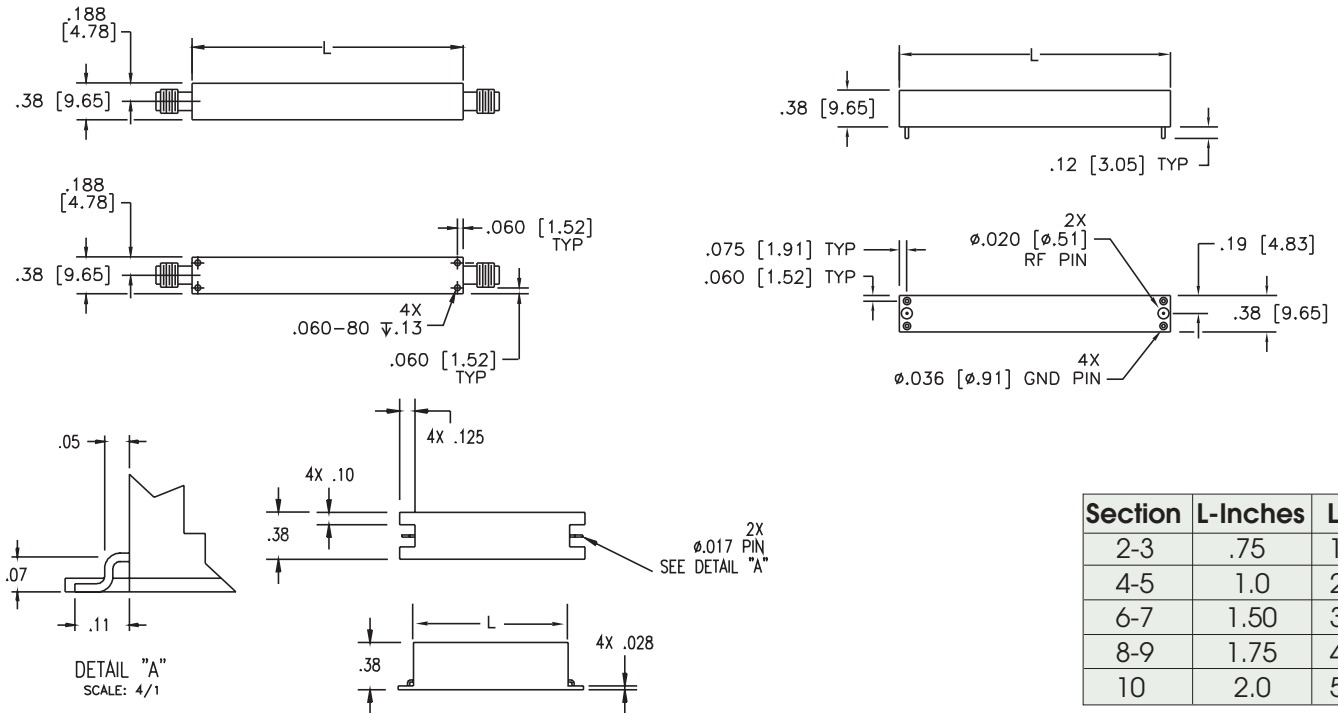
◆ **Connectors:**

Connector	Code
SMA Female	O
SMA Male	OP
PC Pins	P

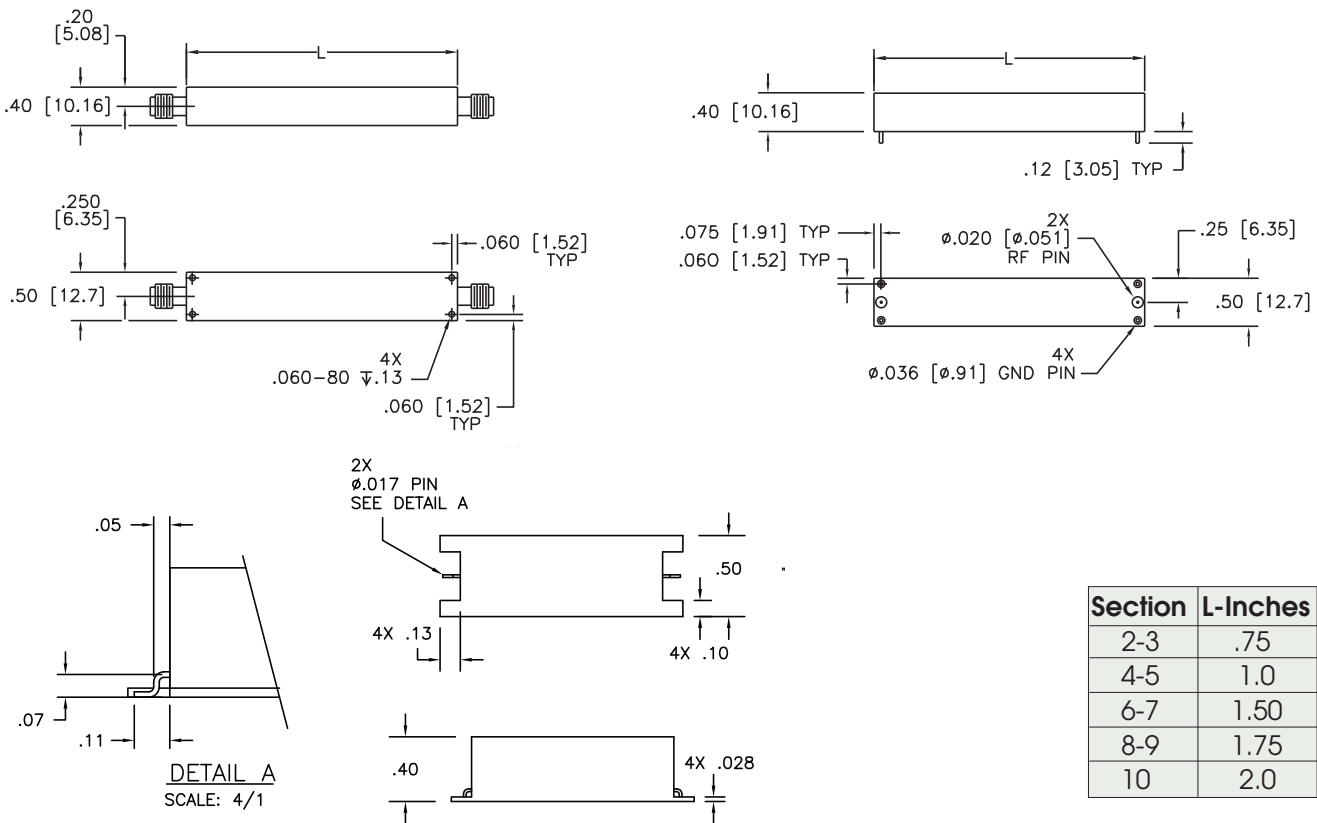


Microminiature Lowpass — IL Series

◆ Package Style 3:



◆ Package Style 4:



Low Frequency, Narrow Bandwidth — MC Series

◆ Features:

- Miniature Package Design Yielding State of the Art Performance
- Ruggedized Package to Withstand Severe Environmental Stress
- Covers the 160 to 3000 MHz Frequency Range
- 0.05 dB Chebyshev Design
- Custom Designs Available



◆ Specifications:

Frequency (MHz)	3 dB % BW	VSWR	Average Power (Watts)	Impedance (Ohms)	No. of Sections	Shock	Vibration	Temperature	Relative Humidity
160-3000	1-15 15-70*	1.5:1	2	50	3-8	30 G's, 1/2 Sine, 11 Ms	10 G's, 10 Hz- 2000 Hz	-55 to +85 °C	0-95%

* Bandwidth may be extended above 15% to 70% through the use of Microminiature Topology.

◆ Insertion Loss:

The following formula is used to determine the insertion loss at the center frequency:

$$\text{Insertion Loss} = \left(\frac{(\text{Loss Constant})(\text{Number of Sections} + 0.5)}{\% \text{ 3 dB BW}} \right) + 0.5$$

Example:

Center Frequency = 500 MHz
 3 dB Bandwidth = 10 MHz
 Number of Sections = 6

Loss Constant from the Table = 2.0

$$\text{Insertion Loss} = \left(\frac{(2.0)(6.5)}{2} \right) + 0.5 = 7.0 \text{ dB}$$

◆ Loss Constant:

Center Frequency (MHz)	Constant
160-200	3.0
201-400	2.5
401-3000	2.0

Low Frequency, Narrow Bandwidth — MC Series

◆ **Attenuation:**

This series of curves is used to determine the out-of-band or stopband attenuation for K&L's miniature cavity filters. These curves show the attenuation as multiples of the 3 dB bandwidth for filters with 2-8 sections. The formula for stopband attenuation:

$$3 \text{ dB BW from } f_0 = \frac{\text{Reject Frequency}-\text{Center Frequency}}{3 \text{ dB BW}}$$

Example:

Center Frequency = 500 MHz
 3 dB Bandwidth = 10 MHz
 Number of Sections = 6

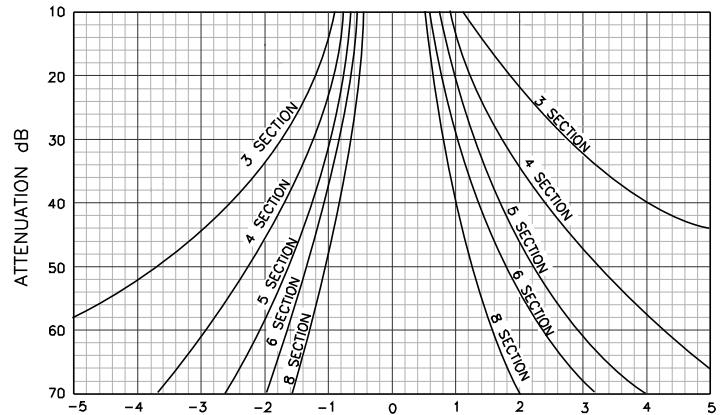
Find the attenuation at 480 MHz and 520 MHz by substituting in the formula:

$$3 \text{ dB BW from } f_0 = \frac{520-500}{10} = +2$$

$$3 \text{ dB BW from } f_0 = \frac{480-500}{10} = -2$$

Referring to the attenuation curves, we find the attenuation in dB for a 6-section response +2 bandwidths from f_0 to yield 54 dB and -2 bandwidths from f_0 to yield 70 dB.

◆ **For Bandwidths 1 to 15%**



◆ **To Order:**

5 MC 10 — 2250 / H 50- O / O - ALT
 1 2 3 4 5 6 7 8 9

Code	Description
1	Number of Sections
2	Series
3	Design type note: Enter "10" in all cases, factory will verify and change if necessary.
4	Center Frequency (MHz)
5	Supplemental Codes (See Page 13)
6	Bandwidth (MHz)
7	Input Connector
8	Output Connector
9	Alternate Configuration

◆ **Connectors:**

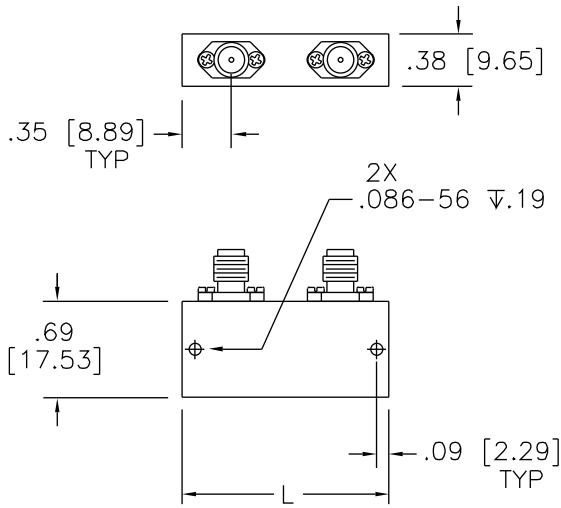
Connector	Code
SMA Female	O
SMA Male	OP
Cables, 6" RG 188	C
RF Pins	P

Most connector types can be supplied on cable: Contact factory

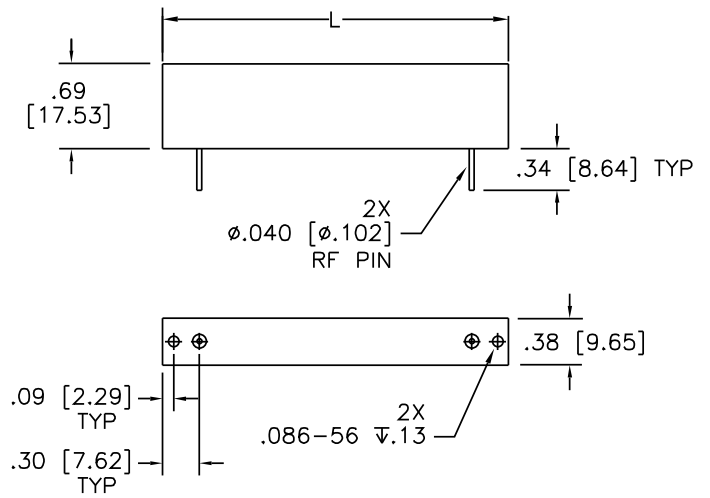


Low Frequency, Narrow Bandwidth — MC Series

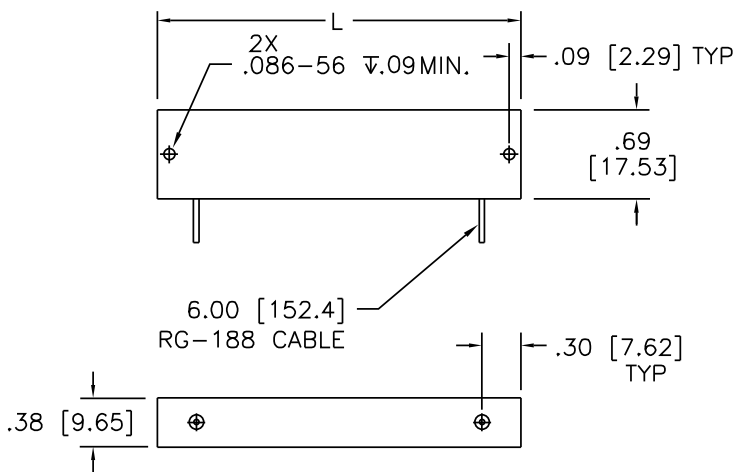
◆ SMA Female Connectors:



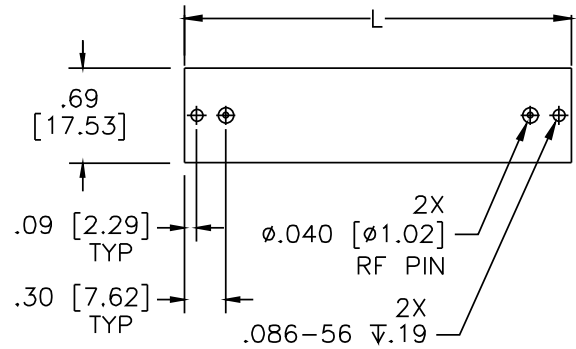
◆ PCB Application:



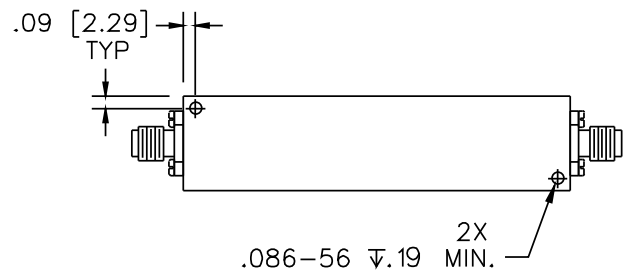
◆ RG - 188 Cable:



◆ Alternate Pin Location:



◆ Alternate Connector Location:



Approx. Length (L) vs. Number of Sections (N)

N	2	3	4	5	6	7	8
L	1.75/44.45	2.0/50.8	2.25/57.15	2.5/63.5	2.75/69.85	3.0/76.2	3.25/82.55

Mini-Max® Series of Microminiature Filters

◆ Features:

- Miniature Size — Maximum Performance
- Low Package Height (.24 inch)
- Ceramic or Lumped Component Chip and Wire Technology
- High Performance Applications
- Leaded Surface Mount Configuration

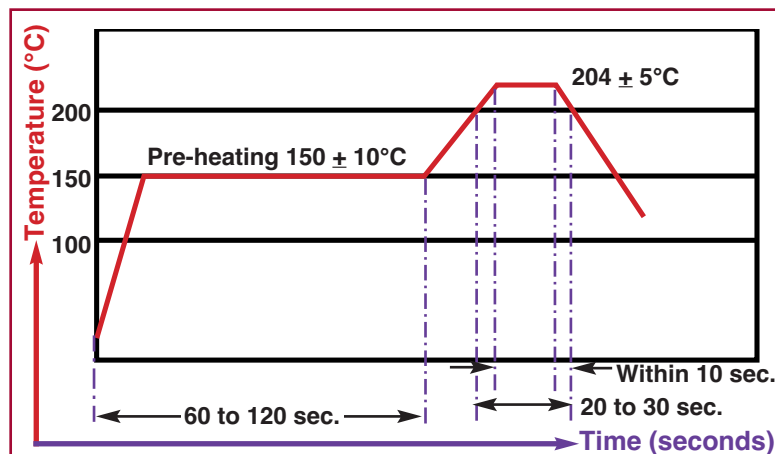


◆ Specifications:

Frequency Range	3 dB % BW	VSWR	Attenuation	Impedance (Ohms)	Number of Sections	Temperature	Packaging
20 MHz-3 GHz	2-20%*	1.5:1 Max	60 dBc	50	3-6*	-40 to +85°C (Operating) -50 to +110°C (Non-Operating)	See Outline Drawings
Vibration:		MIL-STD 202	204A				
Shock:		MIL-STD 202	213A				
Humidity:		MIL-STD 202	103B				
Thermal Shock:		MIL-STD 202	107A				
Solderability:		MIL-STD 202	Method 208				

• Contact factory for > 6 sections and > 20% bandwidth.

◆ Typical Reflow Profile / Installation Notes For Mini-Max, KeL-Fil and KeL-Com Products:

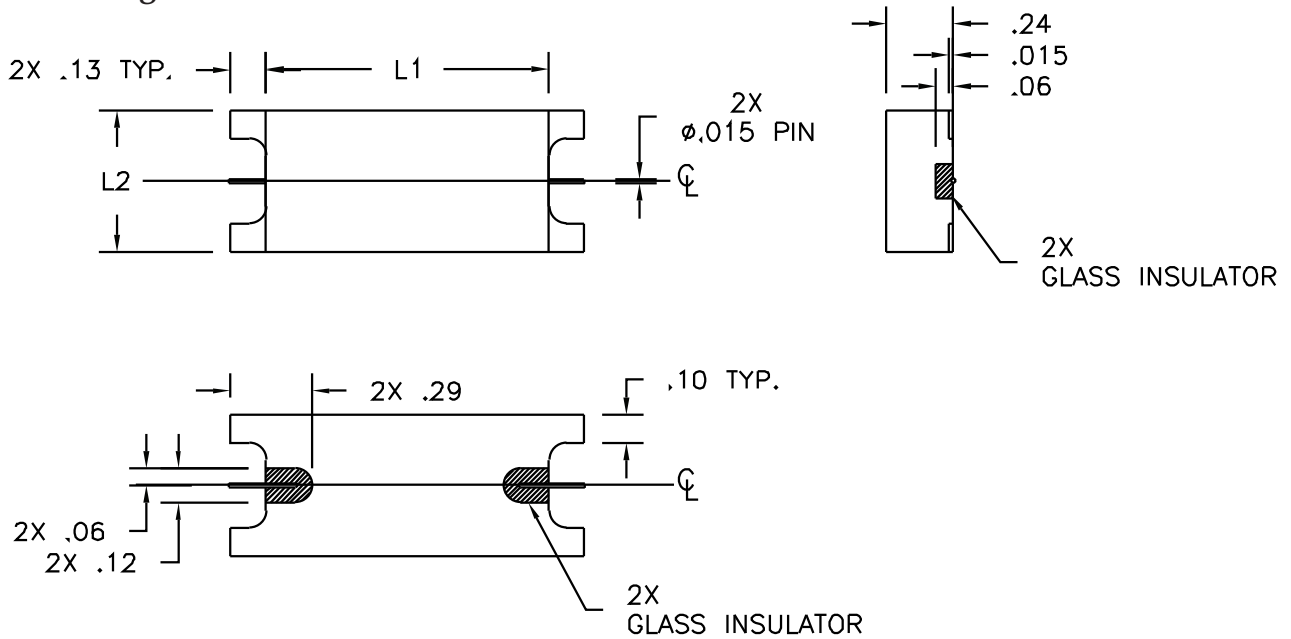


* The rate of heating and cooling must be controlled to preclude thermal cracking of the devices. Processes, heating or cooling, should not exceed a rate of 200°C per min. Spikes must not exceed 100°C max. for any solder operation. Avoid forced cooling or contact with heat sinks, such as conveyor belts, metal tables or cleaning solutions, before the units reach ambient temps.

- * When handling K&L products, avoid touching any solderable surface with bare hands or other contaminants as solderability may be reduced.
- * Filters are made of very durable materials. However, mishandling of the product (especially RF leads) will damage the device. Avoid forcing the product into place by any means.
- * K&L products can be cleaned via solvent-based, aqueous, semi-aqueous, and alcohol-based systems. Be sure to completely dry the units; any entrapped moisture will cause erroneous electrical performance.
- * A typical reflow profile is provided. When establishing a reflow procedure, be sure to consider the higher relative mass of components, as the units will take longer to achieve reflow temps.
- * Take special care to ensure the input trace is not smaller than the RF trace on the filter. This will eliminate an impedance mismatch which would cause the filter to appear to have a high ripple content.
- * All K&L ceramic filters are assembled using SN96 high temp. solder. K&L recommends that customers use SN60 or SN63, or an equivalent, during installation for signal and ground connections.
- * Recommended procedure for hand soldering (Not recommended for Series 5 packages):

Mini-Max® Series of Microminiature Filters

◆ Outline Drawings:



L1	L2
1.00	.50
1.00	.75
1.50	.50
1.50	.75
2.00	.50
2.00	.75

SECTIONS	LENGTH
3	1.0"
4-5	1.5"
6	2.0"

◆ To Order:

3 MM B 7 - 1000 / U 50 - 1.1

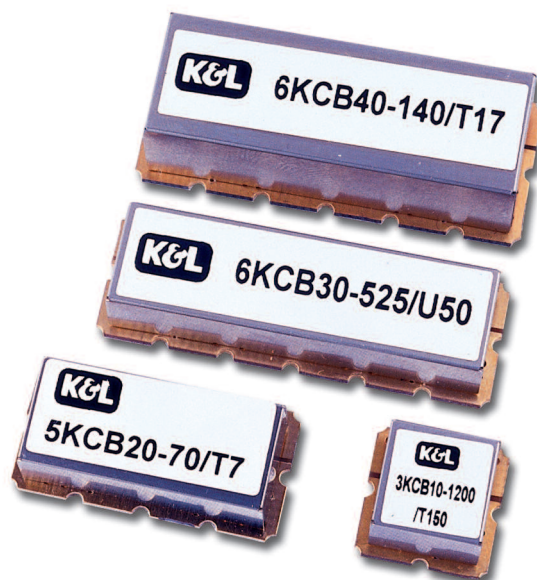
1 2 3 4 5 6 7 8

- 1. Number of Sections
- 2. **Mini-Max**® Series
- 3. Filter Type
- 4. Package Width
5 = .5"
7 = .75"
- 5. Center Frequency in MHz
- 6. Supplemental Codes (see page 13)
- 7. Bandwidth in MHz
- 8. Current Version

KEL-com® Commercial Bandpass

◆ Features:

- Ideal for High Volume, Short Lead Time Requirements
- Designed for Low Cost Applications
- Covers the 10 MHz to 3000 MHz Frequency Range
- 3 dB BW Available 5 to 15%
- Designs Available in 3 - 6 Sections
- Chebyshev Design Response
- See page 46 for Reflow Profile and Suggested Mounting Information.



◆ Specifications:

Center Frequency (MHz)	3 dB % BW	VSWR	Attenuation	Impedance (Ohms)	Number of Sections	Temperature	Package Style
10-3000	*5 to 15%	2.0:1 Max	- 60 dBc	50	3-6	-40 to +85 °C	Open frame, leadless surface mount. See page 49.

- * Different circuit topologies available for non-standard bandwidth
- For more complete specifications please visit us at www.klfilterwizard.com.
- Lowpass and Highpass filters also available. Contact factory for details.

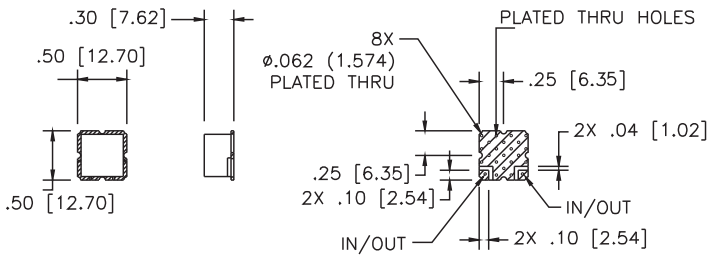


◆ To Order:

3 KC B 10 - 1000 / U 50 - 1.1
1 2 3 4 5 6 7 8

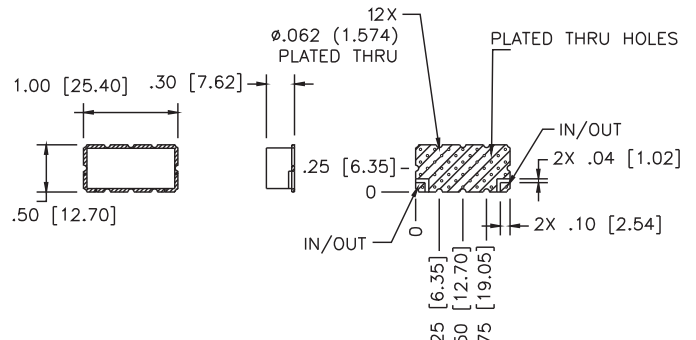
- | | |
|---|-------------------------------------|
| 1. Number of Sections | 5. Center Frequency in MHz |
| 2. KEL-com ® Series | 6. Supplemental Codes (see page 13) |
| 3. Bandpass | 7. Bandwidth in MHz |
| 4. Package Style - Open frame, leadless surface mount | 8. Version Number |
- 10 = 0.5" x 0.5" (12.7mm x 12.7mm)
 20 = 1.0" x 0.5" (25.4mm x 12.7mm)
 30 = 1.5" x 0.5" (38.1mm x 12.7mm)
 40 = 1.5" x 0.6" (38.1mm x 15.24mm)

◆ **Mechanical:**



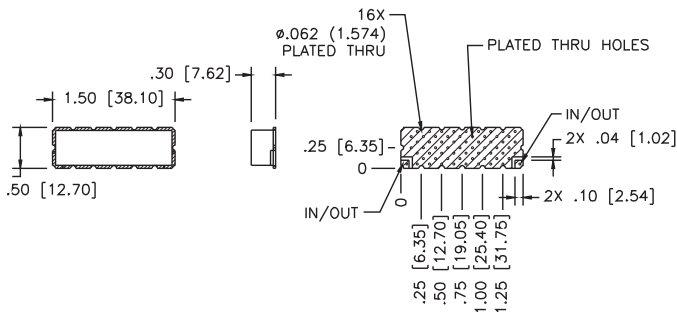
KEL-com®: Series 10 - 0.5" x 0.5"
(12.7mm x 12.7mm)

Open frame, Leadless Surface Mount



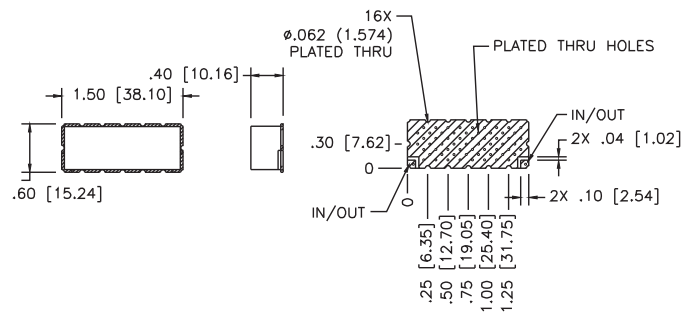
KEL-com®: Series 20 - 1.0" x 0.5"
(25.4mm x 12.7mm)

Open frame, Leadless Surface Mount



KEL-com®: Series 30 - 1.5" x 0.5"
(38.1mm x 12.7mm)

Open frame, Leadless Surface Mount

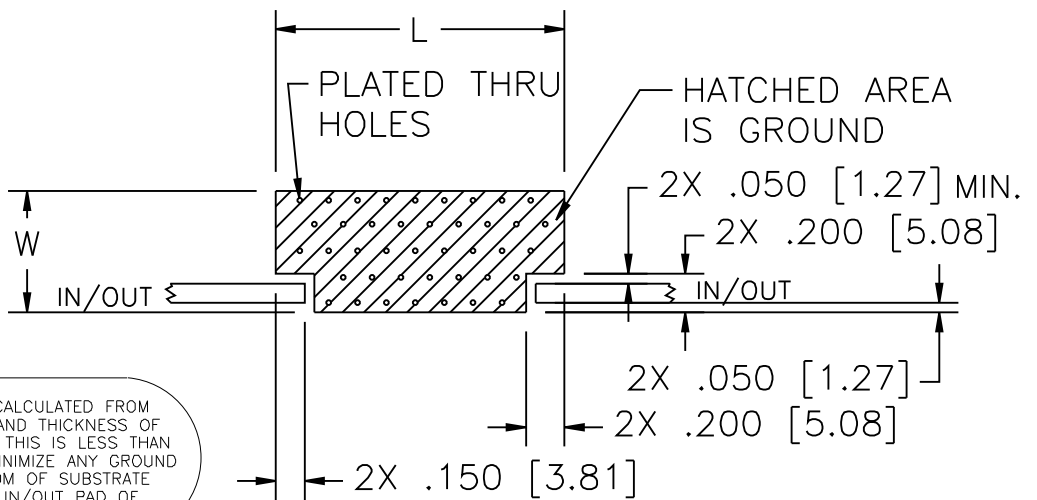


KEL-com®: Series 40 - 1.5" x 0.6"
(38.1mm x 15.24mm)

Open frame, Leadless Surface Mount

◆ **Recommended PCB Layout:**

PACKAGE	PCB (L)	PCB (W)
SERIES 40 1.5 X 0.6	1.600	0.700
SERIES 30 1.5 X 0.5	1.600	0.600
SERIES 20 1.0 X 0.5	1.100	0.600
SERIES 10 0.5 X 0.5	0.600	0.600



50 ohm LINE WIDTH CALCULATED FROM DIELECTRIC CONSTANT AND THICKNESS OF SUBSTRATE MATERIAL. IF THIS IS LESS THAN .10 INCH BE SURE TO MINIMIZE ANY GROUND PLANE ON THE BOTTOM OF SUBSTRATE UNDER THE .10 SQ IN/OUT PAD OF KEL COM FILTER.