*Cavity*

# Bandpass Filters

50Ω DC to 40 GHz

## The Big Deal

- Very low insertion loss with excellent power handling
- Very fast roll-off with wide stopband
- Passbands up to 36 GHz
- Stopbands up to 40 GHz

## Product Overview

Mini-Circuits' cavity filters are designed by implementing resonant structures with very high Q and are ideal for narrow-band, high-selectivity applications. These designs can provide bandwidths as narrow as 1% with very high selectivity and excellent low noise floor. Low insertion loss combined with excellent power handling makes them well-suited for transmitter and receiver front end. Advanced filter design and construction enables stopband width greater than 3x the center frequency.

Mini-Circuits' cavity filters feature a special protective assembly to prevent accidental de-tuning that would otherwise require expensive replacement or return to factory for re-tuning. Custom integrated assembly with LNA and bias tees results in greatly simplifying system integration . Precise machining allows realization of cavity filters with small form factors for applications where size is critical. Excellent repeatability across units is achieved through precise tuning and process control.

## Key Features

| Feature | Advantages |
|---|---|
| Low insertion loss | Low signal loss results in better SNR in receiver front end and better power delivery to antenna in transmitter |
| Fast roll-off | Higher selectivity results in better adjacent channel rejection and dynamic range |
| Wide stopband | Wide spur free band results in better receiver sensitivity |
| High power handling | Well suited for transmitter application |
| Protective assembly | Prevents accidental de-tuning of precisely tuned resonant circuit |

*Cavity*

# Bandpass Filter

## ZVBP-4300-S+

50Ω  4250 to 4350 MHz

*Generic photo used for illustration purposes only*

CASE STYLE: ME1656

| Connectors | Model |
|---|---|
| **SMA-F** | ZVBP-4300-S+ |

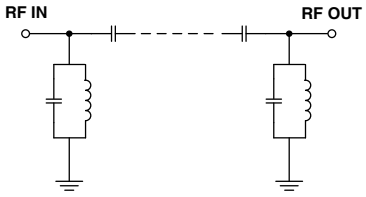
### Features

- Low insertion loss, 1 dB typical
- Good VSWR, 1.3:1 typical
- High rejection
- Fast roll-off
- Connectorized package

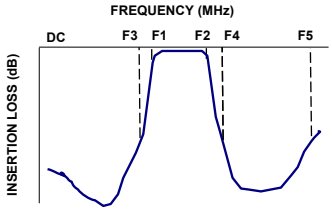
### Applications

- Aviation/Aeronautical
- Broadband
- Passive sensors (satellite)

### Functional Schematic




### Typical Frequency Response




**+RoHS Compliant**

*The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications*

### Electrical Specifications at 25°C

| Parameter | | F# | Frequency (MHz) | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| **Pass Band** | Center Frequency | - | - | - | 4300 | - | MHz |
| | Insertion Loss | F1-F2 | 4250-4350 | - | 1 | 1.5 | dB |
| | VSWR | F1-F2 | 4250-4350 | - | 1.3 | 1.43 | :1 |
| **Stop Band, Lower** | Insertion Loss | DC-F3 | DC - 4140 | 20 | 29 | - | dB |
| | VSWR | DC-F3 | DC - 4140 | - | 20 | - | :1 |
| **Stop Band, Upper** | Insertion Loss | F4-F5 | 4480-8000 | 20 | 29 | - | dB |
| | VSWR | F4-F5 | 4480-8000 | - | 20 | - | :1 |

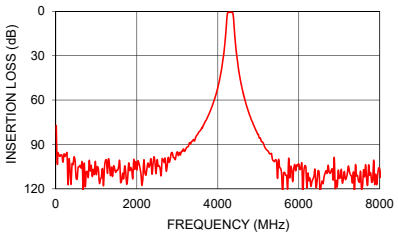
| Maximum Ratings | |
|---|---|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| RF Power Input | 10 W max. |

Permanent damage may occur if any of these limits are exceeded.

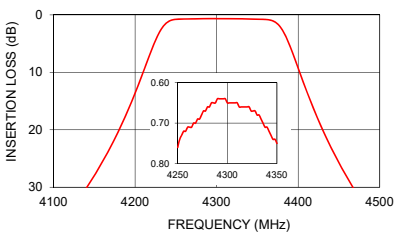
### Typical Performance Data at 25°C

| Frequency (MHz) | Insertion Loss (dB) | VSWR (:1) | Frequency (MHz) | Group Delay (nsec) |
|---|---|---|---|---|
| 10 | 77.25 | 1737.18 | 4250 | 8.28 |
| 500 | 112.86 | 133.63 | 4254 | 7.74 |
| 1500 | 107.49 | 193.02 | 4260 | 7.12 |
| 3600 | 79.00 | 108.58 | 4264 | 6.83 |
| 4140 | 30.22 | 66.82 | 4270 | 6.53 |
| 4180 | 20.13 | 43.44 | 4276 | 6.36 |
| 4228 | 3.52 | 4.08 | 4280 | 6.27 |
| 4232 | 2.49 | 2.95 | 4284 | 6.20 |
| 4250 | 0.76 | 1.08 | 4290 | 6.10 |
| 4300 | 0.65 | 1.09 | 4296 | 6.04 |
| 4350 | 0.75 | 1.24 | 4300 | 6.00 |
| 4380 | 2.50 | 2.85 | 4304 | 5.98 |
| 4384 | 3.51 | 3.90 | 4310 | 5.98 |
| 4430 | 20.02 | 35.46 | 4316 | 6.01 |
| 4470 | 30.69 | 52.65 | 4320 | 6.06 |
| 4480 | 32.91 | 56.04 | 4324 | 6.12 |
| 4700 | 62.88 | 86.86 | 4330 | 6.22 |
| 5500 | 100.21 | 91.43 | 4340 | 6.45 |
| 7000 | 112.78 | 124.09 | 4346 | 6.68 |
| 8000 | 106.65 | 173.72 | 4350 | 6.89 |

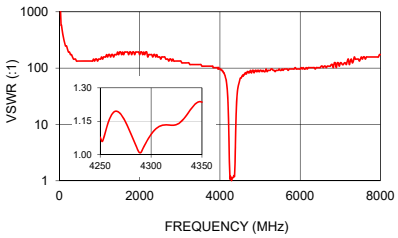
ZVBP-4300-S+
INSERTION LOSS (Full band)



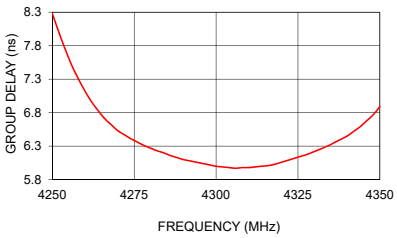

ZVBP-4300-S+
INSERTION LOSS (Pass band)




ZVBP-4300-S+
VSWR




ZVBP-4300-S+
GROUP DELAY



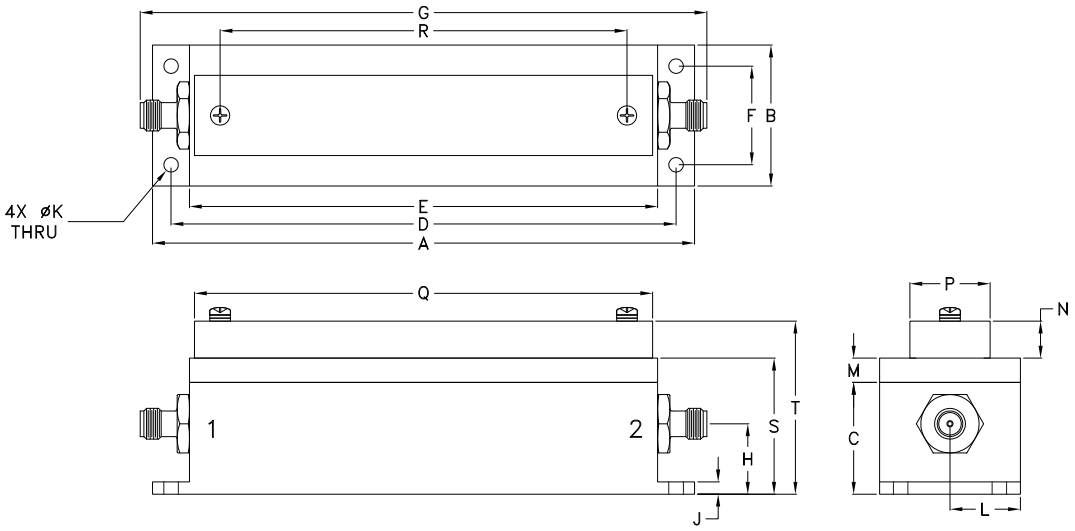

Notes

**A.** Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
**B.** Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
**C.** The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

## Coaxial Connections

| | |
|---|---|
| PORT - 1 | SMA-FEMALE |
| PORT - 2 | SMA-FEMALE |

## Outline Drawing




## Outline Dimensions ( inch / mm )

| A | B | C | D | E | F | G | H | J | K |
|---|---|---|---|---|---|---|---|---|---|
| **4.40** | **1.14** | **0.91** | **4.096** | **3.80** | **0.800** | **4.60** | **0.57** | **0.10** | **0.118** |
| 111.66 | 29.03 | 23.01 | 104.04 | 96.42 | 20.32 | 116.74 | 14.50 | 2.54 | 3.00 |

| L | M | N | P | Q | R | S | T | | Wt. |
|---|---|---|---|---|---|---|---|---|---|
| **0.57** | **0.20** | **0.30** | **0.65** | **3.72** | **3.30** | **1.10** | **1.40** | | grams |
| 14.53 | 5.00 | 7.62 | 16.51 | 94.39 | 83.82 | 28.02 | 35.64 | | **160** |

*Note: Please refer to case style drawing for details.*

# Coaxial Band Pass Filter ZVBP-4300-S+

*Typical Performance Data*

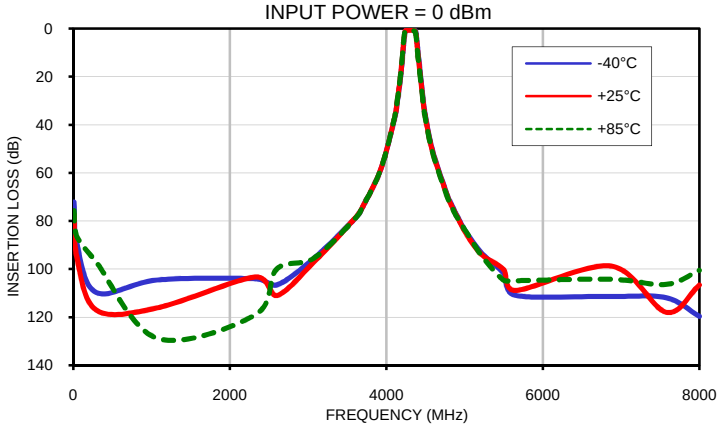
| FREQ. | INSERTION LOSS | | | INPUT RETURN LOSS | | | OUTPUT RETURN LOSS | | |
|---|---|---|---|---|---|---|---|---|---|
| (MHz) | (dB) | | | (dB) | | | (dB) | | |
| | @-40°C | @+25°C | @+85°C | @-40°C | @+25°C | @+85°C | @-40°C | @+25°C | @+85°C |
| 10 | 72.11 | 77.25 | 75.62 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 |
| 50 | 89.97 | 95.66 | 86.59 | 0.02 | 0.03 | 0.03 | 0.02 | 0.03 | 0.03 |
| 300 | 109.80 | 117.17 | 97.31 | 0.10 | 0.10 | 0.11 | 0.10 | 0.11 | 0.11 |
| 1075 | 104.53 | 116.12 | 128.74 | 0.09 | 0.12 | 0.14 | 0.07 | 0.12 | 0.12 |
| 2325 | 104.01 | 103.31 | 118.95 | 0.04 | 0.11 | 0.15 | 0.02 | 0.12 | 0.16 |
| 2600 | 106.61 | 111.01 | 99.92 | 0.03 | 0.11 | 0.16 | 0.03 | 0.14 | 0.17 |
| 3075 | 95.54 | 97.09 | 95.40 | 0.05 | 0.14 | 0.19 | 0.05 | 0.17 | 0.21 |
| 3610 | 78.67 | 78.50 | 78.59 | 0.07 | 0.16 | 0.20 | 0.08 | 0.19 | 0.23 |
| 3700 | 74.03 | 73.99 | 73.88 | 0.08 | 0.16 | 0.20 | 0.08 | 0.20 | 0.23 |
| 3930 | 58.54 | 58.42 | 58.36 | 0.09 | 0.17 | 0.21 | 0.09 | 0.20 | 0.23 |
| 4100 | 38.18 | 37.87 | 37.66 | 0.14 | 0.21 | 0.24 | 0.14 | 0.24 | 0.26 |
| 4140 | 30.67 | 30.22 | 29.92 | 0.17 | 0.26 | 0.28 | 0.17 | 0.28 | 0.29 |
| 4180 | 20.82 | 20.13 | 19.67 | 0.30 | 0.40 | 0.44 | 0.28 | 0.41 | 0.43 |
| 4190 | 17.81 | 17.03 | 16.50 | 0.39 | 0.50 | 0.56 | 0.37 | 0.51 | 0.54 |
| 4216 | 8.63 | 7.65 | 6.97 | 1.29 | 1.68 | 1.99 | 1.23 | 1.65 | 1.93 |
| 4220 | 7.13 | 6.16 | 5.50 | 1.71 | 2.26 | 2.71 | 1.63 | 2.21 | 2.63 |
| 4228 | 4.30 | 3.52 | 3.00 | 3.24 | 4.35 | 5.33 | 3.13 | 4.26 | 5.18 |
| 4236 | 2.15 | 1.73 | 1.48 | 6.42 | 8.58 | 10.65 | 6.24 | 8.40 | 10.32 |
| 4240 | 1.46 | 1.23 | 1.11 | 8.97 | 11.95 | 15.04 | 8.74 | 11.65 | 14.44 |
| 4242 | 1.20 | 1.06 | 0.99 | 10.56 | 14.09 | 18.01 | 10.28 | 13.69 | 17.11 |
| 4248 | 0.76 | 0.80 | 0.82 | 17.07 | 23.66 | 32.35 | 16.56 | 22.46 | 27.62 |
| 4250 | 0.69 | 0.76 | 0.81 | 20.13 | 28.47 | 28.83 | 19.44 | 26.52 | 27.19 |
| 4256 | 0.58 | 0.72 | 0.79 | 30.98 | 25.15 | 21.16 | 30.95 | 25.53 | 21.29 |
| 4260 | 0.57 | 0.71 | 0.79 | 26.27 | 22.16 | 19.67 | 27.25 | 22.56 | 19.81 |
| 4262 | 0.56 | 0.71 | 0.79 | 24.53 | 21.46 | 19.40 | 25.30 | 21.81 | 19.52 |
| 4264 | 0.56 | 0.71 | 0.79 | 23.42 | 21.09 | 19.36 | 24.05 | 21.41 | 19.44 |
| 4270 | 0.55 | 0.69 | 0.77 | 22.54 | 21.52 | 20.41 | 22.92 | 21.69 | 20.31 |
| 4284 | 0.51 | 0.65 | 0.72 | 30.48 | 31.84 | 31.95 | 29.19 | 28.49 | 27.14 |
| 4286 | 0.50 | 0.65 | 0.71 | 33.73 | 36.18 | 36.89 | 30.80 | 29.44 | 27.92 |
| 4288 | 0.50 | 0.65 | 0.71 | 38.78 | 44.38 | 47.07 | 31.96 | 29.74 | 28.11 |
| 4298 | 0.50 | 0.64 | 0.71 | 29.64 | 28.54 | 27.59 | 27.60 | 25.77 | 24.67 |
| 4300 | 0.50 | 0.65 | 0.71 | 28.04 | 27.20 | 26.34 | 26.65 | 25.08 | 24.07 |
| 4304 | 0.50 | 0.65 | 0.72 | 25.93 | 25.43 | 24.68 | 25.35 | 24.20 | 23.27 |
| 4318 | 0.51 | 0.66 | 0.73 | 24.49 | 24.10 | 23.46 | 26.05 | 25.33 | 24.23 |
| 4322 | 0.51 | 0.66 | 0.73 | 24.82 | 24.14 | 23.55 | 27.65 | 26.61 | 25.38 |
| 4326 | 0.52 | 0.67 | 0.74 | 24.88 | 23.85 | 23.42 | 29.33 | 27.67 | 26.50 |
| 4340 | 0.56 | 0.71 | 0.78 | 20.82 | 20.44 | 20.91 | 23.47 | 23.53 | 24.63 |
| 4346 | 0.58 | 0.74 | 0.80 | 19.26 | 19.53 | 20.31 | 21.15 | 22.05 | 23.60 |
| 4350 | 0.60 | 0.75 | 0.82 | 18.80 | 19.53 | 20.46 | 20.42 | 21.87 | 23.55 |
| 4356 | 0.61 | 0.77 | 0.85 | 19.27 | 20.66 | 21.09 | 20.65 | 22.72 | 23.20 |
| 4358 | 0.61 | 0.78 | 0.87 | 19.80 | 21.21 | 20.90 | 21.08 | 22.93 | 22.23 |
| 4362 | 0.63 | 0.82 | 0.94 | 21.33 | 21.21 | 18.81 | 22.11 | 21.49 | 18.79 |
| 4370 | 0.77 | 1.11 | 1.38 | 18.01 | 13.94 | 11.66 | 17.04 | 13.43 | 11.29 |
| 4378 | 1.39 | 2.09 | 2.62 | 9.79 | 7.51 | 6.36 | 9.32 | 7.27 | 6.16 |
| 4390 | 4.21 | 5.46 | 6.28 | 3.45 | 2.80 | 2.51 | 3.29 | 2.74 | 2.45 |
| 4400 | 7.93 | 9.29 | 10.12 | 1.54 | 1.40 | 1.37 | 1.45 | 1.40 | 1.35 |
| 4480 | 32.20 | 32.91 | 33.36 | 0.18 | 0.31 | 0.38 | 0.18 | 0.35 | 0.41 |
| 4500 | 36.31 | 36.95 | 37.36 | 0.15 | 0.27 | 0.34 | 0.16 | 0.32 | 0.38 |
| 4520 | 39.99 | 40.57 | 40.95 | 0.15 | 0.26 | 0.32 | 0.14 | 0.30 | 0.36 |
| 4600 | 51.74 | 52.21 | 52.50 | 0.11 | 0.23 | 0.28 | 0.11 | 0.26 | 0.31 |
| 4780 | 69.31 | 69.66 | 69.97 | 0.10 | 0.21 | 0.25 | 0.10 | 0.24 | 0.28 |
| 4840 | 73.54 | 74.05 | 74.30 | 0.09 | 0.20 | 0.24 | 0.09 | 0.23 | 0.27 |
| 4900 | 77.57 | 77.87 | 78.24 | 0.08 | 0.19 | 0.23 | 0.09 | 0.23 | 0.27 |
| 5025 | 84.92 | 85.60 | 84.64 | 0.08 | 0.19 | 0.23 | 0.10 | 0.23 | 0.27 |
| 5225 | 93.54 | 94.16 | 94.68 | 0.07 | 0.19 | 0.22 | 0.09 | 0.22 | 0.26 |
| 5500 | 101.82 | 100.21 | 104.57 | 0.07 | 0.19 | 0.22 | 0.08 | 0.21 | 0.25 |
| 5650 | 110.92 | 108.89 | 104.75 | 0.07 | 0.18 | 0.21 | 0.07 | 0.20 | 0.23 |
| 6875 | 111.35 | 98.78 | 104.15 | 0.02 | 0.14 | 0.14 | 0.06 | 0.19 | 0.20 |
| 7575 | 111.93 | 117.95 | 106.32 | 0.02 | 0.11 | 0.10 | 0.02 | 0.15 | 0.17 |
| 8000 | 119.64 | 106.65 | 100.46 | 0.03 | 0.10 | 0.09 | 0.02 | 0.16 | 0.18 |

*Typical Performance Data*

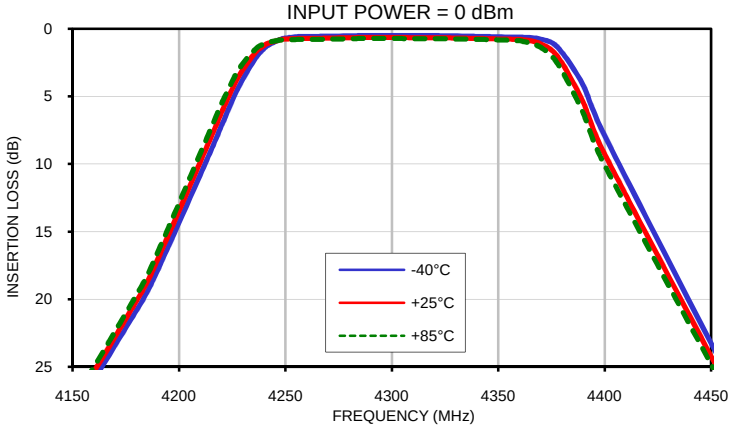
| FREQ. | GROUP DELAY | | |
|---|---|---|---|
| (MHz) | (nsec) | | |
| | @-40°C | @+25°C | @+85°C |
| 4250 | 8.74 | 8.28 | 7.98 |
| 4252 | 8.45 | 8.00 | 7.71 |
| 4254 | 8.16 | 7.74 | 7.48 |
| 4256 | 7.89 | 7.50 | 7.26 |
| 4258 | 7.64 | 7.30 | 7.08 |
| 4260 | 7.42 | 7.12 | 6.93 |
| 4262 | 7.23 | 6.96 | 6.79 |
| 4264 | 7.06 | 6.83 | 6.69 |
| 4266 | 6.92 | 6.71 | 6.59 |
| 4268 | 6.79 | 6.62 | 6.51 |
| 4270 | 6.69 | 6.53 | 6.44 |
| 4272 | 6.60 | 6.47 | 6.39 |
| 4274 | 6.52 | 6.41 | 6.34 |
| 4276 | 6.46 | 6.36 | 6.30 |
| 4278 | 6.39 | 6.31 | 6.26 |
| 4280 | 6.35 | 6.27 | 6.23 |
| 4282 | 6.30 | 6.23 | 6.19 |
| 4284 | 6.26 | 6.20 | 6.16 |
| 4286 | 6.22 | 6.16 | 6.13 |
| 4288 | 6.18 | 6.13 | 6.10 |
| 4290 | 6.15 | 6.10 | 6.08 |
| 4292 | 6.12 | 6.08 | 6.06 |
| 4294 | 6.10 | 6.06 | 6.04 |
| 4296 | 6.07 | 6.04 | 6.02 |
| 4298 | 6.05 | 6.02 | 6.00 |
| 4300 | 6.03 | 6.00 | 6.00 |
| 4302 | 6.01 | 5.99 | 5.98 |
| 4304 | 6.00 | 5.98 | 5.98 |
| 4306 | 5.99 | 5.97 | 5.97 |
| 4308 | 5.98 | 5.98 | 5.98 |
| 4310 | 5.98 | 5.98 | 5.98 |
| 4312 | 5.99 | 5.99 | 5.99 |
| 4314 | 5.99 | 6.00 | 6.01 |
| 4316 | 6.00 | 6.01 | 6.02 |
| 4318 | 6.02 | 6.03 | 6.05 |
| 4320 | 6.04 | 6.06 | 6.07 |
| 4322 | 6.06 | 6.09 | 6.11 |
| 4324 | 6.08 | 6.12 | 6.14 |
| 4326 | 6.11 | 6.15 | 6.18 |
| 4328 | 6.15 | 6.18 | 6.22 |
| 4330 | 6.17 | 6.22 | 6.25 |
| 4332 | 6.21 | 6.26 | 6.30 |
| 4334 | 6.25 | 6.30 | 6.35 |
| 4336 | 6.29 | 6.35 | 6.40 |
| 4338 | 6.33 | 6.40 | 6.46 |
| 4340 | 6.37 | 6.45 | 6.53 |
| 4342 | 6.42 | 6.52 | 6.61 |
| 4344 | 6.48 | 6.59 | 6.69 |
| 4346 | 6.55 | 6.68 | 6.79 |
| 4348 | 6.62 | 6.77 | 6.91 |
| 4350 | 6.71 | 6.89 | 7.04 |

*Typical Performance Curves*

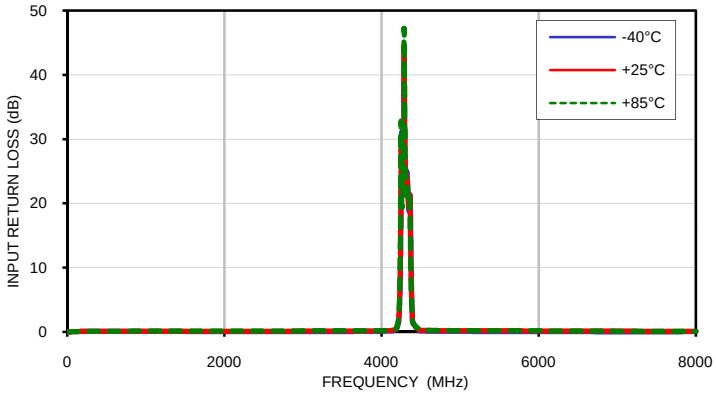
**INSERTION LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm



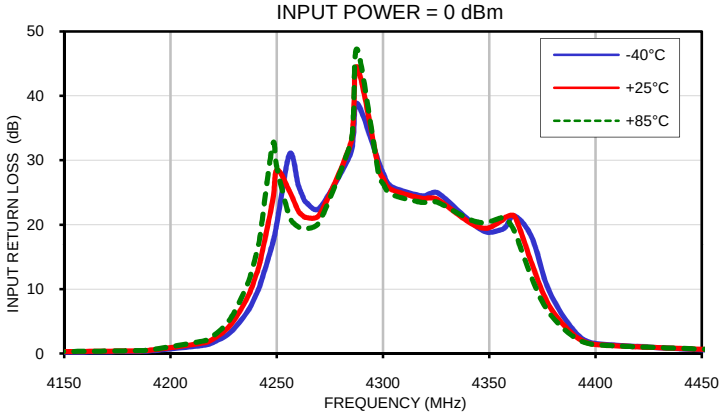

**INSERTION LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm



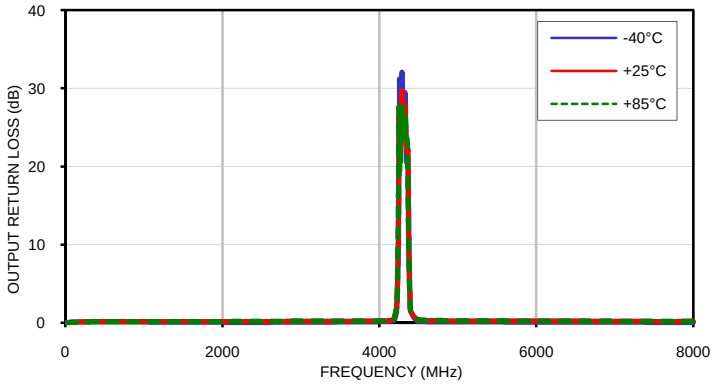

**INPUT RETURN LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm



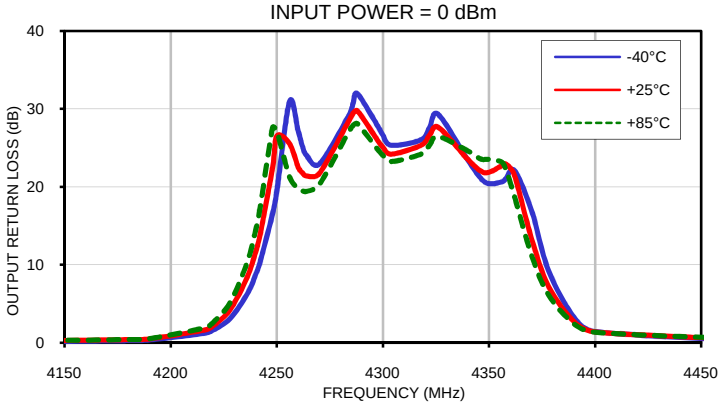

**INPUT RETURN LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm



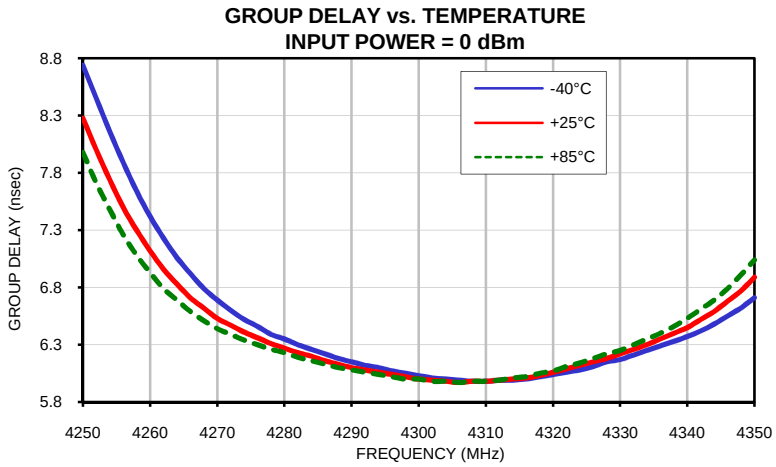

**OUTPUT RETURN LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm




**OUTPUT RETURN LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm



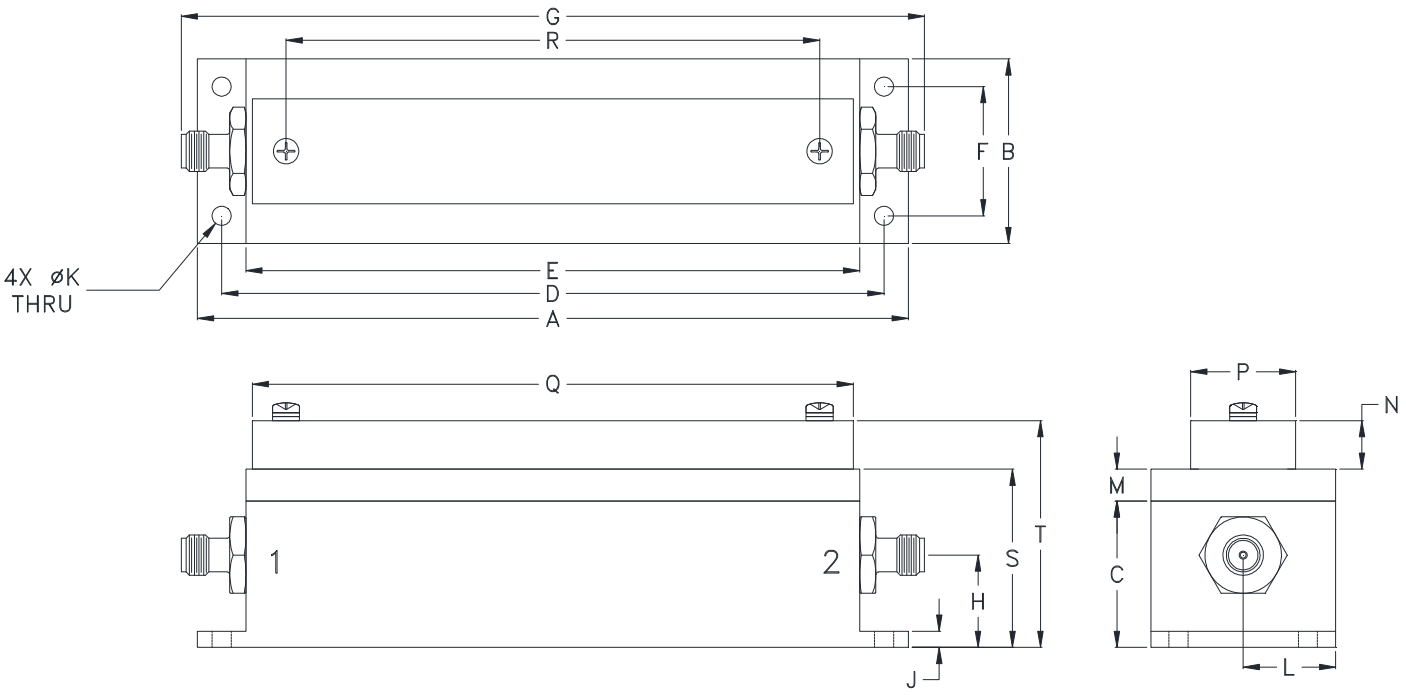
*Typical Performance Curves*



# Case Style ME

**ME1656**

## Outline Dimensions




| CASE #. | A | B | C | D | E | F | G | H | J | K | L | M | N | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ME1656 | 4.40 (111.66) | 1.14 (29.03) | 0.91 (23.01) | 4.096 (104.04) | 3.80 (96.42) | 0.800 (20.32) | 4.60 (116.74) | 0.57 (14.50) | 0.10 (2.54) | 0.118 (3.00) | 0.57 (14.53) | 0.20 (5.00) | 0.30 (7.62) | 0.65 (16.51) |

| CASE #. | Q | R | S | T | WT, GRAM |
|---|---|---|---|---|---|
| ME1656 | 3.72 (94.39) | 3.30 (83.82) | 1.10 (28.02) | 1.40 (35.64) | 160 |

**Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015**

### Notes:

1. Case material: Aluminum alloy.
2. Case finish: Powder coated.
3. Refer to the individual model data sheet for the type of connectors available.


Mini-Circuits®
INTERNET http://www.minicircuits.com
P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661
Distribution Centers NORTH AMERICA 800-654-7949 • 417-335-5935 • Fax 417-335-5945 • EUROPE 44-1252-832600 • Fax 44-1252-837010
Mini-Circuits ISO 9001 & ISO 14001 Certified

Mini-Circuits

# Environmental Specifications ENV46

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification | Test/Inspection Condition | Reference/Spec |
|---|---|---|
| Operating Temperature | -55° to 100°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Humidity | 90 to 95% RH, 40°C, 96 hours;<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103, Condintion B |
| Thermal Shock | -55° to 100°C, 100 cycles | MIL-STD-202, Method 107, Condition A-3, except +100°C |
| Vibration (High Frequency) | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36) | MIL-STD-202, Method 204, Condition D |
| Mechanical Shock | 50g, 11ms half-sine, 3 shocks each direction 3 axes (total 18) | MIL-STD-202, Method 213, Condition A |