LTCC COAXIAL

# Bandpass Filter

# ZBFHK-K2162+

50Ω 19.4 to 23.8 GHz 2.92mm Female

## KEY FEATURES

- Low Insertion Loss, 3.4 dB Typ.
- Return Loss, 11 dB Typ.
- Stopband Rejection, 90 dB Typ.
- Broadband Connectorized Package
- Power Handling: 1 Watts



*Generic photo used for illustration purposes only*

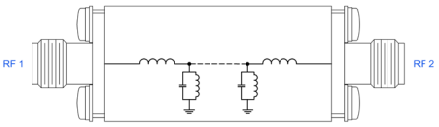
## APPLICATIONS

- Test and Measurement
- Aerospace and Defense Signal Conditioning
- Satellite Communications

## PRODUCT OVERVIEW

ZBFHK-K2162+ is a 50Ω band pass filter built in broad band connectorized package. Covering 19.4-23.8 GHz bandwidth, these units offer good matching within the passband and good rejection in stopband. ZBFHK-K2162+ offer low insertion loss, and excellent power handling capability. It handles up to 1 W RF input power and provides a wide operating temperature range from -55°C to 125°C.

## FUNCTIONAL DIAGRAM




## ELECTRICAL SPECIFICATIONS[1] AT +25°C

| Parameter | | F# | Frequency (GHz) | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| Passband | Center Frequency[2] | — | — | — | 21.6 | — | GHz |
| | Insertion Loss | F1-F2 | 19.4 - 23.8 | — | 3.4 | 5 | dB |
| | Return Loss | F1-F2 | 19.4 - 23.8 | — | 11 | — | dB |
| Stopband, Lower | Rejection | DC-F3 | 0.1 - 5.5 | 80 | 89 | — | dB |
| | | F3-F4 | 5.5 - 10.3 | 65 | 90 | — | |
| | | F4-F5 | 10.3 - 15 | 60 | 70 | — | |
| Stopband, Upper | Rejection | F6-F7 | 29.1 - 30.9 | 60 | 77 | — | dB |
| | | F7-F8 | 30.9 - 36.3 | 70 | 80 | — | |
| | | F8-F9 | 36.3 - 40 | 52 | 62 | — | |

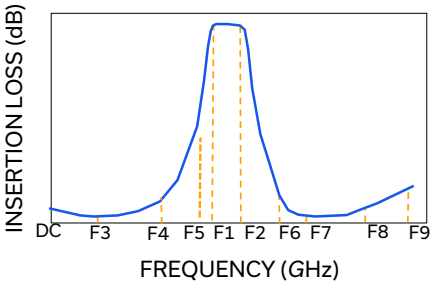
1. This component should not be used as a DC-block. In applications where DC voltage and/or current is present at either the input or output ports, external DC blocking capacitors are required.
2. Typical variation ± 5%

## ABSOLUTE MAXIMUM RATINGS[3]

| Parameter | Ratings |
|---|---|
| Operating Temperature | -55°C to +125°C |
| Storage Temperature | -55°C to +125°C |
| Input Power | 1 W |

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

## TYPICAL FREQUENCY RESPONSE




REV. OR
ECO-031035
EDU4810
ZBFHK-K1272+
MCINU
260903

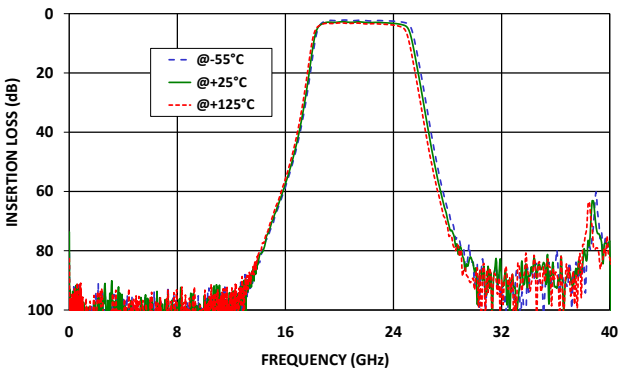
# Bandpass Filter

# ZBFHK-K2162+

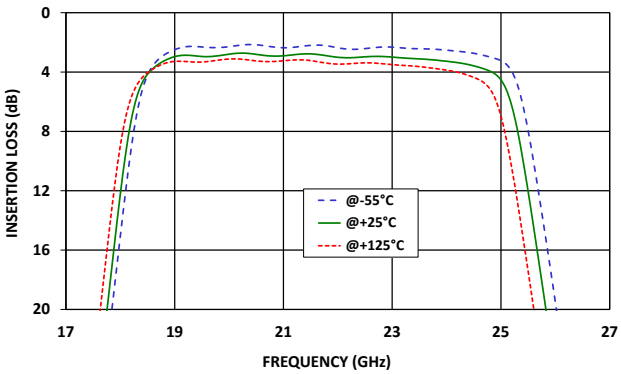
50Ω 19.4 to 23.8 GHz 2.92mm Female

## TYPICAL PERFORMANCE GRAPHS

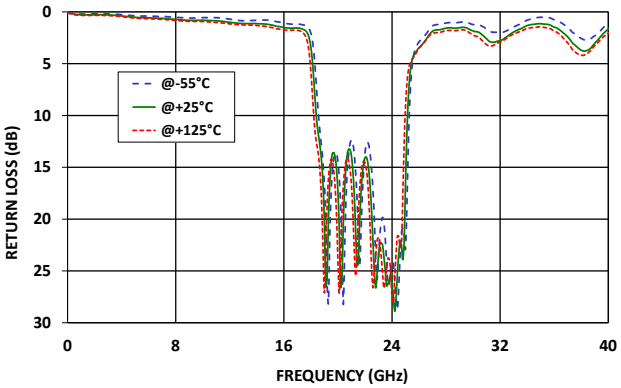
ZBFHK-K2162+
INSERTION LOSS



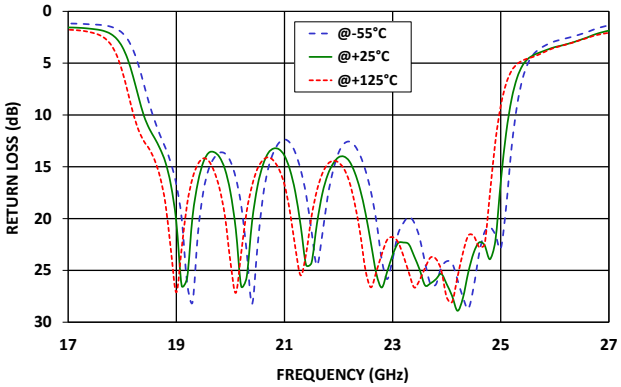

ZBFHK-K2162+
INSERTION LOSS (Zoomed)



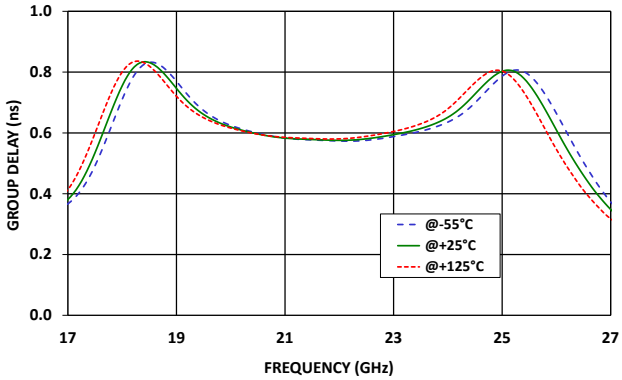

ZBFHK-K2162+
RETURN LOSS




ZBFHK-K2162+
RETURN LOSS (Zoomed)




ZBFHK-K2162+
GROUP DELAY



# Bandpass Filter

# ZBFHK-K2162+

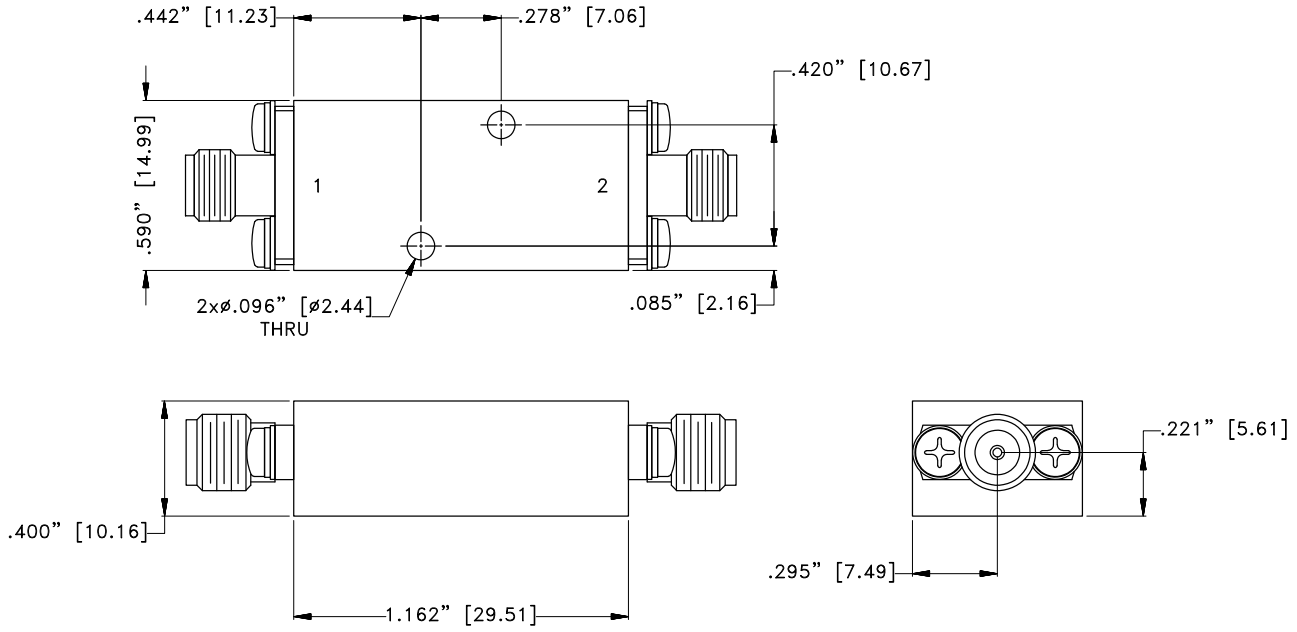
50Ω 19.4 to 23.8 GHz 2.92mm Female

## CONNECTOR DESCRIPTION

| Function | Connector |
|---|---|
| RF1[4] | 2.92mm Female |
| RF2[4] | 2.92mm Female |

4. This filter is bi-directional, RF1 and RF2 ports may be interchanged, see S-Parameters for actual performance.

## CASE STYLE DRAWING




**Weight: 37 grams**
**Dimensions are in inches (mm). Tolerances: 2Pl ± .030 [.76]; 3Pl. ± .015 [.38]**

## PRODUCT MARKING*: ZBFHK-K2162+

*Marking may contain other features or characters for internal lot control.

# Bandpass Filter

## ZBFHK-K2162+

50Ω 19.4 to 23.8 GHz 2.92mm Female

**ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD** CLICK HERE

| | |
|---|---|
| **Performance Data & Graphs** | Data<br>Graphs<br>S-Parameter (S2P Files) Data Set (.zip file) |
| **Case Style** | BBW3851 |
| **RoHS Status** | Compliant |
| **Environmental Ratings** | ENV124 |

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-Circuits' applicable established test performance criteria and measurement instructions.
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# Coaxial Band Pass Filter ZBFHK-K2162+

*Typical Performance Data*

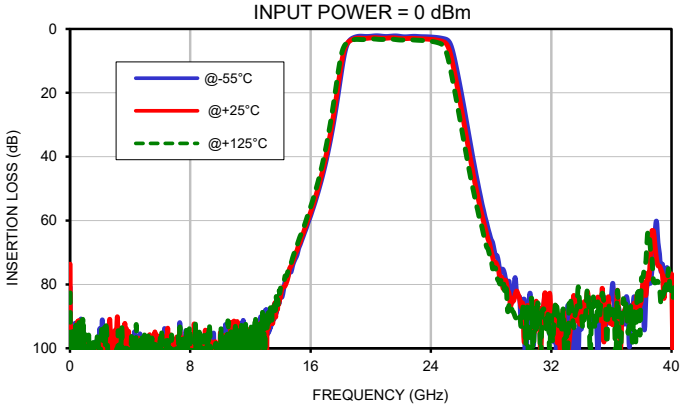
| FREQ. (GHz) | INSERTION LOSS (dB) | | | INPUT RETURN LOSS (dB) | | | OUTPUT RETURN LOSS (dB) | | |
|---|---|---|---|---|---|---|---|---|---|
| | @-55°C | @+25°C | @+125°C | @-55°C | @+25°C | @+125°C | @-55°C | @+25°C | @+125°C |
| 0.1 | 104.72 | 102.53 | 97.13 | 0.07 | 0.11 | 0.14 | 0.08 | 0.11 | 0.14 |
| 0.2 | 99.64 | 109.77 | 107.61 | 0.10 | 0.14 | 0.18 | 0.12 | 0.15 | 0.19 |
| 0.5 | 103.35 | 102.05 | 94.22 | 0.17 | 0.22 | 0.27 | 0.19 | 0.23 | 0.29 |
| 1.0 | 112.06 | 120.10 | 95.65 | 0.21 | 0.27 | 0.33 | 0.23 | 0.29 | 0.35 |
| 1.5 | 99.83 | 101.86 | 103.01 | 0.20 | 0.28 | 0.34 | 0.22 | 0.29 | 0.36 |
| 2.0 | 94.02 | 107.89 | 101.94 | 0.19 | 0.28 | 0.34 | 0.22 | 0.30 | 0.36 |
| 2.5 | 99.35 | 96.41 | 99.35 | 0.18 | 0.28 | 0.34 | 0.22 | 0.30 | 0.37 |
| 3.0 | 107.01 | 94.56 | 101.54 | 0.20 | 0.29 | 0.36 | 0.24 | 0.33 | 0.40 |
| 3.5 | 105.81 | 107.04 | 100.82 | 0.21 | 0.33 | 0.39 | 0.28 | 0.38 | 0.46 |
| 4.0 | 96.20 | 98.81 | 106.77 | 0.27 | 0.39 | 0.46 | 0.34 | 0.45 | 0.52 |
| 4.5 | 102.05 | 101.74 | 111.83 | 0.32 | 0.46 | 0.53 | 0.39 | 0.51 | 0.59 |
| 5.0 | 107.66 | 104.66 | 104.68 | 0.38 | 0.52 | 0.60 | 0.43 | 0.56 | 0.64 |
| 5.5 | 108.79 | 113.59 | 104.65 | 0.40 | 0.56 | 0.64 | 0.43 | 0.58 | 0.67 |
| 6.0 | 99.68 | 106.87 | 95.70 | 0.40 | 0.57 | 0.66 | 0.44 | 0.59 | 0.69 |
| 6.5 | 99.85 | 93.70 | 105.02 | 0.42 | 0.60 | 0.69 | 0.45 | 0.61 | 0.72 |
| 7.0 | 107.26 | 106.72 | 107.37 | 0.44 | 0.62 | 0.72 | 0.48 | 0.65 | 0.77 |
| 7.5 | 107.39 | 100.59 | 107.15 | 0.47 | 0.67 | 0.77 | 0.54 | 0.71 | 0.83 |
| 8.0 | 113.31 | 97.48 | 100.90 | 0.52 | 0.72 | 0.83 | 0.59 | 0.77 | 0.89 |
| 8.6 | 112.10 | 101.40 | 94.93 | 0.57 | 0.78 | 0.89 | 0.64 | 0.82 | 0.94 |
| 9.0 | 98.34 | 94.32 | 102.14 | 0.59 | 0.81 | 0.91 | 0.64 | 0.85 | 0.97 |
| 9.5 | 105.33 | 102.97 | 107.89 | 0.58 | 0.81 | 0.92 | 0.63 | 0.86 | 0.97 |
| 10.0 | 104.30 | 95.06 | 102.05 | 0.56 | 0.81 | 0.93 | 0.62 | 0.86 | 0.99 |
| 10.3 | 96.40 | 104.29 | 98.65 | 0.56 | 0.82 | 0.95 | 0.61 | 0.87 | 1.01 |
| 11.0 | 106.57 | 100.13 | 93.12 | 0.56 | 0.86 | 1.02 | 0.64 | 0.92 | 1.10 |
| 12.0 | 102.38 | 105.79 | 94.58 | 0.71 | 1.01 | 1.16 | 0.79 | 1.07 | 1.25 |
| 13.0 | 88.07 | 103.21 | 92.88 | 0.86 | 1.13 | 1.26 | 0.89 | 1.14 | 1.30 |
| 14.0 | 83.91 | 83.76 | 81.11 | 0.81 | 1.13 | 1.31 | 0.90 | 1.20 | 1.38 |
| 15.0 | 71.77 | 70.21 | 69.13 | 0.82 | 1.25 | 1.49 | 1.01 | 1.42 | 1.68 |
| 16.0 | 58.50 | 57.43 | 55.76 | 1.09 | 1.51 | 1.74 | 1.22 | 1.62 | 1.85 |
| 17.0 | 41.93 | 40.32 | 37.55 | 1.17 | 1.55 | 1.77 | 1.23 | 1.56 | 1.80 |
| 18.0 | 15.07 | 12.24 | 8.97 | 2.08 | 3.42 | 5.78 | 2.22 | 3.56 | 5.91 |
| 19.4 | 2.28 | 2.92 | 3.33 | 21.41 | 16.50 | 14.74 | 21.07 | 16.44 | 14.91 |
| 19.5 | 2.31 | 2.95 | 3.32 | 17.39 | 14.55 | 14.19 | 17.41 | 14.68 | 14.45 |
| 19.6 | 2.34 | 2.96 | 3.29 | 15.20 | 13.65 | 14.44 | 15.41 | 13.89 | 14.72 |
| 19.7 | 2.35 | 2.94 | 3.25 | 14.14 | 13.59 | 15.45 | 14.49 | 13.91 | 15.70 |
| 19.8 | 2.35 | 2.90 | 3.20 | 13.64 | 14.07 | 17.12 | 14.01 | 14.31 | 17.06 |
| 19.9 | 2.33 | 2.85 | 3.15 | 13.72 | 15.25 | 19.79 | 14.12 | 15.41 | 19.31 |
| 20.0 | 2.29 | 2.80 | 3.12 | 14.46 | 17.43 | 24.14 | 14.71 | 17.21 | 22.05 |
| 20.5 | 2.16 | 2.81 | 3.25 | 22.76 | 16.91 | 15.19 | 21.30 | 16.99 | 15.55 |
| 21.6 | 2.18 | 2.81 | 3.29 | 24.51 | 20.52 | 17.30 | 27.07 | 21.90 | 18.07 |
| 22.0 | 2.37 | 3.01 | 3.46 | 13.65 | 14.08 | 14.58 | 14.42 | 14.80 | 15.44 |
| 23.0 | 2.32 | 2.99 | 3.50 | 23.91 | 23.52 | 21.79 | 24.80 | 23.34 | 22.37 |
| 23.8 | 2.47 | 3.19 | 3.76 | 26.36 | 25.86 | 23.88 | 29.29 | 25.14 | 23.38 |
| 25.0 | 3.23 | 4.53 | 6.97 | 22.87 | 16.46 | 9.12 | 22.41 | 17.08 | 9.59 |
| 26.0 | 19.50 | 24.37 | 30.16 | 2.89 | 3.45 | 3.51 | 3.51 | 3.87 | 3.84 |
| 27.0 | 45.61 | 49.87 | 54.66 | 1.35 | 1.86 | 2.07 | 1.48 | 1.97 | 2.20 |
| 27.1 | 47.95 | 52.04 | 56.54 | 1.28 | 1.79 | 2.03 | 1.43 | 1.91 | 2.17 |
| 29.1 | 79.08 | 81.64 | 88.33 | 0.99 | 1.50 | 1.73 | 1.48 | 1.98 | 2.29 |
| 30.0 | 91.86 | 87.15 | 93.20 | 1.21 | 1.83 | 2.21 | 1.49 | 2.14 | 2.47 |
| 30.9 | 93.15 | 94.75 | 86.72 | 1.57 | 2.49 | 3.07 | 1.65 | 2.46 | 2.95 |
| 31.0 | 87.51 | 85.24 | 94.05 | 1.66 | 2.60 | 3.16 | 1.72 | 2.53 | 3.05 |
| 32.0 | 91.08 | 90.19 | 89.79 | 1.98 | 2.77 | 2.92 | 2.12 | 2.80 | 3.12 |
| 33.0 | 91.75 | 92.44 | 94.88 | 1.47 | 1.95 | 2.15 | 1.84 | 2.30 | 2.53 |
| 34.0 | 94.04 | 88.43 | 88.57 | 0.80 | 1.32 | 1.59 | 1.24 | 1.72 | 2.01 |
| 35.0 | 90.27 | 85.62 | 92.12 | 0.51 | 1.14 | 1.44 | 0.86 | 1.46 | 1.78 |
| 36.0 | 83.54 | 92.05 | 87.24 | 0.76 | 1.47 | 1.85 | 0.90 | 1.68 | 2.11 |
| 36.3 | 94.88 | 90.35 | 103.59 | 0.88 | 1.65 | 2.07 | 1.09 | 1.93 | 2.48 |
| 37.0 | 83.88 | 86.99 | 85.93 | 1.51 | 2.42 | 3.00 | 1.91 | 2.83 | 3.50 |
| 38.0 | 86.77 | 84.84 | 78.05 | 2.57 | 3.70 | 4.18 | 2.68 | 3.49 | 4.13 |
| 40.0 | 77.69 | 76.84 | 82.38 | 1.09 | 1.68 | 2.07 | 1.27 | 1.86 | 2.21 |

*Typical Performance Data*

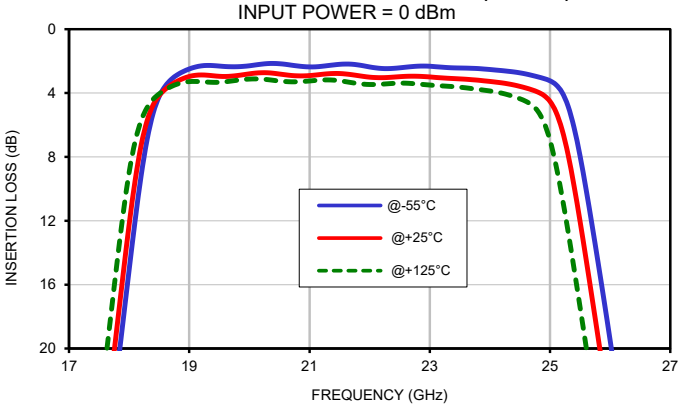
| FREQ. (GHz) | GROUP DELAY (nsec) | | |
|---|---|---|---|
| | @-55°C | @+25°C | @+125°C |
| 19 | 0.69 | 0.67 | 0.66 |
| 20 | 0.67 | 0.66 | 0.65 |
| 20 | 0.66 | 0.65 | 0.64 |
| 20 | 0.65 | 0.64 | 0.63 |
| 20 | 0.64 | 0.63 | 0.63 |
| 20 | 0.63 | 0.63 | 0.62 |
| 20 | 0.62 | 0.62 | 0.62 |
| 20 | 0.62 | 0.61 | 0.61 |
| 20 | 0.61 | 0.61 | 0.61 |
| 20 | 0.61 | 0.60 | 0.60 |
| 20 | 0.60 | 0.60 | 0.60 |
| 21 | 0.60 | 0.60 | 0.60 |
| 21 | 0.60 | 0.59 | 0.59 |
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| 21 | 0.58 | 0.58 | 0.58 |
| 22 | 0.58 | 0.58 | 0.58 |
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| 23 | 0.58 | 0.58 | 0.59 |
| 23 | 0.58 | 0.58 | 0.59 |
| 23 | 0.58 | 0.59 | 0.59 |
| 23 | 0.58 | 0.59 | 0.60 |
| 23 | 0.59 | 0.59 | 0.60 |
| 23 | 0.59 | 0.59 | 0.60 |
| 23 | 0.59 | 0.60 | 0.61 |
| 23 | 0.60 | 0.61 | 0.62 |
| 24 | 0.62 | 0.63 | 0.65 |

*Typical Performance Curves*

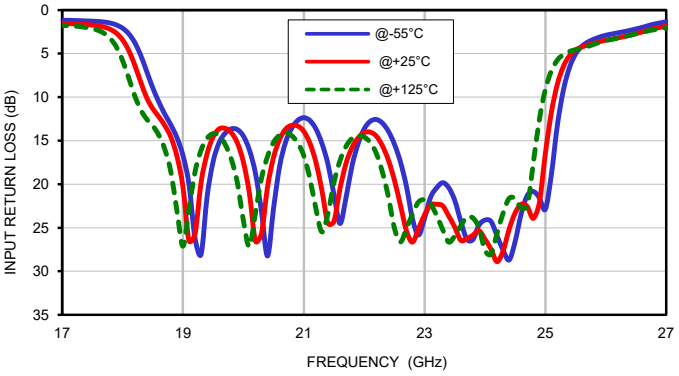
**INSERTION LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm



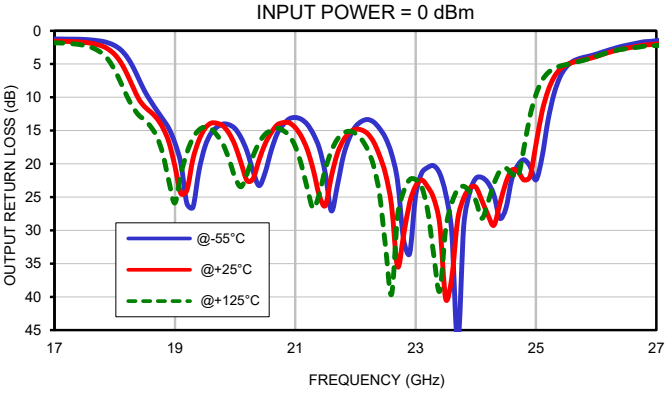

**INSERTION LOSS vs. TEMPERATURE (Zoomed)**
INPUT POWER = 0 dBm



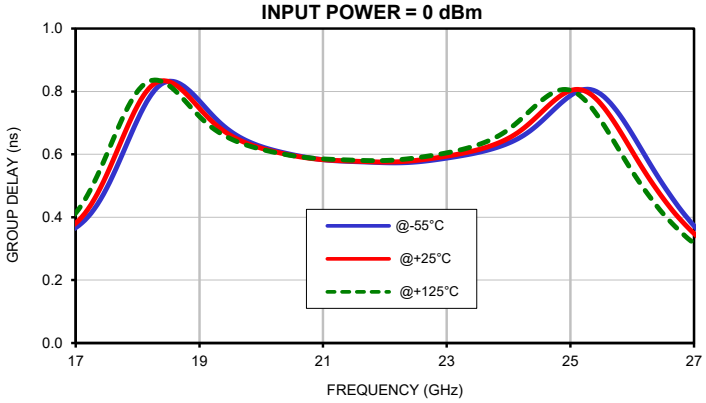

**INPUT RETURN LOSS vs. TEMPERATURE**
INPUT POWER = 0 dBm




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



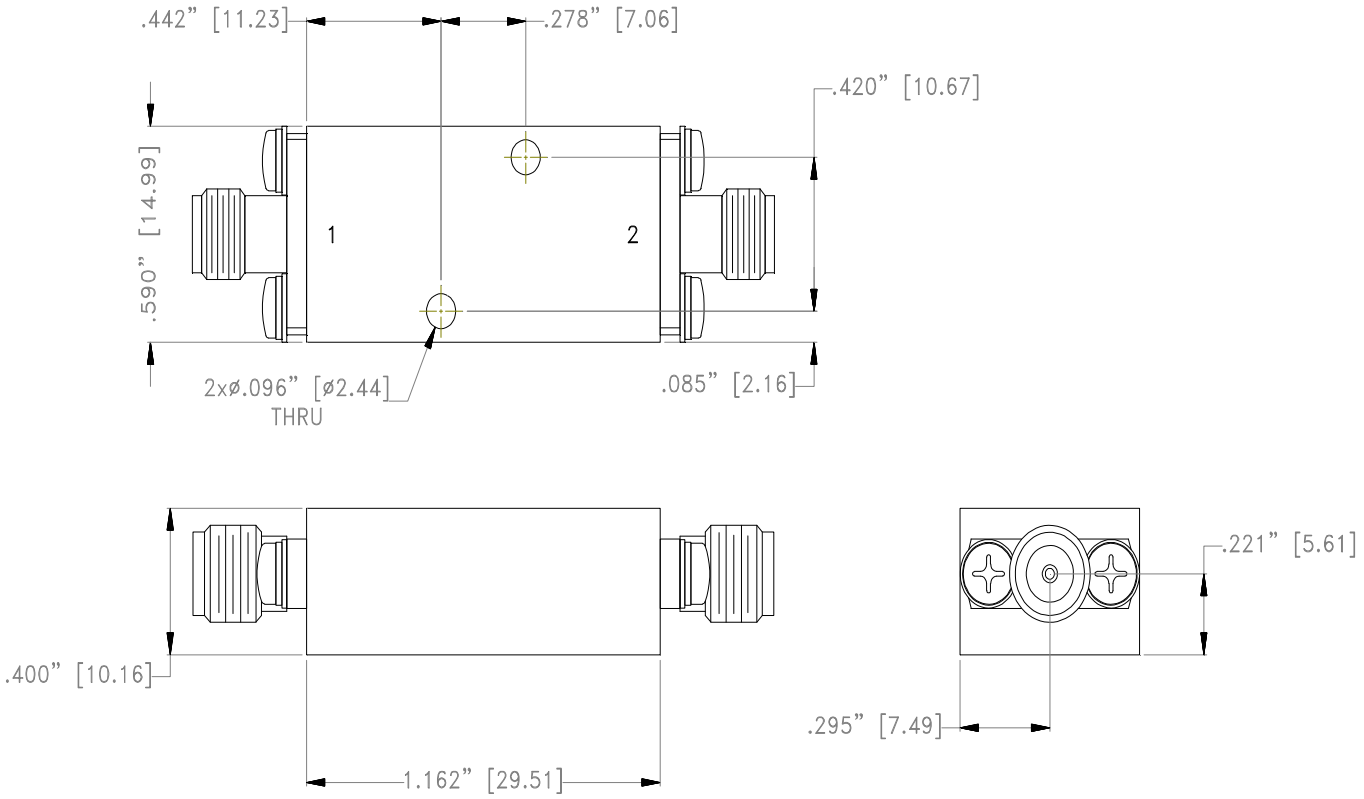

**GROUP DELAY vs. TEMPERATURE**
**INPUT POWER = 0 dBm**



# Case Style BBW

## Outline Dimension

**BBW3851**




**Dimensions are in inches [mm]. Tolerances: 2 Pl ± .030 [.76]; 3 Pl ± .015[.38]**

**Notes:**

1. Case material: Brass alloy.
2. Case finish:
   a. Case & Cover of the units-Gold plating.
3. Unit weight: 37g
4. Refer to the individual model data sheet for the type of connectors available.


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RF/IF MICROWAVE COMPONENTS




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# Environmental Specifications ENV124

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 125° C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 125° C<br>Ambient Environment | Individual Model Data Sheet |


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