

# Coaxial Frequency Mixer

## ZAD-8+

Level 7 (LO Power +7 dBm) 0.0005 to 10 MHz



Generic photo used for illustration purposes only

CASE STYLE: M22

| Connectors            | Model  |
|-----------------------|--------|
| BNC                   | ZAD-8+ |
| BRACKET (OPTION "B")  |        |
| BRACKET (OPTION "BR") |        |

**+RoHS Compliant**

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

### Maximum Ratings

|                       |                |
|-----------------------|----------------|
| Operating Temperature | -55°C to 100°C |
| Storage Temperature   | -55°C to 100°C |
| RF Power              | 50mW           |
| IF Current            | 40mA           |

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

### Coaxial Connections

|    |   |
|----|---|
| LO | 1 |
| RF | 3 |
| IF | 2 |

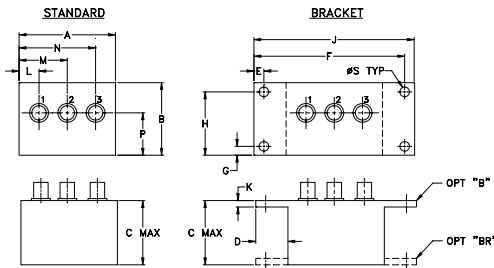
### Features

- low conversion loss, 5.79 dB typ.
- high L-R & L-I isolation, 50 dB typ.
- rugged shielded case

### Applications

- AM radio
- instrumentation

### Outline Drawing



### Outline Dimensions (inch/mm)

| A     | B     | C     | D     | E    | F     | G    | H     |
|-------|-------|-------|-------|------|-------|------|-------|
| 2.25  | 1.38  | 1.24  | .50   | .150 | 3.100 | .138 | 1.238 |
| 57.15 | 35.05 | 31.50 | 12.70 | 3.81 | 78.74 | 3.51 | 31.45 |

| J     | K    | L     | M     | N     | P     | S    | wt    |
|-------|------|-------|-------|-------|-------|------|-------|
| 3.25  | .10  | .40   | 1.15  | 1.86  | .64   | .150 | grams |
| 82.55 | 2.54 | 10.16 | 29.21 | 47.24 | 16.26 | 3.81 | 74.0  |

### Electrical Specifications

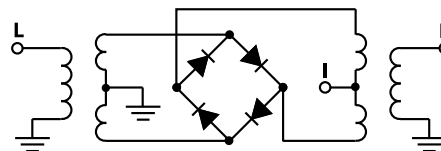
| FREQUENCY (MHz) | CONVERSION LOSS (dB) | LO-RF ISOLATION (dB) |      |     |     |    |    | LO-IF ISOLATION (dB) |    |    |    |    |    |    |    |    |    |
|-----------------|----------------------|----------------------|------|-----|-----|----|----|----------------------|----|----|----|----|----|----|----|----|----|
|                 |                      | L                    |      | M   |     | U  |    | L                    |    | M  |    | U  |    |    |    |    |    |
| 0.0005-10       | DC-10                | 5.79                 | 0.05 | 7.5 | 8.5 | 60 | 50 | 50                   | 40 | 45 | 35 | 60 | 50 | 50 | 40 | 45 | 35 |

1 dB COMP.: +1 dB typ.      L = low range [ $f_L$  to  $10 f_L$ ]      M = mid range [ $10 f_L$  to  $f_U/2$ ]      U = upper range [ $f_U/2$  to  $f_U$ ]  
m = mid band [ $2f_L$  to  $f_U/2$ ]

### Typical Performance Data

| Frequency (MHz) |      | Conversion Loss (dB) | VSWR RF Port (:1) | Frequency | VSWR LO Port (:1) | Isolation L-R (dB) | Isolation L-I (dB) |
|-----------------|------|----------------------|-------------------|-----------|-------------------|--------------------|--------------------|
| RF              | LO   | LO +7dBm             | LO +7dBm          | RF        | LO +7dBm          | LO +7dBm           | LO +7dBm           |
| 0.001           | 3.00 | 5.26                 | 1.41              | 0.001     | 3.30              | 71.79              | 72.81              |
| 0.002           | 3.00 | 4.96                 | 1.37              | 0.002     | 2.70              | 75.56              | 77.65              |
| 0.005           | 3.01 | 4.92                 | 1.38              | 0.005     | 2.54              | 73.77              | 80.99              |
| 0.010           | 3.01 | 4.88                 | 1.37              | 0.010     | 2.46              | 71.40              | 77.86              |
| 0.020           | 3.02 | 4.84                 | 1.37              | 0.020     | 2.41              | 71.40              | 76.56              |
| 0.050           | 3.05 | 4.84                 | 1.38              | 0.050     | 2.32              | 72.03              | 78.06              |
| 0.100           | 3.10 | 4.79                 | 1.38              | 0.100     | 2.29              | 71.80              | 78.10              |
| 0.200           | 3.20 | 4.88                 | 1.38              | 0.200     | 2.21              | 71.48              | 77.93              |
| 0.500           | 3.50 | 4.86                 | 1.37              | 0.500     | 2.10              | 71.98              | 77.73              |
| 0.700           | 3.70 | 4.83                 | 1.37              | 0.700     | 1.98              | 71.80              | 78.54              |
| 1.000           | 4.00 | 4.88                 | 1.37              | 1.000     | 1.95              | 71.65              | 75.42              |
| 1.430           | 4.43 | 4.91                 | 1.37              | 1.430     | 1.94              | 71.81              | 71.58              |
| 2.000           | 5.00 | 4.91                 | 1.36              | 2.000     | 1.96              | 72.01              | 60.03              |
| 2.858           | 5.86 | 4.97                 | 1.37              | 2.858     | 2.01              | 71.64              | 64.97              |
| 4.287           | 7.29 | 5.16                 | 1.36              | 4.287     | 2.03              | 71.16              | 59.48              |
| 5.001           | 8.00 | 5.17                 | 1.36              | 5.001     | 2.02              | 71.48              | 58.45              |
| 6.429           | 9.43 | 5.18                 | 1.36              | 6.429     | 1.98              | 70.78              | 54.45              |
| 7.143           | 4.14 | 5.21                 | 1.36              | 7.143     | 1.94              | 70.73              | 53.39              |
| 8.572           | 5.57 | 5.23                 | 1.36              | 8.572     | 1.92              | 70.34              | 50.80              |
| 10.000          | 7.00 | 5.22                 | 1.35              | 10.000    | 1.90              | 70.20              | 48.53              |

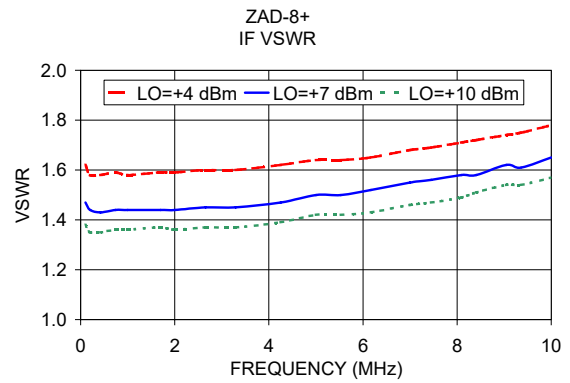
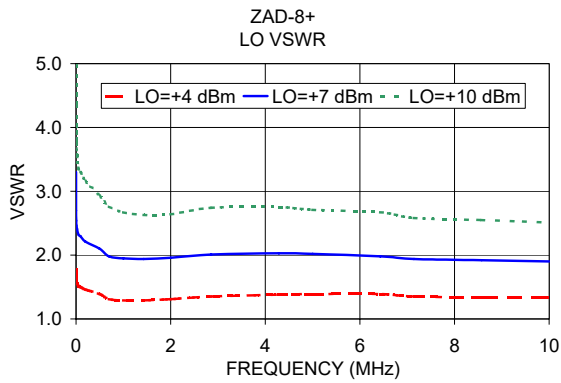
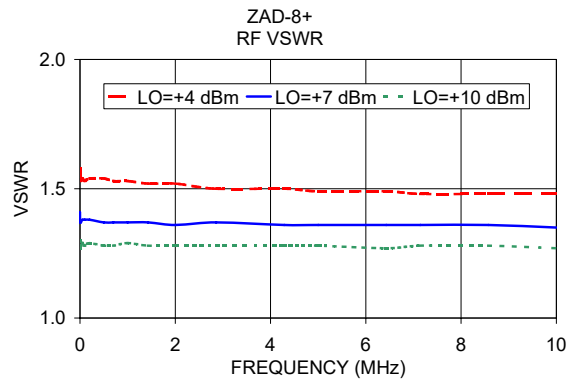
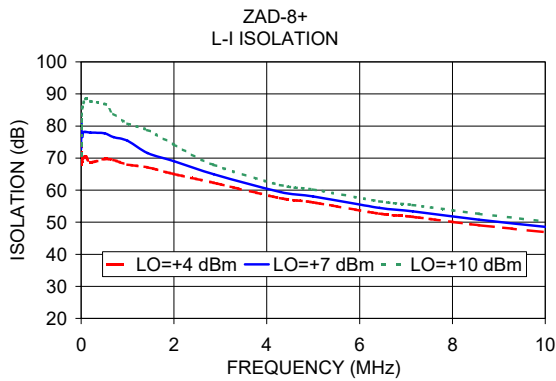
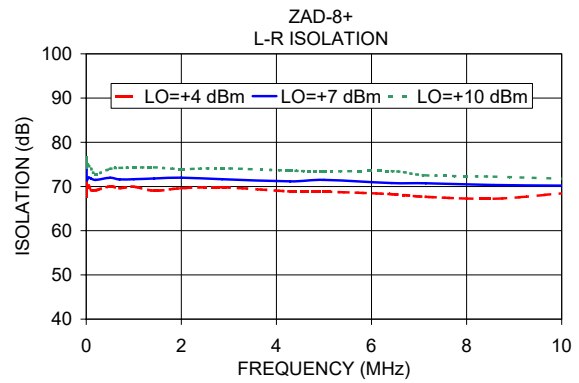
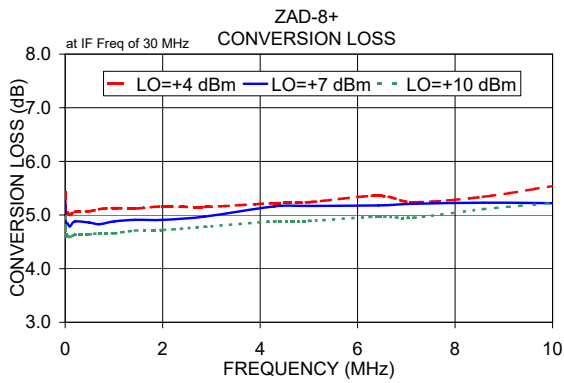
### Electrical Schematic



### Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
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# Frequency Mixer

# ZAD-8+

## Typical Performance Data

| RF<br>(MHz) | LO<br>(MHz) | CONVERSION LOSS<br>(dB) |      |      | LO<br>(MHz) | LO-RF ISOLATION<br>(dB) |       |       | LO-IF ISOLATION<br>(dB) |       |       |
|-------------|-------------|-------------------------|------|------|-------------|-------------------------|-------|-------|-------------------------|-------|-------|
|             |             | @LO (dBm)               |      |      |             | @LO (dBm)               |       |       | @LO (dBm)               |       |       |
|             |             | +4                      | +7   | +10  |             | +4                      | +7    | +10   | +4                      | +7    | +10   |
| 0.001       | 3.0         | 5.43                    | 5.26 | 4.97 | 0.001       | 63.49                   | 67.32 | 68.05 | 64.00                   | 67.00 | 70.00 |
| 0.002       | 3.0         | 5.18                    | 4.96 | 4.76 | 0.002       | 63.34                   | 67.15 | 67.96 | 64.00                   | 67.00 | 70.00 |
| 0.005       | 3.0         | 4.98                    | 4.92 | 4.61 | 0.005       | 63.46                   | 67.23 | 67.72 | 64.00                   | 67.00 | 70.00 |
| 0.01        | 3.0         | 4.96                    | 4.88 | 4.59 | 0.01        | 63.99                   | 67.03 | 67.90 | 64.00                   | 67.00 | 70.00 |
| 0.02        | 3.0         | 5.04                    | 4.84 | 4.64 | 0.02        | 64.00                   | 66.98 | 68.02 | 64.00                   | 67.00 | 70.00 |
| 0.05        | 3.1         | 5.04                    | 4.84 | 4.61 | 0.05        | 64.00                   | 66.86 | 68.43 | 64.00                   | 67.00 | 70.00 |
| 0.10        | 3.1         | 5.00                    | 4.79 | 4.59 | 0.10        | 64.00                   | 67.00 | 68.45 | 64.00                   | 67.00 | 70.00 |
| 0.20        | 3.2         | 5.06                    | 4.88 | 4.63 | 0.20        | 64.00                   | 67.00 | 68.61 | 64.00                   | 67.00 | 70.00 |
| 0.50        | 3.5         | 5.07                    | 4.86 | 4.64 | 0.50        | 64.00                   | 66.98 | 68.77 | 64.00                   | 67.00 | 70.00 |
| 0.70        | 3.7         | 5.11                    | 4.83 | 4.66 | 0.70        | 64.00                   | 67.00 | 68.83 | 64.00                   | 67.00 | 70.00 |
| 1.00        | 4.0         | 5.13                    | 4.88 | 4.66 | 1.00        | 64.00                   | 66.64 | 67.78 | 64.00                   | 67.00 | 70.00 |
| 1.43        | 4.4         | 5.12                    | 4.91 | 4.71 | 1.43        | 64.00                   | 65.85 | 65.86 | 64.00                   | 67.00 | 70.00 |
| 2.00        | 5.0         | 5.16                    | 4.91 | 4.72 | 2.00        | 63.68                   | 64.48 | 63.99 | 64.00                   | 67.00 | 70.00 |
| 2.86        | 5.9         | 5.15                    | 4.97 | 4.78 | 2.86        | 59.08                   | 57.58 | 56.32 | 64.00                   | 67.00 | 70.00 |
| 4.29        | 7.3         | 5.22                    | 5.16 | 4.88 | 4.29        | 54.41                   | 53.00 | 52.31 | 64.00                   | 67.00 | 70.00 |
| 5.00        | 8.0         | 5.24                    | 5.17 | 4.89 | 5.00        | 51.08                   | 50.13 | 50.21 | 64.00                   | 67.00 | 70.00 |
| 6.43        | 9.4         | 5.36                    | 5.18 | 4.97 | 6.43        | 48.83                   | 48.56 | 48.77 | 64.00                   | 67.00 | 70.00 |
| 7.14        | 4.1         | 5.24                    | 5.21 | 4.95 | 7.14        | 45.65                   | 45.59 | 45.96 | 64.00                   | 67.00 | 70.00 |
| 8.57        | 5.6         | 5.34                    | 5.23 | 5.11 | 8.57        | 43.01                   | 43.14 | 43.64 | 64.00                   | 67.00 | 70.00 |
| 10.00       | 7.0         | 5.54                    | 5.22 | 5.22 | 10.00       | 42.01                   | 42.01 | 42.22 | 64.00                   | 67.00 | 70.00 |

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ZAD-8+  
070509

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# Frequency Mixer

# ZAD-8+

## Typical Performance Data

| RF/LO<br>(MHz) | RF VSWR<br>(:1) |      |      | LO VSWR<br>(:1) |      |      | IF<br>(MHz) | IF VSWR<br>(:1) |      |      | LO/RF<br>(MHz) | max.<br>DC<br>output<br>(mV) | DC<br>Offset<br>(mV) |
|----------------|-----------------|------|------|-----------------|------|------|-------------|-----------------|------|------|----------------|------------------------------|----------------------|
|                | @LO (dBm)       |      |      | @LO (dBm)       |      |      |             | @LO (dBm)       |      |      | @LO<br>(dBm)   |                              |                      |
|                | +4              | +7   | +10  | +4              | +7   | +10  |             | +4              | +7   | +10  | +7             |                              |                      |
| 0.1            | 1.58            | 1.41 | 1.30 | 1.78            | 3.30 | 7.11 | 0.1         | 1.62            | 1.47 | 1.38 | 0.001          | -275.2                       | -0.11                |
| 0.2            | 1.54            | 1.37 | 1.27 | 1.64            | 2.70 | 4.36 | 0.2         | 1.58            | 1.44 | 1.35 | 0.005          | -271.2                       | -0.13                |
| 0.4            | 1.54            | 1.38 | 1.28 | 1.57            | 2.54 | 3.76 | 0.4         | 1.58            | 1.43 | 1.35 | 0.01           | -264.3                       | -0.13                |
| 0.7            | 1.53            | 1.37 | 1.28 | 1.55            | 2.46 | 3.67 | 0.7         | 1.59            | 1.44 | 1.36 | 0.02           | -261.9                       | -0.13                |
| 1.0            | 1.54            | 1.37 | 1.28 | 1.56            | 2.41 | 3.56 | 1.0         | 1.58            | 1.44 | 1.36 | 0.05           | -262.0                       | -0.12                |
| 1.7            | 1.54            | 1.38 | 1.29 | 1.51            | 2.32 | 3.35 | 1.7         | 1.59            | 1.44 | 1.37 | 0.10           | -259.7                       | -0.12                |
| 2.0            | 1.53            | 1.38 | 1.28 | 1.50            | 2.29 | 3.30 | 2.0         | 1.59            | 1.44 | 1.36 | 0.20           | -261.0                       | -0.12                |
| 2.7            | 1.54            | 1.38 | 1.29 | 1.46            | 2.21 | 3.16 | 2.7         | 1.60            | 1.45 | 1.37 | 0.50           | -262.4                       | -0.13                |
| 3.3            | 1.54            | 1.37 | 1.28 | 1.39            | 2.10 | 2.93 | 3.3         | 1.60            | 1.45 | 1.37 | 0.70           | -264.8                       | -0.13                |
| 4.3            | 1.53            | 1.37 | 1.28 | 1.31            | 1.98 | 2.76 | 4.3         | 1.62            | 1.47 | 1.39 | 1.00           | -265.8                       | -0.13                |
| 5.0            | 1.53            | 1.37 | 1.29 | 1.29            | 1.95 | 2.67 | 5.0         | 1.64            | 1.50 | 1.42 | 2.00           | -266.1                       | -0.13                |
| 5.5            | 1.52            | 1.37 | 1.28 | 1.29            | 1.94 | 2.63 | 5.5         | 1.64            | 1.50 | 1.42 | 3.33           | -259.8                       | -0.13                |
| 6.2            | 1.52            | 1.36 | 1.28 | 1.31            | 1.96 | 2.64 | 6.2         | 1.65            | 1.52 | 1.43 | 4.17           | -258.1                       | -0.12                |
| 7.0            | 1.50            | 1.37 | 1.28 | 1.35            | 2.01 | 2.74 | 7.0         | 1.68            | 1.55 | 1.46 | 5.00           | -255.2                       | -0.12                |
| 7.4            | 1.50            | 1.36 | 1.28 | 1.38            | 2.03 | 2.75 | 7.4         | 1.69            | 1.56 | 1.47 | 5.83           | -250.6                       | -0.12                |
| 8.1            | 1.49            | 1.36 | 1.28 | 1.39            | 2.02 | 2.71 | 8.1         | 1.71            | 1.58 | 1.49 | 6.67           | -246.6                       | -0.09                |
| 8.4            | 1.49            | 1.36 | 1.27 | 1.39            | 1.98 | 2.67 | 8.4         | 1.72            | 1.58 | 1.51 | 7.00           | -247.1                       | -0.10                |
| 9.0            | 1.48            | 1.36 | 1.28 | 1.35            | 1.94 | 2.58 | 9.0         | 1.74            | 1.62 | 1.54 | 7.50           | -246.8                       | -0.13                |
| 9.4            | 1.48            | 1.36 | 1.28 | 1.34            | 1.92 | 2.55 | 9.4         | 1.75            | 1.61 | 1.54 | 8.33           | -247.7                       | -0.09                |
| 10.0           | 1.48            | 1.35 | 1.27 | 1.34            | 1.90 | 2.51 | 10.0        | 1.78            | 1.65 | 1.57 | 10.00          | -247.8                       | -0.11                |

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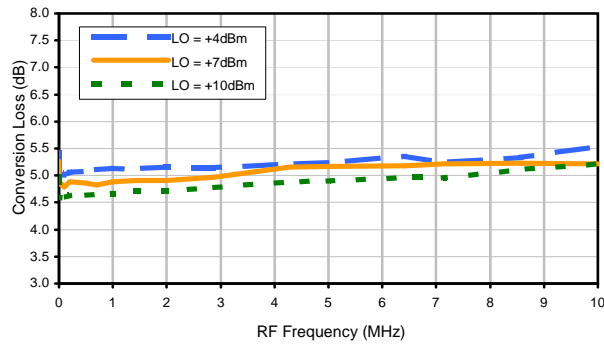


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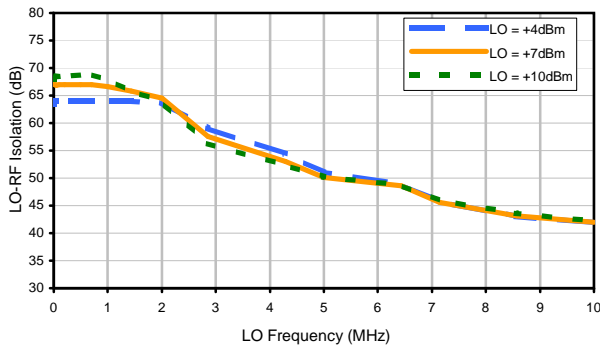


## Typical Performance Curves

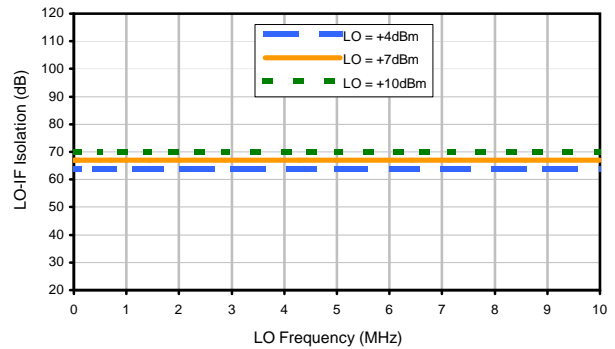
Conversion Loss



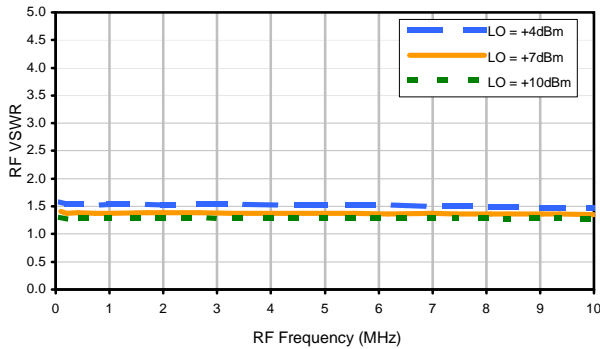
LO-RF Isolation



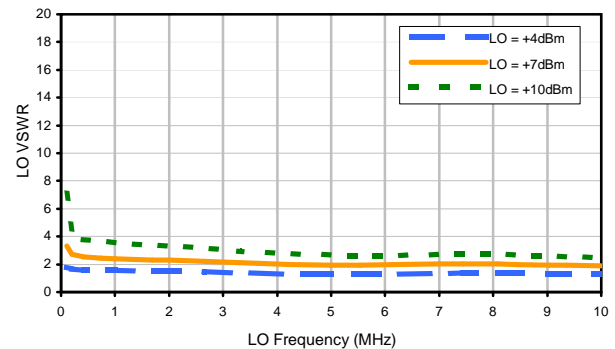
LO-IF Isolation



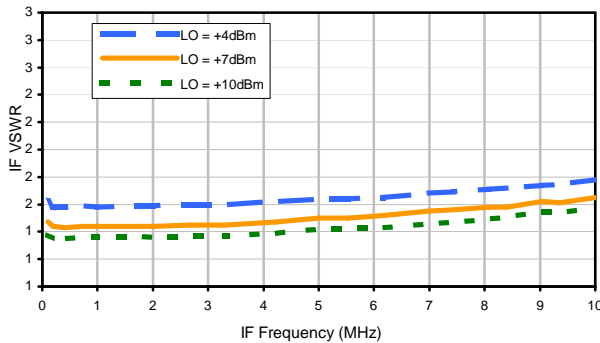
RF VSWR



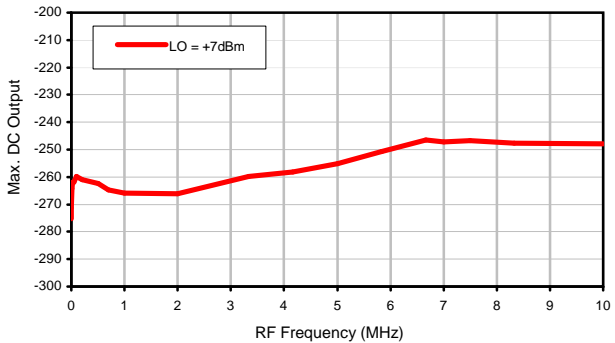
LO VSWR



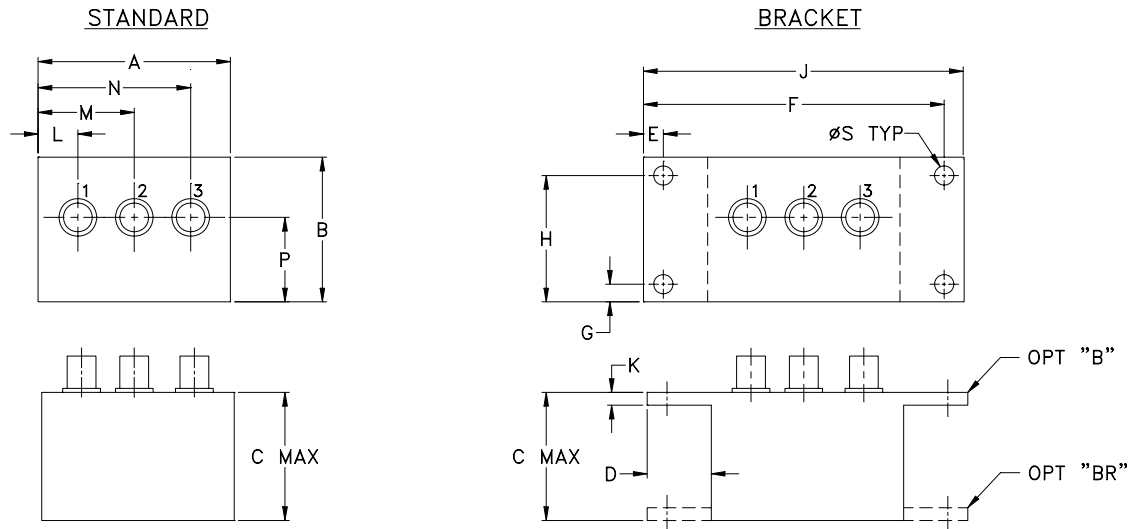
IF VSWR



Max. DC Output



## Outline Dimensions



| CASE# | A               | B               | C               | D              | E              | F                | G              | H                | J               | K             | L              | M               | N               |
|-------|-----------------|-----------------|-----------------|----------------|----------------|------------------|----------------|------------------|-----------------|---------------|----------------|-----------------|-----------------|
| M21   | 1.50<br>(38.10) | 1.13<br>(28.70) | 1.00<br>(25.40) | .50<br>(12.70) | .155<br>(3.94) | 2.345<br>(59.56) | .138<br>(3.51) | .987<br>(25.07)  | 2.50<br>(63.50) | .10<br>(2.54) | .31<br>(7.87)  | .75<br>(19.05)  | 1.19<br>(30.23) |
| M22   | 2.25<br>(57.15) | 1.38<br>(35.05) | 1.24<br>(31.50) |                | .150<br>(3.81) | 3.100<br>(78.74) |                | 1.238<br>(31.45) | 3.25<br>(82.55) |               | .40<br>(10.16) | 1.15<br>(29.21) | 1.86<br>(47.24) |
| M23   | 2.25<br>(57.15) | 1.38<br>(35.05) | 1.24<br>(31.50) |                | .150<br>(3.81) | 3.100<br>(78.74) |                | 1.238<br>(31.45) | 3.25<br>(82.55) |               | .63<br>(16.00) | 1.06<br>(26.92) | 1.63<br>(41.40) |

| CASE# | P              | Q  | R  | S              | WT. GRAMS |
|-------|----------------|----|----|----------------|-----------|
| M21   | .66<br>(16.76) | -- | -- | .150<br>(3.81) | 40.0      |
| M22   | .64<br>(16.26) | -- | -- |                | 74.0      |
| M23   | .69<br>(17.53) | -- | -- |                | 70.0      |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

- Case material: Aluminum alloy.
- Case finish:
  - For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
  - For Non-RoHS Case Styles: Yellow hexavalent chrome based conversion coating.

Due to transition from non-RoHS to RoHS, models will be supplied with either case style finish until the non-RoHS case inventory is depleted.
- Mounting bracket available on request. For bracket mounted on connector end add suffix B to part number and add \$5.00 to unit cost. For bracket mounted on the rear, add suffix BR to part number and add \$1.50 to unit cost.



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.

| <b>Specification</b>       | <b>Test/Inspection Condition</b>   | <b>Reference/Spec</b>                |
|----------------------------|--|--------------------------------------|
| 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          |
| Barometric Pressure        | 100,000 Feet   | MIL-STD-202, Method 105, Condition D |
| Humidity                   | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103              |
| Thermal Shock              | -65° to 125°C, 5 cycles  | MIL-STD-202, Method 107, Condition B |
| 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           | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)                          | MIL-STD-202, Method 213, Condition I |