

# Coaxial Attenuator/Switch

## ZAS-3+

50Ω Bi-Phase 1 to 200 MHz

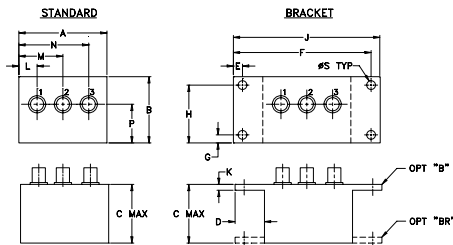
### Maximum Ratings

|   |                |
|---|----------------|
| Operating Temperature   | -55°C to 100°C |
| Storage Temperature   | -55°C to 100°C |
| Control Current   | 30mA           |
| Permanent damage may occur if any of these limits are exceeded. |                |

### Coaxial Connections

|         |   |
|---------|---|
| INPUT   | 3 |
| OUTPUT  | 1 |
| CONTROL | 2 |

### 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  |

### Features

- wideband, 1 to 200 MHz
- rugged shielded case
- excellent phase and amplitude unbalance
- low insertion loss, 1.6 dB typ.

### Applications

- bi-phase modulator
- electronic attenuator



CASE STYLE: M22  
Connectors Model  
BNC ZAS-3+  
BRACKET (OPTION "B")  
BRACKET (OPTION "BR")

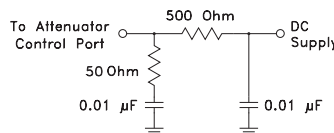
**+RoHS Compliant**  
The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

### Attenuator/Switch Electrical Specifications

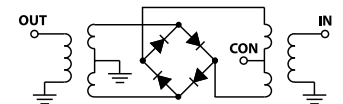
| FREQUENCY (MHz) | INSERTION LOSS (dB) ±20 mA | MAX. INPUT PWR (dBm) ±20mA | IN-OUT ISOLATION (dB) 0 mA |    |    | BI-PHASE X̄ (±20 mA) Typ. |                                  |    |      |     |     |     |
|-----------------|----------------------------|----------------------------|----------------------------|----|----|---------------------------|----------------------------------|----|------|-----|-----|-----|
|                 |                            |                            | L                          | M  | U  | Δ AMP (dB)                | Phase (deg.) deviation from 180° |    |      |     |     |     |
| 1-200           | DC-0.05                    | 15 30                      | 65                         | 50 | 50 | 40                        | 50                               | 35 | 0.10 | 0.1 | 0.5 | 1.0 |

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 = [ $2 f_L$  to  $f_U/2$ ]  
Performance specifications apply for input power up to 10 dB below stated 1 dB compression.

### suggested control port biasing configuration

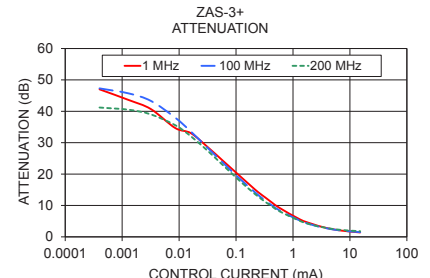
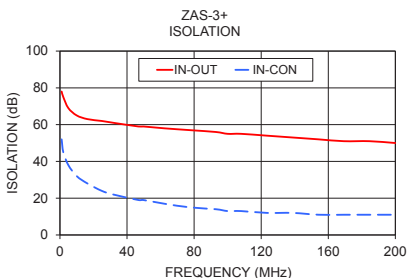
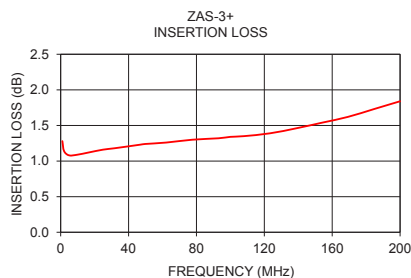


### electrical schematic



### Typical Performance Data

| Freq. (MHz) | I. Loss (dB) at 20mA | ±Control ΔΔAMP (dB) | 20mA ΔΔPhase (deg.) | Isolation (dB) (in-con) | Input R. Loss (dB) | Control Current (mA) | Attenuation (dB) |         |         | Phase Δ ref at 15mA Ctrl deg. |         |         | Input VSWR |         |         |      |     |
|-------------|----------------------|---------------------|---------------------|-------------------------|--------------------|----------------------|------------------|---------|---------|-------------------------------|---------|---------|------------|---------|---------|------|-----|
|             |                      |                     |                     |                         |                    |                      | 1 MHz            | 100 MHz | 200 MHz | 1 MHz                         | 100 MHz | 200 MHz | 1 MHz      | 100 MHz | 200 MHz |      |     |
| 1.0         | 1.28                 | 0.002               | 0.01                | 180.0                   | 78                 | 52                   | 23.5             | 0.0000  | 50.3    | 47.8                          | 41.7    | 26.3    | 69.1       | 69.7    | 13.6    | 11.6 | 8.1 |
| 2.0         | 1.14                 | 0.002               | 0.01                | 180.0                   | 75                 | 45                   | 28.1             | 0.0004  | 47.0    | 47.3                          | 41.2    | 19.0    | 65.6       | 65.4    | 13.5    | 11.6 | 8.0 |
| 5.0         | 1.08                 | 0.002               | 0.01                | 180.0                   | 69                 | 38                   | 35.4             | 0.0013  | 43.6    | 45.7                          | 40.5    | 10.3    | 50.0       | 58.2    | 13.3    | 11.5 | 8.0 |
| 10.0        | 1.09                 | 0.002               | 0.01                | 180.0                   | 65                 | 32                   | 43.0             | 0.0032  | 40.7    | 43.3                          | 39.0    | 5.7     | 36.8       | 46.4    | 12.9    | 11.3 | 7.9 |
| 16.4        | 1.12                 | 0.002               | 0.01                | 179.9                   | 63                 | 28                   | 42.7             | 0.0085  | 34.7    | 38.0                          | 35.6    | 6.3     | 20.9       | 29.7    | 12.5    | 10.9 | 7.7 |
| 24.9        | 1.16                 | 0.002               | 0.01                | 179.9                   | 62                 | 24                   | 37.5             | 0.0162  | 33.0    | 33.5                          | 32.0    | 6.6     | 12.3       | 19.1    | 11.7    | 10.3 | 7.4 |
| 31.8        | 1.18                 | 0.002               | 0.01                | 179.9                   | 61                 | 22                   | 35.2             | 0.0336  | 28.2    | 27.9                          | 27.0    | 7.2     | 7.0        | 10.3    | 10.5    | 9.2  | 6.8 |
| 46.8        | 1.23                 | 0.001               | 0.02                | 179.8                   | 59                 | 19                   | 31.6             | 0.0567  | 24.5    | 23.9                          | 23.1    | 7.5     | 4.7        | 6.0     | 9.3     | 8.1  | 6.1 |
| 49.8        | 1.24                 | 0.001               | 0.02                | 179.8                   | 59                 | 19                   | 31.0             | 0.0807  | 22.0    | 21.2                          | 20.5    | 7.7     | 3.9        | 4.3     | 8.3     | 7.3  | 5.6 |
| 62.2        | 1.26                 | 0.002               | 0.02                | 179.8                   | 58                 | 17                   | 28.7             | 0.1215  | 19.1    | 18.2                          | 17.5    | 7.5     | 3.0        | 2.9     | 7.1     | 6.2  | 4.9 |
| 77.6        | 1.30                 | 0.001               | 0.02                | 179.7                   | 57                 | 15                   | 26.4             | 0.1860  | 16.1    | 15.2                          | 14.6    | 7.1     | 2.4        | 1.8     | 5.8     | 5.1  | 4.2 |
| 93.0        | 1.32                 | 0.001               | 0.02                | 179.6                   | 56                 | 14                   | 24.4             | 0.2459  | 14.2    | 13.3                          | 12.8    | 6.5     | 2.1        | 1.4     | 5.0     | 4.5  | 3.7 |
| 100.0       | 1.34                 | 0.001               | 0.02                | 179.6                   | 55                 | 13                   | 23.5             | 0.3285  | 12.5    | 11.5                          | 11.1    | 6.3     | 1.8        | 1.1     | 4.3     | 3.8  | 3.2 |
| 108.0       | 1.35                 | 0.001               | 0.02                | 179.6                   | 55                 | 13                   | 22.6             | 0.4365  | 10.8    | 9.9                           | 9.6     | 5.7     | 1.6        | 0.9     | 3.6     | 3.3  | 2.8 |
| 123.4       | 1.39                 | 0.001               | 0.02                | 179.5                   | 54                 | 12                   | 21.0             | 0.5714  | 9.3     | 8.5                           | 8.2     | 5.1     | 1.4        | 0.7     | 3.1     | 2.8  | 2.5 |
| 138.8       | 1.46                 | 0.001               | 0.02                | 179.5                   | 53                 | 12                   | 19.5             | 1.3114  | 5.6     | 5.2                           | 5.1     | 3.3     | 0.8        | 0.3     | 2.0     | 1.9  | 1.7 |
| 154.2       | 1.54                 | 0.001               | 0.02                | 179.4                   | 52                 | 11                   | 18.2             | 2.0989  | 4.2     | 3.9                           | 3.9     | 2.3     | 0.6        | 0.3     | 1.6     | 1.6  | 1.5 |
| 169.2       | 1.62                 | 0.001               | 0.02                | 179.5                   | 51                 | 11                   | 17.0             | 3.7220  | 2.9     | 2.8                           | 2.9     | 1.3     | 0.3        | 0.1     | 1.3     | 1.3  | 1.3 |
| 184.6       | 1.73                 | 0.001               | 0.02                | 179.5                   | 51                 | 11                   | 15.9             | 7.0357  | 2.0     | 2.0                           | 2.2     | 0.5     | 0.2        | 0.0     | 1.2     | 1.2  | 1.2 |
| 200.0       | 1.84                 | 0.002               | 0.03                | 179.6                   | 50                 | 11                   | 14.8             | 15.1415 | 1.4     | 1.5                           | 1.8     | 0.0     | 0.0        | 0.0     | 1.1     | 1.1  | 1.1 |



### 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-Circuits' applicable established test performance criteria and measurement instructions.
- 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](http://www.minicircuits.com/MCLStore/terms.jsp)



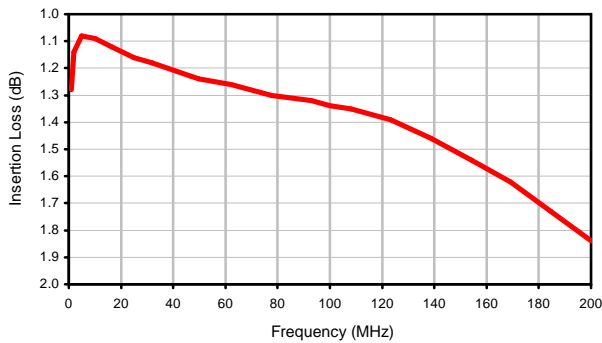
## Typical Performance Data

| FREQ.<br>(MHz) | INSERTION<br>LOSS<br>(dB)<br>at 20mA<br>Control<br>Current | AMP.<br>UNBAL.<br>(dB)<br>at ± 20mA<br>Control<br>Current | PHASE<br>UNBAL.<br>(deg.)<br>at ± 20mA<br>Control<br>Current | ISOLATION<br>at 0 mA<br>Control Current<br>(dB) |        | RETURN<br>LOSS<br>(dB)<br>Input |
|----------------|--|---|--|---|--------|---------------------------------|
|                |  |   |  | In-Out  | In-Con |                                 |
| 1.0            | 1.28   | 0.01  | 180.0  | 78  | 52     | 23.5                            |
| 2.0            | 1.14   | 0.01  | 180.0  | 75  | 45     | 28.1                            |
| 5.0            | 1.08   | 0.01  | 180.0  | 69  | 38     | 35.4                            |
| 10.0           | 1.09   | 0.01  | 180.0  | 65  | 32     | 43.0                            |
| 16.4           | 1.12   | 0.01  | 179.9  | 63  | 28     | 42.7                            |
| 24.9           | 1.16   | 0.01  | 179.9  | 62  | 24     | 37.5                            |
| 31.8           | 1.18   | 0.01  | 179.9  | 61  | 22     | 35.2                            |
| 46.8           | 1.23   | 0.02  | 179.8  | 59  | 19     | 31.6                            |
| 49.8           | 1.24   | 0.02  | 179.8  | 59  | 19     | 31.0                            |
| 62.2           | 1.26   | 0.02  | 179.8  | 58  | 17     | 28.7                            |
| 77.6           | 1.30   | 0.02  | 179.7  | 57  | 15     | 26.4                            |
| 93.0           | 1.32   | 0.02  | 179.6  | 56  | 14     | 24.4                            |
| 100.0          | 1.34   | 0.02  | 179.6  | 55  | 13     | 23.5                            |
| 108.0          | 1.35   | 0.02  | 179.6  | 55  | 13     | 22.6                            |
| 123.4          | 1.39   | 0.02  | 179.5  | 54  | 12     | 21.0                            |
| 138.8          | 1.46   | 0.02  | 179.5  | 53  | 12     | 19.5                            |
| 154.2          | 1.54   | 0.02  | 179.4  | 52  | 11     | 18.2                            |
| 169.2          | 1.62   | 0.02  | 179.5  | 51  | 11     | 17.0                            |
| 184.6          | 1.73   | 0.02  | 179.5  | 51  | 11     | 15.9                            |
| 200.0          | 1.84   | 0.03  | 179.6  | 50  | 11     | 14.8                            |

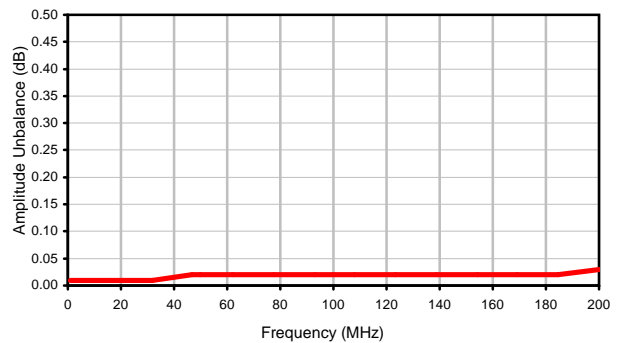
| CONTROL<br>CURRENT<br>(mA) | ATTENUATION<br>(dB) |         |         | PHASE UNBALANCE<br>REF AT 15 mA CONTROL<br>(deg.) |         |         | INPUT VSWR<br>(:1) |         |         |
|----------------------------|---------------------|---------|---------|---|---------|---------|--------------------|---------|---------|
|                            | 1 MHz               | 100 MHz | 200 MHz | 1 MHz   | 100 MHz | 200 MHz | 1 MHz              | 100 MHz | 200 MHz |
| 0.0000                     | 50.3                | 47.8    | 41.7    | 26.3  | 69.1    | 69.7    | 13.6               | 11.6    | 8.1     |
| 0.0004                     | 47.0                | 47.3    | 41.2    | 19.0  | 65.6    | 65.4    | 13.5               | 11.6    | 8.1     |
| 0.0013                     | 43.6                | 45.7    | 40.5    | 10.3  | 50.0    | 58.2    | 13.3               | 11.5    | 8.0     |
| 0.0032                     | 40.7                | 43.3    | 39.0    | 5.7   | 36.8    | 46.4    | 12.9               | 11.3    | 7.9     |
| 0.0085                     | 34.7                | 38.0    | 35.6    | 6.3   | 20.9    | 29.7    | 12.5               | 10.9    | 7.7     |
| 0.0162                     | 33.0                | 33.5    | 32.0    | 6.6   | 12.3    | 19.1    | 11.7               | 10.3    | 7.4     |
| 0.0336                     | 28.2                | 27.9    | 27.0    | 7.2   | 7.0     | 10.3    | 10.5               | 9.2     | 6.8     |
| 0.0567                     | 24.5                | 23.9    | 23.1    | 7.5   | 4.7     | 6.0     | 9.3                | 8.1     | 6.1     |
| 0.0807                     | 22.0                | 21.2    | 20.5    | 7.7   | 3.9     | 4.3     | 8.3                | 7.3     | 5.6     |
| 0.1215                     | 19.1                | 18.2    | 17.5    | 7.5   | 3.0     | 2.9     | 7.1                | 6.2     | 4.9     |
| 0.1860                     | 16.1                | 15.2    | 14.6    | 7.1   | 2.4     | 1.8     | 5.8                | 5.1     | 4.2     |
| 0.2459                     | 14.2                | 13.3    | 12.8    | 6.5   | 2.1     | 1.4     | 5.0                | 4.5     | 3.7     |
| 0.3285                     | 12.5                | 11.5    | 11.1    | 6.3   | 1.8     | 1.1     | 4.3                | 3.8     | 3.2     |
| 0.4365                     | 10.8                | 9.9     | 9.6     | 5.7   | 1.6     | 0.9     | 3.6                | 3.3     | 2.8     |
| 0.5714                     | 9.3                 | 8.5     | 8.2     | 5.1   | 1.4     | 0.7     | 3.1                | 2.8     | 2.5     |
| 1.3114                     | 5.6                 | 5.2     | 5.1     | 3.3   | 0.8     | 0.3     | 2.0                | 1.9     | 1.7     |
| 2.0989                     | 4.2                 | 3.9     | 3.9     | 2.3   | 0.6     | 0.3     | 1.6                | 1.6     | 1.5     |
| 3.7220                     | 2.9                 | 2.8     | 2.9     | 1.3   | 0.3     | 0.1     | 1.3                | 1.3     | 1.3     |
| 7.0357                     | 2.0                 | 2.0     | 2.2     | 0.5   | 0.2     | 0.0     | 1.2                | 1.2     | 1.2     |
| 15.1415                    | 1.4                 | 1.5     | 1.8     | 0.0   | 0.0     | 0.0     | 1.1                | 1.1     | 1.1     |

## Typical Performance Curves

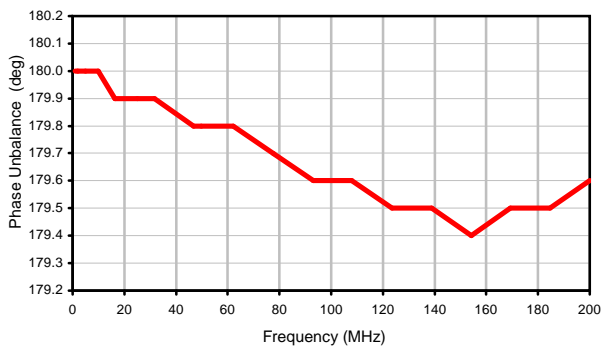
Insertion Loss @ 20 mA



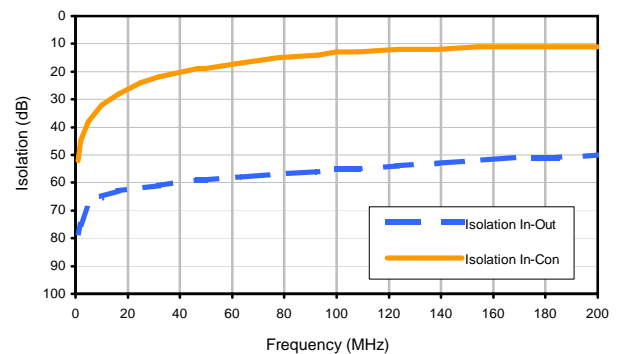
Amplitude Unbalance @ ± 20mA



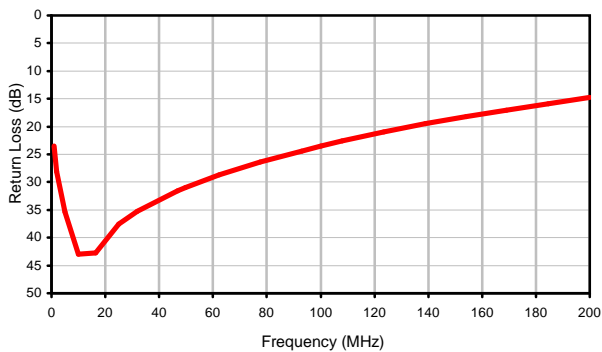
Phase Unbalance @ ± 20mA



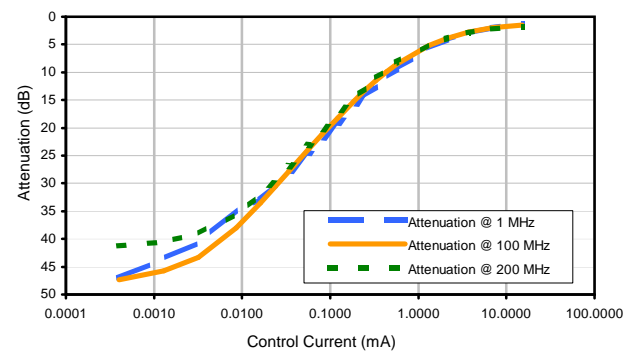
Isolation @ 0 mA



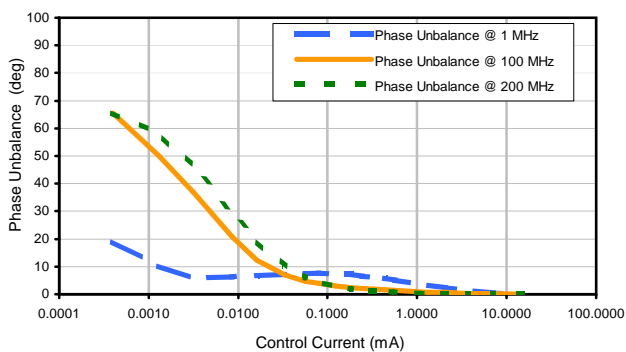
Return Loss Input



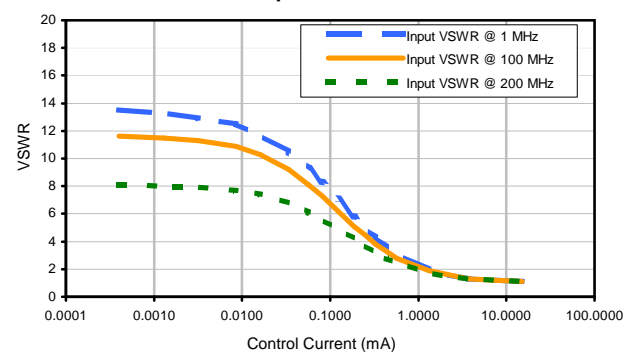
Attenuation



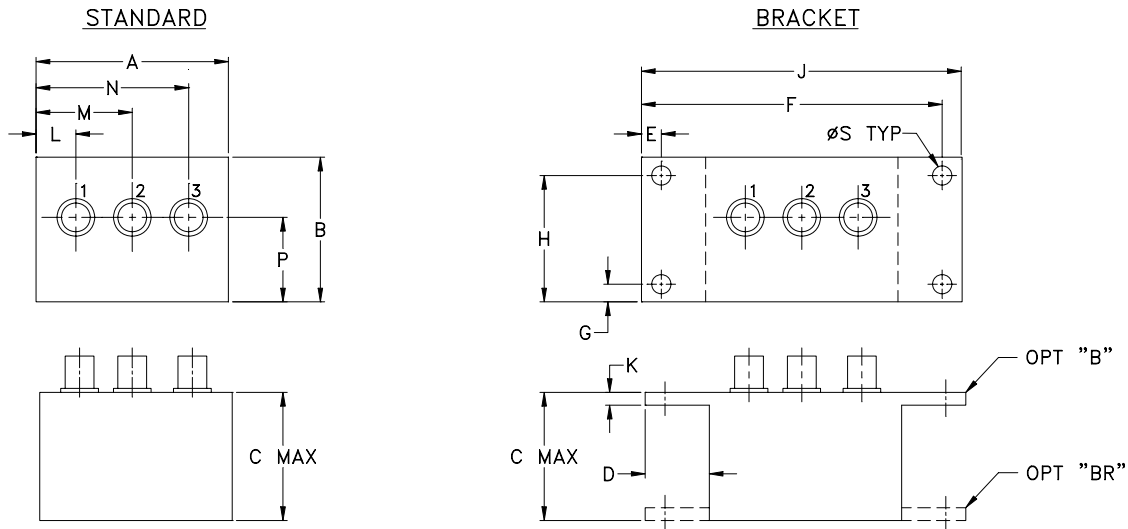
Phase Unbalance ref @ 15 mA



Input VSWR



## 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 |