

X2 Frequency Multiplier

50Ω Output 20 to 1000 MHz

ZX90-2-13-S+



Generic photo used for illustration purposes only

CASE STYLE: JA1242

| Connectors | Model |
|------------|--------------|
| SMA | ZX90-2-13-S+ |

+RoHS Compliant

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

Maximum Ratings

| | |
|-----------------------|----------------|
| Operating Temperature | -40°C to 85°C |
| Storage Temperature | -55°C to 100°C |
| RF Input Power, 25°C | 23 dBm |

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

Coaxial Connections

| | |
|--------|---|
| INPUT | 1 |
| OUTPUT | 2 |

Features

- broadband
- low conversion loss, 11 dB typ.
- rugged construction
- protected by US Patent 6,790,049

Applications

- synthesizers
- local oscillators

Electrical Specifications

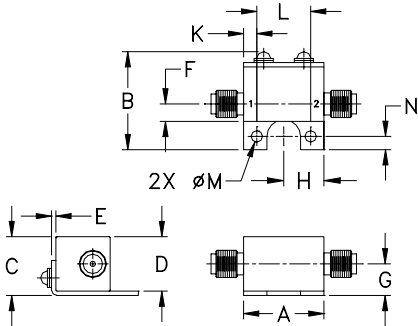
| MULTIPLICATION FACTOR | FREQUENCY (MHz) | | INPUT POWER (dBm) | | CONVERSION LOSS (dB) | | *HARMONIC OUTPUT (dBc) | | | | | |
|-----------------------|-----------------|---------|-------------------|------|----------------------|------|------------------------|-----------|-----------|----|----|----|
| | F1 | F2 | | | | | F1 | F3 | F4 | | | |
| | Input | Output | Min. | Max. | Typ. | Max. | Typ. Min. | Typ. Min. | Typ. Min. | | | |
| 2 | 10-500 | 20-1000 | 4 | 10 | 11.0 | 14.5 | 45 | 21 | 45 | 25 | 21 | 12 |

* Harmonics of input frequency below the power level of F2

Typical Performance Data

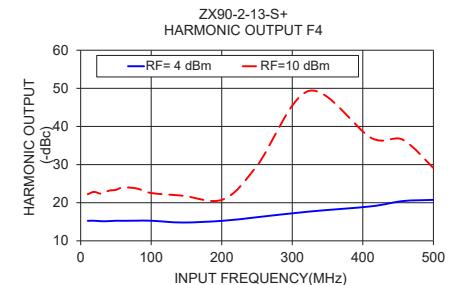
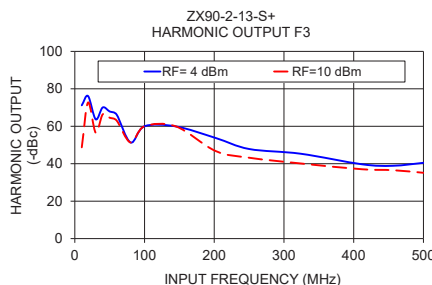
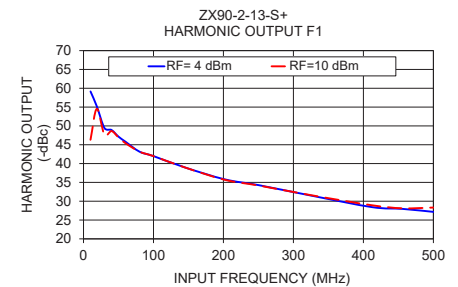
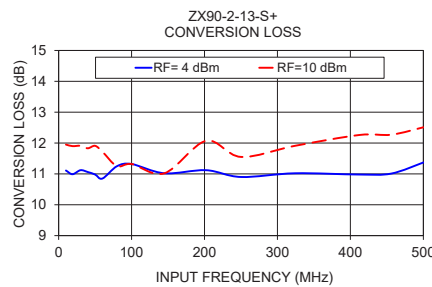
| Input Frequency (MHz) | INPUT RF=4dBm | | | | | INPUT RF=10 dBm | | | | |
|-----------------------|----------------------|---------------------------------|-------|-------|----------------------|---------------------------------|-------|-------|--|--|
| | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) | | | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) | | | | |
| | | F1 | F3 | F4 | | F1 | F3 | F4 | | |
| 10.00 | 11.11 | 59.15 | 71.19 | 15.25 | 11.95 | 46.31 | 48.75 | 22.22 | | |
| 19.00 | 10.99 | 55.21 | 76.15 | 15.28 | 11.90 | 54.53 | 72.71 | 22.84 | | |
| 30.00 | 11.12 | 49.42 | 63.71 | 15.14 | 11.91 | 47.59 | 56.55 | 22.33 | | |
| 40.00 | 11.06 | 48.92 | 70.05 | 15.18 | 11.83 | 48.64 | 66.36 | 23.15 | | |
| 50.00 | 10.98 | 47.15 | 67.89 | 15.27 | 11.91 | 46.95 | 64.56 | 23.38 | | |
| 60.00 | 10.85 | 45.80 | 66.24 | 15.26 | 11.72 | 45.41 | 63.06 | 24.02 | | |
| 80.00 | 11.25 | 43.16 | 51.34 | 15.29 | 11.25 | 43.16 | 51.34 | 23.72 | | |
| 100.00 | 11.32 | 41.98 | 60.02 | 15.28 | 11.32 | 41.98 | 60.02 | 22.55 | | |
| 145.00 | 11.02 | 38.96 | 59.93 | 14.81 | 11.02 | 38.96 | 59.93 | 21.84 | | |
| 202.00 | 11.12 | 35.80 | 53.75 | 15.27 | 12.07 | 35.68 | 46.78 | 20.87 | | |
| 250.00 | 10.90 | 34.28 | 47.86 | 16.20 | 11.55 | 34.18 | 43.20 | 29.69 | | |
| 324.00 | 11.02 | 31.54 | 45.33 | 17.68 | 11.91 | 31.64 | 40.13 | 49.34 | | |
| 412.00 | 10.98 | 28.44 | 39.69 | 19.06 | 12.26 | 28.93 | 37.04 | 36.98 | | |
| 456.00 | 11.01 | 27.96 | 38.89 | 20.42 | 12.27 | 28.12 | 36.56 | 36.58 | | |
| 500.00 | 11.37 | 27.17 | 40.48 | 20.75 | 12.51 | 28.32 | 35.15 | 29.11 | | |

Outline Drawing



Outline Dimensions (inch/mm)

| | | | | | | |
|-------|-------|-------|-------|------|------|-------|
| A | B | C | D | E | F | G |
| .74 | .90 | .54 | .50 | .04 | .16 | .29 |
| 18.80 | 22.86 | 13.72 | 12.70 | 1.02 | 4.06 | 7.37 |
| H | J | K | L | M | N | wt |
| .37 | -- | .122 | .496 | .106 | .122 | grams |
| 9.40 | -- | 3.10 | 12.60 | 2.69 | 3.10 | 19.0 |



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 Multiplier (Doublers)

ZX90-2-13-S+

Typical Performance Data

| Frequency (MHz) | | | | RF IN = 4dBm | | | |
|-----------------|-----------|-----------|-----------|----------------------|-------------------------|-----------|-----------|
| | | | | Conversion Loss (dB) | Harmonic Output* (-dBc) | | |
| X1 Output | X2 Output | X3 Output | X4 Output | X2 Output | X1 Output | X3 Output | X4 Output |
| 10 | 20 | 30 | 40 | 11.11 | 59.15 | 71.19 | 15.25 |
| 12 | 24 | 36 | 48 | 11.11 | 59.13 | 80.11 | 15.26 |
| 14 | 28 | 42 | 56 | 11.05 | 57.87 | 78.65 | 15.27 |
| 15 | 30 | 45 | 60 | 11.08 | 56.79 | 75.26 | 15.30 |
| 17 | 34 | 51 | 68 | 11.04 | 56.14 | 76.86 | 15.28 |
| 19 | 38 | 57 | 76 | 10.99 | 55.21 | 76.15 | 15.28 |
| 21 | 42 | 63 | 84 | 11.02 | 54.38 | 75.25 | 15.27 |
| 30 | 60 | 90 | 120 | 11.12 | 49.42 | 63.71 | 15.14 |
| 35 | 70 | 105 | 140 | 11.04 | 50.01 | 71.18 | 15.20 |
| 40 | 80 | 120 | 160 | 11.06 | 48.92 | 70.05 | 15.18 |
| 45 | 90 | 135 | 180 | 11.05 | 47.95 | 68.75 | 15.22 |
| 50 | 100 | 150 | 200 | 10.98 | 47.15 | 67.89 | 15.27 |
| 55 | 110 | 165 | 220 | 10.95 | 46.47 | 66.97 | 15.28 |
| 60 | 120 | 180 | 240 | 10.85 | 45.80 | 66.24 | 15.26 |
| 64 | 128 | 192 | 256 | 10.88 | 45.23 | 65.54 | 15.26 |
| 68 | 136 | 204 | 272 | 10.89 | 44.74 | 64.77 | 15.25 |
| 80 | 160 | 240 | 320 | 11.25 | 43.16 | 51.34 | 15.29 |
| 90 | 180 | 270 | 360 | 11.25 | 43.12 | 61.64 | 15.31 |
| 100 | 200 | 300 | 400 | 11.32 | 41.98 | 60.02 | 15.28 |
| 110 | 220 | 330 | 440 | 11.29 | 41.16 | 59.26 | 15.23 |
| 120 | 240 | 360 | 480 | 11.06 | 40.53 | 59.35 | 15.09 |
| 130 | 260 | 390 | 520 | 11.26 | 39.78 | 59.29 | 15.05 |
| 140 | 280 | 420 | 560 | 11.05 | 39.23 | 59.78 | 14.92 |
| 143 | 285 | 428 | 570 | 11.03 | 39.08 | 59.92 | 14.91 |
| 145 | 290 | 435 | 580 | 11.02 | 38.96 | 59.93 | 14.81 |
| 170 | 340 | 510 | 680 | 11.06 | 37.29 | 56.33 | 15.01 |
| 186 | 372 | 558 | 744 | 11.07 | 36.50 | 55.57 | 15.17 |
| 202 | 404 | 606 | 808 | 11.12 | 35.80 | 53.75 | 15.27 |
| 218 | 436 | 654 | 872 | 10.95 | 35.29 | 50.73 | 15.65 |
| 234 | 468 | 702 | 936 | 11.06 | 34.83 | 49.46 | 15.93 |
| 250 | 500 | 750 | 1000 | 10.90 | 34.28 | 47.86 | 16.20 |
| 260 | 520 | 780 | 1040 | 10.90 | 33.89 | 46.95 | 16.50 |
| 270 | 540 | 810 | 1080 | 10.90 | 33.53 | 46.33 | 16.52 |
| 280 | 560 | 840 | 1120 | 11.06 | 30.69 | 40.28 | 16.46 |
| 324 | 648 | 972 | 1296 | 11.02 | 31.54 | 45.33 | 17.68 |
| 368 | 736 | 1104 | 1472 | 10.99 | 29.85 | 41.65 | 18.38 |
| 412 | 824 | 1236 | 1648 | 10.98 | 28.44 | 39.69 | 19.06 |
| 456 | 912 | 1368 | 1824 | 11.01 | 27.96 | 38.89 | 20.42 |
| 500 | 1000 | 1500 | 2000 | 11.37 | 27.17 | 40.48 | 20.75 |

*Harmonic Output below power level of X2 Output .



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IF/RF MICROWAVE COMPONENTS

REV. OR

ZX90-2-13-S+

1/3/2019

Page 1 of 2

Frequency Multiplier (Doublers)

ZX90-2-13-S+

Typical Performance Data

| Frequency (MHz) | | | | RF IN = 10dBm | | | |
|-----------------|-----------|-----------|-----------|----------------------|-------------------------|-----------|-----------|
| | | | | Conversion Loss (dB) | Harmonic Output* (-dBc) | | |
| X1 Output | X2 Output | X3 Output | X4 Output | X2 Output | X1 Output | X3 Output | X4 Output |
| 10 | 20 | 30 | 40 | 11.95 | 46.31 | 48.75 | 22.22 |
| 12 | 24 | 36 | 48 | 11.97 | 58.24 | 77.56 | 22.07 |
| 14 | 28 | 42 | 56 | 11.87 | 57.08 | 76.03 | 22.67 |
| 15 | 30 | 45 | 60 | 11.99 | 55.73 | 70.81 | 22.00 |
| 17 | 34 | 51 | 68 | 11.97 | 55.37 | 73.44 | 22.41 |
| 19 | 38 | 57 | 76 | 11.90 | 54.53 | 72.71 | 22.84 |
| 21 | 42 | 63 | 84 | 11.93 | 53.82 | 71.85 | 22.76 |
| 30 | 60 | 90 | 120 | 11.91 | 47.59 | 56.55 | 22.33 |
| 35 | 70 | 105 | 140 | 11.79 | 49.72 | 67.27 | 22.85 |
| 40 | 80 | 120 | 160 | 11.83 | 48.64 | 66.36 | 23.15 |
| 45 | 90 | 135 | 180 | 11.84 | 47.67 | 65.30 | 23.40 |
| 50 | 100 | 150 | 200 | 11.91 | 46.95 | 64.56 | 23.38 |
| 55 | 110 | 165 | 220 | 11.86 | 46.13 | 63.68 | 23.67 |
| 60 | 120 | 180 | 240 | 11.72 | 45.41 | 63.06 | 24.02 |
| 64 | 128 | 192 | 256 | 11.75 | 44.81 | 62.56 | 24.06 |
| 68 | 136 | 204 | 272 | 11.77 | 44.24 | 62.01 | 24.07 |
| 80 | 160 | 240 | 320 | 11.25 | 43.16 | 51.34 | 15.29 |
| 90 | 180 | 270 | 360 | 11.25 | 43.12 | 61.64 | 15.31 |
| 100 | 200 | 300 | 400 | 11.32 | 41.98 | 60.02 | 15.28 |
| 110 | 220 | 330 | 440 | 11.29 | 41.16 | 59.26 | 15.23 |
| 120 | 240 | 360 | 480 | 11.06 | 40.53 | 59.35 | 15.09 |
| 130 | 260 | 390 | 520 | 11.26 | 39.78 | 59.29 | 15.05 |
| 140 | 280 | 420 | 560 | 11.05 | 39.23 | 59.78 | 14.92 |
| 143 | 285 | 428 | 570 | 11.03 | 39.08 | 59.92 | 14.91 |
| 145 | 290 | 435 | 580 | 11.02 | 38.96 | 59.93 | 14.81 |
| 170 | 340 | 510 | 680 | 12.18 | 37.07 | 53.41 | 19.35 |
| 186 | 372 | 558 | 744 | 12.18 | 36.27 | 49.55 | 19.34 |
| 202 | 404 | 606 | 808 | 12.07 | 35.68 | 46.78 | 20.87 |
| 218 | 436 | 654 | 872 | 11.68 | 35.20 | 44.84 | 23.42 |
| 234 | 468 | 702 | 936 | 11.84 | 34.81 | 44.13 | 25.71 |
| 250 | 500 | 750 | 1000 | 11.55 | 34.18 | 43.20 | 29.69 |
| 260 | 520 | 780 | 1040 | 11.60 | 33.80 | 42.59 | 32.25 |
| 270 | 540 | 810 | 1080 | 11.66 | 33.41 | 42.26 | 34.00 |
| 280 | 560 | 840 | 1120 | 11.78 | 29.14 | 33.99 | 31.13 |
| 324 | 648 | 972 | 1296 | 11.91 | 31.64 | 40.13 | 49.34 |
| 368 | 736 | 1104 | 1472 | 12.20 | 29.85 | 38.92 | 35.96 |
| 412 | 824 | 1236 | 1648 | 12.26 | 28.93 | 37.04 | 36.98 |
| 456 | 912 | 1368 | 1824 | 12.27 | 28.12 | 36.56 | 36.58 |
| 500 | 1000 | 1500 | 2000 | 12.51 | 28.32 | 35.15 | 29.11 |

*Harmonic Output below power level of X2 Output .



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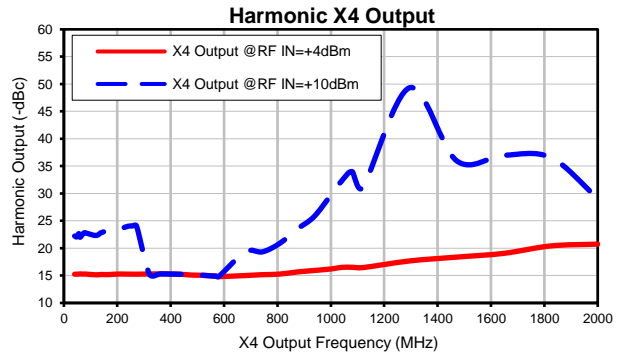
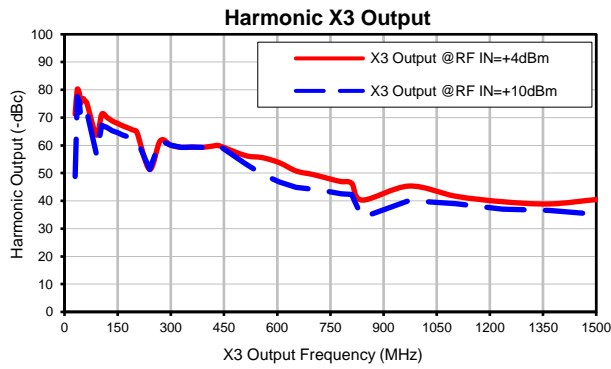
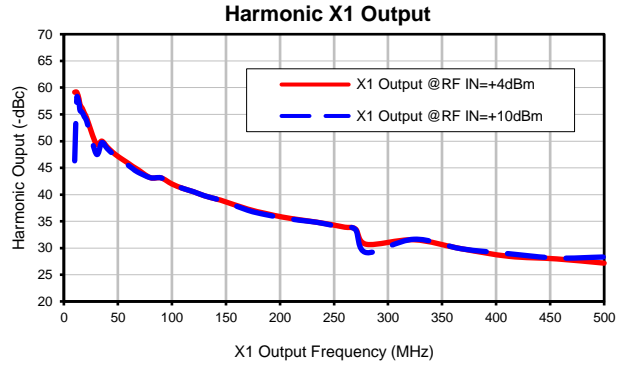
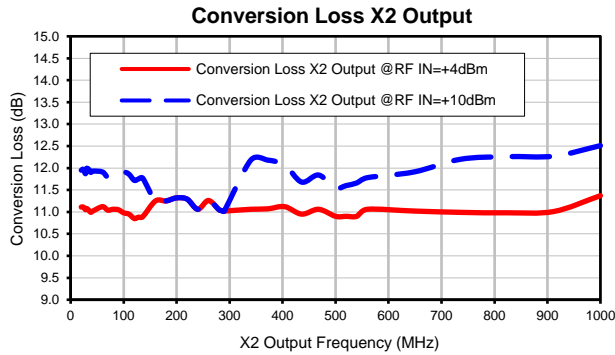


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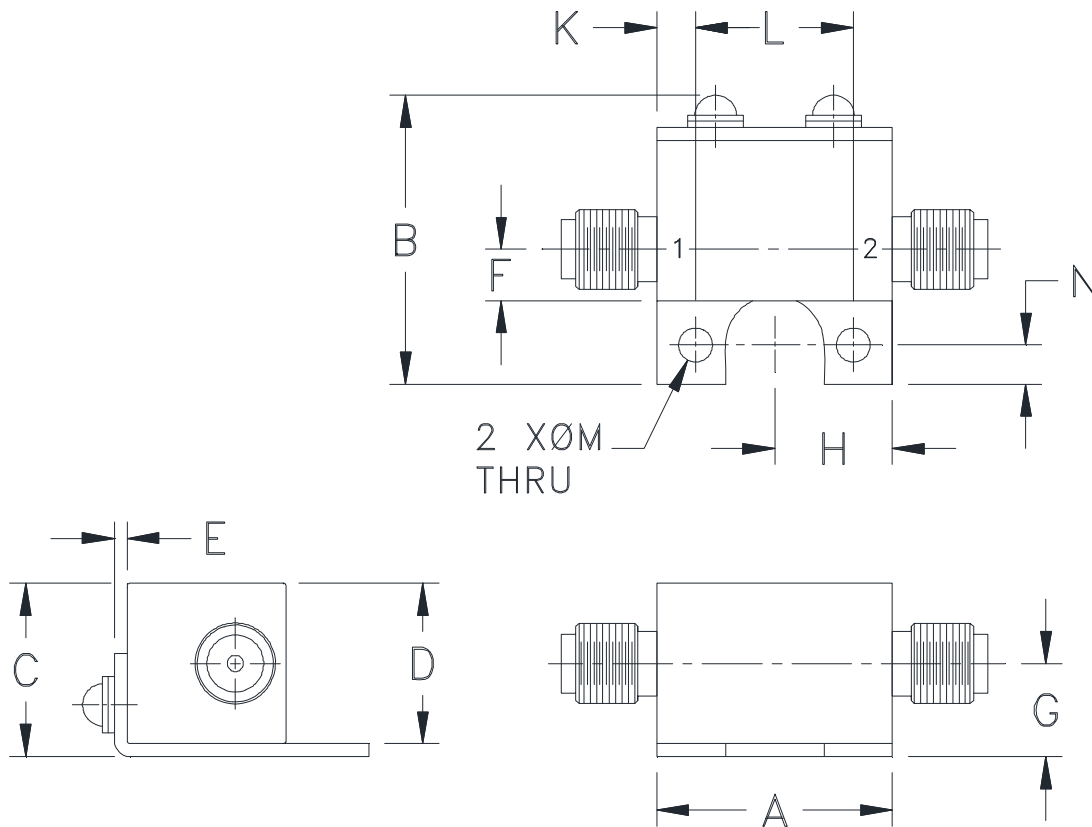
IF/RF MICROWAVE COMPONENTS

Page 2 of 2

Typical Performance Curves



Outline Dimensions



| CASE #. | A | B | C | D | E | F | G | H | J | K | L | M | N | WT, GRAM |
|---------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|--------|----------------|-----------------|----------------|----------------|-------------|
| JA1242 | .74 (18.80) | .90 (22.86) | .54 (13.72) | .50 (12.70) | .04 (1.02) | .16 (4.06) | .29 (7.37) | .37 (9.40) | - - | .122 (3.10) | .496 (12.60) | .106 (2.69) | .122 (3.10) | 19.0 |

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

Tolerance on hole size and interaxes dimensions to be $\pm .005$.

Notes:

1. Case material: Brass.
2. Case finish: Nickel plate.



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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 | -40° to 85°C | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C Ambient Environment | Individual Model Data Sheet |
| Barometric Pressure | 100,000 Feet | MIL-STD-202, Method 105, Condition D |
| Humidity | 90% RH, 65°C 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 |