COAXIAL

# RF Instrument Amplifier ZHL-10M4G21W2+

50Ω 10 to 4200 MHz Broadband 2 W N-Type Female

## THE BIG DEAL

- Broadband, 10 to 4200 MHz
- High Gain, 44 dB Typ.
- High P1dB, +33 dBm Typ.
- High OIP3, +46 dBm Typ.
- Built-In +110/+220 V AC Power Supply

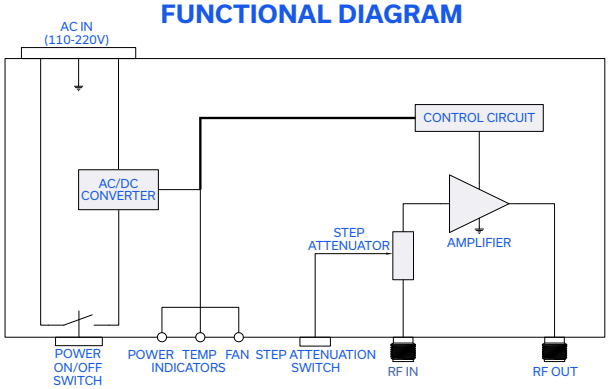


*Generic photo used for illustration purposes only*

## APPLICATIONS

- Communication Systems
- R&D, Production, and OTA Test Systems
- Test & Measurement Equipment
- General Laboratory Applications

## FUNCTIONAL DIAGRAM




## PRODUCT OVERVIEW

Mini-Circuits' ZHL-10M4G21W2+ is an instrument amplifier providing more than 1 W of output power with a typical small signal gain of 44 dB over the 10 to 4200 MHz frequency band. The amplifier uses state-of-the-art semiconductor technology and can be used in a wide range of applications. This model features a built-in digital step attenuator on the input providing gain control from 0 to 15 dB in 1 dB steps with push-button attenuation control on the front panel. The amplifier runs on a built-in +110/+220 V power supply, making it easy to use in most lab environments. It features thermal self-protection, preventing damage to the amplifier and providing added reliability. It comes housed in a light-weight aluminum alloy case (15.35x8.27x3.25") with N-type connectors, ideal for bench-top use. Two N-male to SMA female adapters come included for the user's convenience.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Extremely Broadband, 10 to 4200 MHz and High Power, 1.9 W | One single amplifier that covers the entire frequency band delivering rated power. |
| High Gain, 44 dB Typ. | High gain allows low drive levels to achieve rated output power which can be obtained from many standard lab generators. |
| Built-In Digital Step Attenuator, 0 to 15 dB, 1 dB Step | Allows up to 15 dB variable gain control via push-button control on the front panel. |
| High OIP3, +46 dBm Typ. | High OIP3 makes the amplifier suitable for applications requiring high linearity such as digitally modulated signals. |
| Built-In +110 V/+220 V Power Supply | Operating from a standard AC line power supply, the ZHL-10M4G21W2+ can be powered from +110 to +220 V, making the amplifier versatile for use in most lab environments. |
| Thermally-Self-Protected | A built-in sensing feature signals the unit to power off when the amplifier reaches its maximum rated operating temperature, preventing damage to the equipment and providing added reliability. |

REV. OR
ECO-018311
ZHL-10M4G21W2+
MCL NY
260227

# RF Instrument Amplifier ZHL-10M4G21W2+

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## ELECTRICAL SPECIFICATIONS AT $T_{AMBIENT}$ = +25 °C

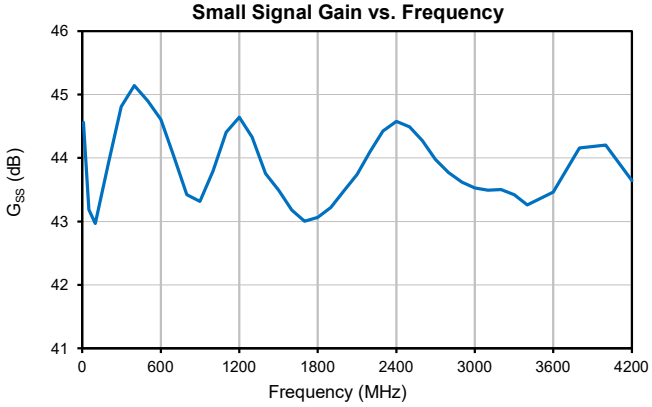
| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Frequency Range | f | | 10 | | 4200 | MHz |
| Small Signal Gain | $G_{SS}$ | | 38 | 44 | | dB |
| Small Signal Gain Flatness | $G_{SS\text{-}FLAT}$ | | | ±1.3 | ±2.1 | dB |
| Output Power at 1 dB Compression | $P_{1dB}$ | 10-3600 MHz<br>3600-4200 MHz | +29<br>+27 | +33<br>+31 | | dBm |
| Noise Figure | NF | | | 5.6 | | dB |
| Output Third Order Intercept Point | OIP3 | $P_{OUT}$ = +20 dBm/Tone | | +46 | | dBm |
| Input VSWR | I-VSWR | | | 1.3 | 3.0 | :1 |
| Output VSWR | O-VSWR | | | 1.5 | 3.0 | :1 |
| DC Supply Voltage | $V_{AC}$ | | +85 | +110/+220 | +264 | V |

# RF Instrument Amplifier ZHL-10M4G21W2+

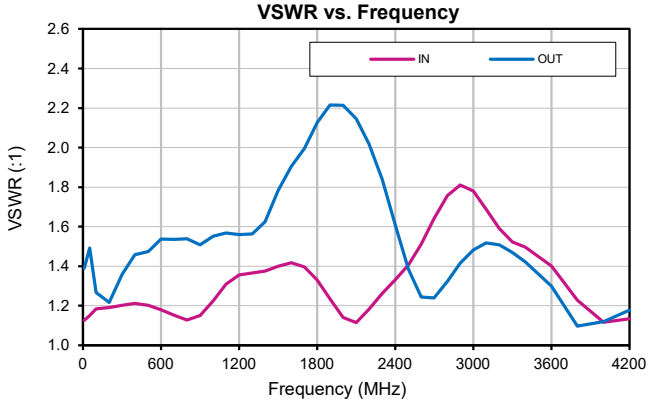
50Ω 10 to 4200 MHz Broadband 2 W N-Type Female

## TYPICAL PERFORMANCE DATA AT $T_{AMBIENT}$ = +25 °C, 50Ω

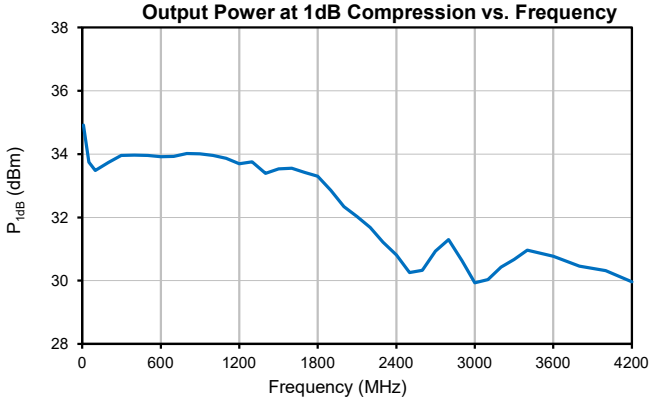
Small Signal Gain vs. Frequency



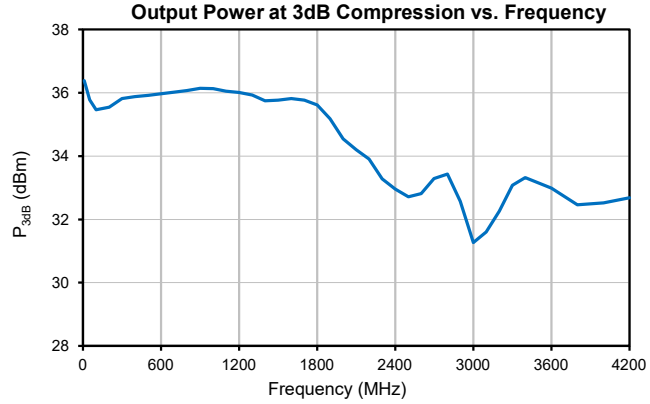

VSWR vs. Frequency



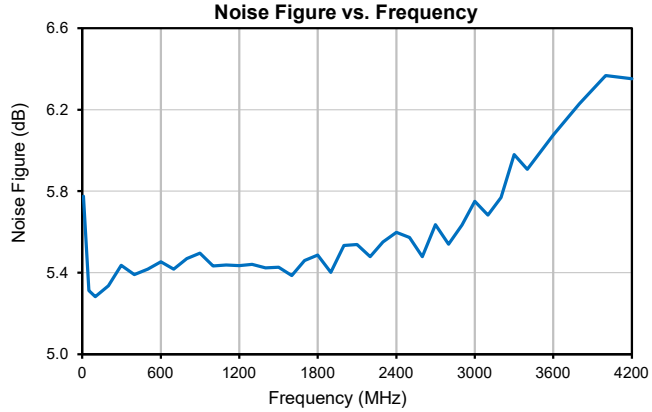

Output Power at 1dB Compression vs. Frequency



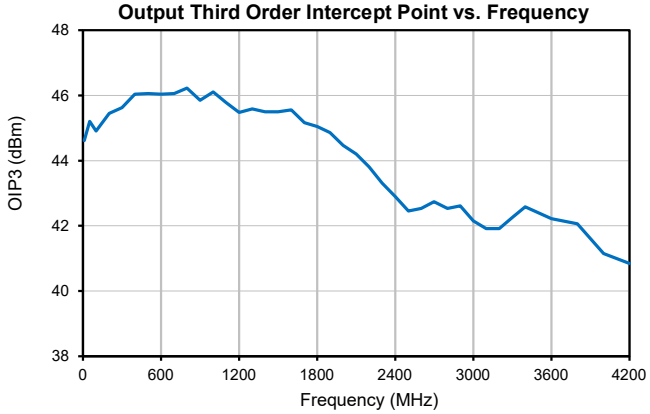

Output Power at 3dB Compression vs. Frequency




Noise Figure vs. Frequency




Output Third Order Intercept Point vs. Frequency



# RF Instrument Amplifier ZHL-10M4G21W2+

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## ABSOLUTE MAXIMUM RATINGS

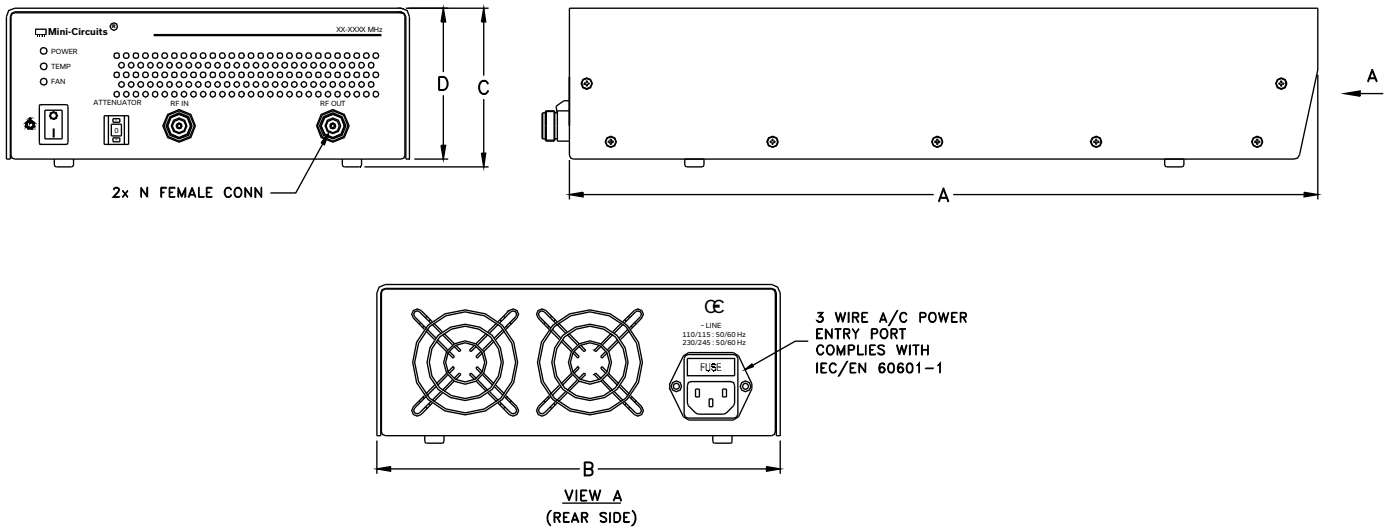
| Parameter | Ratings |
|---|---|
| Operating Temperature | ZHL-10M4G21W2+ $T_{AMBIENT}$: 0 °C to +55 °C |
| Storage Temperature | -40 °C to +70 °C |
| No damage with an open or short at $P_{OUT}$ = +30 dBm CW for 2 minutes max. | |
| RF Input Power[1] (No Damage) | 0 dBm |

1. RF Input Power max is defined at 0 dB attenuation setting.
Permanent damage may occur if any of these limits are exceeded.

## COAXIAL CONNECTIONS

| | |
|---|---|
| **IN (RF-IN)** | N female |
| **OUT (RF-OUT)** | N female |

## CASE STYLE DRAWING




## OUTLINE DIMENSIONS (Inch / mm)

| A | B | C | D | WT. |
|---|---|---|---|---|
| 15.35 | 8.27 | 3.25 | 3.09 | GRAM |
| 389.89 | 210.06 | 82.55 | 78.49 | 3550 |

# RF Instrument Amplifier ZHL-10M4G21W2+

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## ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

| | |
|---|---|
| **Performance Data** | Table<br>Graphs<br>S-Parameter (S2P Files) Data Set (.zip file) |
| **RoHS Status** | Compliant |
| **Environmental Ratings** | ENV35 |

## ORDERING INFORMATION

| | |
|---|---|
| **Model No. Links** | ZHL-10M4G21W2+ |
| **Case Style** | PJ2059-1 |
| **Connector** | IN (N female) / OUT (N female) |

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/terms/viewterm.html

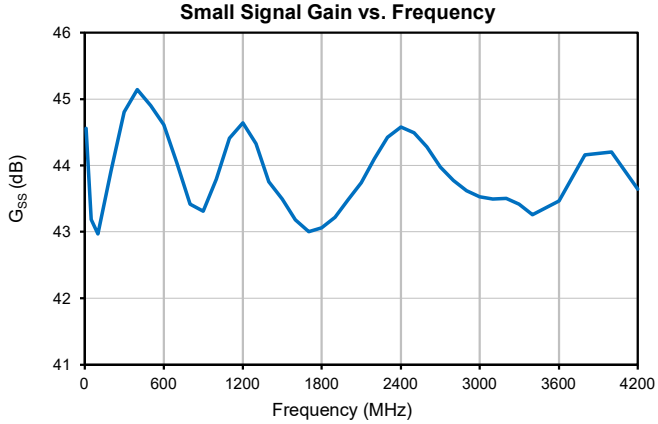
# Coaxial Amplifier ZHL-10M4G21W2+

## *Typical Performance Data*

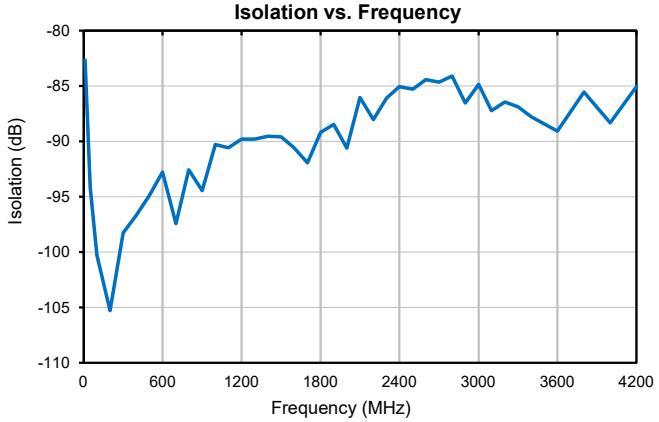
| Frequency (MHz) | Small Signal Gain (dB) | Isolation (dB) | VSWR (:1) | | $P_{OUT}$ @ 1 dB Compression (dBm) | $P_{OUT}$ @ 3 dB Compression (dBm) | OIP3 (dBm) | Noise Figure (dB) |
|---|---|---|---|---|---|---|---|---|
| | | | In | Out | | | | |
| 10 | 44.56 | 82.66 | 1.13 | 1.39 | 34.92 | 36.39 | 44.61 | 5.77 |
| 50 | 43.18 | 94.14 | 1.15 | 1.49 | 33.74 | 35.78 | 45.20 | 5.31 |
| 100 | 42.97 | 100.28 | 1.18 | 1.27 | 33.48 | 35.46 | 44.91 | 5.28 |
| 200 | 43.92 | 105.30 | 1.19 | 1.22 | 33.74 | 35.54 | 45.45 | 5.34 |
| 300 | 44.81 | 98.25 | 1.20 | 1.36 | 33.96 | 35.81 | 45.62 | 5.44 |
| 400 | 45.14 | 96.68 | 1.21 | 1.46 | 33.97 | 35.88 | 46.04 | 5.39 |
| 500 | 44.90 | 94.89 | 1.20 | 1.47 | 33.96 | 35.92 | 46.05 | 5.42 |
| 600 | 44.61 | 92.80 | 1.18 | 1.54 | 33.92 | 35.97 | 46.04 | 5.45 |
| 700 | 44.03 | 97.43 | 1.15 | 1.54 | 33.93 | 36.02 | 46.06 | 5.42 |
| 800 | 43.42 | 92.56 | 1.13 | 1.54 | 34.02 | 36.07 | 46.22 | 5.47 |
| 900 | 43.31 | 94.44 | 1.15 | 1.51 | 34.01 | 36.14 | 45.85 | 5.50 |
| 1000 | 43.79 | 90.31 | 1.22 | 1.55 | 33.95 | 36.13 | 46.10 | 5.43 |
| 1100 | 44.41 | 90.57 | 1.31 | 1.57 | 33.87 | 36.05 | 45.78 | 5.44 |
| 1200 | 44.64 | 89.82 | 1.36 | 1.56 | 33.69 | 36.01 | 45.48 | 5.43 |
| 1300 | 44.33 | 89.79 | 1.37 | 1.56 | 33.76 | 35.93 | 45.59 | 5.44 |
| 1400 | 43.75 | 89.54 | 1.38 | 1.62 | 33.39 | 35.75 | 45.50 | 5.42 |
| 1500 | 43.49 | 89.59 | 1.40 | 1.78 | 33.53 | 35.77 | 45.50 | 5.43 |
| 1600 | 43.18 | 90.56 | 1.42 | 1.90 | 33.55 | 35.81 | 45.55 | 5.39 |
| 1700 | 43.00 | 91.94 | 1.40 | 2.00 | 33.42 | 35.76 | 45.17 | 5.46 |
| 1800 | 43.06 | 89.19 | 1.33 | 2.13 | 33.30 | 35.62 | 45.04 | 5.49 |
| 1900 | 43.22 | 88.46 | 1.23 | 2.22 | 32.86 | 35.18 | 44.86 | 5.40 |
| 2000 | 43.48 | 90.60 | 1.14 | 2.21 | 32.34 | 34.54 | 44.46 | 5.53 |
| 2100 | 43.74 | 86.03 | 1.11 | 2.15 | 32.02 | 34.20 | 44.20 | 5.54 |
| 2200 | 44.10 | 88.05 | 1.18 | 2.02 | 31.68 | 33.91 | 43.80 | 5.48 |
| 2300 | 44.43 | 86.09 | 1.26 | 1.84 | 31.22 | 33.28 | 43.31 | 5.55 |
| 2400 | 44.58 | 85.04 | 1.33 | 1.61 | 30.81 | 32.96 | 42.89 | 5.60 |
| 2500 | 44.49 | 85.29 | 1.41 | 1.39 | 30.26 | 32.72 | 42.46 | 5.57 |
| 2600 | 44.28 | 84.42 | 1.51 | 1.24 | 30.33 | 32.82 | 42.53 | 5.48 |
| 2700 | 43.98 | 84.65 | 1.64 | 1.24 | 30.93 | 33.29 | 42.74 | 5.63 |
| 2800 | 43.77 | 84.11 | 1.76 | 1.32 | 31.30 | 33.42 | 42.54 | 5.54 |
| 2900 | 43.62 | 86.51 | 1.81 | 1.42 | 30.63 | 32.57 | 42.61 | 5.63 |
| 3000 | 43.53 | 84.85 | 1.78 | 1.48 | 29.93 | 31.26 | 42.15 | 5.75 |
| 3100 | 43.49 | 87.22 | 1.69 | 1.52 | 30.04 | 31.60 | 41.91 | 5.68 |
| 3200 | 43.50 | 86.44 | 1.59 | 1.51 | 30.42 | 32.26 | 41.92 | 5.77 |
| 3300 | 43.42 | 86.89 | 1.52 | 1.47 | 30.67 | 33.08 | 42.25 | 5.98 |
| 3400 | 43.26 | 87.77 | 1.50 | 1.42 | 30.96 | 33.33 | 42.58 | 5.91 |
| 3600 | 43.46 | 89.07 | 1.40 | 1.30 | 30.77 | 32.98 | 42.22 | 6.08 |
| 3800 | 44.16 | 85.54 | 1.23 | 1.10 | 30.46 | 32.46 | 42.06 | 6.23 |
| 4000 | 44.20 | 88.32 | 1.12 | 1.12 | 30.32 | 32.52 | 41.14 | 6.37 |
| 4200 | 43.64 | 85.08 | 1.13 | 1.18 | 29.96 | 32.68 | 40.84 | 6.35 |

*Typical Performance Curves*

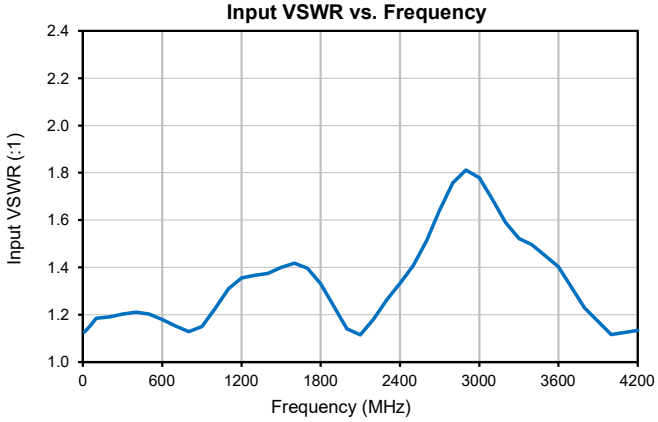
**Small Signal Gain vs. Frequency**



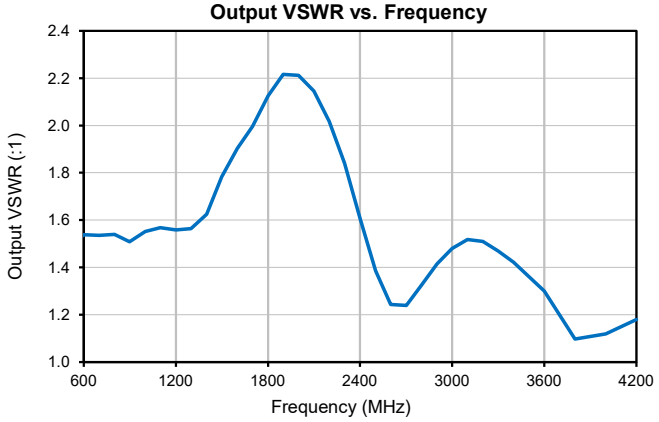

**Isolation vs. Frequency**



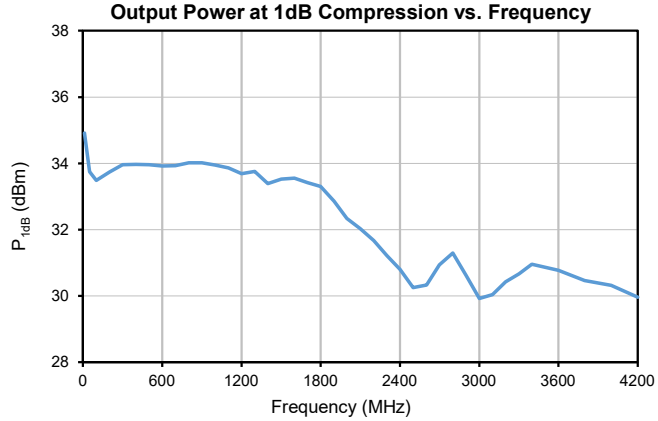

**Input VSWR vs. Frequency**



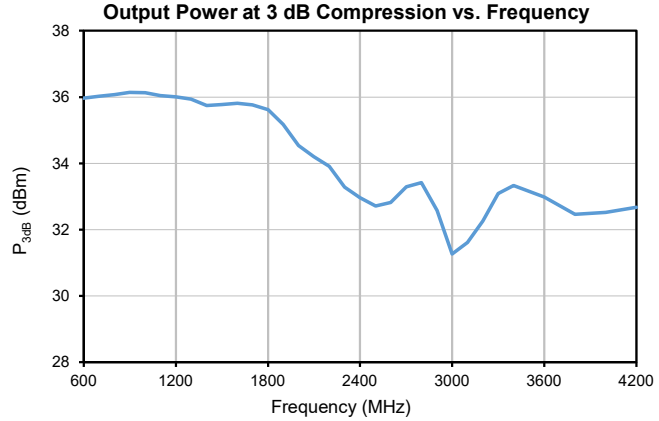

**Output VSWR vs. Frequency**




**Output Power at 1dB Compression vs. Frequency**

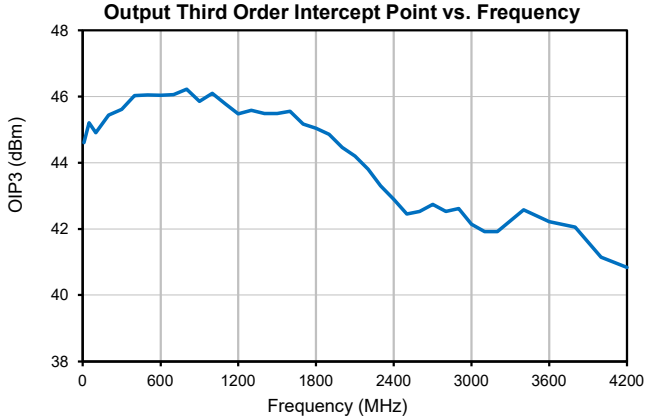



**Output Power at 3 dB Compression vs. Frequency**

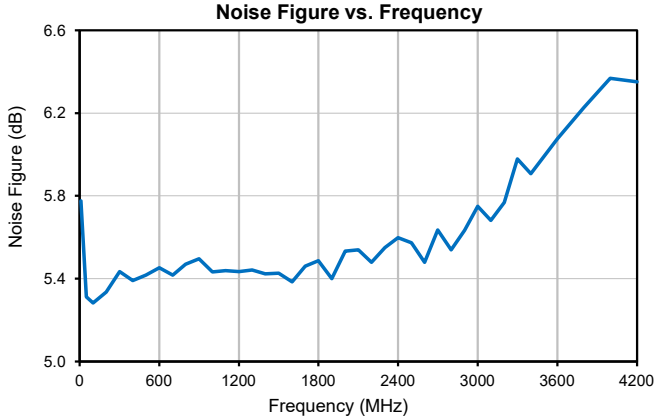


*Typical Performance Curves*

**Output Third Order Intercept Point vs. Frequency**



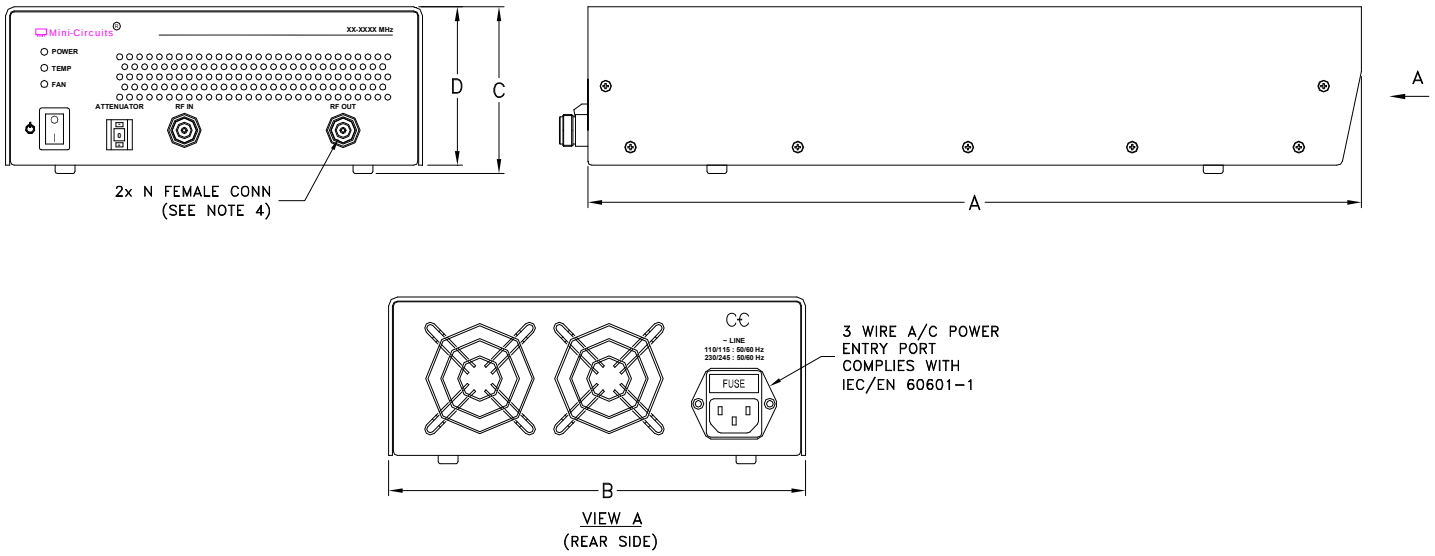

**Noise Figure vs. Frequency**



# Case Style PJ

## Outline Dimensions

**PJ2059-1**




| CASE# | A | B | C | D | E | WT, GRAM |
|---|---|---|---|---|---|---|
| PJ2059-1 | 15.35<br>(390.0) | 8.27<br>(210.0) | 3.25<br>(82.6) | 3.09<br>(78.5) | --<br>-- | 3550 |

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

### Notes:

1. Case material: Aluminum alloy.
2. Finish: White paint.
3. Keep area adjacent to airvents clear to allow free air flow. Caution: Do not insert anything, especially conductors or fingers into case opening. Physical injury, shock or death may occur.
4. Connector shape may vary.


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Mini-Circuits

# Environmental Specifications ENV35

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 | -0° to 55° C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -40° to 70° C<br>Ambient Environment | Individual Model Data Sheet |


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