COAXIAL

# High Power Amplifier

# ZHL-15W-422-S+
# ZHL-15W-422X-S+

50Ω 15 W 600 to 4200 MHz Input- & Output-SMA Female

## THE BIG DEAL

- Saturated Power, 15 W
- Wide Bandwidth, 600 to 4200 MHz
- High Gain, 46 dB Typ.
- Self-Protected Against High Case Temp., Reverse Polarity and Shorting/Unshorting
- Withstands Short and Open Circuit at Output While Delivering Up to 10 W



*Generic photo used for illustration purposes only*

| Model No. | ZHL-15W-422-S+ | ZHL-15W-422X-S+ ▲ |
|---|---|---|
| Case Style | CP2548 | |
| Connectors | Input-SMA female, Output-SMA female | |

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

## APPLICATIONS

- High Power Test Sets
- Burn-In Setups
- Communications
- Radar

## PRODUCT OVERVIEW

Mini-Circuits' ZHL-15W-422(X)-S+ is a Class A, high-power amplifier providing 15 W saturated power over the 600 to 4200 MHz band, ideal for a variety of high-power test setups as well as applications including communications, radar and more. The ruggedly-designed amplifier provides unconditional stability and built-in self-protection against reverse polarity, shorting/unshorting and overheating. It is capable of withstanding short and open circuits at output while continuously delivering 10 W of power. Housed in a rugged aluminum alloy case measuring 4.3x6.7x1.2", the unit features SMA connectors and an optional heatsink and fan attachment for cooling.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Wideband Operation | Suitable for a broad range of high-power, wideband applications, including test setups, communications and defense applications. |
| High Gain, 46 dB Typ. | Enables signal amplification to 15 W output without the need for multiple gain stages. |
| Built-In Self-Protection | Self-protected against high case temperature, reverse polarity and shorting/unshorting. |
| Unconditional Stability | Provides reliable performance independent of input and load conditions. |

REV. D
ECO-018143
ZHL-15W-422(X)-S+
MCL NY
260220

# High Power Amplifier

# ZHL-15W-422-S+
# ZHL-15W-422X-S+

50Ω 15 W 600 to 4200 MHz Input- & Output-SMA Female

## ELECTRICAL SPECIFICATIONS AT +25 °C

| Parameter | Condition (MHz) | ZHL-15W-422-S+ ZHL-15W-422X-S+ ▲ | | | Units |
|---|---|---|---|---|---|
| | | Min | Typ. | Max. | |
| Frequency Range | | 600 | | 4200 | MHz |
| Gain[1] | 600-4200 | 41 | 46 | 51 | dB |
| Gain Flatness[1] | 600-4200 | | ±2.0 | | dB |
| Output Power at 1 dB Compression | 600-4200 | | +39 | | dBm |
| Output Power Saturated | 600-4200 | | +42 | | dBm |
| Noise Figure | 600-4200 | | 10 | | dB |
| Output Third Order Intercept Point[2] | 600-4200 | | +47 | | dBm |
| Input VSWR[1] | 600-4200 | | 1.3 | | :1 |
| Output VSWR[1] | 600-4200 | | 2.0 | | :1 |
| DC Supply Voltage | | +26 | +28[3] | +32 | V |
| Supply Current[1] | | | | 3.5 | A |

1. Small signal input power -50 dBm typ.
2. Two tones, +27 dBm/tone, 1 MHz spacing.
3. Recommended Operating Voltage.
Power Supply should be capable of delivering 4 A at startup.

▲ Heatsink and fan not included. Alternative heat sinking and heat removal must be provided by the user to limit maximum baseplate temperature to +85 °C, in order to ensure proper performance. For reference, this requires thermal resistance of user's external heatsink to be 0.3 °C/W max.

## ABSOLUTE MAXIMUM RATINGS

| Parameter | Ratings |
|---|---|
| Operating Temperature | -20 °C to +50 °C |
| Baseplate Temperature | +85 °C |
| Storage Temperature | -55 °C to +100 °C |
| DC Voltage | +32 V |
| Input RF Power (No Damage) | +7 dBm |

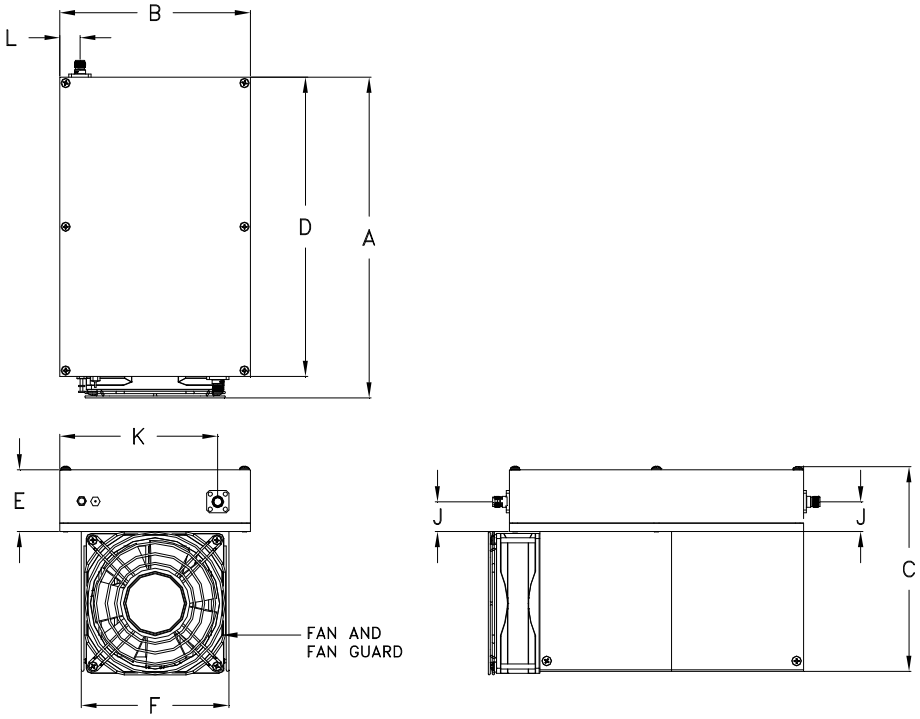
Permanent damage may occur if any of these limits are exceeded.

# High Power Amplifier

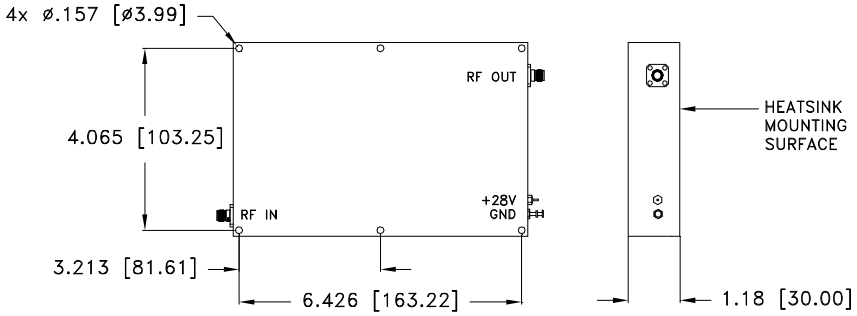
**ZHL-15W-422-S+**
**ZHL-15W-422X-S+**

50Ω 15 W 600 to 4200 MHz Input- & Output-SMA Female

## OUTLINE DRAWING FOR MODEL WITH HEATSINK




MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK




## OUTLINE DIMENSIONS (Inch / mm)

| A | B | C | D | E | F | G | H | J | K | L | M | N | wt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7.25 | 4.33 | 4.58 | 6.69 | 1.38 | 3.36 | -- | -- | 0.67 | 3.34 | 0.71 | -- | -- | grams* |
| 184.15 | 110.00 | 116.33 | 170.00 | 35.05 | 85.34 | -- | -- | 17.05 | 84.80 | 18.00 | -- | -- | 2041 |

*880 grams without heatsink

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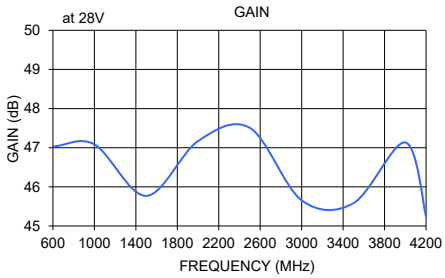
# High Power Amplifier

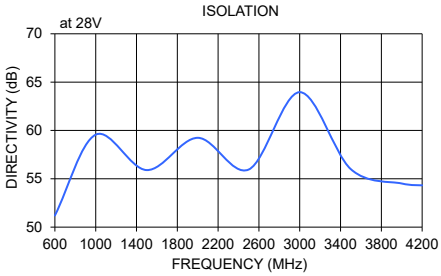
## ZHL-15W-422-S+
## ZHL-15W-422X-S+

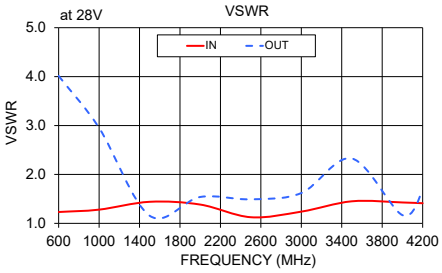
50Ω 15 W 600 to 4200 MHz Input- & Output-SMA Female

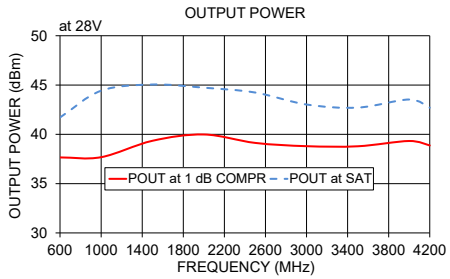
### TYPICAL PERFORMANCE DATA/CURVES

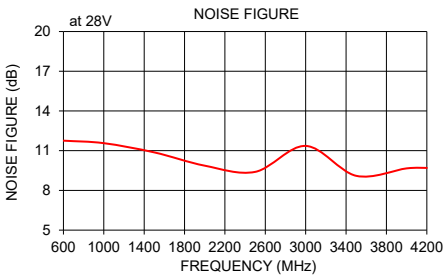
| FREQUENCY (MHz) | GAIN (dB) | ISOLATION (dB) | VSWR (:1) | | $P_{OUT}$ at 1 dB COMPR. (dBm) | $P_{OUT}$ at SAT (dBm) | NOISE FIGURE (dB) | OUTPUT IP3 (dBm) |
|---|---|---|---|---|---|---|---|---|
| | +28 V | +28 V | IN | OUT | +28 V | +28 V | +28 V | +28 V |
| 600 | 47.03 | 51.20 | 1.23 | 4.01 | 37.66 | 41.71 | 11.76 | 45.51 |
| 1000 | 47.09 | 59.56 | 1.28 | 2.95 | 37.68 | 44.43 | 11.57 | 49.17 |
| 1500 | 45.77 | 55.90 | 1.44 | 1.16 | 39.35 | 45.05 | 10.87 | 50.01 |
| 2000 | 47.17 | 59.24 | 1.38 | 1.54 | 39.99 | 44.73 | 9.87 | 49.18 |
| 2500 | 47.51 | 55.96 | 1.13 | 1.49 | 39.13 | 44.24 | 9.40 | 49.22 |
| 3000 | 45.65 | 63.96 | 1.24 | 1.62 | 38.80 | 43.03 | 11.36 | 48.48 |
| 3500 | 45.58 | 56.00 | 1.45 | 2.33 | 38.79 | 42.71 | 9.10 | 48.52 |
| 4000 | 47.13 | 54.51 | 1.43 | 1.17 | 39.33 | 43.53 | 9.66 | 48.91 |
| 4200 | 45.25 | 54.32 | 1.41 | 1.67 | 38.87 | 42.70 | 9.70 | 47.04 |

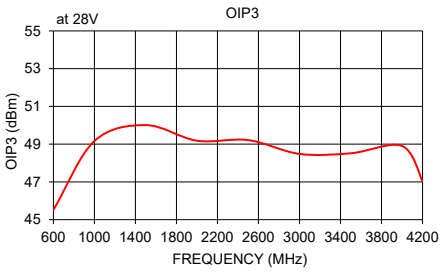



NOTES

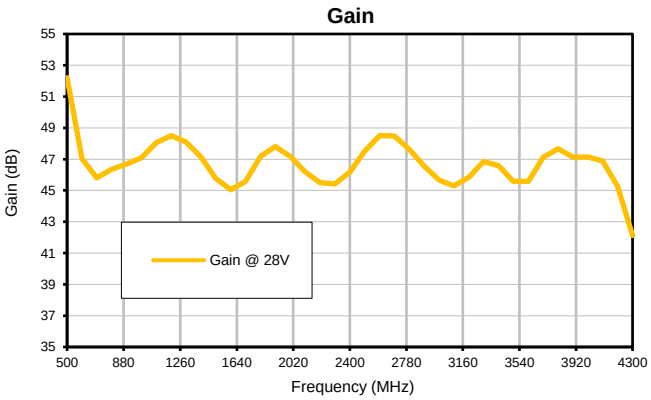
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's 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

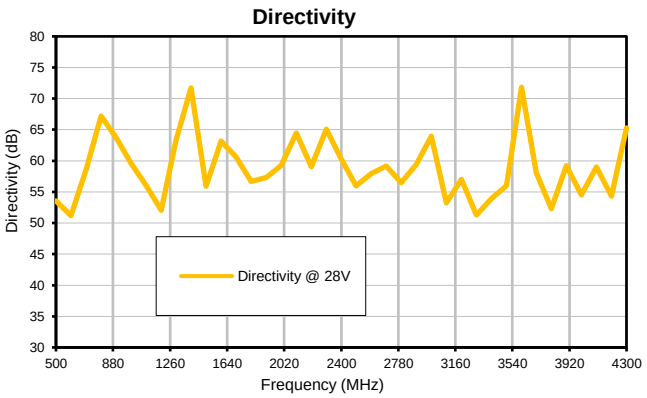
# High Power Amplifier ZHL-15W-422+

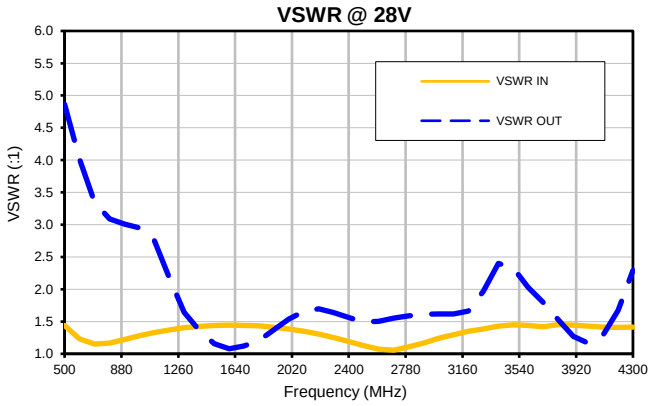
## *Typical Performance Data*

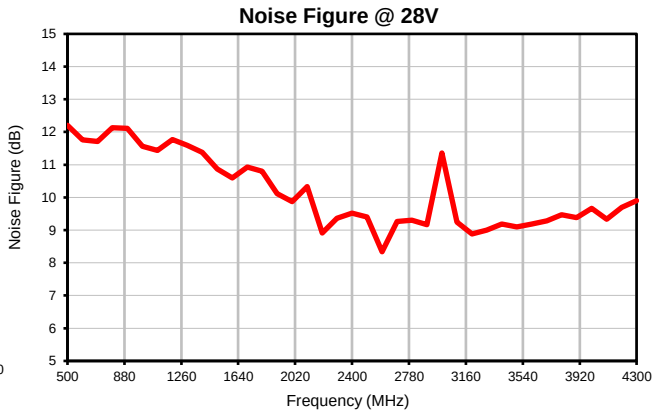
| FREQUENCY (MHz) | GAIN (dB) 28V | DIRECTIVITY (dB) 28V | VSWR (:1) IN 28V | VSWR (:1) OUT 28V | NOISE FIGURE (dB) 28V | POUT @ 1 dB COMPRESSION (dBm) 28V | POUT AT SATURATION (dBm) 28V | OUTPUT IP3 (dBm) 28V |
|---|---|---|---|---|---|---|---|---|
| 500 | 52.20 | 53.57 | 1.44 | 4.87 | 12.20 | 37.43 | 40.65 | 44.27 |
| 600 | 47.03 | 51.20 | 1.23 | 4.01 | 11.76 | 37.66 | 41.71 | 45.51 |
| 700 | 45.80 | 58.52 | 1.15 | 3.35 | 11.71 | 37.79 | 43.03 | 46.89 |
| 800 | 46.37 | 67.16 | 1.17 | 3.09 | 12.13 | 37.58 | 43.90 | 47.94 |
| 900 | 46.68 | 63.75 | 1.22 | 3.01 | 12.11 | 37.59 | 44.23 | 48.49 |
| 1000 | 47.09 | 59.56 | 1.28 | 2.95 | 11.57 | 37.68 | 44.43 | 49.17 |
| 1100 | 48.05 | 56.04 | 1.33 | 2.75 | 11.44 | 38.15 | 45.46 | 49.74 |
| 1200 | 48.50 | 52.05 | 1.37 | 2.17 | 11.77 | 38.98 | 46.06 | 50.17 |
| 1300 | 48.09 | 63.29 | 1.40 | 1.64 | 11.60 | 39.22 | 46.02 | 50.24 |
| 1400 | 47.13 | 71.70 | 1.43 | 1.37 | 11.38 | 39.09 | 45.50 | 50.20 |
| 1500 | 45.77 | 55.90 | 1.44 | 1.16 | 10.87 | 39.35 | 45.05 | 50.01 |
| 1600 | 45.05 | 63.15 | 1.44 | 1.08 | 10.60 | 39.68 | 44.59 | 49.91 |
| 1700 | 45.58 | 60.60 | 1.44 | 1.12 | 10.93 | 39.87 | 44.54 | 49.74 |
| 1800 | 47.18 | 56.68 | 1.43 | 1.21 | 10.80 | 40.02 | 45.00 | 49.82 |
| 1900 | 47.81 | 57.29 | 1.41 | 1.37 | 10.12 | 40.12 | 44.86 | 49.44 |
| 2000 | 47.17 | 59.24 | 1.38 | 1.54 | 9.87 | 39.99 | 44.73 | 49.18 |
| 2100 | 46.20 | 64.46 | 1.35 | 1.66 | 10.33 | 39.81 | 44.90 | 49.67 |
| 2200 | 45.51 | 59.05 | 1.31 | 1.70 | 8.91 | 39.55 | 44.77 | 49.33 |
| 2300 | 45.42 | 65.06 | 1.25 | 1.64 | 9.36 | 39.16 | 44.31 | 48.84 |
| 2400 | 46.18 | 60.26 | 1.19 | 1.57 | 9.52 | 38.86 | 44.02 | 48.93 |
| 2500 | 47.51 | 55.96 | 1.13 | 1.49 | 9.40 | 39.13 | 44.24 | 49.22 |
| 2600 | 48.51 | 57.91 | 1.07 | 1.50 | 8.34 | 39.01 | 43.90 | 48.53 |
| 2700 | 48.49 | 59.17 | 1.06 | 1.55 | 9.26 | 39.15 | 43.43 | 48.96 |
| 2800 | 47.63 | 56.47 | 1.10 | 1.59 | 9.30 | 39.16 | 43.55 | 49.08 |
| 2900 | 46.57 | 59.43 | 1.17 | 1.61 | 9.17 | 39.14 | 43.55 | 48.49 |
| 3000 | 45.65 | 63.96 | 1.24 | 1.62 | 11.36 | 38.80 | 43.03 | 48.48 |
| 3100 | 45.29 | 53.25 | 1.29 | 1.62 | 9.25 | 38.64 | 42.80 | 48.59 |
| 3200 | 45.85 | 57.00 | 1.35 | 1.66 | 8.88 | 38.31 | 42.80 | 48.27 |
| 3300 | 46.85 | 51.31 | 1.39 | 1.97 | 9.01 | 38.70 | 43.39 | 48.49 |
| 3400 | 46.59 | 53.93 | 1.43 | 2.40 | 9.18 | 38.88 | 42.98 | 48.67 |
| 3500 | 45.58 | 56.00 | 1.45 | 2.33 | 9.10 | 38.79 | 42.71 | 48.52 |
| 3600 | 45.58 | 71.82 | 1.44 | 2.03 | 9.18 | 38.33 | 42.32 | 48.68 |
| 3700 | 47.11 | 58.10 | 1.42 | 1.80 | 9.28 | 38.42 | 42.57 | 48.64 |
| 3800 | 47.67 | 52.33 | 1.45 | 1.53 | 9.47 | 38.33 | 42.97 | 48.10 |
| 3900 | 47.13 | 59.23 | 1.45 | 1.27 | 9.39 | 38.48 | 42.93 | 48.50 |
| 4000 | 47.13 | 54.51 | 1.43 | 1.17 | 9.66 | 39.33 | 43.53 | 48.91 |
| 4100 | 46.89 | 59.01 | 1.42 | 1.29 | 9.33 | 39.44 | 43.69 | 48.03 |
| 4200 | 45.25 | 54.32 | 1.41 | 1.67 | 9.70 | 38.87 | 42.70 | 47.04 |
| 4300 | 42.13 | 65.30 | 1.41 | 2.29 | 9.90 | 36.96 | 40.21 | 45.14 |

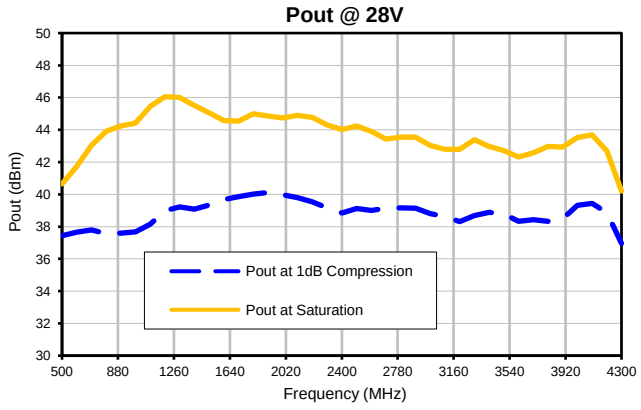
## *Typical Performance Curves*

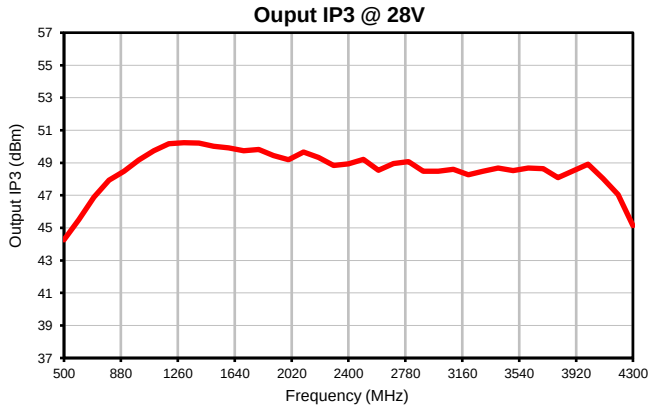


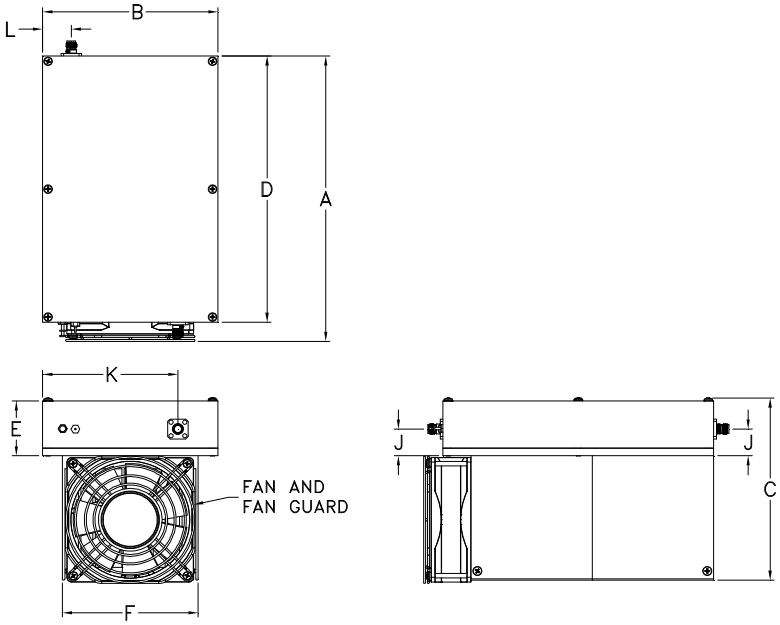



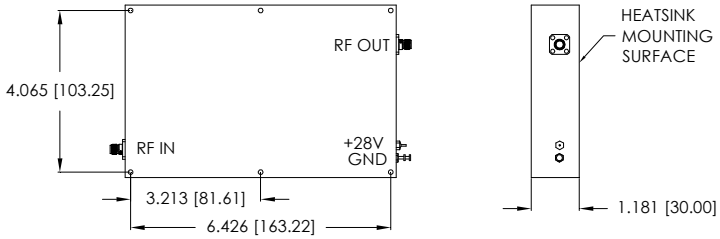
# Case Style CP

**CP2548**

## Outline Dimensions




**MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK**




| CASE# | A | B | C | D | E | F | G | H | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CP2548 | 7.25<br>(184.15) | 4.33<br>(110.0) | 4.58<br>(116.33) | 6.69<br>(170.0) | 1.38<br>(35.05) | 3.36<br>(85.34) | --<br>-- | --<br>-- | .67<br>(17.05) | 3.34<br>(84.80) | .71<br>(18.00) |

| CASE# | M | N | WT. GRAMS | WT. WITHOUT HEATSINK GRAMS |
|---|---|---|---|---|
| CP2548 | --<br>-- | --<br>-- | 2041 | 880 |

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

### Notes:

1. Case material: Aluminum alloy.
2. Finish:
   For RoHS Case Styles: Clear Chemical conversion coating, non-chrome or trivalent chrome based.
3. Heat sink finish: Black anodize.
4. Refer to the individual model data sheet for the type of connectors available.
5. Recommended screws for mounting model without heat sink on 3/32" thick sheet: #6-32, 1.50" Length.
6. Shape of connector flange may vary.


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**Environmental Specifications** **ENV23T19**

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 | -20° to 45°C<br>Ambient Environment | Individual Model Data Sheet |
| Storage Temperature | -55° to 100° C<br>Ambient Environment | Individual Model Data Sheet |
| Stabilization Bake | (non-operating)<br>125°C, 24 hours | - - - |
| Burn-in at Elevated Temp. | (DC on)<br>160 hours at 60° C base plate Temperature | MIL-STD-202, Method 108 |
| Thermal Shock | -55° to 100°C, 5 cycles | MIL-STD-202, Method 107, Condition A, except 100°C |


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