*Coaxial*

# High Power Amplifier

# ZHL-20W-13+
# ZHL-20W-13X+

50Ω 20W 20 to 1000 MHz

## Features

- High power, 20 Watt
- Protected against overheat -shuts off automatically
- Excellent gain flatness, ±1.2 dB typ.
- Class A amplifier
- Usable over 15 to 1100 MHz
- Protected by US patent 7,348,854

## Applications

- VHF/UHF transmitters
- defense
- Amateur radio, FM, TV

*Generic photo used for illustration purposes only*

| Model No. | ZHL-20W-13+ | ZHL-20W-13X+▲ |
|---|---|---|
| Case Style | CP641 | |
| Connectors | SMA | |

***+RoHS Compliant***

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

## Electrical Specifications

| Parameter | ZHL-20W-13+ | | | ZHL-20W-13X+▲ | | | Units |
|---|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min | Typ. | Max. | |
| Frequency Range | 20 | | 1000 | 20 | | 1000 | MHz |
| Gain | 46 | 50 | 55 | 46 | 50 | 55 | dB |
| Gain Flatness | | | ±1.8 | | | ±1.8 | dB |
| Output Power at 1dB compression | +39 | +41 | | +39 | +41 | | dBm |
| Saturated Output Power at 3dB compression | +40 | +43 | | +40 | +43 | | dBm |
| Noise Figure | | 3.5 | | | 3.5 | | dB |
| Output third order intercept point | | +50 | | | +50 | | dBm |
| Input VSWR | | 1.7 | | | 1.7 | | :1 |
| Output VSWR | | 2.5 | | | 2.5 | | :1 |
| DC Supply Voltage | | 24 | | | 24 | | V |
| Supply Current | | | 2.8 | | | 2.8 | A |

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

## Maximum Ratings

| Parameter | Ratings |
|---|---|
| Operating Temperature | -20°C to 65°C |
| Storage Temperature | -55°C to 100°C |
| Base Plate Temperature | 85°C |
| DC Voltage | 28V |
| Input RF Power[1] (no damage) | -3dBm |

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

1. At nominal 50 Ohms RF load. Amplifier can withstand a full mismatch (short or open) across all phases at RF output, if the input RF power does not exceed -13dBm. Maximum RF input power is defined as a peak envelope power (PEP). See the application note AN-60-037 for PEP calculation.

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.

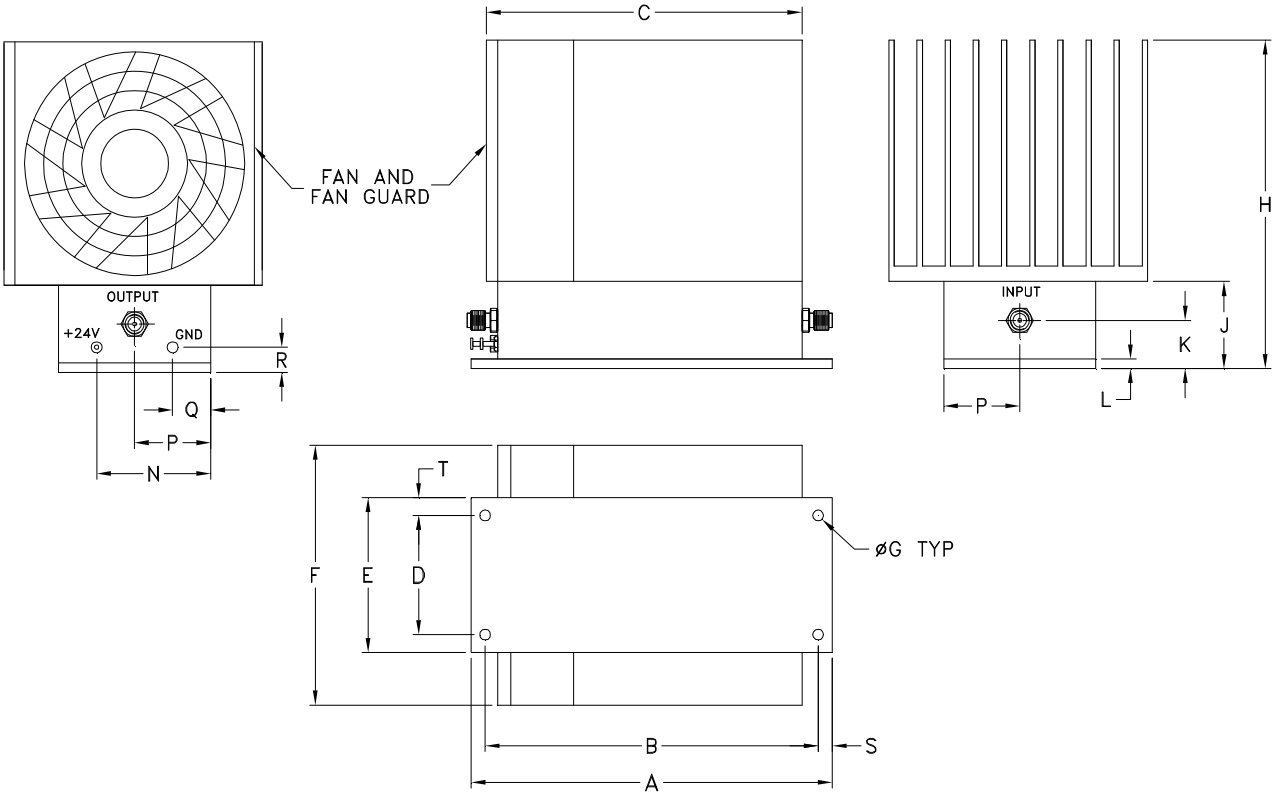
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.

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/MCLStore/terms.jsp

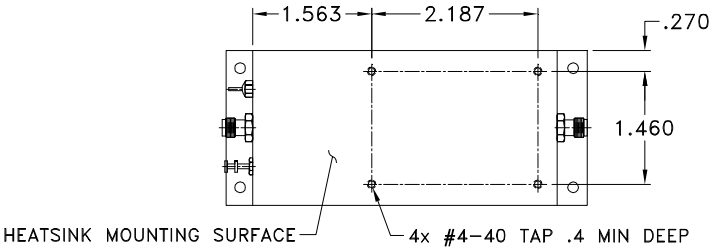
REV. H
ECO-009319
ZHL-20W-13+
ED-13637/2/3
MM/CP/AM
210818


Mini-Circuits®
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

## Outline Drawing for models 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 | P | Q | R | S | T | wt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.75 | 4.375 | 4.18 | 1.540 | 2.00 | 3.36 | .144 | 4.24 | 1.12 | .58 | .125 | -- | 1.50 | 1.00 | .50 | .34 | .19 | .23 | grams* |
| 120.65 | 111.13 | 106.17 | 39.12 | 50.80 | 85.34 | 3.66 | 107.70 | 28.45 | 14.73 | 3.18 | -- | 38.10 | 25.40 | 12.70 | 8.64 | 4.83 | 5.84 | 750 |

*290 grams without heatsink

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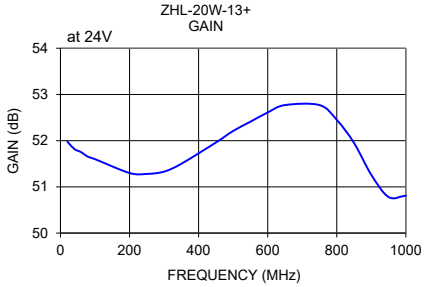
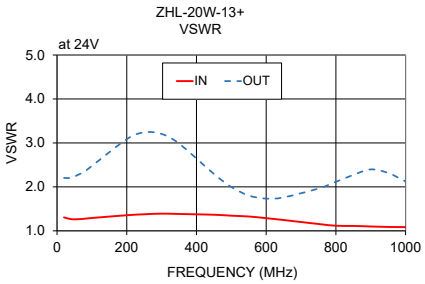
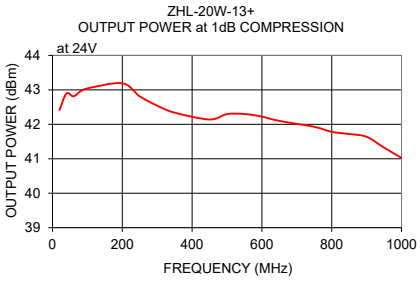
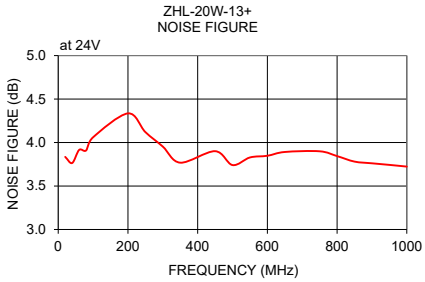
# Typical Performance Data/Curves

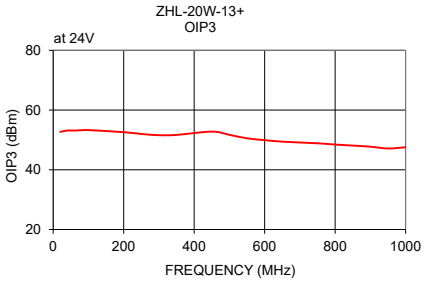
| FREQUENCY (MHz) | GAIN (dB) | VSWR (:1) | | NOISE FIGURE (dB) | POUT at 1 dB COMPR. (dBm) | OIP3 (dBm) |
|---|---|---|---|---|---|---|
| | 24V | IN | OUT | 24V | 24V | 24V |
| 20 | 51.98 | 1.31 | 2.20 | 3.84 | 42.41 | 52.67 |
| 40 | 51.82 | 1.27 | 2.21 | 3.76 | 42.89 | 53.14 |
| 60 | 51.75 | 1.26 | 2.27 | 3.92 | 42.81 | 53.13 |
| 80 | 51.65 | 1.28 | 2.36 | 3.91 | 42.96 | 53.25 |
| 100 | 51.60 | 1.29 | 2.48 | 4.06 | 43.04 | 53.29 |
| 200 | 51.30 | 1.36 | 3.09 | 4.34 | 43.19 | 52.59 |
| 250 | 51.28 | 1.38 | 3.24 | 4.12 | 42.81 | 51.99 |
| 300 | 51.33 | 1.39 | 3.20 | 3.95 | 42.54 | 51.58 |
| 350 | 51.50 | 1.38 | 2.99 | 3.77 | 42.34 | 51.68 |
| 450 | 51.96 | 1.37 | 2.30 | 3.90 | 42.14 | 52.77 |
| 500 | 52.21 | 1.34 | 2.00 | 3.74 | 42.30 | 51.70 |
| 550 | 52.41 | 1.33 | 1.80 | 3.83 | 42.30 | 50.53 |
| 600 | 52.61 | 1.29 | 1.73 | 3.85 | 42.22 | 49.93 |
| 650 | 52.77 | 1.25 | 1.76 | 3.89 | 42.10 | 49.41 |
| 750 | 52.77 | 1.16 | 1.96 | 3.90 | 41.93 | 48.86 |
| 800 | 52.45 | 1.12 | 2.11 | 3.84 | 41.78 | 48.44 |
| 850 | 51.95 | 1.11 | 2.27 | 3.78 | 41.72 | 48.10 |
| 900 | 51.26 | 1.10 | 2.40 | 3.76 | 41.64 | 47.73 |
| 950 | 50.78 | 1.09 | 2.32 | 3.74 | 41.32 | 47.13 |
| 1000 | 50.81 | 1.08 | 2.12 | 3.72 | 41.03 | 47.53 |

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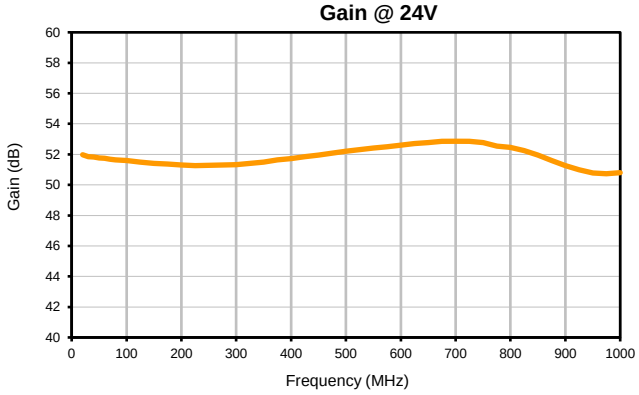
# Amplifier ZHL-20W-13+

## *Typical Performance Data*

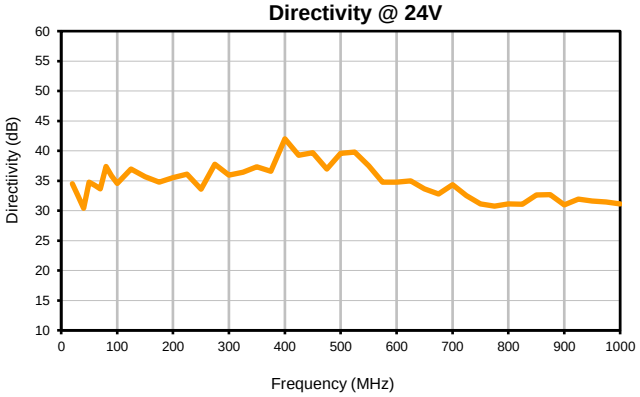
| Frequency | GAIN | Directivity | VSWR In | VSWR Out | Noise Figure | Pout at 1dB Compression | Output IP3 |
|---|---|---|---|---|---|---|---|
| (MHz) | (dB) 24V | (dB) 24V | (:1) 24V | (:1) 24V | (dB) 24V | (dBm) 24V | (dBm) 24V |
| 20 | 51.98 | 34.47 | 1.31 | 2.20 | 3.84 | 42.41 | 52.67 |
| 30 | 51.86 | 32.52 | 1.27 | 2.19 | 3.81 | 42.72 | 53.03 |
| 40 | 51.82 | 30.40 | 1.27 | 2.21 | 3.76 | 42.89 | 53.14 |
| 50 | 51.76 | 34.78 | 1.27 | 2.23 | 3.86 | 42.73 | 53.09 |
| 60 | 51.75 | 34.22 | 1.26 | 2.27 | 3.92 | 42.81 | 53.13 |
| 70 | 51.68 | 33.63 | 1.27 | 2.31 | 3.96 | 42.80 | 53.18 |
| 80 | 51.65 | 37.38 | 1.28 | 2.36 | 3.91 | 42.96 | 53.25 |
| 90 | 51.61 | 35.84 | 1.28 | 2.41 | 4.06 | 42.95 | 53.15 |
| 100 | 51.60 | 34.57 | 1.29 | 2.48 | 4.06 | 43.04 | 53.29 |
| 125 | 51.50 | 36.98 | 1.31 | 2.64 | 4.15 | 43.10 | 53.17 |
| 150 | 51.40 | 35.67 | 1.33 | 2.80 | 4.24 | 43.18 | 53.07 |
| 175 | 51.37 | 34.78 | 1.35 | 2.95 | 4.32 | 43.26 | 52.88 |
| 200 | 51.30 | 35.49 | 1.36 | 3.09 | 4.34 | 43.19 | 52.59 |
| 225 | 51.26 | 36.11 | 1.37 | 3.18 | 4.33 | 43.02 | 52.33 |
| 250 | 51.28 | 33.58 | 1.38 | 3.24 | 4.12 | 42.81 | 51.99 |
| 275 | 51.31 | 37.73 | 1.38 | 3.25 | 4.05 | 42.62 | 51.80 |
| 300 | 51.33 | 35.92 | 1.39 | 3.20 | 3.95 | 42.54 | 51.58 |
| 325 | 51.40 | 36.41 | 1.38 | 3.12 | 3.87 | 42.40 | 51.55 |
| 350 | 51.50 | 37.31 | 1.38 | 2.99 | 3.77 | 42.34 | 51.68 |
| 375 | 51.63 | 36.58 | 1.38 | 2.83 | 3.69 | 42.36 | 51.84 |
| 400 | 51.72 | 42.00 | 1.38 | 2.66 | 3.84 | 42.19 | 52.42 |
| 425 | 51.85 | 39.27 | 1.37 | 2.47 | 4.03 | 42.08 | 52.81 |
| 450 | 51.96 | 39.71 | 1.37 | 2.30 | 3.90 | 42.14 | 52.77 |
| 475 | 52.09 | 36.97 | 1.36 | 2.13 | 3.73 | 42.18 | 52.25 |
| 500 | 52.21 | 39.55 | 1.34 | 2.00 | 3.74 | 42.30 | 51.70 |
| 525 | 52.31 | 39.79 | 1.34 | 1.89 | 3.75 | 42.27 | 51.10 |
| 550 | 52.41 | 37.51 | 1.33 | 1.80 | 3.83 | 42.30 | 50.53 |
| 575 | 52.51 | 34.75 | 1.30 | 1.75 | 3.85 | 42.31 | 50.15 |
| 600 | 52.61 | 34.74 | 1.29 | 1.73 | 3.85 | 42.22 | 49.93 |
| 625 | 52.70 | 34.98 | 1.27 | 1.74 | 3.86 | 42.21 | 49.66 |
| 650 | 52.77 | 33.65 | 1.25 | 1.76 | 3.89 | 42.10 | 49.41 |
| 675 | 52.85 | 32.78 | 1.23 | 1.80 | 3.86 | 42.04 | 49.25 |
| 700 | 52.86 | 34.33 | 1.20 | 1.85 | 3.89 | 41.94 | 49.13 |
| 725 | 52.85 | 32.52 | 1.18 | 1.90 | 3.88 | 41.91 | 48.98 |
| 750 | 52.77 | 31.13 | 1.16 | 1.96 | 3.90 | 41.93 | 48.86 |
| 775 | 52.54 | 30.78 | 1.11 | 2.03 | 3.89 | 41.83 | 48.62 |
| 800 | 52.45 | 31.12 | 1.12 | 2.11 | 3.84 | 41.78 | 48.44 |
| 825 | 52.24 | 31.05 | 1.12 | 2.20 | 3.80 | 41.85 | 48.28 |
| 850 | 51.95 | 32.60 | 1.11 | 2.27 | 3.78 | 41.72 | 48.10 |
| 875 | 51.60 | 32.66 | 1.10 | 2.35 | 3.80 | 41.68 | 47.92 |
| 900 | 51.26 | 30.99 | 1.10 | 2.40 | 3.76 | 41.64 | 47.73 |
| 925 | 50.98 | 31.92 | 1.10 | 2.41 | 3.74 | 41.43 | 47.42 |
| 950 | 50.78 | 31.62 | 1.09 | 2.32 | 3.74 | 41.32 | 47.13 |
| 975 | 50.73 | 31.42 | 1.07 | 2.25 | 3.75 | 41.07 | 46.97 |
| 1000 | 50.81 | 31.11 | 1.08 | 2.12 | 3.72 | 41.03 | 47.53 |

## *Typical Performance Curves*

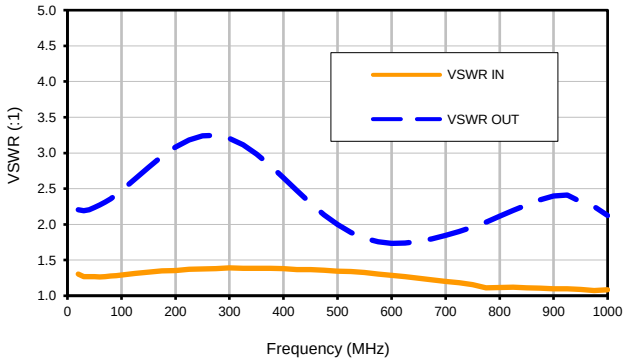
**Gain @ 24V**



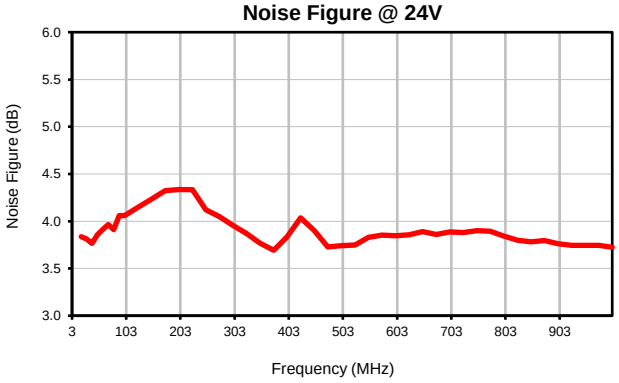

**Directivity @ 24V**



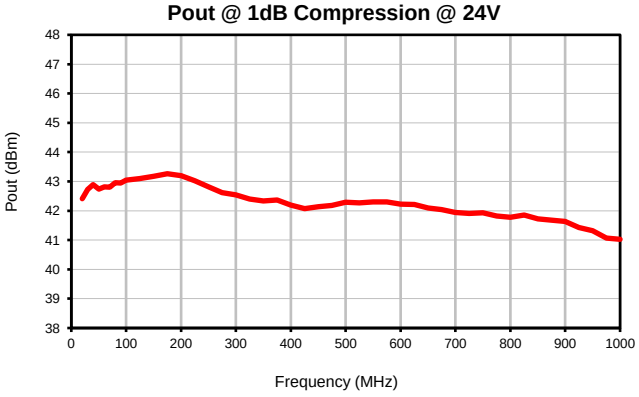

**VSWR @ 24V**



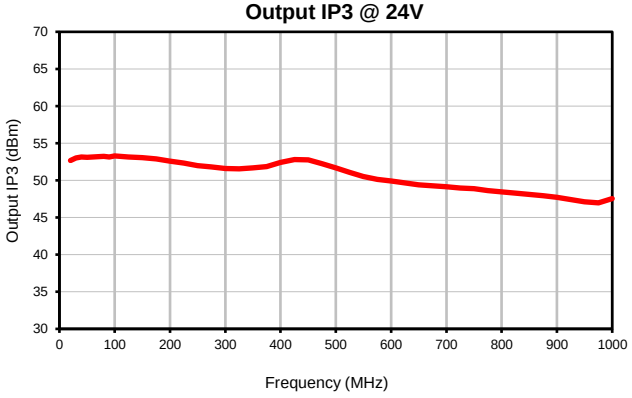

**Noise Figure @ 24V**




**Pout @ 1dB Compression @ 24V**



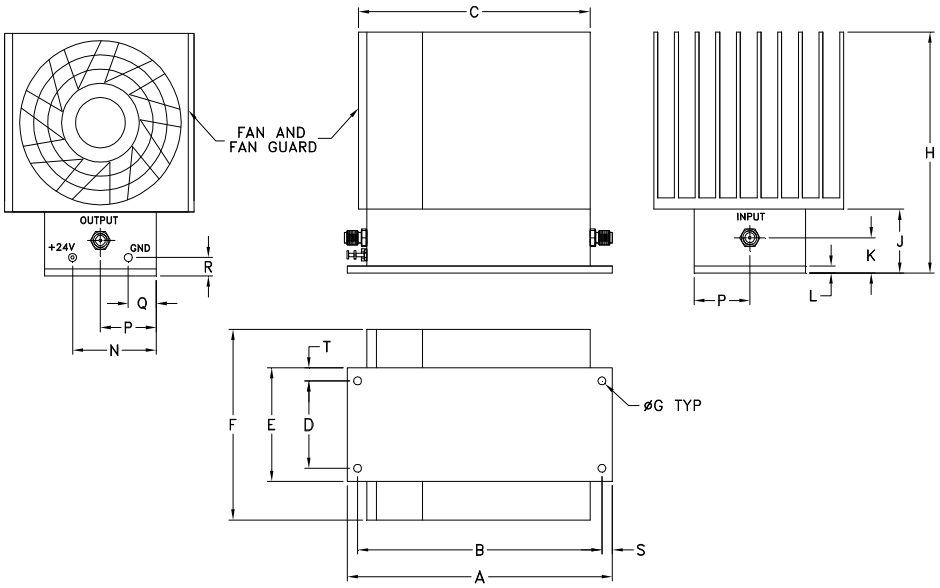

**Output IP3 @ 24V**



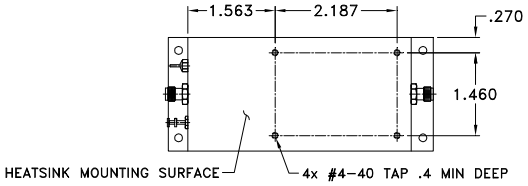
# Case Style CP

## Outline Dimensions

**CP641**




MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK




| CASE# | A | B | C | D | E | F | G | H | J | K | L | M | N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CP641 | 4.75 (120.65) | 4.375 (111.13) | 4.18 (106.17) | 1.540 (39.12) | 2.00 (50.80) | 3.36 (85.34) | .144 (3.66) | 4.24 (107.70) | 1.12 (28.45) | .58 (14.73) | .125 (3.18) | -- -- | 1.50 (38.10) |

| CASE# | P | Q | R | S | T | WT. GRAMS | WT. WITHOUT HEATSINK GRAMS |
|---|---|---|---|---|---|---|---|
| CP641 | 1.00 (25.40) | .50 (12.70) | .34 (8.64) | .19 (4.83) | .23 (5.84) | 750 | 290 |

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

### Notes:

1. Case material: Aluminum alloy.
2. Case finish:
   For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
3. Heat sink finish: Black anodize if supplied with heat sink.

Mini-Circuits

**Environmental Specifications** **ENV23T5**

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 80° 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 85° C | MIL-STD-202, Method 108 |
| Thermal Shock | -55° to 100°C, 5 cycles | MIL-STD-202, Method 107, Condition A, except 100°C |