MEDIUM POWER, HIGH GAIN

# Wideband Amplifier

# ZVE-453HP+
# ZVE-453HPX+

50Ω 1.25 W 18 to 45 GHz 2.4 mm Female

## THE BIG DEAL

- High Gain, 39 dB Typ. Over the Entire Operating Band
- Excellent Gain Flatness, ±2.5 dB Typ.
- Saturated Output Power, +31 dBm Typ.
- Adjustable DC Voltage, +10 to +15 V

*Generic photo used for illustration purposes only*

## APPLICATIONS

- Wideband Test and Instrumentation
- 5G mmW
- SATCOM
- Wireless Infrastructure

| Model No. | ZVE-453HP+ | ZVE-453HPX+ |
|---|---|---|
| Option | With Heatsink & Fan | Without Heatsink & Fan |
| Case Style | VN3071-4 | |
| Connectors | 2.4 mm female | |

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

## PRODUCT OVERVIEW

Mini-Circuits' ZVE-453HP(X)+ is a coaxial, 1.25 Watt wideband high gain amplifier, operating from 18 to 45 GHz. This model operates over a single positive supply range of +10 to +15 V, allowing users to choose their desired operating voltage. Internal DC-DC conversion circuitry maintains constant efficiency over the full input voltage range. The amplifier incorporates several DC-protection features, such as over-voltage, reverse voltage and in-rush current, that protect the amplifier from damage if mishandled during operation. The wideband operation combined with high output power makes this amplifier an ideal choice for testing and instrumentation applications.

## KEY FEATURES

| Feature | Advantages |
|---|---|
| Wideband Amplifier, 18 to 45 GHz | A single amplifier serves the need for applications including 5G bands (24 to 39 GHz), SATCOM, Test & Instrumentation, etc. |
| Integrated Fan Assembly | Model ZVE-453HP+ utilizes two integrated fans, keeping the amplifier cool to the touch during normal operation at room temperature. |
| High Gain<br>Low VSWR<br>Medium RF Power | The amplifier provides 39 dB (typ.) of gain over the entire operating band, and is capable of delivering over 1 Watt of RF power. |
| Adjustable DC Supply Voltage | The device is capable of operating from +10 to +15 V with consistent DC power consumption. |
| DC Protection –<br>Over-Voltage<br>Reverse Voltage<br>In-Rush Current | The internal DC circuitry allows the amplifier to be protected from external mishandling, that could lead to catastrophic failures in the field. |

REV. B
ECO-022344
ZVE-453HP(X)+
MCL NY
260225

## ELECTRICAL SPECIFICATIONS AT +25 °C BASEPLATE

| Parameter | Condition (MHz) | ZVE-453HP+[1] ZVE-453HPX+[2] Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Frequency Range | | 18000 | | 45000 | MHz |
| Gain | 18000-30000 | 33.0 | 37 | | dB |
| | 30000-45000 | 35.0 | 40 | | |
| Output Power at 1 dB Compression | 18000-26000 | +25.0 | +29.0 | | dBm |
| | 26000-40000 | +29.0 | +30.5 | | |
| | 40000-45000 | +25.5 | +28.5 | | |
| Saturated Output Power[3] | 18000-26000 | +28.0 | +30.5 | | dBm |
| | 26000-40000 | +30 | +32.0 | | |
| | 40000-45000 | +27.5 | +30.0 | | |
| Output IP3 | 18000-45000 | | +41 | | dBm |
| Input VSWR | 18000-45000 | | 1.5 | 2.0 | :1 |
| Output VSWR[4] | 18000-45000 | | 1.5 | 2.0 | :1 |
| Operating DC Voltage ($V_{DD}$) | | +10 | | +15 | V |
| Device Operating Current at +15 V (ZVE-453HPX+ / ZVE-453HP+) | | | 900[2] / 1100[1] | 1600[2] / 1800[1] | mA |
| Device Operating Power at +15 V | | | 19[5] | | W |

1. For units with heatsink, limit ambient temperature to +50 °C.
2. For units without heatsink, limit the maximum baseplate temperature to +60 °C.
3. At $P_{SAT}$, $P_{OUT}$ changes less than 0.1 dB for a 1 dB change in $P_{IN}$.
4. Open and short-circuit loads are not recommended at the amplifier output. Ensure proper 50Ω load before turning the amplifier "ON".
5. Device operating power is based on current when amplifier is in saturation.

## ABSOLUTE MAXIMUM RATINGS[6, 7]

| Parameter | Ratings |
|---|---|
| Operating Temperature | ZVE-453HP+ -40 °C to +50 °C ambient<br>ZVE-453HPX+ -40 °C to +60 °C baseplate |
| Storage Temperature | -40 °C to +85 °C |
| Total Power Dissipation | 24 W |
| RF Input Power (CW) | +2 dBm |
| DC Operating Voltage | +16 V |

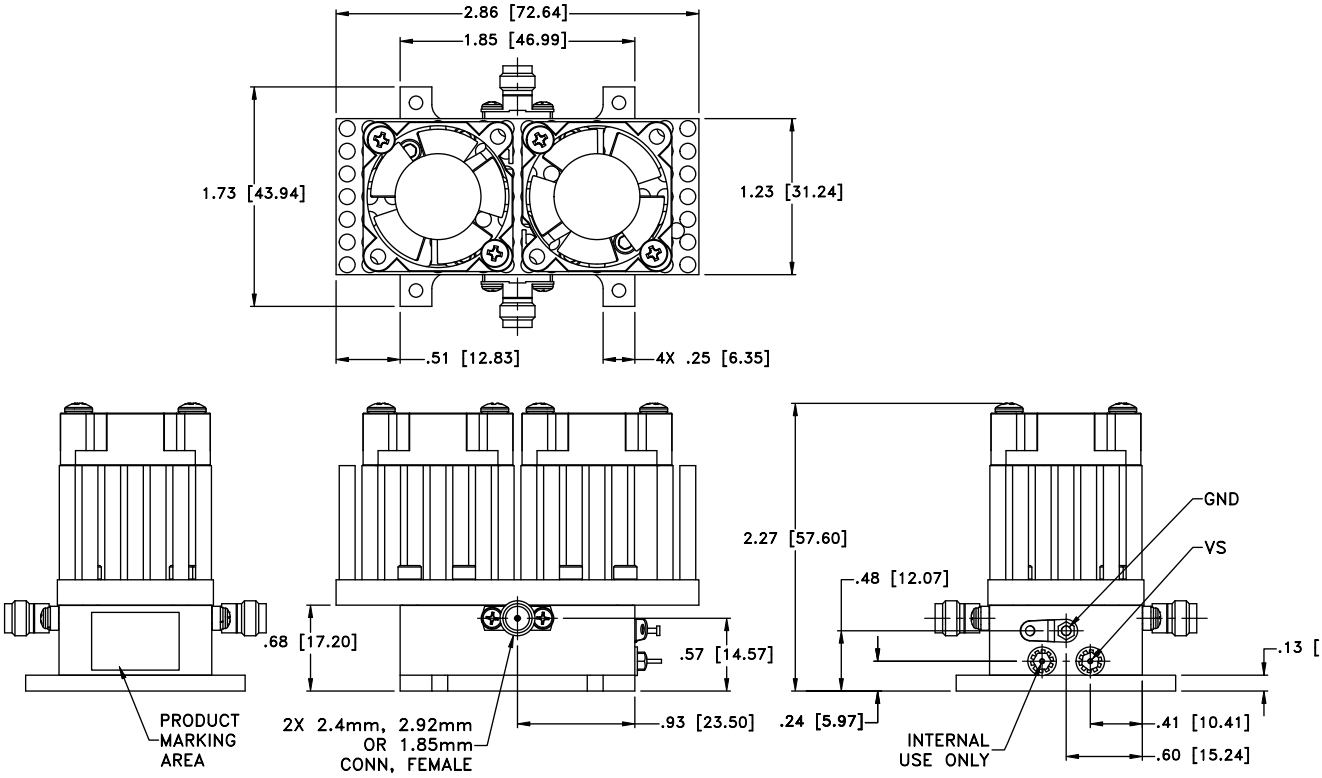
6. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.
7. Specified under matched load to 50Ω.

# Wideband Amplifier

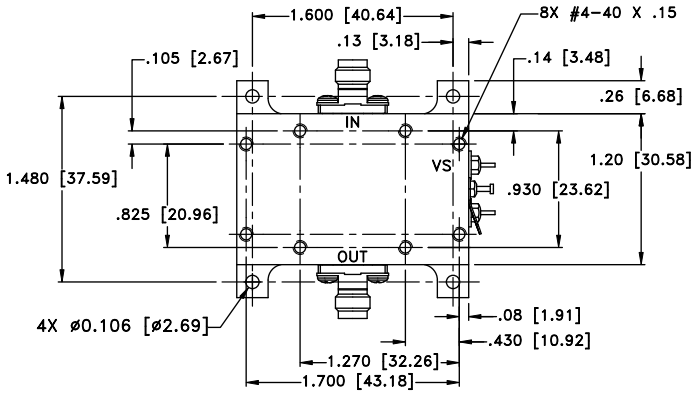


50Ω 1.25 W 18 to 45 GHz 2.4 mm Female

## OUTLINE DRAWING FOR MODELS WITH HEATSINK & FAN (ZVE-453HP+)




## MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK & FAN (ZVE-453HPX+)




Weight: 160 grams; Without Heatsink: 60 grams
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl. ±.015

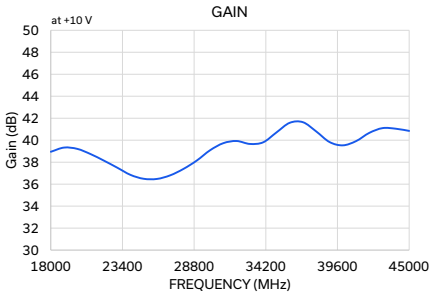
# Wideband Amplifier

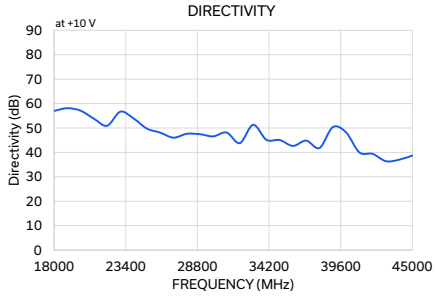
# ZVE-453HP+
# ZVE-453HPX+

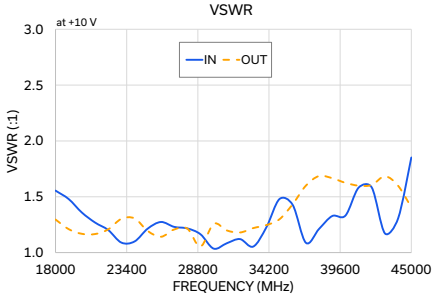
50Ω 1.25 W 18 to 45 GHz 2.4 mm Female

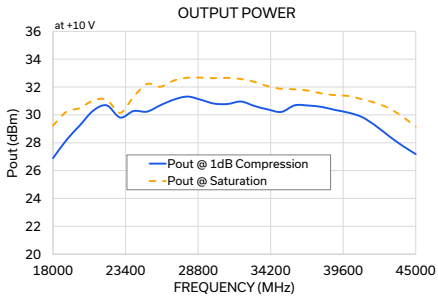
## TYPICAL PERFORMANCE DATA/CURVES

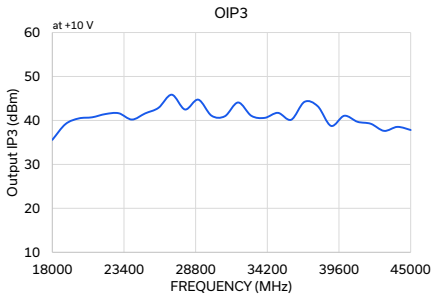
| Frequency (MHz) | Gain (dB) | Directivity (dB) | VSWR (:1) | | $P_{OUT}$ at 1 dB Compression (dBm) | $P_{OUT}$ at Saturation (dBm) | Output IP3 (dBm) |
|---|---|---|---|---|---|---|---|
| | +10 V | +10 V | IN | OUT | +10 V | +10 V | +10 V |
| 18000 | 38.95 | 56.99 | 1.56 | 1.30 | 26.89 | 29.23 | 35.57 |
| 21000 | 38.74 | 53.83 | 1.27 | 1.17 | 30.31 | 31.04 | 40.71 |
| 24000 | 36.85 | 53.88 | 1.10 | 1.31 | 30.28 | 31.30 | 40.20 |
| 27000 | 36.80 | 46.04 | 1.23 | 1.21 | 31.10 | 32.47 | 45.85 |
| 30000 | 39.08 | 46.57 | 1.04 | 1.26 | 30.81 | 32.64 | 41.07 |
| 33000 | 39.66 | 51.30 | 1.05 | 1.22 | 30.64 | 32.37 | 41.05 |
| 36000 | 41.58 | 42.67 | 1.43 | 1.43 | 30.69 | 31.84 | 40.16 |
| 39000 | 39.83 | 50.34 | 1.33 | 1.67 | 30.35 | 31.42 | 38.76 |
| 42000 | 40.67 | 39.41 | 1.58 | 1.61 | 29.23 | 30.87 | 39.23 |
| 45000 | 40.85 | 38.74 | 1.85 | 1.40 | 27.18 | 29.16 | 37.82 |




NOTES

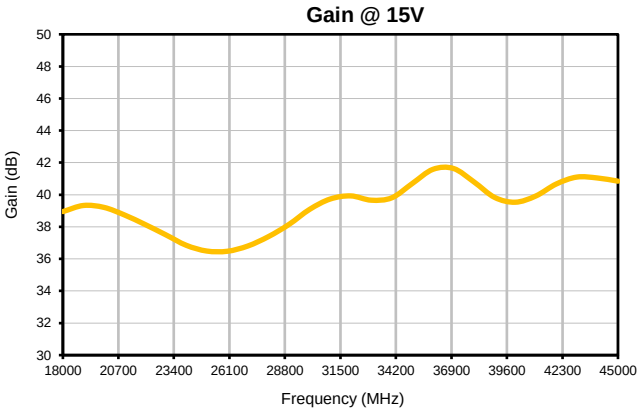
A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's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

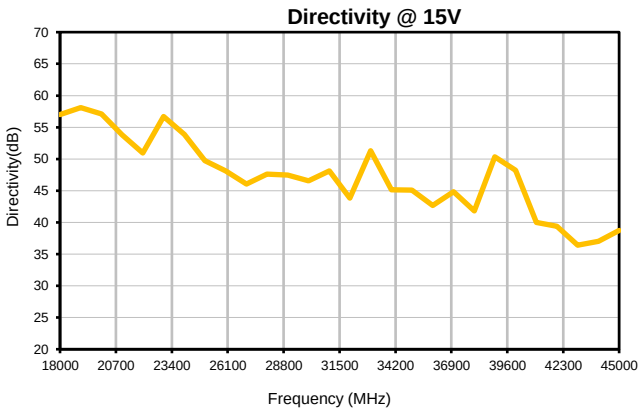
# Wideband Amplifier ZVE-453HP+

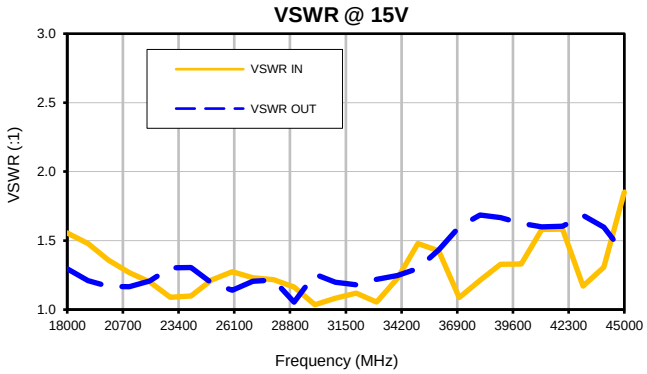
## *Typical Performance Data*

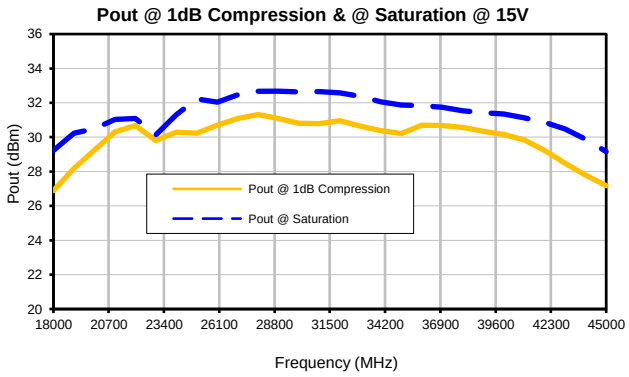
| FREQ. (MHz) | GAIN (dB) 15V | DIRECTIVITY (dB) 15V | VSWR (:1) IN 15V | VSWR (:1) OUT 15V | Pout @ 1 dB COMPRESSION (dBm) 15V | Pout @ SATURATION (dBm) 15V | OUTUPUT IP3 (dBm) 15V |
|---|---|---|---|---|---|---|---|
| 18000 | 38.95 | 56.99 | 1.56 | 1.30 | 26.89 | 29.23 | 35.57 |
| 19000 | 39.33 | 58.10 | 1.48 | 1.21 | 28.19 | 30.23 | 39.18 |
| 20000 | 39.21 | 57.09 | 1.36 | 1.17 | 29.25 | 30.49 | 40.46 |
| 21000 | 38.74 | 53.83 | 1.27 | 1.17 | 30.31 | 31.04 | 40.71 |
| 22000 | 38.14 | 50.93 | 1.20 | 1.21 | 30.68 | 31.09 | 41.45 |
| 23000 | 37.50 | 56.69 | 1.09 | 1.30 | 29.81 | 30.14 | 41.64 |
| 24000 | 36.85 | 53.88 | 1.10 | 1.31 | 30.28 | 31.30 | 40.20 |
| 25000 | 36.49 | 49.75 | 1.21 | 1.19 | 30.24 | 32.22 | 41.60 |
| 26000 | 36.48 | 48.10 | 1.27 | 1.14 | 30.70 | 32.03 | 42.86 |
| 27000 | 36.80 | 46.04 | 1.23 | 1.21 | 31.10 | 32.47 | 45.85 |
| 28000 | 37.39 | 47.62 | 1.22 | 1.22 | 31.32 | 32.67 | 42.48 |
| 29000 | 38.15 | 47.45 | 1.16 | 1.05 | 31.09 | 32.68 | 44.73 |
| 30000 | 39.08 | 46.57 | 1.04 | 1.26 | 30.81 | 32.64 | 41.07 |
| 31000 | 39.73 | 48.15 | 1.08 | 1.20 | 30.78 | 32.66 | 40.95 |
| 32000 | 39.93 | 43.81 | 1.12 | 1.18 | 30.96 | 32.57 | 44.08 |
| 33000 | 39.66 | 51.30 | 1.05 | 1.22 | 30.64 | 32.37 | 41.05 |
| 34000 | 39.81 | 45.16 | 1.23 | 1.25 | 30.39 | 32.06 | 40.58 |
| 35000 | 40.71 | 45.08 | 1.48 | 1.30 | 30.21 | 31.87 | 41.72 |
| 36000 | 41.58 | 42.67 | 1.43 | 1.43 | 30.69 | 31.84 | 40.16 |
| 37000 | 41.64 | 44.83 | 1.09 | 1.60 | 30.67 | 31.74 | 44.22 |
| 38000 | 40.80 | 41.80 | 1.21 | 1.69 | 30.57 | 31.54 | 43.23 |
| 39000 | 39.83 | 50.34 | 1.33 | 1.67 | 30.35 | 31.42 | 38.76 |
| 40000 | 39.53 | 48.21 | 1.33 | 1.62 | 30.16 | 31.35 | 41.06 |
| 41000 | 39.92 | 40.01 | 1.58 | 1.60 | 29.84 | 31.12 | 39.68 |
| 42000 | 40.67 | 39.41 | 1.58 | 1.61 | 29.23 | 30.87 | 39.23 |
| 43000 | 41.10 | 36.41 | 1.17 | 1.68 | 28.48 | 30.48 | 37.62 |
| 44000 | 41.04 | 37.01 | 1.31 | 1.60 | 27.79 | 29.88 | 38.53 |
| 45000 | 40.85 | 38.74 | 1.85 | 1.40 | 27.18 | 29.16 | 37.82 |

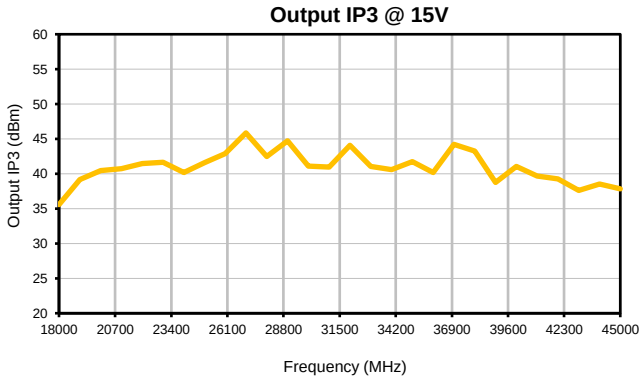
## *Typical Performance Curves*



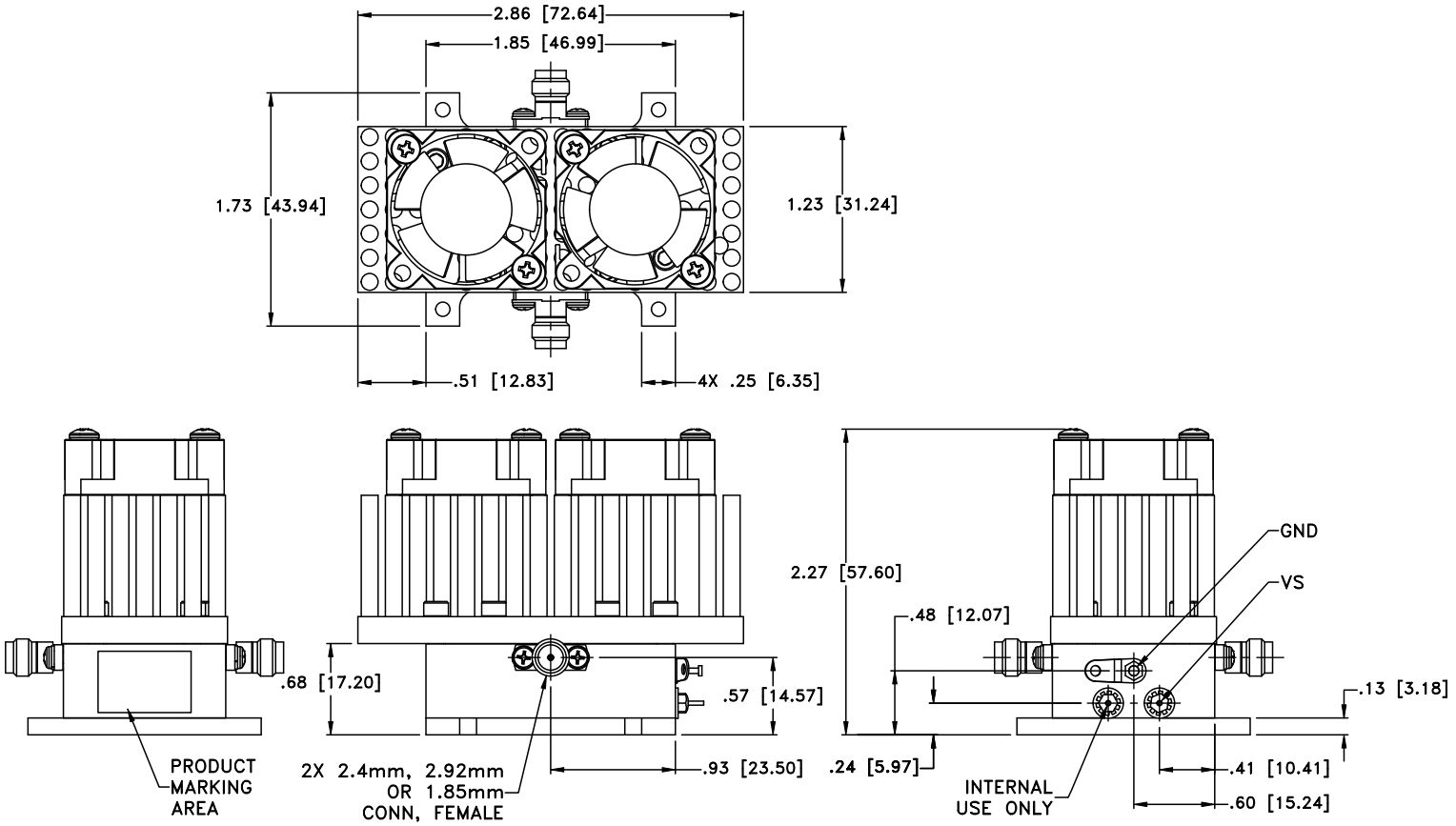



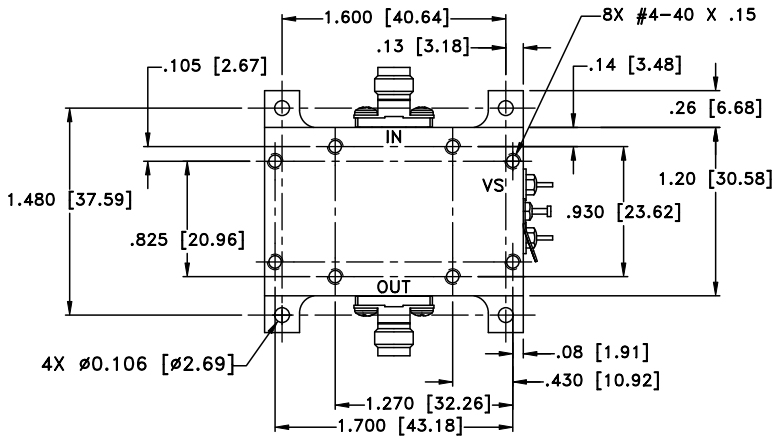



# Outline Dimensions

## VN3071-4




**MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK**




WT. WT. GRAMS 160 grams; WITHOUT HEATSINK GRAMS 60 grams

Dimensions are in inches (mm). Tolerances: 2 Pl.Ñ03; 3 Pl. Ñ015

**Notes**:
1. Case material: Aluminum.
2. Case finish: Gold plating;
3. Heat sink finish: Black anodize.
4. Refer to the individual model data sheet for the type of connectors available.
5. Shape of connector flange may vary.

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RF/IF MICROWAVE COMPONENTS

Mini-Circuits

# Environmental Specifications ENV130

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 +60° C<br>Baseplate Temp | Individual Model Data Sheet |
| Storage Temperature | -40° to +85° C<br>Ambient Environment | Individual Model Data Sheet |
| Burn-in | (DC on)<br>72 hours at 25°C | ---- |
| Thermal Shock | -40° C to +85°C, 100 cycles | Transition time = 5 mins, Dwell time = 30 mins |
| Vibration | Random Vibration<br>(non-operating) | MIL-STD-883K, Method 2025, Cond. 1A |


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