



LOW NOISE, HIGH GAIN

# Wideband Amplifier

## ZVA-24443G1+ ZVA-24443G1X+

50Ω 24 to 43.5 GHz<sup>1</sup>

### THE BIG DEAL

- Extremely Low Noise Figure of 1.7 dB typ. through Q-Band
- High Gain of 45 dB typ., over 5G bands – 24 to 39 GHz
- Available with and without heatsink
- Operates with a single DC supply of +9 to +15 V
- Over-Voltage and Reverse Voltage protected



Generic photo used for illustration purposes only

|            |               |                |
|------------|---------------|----------------|
| Model No.  | ZVA-24443G1+  | ZVA-24443G1X+▲ |
| Case Style | T2704         |                |
| Connectors | 2.92mm Female |                |

#### +RoHS Compliant

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

### APPLICATIONS

- 5G (24-39 GHz)
- Q-Band SATCOM
- Test and Instrumentation

### PRODUCT OVERVIEW

Mini-Circuits' ZVA-24443G1+ is a co-axial, low noise, wideband and high gain amplifier operating from 24 GHz to 43.5 GHz<sup>1</sup>. The model operates over a single positive supply range of +9 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 protects the amplifier from damage if mishandled during operation. The Amplifier is capable of delivering about 100mW (+20 dBm) of RF power over the entire band and has an excellent Noise figure performance of 1.7 dB, typ over the entire band, hence making it an ideal choice for applications with extremely demanding dynamic range requirements.

### KEY FEATURES

| Feature  | Advantages  |
|--|---|
| Wide-band amplifier, 24 to 43.5 GHz <sup>1</sup>   | A single amplifier serves the need for applications including 5G bands (24 to 39 GHz), Q-Band SATCOM, Test & instrumentation etc.   |
| <ul style="list-style-type: none"> <li>• High Gain</li> <li>• Low Noise</li> <li>• Medium RF power</li> </ul>                          | The amplifier is capable of providing high gain of over 45 dB typ. in the entire operating band with extremely Low noise of 1.7 dB typ. and good RF power of about +20 dBm. |
| Adjustable DC Supply voltage   | The device is capable of operating from +9 to +15 V with constant DC power consumption.   |
| DC Protection – <ul style="list-style-type: none"> <li>• Over-voltage</li> <li>• Reverse voltage</li> <li>• In-rush current</li> </ul> | The internal DC circuitry allows the amplifier to be protected from any external mishandling that could lead to catastrophic failures in the field.                         |

1. Amplifier is usable down to 22 GHz





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## ZVA-24443G1+ ZVA-24443G1X+

Mini-Circuits

### ELECTRICAL SPECIFICATIONS AT 25°C

| Parameter  | Condition (MHz) | ZVA-24443G1+<br>ZVA-24443G1X+▲ |      |       | Units |
|--|-----------------|--------------------------------|------|-------|-------|
|  |                 | Min.                           | Typ. | Max.  |       |
| Frequency Range <sup>1</sup>                     |                 | 24000                          | —    | 43500 | MHz   |
| Gain   | 24000 - 30000   | 38                             | 43   | —     | dB    |
|  | 30000 - 40000   | 38                             | 45   | —     |       |
|  | 40000 - 43500   | 40                             | 48   | —     |       |
| Noise Figure                                     | 24000 - 30000   |                                | 1.75 |       | dB    |
|  | 30000 - 40000   |                                | 1.50 |       |       |
|  | 40000 - 43500   |                                | 1.75 |       |       |
| Output Power at 1dB compression                  | 24000 - 30000   |                                | 21   |       | dBm   |
|  | 30000 - 40000   |                                | 23   |       |       |
|  | 40000 - 43500   |                                | 21   |       |       |
| Output third order intercept point               | 24000 - 43500   |                                | 27   |       | dBm   |
| Input VSWR                                       | 24000 - 30000   |                                | 1.8  |       | :1    |
|  | 30000 - 40000   |                                | 1.45 |       |       |
|  | 40000 - 43500   |                                | 1.65 |       |       |
| Output VSWR <sup>3</sup>                         | 24000 - 30000   |                                | 3.0  |       | :1    |
|  | 30000 - 40000   |                                | 2.0  |       |       |
|  | 40000 - 43500   |                                | 1.7  |       |       |
| Operating DC Voltage                             | 24000 - 43500   | +9                             | —    | +15   | V     |
| Device Operating Current <sup>2</sup> (at 9V DC) |                 | —                              | —    | 375   | mA    |
| Device Operating Power at Operating DC Voltage   |                 | —                              | 2.7  | —     | W     |

1. Amplifier is usable down to 22 GHz

2. DC Supply must be able to source at least 400mA DC at startup.

3. Open and short-circuit loads and not recommended at the amplifier output. Ensure proper 50 Ohm load before turning the amplifier "ON".

▲ For units without heat-sink, limit the maximum base-plate temperature to 50°C to ensure proper performance. Alternative heat sinking and heat removal can be provided by the user with max. thermal resistance of 1.8°C/W. This allows the max. base plate temperature to be +85°C.

### MAXIMUM RATINGS<sup>5</sup>

| Parameter                       | Ratings        |
|---------------------------------|----------------|
| Operating Temperature (Ambient) | -40°C to 85°C  |
| Storage Temperature             | -55°C to 100°C |
| Total Power dissipation         | 3.5W           |
| Input Power (CW)                | +5 dBm         |
| DC Operating Voltage            | +16V           |

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



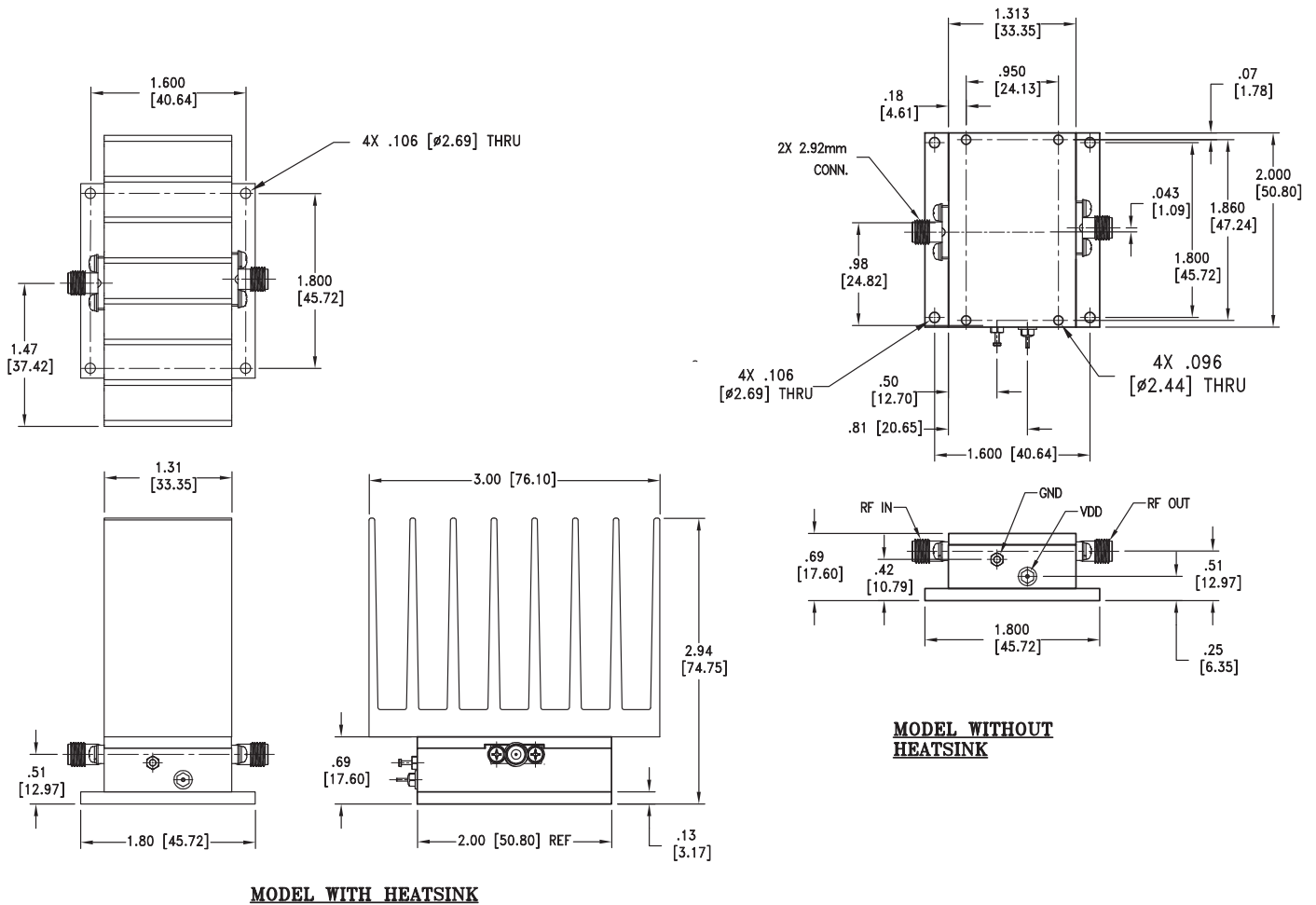


LOW NOISE, HIGH GAIN

# Wideband Amplifier

## ZVA-24443G1+ ZVA-24443G1X+

### OUTLINE DRAWING



Weight: 350 grams;      Weight without heatsink: 220 grams

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



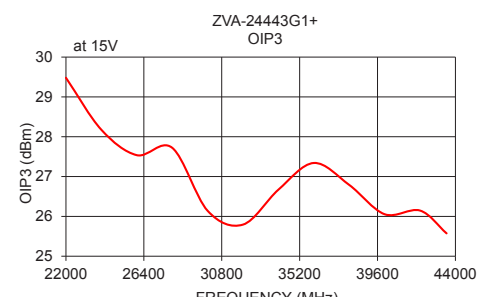
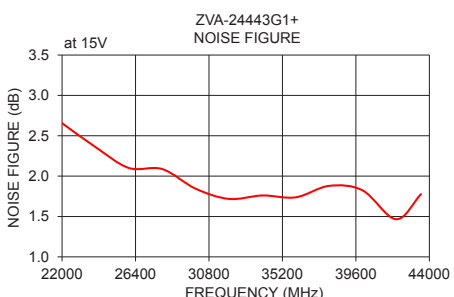
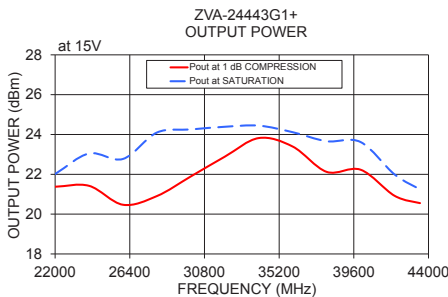
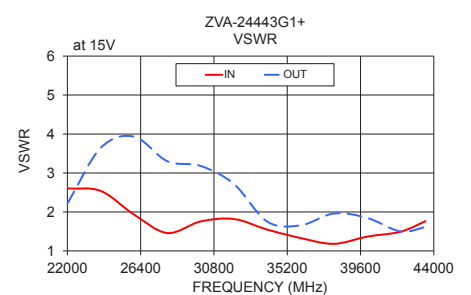
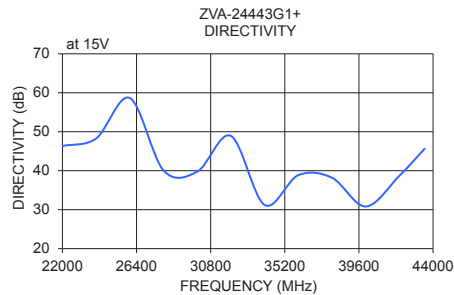
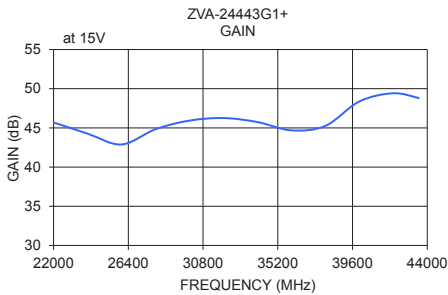
LOW NOISE, HIGH GAIN

# Wideband Amplifier

## ZVA-24443G1+ ZVA-24443G1X+

### TYPICAL PERFORMANCE DATA/CURVES

| Frequency (MHz) | Gain (dB) | Directivity (dB) | VSWR (:1) |      | Noise Figure (Db) | Pout at 1 Db Compr. (Dbm) | Pout at Saturation (Dbm) | Oip3 (Dbm) |
|-----------------|-----------|------------------|-----------|------|-------------------|---------------------------|--------------------------|------------|
|                 |           |                  | IN        | OUT  |                   |                           |                          |            |
| 22000           | 45.69     | 46.34            | 2.60      | 2.21 | 2.66              | 21.38                     | 22.02                    | 29.48      |
| 24000           | 44.27     | 48.27            | 2.54      | 3.64 | 2.36              | 21.42                     | 23.05                    | 28.18      |
| 26000           | 42.88     | 58.65            | 1.93      | 3.93 | 2.10              | 20.47                     | 22.77                    | 27.54      |
| 28000           | 44.83     | 40.07            | 1.46      | 3.30 | 2.09              | 20.91                     | 24.10                    | 27.72      |
| 30000           | 45.93     | 39.76            | 1.76      | 3.18 | 1.84              | 21.90                     | 24.25                    | 26.14      |
| 32000           | 46.26     | 48.93            | 1.82      | 2.72 | 1.72              | 22.89                     | 24.39                    | 25.79      |
| 34000           | 45.75     | 31.21            | 1.55      | 1.75 | 1.76              | 23.82                     | 24.44                    | 26.67      |
| 36000           | 44.69     | 38.86            | 1.33      | 1.66 | 1.74              | 23.39                     | 24.11                    | 27.34      |
| 38000           | 45.25     | 38.19            | 1.18      | 1.96 | 1.88              | 22.12                     | 23.66                    | 26.79      |
| 40000           | 48.37     | 30.81            | 1.37      | 1.85 | 1.82              | 22.23                     | 23.62                    | 26.05      |
| 42000           | 49.42     | 38.69            | 1.49      | 1.50 | 1.47              | 20.92                     | 21.99                    | 26.15      |
| 43500           | 48.80     | 45.64            | 1.76      | 1.62 | 1.78              | 20.55                     | 21.24                    | 25.57      |



### 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 there in.  
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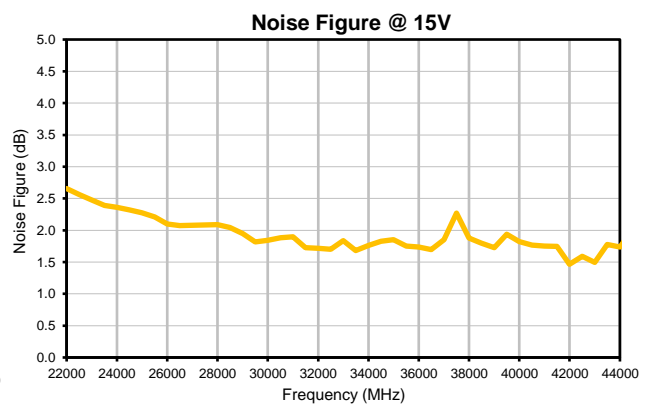
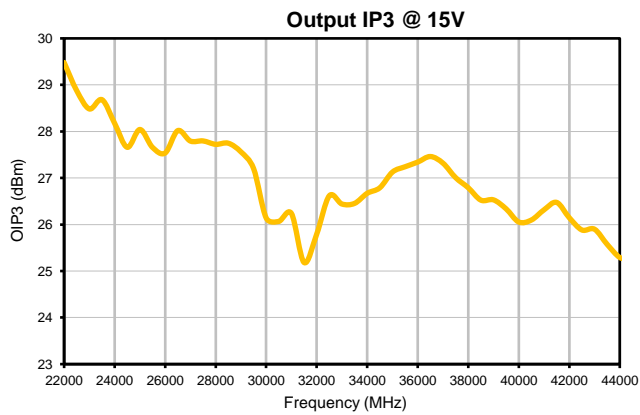
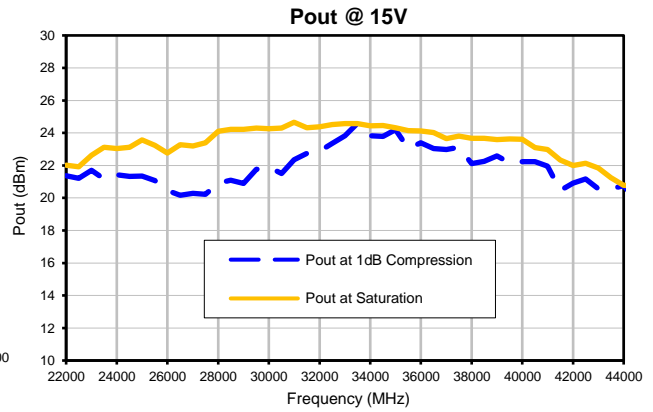
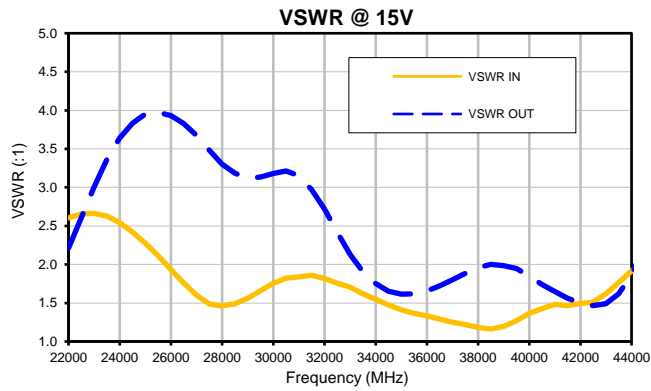
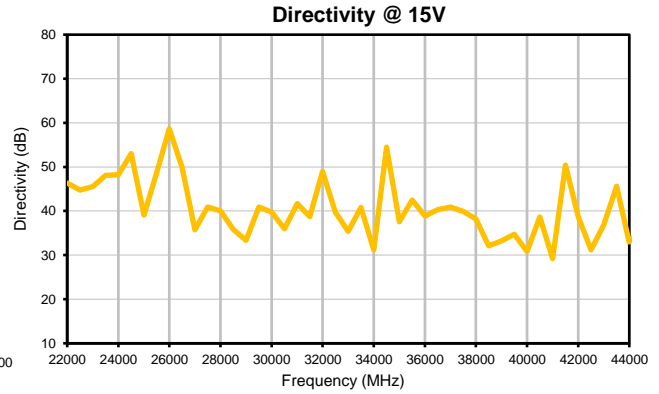
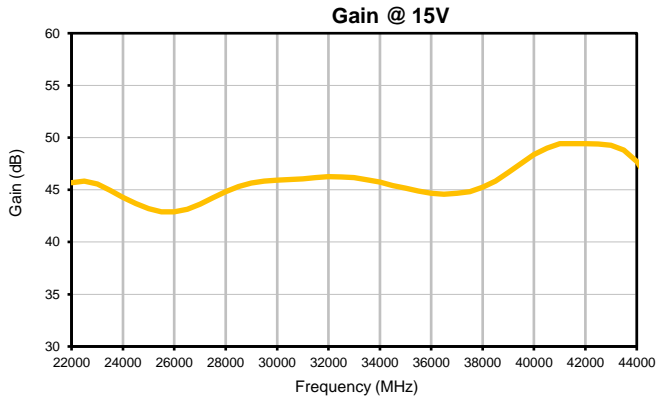
# Coaxial Amplifier

# ZVA-24443G1+

## Typical Performance Data

| FREQUENCY<br>(MHz) | GAIN<br>(dB)<br>15V | DIRECTIVITY<br>(dB)<br>15V | VSWR (:1) |            | NOISE FIGURE<br>(dB)<br>15V | Pout at 1dB<br>COMPRESSION<br>(dBm)<br>15V | Pout at<br>SATURATION<br>(dBm)<br>15V | OUTPUT IP3<br>(dBm)<br>15V |
|--------------------|---------------------|----------------------------|-----------|------------|-----------------------------|--|---------------------------------------|----------------------------|
|                    |                     |                            | IN<br>15V | OUT<br>15V |                             |  |                                       |                            |
| 22000              | 45.69               | 46.34                      | 2.60      | 2.21       | 2.66                        | 21.38                                      | 22.02                                 | 29.48                      |
| 22500              | 45.83               | 44.73                      | 2.66      | 2.61       | 2.56                        | 21.21                                      | 21.91                                 | 28.88                      |
| 23000              | 45.55               | 45.52                      | 2.66      | 3.01       | 2.48                        | 21.70                                      | 22.63                                 | 28.48                      |
| 23500              | 44.95               | 48.12                      | 2.63      | 3.36       | 2.39                        | 21.18                                      | 23.11                                 | 28.68                      |
| 24000              | 44.27               | 48.27                      | 2.54      | 3.64       | 2.36                        | 21.42                                      | 23.05                                 | 28.18                      |
| 24500              | 43.70               | 53.01                      | 2.42      | 3.83       | 2.32                        | 21.33                                      | 23.12                                 | 27.66                      |
| 25000              | 43.19               | 39.11                      | 2.28      | 3.95       | 2.27                        | 21.34                                      | 23.57                                 | 28.04                      |
| 25500              | 42.90               | 48.50                      | 2.11      | 3.97       | 2.21                        | 21.07                                      | 23.23                                 | 27.66                      |
| 26000              | 42.88               | 58.65                      | 1.93      | 3.93       | 2.10                        | 20.47                                      | 22.77                                 | 27.54                      |
| 26500              | 43.14               | 49.89                      | 1.76      | 3.83       | 2.07                        | 20.17                                      | 23.28                                 | 28.02                      |
| 27000              | 43.63               | 35.75                      | 1.60      | 3.67       | 2.08                        | 20.29                                      | 23.19                                 | 27.79                      |
| 27500              | 44.23               | 40.88                      | 1.49      | 3.48       | 2.09                        | 20.23                                      | 23.40                                 | 27.80                      |
| 28000              | 44.83               | 40.07                      | 1.46      | 3.30       | 2.09                        | 20.91                                      | 24.10                                 | 27.72                      |
| 28500              | 45.33               | 35.79                      | 1.49      | 3.18       | 2.04                        | 21.09                                      | 24.21                                 | 27.75                      |
| 29000              | 45.64               | 33.33                      | 1.56      | 3.12       | 1.95                        | 20.89                                      | 24.21                                 | 27.56                      |
| 29500              | 45.84               | 40.93                      | 1.66      | 3.14       | 1.82                        | 21.77                                      | 24.29                                 | 27.20                      |
| 30000              | 45.93               | 39.76                      | 1.76      | 3.18       | 1.84                        | 21.90                                      | 24.25                                 | 26.14                      |
| 30500              | 46.00               | 36.00                      | 1.82      | 3.21       | 1.88                        | 21.51                                      | 24.30                                 | 26.07                      |
| 31000              | 46.06               | 41.68                      | 1.84      | 3.15       | 1.90                        | 22.35                                      | 24.66                                 | 26.24                      |
| 31500              | 46.19               | 38.74                      | 1.86      | 2.97       | 1.73                        | 22.75                                      | 24.33                                 | 25.18                      |
| 32000              | 46.26               | 48.93                      | 1.82      | 2.72       | 1.72                        | 22.89                                      | 24.39                                 | 25.79                      |
| 32500              | 46.22               | 39.74                      | 1.76      | 2.42       | 1.70                        | 23.35                                      | 24.52                                 | 26.62                      |
| 33000              | 46.16               | 35.40                      | 1.71      | 2.13       | 1.84                        | 23.83                                      | 24.58                                 | 26.44                      |
| 33500              | 45.97               | 40.82                      | 1.62      | 1.91       | 1.68                        | 24.59                                      | 24.58                                 | 26.45                      |
| 34000              | 45.75               | 31.21                      | 1.55      | 1.75       | 1.76                        | 23.82                                      | 24.44                                 | 26.67                      |
| 34500              | 45.42               | 54.47                      | 1.48      | 1.65       | 1.83                        | 23.78                                      | 24.46                                 | 26.79                      |
| 35000              | 45.15               | 37.54                      | 1.41      | 1.62       | 1.85                        | 24.20                                      | 24.33                                 | 27.13                      |
| 35500              | 44.89               | 42.49                      | 1.37      | 1.62       | 1.75                        | 23.05                                      | 24.14                                 | 27.24                      |
| 36000              | 44.69               | 38.86                      | 1.33      | 1.66       | 1.74                        | 23.39                                      | 24.11                                 | 27.34                      |
| 36500              | 44.60               | 40.33                      | 1.29      | 1.72       | 1.70                        | 23.03                                      | 24.03                                 | 27.46                      |
| 37000              | 44.66               | 40.90                      | 1.25      | 1.80       | 1.85                        | 22.98                                      | 23.66                                 | 27.32                      |
| 37500              | 44.82               | 39.88                      | 1.22      | 1.88       | 2.27                        | 23.12                                      | 23.80                                 | 27.01                      |
| 38000              | 45.25               | 38.19                      | 1.18      | 1.96       | 1.88                        | 22.12                                      | 23.66                                 | 26.79                      |
| 38500              | 45.85               | 32.13                      | 1.16      | 2.00       | 1.80                        | 22.25                                      | 23.66                                 | 26.52                      |
| 39000              | 46.66               | 33.22                      | 1.20      | 1.99       | 1.73                        | 22.60                                      | 23.59                                 | 26.53                      |
| 39500              | 47.51               | 34.76                      | 1.27      | 1.95       | 1.94                        | 22.15                                      | 23.63                                 | 26.34                      |
| 40000              | 48.37               | 30.81                      | 1.37      | 1.85       | 1.82                        | 22.23                                      | 23.62                                 | 26.05                      |
| 40500              | 49.00               | 38.64                      | 1.43      | 1.74       | 1.77                        | 22.22                                      | 23.10                                 | 26.10                      |
| 41000              | 49.42               | 29.20                      | 1.48      | 1.65       | 1.75                        | 21.96                                      | 22.97                                 | 26.32                      |
| 41500              | 49.43               | 50.39                      | 1.46      | 1.56       | 1.75                        | 20.46                                      | 22.33                                 | 26.48                      |
| 42000              | 49.42               | 38.69                      | 1.49      | 1.50       | 1.47                        | 20.92                                      | 21.99                                 | 26.15                      |
| 42500              | 49.40               | 31.21                      | 1.51      | 1.47       | 1.59                        | 21.16                                      | 22.13                                 | 25.88                      |
| 43000              | 49.27               | 36.93                      | 1.62      | 1.49       | 1.49                        | 20.56                                      | 21.84                                 | 25.90                      |
| 43500              | 48.80               | 45.64                      | 1.76      | 1.62       | 1.78                        | 20.55                                      | 21.24                                 | 25.57                      |
| 44000              | 47.71               | 32.97                      | 1.91      | 1.86       | 1.74                        | 20.75                                      | 20.77                                 | 25.29                      |
| 44500              | 45.84               | 36.11                      | 2.05      | 2.25       | 2.02                        | 19.90                                      | 20.75                                 | 25.22                      |
| 45000              | 43.34               | 47.49                      | 2.15      | 2.74       | 2.09                        | 18.62                                      | 19.59                                 | 24.67                      |
| 45500              | 40.48               | 43.98                      | 2.18      | 3.40       | 2.15                        | 17.66                                      | 18.27                                 | 22.93                      |
| 46000              | 37.58               | 39.58                      | 2.20      | 4.15       | 2.47                        | 16.80                                      | 17.50                                 | 21.16                      |

## Typical Performance Curves

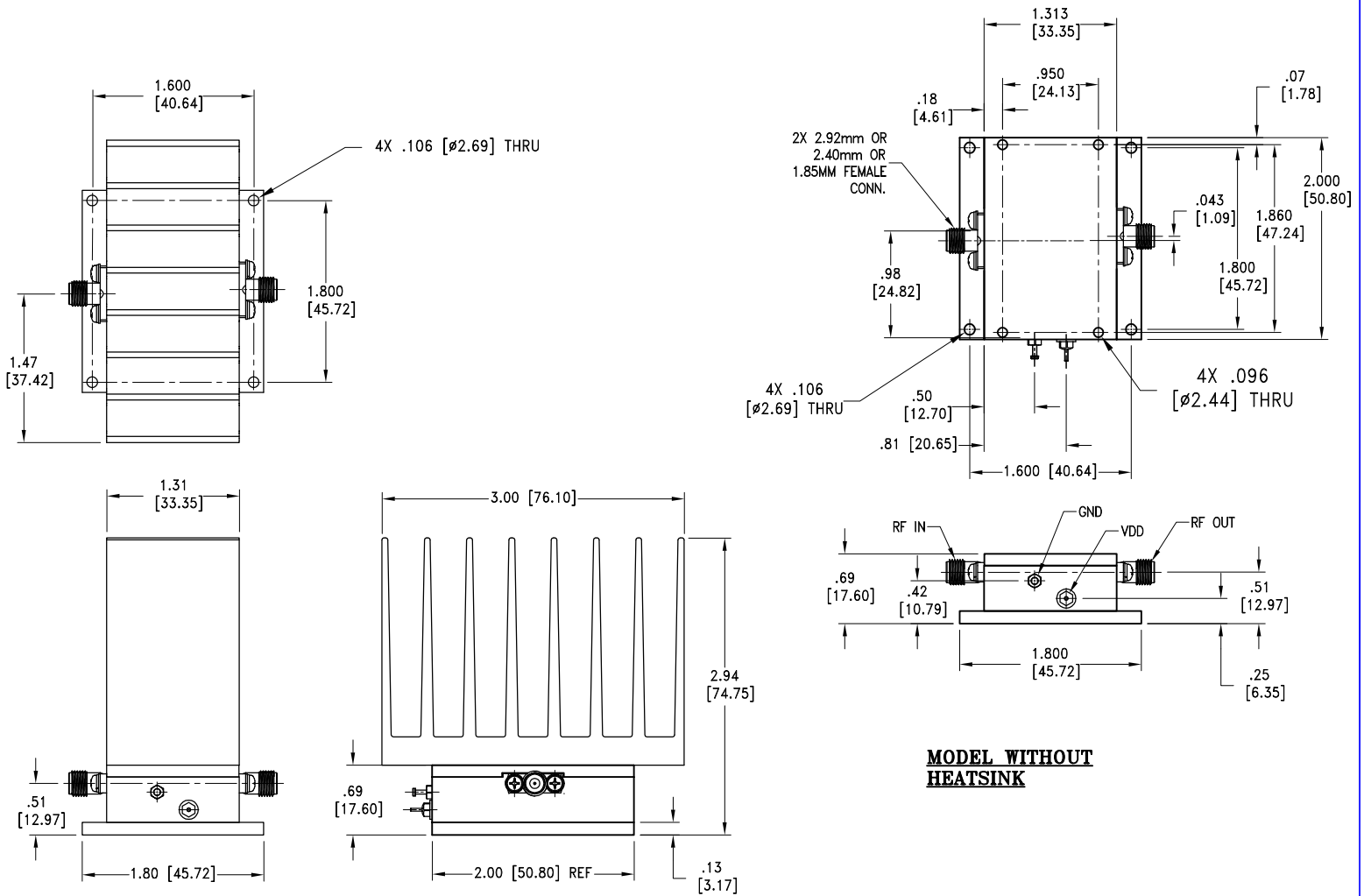


# Case Style

# T

## Outline Dimensions

### T2704



**MODEL WITH HEATSINK**

**MODEL WITHOUT HEATSINK**

Weight: 350 grams; Weight without heatsink: 220 grams

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

### Notes:

1. Case Material: Brass Alloy
2. Case Finish: Gold Plating
3. Heat sink finish: Black anodize.



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

RF/IF MICROWAVE COMPONENTS



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<br>Ambient Environment  | Individual Model Data Sheet                    |
| Base Plate Temperature    | 85°C                                  | Unit with Heatsink                             |
| 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>72 hours at 85° C          | ----   |
| Thermal Shock             | -40° C to +85°C, 100 cycles           | Transition time = 5 mins, Dwell time = 30 mins |