



Thin-Film Cascadable Amplifier 10 to 2000 MHz

Technical Data

UTO/UTC 2022 Series

Features

- **Frequency Range: 10 to 2000 MHz**
- **Medium Gain: 10.0 dB (Typ)**
- **Low VSWR**
- **Temperature Compensated**

Applications

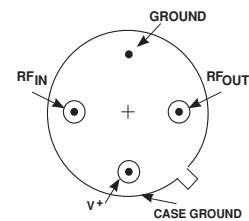
- **IF/RF Amplification**

Description

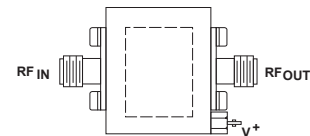
The 2022 Series is a high-power wideband, thin-film bipolar RF amplifier with resistive feedback and active bias for temperature compensation and increased immunity to bias voltage variations. Input/output blocking capacitors couple the RF through the amplifier, while a low VSWR is maintained through inductive tuning. The 2022 Series amplifiers are available in either the TO-8 hermetic case or connected TC-1A package.

Pin Configuration

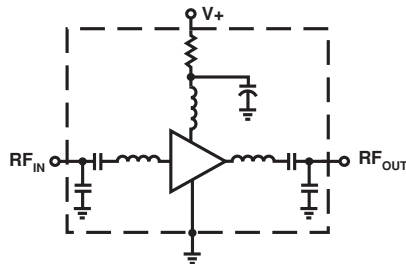
UTO—TO-8U



UTC—TC-1A



Schematic



Maximum Ratings

| Parameter | Maximum |
|--------------------------------|---------------|
| DC Voltage | +17 Volts |
| Continuous RF Input Power | +13 dBm |
| Operating Case Temperature | -55 to +125°C |
| Storage Temperature | -62 to +150°C |
| “R” Series Burn-In Temperature | +125°C |

Thermal Characteristics¹

| | |
|---|--------------|
| θ_{JC} | 105°C/W |
| Active Transistor Power Dissipation | 216 mW |
| Junction Temperature Above Case Temperature | 23°C |
| MTBF (MIL-HDBK-217E, A_{UF} @ 90°C) | 814,700 Hrs. |

Weight: (typical) UTO—2.1 grams; UTC—21.5 grams

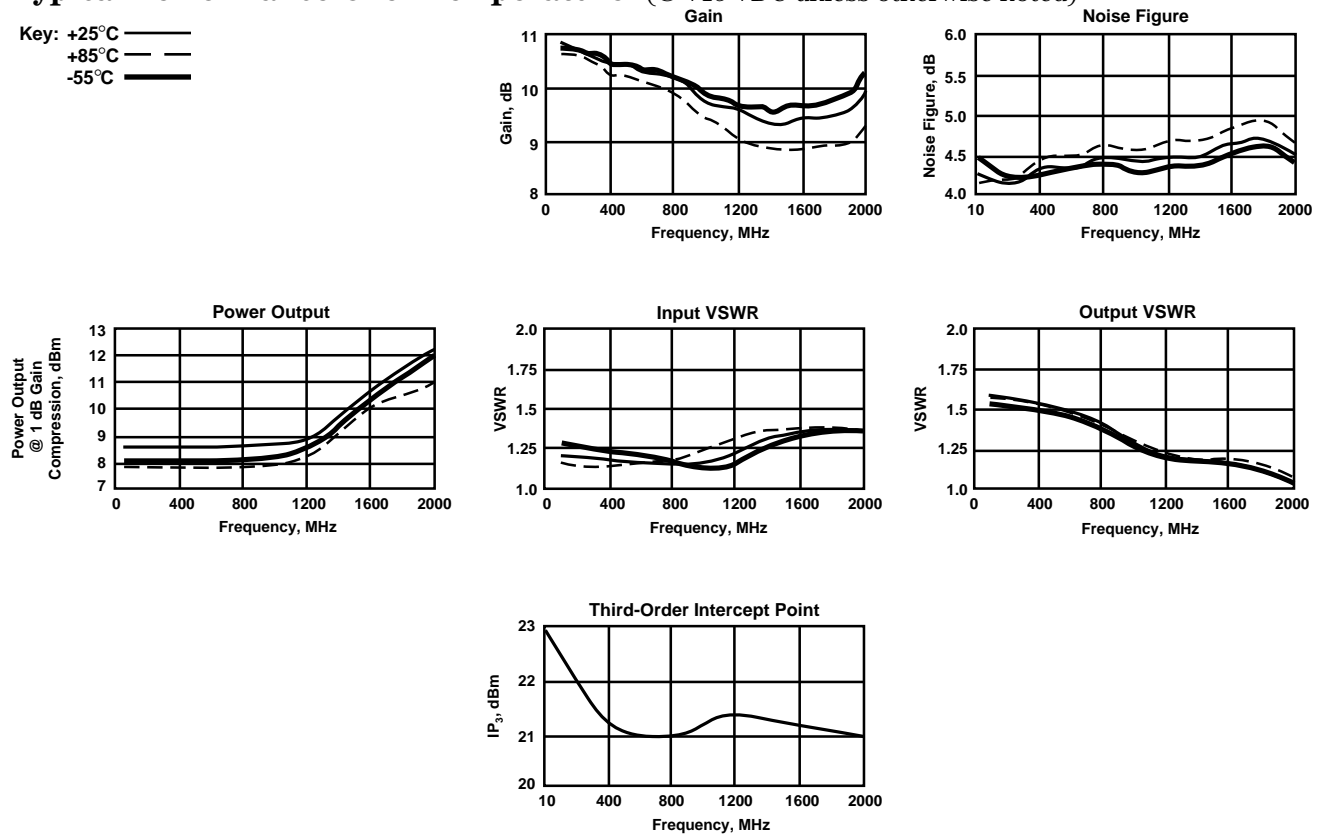
Electrical Specifications

(Measured in 50 Ω system @ +15 VDC nominal unless otherwise noted)

| Symbol | Characteristic | Typical $T_C = 25^\circ\text{C}$ | Guaranteed Specifications | | Unit |
|-----------|---------------------------------------|-------------------------------------|--|---|------|
| | | | $T_C = 0 \text{ to } 50^\circ\text{C}$ | $T_C = -55 \text{ to } +85^\circ\text{C}$ | |
| BW | Frequency Range | 10-2000 | 10-2000 | 10-2000 | MHz |
| GP | Small Signal Gain (Min.) | 10.0 | 9.0 | 8.5 | dB |
| — | Gain Flatness (Max.) | ± 0.5 | ± 1.0 | ± 1.0 | dB |
| NF | Noise Figure (Max.) | 5.0 | 6.0 | 6.0 | dB |
| P_{1dB} | Power Output @ +1 dB Comp. (Min.) | +8.0 | +7.0 | +6.5 | dBm |
| — | Input VSWR (Max.) | <1.7:1 | 2.0:1 | 2.0:1 | — |
| — | Output VSWR (Max.) | <1.6:1 | 2.0:1 | 2.0:1 | — |
| IP_3 | Two Tone 3rd Order Intercept Point | +17.0 | — | — | dBm |
| IP_2 | Two Tone 2nd Order Intercept Point | +30.0 | — | — | dBm |
| HP_2 | One Tone 2nd Harmonic Intercept Point | +35.0 | — | — | dBm |
| I_D | DC Current | 25 | — | — | mA |

Typical Performance Over Temperature (@ +15 VDC unless otherwise noted)

Key: $+25^\circ\text{C}$ —
 $+85^\circ\text{C}$ - -
 -55°C —



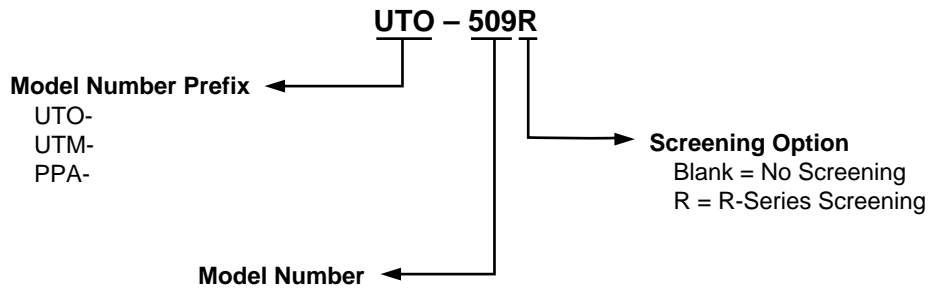
Automatic Network Analyzer Measurements (Typical production unit @ +25°C ambient)**Numerical Readings****Bias = 15.00 Volts**

| FREQUENCY MHz | VSWR IN | GAIN dB | PHASE DEGREES | PHASE DEV | GROUP DELAY ns | VSWR OUT | ISOLATION dB |
|------------------|------------|------------|------------------|--------------|-------------------|-------------|-----------------|
| 100.0 | 1.26 | 10.45 | 166.48 | -7.64 | .00 | 1.62 | 18.02 |
| 200.0 | 1.29 | 10.39 | 154.11 | -6.19 | .35 | 1.59 | 18.22 |
| 300.0 | 1.32 | 10.35 | 141.35 | -5.12 | .36 | 1.58 | 18.22 |
| 400.0 | 1.36 | 10.39 | 128.99 | -3.66 | .33 | 1.58 | 18.32 |
| 500.0 | 1.40 | 10.44 | 117.02 | -1.80 | .33 | 1.57 | 18.42 |
| 600.0 | 1.46 | 10.46 | 105.27 | .25 | .32 | 1.56 | 18.60 |
| 700.0 | 1.50 | 10.50 | 93.48 | 2.30 | .31 | 1.55 | 18.69 |
| 800.0 | 1.56 | 10.57 | 82.37 | 5.01 | .34 | 1.55 | 18.83 |
| 900.0 | 1.60 | 10.71 | 70.04 | 6.48 | .35 | 1.55 | 19.00 |
| 1000.0 | 1.63 | 10.87 | 57.02 | 7.27 | .37 | 1.55 | 19.24 |
| 1100.0 | 1.64 | 11.05 | 43.12 | 7.18 | .39 | 1.56 | 19.50 |
| 1200.0 | 1.61 | 11.20 | 28.58 | 6.47 | .41 | 1.56 | 19.76 |
| 1300.0 | 1.56 | 11.29 | 13.37 | 5.09 | .43 | 1.55 | 19.95 |
| 1400.0 | 1.48 | 11.33 | -2.31 | 3.23 | .43 | 1.53 | 20.00 |
| 1500.0 | 1.40 | 11.26 | -17.82 | 1.55 | .43 | 1.48 | 19.84 |
| 1600.0 | 1.34 | 11.10 | -33.49 | -.28 | .44 | 1.41 | 19.59 |
| 1700.0 | 1.29 | 10.95 | -49.56 | -2.52 | .45 | 1.35 | 19.25 |
| 1800.0 | 1.31 | 10.89 | -65.62 | -4.75 | .44 | 1.31 | 18.95 |
| 1900.0 | 1.38 | 10.76 | -81.80 | -7.11 | .46 | 1.32 | 18.65 |
| 2000.0 | 1.55 | 10.46 | -99.32 | -10.81 | .51 | 1.41 | 18.52 |
| 2100.0 | 1.86 | 10.00 | -118.20 | — | .54 | 1.57 | 18.44 |
| 2200.0 | 2.33 | 9.26 | -138.11 | — | .56 | 1.77 | 18.60 |

S-Parameters**Bias = 15.00 Volts**

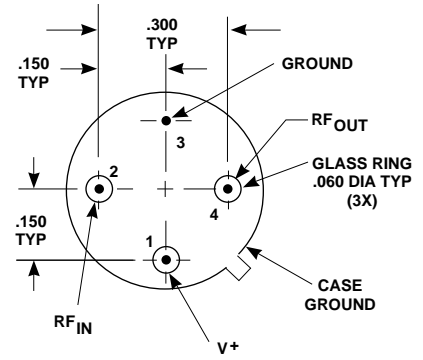
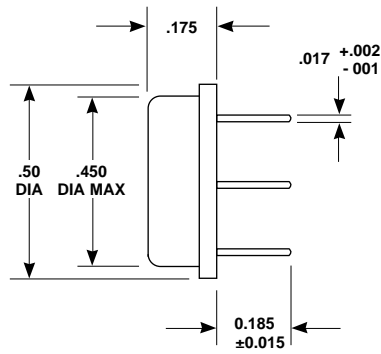
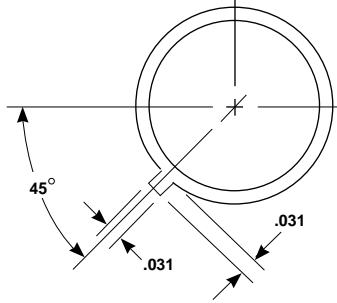
| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|-------|
| | Mag | Ang | dB | Ang | dB | Ang | Mag | Ang |
| 100.00 | .186 | 179.5 | 10.505 | 166.7 | -18.576 | -6.6 | .268 | 166.3 |
| 200.00 | .184 | 179.2 | 10.452 | 154.2 | -18.519 | -12.5 | .261 | 153.2 |
| 300.00 | .183 | 179.4 | 10.393 | 141.6 | -18.585 | -19.2 | .254 | 139.8 |
| 400.00 | .180 | -179.5 | 10.405 | 129.1 | -18.655 | -25.5 | .249 | 126.7 |
| 500.00 | .185 | -177.8 | 10.410 | 117.4 | -18.645 | -32.5 | .239 | 115.3 |
| 600.00 | .190 | -175.8 | 10.410 | 105.9 | -18.672 | -39.2 | .227 | 103.3 |
| 700.00 | .204 | -175.2 | 10.426 | 94.4 | -18.801 | -46.0 | .212 | 91.3 |
| 800.00 | .220 | -175.7 | 10.456 | 83.7 | -18.855 | -52.7 | .202 | 78.7 |
| 900.00 | .239 | -178.3 | 10.570 | 71.8 | -18.982 | -58.5 | .190 | 65.0 |
| 1000.00 | .257 | 178.2 | 10.723 | 59.5 | -19.201 | -64.8 | .184 | 49.7 |
| 1100.00 | .267 | 172.4 | 10.906 | 46.1 | -19.411 | -71.3 | .183 | 32.4 |
| 1200.00 | .266 | 165.7 | 11.096 | 32.3 | -19.628 | -76.8 | .189 | 13.7 |
| 1300.00 | .257 | 157.8 | 11.236 | 17.4 | -19.762 | -81.5 | .199 | -5.4 |
| 1400.00 | .232 | 149.7 | 11.306 | 2.2 | -19.845 | -86.1 | .209 | -24.5 |
| 1500.00 | .201 | 141.9 | 11.242 | -13.1 | -19.678 | -91.0 | .215 | -42.0 |
| 1600.00 | .165 | 134.8 | 11.088 | -28.2 | -19.386 | -96.1 | .213 | -57.7 |
| 1700.00 | .130 | 124.8 | 10.896 | -43.7 | -19.083 | -101.6 | .204 | -69.8 |
| 1800.00 | .096 | 109.6 | 10.809 | -59.0 | -18.775 | -108.0 | .184 | -78.0 |
| 1900.00 | .074 | 75.1 | 10.722 | -73.9 | -18.472 | -114.9 | .157 | -80.1 |
| 2000.00 | .085 | 23.5 | 10.576 | -89.7 | -18.191 | -122.7 | .132 | -71.2 |
| 2100.00 | .150 | -12.3 | 10.340 | -106.5 | -17.919 | -131.8 | .139 | -53.6 |
| 2200.00 | .245 | -34.2 | 10.002 | -124.8 | -17.733 | -142.2 | .188 | -42.5 |
| 2300.00 | .351 | -51.3 | 9.410 | -144.2 | -17.726 | -153.4 | .257 | -43.7 |
| 2400.00 | .458 | -67.1 | 8.497 | -164.3 | -17.862 | -164.8 | .327 | -50.8 |
| 2500.00 | .551 | -81.4 | 7.273 | 176.0 | -18.237 | -176.1 | .377 | -59.9 |

Product Options



Note: R-Series screening is not available in the TC-1 case as the case is non-hermetic.

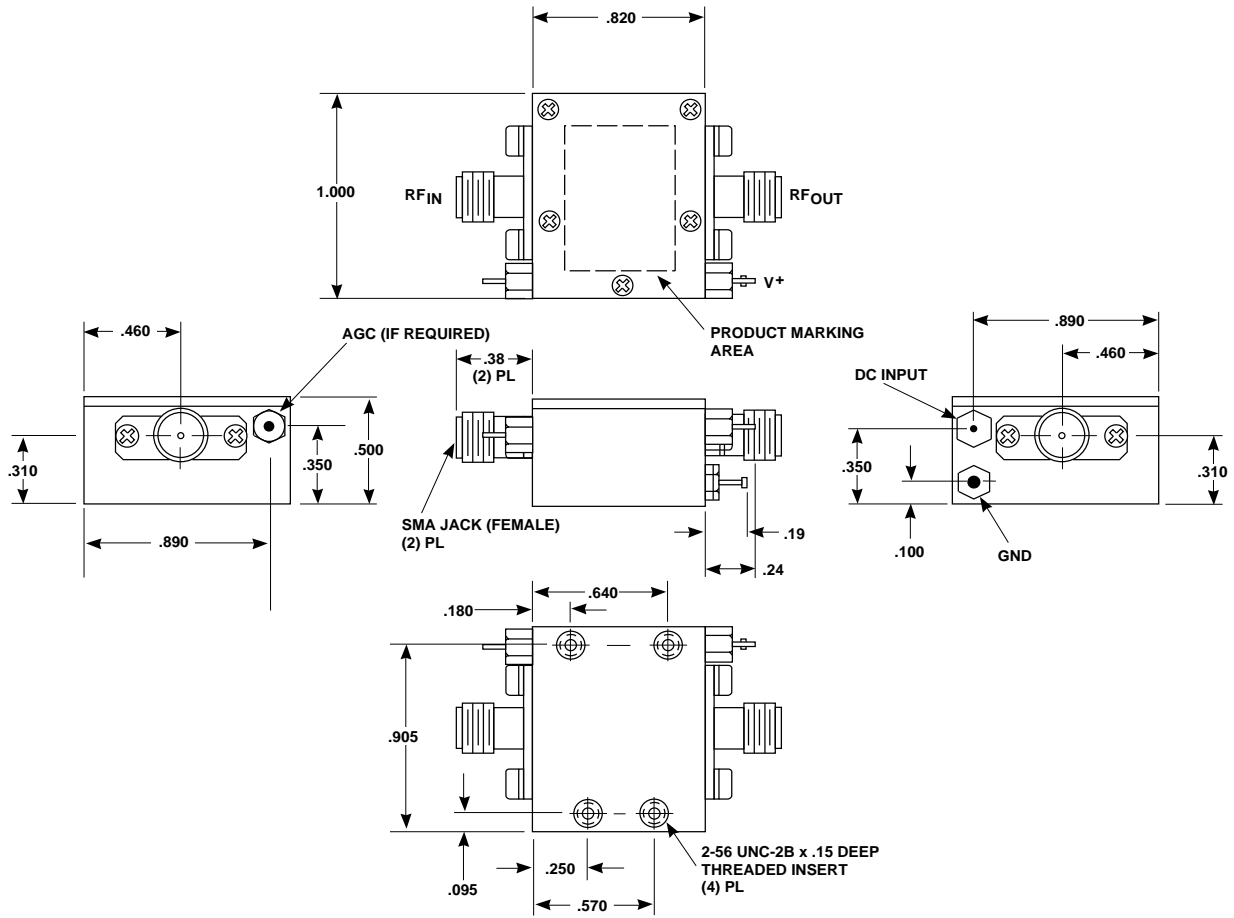
**Case Drawings
TO-8U**



APPROXIMATE WEIGHT 2.1 GRAMS

- NOTES (UNLESS OTHERWISE SPECIFIED):
 1. DIMENSIONS ARE SPECIFIED IN INCHES
 2. TOLERANCES: xx ± .02
 xxx ± .010

Case Drawings TC-1



TYPICAL WEIGHT WITH CONNECTORS = 21.5 GRAMS

NOTES: 1. THE TC-1 CASE IS A NON-HERMETIC CASE.
2. THE ONLY CONNECTOR OPTION AVAILABLE FOR THE TC-1 CASE IS THE -1, SMA FEMALE CONNECTORS AT BOTH INPUT AND OUTPUT PORTS.

NOTES (UNLESS OTHERWISE SPECIFIED):
1. DIMENSIONS ARE SPECIFIED IN INCHES
2. TOLERANCES: xx ± .02
xxx ± .010

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