



Thin-Film Cascadable Amplifier 500 to 2000 MHz

Technical Data

UTO/UTC 2012 Series

Features

- **Frequency Range: 500 to 2000 MHz**
- **High Dynamic Range**
- **Noise Figure: 3.0 dB (Typ)**
- **GaAs FET Technology**
- **Temperature Compensated**
- **Surface Mount Option**

Applications

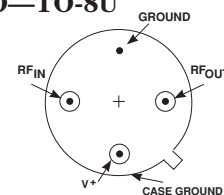
- **System Front End**
- **Surface Mount Assembly**

Description

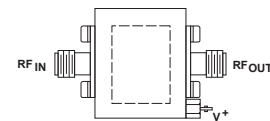
The 2012 Series is a thin-film GaAs FET RF amplifier using active bias and resistive feedback for stability over temperature and bias voltage variations. Input/output blocking capacitors couple RF through the amplifier while a low VSWR is maintained through inductive tuning. The 2012 Series amplifiers are available in three packages: the surface mount PlanarPak PP-38 (.375 in. x .375 in.) case, the TO-8 hermetic case and the connectorized TC-1A case.

Pin Configuration

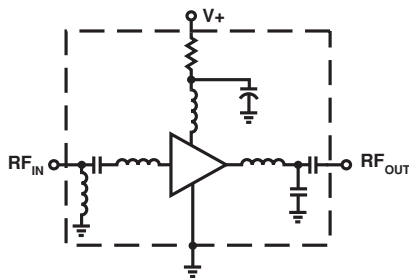
UTO—TO-8U



UTC—TC-1A



Schematic



Maximum Ratings

| Parameter | Maximum |
|--------------------------------|---------------|
| DC Voltage | +17 Volts |
| Continuous RF Input Power | +15 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} | 100°C/W |
| Active Transistor Power Dissipation | 250 mW |
| Junction Temperature Above Case Temperature | 25°C |
| MTBF (MIL-HDBK-217E, A_{UF} @ 90°C) | 299,200 Hrs. |

Weight: (typical) PPA—0.5 grams; UTO—2.1 grams; UTC—21.5 grams

Electrical Specifications¹

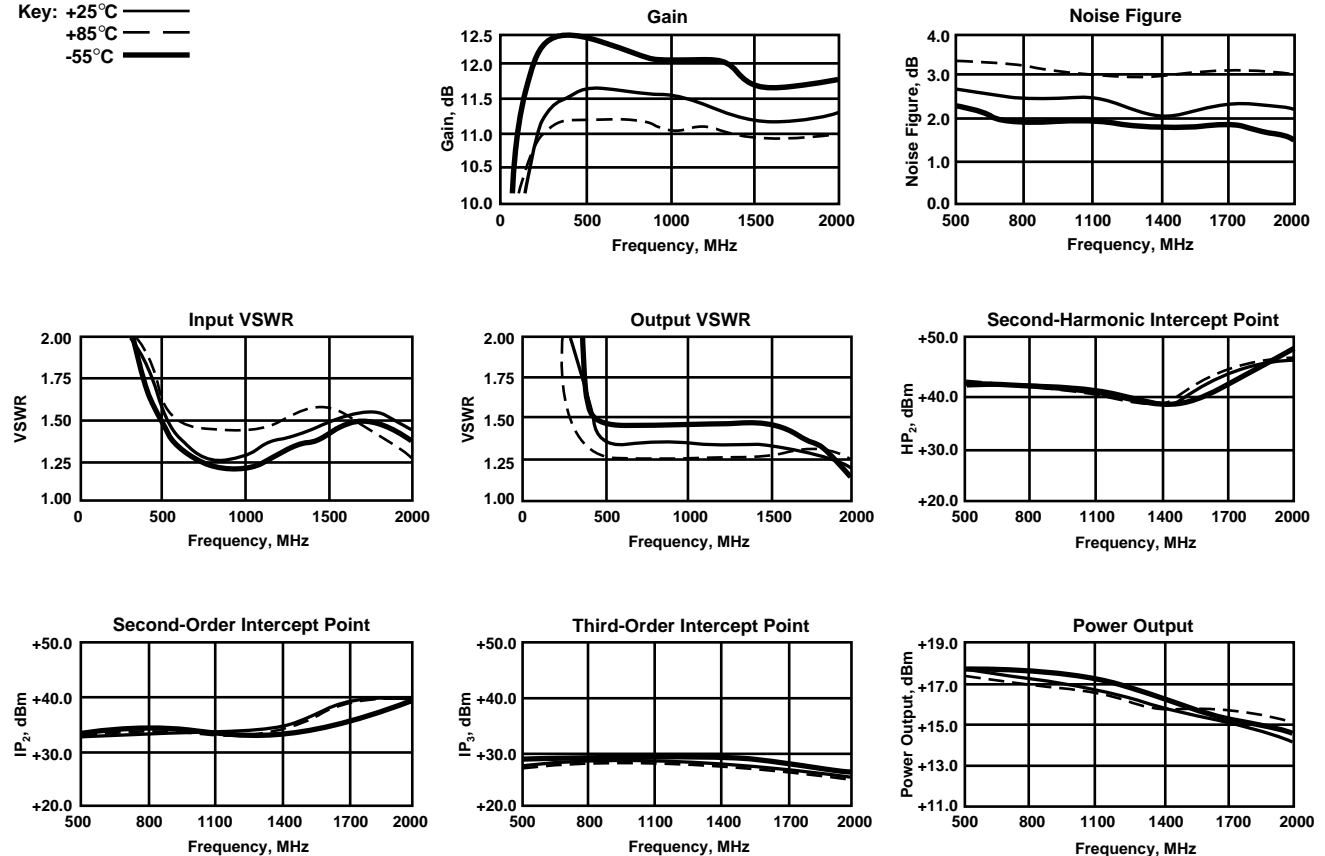
(Measured in 50 Ω system @ +15 VDC nominal unless otherwise noted)

| 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 | 500-2000 | 500-2000 | 500-2000 | MHz |
| GP | Small Signal Gain (Min.) | 11.0 | 9.0 | 8.5 | dB |
| — | Gain Flatness (Max.) | ± 0.5 | ± 1.0 | ± 1.0 | dB |
| NF | Noise Figure (Max.) | 3.0 | 4.0 | 4.5 | dB |
| P_{1dB} | Power Output @ +1 dB Comp. (Min.) | +14.0 | +12.0 | +11.0 | dBm |
| — | Input VSWR (Max.) | <1.6:1 | 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 | +23.0 | — | — | dBm |
| IP_2 | Two Tone 2nd Order Intercept Point | +33.0 | — | — | dBm |
| HP_2 | One Tone 2nd Order Intercept Point | +39.0 | — | — | dBm |
| I_D | DC Current | 50 | — | — | mA |

Note 1: RF input pin is at DC ground—no input blocking capacitor.

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

Key: +25°C —
+85°C - -
-55°C —



Automatic Network Analyzer Measurements (Typical production unit @ +25°C ambient)

Numerical Readings
Bias = 15.00 Volts

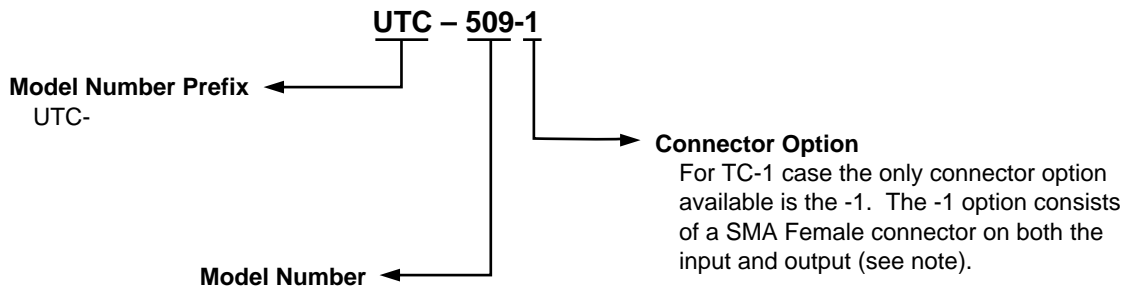
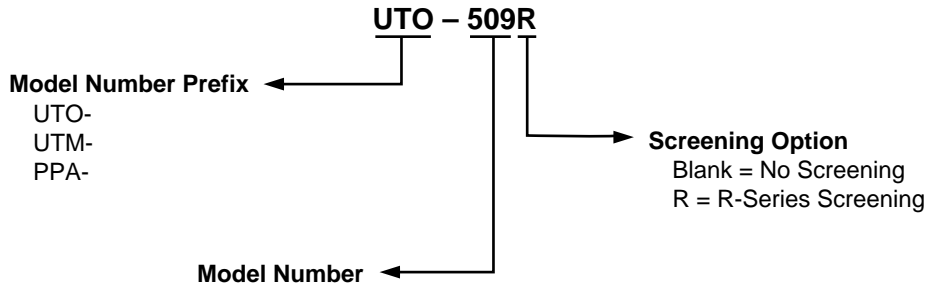
| FREQUENCY MHz | VSWR IN | GAIN dB | PHASE DEGREES | PHASE DEV | GROUP DELAY ns | VSWR OUT | ISOLATION dB |
|------------------|------------|------------|------------------|--------------|-------------------|-------------|-----------------|
| 500.0 | 1.32 | 10.66 | 170.30 | 9.46 | .57 | 1.41 | 16.35 |
| 600.0 | 1.20 | 10.65 | 151.64 | 3.72 | .49 | 1.45 | 16.60 |
| 700.0 | 1.11 | 10.59 | 134.99 | -.02 | .44 | 1.51 | 16.84 |
| 800.0 | 1.03 | 10.59 | 119.69 | -2.41 | .40 | 1.56 | 17.02 |
| 900.0 | 1.03 | 10.57 | 105.49 | -3.71 | .39 | 1.61 | 17.15 |
| 1000.0 | 1.06 | 10.67 | 92.93 | -3.37 | .33 | 1.62 | 17.34 |
| 1100.0 | 1.05 | 10.57 | 81.00 | -2.40 | .34 | 1.55 | 17.48 |
| 1200.0 | 1.05 | 10.54 | 68.30 | -2.21 | .34 | 1.46 | 17.57 |
| 1300.0 | 1.05 | 10.51 | 56.10 | -1.51 | .34 | 1.36 | 17.48 |
| 1400.0 | 1.06 | 10.49 | 43.58 | -1.13 | .34 | 1.30 | 17.46 |
| 1500.0 | 1.06 | 10.48 | 31.45 | -.37 | .35 | 1.30 | 17.44 |
| 1600.0 | 1.04 | 10.57 | 18.63 | -.28 | .33 | 1.35 | 17.35 |
| 1700.0 | 1.05 | 10.55 | 7.26 | 1.24 | .33 | 1.44 | 17.36 |
| 1800.0 | 1.10 | 10.44 | -5.17 | 1.71 | .33 | 1.50 | 17.35 |
| 1900.0 | 1.15 | 10.44 | -17.67 | 2.12 | .36 | 1.47 | 17.40 |
| 2000.0 | 1.19 | 10.35 | -30.49 | 2.19 | .36 | 1.36 | 17.37 |

Linearization Range: 500.0 to 2000.0 MHz

S-Parameters
Bias = 15.00 Volts

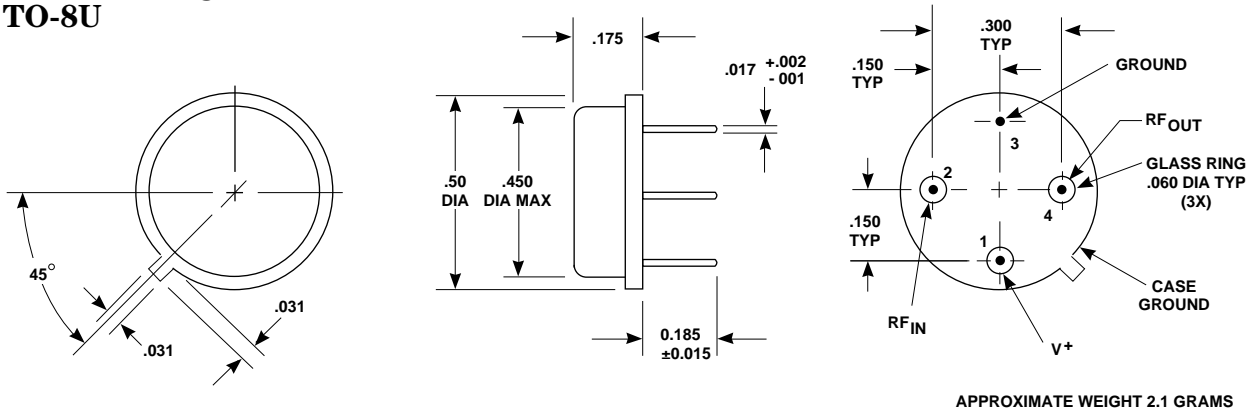
| FREQUENCY MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|-------|-----------------|--------|-----------------|--------|
| | Mag | Ang | dB | Ang | dB | Ang | Mag | Ang |
| 500.00 | .077 | -21.4 | 10.225 | 172.3 | -16.048 | -27.4 | .145 | -129.7 |
| 600.00 | .047 | -6.7 | 10.208 | 152.5 | -16.347 | -39.1 | .167 | -155.5 |
| 700.00 | .021 | -17.1 | 10.256 | 136.3 | -16.996 | -51.0 | .175 | -179.4 |
| 800.00 | .005 | -162.4 | 10.250 | 120.6 | -17.395 | -62.1 | .181 | 164.4 |
| 900.00 | .028 | -146.3 | 10.342 | 105.9 | -17.191 | -74.7 | .202 | 148.8 |
| 1000.00 | .016 | 128.8 | 10.366 | 93.5 | -17.447 | -86.4 | .213 | 136.1 |
| 1100.00 | .013 | 29.1 | 10.281 | 80.8 | -18.202 | -98.1 | .189 | 130.2 |
| 1200.00 | .030 | -15.7 | 10.203 | 67.6 | -17.753 | -110.3 | .172 | 118.9 |
| 1300.00 | .056 | -31.8 | 10.218 | 54.3 | -17.535 | -120.5 | .133 | 112.4 |
| 1400.00 | .046 | -50.1 | 10.320 | 41.3 | -17.343 | -132.6 | .098 | 98.8 |
| 1500.00 | .034 | -75.0 | 10.310 | 28.1 | -17.653 | -143.1 | .079 | 68.0 |
| 1600.00 | .020 | 75.8 | 10.573 | 15.8 | -17.464 | -158.5 | .088 | 36.1 |
| 1700.00 | .066 | 63.7 | 10.470 | 2.5 | -17.371 | -169.5 | .119 | 10.7 |
| 1800.00 | .111 | 80.6 | 10.448 | -11.6 | -17.828 | 176.7 | .102 | 11.4 |
| 1900.00 | .136 | 78.5 | 10.362 | -26.9 | -18.291 | 163.0 | .202 | 29.2 |
| 2000.00 | .103 | 81.1 | 10.227 | -40.9 | -17.434 | 149.7 | .233 | 62.2 |

Product Options



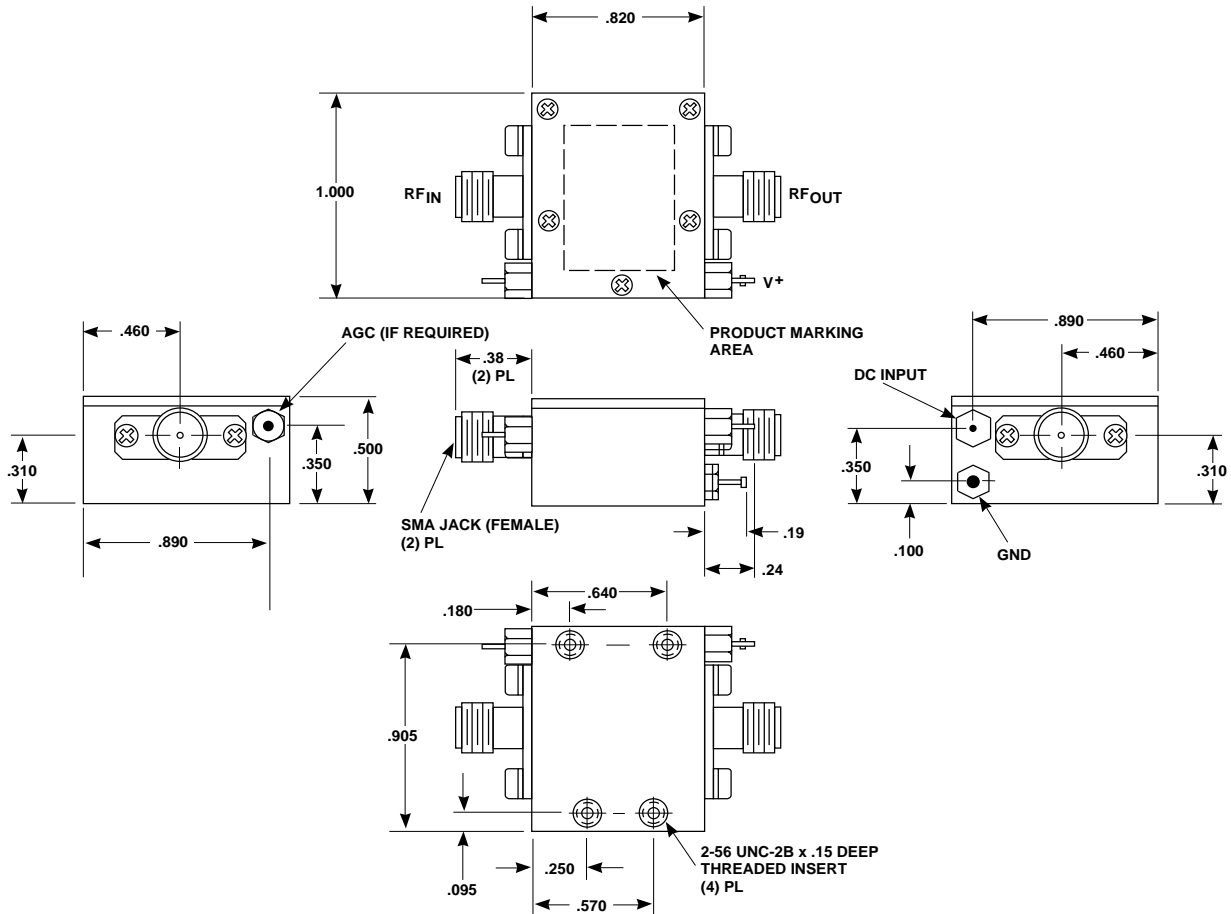
Note: R-Series screening is not available in the TC-1 case as the case is non-hermetic.

Case Drawings TO-8U



- 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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