

# Thin-Film Cascadable Amplifier 5 to 500 MHz

## Technical Data

### UTO/UTC 519 Series

#### Features

- **Frequency Range:** 5 to 500 MHz
- **High Dynamic Range**
- **Output Power:** +19 dBm (Typ)
- **Noise Figure:** 4.4 dB (Typ)
- **Temperature Compensated**
- **Surface Mount Option**

#### Applications

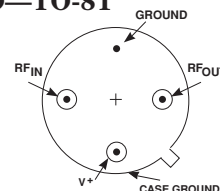
- **IF/RF Amplification**
- **Surface Mount Assembly**

#### Description

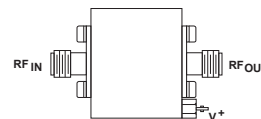
The 519 Series is a wideband, high-power RF amplifier for lower cost applications. Using output choke coupling and transistors on a thin-film substrate, this amplifier provides reliable and stable operation over wide temperature range. The 519 Series amplifiers are available in three packages: the surface mount PlanarPak PP-38 (.375 in. x .375 in.) case, the TO-8 hermetic case and the connectorized TC-1A case.

#### Pin Configuration

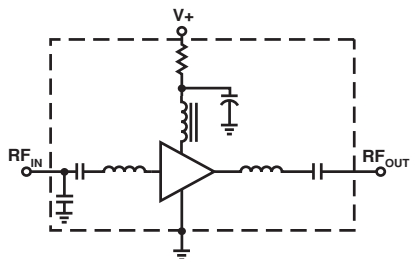
##### UTO—TO-8T



##### UTC—TC-1A



#### Schematic



#### Maximum Ratings

| Parameter                      | Maximum       |
|--------------------------------|---------------|
| DC Voltage                     | +17 Volts     |
| Continuous RF Input Power      | +13 dBm       |
| Operating Case Temperature     | -55 to +100°C |
| Storage Temperature            | -62 to +150°C |
| "R" Series Burn-In Temperature | +100°C        |

#### Thermal Characteristics<sup>1</sup>

|                                             |              |
|---------------------------------------------|--------------|
| $\theta_{JC}$                               | 75°C/W       |
| Active Transistor Power Dissipation         | 637 mW       |
| Junction Temperature Above Case Temperature | 48°C         |
| MTBF (MIL-HDBK-217E, $A_{UF}$ @ 90°C)       | 785,200 Hrs. |

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

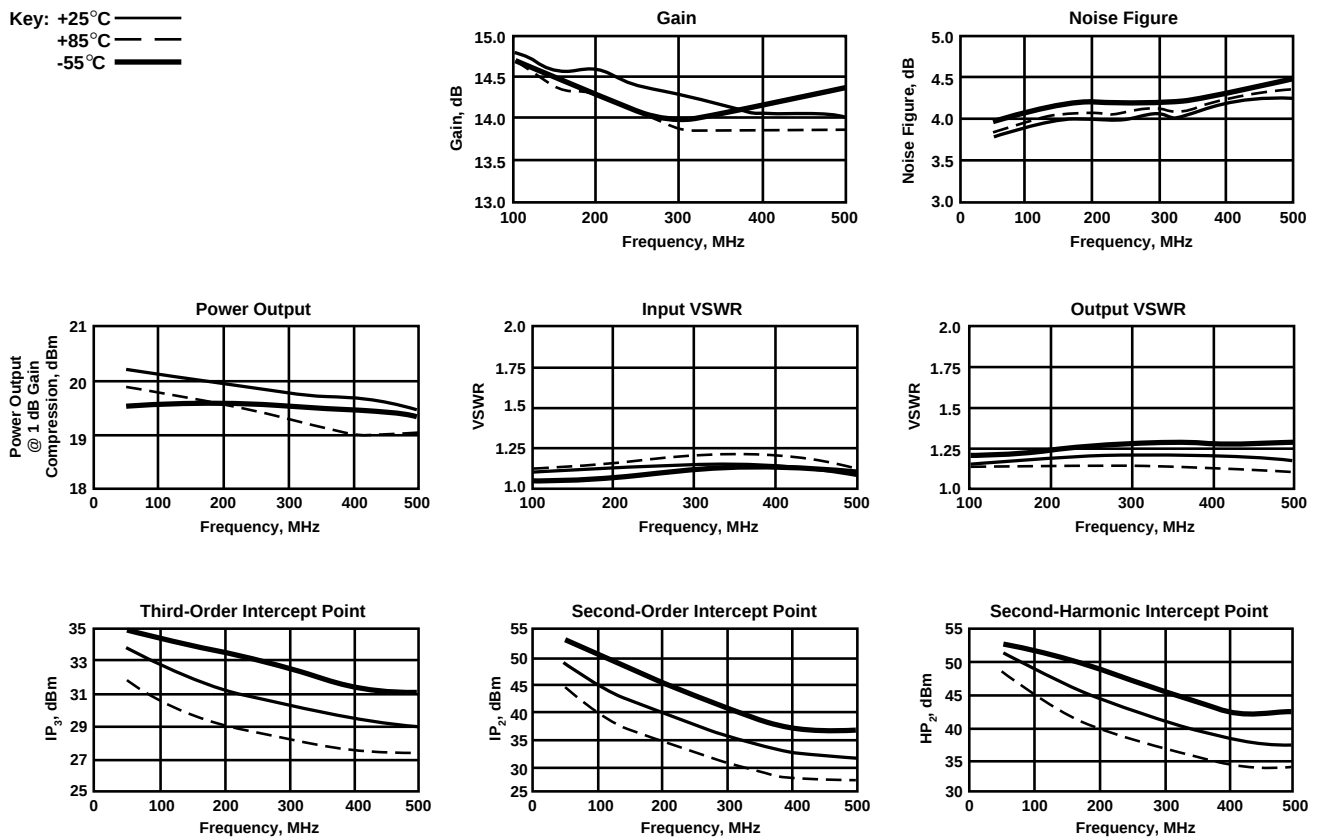
## Electrical Specifications

(Measured in 50  $\Omega$  system @ +15 VDC nominal unless otherwise noted)

| Symbol           | Characteristic                        | Typical<br>$T_C = 25^\circ\text{C}$ | Guaranteed Specifications              |                                           | Unit |
|------------------|---------------------------------------|-------------------------------------|----------------------------------------|-------------------------------------------|------|
|                  |                                       |                                     | $T_C = 0 \text{ to } 50^\circ\text{C}$ | $T_C = -55 \text{ to } +85^\circ\text{C}$ |      |
| BW               | Frequency Range                       | 5-500                               | 5-500                                  | 5-500                                     | MHz  |
| GP               | Small Signal Gain (Min.)              | 14.3                                | 13.0                                   | 12.0                                      | dB   |
| —                | Gain Flatness (Max.)                  | $\pm 0.3$                           | $\pm 0.7$                              | $\pm 1.0$                                 | dB   |
| NF               | Noise Figure (Max.)                   | 4.4                                 | 5.5                                    | 6.0                                       | dB   |
| P <sub>1dB</sub> | Power Output @ +1 dB Comp. (Min.)     | +19.0                               | +18.0                                  | +17.0                                     | dBm  |
| —                | Input VSWR (Max.)                     | <1.2:1                              | 2.0:1                                  | 2.0:1                                     | —    |
| —                | Output VSWR (Max.)                    | <1.2:1                              | 2.0:1                                  | 2.0:1                                     | —    |
| IP <sub>3</sub>  | Two Tone 3rd Order Intercept Point    | +29.0                               | —                                      | —                                         | dBm  |
| IP <sub>2</sub>  | Two Tone 2nd Order Intercept Point    | +31.0                               | —                                      | —                                         | dBm  |
| HP <sub>2</sub>  | One Tone 2nd Harmonic Intercept Point | +37.0                               | —                                      | —                                         | dBm  |
| I <sub>D</sub>   | DC Current                            | 70                                  | —                                      | —                                         | mA   |

## 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**

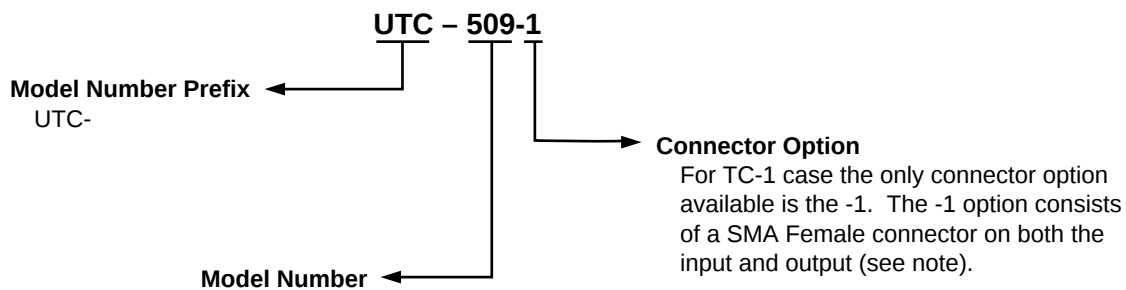
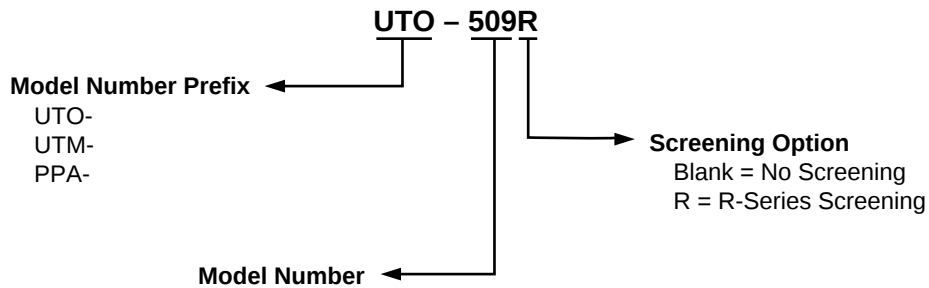
| FREQUENCY<br>MHz | VSWR<br>IN | GAIN<br>dB | PHASE<br>DEGREES | PHASE<br>DEV | GROUP DELAY<br>ns | VSWR<br>OUT | ISOLATION<br>dB |
|------------------|------------|------------|------------------|--------------|-------------------|-------------|-----------------|
| 100.0            | 1.07       | 14.86      | 166.21           | -.29         | .00               | 1.02        | 19.06           |
| 150.0            | 1.07       | 14.84      | 159.21           | -.43         | .37               | 1.03        | 18.88           |
| 200.0            | 1.08       | 14.77      | 152.92           | .13          | .36               | 1.04        | 19.03           |
| 250.0            | 1.08       | 14.68      | 146.17           | .24          | .37               | 1.06        | 19.09           |
| 300.0            | 1.07       | 14.60      | 139.50           | .44          | .38               | 1.09        | 19.12           |
| 350.0            | 1.06       | 14.48      | 132.61           | .42          | .39               | 1.13        | 19.17           |
| 400.0            | 1.04       | 14.38      | 125.62           | .30          | .40               | 1.17        | 19.25           |
| 450.0            | 1.04       | 14.30      | 118.19           | -.27         | .40               | 1.22        | 19.27           |
| 500.0            | 1.08       | 14.24      | 111.04           | -.54         | .39               | 1.28        | 19.27           |
| 550.0            | 1.14       | 14.20      | 104.00           | —            | .41               | 1.34        | 19.26           |
| 600.0            | 1.23       | 14.06      | 96.11            | —            | .43               | 1.41        | 19.22           |
| 650.0            | 1.35       | 13.87      | 88.55            | —            | .45               | 1.47        | 19.31           |
| 700.0            | 1.50       | 13.66      | 80.04            | —            | .49               | 1.53        | 19.37           |
| 750.0            | 1.68       | 13.41      | 70.84            | —            | .52               | 1.59        | 19.47           |
| 800.0            | 1.93       | 13.11      | 61.30            | —            | .52               | 1.63        | 19.46           |
| 850.0            | 2.27       | 12.87      | 52.03            | —            | .52               | 1.65        | 19.84           |
| 900.0            | 2.70       | 12.44      | 42.73            | —            | .52               | 1.65        | 19.93           |
| 950.0            | 3.26       | 11.85      | 33.36            | —            | .55               | 1.62        | 20.57           |
| 1000.0           | 3.99       | 11.18      | 22.87            | —            | .55               | 1.58        | 21.05           |
| 1050.0           | 4.79       | 10.27      | 13.61            | —            | .52               | 1.55        | 21.65           |
| 1100.0           | 5.82       | 9.26       | 4.24             | —            | .50               | 1.52        | 22.48           |
| 1150.0           | 6.98       | 7.96       | -4.41            | —            | .45               | 1.50        | 23.38           |
| 1200.0           | 8.00       | 6.66       | -12.05           | —            | .42               | 1.51        | 24.10           |
| 1250.0           | 8.80       | 5.23       | -19.40           | —            | .36               | 1.53        | 25.42           |
| 1300.0           | 9.81       | 3.82       | -25.15           | —            | .31               | 1.57        | 26.28           |
| 1350.0           | 11.49      | 2.45       | -30.63           | —            | .29               | 1.62        | 27.57           |
| 1400.0           | 12.57      | .82        | -35.56           | —            | .24               | 1.67        | 28.80           |
| 1450.0           | 12.66      | -.63       | -39.43           | —            | .23               | 1.71        | 29.61           |
| 1500.0           | 12.82      | -2.16      | -43.90           | —            | .00               | 1.75        | 30.21           |

LINEARIZATION RANGE: 100.0 to 500.0 MHz

**S-Parameters**
**Bias = 15.00 Volts**

| FREQUENCY<br>MHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |        | S <sub>22</sub> |        |
|------------------|-----------------|--------|-----------------|-------|-----------------|--------|-----------------|--------|
|                  | Mag             | Ang    | dB              | Ang   | dB              | Ang    | Mag             | Ang    |
| 100.00           | .034            | -132.5 | 14.816          | 165.1 | -18.942         | -4.0   | .012            | 92.9   |
| 200.00           | .037            | -132.6 | 14.737          | 150.5 | -18.954         | -10.3  | .018            | -4.2   |
| 300.00           | .031            | -133.2 | 14.587          | 136.0 | -19.137         | -16.5  | .046            | -29.2  |
| 400.00           | .019            | -98.7  | 14.366          | 120.9 | -19.310         | -23.4  | .081            | -53.1  |
| 500.00           | .039            | -22.5  | 14.208          | 105.2 | -19.265         | -31.4  | .125            | -72.9  |
| 600.00           | .107            | -21.7  | 14.044          | 89.4  | -19.267         | -39.9  | .169            | -92.2  |
| 700.00           | .196            | -27.2  | 13.645          | 72.2  | -19.336         | -49.2  | .209            | -112.3 |
| 800.00           | .320            | -39.3  | 13.122          | 52.2  | -19.528         | -60.0  | .235            | -135.5 |
| 900.00           | .455            | -52.3  | 12.451          | 32.1  | -19.959         | -71.7  | .246            | -162.1 |
| 1000.00          | .600            | -66.9  | 11.160          | 11.3  | -21.060         | -85.6  | .223            | 165.4  |
| 1100.00          | .709            | -81.0  | 9.195           | -8.4  | -22.488         | -98.3  | .201            | 124.5  |
| 1200.00          | .777            | -92.8  | 6.628           | -26.1 | -24.144         | -107.9 | .198            | 82.8   |
| 1300.00          | .823            | -102.7 | 3.807           | -40.1 | -26.350         | -115.9 | .216            | 46.3   |
| 1400.00          | .852            | -109.8 | .815            | -52.0 | -28.799         | -124.2 | .248            | 21.1   |
| 1500.00          | .871            | -114.9 | -2.146          | -61.2 | -30.242         | -128.0 | .277            | 3.8    |
| 1600.00          | .870            | -119.4 | -5.149          | -69.7 | -32.149         | -131.4 | .289            | -9.4   |
| 1700.00          | .891            | -123.2 | -7.756          | -75.5 | -33.359         | -133.2 | .297            | -22.5  |
| 1800.00          | .887            | -127.1 | -10.407         | -79.7 | -34.754         | -131.2 | .295            | -33.8  |
| 1900.00          | .937            | -130.8 | -13.149         | -85.6 | -35.497         | -136.3 | .288            | -45.1  |
| 2000.00          | .928            | -133.9 | -15.936         | -90.3 | -36.142         | -139.2 | .273            | -60.5  |

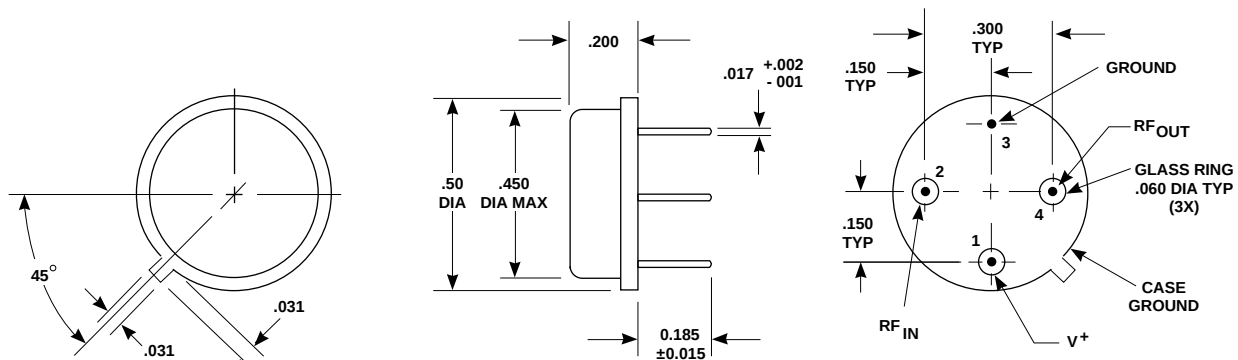
## Product Options



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

## Case Drawings

### TO-8T



APPROXIMATE WEIGHT 2.1 GRAMS

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

# TC-1A

