



## Thin-Film Cascadable Amplifier 1 to 2000 MHz

### Technical Data

#### UTO/UTC 2032 Series

#### Features

- **Frequency Range:** 1 to 2000 MHz
- **Medium Gain:** 10.0 dB (Typ)
- **Low VSWR**
- **Temperature Compensated**

#### Applications

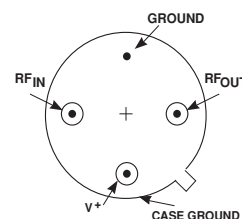
- **IF/RF Amplification**

#### Description

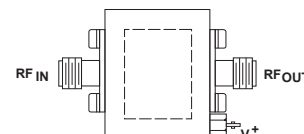
The 2032 Series is a wideband thin-film bipolar RF amplifier using resistive feedback and active bias for temperature compensation and increased immunity to bias voltage variations. Low input/output VSWR is maintained by inductive tuning, and internal blocking capacitors couple the RF through the amplifier. The 2032 Series amplifiers are available in either the TO-8 hermetic case or connected TC-1A package.

#### Pin Configuration

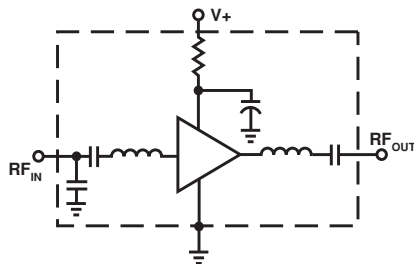
##### UTO—TO-8U



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

|                                             |              |
|---------------------------------------------|--------------|
| $\theta_{JC}$                               | 105°C/W      |
| Active Transistor Power Dissipation         | 216 mW       |
| Junction Temperature Above Case Temperature | 23°C         |
| MTBF (MIL-HDBK-217E, $A_{UF}$ @ 90°C)       | 797,500 Hrs. |

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

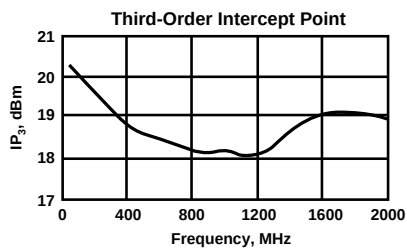
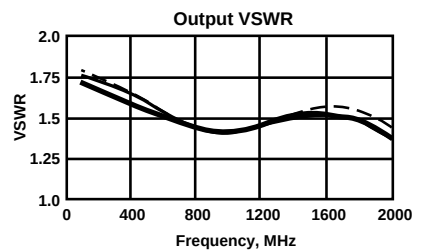
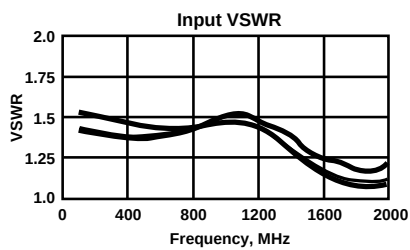
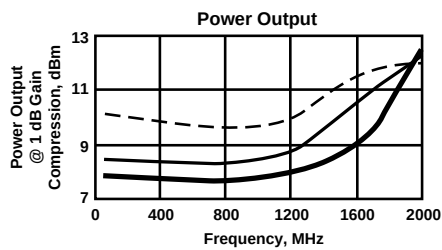
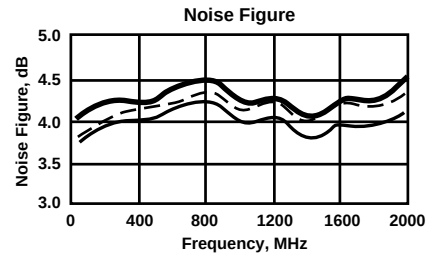
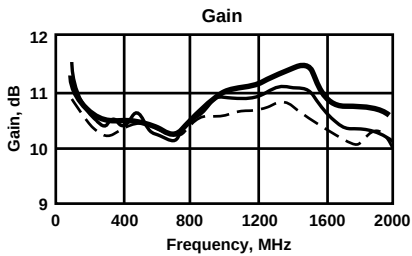
## Electrical Specifications

(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                       | 1-2000                              | 1-2000                                 | 1-2000                                    | MHz  |
| GP               | Small Signal Gain (Min.)              | 10.0                                | 9.0                                    | 8.5                                       | dB   |
| —                | Gain Flatness (Max.)                  | $\pm 0.6$                           | $\pm 1.0$                              | $\pm 1.0$                                 | dB   |
| NF               | Noise Figure (Max.)                   | 5.0                                 | 6.0                                    | 6.0                                       | dB   |
| P <sub>1dB</sub> | Power Output @ +1 dB Comp. (Min.)     | +7.50                               | +7.0                                   | +6.5                                      | dBm  |
| —                | Input VSWR (Max.)                     | <1.8:1                              | 2.0:1                                  | 2.0:1                                     | —    |
| —                | Output VSWR (Max.)                    | <1.4:1                              | 2.0:1                                  | 2.0:1                                     | —    |
| IP <sub>3</sub>  | Two Tone 3rd Order Intercept Point    | +17.0                               | —                                      | —                                         | dBm  |
| IP <sub>2</sub>  | Two Tone 2nd Order Intercept Point    | +23.0                               | —                                      | —                                         | dBm  |
| HP <sub>2</sub>  | One Tone 2nd Harmonic Intercept Point | +28.0                               | —                                      | —                                         | dBm  |
| I <sub>D</sub>   | DC Current                            | 25                                  | —                                      | —                                         | 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)

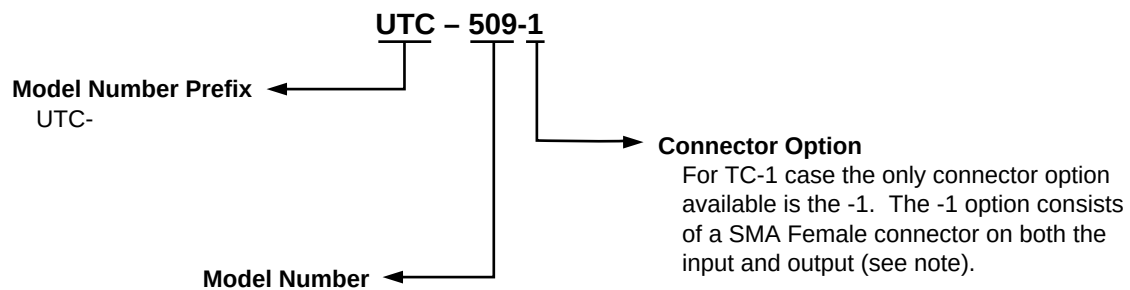
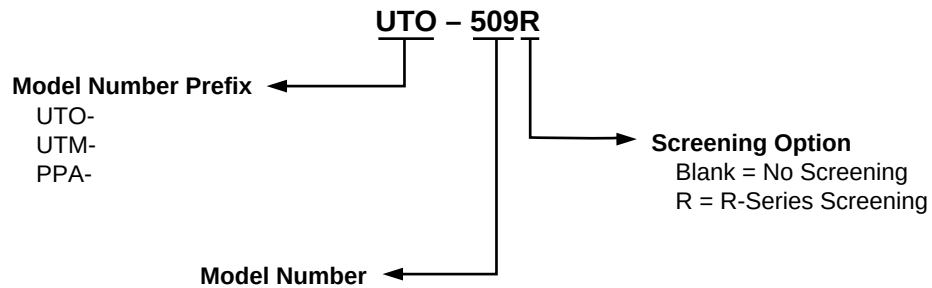
**Numerical Readings**
**Bias = 15.00 Volts**

| 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            | 1.26       | 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            | -4.76        | .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**

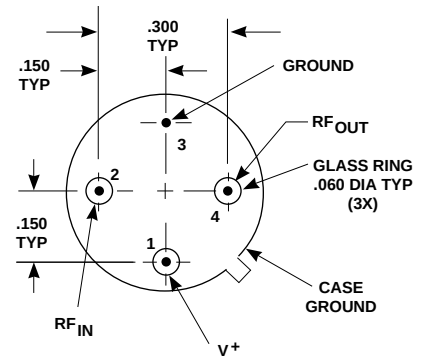
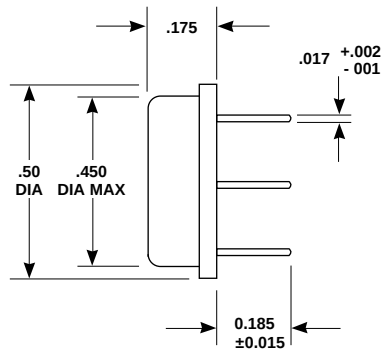
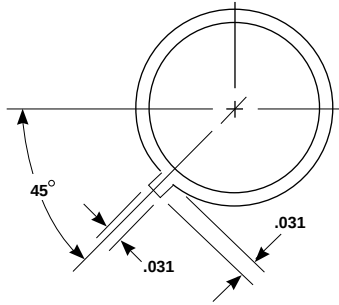
| FREQUENCY<br>MHz | S <sub>11</sub> |        | S <sub>21</sub> |        | S <sub>12</sub> |        | S <sub>22</sub> |       |
|------------------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|-------|
|                  | Mag             | Ang    | dB              | Ang    | dB              | Ang    | Mag             | Ang   |
| 100.00           | .186            | 179.5  | 10.505          | 166.7  | -16.576         | -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          | .268            | 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          | .246            | -34.2  | 10.002          | -124.8 | -17.733         | -142.2 | .188            | -42.5 |
| 2300.00          | .351            | -61.3  | 9.410           | -144.2 | -17.726         | -163.4 | .267            | -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.

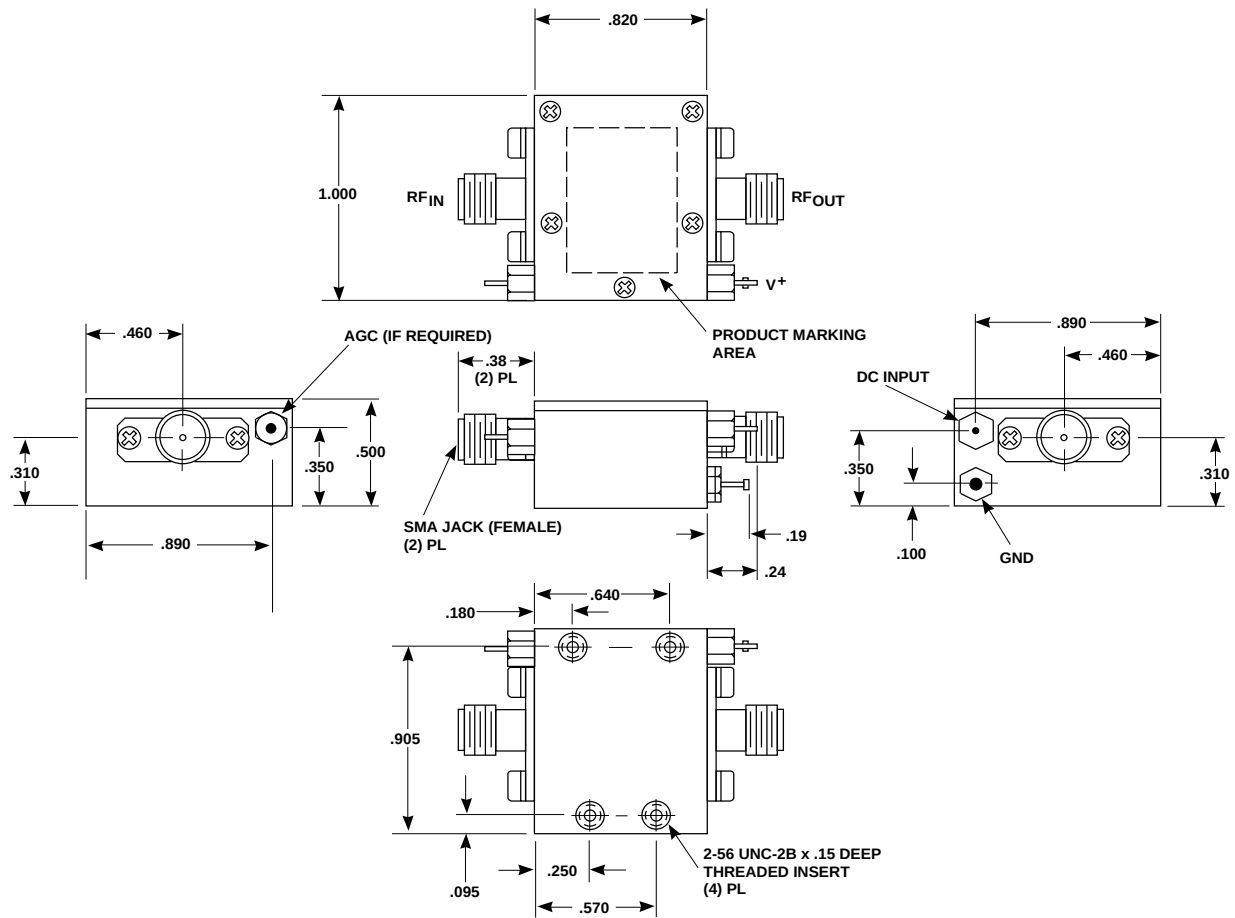
## Case Drawings TO-8U



APPROXIMATE WEIGHT 2.1 GRAMS

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

## 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  $\pm .02$   
xxx  $\pm .010$

Contact Teledyne Microwave Solutions:  
650-691-9800  
650-962-6845 fax

Check for updates:  
[www.teledynemicrowave.com](http://www.teledynemicrowave.com)