



# Thin-Film Cascadable Amplifier 2 to 2000 MHz

## Technical Data

### UTO/UTC 2024 Series

#### Features

- **Frequency Range: 2 to 2000 MHz**
- **High Gain: 16 dB (Typ)**
- **Noise Figure: 4.5 dB (Typ)**
- **Temperature Compensated**

#### Applications

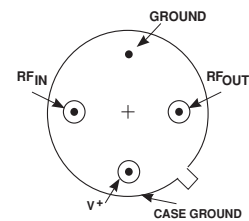
- **IF/RF Amplification**

#### Description

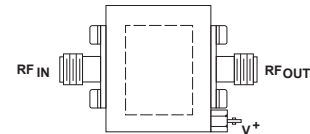
The 2024 Series is a wideband two-stage bipolar RF amplifier using resistive feedback and active bias for temperature compensation and increased immunity to bias voltage variations. Input/output blocking capacitors couple the RF through the amplifier, while a low VSWR is maintained through inductive tuning. The 2024 Series amplifiers are available in either the TO-8 hermetic case or connected TC-1A package.

#### Pin Configuration

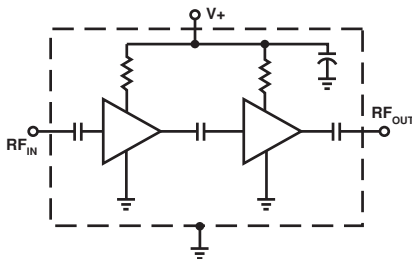
##### UTO—TO-8U



##### 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>

$\theta_{JC}$	105/87°C/W <sup>2</sup>
Active Transistor Power Dissipation	85/170 mW <sup>2</sup>
Junction Temperature Above Case Temperature	9/15°C <sup>2</sup>
MTBF (MIL-HDBK-217E, A <sub>UF</sub> @ 90°C)	741,300 Hrs.

Notes:

1. Values refer to first and second stages, respectively.

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

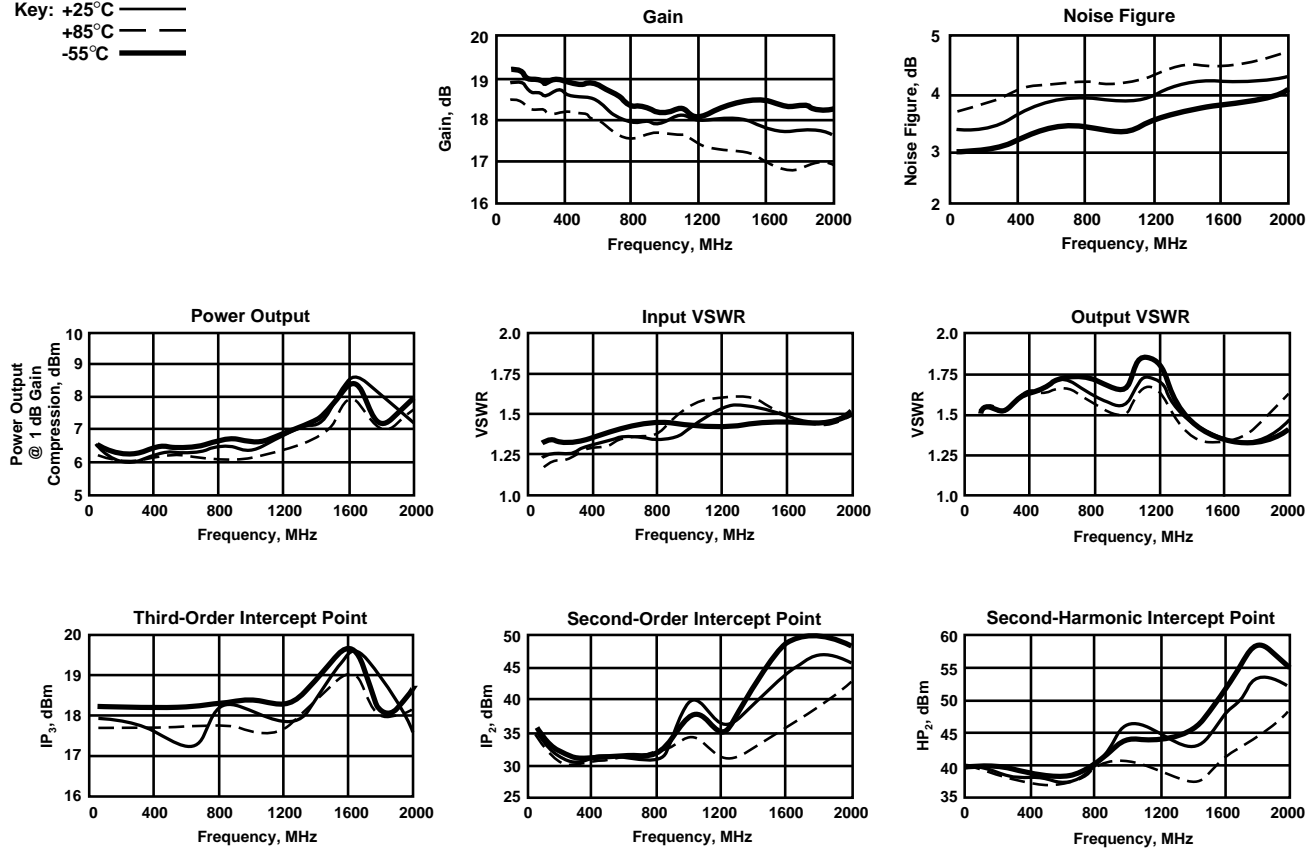
## Electrical Specifications

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

Symbol	Characteristic	Typical $T_C = 25^\circ\text{C}$	Guaranteed Specifications		Unit
			$T_C = 0 \text{ to } 50^\circ\text{C}$	$T_C = -55 \text{ to } +85^\circ\text{C}$	
BW	Frequency Range	5-2000	5-2000	5-2000	MHz
GP	Small Signal Gain (Min.)	16.0	15.0	14.0	dB
—	Gain Flatness (Max.)	$\pm 0.5$	$\pm 1.0$	$\pm 1.0$	dB
NF	Noise Figure (Max.)	4.5	5.5	6.0	dB
P <sub>1dB</sub>	Power Output @ +1 dB Comp. (Min.)	+6.0	+5.0	+4.0	dBm
—	Input VSWR (Max.)	<1.5:1	2.0:1	2.0:1	—
—	Output VSWR (Max.)	<1.8:1	2.0:1	2.0:1	—
IP <sub>3</sub>	Two Tone 3rd Order Intercept Point	+18.0	—	—	dBm
IP <sub>2</sub>	Two Tone 2nd Order Intercept Point	+30.0	—	—	dBm
HP <sub>2</sub>	One Tone 2nd Harmonic Intercept Point	+40.0	—	—	dBm
I <sub>D</sub>	DC Current	38	—	—	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)

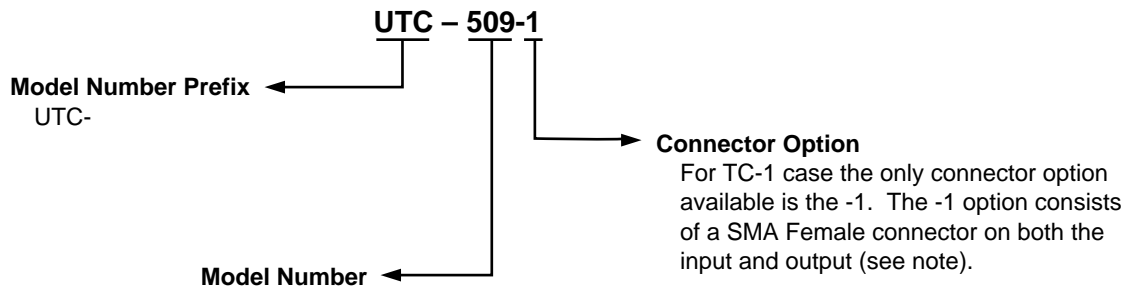
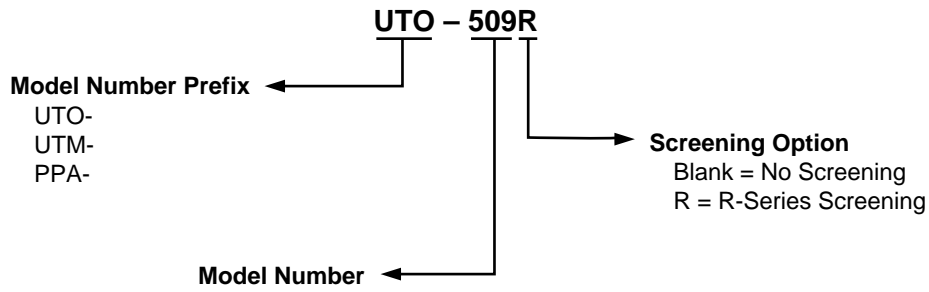
**Numerical Readings**
**Bias = 15.00 Volts**

FREQUENCY MHz	VSWR IN	GAIN dB	PHASE DEGREES	PHASE DEV	GROUP DELAY ns	VSWR OUT	ISOLATION dB
100.0	1.22	16.54	-10.39	-2.14	.00	1.51	30.62
200.0	1.22	16.46	-17.84	-.46	.22	1.55	30.48
300.0	1.22	16.29	-26.31	.19	.25	1.61	30.69
400.0	1.24	16.28	-35.94	-.29	.26	1.68	30.96
500.0	1.26	16.35	-44.87	-.08	.25	1.75	31.27
600.0	1.29	16.50	-53.95	-.02	.27	1.80	31.37
700.0	1.34	16.54	-64.05	-.99	.25	1.84	31.53
800.0	1.37	16.46	-72.05	.14	.23	1.88	31.81
900.0	1.40	16.50	-80.69	.62	.25	1.84	32.04
1000.0	1.43	16.51	-89.75	.70	.23	1.76	32.32
1100.0	1.44	16.54	-97.15	2.44	.22	1.66	32.67
1200.0	1.45	16.42	-105.87	2.85	.26	1.60	32.92
1300.0	1.43	16.26	-116.21	1.64	.29	1.50	33.23
1400.0	1.41	16.33	-126.79	.20	.28	1.50	33.39
1500.0	1.36	16.36	-136.11	.02	.27	1.49	33.63
1600.0	1.30	16.20	-146.31	-1.04	.27	1.54	33.63
1700.0	1.21	16.16	-155.22	-.82	.24	1.57	33.64
1800.0	1.13	16.11	-163.79	-.25	.26	1.60	33.26
1900.0	1.11	16.15	-173.75	-1.08	.27	1.62	32.79
2000.0	1.23	16.43	176.59	-1.62	.28	1.55	32.16

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

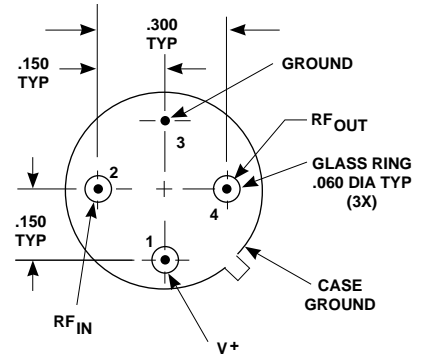
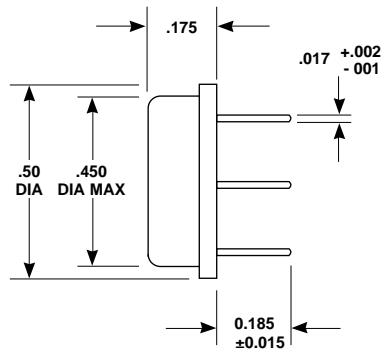
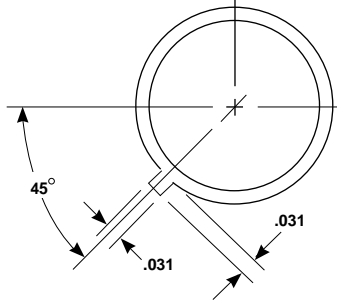
FREQUENCY MHz	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	Mag	Ang	dB	Ang	dB	Ang	Mag	Ang
100.00	.123	-171.3	16.410	-9.6	-30.503	1.1	.180	-177.0
200.00	.126	-166.6	16.256	-18.2	-30.551	.4	.189	-174.4
300.00	.130	-160.1	16.122	-26.8	-30.721	-1.1	.207	-173.7
400.00	.135	-152.7	16.170	-36.6	-31.091	-.9	.226	-173.5
500.00	.140	-147.9	16.329	-45.1	-31.167	-1.9	.246	-174.1
600.00	.151	-146.7	16.417	-54.0	-31.431	-2.5	.265	-176.2
700.00	.168	-146.2	16.614	-62.8	-31.537	-2.3	.286	-179.4
800.00	.188	-142.7	16.505	-71.3	-31.872	-2.6	.297	177.3
900.00	.193	-138.9	16.485	-79.2	-32.074	-2.2	.304	172.1
1000.00	.194	-139.5	16.545	-87.7	-32.430	-1.7	.299	164.8
1100.00	.210	-139.9	16.396	-96.2	-32.821	-3.4	.297	157.5
1200.00	.205	-138.4	16.142	-106.5	-33.044	-5.9	.280	148.3
1300.00	.192	-138.3	16.221	-116.4	-33.275	-5.9	.258	138.0
1400.00	.183	-138.4	16.366	-126.0	-33.473	-7.0	.225	124.2
1500.00	.163	-138.6	16.256	-134.5	-33.646	-11.1	.210	111.0
1600.00	.143	-138.3	16.162	-143.8	-33.738	-13.2	.193	92.9
1700.00	.115	-132.1	16.750	-153.4	-33.560	-15.6	.182	79.6
1800.00	.079	-112.0	16.180	-162.2	-33.228	-16.1	.185	59.6
1900.00	.072	-74.9	16.347	-171.8	-32.786	-19.4	.185	47.2
2000.00	.120	-48.1	16.386	-176.7	-32.129	-21.3	.206	28.3
2500.00	.509	-70.2	16.628	-115.1	-29.189	-45.7	.235	-48.4
3000.00	.406	-89.4	13.788	14.5	-31.971	-82.9	.491	-125.7
3500.00	.800	-124.5	-2.301	-51.6	-35.785	-45.9	.323	-148.9
4000.00	.918	-158.4	-21.583	-65.4	-39.128	-26.5	.310	-162.9

## Product Options



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

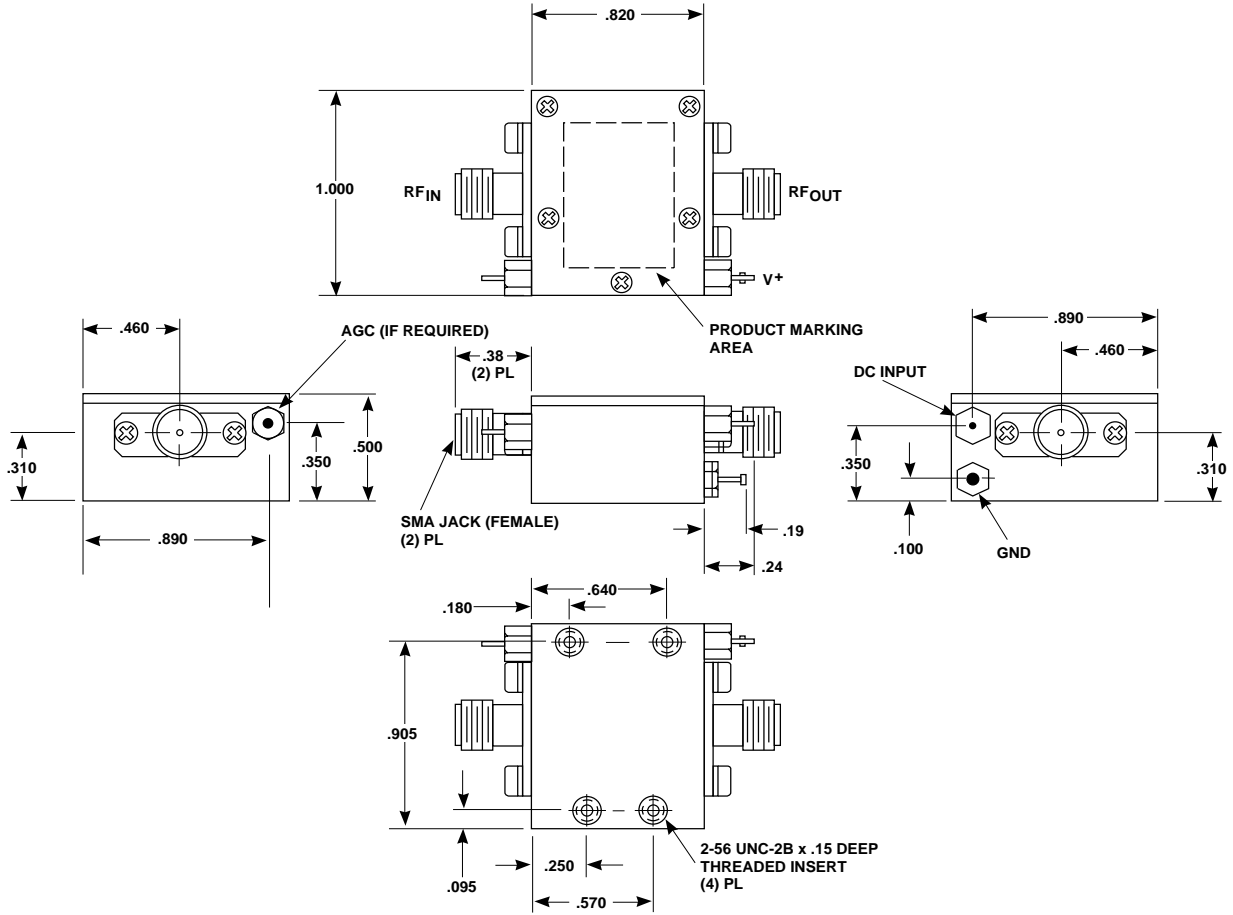
**Case Drawings  
TO-8U**



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

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

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