Avantek Products

Thin-Film Cascadable Amplifier 5 to 1000 MHz

Technical Data

UTO/UTC/PPA 1021 Series

Features

- **Frequency Range: 5 to 1000MHz**
- **High Gain: 23.0 dB (Typ)**
- **Medium Output Power: +14.0 dBm (Typ)**
- **Temperature Compensated**
- **Surface Mount Option**

Applications

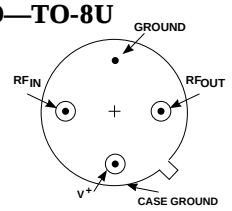
- **IF/RF Amplification**
- **Output Stage**

Description

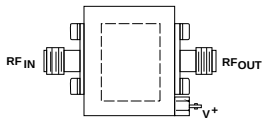
The 1021 Series is a two-stage bipolar RF amplifier built on a thin-film substrate. Active bias and resistive feedback provide for stability over temperature and bias voltage variations. Input/output blocking capacitors couple the RF through the amplifier while a low VSWR is maintained through the use of inductive tuning. The 1021 Series amplifiers are available in three packages: the TO-8 hermetic case, the connectored TC-1 package or the surface mount PlanarPak PP-38.

Pin Configuration

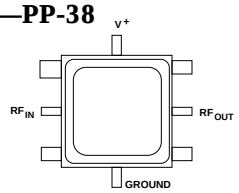
UTO—TO-8U



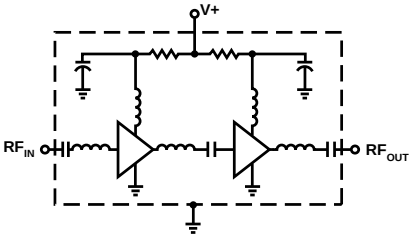
UTC—TC-1



PPA—PP-38



Schematic



Maximum Ratings

Parameter	Maximum
DC Voltage	+17 Volts
Continuous RF Input Power	+13 dBm
Operating Case Temperature	–55 to +115°C
Storage Temperature	–62 to +150°C
"R" Series Burn-In Temperature	+115°C

Thermal Characteristics[1]

θ_{JC}	105/75°C/W[2]
Active Transistor Power Dissipation	230/460 mW[2]
Junction Temperature Above Case Temperature	24/34°C[2]
MTBF (MIL-HDBK-217E, A_{UF} @ 90°C)	575,400 Hrs.

Notes:
1. For further information, see Reliability Screening, Pub. 5963-3240E.
2. Values refer to first and second stages, respectively.

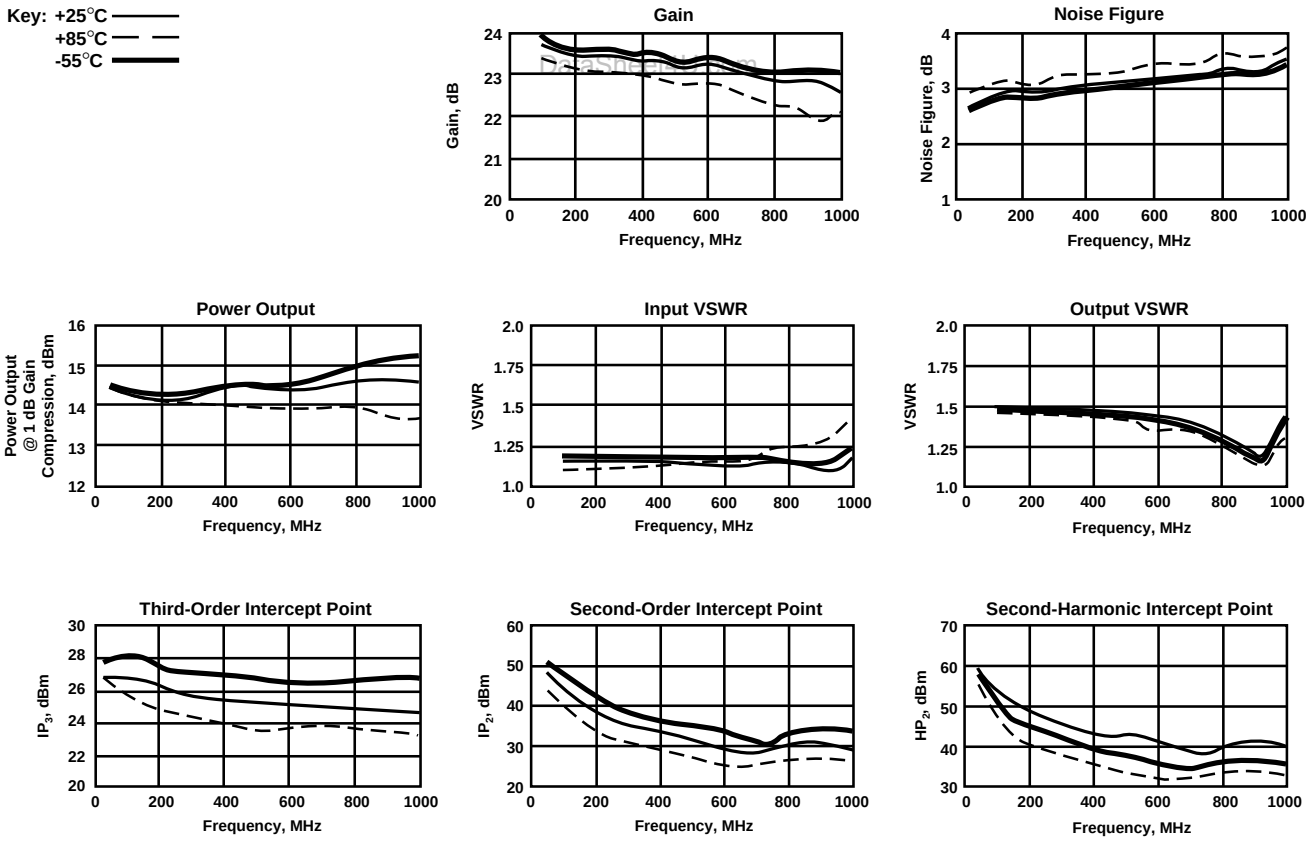
Weight: (typical) UTO—2.1 grams; UTC—21.5 grams; PPA—0.5 grams

Electrical Specifications

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

Symbol	Characteristic	Typical T_C = 25°C	Guaranteed Specifications T_C = 0 to 50°C	Guaranteed Specifications T_C = –55 to +85°C	Unit
BW	Frequency Range	5-1000	5-1000	5-1000	MHz
GP	Small Signal Gain (Min.)	23.0	22.0	21.0	dB
—	Gain Flatness (Max.)	±0.7	±1.0	±1.0	dB
NF	Noise Figure (Max.)	3.8	4.5	5.0	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	+25.0	—	—	dBm
IP_2	Two Tone 2nd Order Intercept Point	+30.0	—	—	dBm
HP_2	One Tone 2nd Harmonic Intercept Point	+40.0	—	—	dBm
I_D	DC Current	85	—	—	mA

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



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	1.23	23.92	–19.76	–1.86	.00	1.46	39.57
200.0	1.29	23.86	–38.37	–.30	.53	1.47	38.06
300.0	1.32	23.81	–58.28	–.05	.55	1.50	38.34
400.0	1.33	23.86	–77.78	.60	.56	1.53	38.86
500.0	1.33	24.06	–97.55	.99	.53	1.57	39.30
600.0	1.33	24.08	–117.37	1.32	.56	1.62	40.29
700.0	1.37	24.08	–137.82	1.02	.58	1.69	41.20
800.0	1.46	23.88	–158.85	.17	.59	1.75	42.65
900.0	1.60	23.79	179.93	–.87	.57	1.80	44.65
1000.0	1.75	23.77	158.44	–2.20	.60	1.80	46.55
1100.0	1.92	23.89	137.08	—	.63	1.74	47.79
1200.0	2.05	23.50	113.77	—	.67	1.57	45.26
1300.0	1.94	22.61	89.77	—	.61	1.41	44.27
1400.0	1.81	21.46	68.99	—	.55	1.32	43.97
1500.0	1.75	20.55	50.19	—	.52	1.29	45.01

LINEARIZATION RANGE: 100.0 to 1000.0 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
100.0	.185	146.0	23.784	–18.6	–38.957	6.3	.127	171.9
200.0	.196	121.9	23.853	–36.4	–38.320	–7.7	.130	172.8
300.0	.208	101.8	23.911	–55.6	–38.914	–13.9	.144	166.8
400.0	.217	82.3	24.117	–74.8	–38.946	–21.9	.157	156.7
500.0	.214	60.7	24.500	–94.9	–39.187	–30.0	.174	142.7
600.0	.204	33.0	24.667	–115.4	–40.060	–39.4	.194	126.6
700.0	.203	–1.5	24.741	–137.0	–41.302	–46.9	.214	110.3
800.0	.218	–37.0	24.566	159.8	–43.007	–53.4	.235	54.0
900.0	.249	–67.7	24.335	177.3	–44.784	–54.5	.249	79.7
1000.0	.277	–93.1	24.053	154.6	–47.587	–41.4	.248	65.2
1100.0	.297	–116.5	23.828	132.8	–47.857	–23.1	.227	45.2
1200.0	.299	–143.5	23.064	109.9	–44.830	–21.8	.181	31.5
1300.0	.255	–172.2	21.912	87.4	–43.135	–30.0	.137	18.9
1400.0	.204	158.6	20.568	68.2	–42.697	–40.6	.110	6.5
1500.0	.169	127.2	19.516	50.7	–42.957	–43.3	.108	–9.7

Product Options

UTO – 509R

Model Number Prefix
UTO-
UTM-
PPA-

Screening Option
Blank = No Screening
R = R-Series Screening

For more information on R-Series screening, see Reliability Screening, Pub. 5963-3240E.

Model Number

UTC – 509-1

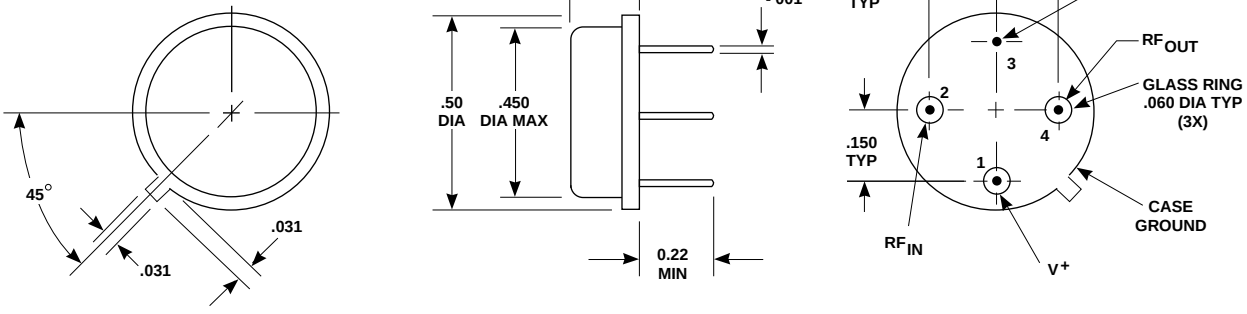
Model Number Prefix
UTC-

Connector Option
For TC-1 case the only connector option available is the -1. The -1 option consists of a SMA Female connector on both the input and output (see note).

Model Number

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

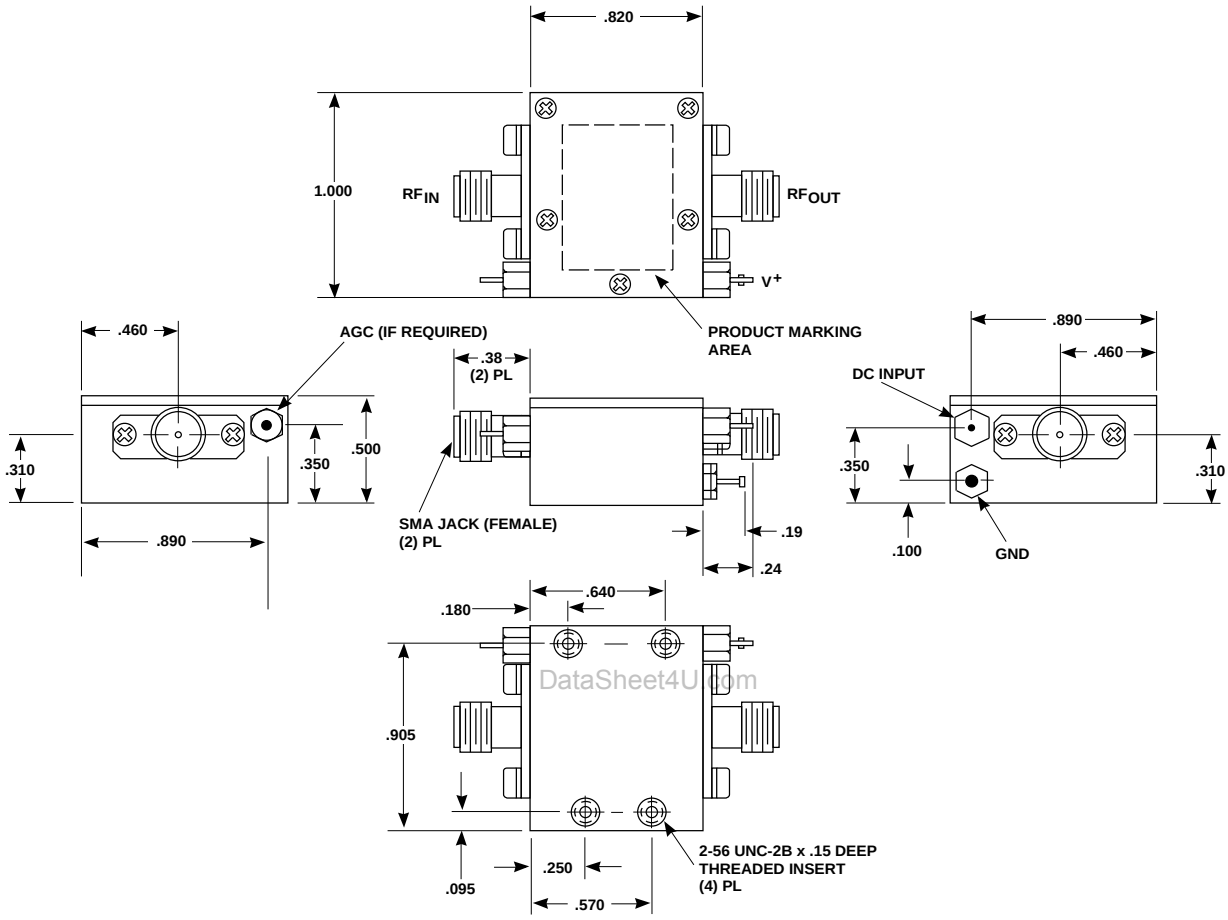
Case Drawings
TO-8U



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



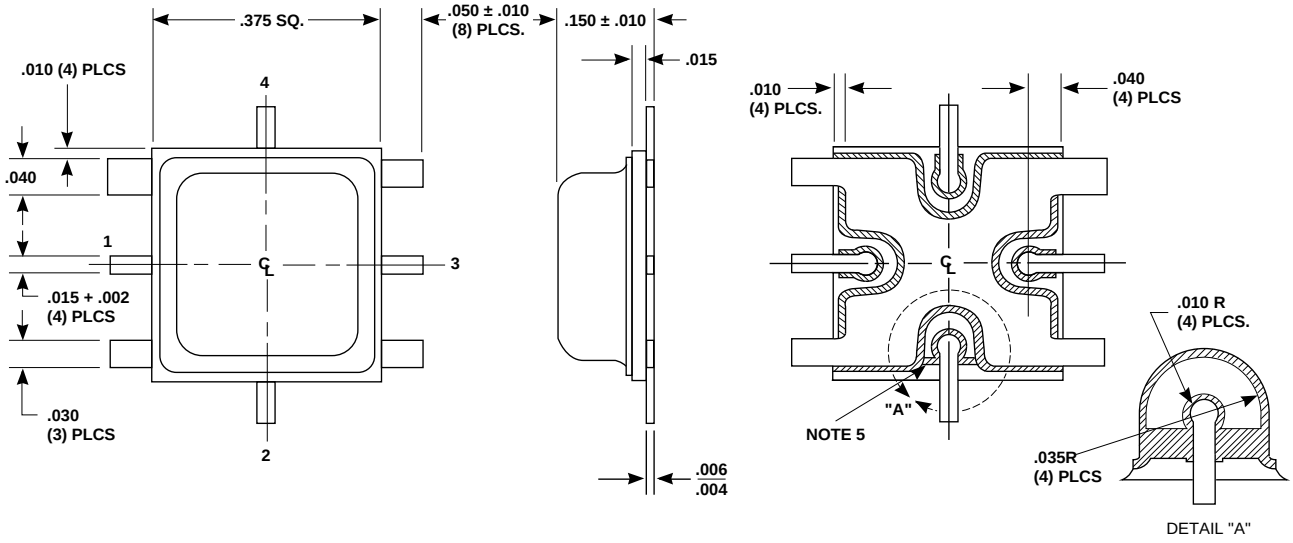
TYPICAL WEIGHT WITH CONNECTORS = 21.5 GRAMS

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

Case Drawings
PP-38

.375 x .375 PLANARPAK SURFACE MOUNTED COMPONENTS



TYPICAL WEIGHT 0.5 GRAMS

CASE	PIN DESIGNATION			
	1	2	3	4
PP-38	RF_{IN}	GROUND	RF_{OUT}	V^+
PP-38M	RF	LO	IF	N/C
PP-38F	RF_{IN}	GROUND	RF_{OUT}	GROUND

NOTES (UNLESS OTHERWISE SPECIFIED):
1. **DIMENSIONS ARE SPECIFIED IN INCHES**
2. **TOLERANCES: xxx ± .005**
3. **LEADS ARE FOR TESTING ONLY AND MAY BE TRIMMED FLUSH AT TIME OF INSTALLATION.**
4. **N/C = NOT CONNECTED**
5. **PIN 2 IS NOT AT GROUND POTENTIAL FOR PP-38M. IT LOOKS THE SAME AS PINS 1, 3, AND 4.**

Recommended Assembly Procedure

1. Chemically clean the PC board and the unit to be mounted using a vapor degreaser or acetone followed by an isopropol alcohol wash. Do not use ultrasonic cleaning.
2. Mask the backside of the PC board to prevent solder from reflowing through the plated thru-holes causing a rough ground plane surface. A suggested masking material is 2 mil thick Kapton® film with silicone adhesive back (Permacel part #P-222).
3. Apply solder cream (suggest Multicore SN62PRMAB3 or equivalent) using screen printing techniques or careful hand application. A layer 4 to 6 mils thick is adequate.
4. Reflow of the unit to the board may be done in many ways. Using a hot plate is one of the most simple. During reflow, pressure (with a clamping arrangement) on the unit is recommended, but not absolutely necessary. Absolute maximum reflow temperature is 260°C for not more than 10 seconds.
5. Chemically reclean the unit using the procedures given in step one. Make sure that a flux remover is used which is appropriate for the type of solder cream used (Multicore PC81 is the recommended flux remover for the above mentioned cream).

It should be noted that there are many alternatives for component attachment. This procedure has been found to be simple and effective. For more detailed instructions on how to use PlanarPak Products, please see the application note "*PlanarPak* Users Information," Pub.□5963-3232E.

For more information:

United States*

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Far East/Australasia: (65) 290-6305

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*Call your local HP sales office listed in your telephone directory. Ask for a Components representative.

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