

Avantek Products

Thin-Film Cascadable Amplifier 5 to 1000 MHz

Technical Data

UTO/UTC/PPA 1005 Series

Features

- **Frequency Range: 5 to 1000MHz**
- **High Dynamic Range**
- **High Output Power: +21.0 dBm (Typ)**
- **Noise Figure: 5.0 dB (Typ)**
- **Temperature Compensated**
- **Surface Mount Option**

Applications

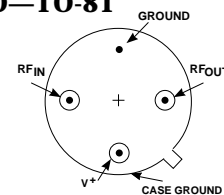
- **IF/RF Amplification**
- **Output Stage**
- **Surface Mount Assembly**

Description

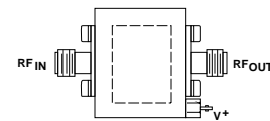
The 1005 Series is a medium-gain, thinfilm bipolar RF amplifier using resistive feedback and active bias for stability over temperature and bias variations. Inductive networks maintain good VSWR while the RF is coupled through input and output blocking capacitors. The 1005 Series amplifiers are available in three packages: the surface mount hermetic PP-38 (.375 in. x .375 in.) case, the TO-8 hermetic case and the connectorized TC-1 case.

Pin Configuration

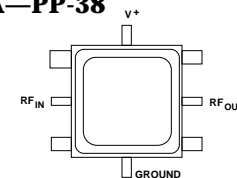
UTO—TO-8T



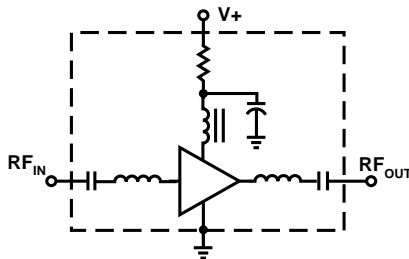
UTC—TC-1



PPA—PP-38



Schematic



Maximum Ratings

Parameter	Maximum
DC Voltage	+17 Volts
Continuous RF Input Power	+15 dBm
Operating Case Temperature	-55 to +115°C
Storage Temperature	-62 to +150°C
"R" Series Burn-In Temperature	+115°C

Thermal Characteristics¹

θ_{JC}	75°C/W
Active Transistor Power Dissipation	413 mW
Junction Temperature Above Case Temperature	31°C
MTBF (MIL-HDBK-217E, A_{UF} @ 90°C)	498,452 Hrs.

Note 1: For further information, see Reliability Screening, Pub. 5963-3240E.

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

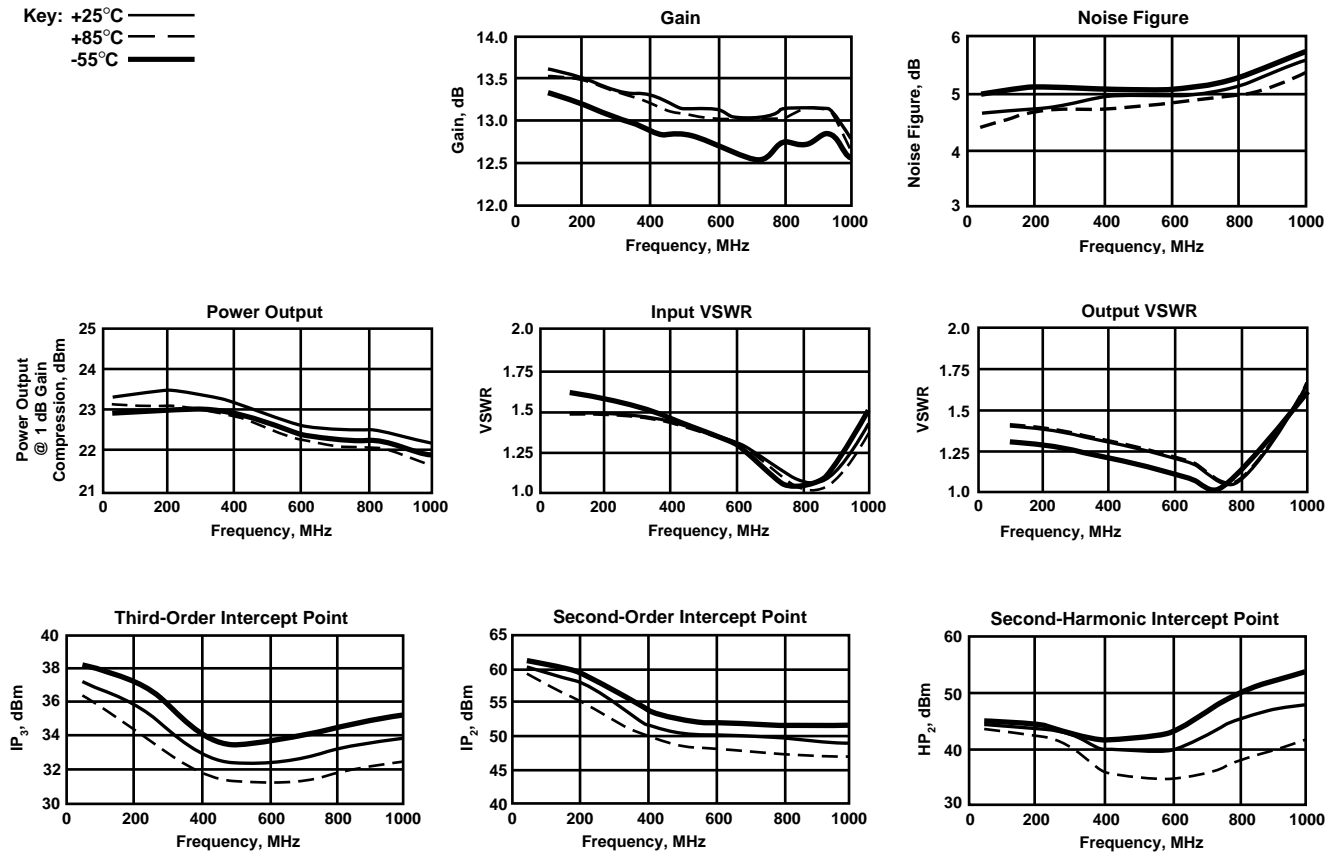
Electrical Specifications

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

Symbol	Characteristic	Typical $T_c = 25^\circ\text{C}$	Guaranteed Specifications		Unit
			$T_c = 0$ to 50°C	$T_c = -55$ to $+85^\circ\text{C}$	
BW	Frequency Range	5-1000	5-1000	5-1000	MHz
GP	Small Signal Gain (Min.)	12.6	11.0	10.5	dB
—	Gain Flatness (Max.)	± 0.3	± 1.0	± 1.0	dB
NF	Noise Figure (Max.)	5.0	6.0	6.5	dB
P _{1dB}	Power Output @ +1 dB Comp. (Min.)	+21.0	+20.0	+19.0	dBm
—	Input VSWR (Max.)	<1.3:1	2.0:1	2.0:1	—
—	Output VSWR (Max.)	<1.4:1	2.0:1	2.0:1	—
IP ₃	Two Tone 3rd Order Intercept Point	+35.0	—	—	dBm
IP ₂	Two Tone 2nd Order Intercept Point	+45.0	—	—	dBm
HP ₂	One Tone 2nd Harmonic Intercept Point	+49.0	—	—	dBm
I _D	DC Current	90	—	—	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

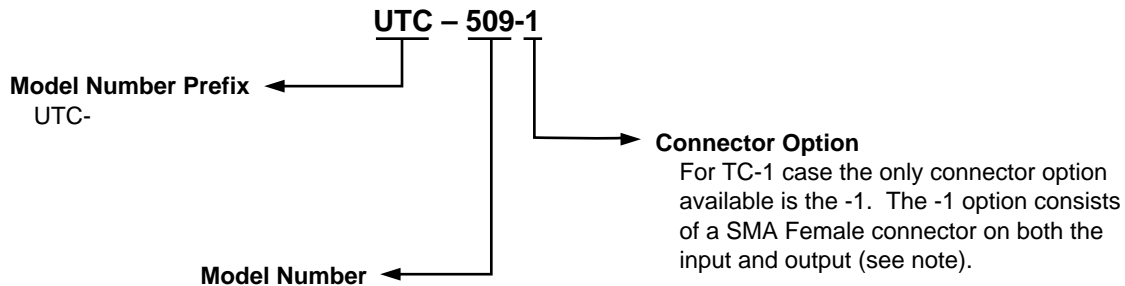
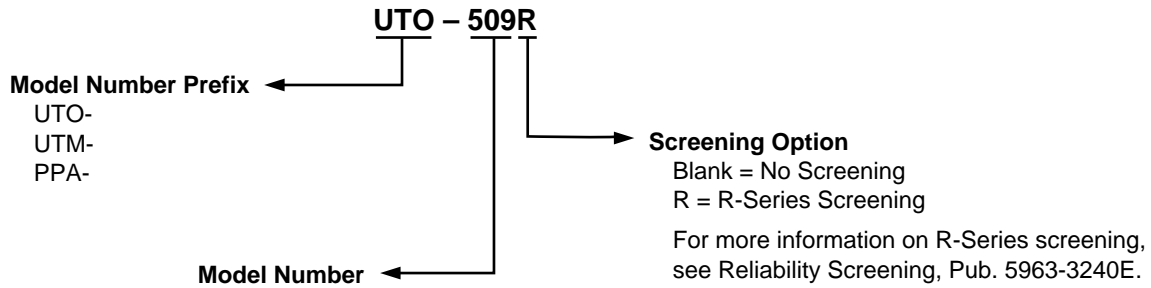
FREQUENCY MHz	VSWR IN	GAIN dB	PHASE DEGREES	PHASE DEV	GROUP DELAY ns	VSWR OUT	ISOLATION dB
100.0	1.31	13.31	170.85	-.69	.00	1.07	17.87
150.0	1.30	13.14	164.96	-1.22	.32	1.08	18.09
200.0	1.29	13.04	159.42	-1.42	.31	1.09	18.06
250.0	1.29	12.97	153.67	-1.81	.30	1.09	18.05
300.0	1.28	12.83	148.73	-1.41	.27	1.09	18.10
350.0	1.28	12.74	143.94	-.85	.27	1.09	18.13
400.0	1.28	12.61	139.10	-.34	.27	1.10	18.23
450.0	1.26	12.53	134.09	.00	.27	1.09	18.35
500.0	1.24	12.50	129.46	.71	.26	1.09	18.43
550.0	1.23	12.52	124.83	1.43	.25	1.09	18.42
600.0	1.23	12.54	120.54	2.49	.24	1.10	18.67
650.0	1.25	12.57	116.05	3.35	.26	1.11	18.97
700.0	1.28	12.64	111.18	3.82	.28	1.12	19.36
750.0	1.32	12.73	106.07	4.05	.32	1.16	19.92
800.0	1.36	12.85	99.81	3.13	.36	1.21	20.64
850.0	1.38	13.05	93.14	1.80	.41	1.28	21.48
900.0	1.39	13.26	84.96	-1.02	.47	1.37	22.55
950.0	1.40	13.40	76.33	-4.31	.48	1.48	23.42
1000.0	1.43	13.55	67.57	-7.71	.54	1.60	23.46
1050.0	1.58	13.23	56.83	—	.58	1.71	22.69
1100.0	1.88	12.83	46.81	—	.57	1.82	21.94
1150.0	2.33	12.23	36.16	—	.57	1.86	21.29
1200.0	2.89	11.14	26.14	—	.48	1.87	20.77
1250.0	3.67	10.05	18.92	—	.44	1.84	20.56
1300.0	4.46	8.91	10.41	—	.41	1.79	20.66
1350.0	5.30	7.69	4.30	—	.32	1.73	20.75
1400.0	6.18	6.65	-.94	—	.28	1.65	21.57
1450.0	7.18	5.42	-5.89	—	.25	1.58	22.17
1500.0	8.43	4.21	-9.78	—	.20	1.52	22.53

LINEARIZATION RANGE: 100.0 to 1000.0 MHz

S-Parameters
Bias = 15.00 Volts

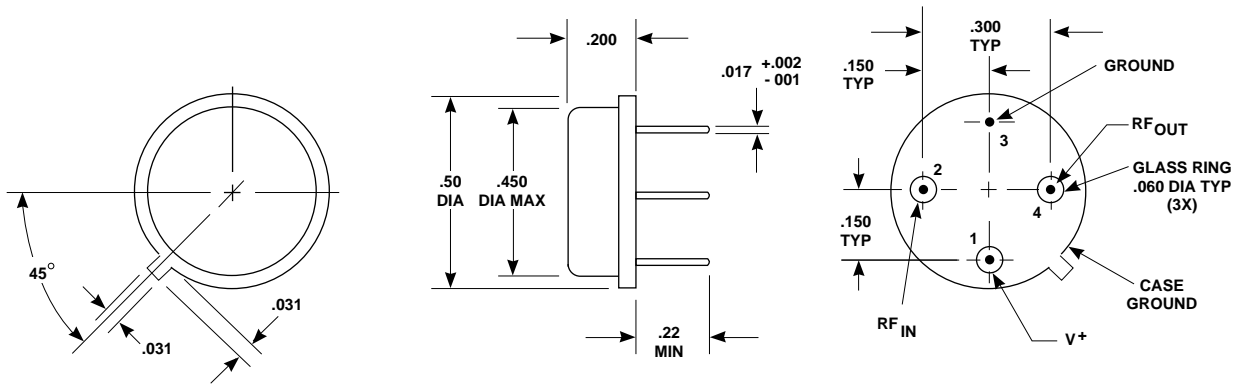
FREQUENCY MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	Mag	Ang	dB	Ang	dB	Ang	Mag	Ang
100.00	.124	-170.0	13.316	169.8	-17.967	-2.2	.035	134.5
200.00	.131	-173.2	13.075	158.9	-17.958	-5.8	.038	119.3
300.00	.125	-173.9	12.887	148.4	-18.079	-9.2	.039	110.2
400.00	.115	-173.0	12.661	138.7	-18.224	-13.8	.036	95.5
500.00	.105	-167.6	12.522	129.3	-18.430	-19.3	.031	67.1
600.00	.098	-155.6	12.569	120.5	-18.674	-25.6	.037	26.7
700.00	.125	-144.1	12.683	111.3	-19.272	-32.2	.067	-1.8
800.00	.163	-154.1	12.927	99.9	-20.491	-38.2	.117	-23.5
900.00	.180	174.0	13.272	85.4	-22.339	-37.6	.186	-43.9
1000.00	.180	113.1	13.495	68.5	-23.134	-25.1	.254	-67.1
1100.00	.279	36.6	12.796	48.5	-21.647	-19.5	.302	-91.7
1200.00	.466	-12.0	11.269	27.9	-20.486	-25.7	.303	-115.7
1300.00	.633	-43.3	9.129	12.0	-20.358	-38.0	.274	-139.4
1400.00	.738	-65.4	6.834	.3	-21.262	-49.5	.232	-160.6
1500.00	.808	-80.8	4.320	-8.8	-22.363	-56.4	.190	177.9
1600.00	.850	-91.9	1.955	-15.3	-23.876	-62.9	.157	154.1
1700.00	.867	-100.5	-.364	-20.7	-24.976	-66.2	.148	128.5
1800.00	.877	-107.4	-2.485	-25.6	-26.442	-64.4	.158	108.3
1900.00	.883	-113.5	-4.374	-27.8	-27.140	-66.2	.179	92.6
2000.00	.967	-121.7	-5.778	-29.8	-27.628	-67.5	.220	80.6
2100.00	.978	-126.0	-7.555	-30.8	-28.498	-63.7	.250	73.6
2200.00	.980	-130.0	-9.321	-33.3	-29.495	-64.5	.280	69.2
2300.00	.975	-133.7	-10.759	-35.1	-29.340	-67.4	.300	66.4
2400.00	.973	-137.8	-12.602	-36.9	-30.389	-68.3	.322	62.1
2500.00	.969	-141.1	-14.529	-37.1	-31.776	-61.6	.339	60.2

Product Options



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

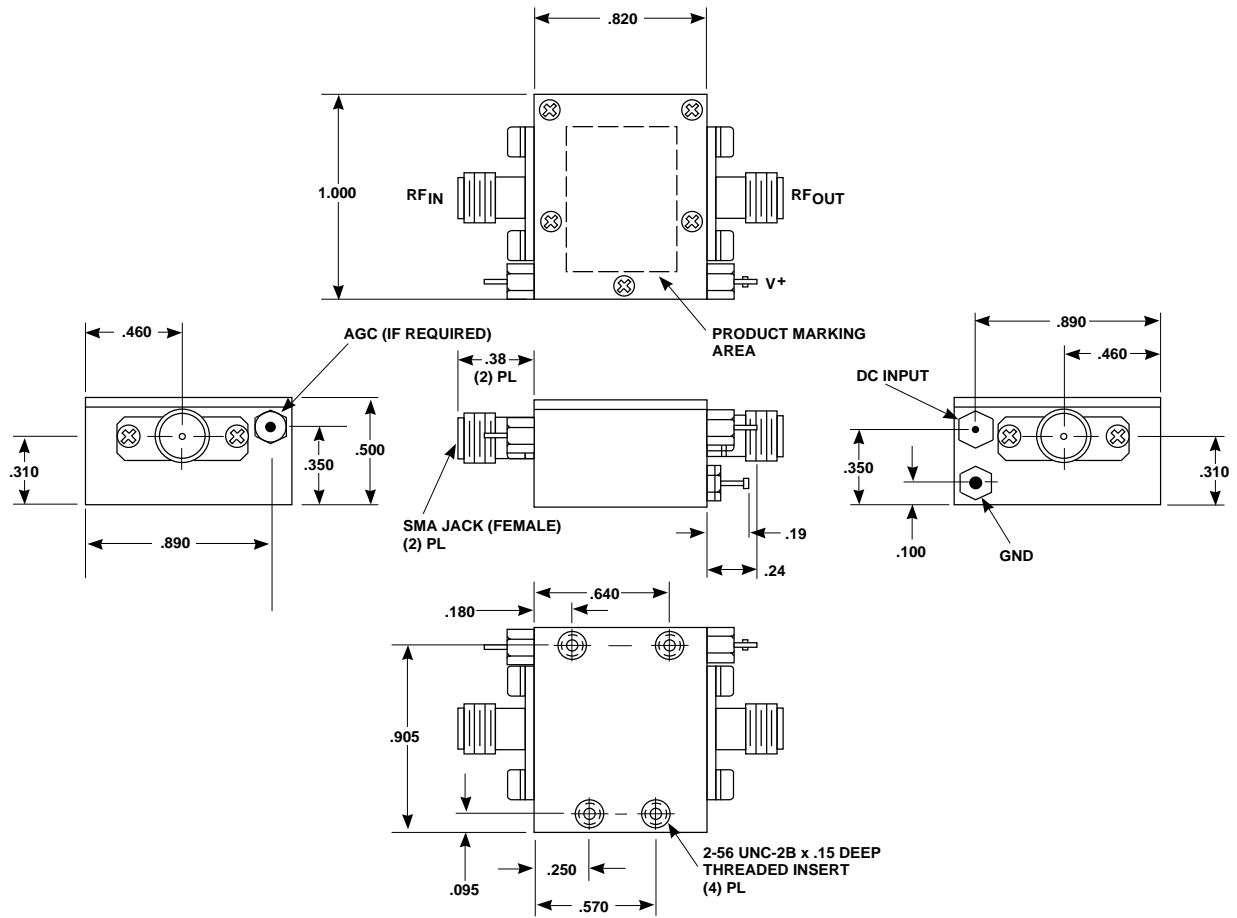
Case Drawings TO-8T



APPROXIMATE WEIGHT 2.1 GRAMS

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

Case Drawings TC-1



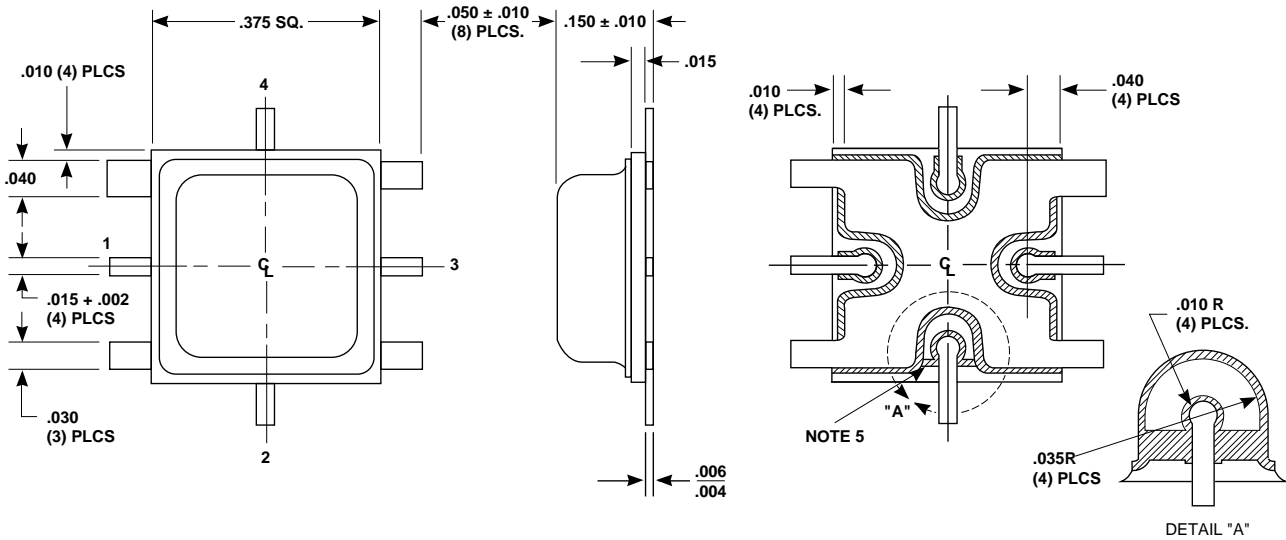
TYPICAL WEIGHT WITH CONNECTORS = 21.5 GRAMS

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 isopropyl 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*

Europe*

Far East/Australasia: (65) 290-6305

Canada: (416) 206-4725

Japan: (81 3) 3331-6111

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

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