HEWLETT PACKARD

# 10-1500 MHz T0-8 CASCADABLE AMPLIFIER

HAMP-1003
HAMP-1003TXV

TECHNICAL DATA APRIL 1985

## Features

**WIDE 1 dB BANDWIDTH**
**5-2100 MHz**

**EXCEPTIONAL PHASE LINEARITY**
**1.6 Degree Deviation from 100 to 1500 MHz**

**LOW VARIATION OVER TEMPERATURE**

**OUTPUT POWER**
**6.5 dBm**

**EASILY CASCADABLE IN A 50 OHM SYSTEM**

## Description/Applications

The HAMP-1003 is a thin-film hybrid amplifier using bipolar transistors. The design uses resistive feedback which provides exceptional phase linearity and high performance over a wide temperature range and bandwidth. The internal bias network and coupling capacitors eliminate the need for external support circuitry.

This amplifier is ideal for IF, RF and high speed digital applications.

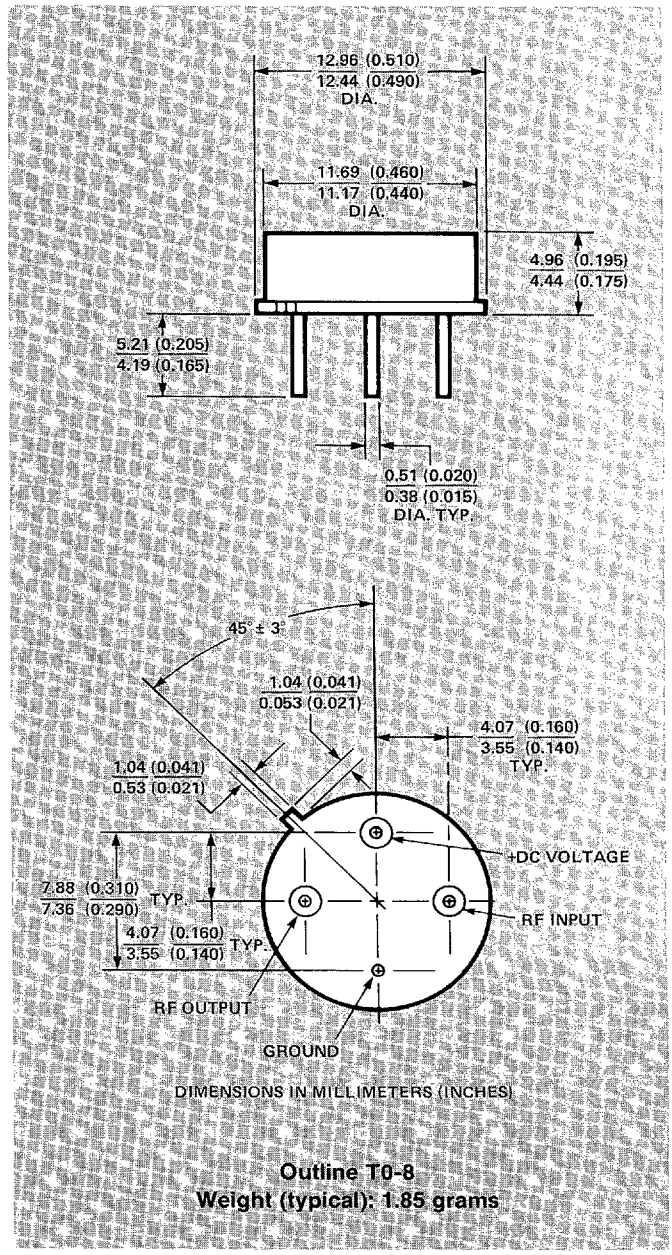
The HAMP-1003 is supplied in a standard rugged four leaded T0-8 hermetic package.

## Absolute Maximum Ratings*

| | |
|---|---|
| DC Voltage | 30.0 V |
| Continuous RF Input Power | +15 dBm |
| Short Term RF Input Power (CW/1 Minute Duration) | +20 dBm |
| Max. Input Peak Power (3 Microsecond Pulse, One Single Pulse) | +27 dBm |
| Operating Case Temperature | –55° C to 125° C |
| Storage Temperature | –65° C to 150° C |

*Operation in excess of any one of these conditions may result in permanent damage to this device.

MTTF: (Calculated, MIL-STD-217D): 1.2 x $10^7$ Hours at Case Temperature +85° C.




**Outline T0-8**
**Weight (typical): 1.85 grams**

# Electrical Specifications (Measured in 50 Ohm System at +15 V)

| Characteristic | Typical at 25° C | Guaranteed 0-50° C | Guaranteed −55 – +85° C |
|---|---|---|---|
| Frequency Range (MHz) | 10-1500 | 10-1500 | 10-1500 |
| 1 dB Bandwidth (MHz) | 5-2100 | | |
| Gain Max. (dB) | 10.1 | 10.5 | 10.6 |
| Gain Min. (dB) | 9.7 | 9.1 | 9.0 |
| Gain Flatness Max. (dB) | ±0.15 | ±0.5 | ±0.5 |
| Maximum Deviation from Linear Phase 100-1500 MHz (°) | 1.6 | | |
| Noise Figure Max. (dB) | 5.0 | 5.5 | 6.0 |

| Characteristic | Typical at 25° C | Guaranteed 0-50° C | Guaranteed −55 – +85° C |
|---|---|---|---|
| Power Output at 1 dB Compression (Min.) (dBm) | 6.5 | 3.8 | 3.0 |
| VSWR Input/Output Max. | 1.7 | 2.0 | 2.0 |
| Second Order Harmonic Intercept Point (dBm) | 25.0 | | |
| Second Order Two Tone Intercept Point (dBm) | 22.0 | | |
| Third Order Two Tone Intercept Point (dBm) | 15.0 | | |
| DC Current (mA) | 39.0 | | |

# Typical Performance

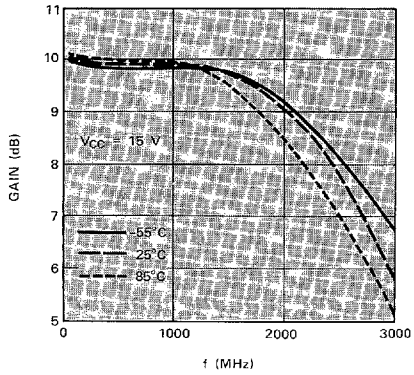



Figure 1. Gain at Three Temperatures

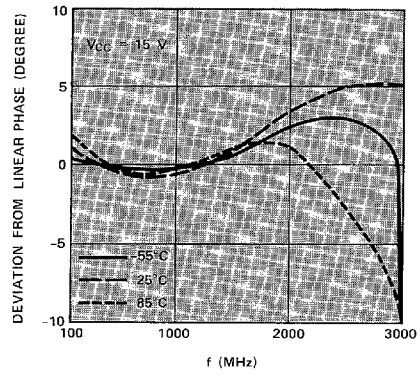



Figure 2. Phase at Three Temperatures

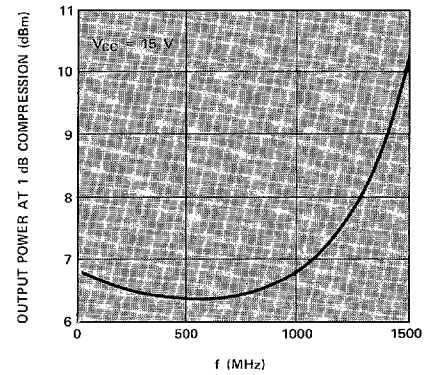



Figure 3. $P_{1dB}$ at 25° C

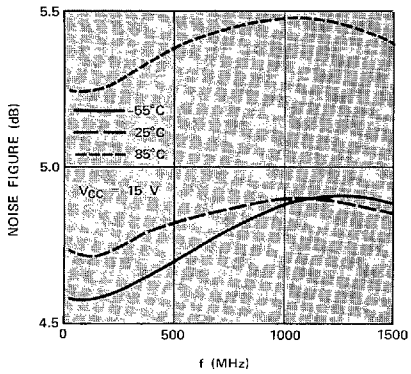



Figure 4. Noise Figure at Three Temperatures

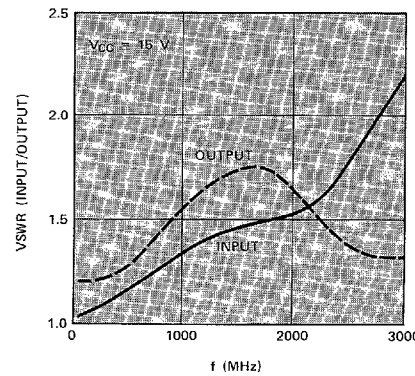



Figure 5. Input/Output VSWR at 25° C

# Typical S-Parameters at 25°C

| Frequency | $S_{11}$ | | $S_{21}$ | | $S_{12}$ | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|
| (MHz) | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. | Mag. | Ang. |
| 100 | 0.017 | –84 | 3.15 | 172 | 0.113 | 2 | 0.078 | –18 |
| 200 | 0.029 | –102 | 3.14 | 168 | 0.112 | 1 | 0.074 | –30 |
| 300 | 0.040 | –94 | 3.13 | 162 | 0.112 | 2 | 0.096 | –47 |
| 400 | 0.054 | –96 | 3.11 | 155 | 0.114 | 3 | 0.105 | –52 |
| 500 | 0.069 | –97 | 3.13 | 148 | 0.114 | 4 | 0.117 | –62 |
| 600 | 0.082 | –100 | 3.10 | 143 | 0.116 | 5 | 0.140 | –69 |
| 700 | 0.099 | –105 | 3.11 | 136 | 0.116 | 5 | 0.155 | –73 |
| 800 | 0.114 | –109 | 3.12 | 129 | 0.117 | 6 | 0.168 | –79 |
| 900 | 0.130 | –113 | 3.10 | 123 | 0.119 | 7 | 0.192 | –84 |
| 1000 | 0.143 | –118 | 3.15 | 117 | 0.121 | 8 | 0.207 | –88 |
| 1100 | 0.158 | –124 | 3.13 | 111 | 0.123 | 9 | 0.222 | –93 |
| 1200 | 0.166 | –130 | 3.12 | 103 | 0.128 | 8 | 0.236 | –99 |
| 1300 | 0.178 | –138 | 3.13 | 97 | 0.127 | 9 | 0.246 | –105 |
| 1400 | 0.186 | –145 | 3.07 | 91 | 0.130 | 9 | 0.261 | –110 |
| 1500 | 0.190 | –155 | 3.06 | 84 | 0.134 | 9 | 0.264 | –116 |
| 1600 | 0.197 | –164 | 3.02 | 77 | 0.140 | 10 | 0.266 | –122 |
| 1700 | 0.200 | –175 | 3.01 | 71 | 0.143 | 10 | 0.273 | –129 |
| 1800 | 0.197 | 173 | 2.96 | 64 | 0.149 | 8 | 0.267 | –135 |
| 1900 | 0.198 | 160 | 2.91 | 56 | 0.151 | 7 | 0.258 | –143 |
| 2000 | 0.202 | 145 | 2.90 | 51 | 0.158 | 7 | 0.252 | –151 |
| 2100 | 0.212 | 131 | 2.79 | 43 | 0.165 | 4 | 0.237 | –160 |
| 2200 | 0.221 | 115 | 2.74 | 37 | 0.165 | 3 | 0.220 | –169 |
| 2300 | 0.233 | 99 | 2.69 | 30 | 0.171 | 3 | 0.197 | –179 |
| 2400 | 0.249 | 83 | 2.56 | 23 | 0.178 | 0 | 0.173 | 167 |
| 2500 | 0.272 | 68 | 2.49 | 16 | 0.179 | –2 | 0.156 | 153 |
| 2600 | 0.294 | 55 | 2.37 | 9 | 0.180 | –4 | 0.136 | 135 |
| 2700 | 0.322 | 42 | 2.30 | 3 | 0.187 | –5 | 0.127 | 115 |
| 2800 | 0.347 | 31 | 2.17 | –3 | 0.192 | –8 | 0.125 | 94 |
| 2900 | 0.368 | 20 | 2.07 | –10 | 0.193 | –11 | 0.132 | 73 |
| 3000 | 0.377 | 10 | 1.97 | –16 | 0.191 | –13 | 0.151 | 59 |

# Typical Performance Parameters at 25°C

| Frequency (MHz) | Linear Phase Deviation (deg.) | Relative Phase (deg.) | Gain Deviation (dB) | Gain Absolute (dB) | Group Delay (ns) | Input VSWR | Output WSWR |
|---|---|---|---|---|---|---|---|
| 10 | | | | 10.00 | | 1.30 | 1.40 |
| 100 | 1.56 | 0 | 0.10 | 9.98 | 0.22 | 1.03 | 1.17 |
| 200 | –0.07 | –5 | 0.07 | 9.95 | 0.13 | 1.06 | 1.16 |
| 300 | –0.51 | –11 | 0.04 | 9.92 | 0.16 | 1.08 | 1.21 |
| 400 | 0.01 | –18 | –0.01 | 9.87 | 0.19 | 1.11 | 1.24 |
| 500 | 0.01 | –24 | 0.04 | 9.92 | 0.18 | 1.15 | 1.26 |
| 600 | –0.63 | –30 | 0.04 | 9.83 | 0.16 | 1.18 | 1.32 |
| 700 | –0.20 | –36 | –0.01 | 9.86 | 0.19 | 1.22 | 1.37 |
| 800 | –0.16 | –43 | 0.01 | 9.88 | 0.18 | 1.26 | 1.41 |
| 900 | –0.34 | –49 | –0.05 | 9.83 | 0.17 | 1.30 | 1.48 |
| 1000 | –0.93 | –55 | 0.08 | 9.96 | 0.16 | 1.33 | 1.52 |
| 1100 | –0.63 | –62 | 0.03 | 9.91 | 0.19 | 1.37 | 1.57 |
| 1200 | 0.39 | –69 | –0.00 | 9.88 | 0.21 | 1.40 | 1.62 |
| 1300 | 0.53 | –75 | 0.03 | 9.90 | 0.18 | 1.43 | 1.65 |
| 1400 | 0.48 | –82 | –0.13 | 9.74 | 0.18 | 1.46 | 1.71 |
| 1500 | 0.51 | –88 | –0.16 | 9.72 | 0.18 | 1.47 | 1.72 |
| 1600 | 1.54 | –96 | –0.27 | 9.65 | 0.21 | 1.49 | 1.73 |
| 1700 | 0.85 | –101 | –0.30 | 9.58 | 0.16 | 1.50 | 1.75 |
| 1800 | 1.37 | –103 | 0.46 | 9.45 | 0.19 | 1.45 | 1.73 |
| 1900 | 3.26 | –116 | –0.60 | 9.22 | 0.23 | 1.49 | 1.69 |
| 2000 | 2.35 | –122 | –0.63 | 9.25 | 0.15 | 1.51 | 1.67 |
| 2100 | 3.66 | –129 | –0.96 | 8.92 | 0.21 | 1.54 | 1.62 |
| 2200 | 3.58 | –136 | –1.12 | 8.75 | 0.17 | 1.57 | 1.56 |
| 2300 | 3.86 | –143 | –1.29 | 8.59 | 0.18 | 1.61 | 1.49 |
| 2400 | 4.37 | –149 | –1.71 | 6.17 | 0.19 | 1.66 | 1.42 |
| 2500 | 4.88 | –156 | –1.94 | 7.94 | 0.19 | 1.75 | 1.37 |
| 2600 | 5.60 | –163 | –2.39 | 7.49 | 0.20 | 1.83 | 1.31 |
| 2700 | 5.11 | –169 | –2.64 | 7.24 | 0.16 | 1.95 | 1.29 |
| 2800 | 5.34 | –176 | –3.15 | 6.73 | 0.18 | 2.06 | 1.28 |
| 2900 | 5.13 | –183 | –3.55 | 6.30 | 0.17 | 2.17 | 1.30 |
| 3000 | 5.20 | –183 | –4.00 | 5.83 | 0.18 | 2.21 | 1.36 |

# HIGH RELIABILITY AMPLIFIER PRODUCTS

## HAMP-1003TXV

Since the advantages of products tested to well established reliability screening standards can be of significant value to reliability oriented customers, HP makes available products with Hi-Rel screening and testing patterned after MIL-STD-883, Method 5004.2 latest revision.

The table below depicts the screening program for this family of amplifiers.

### 100% SCREENING PROGRAM

| Screening Test/Inspection | MIL-STD-883 Test Method | Conditions/Comments |
|---|---|---|
| 1. Internal Visual Inspection (PreCap) | 2017 | |
| 2. High Temperature Storage (Stabilization Bake) | 1008 | Condition B<br>$T = 125°C$, $t = 24$ hours |
| 3. Temperature Cycling | 1010 | Condition B<br>$-55°$ to $125°C$ |
| 4. Constant Acceleration | 2001 | Condition B<br>20 kg's, $Y_1$ Direction |
| 5. Pre Burn-in Electrical | — | Per Applicable Device Specification |
| 6. Burn-in | 1015 | $t = 168$ hours<br>$T_C = 80\%$ of Rated Case Temp. and 80% of Rated Bias Conditions |
| 7. Post Burn-in Electrical (PDA ≤10%) | — | Per Applicable Device Specification |
| 8. Hermeticity Tests (Fine and Gross) | 1014 | Conditions A and C |
| 9. Final Electrical Tests | — | Per Applicable Device Specification |
| 10. External Visual Inspection | 2009 | |

Note: Additional tests, screens and qualification testings (e.g.: X-ray, PIND, Extended Burn-in, Group A, B, C and D) are available on request.

# Ordering Information

Add suffix TXV to standard part number.

Example: Standard Product HAMP-1003
Hi-Rel Product HAMP-1003TXV



For more information call your local HP sales office listed in the telephone directory white pages. Ask for the Components Department. Or write to Hewlett-Packard: **U.S.A.** — P.O. Box 10301, Palo Alto, CA 94303-0890. **Europe** — P.O. Box 999 1180 AZ Amstelveen, The Netherlands, **Canada** — 6877 Goreway Drive, Mississauga, L4V 1M8, Ontario. **Japan** — Yokogawa-Hewlett-Packard Ltd., 3-29-21, Takaido-Higashi, Suginami-ku, Tokyo 168. **Elsewhere** in the world, write to Hewlett-Packard Intercontinental, 3495 Deer Creek Road, Palo Alto, CA 94304.

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