HEWLETT PACKARD

Silicon Bipolar Monolithic Amplifiers

Technical Data

HPMA-0385
HPMA-0386

Features

HPMA-0385

- **3 dB Bandwidth: DC to 2.3 GHz**
- **11.8 dB Gain Typical at 1 GHz**
- **Unconditionally Stable (k > 1)**
- **Cascadable 50 Ohm Gain Block**

HPMA-0386

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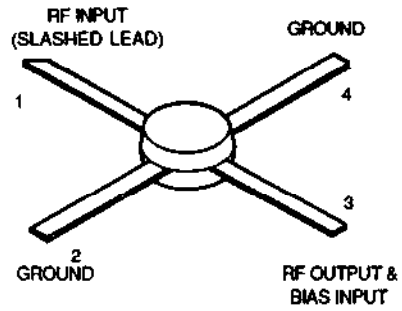
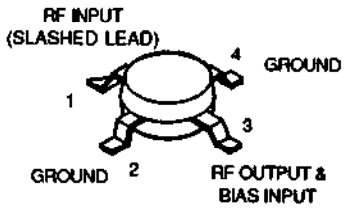
- **11.8 dB Gain Typical at 1 GHz**
- **Unconditionally Stable (k > 1)**
- **Cascadable 50 Ohm Gain Block**
- **Low Cost Surface Mount Plastic Package**
- **Tape and Reel Options Available**

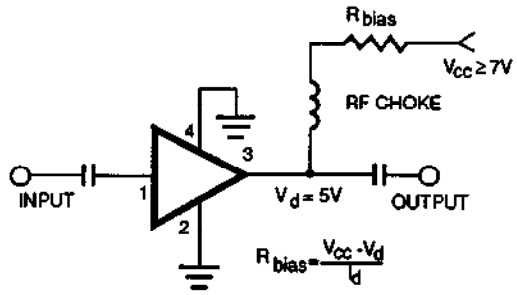
HPMA-0385



HPMA-0386



Typical Biasing Configuration



Description

The HPMA-0385/0386 are silicon monolithic single-stage feedback amplifers supplied in a low cost plastic package. Series and shunt feedback is used to achieve high uniformity from amplifier to amplifier. The device is ideally suited as a 50 ohm building block in narrow and broadband RF amplifier applications. Use of an optional external limiting resistor allows for biasing flexibility.

The device is manufactured using ion implantation and self-alignment techniques and has gold metallization and nitride passivation for high reliability.

The HPMA-0385 is supplied in the HPAC-85, a low cost plastic microstrip package. The HPMA-0386 has the leads formed suitable for surface mount applications. Tape and reel option is also available for the HPMA-0386.

Absolute Maximum Ratings, T_A = 25 °C*

Device Current, I_d ..... 70 mA
Total Device Dissipation, P_t ..... 400 mW
RF Input Power, P_{in} ..... +20 dBm
Junction Temperature, T_J ..... 150 °C
Storage Temperature, T_{stg} ..... −65 to +150 °C

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

Notes:

1. A θ_{JC} of 110 °C/W for HPMA-0385 and 115 °C/W for HPMA-0386 should be used for derating and junction temperature calculations: $T_J = (P_D \times \theta_{JC}) + T_C$.
2. Maximum soldering temperature at 260 °C for 5 seconds

Electrical Specifications, T_A = 25 °C

Symbol	Parameters / Test Conditions I_d = 25 mA, Z_o = 50 ohms		Units	HPMA-0385			HPMA-0386		
				Min.	Typ.	Max.	Min.	Typ.	Max.
G	Small Signal Gain $\|S_{21}\|^2$	f = 0.1 GHz f = 0.5 GHz f = 1.0 GHz	dB	 10.0	12.4 12.2 11.8		 10.0	12.5 12.2 11.8	
ΔG	Gain Flatness	f = 0.1 to 1.6 GHz	dB		±0.8			±0.8	
$F_{3\,dB}$	3 dB Bandwidth		GHz		2.3			2.3	
VSWR	Input VSWR	f = 0.1 to 3.0 GHz			1.5:1			1.8:1	
	Output VSWR	f = 0.1 to 3.0 GHz			1.6:1			1.4:1	
$P_{1\,dB}$	Output Power @ 1 dB Compression	f = 1.0 GHz	dBm		10.0			10.0	
NF	50 Ohm Noise Figure	f = 1.0 GHz	dB		5.3			5.3	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		23			23	
t_d	Group Delay	f = 1.0 GHz	psec.		140			150	
V_d	Device Voltage		Volts	4.0	5.0	6.0	4.0	5.0	6.0
I_d	Normal Operating Current		mA		35			35	
dV/dT	Device Voltage Temperature Coefficient		mV/°C		−8.0			−8.0	

Note: The recommended operating current range for these devices is 20 mA to 50 mA.

HPMA-0385 Typical S-Parameters

Z_O = 50 Ohms, T_A = 25°C, I_d = 35 mA

Freq. MHz	S_{11} Mag.	S_{11} Ang.	S_{21} (dB)	S_{21} Mag.	S_{21} Ang.	S_{12} (dB)	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.
100	0.03	170	12.4	4.19	175	-18.1	0.124	1	0.17	-6
200	0.03	164	12.4	4.19	169	-18.1	0.125	3	0.17	-16
300	0.02	158	12.3	4.13	165	-18.0	0.126	4	0.18	-27
400	0.02	153	12.3	4.10	159	-17.9	0.127	6	0.18	-28
500	0.02	150	12.2	4.08	154	-17.8	0.128	7	0.19	-24
600	0.02	-12	12.1	4.03	150	-17.8	0.130	8	0.19	-37
700	0.03	-26	12.0	4.00	144	-17.6	0.132	9	0.21	-40
800	0.04	-33	11.9	3.94	140	-17.5	0.134	11	0.20	-49
900	0.05	-40	11.7	3.86	135	-17.3	0.136	11	0.20	-52
1,000	0.06	-44	11.8	3.89	130	-17.1	0.139	12	0.23	-60
1,500	0.12	-66	11.0	3.54	107	-16.2	0.155	15	0.21	-80
2,000	0.15	-91	10.1	3.20	86	-15.4	0.171	14	0.21	-93
2,500	0.17	-117	9.1	2.87	67	-14.7	0.184	13	0.21	-106
3,000	0.20	-143	8.0	2.52	50	-14.2	0.196	12	0.22	-105
3,500	0.23	-167	7.0	2.25	34	-12.8	0.229	12	0.27	-111
4,000	0.33	159	6.2	2.05	18	-13.1	0.220	-3	0.24	-125
4,500	0.36	138	5.1	1.81	5	-13.6	0.209	0	0.25	-127
5,000	0.41	123	4.1	1.60	-8	-13.4	0.214	0	0.29	-133

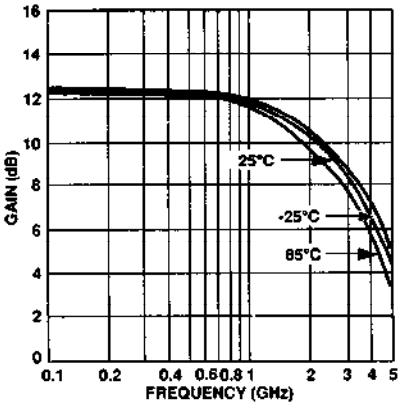


Figure 1. Typical Small Signal Gain vs. Frequency at Three Temperatures

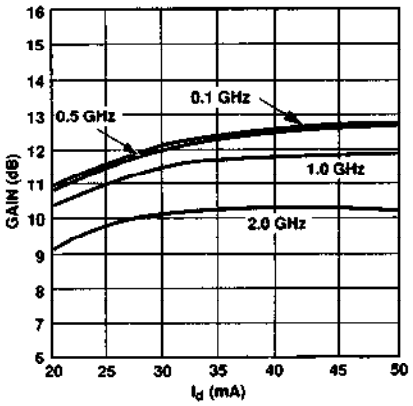


Figure 2. Typical Small Signal Gain vs. I_d at 25°C

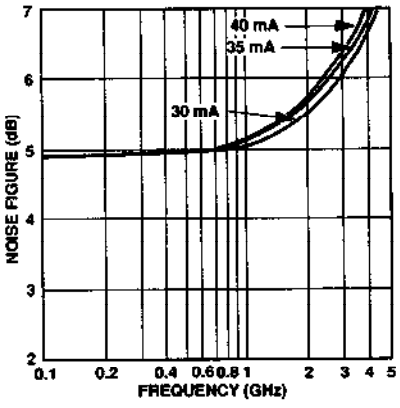


Figure 3. Typical Noise Figure vs. Frequency at 25°C

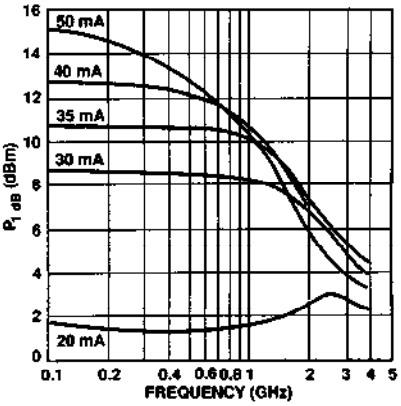


Figure 4. Typical $P_{1\ dB}$ vs. Frequency at 25°C

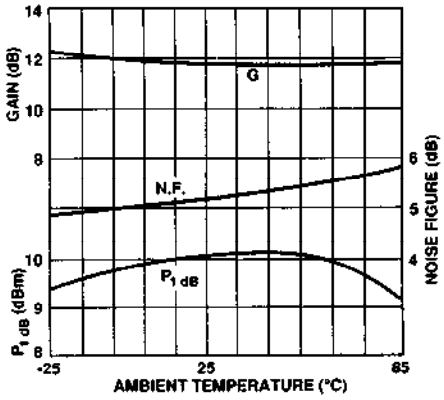


Figure 5. Small Signal Gain, Noise Figure and $P_{1\ dB}$ vs. Temperature at 1 GHz and I_d = 35 mA.

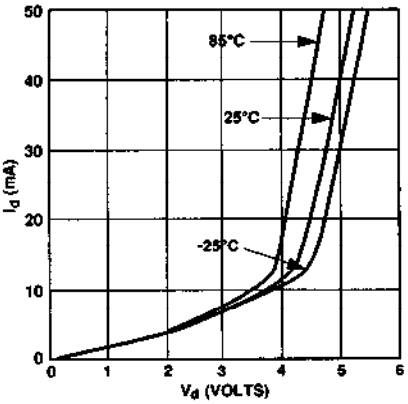


Figure 6. I_d vs. V_d at Three Temperatures

HPMA-0386 Typical S-Parameters

Z_O = 50 Ohms, T_A = 25°C, I_d = 35 mA

Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
MHz	Mag.	Ang.	(dB)	Mag.	Ang.	(dB)	Mag.	Ang.	Mag.	Ang.
100	0.04	169	12.5	4.21	175	-18.2	0.124	1	0.15	-6
200	0.04	160	12.5	4.21	169	-18.1	0.124	3	0.16	-15
300	0.04	151	12.4	4.16	164	-18.0	0.125	4	0.16	-27
400	0.04	144	12.3	4.14	158	-17.9	0.127	5	0.16	-26
500	0.03	164	12.3	4.12	153	-17.9	0.128	6	0.16	-22
600	0.02	95	12.2	4.08	148	-17.7	0.130	7	0.15	-37
700	0.01	85	12.2	4.05	142	-17.6	0.132	8	0.17	-41
800	0.01	59	12.0	4.00	137	-17.4	0.135	9	0.15	-52
900	0.01	29	11.9	3.93	132	-17.2	0.137	10	0.14	-57
1,000	0.01	-17	11.9	3.96	126	-17.1	0.140	10	0.16	-68
1,500	0.04	-127	11.2	3.62	101	-16.1	0.158	11	0.13	-112
2,000	0.10	-167	10.3	3.27	77	-15.2	0.174	8	0.12	-153
2,500	0.18	168	9.3	2.90	56	-14.7	0.185	4	0.15	175
3,000	0.27	149	8.1	2.53	36	-14.3	0.193	0	0.14	163
3,500	0.35	132	6.9	2.20	17	-14.2	0.196	-3	0.16	158
4,000	0.44	117	5.6	1.91	0	-14.0	0.200	-6	0.16	150
4,500	0.52	105	4.5	1.68	-15	-13.8	0.205	-9	0.19	146
5,000	0.59	93	3.3	1.46	-30	-13.5	0.211	-12	0.24	140

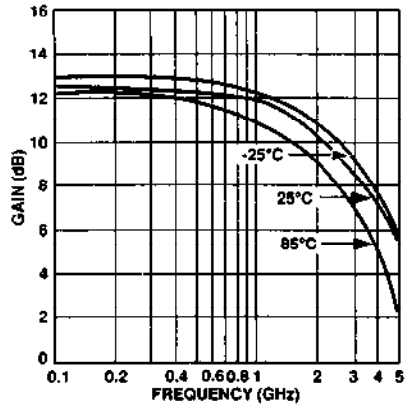


Figure 7. Typical Small Signal Gain vs. Frequency at Three Temperatures

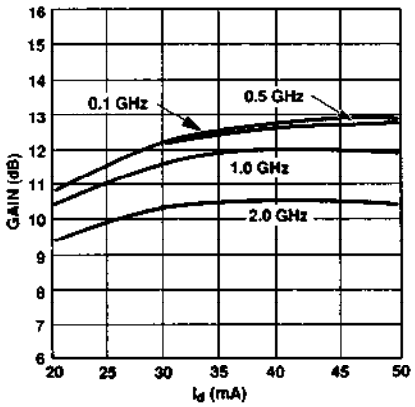


Figure 8. Typical Small Signal Gain vs. I_d at 25°C

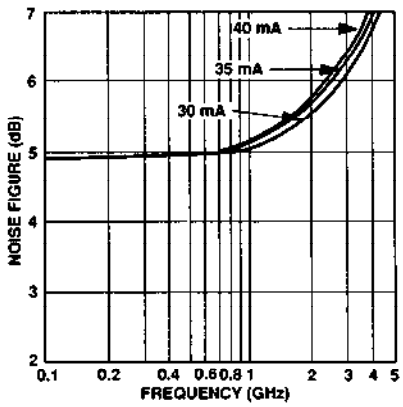


Figure 9. Typical Noise Figure vs. Frequency at 25°C

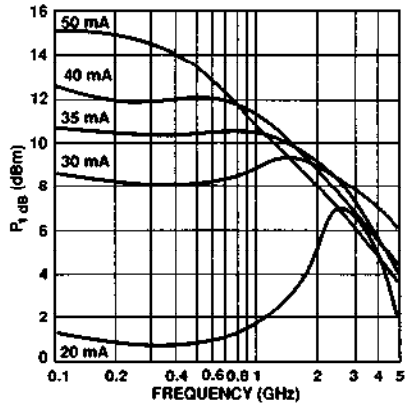


Figure 10. Typical $P_{1\,dB}$ vs. Frequency at 25°C

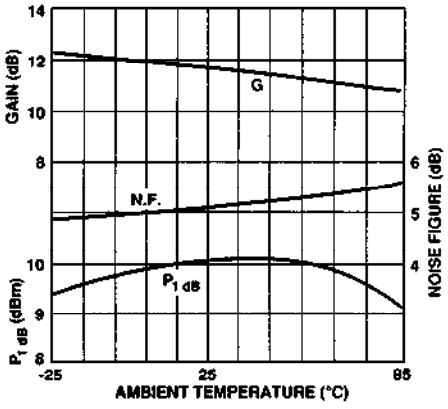


Figure 11. Small Signal Gain, Noise Figure and $P_{1\,dB}$ vs. Temperature at 1 GHz and I_d = 35 mA.

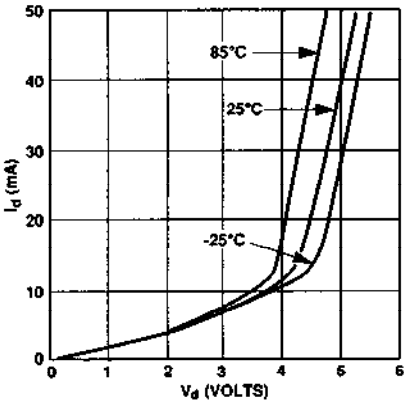


Figure 12. I_d vs. V_d at Three Temperatures

HPMA-0385

Typical Performance Parameters @ T_A = 25°C

Frequency (MHz)	Linear Phase Deviation (Deg.)	Relative Phase (Deg.)	Gain Deviation (dB)	Group Delay (ns)	Input VSWR	Output VSWR
100	-1.8	0	0.00	0.15	1.1	1.4
200	-1.3	-5	0.00	0.15	1.1	1.4
300	-1.0	-10	-0.12	0.14	1.1	1.4
400	-0.4	-15	-0.17	0.15	1.1	1.5
500	-0.1	-20	-0.23	0.14	1.1	1.5
600	0.0	-25	-0.34	0.13	1.1	1.5
700	0.7	-31	-0.41	0.15	1.1	1.5
800	0.2	-35	-0.53	0.12	1.1	1.5
900	0.3	-40	-0.71	0.13	1.1	1.5
1,000	0.7	-45	-0.63	0.14	1.1	1.6
1,500	0.4	-68	-1.46	0.13	1.3	1.5
2,000	-1.6	-89	-2.33	0.11	1.4	1.5
2,500	-6.3	-108	-3.29	0.09	1.4	1.5
3,000	-12.3	-125	-4.40	0.10	1.5	1.6
3,500	-20.4	-140	-5.41	0.09	1.6	1.7
4,000	-27.4	-157	-6.21	0.09	2.0	1.6
4,500	-37.2	-170	-7.31	0.08	2.1	1.7
5,000	-47.8	-183	-8.33	0.07	2.4	1.8

HPMA-0386

Typical Performance Parameters @ T_A = 25°C

Frequency (MHz)	Linear Phase Deviation (Deg.)	Relative Phase (Deg.)	Gain Deviation (dB)	Group Delay (ns)	Input VSWR	Output VSWR
100	-1.4	0	0.00	0.16	1.1	1.4
200	-0.9	-6	0.00	0.16	1.1	1.4
300	-0.8	-11	-0.12	0.15	1.1	1.4
400	-0.3	-17	-0.15	0.16	1.1	1.4
500	-0.1	-22	-0.19	0.15	1.1	1.4
600	-0.1	-27	-0.29	0.14	1.1	1.4
700	0.6	-33	-0.34	0.16	1.1	1.4
800	0.1	-37	-0.45	0.13	1.1	1.4
900	0.1	-43	-0.61	0.14	1.1	1.3
1,000	0.5	-48	-0.55	0.15	1.1	1.4
1,500	0.3	-74	-1.32	0.15	1.1	1.3
2,000	-1.5	-98	-2.21	0.12	1.2	1.3
2,500	-6.1	-119	-3.24	0.10	1.4	1.4
3,000	-11.5	-139	-4.43	0.11	1.8	1.3
3,500	-19.0	-157	-5.64	0.10	2.1	1.4
4,000	-27.5	-174	-6.85	0.10	2.6	1.4
4,500	-37.8	-190	-8.01	0.09	3.2	1.5
5,000	-48.4	-205	-9.23	0.08	3.9	1.6

Ordering Information
For HPMA-0386 only

Option T00 = Bulk
Option T15 = Tape and Reel, See Figure 13.

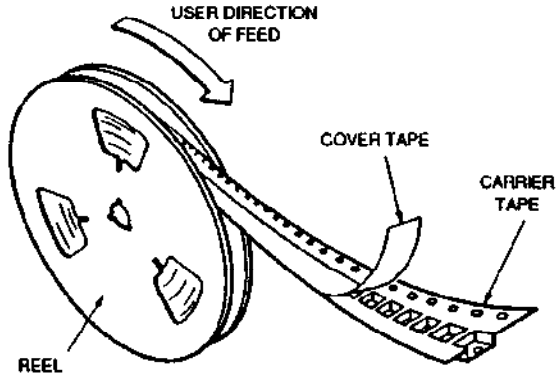
Conforms to Electronic Industries Standard RS-481, "Taping of Surface Mounted Components for Automated Placement." Standard Quantity is 1,500 Devices/Reel.

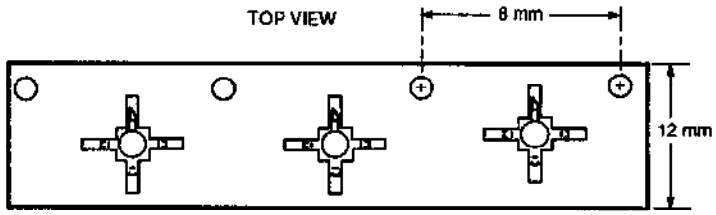
Specify Part Number followed by Option Number

Example:

HPMA-0386 TXX

- Bulk or Tape and Reel Option
- Part Number
- Monolithic Amplifier
- HP





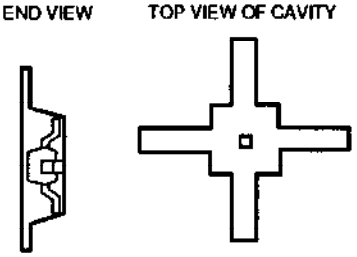
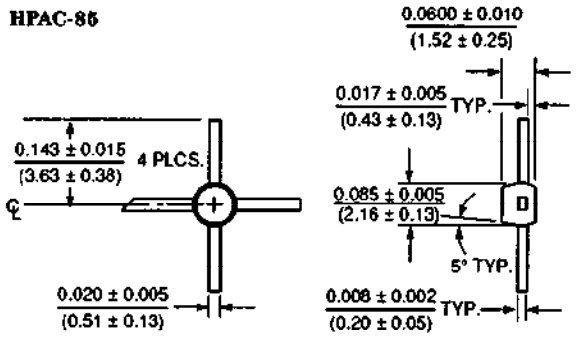


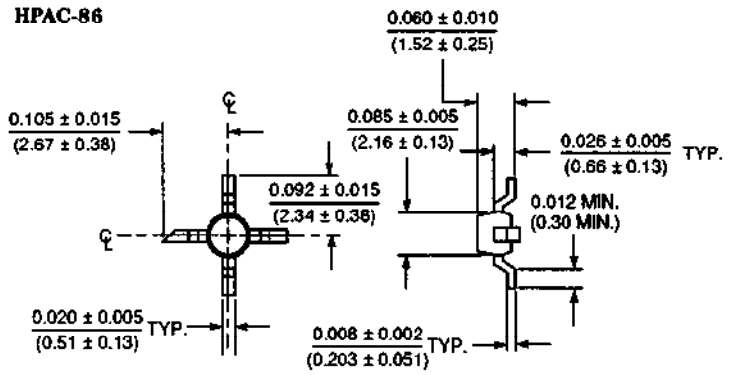
Figure 13. Option T15

Package Dimensions

HPAC-86



HPAC-86



DIMENSIONS ARE IN INCHES (MILLIMETERS)

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