HEWLETT® PACKARD

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-0786

Features

- **Cascadable 50 Ω Gain Block**
- **Low Operating Voltage:** 4.0 V Typical V_d
- **3 dB Bandwidth:** DC to 2.0 GHz
- **12.5 dB Typical Gain at 1.0 GHz**
- **Unconditionally Stable (k>1)**
- **Surface Mount Plastic Package**
- **Tape-and-Reel Packaging Option Available**[1]

Note:

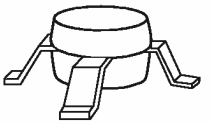
1. Refer to PACKAGING section "Tape-and-Reel Packaging for Semiconductor Devices."

Description

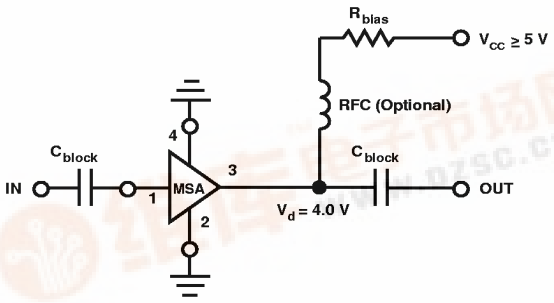
The MSA-0786 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost, surface mount plastic package. This MMIC is designed for use as a general purpose 50 Ω gain block. Applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

The MSA-series is fabricated using HP's 10 GHz f_T, 25 GHz f_{MAX}, silicon bipolar MMIC process which uses nitride self-alignment, ion implantation, and gold metallization to achieve excellent performance, uniformity and reliability. The use of an external bias resistor for temperature and current stability also allows bias flexibility.

86 Plastic Package



Typical Biasing Configuration



MSA-0786 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	60 mA
Power Dissipation[2,3]	275 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	–65 to 150°C

Thermal Resistance[2,4]:
θ_{jc} = 120°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 8.3 mW/°C for T_C > 117°C.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 22 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz f = 1.0 GHz	dB	 10.5	13.5 12.5	
ΔG_P	Gain Flatness	f = 0.1 to 1.3 GHz	dB		±0.7	
$f_{3\,dB}$	3 dB Bandwidth		GHz		2.0	
VSWR	Input VSWR	f = 0.1 to 2.5 GHz			1.7:1	
	Output VSWR	f = 0.1 to 2.5 GHz			1.7:1	
NF	50 Ω Noise Figure	f = 1.0 GHz	dB		5.0	
$P_{1\,dB}$	Output Power at 1 dB Gain Compression	f = 1.0 GHz	dBm		5.5	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		19.0	
t_D	Group Delay	f = 1.0 GHz	psec		150	
V_d	Device Voltage		V	3.2	4.0	4.8
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–7.0	

Note:
1. The recommended operating current range for this device is 15 to 40 mA. Typical performance as a function of current is on the following page.

Part Number Ordering Information

Part Number	No. of Devices	Container
MSA-0786-TR1	1000	7" Reel
MSA-0786-BLK	100	Antistatic Bag

For more information, see "Tape and Reel Packaging for Semiconductor Devices".

MSA-0786 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 22 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.05	175	13.5	4.74	174	–18.7	.116	1	.14	–12
0.2	.05	174	13.4	4.71	169	–18.7	.117	3	.14	–22
0.4	.04	167	13.3	4.64	158	–18.4	.120	4	.15	–44
0.6	.04	175	13.1	4.52	148	–18.3	.122	7	.16	–65
0.8	.05	–156	12.9	4.39	138	–18.0	.126	8	.17	–84
1.0	.06	–134	12.6	4.25	127	–17.5	.134	10	.18	–102
1.5	.08	–142	11.6	3.79	103	–16.6	.148	9	.21	–139
2.0	.15	–159	10.5	3.34	80	–15.7	.164	7	.23	–164
2.5	.25	–176	9.2	2.89	63	–15.1	.176	5	.24	174
3.0	.33	166	7.8	2.45	44	–14.7	.185	1	.24	159
3.5	.41	150	6.5	2.11	27	–14.9	.179	–5	.24	149
4.0	.49	137	5.2	1.82	12	–15.1	.177	–9	.23	145
5.0	.60	116	3.0	1.41	–14	–15.4	.169	–14	.26	145

Note:
1. A model for this device is available in the DEVICE MODELS section.

Typical Performance, T_A = 25°C

(unless otherwise noted)

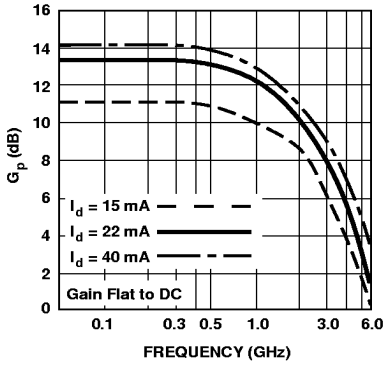


Figure 1. Typical Power Gain vs. Frequency.

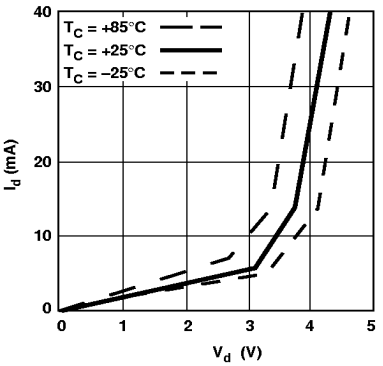


Figure 2. Device Current vs. Voltage.

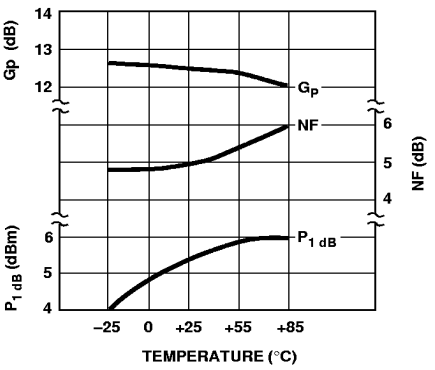


Figure 3. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, I_d = 22 mA.

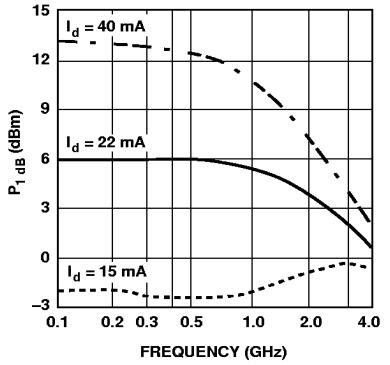


Figure 4. Output Power at 1 dB Gain Compression vs. Frequency.

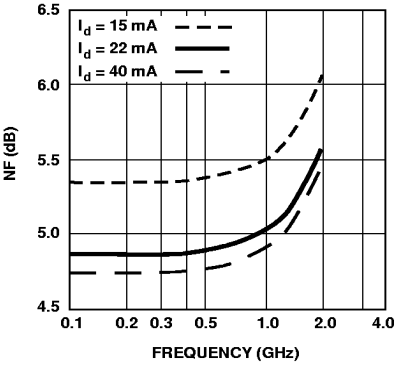
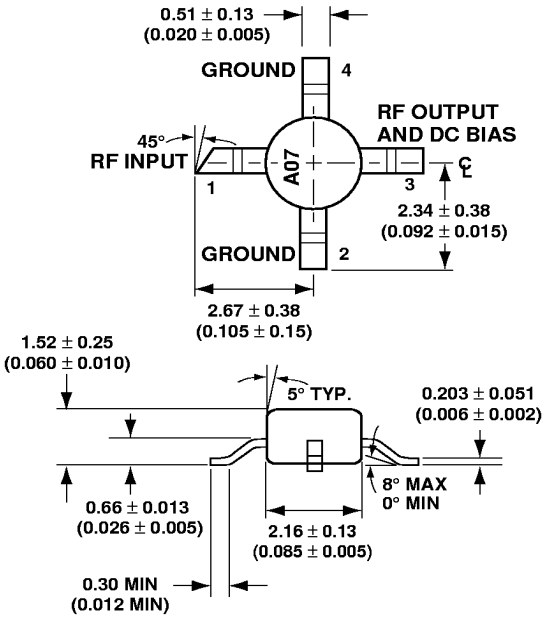


Figure 5. Noise Figure vs. Frequency.

86 Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES)

www.hp.com/go/rf

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Data subject to change.

Obsoletes 5965-9594E
5968-4716E (3/99)