MSA-0786

Cascadable Silicon Bipolar MMIC Amplifier

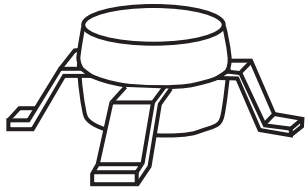
Data Sheet

Description

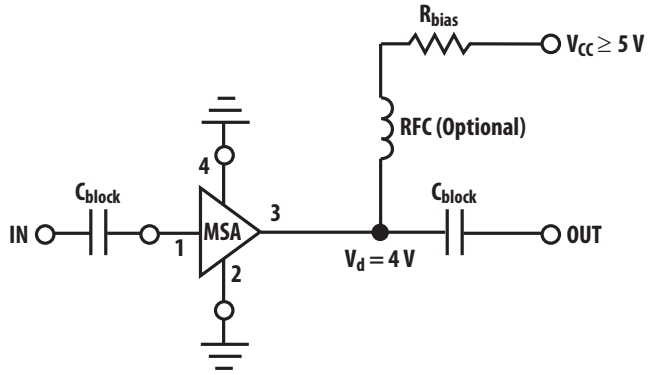
The MSA-0786 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost, surface mount plastic package. This MMIC is designed for use as a general purpose 50 Ω gain block. Applications include narrow and broad band IF and RF amplifiers in commercial and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

The MSA-series is fabricated using Avago'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



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 at 1.0 GHz
- Unconditionally Stable (k>1)
- Surface Mount Plastic Package
- Tape-and-Reel Packaging Available
- Lead-free Option Available

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]:
$\theta_{jc} = 120°C/W$

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.

Electrical Specifications[1], $T_A = 25°$ C

Symbol	Parameters and Test Conditions: $I_d = 16$ mA, $Z_0 = 50\ \Omega$		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[2]		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_{1dB}	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	

Notes:
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.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-0786-BLK	100	Bulk
MSA-0786-BLKG	100	Bulk
MSA-0786-TR1	1000	7" Reel
MSA-0786-TR1G	1000	7" Reel

Note: Order part number with a "G" suffix if lead-free option is desired.

MSA-0786 Typical Scattering Parameters ($Z_0 = 50\ \Omega$, $T_A = 25°\ C$, $I_d = 22\ mA$)

Freq.	S_{11}		S_{21}			S_{12}			S_{22}	
GHz	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	0.05	175	13.5	4.74	174	-18.7	0.116	1	0.14	-12
0.2	0.05	174	13.4	4.71	169	-18.7	0.117	3	0.14	-22
0.4	0.04	167	13.3	4.64	158	-18.4	0.120	7	0.15	-44
0.6	0.04	175	13.1	4.52	148	-18.3	0.122	7	0.16	-65
0.8	0.05	-156	12.9	4.39	138	-18.0	0.126	8	0.17	-84
1.0	0.06	-134	12.6	4.25	127	-17.5	0.134	10	0.18	-102
1.5	0.08	-142	11.6	3.79	103	-16.6	0.148	9	0.21	-139
2.0	0.15	-159	10.5	3.34	80	-15.7	0.164	7	0.23	-164
2.5	0.25	-176	9.2	2.89	63	-15.1	0.176	5	0.24	174
3.0	0.33	166	7.8	2.45	44	-14.7	0.185	1	0.24	159
3.5	0.41	150	6.5	2.11	27	-14.9	0.179	-5	0.24	149
4.0	0.49	137	5.2	1.82	12	-15.1	0.177	-9	0.23	145
5.0	0.60	116	3.0	1.41	-14	-15.4	0.169	-14	0.26	145

Typical Performance, T_A = 25° C

(unless otherwise noted)

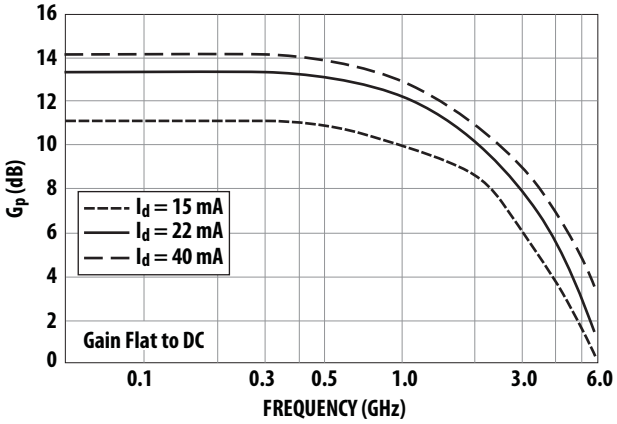


Figure 1. Typical Power Gain vs Frequency.

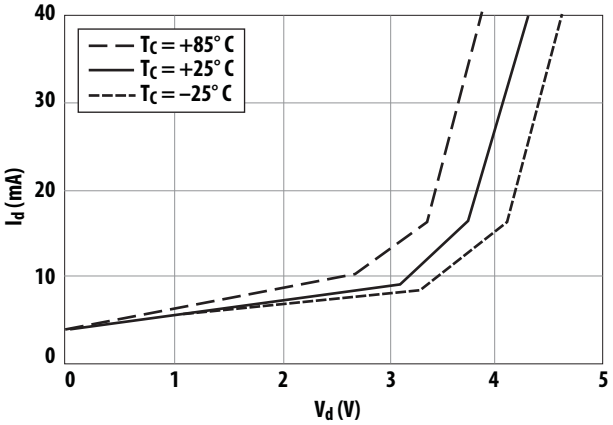


Figure 2. Device Current vs. Voltage.

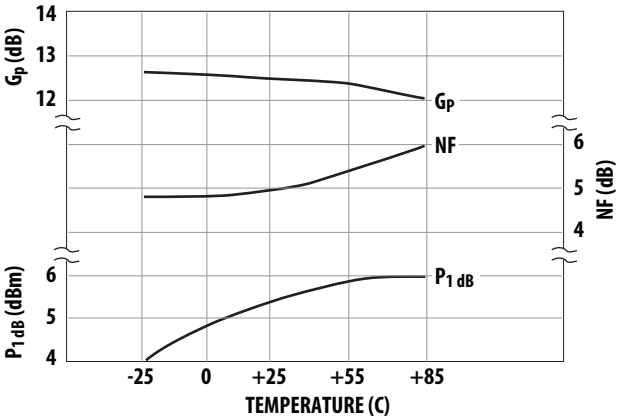


Figure 3. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, I_d = 22 mA.

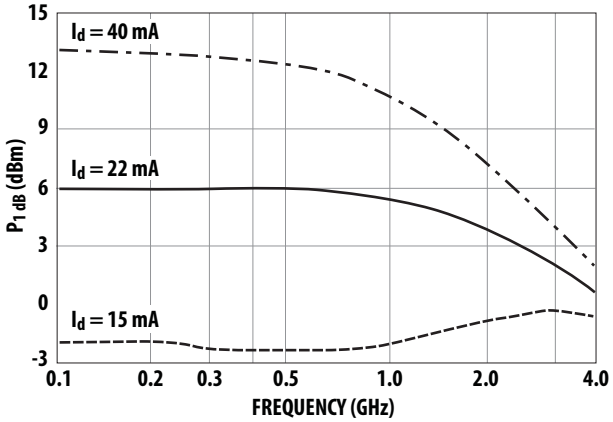


Figure 4. Output Power at 1 dB Gain Compression vs. Frequency.

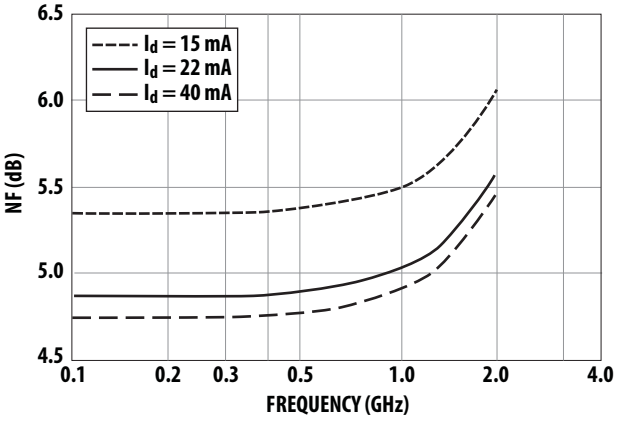
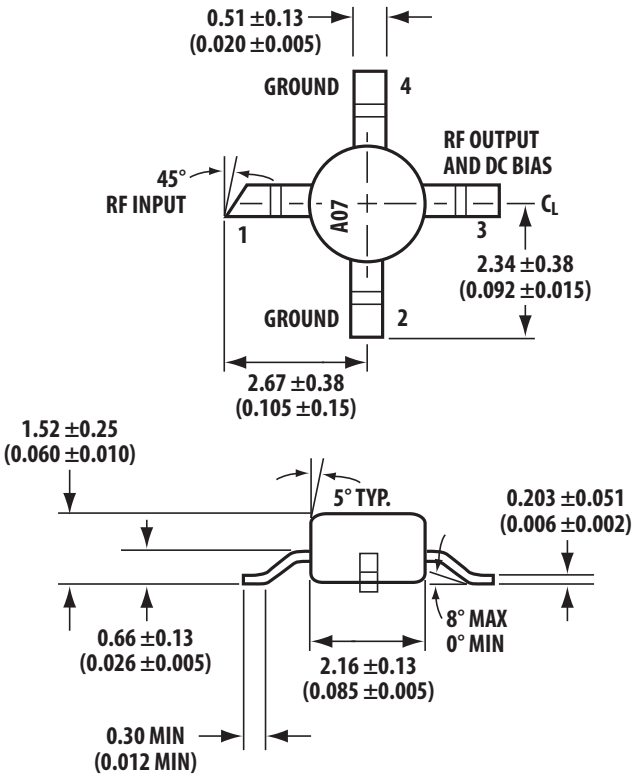


Figure 5. Noise Figure vs. Frequency.

86 Plastic Package Dimensions



Dimensions are in millimeters (inches)

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