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 50Ω 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.

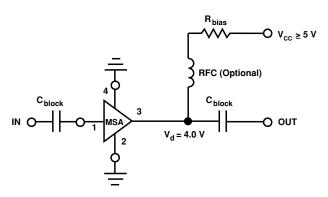
Features

- Cascadable 50Ω 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
- · Lead-free Option Available

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] :
$\theta_{\rm jc} =$	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 $T_{\rm C} > 117 ^{\circ}{\rm C}.$

Electrical Specifications^[1], $T_A = 25^{\circ}C$

Symbol	Parameters and Test Conditions:	Units	Min.	Тур.	Max.	
GP	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	$50~\Omega$ 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	
IP3	Third Order Intercept Point	f = 1.0 GHz	dBm		19.0	
t_{D}	Group Delay	f = 1.0 GHz	psec		150	
Vd	Device Voltage		V	3.2	4.0	4.8
dV/dT	Device Voltage Temperature Coefficient		mV/°C		-7.0	

Note:

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.

^{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.

MSA-0786 Typical Scattering Parameters	$(Z_0 = 50 \Omega, T_A = 25^{\circ}C, I_d = 22 \text{ mA})$
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Freq.	\mathbf{S}_{11}		\mathbf{S}_{21}		S_{12}			\mathbf{S}_{22}		
GHz	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

Typical Performance, $T_A = 25^{\circ}C$ (unless otherwise noted)

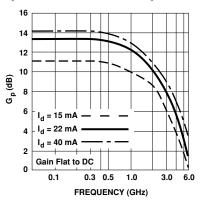


Figure 1. Typical Power Gain vs. Frequency.

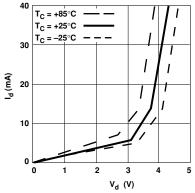


Figure 2. Device Current vs. Voltage.

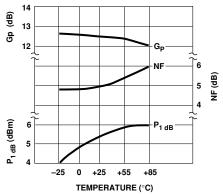


Figure 3. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, $I_d = 22 \text{ mÅ}.$

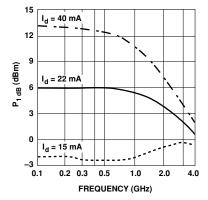


Figure 4. Output Power at 1 dB Gain Compression vs. Frequency.

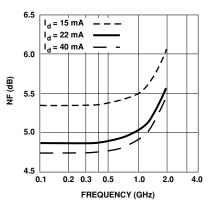
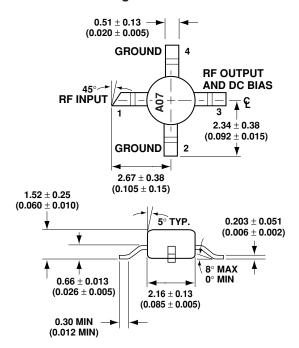


Figure 5. Noise Figure vs. Frequency.

86 Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES)

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