

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-0404

Features

- Cascadable 50 Ω Gain Block
- 3 dB Bandwidth: DC to 2.5 GHz
- 7.5 dB Typical Gain at 1.0 GHz
- * 11.5 dBm Typical $P_{1 dB}$ at 1.0 GHz
- Unconditionally Stable (k>1)
- Low Cost Plastic Package

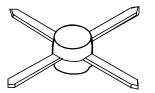
Description

The MSA-0404 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost

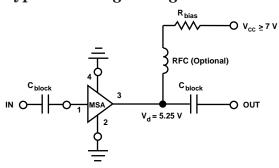
plastic package. This MMIC is designed for use as a general purpose $50~\Omega$ gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

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.

04A Plastic Package



Typical Biasing Configuration



5965-9573E 6-322

MSA-0404 Absolute Maximum Ratings

Parameter	Absolute Maximum ^[1]				
Device Current	85 mA				
Power Dissipation ^[2,3]	500 mW				
RF Input Power	+13dBm				
Junction Temperature	150℃				
Storage Temperature	-65 to 150°C				

Thermal Resistance ^[2,4] :	
$\theta_{\rm jc} = 85^{\circ} \text{C/W}$	

Notes:

- 1. Permanent damage may occur if any of these limits are exceeded.
- 2. $T_{CASE} = 25$ °C.
- 3. Derate at 10 mW/°C for $T_{\rm C} > 108$ °C.
- 4. See MEASUREMENTS section "Thermal Resistance" for more information.

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	dB		8.3	
		f = 0.5 GHz		7.0	8.0	
		$f = 1.0 \mathrm{GHz}$			7.5	
$\Delta G_{ m P}$	Gain Flatness	f = 0.1 to 2.0 GHz	dB		± 1.0	
f _{3 dB}	3 dB Bandwidth		GHz		2.5	
VSWR	Input VSWR	f = 0.1 to 2.5 GHz			1.4:1	
VOVIL	Output VSWR	f = 0.1 to 2.5 GHz			1.8:1	
NF	50Ω Noise Figure	f = 1.0 GHz	dB		7.0	
P _{1 dB}	Output Power at 1 dB Gain Compression	f = 1.0 GHz	dBm		11.5	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		24.5	
t_{D}	Group Delay	f = 1.0 GHz	psec		150	
$V_{\rm d}$	Device Voltage		V	4.75	5.25	5.75
dV/dT	Device Voltage Temperature Coefficient		mV/°C		-8.0	

Note:

^{1.} The recommended operating current range for this device is 30 to 70 mA. Typical performance as a function of current is on the following page.

MSA-0404 Typical Scattering Parameters (Z_{O} = 50 Ω , T_{A} = 25°C, I_{d} = 50 mA)

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	.16	175	8.3	2.59	174	-16.2	.156	0	.13	-13
0.2	.16	170	8.2	2.58	168	-16.2	.155	2	.13	- 25
0.4	.15	161	8.1	2.54	156	-16.0	.158	4	.14	-4 7
0.6	.14	152	8.0	2.51	145	-16.0	.158	6	.16	-64
0.8	.12	145	7.8	2.46	133	-15.8	.163	8	.19	- 79
1.0	.11	141	7.7	2.41	122	-15.4	.169	9	.21	- 91
1.5	.07	141	7.2	2.29	96	-14.6	.186	13	.24	-118
2.0	.09	161	6.6	2.14	71	-13.3	.215	12	.26	-140
2.5	.14	159	5.9	1.98	53	-12.4	.240	13	.28	-157
3.0	.22	148	5.1	1.80	33	-11.7	.260	7	.29	-176
3.5	.30	128	4.3	1.64	13	-10.9	.286	0	.32	167
4.0	.38	109	3.2	1.45	- 6	-10.4	.301	- 7	.33	153
5.0	.47	91	2.1	1.27	- 23	-10.2	.310	- 15	.35	137
6.0	.55	75	1.0	1.09	- 39	-10.1	.312	- 24	.37	120

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

Typical Performance, $T_A = 25^{\circ}C$

(unless otherwise noted)

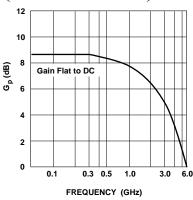


Figure 1. Typical Power Gain vs. Frequency, $T_A=25^{\circ}C,\,I_d=50$ mA.

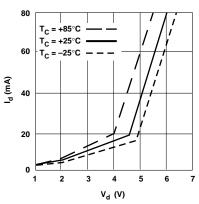


Figure 2. Device Current vs. Voltage.

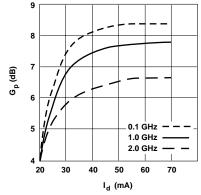


Figure 3. Power Gain vs. Current.

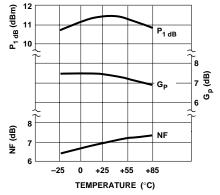


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f=1.0~GHz, $I_d=50mA$.

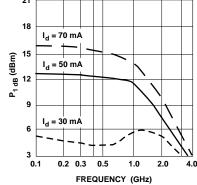


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

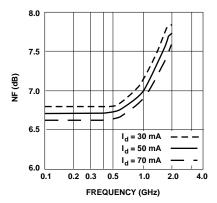
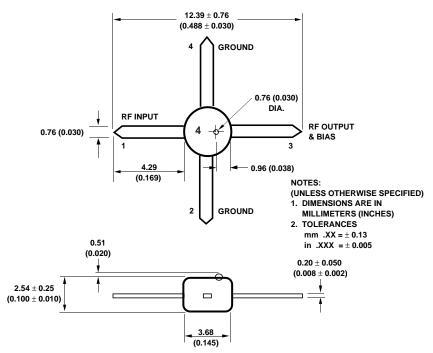


Figure 6. Noise Figure vs. Frequency.

04A Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES).