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Innovating the HP Way

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-0204

Features

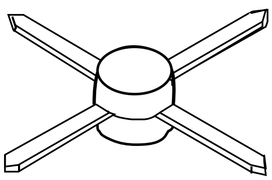
- **Cascadable 50 Ω Gain Block**
- **3 dB Bandwidth:** DC to 1.8 GHz
- **11.0 dB Typical Gain at 1.0 GHz**
- **Unconditionally Stable (k>1)**
- **Low Cost Plastic Package**

Description

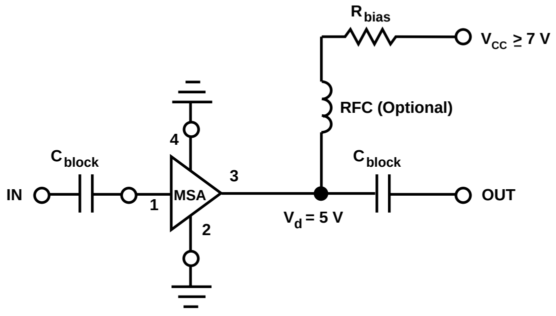
The MSA-0204 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost plastic package. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

The MSA-series is fabricated using Agilent'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



MSA-0204 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	60 mA
Power Dissipation[2,3]	325 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	–65 to 150°C

Thermal Resistance[2,4]:
θ_{jc} = 90°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 11.1 mW/°C for T_C > 121°C.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 25 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz f = 0.5 GHz f = 1.0 GHz	dB	 10.0 	12.5 12.0 11.0	
ΔG_P	Gain Flatness	f = 0.1 to 1.4 GHz	dB		±1.0	
$f_{3\ dB}$	3 dB Bandwidth		GHz		1.8	
VSWR	Input VSWR	f = 0.1 to 3.0 GHz			1.3:1	
	Output VSWR	f = 0.1 to 3.0 GHz			1.3:1	
NF	50 Ω Noise Figure	f = 1.0 GHz	dB		6.5	
$P_{1\ dB}$	Output Power at 1 dB Gain Compression	f = 1.0 GHz	dBm		4.5	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		17.0	
t_D	Group Delay	f = 1.0 GHz	psec		150	
V_d	Device Voltage		V	4.5	5.0	5.5
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Note:
1. The recommended operating current range for this device is 18 to 40 mA. Typical performance as a function of current is on the following page.

MSA-0204 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 25 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.12	170	12.5	4.20	174	–18.5	.119	2	.12	–7
0.2	.12	160	12.4	4.16	168	–18.5	.119	4	.12	–14
0.4	.11	140	12.2	4.05	156	–18.1	.124	6	.12	–29
0.6	.11	121	11.9	3.93	144	–17.9	.127	8	.12	–42
0.8	.10	104	11.6	3.78	134	–17.6	.132	12	.12	–52
1.0	.10	84	11.2	3.62	123	–17.0	.142	14	.13	–61
1.5	.09	42	10.2	3.22	99	–16.1	.157	16	.12	–79
2.0	.07	16	9.1	2.86	77	–14.8	.181	15	.11	–96
2.5	.05	17	8.2	2.57	63	–13.9	.202	16	.09	–115
3.0	.02	96	7.3	2.32	46	–13.2	.220	13	.08	–141
3.5	.08	112	6.5	2.12	29	–12.4	.239	7	.09	–167
4.0	.14	100	5.7	1.93	12	–11.8	.258	0	.11	171
5.0	.35	72	4.0	1.58	–22	–11.2	.276	–15	.17	120
6.0	.59	51	1.6	1.20	–54	–11.3	.272	–33	.32	80

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

Typical Performance, T_A = 25°C

(unless otherwise noted)

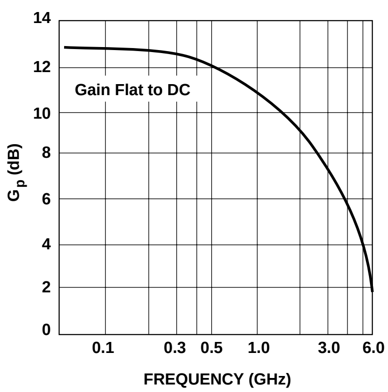


Figure 1. Typical Power Gain vs. Frequency, T_A = 25°C, I_d = 25 mA.

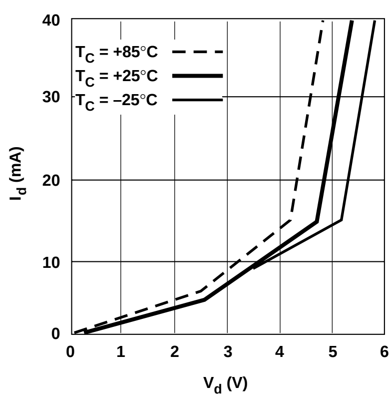


Figure 2. Device Current vs. Voltage.

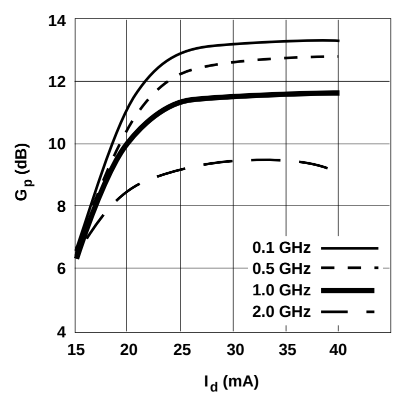


Figure 3. Power Gain vs. Current.

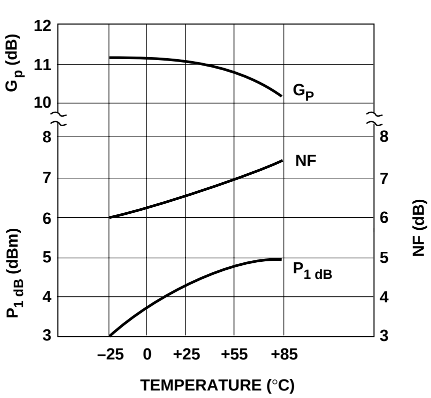


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, I_d = 25 mA.

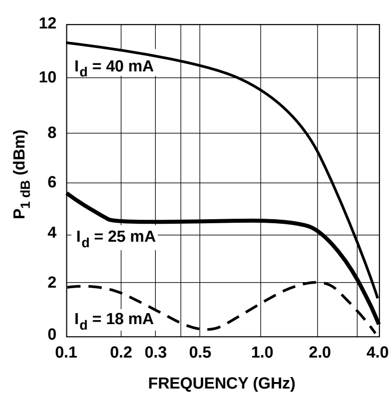


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

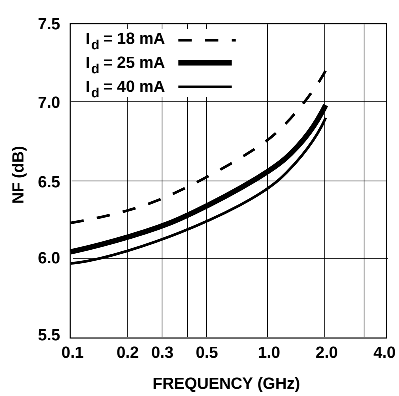


Figure 6. Noise Figure vs. Frequency.

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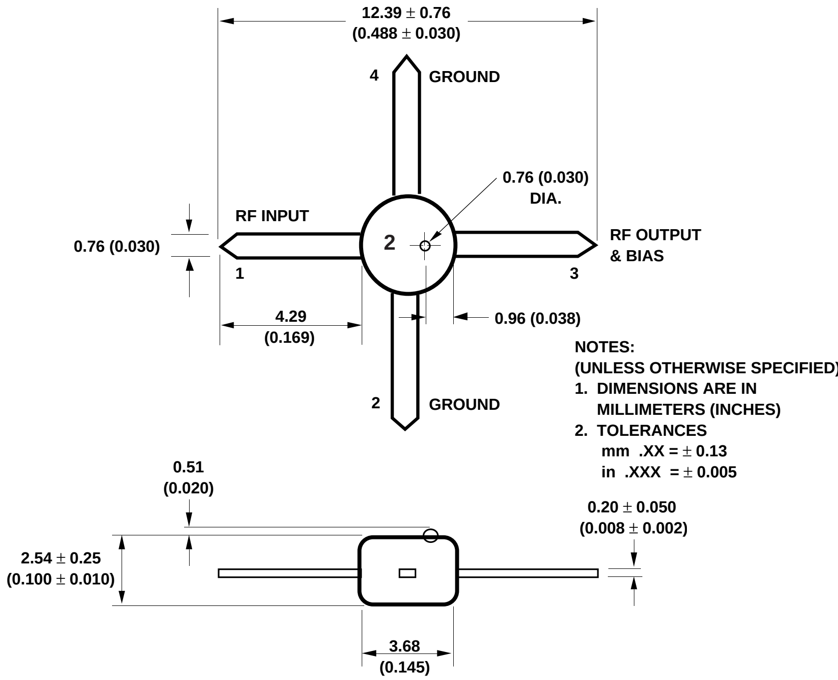
04A Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES).

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Data subject to change.

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