MSA-0420
Cascadable Silicon Bipolar MMIC Amplifier

Data Sheet

Description

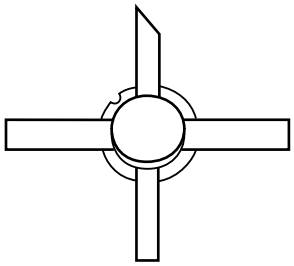
The MSA-0420 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic, high reliability package. This MMIC is designed for use as a general purpose 50Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and military 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.

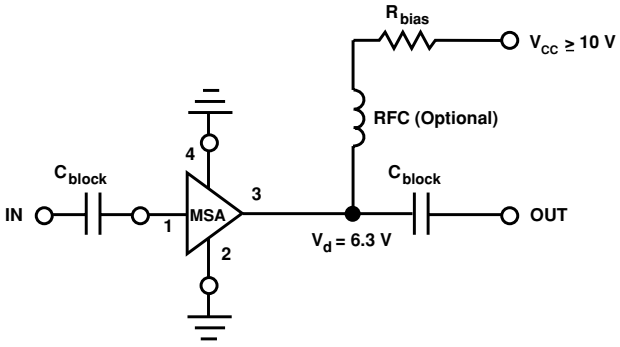
Features

- Cascadable 50Ω Gain Block
- 3 dB Bandwidth: DC to 4.0 GHz
- 8.5 dB Typical Gain at 1.0 GHz
- 16.0 dBm Typical $P_{1\ dB}$ at 1.0 GHz
- Unconditionally Stable (k>1)
- Hermetic Metal/Beryllia Microstrip Package

200 mil BeO Package



Typical Biasing Configuration



MSA-0420 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	120 mA
Power Dissipation[2,3]	850 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature	–65 to 200°C

Thermal Resistance[2,4]:

$\theta_{jc} = 40°C/W$

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE} = 25°C$.
3. Derate at 25 mW/°C for $T_C > 166°C$.
4. The small spot size of this technique results in a higher, though more accurate determination of q_{jc} than do alternate methods.

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

Symbol	Parameters and Test Conditions: $I_d = 90$ mA, $Z_0 = 50\ \Omega$		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz	dB	7.5	8.5	9.5
ΔG_P	Gain Flatness	f = 0.1 to 2.5 GHz	dB		±0.6	±1.0
$f_{3\ dB}$	3 dB Bandwidth		GHz		4.3	
VSWR	Input VSWR	f = 0.1 to 2.5 GHz			1.7:1	
	Output VSWR	f = 0.1 to 2.5 GHz			1.8:1	
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	14.0	16.0	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		30.0	
t_D	Group Delay	f = 1.0 GHz	psec		140	
V_d	Device Voltage		V	5.7	6.3	6.9
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Note:
1. The recommended operating current range for this device is 40 to 110 mA. Typical performance as a function of current is on the following page.

MSA-0420 Typical Scattering Parameters ($Z_0 = 50\ \Omega$, $T_A = 25°C$, $I_d = 90$ mA)

Freq.	S_{11}			S_{21}			S_{12}		S_{22}	
GHz	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.25	177	8.6	2.70	175	−16.4	.151	1	.03	−30
0.2	.25	173	8.6	2.69	170	−16.5	.150	1	.04	−59
0.4	.24	167	8.6	2.69	159	−16.5	.150	−1	.07	−79
0.6	.22	160	8.5	2.67	149	−16.4	.152	−2	.10	−92
0.8	.21	154	8.5	2.66	139	−16.3	.154	−2	.13	−99
1.0	.20	148	8.3	2.60	129	−16.1	.156	−3	.16	−109
1.5	.14	136	8.1	2.54	104	−15.6	.166	−4	.22	−124
2.0	.10	136	7.9	2.48	80	−14.8	.181	−6	.25	−139
2.5	.08	161	7.4	2.34	62	−14.3	.193	−5	.28	−147
3.0	.10	178	7.0	2.24	39	−13.7	.206	−11	.31	−157
3.5	.13	176	6.6	2.13	18	−12.6	.233	−18	.34	−167
4.0	.14	163	5.9	1.97	−3	−11.9	.253	−25	.36	−176
4.5	.14	133	5.3	1.83	−23	−11.3	.273	−33	.37	174
5.0	.16	91	4.5	1.69	−343	−10.5	.299	−43	.37	162

Typical Performance, $T_A = 25°C$

(unless otherwise noted)

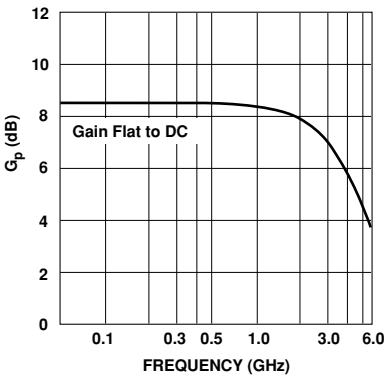


Figure 1. Typical Power Gain vs. Frequency, $T_A = 25°C$, $I_d = 90$ mA.

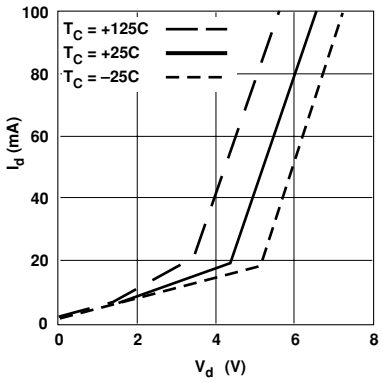


Figure 2. Device Current vs. Voltage.

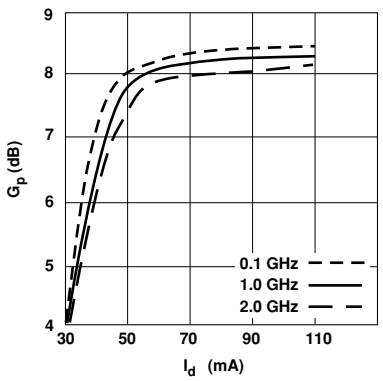


Figure 3. Power Gain vs. Current.

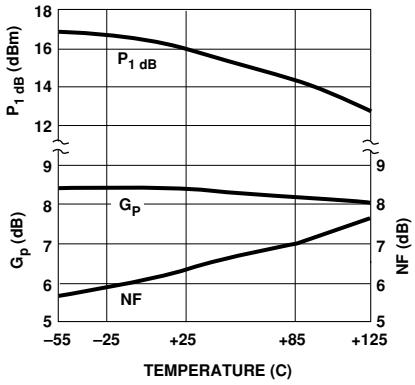


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, $I_d = 90$ mA.

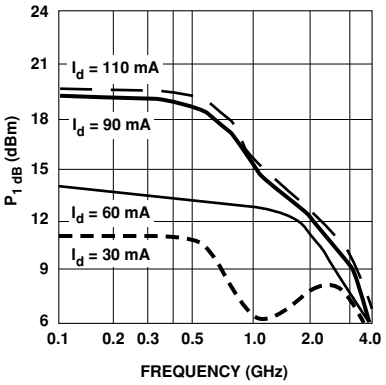


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

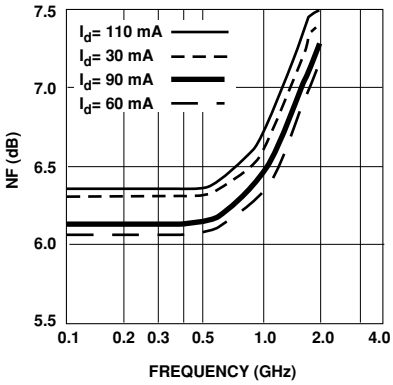
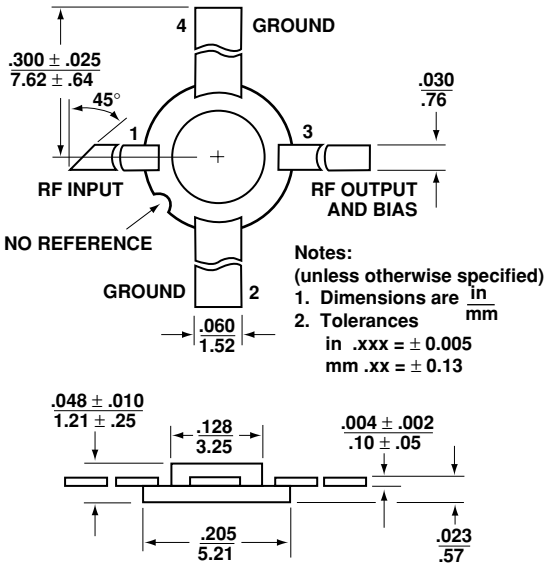


Figure 6. Noise Figure vs. Frequency.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-0420	100	Bulk

200 mil BeO Package Dimensions



For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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