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MSA-1120
Cascadable Silicon Bipolar MMIC Amplifier

Data Sheet

Description

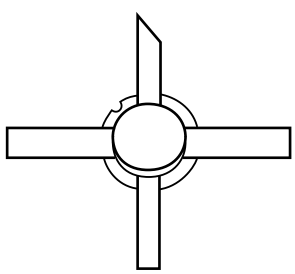
The MSA-1120 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic BeO disk package for good thermal characteristics. This MMIC is designed for high dynamic range in either 50 or 75 Ω systems by combining low noise figure with high IP_3. Typical applications include narrow and broadband linear amplifiers in industrial and military systems.

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.

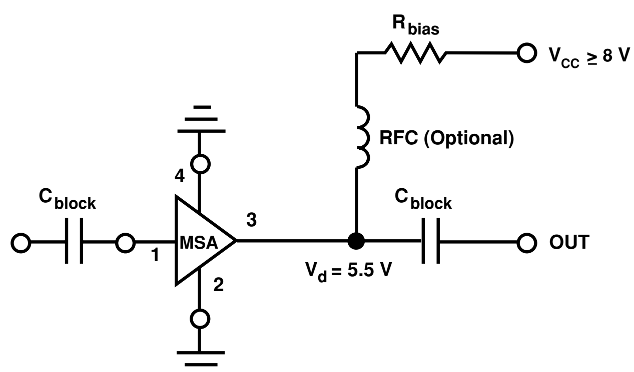
Features

- High Dynamic Range Cascadable 50Ω or 75Ω Gain Block
- 3 dB Bandwidth: 50 MHz to 1.6 GHz
- 17.5 dBm Typical P1 dB at 0.5 GHz
- 12 dB Typical 50 Ω Gain at 0.5 GHz
- 3.5 dB Typical Noise Figure at 0.5 GHz
- Hermetic Metal/ Beryllia Microstrip Package

200 mil BeO Package



Typical Biasing Configuration



MSA-1120 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	100 mA
Power Dissipation[2,3]	650 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature	–65 to 200°C

Thermal Resistance[2,4]:

θ_{jc} = 60°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 16.7 mW/°C for T_C > 161°C.
4. The small spot size of this technique results in a higher, though more accurate determination of θ_{jc} than do alternate methods.

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

Symbol	Parameters and Test Conditions: I_d = 60 mA, Z_0 = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz	dB	11.5	12.5	13.5
ΔG_P	Gain Flatness	f = 0.1 to 1.0 GHz	dB		±0.7	±1.0
$f_{3\,dB}$	3 dB Bandwidth[2]		GHz		1.6	
VSWR	Input VSWR	f = 0.1 to 1.5 GHz			1.7:1	
	Output VSWR	f = 0.1 to 1.5 GHz			1.9:1	
NF	50 Ω Noise Figure	f = 0.5 GHz	dB		3.5	4.5
$P_{1\,dB}$	Output Power at 1 dB Gain Compression	f = 0.5 GHz	dBm	16.0	17.5	
IP_3	Third Order Intercept Point	f = 0.5 GHz	dBm		30.0	
t_D	Group Delay	f = 0.5 GHz	psec		200	
V_d	Device Voltage		V	4.5	5.5	6.5
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Notes:
1. The recommended operating current range for this device is 40 to 75 mA. Typical performance as a function of current is on the following page.
2. Referenced from 50 MHz gain (GP).

MSA-1120 Typical Scattering Parameters ($Z_0 = 50\ \Omega$, $T_A = 25°C$, $I_d = 60$ mA)

Freq.	S_{11}		S_{21}			S_{12}			S_{22}		
GHz	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	k
.0005	.78	–21	19.6	9.53	168	–25.1	.057	50	.79	–21	0.51
.005	.19	–72	13.8	4.91	165	–16.8	.144	11	.19	–72	0.98
.025	.05	–56	12.9	4.44	174	–16.5	.149	3	.06	–75	1.08
.050	.04	–52	12.5	4.23	174	–16.1	.156	2	.04	–79	1.08
.100	.04	–56	12.5	4.22	172	–16.2	.155	1	.04	–78	1.09
.200	.05	–72	12.4	4.19	165	–16.1	.157	1	.06	–91	1.08
.300	.07	–84	12.4	4.15	158	–16.0	.159	2	.09	–101	1.07
.400	.09	–96	12.3	4.10	151	–15.9	.161	2	.11	–109	1.06
.500	.10	–105	12.1	4.04	144	–15.8	.163	3	.13	–117	1.05
.600	.12	–113	12.0	3.98	137	–15.6	.166	3	.16	–124	1.04
.700	.14	–120	11.8	3.89	131	–15.4	.169	2	.18	–130	1.03
.800	.15	–127	11.6	3.80	124	–15.2	.173	2	.20	–136	1.01
.900	.17	–134	11.4	3.71	118	–15.0	.178	1	.22	–142	1.00
1.000	.19	–140	11.1	3.60	112	–14.8	.181	2	.24	–148	0.99
1.500	.25	–167	9.8	3.10	83	–14.0	.200	–3	.31	–174	0.95
2.000	.31	171	8.4	2.64	58	–13.3	.216	–10	.35	163	0.95
2.500	.35	157	7.3	2.31	39	–12.8	.228	–16	.36	148	0.96
3.000	.40	140	6.1	2.02	19	–12.5	.236	–23	.36	134	0.99

Typical Performance, $T_A = 25°C$, $Z_0 = 50\ \Omega$

(unless otherwise noted)

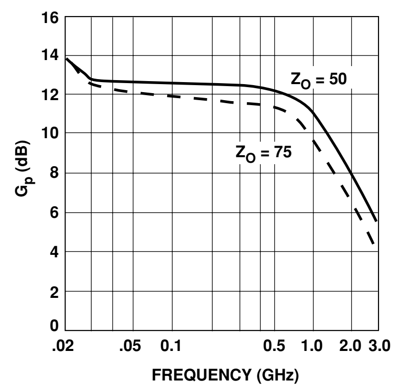


Figure 1. Typical Power Gain vs. Frequency, $I_d = 60$ mA.

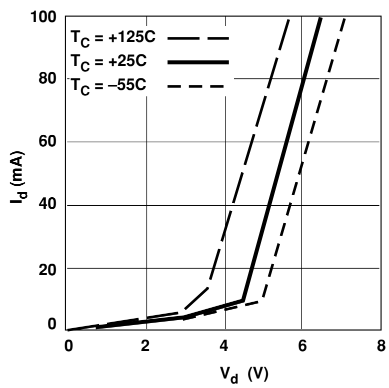


Figure 2. Device Current vs. Voltage.

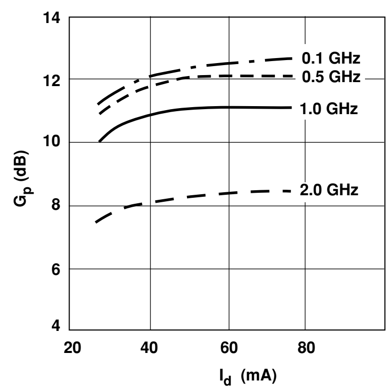


Figure 3. Power Gain vs. Current.

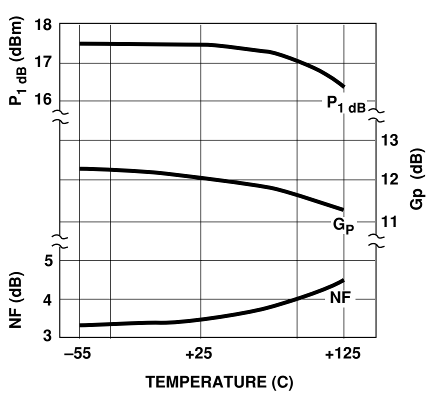


Figure 4. Output Power at 1 dB Gain Compression, Noise Figure and Power Gain vs. Case Temperature, f = 0.5 GHz, $I_d = 60$ mA.

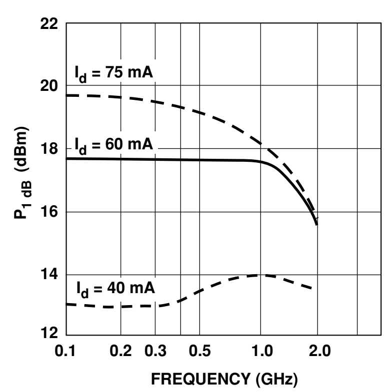


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

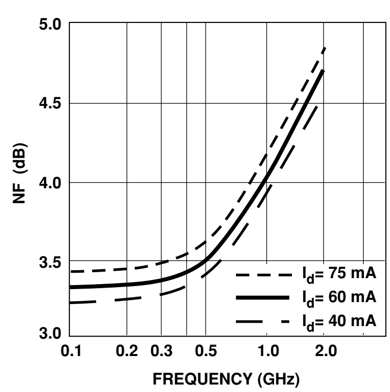
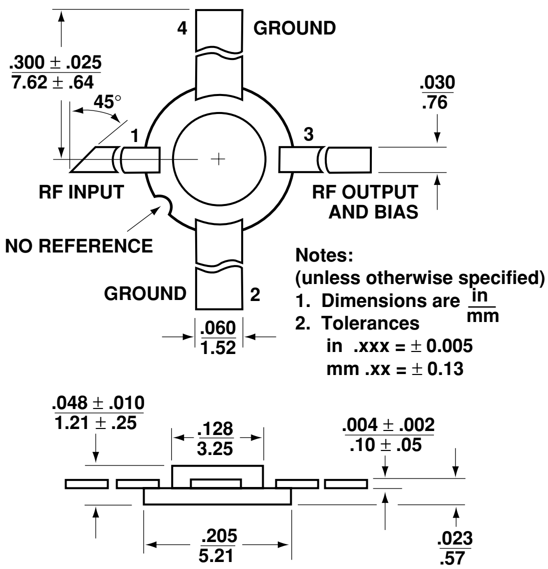


Figure 6. Noise Figure vs. Frequency.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-1120	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**

AV02-1234EN May 14, 2008