MSA-1120
Cascadable Silicon Bipolar MMIC Amplifier

Data Sheet

Description

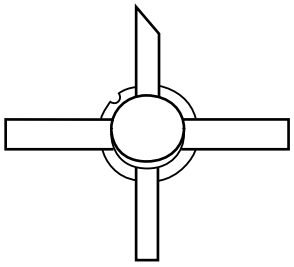
The MSA-1120 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic BeO disk package for good thermal characteristics. This MMIC is designed for high dynamic range in either 50 or 75 Ω systems by combining low noise figure with high IP_3. Typical applications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

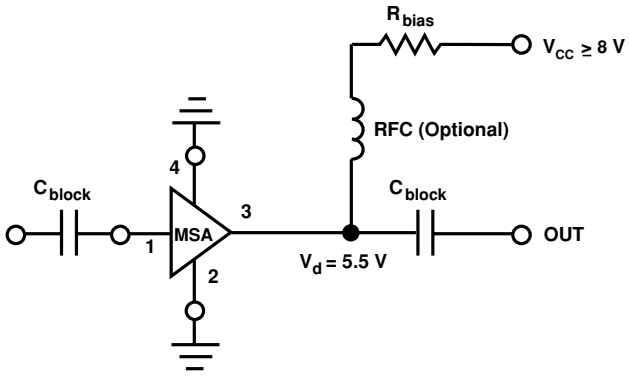
Features

- 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]:

$\theta_{jc} = 60°C/W$

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, $Z_0 = 50\ \Omega$		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)

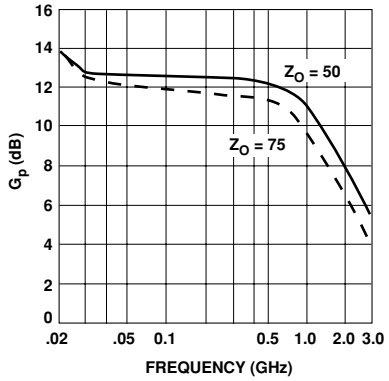


Figure 1. Typical Power Gain vs. Frequency, $I_d = 60$ mA.

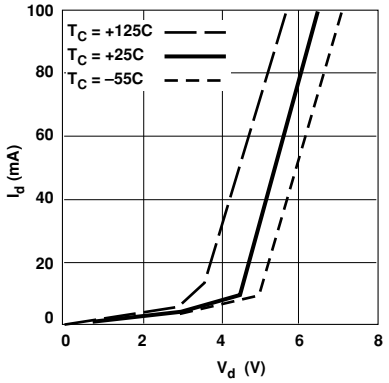


Figure 2. Device Current vs. Voltage.

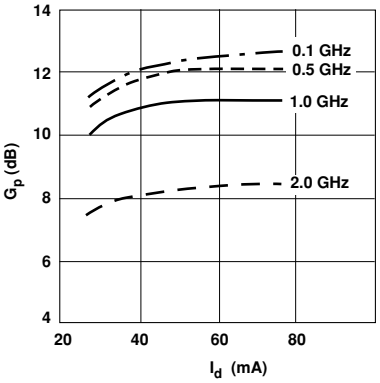


Figure 3. Power Gain vs. Current.

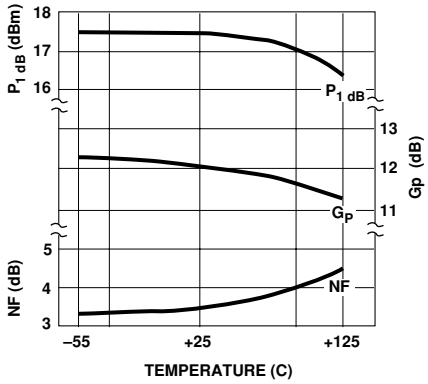


Figure 4. Output Power at 1 dB Gain Compression, Noise Figure and Power Gain vs. Case Temperature, f = 0.5 GHz, $I_d = 60$ mA.

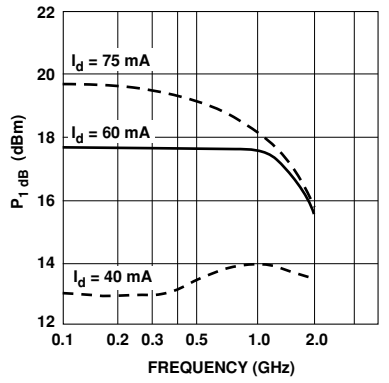


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

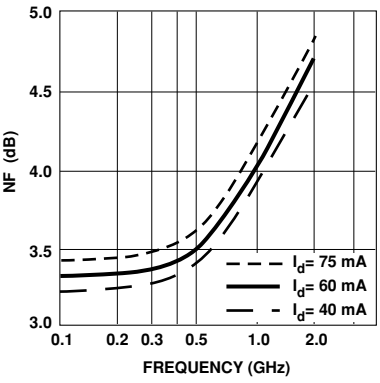
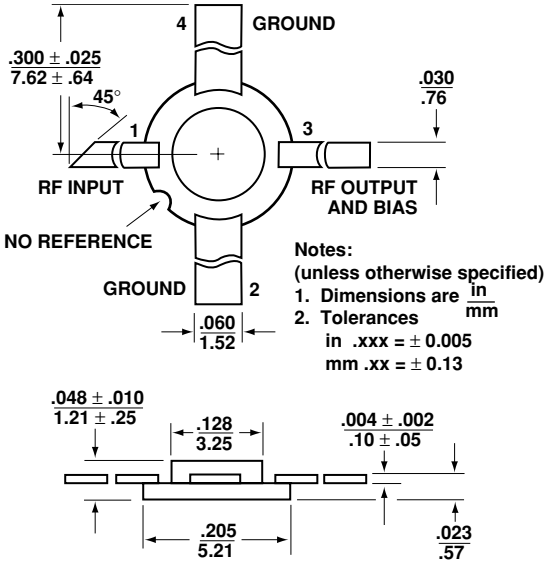


Figure 6. Noise Figure vs. Frequency.

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**

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