Agilent MSA-0520 Cascadable Silicon Bipolar MMIC Amplifier

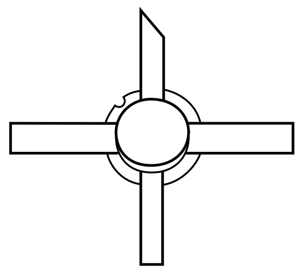
Data Sheet

Description

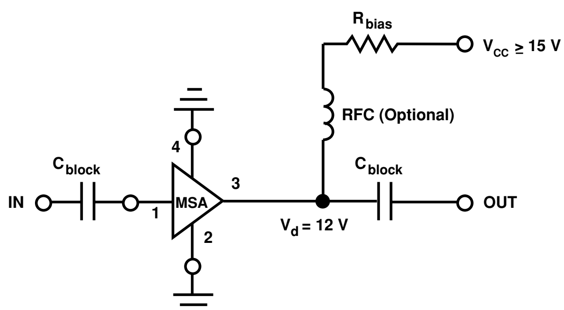
The MSA-0520 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic, BeO disk package for good thermal characteristics. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and military 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.

200 mil BeO Package



Typical Biasing Configuration



Features

- **Cascadable 50 Ω Gain Block**
- **High Output Power:** +23 dBm Typical $P_{1\,dB}$ at 1.0 GHz
- **Low Distortion:** 33 dBm Typical IP_3 at 1.0 GHz
- **8.5 dB Typical Gain at 1.0 GHz**
- **Hermetic Metal/Beryllia Microstrip Package**

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MSA-0520 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	225 mA
Power Dissipation[2,3]	3.0 W
RF Input Power	+25 dBm
Junction Temperature	200°C
Storage Temperature	–65 to 200°C

Thermal Resistance[2,4]:
θ_{jc} = 25°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 40 mW/°C for T_C > 125°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 = 165 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
$P_{1\,dB}$	Output Power at 1 dB Gain Compression	f = 1.0 GHz	dBm	21.0	23.0	
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 2.0 GHz	dB		±0.75	
$f_{3\,dB}$	3 dB Bandwidth[2]		GHz		2.8	
VSWR	Input VSWR	f = 0.1 to 2.0 GHz			2.0:1	
	Output VSWR	f = 0.1 to 2.0 GHz			2.5:1	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		33.0	
$NF_{50\,\Omega}$	50 Ω Noise Figure	f = 1.0 GHz	dB		6.5	
t_D	Group Delay	f = 1.0 GHz	psec		170	
V_d	Device Voltage		V	10.5	12.0	13.5
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–16.0	

Notes:
1. The recommended operating current range for this device is 80 to 200 mA. Typical performance as a function of current is on the following page.
2. Referenced from 0.1 GHz Gain (G_P).

MSA-0520 Typical Scattering Parameters (T_A = 25°C, I_d = 165 mA)

Freq. MHz	S11 Mag	S11 Ang	S21 dB	S21 Mag	S21 Ang	S12 dB	S12 Mag	S12 Ang	S22 Mag	S22 Ang	k
5	.57	–38	14.4	5.25	165	–19.4	.107	38	.67	–35	0.57
25	.25	–90	10.7	3.42	160	–14.9	.180	17	.29	–81	0.93
50	.15	–111	9.5	2.97	163	–14.4	.190	9	.18	–97	1.10
100	.11	–138	8.9	2.80	166	–14.2	.195	3	.11	–113	1.16
200	.10	–152	8.8	2.75	163	–14.1	.197	1	.10	–125	1.17
400	.10	–152	8.7	2.72	152	–14.1	.198	–2	.14	–123	1.16
600	.11	–147	8.6	2.70	140	–14.0	.199	–4	.18	–123	1.14
800	.13	–142	8.5	2.67	128	–14.1	.199	–6	.22	–127	1.12
1000	.15	–140	8.4	2.64	115	–14.1	.198	–8	.27	–131	1.09
1500	.22	–142	8.0	2.52	85	–13.7	.206	–12	.34	–143	0.98
2000	.30	–156	7.4	2.36	55	–13.3	.216	–16	.43	–158	0.85
2500	.37	–170	6.7	2.16	33	–12.9	.227	–18	.48	–166	0.75
3000	.41	170	5.6	1.91	8	–12.7	.232	–23	.51	–177	0.70
3500	.45	149	4.5	1.68	–16	–12.1	.249	–31	.55	173	0.63
4000	.46	124	3.3	1.45	–40	–11.7	.259	–39	.56	162	0.66

Typical Performance, T_A = 25°C
(unless otherwise noted)

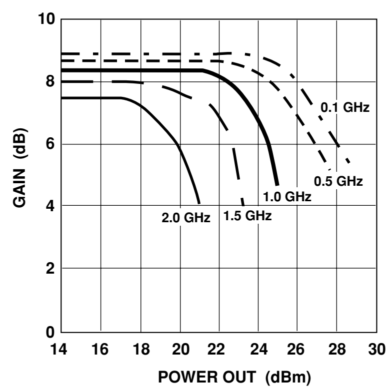


Figure 1. Typical Gain vs. Power Out, T_A = 25°C, I_d = 165 mA.

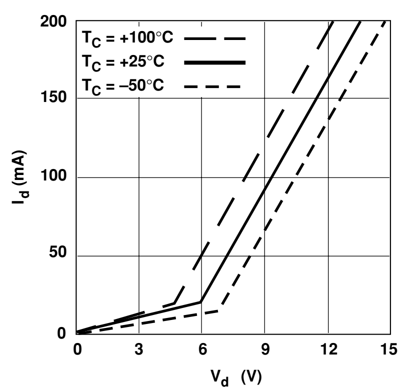


Figure 2. Device Current vs. Voltage.

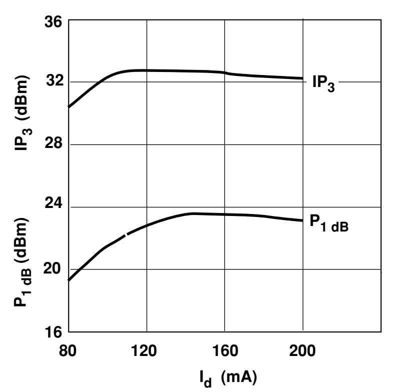


Figure 3. Output Power at 1 dB Gain Compression, Third Order Intercept vs. Current, f = 1.0 GHz.

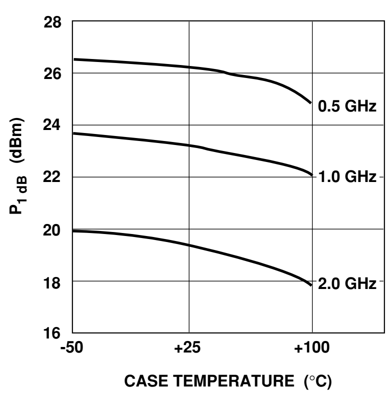


Figure 4. Output Power @ 1 dB Gain Compression vs. Temperature, I_d = 165 mA.

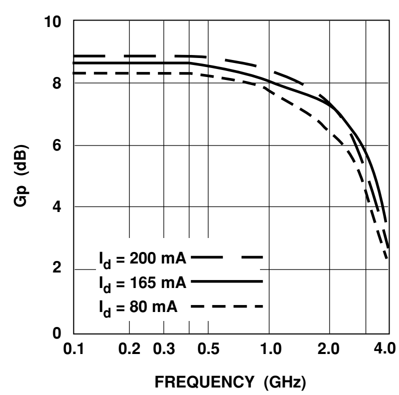


Figure 5. Gain vs. Frequency.

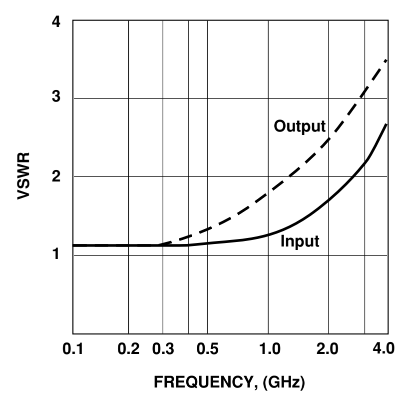
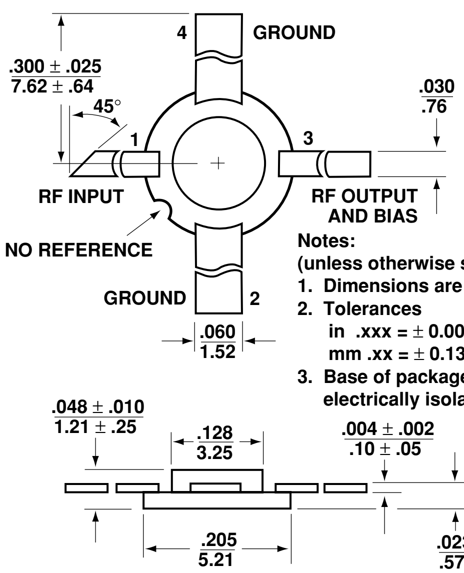


Figure 6. VSWR vs. Frequency, I_d = 165 mA.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-0520	10	Bulk

200 mil BeO Package Dimensions



Notes:
(unless otherwise specified)
1. Dimensions are $\frac{in}{mm}$
2. Tolerances
   in .xxx = ± 0.005
   mm .xx = ± 0.13
3. Base of package is electrically isolated.

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Data subject to change.

Obsoletes 5965-9582E
April 4, 2005
5989-2755EN

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