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Avago Technologies US, Inc.
MSA-1110

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MSA-1110
Cascadable Silicon Bipolar MMIC Amplifier

Data Sheet

Description

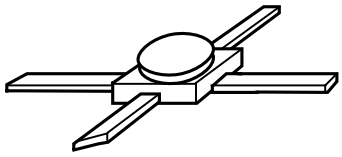
The MSA-1110 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic high reliability package. This MMIC is designed for high dynamic range in either 50 or 75Ω systems by combining low noise figure with high IP_3. Typical applications include narrow and 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.

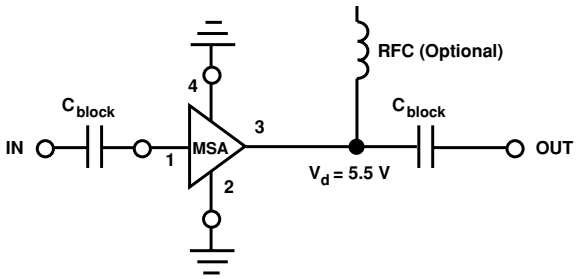
Features

- High Dynamic Range Cascadable 50Ω or 75Ω Gain Block
- 3 dB Bandwidth: 50 MHz to 1.6 GHz
- 17.5 dBm Typical $P_{1\ dB}$ 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 Gold-ceramic Microstrip Package

100 mil Package



Typical Biasing Configuration



MSA-1110 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	90 mA
Power Dissipation[2,3]	560 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature	−65 to 200°C

Thermal Resistance[2, 4]:
$\theta_{jc} = 135°C/W$

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE} = 25°C$.
3. Derate at 7.4 mW/°C for $T_C > 124°C$.
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 1.0 GHz			1.7:1	
	Output VSWR	f = 0.1 to 1.0 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		160	
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-1110 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	.83	–7	19.5	9.44	176	–31.9	.025	39	.84	–7	0.77
.005	.54	–50	16.8	6.92	158	–18.7	.116	34	.55	–50	0.60
.025	.15	–78	13.0	4.47	167	–16.6	.148	9	.15	–79	1.03
.050	.10	–64	12.6	4.26	171	–16.5	.149	5	.10	–67	1.08
.100	.08	–63	12.5	4.23	171	–16.5	.150	4	.08	–66	1.09
.200	.09	–74	12.4	4.17	166	–16.4	.152	4	.09	–78	1.09
.300	.11	–85	12.3	4.10	160	–16.2	.154	5	.12	–89	1.07
.400	.13	–94	12.3	4.10	154	–16.1	.157	6	.15	–98	1.05
.500	.16	–102	12.1	4.04	148	–15.9	.161	7	.18	–106	1.02
.600	.18	–108	12.0	3.98	143	–15.6	.165	8	.20	–113	1.00
.700	.21	–114	11.8	3.89	137	–15.4	.169	8	.23	–120	0.97
.800	.23	–120	11.6	3.80	131	–15.2	.173	8	.25	–126	0.95
.900	.25	–126	11.4	3.71	126	–15.0	.178	8	.28	–132	0.92
1.000	.27	–131	11.1	3.60	120	–14.8	.182	8	.30	–137	0.91
1.500	.36	–153	9.8	3.10	96	–13.8	.203	4	.37	–160	0.83
2.000	.42	–171	8.4	2.64	74	–13.3	.217	1	.40	–178	0.82
2.500	.47	177	7.2	2.29	59	–12.5	.236	–2	.41	172	0.80
3.000	.47	159	5.9	1.97	43	–13.2	.220	–10	.38	157	0.95

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

(unless otherwise noted)

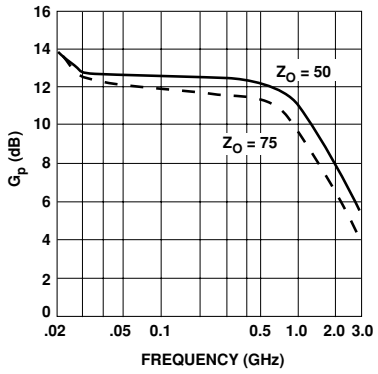


Figure 1. Typical Power Gain vs. Frequency, $I_d = 60$ mA.

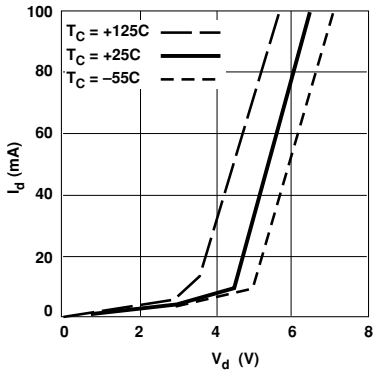


Figure 2. Device Current vs. Voltage.

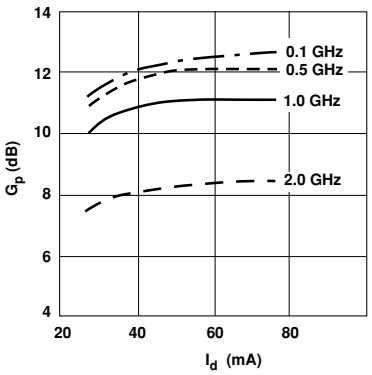


Figure 3. Power Gain vs. Current.

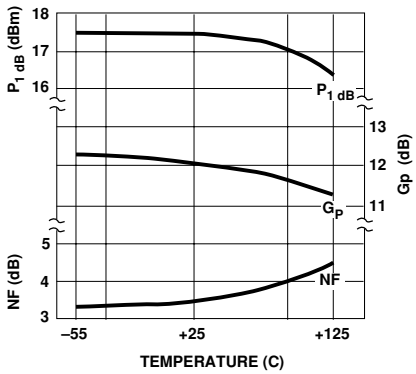


Figure 4. Output Power at 1 dB Gain Compression, Noise Figure and Power Gain vs. Case Temperature, f = 0.5 GHz, $I_d = 60$ mA.

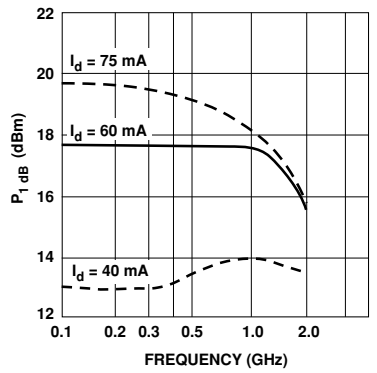


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

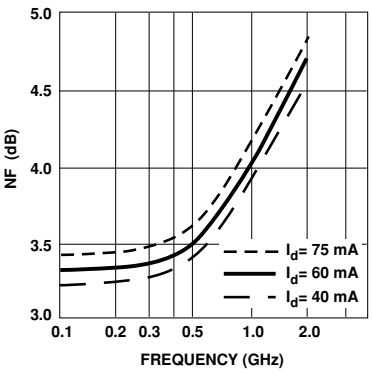
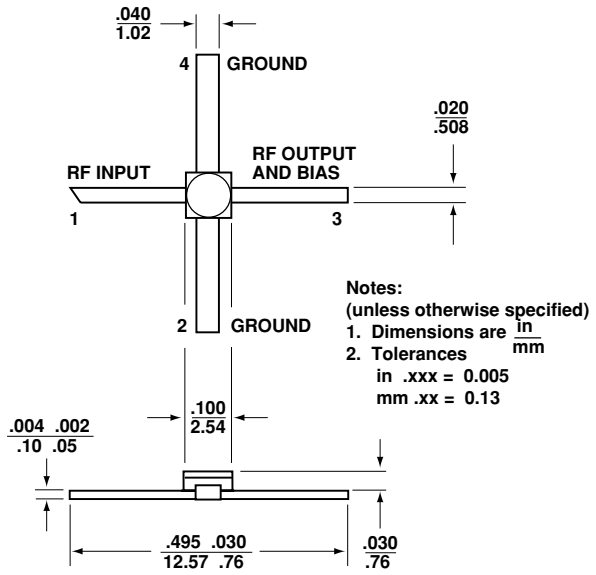


Figure 6. Noise Figure vs. Frequency.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-1110	100	Bulk

100 mil Package Dimensions



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