HEWLETT® PACKARD

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-2111

Features

- **Cascadable 50 Ω Gain Block**
- **Medium Power:** 10 dBm at 900 MHz
- **High Gain:** 16.5 dB Typical at 900 MHz
- **Low Noise Figure:** 3.3 dB Typical at 900 MHz
- **Low Cost Surface Mount Plastic Package**
- **Tape-and-Reel Packaging Option Available**[1]

Note:

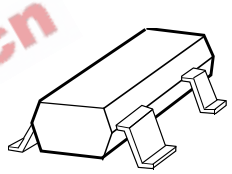
1. Refer to PACKAGING section "Tape-and-Reel Packaging for Semiconductor Devices."

Description

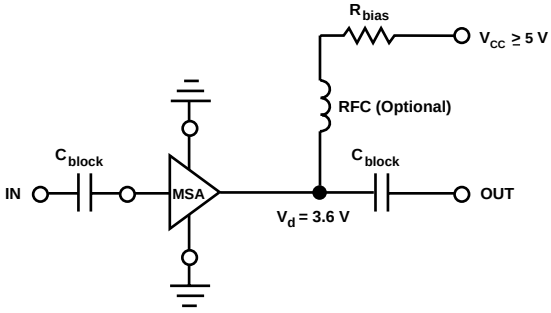
The MSA-2111 is a low cost silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a surface mount plastic SOT-143 package. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

The MSA-series is fabricated using HP'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.

SOT-143 Package



Typical Biasing Configuration



MSA-2111 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	40 mA
Power Dissipation[2,3]	125 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	–65°C to 150°C

Thermal Resistance[2]:
$\theta_{jc} = 505°C/W$

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE} = 25°C$.
3. Derate at 2.0 mW/°C for $T_C > 85°C$.

Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 29 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 900 MHz	dB	16.0	17.5	
ΔG_P	Gain Flatness	f = 0.1 to 0.3 GHz	dB		±0.5	
$f_{3\,dB}$	3 dB Bandwidth		GHz		0.5	
VSWR	Input VSWR	f = 0.1 to 2.5 GHz			1.8:1	
	Output VSWR	f = 0.1 to 2.5 GHz			1.8:1	
NF	50 Ω Noise Figure	f = 900 MHz	dB		3.3	
$P_{1\,dB}$	Output Power at 1 dB Gain Compression	f = 900 MHz	dBm		10	
IP_3	Third Order Intercept Point	f = 900 MHz	dBm		20	
t_D	Group Delay	f = 900 MHz	psec		158	
V_d	Device Voltage		V	2.9	3.6	4.3
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Notes:
1. The recommended operating current range for this device is 12 to 35 mA. Typical gain performance as a function of current is on the following page.

Part Number Ordering Information

Part Number	No. of Devices	Container
MSA-2111-TR1	3000	7" Reel
MSA-2111-BLK	100	Antistatic Bag

For more information, see "Tape and Reel Packaging for Semiconductor Devices".

MSA-2111 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 29 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
0.1	.28	171	23.0	14.1	167	–26.0	.050	9	.27	177	1.03
0.2	.26	163	22.5	13.4	156	–25.5	.053	18	.27	175	1.03
0.3	.24	156	21.9	12.5	145	–24.9	.057	25	.26	173	1.03
0.4	.21	152	21.2	11.5	136	–24.0	.063	30	.26	171	1.03
0.5	.18	149	20.5	10.6	128	–23.4	.068	35	.24	170	1.03
0.6	.15	148	19.7	9.7	120	–22.6	.074	38	.24	169	1.03
0.7	.13	148	19.0	8.9	114	–21.8	.081	40	.22	169	1.04
0.8	.11	152	18.3	8.2	108	–21.1	.088	42	.21	169	1.04
0.9	.09	158	17.6	7.6	102	–20.4	.095	43	.20	168	1.04
1.0	.07	169	16.9	7.0	98	–19.9	.101	44	.19	169	1.05
1.5	.08	–123	14.0	5.0	79	–17.3	.136	45	.10	179	1.06
2.0	.11	–124	11.8	3.9	63	–15.5	.167	42	.06	–147	1.08
2.5	.15	–167	10.1	3.2	56	–14.3	.193	43	.06	–177	1.10
3.0	.27	158	8.3	2.6	43	–13.5	.211	38	.12	149	1.13
3.5	.38	145	6.8	2.2	32	–13.1	.222	34	.16	145	1.14
4.0	.46	135	5.6	1.9	21	–12.6	.234	30	.17	144	1.14

Typical Performance, T_A = 25°C

(unless otherwise noted)

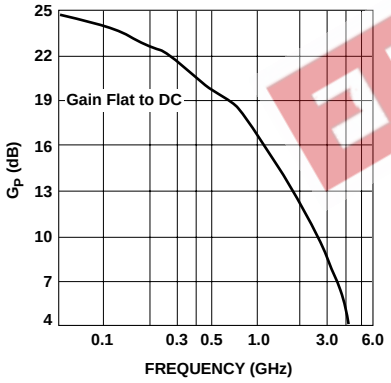


Figure 1. Power Gain vs. Frequency, I_d = 29 mA.

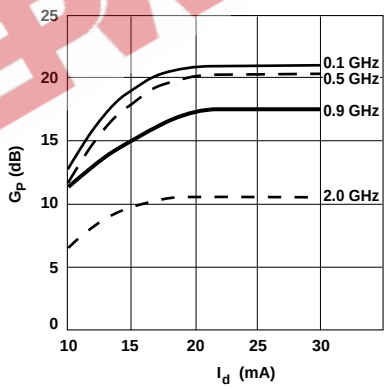


Figure 2. Power Gain vs. Current.

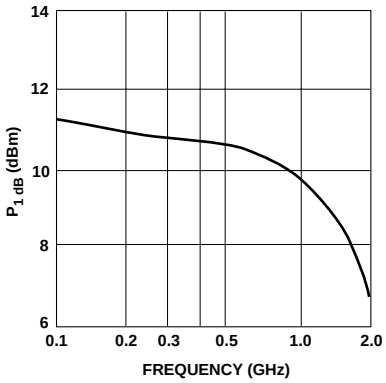


Figure 3. Output Power at 1 dB Gain Compression vs. Frequency, I_d = 29 mA.

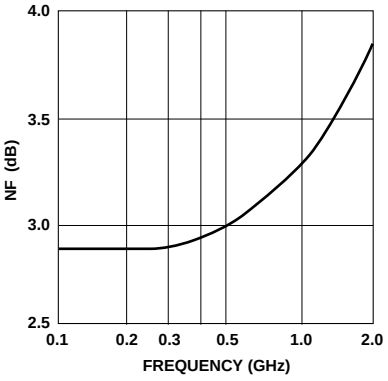
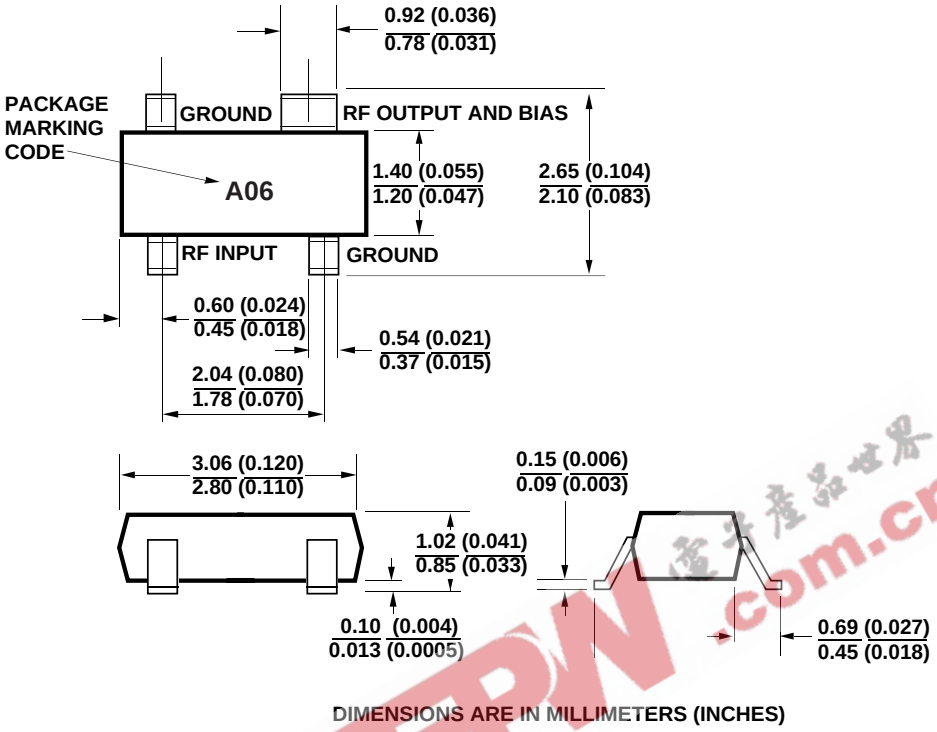


Figure 4. Noise Figure vs. Frequency, I_d = 29 mA.

SOT-143 Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES)