HEWLETT PACKARD

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-0611

Features

- **Cascadable 50 Ω Gain Block**
- **3 dB Bandwidth:** DC to 0.7 GHz
- **High Gain:** 18.0 dB Typical at 0.5 GHz
- **Low Noise Figure:** 3.0 dB Typical at 0.5 GHz
- **Low Cost Surface Mount Plastic Package**
- **Tape-and-Reel Packaging Option Available**[1]

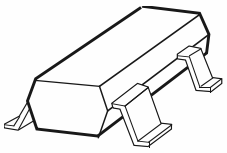
Note:
1. Refer to PACKAGING section "Tape-and-Reel Packaging for Semiconductor Devices".

Description

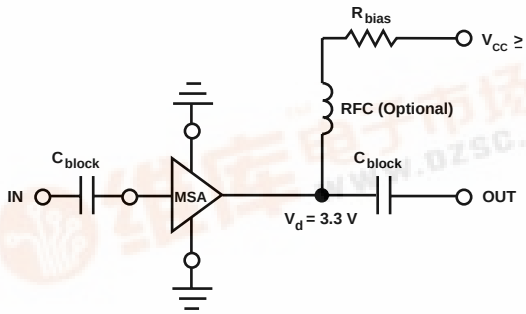
The MSA-0611 is a low cost silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in the surface mount plastic SOT-143 package. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and 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-0611 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 to 150°C

Thermal Resistance[2,4]:
$\theta_{jc} = 505°C/W$

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 $T_C > 87°C$.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

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

Symbol	Parameters and Test Conditions: $I_d = 16$ mA, $Z_O = 50\ \Omega$		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz f = 0.5 GHz	dB	 16.0	19.5 18.0	
ΔG_P	Gain Flatness	f = 0.1 to 0.5 GHz	dB		±0.8	
$f_{3\ dB}$	3 dB Bandwidth		GHz		0.7	
VSWR	Input VSWR	f = 0.1 to 1.5 GHz			1.6:1	
	Output VSWR	f = 0.1 to 1.5 GHz			1.5:1	
NF	50 Ω Noise Figure	f = 0.5 GHz	dB		3.0	
$P_{1\ dB}$	Output Power at 1 dB Gain Compression	f = 0.5 GHz	dBm		2.0	
IP_3	Third Order Intercept Point	f = 0.5 GHz	dBm		14.0	
t_D	Group Delay	f = 0.5 GHz	psec		225	
V_d	Device Voltage	$T_C = 25°C$	V	2.6	3.3	4.0
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Notes:
1. The recommended operating current range for this device is 12 to 20 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-0611-TR1	3000	7" Reel
MSA-0611-BLK	100	Antistatic Bag

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

MSA-0611 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 16 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	k
0.1	.04	–176	19.6	9.53	170	–23.0	.071	6	.04	–57	1.07
0.2	.03	–163	19.3	9.25	160	–22.7	.073	10	.07	–82	1.07
0.3	.03	–149	18.9	8.79	150	–22.8	.072	14	.09	–97	1.10
0.4	.04	–132	18.5	8.38	141	–21.9	.080	17	.11	–111	1.07
0.5	.05	–127	18.0	7.96	133	–21.6	.083	21	.13	–122	1.07
0.6	.07	–123	17.3	7.33	125	–21.2	.087	23	.15	–131	1.07
0.8	.10	–129	16.2	6.46	111	–19.7	.103	25	.17	–147	1.04
1.0	.13	–139	15.0	5.64	98	–19.0	.112	28	.18	–160	1.06
1.5	.22	–164	12.5	4.22	73	–17.1	.139	25	.19	175	1.07
2.0	.31	171	10.1	3.20	53	–16.1	.157	21	.19	160	1.13
2.5	.39	158	8.1	2.55	42	–15.4	.169	22	.20	153	1.19
3.0	.45	144	6.3	2.07	28	–15.0	.178	18	.19	150	1.26
3.5	.50	132	4.7	1.72	16	–14.6	.185	15	.16	152	1.33
4.0	.52	121	3.4	1.48	4	–14.1	.197	11	.14	166	1.37

A model for this device is available in the DEVICE MODELS section.

Typical Performance, T_A = 25°C

(unless otherwise noted)

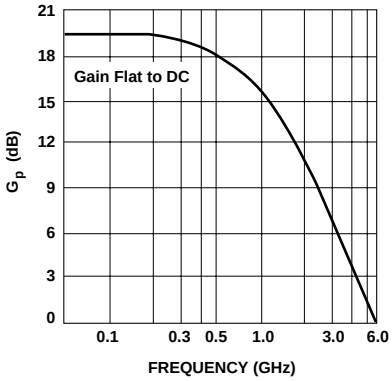


Figure 1. Power Gain vs. Frequency, T_A = 25°C, I_d = 16 mA.

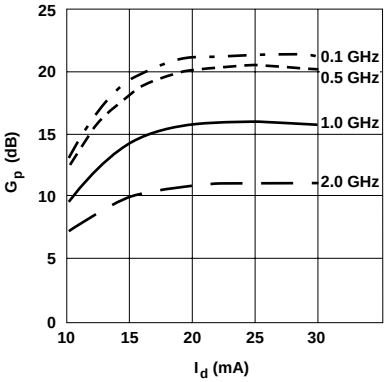


Figure 2. Power Gain vs. Current.

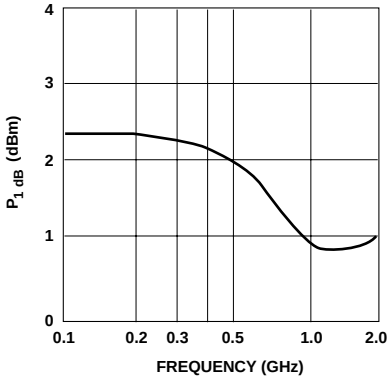


Figure 3. Output Power @ 1 dB Gain Compression vs. Frequency, I_d = 16 mA.

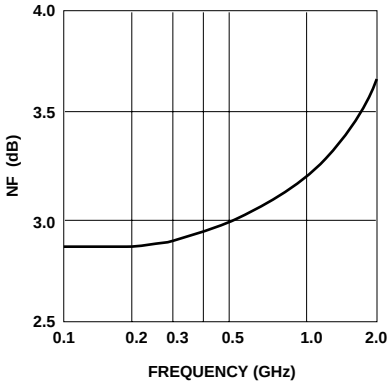
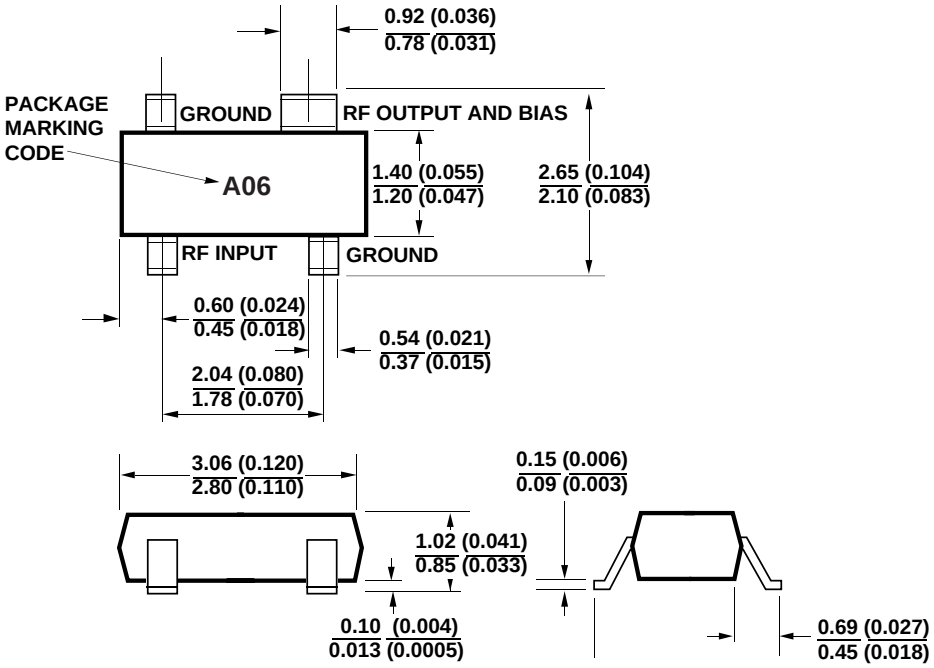


Figure 4. Noise Figure vs. Frequency, I_d = 16 mA.

SOT-143 Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES)