MSA-0636

Cascadable Silicon Bipolar MMIC Amplifiers

Data Sheet

Description

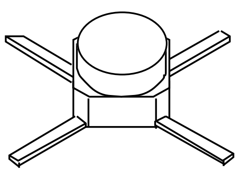
The MSA-0636 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a cost effective, microstrip package. This MMIC is designed for use as a general purpose 50Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

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.

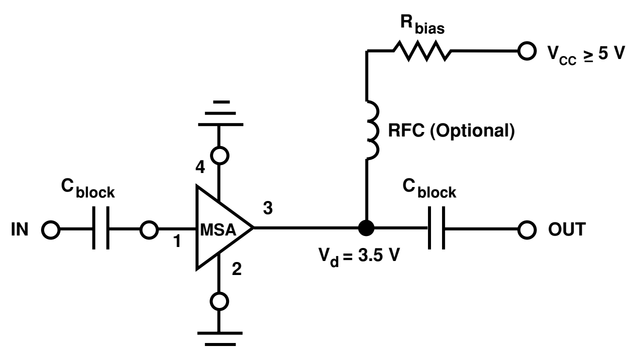
Features

- Cascadable 50Ω Gain Block
- Low Operating Voltage:
  3.5 V Typical V_d
- 3 dB Bandwidth:
  DC to 0.9 GHz
- High Gain:
  19.0 dB Typical at 0.5 GHz
- Low Noise Figure:
  2.8 dB Typical at 0.5 GHz
- Cost Effective Ceramic Microstrip Package

36 micro-X Package



Typical Biasing Configuration



MSA-0636 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	50 mA
Power Dissipation[2,3]	200 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature[4]	–65 to 150°C

Thermal Resistance[2,5]:
θ_{jc} = 155°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 6.5 mW/°C for T_C > 169°C.
4. Storage above +150°C may tarnish the leads of this package making it difficult to solder into a circuit.
5. 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 = 16 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz	dB	19.0	20.5	22.0
ΔG_P	Gain Flatness	f = 0.1 to 0.5 GHz	dB		±0.7	±1.0
$f_{3\ dB}$	3 dB Bandwidth		GHz		0.9	
VSWR	Input VSWR	f = 0.1 to 1.5 GHz			1.4:1	
	Output VSWR	f = 0.1 to 1.5 GHz			1.3:1	
NF	50 Ω Noise Figure	f = 0.5 GHz	dB		2.8	4.0
$P_{1\ dB}$	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		14.5	
t_D	Group Delay	f = 0.5 GHz	psec		200	
V_d	Device Voltage		V	3.1	3.5	3.9
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Note:
1. The recommended operating current range for this device is 12 to 30 mA. Typical performance as a function of current is on the following page.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-0636-BLKG	100	Bulk
MSA-0636-TR1G	1000	7" Reel

MSA-0636 Typical Scattering Parameters (Z_0 = 50 Ω, T_A = 25°C, I_d = 16 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
0.1	.03	–178	20.5	10.59	171	–23.4	.068	5	.04	–44	1.05
0.2	.02	–177	20.3	10.31	161	–22.9	.071	8	.05	–68	1.04
0.3	.02	–164	20.0	9.96	152	–22.4	.076	14	.06	–87	1.04
0.4	.02	–116	19.6	9.55	144	–22.0	.079	19	.07	–104	1.03
0.5	.02	–100	19.2	9.08	136	–21.8	.081	21	.09	–114	1.04
0.6	.04	–89	18.7	8.59	128	–21.3	.086	24	.09	–123	1.04
0.8	.07	–96	17.7	7.66	115	–20.2	.098	29	.10	–140	1.03
1.0	.10	–108	16.6	6.79	103	–19.4	.107	31	.11	–156	1.02
1.5	.17	–134	14.2	5.13	79	–17.2	.138	30	.12	172	1.03
2.0	.24	–160	12.1	4.01	60	–15.8	.163	26	.12	148	1.04
2.5	.31	–178	10.3	3.26	48	–15.1	.175	27	.12	140	1.08
3.0	.37	166	8.7	2.72	34	–14.4	.190	24	.11	135	1.10
3.5	.42	151	7.4	2.33	21	–13.9	.203	19	.10	144	1.11
4.0	.46	139	6.2	2.04	9	–13.3	.216	16	.08	167	1.11
4.5	.48	126	5.1	1.81	–3	–12.8	.229	12	.08	–173	1.11
5.0	.52	110	4.2	1.62	–15	–12.2	.245	8	.09	–173	1.09

Typical Performance, T_A = 25°C

(unless otherwise noted)

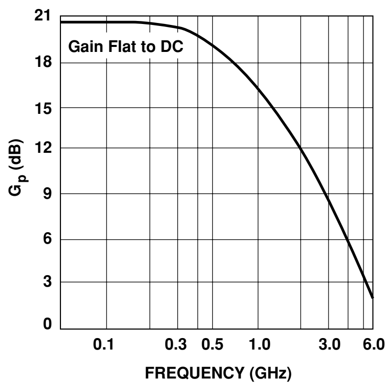


Figure 1. Typical Power Gain vs. Frequency, I_d = 16 mA.

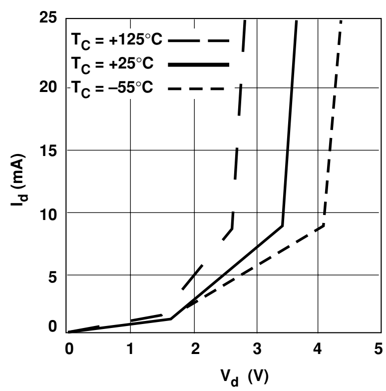


Figure 2. Device Current vs. Voltage.

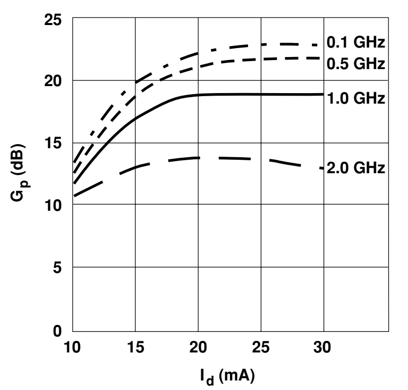


Figure 3. Power Gain vs. Current.

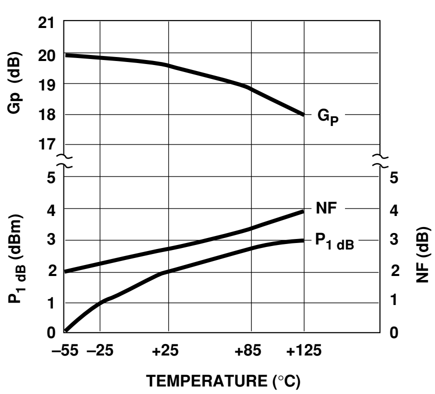


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 0.5 GHz, I_d = 16 mA.

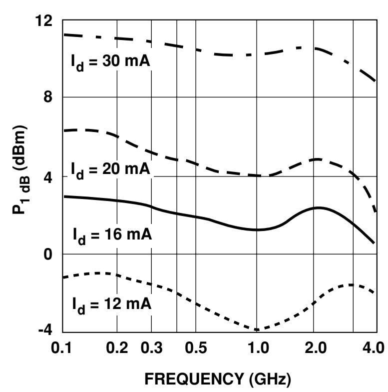


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

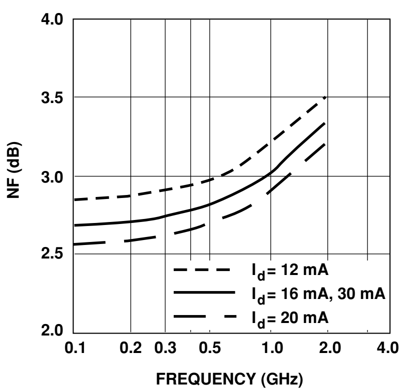
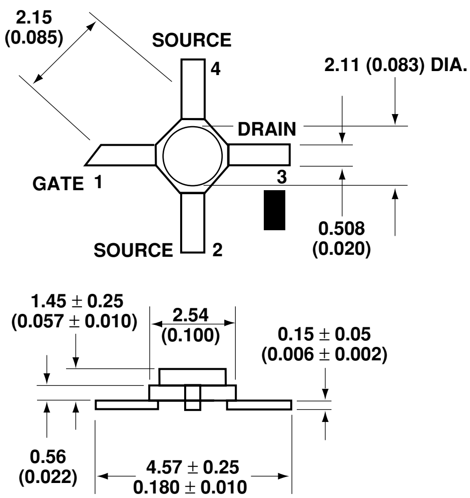


Figure 6. Noise Figure vs. Frequency.

36 micro-X Package Dimensions



Notes:

1. Dimensions are in millimeters (inches)
2. Tolerances: in .xxx = ± 0.005
   mm .xx = ± 0.13

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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