

Features

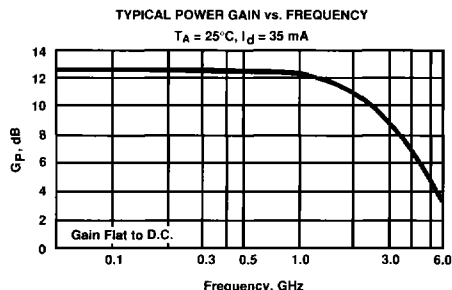
- **Cascadable 50 Ω Gain Block**
- **3 dB Bandwidth: DC to 2.8 GHz**
- **12.0 dB typical Gain at 1.0 GHz**
- **10.0 dBm typical $P_{1\text{ dB}}$ at 1.0 GHz**

Description

The MSA-0300 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) chip. This MODAMP™ 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, industrial and military applications.

The MODAMP MSA-series is fabricated using a 10 GHz f_t , 25 GHz f_{MAX} silicon bipolar MMIC process which utilizes nitride self-alignment, ion implantation and gold metallization to achieve excellent uniformity, performance, and reliability. The use of an external bias resistor for temperature and current stability also allows bias flexibility.

The recommended assembly procedure is gold-eutectic die attach at 400°C and either wedge or ball bonding using 0.7 mil gold wire. See APPLICATIONS section, "Chip Use".



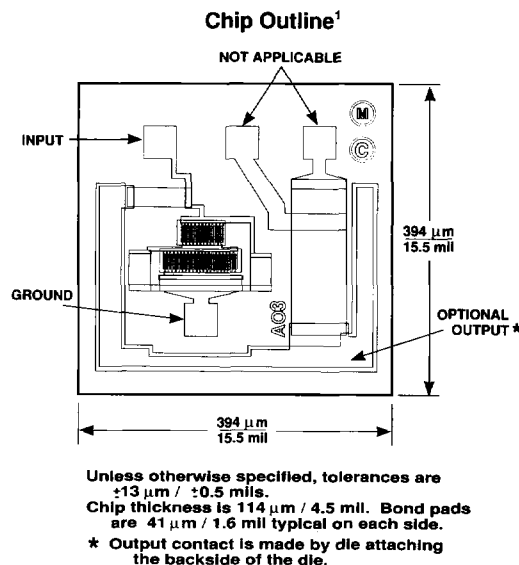
Electrical Specifications², $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions ³ : $I_d = 35\text{ mA}$, $Z_0 = 50\ \Omega$	Units	Min.	Typ.	Max.
GP	Power Gain ($ S_{21} ^2$) $f = 0.1\text{ GHz}$	dB		12.5	
ΔGP	Gain Flatness $f = 0.1\text{ to }1.8\text{ GHz}$	dB		± 0.6	
$f_{3\text{ dB}}$	3 dB Bandwidth	GHz		2.8	
VSWR	Input VSWR $f = 0.1\text{ to }3.0\text{ GHz}$			1.8:1	
	Output VSWR $f = 0.1\text{ to }3.0\text{ GHz}$			1.8:1	
$P_{1\text{ dB}}$	Output Power @ 1 dB Gain Compression $f = 1.0\text{ GHz}$	dBm		10.0	
NF	50 Ω Noise Figure $f = 1.0\text{ GHz}$	dB		6.0	
IP ₃	Third Order Intercept Point $f = 1.0\text{ GHz}$	dBm		23.0	
t_p	Group Delay $f = 1.0\text{ GHz}$	psec.		125	
V_d	Device Voltage	V	4.5	5.0	5.5
dV/dT	Device Voltage Temperature Coefficient	mV/ $^\circ\text{C}$		-8.0	

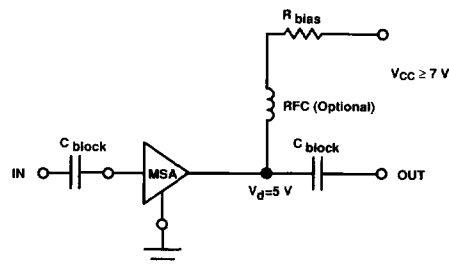
Notes: 1. This chip contains additional biasing options. The performance specified applies only to the bias option whose bond pads are indicated on the chip outline. Refer to the APPLICATIONS section "MODAMP™ Silicon MMIC Chip Use" for additional information.

2. The recommended operating current range for this device is 20 mA to 50 mA. Typical performance as a function of current is on the following page.

3. RF performance of the chip is determined by packaging and testing 10 devices per wafer in a dual ground configuration.



Typical Biasing Configuration



MSA-0300 MODAMP™ Cascadable Silicon Bipolar Monolithic Microwave Integrated Circuit Amplifiers

Absolute Maximum Ratings

Parameter	Absolute Maximum ¹
Device Current	80 mA
Power Dissipation ^{2,3}	425 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature	-65°C to 200°C

Thermal Resistance^{2,4}: $\theta_{jc} = 45^\circ\text{C/W}$

Notes:

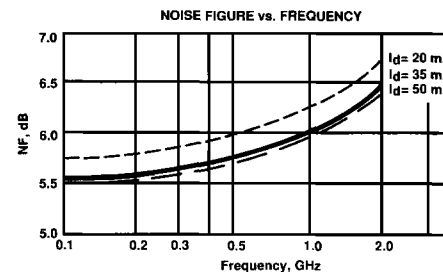
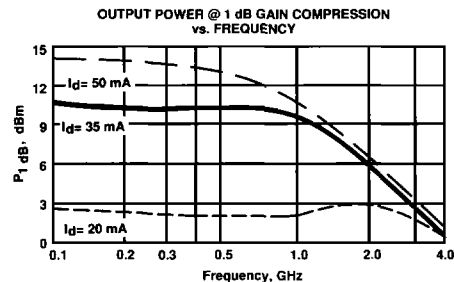
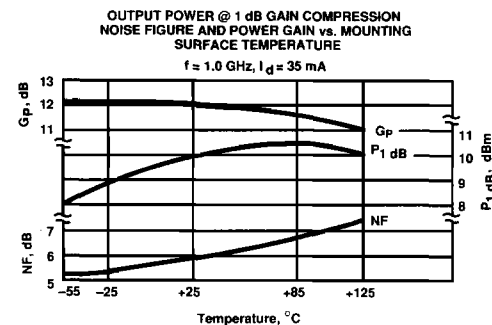
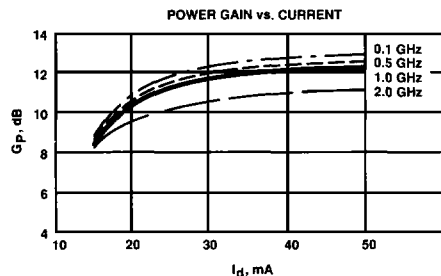
1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE} = 25^\circ\text{C}$
3. Derate at $22.2 \text{ mW}/^\circ\text{C}$ for $T_C > 181^\circ\text{C}$.
4. The small spot size of this technique results in a higher, though more accurate determination of θ_{jc} than do alternate methods. See MEASUREMENTS section "Thermal Resistance" for more information.

Part Number Ordering Information

Part Number	Devices Per Tray
MSA-0300-GP2	10
MSA-0300-GP4	100
MSA-0300-GP6	up to 300

Typical Performance, $T_A = 25^\circ\text{C}$

(unless otherwise noted)



Typical Scattering Parameters⁴: $Z_0 = 50 \Omega$

$T_A = 25^\circ\text{C}, I_d = 35 \text{ mA}$

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
0.1	.13	-179	12.6	4.28	177	-18.6	.118	2	.09	-13	1.21
0.2	.13	-179	12.6	4.27	172	-18.3	.121	3	.10	-27	1.19
0.4	.12	-179	12.5	4.24	165	-18.3	.121	5	.12	-48	1.19
0.6	.11	-177	12.5	4.22	158	-18.2	.123	8	.14	-65	1.18
0.8	.11	-172	12.4	4.19	152	-17.8	.129	11	.17	-76	1.15
1.0	.10	-166	12.4	4.15	144	-17.7	.130	12	.20	-85	1.14
1.5	.11	-145	12.0	4.00	126	-17.1	.139	17	.24	-104	1.09
2.0	.16	-140	11.5	3.76	109	-16.2	.154	20	.27	-122	1.03
2.5	.23	-141	10.8	3.47	97	-15.6	.166	25	.28	-133	0.99
3.0	.29	-149	9.8	3.10	82	-15.2	.173	24	.28	-145	0.99
3.5	.35	-157	8.7	2.72	67	-14.5	.188	22	.27	-148	0.97
4.0	.38	-164	7.6	2.40	55	-14.3	.193	21	.25	-146	1.00
5.0	.41	179	5.5	1.88	35	-13.7	.206	17	.21	-134	1.14
6.0	.43	153	3.6	1.51	18	-13.3	.217	14	.21	-137	1.27

Note: 4. S-parameters are de-embedded from 70 mil package measured data using the package model found in the DEVICE MODELS section.