HEWLETT PACKARD

MSA-0235, -0236
MODAMP™ Cascadable Silicon Bipolar Monolithic Microwave Integrated Circuit Amplifiers

Features

- **Cascadable 50 Ω Gain Block**
- **3 dB Bandwidth: DC to 2.7 GHz**
- **12.0 dB typical Gain at 1.0 GHz**
- **Unconditionally Stable (k>1)**
- **Cost Effective Ceramic Microstrip Package**

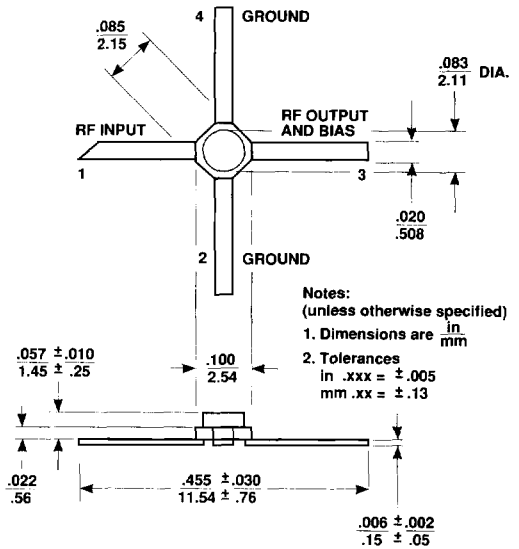
Description

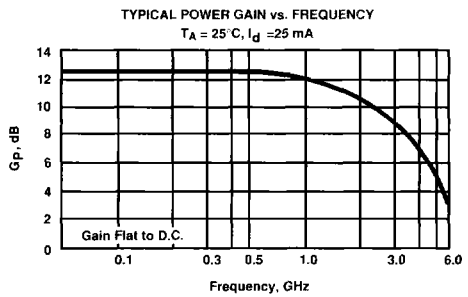
The MSA-0235 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a cost effective, microstrip package. This MODAMP™ MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial 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.

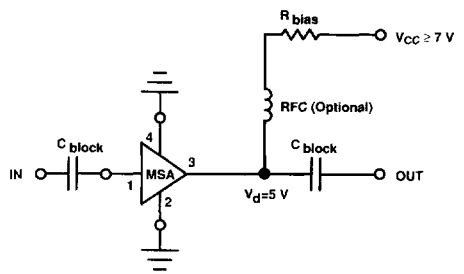
Available in cut lead version (package 36) as MSA-0236.

35 micro-X Package[1]





Typical Biasing Configuration



Electrical Specifications[2], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 25 mA, Z_O = 50 Ω		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 1.6 GHz	dB		±0.6	±1.0
$f_{3\,dB}$	3 dB Bandwidth		GHz		2.7	
VSWR	Input VSWR	f = 0.1 to 3.0 GHz			1.2:1	
	Output VSWR	f = 0.1 to 3.0 GHz			1.4:1	
$P_{1\,dB}$	Output Power @ 1 dB Gain Compression	f = 1.0 GHz	dBm		4.5	
NF	50 Ω Noise Figure	f = 1.0 GHz	dB		6.5	
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm		17.0	
t_D	Group Delay	f = 1.0 GHz	psec.		125	
V_d	Device Voltage		V	4.5	5.0	5.5
dV/dT	Device Voltage Temperature Coefficient		mV/°C		-8.0	

Notes: 1. Short leaded 36 package available upon request.
2. The recommended operating current range for this device is 18 mA to 40 mA. Typical performance as a function of current is on the following page.

Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	60 mA
Power Dissipation[2,3]	325 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature[4]	–65°C to 200°C

Thermal Resistance[2,5]: θ_{jc} = 145°C/W

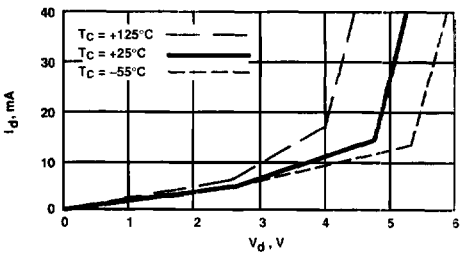
Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C
3. Derate at 6.9 mW/°C for T_C > 153°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. See MEASUREMENTS section "Thermal Resistance" for more information.

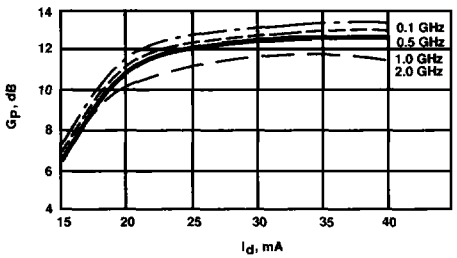
Typical Performance, T_A = 25°C

(unless otherwise noted)

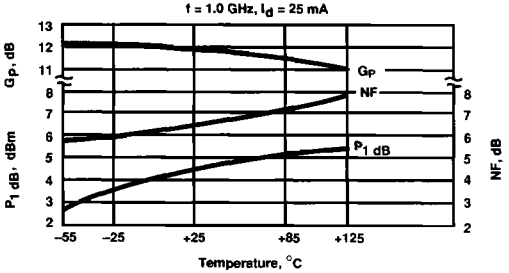
DEVICE CURRENT vs. VOLTAGE



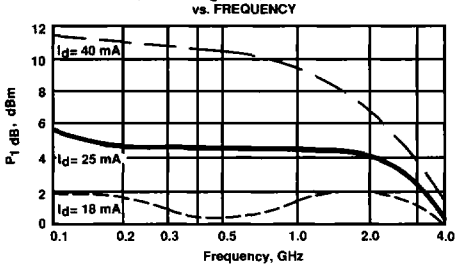
POWER GAIN vs. CURRENT



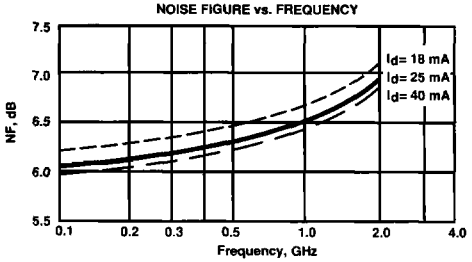
OUTPUT POWER @ 1 dB GAIN COMPRESSION
NOISE FIGURE AND POWER GAIN vs. CASE TEMPERATURE
f = 1.0 GHz, I_d = 25 mA



OUTPUT POWER @ 1 dB GAIN COMPRESSION
vs. FREQUENCY



NOISE FIGURE vs. FREQUENCY



Typical Scattering Parameters: Z_O = 50 Ω

T_A = 25°C, I_d = 25 mA

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.08	170	12.6	4.25	176	–18.6	.118	2	.16	–6
0.2	.08	163	12.5	4.23	171	–18.5	.119	2	.15	–10
0.4	.08	147	12.5	4.19	161	–18.4	.120	4	.15	–21
0.6	.08	130	12.4	4.14	152	–18.3	.121	4	.15	–30
0.8	.07	112	12.2	4.09	143	–18.1	.125	7	.15	–39
1.0	.07	91	12.1	4.02	134	–18.0	.126	10	.15	–46
1.5	.06	47	11.6	3.80	112	–17.3	.137	11	.13	–66
2.0	.03	–1	11.0	3.53	91	–16.3	.153	10	.11	–89
2.5	.03	–115	10.2	3.24	75	–15.4	.169	12	.09	–111
3.0	.09	–157	9.3	2.92	57	–15.1	.176	8	.08	–127
3.5	.16	–175	8.3	2.60	39	–14.4	.190	3	.09	–129
4.0	.20	173	7.2	2.29	23	–14.1	.198	–2	.11	–118
5.0	.27	136	5.2	1.81	–6	–13.5	.211	–11	.15	–117
6.0	.41	94	3.2	1.44	–33	–13.5	.212	–24	.11	–148

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