

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-0304

Features

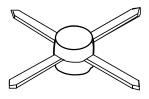
- Cascadable 50 Ω Gain Block
- **3 dB Bandwidth:** DC to 1.6 GHz
- 11.0 dB Typical Gain at 1.0 GHz
- * 10.0 dBm Typical $P_{1 dB}$ at 1.0 GHz
- Unconditionally Stable (k>1)
- Low Cost Plastic Package

Description

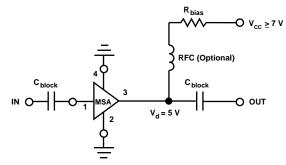
The MSA-0304 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost plastic package. This MMIC is designed for use as a general purpose 50Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and military 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.

04A Plastic Package



Typical Biasing Configuration



MSA-0304 Absolute Maximum Ratings

Parameter	Absolute Maximum ^[1]		
Device Current	70 mA		
Power Dissipation ^[2,3]	400 mW		
RF Input Power	+13dBm		
Junction Temperature	150°C		
Storage Temperature	−65 to 150°C		

Thermal Resistance^[2,4]: $\theta_{jc} = 100^{\circ}C/W$

Notes:

- Permanent damage may occur if any of these limits are exceeded.
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- 2. $T_{CASE} = 25^{\circ}C.$
- 3. Derate at 10 mW/°C for $T_{\rm C} > 110$ °C.
- 4. See MEASUREMENTS section "Thermal Resistance" for more information.

Symbol	Parameters and Test Conditions: I_{d} = 35 mA, Z_{0} = 50 Ω		Units	Min.	Тур.	Max.
GP	Power Gain $(S_{21} ^2)$	f = 0.1 GHz f = 0.5 GHz f = 1.0 GHz	dB	10.0	12.5 12.0 11.0	
ΔG_P	Gain Flatness	f = 0.1 to 1.3 GHz	dB		± 1.0	
f _{3 dB}	3 dB Bandwidth		GHz		1.6	
VSWR	Input VSWR	f = 0.1 to 3.0 GHz			1.3:1	
	Output VSWR	f = 0.1 to 3.0 GHz			1.6:1	
NF	50Ω Noise Figure	f = 1.0 GHz	dB		6.0	
P _{1 dB}	Output Power at 1 dB Gain Compression	f = 1.0 GHz	dBm		10.0	
IP ₃	Third Order Intercept Point	f = 1.0 GHz	dBm		23.0	
tD	Group Delay	f = 1.0 GHz	psec		150	
Vd	Device Voltage		V	4.5	5.0	5.5
dV/dT	Device Voltage Temperature Coefficient		mV/°C		-8.0	

Electrical Specifications^[1], $T_A = 25^{\circ}C$

Note:

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

 S_{21} \mathbf{S}_{22} S_{11} S_{12} Freq. dB GHz Mag Ang Mag Ang dB Mag Ang Mag Ang 0.1 .10 173 12.54.24 173 -18.5.120 3 .12 -13 0.2 .10 162 12.54.21 167 -18.2.123 4 .12 -24 .09 142 12.2 4.08 -18.0.125 7 .13 0.4 153 -46.08 11.9 -17.8.128 0.6 127 3.93 141 10 .15 -64 3.76 -17.30.8 .07 110 11.5130 .136 14 .16 -781.0 .06 92 11.1 3.58 118 -16.8.144 16 .17 -911.5 .03 58 10.0 3.15 93 -15.5.169 19 .19 -1172.0 .03 175 8.8 2.7671-14.1.197 18 .20 -1392.5.05 163 7.8 2.4655-13.2.218 18 .21 -158.22 3.0 .12 148 6.8 2.20 38 -12.2.246 15 -174

20

-28

-56

3

-11.2

-10.6

-10.2

-9.9

.275

.296

.319

.310

7

1

-15

-31

.24

.26

.29

.37

171

158

128

94

MSA-0304 Typical Scattering Parameters ($Z_0 = 50 \Omega$, $T_A = 25^{\circ}C$, $I_d = 35 mA$)

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

5.9

5.0

3.0

0.4

1.98

1.77

1.41

1.05

129

110

77

52

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

.19

.26

.44

.63

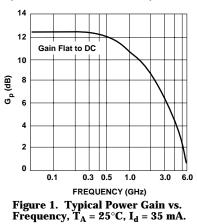
(unless otherwise noted)

3.5

4.0

5.0

6.0



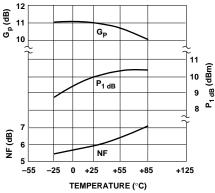


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, I_d =35mA.

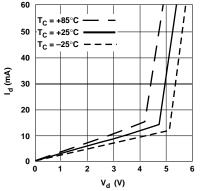


Figure 2. Device Current vs. Voltage.

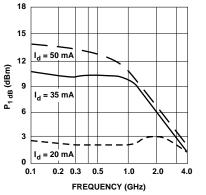
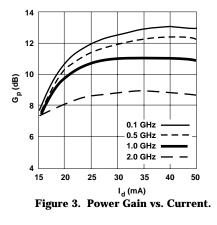
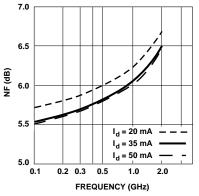


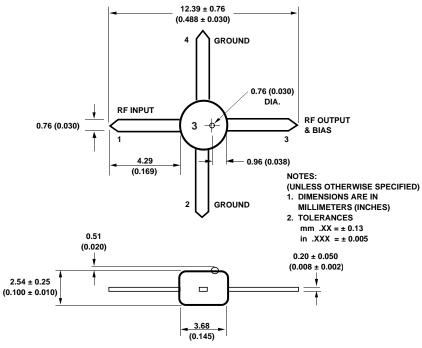
Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.







04A Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES).