

# Cascadable Silicon Bipolar MMIC Amplifier

## Technical Data

**MSA-0385**

### Features

- **Cascadable 50 Ω Gain Block**
- **3 dB Bandwidth:**  
DC to 2.5 GHz
- **12.0 dB Typical Gain at  
1.0 GHz**
- **10.0 dBm Typical P<sub>1 dB</sub> at  
1.0 GHz**
- **Unconditionally Stable  
(k>1)**
- **Low Cost Plastic Package**

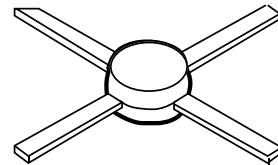
### Description

The MSA-0385 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost

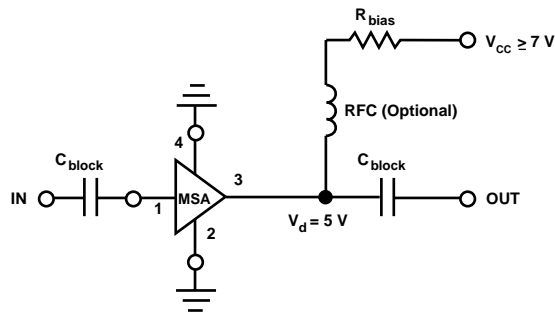
plastic package. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

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.

### 85 Plastic Package



### Typical Biasing Configuration



## MSA-0385 Absolute Maximum Ratings

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

**Thermal Resistance<sup>[2,4]</sup>:**

$$\theta_{jc} = 105^{\circ}\text{C/W}$$

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{\text{CASE}} = 25^{\circ}\text{C}$ .
3. Derate at  $9.5 \text{ mW/}^{\circ}\text{C}$  for  $T_{\text{C}} > 108^{\circ}\text{C}$ .
4. See MEASUREMENTS section “Thermal Resistance” for more information.

## Electrical Specifications<sup>[1]</sup>, $T_{\text{A}} = 25^{\circ}\text{C}$

Symbol	Parameters and Test Conditions: $I_{\text{d}} = 35 \text{ mA}$ , $Z_{\text{o}} = 50 \Omega$	Units	Min.	Typ.	Max.
$G_{\text{P}}$	Power Gain ( $ S_{21} ^2$ ) $f = 0.1 \text{ GHz}$ $f = 1.0 \text{ GHz}$	dB	10.0	12.5 12.0	
$\Delta G_{\text{P}}$	Gain Flatness $f = 0.1 \text{ to } 1.6 \text{ GHz}$	dB		$\pm 0.7$	
$f_{3 \text{ dB}}$	3 dB Bandwidth	GHz		2.5	
VSWR	Input VSWR $f = 0.1 \text{ to } 3.0 \text{ GHz}$			1.5:1	
	Output VSWR $f = 0.1 \text{ to } 3.0 \text{ GHz}$			1.7:1	
NF	50 $\Omega$ Noise Figure $f = 1.0 \text{ GHz}$	dB		6.0	
$P_{1 \text{ dB}}$	Output Power at 1 dB Gain Compression $f = 1.0 \text{ GHz}$	dBm		10.0	
$\text{IP}_3$	Third Order Intercept Point $f = 1.0 \text{ GHz}$	dBm		23.0	
$t_{\text{D}}$	Group Delay $f = 1.0 \text{ GHz}$	psec		125	
$V_{\text{d}}$	Device Voltage	V	4.0	5.0	6.0
$\text{dV/dT}$	Device Voltage Temperature Coefficient	mV/°C		-8.0	

### 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.

### MSA-0385 Typical Scattering Parameters ( $Z_0 = 50 \Omega$ , $T_A = 25^\circ\text{C}$ , $I_d = 35 \text{ mA}$ )

Freq. GHz	$S_{11}$		$S_{21}$			$S_{12}$			$S_{22}$	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.09	178	12.6	4.26	175	-18.1	.124	2	.13	-10
0.2	.09	171	12.5	4.24	170	-18.4	.120	3	.13	-20
0.4	.08	166	12.4	4.17	161	-18.4	.121	6	.14	-41
0.6	.07	160	12.3	4.10	151	-18.0	.126	8	.15	-57
0.8	.07	155	12.1	4.01	142	-17.9	.127	12	.16	-71
1.0	.06	152	11.9	3.92	133	-17.6	.132	12	.18	-84
1.5	.05	-169	11.2	3.63	112	-16.5	.149	18	.21	-112
2.0	.08	-174	10.4	3.29	92	-15.6	.167	19	.23	-136
2.5	.12	-173	9.5	2.98	79	-14.6	.186	22	.25	-150
3.0	.20	178	8.4	2.64	63	-14.1	.198	20	.26	-166
3.5	.25	170	7.5	2.36	47	-13.5	.211	17	.25	-174
4.0	.28	160	6.5	2.12	33	-13.0	.207	13	.24	-180
5.0	.42	134	4.7	1.71	7	-12.2	.224	4	.20	168
6.0	.50	99	2.7	1.37	-18	-12.0	.252	-7	.23	133

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

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

(unless otherwise noted)

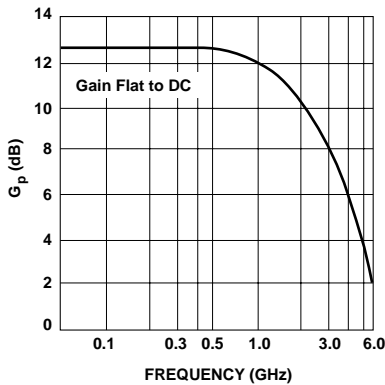


Figure 1. Typical Power Gain vs. Frequency,  $T_A = 25^\circ\text{C}$ ,  $I_d = 35 \text{ mA}$ .

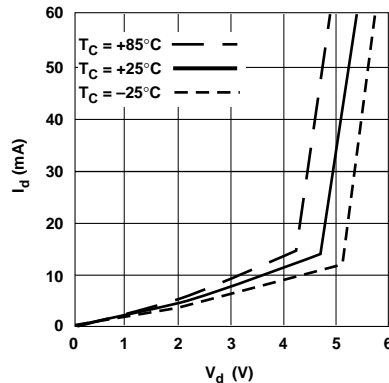


Figure 2. Device Current vs. Voltage.

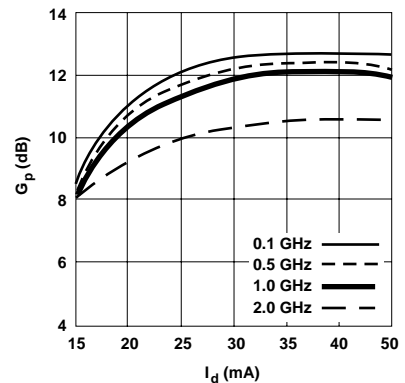


Figure 3. Power Gain vs. Current.

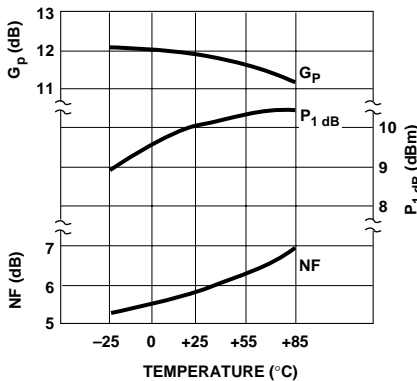


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature,  $f = 1.0 \text{ GHz}$ ,  $I_d = 35 \text{ mA}$ .

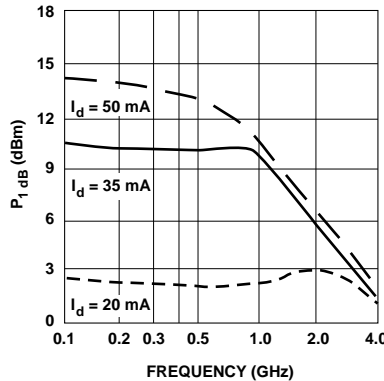


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

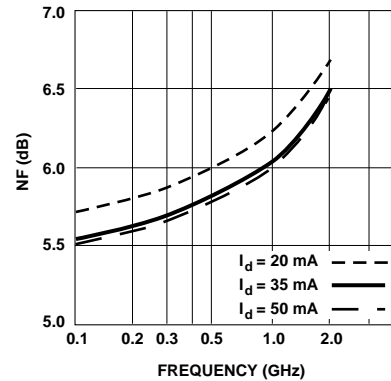


Figure 6. Noise Figure vs. Frequency.

# 85 Plastic Package Dimensions

