

# Cascadable Silicon Bipolar MMIC Amplifier

## Technical Data

MSA-0285

### Features

- **Cascadable 50 Ω Gain Block**
- **3 dB Bandwidth:**  
DC to 2.6 GHz
- **12.0 dB Typical Gain at  
1.0 GHz**
- **Unconditionally Stable  
( $k > 1$ )**
- **Low Cost Plastic Package**

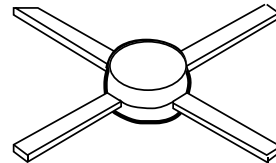
### Description

The MSA-0285 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost plastic package. This MMIC is

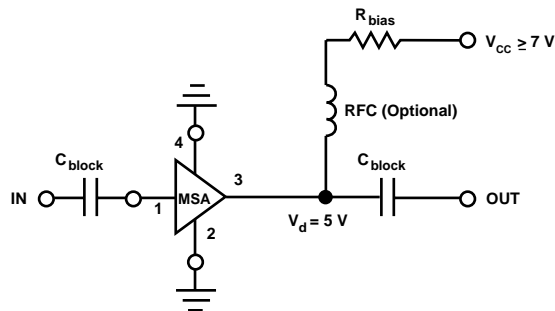
designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and military applications.

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.

### 85 Plastic Package



### Typical Biasing Configuration



## MSA-0285 Absolute Maximum Ratings

Parameter	Absolute Maximum <sup>[1]</sup>
Device Current	60 mA
Power Dissipation <sup>[2,3]</sup>	325 mW
RF Input Power	+13dBm
Junction Temperature	150°C
Storage Temperature	-65 to 150°C

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

$$\theta_{jc} = 95^{\circ}\text{C/W}$$

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{\text{CASE}} = 25^{\circ}\text{C}$ .
3. Derate at  $10.5 \text{ mW}/^{\circ}\text{C}$  for  $T_{\text{C}} > 119^{\circ}\text{C}$ .
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: $I_{\text{d}} = 25 \text{ mA}$ , $Z_{\text{o}} = 50 \Omega$	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		$\pm 0.6$	
$f_{3 \text{ dB}}$	3 dB Bandwidth	GHz		2.6	
VSWR	Input VSWR $f = 0.1 \text{ to } 3.0 \text{ GHz}$			1.3:1	
	Output VSWR $f = 0.1 \text{ to } 3.0 \text{ GHz}$			1.4:1	
NF	50 $\Omega$ Noise Figure $f = 1.0 \text{ GHz}$	dB		6.5	
$P_{1 \text{ dB}}$	Output Power at 1 dB Gain Compression $f = 1.0 \text{ GHz}$	dBm		4.5	
$\text{IP}_3$	Third Order Intercept Point $f = 1.0 \text{ GHz}$	dBm		17.0	
$t_{\text{D}}$	Group Delay $f = 1.0 \text{ GHz}$	psec		125	
$V_{\text{d}}$	Device Voltage	V	4.0	5.0	6.0
$\text{dV}/\text{dT}$	Device Voltage Temperature Coefficient	$\text{mV}/^{\circ}\text{C}$		-8.0	

### Note:

1. The recommended operating current range for this device is 18 to 40 mA. Typical performance as a function of current is on the following page.

### MSA-0285 Typical Scattering Parameters ( $Z_0 = 50 \Omega$ , $T_A = 25^\circ\text{C}$ , $I_d = 25 \text{ mA}$ )

Freq. GHz	$S_{11}$		$S_{21}$			$S_{12}$			$S_{22}$	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.10	174	12.6	4.25	175	-18.6	.118	2	.14	-7
0.2	.10	168	12.5	4.22	171	-18.5	.119	3	.13	-12
0.4	.10	157	12.4	4.17	161	-18.3	.122	6	.14	-26
0.6	.09	143	12.3	4.10	153	-18.3	.121	7	.14	-38
0.8	.08	132	12.1	4.03	144	-18.0	.126	11	.14	-48
1.0	.08	122	11.9	3.95	135	-17.5	.133	12	.14	-60
1.5	.04	95	11.4	3.70	115	-17.0	.142	16	.13	-85
2.0	.02	117	10.6	3.40	95	-16.0	.158	17	.12	-110
2.5	.05	-173	9.9	3.11	82	-15.0	.177	20	.12	-128
3.0	.12	-175	8.9	2.78	65	-14.7	.185	19	.11	-148
3.5	.16	179	7.9	2.49	49	-14.0	.199	14	.10	-145
4.0	.21	169	6.9	2.22	35	-13.7	.207	11	.10	-134
5.0	.28	139	5.0	1.77	9	-13.0	.224	4	.12	-118
6.0	.41	100	3.0	1.42	-16	-12.9	.226	-5	.09	-154

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

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

(unless otherwise noted)

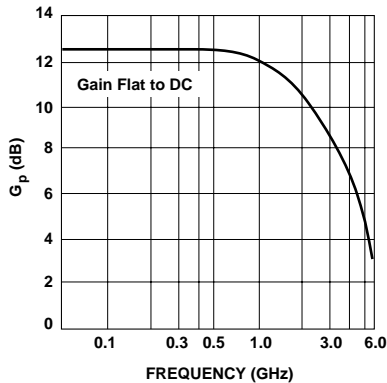


Figure 1. Typical Power Gain vs. Frequency,  $T_A = 25^\circ\text{C}$ ,  $I_d = 25 \text{ mA}$ .

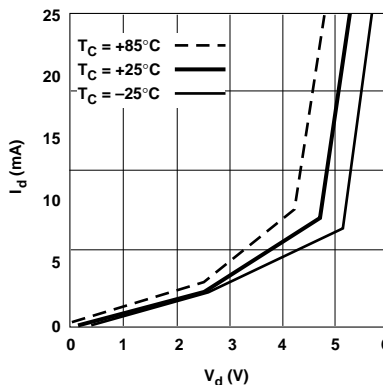


Figure 2. Device Current vs. Voltage.

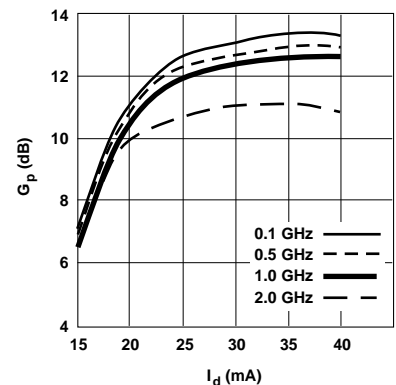


Figure 3. Power Gain vs. Current.

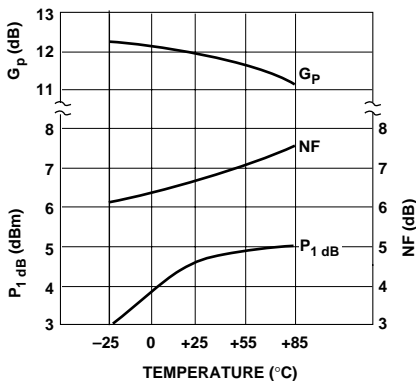


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature,  $f = 1.0 \text{ GHz}$ ,  $I_d = 25 \text{ mA}$ .

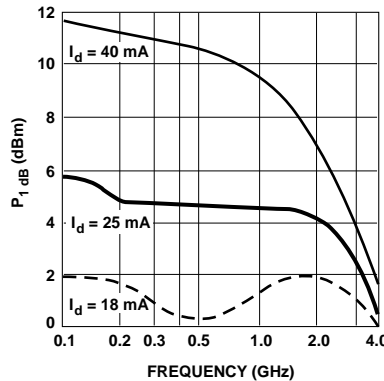


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

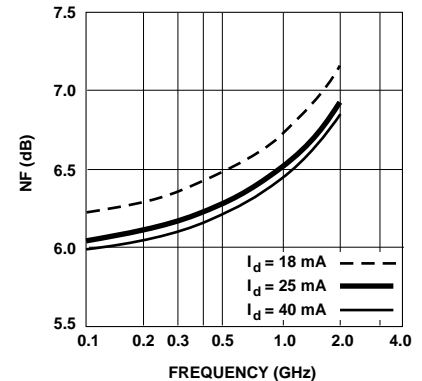


Figure 6. Noise Figure vs. Frequency.

# 85 Plastic Package Dimensions

