

# Cascadable Silicon Bipolar MMIC Amplifier

## Technical Data

**MSA-0785**

### Features

- **Cascadable 50  $\Omega$  Gain Block**
- **Low Operating Voltage:**  
4.0 V Typical  $V_d$
- **3 dB Bandwidth:**  
DC to 2.0 GHz
- **12.5 dB Typical Gain at  
1.0 GHz**
- **Unconditionally Stable  
( $k > 1$ )**
- **Low Cost Plastic Package**

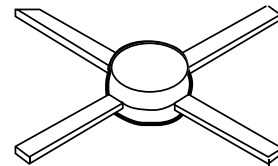
### Description

The MSA-0785 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost

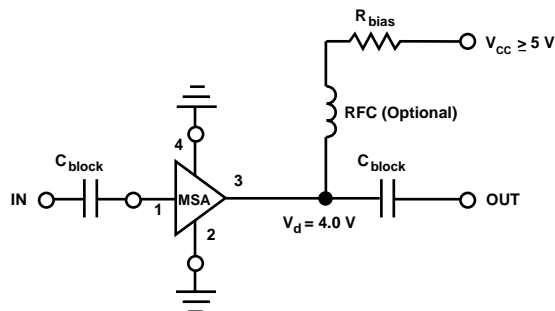
plastic package. This MMIC is designed for use as a general purpose 50  $\Omega$  gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial applications.

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-0785 Absolute Maximum Ratings

Parameter	Absolute Maximum <sup>[1]</sup>
Device Current	60 mA
Power Dissipation <sup>[2,3]</sup>	275 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	-65 to 150°C

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

$$\theta_{jc} = 110^{\circ}\text{C/W}$$

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{\text{CASE}} = 25^{\circ}\text{C}$ .
3. Derate at  $9.1 \text{ mW}/^{\circ}\text{C}$  for  $T_{\text{C}} > 120^{\circ}\text{C}$ .
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: $I_{\text{d}} = 22 \text{ mA}$ , $Z_{\text{o}} = 50 \Omega$	Units	Min.	Typ.	Max.
$G_{\text{P}}$	Power Gain ( $ S_{21} ^2$ ) f = 0.1 GHz f = 1.0 GHz	dB	10.5	13.5 12.5	
$\Delta G_{\text{P}}$	Gain Flatness f = 0.1 to 1.3 GHz	dB		$\pm 0.7$	
$f_{3 \text{ dB}}$	3 dB Bandwidth	GHz		2.0	
VSWR	Input VSWR f = 0.1 to 2.5 GHz			1.4:1	
	Output VSWR f = 0.1 to 2.5 GHz			1.5:1	
NF	50 $\Omega$ Noise Figure f = 1.0 GHz	dB		5.0	
$P_{1 \text{ dB}}$	Output Power at 1 dB Gain Compression f = 1.0 GHz	dBm		5.5	
$\text{IP}_3$	Third Order Intercept Point f = 1.0 GHz	dBm		19.0	
$t_{\text{D}}$	Group Delay f = 1.0 GHz	psec		140	
$V_{\text{d}}$	Device Voltage	V	3.2	4.0	4.8
$\text{dV}/\text{dT}$	Device Voltage Temperature Coefficient	mV/ $^{\circ}\text{C}$		-7.0	

### Note:

1. The recommended operating current range for this device is 15 to 40 mA. Typical performance as a function of current is on the following page.

### MSA-0785 Typical Scattering Parameters ( $Z_0 = 50 \Omega$ , $T_A = 25^\circ\text{C}$ , $I_d = 22 \text{ mA}$ )

Freq. GHz	$S_{11}$		$S_{21}$			$S_{12}$			$S_{22}$	
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.05	166	13.5	4.73	174	-18.4	.120	1	.14	-11
0.2	.05	151	13.4	4.70	169	-18.3	.122	3	.14	-21
0.4	.04	115	13.3	4.63	158	-18.3	.121	6	.14	-40
0.6	.04	65	13.1	4.53	148	-18.0	.125	7	.16	-58
0.8	.05	26	12.9	4.41	138	-17.8	.139	9	.17	-71
1.0	.06	-5	12.6	4.25	127	-17.6	.132	10	.18	-84
1.5	.08	-51	11.6	3.82	104	-16.5	.149	12	.18	-109
2.0	.11	-99	10.5	3.33	82	-15.9	.161	11	.17	-126
2.5	.14	-127	9.3	2.91	68	-15.2	.174	13	.16	-134
3.0	.20	-154	7.9	2.48	52	-14.8	.183	7	.16	-139
3.5	.25	-173	6.7	2.16	37	-14.7	.184	5	.16	-132
4.0	.29	-171	5.5	1.88	23	-14.8	.182	1	.18	-130
5.0	.35	-139	3.5	1.50	-1	-14.3	.193	-6	.21	-133
6.0	.46	100	1.7	1.22	-26	-14.5	.189	-14	.20	-169

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

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

(unless otherwise noted)

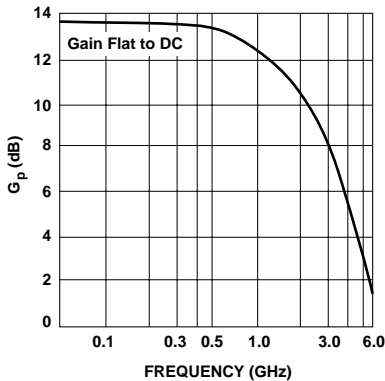


Figure 1. Typical Power Gain vs. Frequency,  $I_d = 22 \text{ mA}$ .

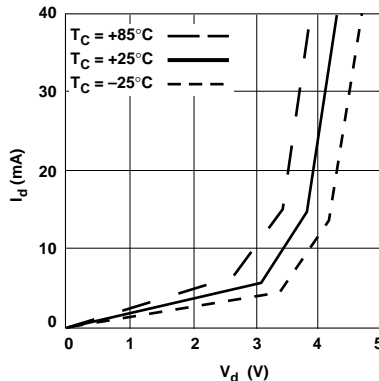


Figure 2. Device Current vs. Voltage.

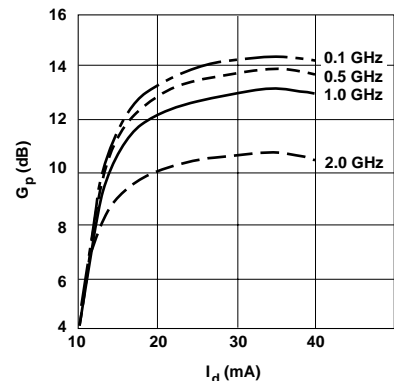


Figure 3. Power Gain vs. Current.

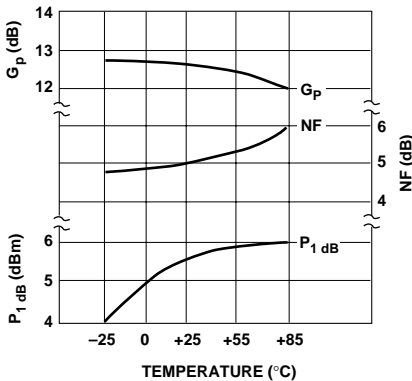


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature,  $f = 1.0 \text{ GHz}$ ,  $I_d = 22 \text{ mA}$ .

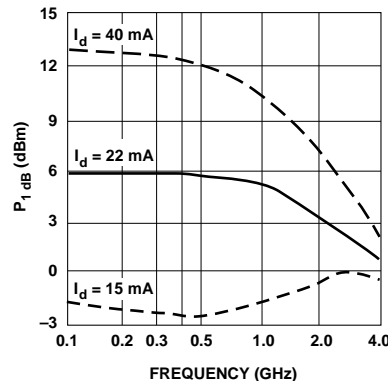


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

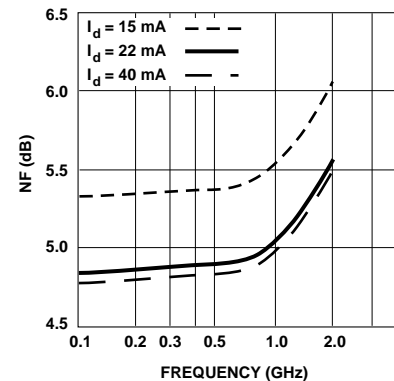


Figure 6. Noise Figure vs. Frequency.

# 85 Plastic Package Dimensions

