# Cascadable Silicon Bipolar MMIC Amplifier



## **Data Sheet**

### Description

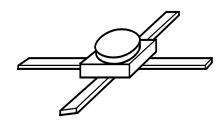
The MSA-0770 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic, high reliability package. This MMIC is designed for use as a general purpose  $50\Omega$  gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and military applications.

The MSA-series is fabricated using Avago'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.

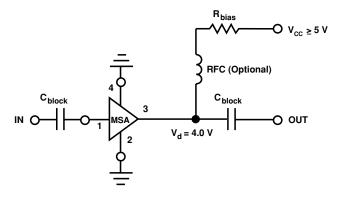
#### **Features**

- Cascadable 50Ω Gain Block
- Low Operating Voltage: 4.0 V Typical V<sub>d</sub>
- 3 dB Bandwidth: DC to 2.5 GHz
- 13.0 dB Typical Gain at 1.0 GHz
- Unconditionally Stable (k>1)
- Hermetic, Gold-ceramic Microstrip Package

### 70 mil Package



### **Typical Biasing Configuration**



MSA-0770 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	200°C		
Storage Temperature	−65 to 200°C		

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

 $\theta_{jc} = 130^{\circ}\text{C/W}$ 

- 1. Permanent damage may occur if any of these limits are exceeded.
- T<sub>CASE</sub> = 25°C.
  Derate at 7.7 mW/°C for T<sub>C</sub> > 164°C.
- 4. Ths small spot size of this technique results in a higher, though more accurate determination of  $\theta_{ic}$  than do alternate methods.

# Electrical Specifications<sup>[1]</sup>, $T_A = 25$ °C

Symbol	Parameters and Test Conditions: $I_d = 22 \text{ m}$	Units	Min.	Тур.	Max.	
G <sub>P</sub>	Power Gain ( S <sub>21</sub>   <sup>2</sup> )	f = 0.1 GHz	dB	12.5	13.5	14.5
$\Delta G_P$	Gain Flatness	f = 0.1 to 1.5 GHz	dB		±0.6	±1.0
f <sub>3 dB</sub>	3 dB Bandwidth		GHz		2.5	
VSWR —	Input VSWR	f = 0.1 to 2.5 GHz			2.0:1	
	Output VSWR	f = 0.1 to 2.5 GHz			1.6:1	
NF	50 Ω Noise Figure	f = 1.0 GHz	dB		4.5	
P <sub>1 dB</sub>	Output Power at 1 dB Gain Compression	f = 1.0 GHz	dBm		5.5	
IP <sub>3</sub>	Third Order Intercept Point	f = 1.0 GHz	dBm		19.0	
t <sub>D</sub>	Group Delay	f = 1.0 GHz	psec		130	
V <sub>d</sub>	Device Voltage		V	3.6	4.0	4.4
dV/dT	Device Voltage Temperature Coefficient		mV/°C		-7.0	

<sup>1.</sup> 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-0770 Typical Scattering Parameters (Z $_0$ = 50 $\Omega$ , T $_A$ = 25°C, I $_d$ = 22 mA)

Freq. S <sub>11</sub>			S <sub>21</sub>			S <sub>12</sub>		S <sub>22</sub>		
GHz	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang
0.1	.04	-7	13.5	4.74	175	-18.6	.118	2	.20	-10
0.2	.05	-11	13.5	4.72	170	-18.4	.120	2	.19	-18
0.4	.06	-24	13.4	4.70	160	-18.4	.121	6	.20	-34
0.6	.08	-38	13.4	4.65	151	-18.1	.124	7	.21	-50
0.8	.10	-48	13.2	4.58	141	-17.8	.133	9	.23	-76
1.0	.12	-58	13.0	4.47	131	-17.5	.133	9	.23	-76
1.5	.20	-82	12.3	4.12	107	-16.6	.148	10	.23	-101
2.0	.30	-107	11.6	3.82	85	-15.7	.163	8	.22	-116
2.5	.37	-123	10.4	3.33	70	-15.3	.171	7	.19	-116
3.0	.42	-140	9.0	2.83	52	-15.4	.170	3	.20	-111
3.5	.46	-154	7.7	2.42	37	-15.4	.170	1	.23	-107
4.0	.47	-167	6.4	2.08	23	-15.5	.169	-4	.29	-107
5.0	.47	163	4.2	1.63	-1	-15.5	.167	-9	.35	-116
6.0	.51	131	2.3	1.30	-23	-15.9	.160	-11	.38	-133

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

(unless otherwise noted)

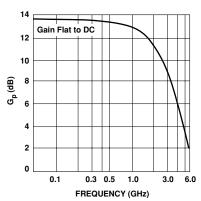


Figure 1. Typical Power Gain vs. Frequency,  $I_d = 22 \text{ mA}$ .

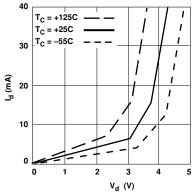


Figure 2. Device Current vs. Voltage.

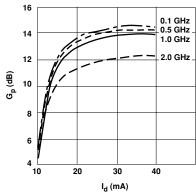


Figure 3. Power Gain vs. Current.

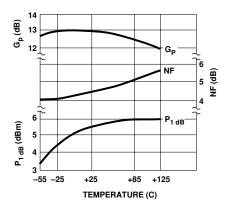


Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz,  $\rm I_d$  = 22 mA.

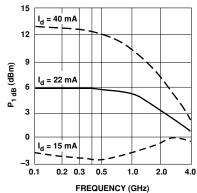


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

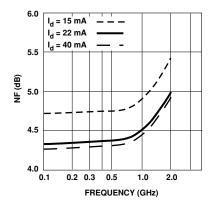
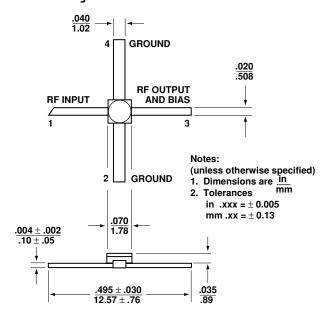


Figure 6. Noise Figure vs. Frequency.

## **Ordering Information**

Part Numbers	No. of Devices	Comments		
MSA-0770	100	Bulk		

## 70 mil Package Dimensions



For product information and a complete list of distributors, please go to our web site: www.avagotech.com

