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MSA-0686

Cascadable Silicon Bipolar MMIC Amplifier

Data Sheet

Description

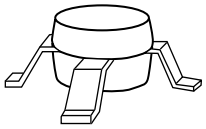
The MSA-0686 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost, surface mount plastic package. This MMIC is designed for use as a general purpose 50Ω gain block. Applications include narrow and broad band IF and RF amplifiers in commercial and industrial 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.

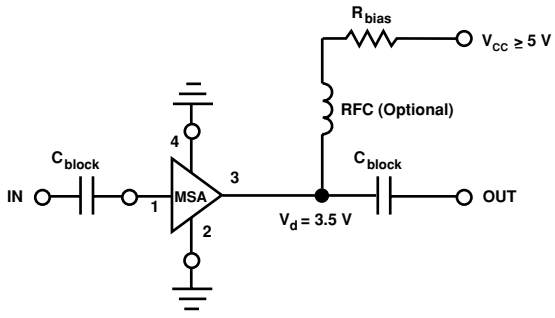
Features

- Cascadable 50Ω Gain Block
- Low Operating Voltage: 3.5 V Typical V_d
- 3 dB Bandwidth: DC to 0.8 GHz
- High Gain: 18.5 dB Typical at 0.5 GHz
- Low Noise Figure: 3.0 dB Typical at 0.5 GHz
- Surface Mount Plastic Package
- Tape-and-Reel Packaging Available
- Lead-free Option Available

86 Plastic Package



Typical Biasing Configuration



MSA-0686 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	50 mA
Power Dissipation[2,3]	200 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	–65 to 150°C

Thermal Resistance[2]:
θ_{jc} = 120°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 8.3 mW/°C for T_C > 126°C.

Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 16 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz	dB		20.0	
		f = 0.5 GHz		16.5	18.5	
ΔG_P	Gain Flatness	f = 0.1 to 0.5 GHz	dB		±0.7	
$f_{3\ dB}$	3 dB Bandwidth		GHz		0.8	
VSWR	Input VSWR	f = 0.1 to 1.5 GHz			1.7:1	
	Output VSWR	f = 0.1 to 1.5 GHz			1.7:1	
NF	50 Ω Noise Figure	f = 0.5 GHz	dB		3.0	
$P_{1\ dB}$	Output Power at 1 dB Gain Compression	f = 0.5 GHz	dBm		2.0	
IP_3	Third Order Intercept Point	f = 0.5 GHz	dBm		14.5	
t_D	Group Delay	f = 0.5 GHz	psec		225	
V_d	Device Voltage		V	2.8	3.5	4.2
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Notes:
1. The recommended operating current range for this device is 12 to 20 mA. Typical performance as a function of current is on the following page.

Ordering Information

Part Numbers	No. of Devices	Comments
MSA-0686-BLK	100	Bulk
MSA-0686-BLKG	100	Bulk
MSA-0686-TR1	1000	7" Reel
MSA-0686-TR1G	1000	7" Reel
MSA-0686-TR2	4000	13" Reel
MSA-0686-TR2G	1000	13" Reel

Note: Order part number with a “G” suffix if lead-free option is desired.

MSA-0686 Typical Scattering Parameters (Z_0 = 50 Ω, T_A = 25°C, I_d = 16 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
0.1	.06	–175	20.1	10.08	170	–23.3	.069	4	.04	–84	1.05
0.2	.06	–169	19.8	9.77	161	–23.2	.069	8	.07	–103	1.05
0.3	.07	–164	19.4	9.35	152	–22.5	.075	13	.10	–113	1.03
0.4	.08	–158	19.1	8.98	144	–22.2	.078	16	.13	–123	1.02
0.5	.08	–154	18.7	8.58	135	–21.6	.083	18	.15	–131	1.01
0.6	.09	–152	18.0	7.94	128	–21.1	.088	21	.18	–140	1.01
0.8	.12	–152	17.2	7.25	114	–20.3	.097	25	.21	–155	1.00
1.0	.15	–154	16.3	6.51	102	–19.5	.106	25	.24	–168	0.99
1.5	.25	–171	14.0	5.01	76	–17.6	.133	22	.27	165	0.99
2.0	.34	171	11.9	3.94	56	–16.1	.157	19	.27	147	1.01
2.5	.43	155	9.8	3.09	42	–15.9	.161	16	.27	134	1.06
3.0	.49	140	8.0	2.51	28	–15.3	.171	11	.26	124	1.10
3.5	.56	128	6.4	2.09	15	–15.1	.175	6	.25	118	1.13
4.0	.61	118	5.0	1.78	3	–14.9	.180	3	.24	115	1.15
5.0	.70	99	2.4	1.32	–18	–14.7	.185	–2	.24	118	1.16

Typical Performance, T_A = 25°C

(unless otherwise noted)

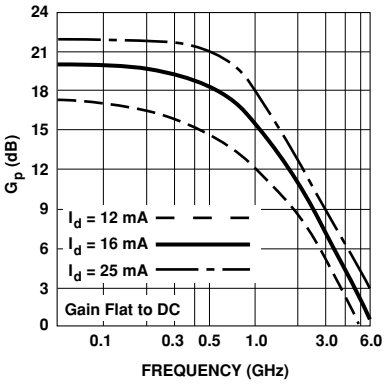


Figure 1. Typical Power Gain vs. Frequency, T_A = 25°C.

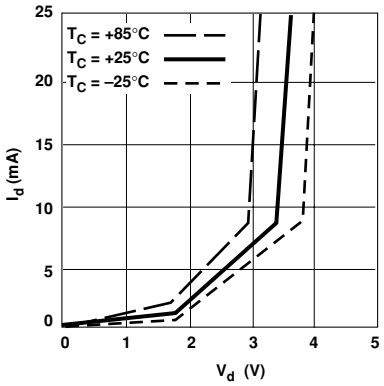


Figure 2. Device Current vs. Voltage.

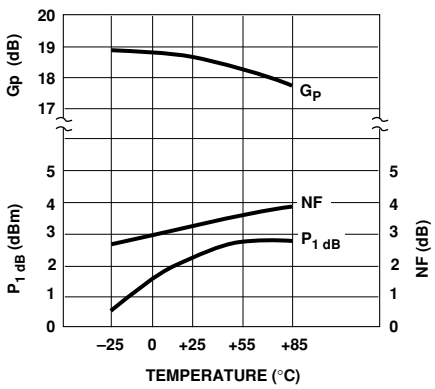


Figure 3. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, I_d = 16 mA.

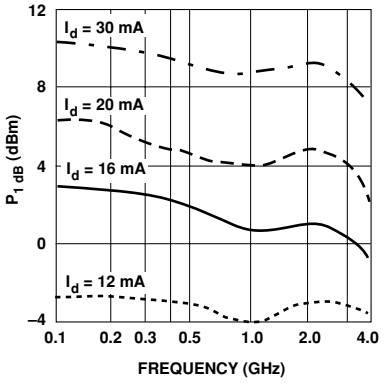


Figure 4. Output Power at 1 dB Gain Compression vs. Frequency.

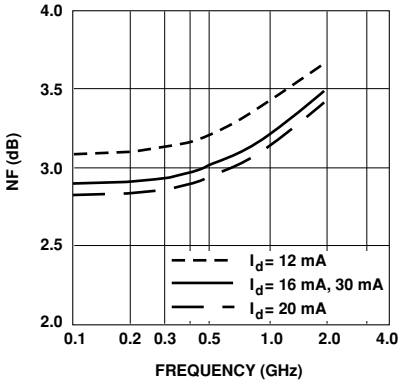
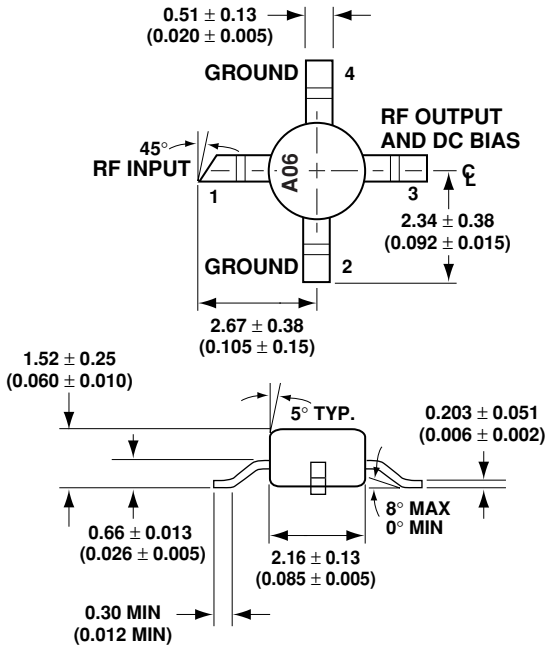


Figure 5. Noise Figure vs. Frequency.

86 Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES)

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

Obsoletes 5965-9588EN
5989-2757EN May 11, 2006