Agilent Technologies
Innovating the HP Way

Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-1105

Features

- **High Dynamic Range Cascadable 50 Ω or 75 Ω Gain Block**
- **3 dB Bandwidth:** 50 MHz to 1.3 GHz
- **17.5 dBm Typical $P_{1\ dB}$ at 0.5 GHz**
- **3.6 dB Typical Noise Figure at 0.5 GHz**
- **Surface Mount Plastic Package**
- **Tape-and-Reel Packaging Option Available[1]**

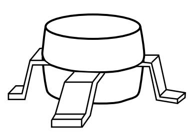
Note:
1. Refer to PACKAGING section "Tape-and-Reel Packaging for Semiconductor Devices."

Description

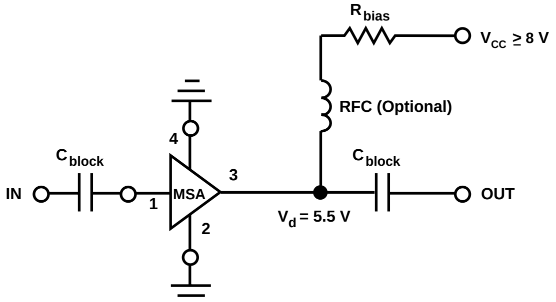
The MSA-1105 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost, surface mount plastic package. This MMIC is designed for high dynamic range in either 50 or 75 Ω systems by combining low noise figure with high IP_3. Typical applications include narrow and broadband linear amplifiers in commercial and industrial systems.

The MSA-series is fabricated using Agilent'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.

05 Plastic Package



Typical Biasing Configuration



MSA-1105 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	80 mA
Power Dissipation[2,3]	550 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	–65 to 150°C

Thermal Resistance[2,4]:
θ_{jc} = 125°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 8 mW/°C for T_C > 124°C.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 60 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 0.05 GHz	dB		12.7	
		f = 0.5 GHz	dB	10.0	12.0	
		f = 1.0 GHz	dB		10.5	
ΔG_P	Gain Flatness	f = 0.1 to 1.0 GHz	dB		±1.0	
$f_{3\ dB}$	3 dB Bandwidth[2]		GHz		1.3	
VSWR	Input VSWR	f = 0.1 to 1.0 GHz			1.5:1	
	Output VSWR	f = 0.1 to 1.0 GHz			1.7:1	
NF	50 Ω Noise Figure	f = 0.5 GHz	dB		3.6	
$P_{1\ dB}$	Output Power at 1 dB Gain Compression	f = 0.5 GHz	dBm		17.5	
IP_3	Third Order Intercept Point	f = 0.5 GHz	dBm		30.0	
t_D	Group Delay	f = 0.5 GHz	psec		200	
V_d	Device Voltage		V	4.4	5.5	6.6
dV/dT	Device Voltage Temperature Coefficient		mV/°C		–8.0	

Notes:
1. The recommended operating current range for this device is 40 to 70 mA. Typical performance as a function of current is on the following page.
2. Referenced from 50 MHz gain (G_P).

Part Number Ordering Information

Part Number	No. of Devices	Container
MSA-1105-TR1	500	7" Reel
MSA-1105-STR	10	Antistatic Bag

For more information, see "Tape and Reel Packaging for Semiconductor Devices".

MSA-1105 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 60 mA)

Freq. GHz	S_{11} Mag	S_{11} Ang	S_{21} dB	S_{21} Mag	S_{21} Ang	S_{12} dB	S_{12} Mag	S_{12} Ang	S_{22} Mag	S_{22} Ang	k
.0005	.80	–17	19.0	8.94	171	–26.0	.050	51	.81	–16	0.53
.005	.26	–62	13.9	4.98	163	–16.8	.144	15	.26	–64	0.93
.025	.07	–48	12.8	4.36	174	–16.4	.151	4	.08	–52	1.08
.050	.06	–38	12.7	4.33	174	–16.3	.153	2	.06	–48	1.08
.100	.05	–41	12.7	4.31	170	–16.4	.152	3	.06	–52	1.09
.200	.06	–58	12.6	4.26	162	–16.2	.155	5	.08	–73	1.08
.300	.07	–74	12.4	4.19	154	–16.1	.157	7	.10	–91	1.07
.400	.09	–91	12.2	4.10	146	–15.8	.163	8	.12	–105	1.06
.500	.10	–105	12.0	4.00	138	–15.6	.166	8	.14	–116	1.05
.600	.11	–116	11.8	3.88	131	–15.4	.171	10	.17	–126	1.04
.700	.13	–128	11.5	3.76	123	–15.0	.178	11	.18	–135	1.03
.800	.15	–136	11.2	3.63	116	–14.7	.184	11	.21	–144	1.01
.900	.16	–145	10.9	3.49	109	–15.5	.188	11	.22	–151	1.01
1.000	.18	–152	10.5	3.37	102	–14.1	.197	11	.24	–159	1.00
1.500	.28	174	8.8	2.75	72	–13.2	.219	7	.31	170	1.00
2.000	.38	150	7.1	2.28	48	–12.1	.248	0	.34	151	0.99
2.500	.46	133	5.6	1.90	28	–11.9	.254	–4	.38	134	1.02
3.000	.53	118	4.2	1.62	11	–11.6	.262	–8	.40	122	1.04

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

Typical Performance, T_A = 25°C, Z_O = 50 Ω

(unless otherwise noted)

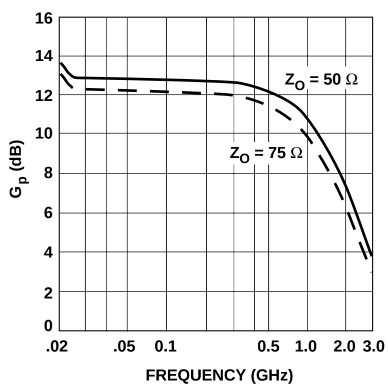


Figure 1. Typical Power Gain vs. Frequency, I_d = 60 mA.

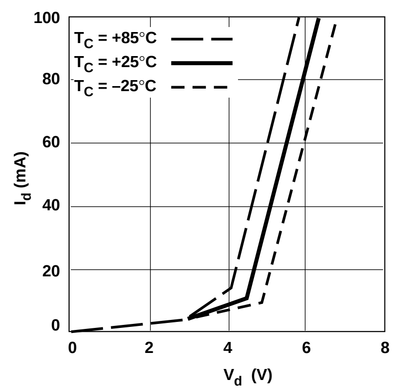


Figure 2. Device Current vs. Voltage.

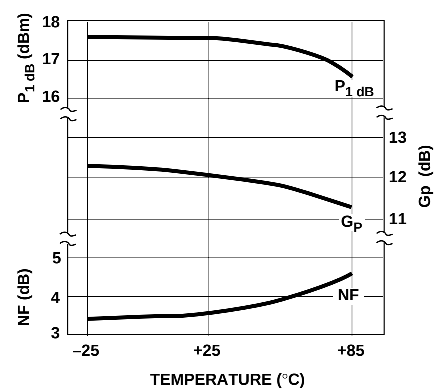


Figure 3. Output Power at 1 dB Gain Compression, Noise Figure and Power Gain vs. Case Temperature, f = 0.5 GHz, I_d = 60 mA.

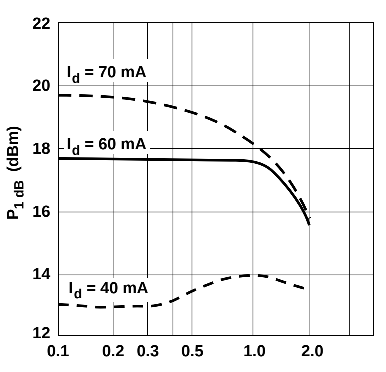


Figure 4. Output Power at 1 dB Gain Compression vs. Frequency.

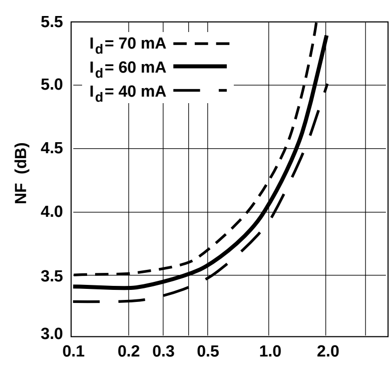


Figure 5. Noise Figure vs. Frequency.

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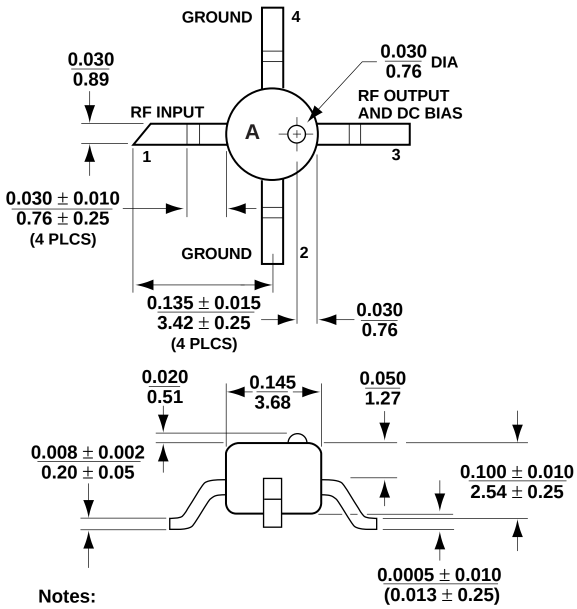
05 Plastic Package Dimensions



Notes:
(unless otherwise specified)
1. Dimensions are in/mm
2. Tolerances
   in .xxx = ± 0.005
   mm .xx = ± 0.13

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Data subject to change.

5965-9557E (11/99)