Agilent Technologies
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Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

MSA-1104

Features

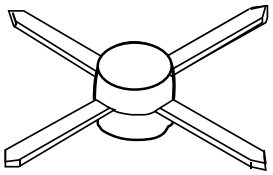
- **High Dynamic Range Cascadable 50 Ω or 75 Ω Gain Block**
- **3 dB Bandwidth:** 50 MHz to 1.3 GHz
- **17.5 dBm Typical $P_{1\ dB}$ at 0.5 GHz**
- **12 dB Typical 50 Ω Gain at 0.5 GHz**
- **3.6 dB Typical Noise Figure at 0.5 GHz**
- **Low Cost Plastic Package**

Description

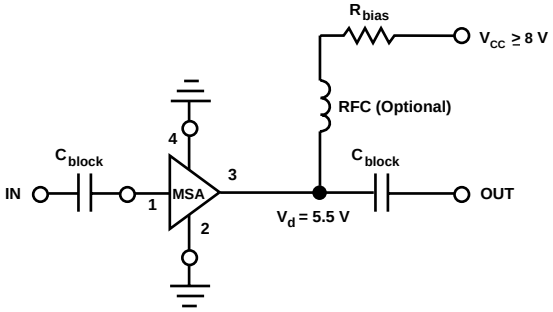
The MSA-1104 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost plastic package. This MMIC is designed for high dynamic range in either 50 or 75 Ω systems by combining low noise figure with high IP_3. Typical applications include narrow and broadband 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.

04A Plastic Package



Typical Biasing Configuration



MSA-1104 Absolute Maximum Ratings

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

Thermal Resistance[2,4]:
θ_{jc} = 115°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 8.7 mW/°C for T_C > 87°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 f = 0.5 GHz f = 1.0 GHz	dB dB dB	 10.0	12.7 12.0 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	
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).

MSA-1104 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 60 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
.0005	.76	–22	19.3	9.19	167	–24.4	.060	54	.77	–22	0.48
.005	.20	–79	13.7	4.83	164	–16.5	.149	12	.21	–83	0.96
.025	.05	–78	12.8	4.35	174	–16.2	.154	2	.06	–101	1.07
.050	.04	–75	12.7	4.31	174	–16.4	.151	2	.05	–136	1.09
.100	.04	–81	12.6	4.29	171	–16.4	.152	2	.05	–137	1.09
.200	.04	–93	12.6	4.24	164	–16.3	.153	3	.07	–135	1.09
.300	.06	–105	12.4	4.18	156	–16.2	.155	4	.10	–136	1.08
.400	.07	–115	12.3	4.11	148	–16.0	.158	5	.12	–139	1.07
.500	.09	–124	12.1	4.01	141	–15.8	.162	6	.15	–144	1.06
.600	.11	–132	11.8	3.91	134	–15.6	.166	7	.17	–150	1.06
.700	.13	–140	11.6	3.80	126	–15.4	.170	7	.19	–156	1.05
.800	.15	–147	11.3	3.68	120	–15.2	.174	7	.22	–161	1.04
.900	.16	–154	11.0	3.56	113	–14.9	.180	7	.24	–168	1.03
1.000	.18	–161	10.7	3.43	106	–14.7	.184	6	.26	–173	1.03
1.500	.28	171	9.1	2.85	77	–13.5	.211	2	.35	163	0.99
2.000	.37	149	7.6	2.39	52	–13.0	.224	–5	.43	140	0.99
2.500	.45	133	6.1	2.02	33	–12.7	.231	–10	.47	125	1.02
3.000	.52	118	4.6	1.69	14	–12.6	.234	–16	.50	112	1.05

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)

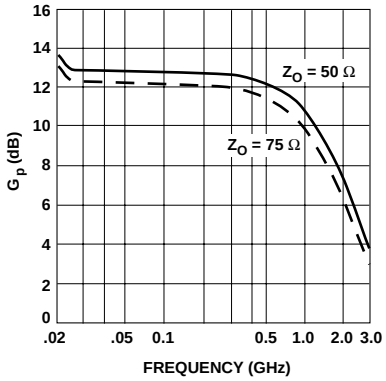


Figure 1. Typical Power Gain vs. Frequency, I_d = 60 mA.

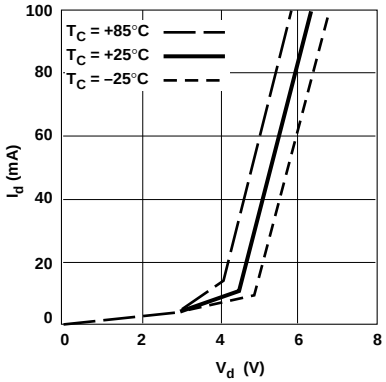


Figure 2. Device Current vs. Voltage.

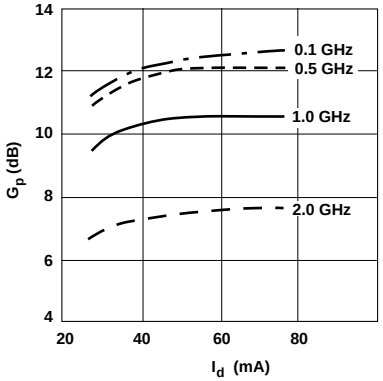


Figure 3. Power Gain vs. Current.

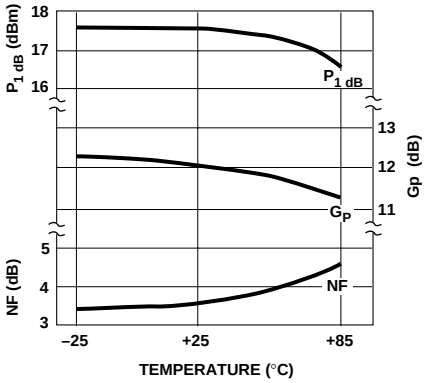


Figure 4. Output Power at 1 dB Gain Compression, Noise Figure and Power Gain vs. Case Temperature, f = 0.5 GHz, I_d = 60 mA.

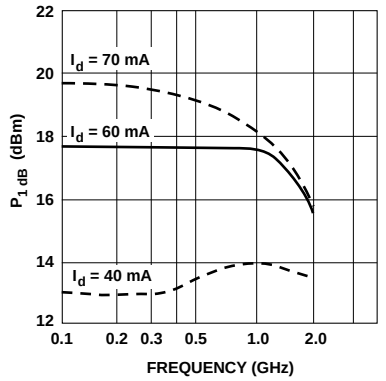


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

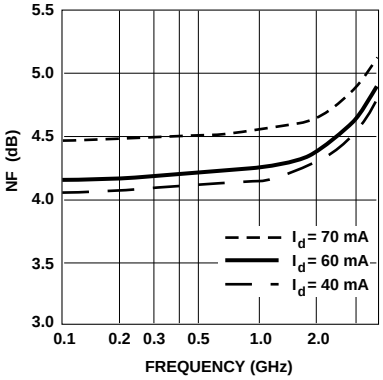


Figure 6. Noise Figure vs. Frequency.

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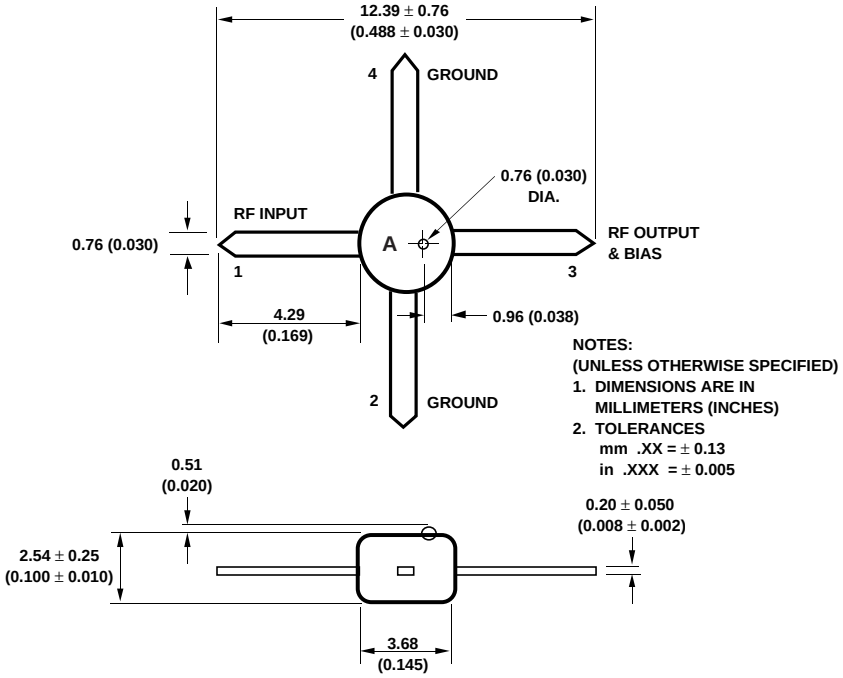
04A Plastic Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES).

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Data subject to change.

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