HEWLETT PACKARD

Low Noise, Cascadable Silicon Bipolar MMIC Amplifier

Technical Data

INA-03170

Features

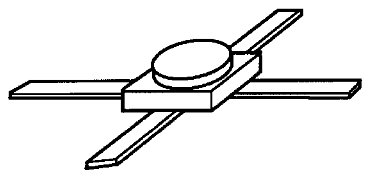
- **Cascadable 50 Ω Gain Block**
- **Low Noise Figure:** 2.5 dB Typical at 1.5 GHz
- **High Gain:** 26.0 dB Typical at 1.5 GHz
- **3 dB Bandwidth:** DC to 2.8 GHz
- **Unconditionally Stable (k>1)**
- **Low Power Dissipation**
- **Hermetic Gold-Ceramic Surface Mount Package**

Description

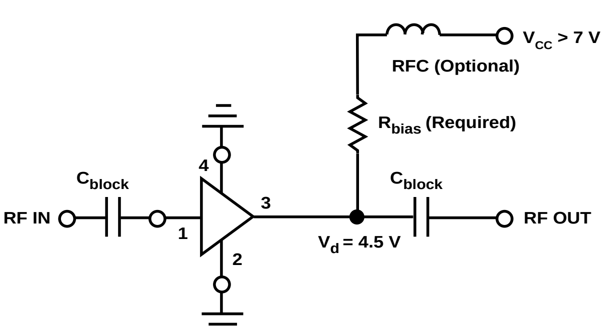
The INA-03170 is a low-noise silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) feedback amplifier housed in a hermetic, high reliability package. It is designed for narrow or wide bandwidth commercial, industrial and military applications that require high gain and low noise IF or RF amplification with minimum power consumption.

The INA series of MMICs is fabricated using HP's 10 GHz f_T, 25 GHz f_{MAX}, ISOSAT™-I silicon bipolar process which uses nitride self-alignment, submicrometer lithography, trench isolation, ion implantation, gold metallization and polyimide intermetal dielectric and scratch protection to achieve excellent performance, uniformity and reliability.

70 mil Package



Typical Biasing Configuration



INA-03170 Absolute Maximum Ratings

Parameter	Absolute Maximum[1]
Device Current	25 mA
Power Dissipation[2,3]	200 mW
RF Input Power	+13 dBm
Junction Temperature	200°C
Storage Temperature	–65 to 200°C

Thermal Resistance[2,4]:
θ_{jc} = 150°C/W

Notes:
1. Permanent damage may occur if any of these limits are exceeded.
2. T_{CASE} = 25°C.
3. Derate at 6.7 mW/°C for T_C > 170°C.
4. See MEASUREMENTS section "Thermal Resistance" for more information.

INA-03170 Electrical Specifications[1], T_A = 25°C

Symbol	Parameters and Test Conditions: I_d = 12 mA, Z_O = 50 Ω		Units	Min.	Typ.	Max.
G_P	Power Gain ($\|S_{21}\|^2$)	f = 1.5 GHz	dB	24.5	28.0	30.0
ΔG_P	Gain Flatness	f = 0.01 to 2.0 GHz	dB		±0.5	
$f_{3\ dB}$	3 dB Bandwidth[2]		GHz		2.8	
ISO	Reverse Isolation ($\|S_{12}\|^2$)	f = 0.01 to 2.0 GHz	dB		37	
VSWR	Input VSWR	f = 0.01 to 2.0 GHz			2.0[3]	
	Output VSWR	f = 0.01 to 2.0 GHz			3.0[3]	
NF	50 Ω Noise Figure	f = 1.5 GHz	dB		2.5	3.0
$P_{1\ dB}$	Output Power at 1 dB Gain Compression	f = 1.5 GHz	dBm		1.0	
IP_3	Third Order Intercept Point	f = 1.5 GHz	dBm		10	
t_D	Group Delay	f = 1.5 GHz	psec		200	
V_d	Device Voltage	f = 1.5 GHz	V	4.0	5.3	6.0
dV/dT	Device Voltage Temperature Coefficient		mV/°C		+5	

Notes:
1. The recommended operating current range for this device is 8 to 20 mA. Typical performance as a function of current is on the following page.
2. Referenced from 10 MHz Gain (G_P).
3. VSWR can be improved by bypassing the bias directly to ground.

INA-03170 Typical Scattering Parameters (Z_O = 50 Ω, T_A = 25°C, I_d = 12 mA)

Freq. GHz	S_{11}		S_{21}			S_{12}			S_{22}		k
	Mag	Ang	dB	Mag	Ang	dB	Mag	Ang	Mag	Ang	
0.05	.35	178	26.6	21.48	–4	–35.9	.016	9	.56	–1	1.24
0.10	.35	176	26.6	21.42	–7	–36.5	.015	6	.56	–4	1.29
0.20	.34	172	26.6	21.37	–14	–36.5	.015	–1	.56	–7	1.30
0.40	.34	164	26.5	21.19	–28	–36.5	.015	–5	.54	–13	1.33
0.60	.33	158	26.4	20.91	–41	–38.4	.012	2	.53	–18	1.58
0.80	.32	152	26.3	20.69	–54	–37.1	.014	5	.51	–22	1.46
1.00	.32	147	26.2	20.48	–67	–36.5	.015	4	.50	–27	1.41
1.20	.32	141	26.2	20.40	–80	–39.2	.011	13	.49	–32	1.79
1.40	.31	133	26.3	20.73	–93	–37.7	.013	25	.48	–38	1.57
1.60	.31	125	26.5	21.15	–106	–37.1	.014	28	.47	–45	1.47
1.80	.30	117	26.8	21.84	–121	–35.4	.017	30	.46	–52	1.28
2.00	.27	106	26.9	22.20	–138	–37.1	.014	33	.42	–62	1.48
2.50	.15	94	26.6	21.48	–177	–35.4	.017	23	.31	–79	1.44
3.00	.16	159	23.7	15.32	133	–34.4	.019	42	.16	–72	1.78
3.50	.28	150	19.8	9.81	99	–35.4	.017	28	.19	–60	2.71

INA-03170 Typical Performance, T_A = 25°C

(unless otherwise noted)

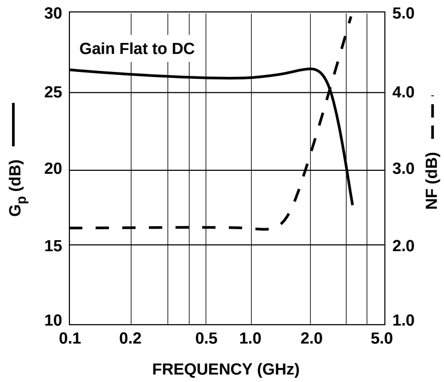


Figure 1. Typical Gain and Noise Figure vs. Frequency, T_A = 25°C, I_d = 12 mA.

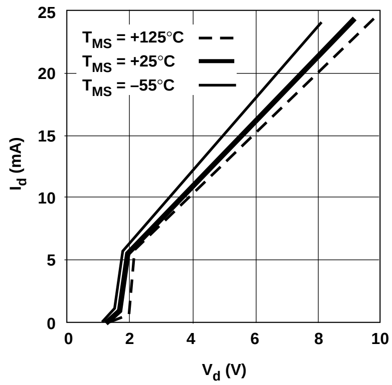


Figure 2. Device Current vs. Voltage.

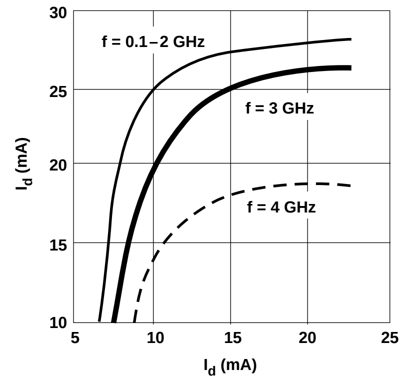


Figure 3. Power Gain vs. Current.

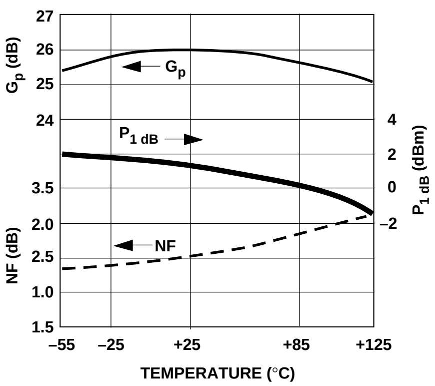


Figure 4. Output Power and 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.5 GHz, I_d = 12 mA.

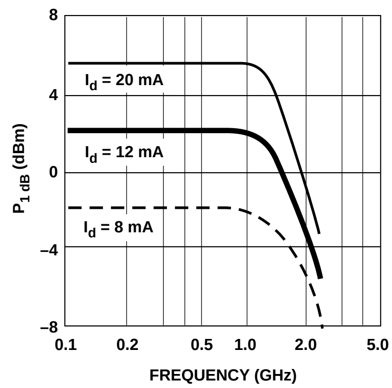


Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.

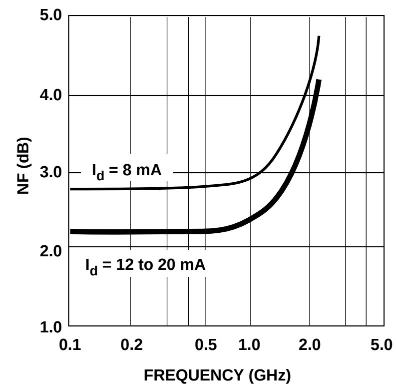
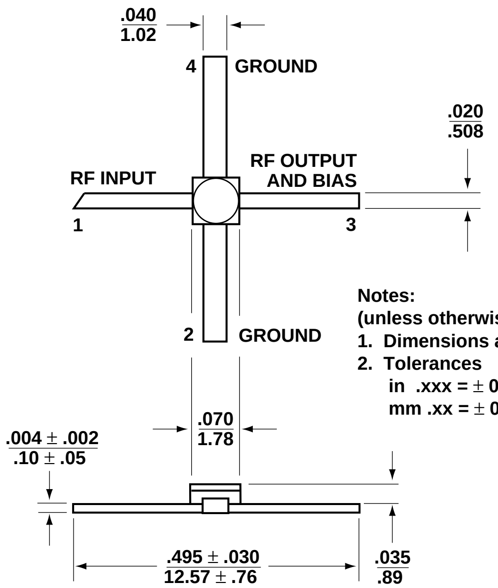


Figure 6. Noise Figure vs. Frequency.

70 mil Package Dimensions



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

www.hp.com/go/rf

For technical assistance or the location of your nearest Hewlett-Packard sales office, distributor or representative call:

Americas/Canada: 1-800-235-0312 or 408-654-8675

Far East/Australasia: Call your local HP sales office.

Japan: (81 3) 3335-8152

Europe: Call your local HP sales office.

Data subject to change.

Obsoletes 5965-9677E
Printed in U.S.A. 5966-4956E (5/98)