EiC Corp.

Excellence in Communications

DATA SHEET

ECG002

HIGH LINEARITY BROADBAND AMPLIFIER

DC - 6000 MHz

Features

- DC to 6000 MHz
- 20 dB Gain at 1000 MHz
- 15 dBm Output P1dB at 1000 MHz
- 29 dBm Output IP3 at 1000 MHz
- 3.8 dB Noise Figure at 2000 MHz

Applications

- Broadband Gain Blocks
- High Linearity Amplifiers

Packages Available

(-B) SOT-89
(-C) 85 Mil Micro-X

Description

The ECG002 is a high reliability, high linearity, low cost broadband amplifier, optimized for commercial communications. The device is manufactured using in-house developed, advanced Indium Gallium Phosphide Heterojunction Bipolar Transistor (InGaP HBT) technology and is designed for use as a 50 Ohm gain block. The amplifier features excellent VSWR, low noise figure and highly linear performance. Typical OIP3 is +29dBm at 1000MHz. The ECG002 operates from a single voltage supply and requires only two DC-blocking capacitors, a bias resistor and an inductor for operation. The device is ideal for wireless applications and is available in a low cost, surface-mountable plastic 85 mil Micro-X and SOT-89 packages. The ECG002 is designed in the Darlington configuration with direct feedback. Its operation frequency at low end is limited only by the dc blocking capacitor and the RF choke inductor (large values are required in both cases).

Electrical Specifications

Test Conditions: Ic = 45 mA, Ta = 25°C

SYMBOL	PARAMETER		LIMITS			UNIT	TEST CONDITION
			MIN.	TYP.	MAX.		
F	Frequency		DC		6000	MHz	
G	Gain (Small Signal)	f = 1000MHz		20.0		dB	
		f = 2000MHz		19.0			
		f = 3000MHz		17.0			
		f = 6000MHz		13.0			
G	Gain (Large Signal)	f = 2000MHz	16.0	18.0		dB	Note 2
P_{1dB}	Output Power @ 1dB Compression	f = 1000MHz		15.0		dBm	
		f = 2000MHz		15.0			
		f = 3000MHz		14.0			
		f = 6000MHz		12.0			
OIP3	Output Third Order Intercept	f = 1000MHz		29.0		dBm	Note 1
		f = 2000MHz		29.0			
		f = 3000MHz		29.0			
RL_{in}	Input Return Loss, 50 Ohm	f = 2000MHz		14.0		dB	
RL_{out}	Output Return Loss, 50 Ohm	f = 2000MHz		20.0		dB	
NF	Noise Figure	f = 2000MHz		3.8		dB	
Vde	Device Voltage		3.5	3.9	4.3	V	
Note 1: OIP3 = Pout (by power meter, total 2-tone power) + (IM3(dB))/2) - 3dB							
Note 2: Pin= -3dBm (Gain at 1dB compression)							

CAUTION!
SENSITIVE ELECTRONIC DEVICE

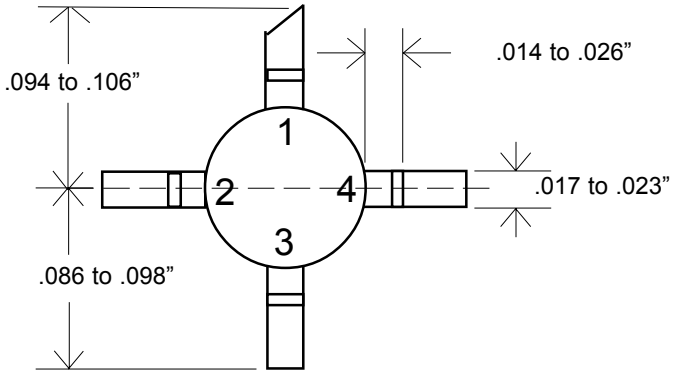
Absolute Maximum Ratings

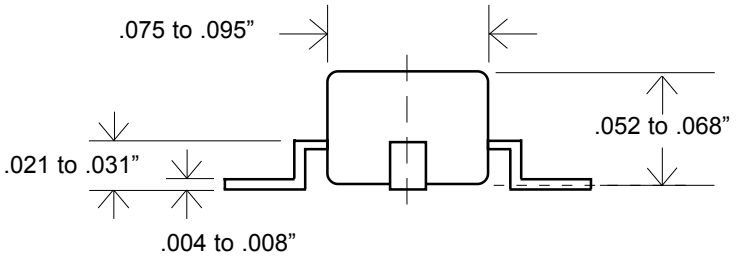
Device Current	150	mA
RF Power Input	12	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-65 to +150	°C
Junction Temperature	+200	°C

Note: Exceeding any of the absolute maximum ratings may cause permanent damage to the device.

Micro-X Package Outline

(all units are in inches)



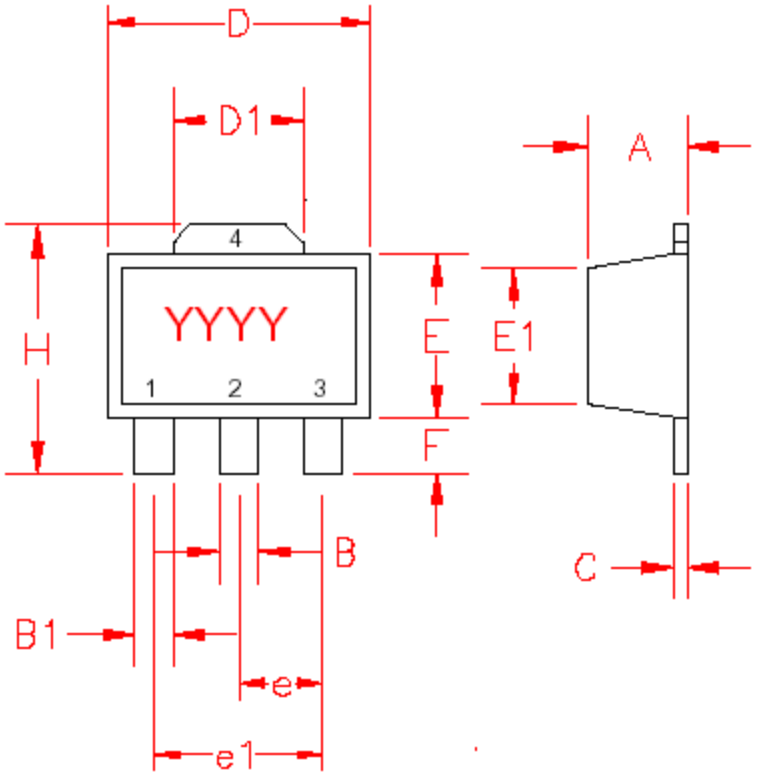


Pin Definitions

Pin #	Pin	Definition
1	RFin	This pin has a nominal 50 ohm input impedance. It requires a DC blocking capacitor large enough to handle the lowest frequency used.
2, 4	Gnd	The two ground connections should be directly connected together to the ground plane on the PCB. The ground connection also serves as a heatsink.
3	RFout	This pin has a nominal 50 ohm output impedance. It requires a DC bias of 45mA through a series inductor and a resistor. A bypass capacitor (1.0 micro Farad) on the DC side of the inductor is recommended for providing instantaneous current during a modulated RF signal. Use a DC blocking capacitor on the output with similar requirements as the input side.

SOT-89 Package Outline

(all units are in inches)



SYMBOL	Inches	
	MIN.	MAX.
A	.055	.063
B	.017	.022
B1	.014	.019
C	.014	.017
D	.173	.181
D1	.064	.072
E	.090	.102
E1	.084	.090
e	.059	
E1	.118	
F	.035	.047
H	.155	.167

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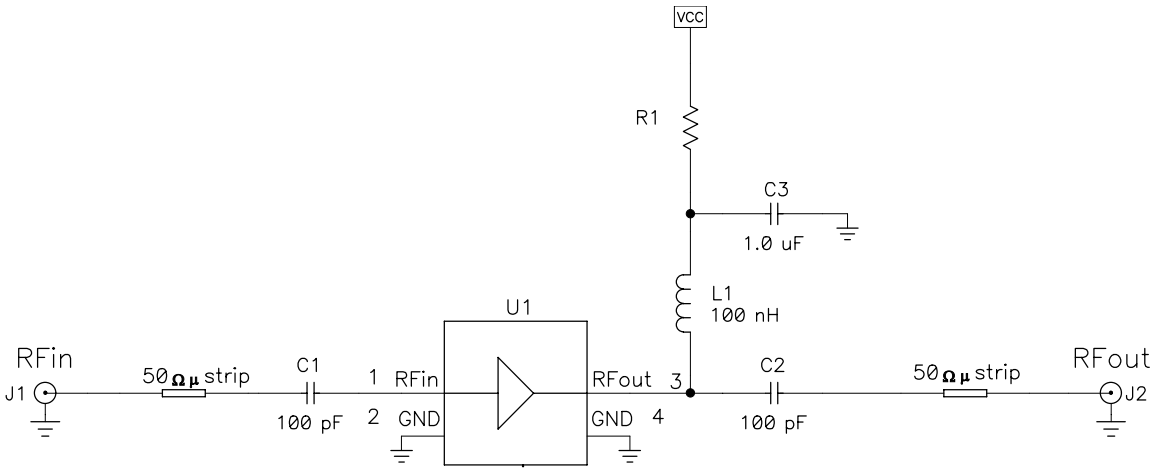
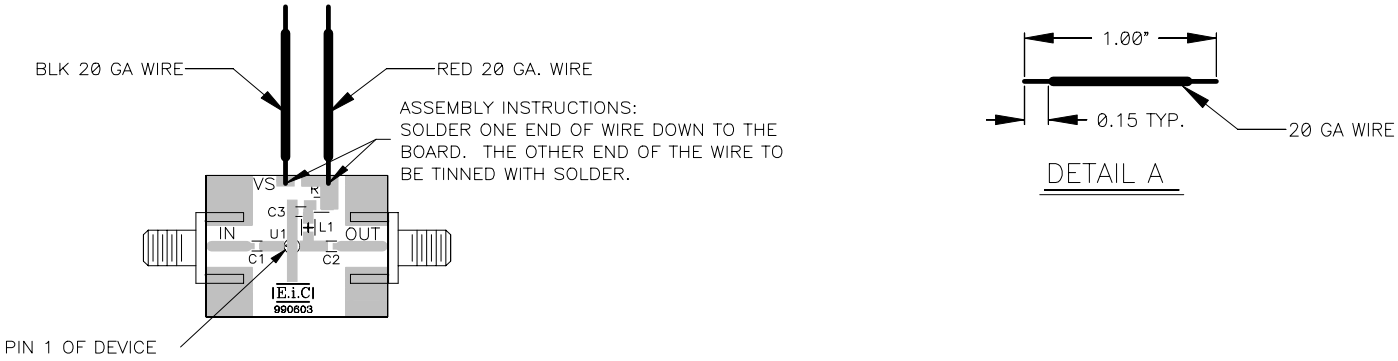
Evaluation Board Schematic
SOT-89 and Micro-X

Recommended Bias Resistor Values
R = (Vcc-Vde)/Icc = (Vcc-3.9)/0.045

Approximate Supply Voltage (V_{cc}) based on standard values for R1	5	6	7	8	9	10
R1 (Ohms)	24	47	68	91	110	130



Evaluation Board Layout



Evaluation Board Materials

QTY	DESIGNATOR	VALUE	DESCRIPTION	MANUFACTURER &P/N	
2	C1, C2	100pF	CAPACITOR, 0603	MARUWA CE101J1NO	NOTE 1
1	C3	1.0uF	CAPACITOR, 0603	MARUWA CE105K1NR	NOTE 1
1	R1	47 Ω	RESISTOR, 0603	ROHM MCR03J470	NOTE 1
1	L1	100 nH	INDUCTOR, 0805	TOKO LL2012-FR10K	NOTE 1
2	J1, J2		SMA CONNECTOR	EF JOHNSON 142-0701-881	NOTE 1
1		---	IC, ECG002	EiC Corp	
RED		---	20 GA, WIRE 1.0”	ANY	SEE DETAIL A
BLACK		---	20 GA, WIRE 1.0”	ANY	SEE DETAIL A
		---	PCB	EiC Corp 60-000009-003B	

1. EiC RECOMMENDED COMPONENTS ARE SHOW. EQUIVALENT COMPONENTS MAY BE USED.
2. LARGER VALUES GIVE BETTER LOW FREQUENCY RESPONSE(<500MHz)
NOTES: UNLESS OTHERWISE SPECIFIED

Figure 1

Vde vs. Icc
(IC Tested on Eval Board)

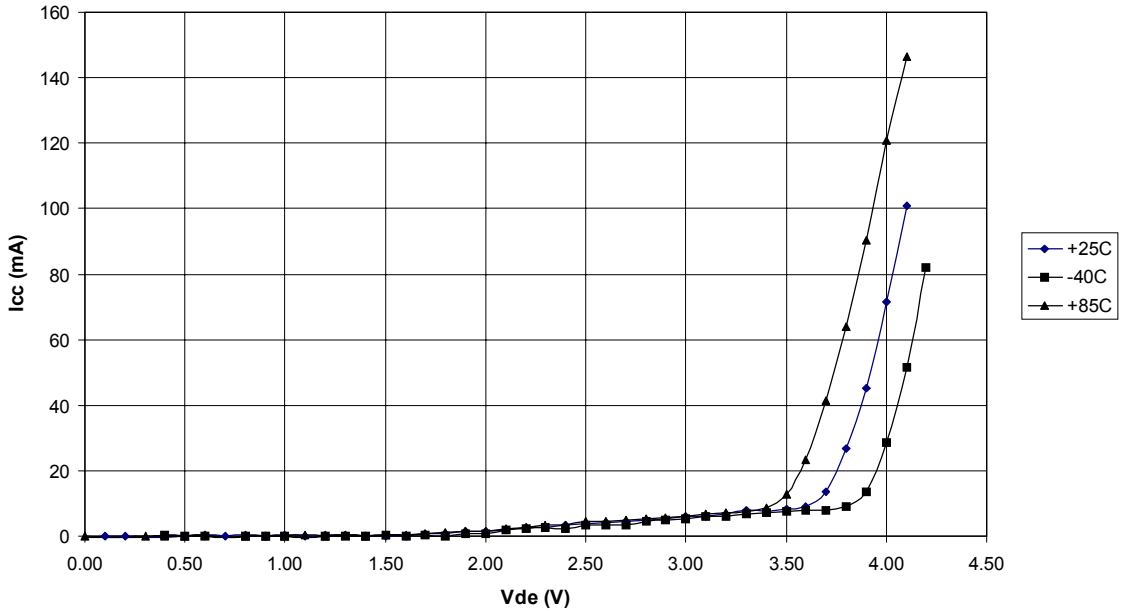


Figure 2

P1dB vs. Frequency
(IC Tested on Eval Board)

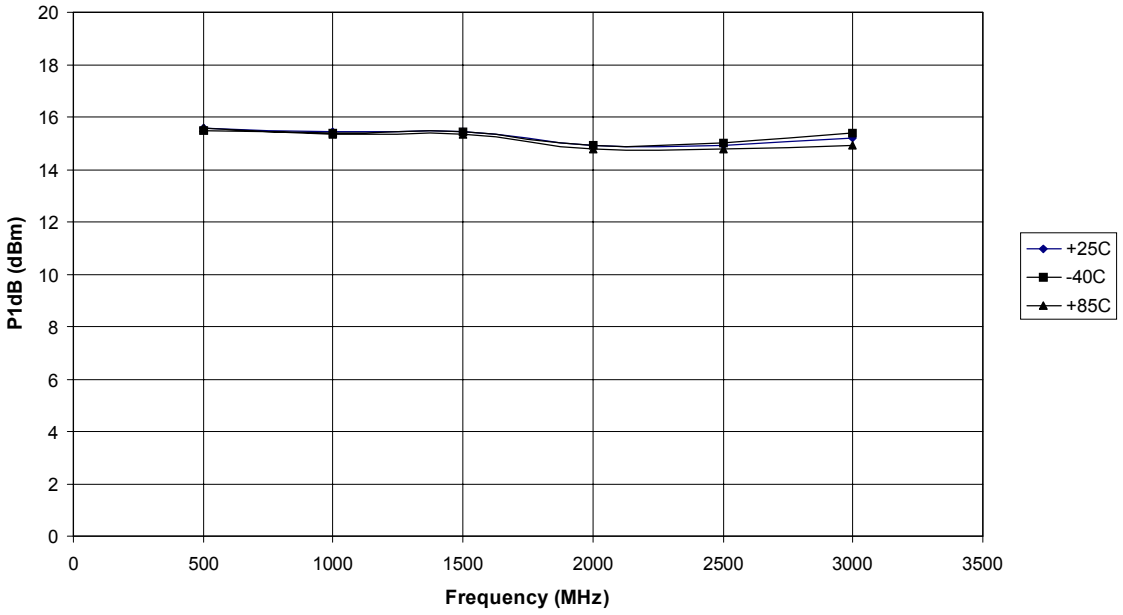


Figure 3

Gain vs. Frequency
(IC Tested on Eval Board)

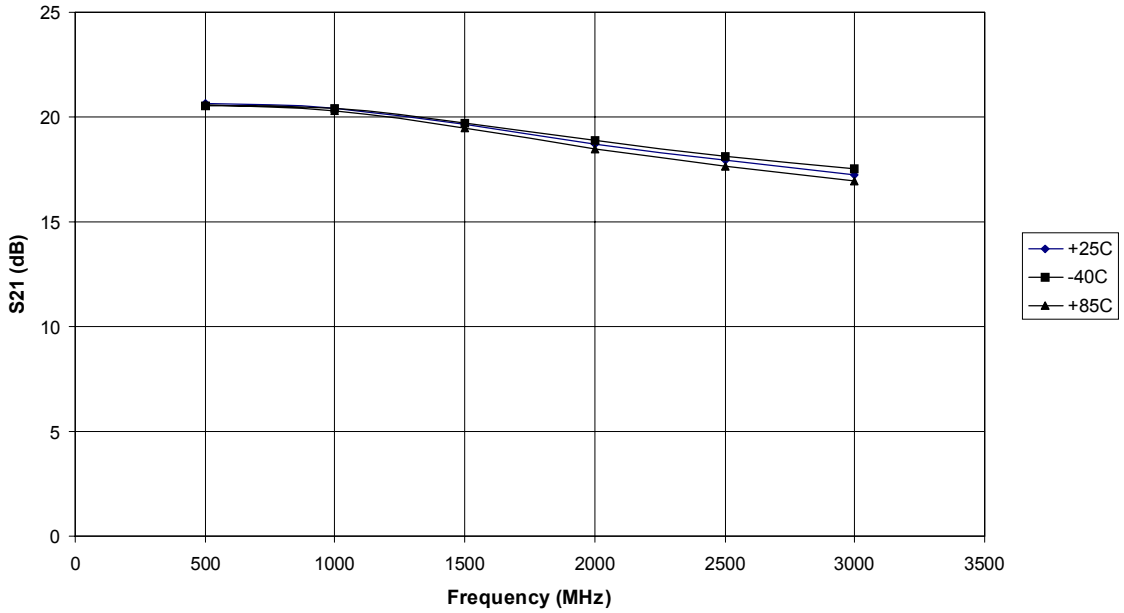


Figure 4

Gain vs. Frequency, T=25 degree C
(IC Tested in a 50 Ohm Fixture)

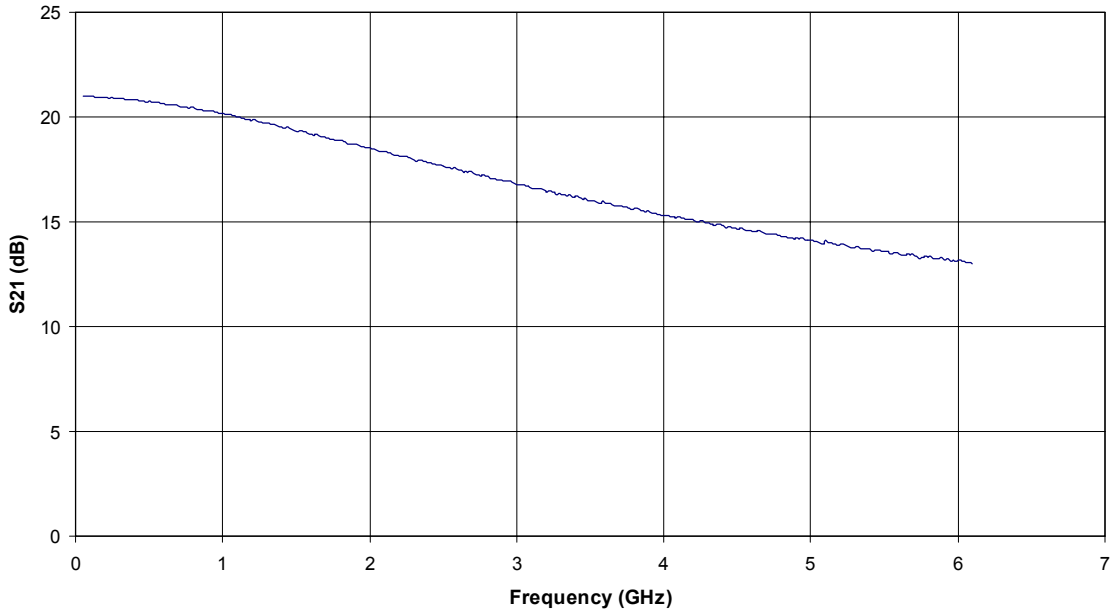


Figure 5

S11, S22 vs. Frequency, T=25 degree C
(IC Tested in a 50 Ohm Fixture)

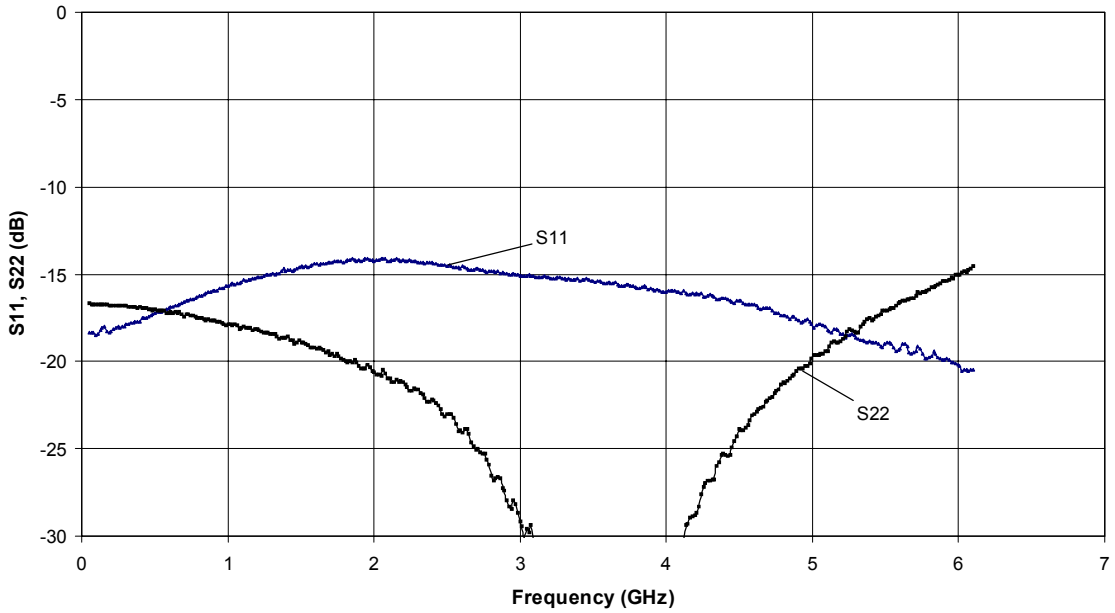


Figure 6

Reverse Isolation vs. Frequency, T=25 degree C
(IC Tested in a 50 Ohm Fixture)

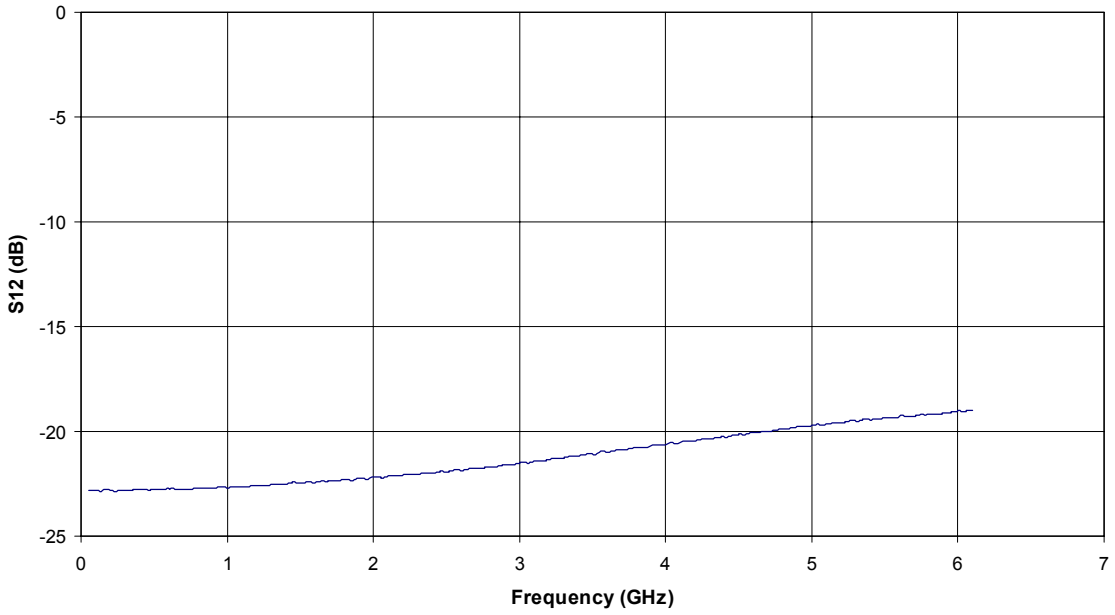


Figure 7

OIP3 vs. Frequency
(IC Tested on Eval Board)

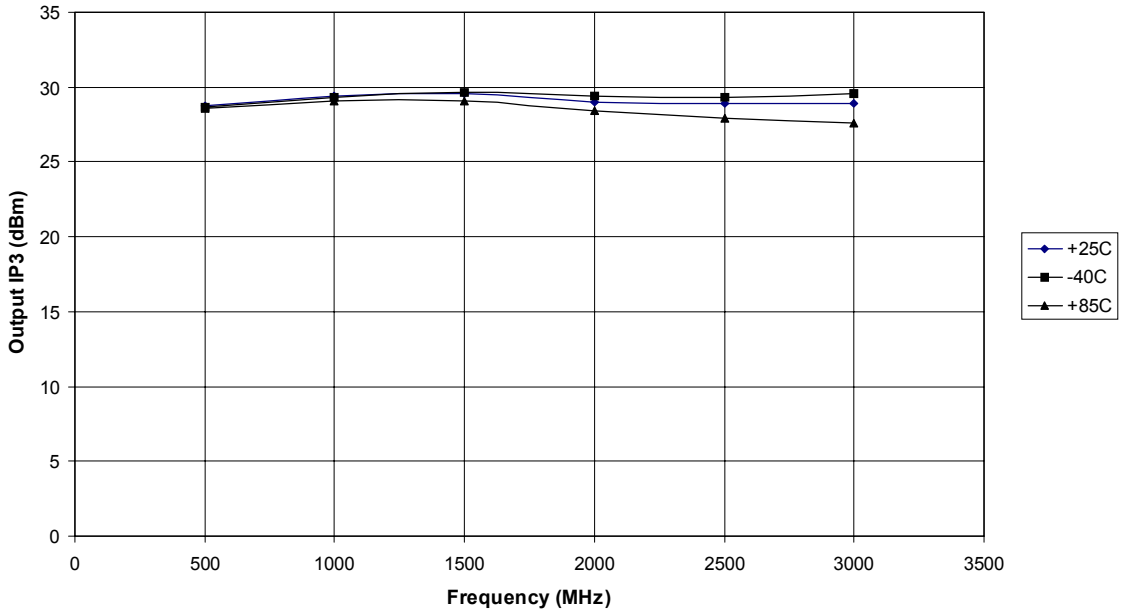
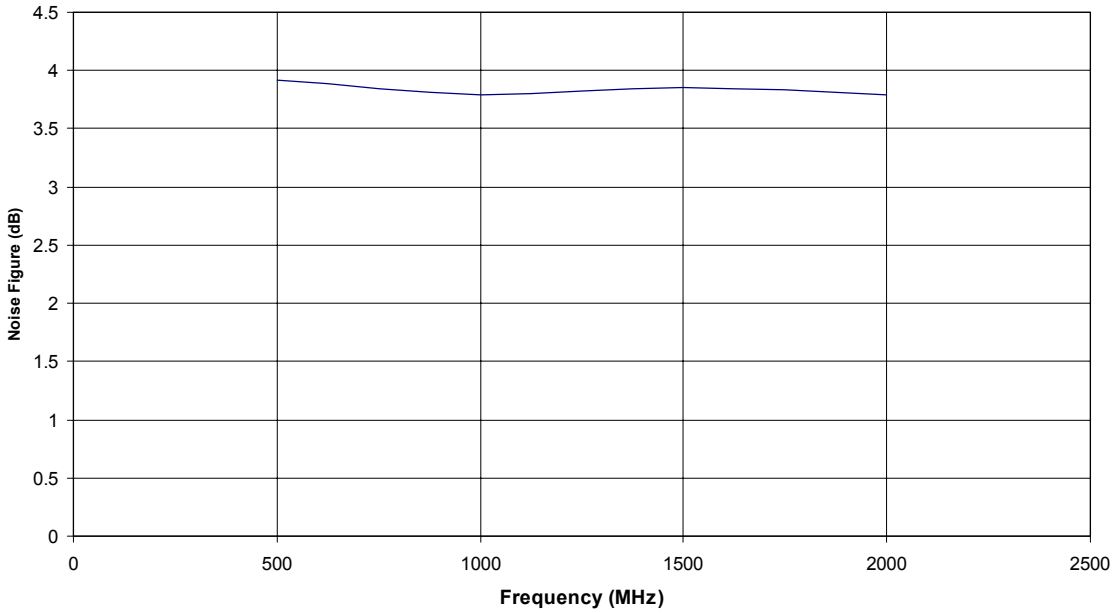


Figure 8

Noise Figure vs. Frequency
(IC Tested on Eval Board)



APPLICATION NOTES

AP-000194-000__GAIN BLOCKS: BIASING AND PERFORMANCE ENHANCEMENTS

AP-000192-000 __GAIN BLOCKS: DISCUSSION OF TECHNOLOGY AND RELIABILITY ENHANCEMENTS

AP-000487-000__GAIN BLOCKS: TAPE AND REEL SPECIFICATIONS AND PACKAGE DRAWINGS