EiC Corp.
Excellence in Communications

PRODUCTION DATA SHEET

EC-1019

HIGH LINEARITY BROADBAND AMPLIFIER

DC - 6 GHz

Features

- DC to 6 GHz
- 18.5 dB Gain at 1000 MHz
- 19 dBm Output P1dB at 1000 MHz
- 34 dBm Output IP3 at 1000 MHz
- 5.5 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 EC-1019 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 +34dBm at 1000MHz. The EC-1019 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.

Electrical Specifications

Test Conditions: Ic = 70 mA, Ta = 25°C

SYMBOL	PARAMETER		LIMITS			UNIT	TEST CONDITION
			MIN.	TYP.	MAX.		
F	Frequency		DC		6000	MHz	
G	Gain (Small Signal)	f = 1000MHz f = 2000MHz f = 3000MHz		18.5 16.5 14.5		dB	
G	Gain (Large Signal) P_{in} = +4.0 dBm	f = 2000MHz f = 3000MHz	14.0 12.0	15.5 13.5		dB	
P_{1dB}	Output Power @ 1dB Compression	f = 1000MHz f = 2000MHz f = 3000MHz		19.0 19.5 17.5			
P_{sat}	Saturated Output Power	f = 1000MHz f = 2000MHz f = 3000MHz		20.0 21.0 20.0		dBm	
OIP3	Output Third Order Intercept	f = 1000MHz f = 2000MHz f = 3000MHz		34.0 31.0 30.0		dBm	Note 1
RL_{in}	Input Return Loss, 50 Ohm	f = 2000MHz		19.0		dB	
RL_{out}	Output Return Loss, 50 Ohm	f = 2000MHz		15.0		dB	
NF	Noise Figure	f = 2000MHz		5.5		dB	
Vde	Device Voltage		4.2	5.0	5.2	V	

Note 1: OIP3 = Pout (by power meter, total 2-tone power) + (IM3(dB))/2) - 3dB

CAUTION!
SENSITIVE ELECTRONIC DEVICE

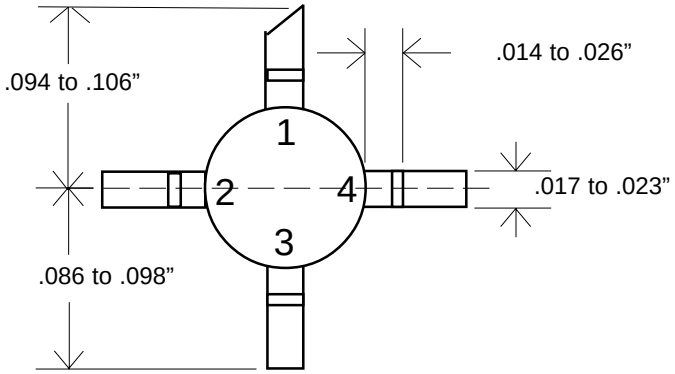
Absolute Maximum Ratings

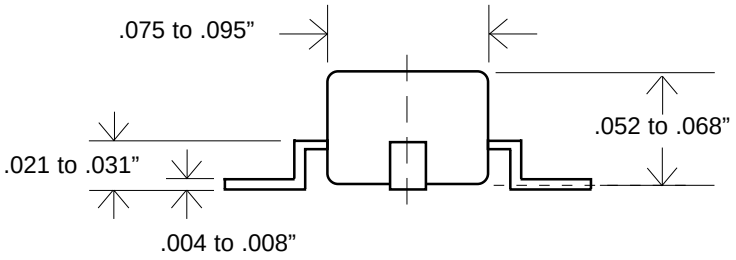
Device Current	130	mA
RF Power Input	12	dBm
Operating Temperature	-40 to +85	°C
Storage Temperature	-65 to +150	°C
Junction Temperature	200	°C

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

Micro-X Package Outline

(all units are in inches)



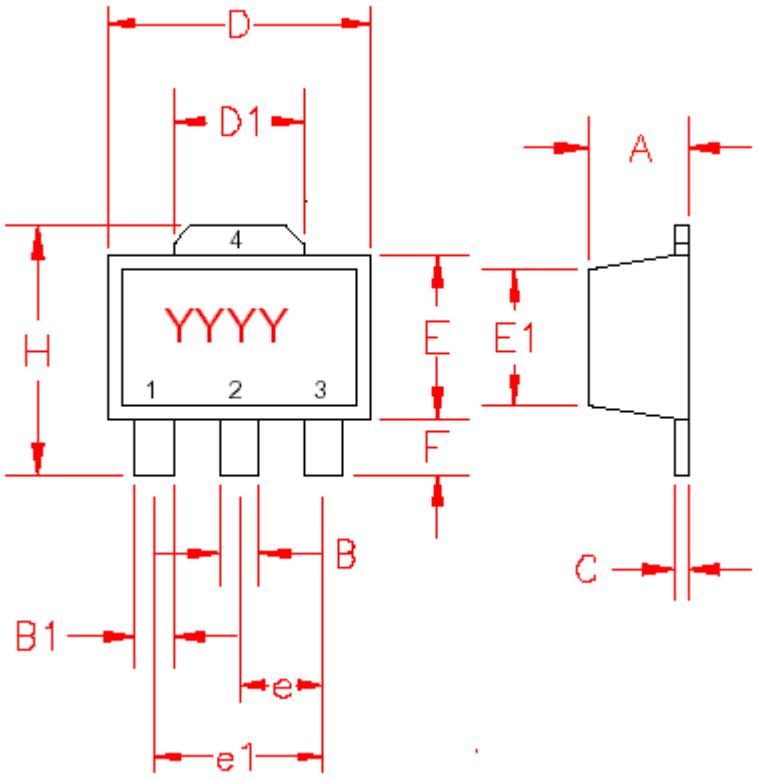


Pin Definitions

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.
3	RFout	This pin has a nominal 50 ohm output impedance. It requires a DC bias of 70mA typically through a series inductor/ resistor pair. Using a bypass capacitor (0.01 micro Farad) on the DC side of the the series inductor/ resistor is also recommended. 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

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.
3	RFout	This pin has a nominal 50 ohm output impedance. It requires a DC bias of 70mA 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.

Typical S-Parameters: Vde = 5.0V, Icc = 70mA, Temperature = 25°C

Frequency (MHz)	S11 (Mag)	S11 (Ang)	S21 (Mag)	S21 (Ang)	S12 (Mag)	S12 (Ang)	S22 (Mag)	S22 (Ang)
100	0.1366	-2.271	10.4184	175.001	0.0725	0.005	0.1873	-7.367
250	0.1386	-5.111	10.2799	167.334	0.0724	1.952	0.1865	-17.713
500	0.1372	-10.411	9.9637	155.093	0.0736	4.133	0.1846	-34.976
1000	0.1324	-23.163	9.0971	132.705	0.0768	7.466	0.1802	-66.222
1500	0.1201	-38.163	8.0788	112.717	0.0823	9.848	0.1756	-93.817
2000	0.1087	-59.401	7.1965	94.955	0.0903	10.966	0.1744	-120.646
2500	0.0976	-85.134	6.3693	78.762	0.0979	10.329	0.1763	-144.965
3000	0.0955	-116.073	5.6849	64.356	0.1065	8.874	0.1886	-168.422
3500	0.1083	-148.51	5.1244	50.134	0.1154	5.636	0.2113	169.493
4000	0.1319	-175.599	4.6624	36.769	0.1240	1.899	0.2449	151.452
4500	0.1687	161.937	4.2386	23.493	0.1323	-2.8	0.2868	136.312
5000	0.2155	142.398	3.8801	10.371	0.1396	-8.334	0.3366	123.238
5500	0.2628	126.047	3.5234	-2.967	0.1450	-14.354	0.3841	111.666
6000	0.3188	111.475	3.1812	-15.408	0.1488	-20.52	0.4352	100.938

Please follow the link on website page “http://eiccorp.com/products/gain.htm” for detailed s-parameter to 6.1 GHz.

Reliability and Burn-In Test

EiC performs burn-in for selected lots on a regular basis to monitor and guarantee consistent product quality and reliability. The burn-in process consists of pre-conditioning (JESD22-A113-B), pre and post RF tests, and bias life (JESD22-A108-A).

The table is based on the following parameters and conditions:
Activation Energy: 1.85eV
Junction to Ambient Temperature Difference: +45°C

Confidence levels of 60% and 90% are used to calculate FIT (Failure In Time), for the maximum operating ambient temperature at +85°C.

Test Temp	Hours Completed	Quantity Tested	Quantity Failed
+145°C	1000	80	0
+125°C	1000	20	0
Cumulative FIT @ 60% Confidence Level			11
Cumulative MTTF @ 60% Confidence Level (FIT 11)			8.98E+07 Hours
Cumulative FIT @ 90% Confidence Level			28
Cumulative MTTF @ 90% Confidence Level (FIT 28)			3.57E+07 Hours

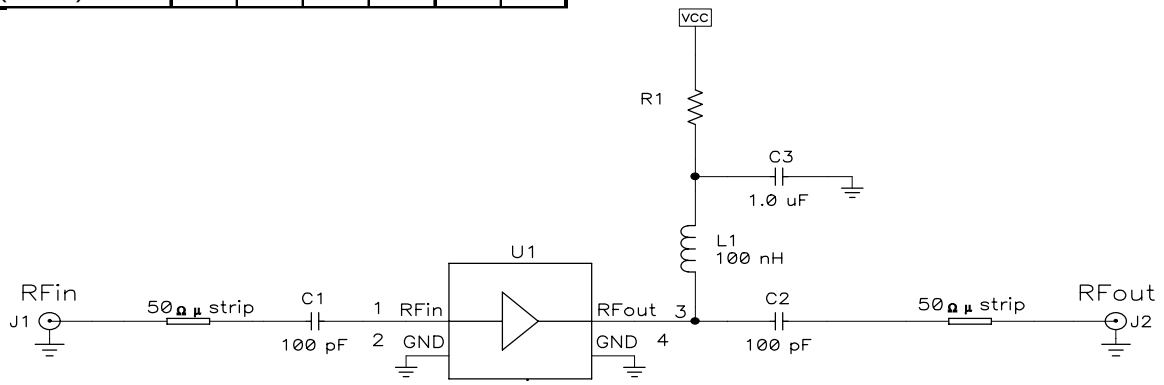
EiC will update the burn-in and cumulative FIT results periodically. Please check the website at www.eiccorp.com

Evaluation Board Schematic
85 Mil Micro-X and SOT-89

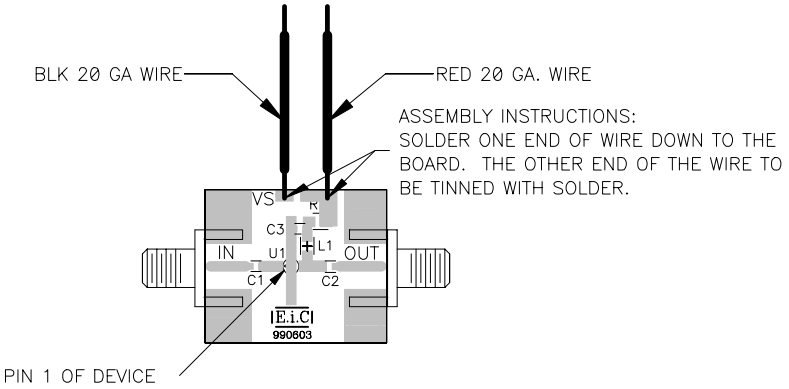
Recommended Bias Resistor Values

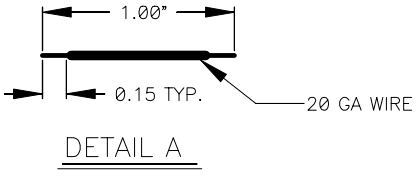
R = (Vcc-Vde)/Icc = (Vcc-5.0)/0.070

Supply Voltage (V_{cc})	6	7	8	9	10	11
R1 (Ohms)	15	30	43	56	68	82



Evaluation Board Layout





Evaluation Board Materials

MANUFACTURER	PART NUMBER	QTY.	DESCRIPTION	VALUE	DESIGNATORS
MARU	CE101J1NO	2	Capacitor (0603)	100 pF	C1, C2
MARU	CE105K1NR	1	Capacitor (0603)	1.0 uF	C3
ROHM	Various	1	Resistor (0805)	Depends on V_{cc} (See Table)	R1
DIGI-KEY	TKS2386CT-ND	1	Inductor (0603)	100 nH	L1
EF Johnson	142-0701-881	2	SMA Connector	-	J1,J2
EiC Corp	EC-1019	1	Amplifier	-	U1
EiC Corp	60-000009-003B	1	Printed Circuit Board	-	---

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

Icc vs. Vde

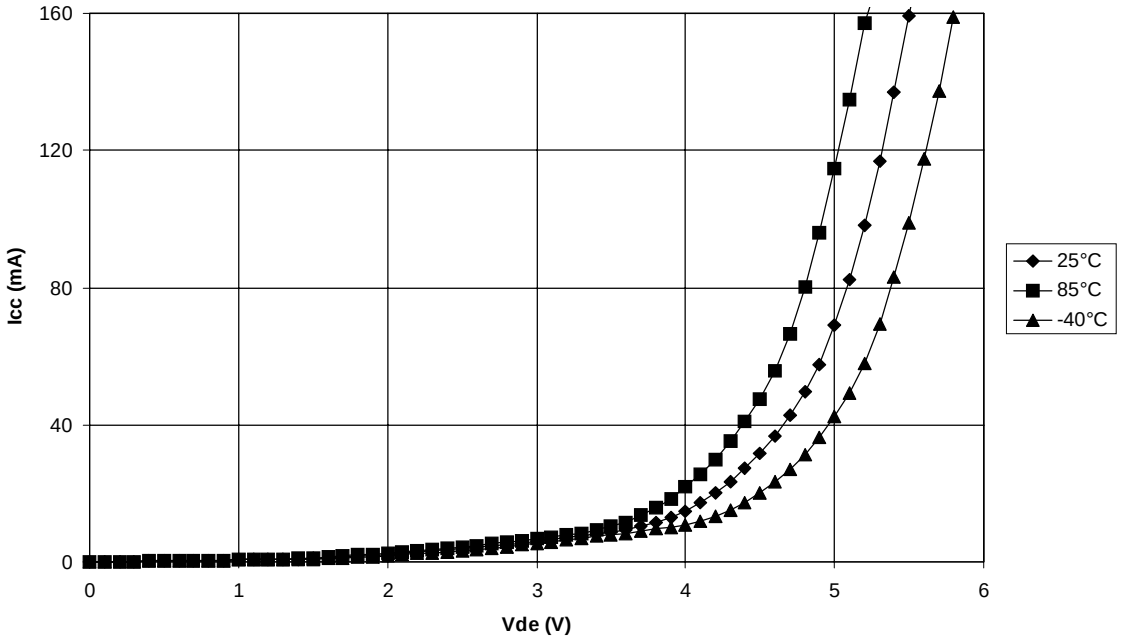


Figure 2

P1dB vs. Frequency

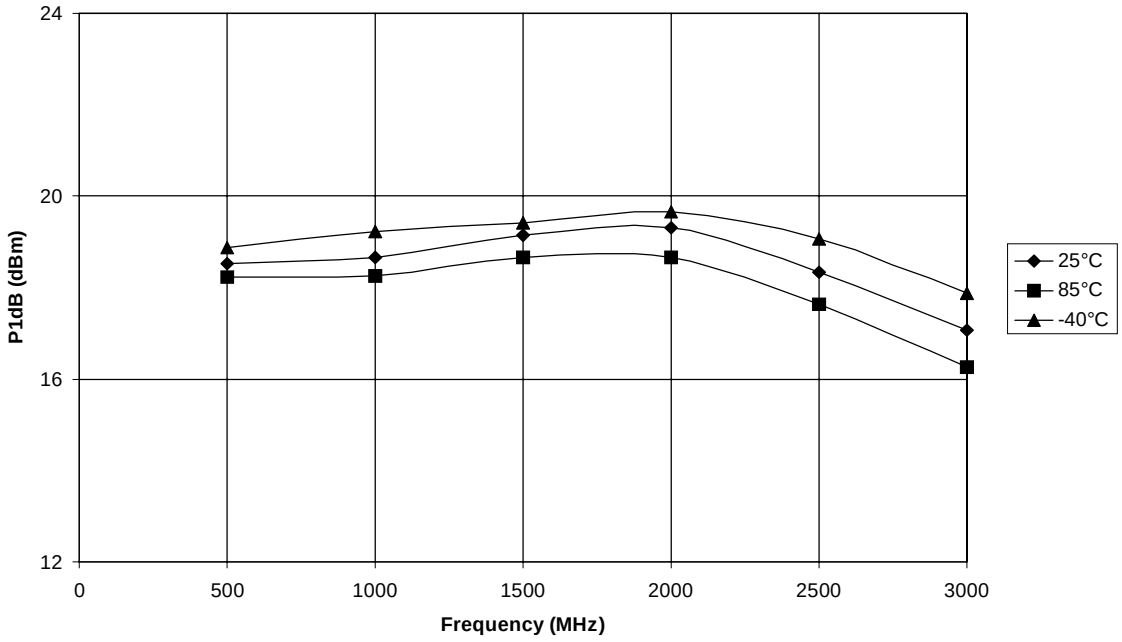


Figure 3

Gain vs. Frequency, T=25°C

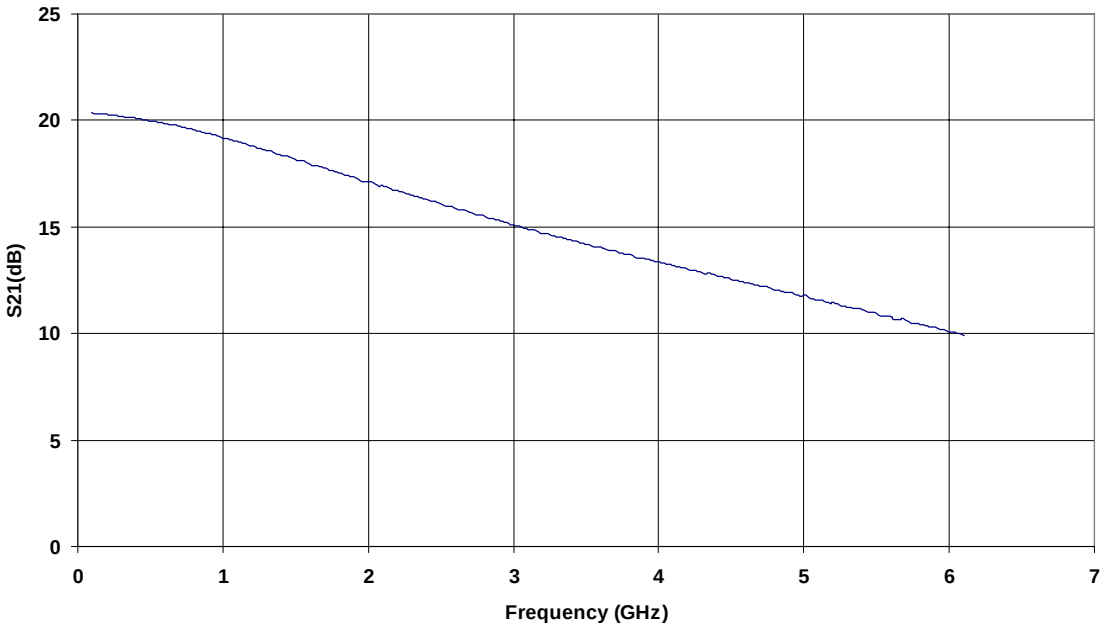


Figure 4

S11, S22 vs. Frequency, T=25°C

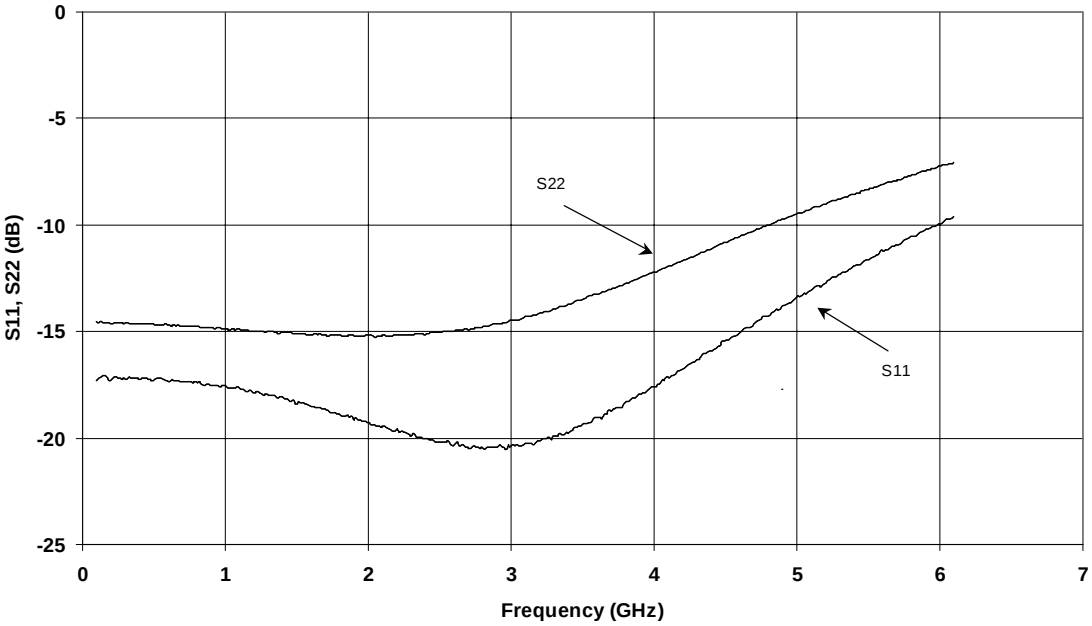


Figure 5

Reverse Isolation vs. Frequency, T=25°C

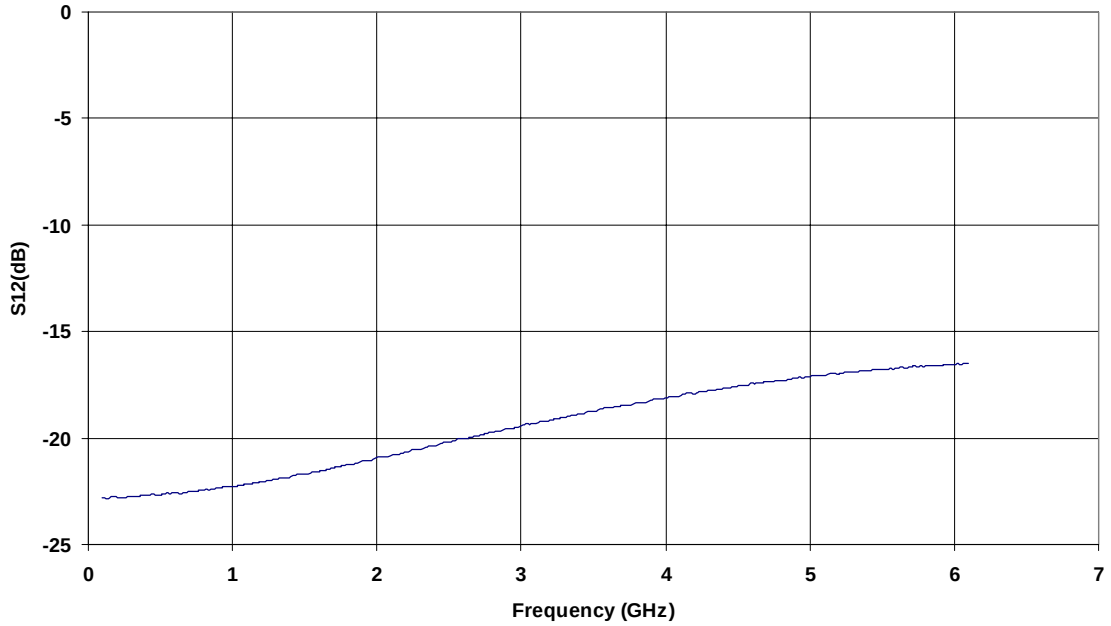


Figure 6

Noise Figure vs. Frequency, T=25°C

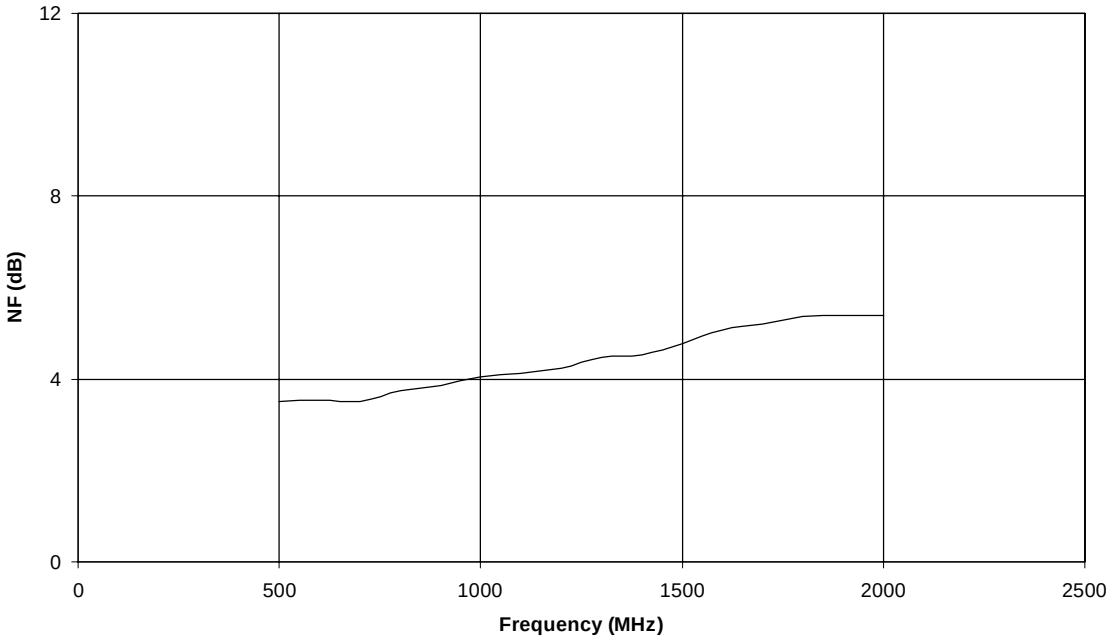
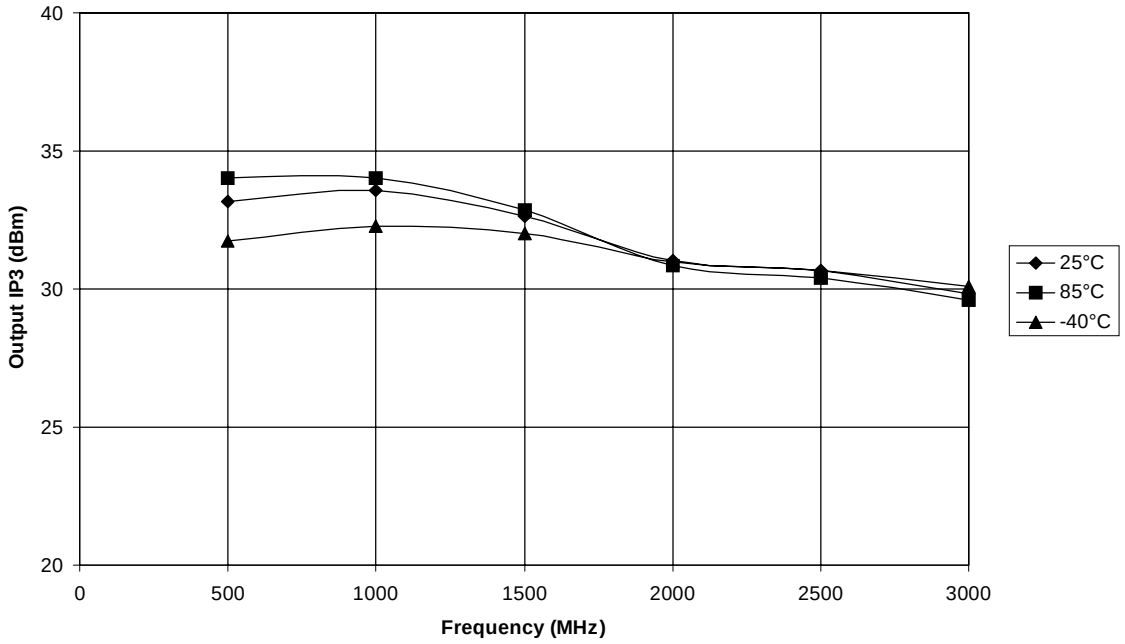


Figure 7

OIP3 vs. Frequency



APPLICATION NOTES

Please visit our website at www.eiccorp.com to view or download the following documents.
You may also call our Customer Service to request a hardcopy.

Document #	Description
AP-000192-000	Discussion of Technology and Reliability Enhancements
AP-000194-000	Biasing and Performance Enhancements
AP-000487-000	Tape and Reel Specifications and Package Drawings
AP-000515-000	Voltage Spike Suppression
AP-000516-000	Application Note Index