

Features

- DC to 6 GHz
- 14.8 dB Gain at 1000 MHz
- 18.6 dBm Output P1dB at 1000 MHz
- 36 dBm Output IP3 at 1000 MHz

Applications

- Broadband Gain Blocks
- High Linearity Amplifiers

Description

The EC-1119 is a high reliability, 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 +36dBm at 80 mA. The EC-1119 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 package.

Electrical Specifications

Test Conditions: $I_c = 80 \text{ mA}$, $T_a = 25^\circ\text{C}$

SYMBOL	PARAMETER		LIMITS			UNIT	TEST CONDITION
			MIN.	TYP.	MAX.		
F	Frequency		DC		6000	MHz	
G	Gain (Small Signal)	f = 1000MHz f = 2000MHz f = 3000MHz		14.8 13.5 12.8		dB	
G	Gain (Large Signal) $P_{in} = +5.5 \text{ dBm}$	f = 2000MHz f = 3000MHz		13.2 12.2		dB	
P_{1dB}	Output Power @ 1dB Compression	f = 1000MHz f = 2000MHz f = 3000MHz		18.6 18.6 18.3		dBm	
P_{sat}	Saturated Output Power	f = 1000MHz f = 2000MHz f = 3000MHz		19.8 19.9 19.5		dBm	
OIP3	Output Third Order Intercept	f = 1000MHz f = 2000MHz f = 3000MHz		35.9 33.2 32.0		dBm	Note 1
RL_{in}	Input Return Loss, 50 Ohm	f = 2000MHz		20.0		dB	
RL_{out}	Output Return Loss, 50 Ohm	f = 2000MHz		24.0		dB	
NF	Noise Figure	f = 2000MHz		5.5		dB	
Vde	Device Voltage			4.8		V	

Note 1: $OIP3 = P_{out} \text{ (by power meter, total 2-tone power)} + (IM3(dB))/2 - 3dB$



CAUTION!
SENSITIVE ELECTRONIC DEVICE

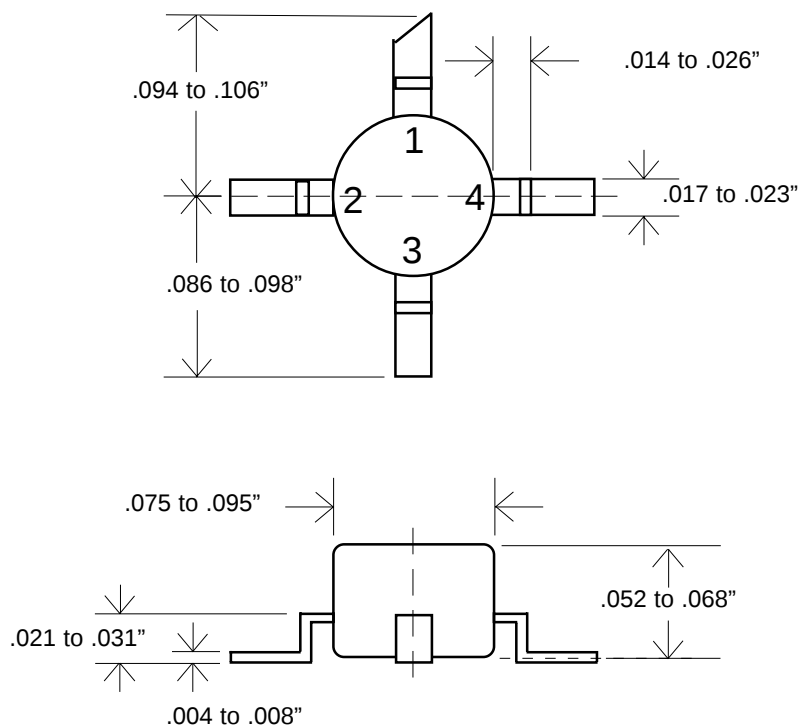
Absolute Maximum Ratings

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.

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 80mA 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=4.8V, Icc=80mA, Temperature=25°C

Frequency (MHz)	S11 (Mag)	S11 (Ang)	S21 (Mag)	S21 (Ang)	S12 (Mag)	S12 (Ang)	S22 (Mag)	S22 (Ang)
100	0.0081	64.62	5.892	176.4	0.1169	-1.142	0.0570	-6.991
250	0.0207	70.428	5.846	170.79	0.1164	-1.039	0.0573	-16.103
500	0.0406	68.562	5.769	161.605	0.1168	-2.124	0.0577	-32.054
1000	0.0709	59.616	5.562	144.367	0.1167	-3.928	0.0595	-61.318
1500	0.0926	49.117	5.268	127.577	0.1171	-5.683	0.0601	-88.717
2000	0.1029	39.537	5.003	112.23	0.1186	-7.459	0.0612	-117.062
2500	0.1051	31.399	4.679	97.347	0.1188	-9.677	0.0624	-146.841
3000	0.1009	25.504	4.366	83.804	0.1200	-11.365	0.0732	-175.799
3500	0.0911	22.857	4.102	70.348	0.1215	-13.982	0.0939	159.19
4000	0.0824	23.55	3.874	57.65	0.1233	-16.563	0.1223	142.118
4500	0.0740	29.546	3.641	44.83	0.1253	-19.733	0.1586	129.141
5000	0.0704	43.439	3.463	32.675	0.1272	-23.035	0.1996	119.639
5500	0.0850	58.605	3.279	20.029	0.1288	-26.884	0.2407	110.956
6000	0.1094	68.677	3.086	7.797	0.1301	-30.807	0.2865	103.133

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 nominal operating ambient temperature at +40°C.

Test Temp	Hours Completed	Quantity Tested	Quantity Failed
+145°C	1000	80	2
+145°C	400	40	0
+125°C	1000	20	0
Cumulative FIT @ 60% Confidence Level			22
Cumulative MTTF @ 60% Confidence Level (FIT 11)			4.5E+07 Hours
Cumulative FIT @ 90% Confidence Level			43
Cumulative MTTF @ 90% Confidence Level (FIT 28)			2.34E+07 Hours

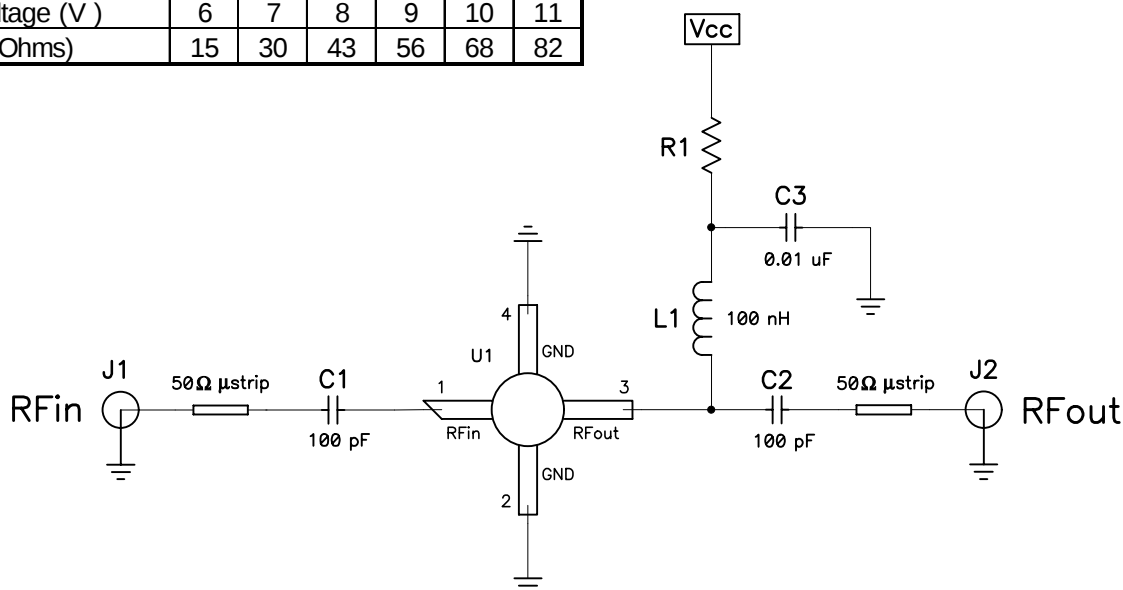
EiC will update the burn-in and cumulative FIT results periodically. Please check the website at www.eiccorp.com

Evaluation Board Schematic

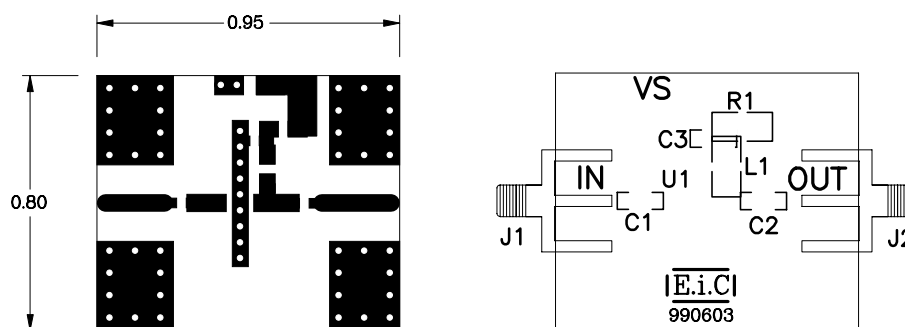
Recommended Bias Resistor Values

$$R = (V_{cc} - V_{de}) / I_{cc} = (V_{cc} - 4.8) / 0.080$$

Supply Voltage (V)	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	CE103K1NR	2	Capacitor (0603)	100 pF	C1, C2
PANASONIC	ECJ-1VF1A105Z	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
---	60-000009-003B	1	Printed Circuit Board	-	---

Figure 1

I_{cc} vs. V_{cc}

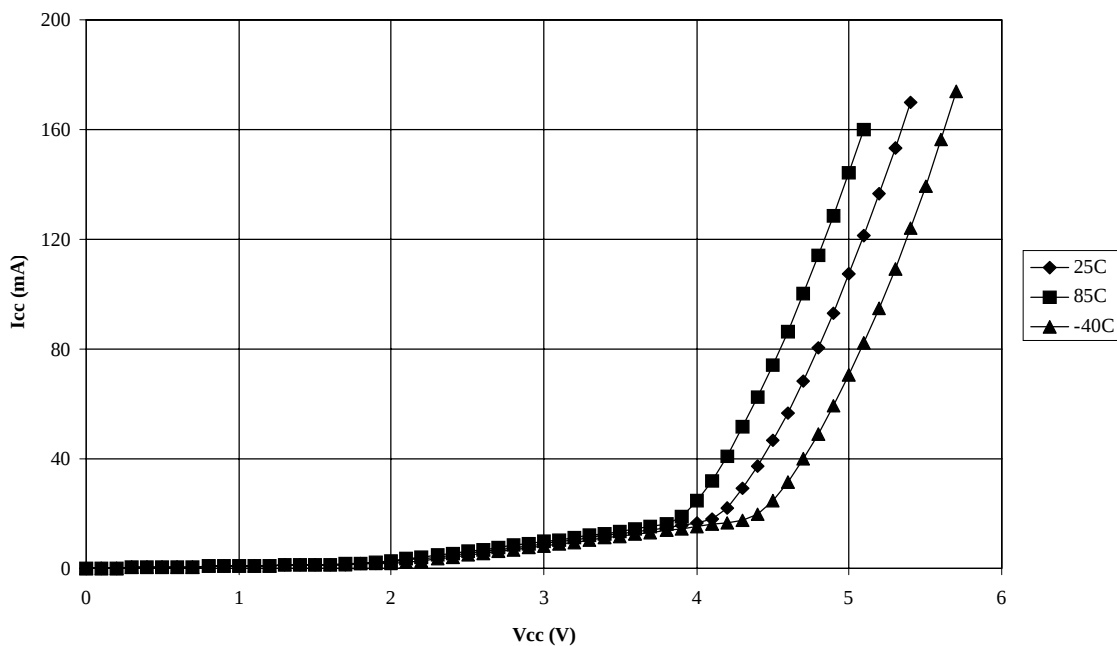


Figure 2

P1dB vs. Frequency

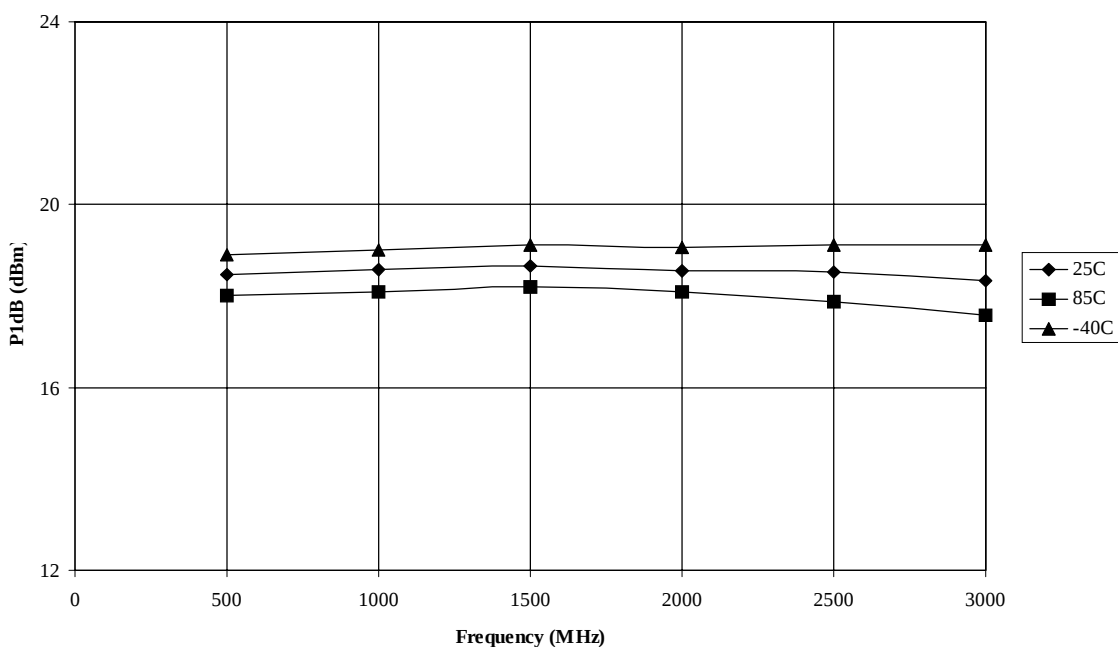


Figure 3

Gain vs. Frequency, T=25°C

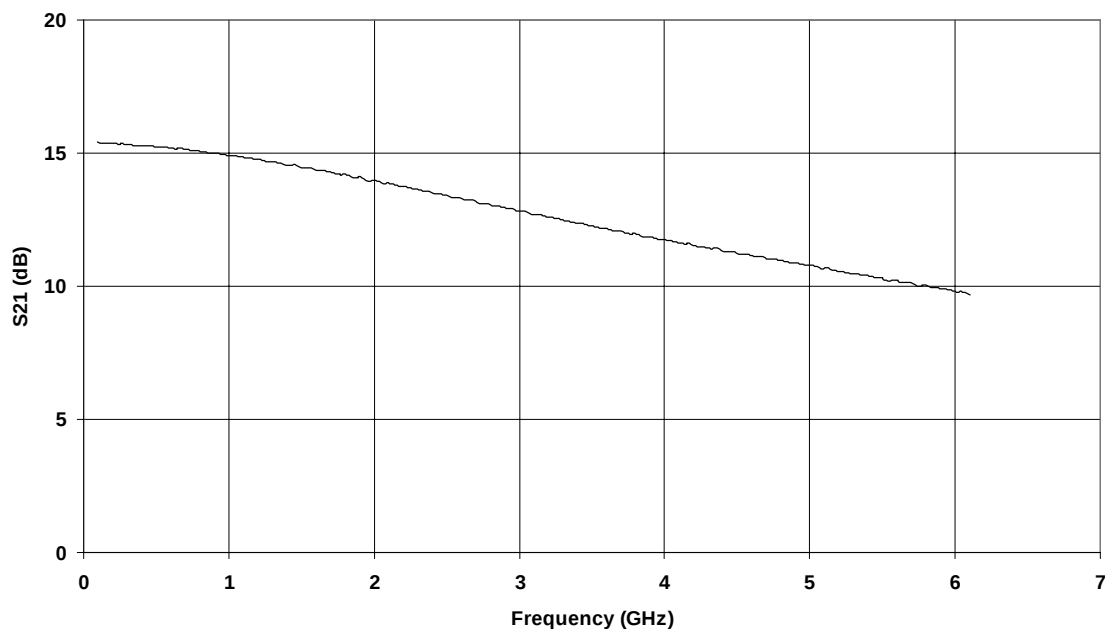


Figure 4

S11, S22 vs. Frequency, T=25°C

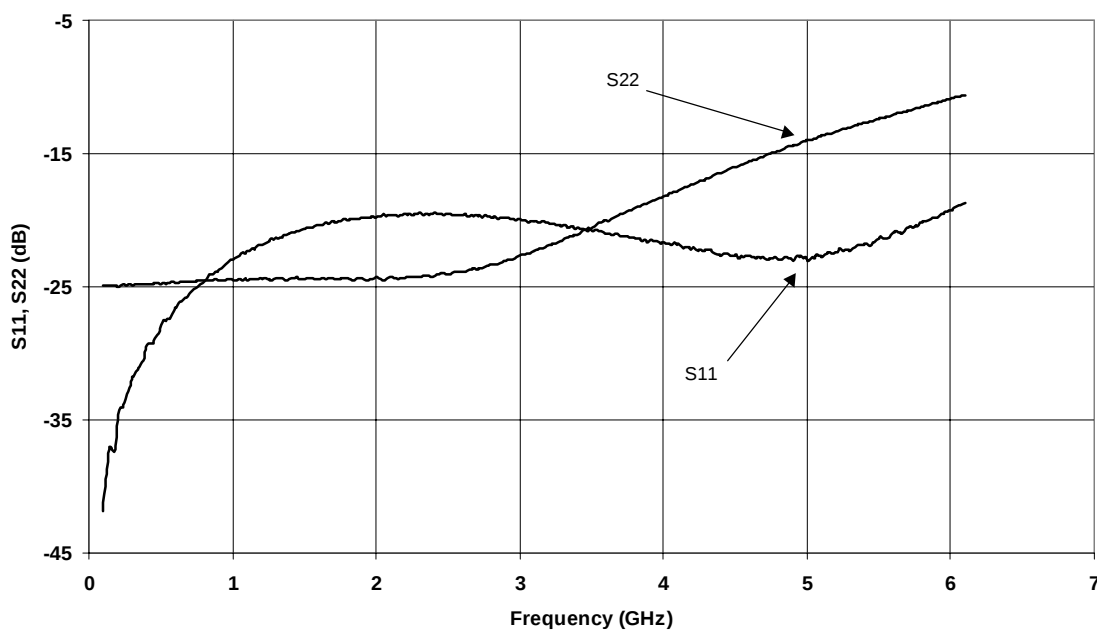


Figure 5

Reverse Isolation vs Frequency, T=25°C

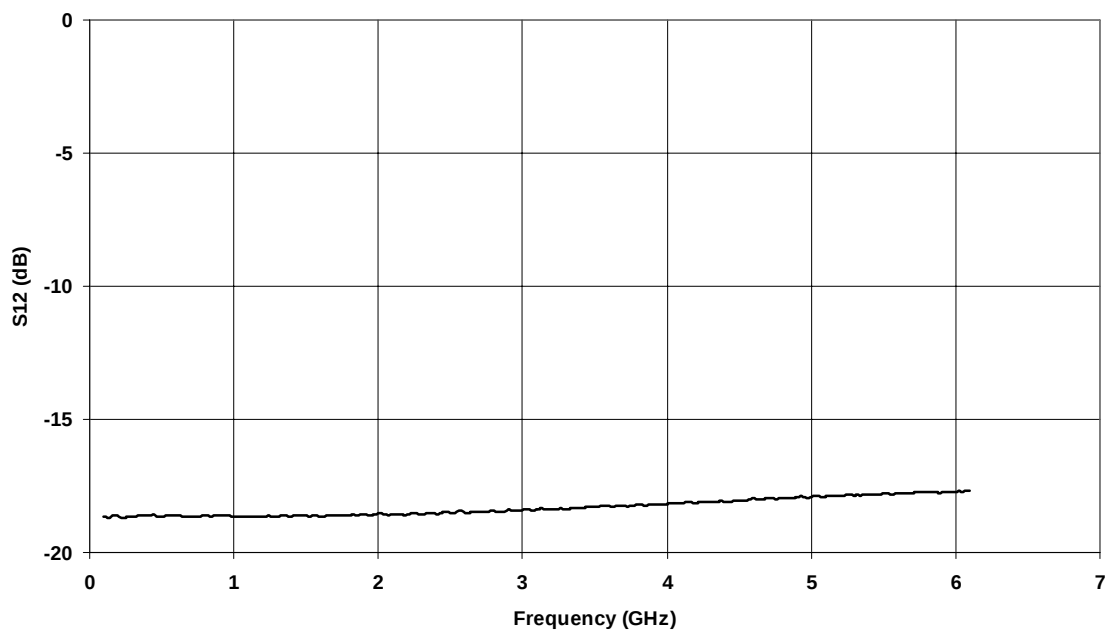


Figure 6

Noise Figure vs. Frequency, T=25°C

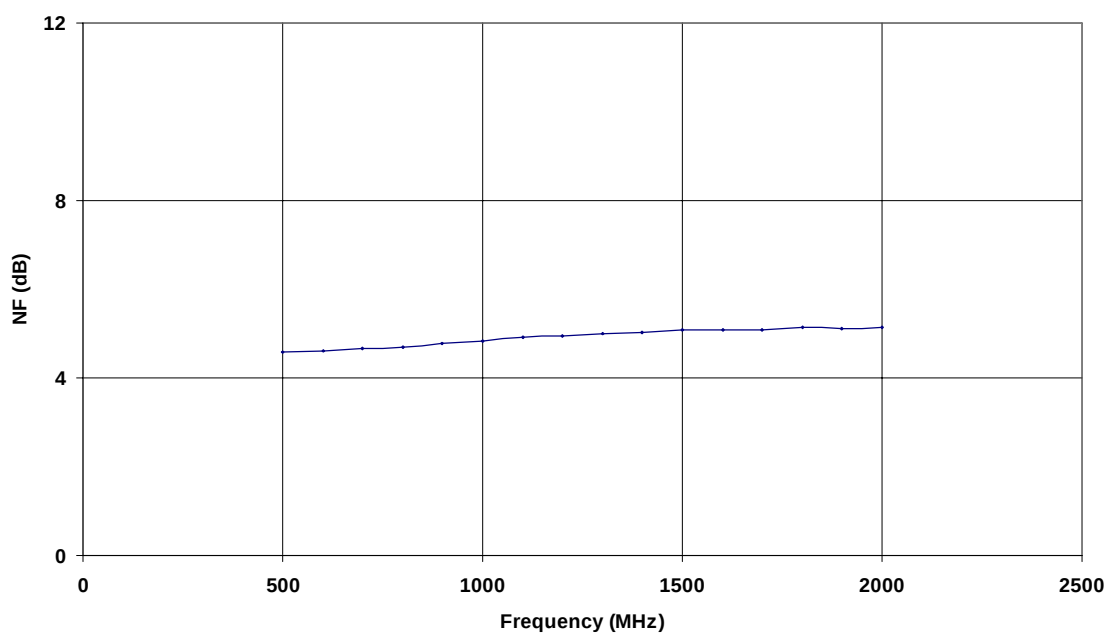
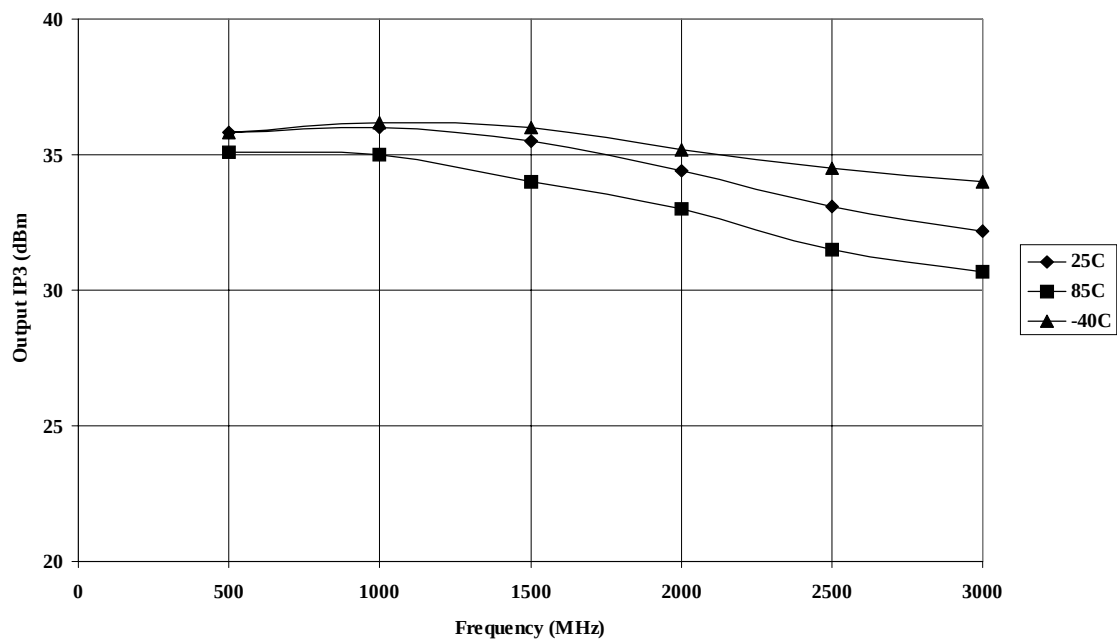


Figure 7**OIP3 vs. Frequency**

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