

Features

- DC to 2500 MHz
- 41 dBm Typical OIP3 at 1900 MHz
- Highly Reliable InGaP HBT
- 19.0 dB Typical Gain at 900 MHz
- 24.0 dBm Typical P1dB at 1900 MHz
- 24.0 dBm Typical P1dB at 2170 MHz
- 5.7dB Typical noise figure at 900MHz
- Excellent Stability

Applications

- Multi-carrier Systems
- High Linearity Amplifiers
- Cellular, PCS, WLL

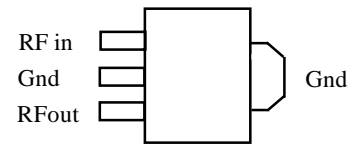
Packages Available

- (-B) SOT-89
- (-BL) SOT-89 (Lead Free)

Package

Description

The ECG009 is a high reliability, high OIP3 amplifier in a low cost SOT-89 package, optimized for the commercial communications market. The device is manufactured using advanced Indium Gallium Phosphide Heterojunction Bipolar Transistor (InGaP HBT) technology. The amplifier can be matched to achieve low VSWR and high OIP3 over the DC to 2500 MHz range. Typical OIP3 at 1900 MHz is +41 dBm. The ECG009 operates from a single 5 volt power supply.



SOT-89 (Top View)

Electrical Specifications

Test Conditions: Ta = 25°C, V = 5.0 V

SYMBOL	PARAMETER		LIMITS			UNIT	TEST CONDITION
			MIN.	TYP.	MAX.		
F	Frequency		DC		2500	MHz	
G	Gain (Small Signal)	f = 900 MHz f = 1900 MHz f = 2170 MHz	13.5 12.5	19.0 14.5 13.5		dB	
P _{1dB}	Output Power @ 1 dB Compression	f = 900 MHz f = 1900 MHz f = 2170 MHz		24 24 24		dBm	
OIP3	Output Third Order Intercept	f = 900 MHz f = 1900 MHz f = 2170 MHz	39.5 38.5	41 41 40		dBm	Note 1
RL _{IN}	Input Return Loss, 50 Ohm	f = 900 MHz f = 1900 MHz		8.0 9.0		dB	
RL _{IN}	Input Return Loss, 50 Ohm	f = 2170 MHz	15.0	20.0		dB	Note 2
RL _{OUT}	Output Return Loss, 50 Ohm	f = .9 to 2.5 GHz		12.0		dB	
NF	Noise Figure	f = 900 MHz f = 1900 MHz		5.7 6.5		dB	
I _c	Supply Current		130	150	170	mA	
	Output Mismatch without Spurs			10:1			
θ _j	Thermal Resistance			86		°C/W	

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

Note 2: Tested at Vcc= 5.0 V on an eval board with recommended matching circuit

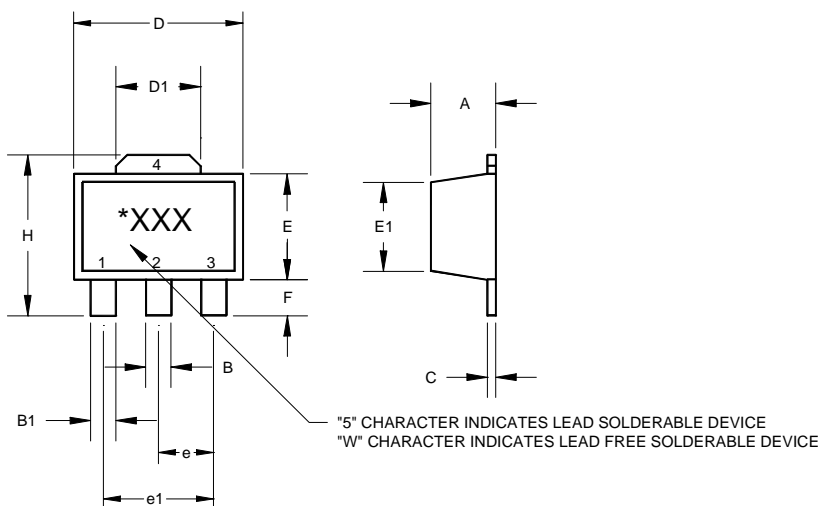


CAUTION!
SENSITIVE ELECTRONIC DEVICE

Absolute Maximum Ratings

Device Voltage	6.0	V
Device Current	220	mA
RF Power Input	15	dBm
Storage Temperature	-65 to +150	°C
Ambient Operating Temperature	-40 to +85	°C
Junction Temperature at 85°C Ambient	+200	°C

Package Outline



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

Device Marking

5: Part number (contains Pb)

W: Part number (Pb Free pkg.)

XXX: Lot number

Pin Definitions

Pin #	Pin	Definition
1	RFin	This pin has a non-zero DC potential, requiring a DC blocking capacitor. Input matching is required to achieve a low VSWR.
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	DC bias is applied to this pin through a RF choke. A bypass capacitor (1.0 micro farad) on the DC side of the choke is recommended for low frequency modulation signal.

Typical S-parameters

V_{cc} = 5V, I_{cc} = 150mA

FREQ-GHz	MAG[S11]	ANG[S11]	MAG[S21]	ANG[S21]	MAG[S12]	ANG[S12]	MAG[S22]	ANG[S22]
0.050	0.66	-169.14	14.26	149.67	0.03	17.14	0.41	-128.38
0.201	0.74	179.05	8.90	146.40	0.04	9.36	0.48	-169.64
0.353	0.74	174.44	7.95	138.81	0.04	10.91	0.48	-178.36
0.504	0.74	170.56	7.25	129.54	0.04	10.76	0.49	176.60
0.655	0.75	167.03	6.62	120.16	0.04	10.92	0.50	172.19
0.806	0.76	163.16	6.02	111.14	0.04	10.61	0.51	168.22
0.958	0.77	159.13	5.49	103.07	0.05	10.06	0.52	164.28
1.109	0.77	155.30	5.02	95.60	0.05	9.42	0.52	160.12
1.260	0.78	151.32	4.60	88.37	0.05	8.51	0.53	156.18
1.411	0.78	147.25	4.21	82.20	0.05	7.50	0.54	152.17
1.563	0.79	143.43	3.91	75.65	0.05	6.27	0.55	148.06
1.714	0.79	139.80	3.58	69.95	0.05	4.97	0.55	144.09
1.865	0.80	136.39	3.32	64.57	0.06	3.75	0.55	139.91
2.016	0.81	133.13	3.11	59.38	0.06	2.21	0.56	136.02
2.168	0.82	130.06	2.90	54.71	0.06	0.61	0.56	132.13
2.319	0.84	127.04	2.72	50.39	0.06	-1.15	0.57	128.24
2.470	0.85	123.62	2.59	45.22	0.06	-3.47	0.57	124.37
2.621	0.86	119.98	2.45	40.63	0.07	-5.81	0.57	120.68
2.773	0.87	115.83	2.32	35.60	0.07	-8.57	0.58	116.93
2.924	0.88	111.42	2.20	30.54	0.07	-11.70	0.58	113.27
3.075	0.87	106.68	2.09	24.91	0.07	-14.01	0.59	109.58

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

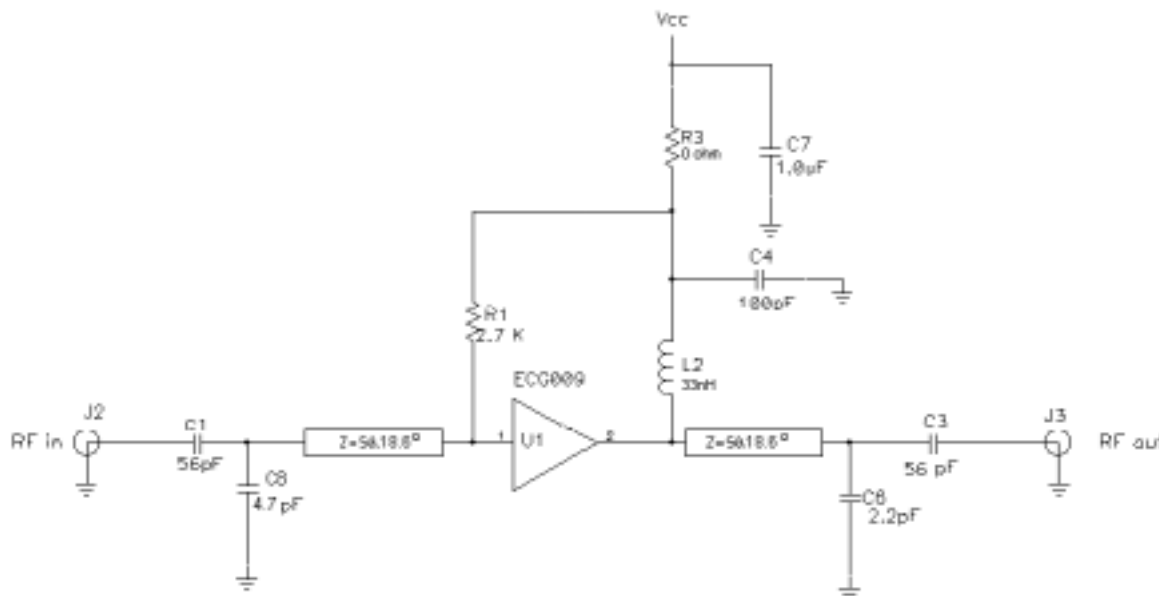
Junction to Ambient Temperature Difference: +65°C

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

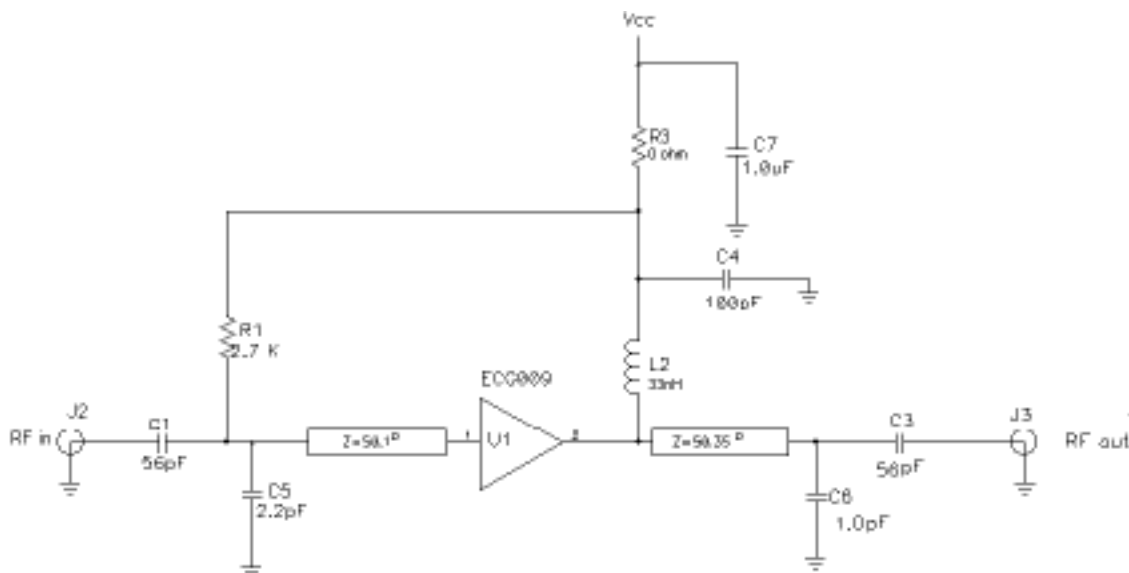
Test Temp	Hours Completed	Quantity Tested	Quantity Failed
+145°C	1000	80	0
+125°C	1000	20	0
Cumulative FIT @ 60% Confidence Level (T _j =125°C)			4
Cumulative MTTF @ 60% Confidence Level (FIT 4)			2.67E+08 Hours
Cumulative FIT @ 90% Confidence Level (T _j =125°C)			6
Cumulative MTTF @ 90% Confidence Level (FIT 6)			1.75E+08 Hours

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

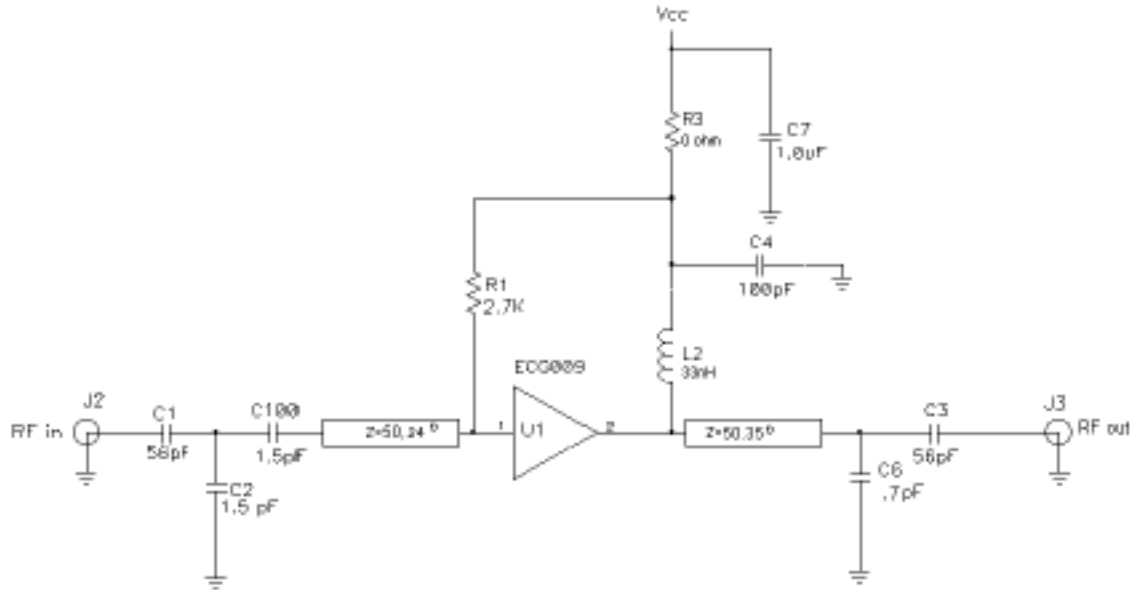
900MHz Application Circuit



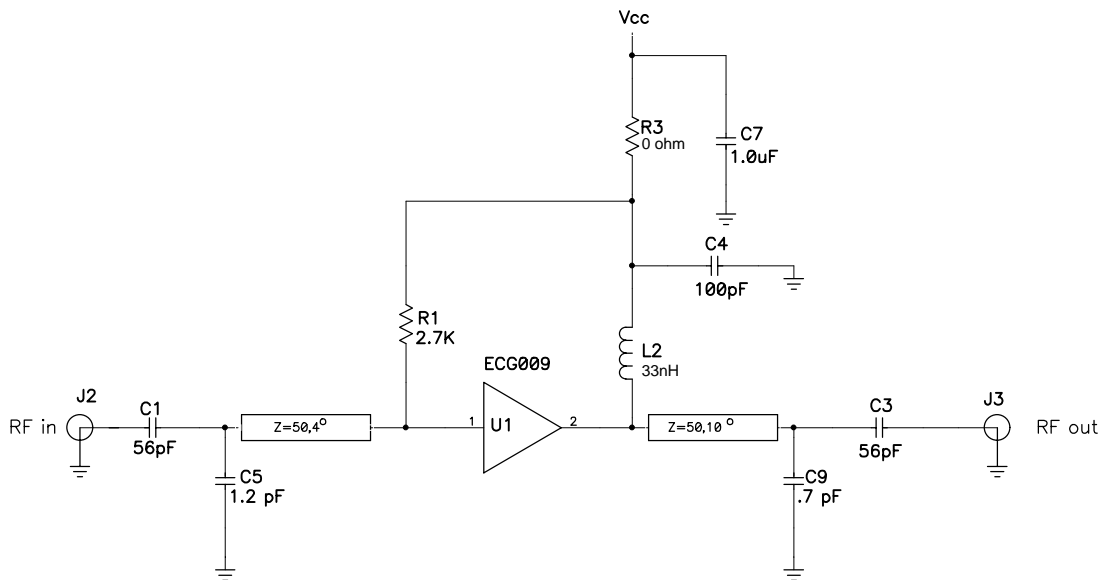
1900MHz Application Circuit



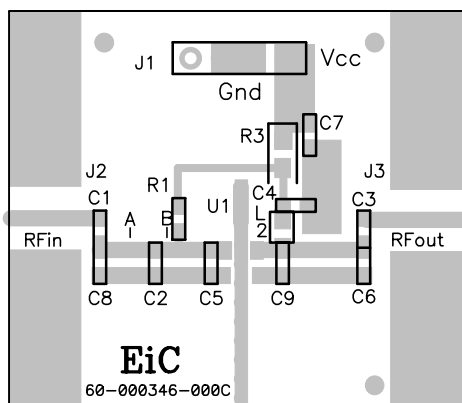
2170MHz Application Circuit



2450MHz Application Circuit



Evaluation Board Layout



REWORK INSTRUCTIONS

1. CUT INPUT TRACE AT LOCATION MARKED 'B' AND SOLDER COMPONENT C100 IN SERIES WITH INPUT AT LOCATION 'B' (For MINIMUM INPUT R/L of 15 dB at 2.17GHz)
2. FOR APPLICATIONS BELOW 500MHz. CUT INPUT TRACE AT LOCATION MARKED 'A' AND USE AN INDUCTOR IN SERIES WITH THE INPUT.

Evaluation Board Materials

.9GHZ	1.9GHZ	2.17GHZ	2.45GHZ	DESIG.	VALUE	DESCRIPTION	MANUFACTURER & P/N	
2	2	2	2	C1, C3	56pF	CAPACITOR, 0603	ROHM MCH185A560JK	NOTE 1
1	--	--	--	C8	4.7pF	CAPACITOR, 0603	ROHM MCH185A4R7DK	NOTE 1
1	1	1	1	C4	100pF	CAPACITOR, 0603	ROHM MCH185A5101JK	NOTE 1
--	1	--	--	C5	2.2pF	CAPACITOR, 0603	ROHM MCH185A2R2DK	NOTE 1
1	--	--	--	C6	2.2pF	CAPACITOR, 0603	ROHM MCH185A2R2DK	NOTE 1
--	1	--	--	C6	1.0pF	CAPACITOR, 0603	ROHM MCH185A10CK	NOTE 1
1	1	1	1	C7	1.0uF	CAPACITOR, 0603	PANASONIC ECJ-1VF1A105Z	NOTE 1
--	--	2	--	C2,C100	1.5pF	CAPACITOR, 0603	ROHM MCH185A1R5DK	NOTE 1
--	--	--	1	C5	1.2pF	CAPACITOR, 0603	ROHM MCH185A1R2DK	NOTE 1
--	--	1	--	C6	.7pF	CAPACITOR, 0603	NOVA N0R7C500NT	NOTE 1
--	--	--	1	C9	.7pF	CAPACITOR, 0603	NOVA N0R7C500NT	NOTE 1
1	1	1	1	R1	2.7K Ω	RESISTOR, 0603	ROHM MCR03J272	NOTE 1
1	1	1	1	R3	0 Ω	RESISTOR, 0603	ROHM MCR03J000	NOTE 1
1	1	1	1	L2	33 nH	INDUCTOR, 0805	CTLL 2012-33N	NOTE 1
2	2	2	2	J2, J3	---	SMA CONNECTOR	EF JOHNSON 142-0701-881	NOTE 1
1	1	1	1	J1	---	RT ANG. CONN.	SULLINS ELEC PZC04SGAN	
1	1	1	1		---	IC, ECG009	EiC Corp	
1	1	1	1		---	PCB	EiC Corp 60-000346-000C	

1. EiC RECOMMENDED COMPONENTS ARE SHOWN.
EQUIVALENT COMPONENTS MAY BE USED.

Figure 1

ACPR1 and ACPR2 vs. Pout
vs. Temperature at .9GHz
(See note below)

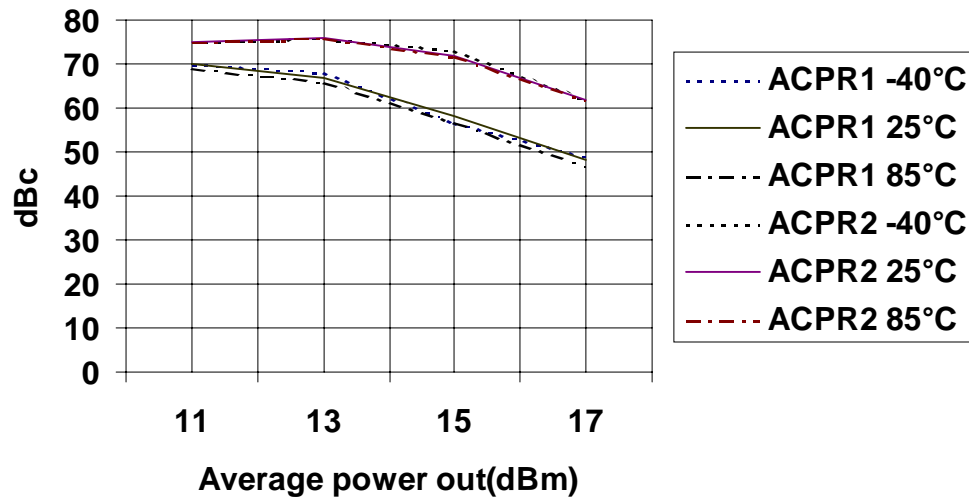
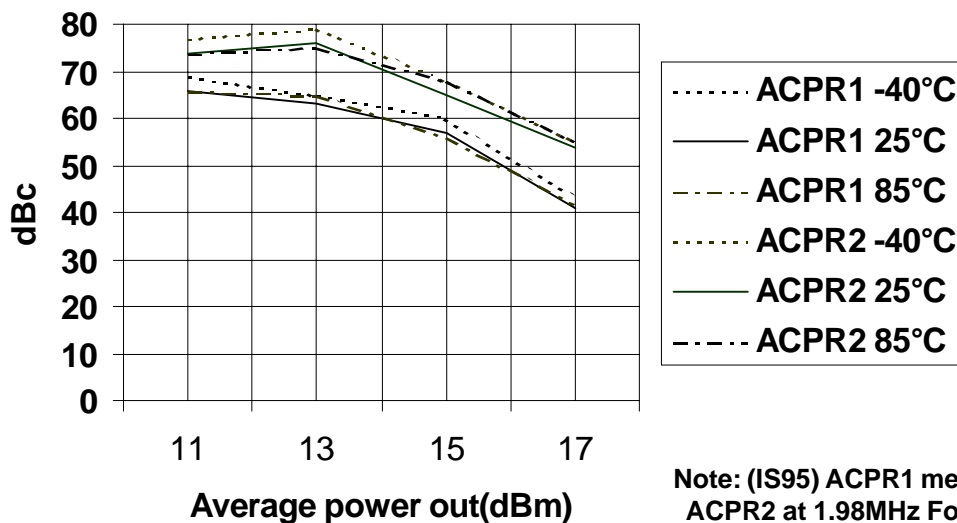


Figure 2

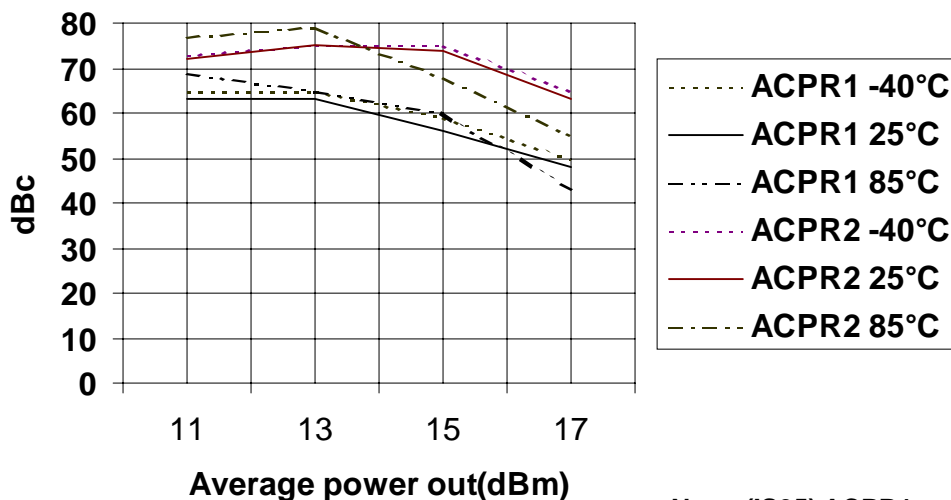
ACPR1 and ACPR2 vs. Pout
vs. Temperature at 1.9GHz
(See note below)



Note: (IS95) ACPR1 measured at 750KHz
ACPR2 at 1.98MHz Forward 9 Channel
Signal Generator: HP E4432B

Figure 3

ACPR1 and ACPR2 vs. Pout
vs. Temperature at 2.17GHz
(See note below)



Note: (IS95) ACPR1 measured at 750KHz
ACPR2 at 1.98MHz Forward 9 Channel
Signal Generator: HP E4432B

Figure 4

Ssg, OIP3 and P1dB vs.
Temperature at .9GHz

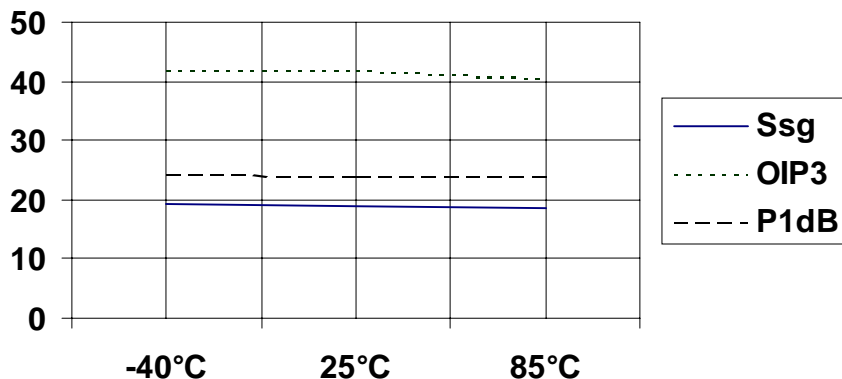


Figure 5

Ssg, OIP3 and P1dB vs. Temperature at 1.9GHz

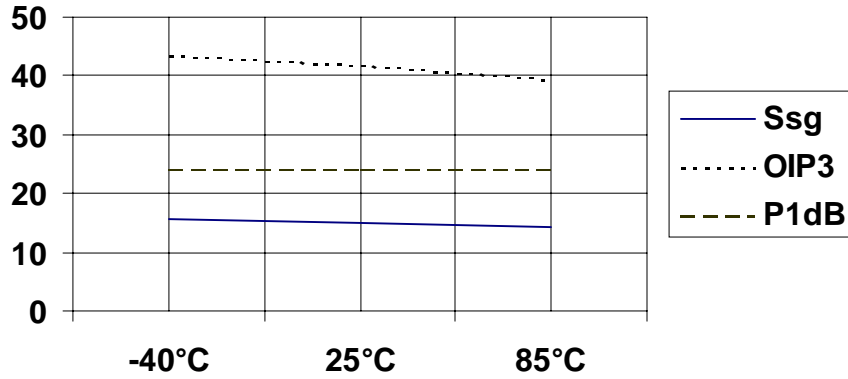
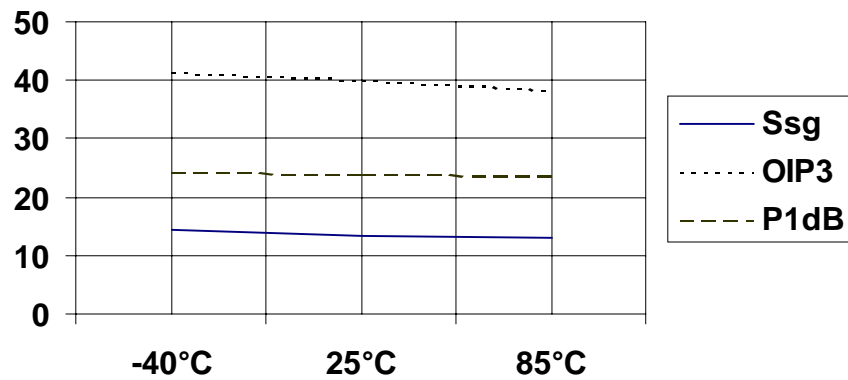


Figure 6

Ssg, OIP3 and P1dB vs. Temperature at 2.17GHz



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	Biassing 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

ORDERING INFORMATION

	PKG. TYPE	REEL QTY.
ECG009B	SOT89	BULK
ECG009B-500	SOT89	500
ECG009B-1000	SOT89	1000
ECG009BL	SOT89	BULK (Lead free)
ECG009BL-500	SOT89	500 (Lead free)
ECG009BL-1000	SOT89	1000 (Lead free)