

Features

- 1800 MHz - 2300MHz
- 28dBm P1dB
- High Linearity: 45dBm OIP3
- High Efficiency: PAE > 45%
- 15 dB of Linear Gain
- Single 5V Supply
- High Reliability
- Class A or AB operation

Product Description

The ECP050 is a single stage 0.5W power amplifier that offers excellent linearity and efficiency. This device was developed using EiC's proprietary InGaP Heterojunction Bipolar Transistor (HBT) process. The devices have partially matched input impedance. It is optimized for multicarrier applications and allows customers to use class A or class AB operations. The devices can be easily matched to obtain optimum power, linearity and efficiency. The product is targeted for use as a driver amplifier for wireless infrastructure applications. It is available in two surface-mount plastic packages: QFN-16 (4x4mm) and SOIC-8 slug.

Electrical Specifications

Test Conditions: $T_a = 25^{\circ}\text{C}$, $V_{cc} = +5\text{ V}$ $I_{cq} = 250\text{mA}$ (class A operation)

Applications

- Basestations and Repeaters
- CDMA/GSM/TDMA/EDGE
- PCS/CDMA2000/IMT2000/UMTS
- Multi-carrier systems

Packages Available

- QFN-16 (4x4mm)
- SOIC-8

SYMBOL	PARAMETER		LIMITS			UNIT	TEST CONDITION
			MIN.	TYP.	MAX.		
F	Frequency		1800		2300	MHz	
G	Gain (Small Signal)	f = 1960MHz		15.0			
		f = 2140MHz		14.0			
P1dB	Output Power @ 1dB Compression	f = 1960MHz		28.0			
		f = 2140MHz		27.0			
OIP3	Output Third Order Intercept	f = 1960MHz		45.0			
		f = 2140MHz		44.0			
ACPR1	Pout = 22dBm (IS-95)	f = 1960MHz		-45		dBc	9 ch. Fwd.
ACPR1	Pout = 20dBm (WCDMA)	f = 2140MHz		-45		dBc	Note 2
	Gain Flatness (120MHz Band)	f = 2140MHz		± 0.5		dB	
RL in	Input Return Loss (50 Ohm)	f = 2000MHz		15.0		dB	
Icop	Operational Current @ P1dB			290		mA	
Vde	Device Voltage			5.0		Vdc	
θ_{JA}	Thermal Resistance			60.0		$^{\circ}\text{C/W}$	
θ_{JA}	Thermal Resistance (reference)			102.0		$^{\circ}\text{C/W}$	Note 3

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

Note 2: ACPR measured for 3GPP test model 1, 64 DPCH. Channel bandwidth = 3.84MHz. Frequency offset: +/- 5MHz.

Note 3: For the recommended mounting solution please refer to APNOTE AP-000556-000.



CAUTION!
SENSITIVE ELECTRONIC DEVICE

Absolute Maximum Ratings

PARAMETER	RATING	UNIT
Supply Voltage	8	Volts
Supply Current	400	mA
RF Power Input	+22	dBm
Storage Temperature	-65 to +150	°C
Ambient Operating Temperature	-40 to +85	°C
Absolute Maximum DC Power	2	Watts

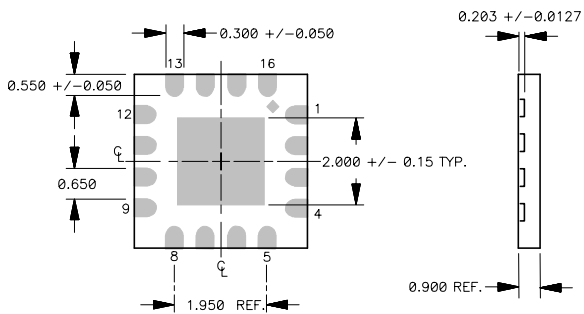
Note: Exceeding any of the absolute maximum ratings may cause permanent damage to the device.

Note: Do not exceed more than one parameter at the same time.

QFN-16 (4x4mm) Package Outline

Package

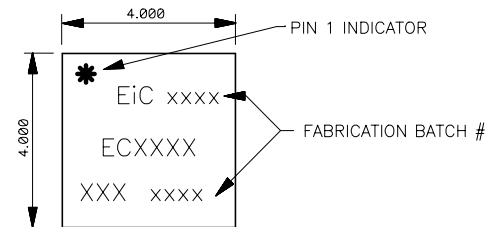
NOTE: ALL DIMENSIONS ARE IN MILLIMETERS



BOTTOM VIEW

SIDE VIEW

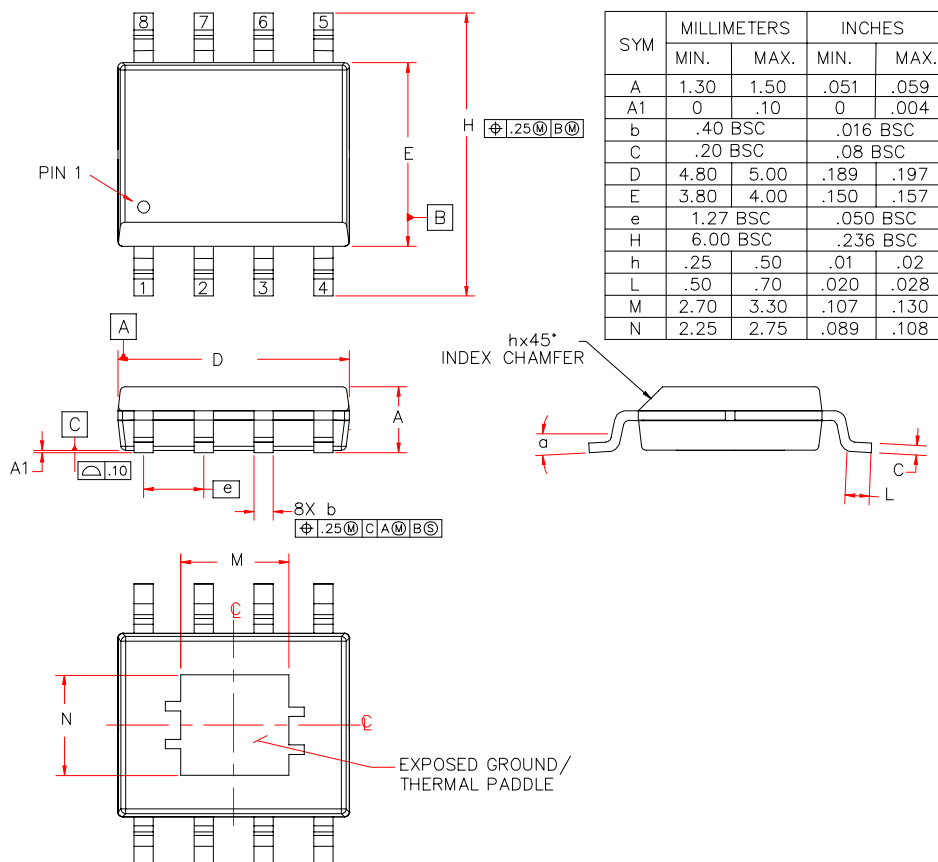
DEVICE MARKING



TOP VIEW

Pin Definitions

PIN	FUNCTION	DEFINITION
1	Vref/pd	This pin sets the reference / quiescent current.
2,4-9, 12-15	N/C	These pins are not connected but should be grounded.
3	RF in	This pin connects to the input of the amplifier. It will have a dc voltage around 1.25 to 1.3 VDC. External circuit should provide DC blocking.
10,11	RF out	These are the output pins, which connects to the collector of the transistor. On the PCB, the two pins should also be tied together. Vcc connects to these through an inductor. A DC blocking capacitor is required.
16	Vbias	This pin provides current to the bias circuit , typically Vbias = Vcc. Bypass capacitors should be placed as close as practically possible to this pin.
Slug	GND	This pin provides ground and heat sinking.

SOIC-8 Package Outline

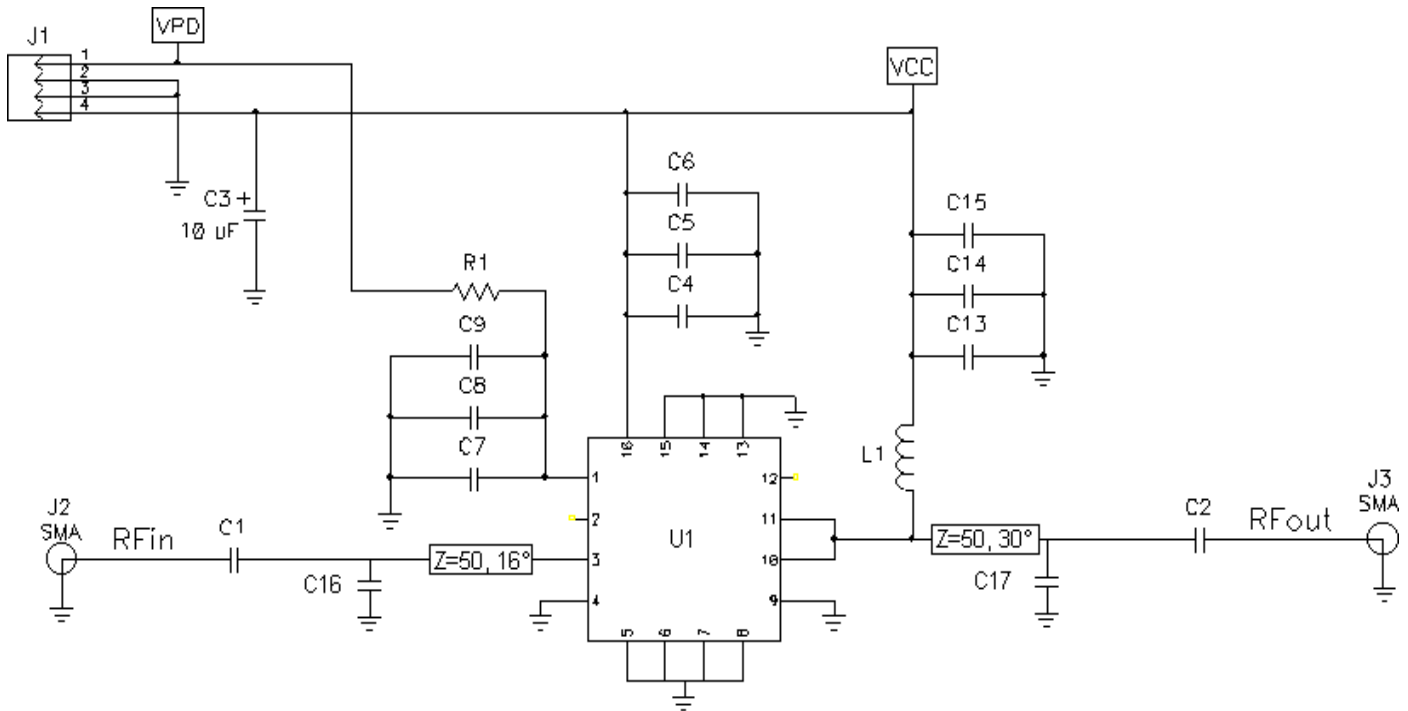
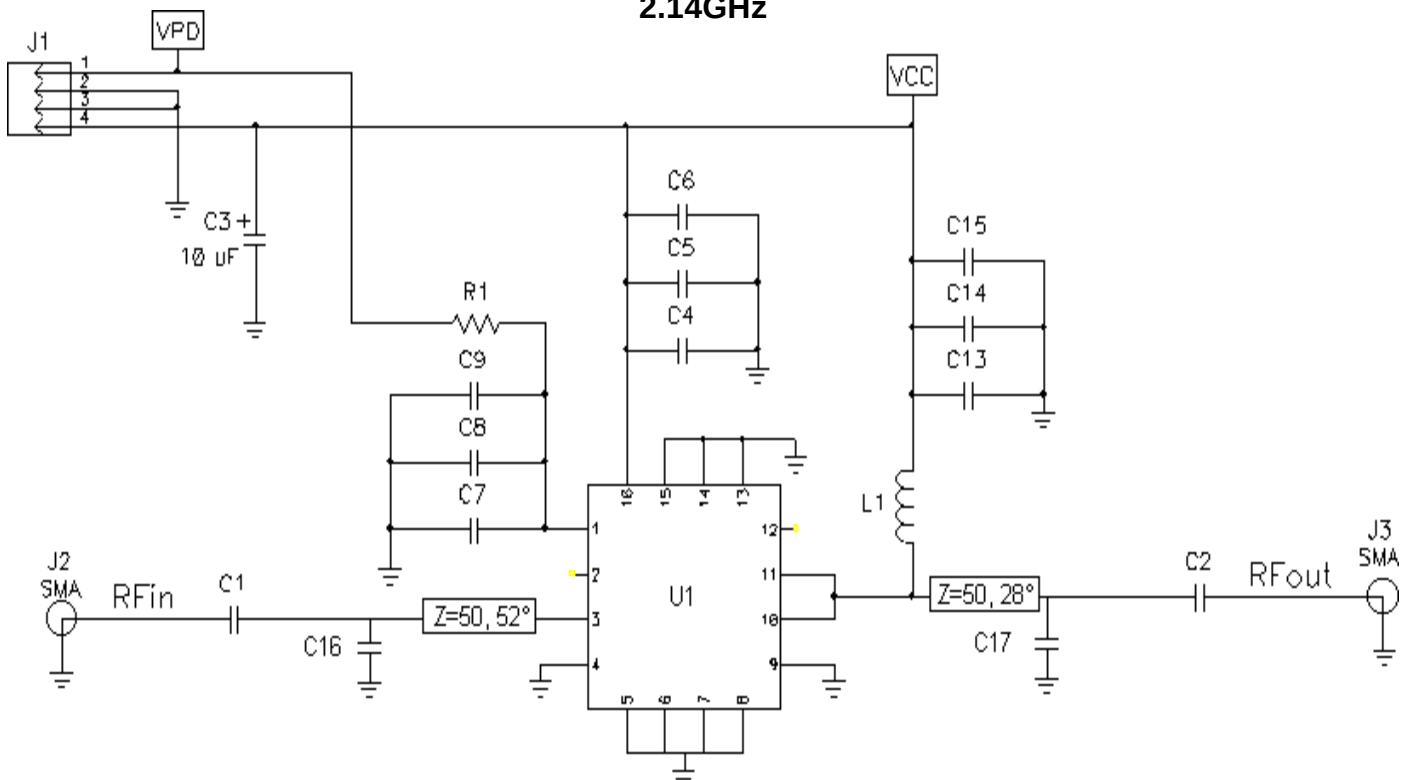
1. MOLD FLASH, PROTRUSIONS AND GATE BURRS
AT THE END OF THE PACKAGE BODY SHALL NOT
EXCEED 0.0006" PER SIDE.

2. UNIT = INCH

NOTES: UNLESS OTHERWISE SPECIFIED

Pin Definitions

PIN	FUNCTION	DEFINITION
1	Vref/pd	This pin sets the reference / quiescent current.
2,4,5	N/C	These pins are not connected but should be grounded.
3	RF in	This pin connects to the input of the amplifier. It will have a dc voltage around 1.25 to 1.3 VDC. External circuit should provide DC blocking.
6,7	RF out	These are the output pins, which connects to the collector of the transistor. On the PCB, the two pins should also be tied together. Vcc connects to these through an inductor. A DC blocking capacitor is required.
8	Vbias	This pin provides current to the bias circuit , typically Vbias = Vcc. Bypass capacitors should be placed as close as practically possible to this pin.
Slug	GND	This pin provides ground and heat sinking.

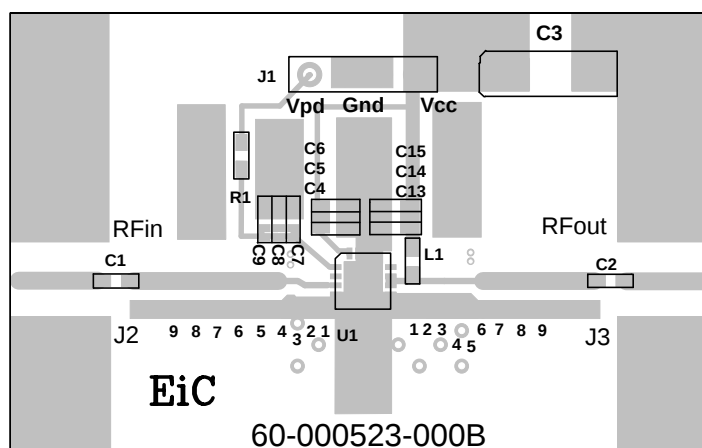
**Evaluation Board Application Schematics (4X4)
1.96GHz****2.14GHz**

Evaluation Board Bill of Material (4x4)

1.9GHz Qty.	2.14GHz Qty.	Location (See eval brd. Layout)	DESIG.	VALUE	DESCRIPTION	MANUFACTURER & P/N	
1	1		C1	10pF	CAPACITOR, 0603	ROHM MCH185A100DK	NOTE1
1	1		C2	100pF	CAPACITOR, 0603	ROHM MCH185A101JK	NOTE1
1	1		C3	10.0uF	CAPACITOR, 2512	PANASONIC ECS-H1CC106R	NOTE1
3	3		C4, C7, C13	18pF	CAPACITOR, 0603	ROHM MCH185A180JK	NOTE1
3	3		C5, C8, C14	1000pF	CAPACITOR, 0603	ROHM MCH185C102KK	NOTE1
3	3		C9, C6, C15	1.0uF	CAPACITOR, 0603	PANASONIC ECJ-1VF1A105Z	NOTE1
--	1	INPUT 4 5	C16	3pF	CAPACITOR, 0603	ROHM MCH185A020CK	NOTE1
1	--	INPUT 6	C16	2.7pF	CAPACITOR, 0603	ROHM MCH185A2R7CK	NOTE1
--	1	OUTPUT 2	C17	3.9pF	CAPACITOR, 0603	ROHM MCH185A3R9CK	NOTE1
1	--	OUTPUT 1 2	C17	3.9pF	CAPACITOR, 0603	ROHM MCH185A3R9CK	NOTE1
	1	OUTPUT 4	C18	1.5pF	CAPACITOR, 0603	ROHM MCH185A1R5CK	NOTE1
1	--	OUTPUT 5	C18	1.5pF	CAPACITOR, 0603	ROHM MCH185A1R5CK	NOTE1
1	1		R1	15 Ω	RESISTOR, 0603	ROHM MCR03EZJH150	NOTE1
1	1		L1	18 nH	INDUCTOR, 2520	1008HQ-18NX_B	NOTE1
2	2		J2, J3	---	SMA CONNECTOR	EF JOHNSON 142-0701-631	NOTE1
1	1		J1	---	RT ANG. CONN.	SULLINS ELEC PZC04SGAN	NOTE1
1	1			---	IC, ECP200D (4X4)	EiC Corp	
1	1			---	PCB (4X4)	EiC Corp 60-000523-000B	

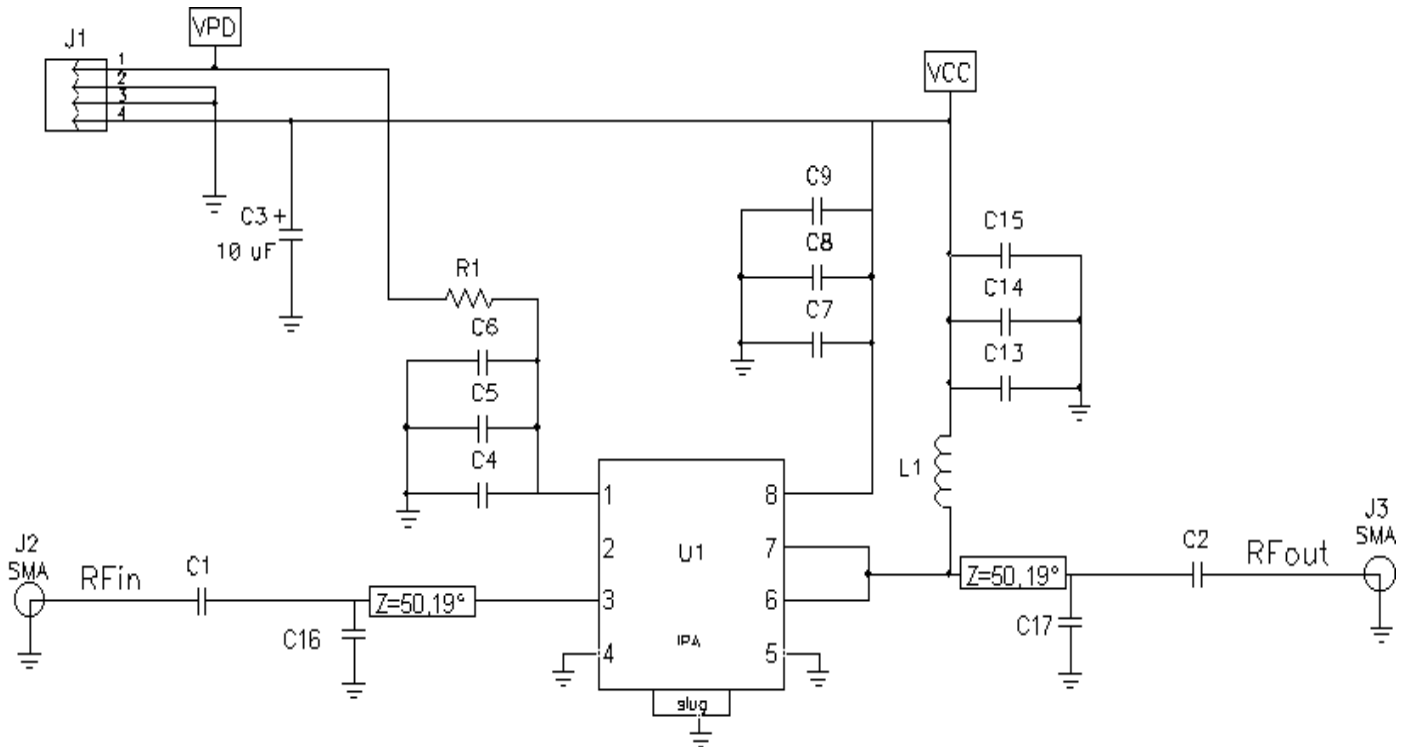
1. EiC RECOMMENDED COMPONENTS ARE SHOWN. EQUIVALENT COMPONENTS MAY BE USED.

Evaluation Board Layout (4X4)

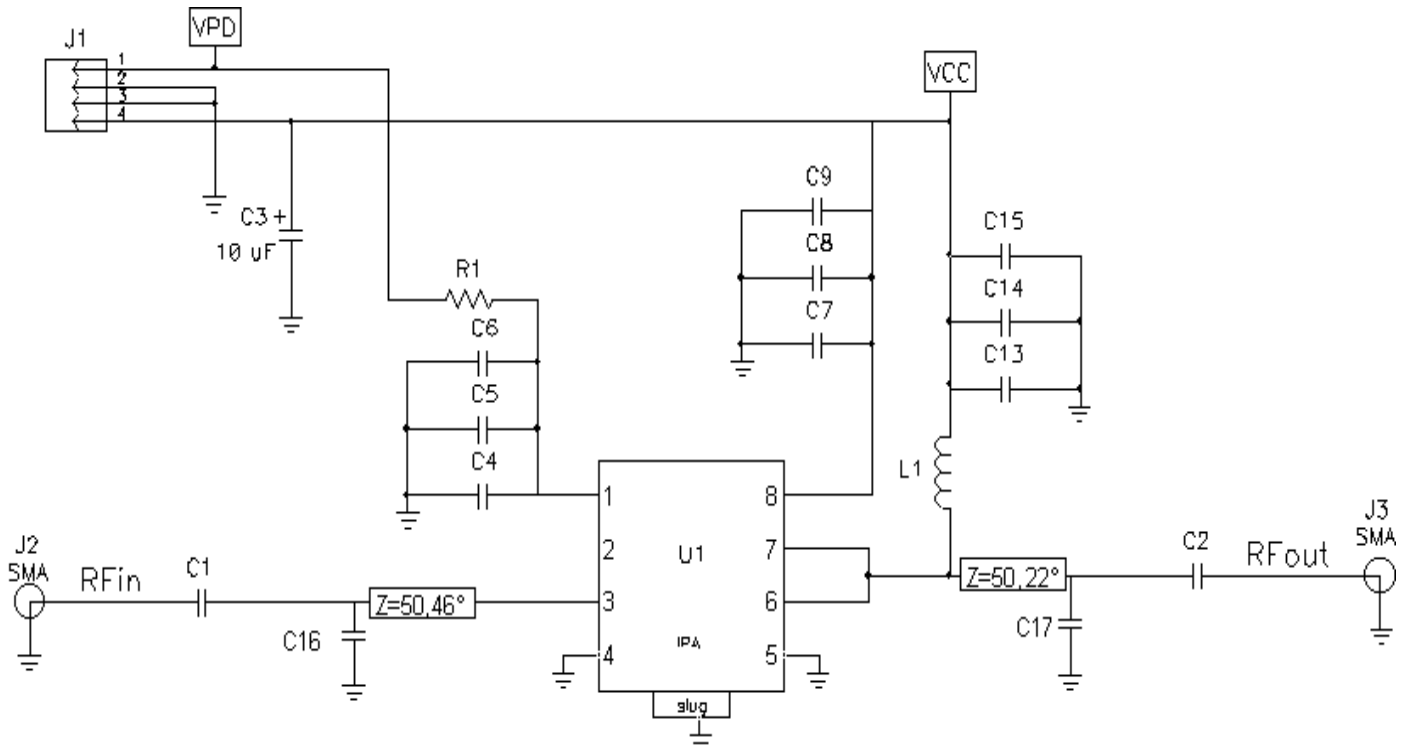


Evaluation Board Application Schematic (SOIC-8)

1.96GHz



2.14GHz

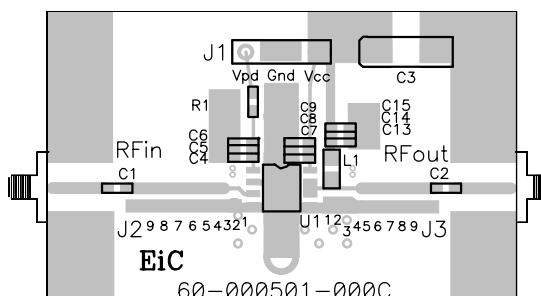


Evaluation Board Bill of Material (SOIC-8)

1.9GHz Qty.	2.14GHz Qty.	Location (See eval brd. Layout)	DESIG.	VALUE	DESCRIPTION	MANUFACTURER & P/N	
1	1		C1	10pF	CAPACITOR, 0603	ROHM MCH185A100DK	NOTE1
1	1		C1, C2	100pF	CAPACITOR, 0603	ROHM MCH185A101JK	NOTE 1
1	1		C3	10.0uF	CAPACITOR, 2512	PANASONIC ECS-H1CC106R	NOTE 1
2	3		C4, C13	18pF	CAPACITOR, 0603	ROHM MCH185A180JK	NOTE 1
2	3		C5, C14	1000pF	CAPACITOR, 0603	ROHM MCH185C102KK	NOTE 1
2	3		C6, C15	1.0uF	CAPACITOR, 0603	PANASONIC ECJ-1VF1A105Z	NOTE 1
1	--	INPUT 4 5	C16	1.0pF	CAPACITOR, 0603	ROHM MCH185A010CK	NOTE 1
--	1	INPUT 8	C16	.8pF	CAPACITOR, 0603	AVX 06035J0R8BBT	NOTE 1
--	1	OUTPUT 4	C17	1.8pF	CAPACITOR, 0603	ROHM MCH185A1R8DK	NOTE 1
1	--	OUTPUT 4	C17	1.8pF	CAPACITOR, 0603	ROHM MCH185A1R8DK	NOTE 1
1	1		R1	100 Ω	RESISTOR, 0603	ROHM MCR01J101	NOTE 1
1	1		L1	15 nH	INDUCTOR, 0805	CTLL 2012-15N	NOTE 1
2	2		J2, J3	---	SMA CONNECTOR	EF JOHNSON 142-0701-631	NOTE 1
1	1		J1	---	RT ANG. CONN.	SULLINS ELEC PZC04SGAN	NOTE 1
1	1			---	IC, ECP050G	EiC Corp	
1	1			---	PCB (SOIC-8)	EiC Corp 60-000501-000C	

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

Evaluation Board Layout



**ECP050 @ 25°C 1.96GHz
CW Pout & PAE vs. Pin
Class A 5Vcc 250mA Icq**

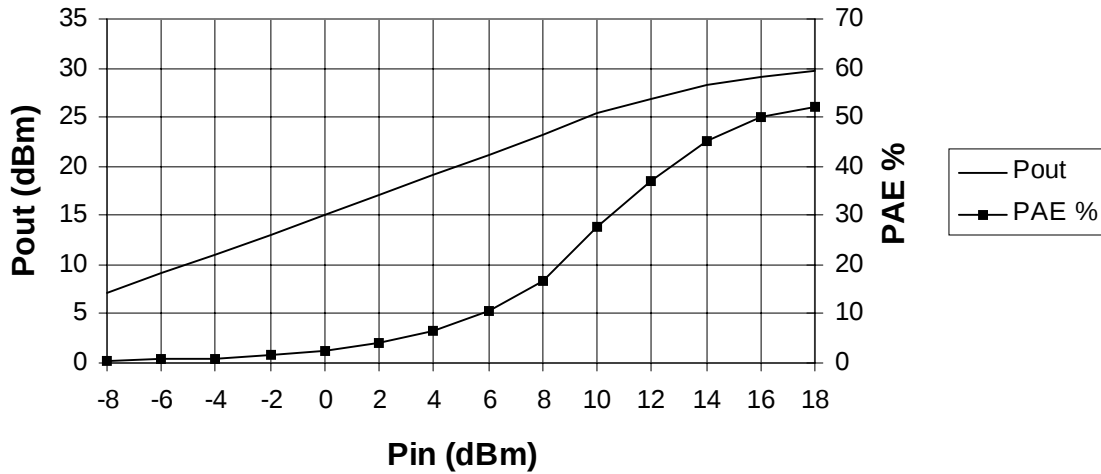


Figure 1

**ECP050 @ 25°C Pout vs. Frequency
Class A 5Vcc 250mA Icq**

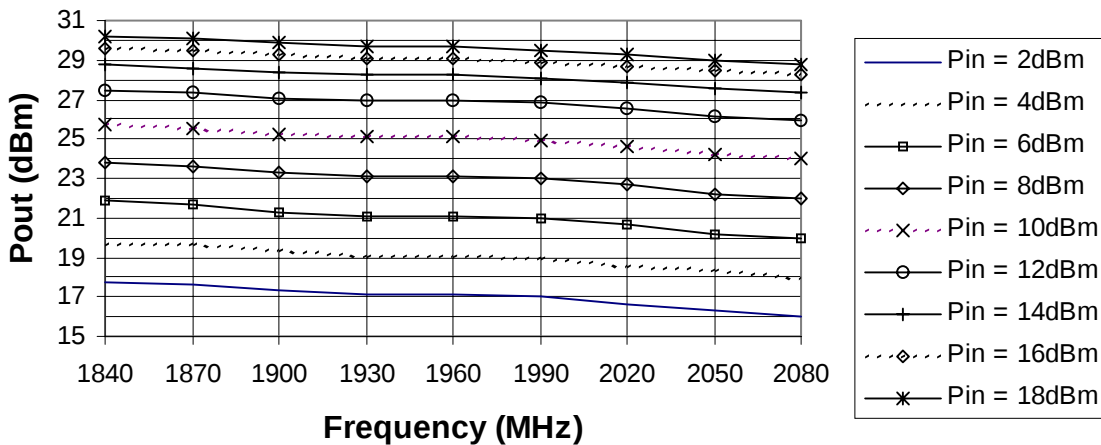


Figure 2

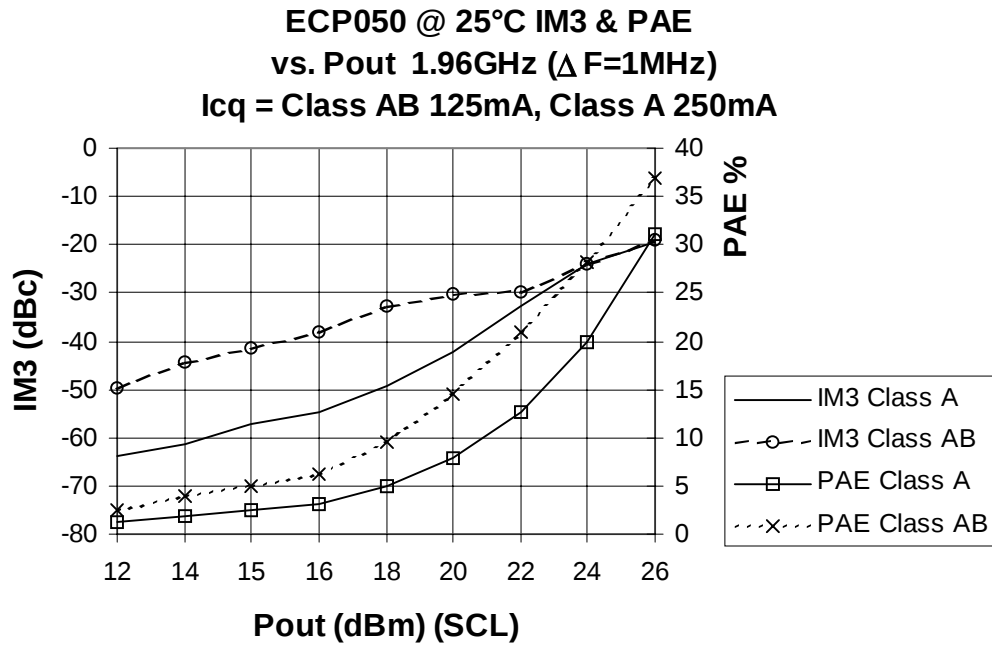


Figure 3

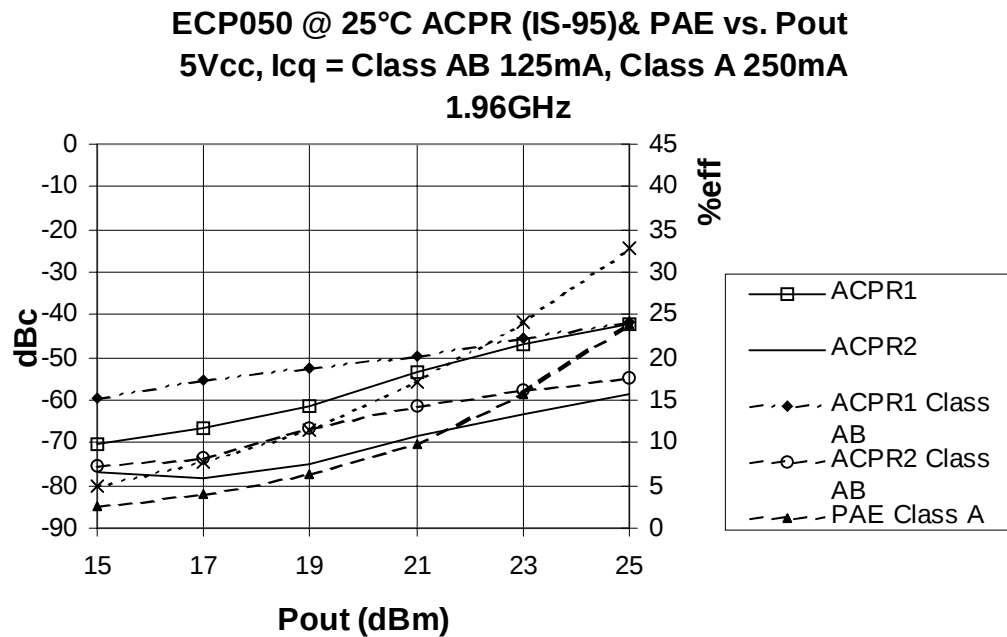


Figure 4

**ECP050 @ 25°C CW Pout & PAE vs. Pin
@ 2.14GHz Class A 5Vcc 250mA**

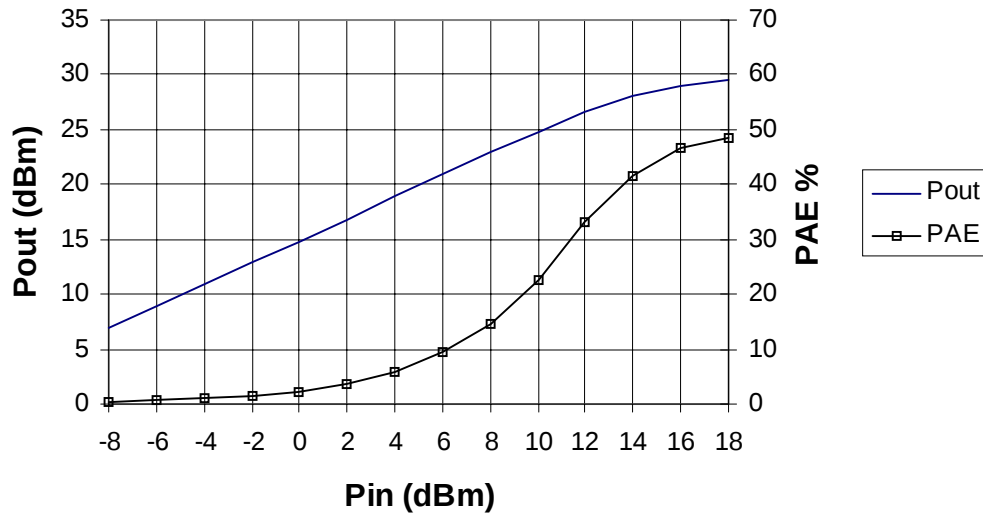


Figure 5

**ECP050 @ 25°C Pout vs. Frequency
Class A 5Vcc 250mA Icq**

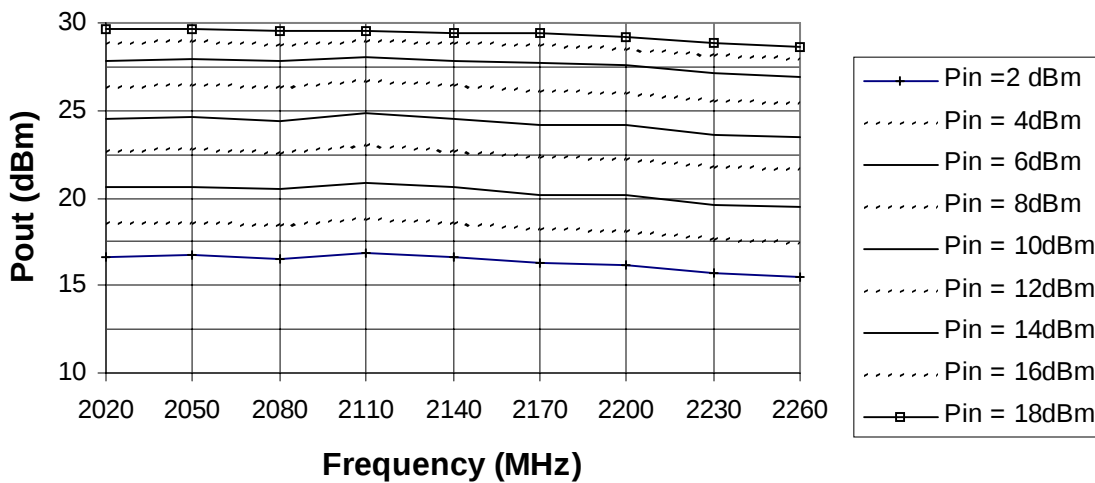
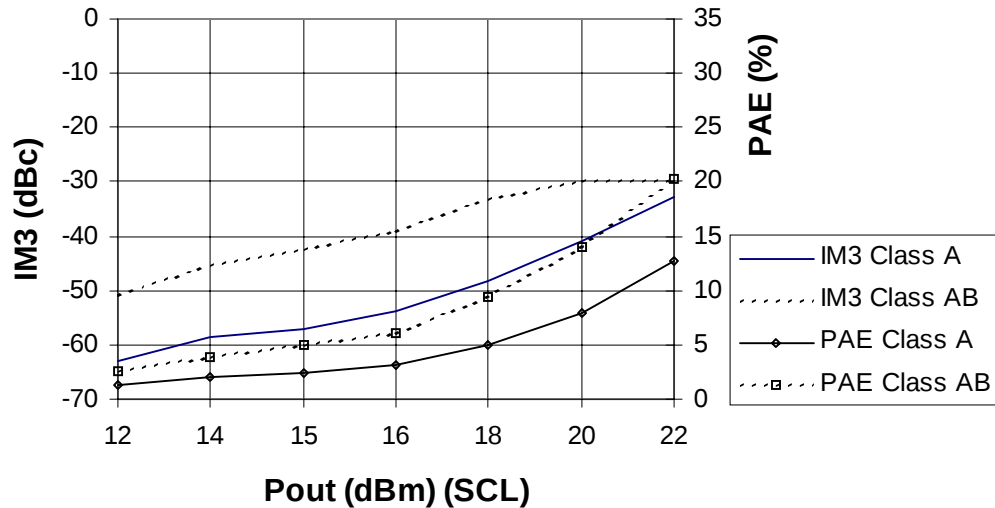


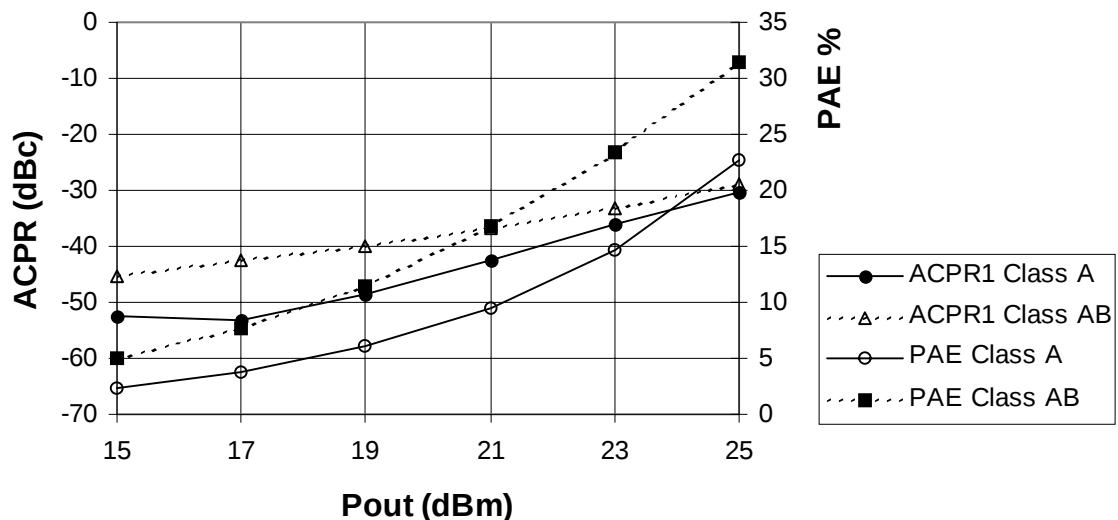
Figure 6

ECP050 @ 25°C IM3 & PAE vs. Pout
@ 2.14GHz Icq = Class AB 125mA, Class A 250mA

**Figure 7**

Note: Test Model 1, 64 DPCH, Class AB Icq = 225mA

ECP050 @ 25°C 2.14GHz ACPR & PAE vs. Pout
Icq = Class AB 125mA, Class A 250mA

**Figure 8**

ECP050 OIP3 & PAE vs. Pout vs. Temperature
Class A 5Vcc 250mA Icq @ 2.14GHz

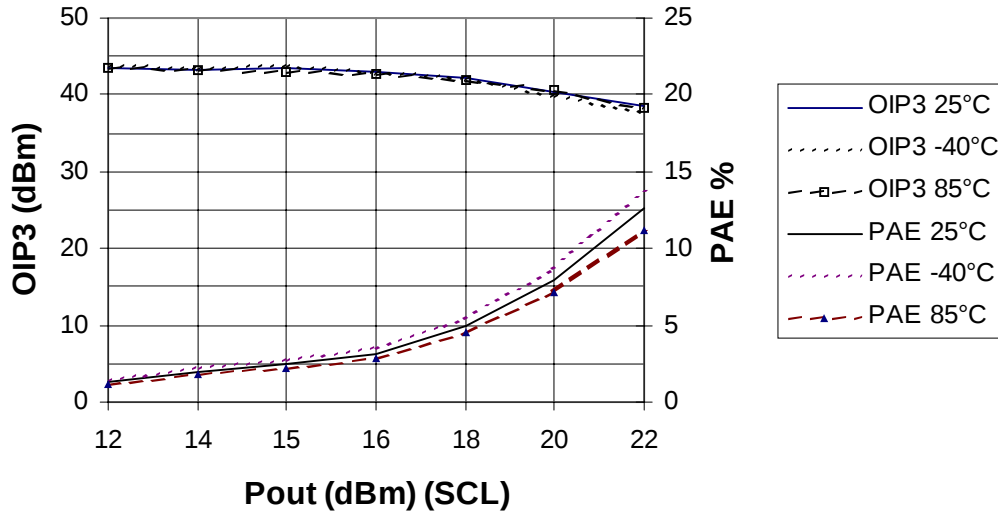


Figure 9

ECP050 ACPR & PAE vs. Temperature
vs. Pout @ 2.14GHz Class A 5Vcc 250mA Icq

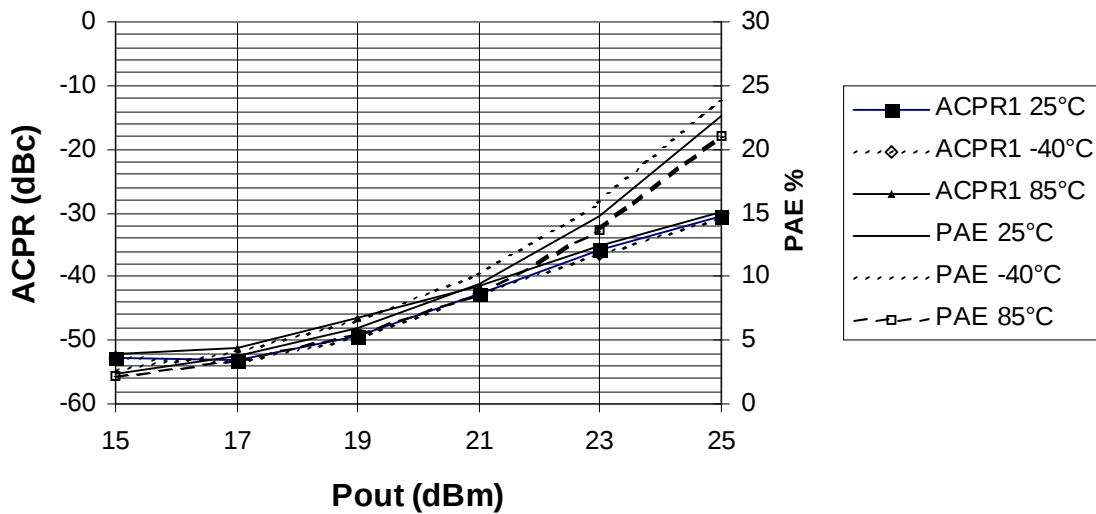


Figure 10

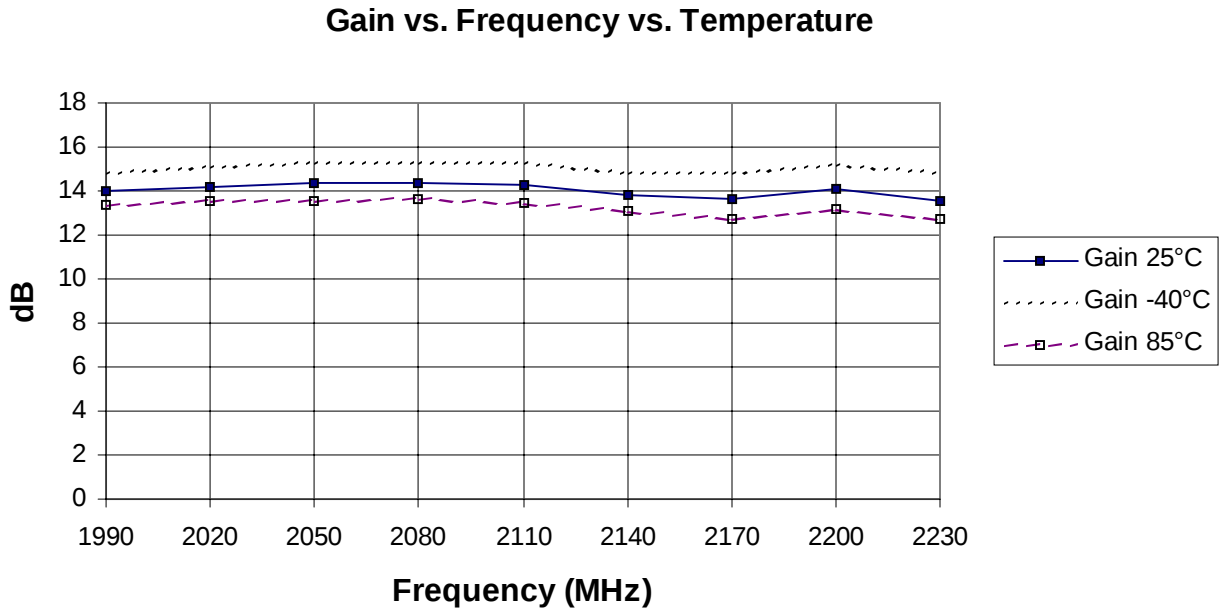


Figure 11

APPLICATION NOTE

- All of EiC's IPAs use the same evaluation board, bypass and DC blocking capacitors. The values are the same for all the capacitors except for matching.
- Matching circuits are described by the schematics. The values of the components are listed in the bill of material.
- The DC power connector consists of four pins. The two inside pins are for ground.
- The Vref/pd pin of the IC can be used to set the amplifier in class A operation when connected to 5V, or varying degree of Class AB by adjusting the voltage lower (typically >3.0 volts). The bias condition can also be set by varying the value of R1 while keeping the Vref/pd at 5V.
- The Vcc pin can operate up to 7 volts Vcc. The bias current can be adjusted by the reference voltage or R1 value.