ANADIGICS

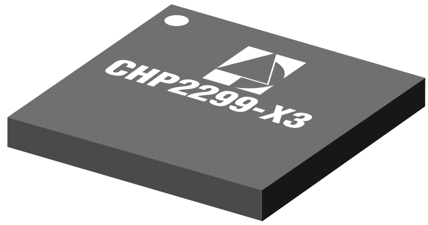
CHP2299-X3

WCDMA
InGaP HBT Amplifier Module

PRELIMINARY DATA SHEET - Rev 1.1

FEATURES

- Small profile (3 x 3 x 1 mm)
- InGaP HBT Technology
- Low quiescent current of 20 mA
- PFT™ 50 Ω matched module
- High linearity of -40 dBc
- High PAE of 40%
- Low V_{REF} of 2.85 V
- Single positive supply voltage
- Single mode operation for high and low powers
- Optional Analog gain control (AGC) & current adjust
- Lead-Free package



X3 Package
9 Pin 3 x 3 x 1 mm
Surface Mount Module

APPLICATIONS

- WCDMA Multi-mode handsets
- WLL Subscriber units

PRODUCT DESCRIPTION

CHP2299-X3 is an InGaP HBT amplifier module offering high performance for WCDMA wireless handsets. It consists of a two-stage amplifier, 50 Ω matching network for both input and output, and a bias control circuit. It is packaged in a 3 x 3 x 1 mm package using proprietary Passive-Free Technology (PFT)™. The package is Lead-Free and provides excellent electrical stability and low thermal resistance.

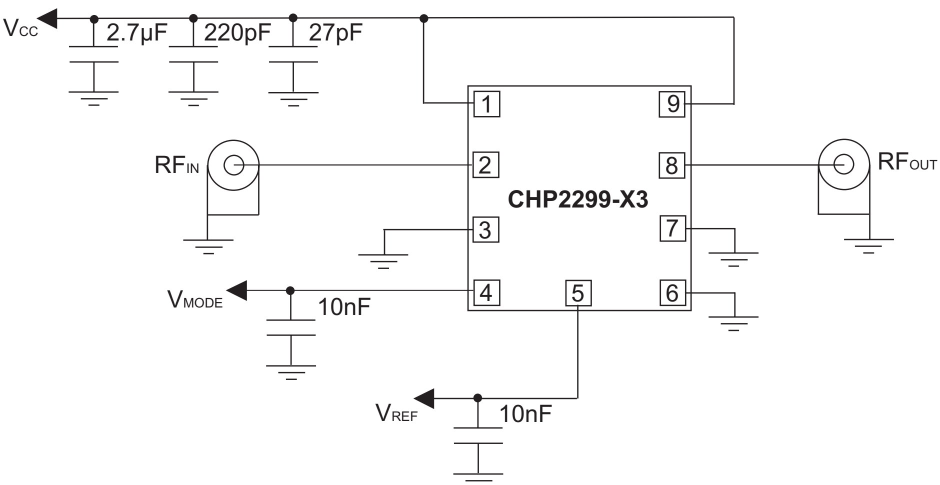


Figure 1: Block Diagram

Table 1: Pad Description

PIN	NAME	DESCRIPTION
1	V_{CC}	Supply Voltage
2	RF_{IN}	RF Input Signal
3	GND	Ground
4	V_{MODE}	Mode Control
5	V_{REF}	Reference Voltage
6	GND	Ground
7	GND	Ground
8	RF_{OUT}	RF Output
9	V_{CC}	Supply Voltage

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Minimum and Maximum Ratings

PARAMETER	MIN	MAX	UNIT	COMMENTS
RF Input Power (P_{IN})	-	10	dBm	
Supply Voltage (V_{CC})	-	6	V	
Reference Voltage (V_{REF})	-	3.4	V	
Mode Control Voltage(V_{MODE})	-	3.4	V	
Case Operating Temperature (T_C)	-25	100	°C	
Storage Temperature (T_{STG})	- 55	125	°C	
Soldering Temperature (T_S)	-	260	°C	5 seconds

Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.

Table 3: Operating Ranges (with NO AGC)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (f)	1920	-	1980	MHz	
Supply Voltage (V_{CC})	+1.8	+3.4	+4.2	V	
Reference Voltage (V_{REF})	+2.8	+2.85	+2.9	V	
Mode Control Voltage (V_{MODE})	+2.1	+2.85	+3.0	V	with NO AGC option
Operating Temperature (T_C)	-25	+25	+85	°C	

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

Notes:

1. In NO AGC option, V_{MODE} can simply be tied to V_{REF}.

Table 4: Electrical Specifications (with NO AGC)
(T_C = +25 °C, fo = 1950 MHz (unless otherwise specified), V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain GL G Gh	 22 24 25	 24 26 27	 26 28 29	dB	 V_{CC} = 1.8 V, Po = 0 dBm V_{CC} = 3.4 V, Po = 16 dBm V_{CC} = 3.4 V, Po = 27.5 dBm
Power-Added Efficiency (1) PAE PAEH	 - -	 18 40	 - -	%	 V_{CC} = 1.8 V, Po = 16 dBm V_{CC} = 3.4 V, Po = 27.5 dBm
Adjacent Channel Power Ratio(2) 5 MHz Offset ACLR1L ACLR1H 10 MHz Offset ACLR2L ACLR2H	 - - - -	 -43 -40 -62 -50	 -38 -37 -50 -47	dBc	 V_{CC} = 1.8 V, Po = 16 dBm V_{CC} = 3.4 V, Po = 27.5 dBm V_{CC} = 1.8 V, Po = 16 dBm V_{CC} = 3.4 V, Po = 27.5 dBm
Quiescent Current Shutdown Mode Iqs Iq(3)	 - 45	 1 50	 5 65	 µA mA	 V_{REF} = 0V, V_{MODE} = 0V, No RF No RF
Reference Current (V_{REF})	-	-	8	mA	Po = 27.5 dBm
V_{MODE} Current	-	-	100	µA	V_{MODE} = 2.1 V
Noise in Receive Band(4)	-	-136	-	dBm/Hz	Po = 27.5 dBm
Harmonics 2fo 3fo	 - -	 - -	 -28 -28	dBc	 Po = 27.5 dBm Po = 27.5 dBm
Input Return Loss	-	-18	-12	dB	S11
Spurious Output Level	-	-	-60	dBc	VSWR < 6:1 Applies over all voltage and temperature operating ranges
Ruggedness - no damage(5)	10:1	-	-	VSWR	Po = 27.5 dBm

Notes:
(1) Includes the current at pins 1, 4, 5, and 9.
(2) ACPR is specified per IS95 as the ratio of adjacent power in 30 kHz BW to the total in-band power (1.23 MHz BW).
(3) Includes the current at pins 1 and 9 (Vcc current).
(4) RxBn is measured at 190 MHz above the operating frequency (Fo). (Measurement setup: RBW = 30 kHz, VBW = 30 kHz).
(5) All phases, time equals to 10 seconds.

Table 5: Power Mode Truth Table (with NO AGC)

POWER MODE	V_{CC}	V_{REF}	V_{MODE}	TYPICAL GAIN
Shut Down	3.4	0 V(1)	0 V	<-40 dB
PA ON	3.4	2.85 V	>2.1 V	27 dB
PA ON	1.8	2.85 V	>2.1 V	24 dB

Notes:
1. V_{REF} = 0V forces all currents to zero excluding the current of V_{MODE} pin. To shut down the V_{MODE} current V_{MODE} should be zero as well.

Using the AGC Option

If the analog gain control (AGC) option is needed, then for a typical operation, Vmode can be defined as a linear function of output power:

V_{MODE} = 1.5 V + 0.025* P_{OUT}(dBm)

The following tables list the electrical performance, of CHP2299-X3 with AGC option as well as the power mode truth table.

Table 6: Operating Ranges (with AGC)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Operating Frequency (f)	1920	-	1980	MHz	
Supply Voltage (V_{CC})	+3.2	+3.4	+4.2	V	
Reference Voltage (V_{REF})	+2.8	+2.85	+2.9	V	
Mode Control Voltage (V_{MODE})	+1.1	-	+2.1	V	effective range with AGC(1)
Operating Temperature (T_C)	-25	+25	+85	°C	

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

Notes:
(1) Gain and idle current for V_{MODE} less than $V_{MODE_{Min}}$ are the same as that of V_{MODE} = $V_{MODE_{Min}}$. Also the Gain and idle current for V_{MODE} higher than $V_{MODE_{Max}}$ are the same as that of V_{MODE} = $V_{MODE_{Max}}$.

Figure 2: Idle Current vs. V_{MODE}

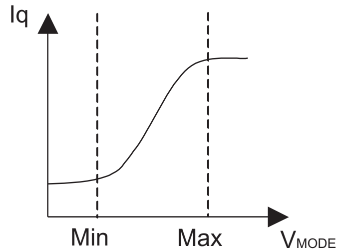


Table 7: Electrical Specifications (with AGC)
(T_C = +25 °C, fo = 1950 MHz (unless otherwise specified), V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = (1.5 + 0.025*P_{OUT} {dBm}) V)

PARAMETER	MIN	TYP	MAX	UNIT	COMMENTS
Gain					
GL	14	16	18	dB	V_{MODE} = 1.25V, Po = -10 dBm
G	24	26	28	dB	V_{MODE} > 1.8 V, Po = 16 dBm
Gh	25	27	29	dB	V_{MODE} > 2.1 V, Po = 27.5 dBm
Power-Added Efficiency (1)					
PAE	-	9	-	%	V_{MODE} > 1.8 V, Po = 16 dBm
PAEH	-	40	-	%	V_{MODE} > 2.1 V, Po = 27.5 dBm
Adjacent Channel Power Ratio(2)					
5 MHz Offset					
ACPR1L	-	-43	-38	dBc	V_{MODE} > 1.8 V, Po = 16 dBm
ACPR1H	-	-40	-37	dBc	V_{MODE} > 2.1 V, Po = 28 dBm
10 MHz Offset					
ACPR2L	-	-62	-50	dBc	V_{MODE} > 1.8 V, Po = 16 dBm
ACPR2H	-	-50	-47	dBc	V_{MODE} > 2.1 V, Po = 27.5 dBm
Quiescent Current					
Shutdown Mode(3)					
Iqs	-	1	5	µA	V_{REF} = 0V, V_{MODE} = 0V, No RF
Iq1	17	20	28	mA	V_{MODE} < 1.0 V, No RF
Iq	45	50	60	mA	V_{MODE} > 2.1 V, No RF
Reference Current (V_{REF})	-	-	8	mA	Po = 27.5 dBm
V_{MODE} Current	-	-	100	mA	V_{MODE} = 2.1 V
Noise in Receive Band(4)	-	-136	-	dBm/Hz	Po = 27.5 dBm
Harmonics					
2fo	-	-	-28	dBc	Po = 27.5 dBm
3fo	-	-	-28	dBc	Po = 27.5 dBm
Input Return Loss	-	-18	-12	dB	S11
Spurious Output Level	-	-	-60	dBc	VSWR < 6:1 Applies over all voltage and temperature operating ranges
Ruggedness - no damage(5)	10:1	-	-	VSWR	Po = 27.5 dBm

Notes:
(1) Includes the current at pins 1, 4, 5, and 9.
(2) ACLR is specified per ETSI 3GPP TS 25.101 as the ratio of adjacent power (3.84 MHz BW) to the total in-band power (3.84 MHz BW).
(3) Includes the current at pins 1 and 9 (Vcc current).
(4) RxBn is measured at 80 MHz above the operating frequency (Fo).
(Measurement setup: RBW = 30 kHz, VBW = 30 kHz).
(5) All phases, time equals to 10 seconds.

Table 8: Power Mode Truth Table (with AGC)

POWER MODE	V_{CC}	V_{REF}	V_{MODE}	TYPICAL GAIN
Shut Down	3.4	0 V[(1)]	0 V	<-40 dB
High Power	3.4	2.85 V	>2.1 V	27 dB
Low Power	3.4	2.85 V	<1.1 V	16 dB

Notes:

1. *V_{REF} = 0V forces all currents to zero excluding the current of V_{MODE} pin. To shut down the V_{MODE} current V_{MODE} should be zero as well.*

PERFORMANCE DATA

Figure 3: ACLR1_U vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

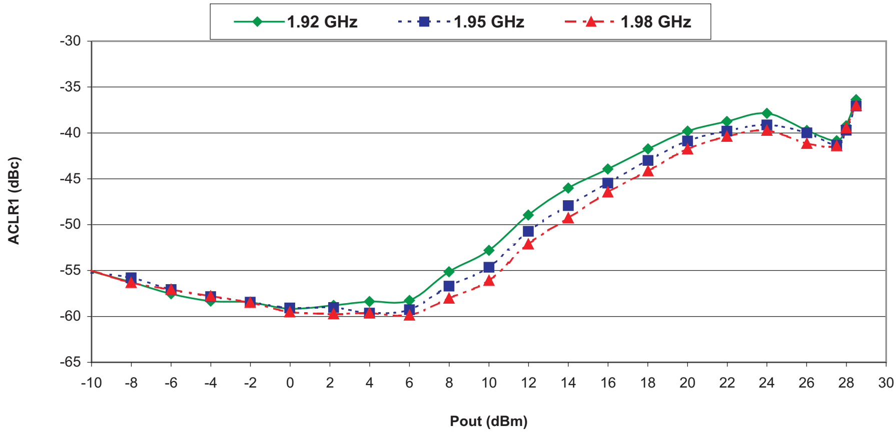


Figure 4: ACLR2_U vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

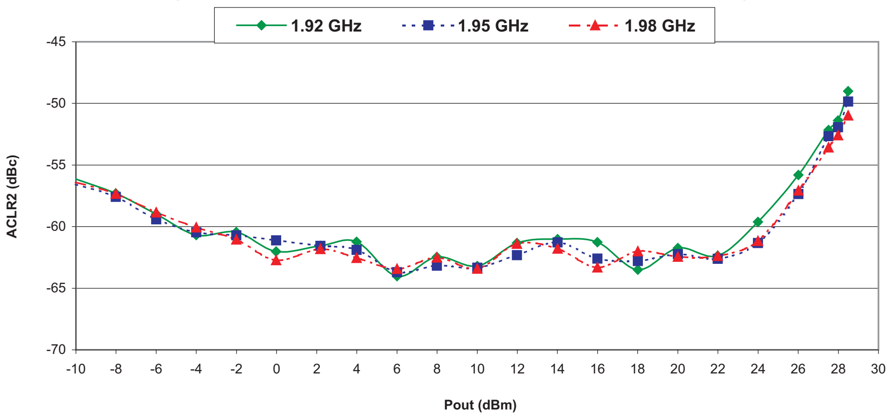


Figure 5: Gain vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

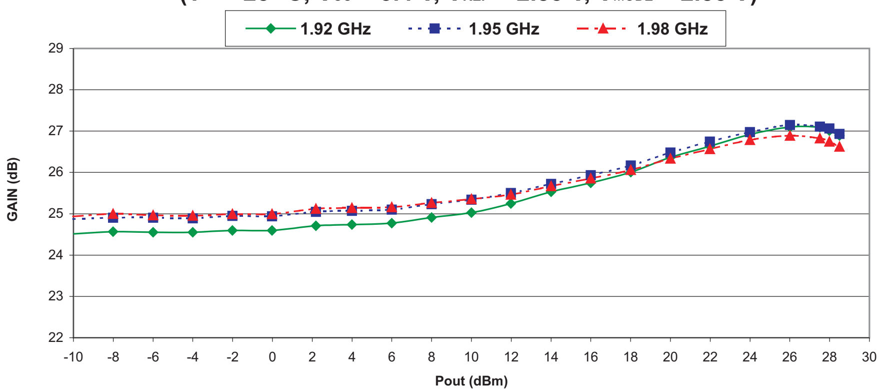


Figure 6: PAE vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

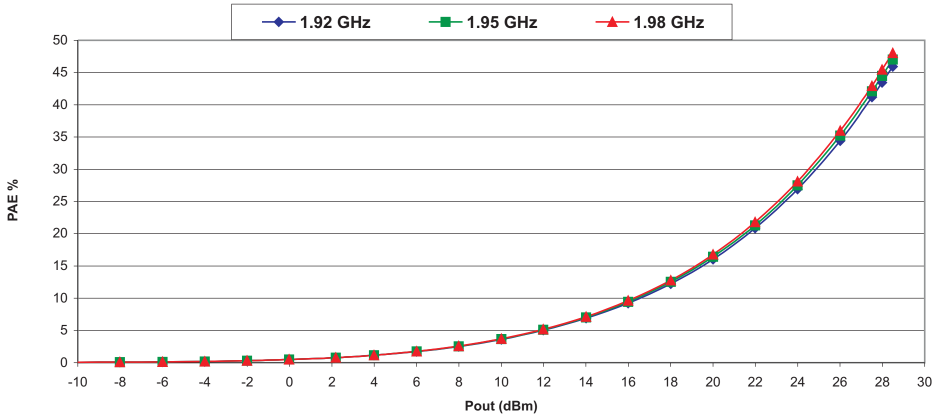


Figure 7: I_{CC} vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

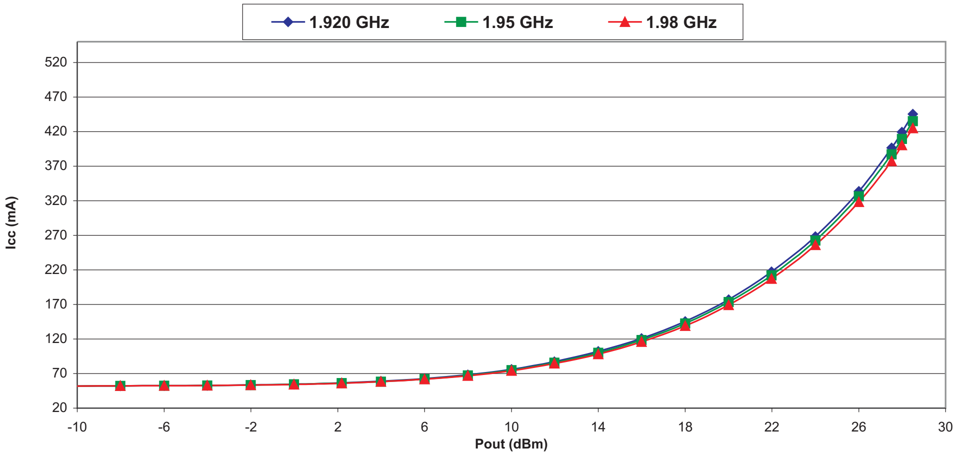


Figure 8: ACLR1_U vs V_{CC}
(P_{OUT} = 27.5 dBm, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

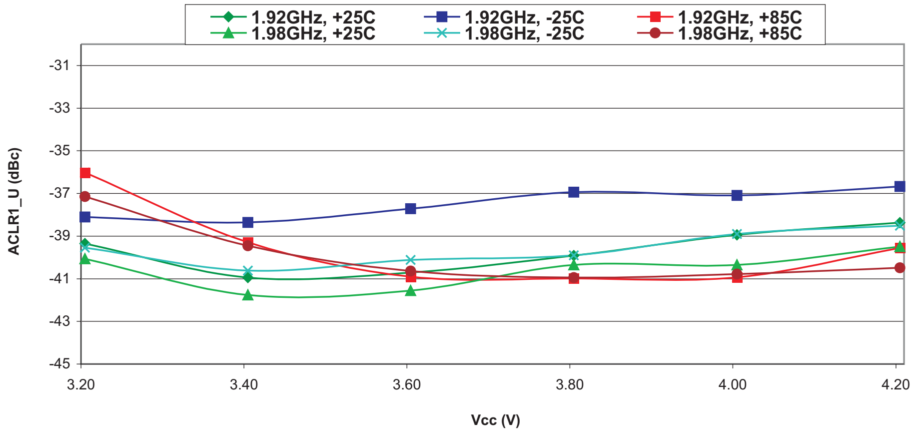


Figure 9: ACLR2_U vs V_{CC}
(P_{OUT} = 27.5 dBm, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

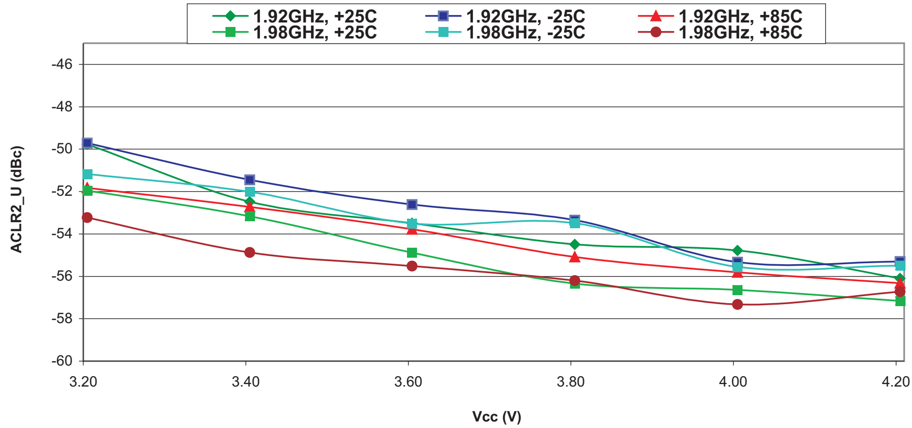


Figure 10: PAE vs V_{CC}
(P_{OUT} = 27.5 dBm, V_{REF} = 2.85 V, V_{MODE} = 2.85 V)

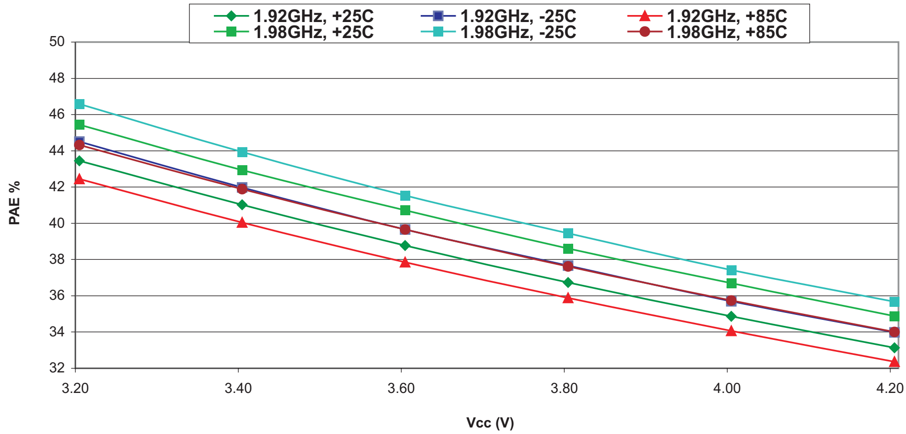


Figure 11: ACLR1_U vs Po
(V_{CC} = 1.8 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V, F = 1.95 GHz)

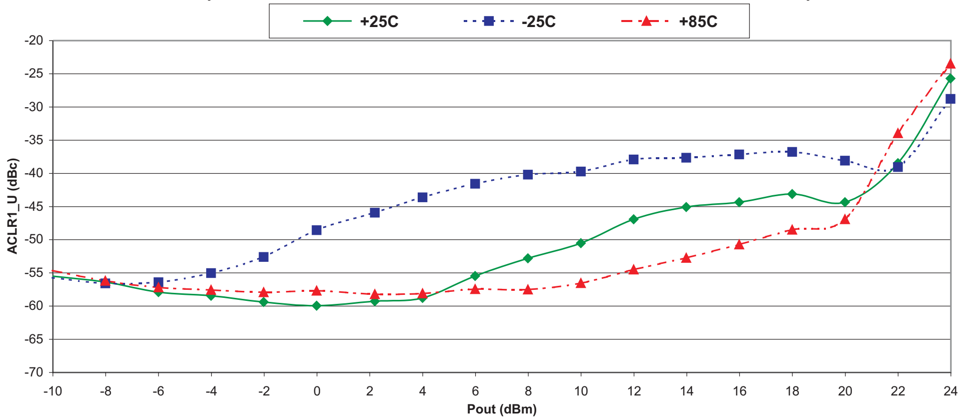


Figure 12: ACLR2_U vs Po
(V_{CC} = 1.8 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V, F = 1.95 GHz)

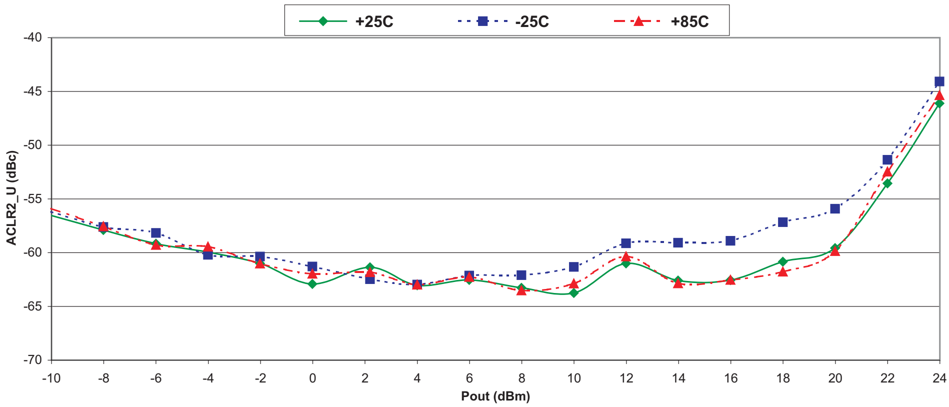


Figure 13: Gain vs P_{OUT}
(V_{CC} = 1.8 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V, F = 1.95 GHz)

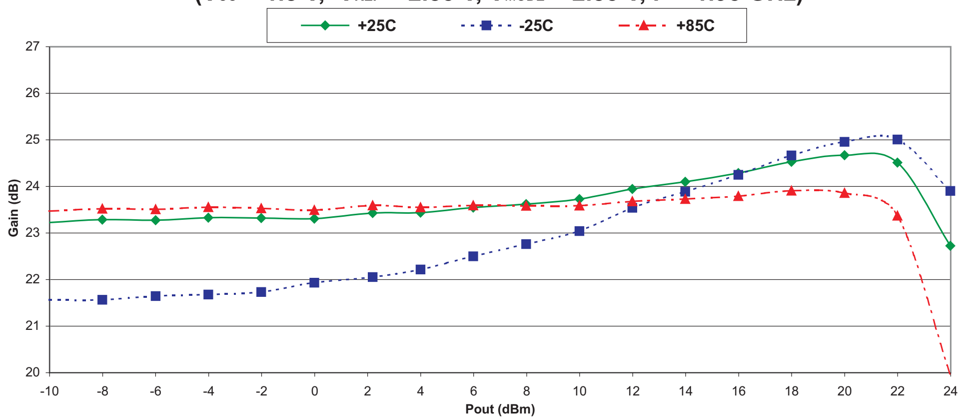


Figure 14: I_{CC} vs P_{OUT}
(V_{CC} = 1.8 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V, F = 1.95 GHz)

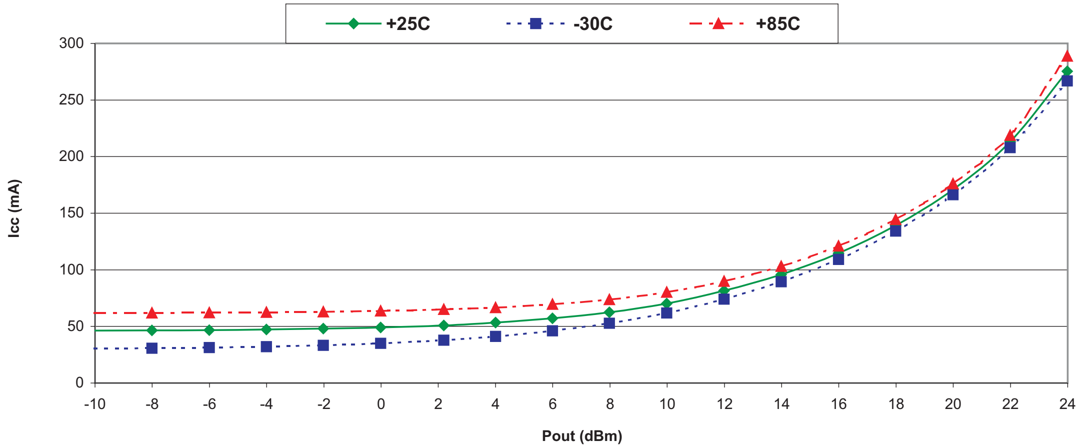


Figure 15: PAE vs P_{OUT}
(V_{CC} = 1.8 V, V_{REF} = 2.85 V, V_{MODE} = 2.85 V, F = 1.95 GHz)

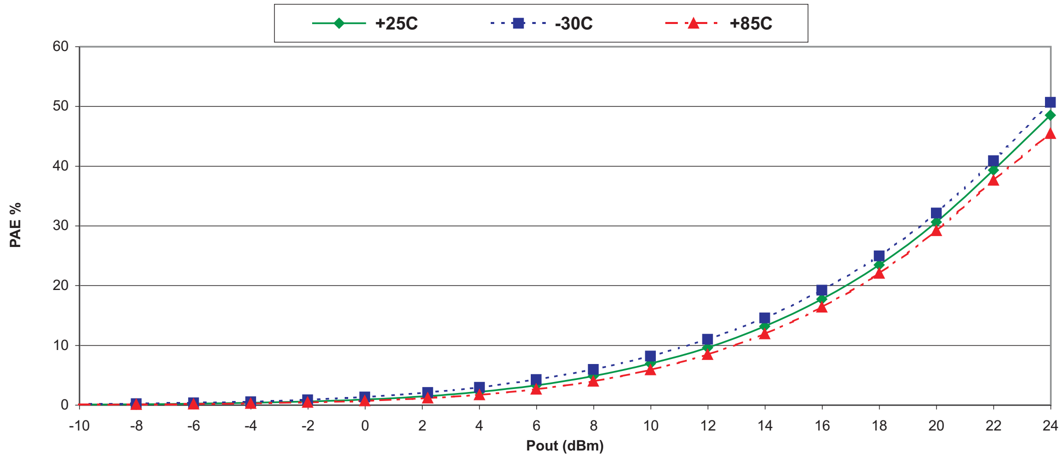


Figure 16: ACLR1_U vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT})

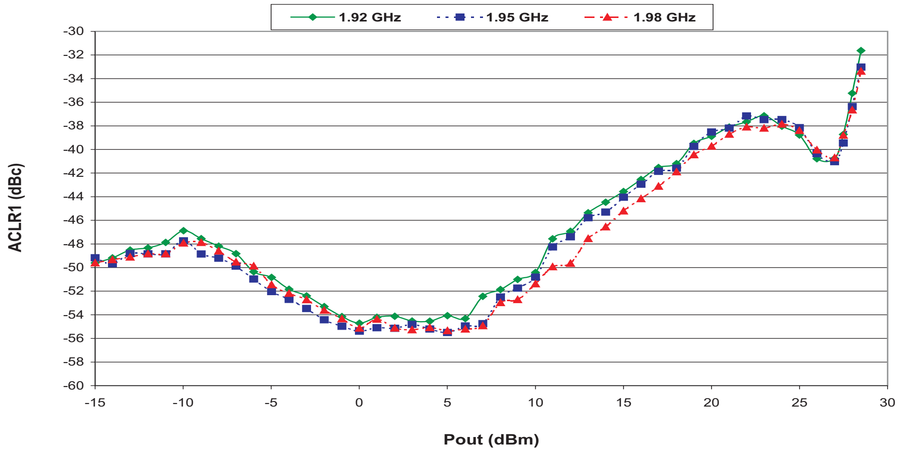


Figure 17: ACLR2_U vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT})

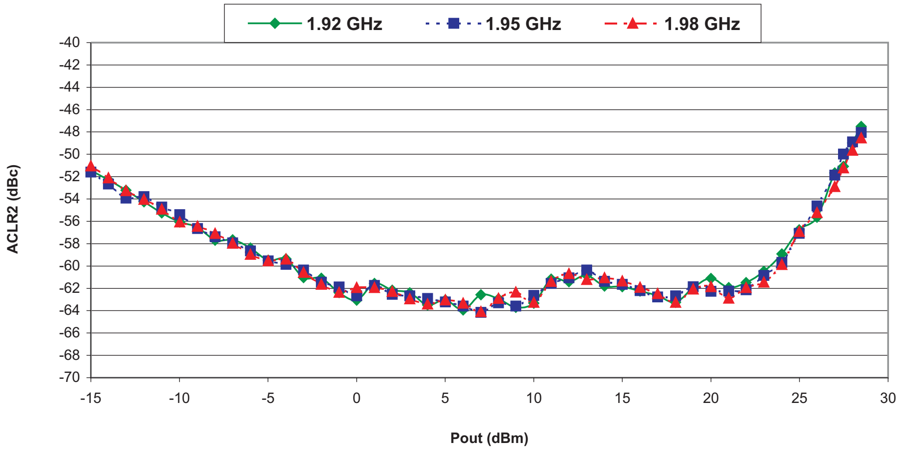


Figure 18: Gain vs P_{OUT}
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.4 + 0.025* P_{OUT})

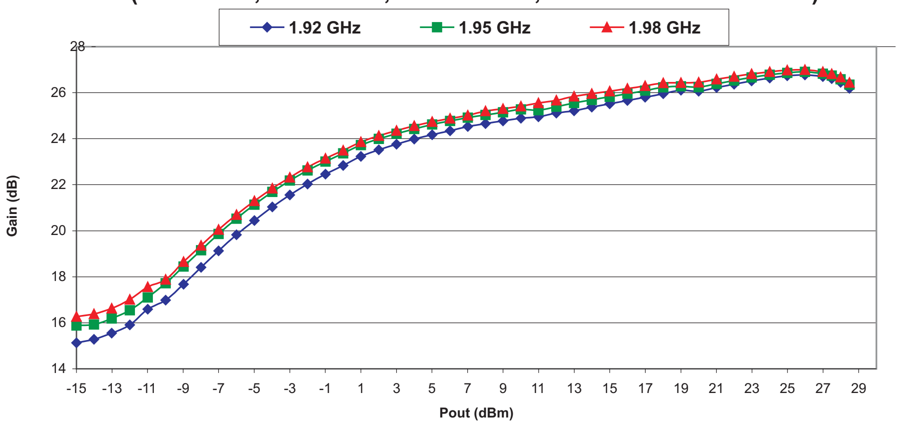


Figure 19: Icc vs POUT
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT})

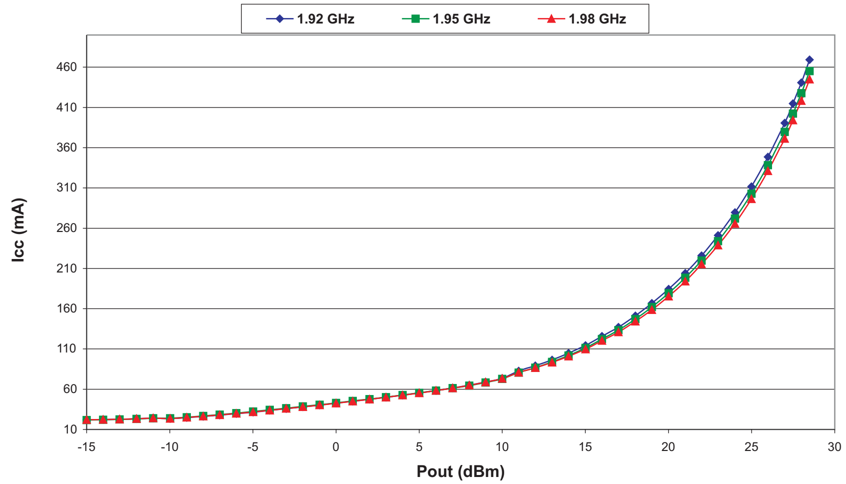


Figure 20: PAE vs POUT
(T = +25 °C, V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT})

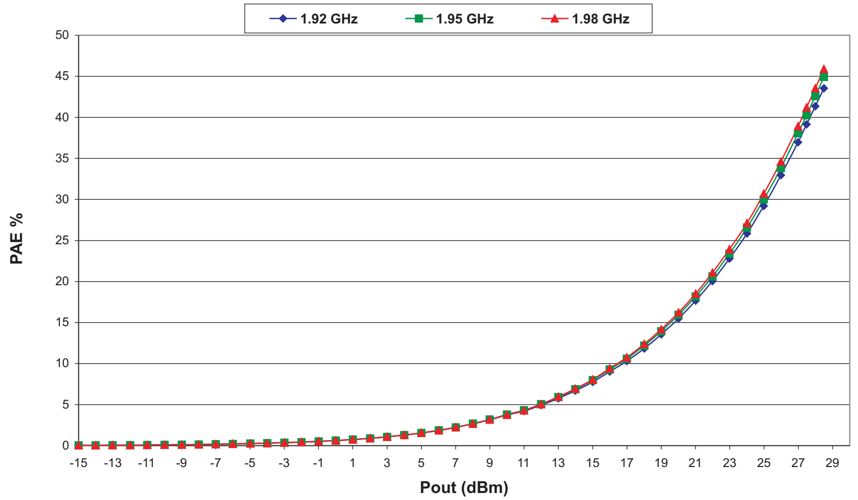


Figure 21: ACLR1_U vs Po
(V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT}, F = 1.95 GHz)

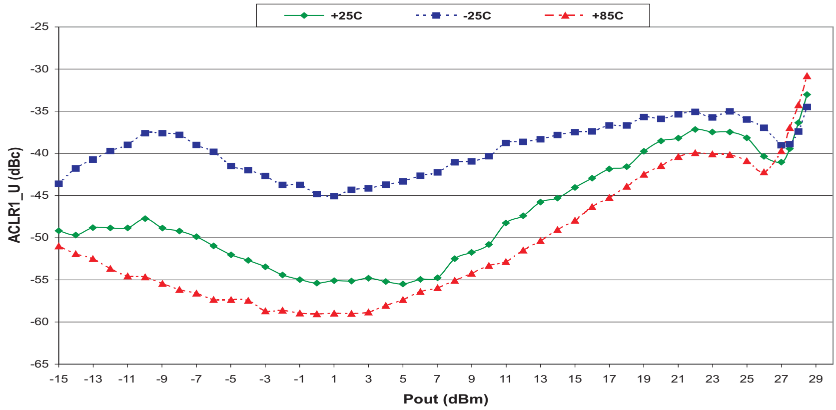


Figure 22: ACLR2_U vs Po
(V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT}, F = 1.95 GHz)

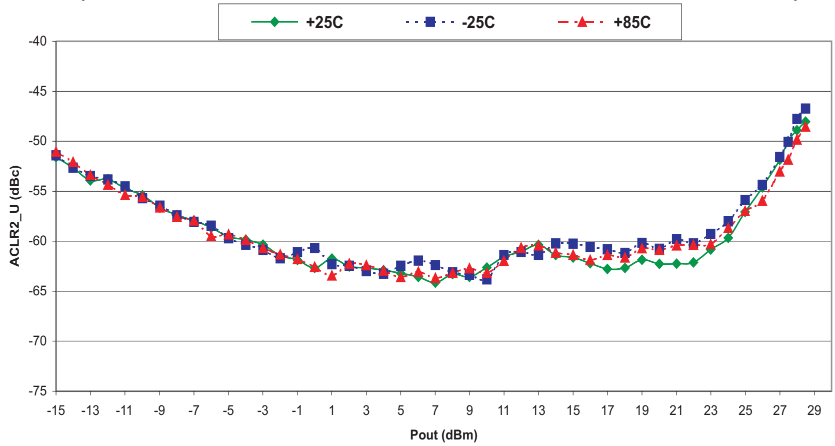


Figure 23: PAE vs P_{OUT}
(V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT}, F = 1.95 GHz)

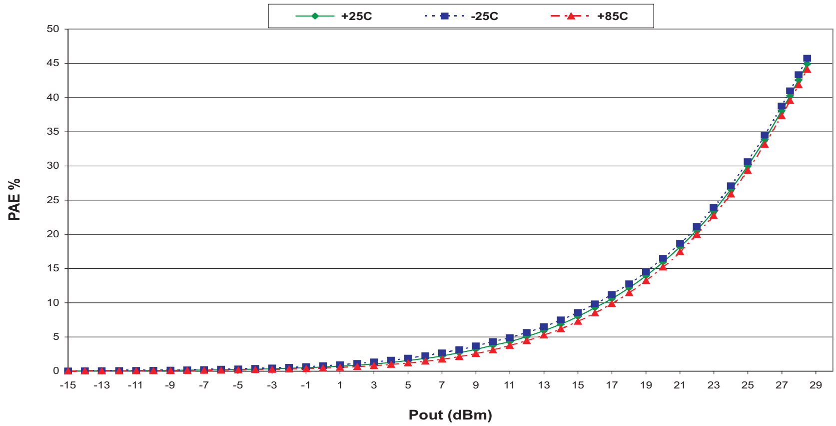


Figure 24: Icc vs POUT
(V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT}, F = 1.95 GHz)

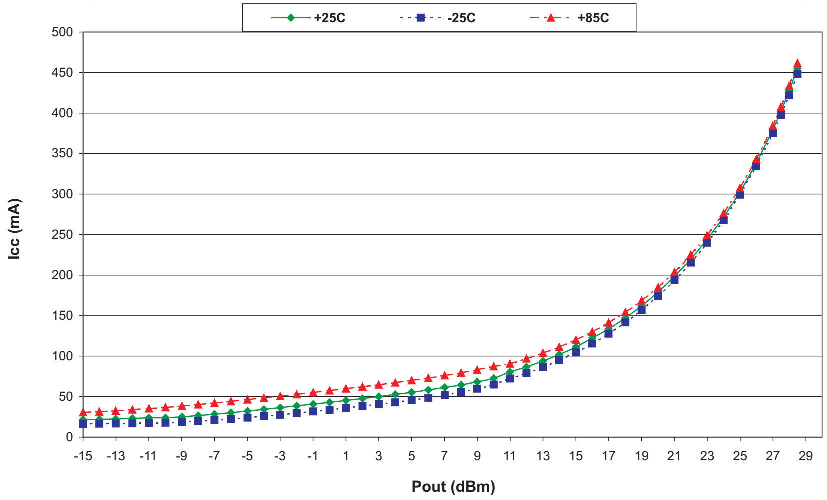
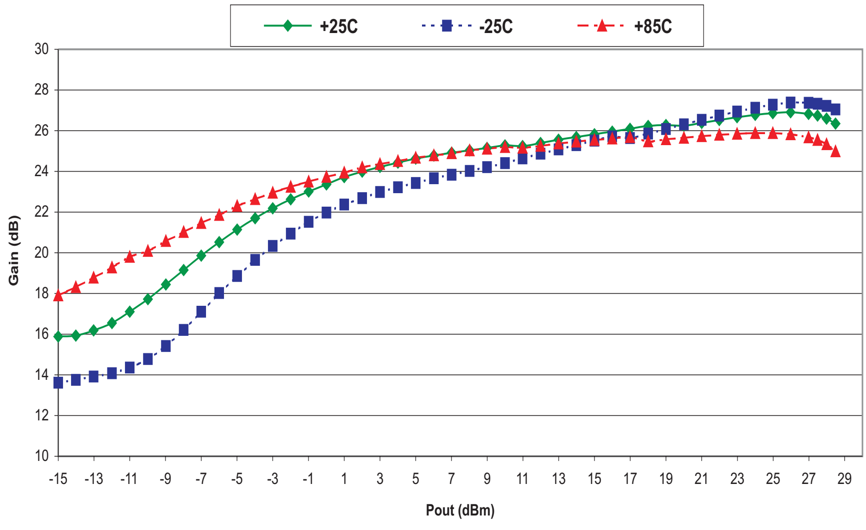


Figure 25: Gain vs POUT
(V_{CC} = 3.4 V, V_{REF} = 2.85 V, V_{MODE} = 1.5 + 0.025* P_{OUT}, F = 1.95 GHz)



PACKAGE OUTLINES

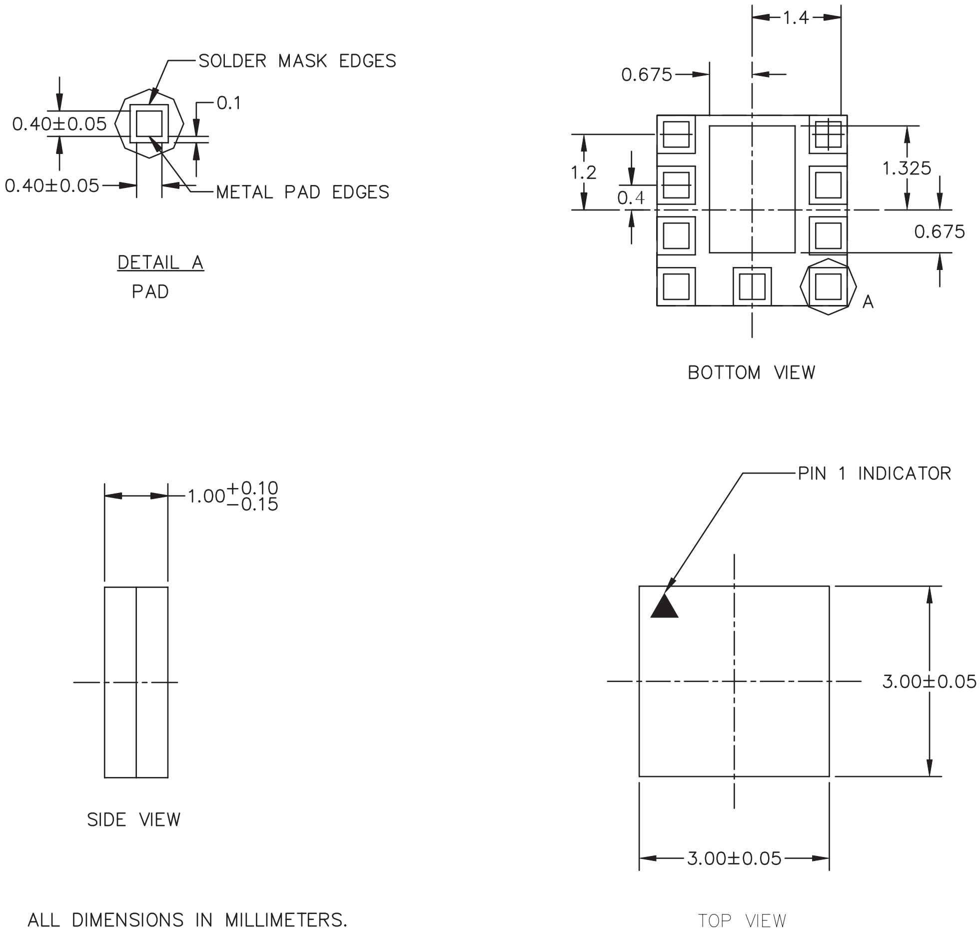


Figure 26: Package Outline

NOTES

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ANADIGICS, Inc.
141 Mount Bethel Road
Warren, New Jersey 07059, U.S.A.
Tel: +1 (908) 668-5000
Fax: +1 (908) 668-5132

URL: http://www.anadigics.com
E-mail: Mktg@anadigics.com

SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销 、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一,是一家专业代理和分銷世界各大品牌 IC 芯片和電子元器件的连锁经营綜合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商,已在全国范围内建成强大统一的供货和代理分销网络。 我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

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传真：0755-83376182 （0）13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:szss20@163.com QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

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西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL：029-81022619 13072977981 FAX:029-88789382