



AWT6123

GSM850/GSM900/DCS/PCS

Quad Band Power Amplifier

Advanced Product Information Rev 0.7

## FEATURES

- InGaP HBT Technology
- +35dBm GSM Output Power at 3.5V
- +32.5dBm DCS/PCS Output Power at 3.5V
- 35% GSM850 PAE (Class 5)
- 50% GSM850 PAE (Class 4)
- 55% GSM900 PAE
- 50% DCS/PCS PAE
- Low Profile 1.4mm Package
- Small footprint 6 x 8mm SMT Package
- GPRS Capable (class 12)

## APPLICATIONS

GSM850/GSM900/DCS/PCS Handsets

Dual/Tri/Quad Band PDA

## PRODUCT DESCRIPTION

ANADIGICS is introducing two 3-stage power amplifiers designed for high performance in Quad Band Applications. The amplifiers are packaged in a very small 6 x 8mm module. The output power is controlled by changing the voltage applied to the  $V_{APC}$  pin for each amplifier. The part is shut down by removing the regulated supply voltage.

The amplifier is manufactured using an advanced InGaP HBT technology, offering state of the art reliability, temperature stability and ruggedness. Passive matching networks are integrated to provide internal matching to  $50\Omega$  at both the RF inputs and outputs. Internal DC blocks are provided at the RF inputs.

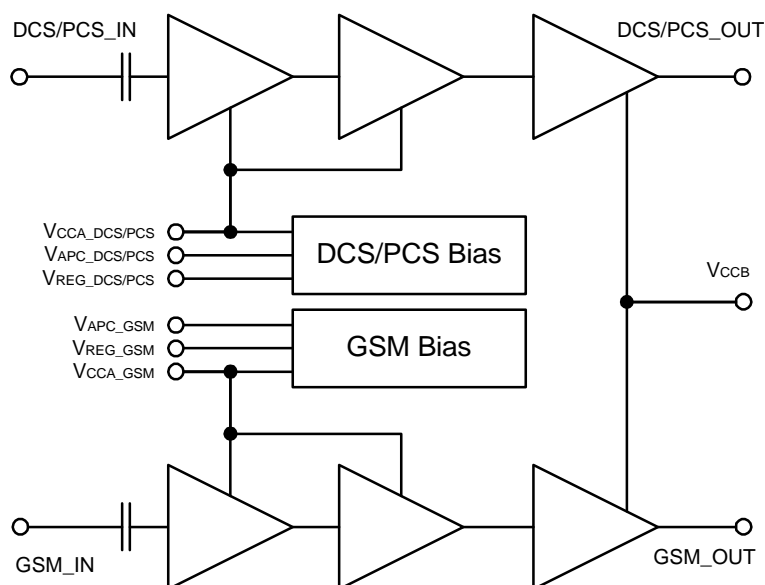


Figure 1: Block Diagram

## ELECTRICAL CHARACTERISTICS

Table 1: Absolute Maximum Ratings

PARAMETER	MIN	MAX	UNITS
Supply Voltage ( $V_{CC}$ )		+7	V
RF Input Power ( $RF_{IN}$ )		+14	dBm
Control Voltage ( $V_{APC}$ )		3.0	V
Storage Temperature ( $T_{STG}$ )	-55	150	°C

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 2: ESD Ratings

PARAMETER	METHOD	RATING	UNITS
ESD threshold voltage (RF ports)	HBM	250	V
ESD threshold voltage (control inputs)	HBM	250	V
ESD threshold voltage (RF inputs)	CDM	TBD	V
ESD threshold voltage (control inputs)	CDM	TBD	V

Table 3: Operating Conditions

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Supply voltage ( $V_{CC}$ )		3.0	3.5	4.2	V
Regulated voltage ( $V_{REG}$ )		2.7	2.8	3.0	V
Individual Regulated current ( $I_{REG}$ )	$V_{REG\_GSM}$ or $V_{REG\_DCS/PCS} = 3.0V$		3.5	4.5	mA
Control voltage ( $V_{APC}$ )		0.45		$V_{REG}$	V
Control Voltage ( $V_{APC}$ ) for max power			1.8	2.2	V
Individual Control current ( $I_{APC}$ ) See Note 1	$V_{APC} = 0.45V$	-3			mA
	$V_{APC} = 2.2V$			3	mA
	$V_{APC} = 3.0V$			6	mA
Leakage current	$V_{CC} = 4.2V$ , No RF Applied $V_{REG\_GSM} = V_{REG\_DCS/PCS} = 0V$	0		10	$\mu A$
Case temperature ( $T_c$ )		-20		85	°C

**Note 1: The  $V_{APC}$  must be pulled down to 0.45V with a low impedance. If  $V_{REG\_GSM}$  &  $V_{REG\_DCS/PCS}$  inputs are connected then both  $V_{APC}$  inputs must be pulled down to 0.45V to disable both power amplifiers.**

Figure 3: Application Block Diagram For Single Output Power Control

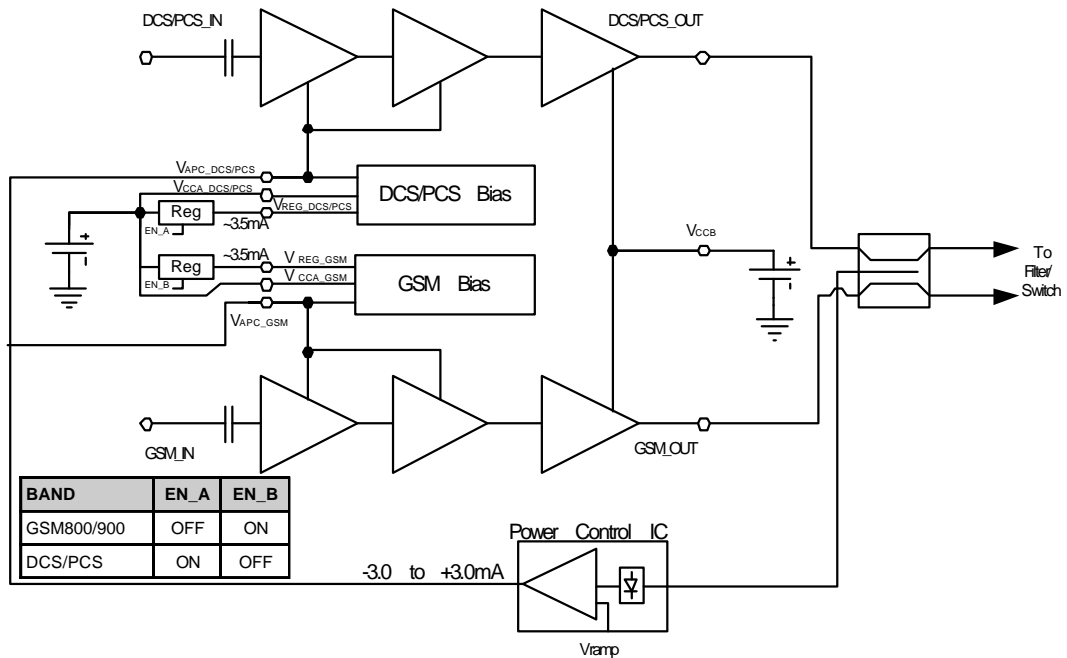
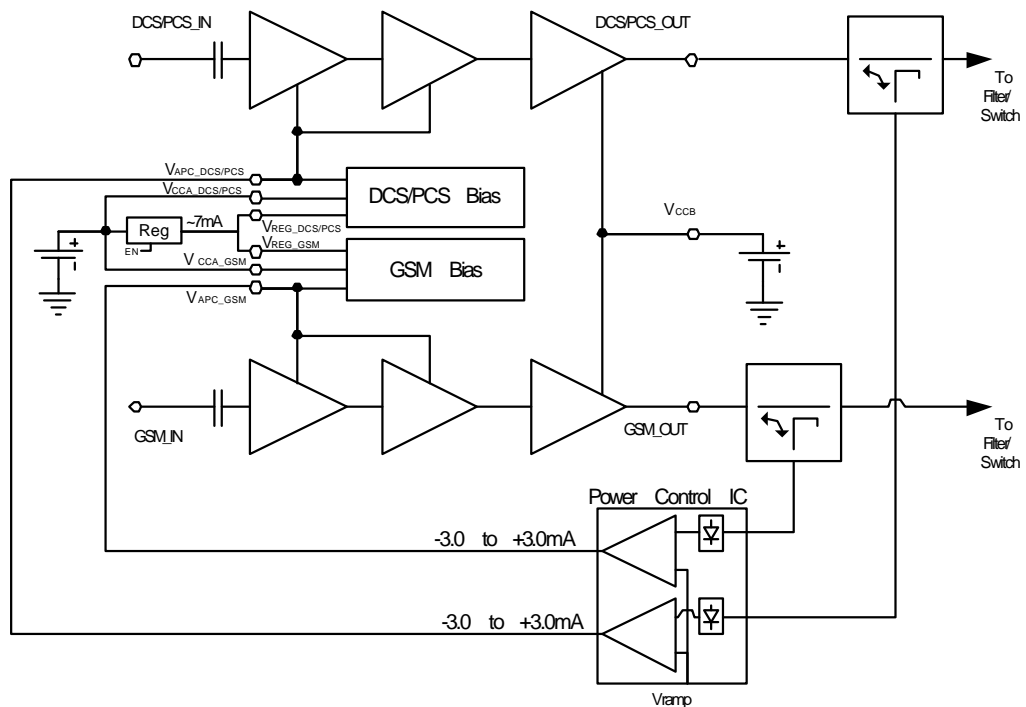


Figure 4: Application Block Diagram For Dual Output Power Control



Note: Power control outputs need to sink current to power down each power amplifier

**AWT6123**

**Table 4: Electrical Characteristics for GSM850/900**

Unless otherwise specified:  $V_{CC} = 3.5V$ ,  $P_{IN} = 5.5dBm$ ,  $V_{REG\_GSM} = 2.8V$ ,  $V_{APC\_GSM} = 2.2V$ ,  $Z_{IN} = Z_{OUT} = 50\Omega$ ,  $T_C = 25\text{ }^\circ\text{C}$   
 $V_{REG\_DCS/PCS} = V_{APC\_DCS/PCS} = 0V$ , Pulse Width = 1154 $\mu\text{s}$

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Frequency	$F_{IN}$		824 880		849 915	MHz MHz
Input Power	$P_{IN}$		3	5.5	8	dBm
GSM850 Band (824 to 849MHz)						
Output Power	$P_{MAX}$		34.5	35		dBm
Efficiency GSM850 Class 4	PAE	$P_{OUT} = P_{MAX}$	45	50		%
Efficiency GSM850 Class 5	PAE	$P_{OUT} = 31.5dBm$		35		%
Degraded Output Power		$V_{CC} = 3.0V$ , $V_{REG} = 2.7V$ , $T_C = 85^\circ\text{C}$ , $P_{IN} = 3dBm$	32.5			dBm
GSM900 Band (880 to 915MHz)						
Output Power	$P_{MAX}$		34.5	35		dBm
Efficiency GSM900 Class 4	PAE	$P_{OUT} = P_{MAX}$	50	55		%
Degraded Output Power		$V_{CC} = 3.0V$ , $V_{REG} = 2.7V$ , $T_C = 85^\circ\text{C}$ , $P_{IN} = 3dBm$	32.5			dBm
All Bands						
Isolation		$V_{APC} = 0.45V$ , $P_{IN} = 8dBm$		-35	-30	dBm
Cross Isolation		$2 \cdot F_{IN}$ at DCS/PCS_OUT port, DCS/PCS PA = OFF			-20	dBm
Harmonics (2-14F)		$V_{APC} = 0.45$ to $2.2V$		-12	-7	dBm
Stability		All $V_{APC}$ , All $V_{CC}$ , All $V_{REG}$ , $T_C = -20$ to $85^\circ\text{C}$ , VSWR = 8:1 All phases			-36	dBm
Ruggedness		All $V_{APC}$ , All $V_{CC}$ , All $V_{REG}$ , $T_C = -20$ to $85^\circ\text{C}$ , All phases	10:1			ratio
RX Band Noise Power		RBW=VBW=100kHz, $P_{IN} = 3.0$ to $8dBm$ , $F_{IN} = 915MHz$ , $F_{OUT} = F_{IN} + 10$ to $20MHz$			-70	dBm
		RBW=VBW=100kHz, $P_{IN} = 3.0$ to $8dBm$ , $F_{IN} = 849$ or $915MHz$ , $F_{OUT} = F_{IN} + 20$ to $45MHz$			-82	dBm
Input Return Loss		$P_{OUT} = 5dBm$ to $P_{MAX}$			2.5:1	

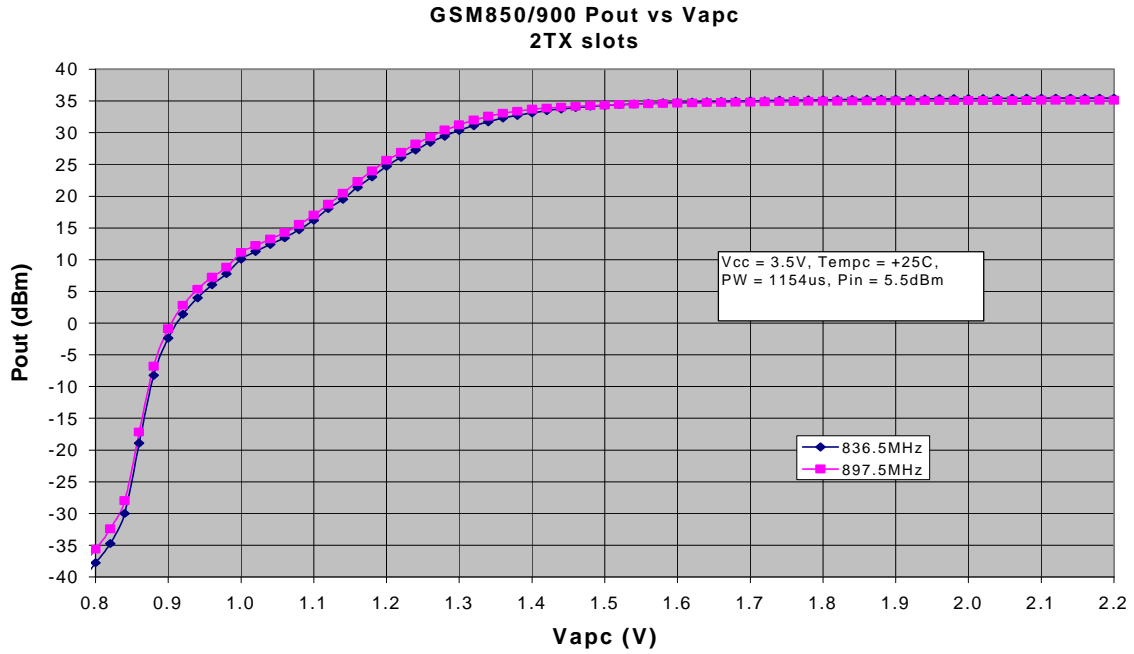
**Table 5: Electrical Characteristics for DCS/PCS**

Unless otherwise specified:

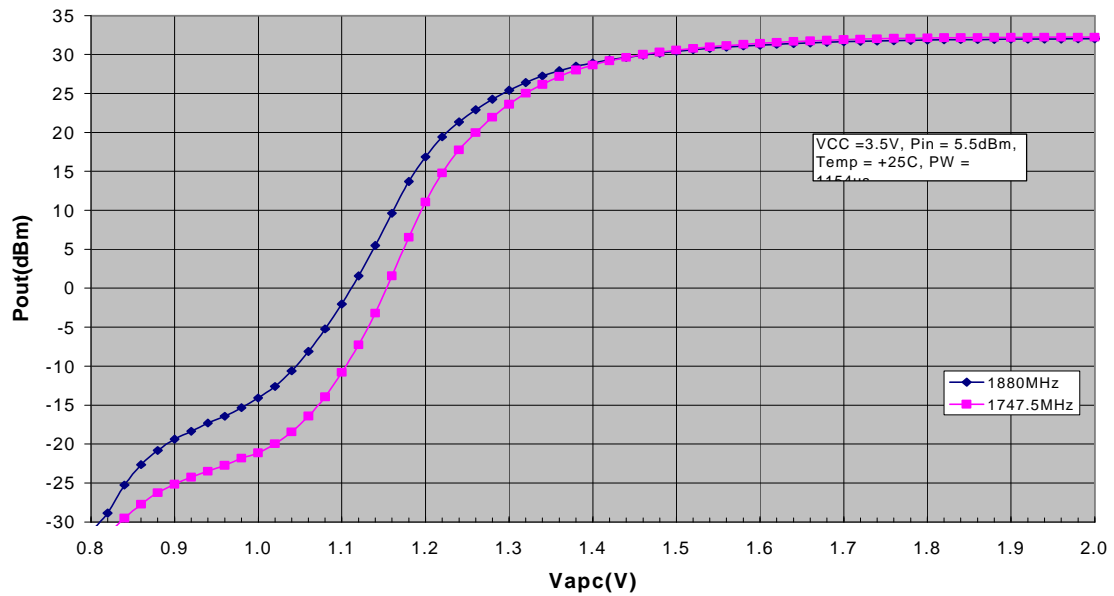
 $V_{CC} = 3.5V$ ,  $P_{IN} = 5.5dBm$ ,  $V_{REG\_DCS/PCS} = 2.8V$ ,  $V_{APC\_DCS/PCS} = 2.2V$ ,  $Z_{IN} = Z_{OUT} = 50\Omega$ ,  $T_C = 25^\circ C$  $V_{REG\_GSM} = V_{APC\_GSM} = 0V$ , Pulse Width = 1154 $\mu s$ 

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Frequency	$F_{IN}$		1710 1850		1785 1910	MHz MHz
Input Power	$P_{IN}$		3	5.5	8	dBm
Output Power	$P_{MAX}$	$F_{IN} = 1710$ to 1785MHz	32.0	32.5		dBm
		$F_{IN} = 1850$ to 1910MHz	32.0	32.5		dBm
Degraded Output Power		$V_{CC} = 3.0V$ , $V_{REG} = 2.7V$ , $T_C = 85^\circ C$ $F_{IN} = 1710$ to 1785MHz	29.5			dBm
		$V_{CC} = 3.0V$ , $V_{REG} = 2.7V$ , $T_C = 85^\circ C$ $F_{IN} = 1880$ to 1910MHz	29.5			dBm
Efficiency ( $P_{OUT} = P_{MAX}$ )		$F_{IN} = 1710$ to 1910MHz	45	50		%
Isolation		$V_{APC} = 0.45V$ , $P_{IN} = 8dBm$		-35	-30	dBm
Harmonics (2-7F)		$V_{APC} = 0.45$ to 2.2V		-12	-7	dBm
Stability		All $V_{APC}$ , All $V_{CC}$ , All $V_{REG}$ , $T_C = -20$ to $85^\circ C$ , VSWR = 8:1 All phases			-36	dBm
Ruggedness		All $V_{APC}$ , All $V_{CC}$ , All $V_{REG}$ , $T_C = -20$ to $85^\circ C$ , All phases	10:1			ratio
RX Band Noise Power		RBW=VBW=100kHz, $P_{IN} = 3.0$ to 8.0dBm, $F_{IN} = 1785$ or 1910MHz, $F_{OUT} = F_{IN} + 20$ to 95MHz		-80	-74	dBm
Input Return Loss		$P_{OUT} = 0dBm$ to $P_{MAX}$			2.5:1	

TYPICAL PERFORMANCE CHARACTERISTICS



**Figure 5:GSM850/900 Pout vs Vapc  
DCS/PCS POUT vs Vapc  
2TX slots**



**Figure 6:DCS/PCS Pout vs Vapc**

TYPICAL PERFORMANCE CHARACTERISTICS

GSM850/900 P<sub>MAX</sub> & PAE @ 3.5V

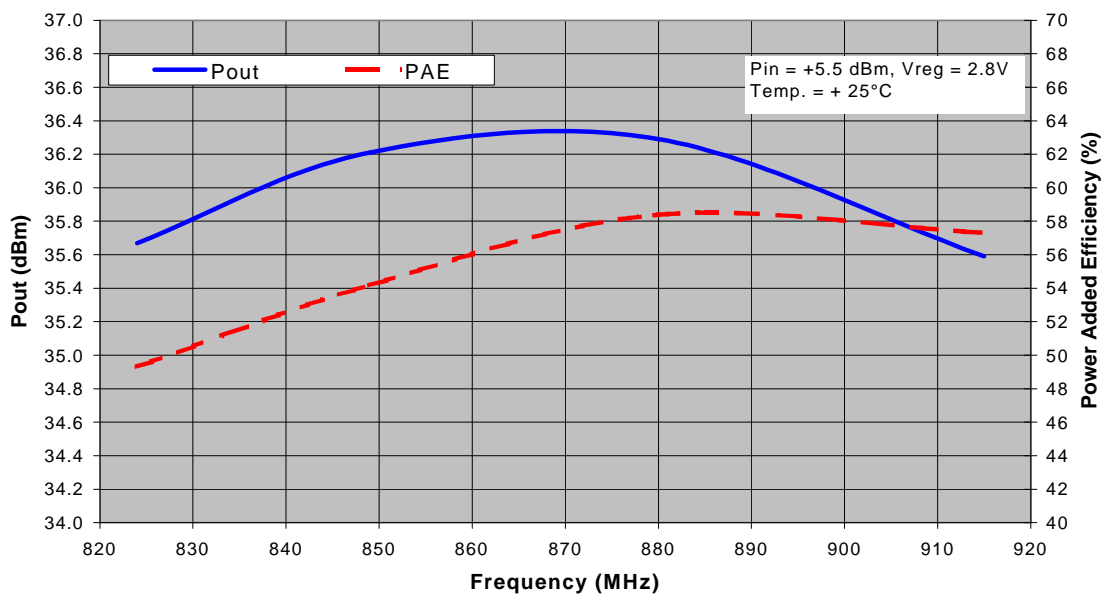


Figure 7: GSM850/900P<sub>MAX</sub> & PAE vs Frequency

DCS/PCS P<sub>MAX</sub> & PAE @ 3.5V

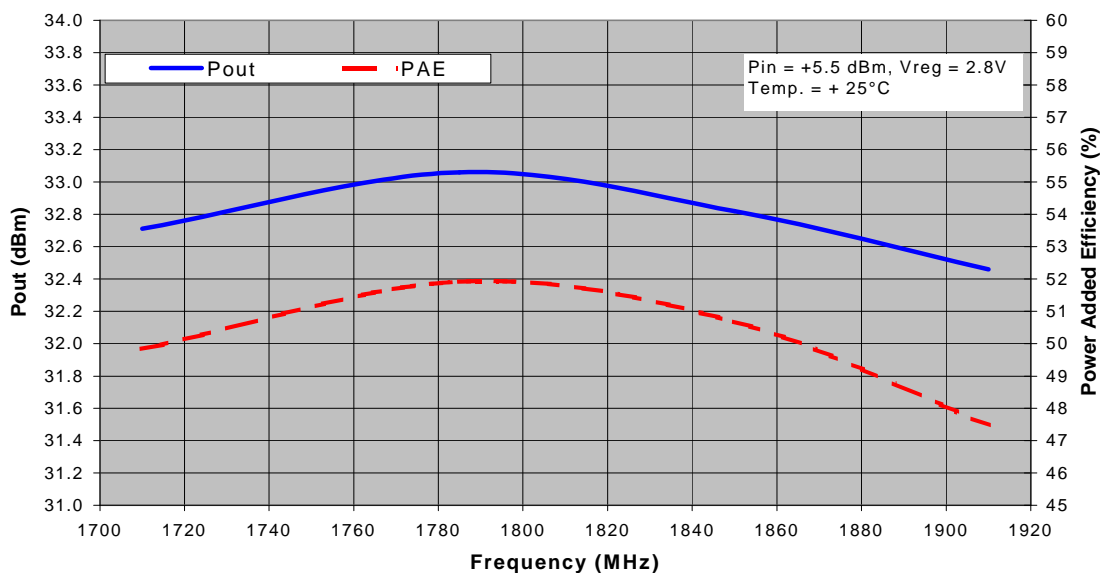


Figure 8: DCS/PCS P<sub>MAX</sub> & PAE vs Frequency

Figure 4: Package Outline (X-Ray View)

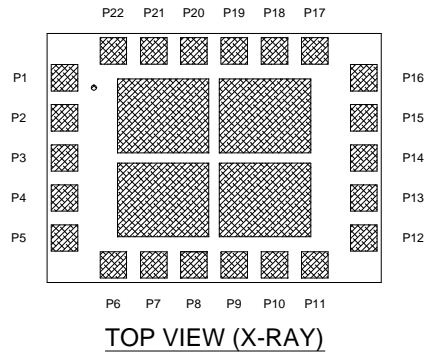
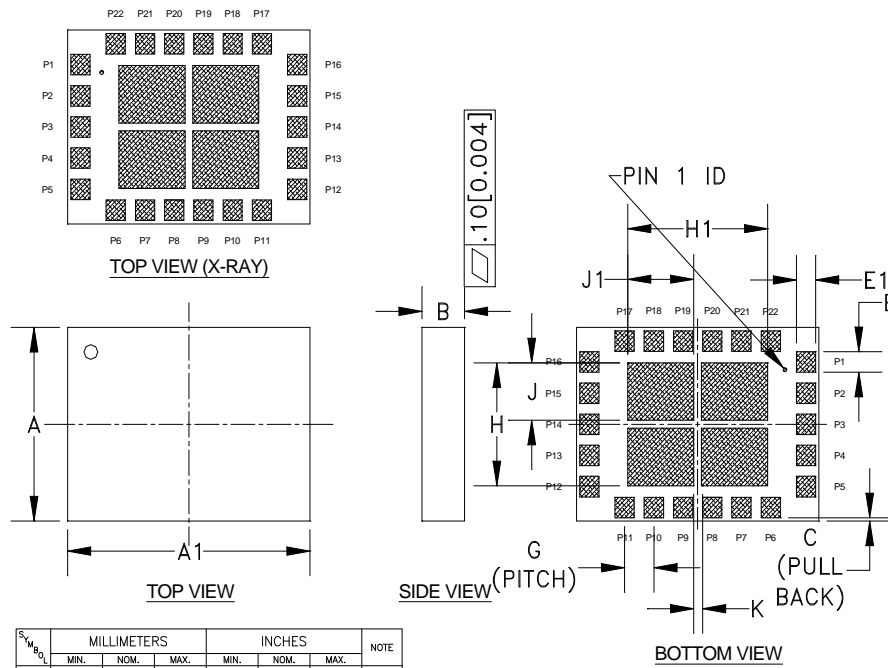


Table 6: Pin Description

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	DCS/PCS_IN	DCS/PCS RF Input	12	GSM_OUT	GSM RF Output
2	VAPC_DCS/PCS	Power Control Voltage DCS/PCS	13	GND	Ground
3	GND	Ground	14	GND	Ground
4	VAPC_GSM	Power Control Voltage GSM	15	GND	Ground
5	GSM_IN	GSM RF Input	16	DCS/PCS_OUT	DCS/PCS RF Output
6	VREG_GSM	Regulated Supply GSM	17	VCCB	Final stage Supply Voltage
7	VCCA_GSM	VCC to stages 1 & 2 and bias circuits for GSM	18	GND	Ground
8	GND	Ground	19	GND	Ground
9	GND	Ground	20	GND	Ground
10	GND	Ground	21	VCCA_DCS/PCS	Vcc to stages 1 & 2 and bias circuits for DCS/PCS
11	GND	Ground	22	VREG_DCS/PCS	Regulated Supply DCS/PCS



Figure 5: Package Drawing



SYMBOL	MILLIMETERS			INCHES			NOTE
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.	
A	5.88	6.00	6.12	0.231	0.236	0.241	-
A1	7.88	8.00	8.12	0.310	0.315	0.320	-
B	1.25	1.4	1.55	0.051	0.057	0.063	A
C	-	0.10	-	-	0.004	-	-
E	0.59	0.64	0.69	0.023	0.025	0.027	-
E1	0.59	0.64	0.69	0.023	0.025	0.027	-
G	0.96 BSC			0.038 BSC			-
H	-	3.81	-	-	0.150	-	-
H1	-	4.62	-	-	0.182	-	-
J	-	1.77	-	-	0.070	-	(4X)
J1	-	2.18	-	-	0.086	-	(4X)
K	-	0.25	-	-	0.010	-	-

NOTES:

1. CONTROLLING DIMENSIONS: MILLIMETERS
2. UNLESS SPECIFIED TOLERANCE=±0.076[0.003].

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