



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 50Ω at both the RF inputs and outputs. Internal DC blocks are provided at the RF inputs.

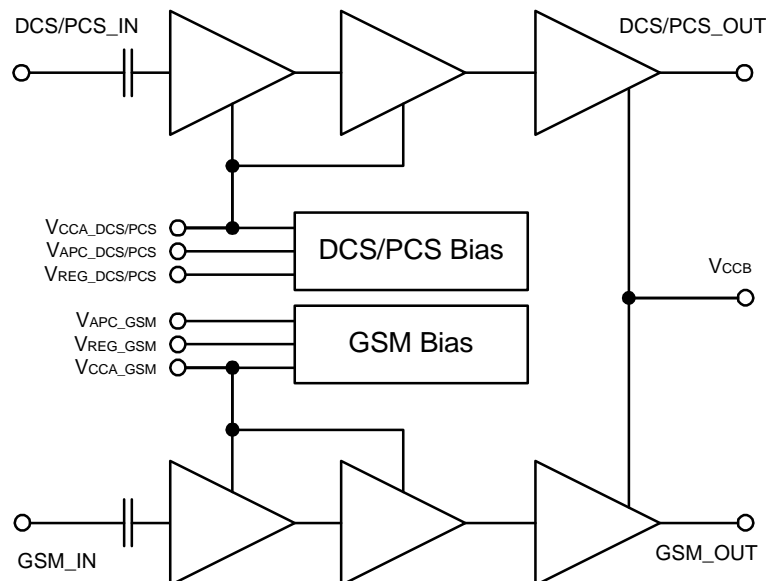


Figure 1: Block Diagram

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 | μA |
| 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

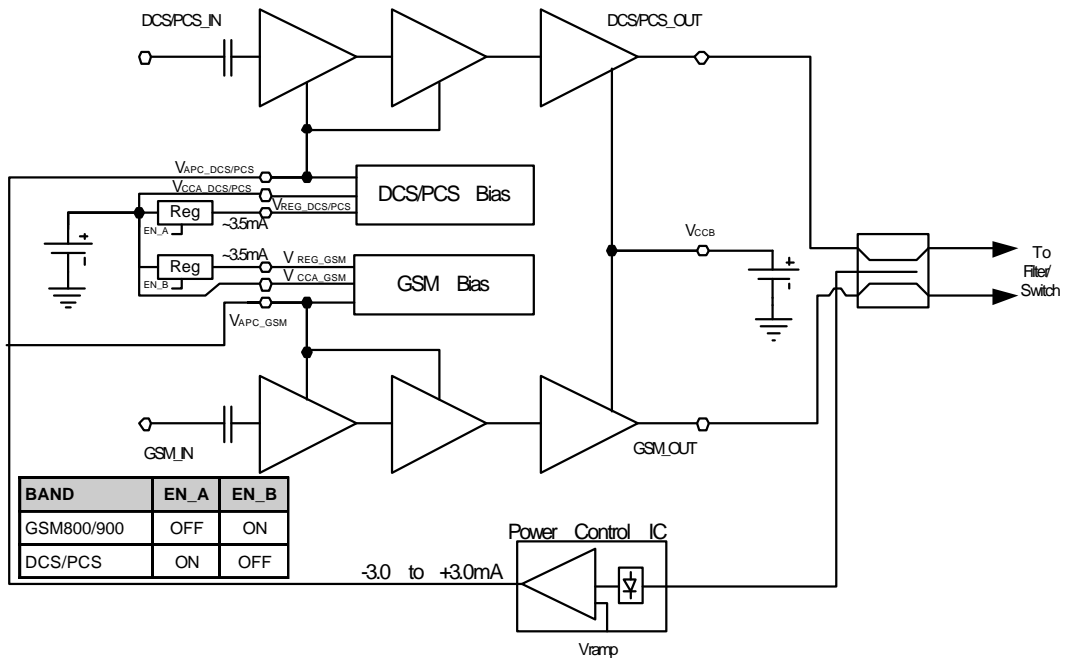
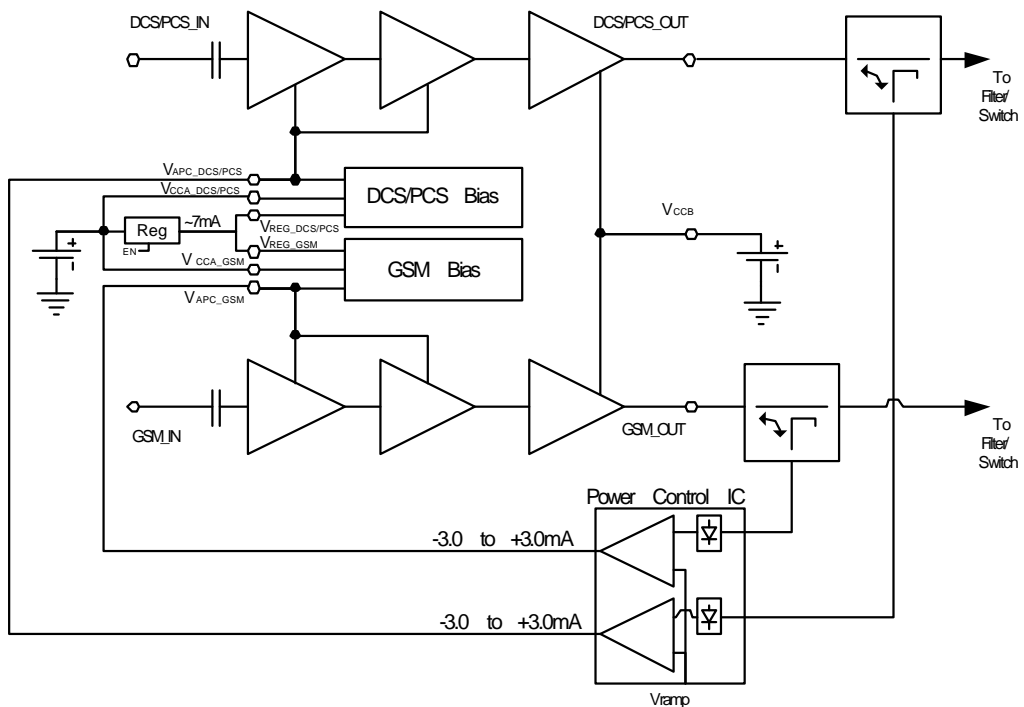


Figure 4: Application Block Diagram For Dual Output Power Control



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

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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 μs

| 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°C , VSWR = 8:1 All phases | | | -36 | dBm |
| Ruggedness | | All V_{APC} , All V_{CC} , All V_{REG} , $T_C = -20$ to 85°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 | |

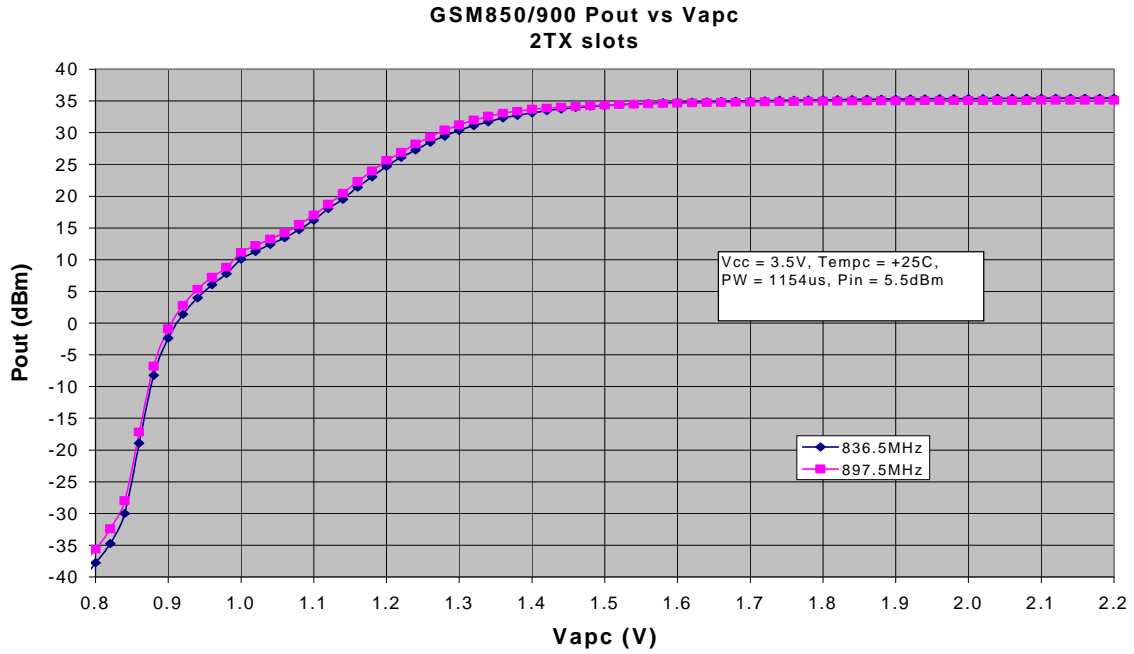
Table 5: Electrical Characteristics for DCS/PCS

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 μs

| 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**

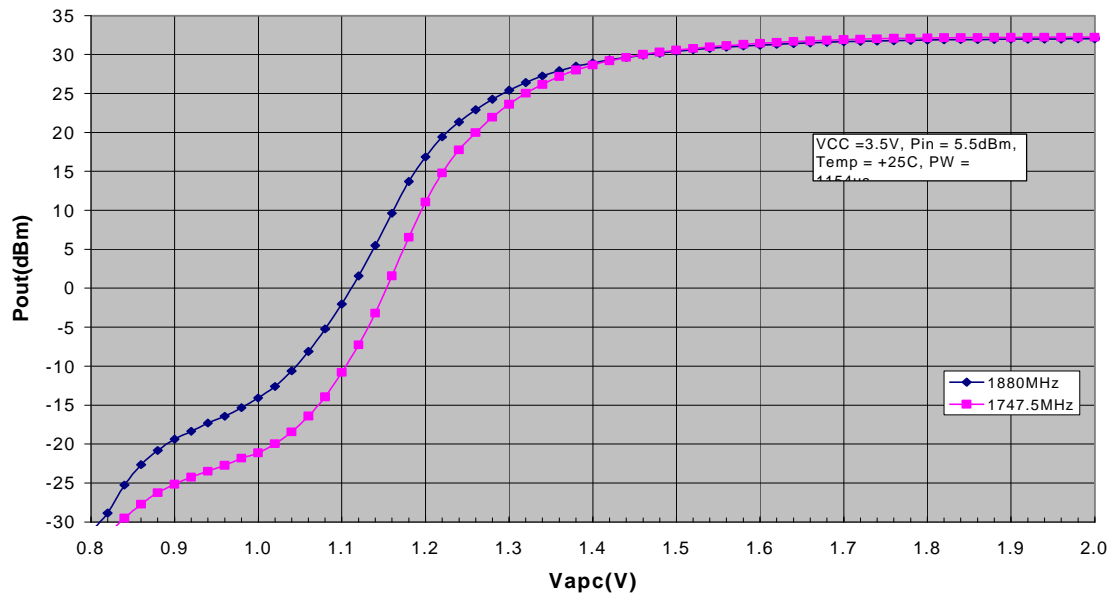


Figure 6:DCS/PCS Pout vs Vapc

TYPICAL PERFORMANCE CHARACTERISTICS

GSM850/900 P_{MAX} & PAE @ 3.5V

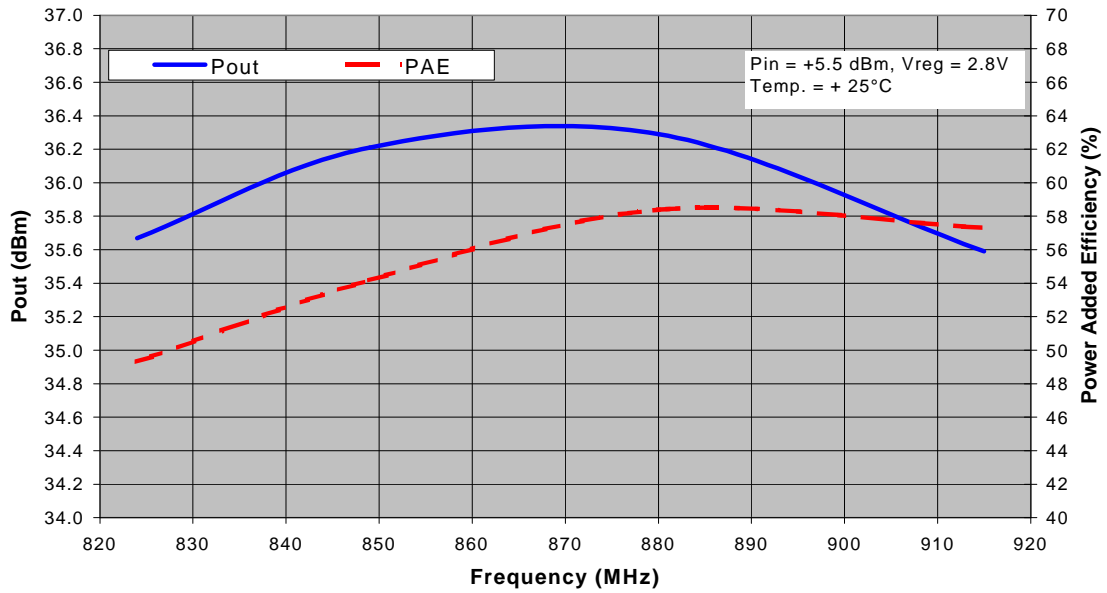


Figure 7: GSM850/900P_{MAX} & PAE vs Frequency

DCS/PCS P_{MAX} & PAE @ 3.5V

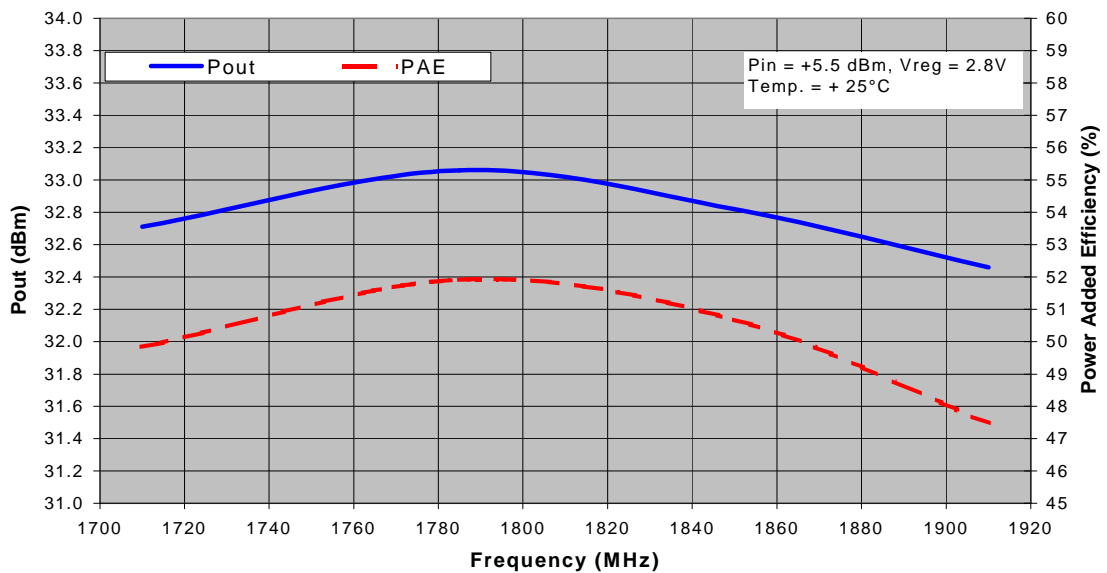


Figure 8: DCS/PCS P_{MAX} & PAE vs Frequency

Figure 4: Package Outline (X-Ray View)

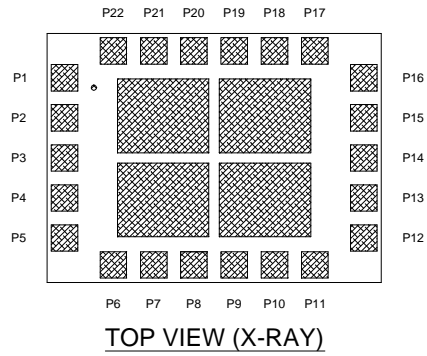
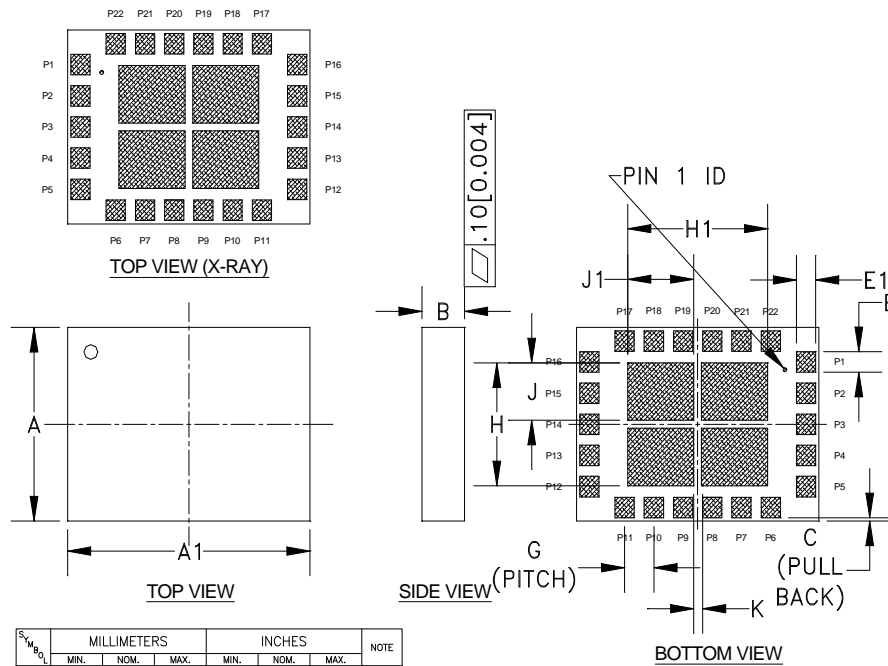


Table 6: Pin Description

| 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].

AWT6123



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

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