# AWT6135

PCS/CDMA 3.4V/28dBm
Linear Power Amplifier Module

**PRELIMINARY DATA SHEET - Rev 1.1**

## FEATURES

- InGaP HBT Technology
- High Efficiency: 40%
- Low Quiescent Current: 48 mA
- Low Leakage Current in Shutdown Mode: <1 µA
- $V_{REF}$ = +2.8 V (+2.7 V min over temp)
- Optimized for a 50 Ω System
- Low Profile Miniature Surface Mount Package: 1.56mm Max
- CDMA 1XRTT Compliant
- CDMA 1xEV-DO Compliant


**M7 Package**
**10 Pin 4mm x 4mm**
**Surface Mount Module**

## APPLICATIONS

- PCS CDMA Wireless Handsets
- Dual Band CDMA Wireless Handsets

## PRODUCT DESCRIPTION

The AWT6135 meets the increasing demands for higher efficiency and linearity in CDMA 1XRTT handsets. The PA module is optimized for $V_{REF}$ = +2.8 V, a requirement for compatibility with the Qualcomm® 6000 chipset. The device is manufactured on an advanced InGaP HBT MMIC technology offering state-of-the-art reliability, temperature stability, and ruggedness. Selectable bias modes that optimize efficiency for different output power levels, and a shutdown mode with low leakage current, increase handset talk and standby time. The self-contained 4mm x 4mm surface mount package incorporates matching networks optimized for output power, efficiency, and linearity in a 50 Ω system.

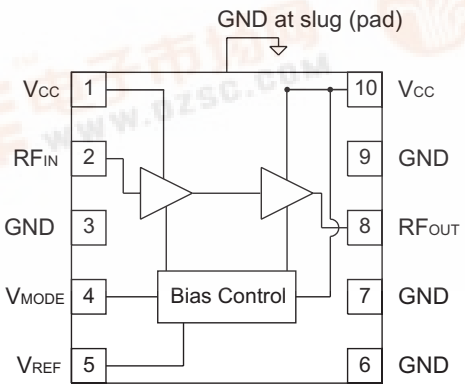



**Figure 1: Block Diagram**

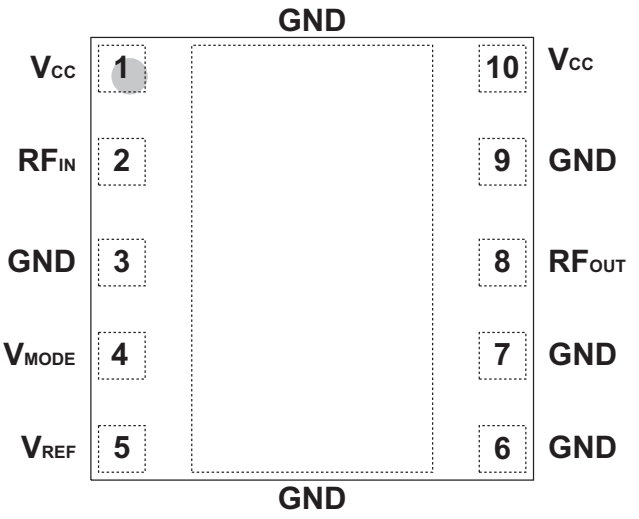



**Figure 2: Pinout (X-ray Top View)**

**Table 1: Pin Description**

| PIN | NAME | DESCRIPTION |
|---|---|---|
| 1 | $V_{CC}$ | Supply Voltage |
| 2 | $RF_{IN}$ | RF Input |
| 3 | GND | Ground |
| 4 | $V_{MODE}$ | Mode Control Voltage |
| 5 | $V_{REF}$ | Reference Voltage |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | $RF_{OUT}$ | RF Output |
| 9 | GND | Ground |
| 10 | $V_{CC}$ | Supply Voltage |

## ELECTRICAL CHARACTERISTICS

**Table 2: Absolute Minimum and Maximum Ratings**

| PARAMETER | MIN | MAX | UNIT |
|---|---|---|---|
| Supply Voltage ($V_{CC}$) | 0 | +5 | V |
| Mode Control Voltage ($V_{MODE}$) | 0 | +3.5 | V |
| Reference Voltage ($V_{REF}$) | 0 | +3.5 | V |
| RF Input Power ($P_{IN}$) | - | +10 | dBm |
| Storage Temperature ($T_{STG}$) | -40 | +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 3: Operating Ranges**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Operating Frequency (f) | 1850 | - | 1910 | MHz | |
| Supply Voltage ($V_{CC}$) | +3.2 | +3.4 | +4.2 | V | |
| Reference Voltage ($V_{REF}$) | +2.7<br>0 | +2.8<br>- | +2.9<br>+0.5 | V | PA "on"<br>PA "shut down" |
| Mode Control Voltage ($V_{MODE}$) | +2.5<br>0 | +2.8<br>- | +3.1<br>+0.5 | V | Low Bias Mode<br>High Bias Mode |
| RF Output Power ($P_{OUT}$) | +27.5(1) | +28.0 | - | dBm | |
| Case Temperature ($T_C$) | -30 | - | +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) For operation at $T_C$ = +85 °C and $V_{CC}$ = +3.2 V, $P_{OUT}$ is derated by 0.5 dB.*

**Table 4: Electrical Specifications**
**($T_C$ = +25 °C, $V_{CC}$ = +3.4 V, $V_{REF}$ = +2.8 V, 50 Ω system)**

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|---|---|---|---|---|---|
| Gain | 25<br>22 | 27<br>25 | 30<br>27 | dB | $P_{OUT}$ = +28 dBm, $V_{MODE}$ = 0 V<br>$P_{OUT}$ = +16 dBm, $V_{MODE}$ = +2.8 V |
| Adjacent Channel Power (1)<br>at ±1.25 kHz offset<br>Primary Channel BW = 1.23 MHz<br>Adjacent Channel BW = 30 kHz | <br><br>-<br>- | <br><br>-49<br>-51 | <br><br>-47<br>-47 | dBc | <br><br>$P_{OUT}$ = +28 dBm, $V_{MODE}$ = 0 V<br>$P_{OUT}$ = +16 dBm, $V_{MODE}$ = +2.8 V |
| Adjacent Channel Power (1)<br>at ±2.25 MHz offset<br>Primary Channel BW = 1.23 MHz<br>Adjacent Channel BW = 30 kHz | <br><br>-<br>- | <br><br>-60<br>-70 | <br><br>-57<br>-57 | dBc | <br><br>$P_{OUT}$ = +28 dBm, $V_{MODE}$ = 0 V<br>$P_{OUT}$ = +16 dBm, $V_{MODE}$ = +2.8 V |
| Power-Added Efficiency (1) | 37<br>8 | 39.5<br>9 | -<br>- | % | $P_{OUT}$ = +28 dBm, $V_{MODE}$ = 0 V<br>$P_{OUT}$ = +16 dBm, $V_{MODE}$ = +2.8 V |
| Quiescent Current (Icq) | - | 48 | 60 | mA | $V_{MODE}$ = +2.8 V |
| Reference Current | - | 3.5 | 5 | mA | through $V_{REF}$ pin |
| Mode Control Current | - | 0.3 | 0.5 | mA | through $V_{MODE}$ pin, $V_{MODE}$ = +2.8 V |
| Leakage Current | - | <1 | 5 | μA | $V_{CC}$ = +4.2 V, $V_{REF}$ = 0 V<br>$V_{MODE}$ = 0 V |
| Noise in Receive Band<br>1930 MHz to 1990 MHz | - | -137<br>-140 | -135<br>-138 | dBm/Hz | $P_{OUT}$ = +28 dBm, $V_{MODE}$ = 0 V,<br>$P_{OUT}$ = +16 dBm, $V_{MODE}$ = +2.8 V |
| Harmonics<br>2fo<br>3fo, 4fo | <br>-<br>- | <br>-40<br>-55 | <br>-30<br>-30 | dBc | |
| Input Impedance | - | - | 2:1 | VSWR | |
| Spurious Output Level<br>(all spurious outputs) | - | - | -65 | dBc | $P_{OUT}$ ≤ +28 dBm<br>In-band load VSWR < 8:1<br>Out-of-band load VSWR < 8:1<br>Applies over all voltage and temperature operating ranges |
| Load mismatch stress with no permanent degradation or failure | 8:1 | - | - | VSWR | $V_{CC}$ = +5.0 V, $P_{IN}$ = +5 dBm<br>Applies over full operating temperature range |

*Notes:*
*(1) ACPR and PAE limits apply to middle frequency only.*

## APPLICATION INFORMATION

To ensure proper performance, refer to all related Application Notes on the ANADIGICS web site: http://www.anadigics.com

### Shutdown Mode

The power amplifier may be placed in a shutdown mode by applying logic low levels (see Operating Ranges table) to both the $V_{REF}$ and $V_{MODE}$ voltages.

### Bias Modes

The power amplifier may be placed in either a Low Bias mode or a High Bias mode by applying the appropriate logic level (see Operating Ranges table) to the $V_{MODE}$ voltage. The Bias Control table lists the recommended modes of operation for various applications.

**Table 5: Bias Control**

| APPLICATION | $P_{OUT}$ LEVELS | BIAS MODE | $V_{REF}$ | $V_{MODE}$ |
|---|---|---|---|---|
| CDMA - low power | ≤+16dBm | Low | +2.8 V | +2.8 V |
| CDMA - high power | >+16 dBm | High | +2.8 V | 0 V |
| Shutdown | - | Shutdown | 0 V | 0 V |

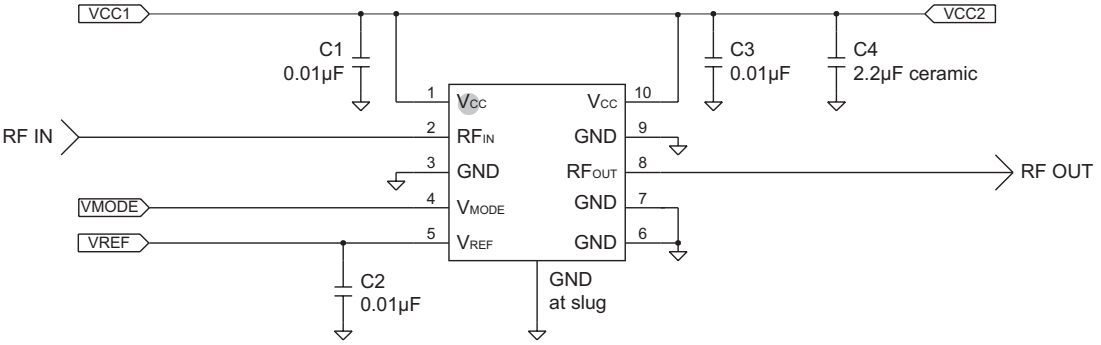
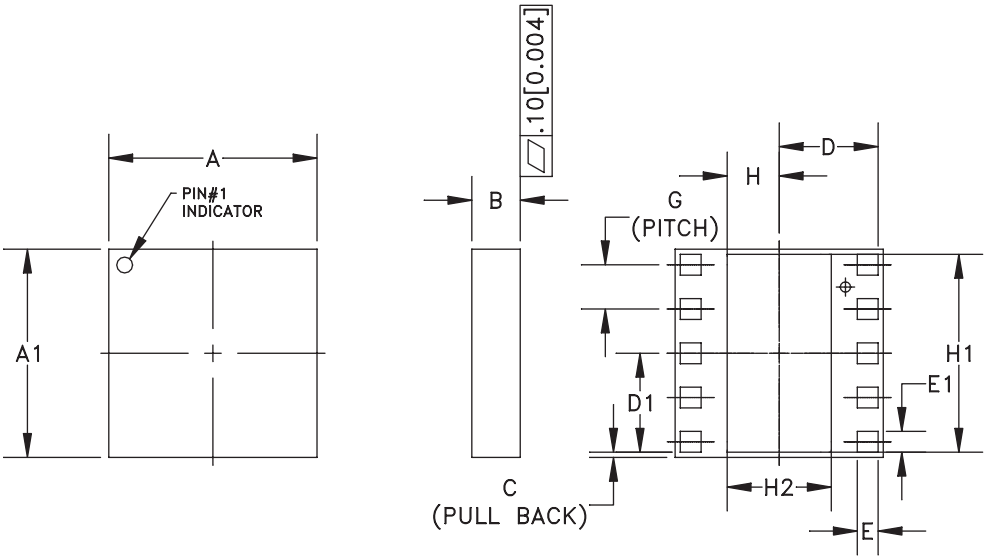



**Figure 3: Application Circuit Schematic**

## PACKAGE OUTLINE

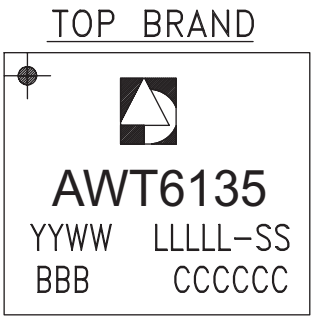



| SYMBOL | MILLIMETERS | | | INCHES | | | NOTE |
|---|---|---|---|---|---|---|---|
| | MIN. | NOM. | MAX. | MIN. | NOM. | MAX. | |
| A | 3.88 | 4.00 | 4.12 | 0.152 | 0.157 | 0.162 | – |
| A1 | 3.88 | 4.00 | 4.12 | 0.152 | 0.157 | 0.162 | – |
| B | 1.26 | 1.41 | 1.56 | 0.049 | 0.055 | 0.061 | – |
| C | – | 0.10 | – | – | 0.004 | – | – |
| D | – | 1.90 | – | – | 0.075 | – | – |
| D1 | – | 1.90 | – | – | 0.075 | – | – |
| E | 0.35 | 0.40 | 0.45 | 0.013 | 0.015 | 0.017 | – |
| E1 | 0.35 | 0.40 | 0.45 | 0.013 | 0.015 | 0.017 | – |
| G | 0.85 BSC | | | 0.033 BSC | | | – |
| H | – | 1.00 | – | – | 0.039 | – | – |
| H1 | – | 3.80 | – | – | 0.149 | – | – |
| H2 | – | 2.00 | – | – | 0.078 | – | – |

NOTES:

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

**Figure 4: M7 Package Outline - 10 Pin 4mm x 4mm Surface Mount Module**




NOTES:

| | |
|---|---|
| 1. ANADIGICS LOGO SIZE: | X=0.040±0.010 Y=0.048±0.010 |
| 2. PART # | AWT6135 |
| 3. YEAR AND WORK WEEK: | YYWW: YY = YEAR, WW = WORK WEEK |
| 4. LOT – WAFER I.D.: | LLLLL – SS = WAFER/LOT I.D. |
| 5. PIN 1 INDICATOR: | MOLD NOTCH –or– INK DOT |
| 6. BOM # | BBB |
| 7. COUNTRY CODE: | CCCCCC |
| 8. TYPE : ELITE<br>SIZE : AS LARGE AS POSSIBLE<br>LASER MARKED | |

**Figure 5: Branding Specification**

## COMPONENT PACKAGING

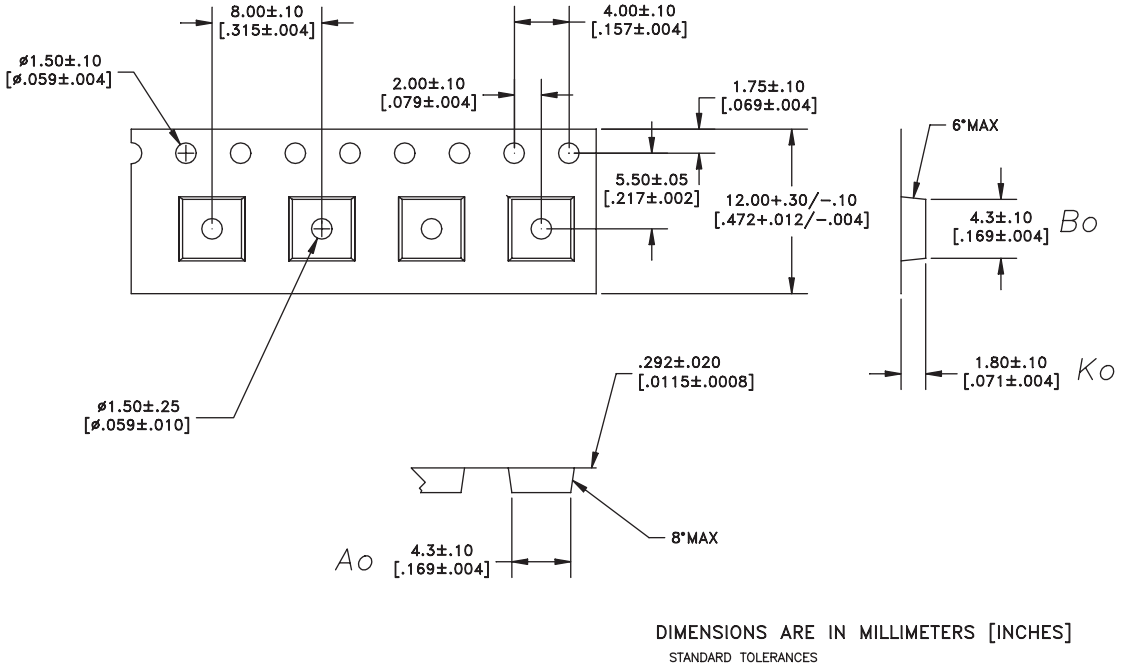



**Figure 6: Tape & Reel Packaging**

**Table 6: Tape & Reel Dimensions**

| PACKAGE TYPE | TAPE WIDTH | POCKET PITCH | REEL CAPACITY | MAX REEL DIA |
|---|---|---|---|---|
| 4mm X 4mm | 12mm | 8mm | 2500 | 13" |

## ORDERING INFORMATION

| ORDER NUMBER | TEMPERATURE RANGE | PACKAGE DESCRIPTION | COMPONENT PACKAGING |
|---|---|---|---|
| AWT6135M7P8 | -30 °C to +110 °C | 10 Pin 4mm x 4mm Surface Mount Module | Tape and Reel, 2500 pieces per Reel |

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