Application Note

PCS CDMA 4mm x 4mm
Power Amplifier Modules
Rev 1

RELEVANT PRODUCTS

- AWT6113

GENERAL DESCRIPTION

The ANADIGICS 4mm x 4mm hetero-junction bipolar transistor (HBT) power amplifier modules designed for PCS CDMA handsets have an operating frequency band from 1850 MHz to 1910 MHz and operate from a single lithium-ion (Li-ion) battery. The amplifier input and output are matched to provide optimum performance in a 50 Ω system; only minimal external components are required for proper RF bypassing. The tantalum capacitors, C8 and C9, are optional.

Table 1: Module Pin Description

PIN	NAME	DESCRIPTION	NOTES
1	V_{CC}	Supply Voltage	+3.2 to +4.2 V
2	RF_{IN}	RF Input	Use 50 Ω transmission line
4	V_{MODE}	Mode Control Voltage	+2.5 to +3.1 V for Low Bias Mode 0 to +0.5 V for High Bias Mode
5	V_{REF}	Reference Voltage	+2.75 to +3.1 V for PA "on" 0 to +0.5 V for PA "shut down"
8	RF_{OUT}	RF Output	Use 50 Ω transmission line
10	V_{CC}	Supply Voltage	+3.2 to +4.2 V
3, 6, 7, 9,	GND	Ground	

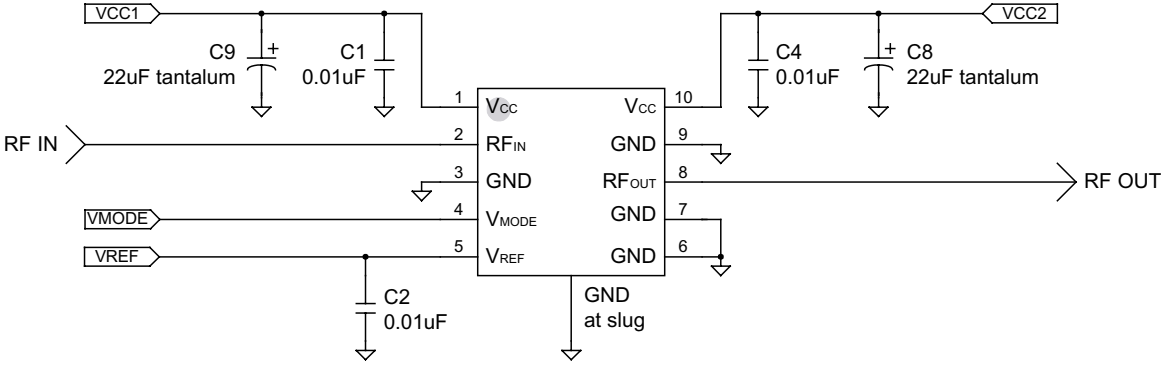

Figure 1. Evaluation Circuit

Note: Tantalum capacitors are not required in actual battery-operated applications.

EVALUATION BOARD

The evaluation board, shown in Figure 2, was designed on GETEK material with 0.014" thickness:

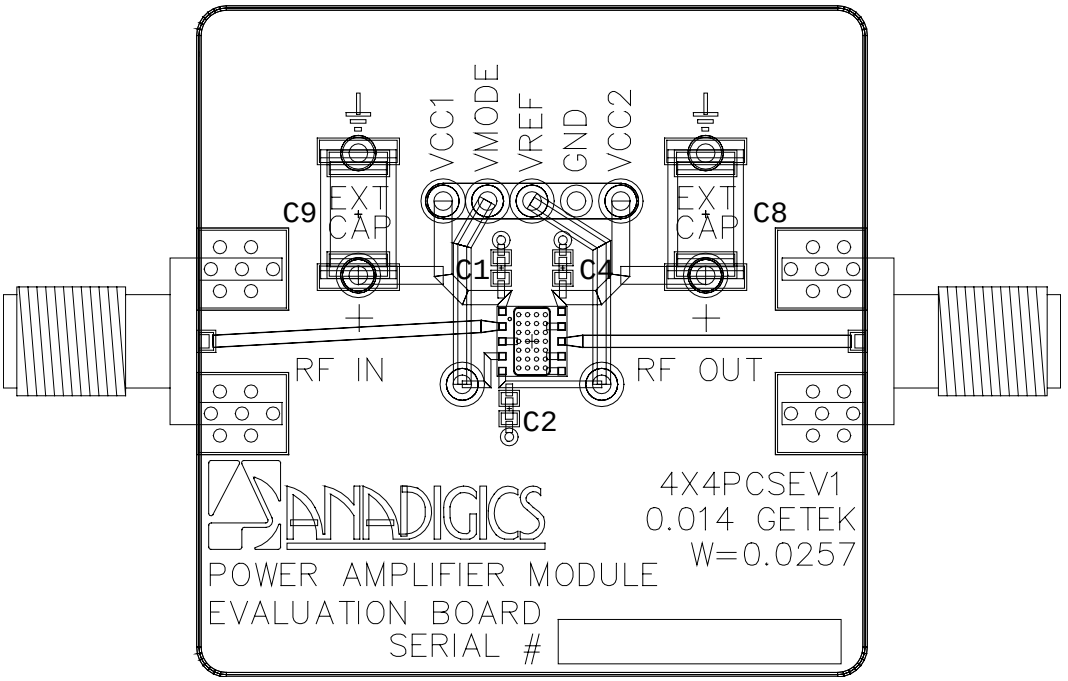

Figure 2: Evaluation Board Layout

Notes:
1. Copper trace width is 0.0257 +/- 0.001".
2. Relative dielectric constant is 4.37 at 1 GHz.
3. Dielectric thickness is 0.014 +/- 0.001".

Table 2: Evaluation Board Parts List

DESCRIPTION	VALUE	FUNCTION
C1	0.01µF	Bypass
C2	0.01µF	Bypass
C4	0.01µF	Bypass
C8	22µF, tant.	Bypass
C9	22µF, tant.	Bypass

Notes:
1. C3, C5, C6 and C7 not used.

MINIMUM TEST BENCH REQUIREMENTS

The following minimum equipment is required for proper power amplifier evaluation:

1. Spectrum Analyzer
2. DC Power Supplies (3)
3. CDMA Function Generator
4. RF SAW (Surface Acoustic Wave) Filter
5. Isolator
6. RF Power Meter
7. Coupler(s)

TURN ON PROCEDURES

Upon receipt of the amplifier module, the characterization sheet should be reviewed for the appropriate bias conditions. Review the evaluation board drawing prior to connecting the bias pins. The order in which the supply, reference and control voltages are applied is offered as a recommendation only; the device will not be damaged if the sequence is altered. Do not exceed any maximum ratings for the device, per the product data sheet.

1. Connect the amplifier to 50 Ω RF input and output cables.
2. With all the DC supplies off, attach V_{CC1}, V_{CC2}, V_{REF} and V_{MODE}.
3. Set the V_{REF} supply to +2.85 V, and observe a current draw of approximately 7 mA.
4. Set the V_{CC1} and V_{CC2} supplies to +3.4 V. Observe a current draw of approximately 90 mA from the V_{CC} supplies. (V_{MODE} = 0 V, so the amplifier is in High Bias Mode.)
5. Apply an RF input power of 0 dBm. Adjust the input power until the appropriate output power level is obtained (+28 dBm.)
6. Perform measurements.

LAYOUT CONSIDERATIONS

A sufficient number of plated through via holes should be placed under the module in order to channel the heat properly. In addition, contact should be made between the PA slug, located under the amplifier module, and the board. For hand assembly of the board, apply a sufficient amount of bonding paste, so that contact is made between the PA and ground. For large volume assembly, please refer to the Solder Reflow Report application note. For RF in/out, provide 50 Ω transmission lines.

OTHER RECOMMENDATIONS

In order to maximize the performance of the power amplifier module in CDMA systems, both the Low and High Bias Modes should be used. Operation in the High Bias Mode allows the PA to exceed the system performance requirements at output power levels from +16 dBm to +28 dBm. For an output power less than +16 dBm, the Low Bias Mode should be used to minimize quiescent current and extend battery life.

A logic low (0 V) at the V_{MODE} pin places the PA in High Bias Mode, and a logic high (+2.85 V) at the V_{MODE} pin places the PA in Low Bias Mode. Applying a logic low to both the V_{REF} and V_{MODE} pins places the amplifier in shutdown (standby) mode.

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