



Quad-Band GSM Power Amplifier Module

Alpha

AP137-501

Features

- First Quad-Band InGaP HBT GSM PA Module
- 3.2 V Nominal Operating Voltage
- 50 Ω Internally Matched Input and Output
- High Power Added Efficiency: 55% for GSM and 50% for DCS and PCS
- Small Size: 10 x 8 x 1.6 mm MCM Land Grid Array Package
- Low Current Standby Mode: < 30 μ A
- Integral Band Select and Analog Power Control
- GPRS Class 12 Capable

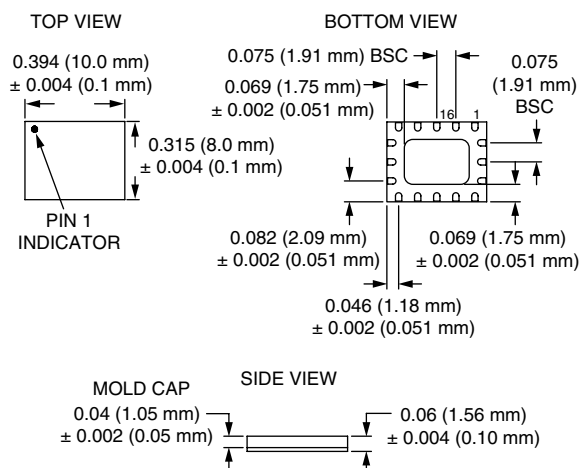
Description

The AP137-501 is a high performance power amplifier module designed for use as the final amplification stage in multi-band GSM and GPRS mobile phone applications (824–849, 880–915, 1710–1785 and 1850–1910 MHz). It features 3-cell battery operation, a band select switch, a single positive analog power control input for all three bands, and exceptional power added efficiency. The AP137-501 also incorporates an advanced silicon bipolar power control ASIC providing an outstandingly smooth and flat power control response, greatly improving the ease of use. The amplifier IC's are manufactured on an advanced InGaP HBT process, known industry-wide for its excellent reliability, ruggedness and performance. The amplifier module is completely self-contained, requiring no external matching components, and packaged in a small land grid array package.

DC Specifications

Parameter	Condition	Min.	Typ.	Max.	Unit
Supply Voltage		2.8	3.2	4.2	V
Leakage Current	No Input RF Power			30	μ A
Band Select Voltage	GSM	0		0.5	V
	DCS/PCS	2.0		2.8	V
Band Select Current				1.0	mA
Power Control Voltage		0.1		1.9	V
Power Control Current				1.0	mA

-501



Absolute Maximum Ratings

Characteristic	Value
Supply Voltage V_{CC} , Standby Mode, $V_{APC} < 0.3$ (No RF Input Power)	6.5 V Max.
Power Control Voltage	4 V Max.
Band Select Voltage	4 V Max.
Input Power (CW)	15 dBm Max.
Operating Case Temperature	-35 to +85°C
Storage Temperature	-45 to 120°C

Electrical Specifications

GSM850/GSM900 Mode

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency	GSM850 GSM900	824 880		849 915	MHz MHz
Output Power	GSM850 GSM900 GSM850, $V_{CC} = 2.8$ V, T = -20 to +70°C GSM900, $V_{CC} = 2.8$ V, T = -20 to +70°C	31.0 34.0 31.0 32.5	31.5 35.0		dBm dBm dBm dBm
Dynamic Range	$V_{APC} = 0.1-1.9$ V	60			dB
Power Control Slope	$V_{APC} = 0.1-1.9$ V		75	150	dB/ V_{APC}
Power Added Efficiency	$P_{OUT} = 34$ dBm $P_{OUT} = 31$ dBm	50 35	55 40		% %
Input Power		3	6	10	dBm
Input VSWR	$P_{OUT} = 5-35$ dBm			2:1	
Forward Isolation	$P_{IN} = -5$ dBm, $V_{APC} = 0.1$ V $P_{IN} = 10$ dBm, $V_{APC} = 0.1$ V			-40 -25	dBm dBm
Harmonics	$2 F_0 \dots 7 F_0$			-10	dBm
Noise in the R_X Band	F = 849 MHz, 869 MHz, 100 KHz BW 925 MHz, 100 KHz BW 935 MHz, 100 KHz BW 1805-1880 MHz, 100 KHz BW			-84 -72 -84 -76	dBm dBm dBm dBm
Ruggedness	1930-1990 MHz, 100 KHz BW			-76	dBm
Stability	Output VSWR = 10:1 All Phase Angles, $V_{CC} = 4.2$ V, $P_{IN} = 10$ dBm, $V_{APC} = 1.9$ V	No Module Damage or Permanent Performance Degradation			
Band to Band Isolation	Output VSWR = 10:1 All Phase Angles, $V_{CC} = 4.2$ V, $P_{IN} = 10$ dBm, $V_{APC} = 1.9$ V			-36	dBm
	$2 F_0$ Measured at DCS Output			-20	dBm
	$3 F_0$ Measured at DCS Output			-20	dBm

Unless otherwise stated: pulsed operation @ 12.5% duty cycle, 50 Ω system, $V_{CC} = 3.2$ V, $P_{IN} = 6$ dBm and $T_A = 25^\circ\text{C}$.

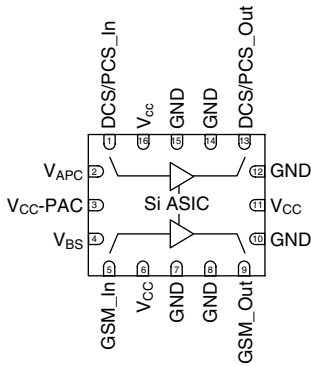
Electrical Specifications

DCS/PCS Mode

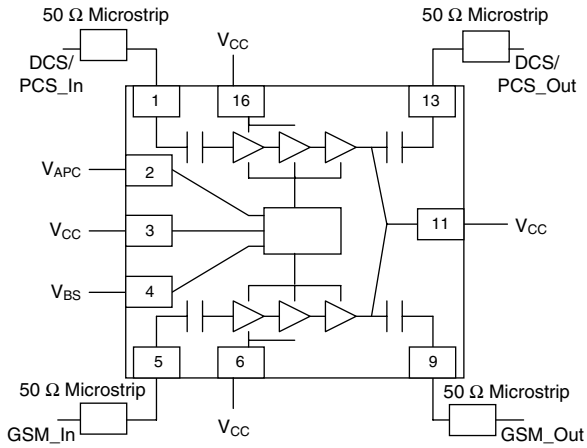
Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency	DCS PCS	1710 1850		1785 1910	MHz MHz
Output Power	$V_{CC} = 2.8 \text{ V}$, $T = -20 \text{ to } +70^\circ\text{C}$	31.9 29.5	32.5		dBm dBm
Dynamic Range	$V_{APC} = 0.1\text{--}1.9 \text{ V}$	60			dB
Power Control Slope	$V_{APC} = 0.1\text{--}1.9 \text{ V}$		75	150	dB/ V_{APC}
Power Added Efficiency	$P_{OUT} = 31.9 \text{ dBm}$	42	50		%
Input Power		3	6	10	dBm
Input VSWR	$P_{OUT} = 0\text{--}32 \text{ dBm}$			2:1	
Forward Isolation	$P_{IN} = -5 \text{ dBm}$, $V_{APC} = 0.1 \text{ V}$ $P_{IN} = 10 \text{ dBm}$, $V_{APC} = 0.1 \text{ V}$			-48 -20	dBm dBm
Harmonics	$2 F_0 \dots 7 F_0$			-10	dBm
Noise in the R_X Band	1805–1880 MHz, 100 KHz BW			-76	dBm
Ruggedness	Output VSWR = 10:1 All Phase Angles, $V_{CC} = 4.2 \text{ V}$, $P_{IN} = 10 \text{ dBm}$, $V_{APC} = 1.9 \text{ V}$	No Module Damage or Permanent Performance Degradation			
Stability	Output VSWR = 10:1 All Phase Angles, $V_{CC} = 4.2 \text{ V}$, $P_{IN} = 10 \text{ dBm}$, $V_{APC} = 1.9 \text{ V}$			-36	dBm

Unless otherwise stated: pulsed operation @ 12.5% duty cycle, 50 Ω system, $V_{CC} = 3.2 \text{ V}$, $P_{IN} = 6 \text{ dBm}$ and $T_A = 25^\circ\text{C}$.

Pin Out



Application Schematic



Pin Out Description

Pin	Symbol	Description
1	DCS/PCS_In	RF input to DCS/PCS power amplifier.
2	V _{APC}	Analog power control input voltage. 10 nF RF bypassing capacitor recommended.
3	V _{CC-PAC}	Power supply input voltage for the silicon ASIC. A 10 μF RF bypassing capacitor is required. This capacitor is only required to help reduce power supply ripple on the test board.
4	V _{BS}	Band select input voltage.
5	GSM_In	RF input to GSM850/GSM900 power amplifier.
6	V _{CC}	Power supply input voltage. 10 μF RF bypassing capacitor is required. This capacitor is only required to help reduce power supply ripple on the test board.
7	GND	Ground connection.
8	GND	Ground connection.
9	GSM_Out	RF output for GSM850/GSM900 amplifier.
10	GND	Ground connection.
11	V _{CC}	Power supply input voltage. 10 μF RF bypassing capacitor is required. This capacitor is only required to help reduce power supply ripple on the test board.
12	GND	Ground connection.
13	DCS/PCS_Out	RF output for DCS/PCS power amplifier.
14	GND	Ground connection.
15	GND	Ground connection.
16	V _{CC}	Power supply input voltage. 10 μF RF bypassing capacitor is required. This capacitor is only required to help reduce power supply ripple on the test board.