GaAs IC 3 Stage GSM Power Amplifier

Ⅱ Alpha

AP121-89

Features

■ +3.5 V Operation

■ Output Power of 35 dBm

■ Efficiency Typically 55%

■ Outstanding Efficiency vs. Supply Voltage

■ High Power SSOP-16 Package with Exposed Pad

■ Wide Power Control Range (70 dB)

■ Designed to work with AP122-89 as a Dualband Solution

Description

The AP121-89 is a low cost IC power amplifier designed for the 880–915 MHz frequency band. It features single supply, 3.5 V battery operation and exceptional efficiency. Drive level requirements are minimized with 3 stages of amplification, thereby reducing the cost of the VCO. The AP121-89 is designed to be stable over a temperature range of -40 to +85°C and over a 10:1 output VSWR load. External matching is used for improved performance and flexibility.

Output Matching Circuit

The output match for the AP121-89 is provided externally in order to improve performance, reduce cost, and add flexibility. By making use of ceramic surface mount components with better Qs than GaAs matching elements, a lower loss matching network can be made. This lower loss results in higher power and efficiency for the amplifier. Also, by keeping these elements external the GaAs die size is reduced and the overall cost is less. This approach also permits the flexibility to tweak the amplifier for optimum performance at different powers, and/or frequencies.

SSOP-16 with Exposed Pad
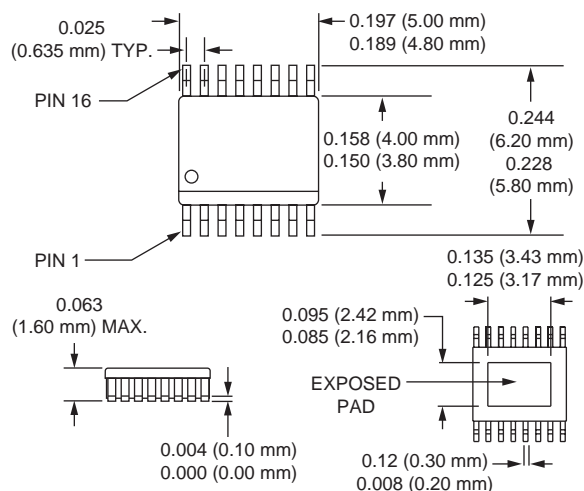
Absolute Maximum Ratings

Quantity	Value	Unit
Amplifier Supply Voltage (V_{DS})	10	V
Input RF Power (P_{IN})	14	dBm
Duty Cycle	50	%
Operating Temperature (T_{OP})	-40 to +85	°C
Storage Temperature (T_{ST})	-65 to +150	°C

Alpha Industries, Inc. **[781] 935-5150** • Fax **[617] 824-4579** • Email **sales@alphaind.com** • **www.alphaind.com**　　**1**

Specifications subject to change without notice. 3/99A

Electrical Specifications at 25°C

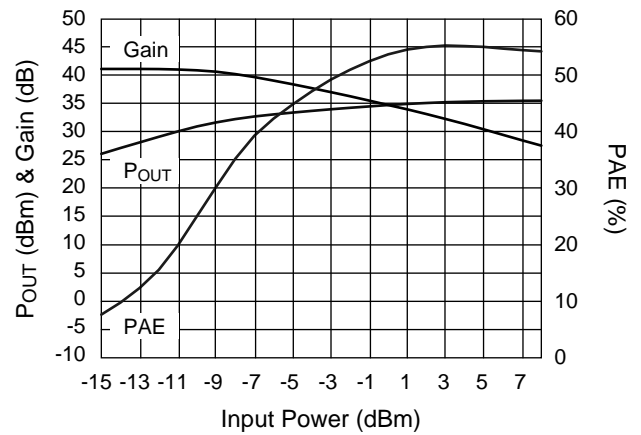| Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Output Power	P_{OUT}	T_{OP} = +25°C	34.5	35		dBm
		V_{DS} = 2.8 V, T_{OP} = (-40 to +85°C)	32.5	33		
Power Added Efficiency	n_{PAE}		50	55		%
Control Voltage Range	V_{GG}		-3		-1	V
2nd Harmonic	H_2			-43	-40	dBc
3rd Harmonic	H_3			-48	-45	dBc
Input VSWR	$VSWR_{IN}$	P_{OUT} (5–35 dBm), Controlled by V_{GG}	3:1	2:1		
Forward Isolation	$P_{OUT, STANDBY}$	P_{IN} = 10 dBm, V_{GG} = -3.0 V		-49	-40	dBm
Switching Time	t_R, t_F	Time from P_{OUT} = -10 dBm to P_{OUT} = 34.5 dBm		1	2	µS
Burn Out	BO	V_{DS} = 2.8 V to 6.0 V, P_{IN} = 0 dBm to 10 dBm, Z_S = 50 Ω, Load VSWR = 10:1, All Phase Angles	No Module Damage or Permanent Degradation			
Stability	Stab.	All Combinations of the Following Parameters: I_{DS} = 0A to xA, x = Current at P_{OUT} = 34.5 dBm in 50 Ω P_{IN} = 3 dBm to 10 dBm, V_{DS} = 2.5 V to 4.5 V, T_{OP} = -40 to +85°C, Load VSWR = 10:1, All Phase Angles	No Parasitic Oscillations Above -36 dBm			
Slope P_{OUT}/V_{GG}		P_{OUT} = -15 dBm to 35 dBm	10	100	150	dB/V
Noise Power		100 KHz BW 925-960 MHz Band		-90	-85	dBm
Phase Change	AM-PM	The Change in Phase When P_{OUT} Changes from 33 dBm to 34 dBm		5	10	Deg.

Characteristic Values:
P_{IN} = 3 dBm
fc = 880–915 MHz
V_{DS} = 3.5 V
T_{OP} = +25°C
V_{GG} = Switched at 217 Hz with Duty Cycle of 12.5%

2 Alpha Industries, Inc. **[781] 935-5150** • Fax **[617] 824-4579** • Email **sales@alphaind.com** • **www.alphaind.com**

Specifications subject to change without notice. 3/99A

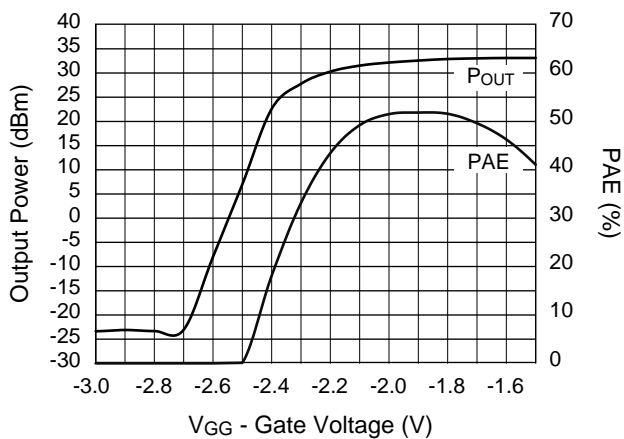## Typical Performance Data
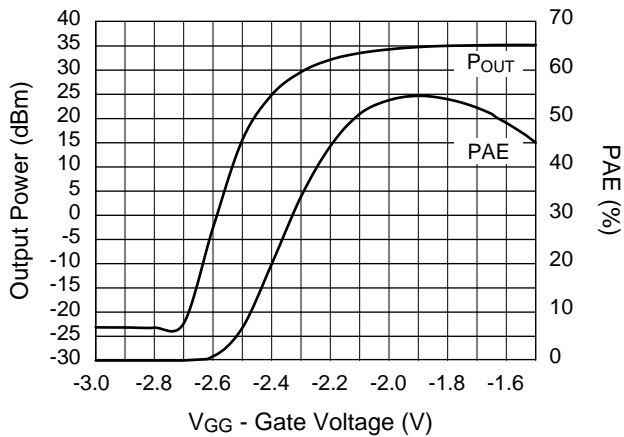
GSM PA - Gate Sweep
P_IN = 3 dBm, V_DD = 3.5 V,
Frequency = 902 MHz

GSM PA - Power Sweep
V_G = -1.9 V, V_DD = 3.5 V,
Frequency = 902 MHz

GSM PA - Gate Sweep
P_IN = 3 dBm, V_DD = 2.8 V,
Frequency = 902 MHz
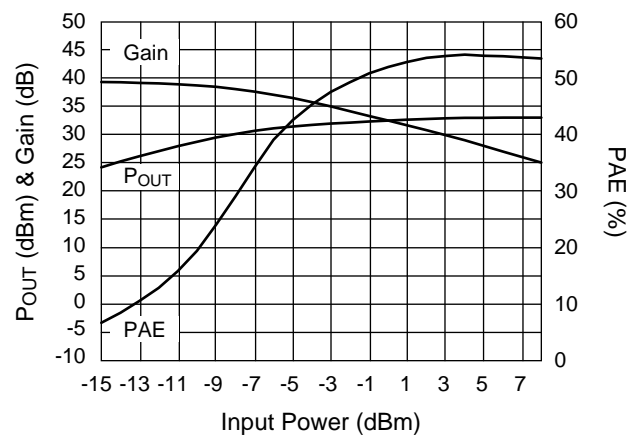
GSM PA - Power Sweep
V_G = -1.9 V, V_DD = 2.8 V,
Frequency = 902 MHz

Pin Out
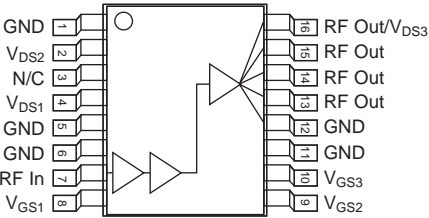
Pin Configuration

Terminal	Symbol	Function
1	GND	Ground
2	V_{DS2}	Stage 2 Drain Voltage
3	N/C	No Connect
4	V_{DS1}	Stage 1 Drain Voltage
5	GND	Ground
6	GND	Ground
7	RF IN	RF Input
8	V_{GS1}	Stage 1 Gate Voltage
9	V_{GS2}	Stage 2 Gate Voltage
10	V_{GS3}	Stage 3 Gate Voltage
11	GND	Ground
12	GND	Ground
13	RF Out	RF Output
14	RF Out	RF Output
15	RF Out	RF Output
16	RF Out/V_{DS3}	RF Output/Stage 3 Drain Voltage