GaAs IC 3 Stage DCS/PCS Power Amplifier

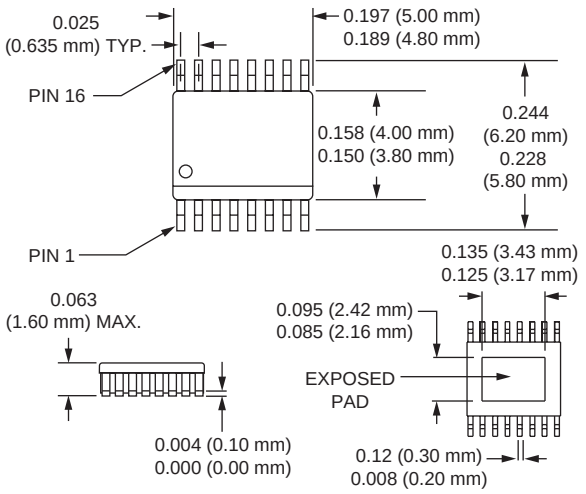
SKYWORKS

AP122-89

Features

- +3.5 V Operation
- Output Power of 33 dBm
- Large Signal Gain of 30 dB
- Power Added Efficiency of 50%
- Outstanding Efficiency vs. Supply Voltage
- High Power SSOP-16 Package with Exposed Pad
- Wide Power Control Range (70 dB)
- Designed to work with AP121-89 as a Dualband Solution

SSOP-16 with Exposed Pad



Description

The AP122-89 is a low cost IC power amplifier designed for the 1700–1900 MHz frequency band. It features 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 AP122-89 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, flexibility, and multi-band operation.

Absolute Maximum Ratings

Quantity	Value	Unit
Amplifier Supply Voltage (V_{DS})	10	V
Input RF Power (P_{IN})	17	dBm
Duty Cycle	50	%
Operating Temperature (T_{OP})	-40 to +85	°C
Storage Temperature (T_{ST})	-65 to +150	°C

Output Matching Circuit

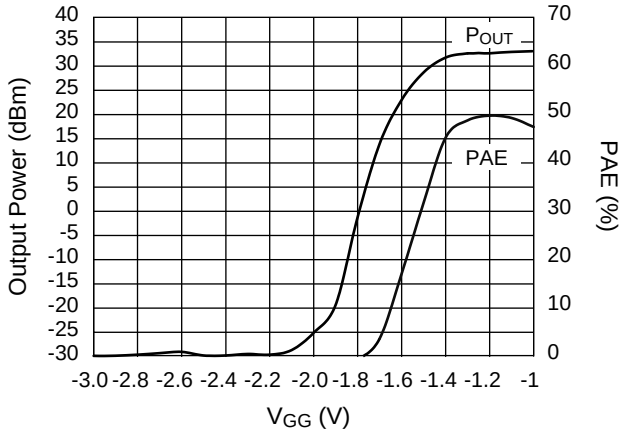
The output match for the AP122-89 is provided externally in order to improve performance, reduce cost, and add flexibility. By making use of ceramic surface mount components with better Qs than GaAs matching elements, a lower loss matching network can be made. This lower loss results in higher power 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.

Electrical Specifications at 25°C

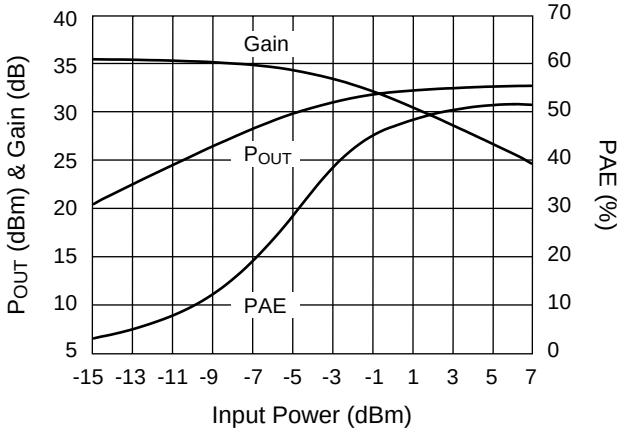
Quantity	Symbol	Condition	Min.	Typ.	Max.	Unit
Output Power	P_{OUT}	T_{OP} = +25°C	32.5	33		dBm
		V_{DS} = 2.8 V, T_{OP} = (-40 to +85°C)	29.5	30.5		
Power Added Efficiency	n_{PAE}		45	50		%
Control Voltage Range	V_{GG}		-3		-1	V
2nd Harmonic Distortion	H_2			-40	-35	dBc
3rd Harmonic Distortion	H_3			-40	-35	dBc
Input VSWR	$VSWR_{IN}$	P_{OUT} (0–32 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} = 33 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} = 33 dBm in 50 Ω P_{IN} = 0 dBm to 10 dBm, V_{DD} = 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 33 dBm	10	100	150	dB/V
Noise Power		100 KHz BW 1805-1880 MHz Band		-85	-79	dBm
Phase Change		The Change in Phase When P_{OUT} Changes from 31 dBm to 32 dBm		5	10	Deg.

Characteristic Values:
P_{IN} = 6 dBm
fc = 1710–1785 MHz
V_{DS} = 3.5 V
T_{OP} = +25°C
V_{GG} = Switched at 217 Hz with Duty Cycle of 12.5%

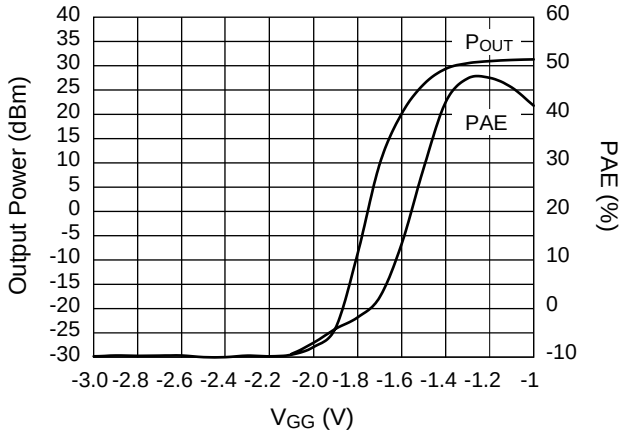
Typical Performance Data



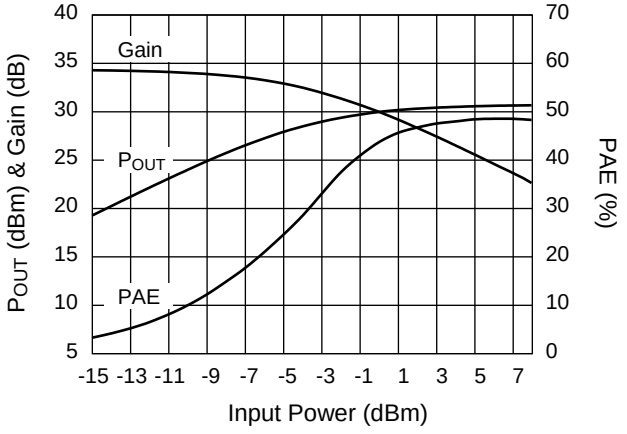
DCS PA - Gate Sweep
P_{IN} = 3 dBm, V_{DD} = 3.5 V,
Frequency = 1.785 GHz



DCS PA - Power Sweep
V_G = -1.2 V, V_{DD} = 3.5 V,
Frequency = 1.785 GHz

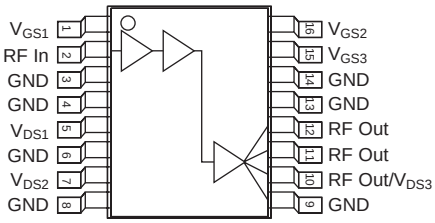


DCS PA - Gate Sweep
P_{IN} = 3 dBm, V_{DD} = 2.8 V,
Frequency = 1.785 GHz



DCS PA - Power Sweep
V_G = -1.2 V, V_{DD} = 2.8 V,
Frequency = 1.785 GHz

Pin Out



Pin Configuration

Terminal	Symbol	Function
1	V_{GS1}	Stage 1 Gate Bias
2	RF In	RF Input
3	GND	Ground
4	GND	Ground
5	V_{DS1}	Stage 1 Drain Voltage
6	GND	Ground
7	V_{DS2}	Stage 2 Drain Voltage
8	GND	Ground
9	GND	Ground
10	RF Out/V_{DS3}	RF Output/Stage 3 Drain Voltage
11	RF Out	RF Output
12	RF Out	RF Output
13	GND	Ground
14	GND	Ground
15	V_{GS3}	Stage 3 Gate Bias
16	V_{GS2}	Stage 2 Gate Bias