

## Features

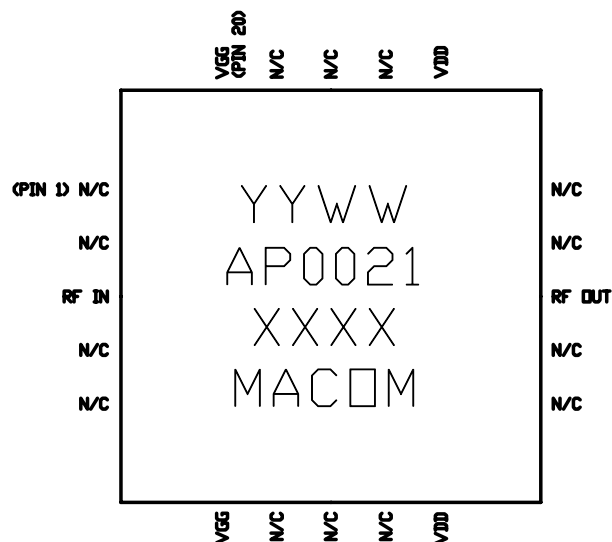
- ◆ 2 Watt Saturated Output Power Level
- ◆ Variable Drain Voltage (4-10V) Operation
- ◆ MSAG Process
- ◆ 5x5 mm 20 Lead MLP Package

## Description

The MAAP-000021-PKG0003 is a 2-stage 2 W power amplifier with on-chip bias networks in a 20 lead MLP package, allowing easy assembly. This product is fully matched to 50 ohms on both the input and output. It can be used as a power amplifier stage or as a driver stage in high power applications.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using M/A-COM's GaAs Multifunction Self-Aligned Gate (MSAG) Process.

M/A-COM's MSAG process features robust silicon-like manufacturing processes, planar processing of ion implanted transistors and multiple implant capability enabling power, low-noise, switch and digital FETs on a single chip. The use of refractory metals and the absence of platinum in the gate metal formulation prevents hydrogen poisoning when employed in hermetic packaging.



## Primary Applications

- ◆ Multiple Band Point-to-Point Radio
- ◆ SatCom
- ◆ ISM Band

## Maximum Operating Conditions<sup>1</sup>

Parameter	Symbol	Absolute Maximum	Units
Input Power	$P_{IN}$	23.0	dBm
Drain Supply Voltage	$V_{DD}$	+12.0	V
Gate Supply Voltage	$V_{GG}$	-3.0	V
Quiescent Drain Current (No RF)	$I_{DQ}$	790	mA
Quiescent DC Power Dissipated (No RF)	$P_{DISS}$	6.3	W
Junction Temperature	$T_J$	180	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

1. Operation beyond these limits may result in permanent damage to the part.

## Recommended Operating Conditions<sup>2</sup>

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Supply Voltage	$V_{DD}$	4.0	8.0	10.0	V
Gate Supply Voltage	$V_{GG}$	-2.4	-1.7	-1.3	V
Input Power	$P_{IN}$		18	21.0	dBm
Junction Temperature	$T_J$			150	°C
Thermal Resistance	$\Theta_{JC}$		14.9		°C/W
Package Base Temperature	$T_B$			Note 3	°C

2. Operation outside of these ranges may reduce product reliability.

3. Maximum Package Base Temperature = 150°C —  $\Theta_{JC} * V_{DD} * I_{DQ}$

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Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

**Electrical Characteristics:  $T_B = 40^\circ\text{C}^4$ ,  $Z_0 = 50 \Omega$ ,  $V_{DD} = 8\text{V}$ ,  $I_{DQ} = 600 \text{mA}$ ,  $P_{in} = 18 \text{dBm}$ ,  $R_G = 121\Omega$**

Parameter	Symbol	Typical	Units
Bandwidth	f	5.0-8.5	GHz
Output Power	POUT	33	dBm
Power Added Efficiency	PAE	30	%
1-dB Compression Point	P1dB	32	dBm
Small Signal Gain	G	17	dB
Input VSWR	VSWR	1.6	—
Output VSWR	VSWR	2:1	—
Gate Supply Current	$I_{GG}$	<2	mA
Drain Supply Current	$I_{DD}$	0.9	A
Noise Figure	NF	9.5	dB
2 <sup>nd</sup> Harmonic	2f	-20	dBc
3 <sup>rd</sup> Harmonic	3f	-45	dBc
Output Third Order Intercept	OTOI	40	dBm
3 <sup>rd</sup> Order Intermodulation Distortion, Single Carrier Level = 23 dBm	IM3	-10	dBm
5 <sup>th</sup> Order Intermodulation Distortion, Single Carrier Level = 23 dBm	IM5	-25	dBm

**4. Adjust  $V_{GG}$  between -2.4 to -1.3 to achieve indicated  $I_{DQ}$ .**

## Operating Instructions

This device is static sensitive. Please handle with care. To operate the device, follow these steps.

1. Apply  $V_{GG} = -1.7 \text{V}$ ,  $V_{DD} = 0 \text{V}$ .
2. Ramp  $V_{DD}$  to desired voltage, typically 8 V.
3. Adjust  $V_{GG}$  to set  $I_{DQ}$ , (approximately @ -1.7V).
4. Set RF input.
5. Power down sequence in reverse. Turn gate voltage off last.



**Amplifier, Power, 2W  
5.0-8.5 GHz**

MAAP-000021-PKG003

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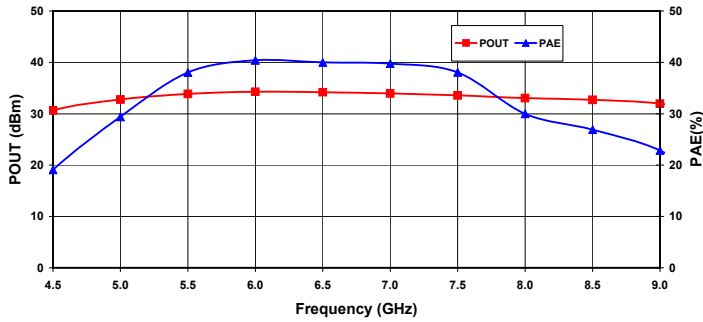


Figure 1. Output Power and Power Added Efficiency vs. Frequency at  $V_{DD} = 8V$  and  $P_{in} = 18\text{ dBm}$

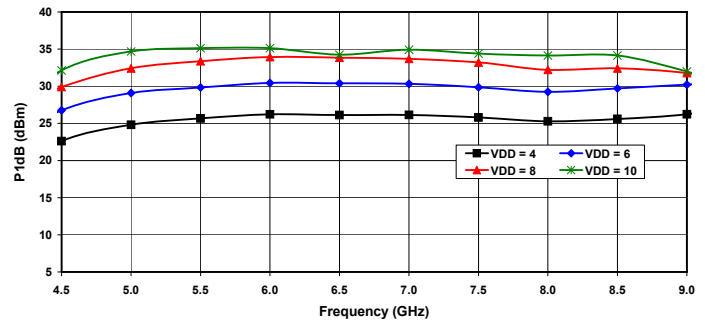


Figure 2. 1dB Compression Point vs. Drain Voltage

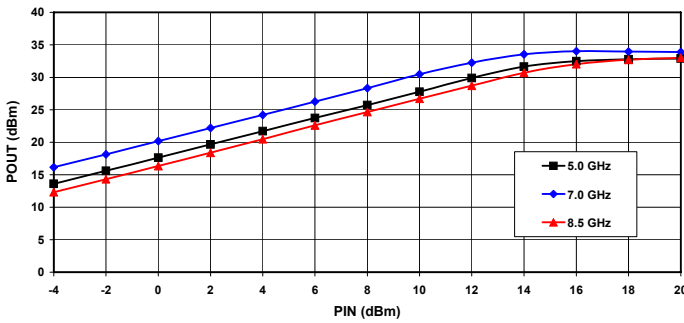


Figure 3. Output Power vs. Input Power at  $V_{DD} = 8V$

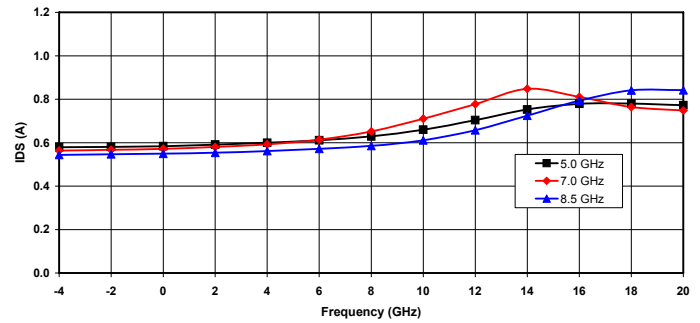


Figure 4. Drain Current vs. Input Power at  $V_{DD} = 8V$

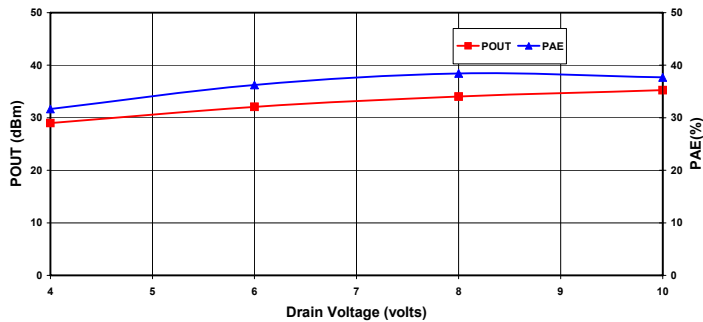


Figure 5. Saturated Output Power and Power Added Efficiency vs. Drain Voltage at  $f_i = 7\text{ GHz}$

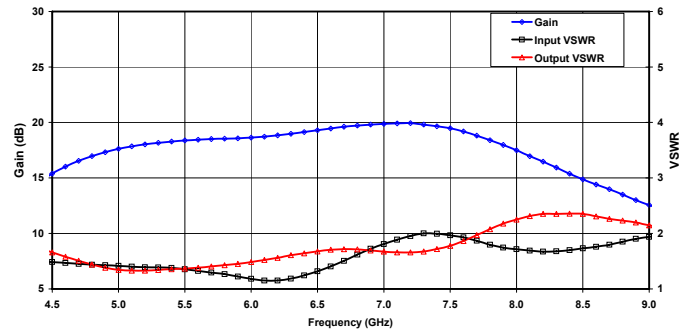
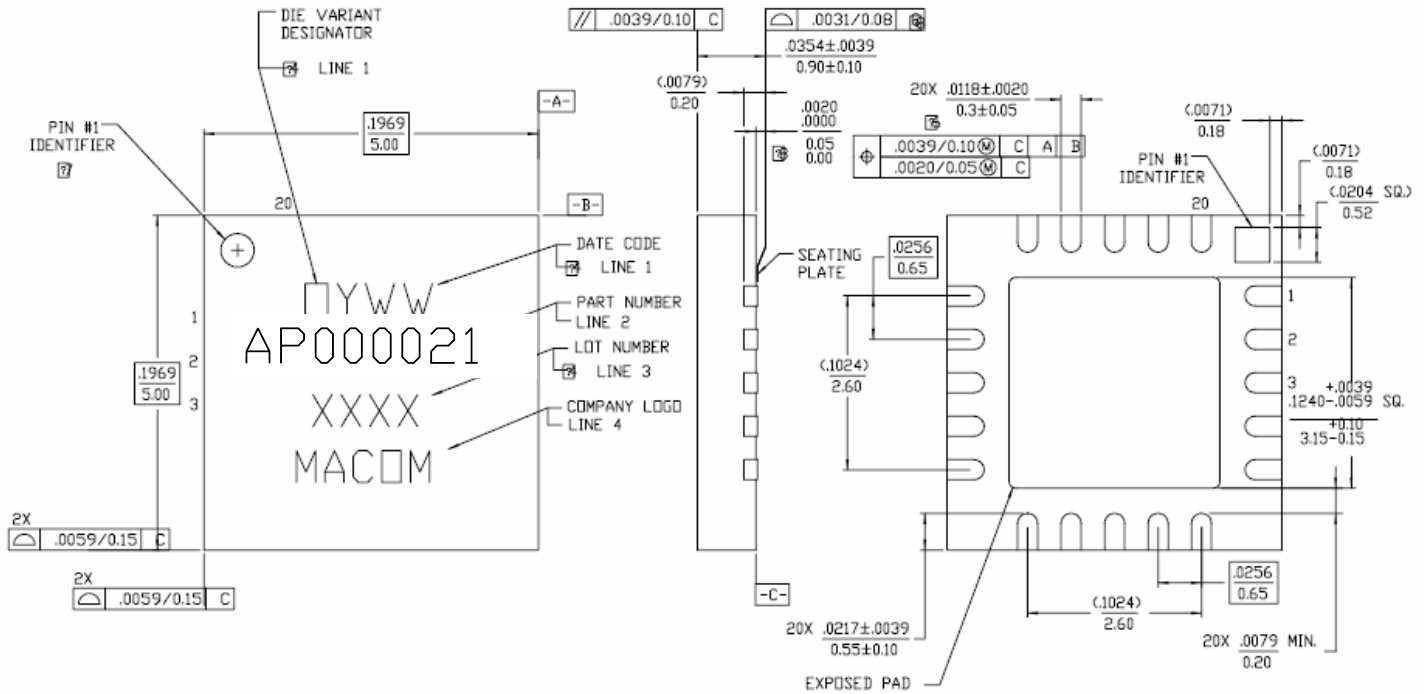


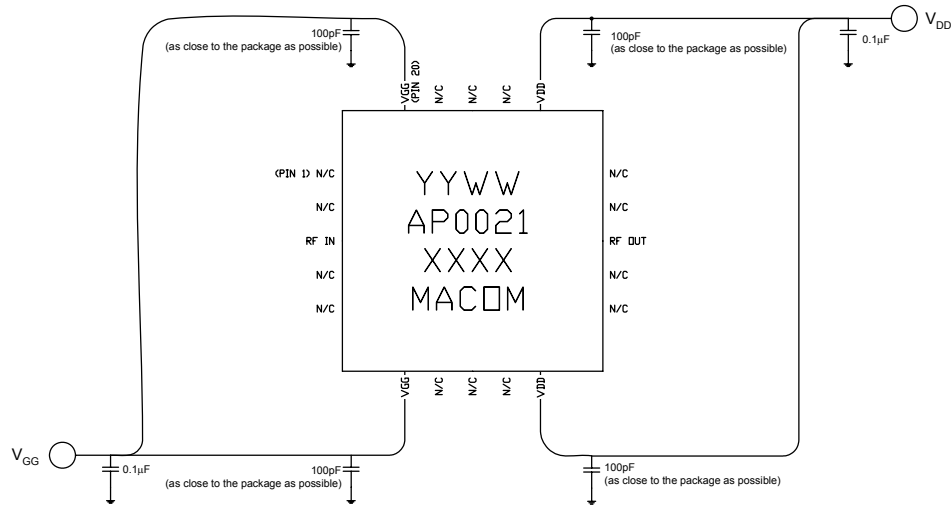
Figure 6. Small Signal Gain and VSWR vs. Frequency at  $V_{DD} = 8V$ .

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**Figure 7. 5x5 mm 20-Lead MLP.**



**Figure 8. Recommended Bias Configuration.**

Note: The exposed pad centered on the package bottom must be connected to RF and dc ground for proper electrical and thermal operation.

Refer to M/A-COM Application Note **Surface Mounting Instructions for PQFN Packages #S2083\*** for assembly guidelines.

**Additional Precaution: All parts must receive a bake-out of 125°C for 24 hours prior to any solder reflow operation.**

\*Application Notes can be found by going to the Site Search Page of M/A-COM's web page (<http://www.macom.com/search/search.jsp>) and searching for the required Application Note.

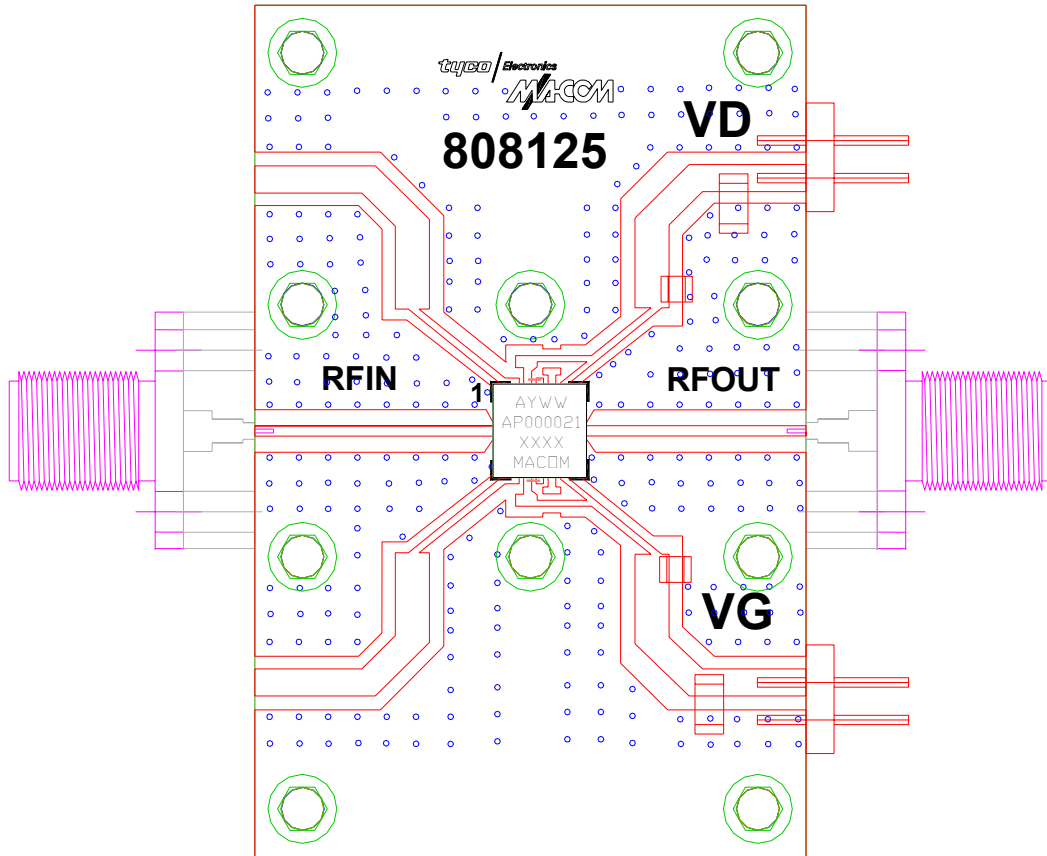


Figure 9. Demonstration Board PN MAAP-000021-PKG-SMB (available upon request).