

10 W Power Amplifier

2 - 6 GHz V1

Features

- +41 dBm Saturated Output Power
- Linear Gain: 18 dB
- Power Added Efficiency: 30% at P_{SAT}
- 50 Ω Input / Output Match
- Ceramic Flange Mount Package
- RoHS* Compliant and 260°C Re-flow Compatible

Description

The MAAP-010169 is a two stage MMIC power amplifier designed for broadband high power applications. It can be used as either a driver or an output stage amplifier. This device is fully matched input and output to 50 Ω which eliminates any sensitive external RF tuning components.

The device is packaged in a lead free 10-lead flanged package for high volume manufacturing.

The MAAP-010169 is fabricated using a high reliability pHEMT process, to realize good power added efficiency and gain. The pHEMT process features full passivation for high performance and reliability.

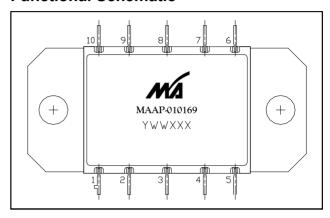
Ordering Information¹

Part Number	Package
MAAP-010169-000000	Bulk

 Reference Application Note M567 for package handling and mounting procedure.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

Functional Schematic



Pin Configuration²

Pin No.	Function		
1	V _{GG} 2		
2	V _{GG} 1		
3	RF Input		
4	V _{GG} 1		
5	V _{GG} 2		
6	V _{DD} 1		
7	V _{DD} 2		
8	RF Output		
9	V _{DD} 2		
10	V _{DD} 1		

2. Flange is DC and RF ground.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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Electrical Specifications: Freq. = 2 - 6 GHz, V_{DD} = 10 V, I_{DQ} = 3.5 A, T_A = +25 °C, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Тур.	Max.
Gain	_	dB	14	18	_
Input Return Loss	_	dB	_	8	
Output Return Loss	-	dB	_	10	_
P1dB	-	dBm	_	38	_
P _{SAT}	-	dBm	_	40	_
PAE	P _{SAT}	%	_	30	_
Duty Cycle	-	%	_	_	100
Gate Bias	Voltage	V	_	-0.56	_
Current	I _{DQ} P _{SAT}	Α	_	3.5 5.5	_

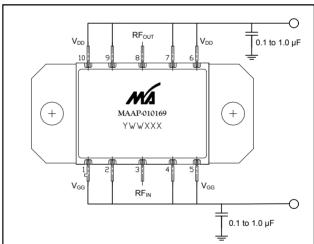
Absolute Maximum Ratings 3,4,5

Parameter	Absolute Maximum		
Input Power	+26 dBm		
Operating Supply Voltage	Voltage +11 Volts		
Operating Gate Voltage	-2 V < V _{GG} < 0 V		
Operating Temperature ⁶	-40°C to +25°C		
Channel Temperature ⁷	+150 °C		
Storage Temperature	-65°C to +150°C		

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
- 5. Operating at nominal conditions with $T_J \le \pm 150^{\circ} C$ will ensure MTTF > 1 x 10^6 hours.
- Operating temperatures >25°C will require regulation of dissipated power to maintain T_J ≤ 150°C. Refer to the Max. Power Dissipation vs. Base Plate Temperature curve on page 6.
- 7. Junction Temperature $(T_J) = T_C + \Theta_{JC} * ((V * I) (P_{OUT} P_{IN}))$ Typical thermal resistance $(\Theta_{JC}) = 2.8$ °C/W
 - a) For T_C = 25°C, 4 GHz

 $T_J = +130$ °C @ +10 V, 5.3 A, $P_{OUT} = 42$ dBm, $P_{IN} = 24$ dBm

Recommended Bias Configuration



Operating the MAAP-010169

The MAAP-010169 is static sensitive. Please handle with care. To operate the device, follow these steps. Ramp down or shutdown in reverse order (gate bias on first and off last). All $V_{\rm GG}$ pins should have the same voltage applied at all times.

- 1. Apply V_{GG} (-1.5 V).
- 2. Apply V_{DD} (10 V Typical).
- 3. Set I_{DQ} by adjusting V_{GG} .
- 4. Apply RF_{IN}.

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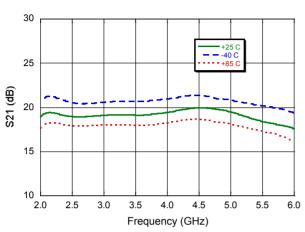


10 W Power Amplifier

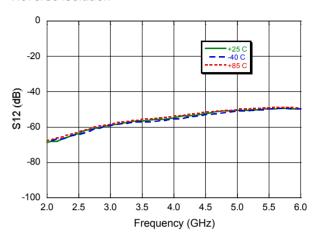
2 - 6 GHz

Typical Performance Curves

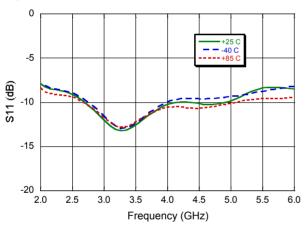
Gain



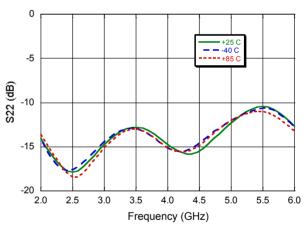
Reverse Isolation



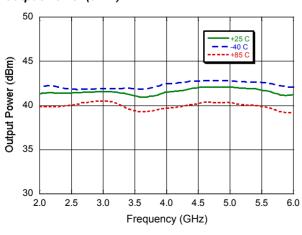
Input Return Loss



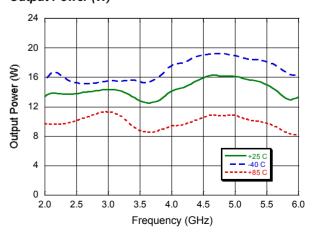
Output Return Loss



Output Power (dBm)



Output Power (W)



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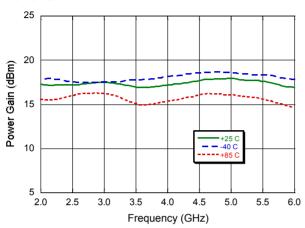


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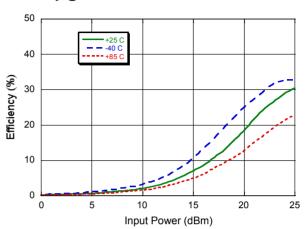
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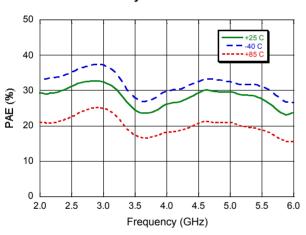
Power Gain



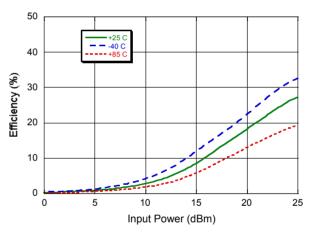
Efficiency @ 2 GHz



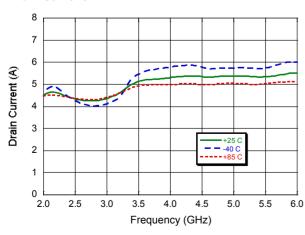
Power Added Efficiency



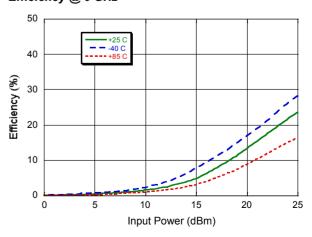
Efficiency @ 4 GHz



Drain Current



Efficiency @ 6 GHz



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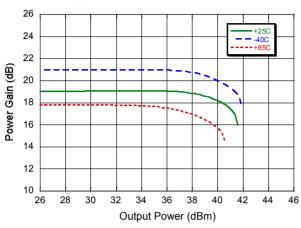


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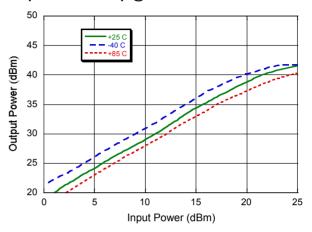
V1

Typical Performance Curves

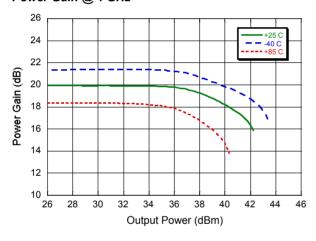
Power Gain @ 2 GHz



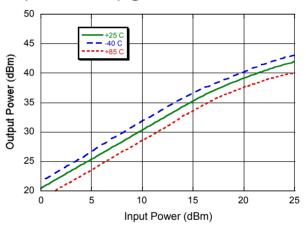
Output Power Sweep @ 2 GHz



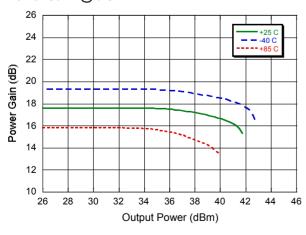
Power Gain @ 4 GHz



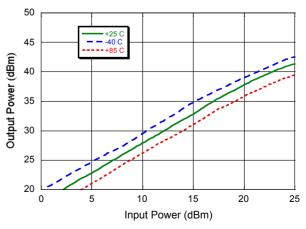
Output Power Sweep @ 4 GHz



Power Gain @ 6 GHz



Output Power Sweep @ 6 GHz



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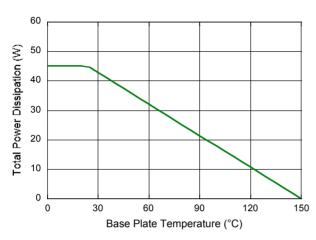


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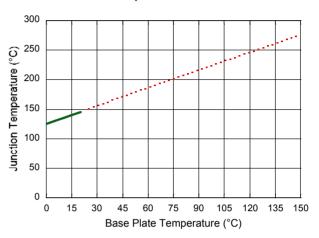
Typical Performance Curves

Max. Power Dissipation vs. Base Plate Temperature⁸

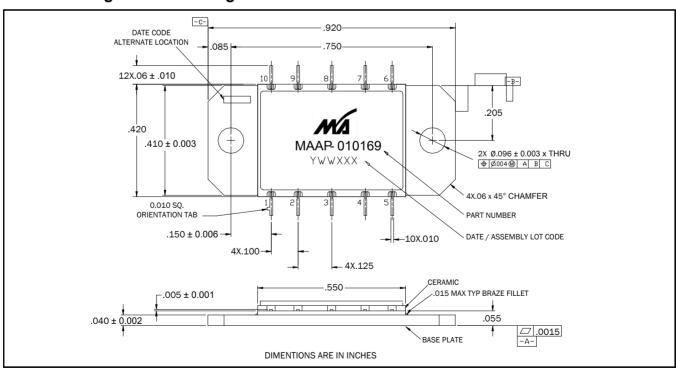


8. Power dissipation should not exceed the maximum plot shown above to maintain T_J <150°C. It is recommended to monitor power dissipation and decrease power dissipation in the device as required.

Junction Temperature vs. Base Plate Temperature with 45 W Power Dissipation



Ceramic Flange Mount Package[†]



Reference Application Note M538 for lead-free solder reflow recommendations.

This is a high frequency, low thermal resistance package. The package consists of a cofired ceramic construction with a copper-tungsten base and iron-nickel-cobalt leads. The finish consists of electrolytic gold over nickel plate.

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MAAP-010169



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