# Amplifier, Power, 8 W 2.5 - 3.5 GHz

### **Features**

- Linear Gain: 27 dB
- Saturated Output Power: +39 dBm Pulsed
- 50 Ω Input / Output Match
- Lead-Free 5 mm 20-lead PQFN Package
- Halogen-Free "Green" Mold Compound
- RoHS\* Compliant and 260°C Reflow Compatible

### Description

The MAAP-010171 is a 2-stage, 8 W saturated S-band power amplifier in a 5mm 20 lead PQFN 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 pulsed applications. It is ideally suited for Air Traffic Control, Weather, Military and S-band radar applications.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using M/A-COM Technology Solutions' high linearity pHEMT Process.

## Ordering Information<sup>1</sup>

Part Number	Package
MAAP-010171-TR0500	500 piece reel
MAAP-010171-TR1000	1000 piece reel
MAAP-010171-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.

### **Functional Schematic**



# Pin Configuration<sup>2</sup>

Pin No.	Function	Pin No.	Function	
1	Ground	11	Ground	
2	Ground	12	Ground	
3	RF <sub>IN</sub>	13	RFout	
4	Ground	14	Ground	
5	Ground	15	Ground	
6	V <sub>G</sub> 1b	16	V <sub>D</sub> 2a	
7	V <sub>G</sub> 2b	17	V <sub>D</sub> 2a	
8	V <sub>D</sub> 1b	18	V <sub>D</sub> 1a	
9	V <sub>D</sub> 2b	19 V <sub>G</sub> 2a		
10	V <sub>D</sub> 2b	20	V <sub>G</sub> 1a	
		21	Paddle <sup>3</sup>	

2. M/A-COM Technology Solutions recommends connecting unused package pins to ground.

3. The exposed pad centered on the package bottom must be connected to RF, DC, and thermal ground.

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

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- North America Tel: 800.366.2266 / Fax: 978.366.2266
- Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300

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Rev. V3

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### **Electrical Specifications:**

Freq. 2.5 - 3.5 GHz,  $V_{DD}$  = 9 V Pulsed, 100 µs Pulse Width, 10% Duty Cycle, Z<sub>0</sub> = 50  $\Omega$ 

Parameter	Units	Min.	Тур.	Max.
Gain	dB	25	27	—
Input Return Loss	dB	_	10	—
Output Return Loss	dB	_	10	—
Psat	dBm	37	39	—
Small Signal Current (I <sub>DD</sub> )	А	_	1	_
Efficiency	%	_	38	_

## Absolute Maximum Ratings <sup>4,5</sup>

Parameter	Absolute Maximum		
Input Power	+22 dBm		
Supply Voltage	11 V		
Gate Current	25 mA		
Duty Cycle	50 %		
Operating Temperature	-40°C to +85°C		
Junction Temperature <sup>6,7</sup>	+150 °C		
Storage Temperature	-55°C to +150°C		

4. 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.
- 6. Operating at nominal conditions with  $T_J \le 150^{\circ}$ C will ensure MTTF > 1 x 10<sup>6</sup> hours.
- 7. Junction Temperature  $(T_J) = T_C + \Theta jc * (V * I)$ Typical thermal resistance  $(\Theta jc) = 5.75^{\circ} C/W$

## Operating the MAAP-010171

To operate the MAAP-010171, follow these steps. Ramp down or shut down in reverse order.

- 1. Apply  $V_G$  between -1 V and -0.5 V to set IDQ to 1 A
- 2. Apply RF Power ON
- 3. Apply V<sub>DD</sub> Pulsed

### **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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## Schematic



### Parts List

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Component	Value	Package
C2, C3, C6, C7, C9, C11, C13, C16	100 pF	0402
C1, C4, C5, C8, C10, C12, C14, C15	1000 pF	0402
C17, C18	1 µF	0805
C19, C20	10 nF	0805

## **Recommended PCB Layout**



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## **Typical Performance Curves**

#### S-Parameters



Output Power, Pin = 19 dBm @ +25°C



Output Power, Pin = 19 dBm @ +85°C



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Output Power, Pin = 19 dBm @ -40°C

Small Signal Gain



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## **Typical Performance Curves**

#### Output Power @ 2.5 GHz



#### Output Power @ 3.1 GHz



Output Power @ 3.5 GHz



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Output Power,  $V_{DD} = 8 V$ 



Output Power,  $V_{DD} = 9 V$ 



Output Power,  $V_{DD} = 10 V$ 



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## **Typical Performance Curves**

#### PAE 44 /dd 42 40 PAE (%) 38 36 34 32 30 2.0 2.5 3.0 3.5 4.0 Frequency (GHz)

#### 1st Stage Gate Current @ 2.9 GHz



#### Drain Current @ 2.9 GHz



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#### Small Signal Drain Current @ 2.9 GHz



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# Lead-Free 5 mm 20-Lead PQFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations. Meets JEDEC moisture sensitivity level 1 requirements.

Plating is 100% matte tin over copper.

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