

## Features

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

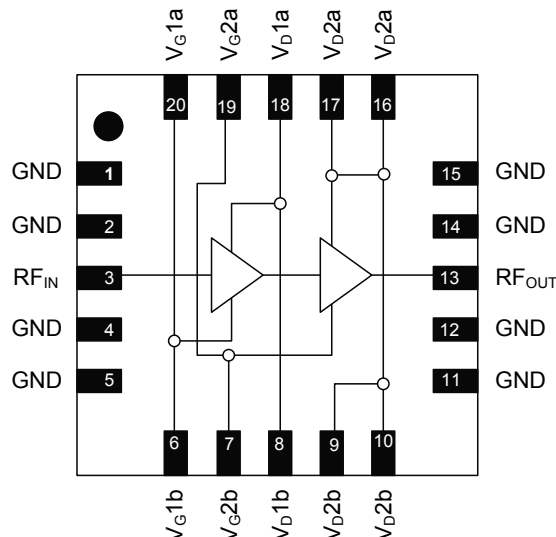
## Description

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.

## 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      | RF <sub>OUT</sub>   |
| 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. MACOM 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.

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

| Part Number        | Package         |
|--------------------|-----------------|
| MAAP-010171-TR0500 | 500 piece reel  |
| MAAP-010171-TR1000 | 1000 piece reel |
| MAAP-010171-000SMB | Sample Board    |

1. Reference Application Note M513 for reel size information.

\* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

## Electrical Specifications:

Freq. 2.5 - 3.5 GHz,  $V_{DD} = 9\text{ V}$  Pulsed, 100  $\mu\text{s}$  Pulse Width, 10% Duty Cycle,  $Z_0 = 50\ \Omega$

| Parameter                         | Units | Min. | Typ. | Max. |
|-----------------------------------|-------|------|------|------|
| Gain                              | dB    | 25   | 27   | —    |
| Input Return Loss                 | dB    | —    | 10   | —    |
| Output Return Loss                | dB    | —    | 10   | —    |
| $P_{SAT}$                         | dBm   | 37   | 39   | —    |
| Small Signal Current ( $I_{DD}$ ) | A     | —    | 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.
5. MACOM does not recommend sustained operation near these survivability limits.
6. Operating at nominal conditions with  $T_J \leq 150^\circ\text{C}$  will ensure  $MTTF > 1 \times 10^6$  hours.
7. Junction Temperature ( $T_J$ ) =  $T_C + \Theta_{JC} * (V * I)$ .  
Typical thermal resistance ( $\Theta_{JC}$ ) = 5.75°C/W

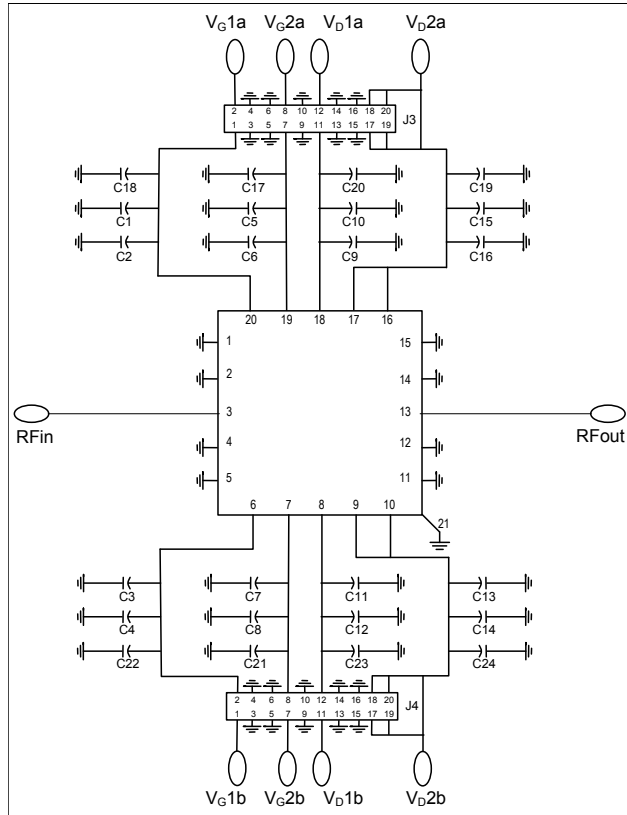
## Handling Procedures

Please observe the following precautions to avoid damage:

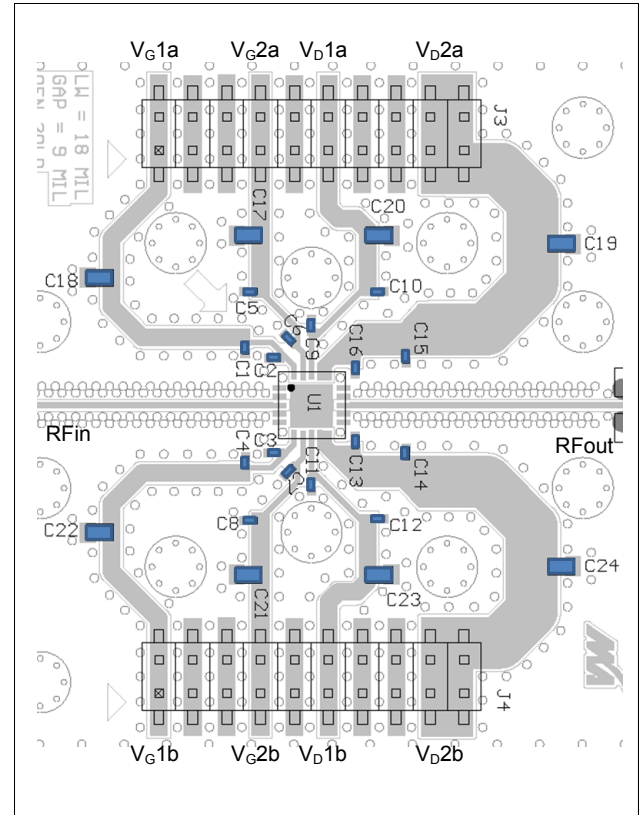
## Static Sensitivity

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 class 1A devices.

## Schematic



## Recommended PCB Layout



## Parts List

| Component                          | Value     | Package |
|------------------------------------|-----------|---------|
| C1, C4, C5, C8, C10, C12, C14, C15 | 1000 pF   | 0402    |
| C2, C3, C6, C7, C9, C11, C13, C16  | 100 pF    | 0402    |
| C17, C18, C21, C22                 | 1 $\mu$ F | 0805    |
| C19, C20, C23, C24                 | 10 nF     | 0805    |

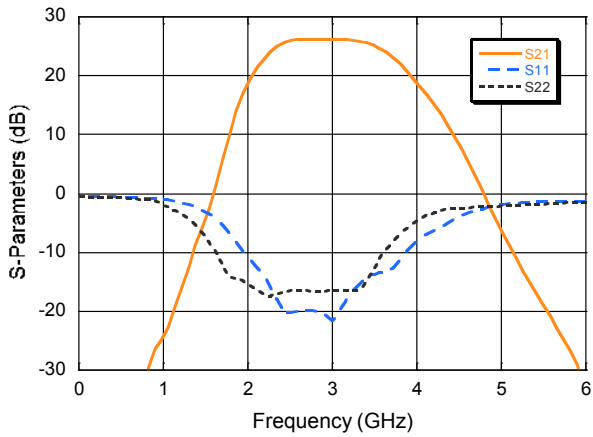
## Operating the MAAP-010171

To operate, follow these steps.

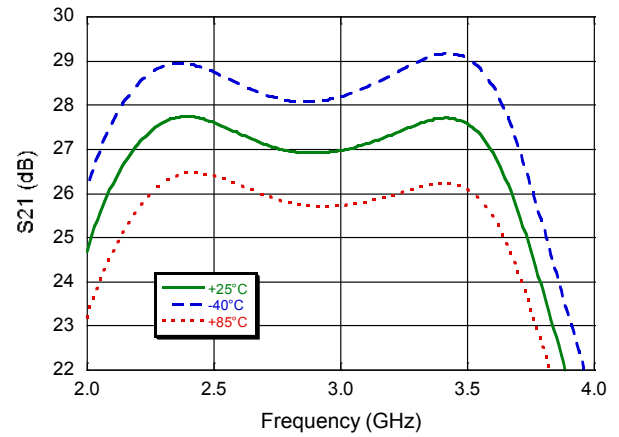
1. Apply  $V_G$  between -1 V and -0.5 V to set  $IDQ$  to 1 A
2. Apply  $V_{DD}$  Pulsed
3. Apply RF Power ON
4. The RF ports (pins 3 & 13) are not DC blocked.  
Do not apply DC voltage directly onto these pins.
5. Ramp down or shut down in reverse order.

## Typical Performance Curves

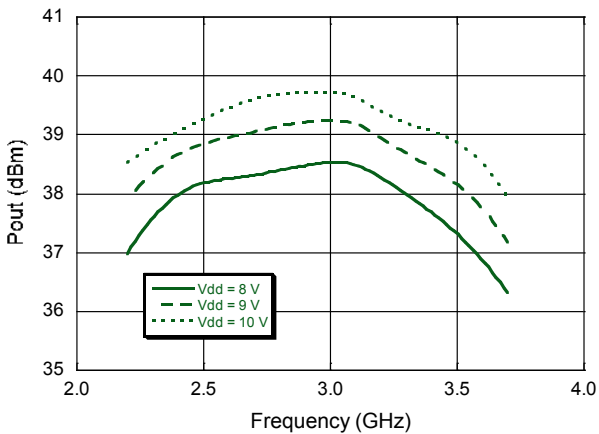
### S-Parameters



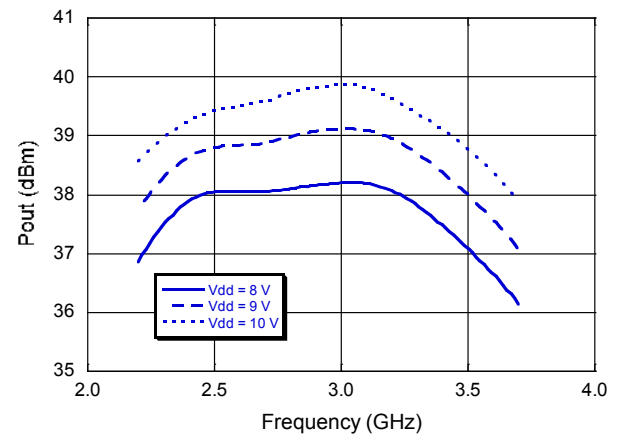
### Small Signal Gain



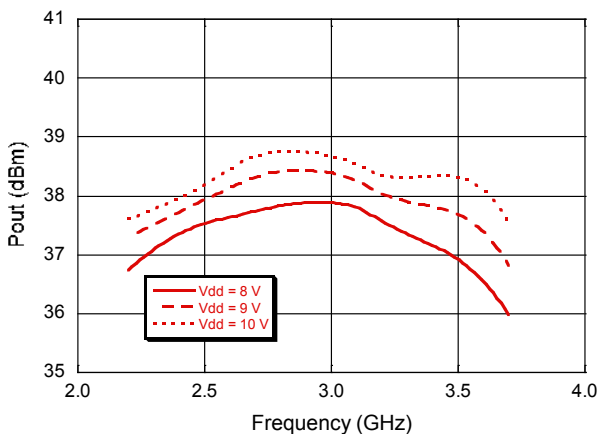
### Output Power, Pin = 19 dBm @ +25°C



### Output Power, Pin = 19 dBm @ -40°C



### Output Power, Pin = 19 dBm @ +85°C

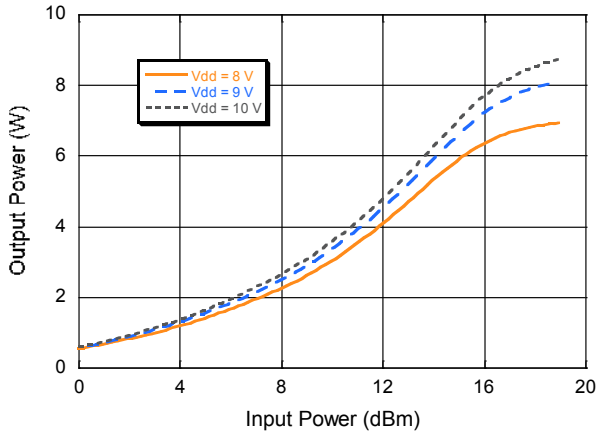


## Amplifier, Power, 8 W 2.5 - 3.5 GHz

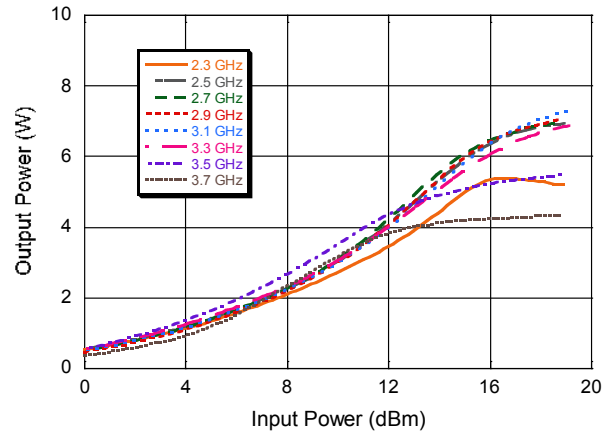
Rev. V3

### Typical Performance Curves

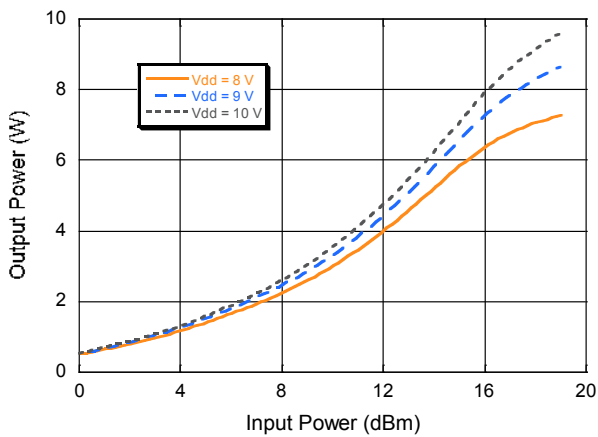
Output Power @ 2.5 GHz



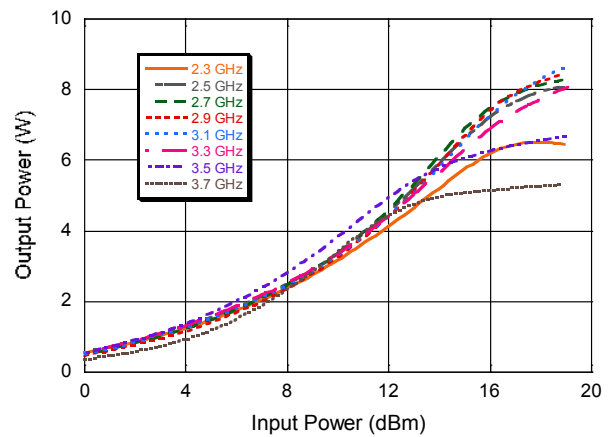
Output Power, V<sub>DD</sub> = 8 V



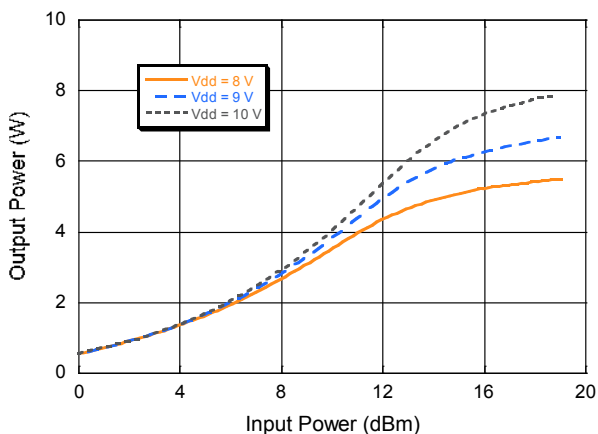
Output Power @ 3.1 GHz



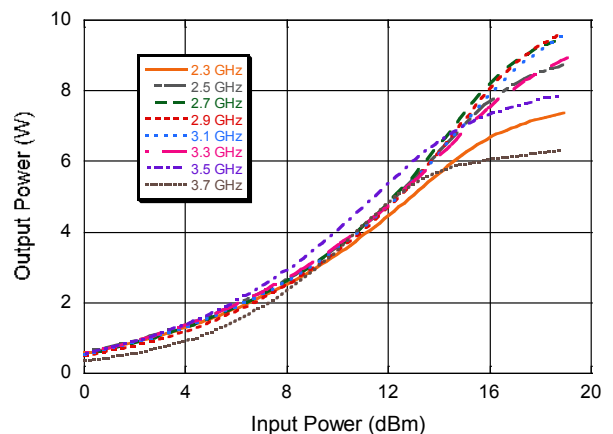
Output Power, V<sub>DD</sub> = 9 V



Output Power @ 3.5 GHz

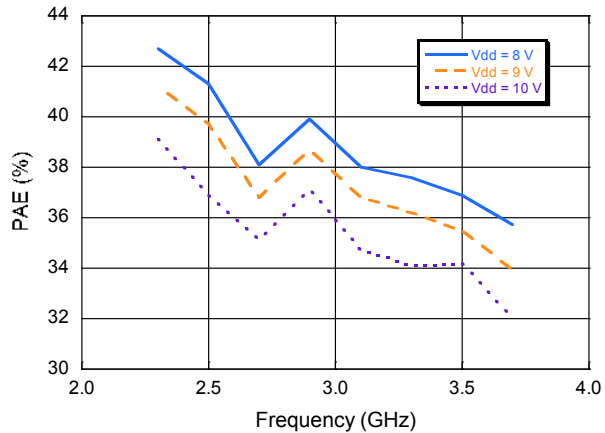


Output Power, V<sub>DD</sub> = 10 V

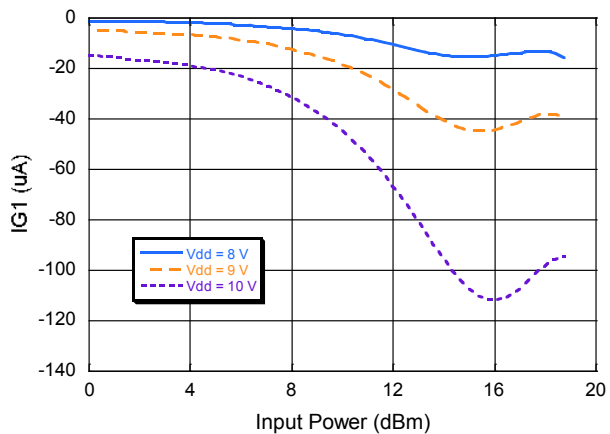


## Typical Performance Curves

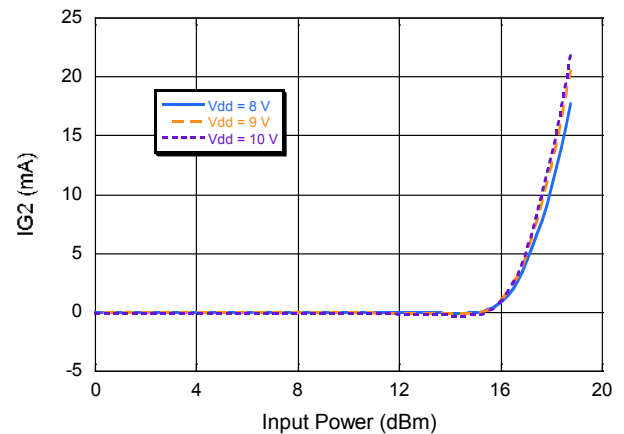
### PAE



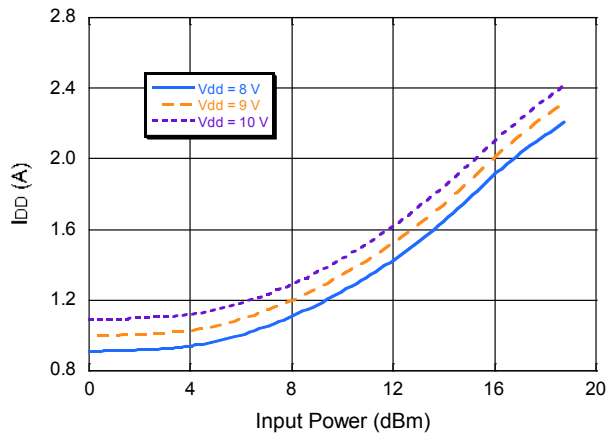
### 1st Stage Gate Current @ 2.9 GHz



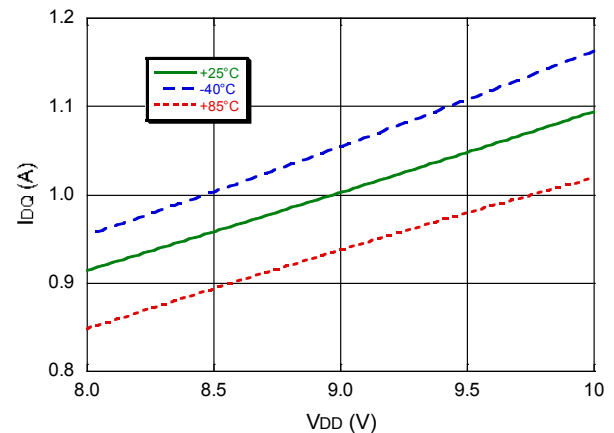
### 2nd Stage Gate Current @ 2.9 GHz



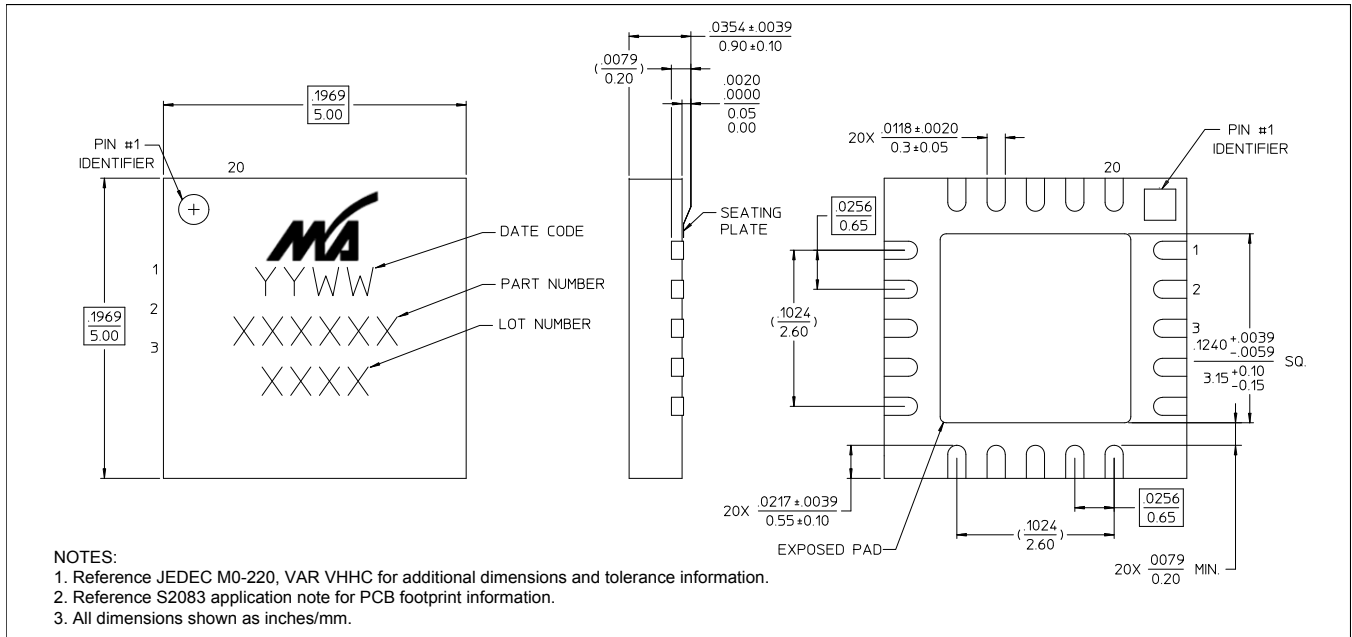
### Drain Current @ 2.9 GHz



### Small Signal Drain Current @ 2.9 GHz



## 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.

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

8

---

M/A-COM Technology Solutions Inc. (MACOM) and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.  
Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.