# MAAP-010171

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

Rev. V3

### 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

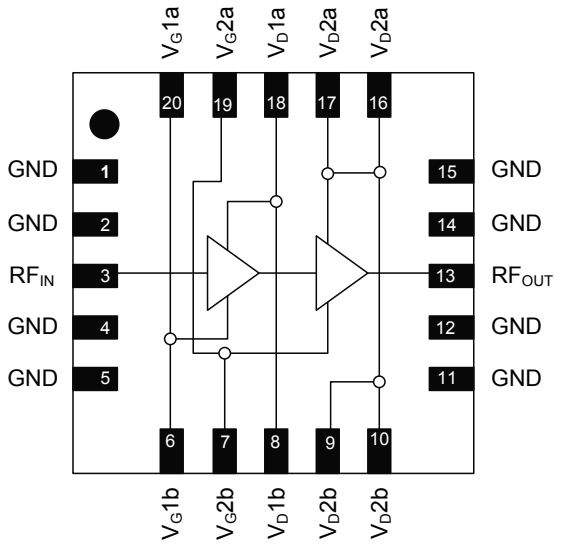
### Description

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.

### Functional Schematic




### Ordering Information[1]

| 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.

### Pin Configuration[2]

| Pin No. | Function | Pin No. | Function |
|---|---|---|---|
| 1 | Ground | 11 | Ground |
| 2 | Ground | 12 | Ground |
| 3 | $RF_{IN}$ | 13 | $RF_{OUT}$ |
| 4 | Ground | 14 | Ground |
| 5 | Ground | 15 | Ground |
| 6 | $V_G1b$ | 16 | $V_D2a$ |
| 7 | $V_G2b$ | 17 | $V_D2a$ |
| 8 | $V_D1b$ | 18 | $V_D1a$ |
| 9 | $V_D2b$ | 19 | $V_G2a$ |
| 10 | $V_D2b$ | 20 | $V_G1a$ |
| | | 21 | Paddle[3] |

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.

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

## Electrical Specifications:
## Freq. 2.5 - 3.5 GHz, $V_{DD}$ = 9 V Pulsed, 100 µs Pulse Width, 10% Duty Cycle, $Z_0$ = 50 Ω

| 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[4,5]

| 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[6,7] | +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 $T_J \leq 150°C$ will ensure MTTF > 1 x $10^6$ hours.
7. Junction Temperature ($T_J$) = $T_C$ + $\Theta_{JC}$ * (V * I).
   Typical thermal resistance ($\Theta_{JC}$) = 5.75°C/W

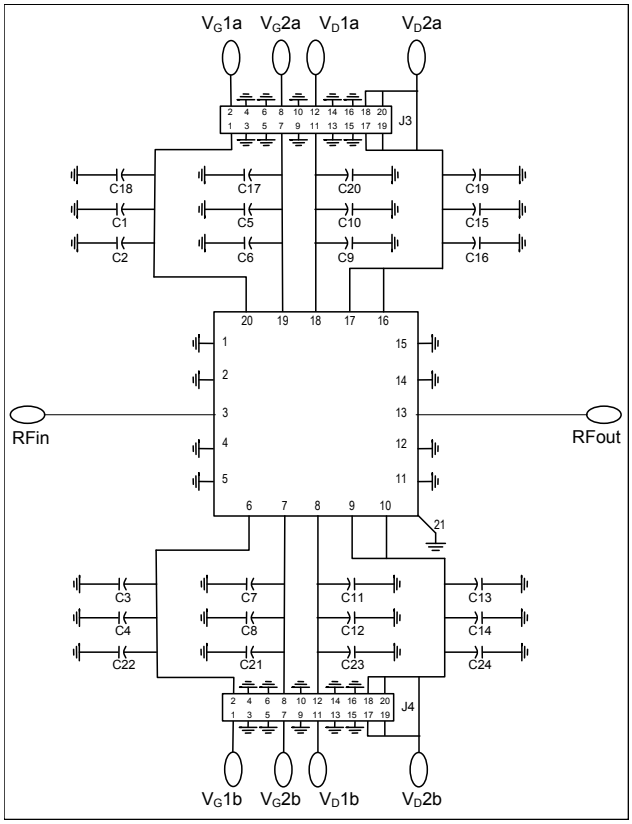
## Handling Procedures

Please observe the following precautions to avoid damage:

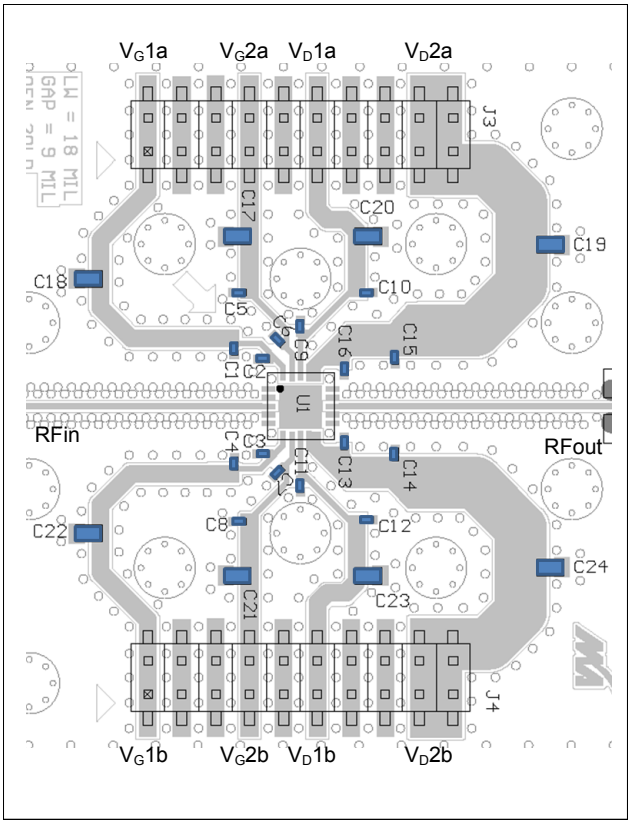
## Static Sensitivity

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 µF | 0805 |
| C19, C20, C23, C24 | 10 nF | 0805 |

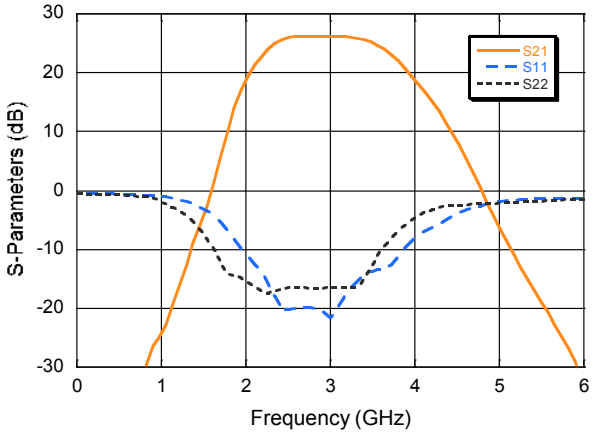
## Operating the MAAP-010171

To operate, follow these steps.

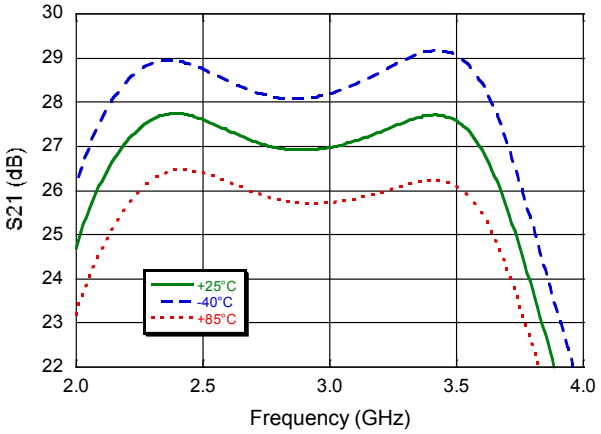
1. Apply $V_G$ between -1 V and -0.5 V to set IDQ to 1 A
2. Apply $V_{DD}$ Pulsed
3. Apply RF Power ON
4. The RF ports (pins 3 & 13) are not DC blocked. Do not apply DC voltage directly onto these pins.
5. Ramp down or shut down in reverse order.

## Typical Performance Curves

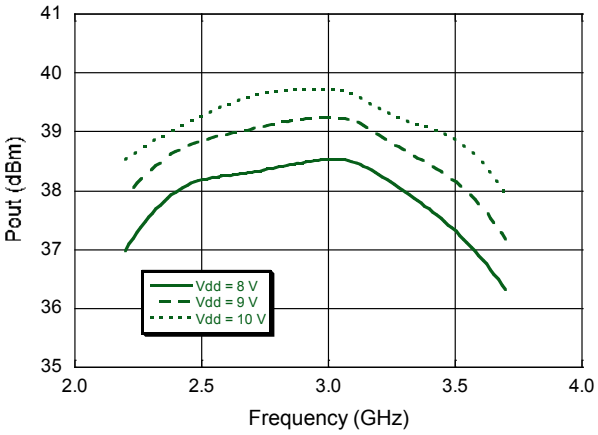
***S-Parameters***



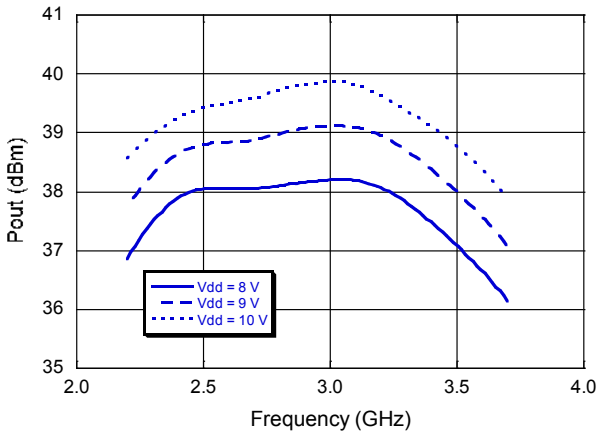

***Small Signal Gain***



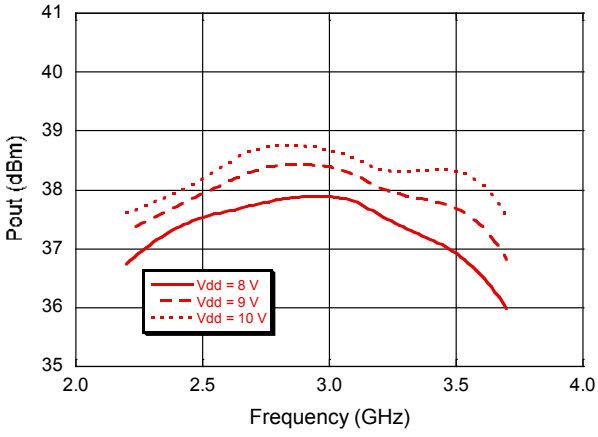

***Output Power, Pin = 19 dBm @ +25°C***




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

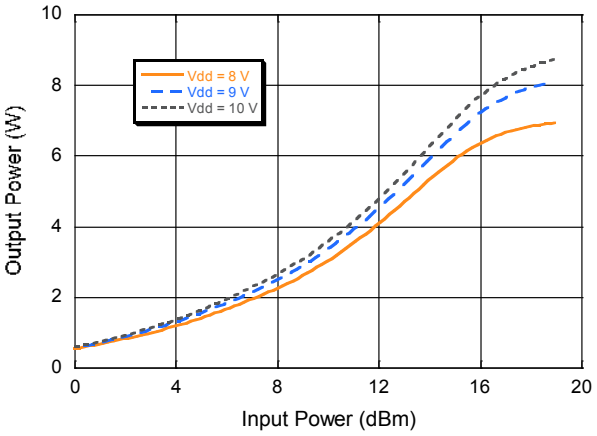



***Output Power, Pin = 19 dBm @ +85°C***

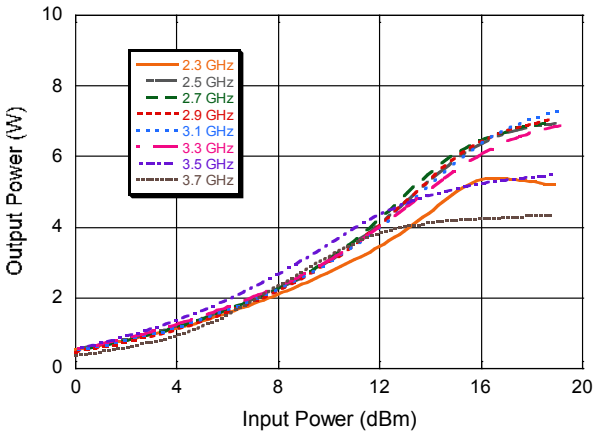


## Typical Performance Curves

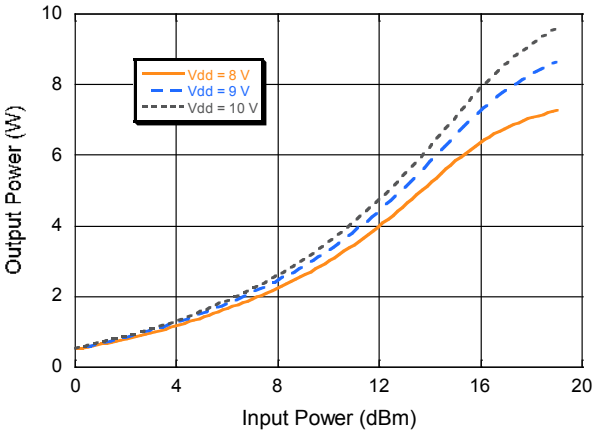
***Output Power @ 2.5 GHz***



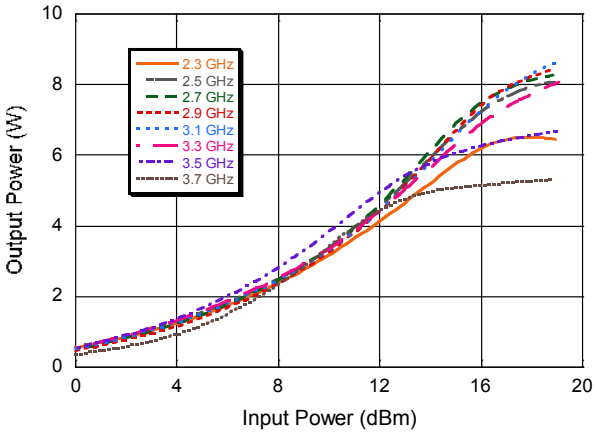

***Output Power, $V_{DD}$ = 8 V***



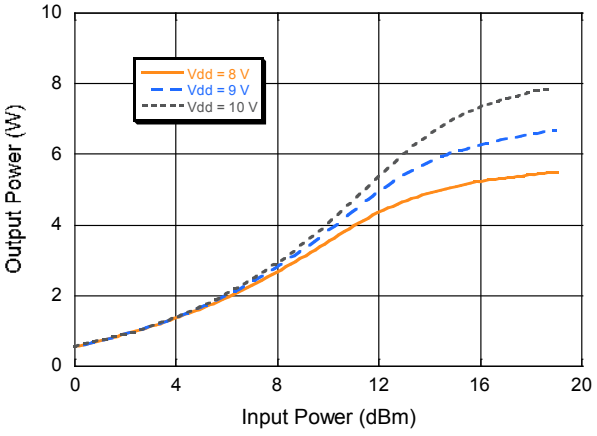

***Output Power @ 3.1 GHz***



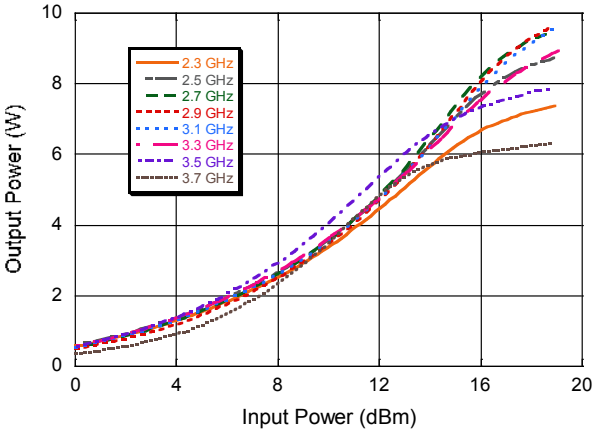

***Output Power, $V_{DD}$ = 9 V***




***Output Power @ 3.5 GHz***

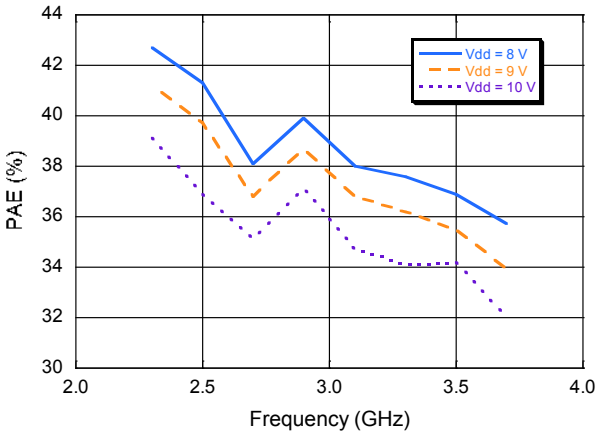



***Output Power, $V_{DD}$ = 10 V***

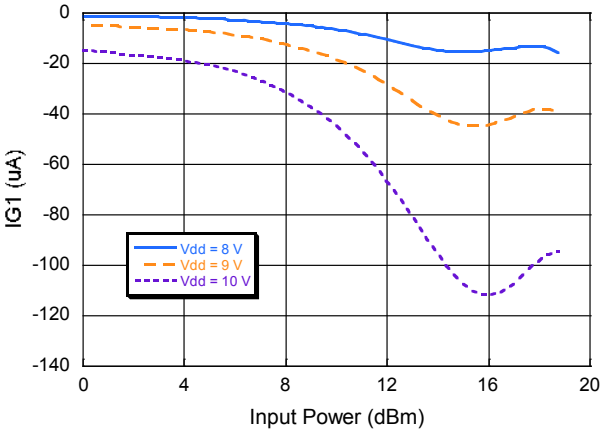


## Typical Performance Curves

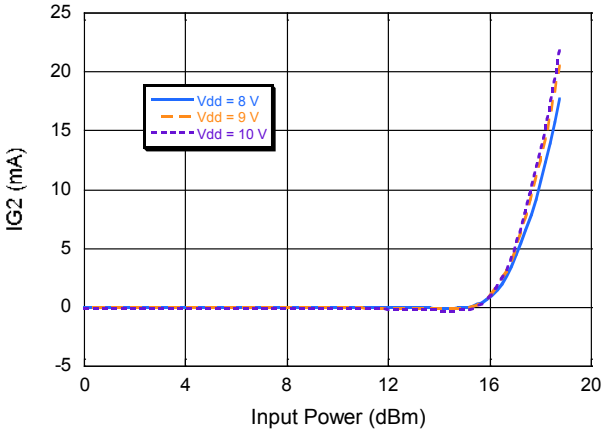
***PAE***



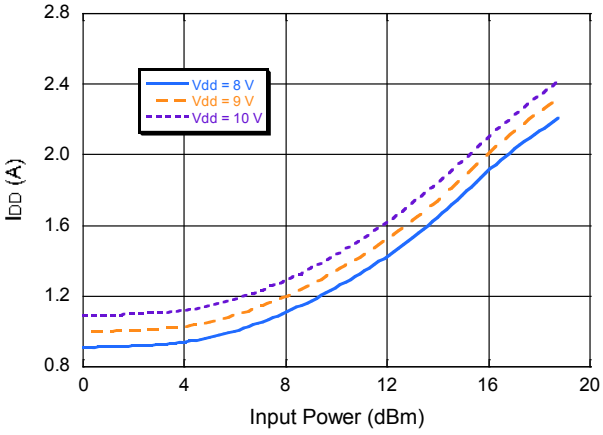

***1st Stage Gate Current @ 2.9 GHz***



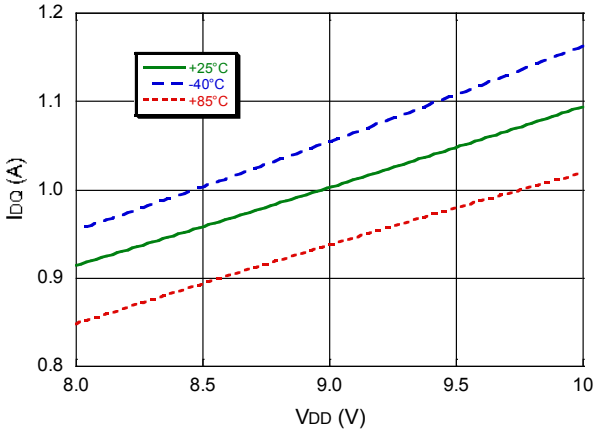

***2nd Stage Gate Current @ 2.9 GHz***



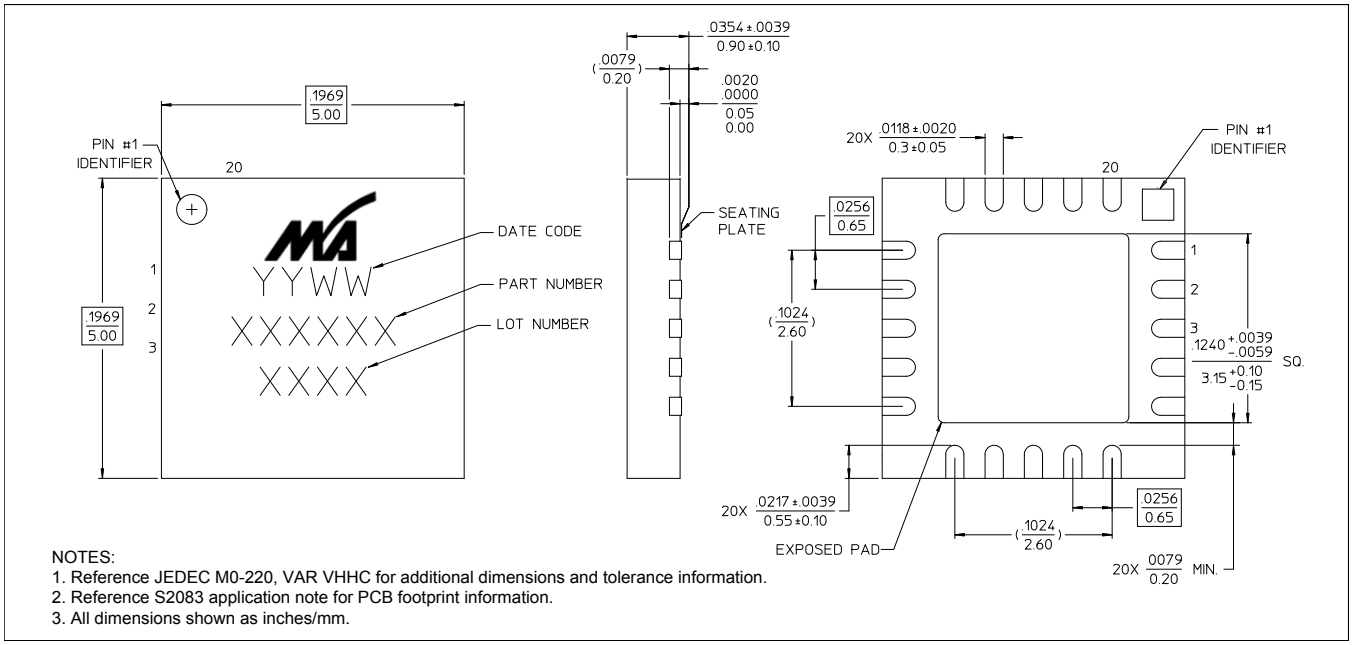

***Drain Current @ 2.9 GHz***




***Small Signal Drain Current @ 2.9 GHz***



## *Lead-Free 5* mm 20-Lead PQFN†




NOTES:
1. Reference JEDEC M0-220, VAR VHHC for additional dimensions and tolerance information.
2. Reference S2083 application note for PCB footprint information.
3. All dimensions shown as inches/mm.

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.