# Power Amplifier, 8 W
# 5.2 - 5.9 GHz

**MAAP-011027**
**Rev. V4**

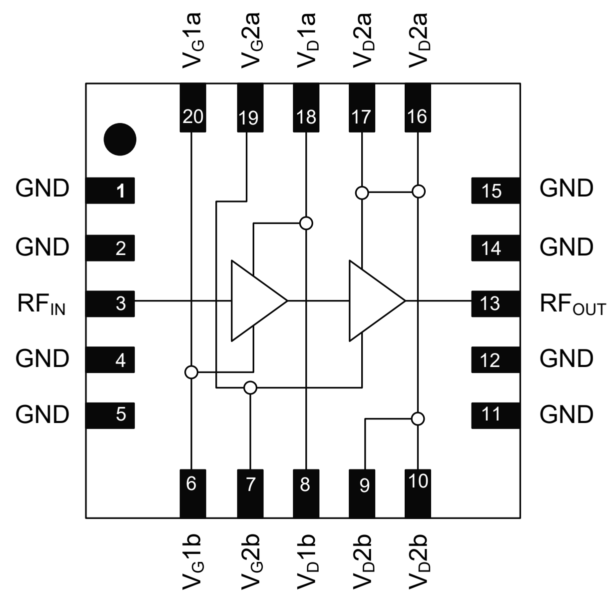
## Features
- Linear Gain: 20 dB
- Saturated Output Power: 39 dBm Pulsed
- 50 Ω Input / Output Match
- Lead-Free 5 mm 20-lead PQFN Package
- RoHS* Compliant

## Applications
- Point-to-Point Radios
- C-Band Radar

## Description
The MAAP-011027 is a 2-stage, 8 W saturated C-band power amplifier in a 5 mm 20 lead PQFN package, allowing for 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.

Each device is 100% RF tested to ensure performance compliance.

## Functional Schematic




## Ordering Information[1]

| Part Number | Package |
|---|---|
| MAAP-011027-TR0500 | 500 piece reel |
| MAAP-011027-TR1000 | 1000 piece reel |
| MAAP-011027-000SMB | Sample Board |

1. Reference Application Note M513 for reel size information.

## Pin Configuration[2]

| Pin # | Function | Pin # | Function |
|---|---|---|---|
| 1,2,4,5,11, 12,14,15, | Ground | 13 | $RF_{OUT}$ |
| 3 | $RF_{IN}$ | 16,17 | $V_D2a$ |
| 6 | $V_G1b$ | 18 | $V_D1a$ |
| 7 | $V_G2b$ | 19 | $V_G2a$ |
| 8 | $V_D1b$ | 20 | $V_G1a$ |
| 9,10 | $V_D2b$ | 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 and DC ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

## Electrical Specifications:
## Freq. 5.2 - 5.9 GHz, $V_{DD}$ = 9 V Pulsed, 100 µs Pulse Width,10% Duty Cycle , $Z_0$ = 50 Ω

| Parameter | Units | Min. | Typ. | Max. |
|---|---|---|---|---|
| Gain | dB | 17 | 20 | — |
| Input Return Loss | dB | — | 10 | — |
| Output Return Loss | dB | — | 10 | — |
| $P_{SAT}$ | dBm | 37 | 39 | — |
| Pulse Period | µs | — | 100 | — |
| Pulse Duty Cycle | % | — | 10 | — |
| Efficiency | % | — | 37 | — |
| Small Signal Current | A | — | 1 | — |

## Maximum Operating Ratings[4,5,6]

| Parameter | Absolute Maximum |
|---|---|
| Input Power | 28 dBm |
| Supply Voltage | 11 V |
| Junction Temperature[7] | +150 °C |
| Operating Temperature | -40°C to +85°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 > $1 \times 10^6$ hours.
7. Junction Temperature ($T_J$) = $T_C + Θ_{JC}$ * (V * I)
   Typical CW thermal resistance ($Θ_{JC}$) = 7.7°C/W

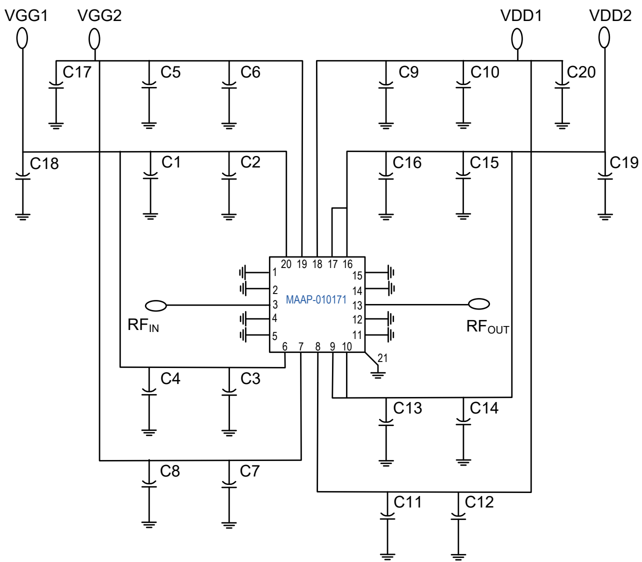
## Handling Procedures

Please observe the following precautions to avoid damage:

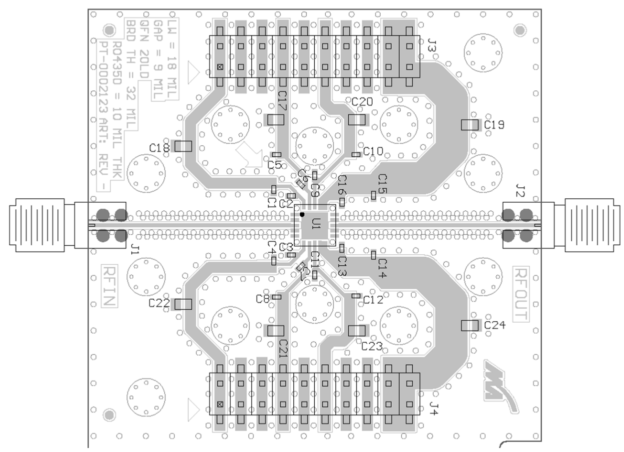
## Static Sensitivity

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

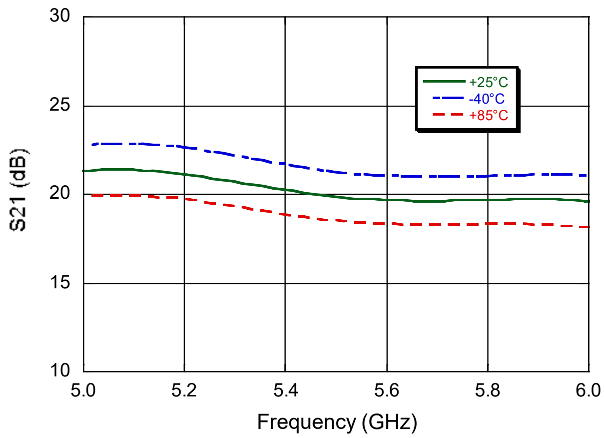
## Operating the MAAP-011027

To operate the MAAP-011027, follow these steps. Ramp down or shut down in reverse order.

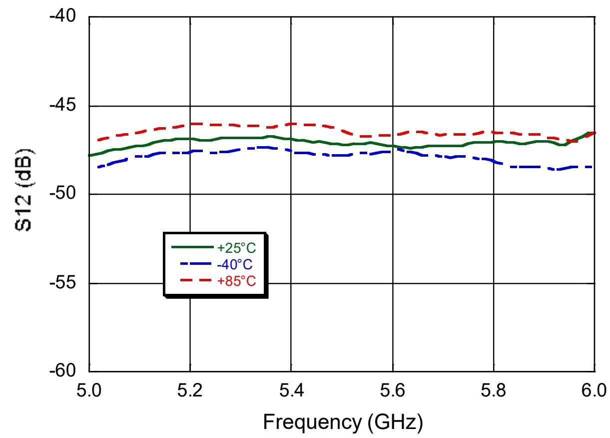
1. Apply $V_G$ between -1 V and -0.5 V to set IDQ to 1 A
2. Apply RF Power ON
3. Apply $V_{DD}$ Pulsed

## Typical Performance Curves over Temperature

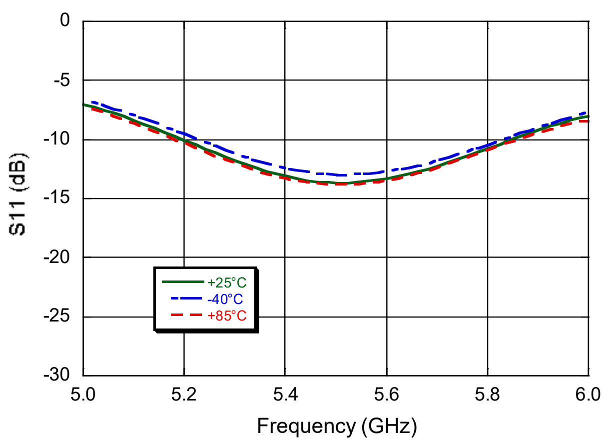
***Gain***



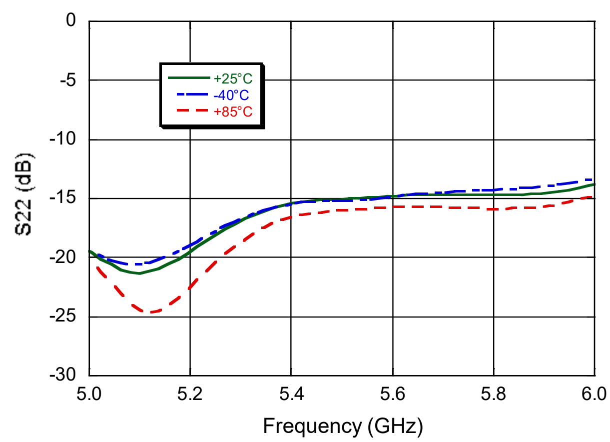

***Reverse Isolation***



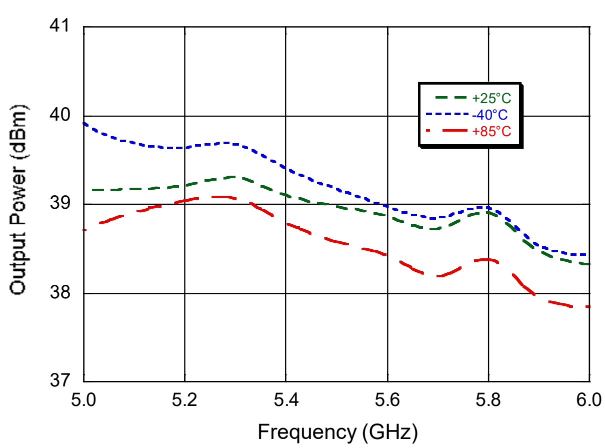

***Input Return Loss***



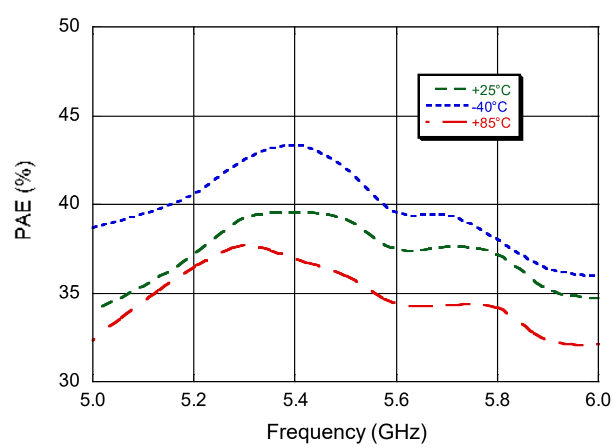

***Output Return Loss***




***Output Power***

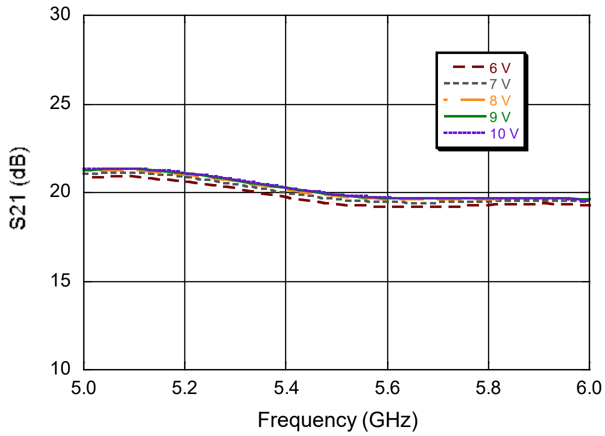



***Power Added Efficiency***

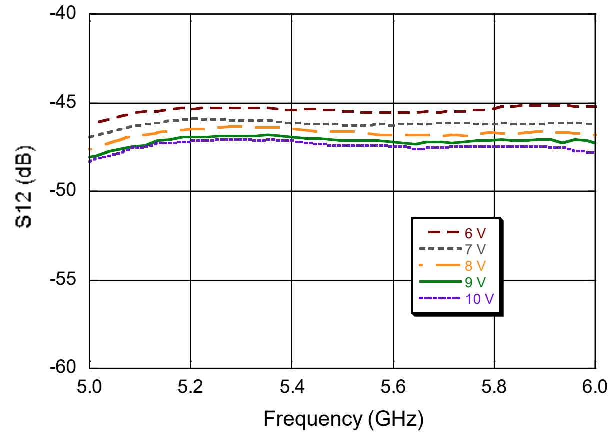


## Typical Performance Curves over Voltage

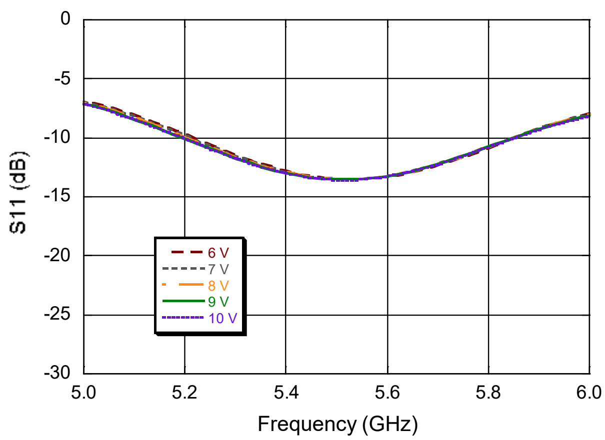
### *Gain*



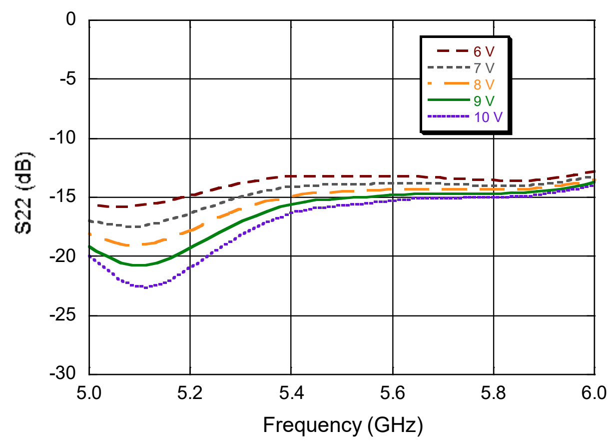

### *Reverse Isolation*



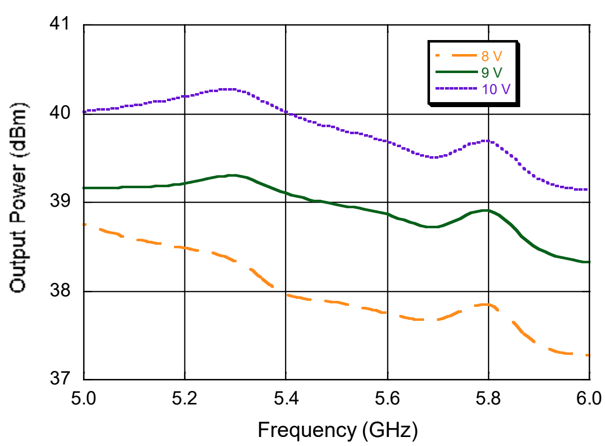

### *Input Return Loss*



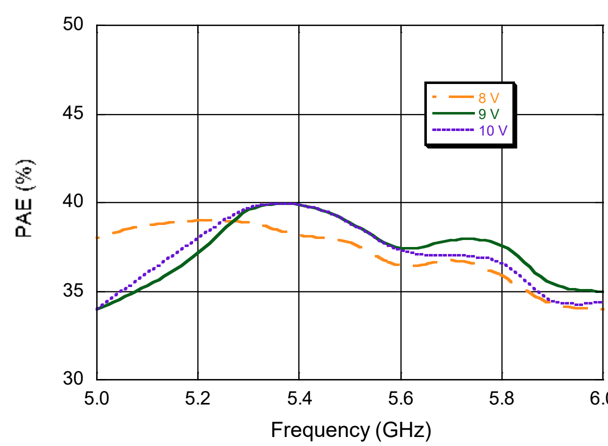

### *Output Return Loss*




### *Output Power*

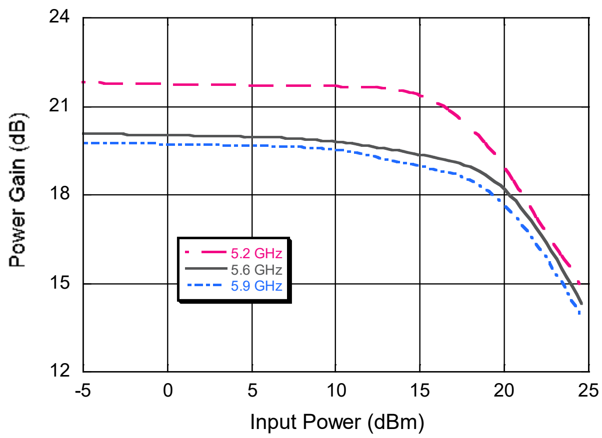



### *Power Added Efficiency*

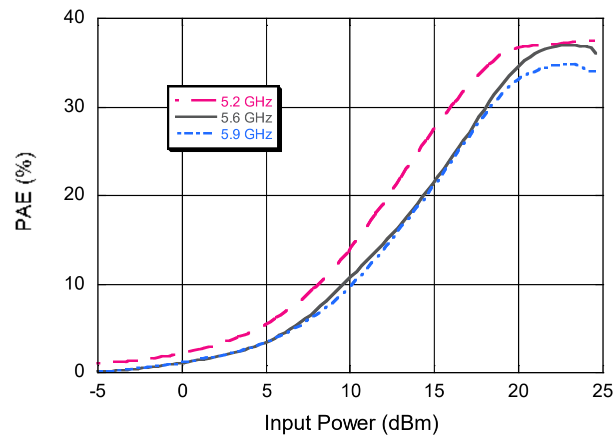


## Typical Performance Curves

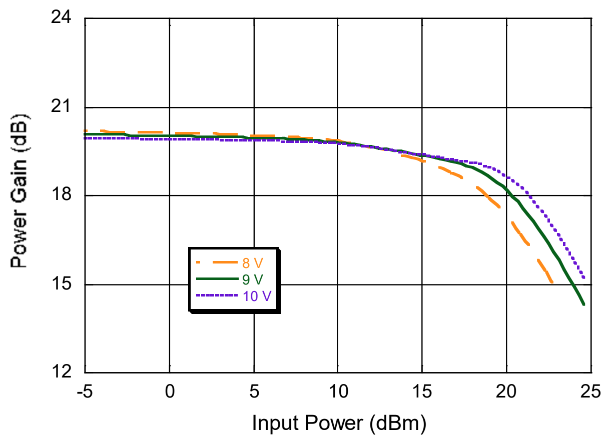
***Power Gain vs. Input Power***



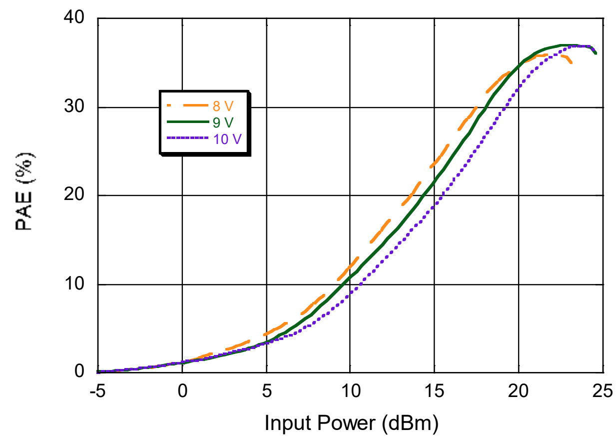

***Power Added Efficiency vs. Output Power***



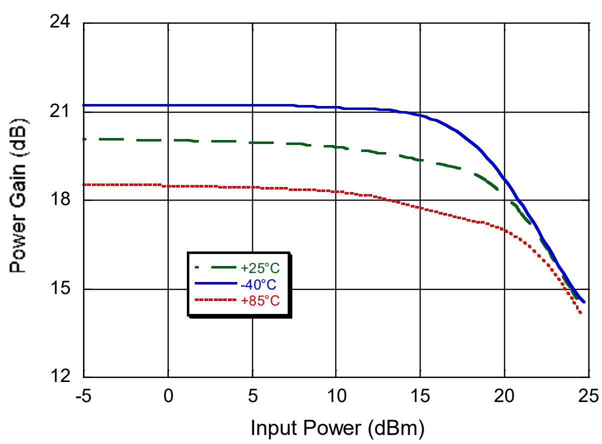

***Power Gain vs. Input Power @ 5.6 GHz***



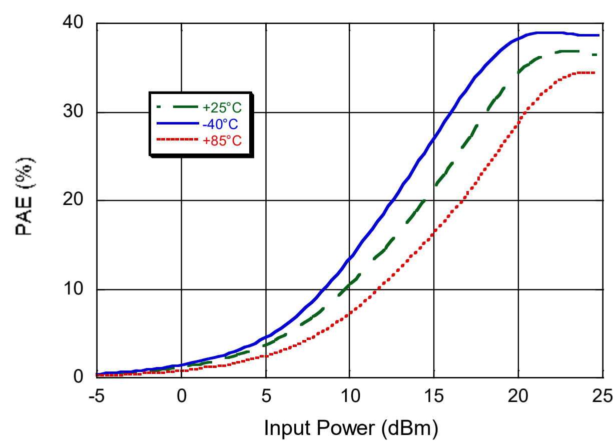

***Power Added Efficiency vs. Input Power @ 5.6 GHz***




***Power Gain vs. Input Power @ 5.6 GHz***

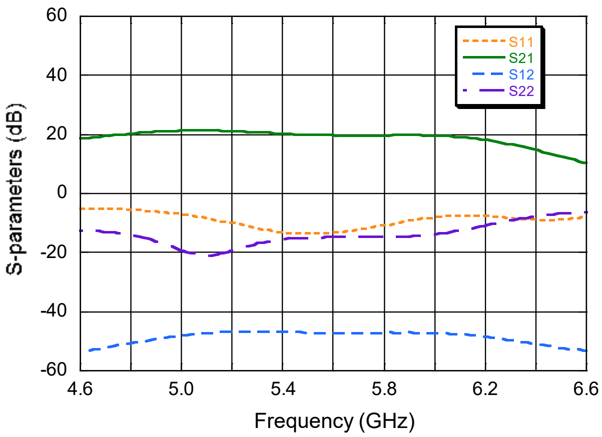



***Power Added Efficiency vs. Input Power @ 5.6 GHz***

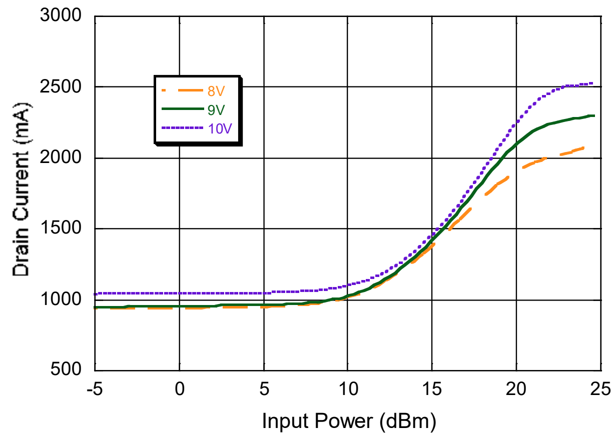


## Typical Performance Curves

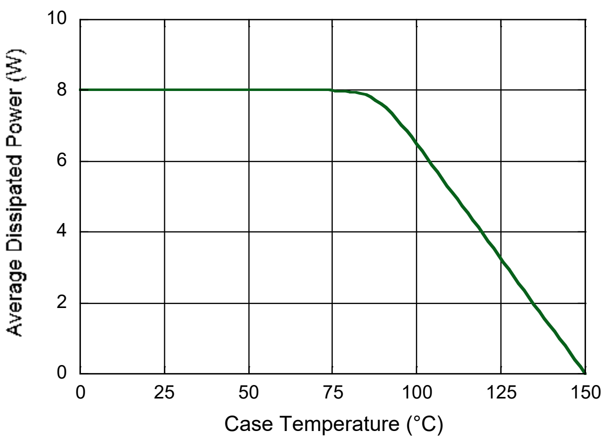
***Small Signal wideband performance***



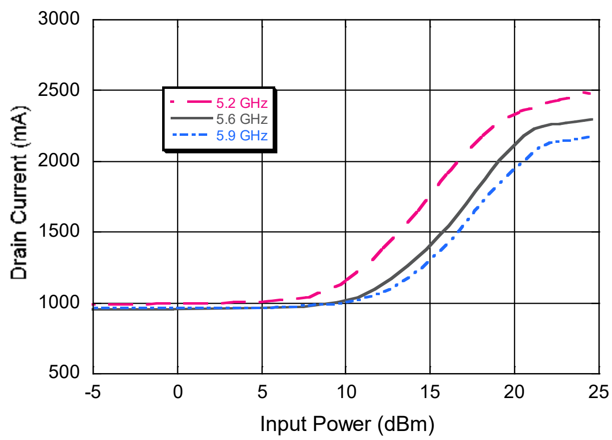

***Drain Current vs. Input Power @ T = +25°C, F = 5.6 GHz***




***Power Dissipation[8] vs. Case Temperature[9,10]***

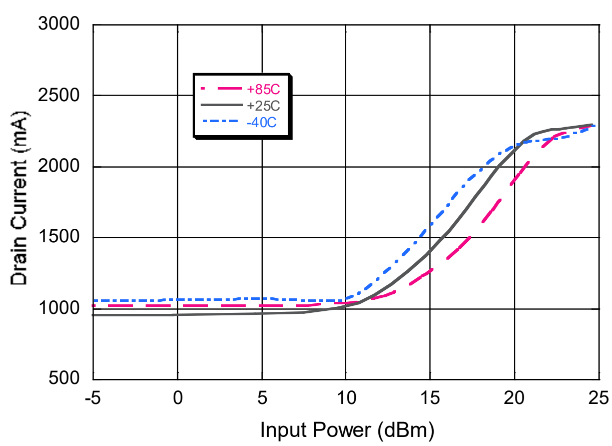



***Drain Current vs. Input Power @ T = +25°C, $V_D$ = 9 V***

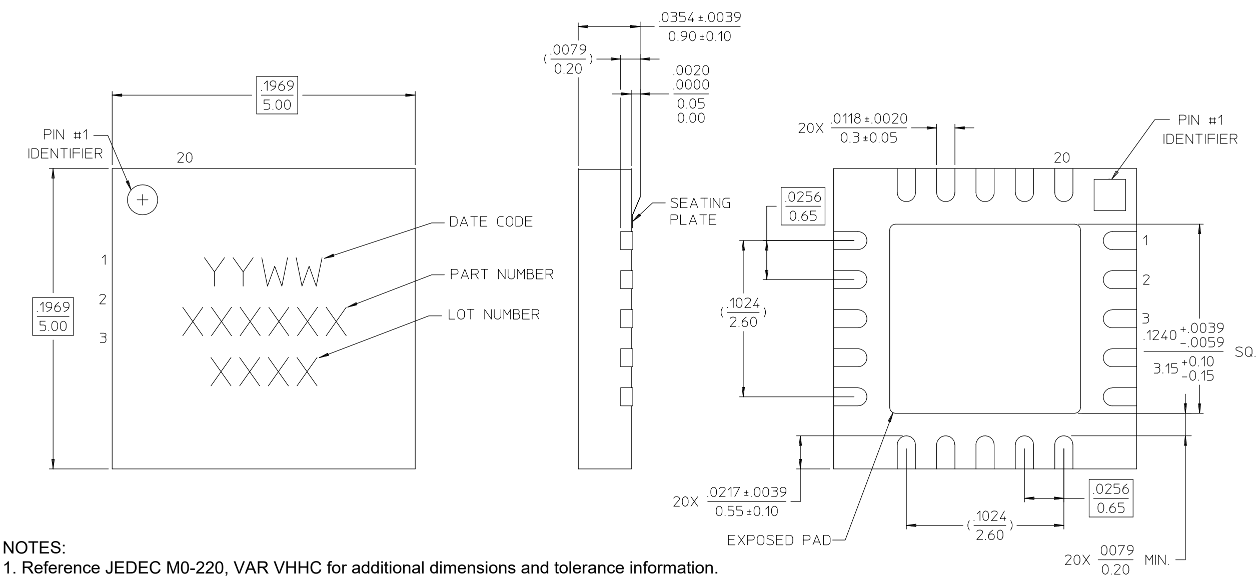



8. Average dissipated power: $P_{DISS} = P_{DC} + P_{IN} - P_{OUT}$ (all powers are average in Watts)
9. Average power is integrated over pulse period, for short pulses (not exceeding pulse width of 100 µs), average power can be approximated as $P_{AVERAGE} = P_{PEAK}*D$, where D is duty cycle.
10. For pulses wider than 100 µs self heating during pulse reduces allowable average dissipated power.

***Drain Current vs. Input Power @ F = 5.6 GHz, $V_D$ = 9 V***



## *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 (MSL) 3 requirements.
Plating is 100% matte tin over copper.