

Driver Amplifier 5 - 20 GHz

MACOM™

MAAM-011289

Rev. V3

Features

- Gain: 16.5 dB
 - Saturated Power: 21.5 dBm
 - Output IP3: 30.5 dBm
 - High Reverse Isolation: 47 dB
 - 50 Ω Matched Input and Output
 - +5 V Supply @ 102 mA
 - Integrated Capacitors on RF Input and Output
 - 3 mm 12-Lead AQFN Package
 - RoHS* Compliant

Applications

- Microwave Radio
 - VSAT
 - Aerospace & Defense
 - Test & Measurement

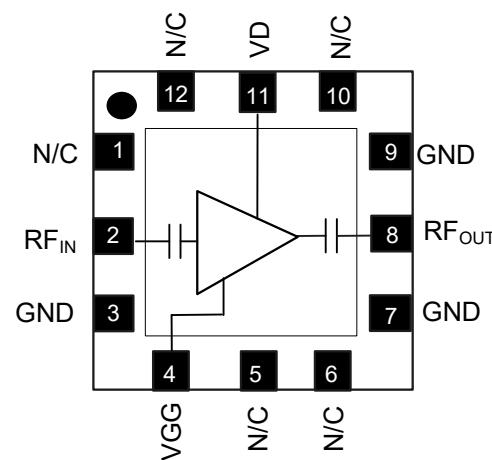
Description

The MAAM-011289 is a 5 - 20 GHz MMIC amplifier with 16.5 dB small signal gain, P_{SAT} of 21.5 dBm and high reverse isolation of 47 dB. The component requires only a single positive power supply.

Ordering Information

| Part Number | Package |
|--------------------|----------------|
| MAAM-011289-TR0500 | 500 piece reel |
| MAAM-011289-001SMB | Sample Board |

Functional Schematic



Pin Configuration^{1,2}

| Pin # | Function |
|-----------------|--------------------------|
| 1, 5, 6, 10, 12 | No Connection |
| 2 | RF Input |
| 3, 7, 9 | Ground |
| 4 | Gate Voltage Not Used |
| 8 | RF Output |
| 11 | Drain Voltage |

1. MACOM recommends connecting all no connection pins to ground.
 2. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

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

Electrical Specifications: Freq. = 5 - 20 GHz, $T_A = 25^\circ\text{C}$, $V_{DD} = 5 \text{ V}$, $Z_0 = 50 \Omega$

| Parameter | Test Condition | Units | Min. | Typ. | Max. |
|------------------------------|----------------------|-------|------|------|------|
| Small Signal Gain | 5 GHz | dB | 12.5 | 15.0 | — |
| | 10 GHz | | 14.0 | 16.5 | |
| | 15 GHz | | — | 15.5 | |
| | 18 GHz | | 14.0 | 16.0 | |
| | 20 GHz | | — | 15.0 | |
| Small Signal Gain Variation | — | dB | — | ±1 | — |
| Input Return Loss | — | dB | — | 12 | — |
| Output Return Loss | — | dB | — | 14 | — |
| P1dB | 5 GHz | dBm | 18 | 19.5 | — |
| | 10 GHz | | 18 | 20.0 | |
| | 15 GHz | | — | 20.0 | |
| | 18 GHz | | 19 | 21.0 | |
| | 20 GHz | | — | 21.0 | |
| P _{SAT} | 5 GHz | dBm | — | 20.0 | — |
| | 10 GHz | | — | 20.5 | |
| | 15 GHz | | — | 20.5 | |
| | 20 GHz | | — | 21.5 | |
| Output IP3 | 10 dBm Pout per Tone | dBm | — | 30.0 | — |
| | 5 GHz | | | 30.0 | |
| | 10 GHz | | | 29.5 | |
| | 15 GHz | | | 30.5 | |
| | 20 GHz | | | — | |
| Noise Figure | 5 GHz | dB | — | 5.5 | — |
| | 10 GHz | | | 5.5 | |
| | 15 GHz | | | 5.5 | |
| | 20 GHz | | | 6 | |
| V _{DD} Drain Supply | — | V | — | 5 | — |
| Supply Current | — | mA | — | 102 | 130 |

Absolute Maximum Ratings^{3,4}

| Parameter | Absolute Maximum |
|-------------------------------------|------------------|
| RF Power In | 15 dBm |
| V _{DD} Supply Voltage | 6 V |
| Supply Current | 160 mA |
| Junction Temperature ^{5,6} | +150°C |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +165°C |

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. MACOM does not recommend sustained operation near these survivability limits.
5. Operating at nominal conditions with $T_J \leq +150^\circ\text{C}$ will ensure $\text{MTTF} > 1 \times 10^6$ hours.
6. Junction Temperature (T_J) = $T_C + \Theta_{JC} * (V * I)$
Typical thermal resistance (Θ_{JC}) = 68°C/W.
a) For $T_C = +25^\circ\text{C}$,
 $T_J = 61^\circ\text{C}$ @ 5 V, 102 mA
b) For $T_C = +85^\circ\text{C}$,
 $T_J = 133^\circ\text{C}$ @ 5 V, 140 mA

Operating Conditions

Recommended biasing conditions are $V_D = 5$ V and $V_G = 0$ V open circuit.

Simply perform the following for bias:

1. Set V_G = Open Circuit
2. Set $V_D = 5$ V

DC blocking is not required on the RF input or RF output since blocking capacitors are provided internally. Use 0.01 μF and 1 μF bypass capacitors on the V_D node and a 0.01 μF capacitor on the V_G node. Place the 0.01 μF bypass capacitors as close as possible to the chip.

Maximum Operation Conditions

| Parameter | Maximum |
|-------------------------------------|----------------|
| RF Power In | 10 dBm |
| V _{DD} Supply Voltage | 4 - 5 V |
| Supply Current | 140 mA |
| Junction Temperature ^{5,6} | +150°C |
| Operating Temperature | -40°C to +85°C |

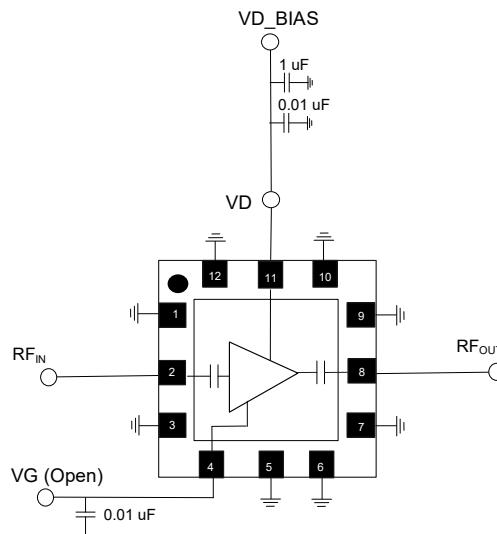
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

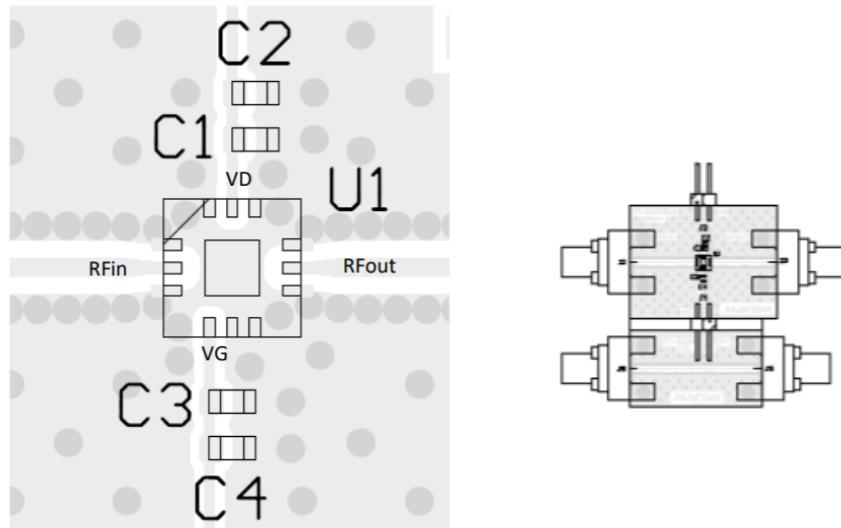
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these class 1B greater than 500 V HBM devices.

Application Schematic



Evaluation Board

10 mils Rogers RO4350B with 1 oz. copper



Evaluation Board Parts List

| Part | Value | Case Style |
|--------|--------------|------------|
| C1, C3 | 0.01 μ F | 0402 |
| C2 | 1 μ F | 0402 |
| C4 | NA | NA |

Driver Amplifier

5 - 20 GHz

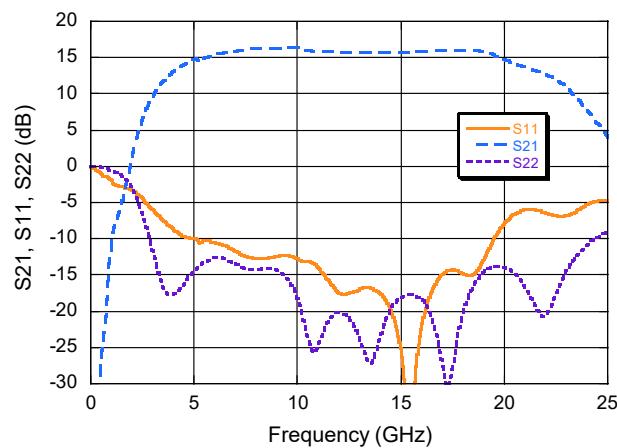
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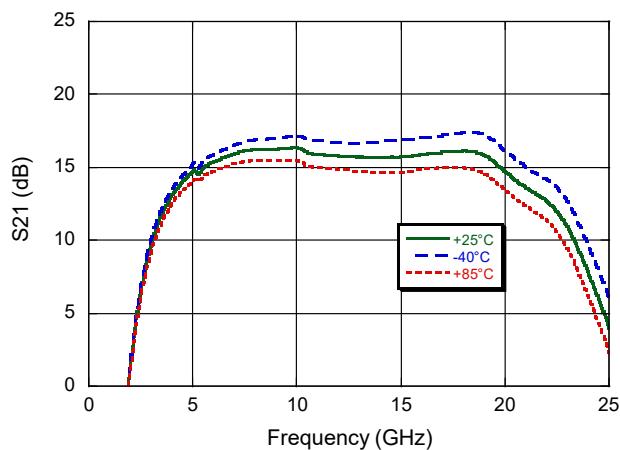
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Typical Performance Curves $V_D = 5$ V

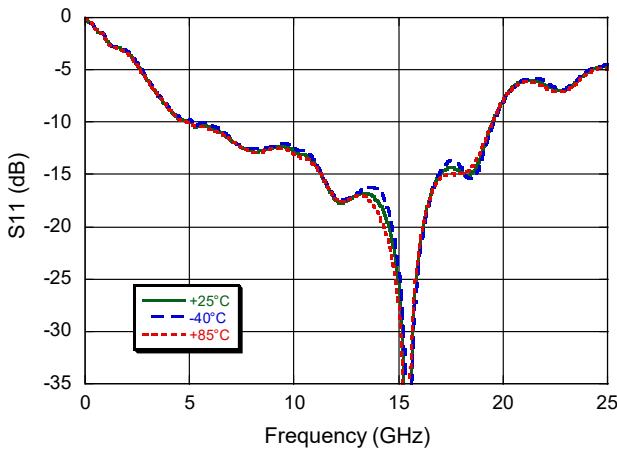
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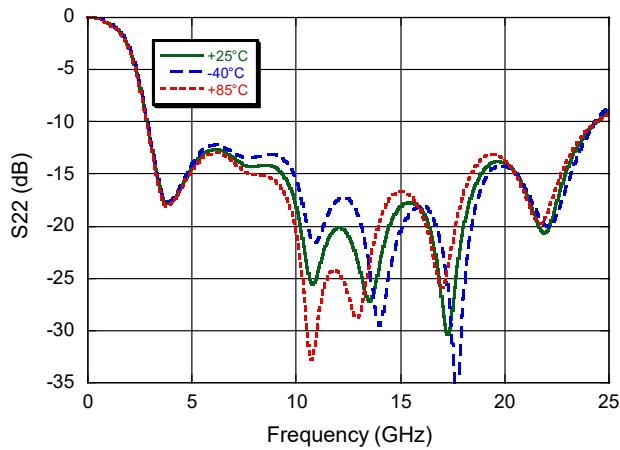
Gain



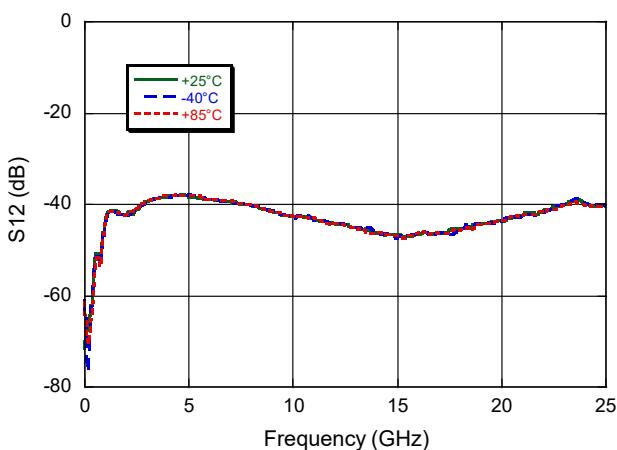
Input Return Loss



Output Return Loss

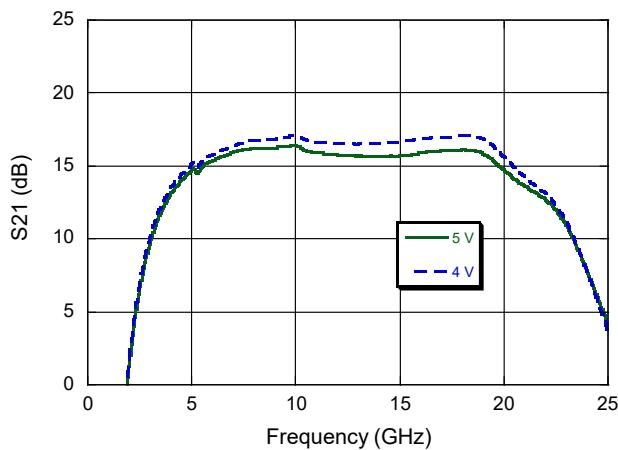


Isolation

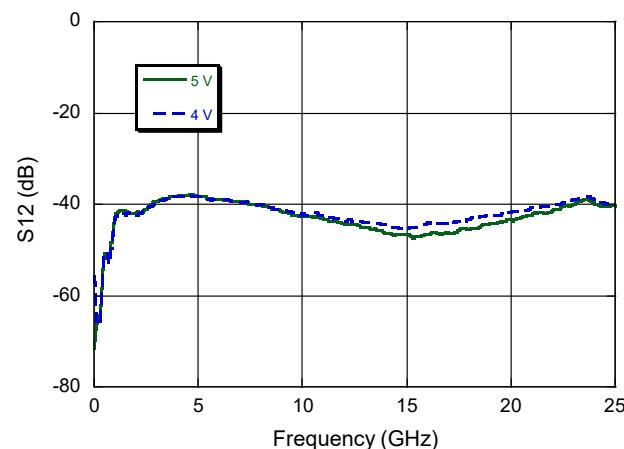


Typical Performance Curves $V_D = 4$ and 5 V

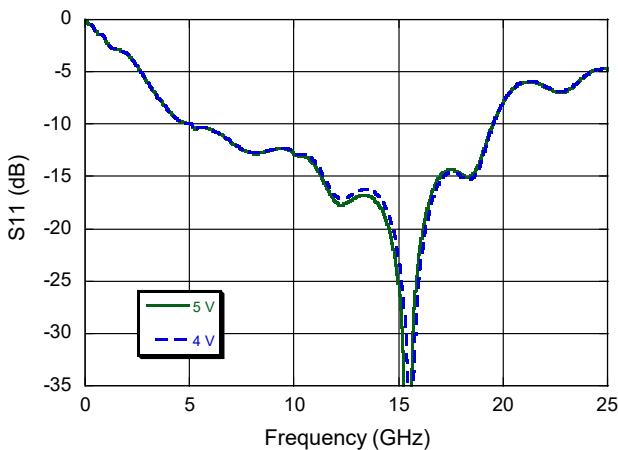
Gain



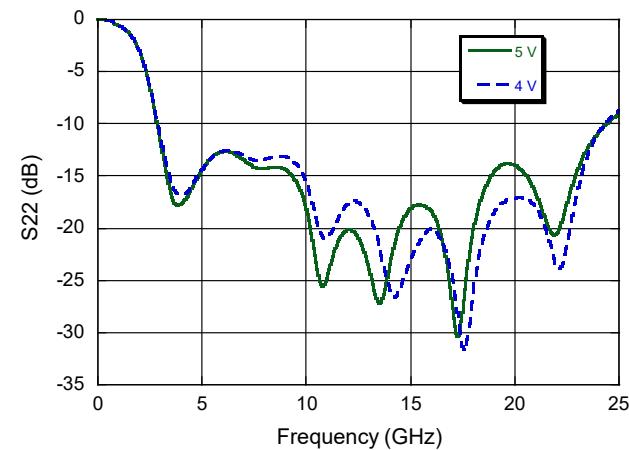
Isolation



Input Return Loss



Output Return Loss



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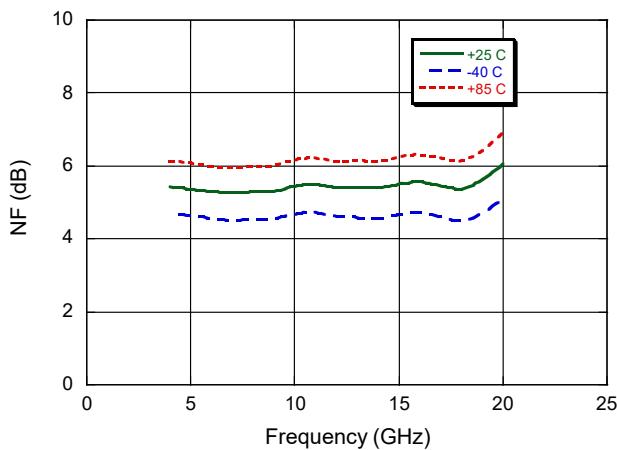
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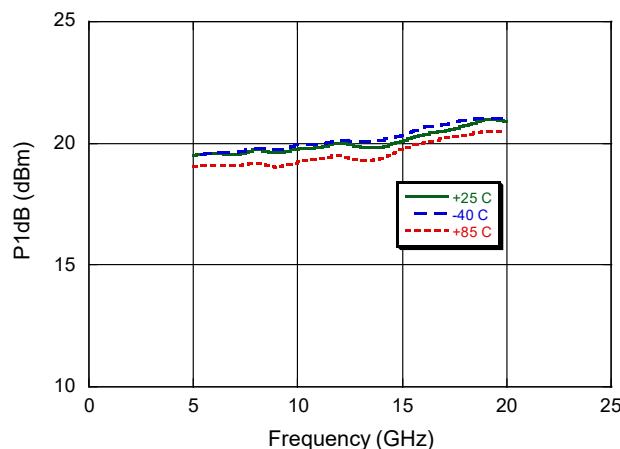
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Typical Performance Curves $V_D = 5$ V

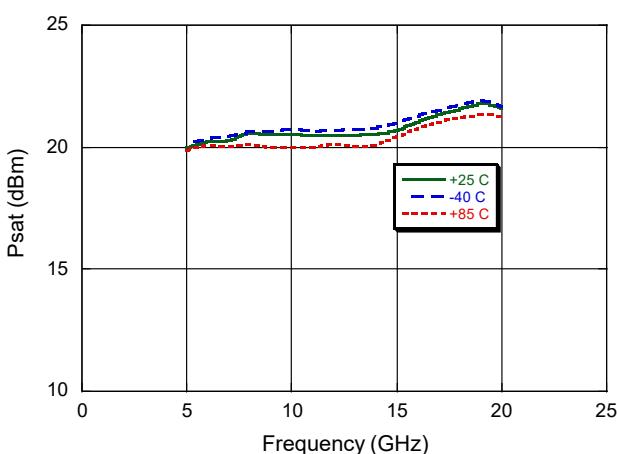
Noise Figure



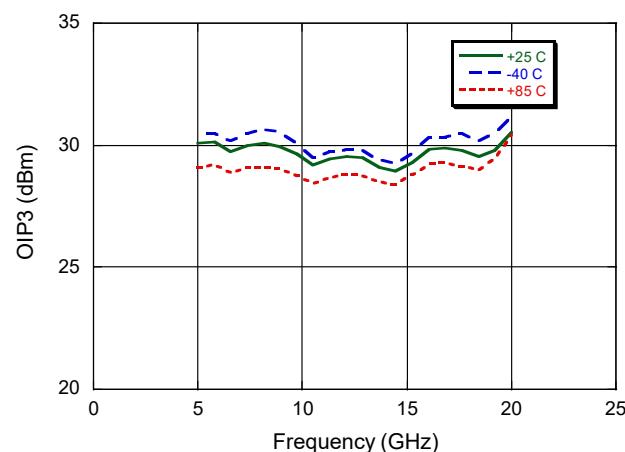
P_{1dB}



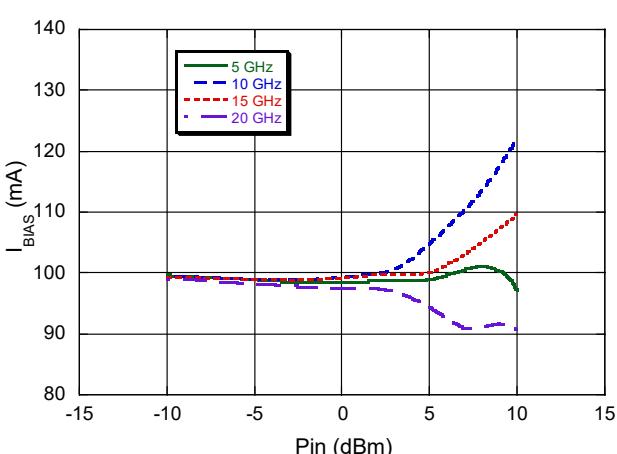
P_{sat}



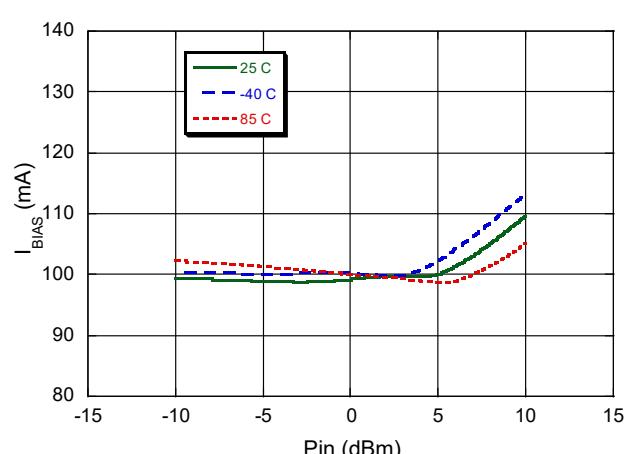
$OIP3 @ 10$ dBm Pout per Tone



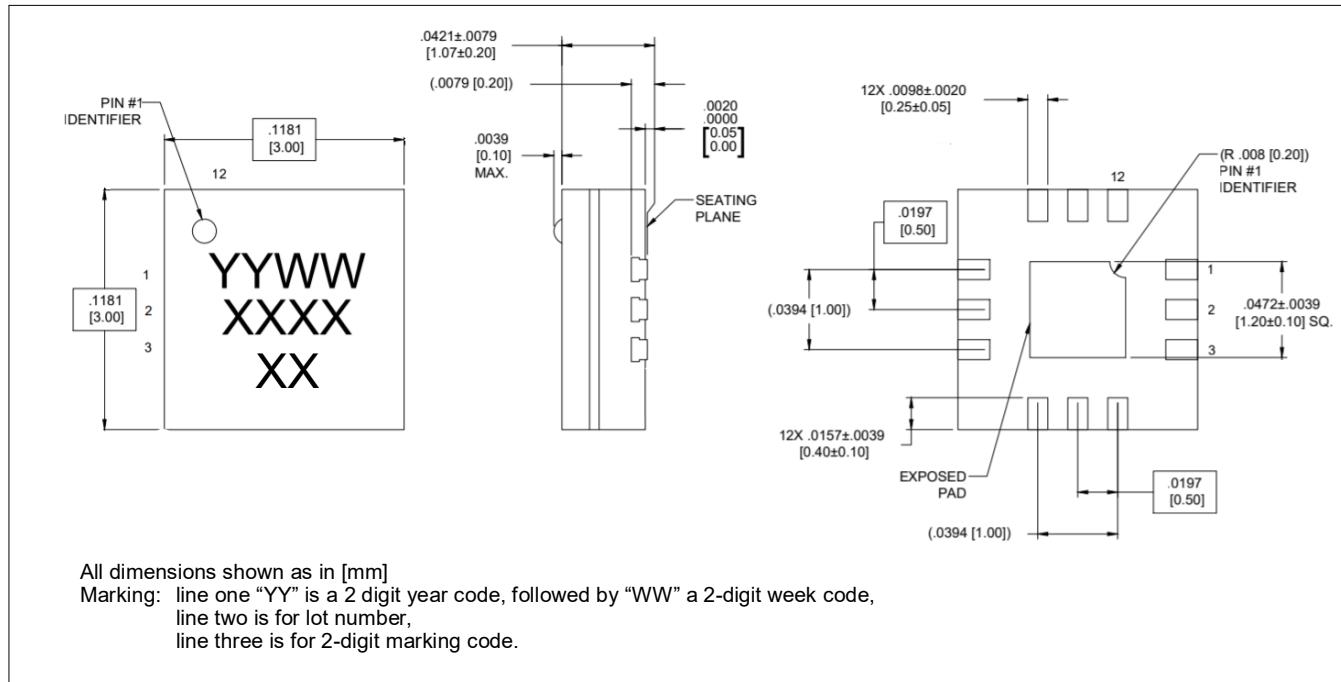
I_{BIAS}



$I_{BIAS} @ 15$ GHz



3 mm 12-Lead AQFN Package



All dimensions shown as in [mm]

Marking: line one "YY" is a 2 digit year code, followed by "WW" a 2-digit week code,
line two is for lot number,
line three is for 2-digit marking code.

[†] Reference Application Note S2083 for lead-free solder reflow recommendations.

Meets JEDEC moisture sensitivity level 3 requirements.
Plating is NiPdAu

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