

Features

- 1 dB Noise Figure
- 21 dB Gain
- 5 V Single Bias Voltage
- 28 dBm OIP3
- Matched to 50 Ω (No External RF Matching)
- Lead-Free 2 mm 8-LD PDFN Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant

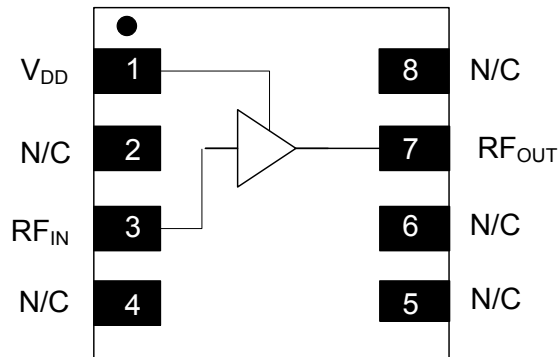
Description

The MAAL-011138 is a high dynamic range, single stage MMIC LNA designed to operate from 2.5 GHz to 3.5 GHz assembled in a lead-free 2 mm 8-LD PDFN plastic package. This amplifier has low noise figure, high gain and excellent linearity. In the 50 Ω environment and at +5 V, this device offers low, 1.0 dB noise figure with over 21 dB of typical gain and 28 dBm OIP3.

This LNA is matched to 50 Ω at both the input and output ports. No external RF matching is required. Only a single DC decoupling capacitor is required on the V_{DD} port.

This MAAL-011138 is ideally suited for S-Band Transmit-Receive Modules requiring low noise figure, high gain and excellent output IP3.

Functional Block Diagram



Pin Configuration³

Pin #	Pin Name	Description
1	V_{DD}	Bias Voltage
2, 4 - 6, 8	N/C	No Connection
3	RF_{IN}	RF Input
7	RF_{OUT}	RF Output
9	Pad ⁴	Ground

3. MACOM recommends connecting all No Connection (N/C) pins to ground.

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

Ordering Information^{1,2}

Part Number	Package
MAAL-011138-TR1000	1000 piece reel
MAAL-011138-TR3000	3000 piece reel
MAAL-011138-SMB	Sample Board

1. Reference Application Note M513 for reel size information.

2. All sample boards include 5 loose parts.

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

Electrical Specifications: $V_{DD} = 5\text{ V}$, $+25^{\circ}\text{C}$, $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Noise Figure	3 GHz	dB	—	1.0	1.4
Gain	3 GHz	dB	19.5	21	—
Input Return Loss	2.5 to 3.5 GHz	dB	—	12	—
Output Return Loss	2.5 to 3.5 GHz	dB	—	10	—
Output IP3	$P_{IN} = -22\text{ dBm}$ per tone, 10 MHz spacing 3 GHz	dBm	—	28	—
Current	I_{DD}	mA	—	55	65

Maximum Operating Conditions

Parameter	Absolute Maximum
RF Input Power CW	$P_{IN} \leq 3\text{ dB}$ compression level
Operating Temperature	-40°C to $+85^{\circ}\text{C}$
Junction Temperature ⁷	$+150^{\circ}\text{C}$

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with $T_J \leq 150^{\circ}\text{C}$ will ensure $MTTF > 1 \times 10^6$ hours.
- Junction Temperature (T_J) = $T_C + \Theta_{JC} * ((V * I) - (P_{OUT} - P_{IN}))$
Typical thermal resistance (Θ_{JC}) = 83°C/W
 - For $T_C = +25^{\circ}\text{C}$,
 $T_J = 45^{\circ}\text{C}$ @ 5 V, 0.055 A, $P_{OUT} = 15\text{ dBm}$, $P_{IN} = -6\text{ dBm}$
 - For $T_C = +85^{\circ}\text{C}$,
 $T_J = 105^{\circ}\text{C}$ @ 5 V, 0.055 A, $P_{OUT} = 15\text{ dBm}$, $P_{IN} = -5\text{ dBm}$

Absolute Maximum Ratings^{4,5,6}

Parameter	Absolute Maximum
RF Input Power CW	$P_{IN} \leq 6\text{ dB}$ compression level
V_{DD}	6 V
Storage Temperature	-55°C to $+125^{\circ}\text{C}$

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

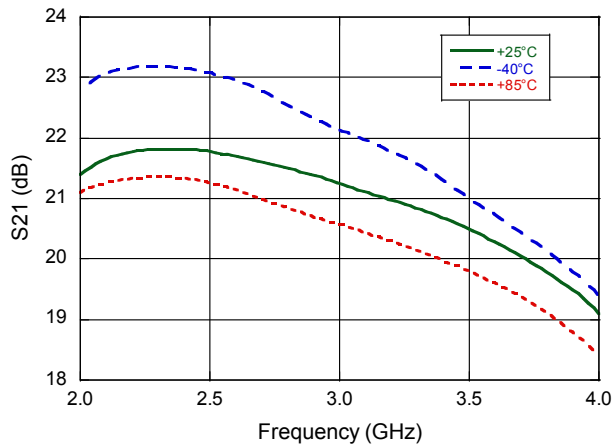
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1A (HBM) devices.

Low Noise Amplifier 2.5 - 3.5 GHz

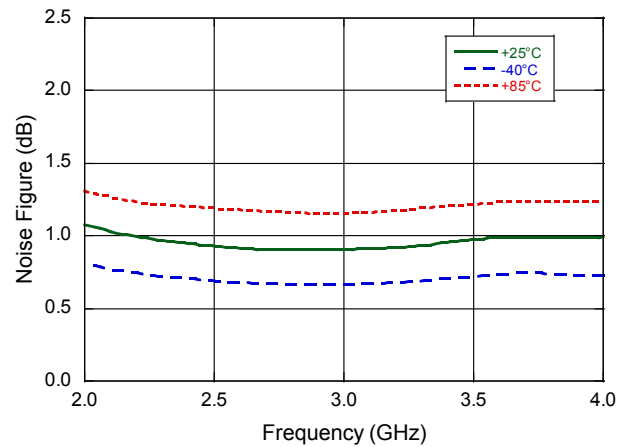
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Typical Performance Curves: 5 V, 55 mA

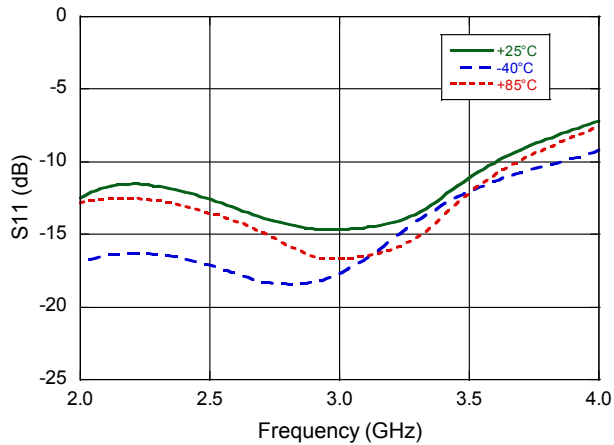
Gain



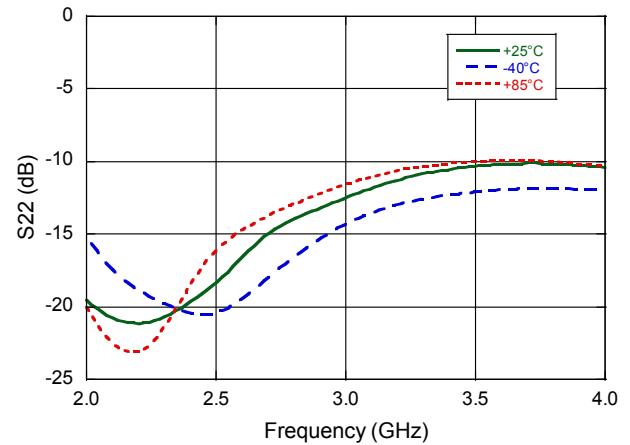
Noise Figure



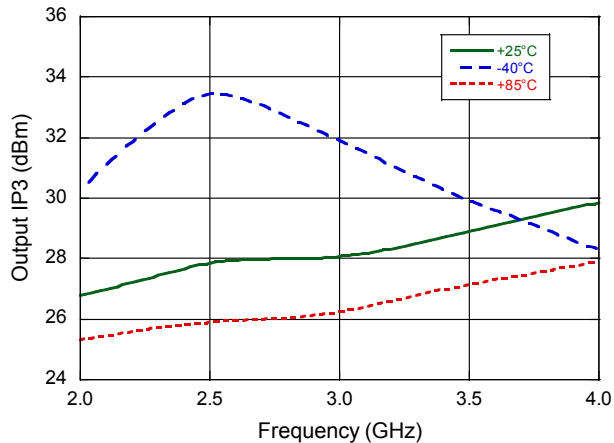
Input Return Loss



Output Return Loss



Output IP3



MAAL-011138



Low Noise Amplifier 2.5 - 3.5 GHz

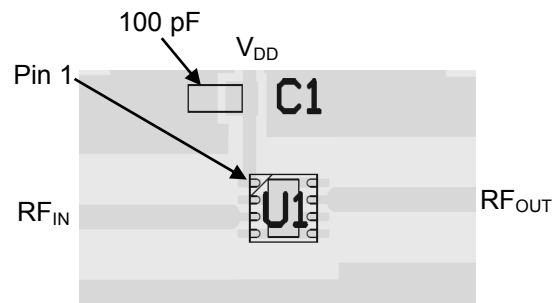
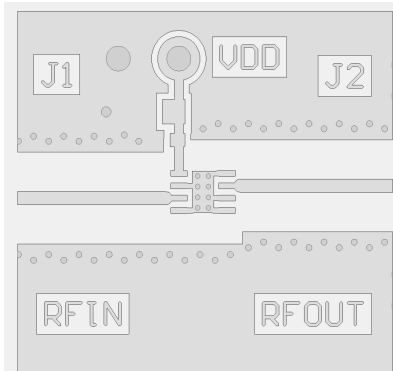
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Applications

The MAAL-011138 is designed to work as a low noise gain block over the 2.5 - 3.5 GHz frequency range in a 50 Ω environment.

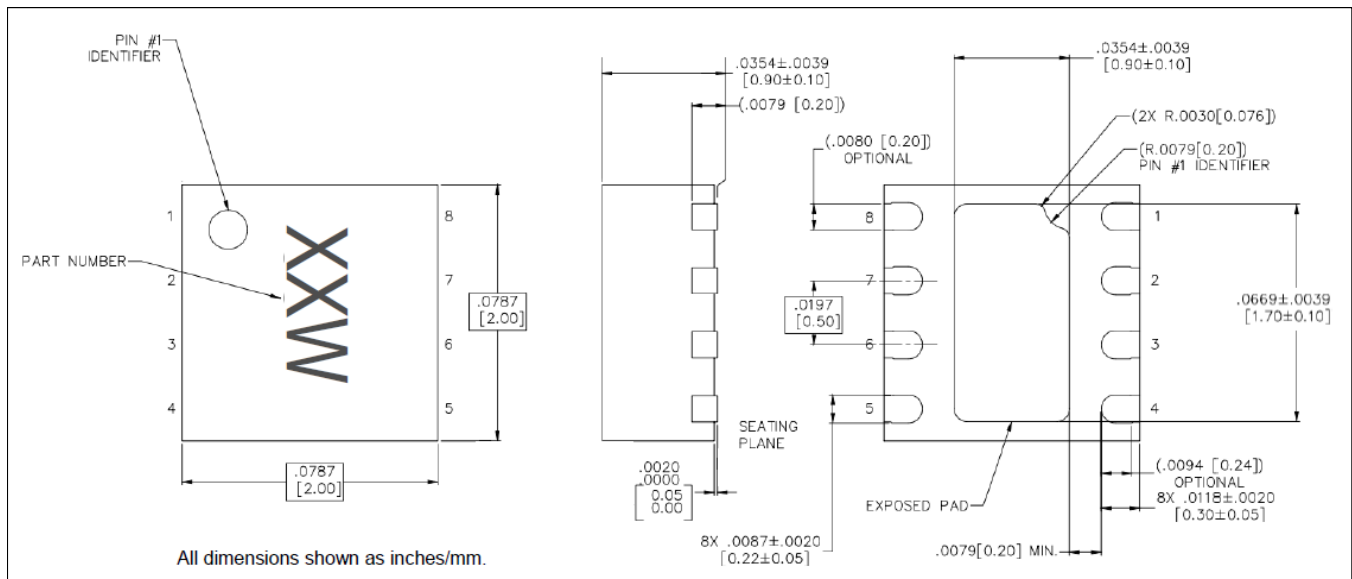
A 100 pF capacitor from pin 1 to ground is the only external SMT component required.

The PCB must have good grounding. Via holes directly under the MAAL-011138 are required for RF & DC ground.



Vias beneath DUT = (8) 8 mil plated through holes
Dielectric = RO4350, 10 mil thick
Top Metal = 1 oz. CU
LW = 21 mil

Lead-Free 2 mm 8-Lead PDFN[†]



[†] 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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