

3T Low Noise Low Input Impedance Pre-Amplifier 127.74 MHz



MAAL-011228
Rev. V1

Features

- Non-Magnetic Laminate Module
- Noise Figure: 0.5 dB
- Gain: 27.1 dB
- Input Impedance (Real): 2.7Ω
- Output Impedance: 50Ω
- Single Voltage Bias: 3 V
- Integrated Active Bias Circuit
- RoHS* Compliant

Applications

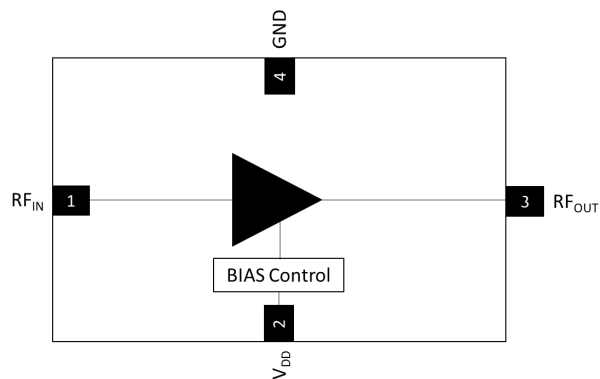
- MRI Applications

Description

The MAAL-011228 is a high dynamic range, single stage MMIC LNA. The module includes external matching networks to provide excellent low noise performance and high gain characteristics suitable for 3.0T MRI applications.

This low noise amplifier has an integrated active bias circuit allowing direct connection to a 3 V bias and minimizing variations over temperature and process.

Functional Block Diagram



Pin Names^{2,3}

Pin #	Pin Name	Description
1	RF _{IN}	RF Input, DC Blocked
2	V _{DD}	Bias Voltage
3	RF _{OUT}	RF Output, DC Blocked
4	GND	Ground

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 Information¹

Part Number	Package
MAAL-011228-TR0100	100 piece reel
MAAL-011228-TR0500	500 piece reel
MAAL-011228-SMB	Sample Board

1. Reference Application Note M513 for reel size information.

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

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Electrical Specifications: Freq. = 127.74 MHz, T_A = 25°C, V_{DD} = +3 V, Z₀ = 50 Ω

3.0T (F _o = 127.74 MHz)					
Parameter	Test Conditions	Units	Min.	Typ.	Max.
Bandwidth	Centered at 127.74 MHz	MHz	—	1	—
Noise Figure	—	dB	—	0.5	—
Gain	—	dB	24.0	27.1	—
Input Reflection Coefficient	—	—	—	0.923	—
Real Input Impedance	—	Ω	—	2.7	—
Imaginary Input Impedance ⁴	—	Ω	-2.0	0	2.0
Output Return Loss	—	dB	—	18	—
Reverse Isolation	—	dB	—	57	—
Output IP3	P _{IN} = -22 dBm per tone, 100 kHz spacing	dBm	—	21	—
Output P1dB	—	dBm	—	8.5	—
Output P0.1 dB	—	dBm	—	5	—
Total Current	I _{DD} (I _{DS} +I _{BIAS})	mA	—	27	42

4. With test fixture at 27.6 mm “Delay Dist.” of RF input port and 1 Velocity Factor Port Extensions added.

Maximum Operating Limits^{5,6}

Parameter	Maximum
RF Input Power CW	-10 dBm
V _{DD}	5.5 V
Operating Temperature	-40°C to +85°C
Junction Temperature ^{6,7}	+150°C

5. Operating at nominal conditions with T_J ≤ 150°C will ensure MTTF > 1 x 10⁶ hours.

6. Junction Temperature (T_J) = T_C + Θ_{JC} * ((V * I) - (P_{OUT} - P_{IN}))

Typical thermal resistance (Θ_{JC}) = 83°C/W

a) For T_C = +25°C,

T_J = 33°C @ 3V, 50 mA, P_{OUT} = 11 dBm

b) For T_C = +85°C,

T_J = 93°C @ 3V, 50 mA, P_{OUT} = 11 dBm

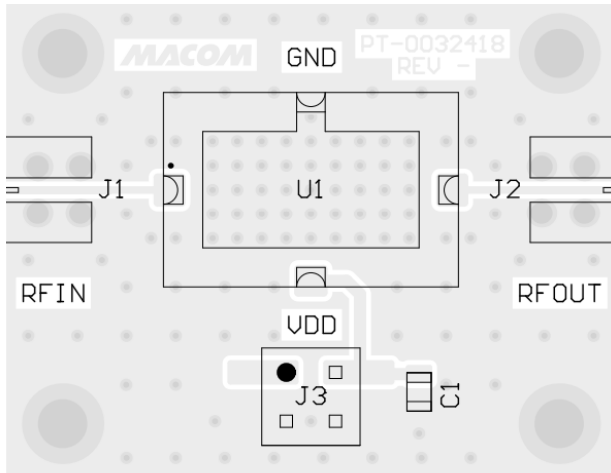
Absolute Maximum Ratings^{7,8}

Parameter	Absolute Maximum
RF Input Power CW	19 dBm
V _{DD}	6.0 V
Storage Temperature	-55°C to +150°C

7. Exceeding any one or combination of these limits may cause permanent damage to this device.

8. MACOM does not recommend sustained operation near these survivability limits.

PCB Layout



Parts List

Part	Value	Case Style
C1	1 μ F	0805

Handling Procedures

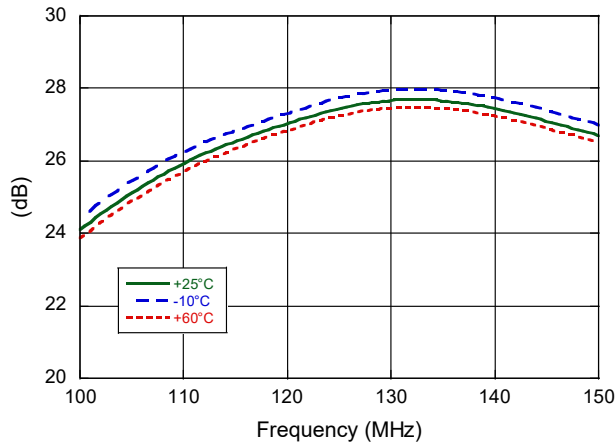
Please observe the following precautions to avoid damage:

Static Sensitivity

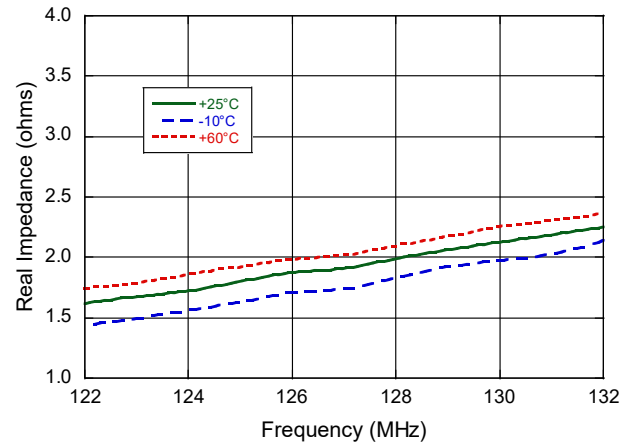
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 2 HBM and Class C2A CDM devices.

Typical Performance Curves

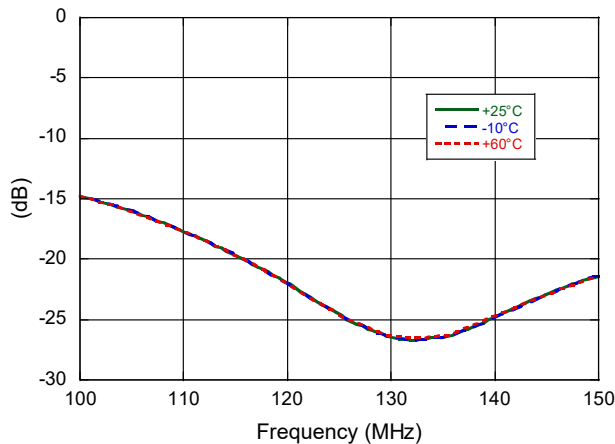
Gain



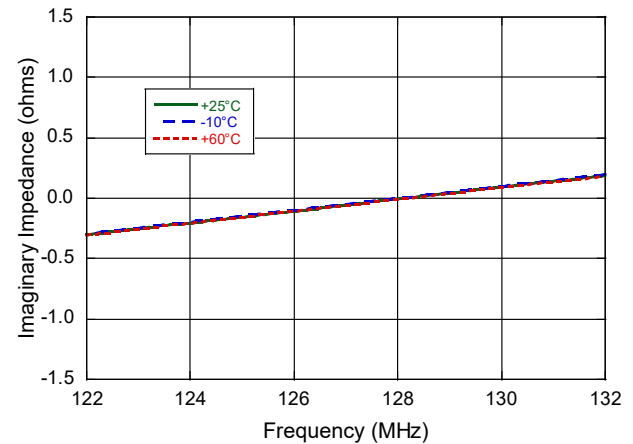
Real Zin



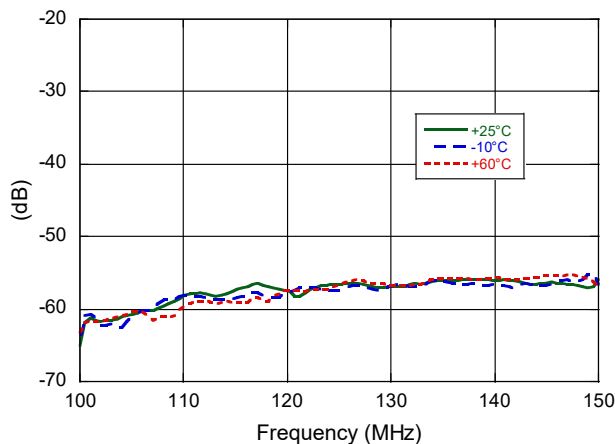
Output Return Loss



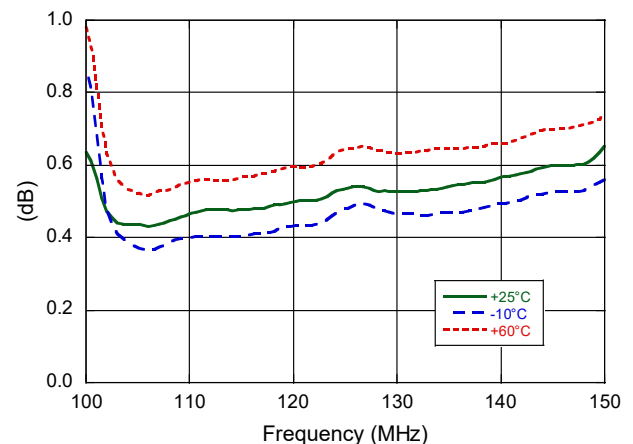
Imaginary Zin



Reverse Isolation



Noise Figure

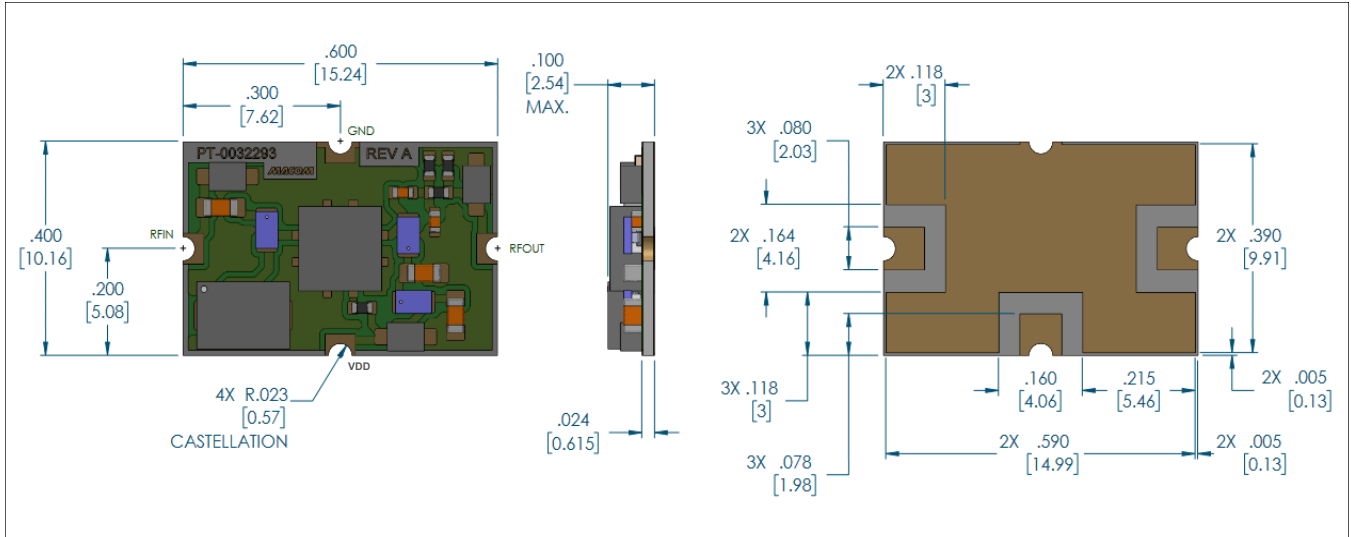


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Lead-Free Laminate Package



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