

# Broadband Low Noise Gain Block 0.025 - 8 GHz

**MACOM**<sup>®</sup>

**MAAM-011252-DIE**

Rev. V5

## Features

- 20 dB Flat Broadband Gain to 8 GHz
- Low Noise Figure:
  - 1.2 dB Noise Figure to 1.5 GHz
  - 1.7 dB Noise Figure @ 6 GHz
  - 2.3 dB Noise Figure @ 8 GHz
- High Linearity OIP3:
  - 36 dBm @ 1.5 GHz
  - 33 dBm @ 6 GHz
  - 30 dBm @ 8 GHz
- Internal Matching to 50 Ω
- Single Voltage Bias: 3 - 5 V
- Integrated Active Bias Circuit
- RoHS\* Compliant

## Applications

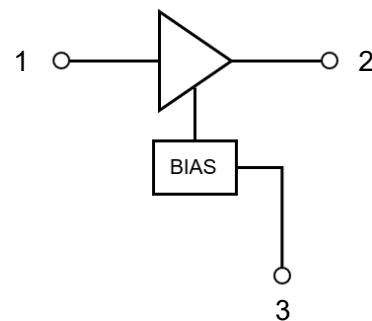
- ISM/MM

## Description

The MAAM-011252-DIE is a broadband high dynamic range, single stage MMIC LNA. This bare die is 0.795 x 0.715 mm. The amplifier is internally matched to provide flat gain and good return losses to 8 GHz without any external matching components. Only DC blocking capacitors and an RF choke with bypass capacitance is required.

This low noise amplifier has an integrated active bias circuit allowing direct connection to 3 V or 5 V bias and minimizing variations over temperature and process.

## Functional Block Diagram



## Pin Configuration<sup>1</sup>

Pin #	Pin Name	Description
1	RF <sub>IN</sub>	RF Input
2	RF <sub>OUT</sub> / V <sub>DD</sub>	RF Output / Drain Voltage
3	NC	No Connection

1. Bottom of die is RF and thermal ground.

## Ordering Information

Part Number	Package
MAAM-011252-DIE	Bare Die

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

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**Electrical Specifications:  $V_{DD} = 5 \text{ V}$ ,  $+25^\circ\text{C}$ ,  $Z_0 = 50 \Omega$  (all data is GSG probed)**

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	0.03 - 8 GHz	dB	18	20	—
Noise Figure	0.1 - 1.5 GHz 6.0 GHz 8.0 GHz	dB	—	1.2 1.7 2.3	—
Input Return Loss	0.03 - 8 GHz	dB	—	12	—
Output Return Loss	0.03 - 8 GHz	dB	—	12	—
Output IP3	$P_{IN} = -15 \text{ dBm}$ per tone, 6 MHz spacing 0.03 - 3 GHz 6 GHz 8 GHz	dBm	—	34 33 30	—
Output IP2	$P_{IN} = -15 \text{ dBm}$ per tone, 6 MHz spacing 0.03 - 3 GHz 6 GHz 8 GHz	dBm	—	44 48 50	—
Output P1dB	0.03 - 3 GHz 6 GHz 8 GHz	dBm	—	20 18 14	—
Current	$I_{DD}$	mA	—	60	75

## Maximum Operating Ratings

Parameter	Maximum
RF Input Power CW	10 dBm
$V_{DD}$	6 V
$I_{DQ}$	100 mA
Operating Temperature	-40°C to +85°C
Junction Temperature <sup>4,5</sup>	+160°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  $T_J \leq 160^\circ\text{C}$  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 ( $\Theta_{JC}$ ) = 40°C/W
  - For  $T_C = 25^\circ\text{C}$ ,  
 $T_J = 38^\circ\text{C} @ 5 \text{ V}, 60 \text{ mA}$
  - For  $T_C = 85^\circ\text{C}$ ,  
 $T_J = 99^\circ\text{C} @ 5 \text{ V}, 70 \text{ mA}$

## Absolute Maximum Ratings<sup>2,3</sup>

Parameter	Absolute Maximum
RF Input Power CW	24 dBm
$V_{DD}$	7 V
Storage Temperature	-55°C to +150°C

## Handling Procedures

Please observe the following precautions to avoid damage:

## Static Sensitivity

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 HBM Class 1B devices.

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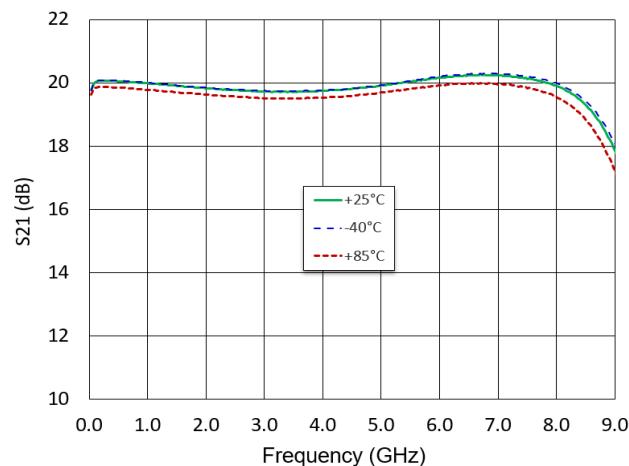
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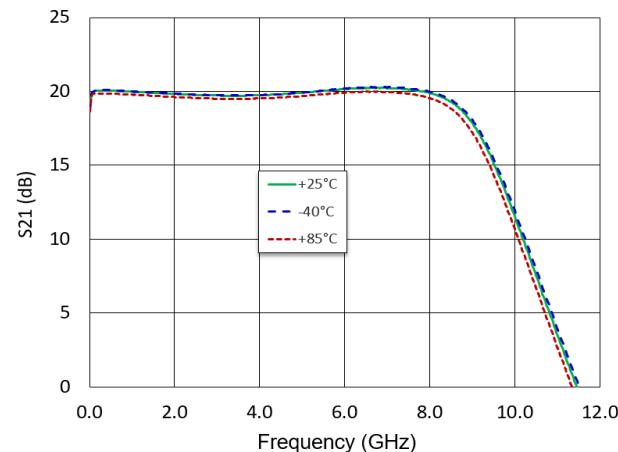
Rev. V5

Typical Performance Curves @ 5 V / 60 mA,  $Z_0 = 50 \Omega$  (all data is GSG probed)

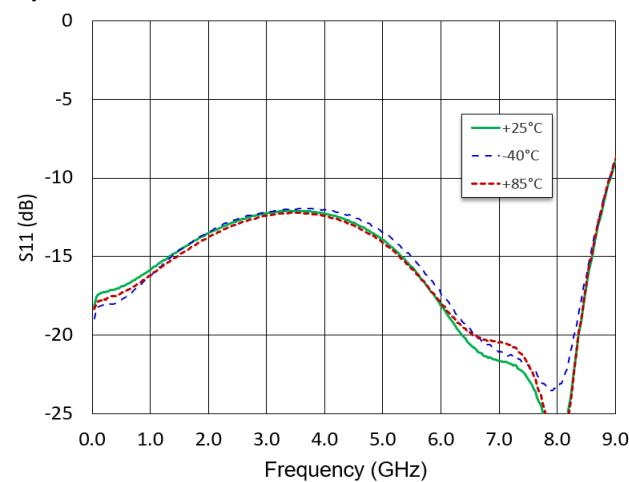
## Gain



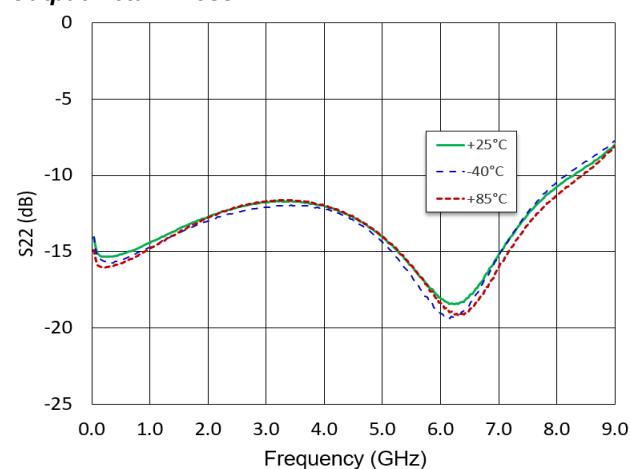
## Gain to 12 GHz



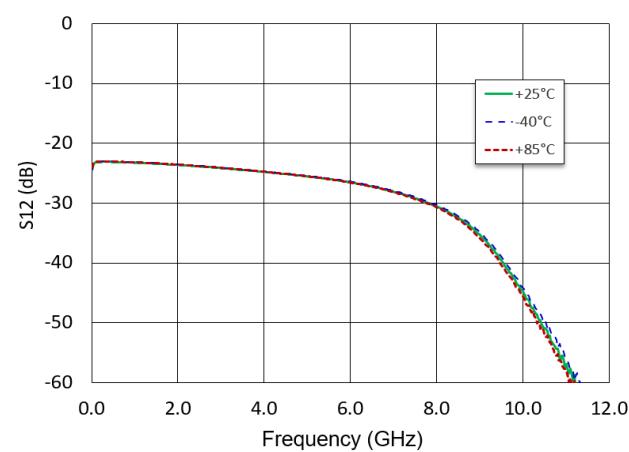
## Input Return Loss



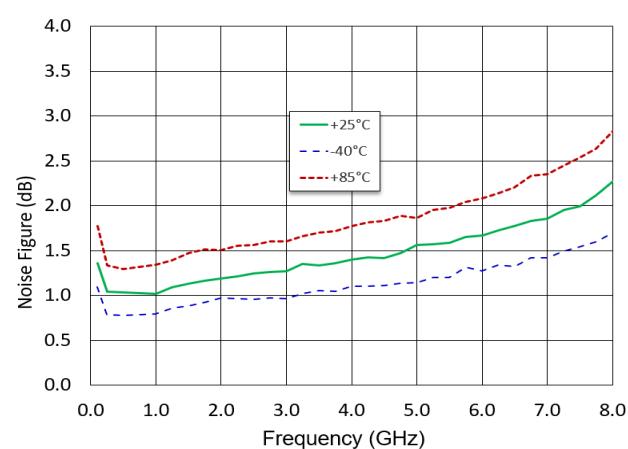
## Output Return Loss



## Reverse Isolation



## Noise Figure



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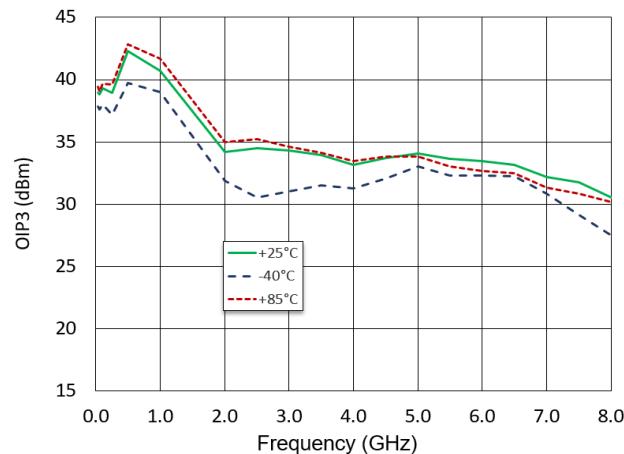
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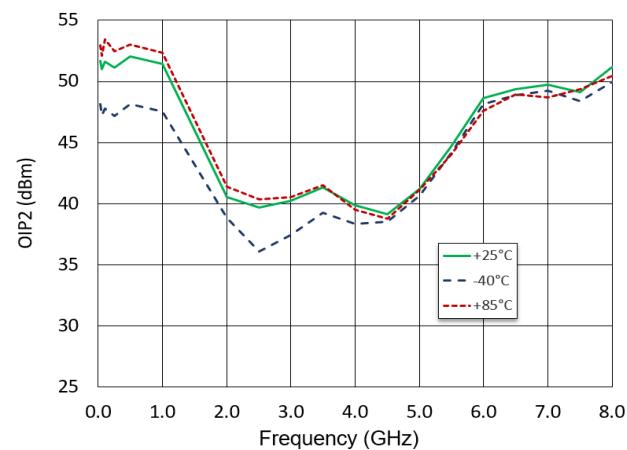
Rev. V5

Typical Performance Curves @ 5 V / 60 mA,  $Z_0 = 50 \Omega$  (all data is GSG probed)

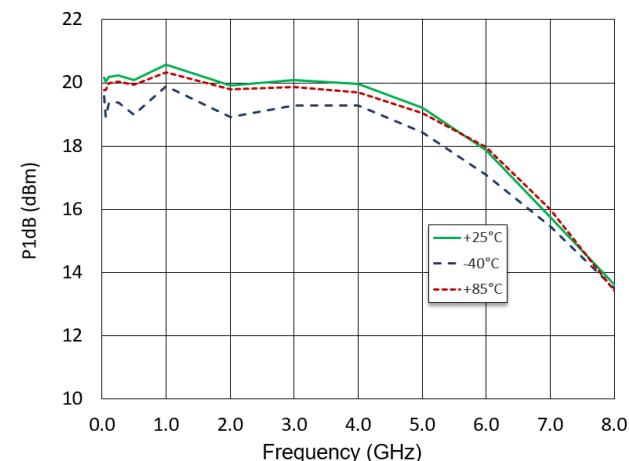
OIP3 at  $P_{IN} = -15 \text{ dBm/tone}$ , 6MHz Spacing



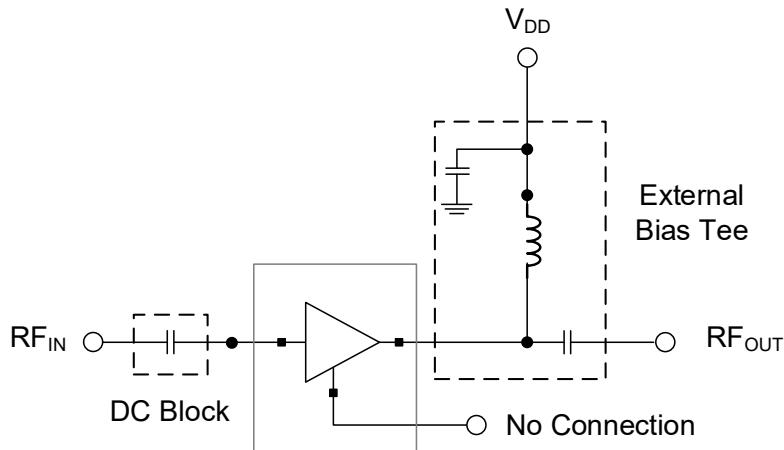
OIP2 at  $P_{IN} = -15 \text{ dBm/tone}$ , 6MHz Spacing



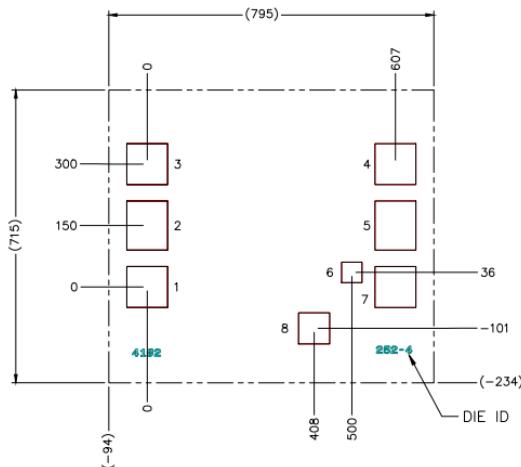
P1dB



**Typical Application Circuit**



**Die Outline<sup>6,7,8,9,10</sup> (0.795 x 0.715 mm)**



**Bond Pad Dimensions (µm)**

Pad #	Size (x)	Size (y)	Description
1, 3, 4, 7	100	100	GND
2	100	120	RF <sub>IN</sub>
5	100	120	RF <sub>OUT</sub> / V <sub>DD</sub>
8	76	76	No Connection
6	50	50	GND

6. Unless otherwise specified, all dimensions shown are µm with a tolerance of  $\pm 5$  µm.
7. Die thickness is  $100 \pm 10$  µm.
8. Bond pad/backside metallization: Gold.
9. Die size reflects cut dimensions. Saw or laser kerf reduces die size ~22 µm each dimension
10. GND bond pads 1, 3, 4, 6 and 7 are connected to the backside of the die through via holes. GND bond pads do not require bond wires, only pin 2 and 5 require bond wires.

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