21 dB Gain Amplifier, Die
0.5 - 6 GHz

MAAM-011326-DIE
Rev. V1

Features

- Wideband Performance
- Gain: 21 dB @ 3 GHz
- P1dB: 20 dBm @ 3 GHz
- Noise Figure: 1.4 dB @ 3 GHz
- OIP3: 36 dBm @ 3 GHz
- Bias Voltage: 5 V
- Bias Current: 90 mA
- 50 Ω Matched Input / Output
- Positive Voltage Only
- Die Size: 0.59 x 0.70 mm
- RoHS* Compliant

Applications

- Instrumentation & Communication Systems

Description

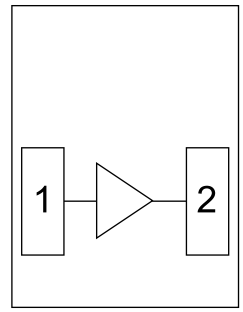
MAAM-011326-DIE is an easy-to-use, wideband amplifier that operates from 0.5 to 6 GHz. The amplifier provides 21 dB gain, 20 dBm output P1dB and 36 dBm OIP3 at 3 GHz. The gain slope is only ± 0.5 dB from 0.5 to 3 GHz. It is matched to 50 Ω with typical return losses of 15 dB at the input and 13 dB at the output. The amplifier requires only positive bias voltages and consumes 90 mA from a 5 V supply.

MAAM-011326-DIE is suitable for a wide range of applications in instrumentation and communication systems.

Ordering Information

Part Number	Package
MAAM-011326-DIE	Bare Die

Functional Schematic



Pad Configuration[1,2,3]

Pin #	Pin Name	Function
1	RFIN	RF Input
2	RFOUT / V_{DD}	RF Output / V_{DD}

1. The RFIN pad is DC coupled and matched to 50 Ω. An external DC block is required
2. The RFOUT pad is DC coupled and matched to 50 Ω. DC bias is supplied through this pad.
3. Backside of die must be connected to RF, DC and thermal ground.

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

Electrical Specifications: $T_B = 25°C$[4], $V_{DD} = +5$ V[5], $Z_0 = 50\ \Omega$ (Probe Data with Bias Tees)

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	0.5 GHz 2 GHz 3 GHz 4 GHz 6 GHz	dB	21.0 — 20.0 — 19.0	22.0 21.5 21.0 21.0 20.0	—
Gain Variation vs. Temp	0.5 - 3 GHz 3 - 6 GHz	dB/°C	—	0.01 0.02	—
Gain Variation vs. Freq	0.5 - 3 GHz	dB	—	±0.5	—
Noise Figure	0.5 GHz 3 GHz 6 GHz	dB	—	1.5 1.4 2.0	1.8 1.6 2.2
Input Return Loss	0.5 - 2 GHz 2 - 4 GHz 4 - 6 GHz	dB	—	-15 -16 -20	-10 -11 -10
Output Return Loss	0.5 - 6 GHz	dB	—	-13	-12
P1dB	0.5 GHz 2 GHz 3 GHz 4 GHz 5 GHz 6 GHz	dBm	—	20.3 20.3 20.0 19.0 17.6 16.2	—
Saturated Output Power	0.5 - 6 GHz	dBm	—	21	—
Output IP3[6]	0.5 GHz 2 GHz 3 GHz 4 GHz 5 GHz 6 GHz	dBm	33.0 — 32.5 — — 27.5	35.0 38.0 36.0 34.0 31.5 30.0	—
Supply Current	Quiescent bias	mA	—	90	100

4. Baseplate temperature.
5. Drain voltage injected through the RF output port using an external bias tees. Voltage at the output pin is ≈ +4.8 V.
6. Output IP3 tested with two input tones of -20 dBm each with 10 MHz spacing.

Maximum Operating Conditions

Parameter	Rating
Input Power	5 dBm
IC	120 mA
Junction Temperature[7,8]	+150°C
Operating Temperature	-40°C to +105°C

7. Operating at nominal conditions with junction temperature ≤ 130°C will ensure MTTF > 1 x 106 hours.
8. Junction Temperature (T_J) = T_B + Ѳjc * (V * I)
   Typical thermal resistance (Ѳjc) = 65 °C/W.
   a) For T_B = +25°C,
      T_J = 55 °C @ 5 V, 90 mA
   b) For T_B = +105°C,
      T_J = 135 °C @ 5 V, 90 mA

Absolute Maximum Ratings[9,10]

Parameter	Absolute Maximum
V_{DD}	8 V
Input Power	20 dBm
Junction Temperature[11]	+150°C
Storage Temperature	-65°C to +125°C

9. Exceeding any one or combination of these limits may cause permanent damage to this device
10. MACOM does not recommend sustained operation near these survivability limits.
11. Junction temperature directly effects device MTTF. Junction temperature should be kept as low as possible to maximize lifetime.

Handling Procedures

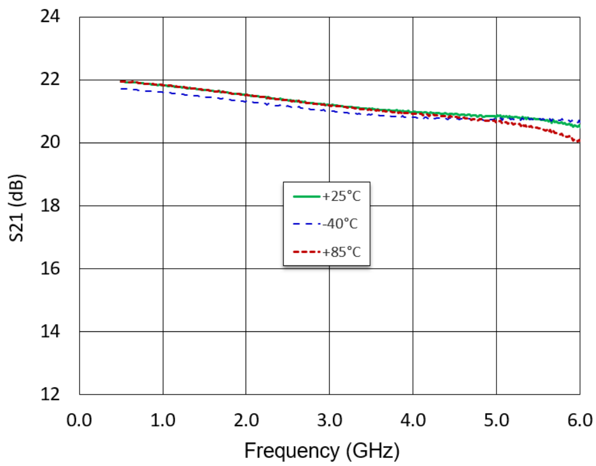
Please observe the following precautions to avoid damage:

Static Sensitivity

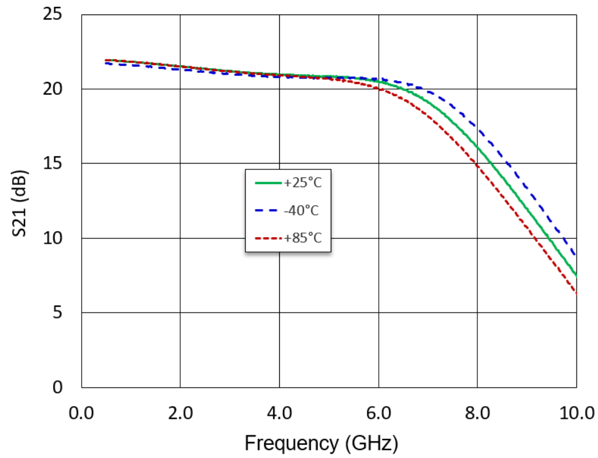
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these HBM Class 1B devices.

Typical Performance Curves @ 5 V / 90 mA, Z_0 = 50 Ω (Probe data with Bias Tees)

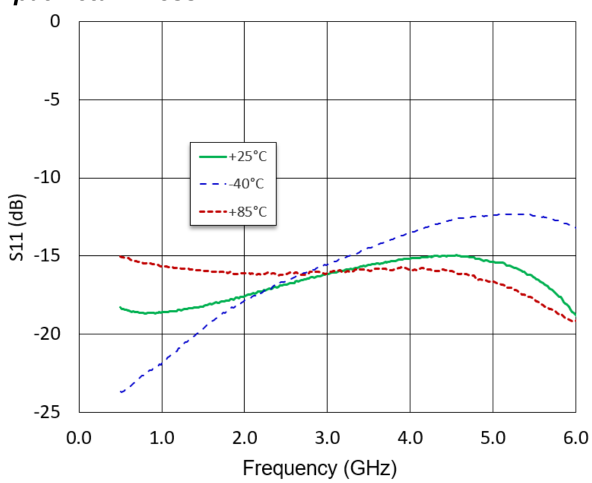
Gain



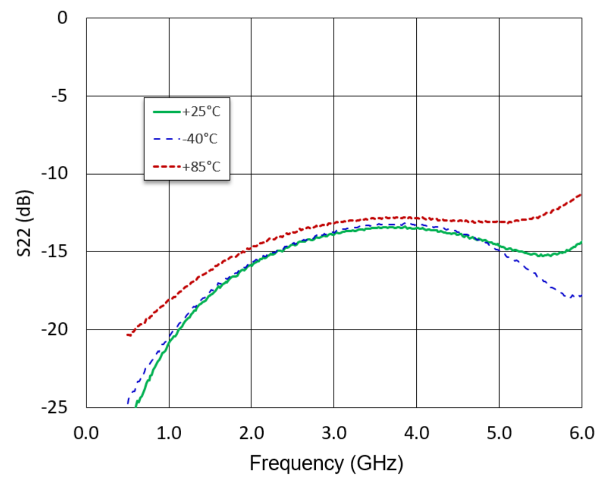
Gain to 10 GHz



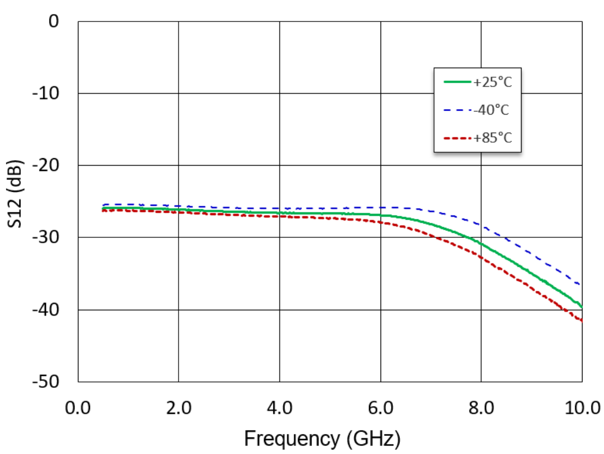
Input Return Loss



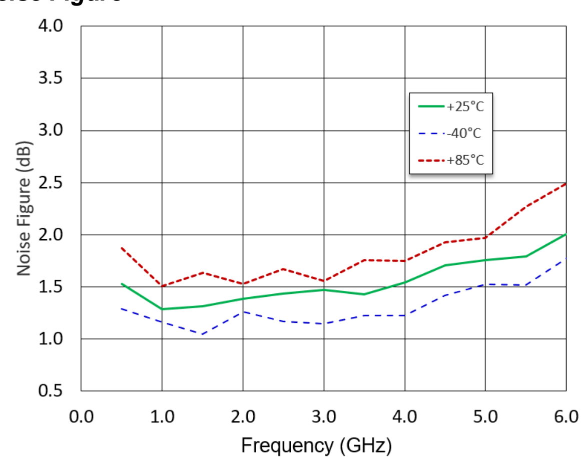
Output Return Loss



Reverse Isolation

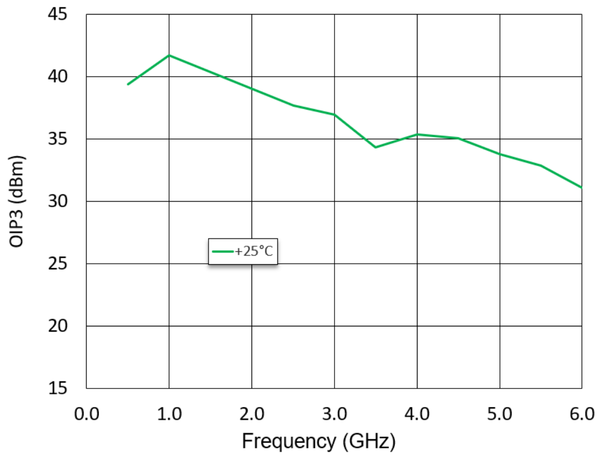


Noise Figure

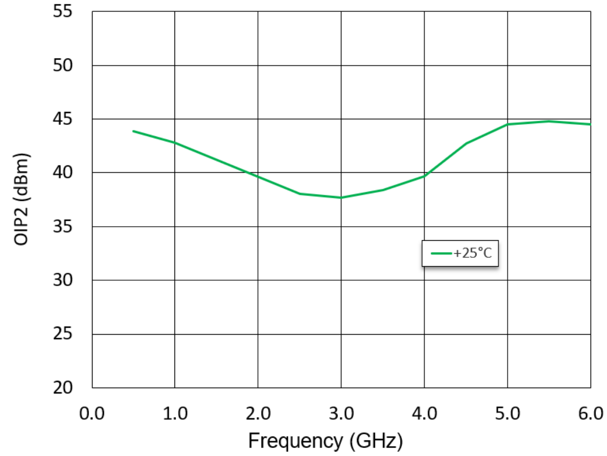


Typical Performance Curves @ 5 V / 90 mA, Z_0 = 50 Ω (Probe data with Bias Tees)

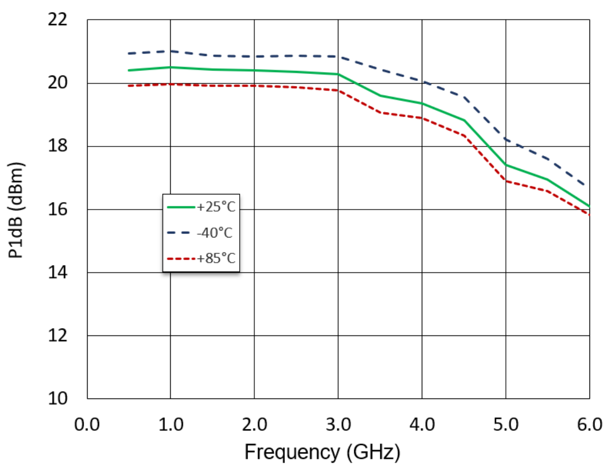
OIP3 at P_{IN} = -20 dBm/tone, 10 MHz Spacing



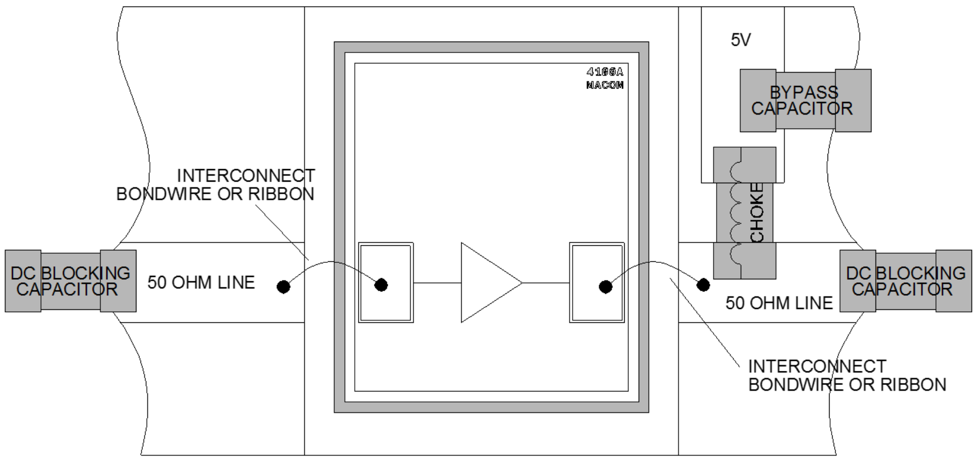
OIP2 at P_{IN} = -20 dBm/tone, 10 MHz Spacing



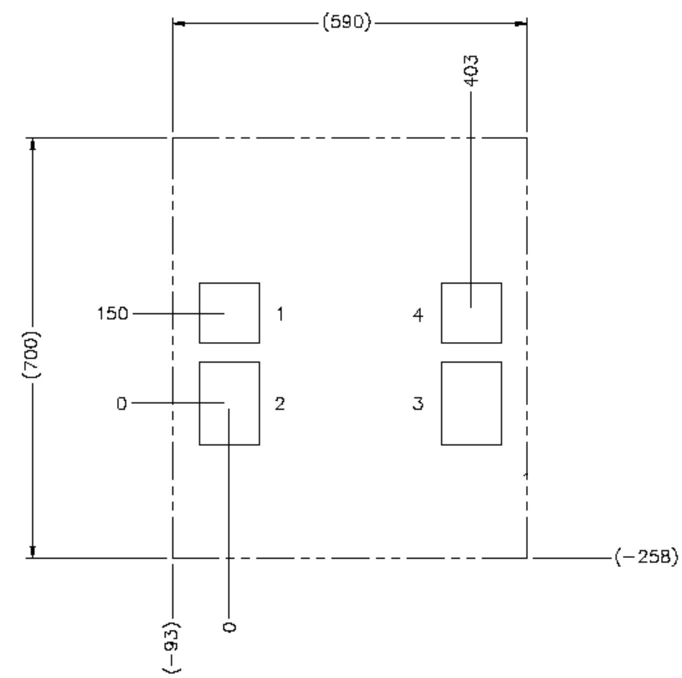
P1dB



Device Assembly



Die Dimensions[12,13]



Bond Pad Dimensions (µm)			
Pad #	Size (x)	Size (y)	Description
1, 4	100	100	GND
2	100	139	RF_{IN}
3	100	139	RF_{OUT} / V_{DD}

12. Dimensions are in microns.
13. GND bond pads 1 and 4 are connected to the backside of the die through via holes. These bond pads do not require bond wires. Only pin 2 and 3 require bond wires.