RF Driver Amplifier, 0.5 W
250 - 4000 MHz

MAAM-011270
Rev. V2

Features

- Broadband Operation
- 15 dB Gain
- Output P1dB: +27 dBm
- Output IP3: +42 dBm
- Current Adjustable 60 - 155 mA
- Lead-Free 2 mm 8-LD PDFN Package
- RoHS* Compliant

Applications

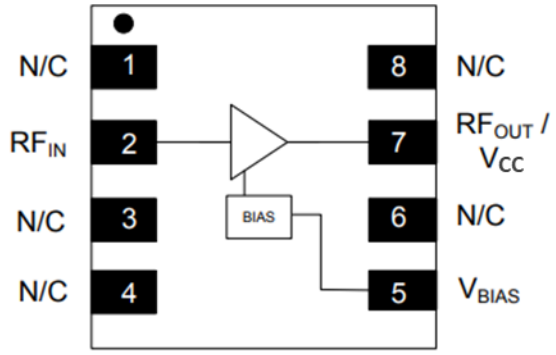
- 5G Massive MIMO
- Wireless Infrastructure
- General Purpose Wireless

Description

The MAAM-011270 RF driver amplifier is a GaAs MMIC which exhibits exceptional linearity, as well as high gain in a lead-free 2 mm 8-LD PDFN surface mount plastic package.

Broadband operation over the 250 to 4000 MHz range is achieved using external matching components. Different component values may be needed to optimize performance at different center frequencies. The device is biased with a single +5 V supply. The bias current is set by an external resistor, so the user can customize the power consumption to fit the application. V_{BIAS} can be utilized as an enable pin to power the device up and down during operation.

Functional Schematic



Pin Configuration[2]

Pin #	Pin Name	Description
1, 3, 4, 6, 8	N/C	No Internal Connection
2	RF_{IN}	RF Input
5	V_{BIAS}	Bias Voltage
7	RF_{OUT}/V_{CC}	RF Output/+5 V Supply
9	Pad[3]	Ground

2. MACOM recommends connecting all No Connection (N/C) pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

Ordering Information[1]

Part Number	Package
MAAM-011270-TR1000	1K reel
MAAM-011270-001SMB	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. = 2140 MHz, T_A = +25°C, V_{CC} = V_{BIAS} = +5 V, Z_0 = 50 Ω

Parameter	Units	Min.	Typ.	Max.
Gain	dB	13	15	—
Noise Figure	dB	—	4.5	—
Input Return Loss	dB	—	8	—
Output Return Loss	dB	—	27	—
Output P1dB	dBm	—	27	—
Output IP3 P_{IN} = -6 dBm / tone, 1 MHz spacing	dBm	38	42	—
Quiescent Current	mA	—	155	—

Maximum Operating Conditions[3]

Parameter	Maximum Operating Conditions
RF Output Power	27 dBm
Junction Temperature	170°C
Operating Temperature	-40°C to +105°C

3. These operating conditions will ensure MTTF > 1 x 10^6 hours.
4. Junction Temperature (T_J) = T_A + Θjc * ((V * I) - (P_{OUT} - P_{IN}))
   Typical thermal resistance (Θjc) = 70° C/W
   a) For T_A = 25°C,
   T_J = 76 °C @ 5 V, 170 mA, P_{OUT} = 21 dBm, P_{IN} = 5.5 dBm
   b) For T_A = 105°C,
   T_J = 146 °C @ 5 V, 140 mA, P_{OUT} = 21 dBm, P_{IN} = 6.2 dBm

Absolute Maximum Ratings[5,6]

Parameter	Absolute Maximum
RF Output Power	28 dBm
Voltage	6 volts
Storage Temperature	-65°C to +150°C
Junction Temperature	210°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM Technology does not recommend sustained operation near these survivability limits.

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 HBM Class 1C and CDM Class C3 devices.

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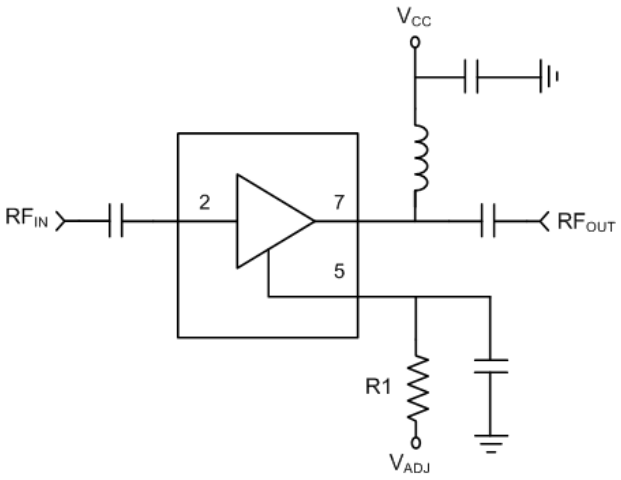
Simplified Schematic



Biasing Options

The MAAM-011270 bias can be set in 2 different ways: using only V_{DD} or using separate V_{DD} and V_{BIAS} voltages. A separate V_{BIAS} voltage allows pin 5 (V_{BIAS}) to be used as an enable pin to power the device up and down during operation.

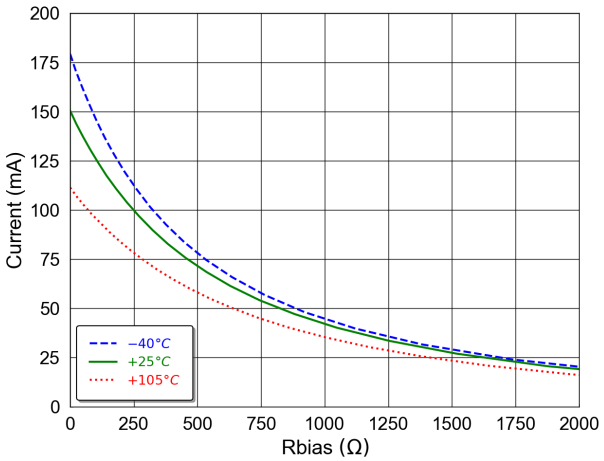
For both bias methods select the value of R_1 to achieve the desired current based on the tables below, and use DC blocks at pin 2 (RF_{IN}) and pin 7 (RF_{OUT} / V_{DD}).

Biasing - V_{DD} only

To use only V_{DD}, connect pin 7 (RF_{OUT} / V_{DD}) to V_{DD} through an RF choke inductor and connect pin 5 (V_{BIAS}) to V_{DD} through bias resistor R_1 as shown in the schematic.

Typical Performance Curves of the Active Bias Circuit

Current, V_{DD} = 5 V



R_1 (Ω)	Total Current (mA)		
	V_{DD} = 5 V		
	-40°C	+25°C	+105°C
2000	21	20	16
1200	37	35	30
1000	45	43	35
800	55	51	43
600	69	63	52
400	90	82	65
200	123	118	83
0	180	150	111

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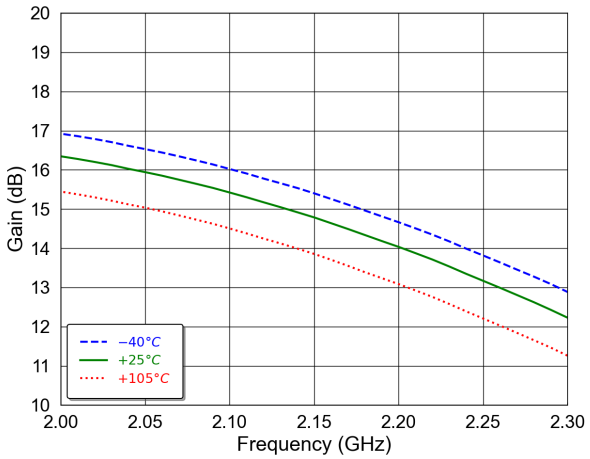
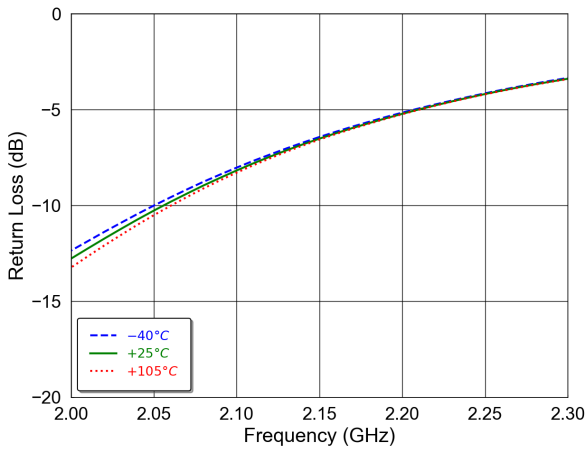
Typical Performance Curves @ V_{DD} = V_{BIAS} = 5 V, 2140 MHz Configuration

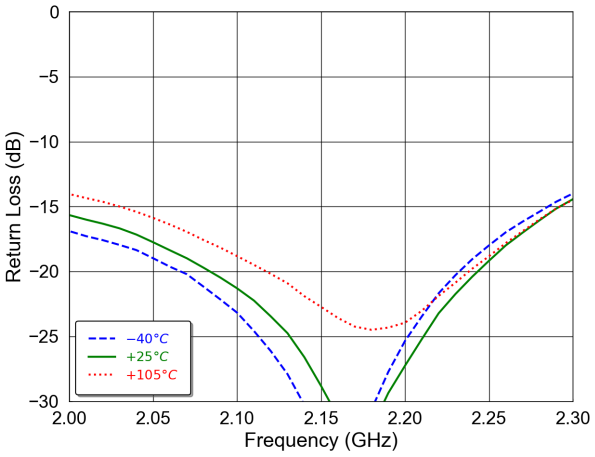
Gain



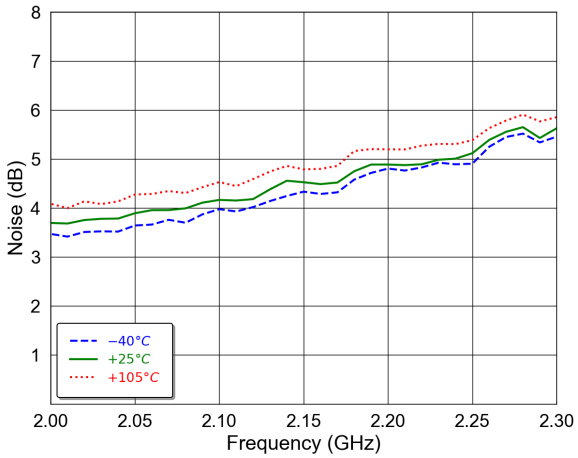
Input Return Loss



Output Return Loss



Noise Figure



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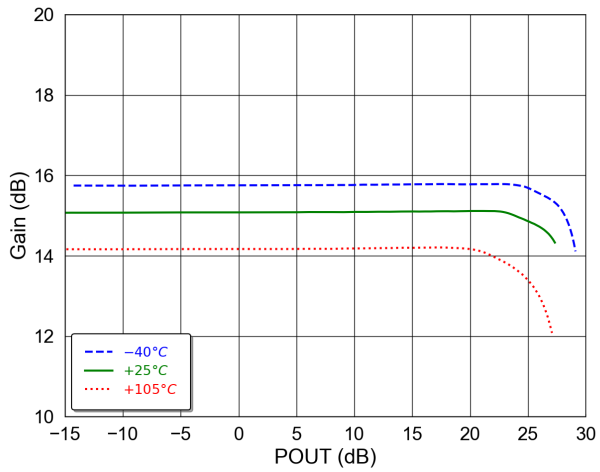
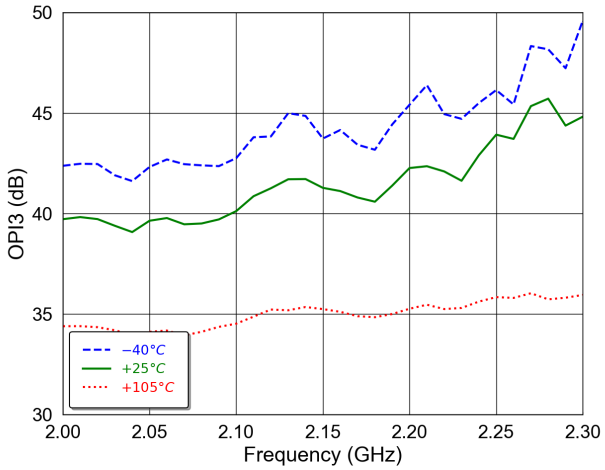
Typical Performance Curves, 2140 MHz Configuration

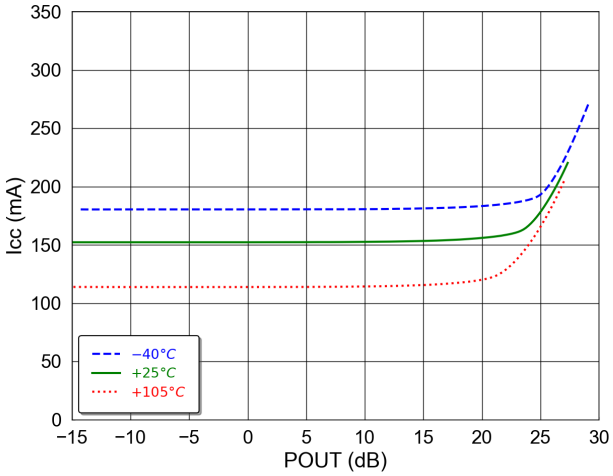
P1dB



Output IP3 —1 MHz tone spacing, -6dBm Pin



Current vs P_{OUT}



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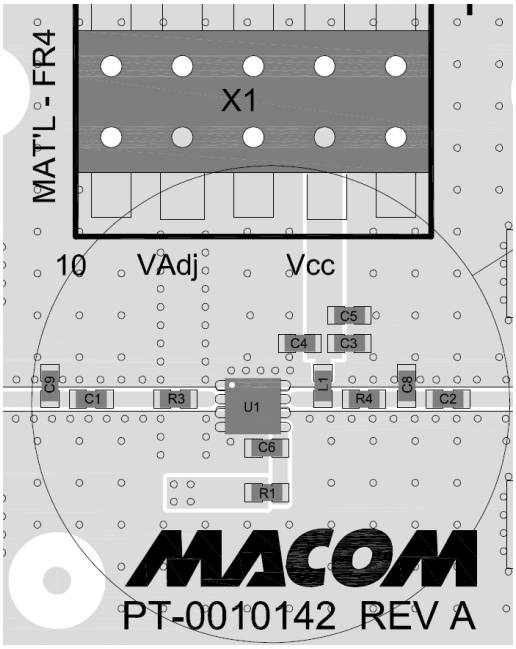
Recommended PCB Layout

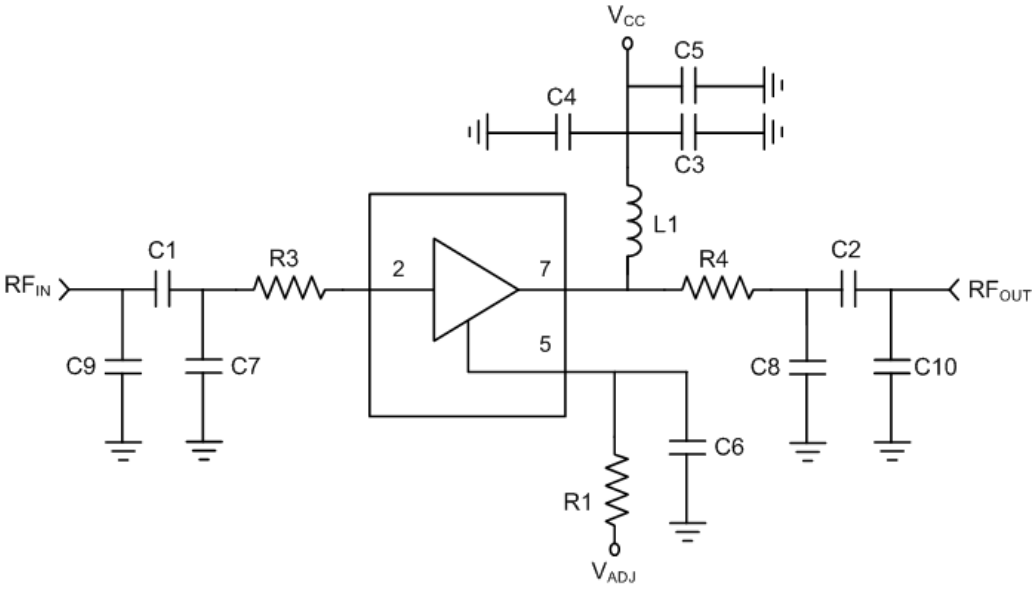


Sample Board Parts List for 2140 MHz

Component	Value	Package
C1, C2, R1	0 Ω	0402
C3, C4	47 pF	0402
C5, C6	100 nF	0402
C7, C10	DNP	0402
C8	2.4p F	0402
C9	2.7 pF	0402
R3, R4	12 pF	0402
L1	7.5 nH	0402

The recommended PCB layout includes place holders for additional components that are not necessary for typical applications but may be useful for extending performance to higher frequencies or optimizing a particular performance parameter at different bias conditions.

Sample Board Schematic



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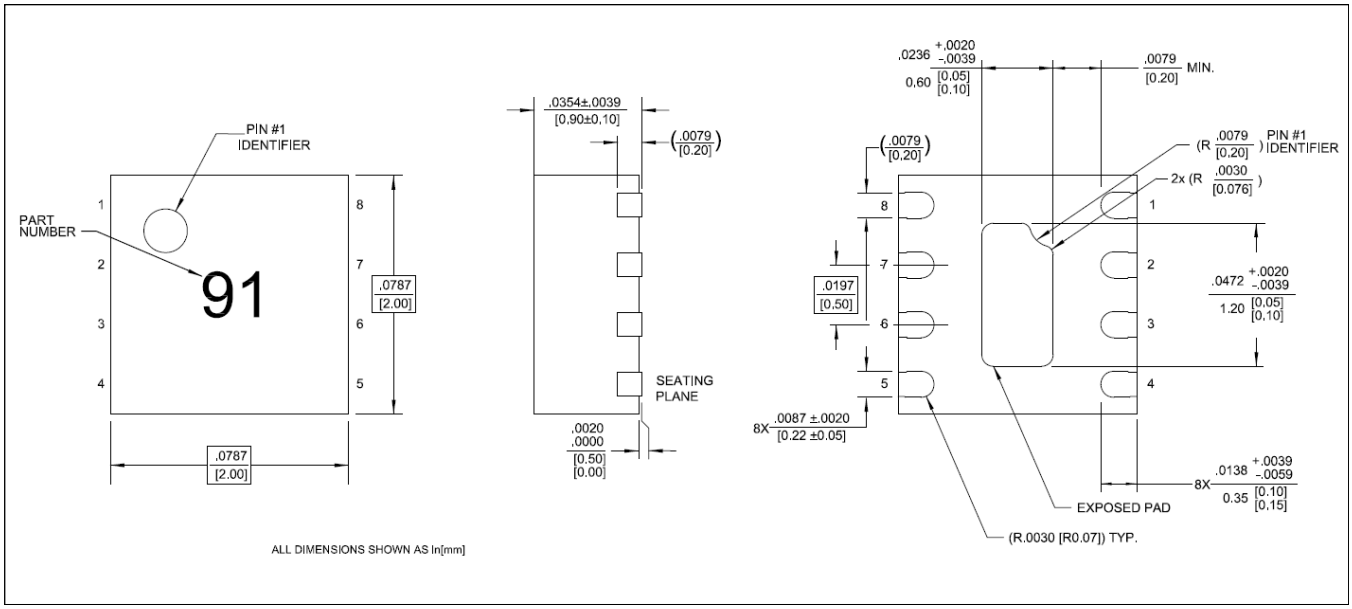
Lead-Free 2 mm 8-Lead PDFN†



† 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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