MAAM-010651

Amplifier, Buffer
37 - 40 GHz

Rev. V4

Features

- High Gain: 21 dB
- Output P1dB: 20 dBm
- Variable Gain with Adjustable Bias
- Lead-Free 3 mm QFN Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant

Description

The MAAM-010651 is a 3-stage, buffer amplifier with a 20 dBm output P1dB. The surface mount 3 mm QFN package allows easy assembly. This amplifier is fully matched to 50 ohms on both the input and output. It is designed for use as an LO buffer amplifier stage or as a driver amplifier in transmit chains and is ideally suited for 38 GHz band point-to-point radios.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using an efficient PHEMT process.

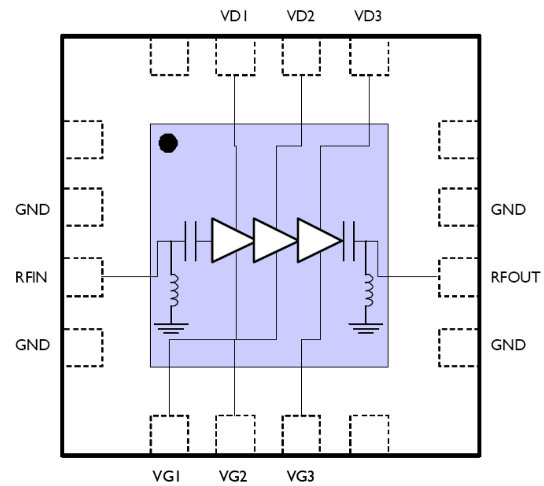
The MTTF is >1,000,000 hours at a 150°C junction temperature.

Ordering Information[1]

Part Number	Package
MAAM-010651-000000	Bulk Packaging
MAAM-010651-TR0500	500 Piece Reel
MAAM-010651-TR1000	1000 Piece Reel
MAAM-010651-000SMB	Sample Evaluation Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration[2,3]

Pin No.	Function	Pin No.	Function
1	No Connection	9	Ground
2	Ground	10	RF_{OUT}
3	RF_{IN}	11	Ground
4	Ground	12	No Connection
5	V_G1	13	V_D3
6	V_G2	14	V_D2
7	V_G3	15	V_D1
8	No Connection	16	No Connection
		Paddle [3]	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.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU

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Electrical Specifications:
Freq. 37 - 40 GHz, T_B = 30°C[4], V_{DD} = 4 V, I_{DQ} = 250 mA[5], P_{in} = -14 dBm, Z_0 = 50 Ω

Parameter	Units	Min.	Typ.	Max.
Input Return Loss	dB	—	7	—
Output Return Loss	dB	—	10	—
Small Signal Gain	dB	17	21	24.5
Reverse Isolation (S12)	dB	—	40	—
Output P1dB	dBm	—	20	—
Output IP3 (@ +4 dBm SCL)	dBm	27	30.5	—
P_{SAT}	dBm	19.5	22	—

4. T_B = MMIC Base Temperature
5. Adjust V_{GG} between -1.0 and -0.1 V to achieve specified I_{DQ}.

Maximum Operating Ratings[6,7]

Parameter	Absolute Maximum
Input Power	+20 dBm
Drain Supply Voltage	+4.3 V
Gate Supply Voltage	-1.5 to 0 V
Operating Temperature	-40°C to +85°C
Junction Temperature	+150 °C
Storage Temperature	-55°C to +150°C
ESD Machine Model	Class A
ESD Human Body Model	Class 1A
MSL	MSL3

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

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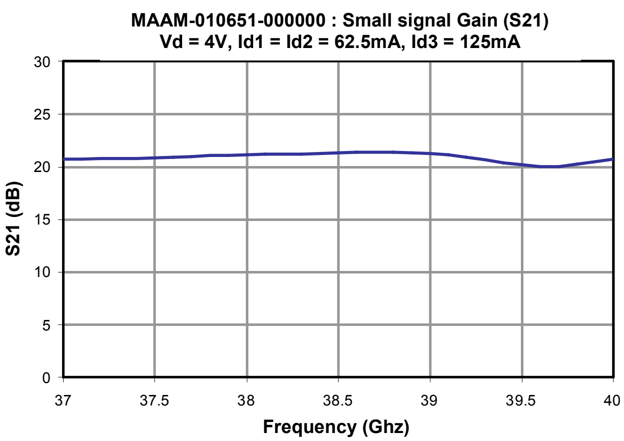
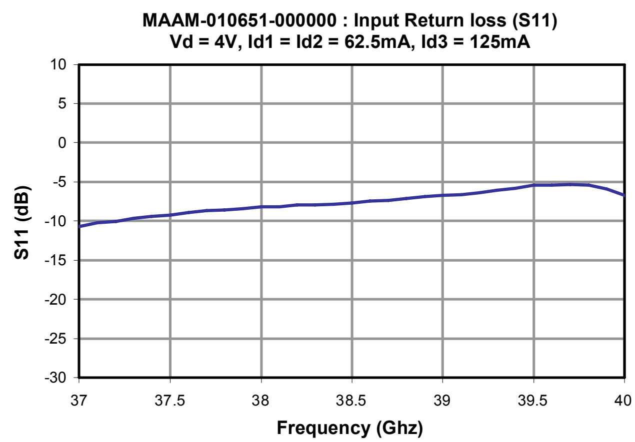
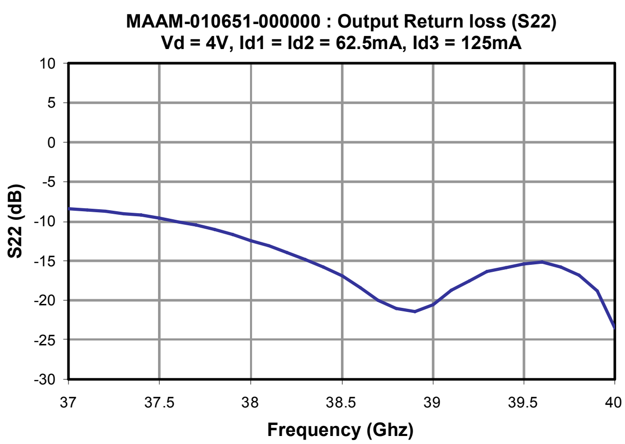
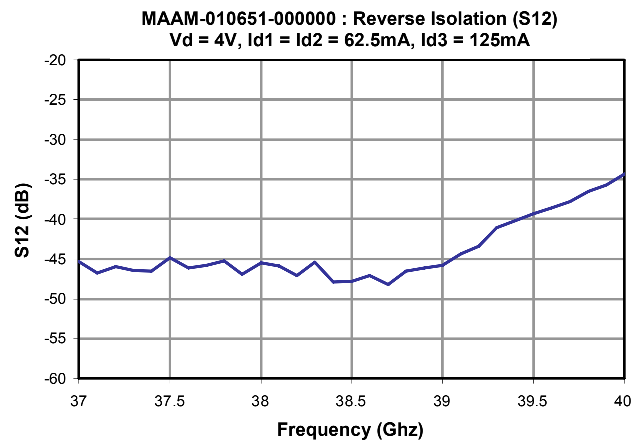
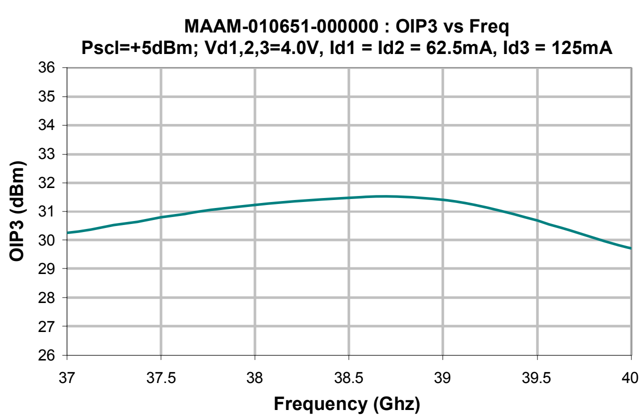
Typical Performance Curves

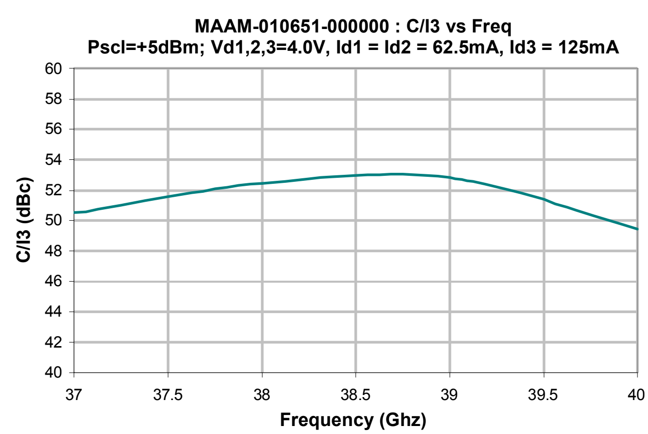












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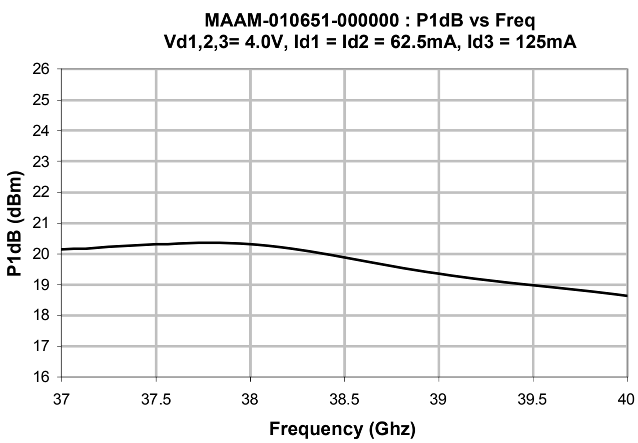
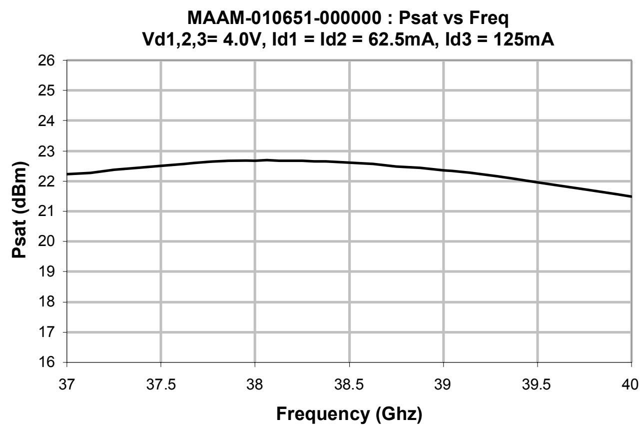
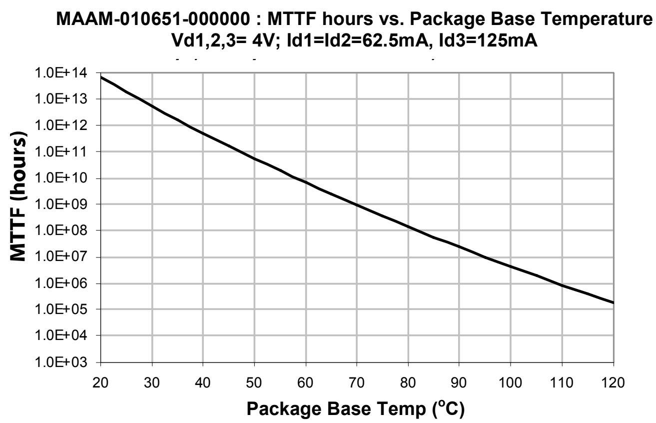
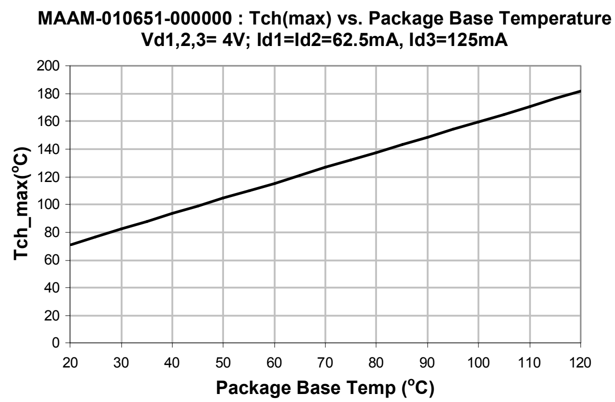
Typical Performance Curves (cont.)

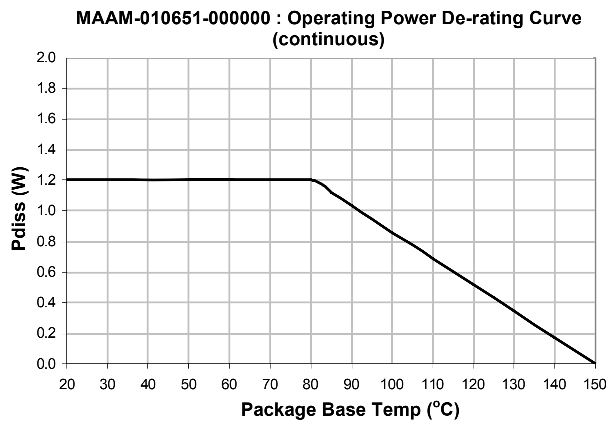




MTTF







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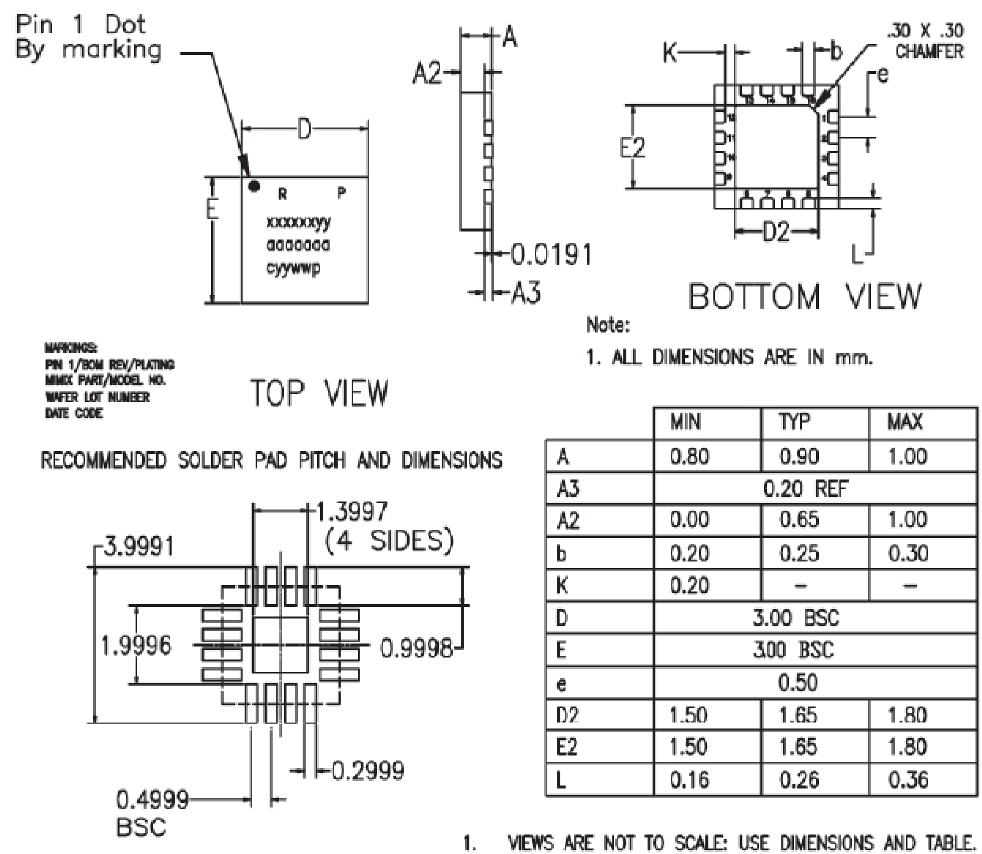
App Note [1] Biasing - It is recommended to bias the amplifier with V_D = 4 V and I_{D_TOTAL} = 250 mA. It is also recommended to use active biasing to keep the currents constant as the RF power and temperature vary; this gives the most reproducible results. Depending on the supply voltage available and the power dissipation constraints, the bias circuit may be a single transistor or a low power operational amplifier, with a low value resistor in series with the drain supply used to sense the current. The gate of the pHEMT is controlled to maintain correct drain current and thus drain voltage. The typical gate voltage needed to do this is -0.3 V. Typically the gate is protected with Silicon diodes to limit the applied voltage. Also, make sure to sequence the applied voltage to ensure negative gate bias is available before applying the positive drain supply.

App Note [2] Bias Arrangement - Each DC pin (V_D and V_G) needs to have DC bypass capacitance (100 pF/10 nF/1 µF) as close to the package as possible.

Lead-Free 3 mm QFN Package



Note:
1. ALL DIMENSIONS ARE IN mm.

	MIN	TYP	MAX
A	0.80	0.90	1.00
A3	0.20 REF		
A2	0.00	0.65	1.00
b	0.20	0.25	0.30
K	0.20	–	–
D	3.00 BSC		
E	3.00 BSC		
e	0.50		
D2	1.50	1.65	1.80
E2	1.50	1.65	1.80
L	0.16	0.26	0.36

1. VIEWS ARE NOT TO SCALE: USE DIMENSIONS AND TABLE.

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