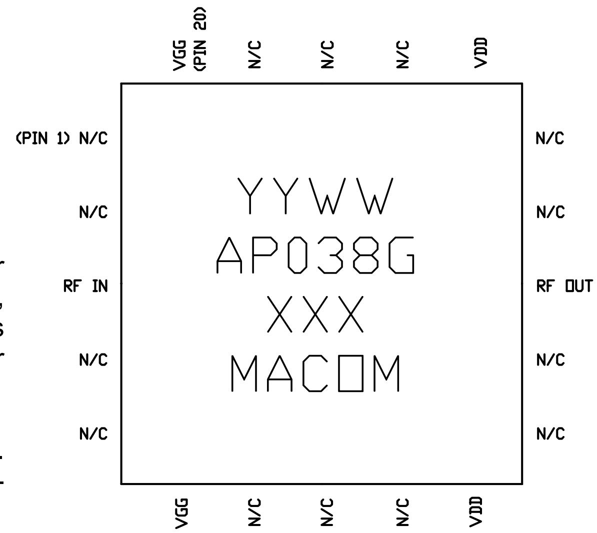
Tyco Electronics

Amplifier, Power, 1.2W
8.5—10.5 GHz

M/A-COM Products
RoHS Compliant

Features

- ♦ **1.2 Watt Saturated Output Power Level**
- ♦ **Variable Drain Voltage (6-8V) Operation**
- ♦ **MSAG™ Process**
- ♦ **5x5 mm 20 Lead MLP Package**



Description

The MAAP-000038-PKG003 is a packaged, 3-stage, 1.2 W power amplifier with on-chip bias networks in a 20 lead MLP package, allowing easy assembly. This product is fully matched to 50 ohms on both the input and output. It can be used as a power amplifier stage or as a driver stage in high power applications.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using M/A-COM's GaAs Multifunction Self-Aligned Gate (MSAG) Process.

The 5 mm PQFN package has a lead-free lead finish that is RoHS compliant and compatible with a 260ºC reflow temperature. The package also features low lead inductance and an excellent thermal path. The MTTF is 1,000,000 hours at 170ºC.

Primary Applications

- ♦ Weather Radar
- ♦ Airborne Radar

Ordering Information

Description	Die	Ceramic Pkg	Tape & Reel (500)	Tape & Reel (1000)	Plastic Pkg Sample Brd
Part Number	MAAPGM0038-DIE	MAAPGM0038	MAAP-000038-TR0500	MAAP-000038-TR1000	MAAP-000038-SMB003

Electrical Characteristics: $T_C = 40°C^1$, $Z_0 = 50\ \Omega$, $V_{DD} = 8V$, $I_{DQ} \approx 710mA^2$, $P_{in} = 16dBm$, $R_G \approx 30\Omega$

Parameter	Symbol	Typical*	Units
Bandwidth	f	8.5-10.5	GHz
Output Power	POUT	31.5	dBm
Power Added Efficiency	PAE	17	%
1-dB Compression Point	P1dB	30	dBm
Small Signal Gain	G	17	dB
Gate Supply Current	I_{GG}	<10	mA
Drain Supply Current	I_{DD}	0.9	A
Input VSWR	VSWR	2.5:1	—
Output VSWR	VSWR	2:1	—
Output Third Order Intercept	OTOI	41	dBm
3rd Order Intermodulation Distortion, Single Carrier Level = 21 dBm	IM3	42	dBc

1. **T_C = Case Temperature**
2. **Adjust V_{GG} between –2.5 to –1.2V to achieve indicated I_{DQ}.**

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Maximum Ratings[3]

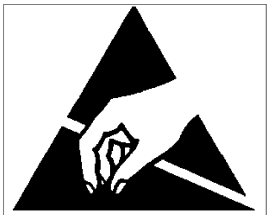
Parameter	Symbol	Absolute Maximum	Units
Input Power	P_{IN}	21.0	dBm
Drain Supply Voltage	V_{DD}	+12.0	V
Gate Supply Voltage	V_{GG}	-3.0	V
Quiescent Drain Current (No RF)	I_{DQ}	1.15	A
Quiescent DC Power Dissipated (No RF)	P_{DISS}	11.5	W
Junction Temperature	T_J	170	°C
Storage Temperature	T_{STG}	-55 to +150	°C

3. Operation beyond these limits may result in permanent damage to the part.

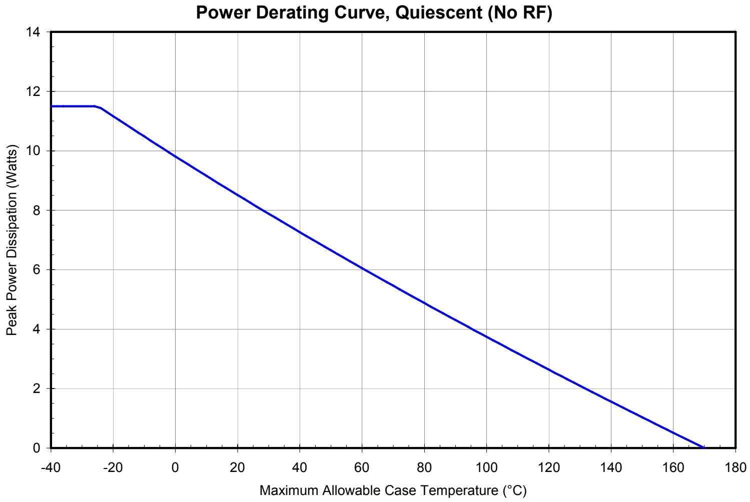
Recommended Operating Conditions[4]

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Supply Voltage	V_{DD}	6.0	8.0	8.0	V
Gate Supply Voltage	V_{GG}	-2.5	-2.0	-1.2	V
Input Power	P_{IN}		16.0	19.0	dBm
Thermal Resistance	Θ_{JC}		16.9		°C/W
Case Temperature	T_C			Note 5	°C

4. Operation outside of these ranges may reduce product reliability.
5. Maximum Case Temperature = 170°C — Θ_{JC}* V_{DD} * I_{DQ}



ATTENTION
Static-Sensitive Devices
Handling Precautions Required



Operating Instructions

This device is static sensitive. Please handle with care.

To operate the device, follow these steps.

1. Apply V_{GG} = -2.7 V, V_{DD}= 0 V.
2. Ramp V_{DD} to desired voltage, typically 8.0 V.
3. Adjust V_{GG} to set I_{DQ}, (approximately @ –2 V).
4. Set RF input.
5. Power down sequence in reverse. Turn V_{GG} off last.

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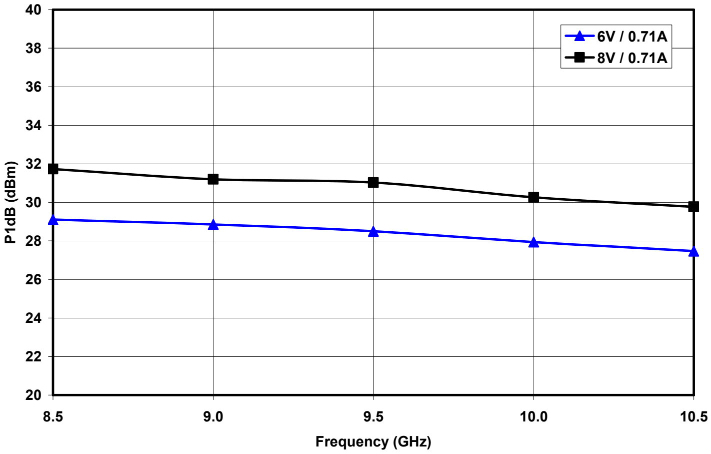

Figure 1. P1dB vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

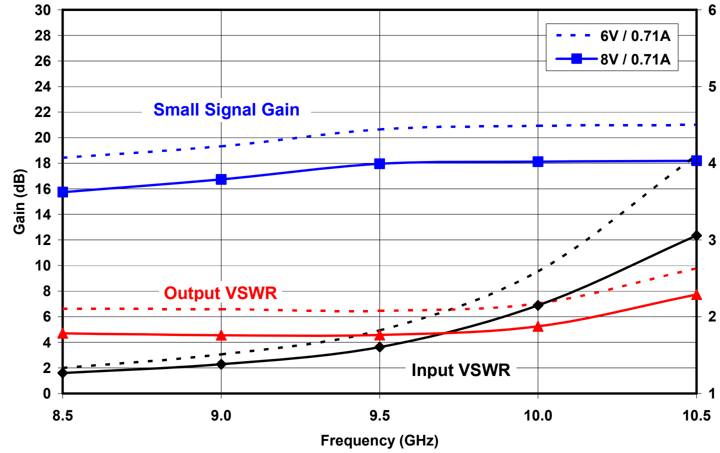

Figure 2. Small Signal Gain and Input & Output VSWR vs. Frequency and Quiescent Bias (Vdd / IDQ)

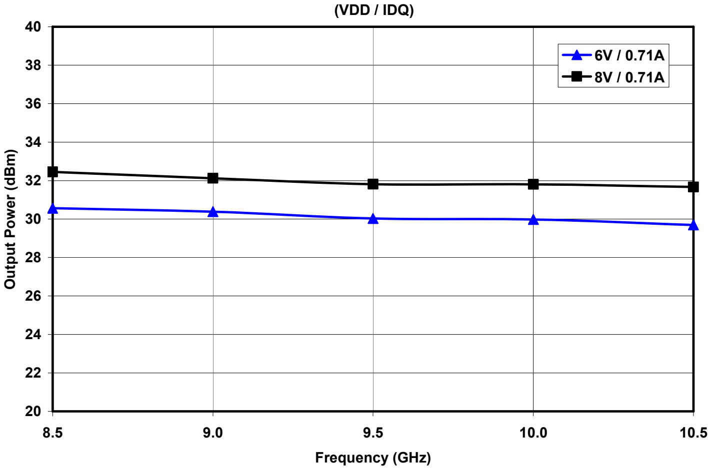

Figure 3. Saturated Output Power vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

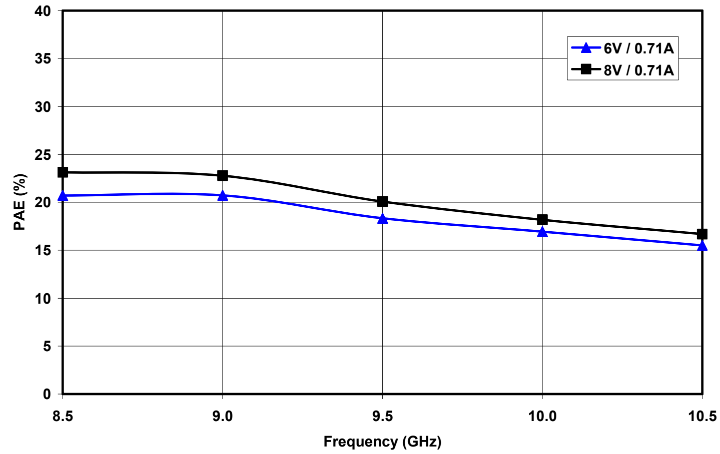

Figure 4. Saturated Power Added Efficiency vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

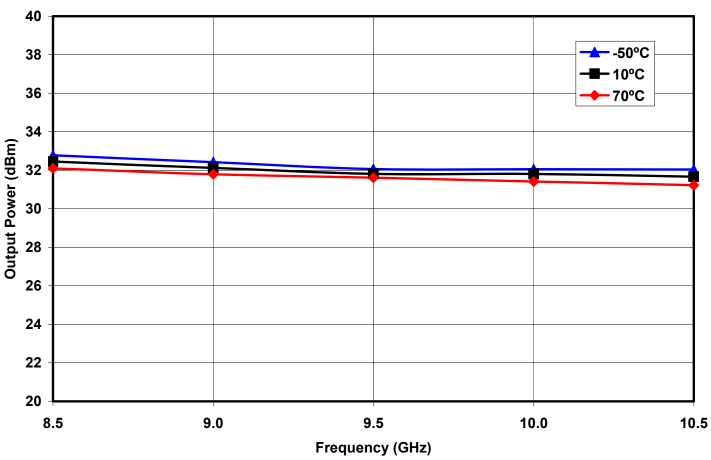

Figure 5. Saturated Output Power vs. Frequency and Case Temperature at VD = 8V and IDQ = 0.71A

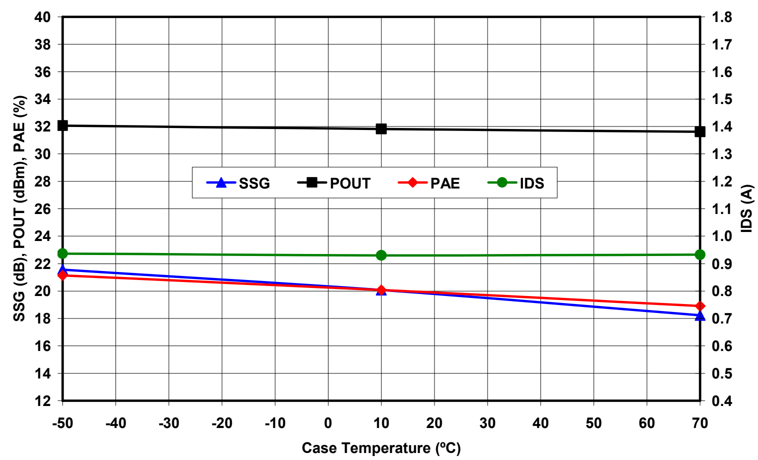

Figure 6. Small Signal Gain & Saturated Output Power, Power Added Efficiency and Drain Current vs. Case Temperature at 9.5GHz, VD = 8V, and IDQ = 0.71A

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6V

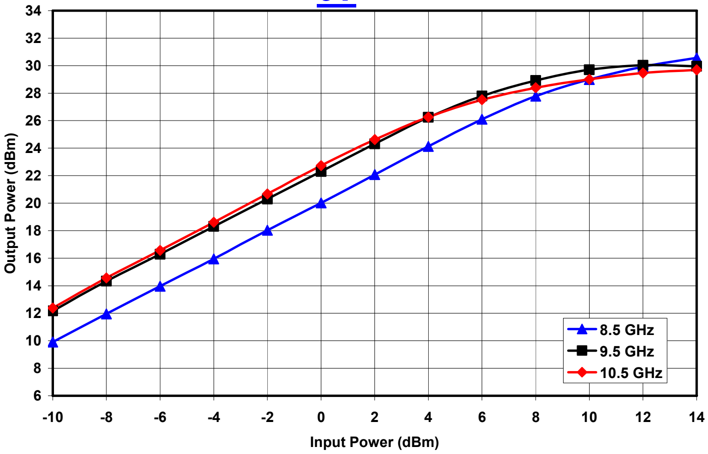

Figure 7. Output Power vs. Input Power and Frequency at VD = 6V and IDQ = 0.71A

8V

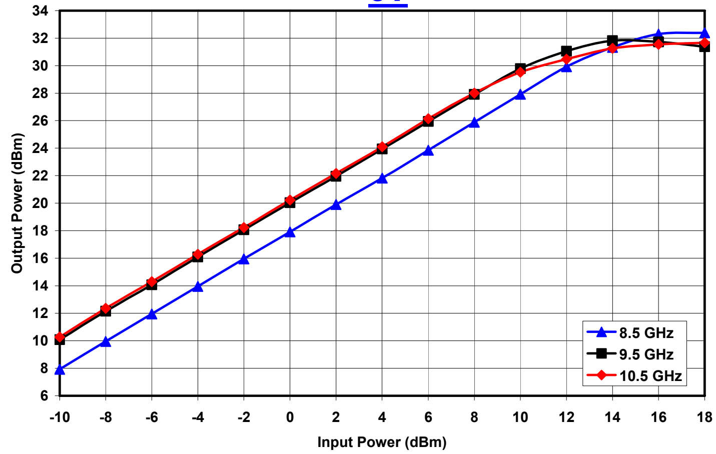

Figure 8. Output Power vs. Input Power and Frequency at VD = 8V and IDQ = 0.71A

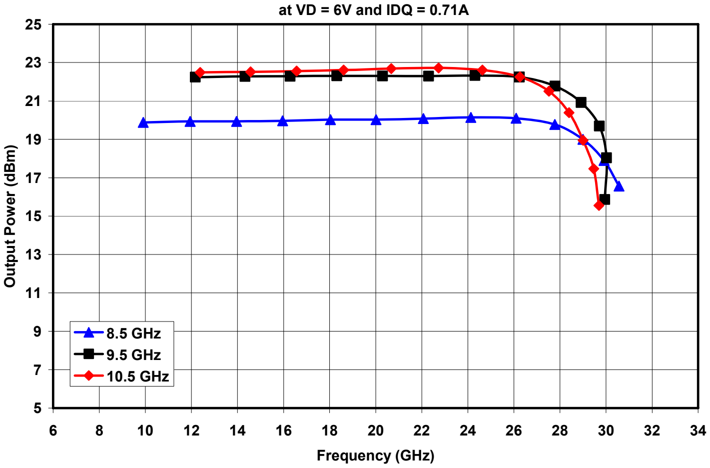

Figure 9. Gain vs. Output Power and Frequency at VD = 6V and IDQ = 0.71A

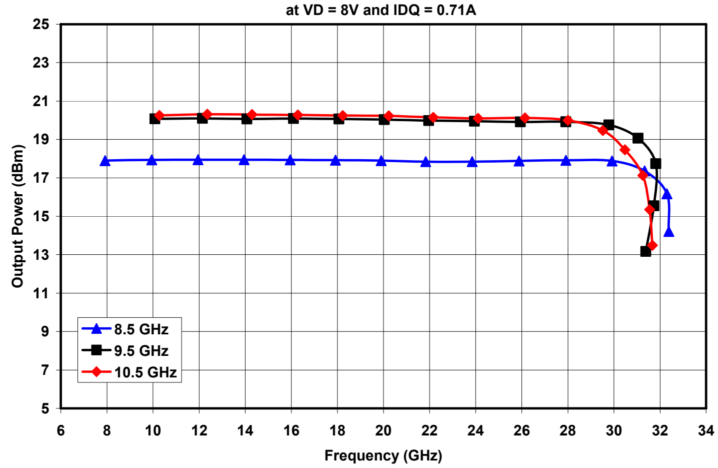

Figure 10. Gain vs. Output Power and Frequency at VD = 8V and IDQ = 0.71A

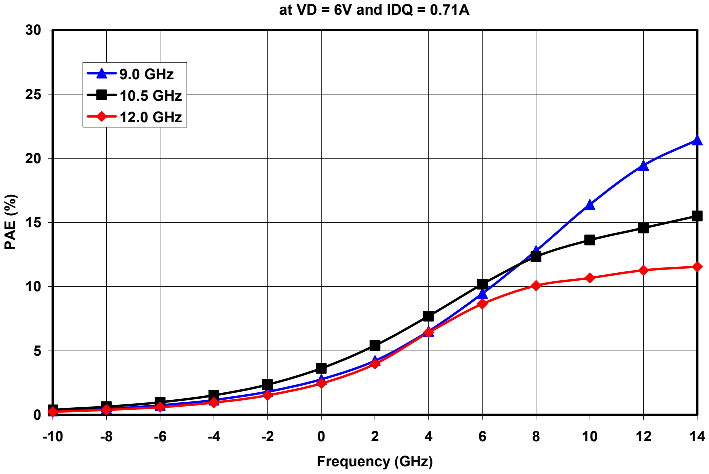

Figure 11. Power Added Efficiency vs. Input Power and Frequency at VD = 6V and IDQ = 0.71A

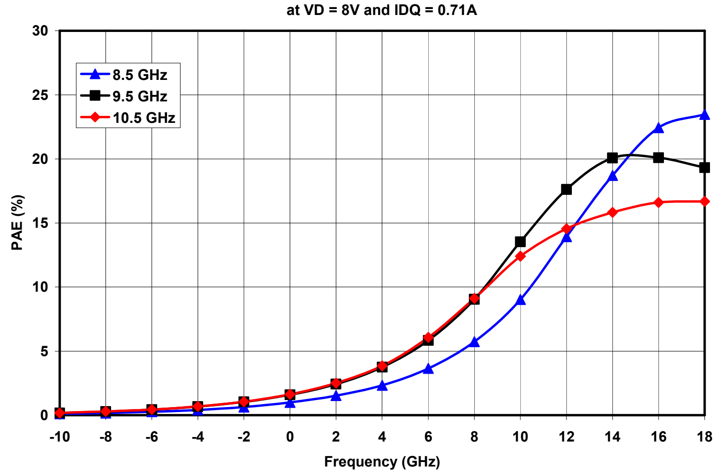

Figure 12. Power Added Efficiency vs. Input Power and Frequency at VD = 8V and IDQ = 0.71A

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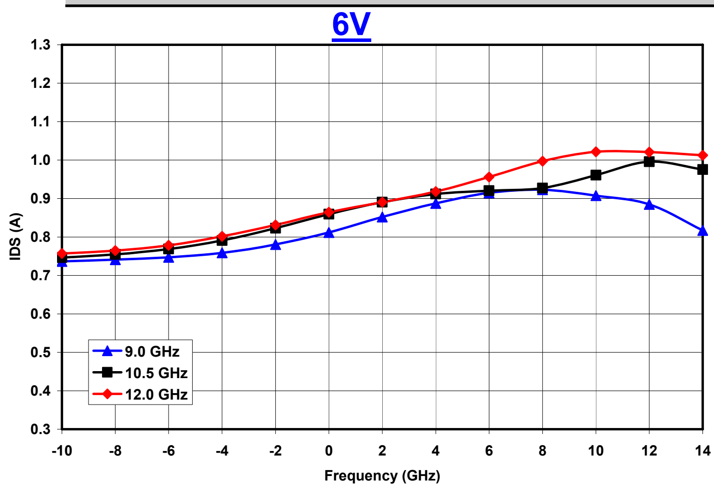

Figure 13. Drain Current vs. Input Power and Frequency at VD = 6V and IDQ = 0.71A

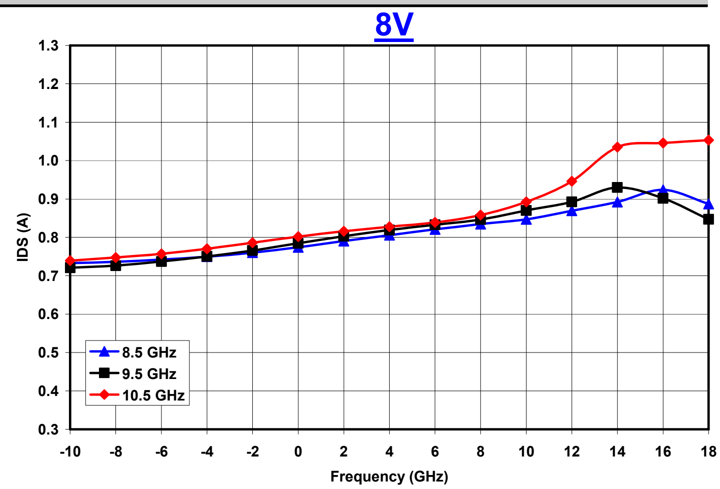

Figure 14. Drain Current vs. Input Power and Frequency at VD = 8V and IDQ = 0.71A

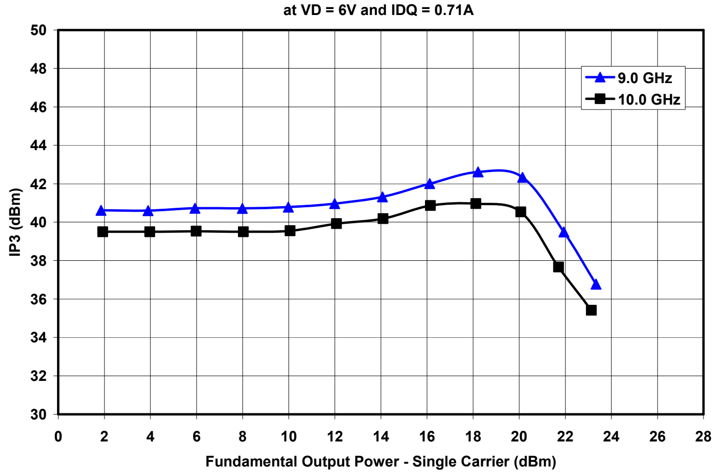

Figure 15. Third Order Intercept vs. Output Power and Frequency at VD = 6V and IDQ = 0.71A

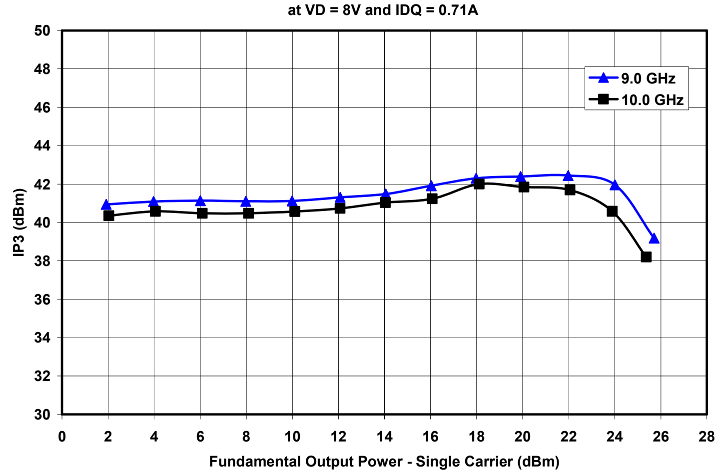

Figure 16. Third Order Intercept vs. Output Power and Frequency at VD = 8V and IDQ = 0.71A

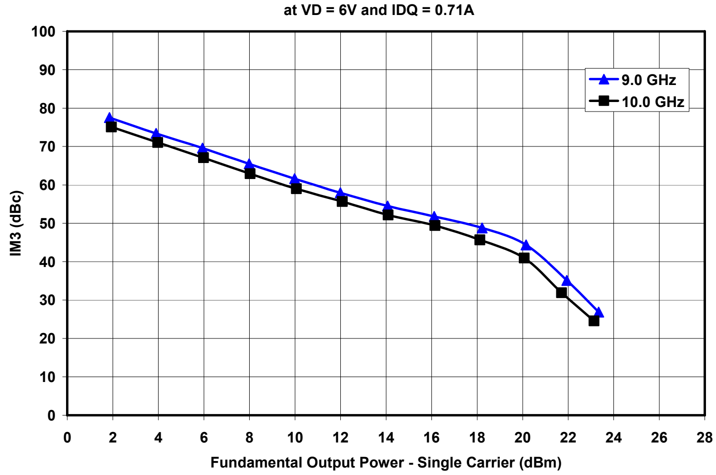

Figure 17. Third Order Intermod vs. Output Power and Frequency at VD = 6V and IDQ = 0.71A

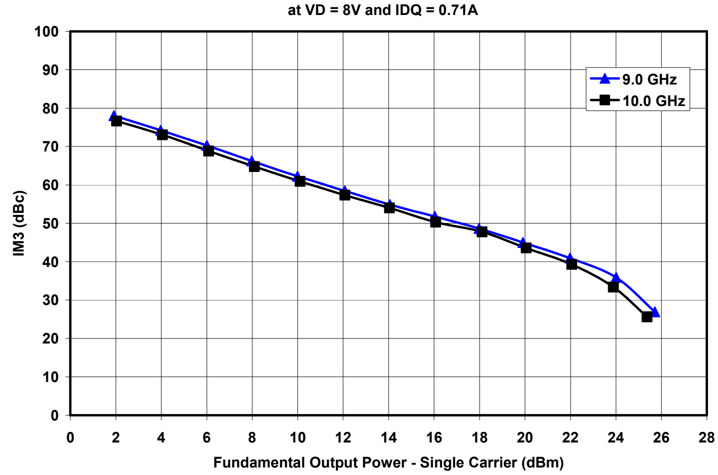

Figure 18. Third Order Intermod vs. Output Power and Frequency at VD = 8V and IDQ = 0.71A

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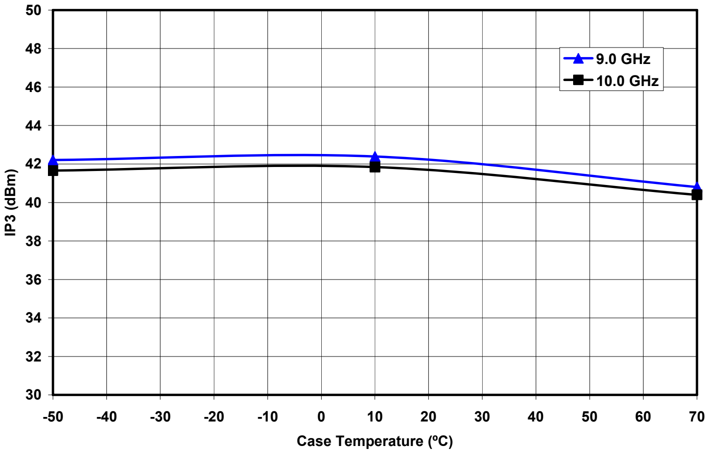

Figure 19. Third Order Intercept vs. Case Temperature and Frequency at Single Carrier Output Power Level = 20dBm, VD = 8V and IDQ = 0.71A

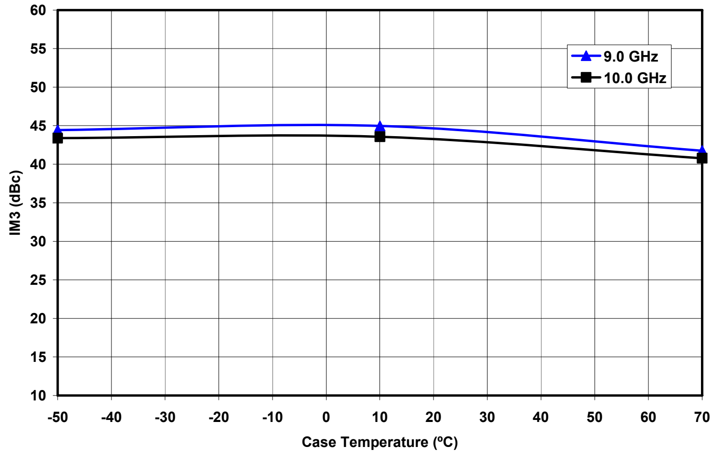

Figure 20. Third Order Intermod vs. Case Temperature and Frequency at Single Carrier Output Power Level = 20 dBm, VD = 8V and IDQ = 0.71A

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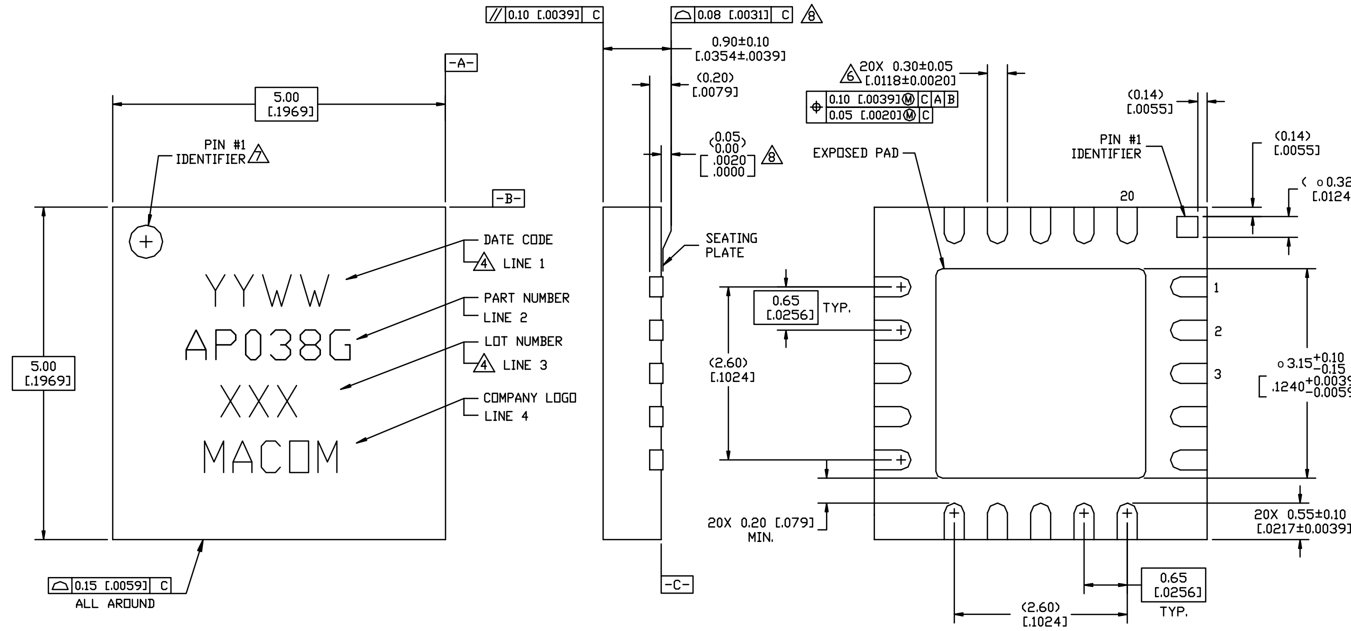

Figure 21. 5x5 mm 20-Lead MLP.

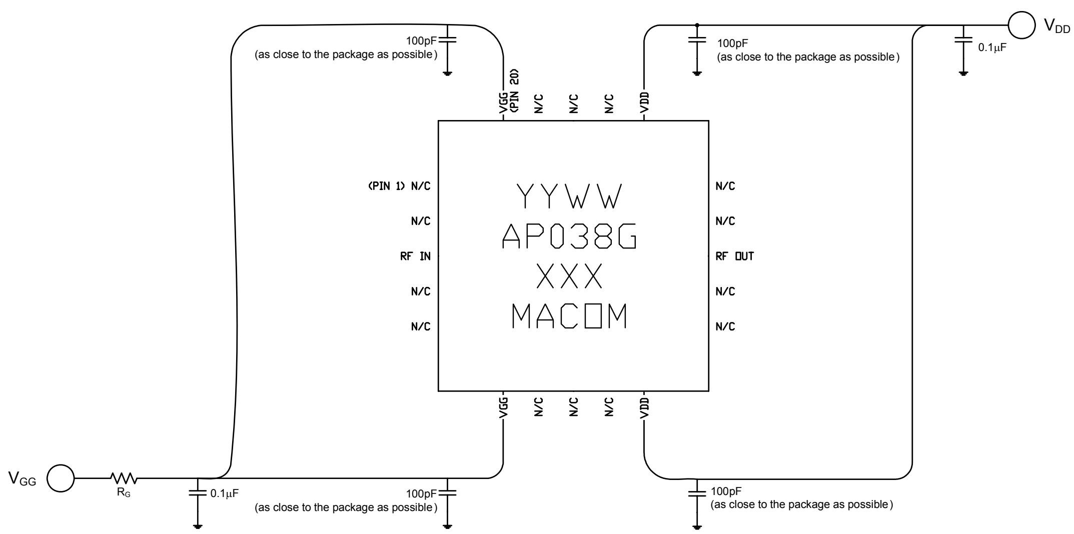

Figure 22. Recommended Bias Configuration.

Note: The exposed pad centered on the package bottom must be connected to RF and dc ground for proper electrical and thermal operation.

Refer to M/A-COM Application Note ***Surface Mounting Instructions for PQFN Packages #S2083**** for assembly guidelines.

Additional Precaution: All parts must receive a bake-out of 125ºC for 24 hours prior to any solder reflow operation.

*Application Notes can be found by going to the Site Search Page of M/A-COM's web page (http://www.macom.com/search/search.jsp) and searching for the required Application Note.

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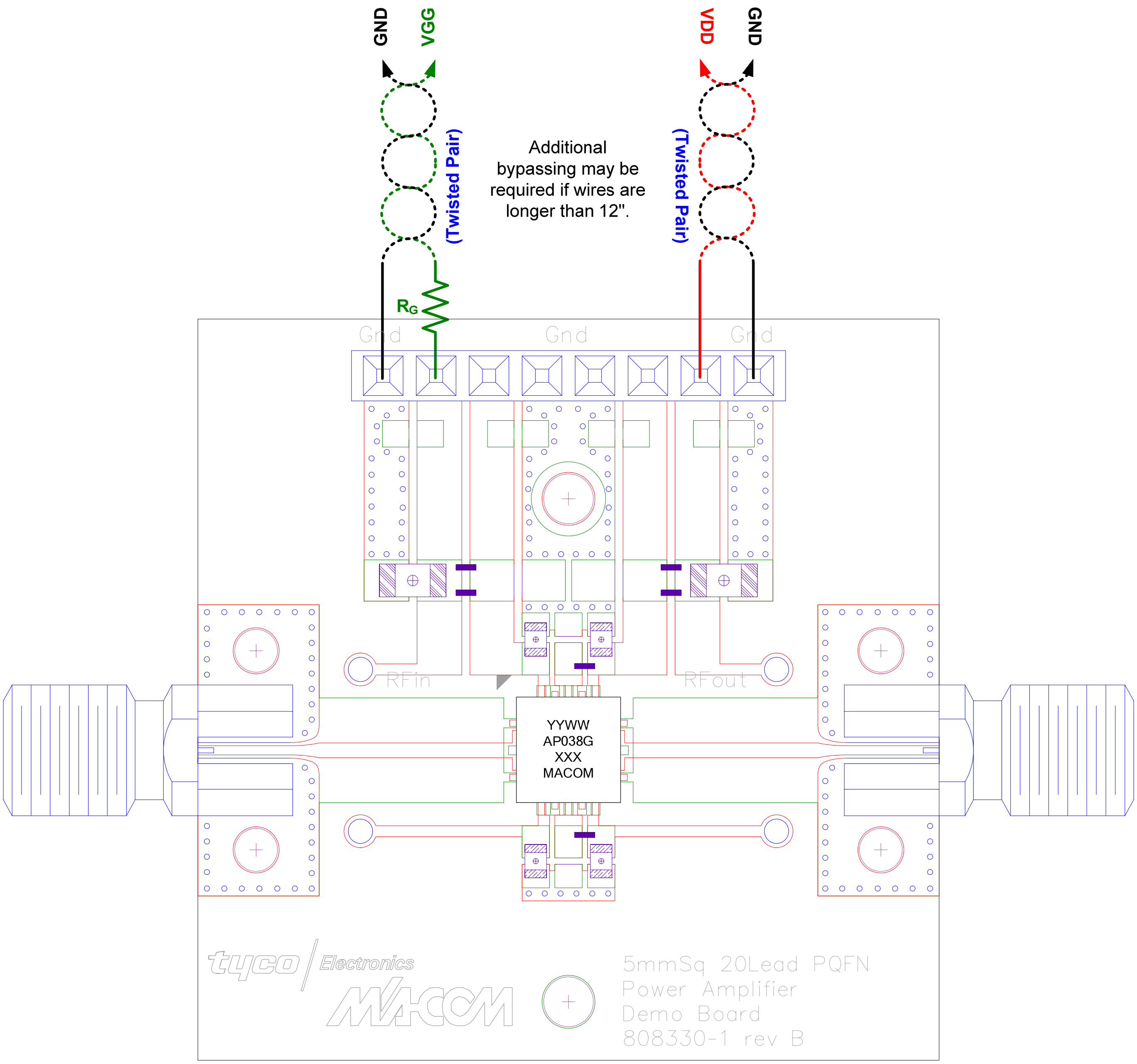

Figure 23. Demonstration Board PN MAAP-000038-PKG-SMB (available upon request).

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