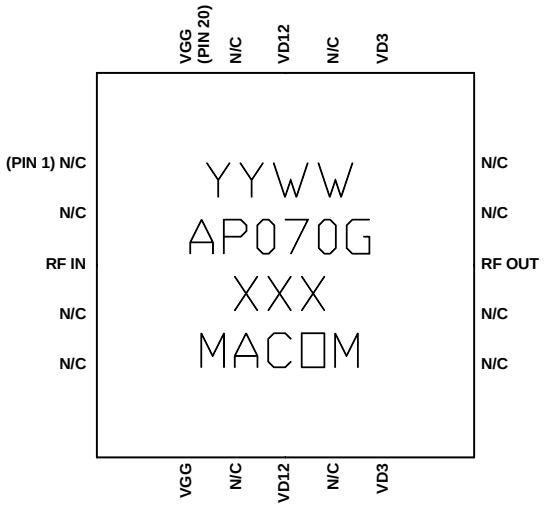
Tyco Electronics

Amplifier, Power, 1.6W 10.0—13.25 GHZ

M/A-COM Products
RoHS Compliant

Features

- **1.6 Watt Saturated Output Power Level**
- **Variable Drain Voltage (6-8V) Operation**
- **MSAG™ Process**



Description

The MAAP-000070-PKG003 is a 4-stage 1.6 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 finish of leads that are RoHS compliant and is compatible with a 260°C 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

- **Point-to-Point Radio**
  - ◊ **10, 11, and 13 GHz Bands**

Ordering Information

Description	Die	Tape & Reel (500)	Tape & Reel (1000)	Package Sample Board
Part Number	MAAPGM0070-DIE	MAAP-000070-TR0500	MAAP-000070-TR1000	MAAP-000070-SMB003

Electrical Characteristics: T_C = 40°C[1], Z_0 = 50 Ω, V_{DD} = 8V, I_{DQ} = 0.88A[2], P_{in} = 7 dBm, R_G=20 Ω

Parameter	Symbol	Typical	Units
Bandwidth	f	10.0-13.25	GHz
Output Power	P_{OUT}	32.5	dBm
1-dB Compression Point	P1dB	32	dBm
Small Signal Gain	G	29	dB
Input VSWR	VSWR	2.0:1	
Output VSWR	VSWR	2.5:1	
Gate Current	I_{GG}	<15	mA
Drain Current	I_{DD}	1400	mA
Output Third Order Intercept	OTOI	41	dBm
3rd Order Intermodulation Distortion, Single Carrier Level = 22 dBm	IM3	39	dBc

1. **T_C = Case Temperature**
2. **Adjust V_{GG} between –2.5 and –1.2V to achieve specified Idq.**

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Maximum Operating Conditions [3]

Parameter	Symbol	Absolute Maximum	Units
Input Power	P_{IN}	12	dBm
Drain Supply Voltage	V_{DD}	+12.0	V
Gate Supply Voltage	V_{GG}	-3.0	V
Quiescent Drain Current (No RF)	I_{DQ}	1.4	A
Quiescent DC Power Dissipated (No RF)	P_{DISS}	11.2	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 Voltage	V_{DD}	6.0	8.0	8.0	V
Gate Voltage	V_{GG}	-2.5	-2.0	-1.2	V
Input Power	P_{IN}		7	10	dBm
Thermal Resistance	Θ_{JC}		10.8		°C/W
Case Temperature	T_C			Note 5	°C

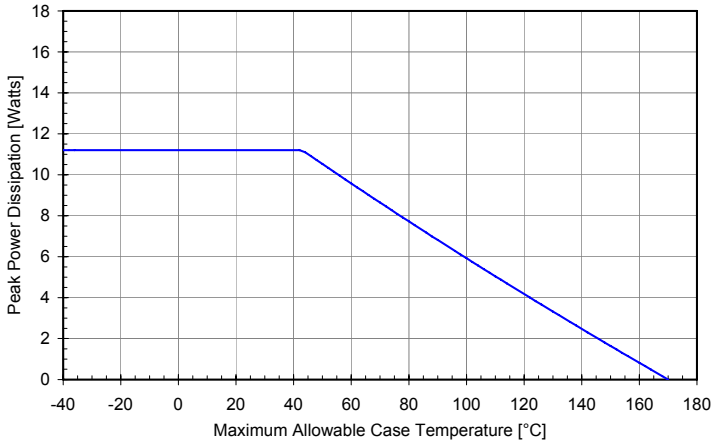
4. Operation outside of these ranges may reduce product reliability.
5. Case Temperature = 170°C — Θ_{JC}* V_{DD} * I_{DQ}

Operating Instructions

This device is static sensitive. Please handle with care. To operate the device, follow these steps.

1. Apply V_{GG} = -2 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.

Power Derating Curve, Quiescent (No RF)



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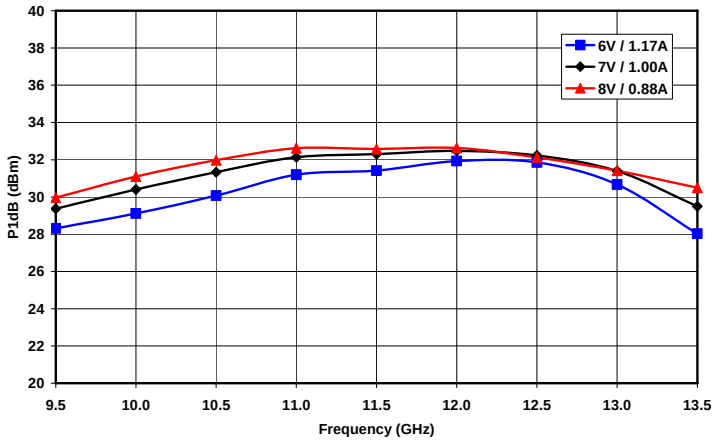

Figure 1. P1dB vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

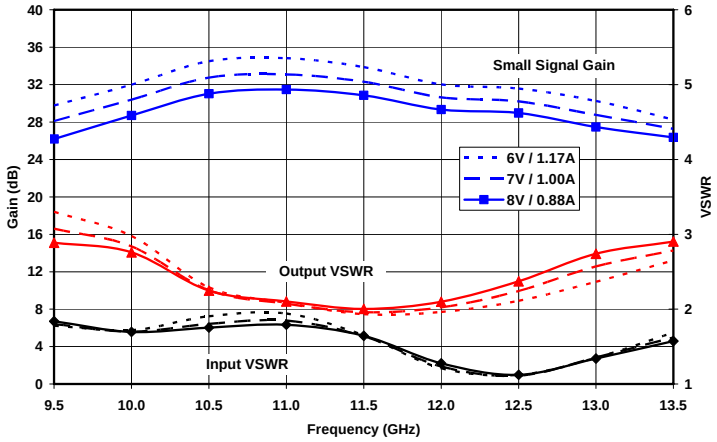

Figure 2. Small Signal Gain and Input & Output VSWR vs. Frequency and Quiescent Drain Bias (VDD / IDQ)

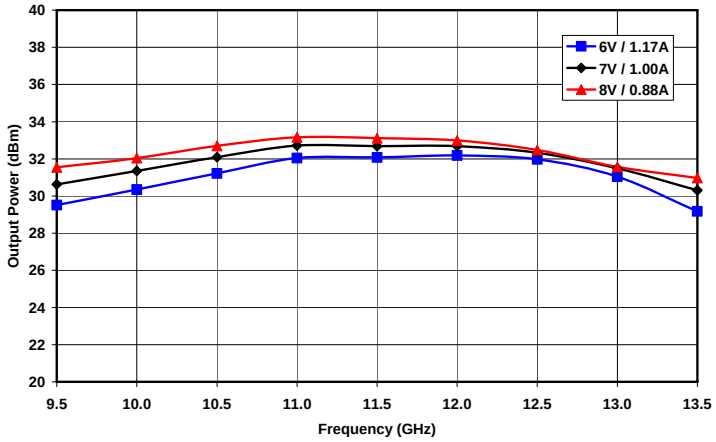

Figure 3. Saturated Output Power vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

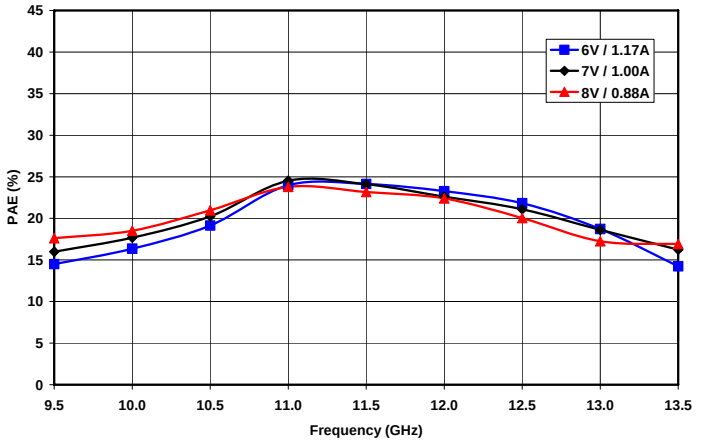

Figure 4. Saturated Power Added Efficiency vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

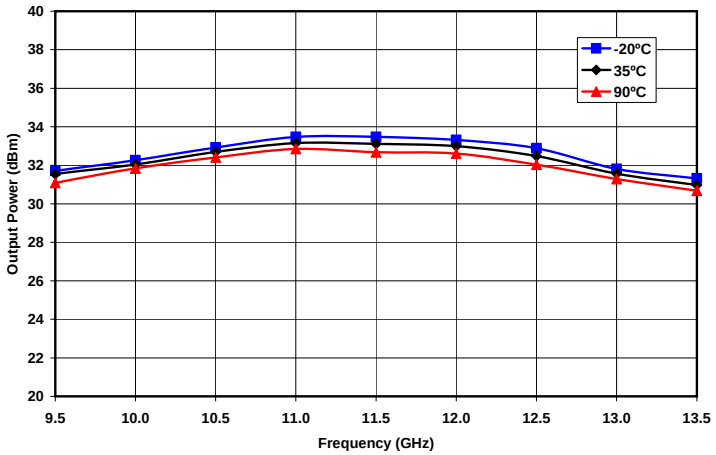

Figure 5. Saturated Output Power vs. Frequency and Case Temperature at VD = 8V and IDQ = 0.88A

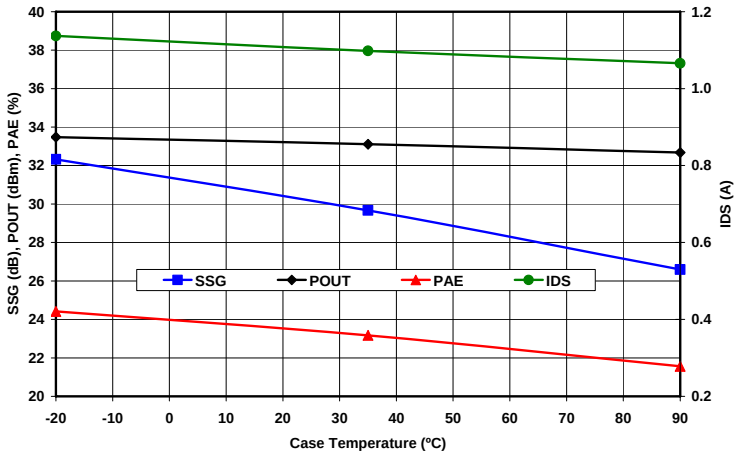

Figure 6. Small Signal Gain & Saturated Output Power, Power Added Efficiency and Drain Current vs. Case Temperature at 11.5 GHZ, VD = 8V, and IDQ = 0.88A

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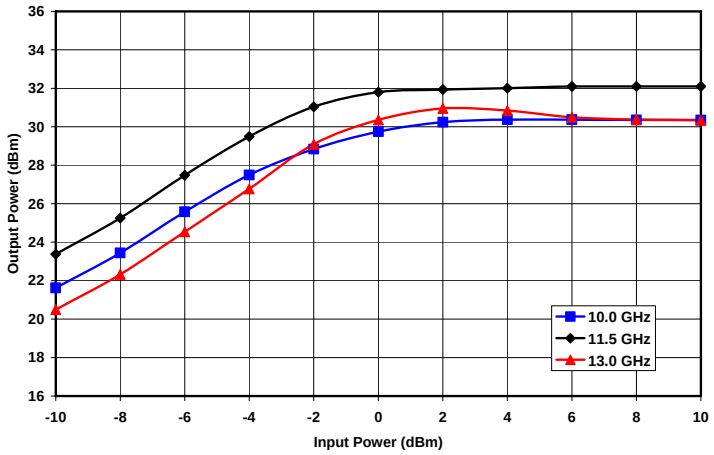

Figure 7. Output Power vs. Input Power and Frequency at VD = 6V and IDQ = 1.17A

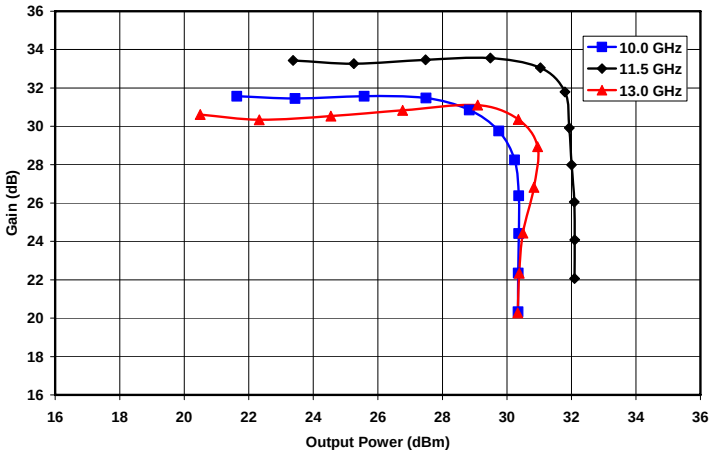

Figure 8. Gain vs. Output Power and Frequency at VD = 6V and IDQ = 1.17A

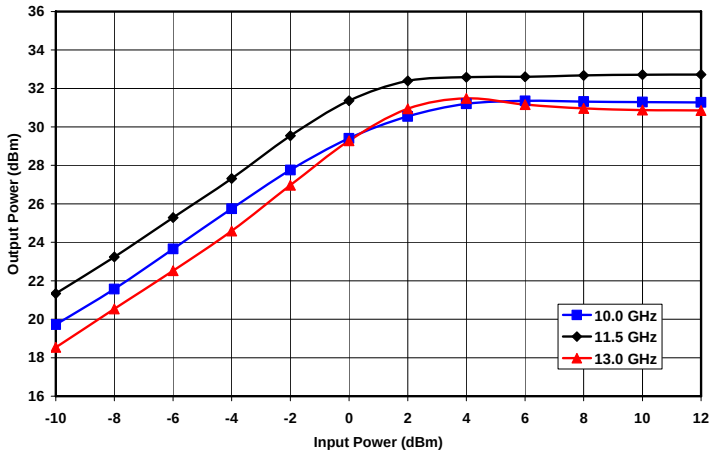

Figure 9. Output Power vs. Input Power and Frequency at VD = 7V and IDQ = 1.00A

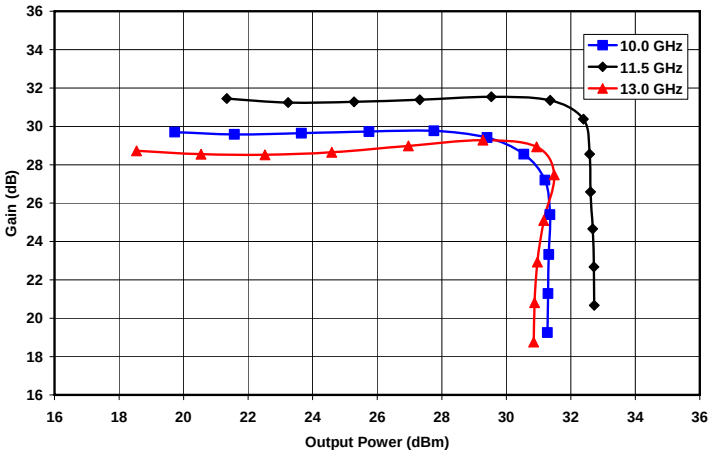

Figure 10. Gain vs. Output Power and Frequency at VD = 7V and IDQ = 1.00A

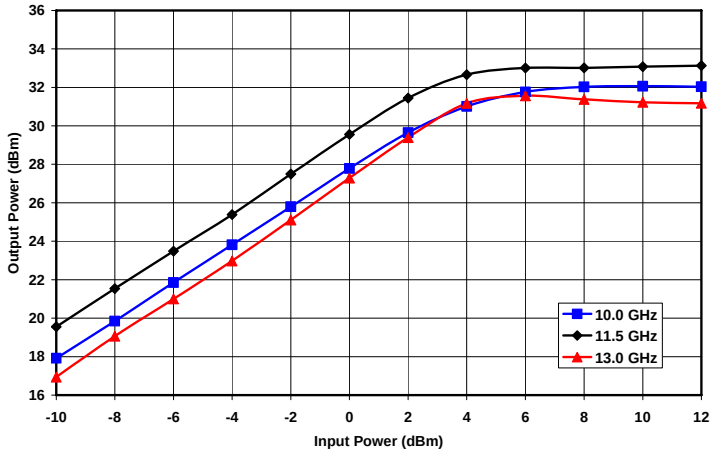

Figure 11. Output Power vs. Input Power and Frequency at VD = 8V and IDQ = 0.88A

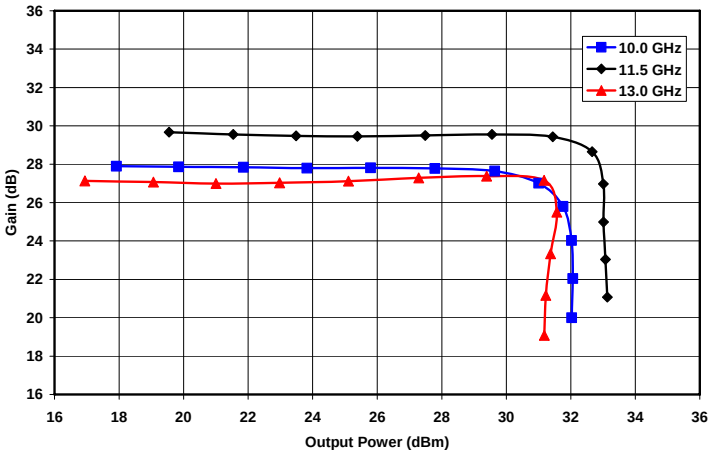

Figure 12. Gain vs. Output Power and Frequency at VD = 8V and IDQ = 0.88A

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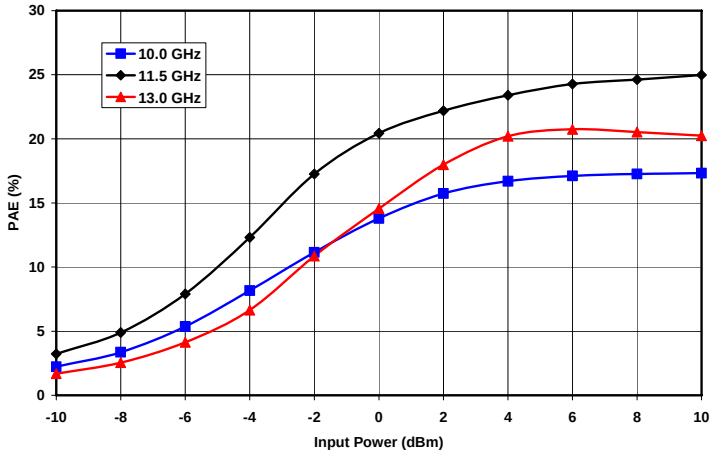

Figure 13. Power Added Efficiency vs. Input Power and Frequency at VD = 6V and IDQ = 1.17A

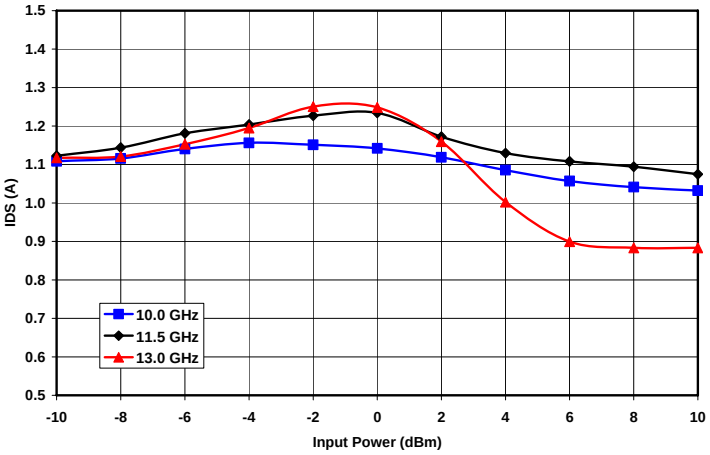

Figure 14. Drain Current vs. Input Power and Frequency at VD = 6V and IDQ = 1.17A

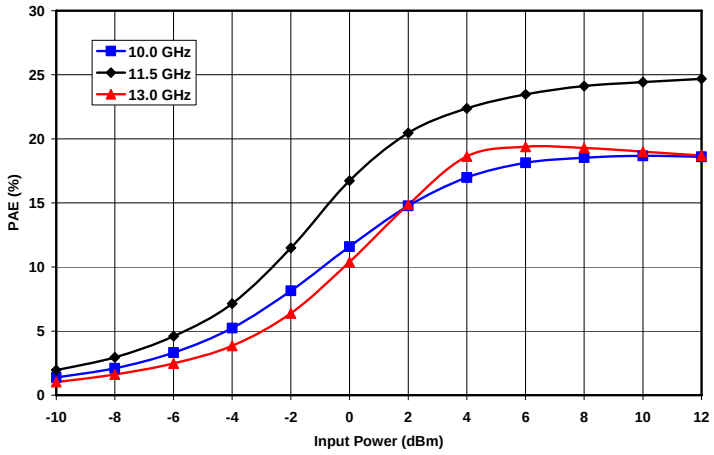

Figure 15. Power Added Efficiency vs. Input Power and Frequency at VD = 7V and IDQ = 1.00A

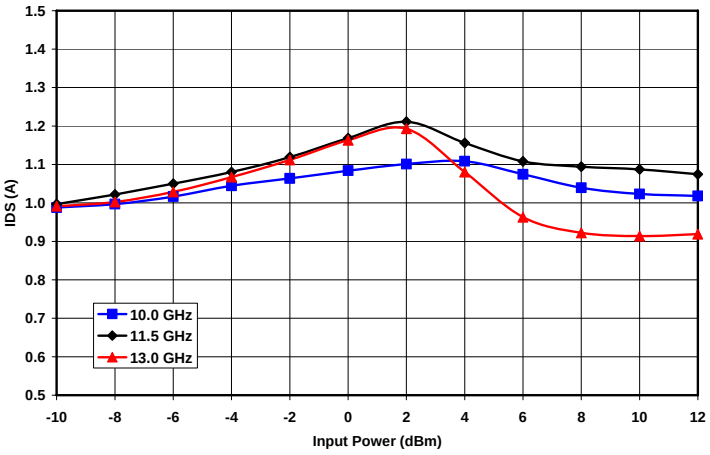

Figure 16. Drain Current vs. Input Power and Frequency at VD = 7V and IDQ = 1.00A

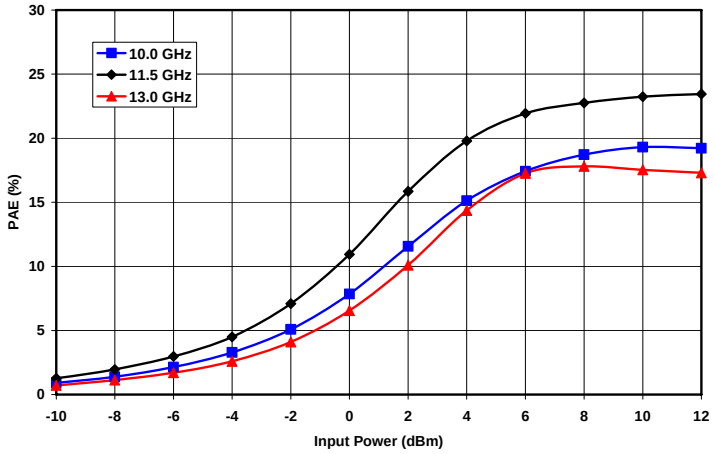

Figure 17. Power Added Efficiency vs. Input Power and Frequency at VD = 8V and IDQ = 0.88A

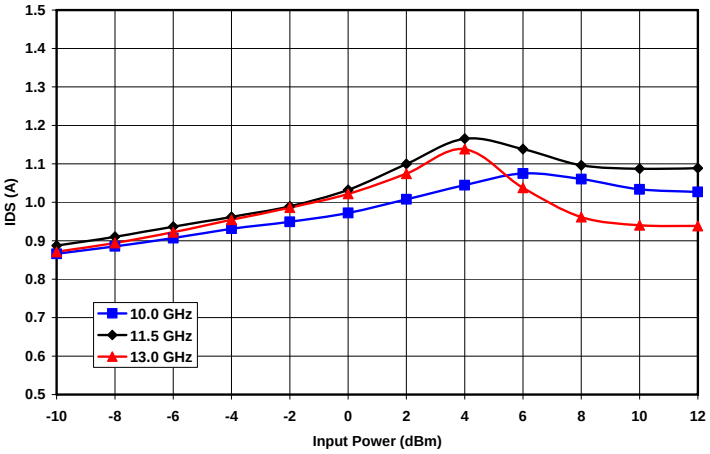

Figure 18. Drain Current vs. Input Power and Frequency at VD = 8V and IDQ = 0.88A

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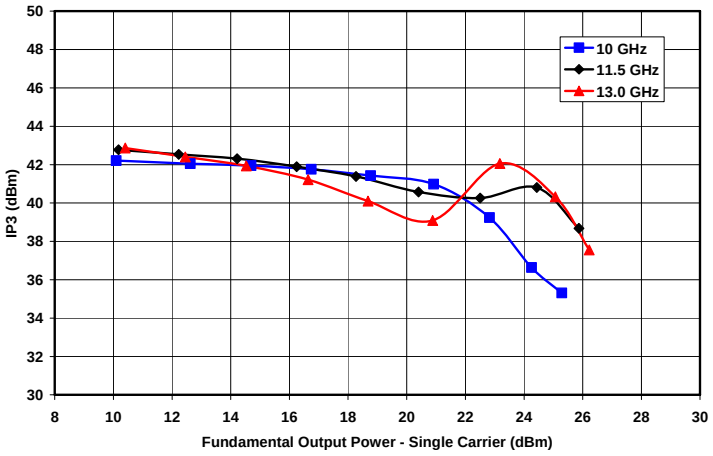

Figure 19. Third Order Intercept vs. Output Power and Frequency at VD = 6V and IDQ = 1.17A

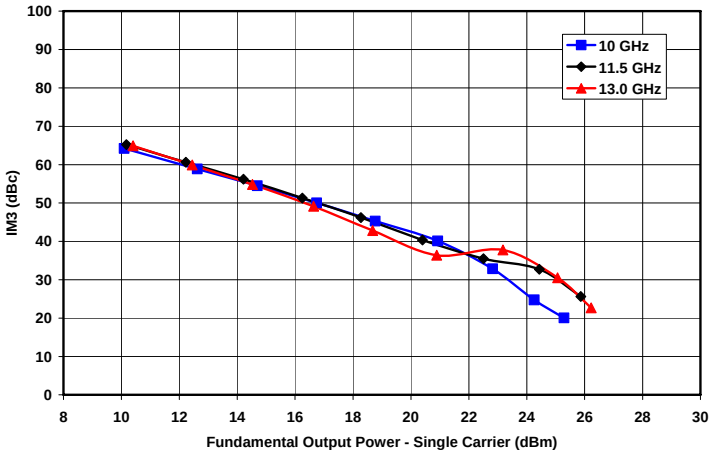

Figure 20. Third Order Intermod vs. Output Power and Frequency at VD = 6V and IDQ = 1.17A

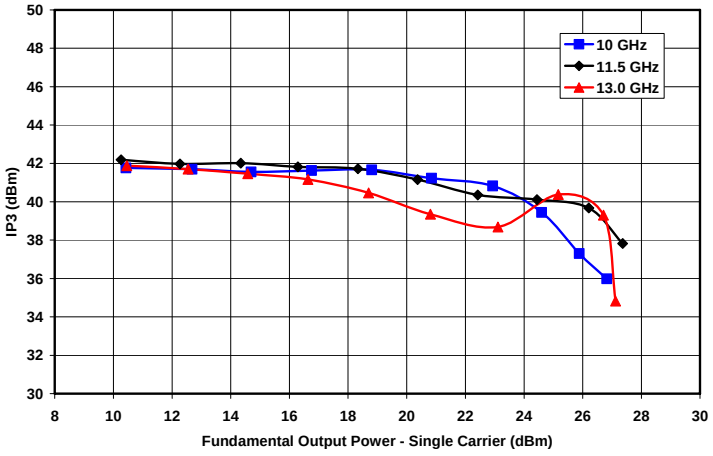

Figure 21. Third Order Intercept vs. Output Power and Frequency at VD = 7V and IDQ = 1.00A

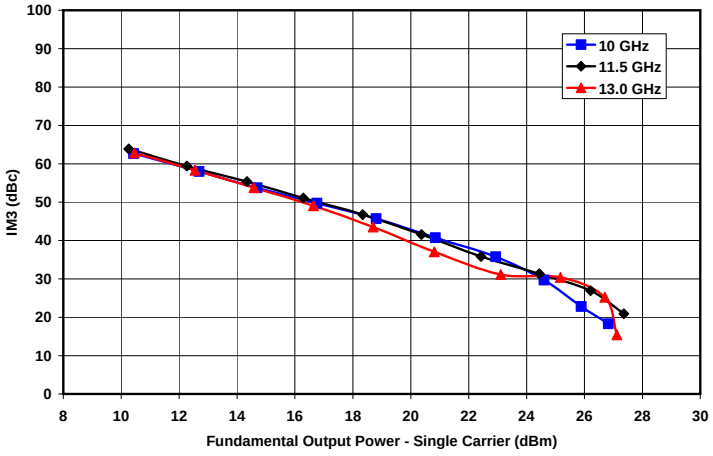

Figure 22. Third Order Intermod vs. Output Power and Frequency at VD = 7V and IDQ = 1.00A

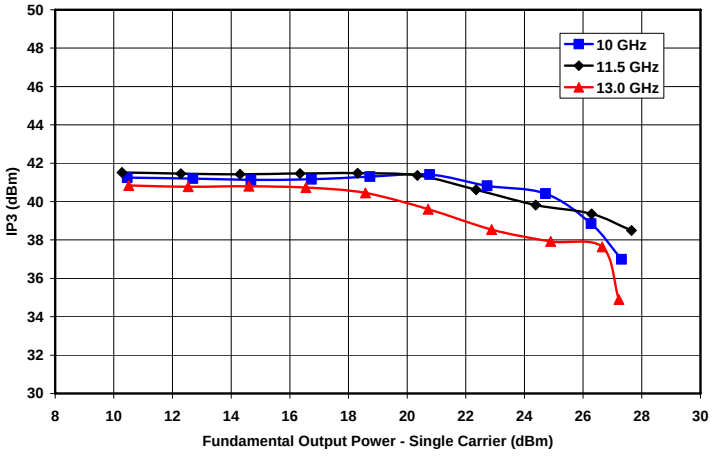

Figure 23. Third Order Intercept vs. Output Power and Frequency at VD = 8V and IDQ = 0.88A

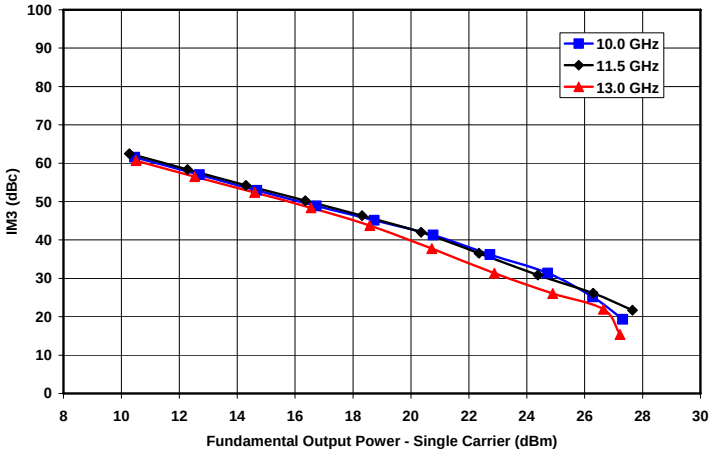

Figure 24. Third Order Intermod vs. Output Power and Frequency at VD = 8V and IDQ = 0.88A

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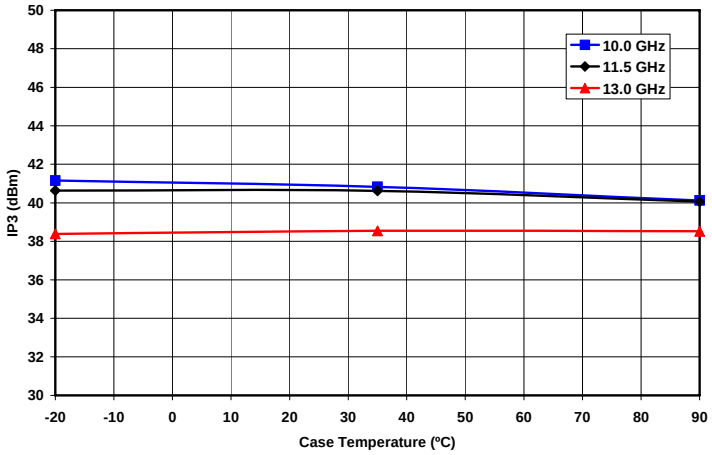

Figure 25. Third Order Intercept vs. Case Temperature and Frequency at Single Carrier Output Power Level = 22 dBm, VD = 8V and IDQ = 0.88A

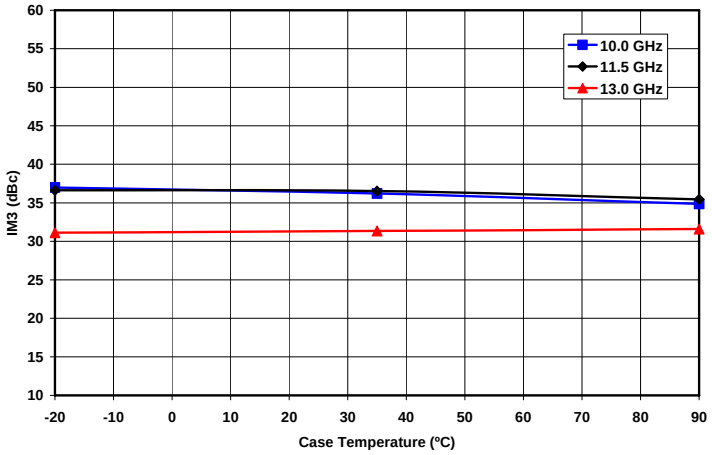

Figure 26. Third Order Intermod vs. Case Temperature and Frequency at Single Carrier Output Power Level = 22 dBm, VD = 8V and IDQ = 0.88A

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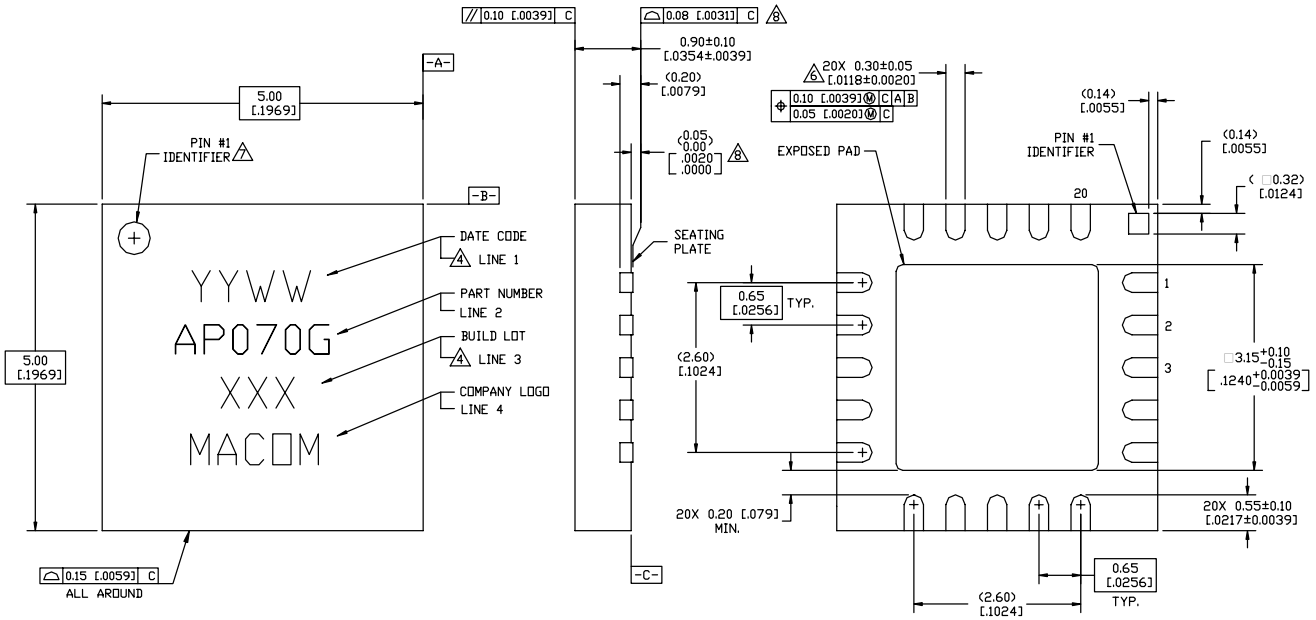

Figure 27. 5x5 mm 20-Lead MLP.

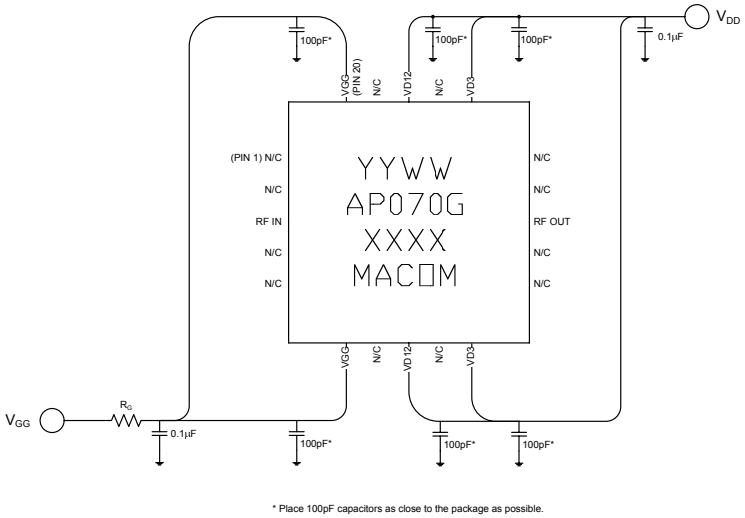

Figure 28. Recommended Bias Configuration.

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/Application%20Notes/index.htm) and searching for the required Application Note.

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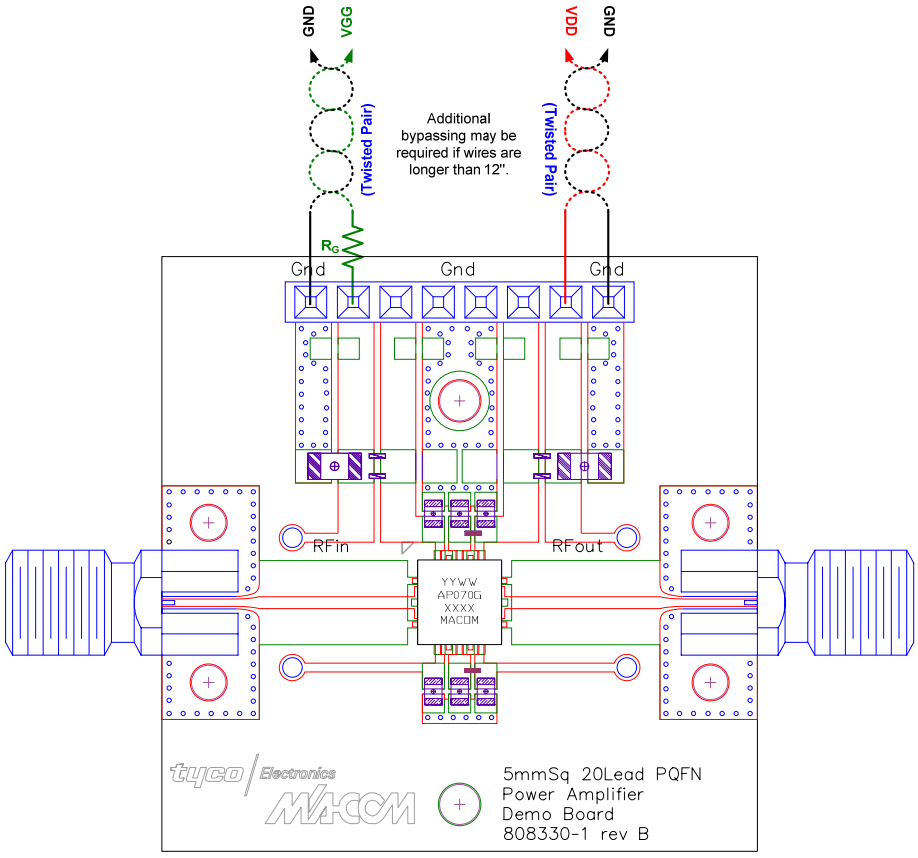

Figure 29. Demonstration Board PN MAAP-000070-SMB003 (available upon request).

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