

**Amplifier, Power, 1.2W  
5.7—8.5 GHz**

M/A-COM Products  
RoHS Compliant

**Features**

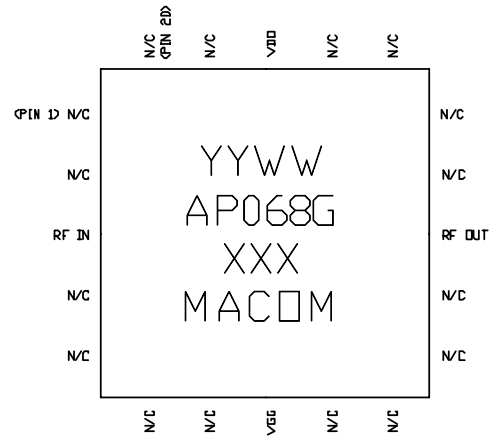
- ◆ 1.2 Watt Saturated Output Power Level
- ◆ Variable Drain Voltage (6-10V) Operation
- ◆ MSAG™ Process

**Description**

The MAAP-000068-PKG003 is a 3-stage 1.2 W power amplifier with on-chip bias networks in a 20 lead, 5 mm PQFN 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 260°C reflow temperature. The package also features low lead inductance and an excellent thermal path. The MTTF is 1,000,000 hours at 170°C.



**Primary Applications**

- ◆ Point-to-Point Radio
  - ◇ 6, 7, and 8 GHz Bands
- ◆ SatCom
- ◆ Broadband Wireless Access

**Ordering Information**

Description	Die	Tape & Reel (500)	Tape & Reel (1000)	Plastic Pkg Sample Board
Part Number	MAAPGM0068-DIE	MAAP-000068-TR0500	MAAP-000068-TR1000	MAAP-000068-SMB003

**Electrical Characteristics:  $T_C = 35^\circ C^1$ ,  $Z_0 = 50 \Omega$ ,  $V_{DD} = 8V$ ,  $I_{DQ} = 320mA^2$ ,  $P_{in} = 8dBm$ ,  $R_G = 300\Omega$**

Parameter	Symbol	Typical	Units
Bandwidth	f	5.7-8.5	GHz
Output Power	$P_{OUT}$	31	dBm
1-dB Compression Point	$P_{1dB}$	30	dBm
Small Signal Gain	G	25	dB
Input VSWR	VSWR	1.3:1	
Output VSWR	VSWR	1.8:1	
Output Third Order Intercept	TOI	40	dBm
Output Third Order Intermod, $P_{out} = 20 \text{ dBm (DCL)}$	IMD3	39	dBc
Gate Current	$I_{GG}$	5	mA
Drain Current	$I_{DD}$	600	mA

1.  $T_C$  = Case Temperature
2. Adjust  $V_{GG}$  between -2.6 and -1.2V to achieve specified  $I_{dq}$ .

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**Maximum Ratings**<sup>3</sup>

Parameter	Symbol	Absolute Maximum	Units
Input Power	P <sub>IN</sub>	13.0	dBm
Drain Supply Voltage	V <sub>DD</sub>	+12.0	V
Gate Supply Voltage	V <sub>GG</sub>	-3.0	V
Quiescent Drain Current (No RF)	I <sub>DQ</sub>	520	mA
Quiescent DC Power Dissipated (No RF)	P <sub>DISS</sub>	2.8	W
Junction Temperature	T <sub>J</sub>	170	°C
Storage Temperature	T <sub>STG</sub>	-55 to +150	°C

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

**Recommended Operating Conditions**<sup>4</sup>

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Voltage	V <sub>DD</sub>	6.0	8.0	10.0	V
Gate Voltage	V <sub>GG</sub>	-2.6	-2.0	-1.2	V
Input Power	P <sub>IN</sub>		8.0	11.0	dBm
Thermal Resistance	Θ <sub>JC</sub>		32		°C/W
Case Temperature	T <sub>C</sub>			Note 5	°C

4. Operation outside of these ranges may reduce product reliability.

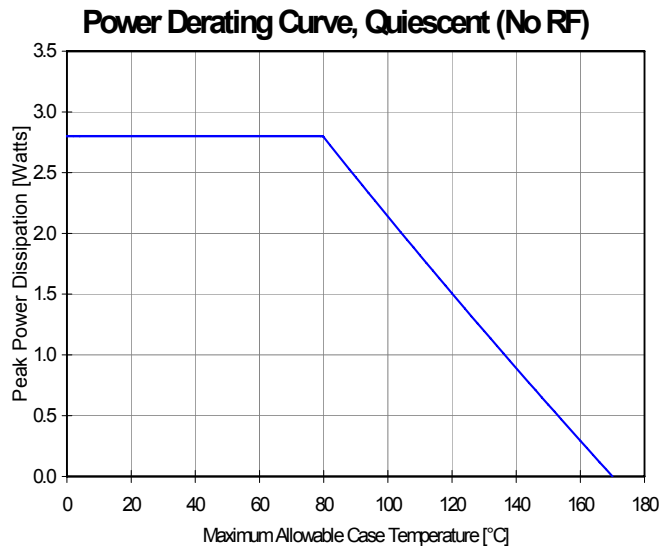
5. Case Temperature = 170°C — Θ<sub>JC</sub> \* V<sub>DD</sub> \* I<sub>DQ</sub>



**Operating Instructions**

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

1. Apply V<sub>GG</sub> = -2 V, V<sub>DD</sub> = 0 V.
2. Ramp V<sub>DD</sub> to desired voltage, typically 8.0 V.
3. Adjust V<sub>GG</sub> to set I<sub>DQ</sub>, (approximately @ -2 V).
4. Set RF input.
5. Power down sequence in reverse. Turn V<sub>GG</sub> off last.



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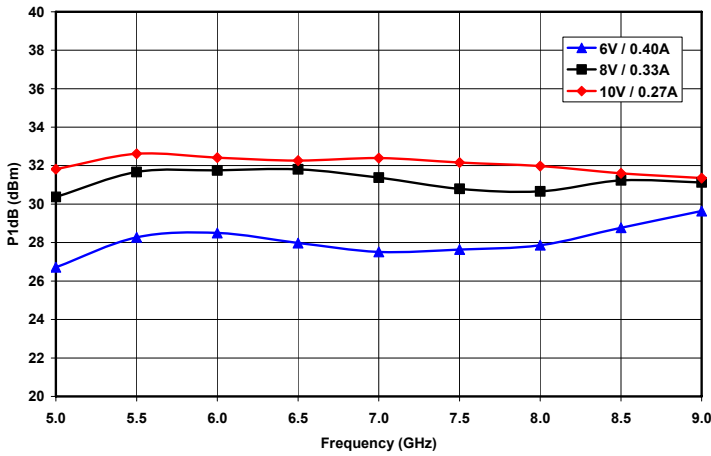


Figure 1. P1dB vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

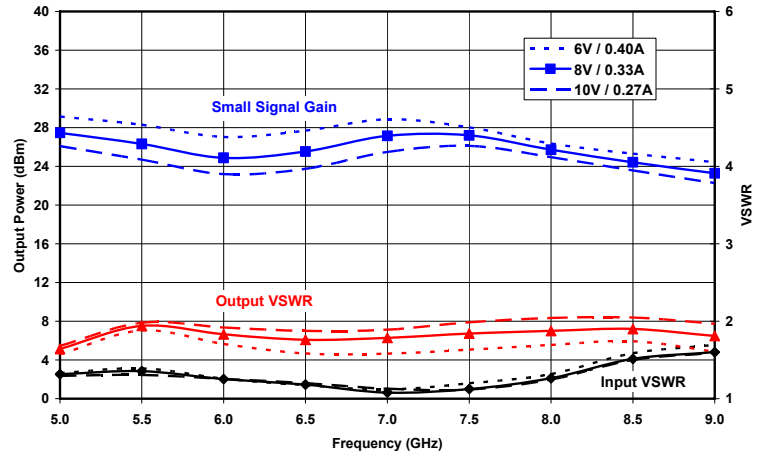


Figure 2. Small Signal Gain and Input & Output VSWR vs. Frequency and Quiescent Bias Condition (Vdd / IDQ)

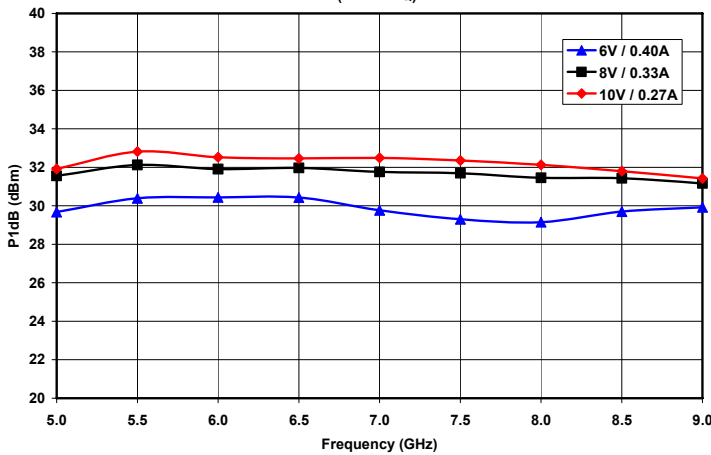


Figure 3. Saturated Output Power vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

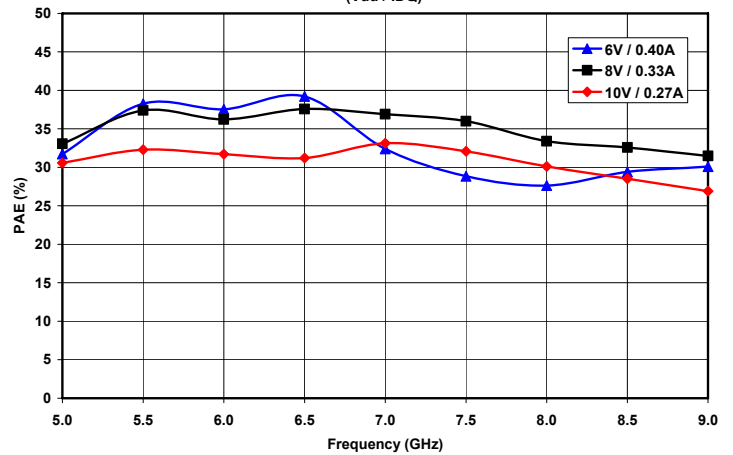


Figure 4. Saturated Power Added Efficiency vs. Frequency and Quiescent Bias Condition (VDD / IDQ)

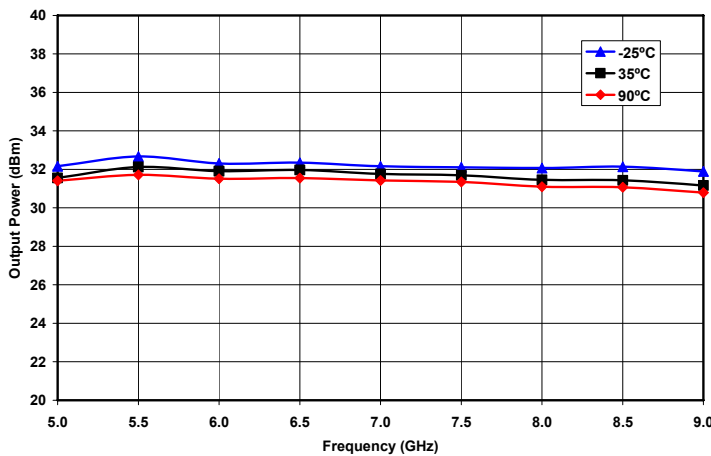


Figure 5. Saturated Output Power vs. Frequency and Case Temperature at VD = 8V and IDQ = 0.33A

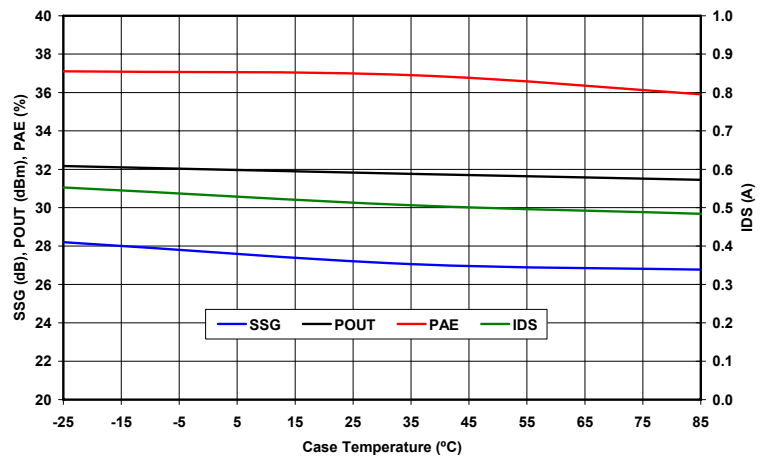


Figure 6. Small Signal Gain & Saturated Output Power, Power Added Efficiency and Drain Current vs. Case Temperature at 7.0 GHz, VD = 8V, and IDQ = 0.33A

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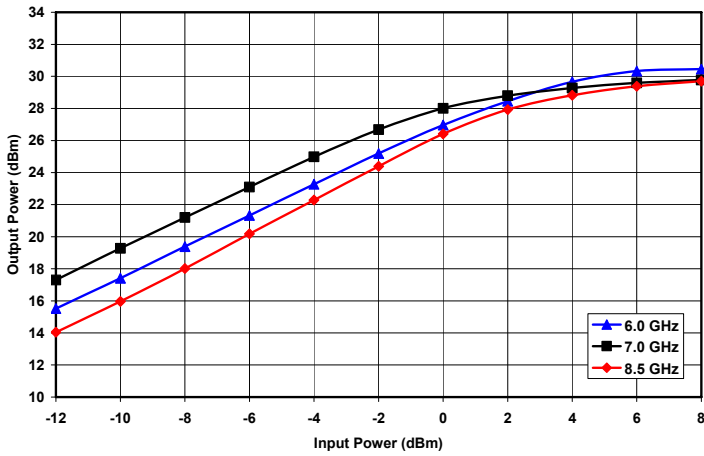


Figure 7. Output Power vs. Input Power and Frequency at VD = 6V and IDQ = 0.40A

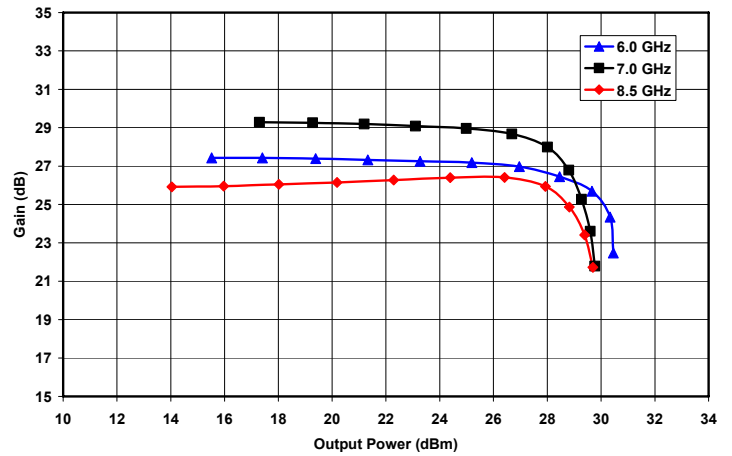


Figure 8. Gain vs. Output Power and Frequency at VD = 6V and IDQ = 0.40A

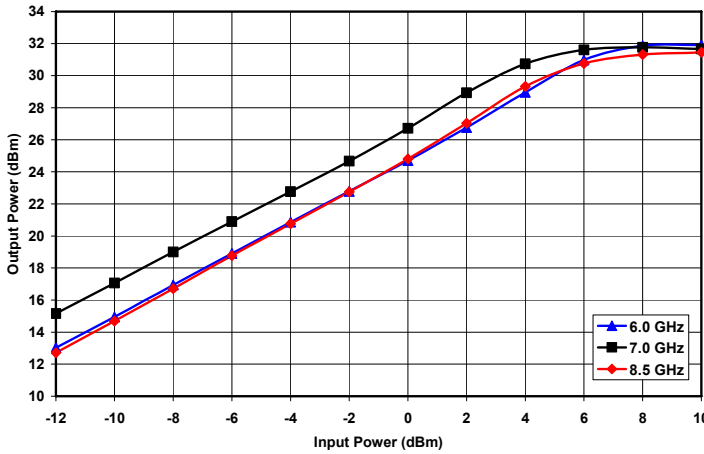


Figure 9. Output Power vs. Input Power and Frequency at VD = 8V and IDQ = 0.33A

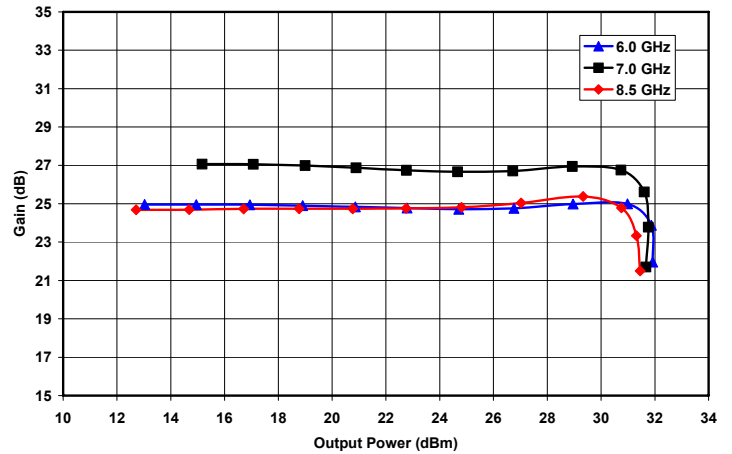


Figure 10. Gain vs. Output Power and Frequency at VD = 8V and IDQ = 0.33A

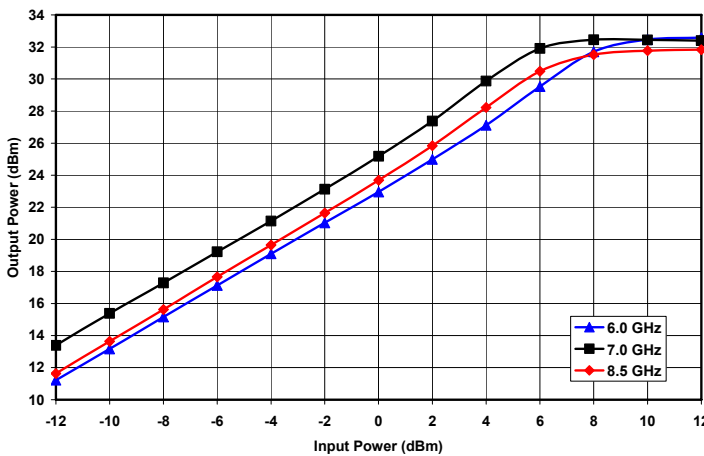


Figure 11. Output Power vs. Input Power and Frequency at VD = 10V and IDQ = 0.27A

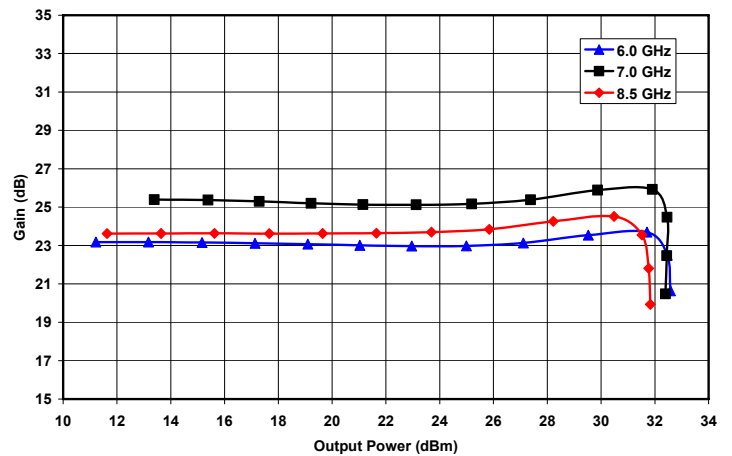


Figure 12. Gain vs. Output Power and Frequency at VD = 10V and IDQ = 0.27A

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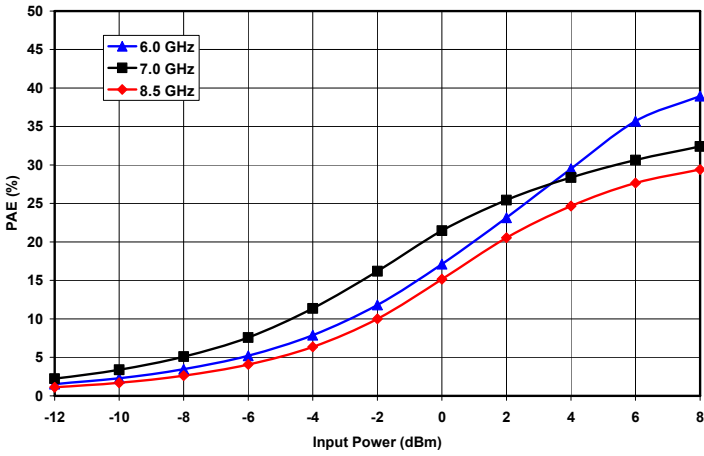


Figure 13. Power Added Efficiency vs. Input Power and Frequency at  $V_D = 6V$  and  $IDQ = 0.40A$

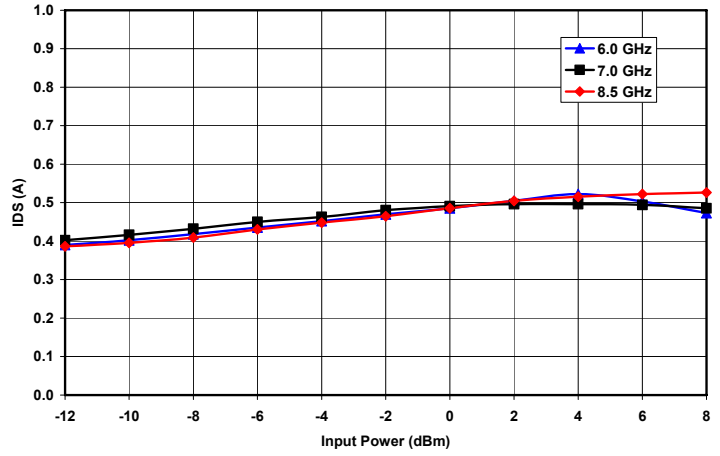


Figure 14. Drain Current vs. Input Power and Frequency at  $V_D = 6V$  and  $IDQ = 0.40A$

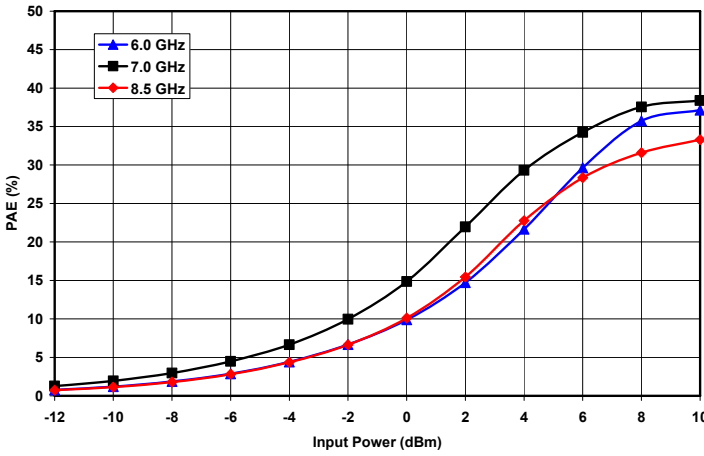


Figure 15. Power Added Efficiency vs. Input Power and Frequency at  $V_D = 8V$  and  $IDQ = 0.33A$

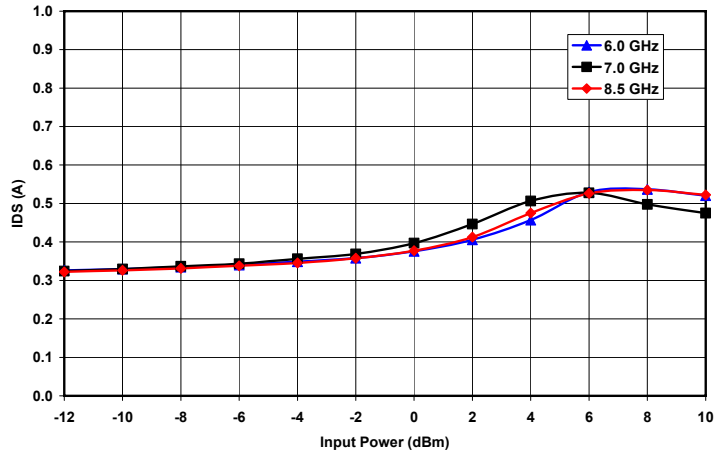


Figure 16. Drain Current vs. Input Power and Frequency at  $V_D = 8V$  and  $IDQ = 0.33A$

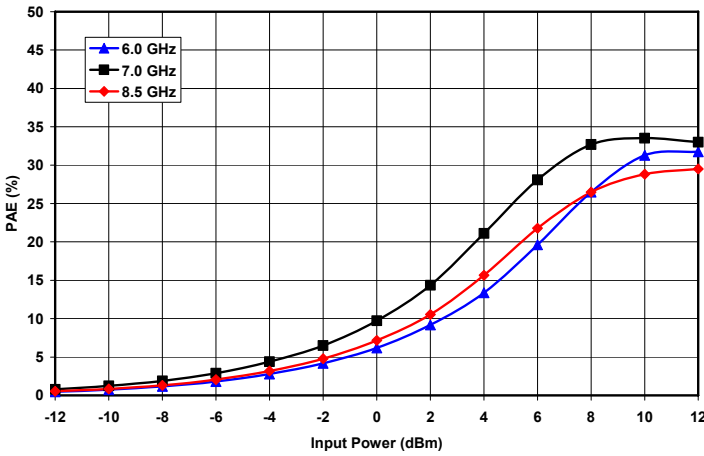


Figure 17. Power Added Efficiency vs. Input Power and Frequency at  $V_D = 10V$  and  $IDQ = 0.27A$

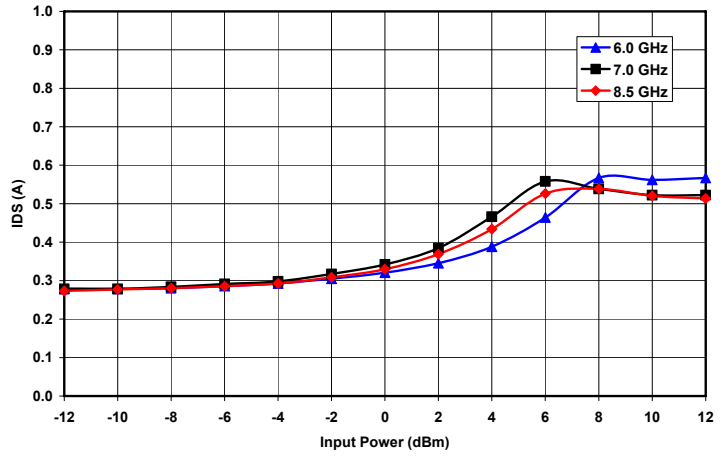


Figure 18. Drain Current vs. Input Power and Frequency at  $V_D = 10V$  and  $IDQ = 0.27A$

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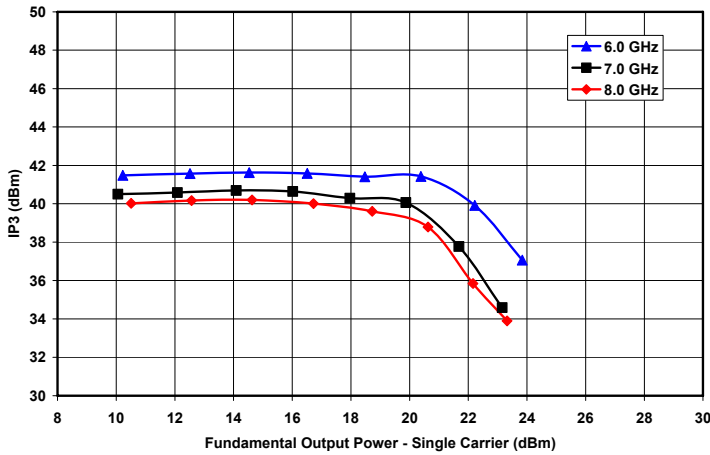


Figure 19. Third Order Intercept vs. Output Power and Frequency at  $V_D = 6V$  and  $ID_Q = 0.40A$

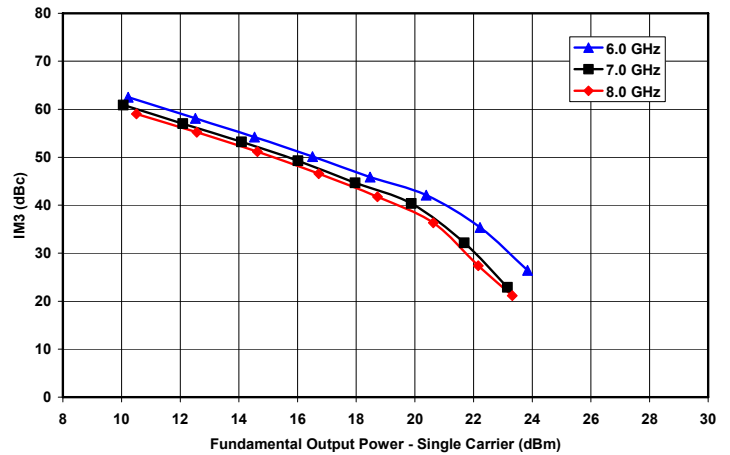


Figure 20. Third Order Intermod vs. Output Power and Frequency at  $V_D = 6V$  and  $ID_Q = 0.40A$

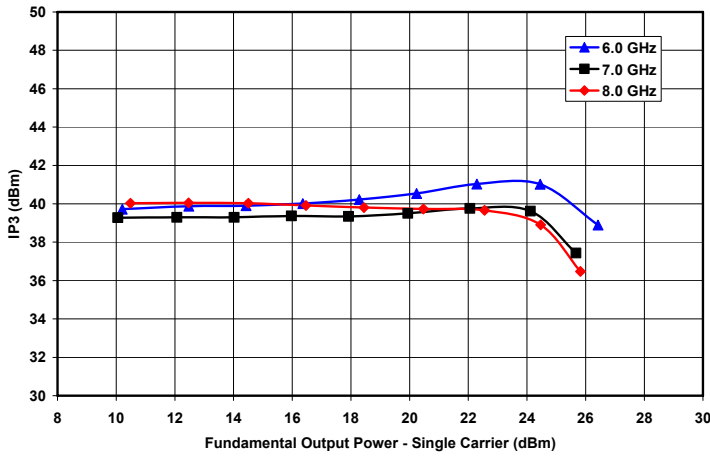


Figure 21. Third Order Intercept vs. Output Power and Frequency at  $V_D = 8V$  and  $ID_Q = 0.33A$

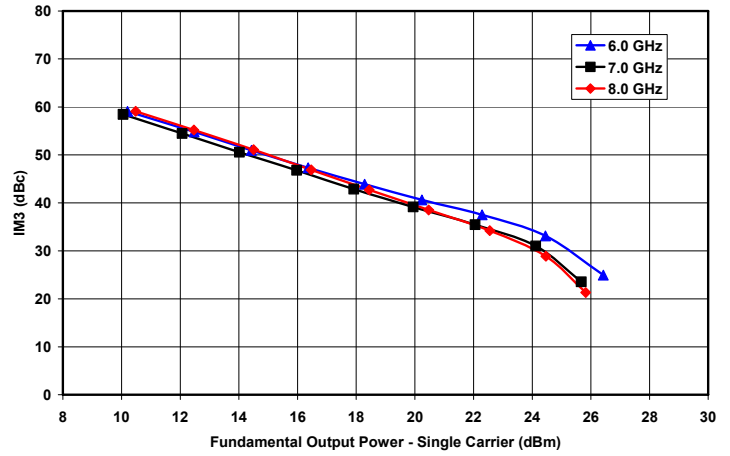


Figure 22. Third Order Intermod vs. Output Power and Frequency at  $V_D = 8V$  and  $ID_Q = 0.33A$

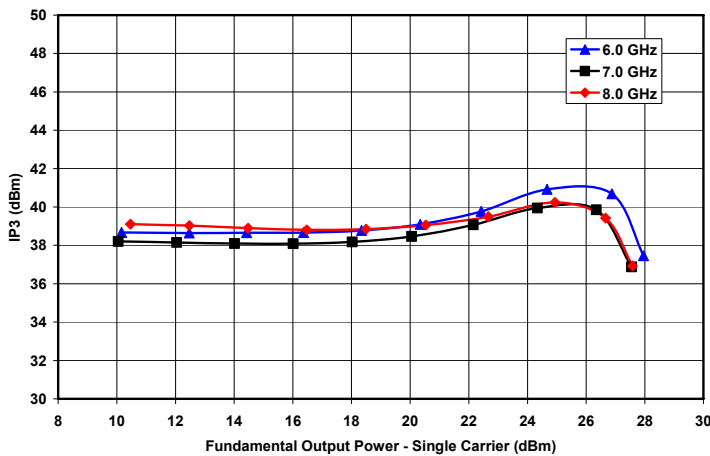


Figure 23. Third Order Intercept vs. Output Power and Frequency at  $V_D = 10V$  and  $ID_Q = 0.27A$

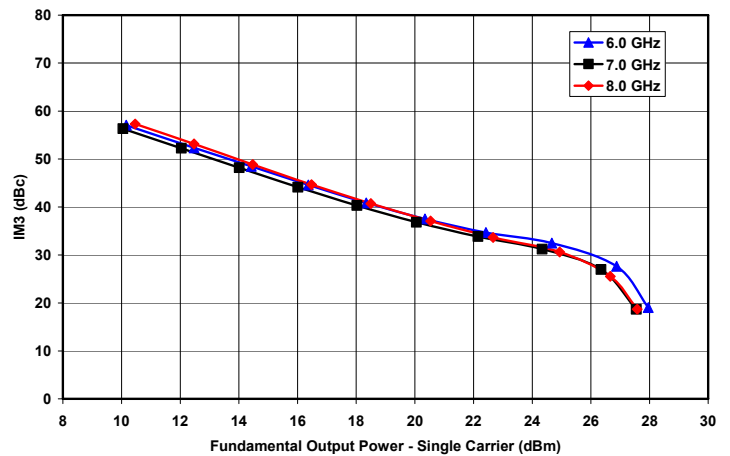


Figure 24. Third Order Intermod vs. Output Power and Frequency at  $V_D = 10V$  and  $ID_Q = 0.27A$

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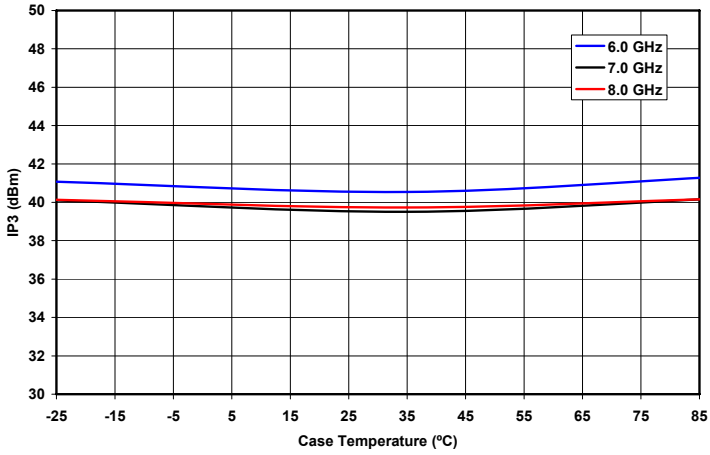


Figure 25. Third Order Intercept vs. Case Temperature and Frequency at Single Carrier Output Power Level = 20 dBm, VD = 8V and IDQ = 0.33A

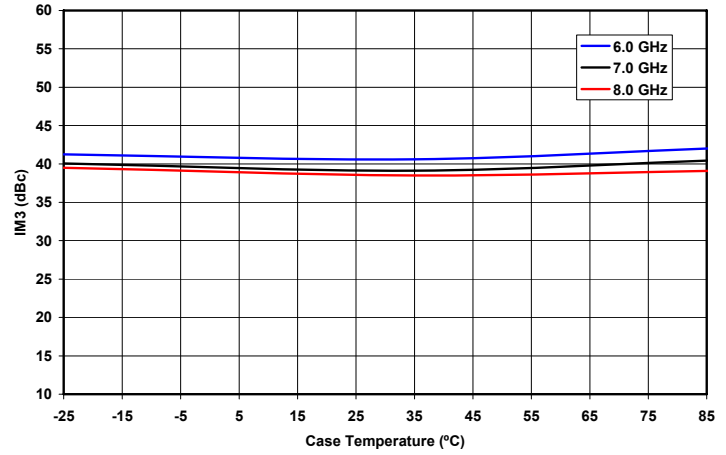


Figure 26. Third Order Intermod vs. Case Temperature and Frequency at Single Carrier Output Power Level = 20 dBm, VD = 8V and IDQ = 0.33A

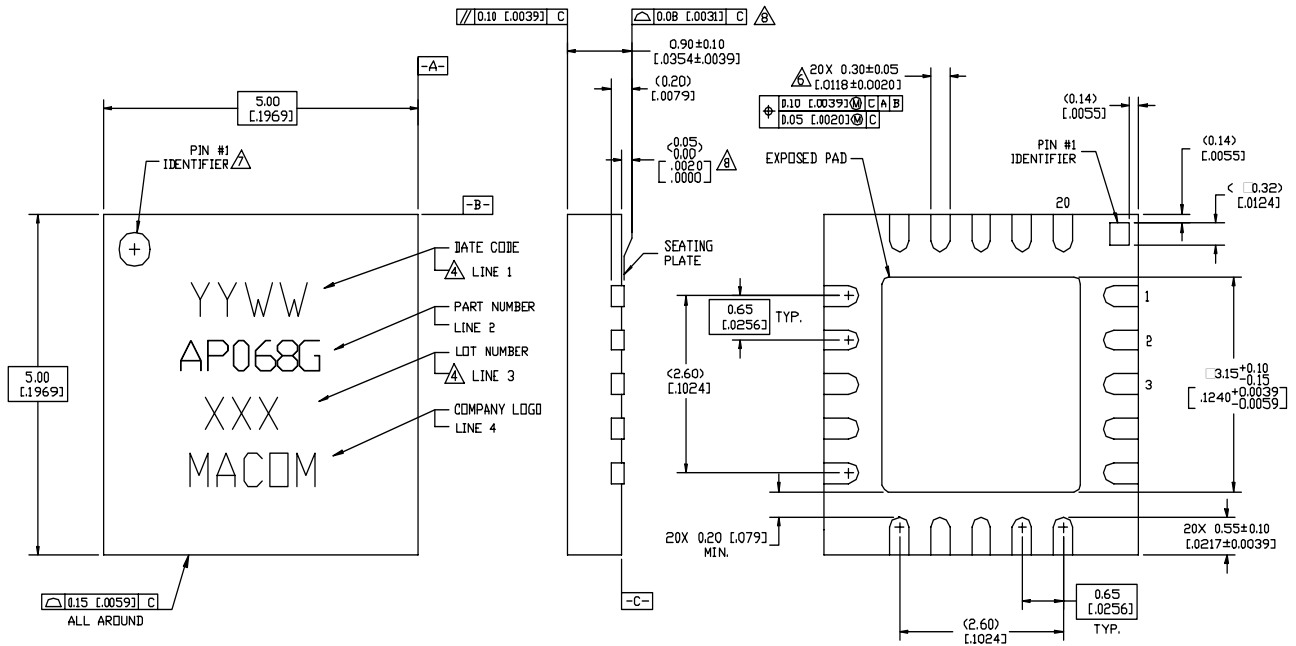
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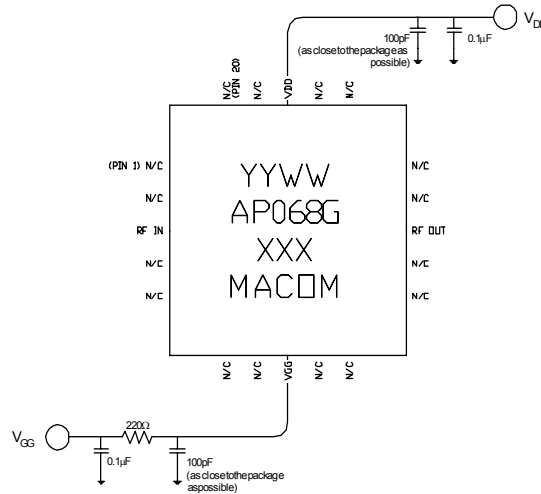
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**Figure 27. 5x5 mm 20-Lead MLP.**



**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 125°C 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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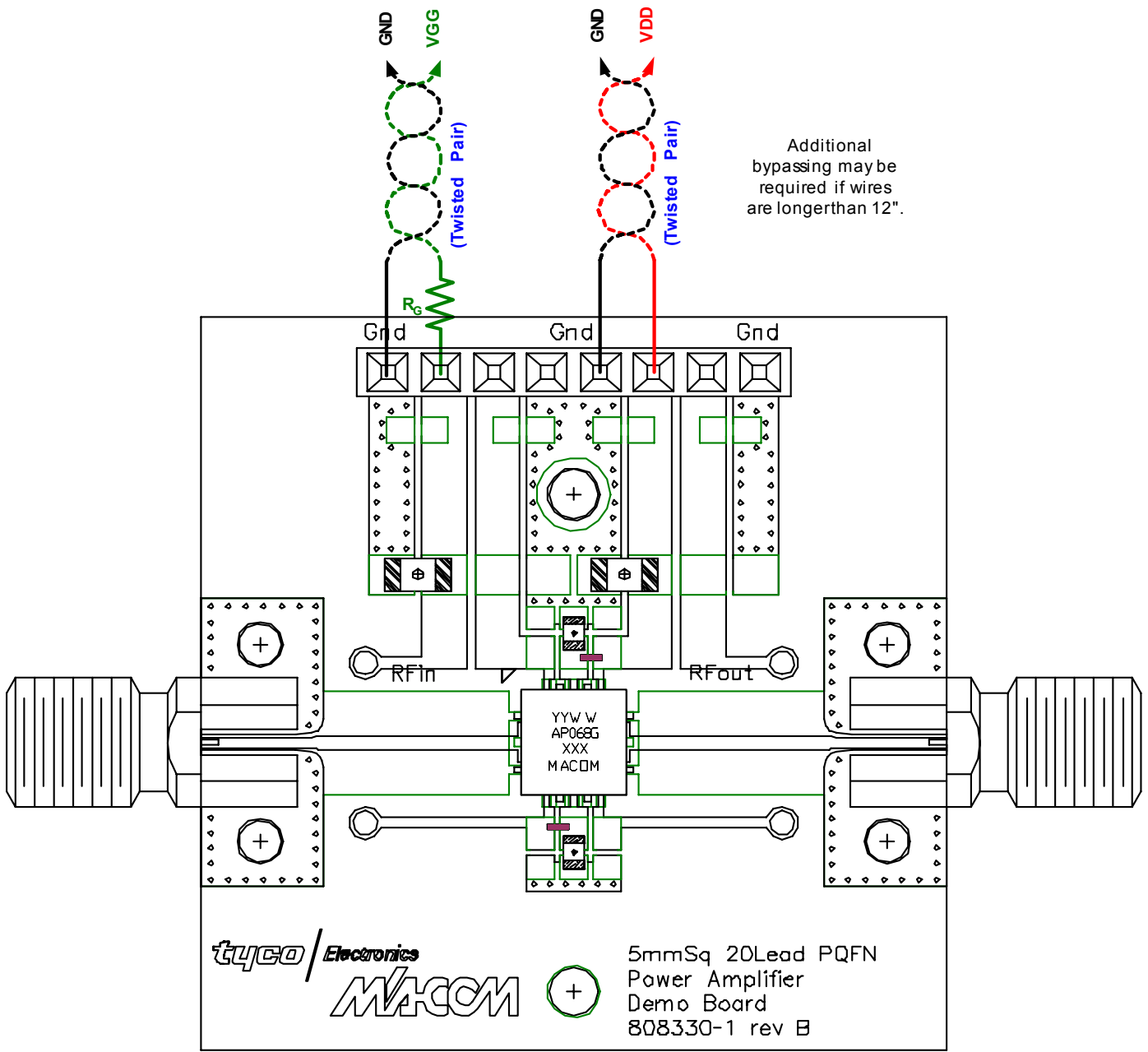
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**Figure 29. Demonstration Board P/N MAAP-000068-SMB003 (available upon request).**

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