

**Amplifier, Power, 1 W  
2-18 GHz**

**MAAPGM0080-DIE**  
Rev -  
Preliminary Datasheet

**Features**

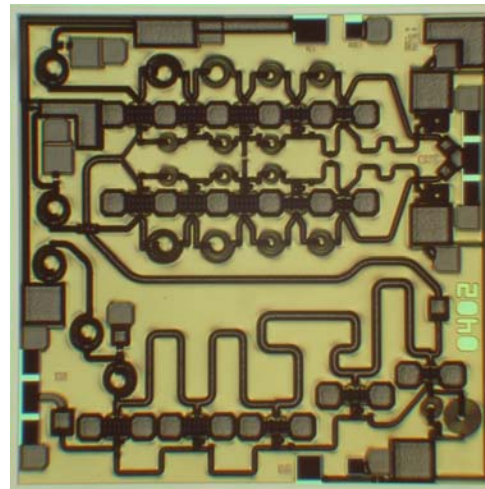
- ◆ **1 Watt Saturated Output Power Level**
- ◆ **Variable Drain Voltage (6-10V) Operation**
- ◆ **MSAG<sup>®</sup> Process**

**Description**

The MAAPGM0080-DIE is a 2-stage 1 W distributed power amplifier with on-chip bias networks. 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.

Fabricated using M/A-COM's repeatable, high performance and highly reliable GaAs Multifunction Self-Aligned Gate (MSAG<sup>™</sup>) Process, each device is 100% RF tested on wafer to ensure performance compliance.

M/A-COM's MSAG<sup>™</sup> process features robust silicon-like manufacturing processes, planar processing of ion implanted transistors, multiple implant capability enabling power, low-noise, switch and digital FETs on a single chip, and polyimide scratch protection for ease of use with automated manufacturing processes. The use of refractory metals and the absence of platinum in the gate metal formulation prevents hydrogen poisoning when employed in hermetic packaging.



**Primary Applications**

- ◆ **Electronic Warfare**
- ◆ **Ultra Wideband (UWB)**
- ◆ **Test Instrumentation**

**Also Available in:**

Description	SAMPLES		
	Plastic	Sample Board (Die)	Mechanical Sample (Die)
Part Number	MAAP-000080-PKG003	MAAP-000080-SMB004	MAAP-000080-MCH000

**Electrical Characteristics:  $T_B = 10^\circ C^1$ ,  $Z_0 = 50\Omega$ ,  $V_{DD} = 10V$ ,  $I_{DQ} = 750mA^2$ ,  $P_{in} = 22\text{ dBm}$ ,  $R_G = 130\Omega$**

Parameter	Symbol	Typical	Units
Bandwidth	f	2.0-18.0	GHz
Output Power	P <sub>OUT</sub>	30	dBm
1-dB Compression Point	P1dB	29.5	dBm
Small Signal Gain	G	11.5	dB
Power Added Efficiency	PAE	11	%
Input VSWR	VSWR	1.5:1	
Output VSWR	VSWR	1.8:1	
Gate Current	I <sub>GG</sub>	5	mA
Drain Current	I <sub>DD</sub>	800	mA

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

### Maximum Ratings<sup>3</sup>

Parameter	Symbol	Absolute Maximum	Units
Input Power	$P_{IN}$	27.0	dBm
Drain Supply Voltage	$V_{DD}$	+12.0	V
Gate Supply Voltage	$V_{GG}$	-3.0	V
Quiescent Drain Current (No RF)	$I_{DQ}$	0.78	A
Quiescent DC Power Dissipated (No RF)	$P_{DISS}$	7.8	W
Junction Temperature	$T_J$	170	°C
Storage Temperature	$T_{STG}$	-55 to +150	°C

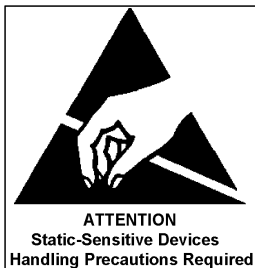
3. Operation beyond these limits may result in permanent damage to the part.

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

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Voltage	$V_{DD}$	6.0	10.0	10.0	V
Gate Voltage	$V_{GG}$	-2.6	-2.0	-1.2	V
Input Power	$P_{IN}$		22.0	25.0	dBm
Thermal Resistance	$\Theta_{JC}$		13.1		°C/W
MMIC Base Temperature	$T_B$			Note 5	°C

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

5. MMIC Base Temperature = 170°C —  $\Theta_{JC} * V_{DD} * I_{DQ}$

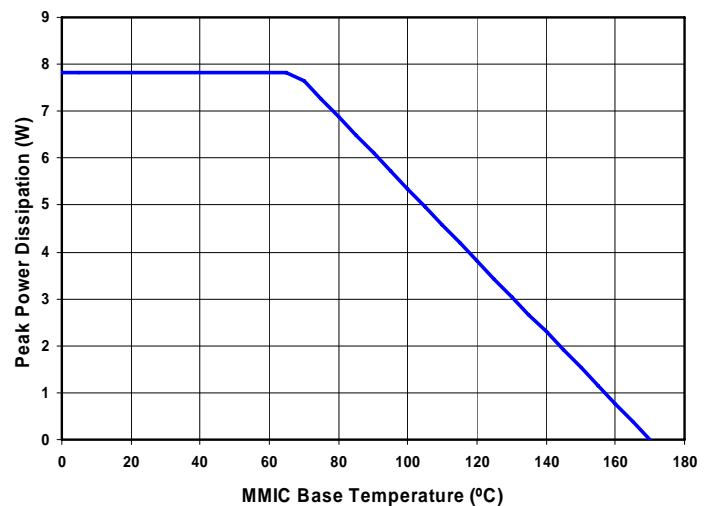


### Operating Instructions

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

1. Apply  $V_{GG} = -2.7$  V,  $V_{DD} = 0$  V.
2. Ramp  $V_{DD}$  to desired voltage, typically 10.0 V.
3. Adjust  $V_{GG}$  to set  $I_{DQ}$ , (approximately @ -2.0 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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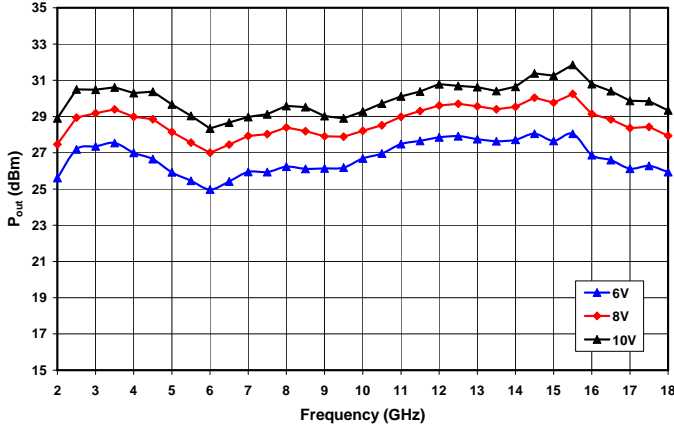


Figure 1. Output Power and Power Added Efficiency at  $P_{in} = 22\text{dBm}$ , and  $I_{DSQ}=740\text{mA}$

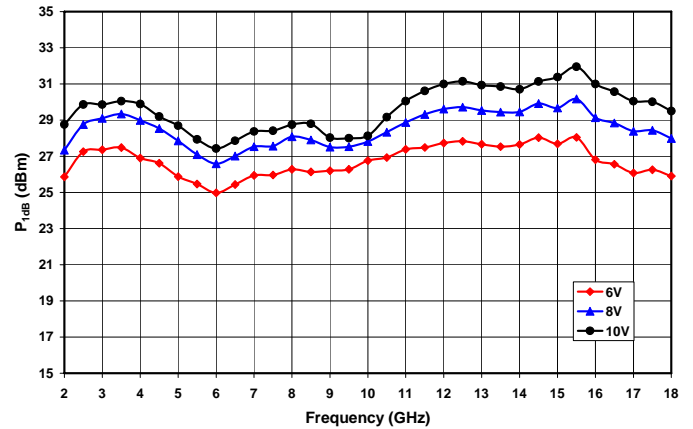


Figure 2. 1dB Compression Point and Drain Voltage at  $I_{DSQ}=750\text{mA}$

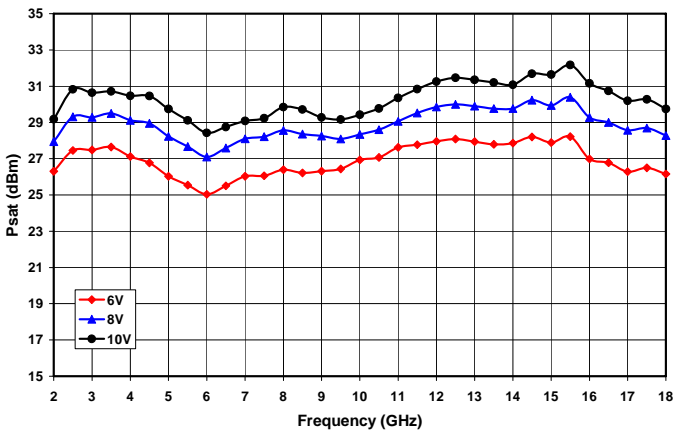


Figure 3. Saturated Output Power vs. Frequency and Drain Voltage

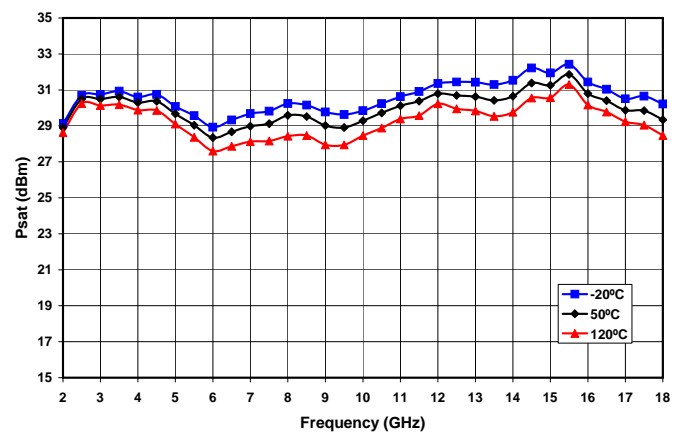


Figure 4. Saturated Output Power vs. Frequency and Temperature at  $V_D=10\text{V}$  and  $I_{DSQ}=750\text{mA}$ .

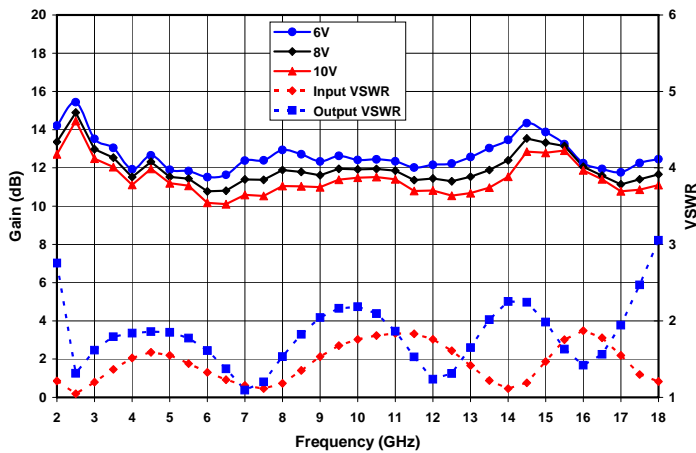


Figure 5. Small Signal Gain and Input and Output VSWR at  $I_{DSQ}=750\text{mA}$ .

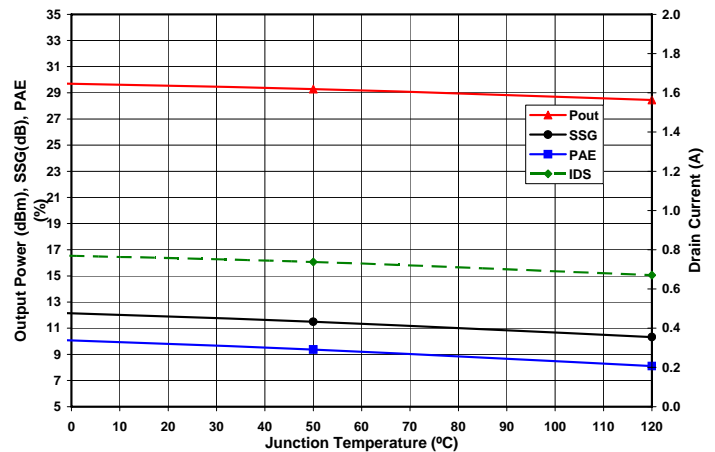


Figure 6. Output Power, Small Signal Gain, Power Added Efficiency, and Drain Current vs. Junction Temperature at 10V, 10GHz, and 750mA.

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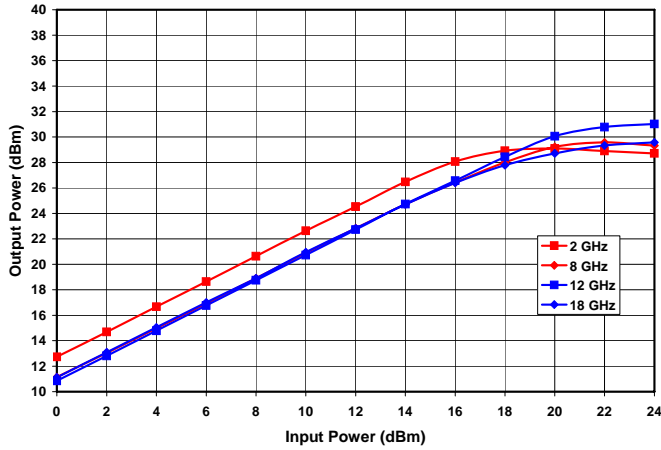


Figure 7. Output Power vs. Input Power and Frequency at 10V and 750mA

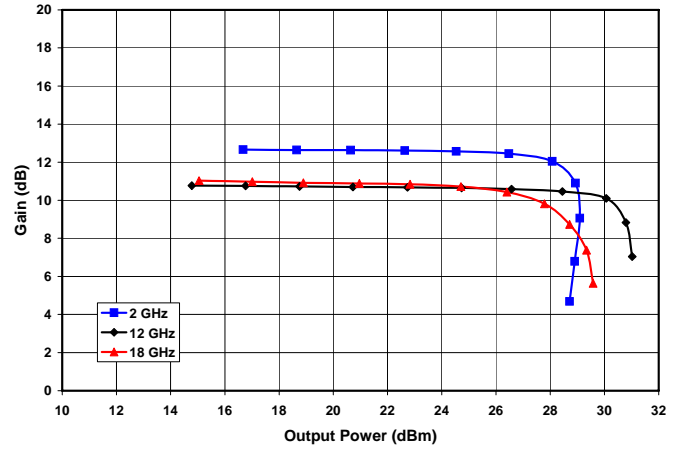


Figure 8. Gain vs. Output Power and Frequency at 10V and 750mA.

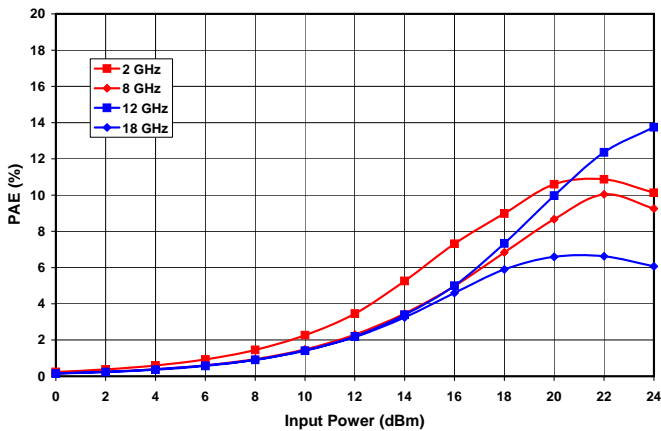


Figure 9. Power Added Efficiency vs. Input Power and Frequency at 10V and  $I_{DC}=750mA$ .

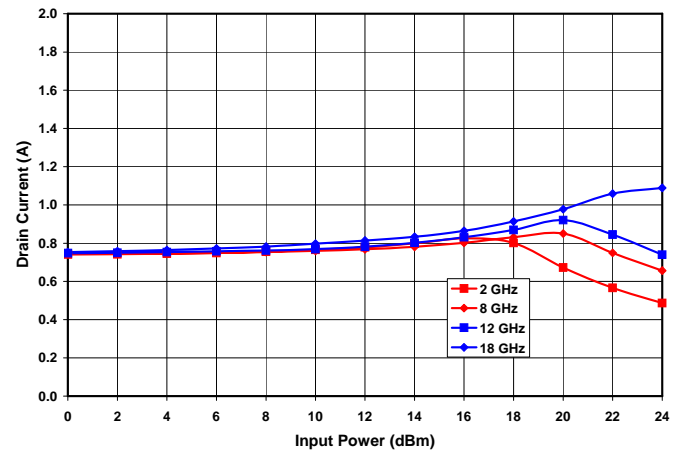


Figure 10. Drain Current vs. Input Power and Frequency at 10V and 750mA.

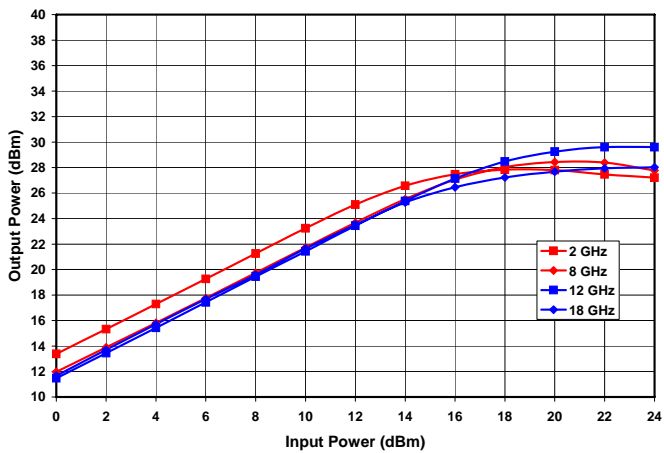


Figure 11. Output Power vs. Input Power and Frequency at 8V and 750mA.

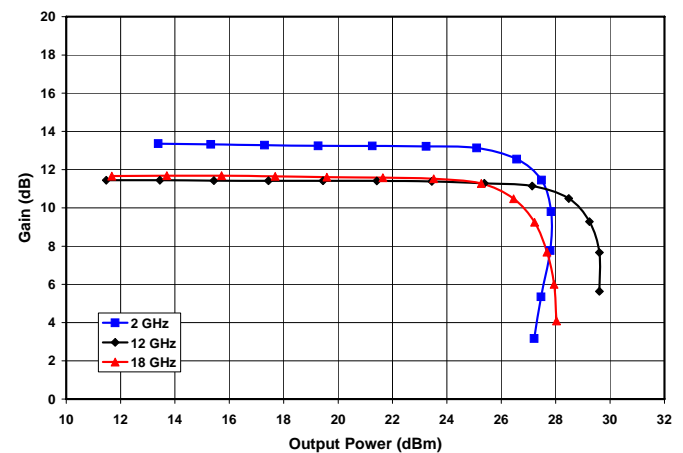


Figure 12. Gain vs. Output Power and Frequency at 8V and 750mA.

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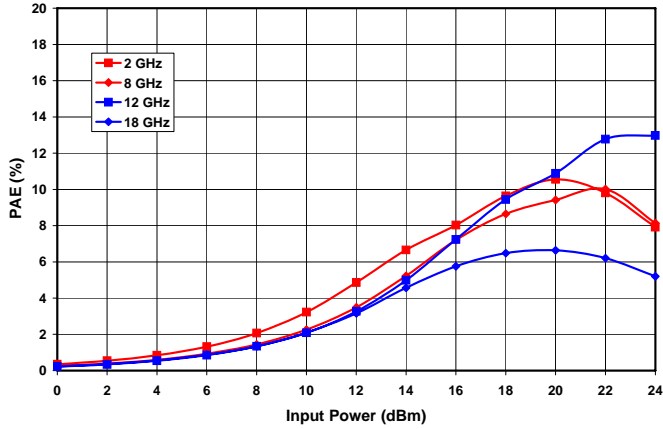


Figure 13. Power Added Efficiency vs. Input Power and Frequency at 8V and  $I_{DSQ}=750mA$ .

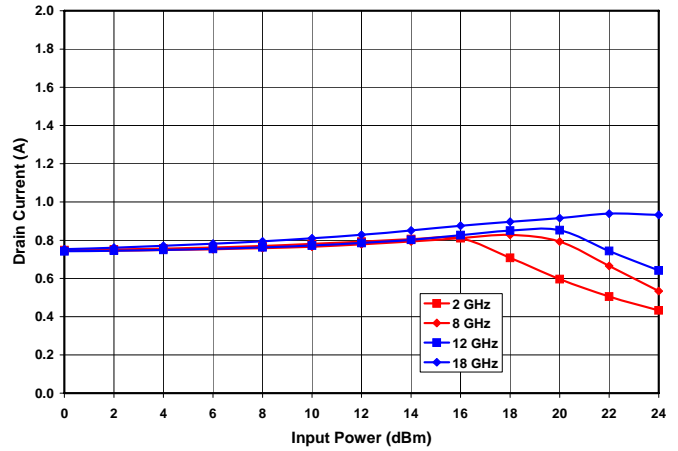
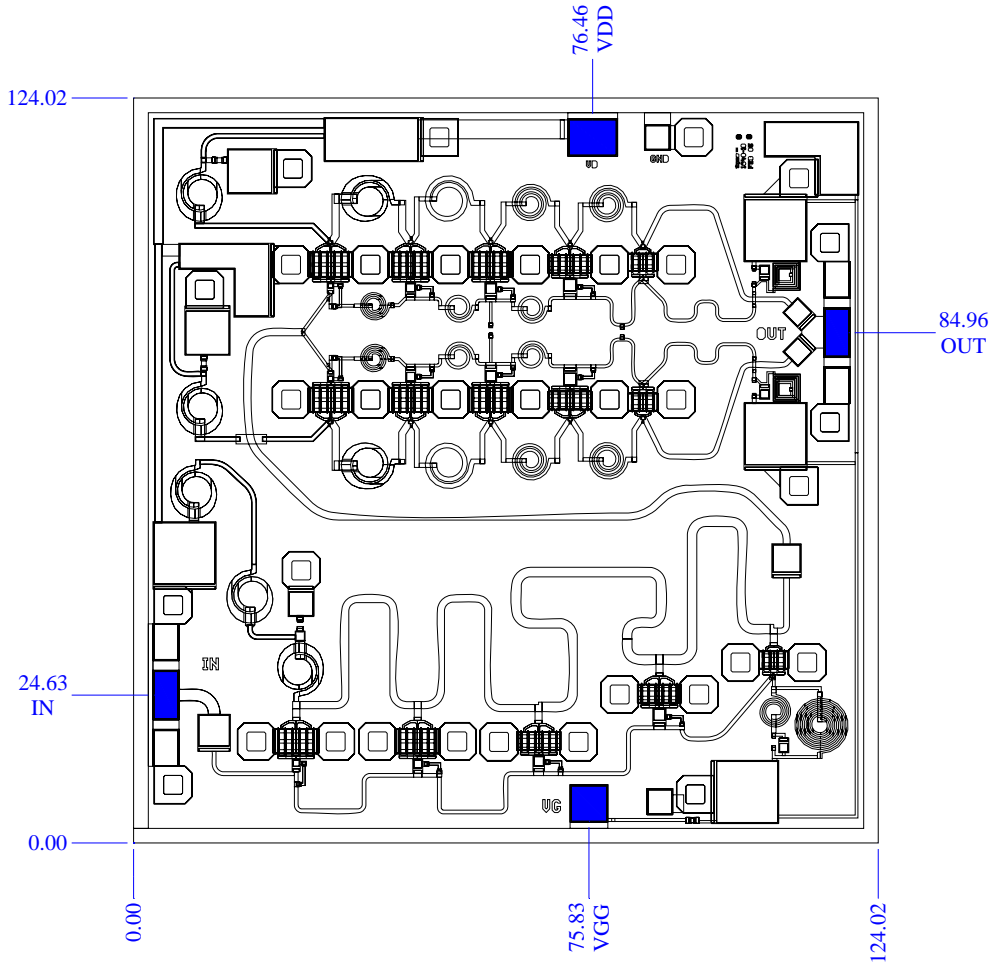


Figure 14. Drain Current vs. Input Power and Frequency at 8V and 750mA

### Mechanical Information

Chip Size: 3.150 x 3.150 x 0.075 mm (124 x 124 x 3 mils)



Chip edge to bond pad dimensions are shown to the center of the bond pad (mils).

**Figure 1. Die Layout**

### Bond Pad Dimensions

Pad	Size (µm)	Size (mils)
RF In and Out	100 x 200	4 x 8
DC Drain Supply Voltage VDD	200 x 150	8 x 6
DC Gate Supply Voltage VGG	150 x 150	6 x 6

**Assembly and Bonding Diagram**

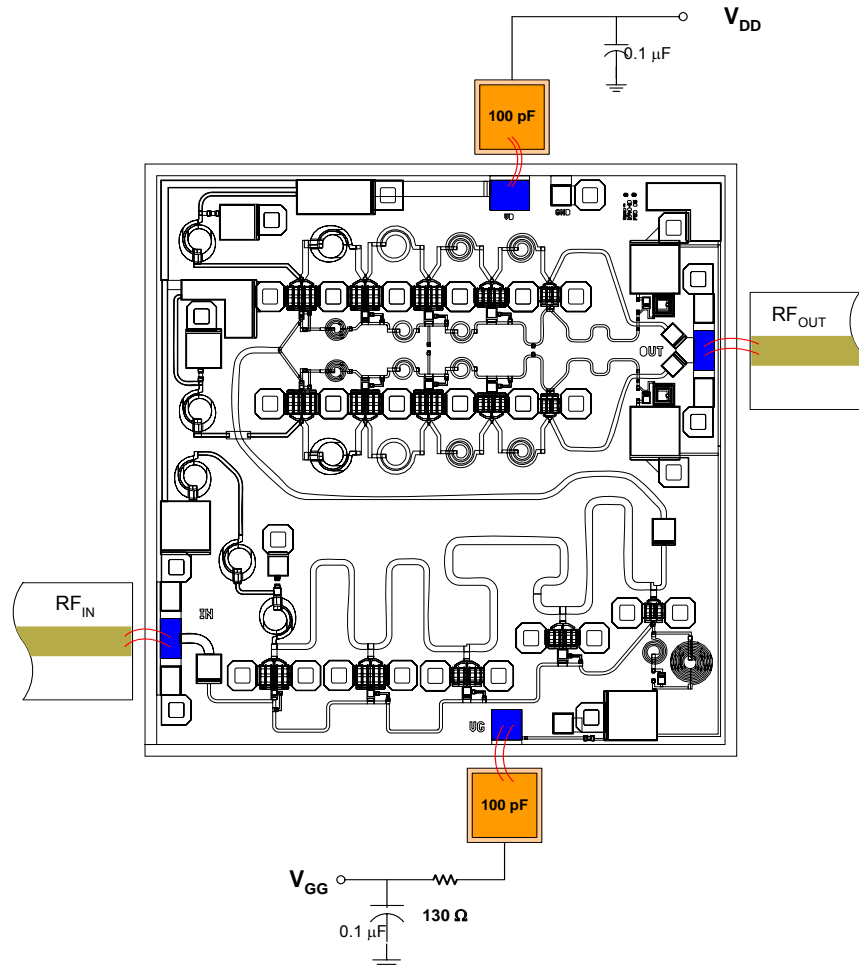


Figure 2. Recommended operational configuration. Wire bond as shown.

**Assembly Instructions:**

**Die attach:** Use AuSn (80/20) 1 mil. preform solder. Limit time @ 300 °C to less than 5 minutes.

**Wirebonding:** Bond @ 160 °C using standard ball or thermal compression wedge bond techniques. For DC pad connections, use either ball or wedge bonds. For best RF performance, use wedge bonds of shortest length, although ball bonds are also acceptable.

**Biasing Note:** Must apply negative bias to V<sub>GG</sub> before applying positive bias to V<sub>DD</sub> to prevent

