1.2W C/Ku-Band Power Amplifier 7.5-13.5 GHz

Preliminary Information

MAAPGM0038-DIE

Features

- **7.5-13.5 GHz Operation**
- **1.2 Watt Saturated Output Power Level**
- **Variable Drain Voltage (4-10V) Operation**
- **Self-Aligned MSAG® MESFET Process**

Primary Applications

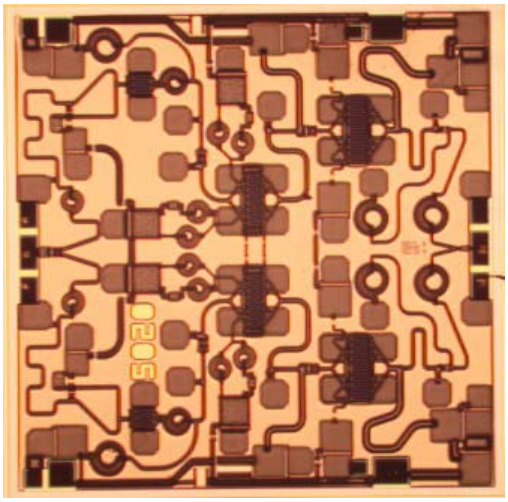
- **Point-to-Point**
- **Weather Radar**
- **Airborne Radar**

Description

The MAAPGM0038-Die is a 3-stage 1.2 W 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.

Each device is 100% RF tested on wafer to ensure performance compliance. The part is fabricated using M/A-COM's repeatable, high performance and highly reliable GaAs Multifunction Self-Aligned Gate (MSAG®) MESFET Process. This process features silicon nitride passivation and polyimide scratch protection.

7.5-13.5 GHz GaAs MMIC Amplifier



Electrical Characteristics: T_B = 40°C[1], Z_0 = 50 Ω, V_{DD} = 8V, V_{GG} = -2V, P_{in} = 20 dBm

Parameter	Symbol	Typical	Units
Bandwidth	f	7.5-13.5	GHz
Output Power	POUT	31	dBm
Power Added Efficiency	PAE	21	%
1-dB Compression Point	P1dB	29	dBm
Small Signal Gain	G	19	dB
Input VSWR	VSWR	4:1	
Gate Current	IGG	< 12	mA
Drain Current	IDD	< 1.1	A
Output Third Order Intercept	OTOI	40	dBm
Noise Figure	NF	8	dB
2nd Harmonic	2f	-17	dBc
3rd Harmonic	3f	-34	dBc

1. T_B = MMIC Base Temperature

Maximum Operating Conditions [1]

Parameter	Symbol	Absolute Maximum	Units
Input Power	P_{IN}	25.0	dBm
Drain Supply Voltage	V_{DD}	+12.0	V
Gate Supply Voltage	V_{GG}	-3.0	V
Quiescent Drain Current (No RF)	I_{DQ}	1.13	A
Quiescent DC Power Dissipated (No RF)	P_{DISS}	7.5	W
Junction Temperature	T_J	180	°C
Storage Temperature	T_{STG}	-55 to +150	°C

1. Operation outside of these ranges may reduce product reliability. Operation at other than the typical values may result in performance outside the guaranteed limits.

Recommended Operating Conditions

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Voltage	V_{DD}	4.0	8.0	10.0	V
Gate Voltage	V_{GG}	-2.3	-2.0	-1.5	V
Input Power	P_{IN}			23.0	dBm
Junction Temperature	T_J			150	°C
MMIC Base Temperature	T_B			Note 2	°C

2. Maximum MMIC Base Temperature = 150°C — 10.7 °C/W * 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 V.
3. Adjust V_{GG} to set I_{DQ}, (approximately @ –2 V).
4. Set RF input.
5. Power down sequence in reverse. Turn gate voltage off last.

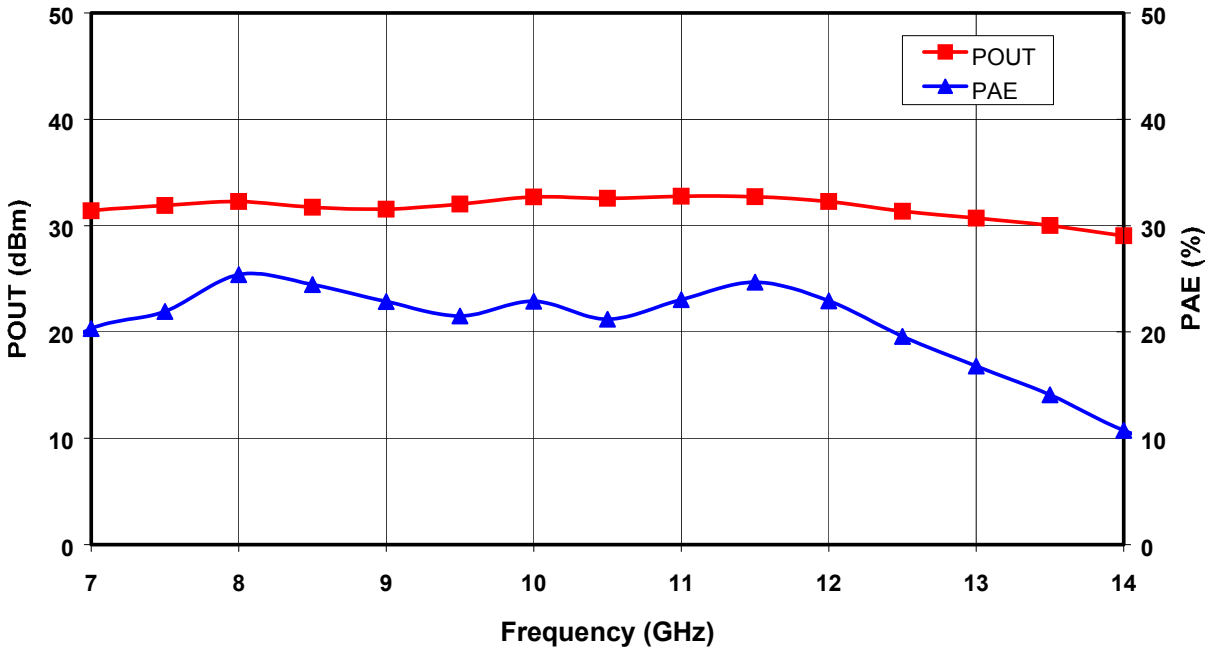


Figure 1. Output Power and Power Added Efficiency vs. Frequency at V_{DD} = 8V and P_{in} = 20 dBm.

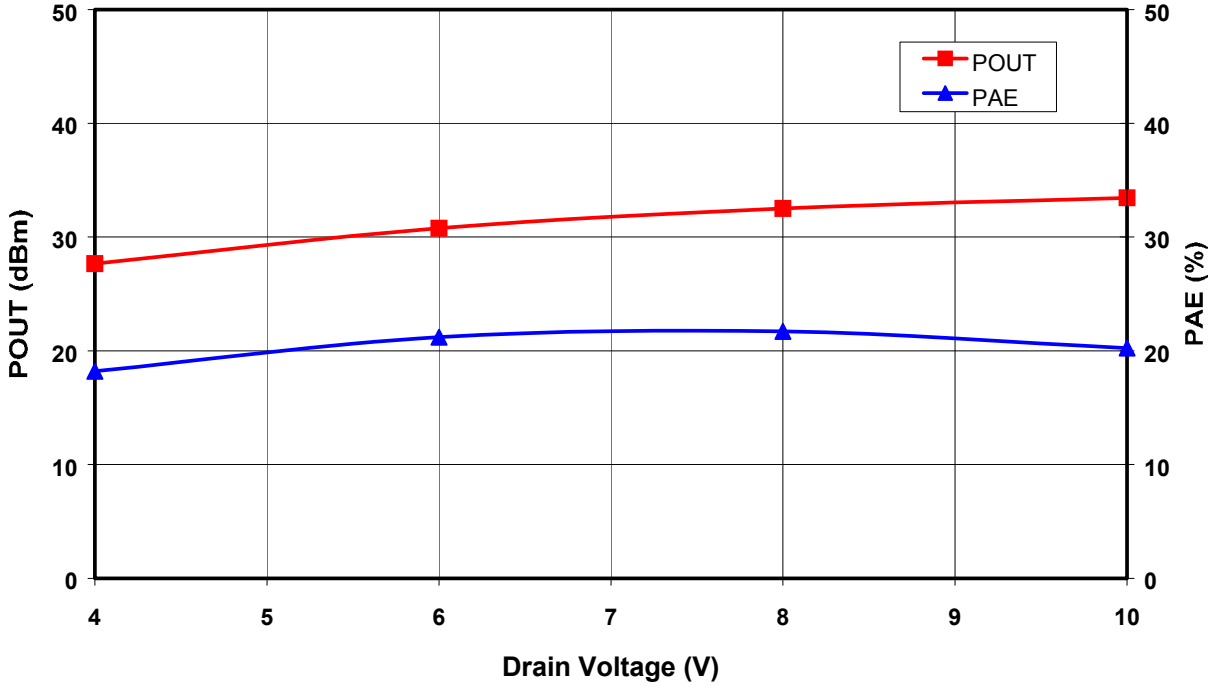


Figure 2. Saturated Output Power and Power Added Efficiency vs. Drain Voltage at f_o = 10.5 GHz.

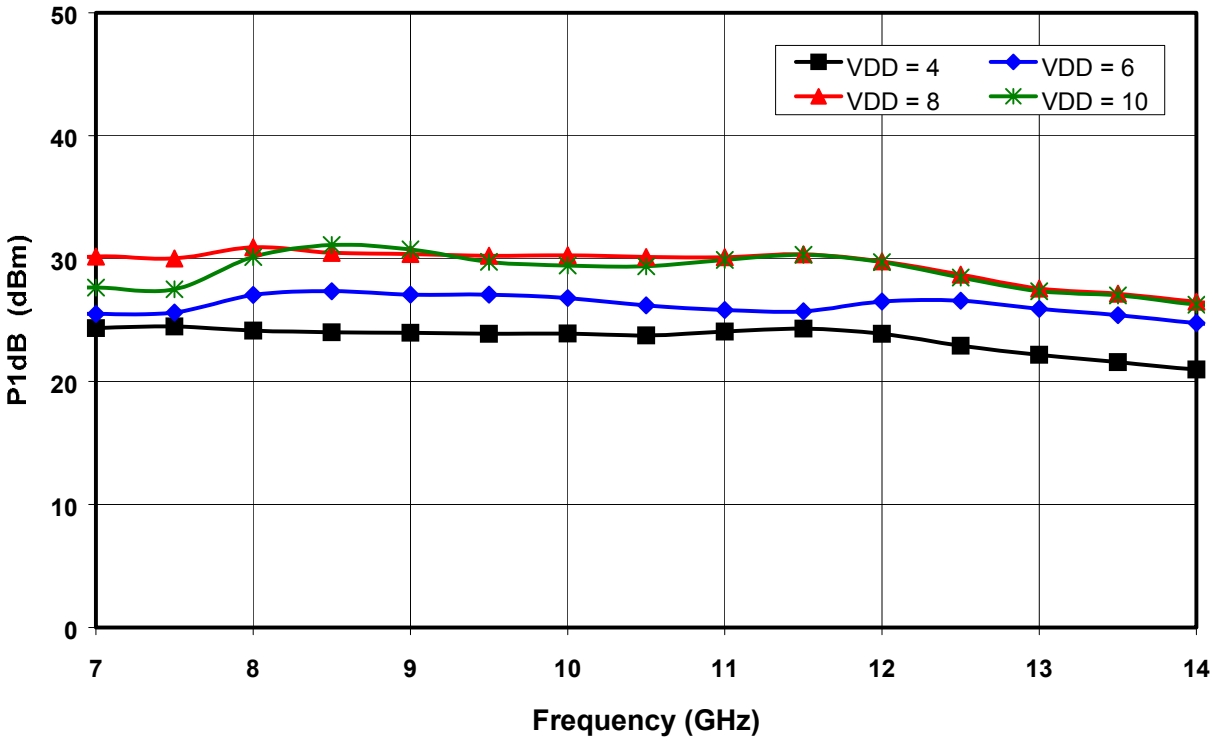


Figure 3. 1dB Compression Point vs. Drain Voltage

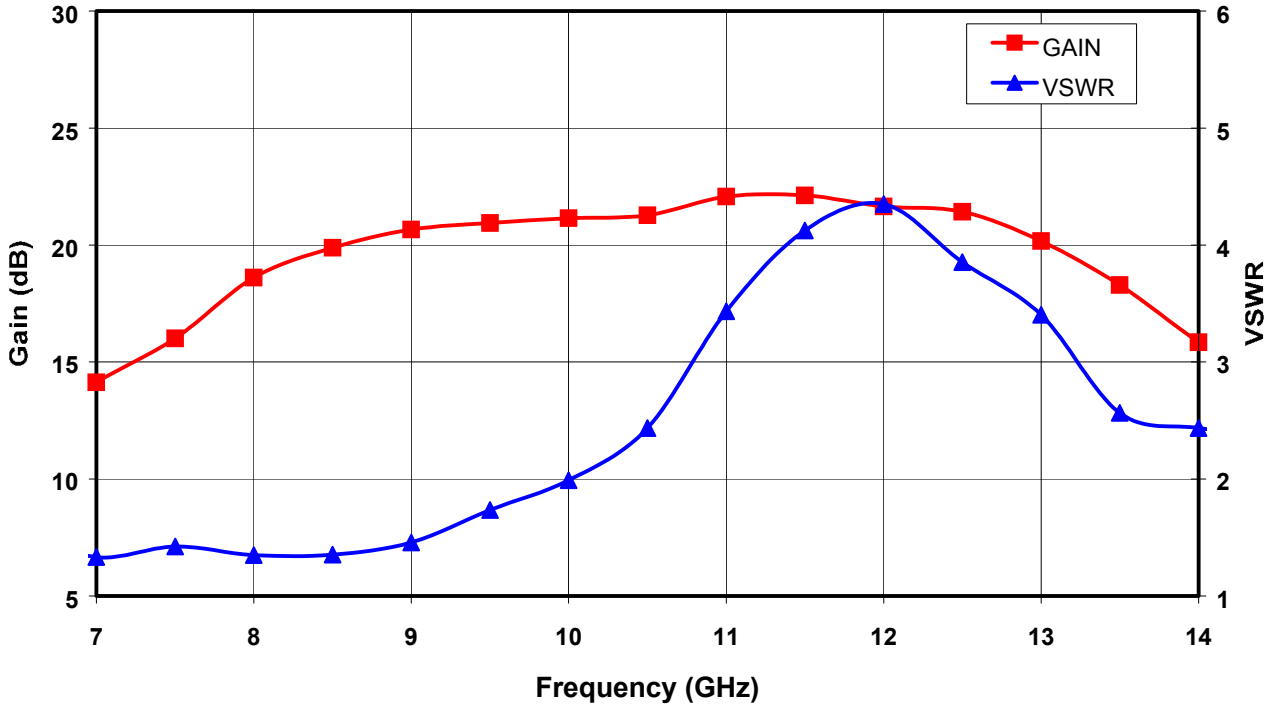


Figure 4. Small Signal Gain and Input VSWR vs. Frequency at V_{DD} = 8V.

Mechanical Information

Chip Size: 2.980 x 2.980 x 0.075 mm (117 x 117 x 3 mils)

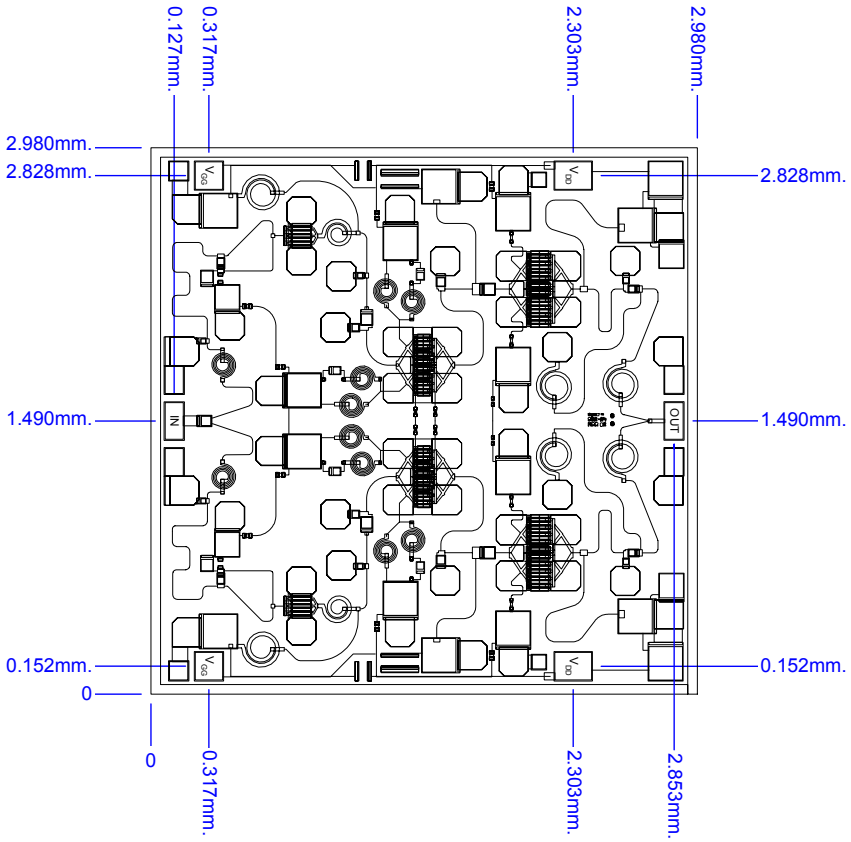


Figure 5. Die Layout

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

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

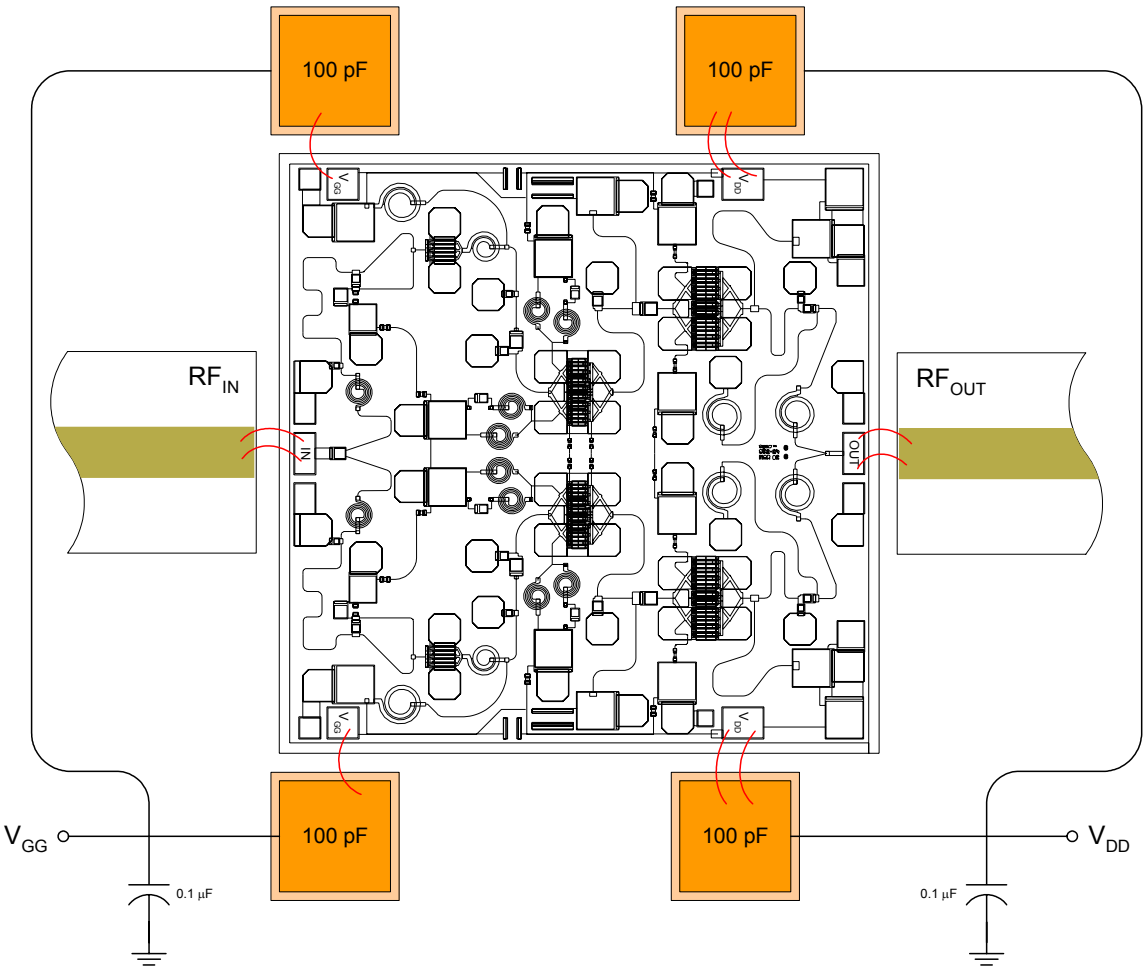


Figure 6. Recommended bonding diagram for pedestal mount.
Support circuitry typical of MMIC characterization fixture for CW testing.

Assembly Instructions:

Die attach: Use AuSn (80/20) 1-2 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_{GG} before applying positive bias to V_{DD} to prevent damage to amplifier.