tyco Electronics

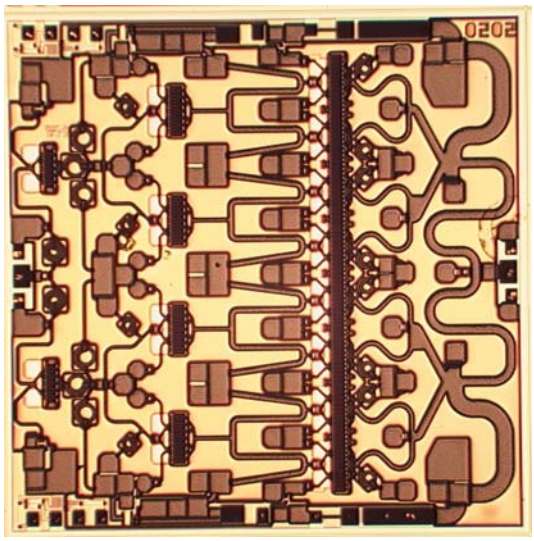
MACOM

Amplifier, Power, 10W
8.5—10.5 GHz

MA08509D
Rev A
Preliminary Information

Features

- **10 Watt CW Saturated Output Power Level**
- **Variable Drain Voltage (8-10V) Operation**
- **GaAs MSAG™ Process**
- **Proven Manufacturability and Reliability**
  - **No Airbridges**
  - **Polyimide Scratch Protection**
  - **No Hydrogen Poisoning Susceptibility**



Description

The MA08509D is a 3-stage 10 W power amplifier with on-chip bias networks. This product is fully matched to 50 ohms on both the input and output.

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

M/A-COM's MSAG™ 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

- **Weather Radar**
- **Airborne Radar**

Also Available in:

Description	Sample Board (Die)	Die on Pedestal	Mechanical Sample (Die)
Part Number	MAAP-008509-SMB004	MAAP-008509-PED000	MAAP-008509-MCH000

Electrical Characteristics: On-Wafer, Z_0 = 50Ω, V_{DD} = 10V, V_{GG} = -4V, P_{in} = 18 dBm

Parameter	Symbol	Minimum	Typical	Maximum	Units
Bandwidth	f	8.5		10.5	GHz
Saturated Output Power	POUT	39.0	41.0		dBm
Power Added Efficiency	PAE	25	32		%
Small Signal Gain	G	24	27		dB
Input VSWR	VSWR		2.5:1	4:1	
Quiescent Gate Current	IGQ	8	20	26	mA
Quiescent Drain Current	IDQ	1.3	2.0	2.5	A
Drain Current @ 10 GHz	IDD		3.9	4.5	A
Harmonics	2f, 3f		< -30		dBc

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit www.macom.com for additional data sheets and product information.

Maximum CW Operating Conditions[1]

Parameter	Symbol	Absolute Maximum	Units
Input Power	P_{IN}	24.0	dBm
Drain Supply Voltage	V_{DD}	+12.0	V
Gate Supply Voltage	V_{GG}	-6.0	V
Quiescent Drain Current (No RF)	I_{DQ}	2.7	A
Quiescent DC Power Dissipated (No RF)	P_{DISS}	27	W
Junction Temperature	T_J	170	°C
Storage Temperature	T_{STG}	-55 to +150	°C

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

Recommended Operating Conditions[2]

Characteristic	Symbol	Min	Typ	Max	Unit
Drain Voltage	V_{DD}	8.0	10.0	10.0	V
Gate Voltage	V_{GG}	-4.4	-4.0	-3.6	V
Input Power	P_{IN}		18.0	20.0	dBm
MMIC Base Temperature	T_B			Note 3	°C

2. Operation outside of these ranges may reduce product reliability.
3. Maximum 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} = -4 V, V_{DD}= 0 V.
2. Ramp V_{DD} to desired voltage, typically 10 V.
3. Adjust V_{GG} to set I_{DQ}, (approximately @ –4 V).
4. Set RF input.
5. Power down sequence in reverse. Turn gate voltage off last.

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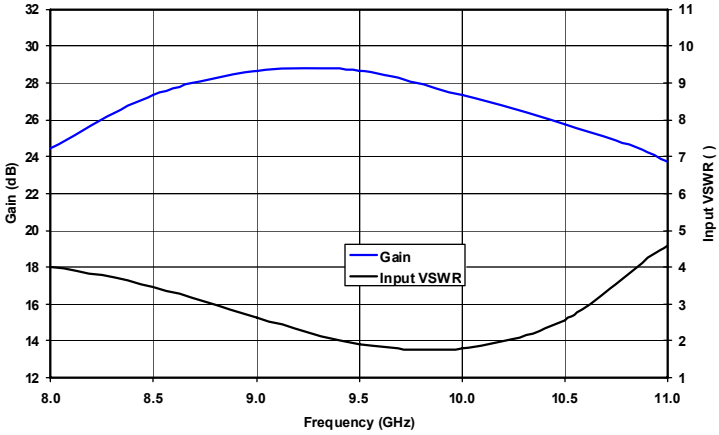

Figure 1. MA08509D on Pedestals, Ckt 1255-1

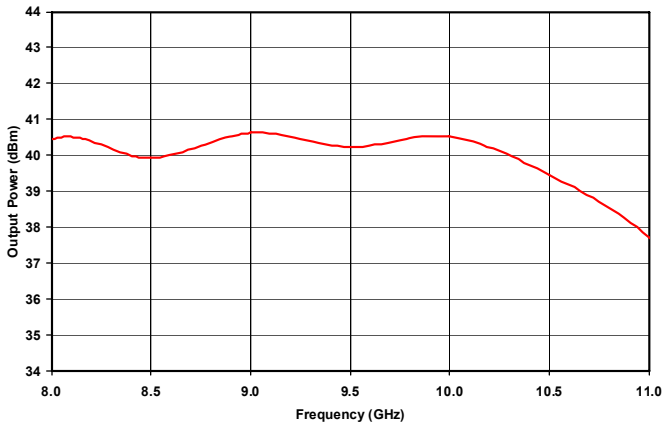

Figure 2. MA08509D on Pedestals, Ckt 1255-1

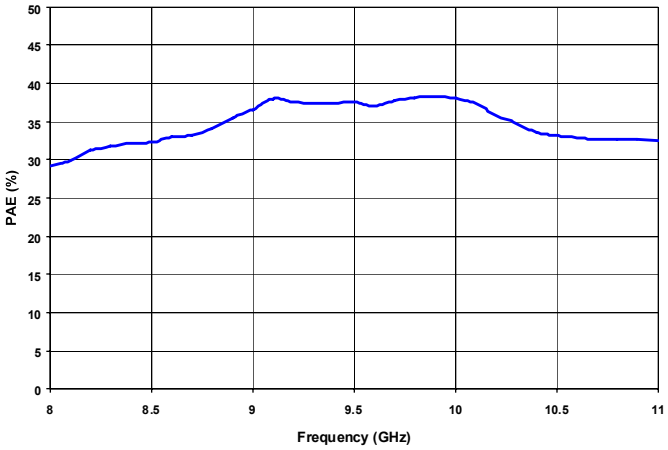

Figure 3. CW Power Added Efficiency at V_{DD} = 10V, V_{GG}= -4V, Pin = 18dBm

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Mechanical Information

Chip Size: 4.58 x 4.58 x 0.075 mm (181 x 181 x 3 mils)

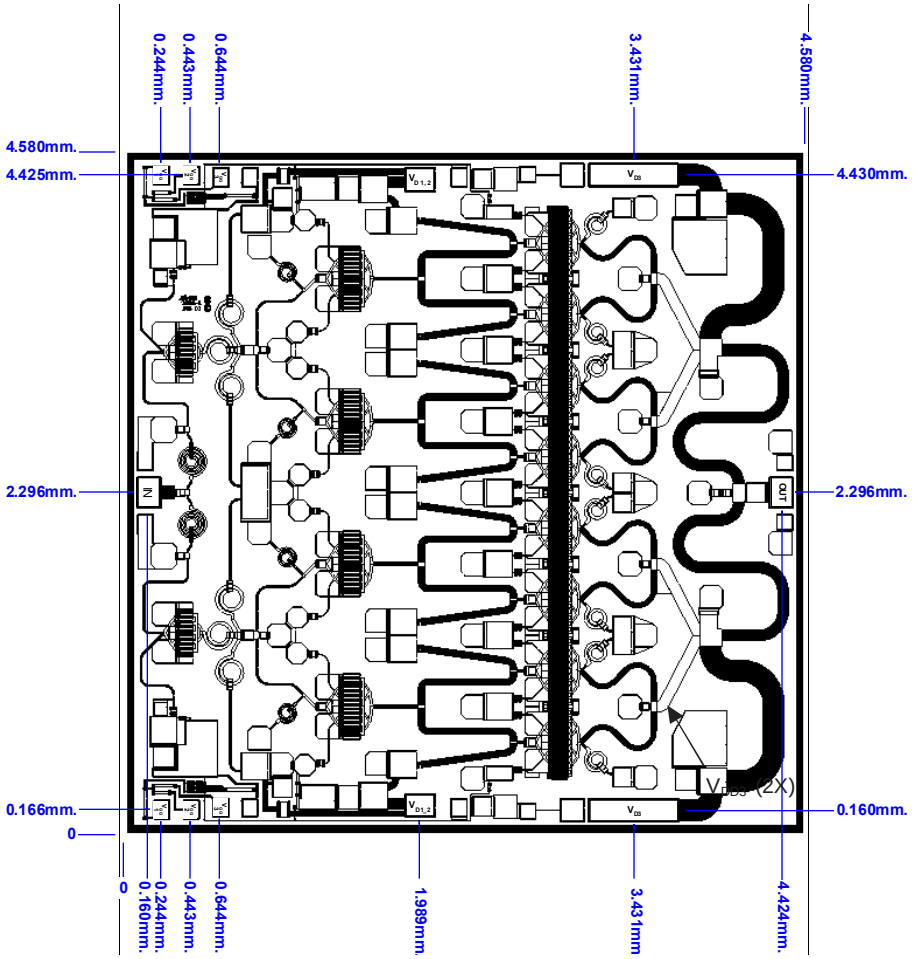

Figure 4. Die Layout

Bond Pad Information

Pad	Type	Nominal Voltage	Size	
			(mm)	(mils)
IN, OUT	RF	N/A	150 x 200	6 x 8
$V_{DD\ 1/2}$	DC	10.0 V	200 x 150	8 x 6
$V_{DD\ 3}$	DC	10.0 V	400 x 150	16 x 6
V_{GG}	DC	-4.0 V	150 x 150	6 x 6

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Assembly and Bonding Diagram

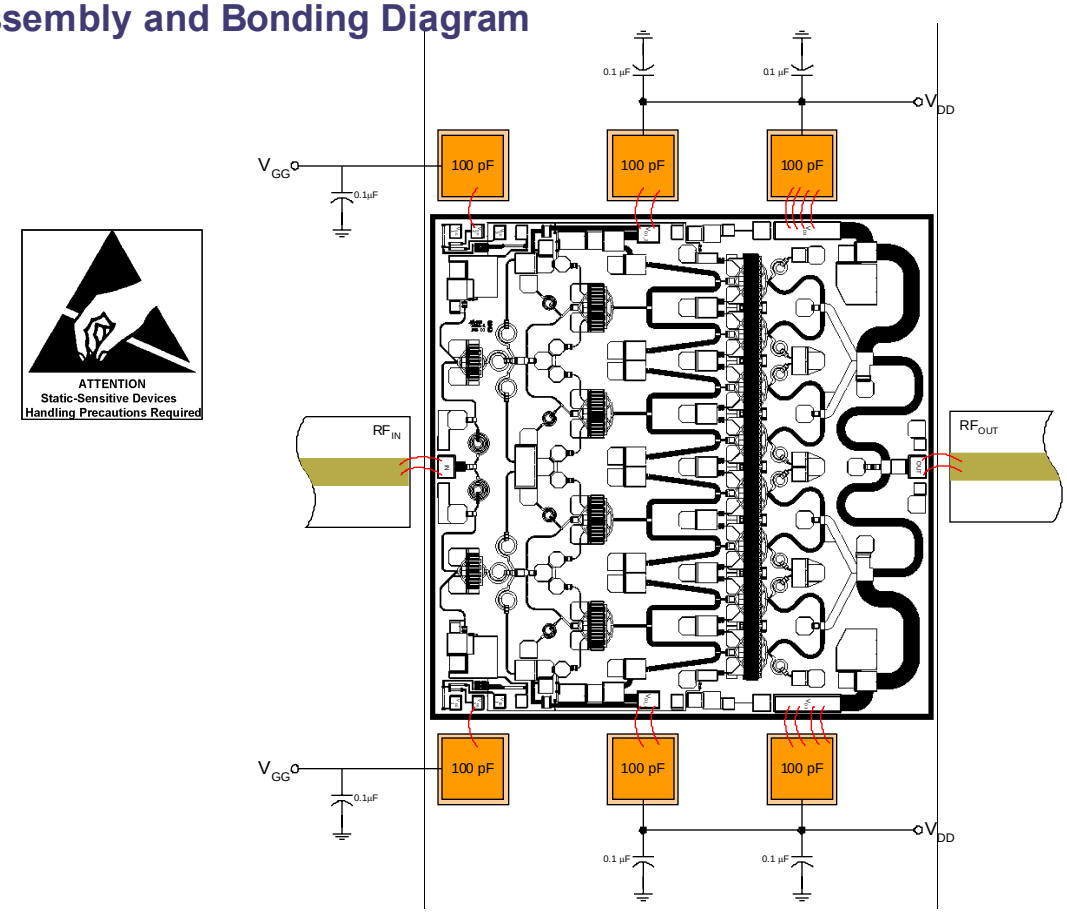

Figure 5. Recommended bonding diagram for pedestal mount.
Support circuitry typical of MMIC characterization fixture for CW testing.

NOTE: Indicated Gate voltage pad (VGG 2) represents the nominal bias condition. However, the device current can be increased or decreased as required by bonding to either VGG 1 or VGG 3 (respectively).

Assembly Instructions:

Die attach: Use AuSn (80/20) 1 mil. preform solder. Limit time @ 310 °C to less than 7 minutes. Refer to Application Note AN3017 for more detailed information.

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.

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