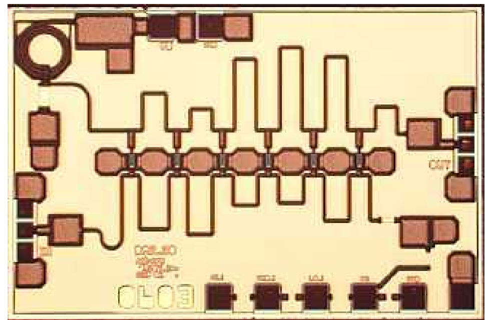
1.0 – 18.0 GHz 0.1W Distributed Amplifier

MAAMGM0002-DIE

Features

- 0.1 Watt Saturated Output Power Level
- 1.0 to 18.0 GHz Operation
- 4 dB Typical Noise Figure
- Select-at-Test Biasing
- Self-Aligned MSAG™ MESFET Process



Description

The MAAMGM0002-Die is a 0.1W Distributed Amplifier with on-chip bias networks. This product is fully matched to 50 ohms on both the input and output. The MMIC can be used as a broad-band 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 MESFET 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

- Test Equipment
- Electronic Warfare
- Radar

MAAMGM0002-DIE

Electrical Characteristics: T_B = 40°C[1], Z_0 = 50Ω, V_{DD} = 5V, I_{DQ} = 75 mA, P_{in} = 14 dBm

Parameter	Symbol	Typical	Units
Bandwidth	f	1.0 - 18.0	GHz
Output Power	P_{OUT}	21	dBm
Power Added Efficiency	PAE	12	%
1-dB Compression Point	P1dB	20	dBm
Small Signal Gain	G	9	dB
Noise Figure	NF	4	dB
Output TOI	OTOI	31	dBm
Input VSWR	VSWR	1.7:1	
Output VSWR	VSWR	1.7:1	
Gate Current	I_{GG}	< 2	mA
Drain Current	I_{DD}	100	mA

1. T_B = MMIC Base Temperature
2. Adjust V_{GG} between –1.0 and –0.3 V to achieve I_{DQ} indicated.

Maximum Operating Conditions [2]

Parameter	Symbol	Absolute Maximum	Units
Input Power	P_{IN}	19.0	dBm
Drain Voltage	V_{DD}	+7.0	V
Gate Voltage	V_{GG}	-1.5	V
Gate Voltage, Select at Test	HI, MID, LO	-6.0	V
Quiescent Drain Current (No RF)	I_{DQ}	120	mA
Quiescent DC Power Dissipation (No RF)	P_{DISS}	0.5	W
Junction Temperature	T_J	180	°C
Storage Temperature	T_{STG}	-55 to +150	°C

2. 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

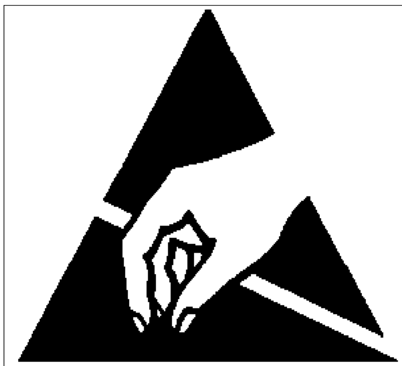
Parameter	Symbol	Min	Typ	Max	Unit
Drain Voltage	V_{DD}	4.5	5.0	5.5	V
Gate Voltage	V_{GG}	-1.0	-0.6	-0.3	V
Gate Voltage, Select at Test	HI, MID, LO		-5.0		V
Input Power	P_{IN}		14	17	dBm
Junction Temperature	T_J			150	°C
Thermal Resistance	Θ_{JC}		91.2		°C/W
MMIC Base Temperature	T_B			Note 3	°C

3. Maximum MMIC Base Temperature = 150°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 according to which configuration you are using.

Select-at-Test Gate Bias Figure 5a.	Direct Gate Bias Figure 5b.
1. With V_{DD} = 0, apply V_{GG} = -5V to HI, MID or LO for desired I_{DQ}. 2. Set V_{DD} = 5V. Confirm I_{DQ}. 3. Power down sequence in reverse. 4.Turn off V_{GG} last.	1. With V_{DD} = 0 V, set V_{GG} = -0.8 V. 2. Set V_{DD} = 5 V. 3. Adjust V_{GG} for desired I_{DQ}. 4. Power down sequence in reverse. 5. Turn off V_{GG} last.



ATTENTION
Static-Sensitive Devices
Handling Precautions Required

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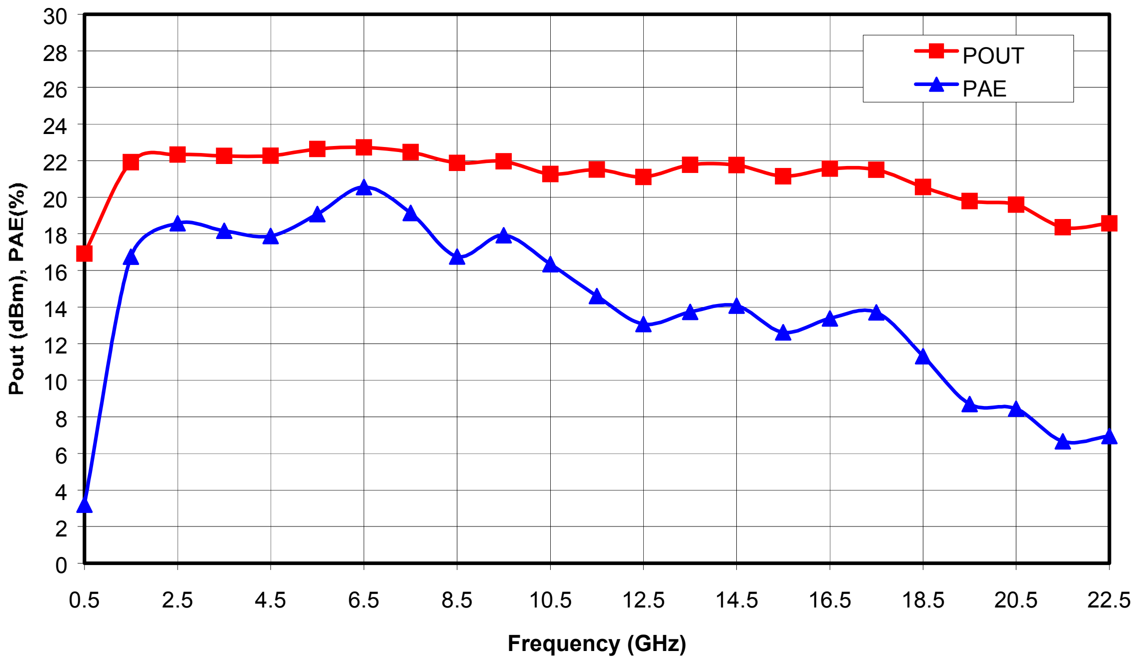

Figure 1. Output Power and Power Added Efficiency vs. Frequency at V_{DD} = 5V, P_{in} = 14dBm.

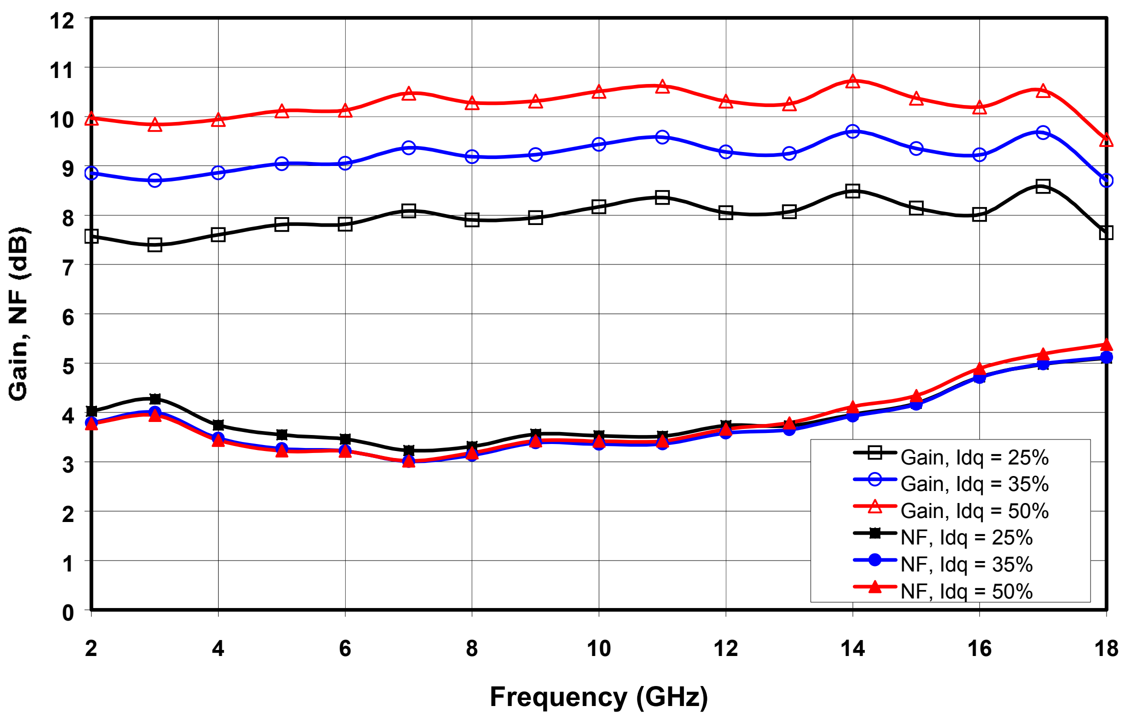

Figure 2. Gain and Noise Figure vs Idq as a Relative Percentage of Idss (50% Idss ~ 100 mA).

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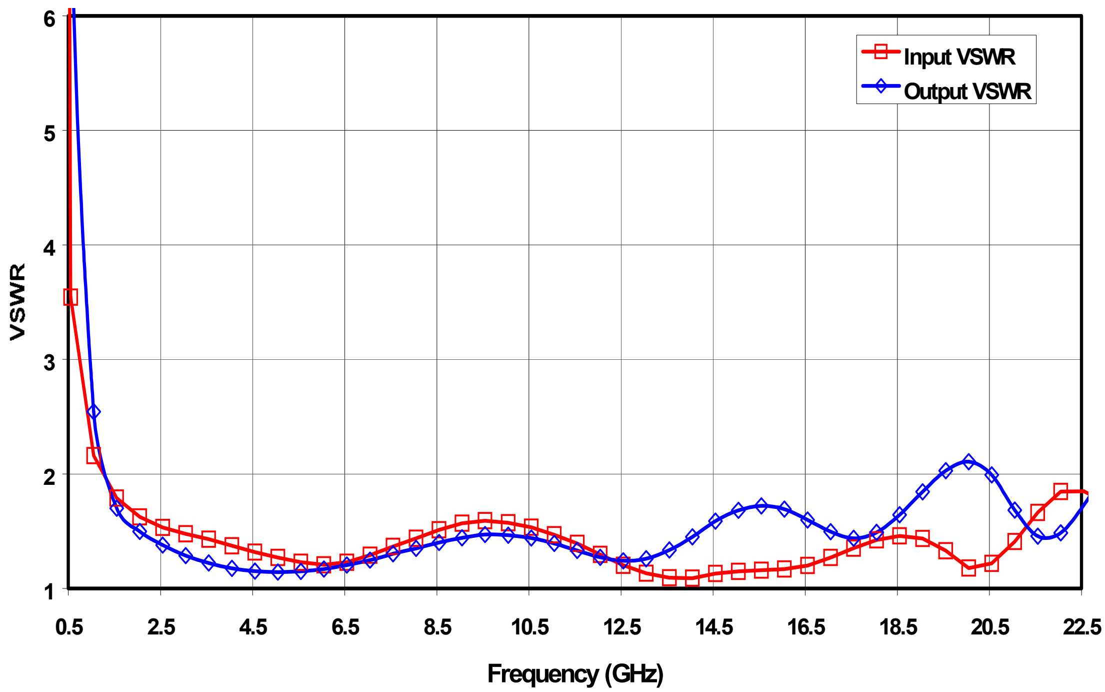

Figure 3. Input and Output VSWR.

Specifications subject to change without notice.

Email: macom_adbu_ics@tycoelectronics.com

- **North America:** Tel. (800) 366-2266
- **Asia/Pacific:** Tel.+81-44-844-8296, Fax +81-44-844-8298
- **Europe:** Tel. +44 (1908) 574 200, Fax+44 (1908) 574 300

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Mechanical Information

Chip Size: 2.98 x 1.98 x 0.075 mm (118 x 78 x 3 mils)

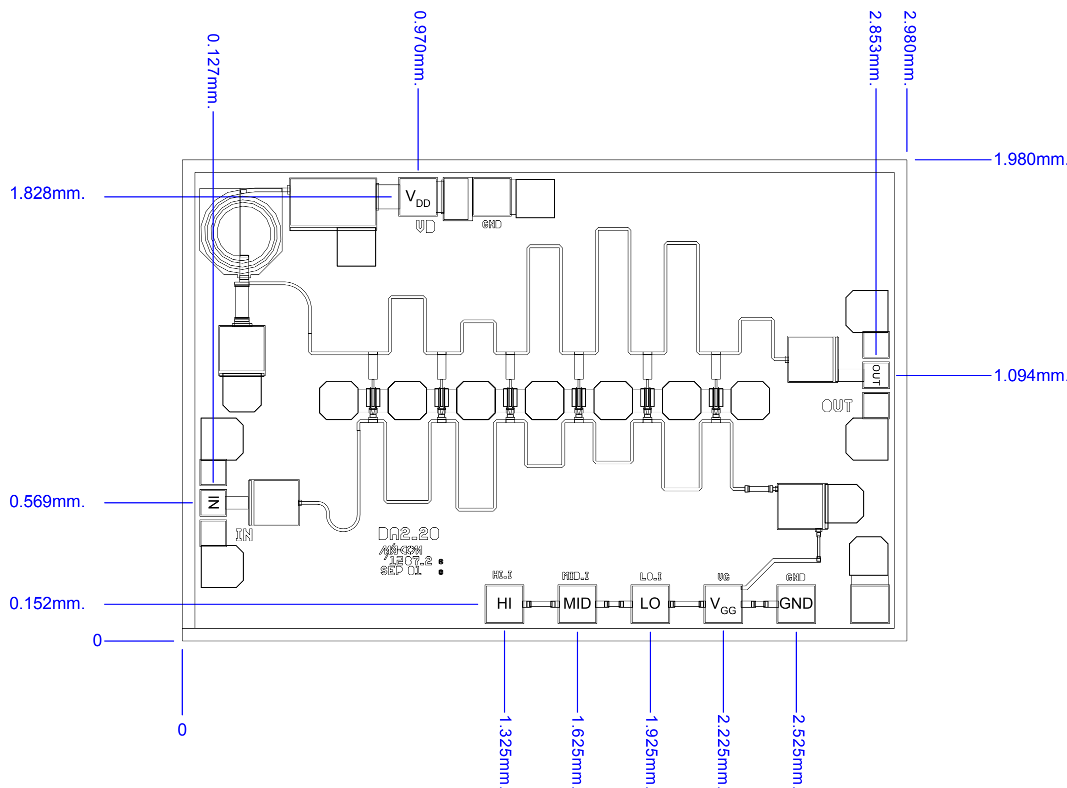

Figure 4. Die Layout

Bond Pad Dimensions

Pad	Size (μm)	Size (mils)
RF: IN, OUT	100 x 100	4 x 4
Drain Supply Voltage: V_{DD}	150 x 150	6 x 6
Direct Gate Supply Voltage: V_{GG}	150 x 150	6 x 6
Select-at-Test Gate Supply Voltage: HI, MID, LO	150 x 150	6 x 6
Ground: GND	150 x 150	6 x 6

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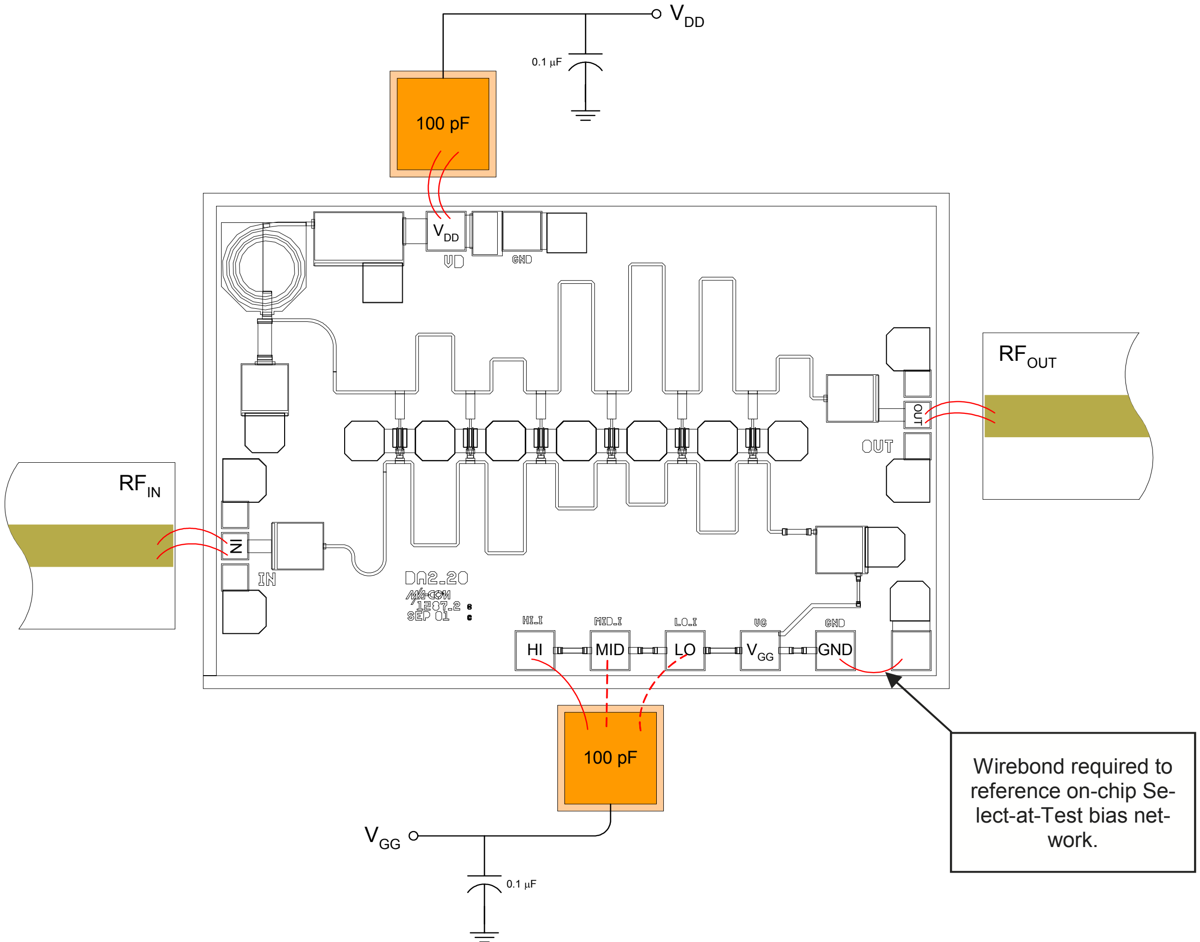

Figure 5a. Required Bonding for Select-at-Test Gate Bias Configuration. Support circuitry typical of MMIC characterization fixture for CW testing.

Pad	Applied Voltage (V)	% IDSS
HI	-5	50
MID	-5	35
LO	-5	25

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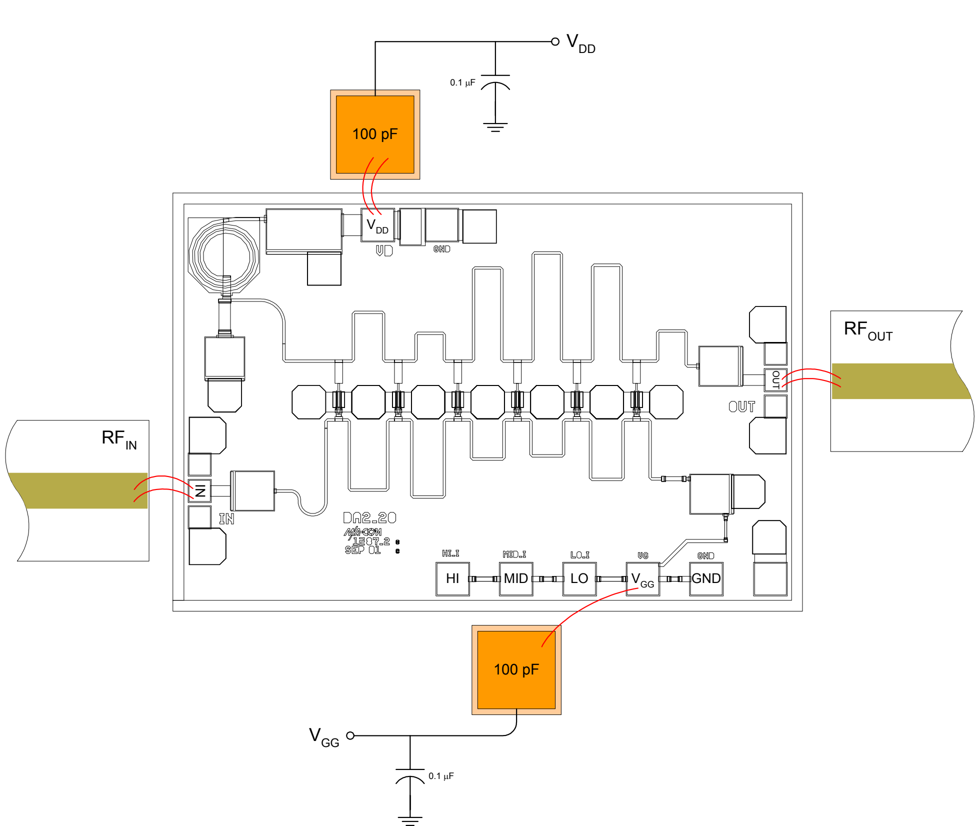

Figure 5b. Required Bonding for Direct Application of Gate Bias.
Support circuitry typical of MMIC characterization fixture for CW testing.

Pad	Applied Voltage (V)	% IDSS
V_{GG}	-1.0 to -0.3	25 - 50

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.

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