

MAMG-100227-010C0L

Rev. V7

#### **Features**

- Compact Size (14 x 18 mm²)
- GaN-on-Si Technology
- · Fully Matched at Input and Output
- 28 V Operation
- CW Output Power >10 W, 40% PAE and 22 dB Power Gain
- Lead-Free Package with Heat Sink
- RoHS\* Compliant

### **Applications**

- Tactical Military Communications
- LMR
- · Wireless (public safety)

#### **Description**

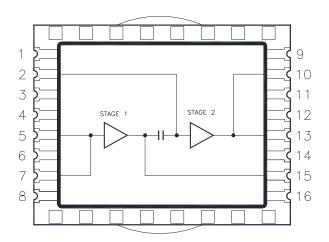
The MAMG-100227-010C0L is a broadband 2-stage GaN-on-Si hybrid power amplifier module in an air-cavity laminate package. A gold-plated copper heat sink is attached to the bottom side of the laminate substrate. The package can be accessed from the top or the bottom allowing for "live bug" or "dead bug" mounting.

## Ordering Information<sup>1</sup>

Part Number	Package
MAMG-100227-010C0L	JEDEC tray (84 per tray)
MAMG-1U0227-010C0L	Sample Board

<sup>1.</sup> All sample boards include a part soldered down to the board.

#### **Functional Schematic**



# Pin Configuration<sup>2,3</sup>

Pin#	Function	Pin#	Function
1	NC	9	GND
2	$V_{G2}$	10	$V_{D2}$
3	GND	11	GND
4	GND	12	GND
5	RF <sub>IN</sub>	13	RF <sub>OUT</sub>
6	GND	14	GND
7	$V_{G1}$	15	V <sub>D1</sub>
8	GND	16	GND

- 2. MACOM recommends connecting unused package pins to ground
- The package heat sink must be connected to RF, DC, and thermal ground.

<sup>\*</sup> Restrictions on Hazardous Substances, compliant to current RoHS EU directive.



MAMG-100227-010C0L

# **Electrical Specifications<sup>4</sup>:**

 $T_A = 25$ °C,  $Z_O = 50 \Omega$ , CW RF Signal,  $I_{DQ1} = 40$  mA,  $I_{DQ2} = 100$  mA

Parameter	Test Co	Min.	Тур.	Max.	Units		
28 V Specifications							
Output Power (P <sub>OUT</sub> )	P <sub>IN</sub> = 16 dBm P <sub>IN</sub> = 18 dBm P <sub>IN</sub> = 18 dBm P <sub>IN</sub> = 16 dBm	225 MHz 450 MHz 1400 MHz 2600 MHz	39.5	41	_	dBm	
Power Gain (G <sub>P</sub> )	P <sub>IN</sub> = 16 dBm 225 MHz P <sub>IN</sub> = 18 dBm 450 MHz P <sub>IN</sub> = 18 dBm 1400 MHz P <sub>IN</sub> = 16 dBm 2600 MHz		_	25 23 23 25	_	dB	
Drain Efficiency (η <sub>D</sub> )	P <sub>IN</sub> = 16 dBm P <sub>IN</sub> = 18 dBm P <sub>IN</sub> = 18 dBm P <sub>IN</sub> = 16 dBm	225 MHz 450 MHz 1400 MHz 2600 MHz	46 39 30 33	50 43 37 38	_	%	
Input Return Loss (I <sub>RL</sub> )	P <sub>IN</sub> = 16 dBm P <sub>IN</sub> = 18 dBm P <sub>IN</sub> = 18 dBm P <sub>IN</sub> = 16 dBm	225 MHz 450 MHz 1400 MHz 2600 MHz	_	-14 -15 -15 -8	_	dB	
3rd Order Intermodulation Distortion (IM3)	33.5 dBm/tone, F <sub>2</sub> -F <sub>1</sub> = 1.25 MHz  31.0 dBm/tone, F <sub>2</sub> -F <sub>1</sub> = 1.25 MHz  225 MHz 450 MHz 1400 MHz 2600 MHz		_	-30 -31 -43 -36	-26 -26 -26 -25	dBc	
Load Mismatch Tolerance (VSWR <sub>T</sub> )	No Damage o All Ph	_	5:1	_	_		
36 V Specifications							
Output Power (P <sub>OUT</sub> )			42.2	43	_	dBm	
Power Gain (G <sub>P</sub> )	P <sub>IN</sub> = 18 dBm	P <sub>IN</sub> = 18 dBm 320 MHz		25	_	dB	
Drain Efficiency (η <sub>D</sub> )			49	51	_	%	

<sup>4.</sup> Measured in MACOM's evaluation circuit (see page 4).

#### **Thermal Characteristics**

Parameter	Symbol	Test Conditions	Units	Min.	Тур.	Max.
Channel-to-Case Thermal Resistance⁵	Өсн-с	T <sub>CASE</sub> = 85°C, RF applied, P <sub>DISS</sub> = 22.5 W	°C/W	_	4.35	_

<sup>5.</sup> The channel temperature (T<sub>CH</sub>) is determined using Raman and simulation techniques. For more details about this measurement contact the local application team.



MAMG-100227-010C0L Rev. V7

## **Absolute Maximum Ratings**<sup>6,7</sup>

Parameter	Symbol	Absolute Maximum
Input Power	P <sub>IN</sub>	27 dBm
Drain Supply Voltage	V <sub>D</sub>	40 V
Gate Supply Voltage	V <sub>G</sub>	-4 V to 0 V
Supply Current	I <sub>DS</sub>	1.6 A
Power Dissipation	P <sub>DISS</sub>	32 W
Channel Temperature <sup>8</sup>	T <sub>CH</sub>	250°C
Operating Temperature	T <sub>OP</sub>	-40°C to 85°C
Storage Temperature	TSTG	-65°C to 150°C

<sup>6.</sup> Exceeding any one or combination of these limits may cause permanent damage to this device.

#### **Handling Procedures**

Please observe the following precautions to avoid damage:

### **Static Sensitivity**

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

### **Biasing Sequence**

#### Turning the device ON:

- 1. Set V<sub>G</sub> to pinch-off (V<sub>P</sub>), typically -5 V.
- 2. Turn on  $V_D$  to nominal voltage (+28 V).
- 3. Increase  $V_G$  until the desired quiescent current  $I_{DQ}$  is reached.
- 4. Apply RF power to desired level.

#### Turning the device OFF:

- 1. Turn the RF power off.
- 2. Decrease  $V_{GS}$  down to  $V_{P}$
- 3. Decrease  $V_{DS}$  down to 0 V.
- 4. Turn off V<sub>GS</sub>.

<sup>7.</sup> MACOM does not recommend sustained operation near these survivability limits.

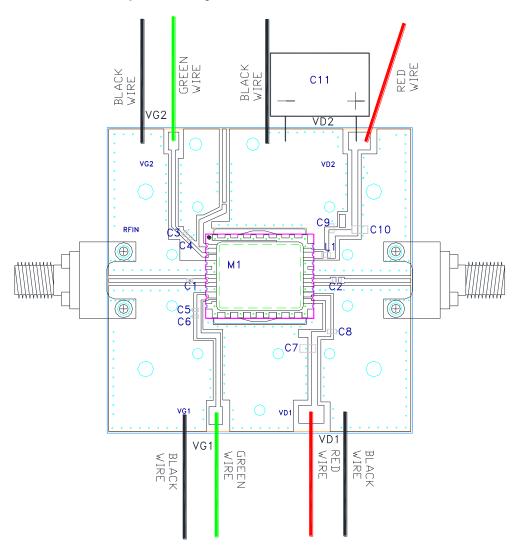
<sup>8.</sup> Operating at nominal conditions with  $T_{CH} \le 210^{\circ}$ C will ensure MTTF > 1 x  $10^{6}$  hours.



MAMG-100227-010C0L

Rev. V7

# **Evaluation Board and Component Layout**



#### **Parts List**

Reference	Value	Case Style	Tolerance	Manufacturer	Part Number
L1	110 nH	0805	5%	Coilcraft	0805LS-111XJE
C1	1000 pF	0402	10%	Murata	GRM155R72A102KA01D
C2	1000 pF	0603	10%	Murata	GRM188R72A102KA37D
C3,C6	1 µF	0402	20%	TDK	C1005X5R1E105M050BC
C4,C5	10 nF	0402	10%	Murata	GRM155R71H103KA88D
C8,C9	10 nF	0603	10%	Murata	GCM188R72A103KA37D
C7,C10	1 µF	1210	10%	KEMET	C1210C105K1RACTU
C11	100 µF	Axial	20%	Multicomp	MCAX63V107M10X21



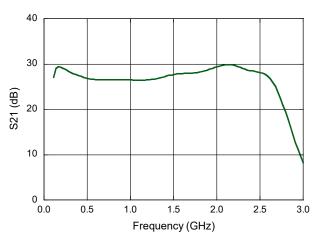
MAMG-100227-010C0L

Rev. V7

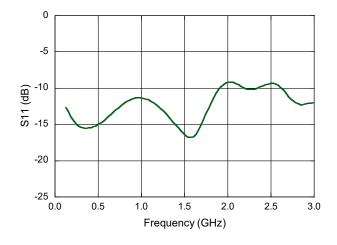
# **Typical Small Signal Performance:**

 $V_{DD} = 28 \text{ V}, I_{DQ1} = 40 \text{ mA}, I_{DQ2} = 100 \text{ mA}, T_A = 25^{\circ}\text{C}$ 

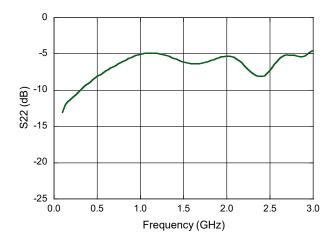
#### Gain



#### Input Return Loss



#### **Output Return Loss**





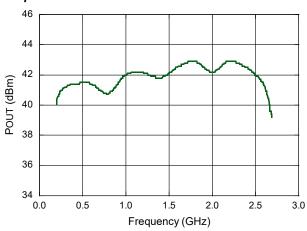
MAMG-100227-010C0L

Rev. V7

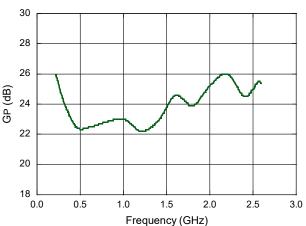
# **Typical Large Signal Performance:**

 $T_A = 25$ °C,  $V_{DD} = 28 \text{ V}$ ,  $I_{DQ1} = 40 \text{ mA}$ ,  $I_{DQ2} = 100 \text{ mA}$ ,  $P_{SAT}$ , CW

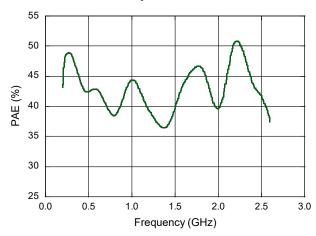
#### **Output Power**



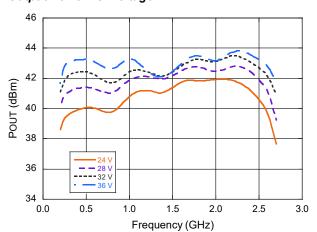
#### Power Gain



#### Power Added Efficiency



#### Output Power vs. Voltage

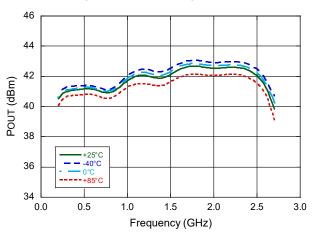




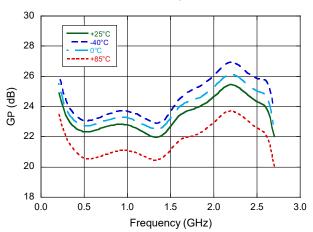
MAMG-100227-010C0L Rev. V7

# Typical Large Signal Performance vs. Temperature: $V_{DD} = 28 \text{ V}$ , $I_{DQ1} = 40 \text{ mA}$ , $I_{DQ2} = 100 \text{ mA}$

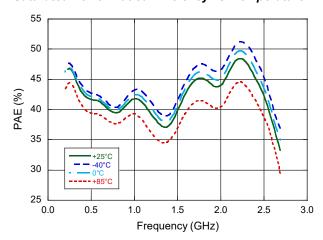
#### Saturated Output Power vs. Temperature



#### Saturated Power Gain vs. Temperature



#### Saturated Power Added Efficiency vs. Temperature

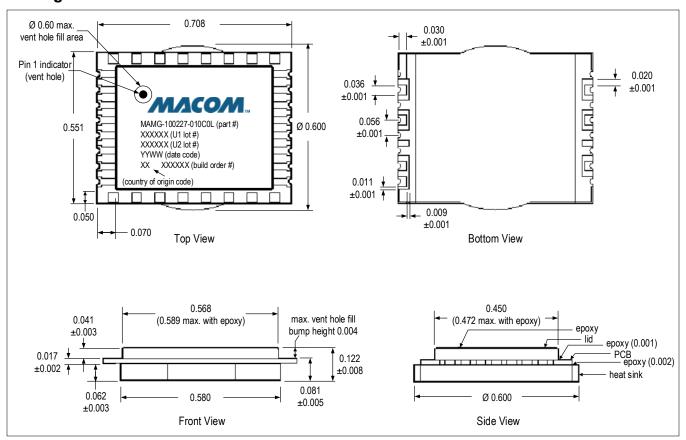




MAMG-100227-010C0L

Rev. V7

## Package Outline<sup>†</sup>



† All dimensions shown as inches. Reference Application Note AN-0004016 for lead-free solder reflow recommendations. Meets JEDEC moisture sensitivity level 3 requirements. Plating is Gold.



MAMG-100227-010C0L

Rev. V7

### MACOM Technology Solutions Inc. ("MACOM"). All rights reserved.

These materials are provided in connection with MACOM's products as a service to its customers and may be used for informational purposes only. Except as provided in its Terms and Conditions of Sale or any separate agreement, MACOM assumes no liability or responsibility whatsoever, including for (i) errors or omissions in these materials; (ii) failure to update these materials; or (iii) conflicts or incompatibilities arising from future changes to specifications and product descriptions, which MACOM may make at any time, without notice. These materials grant no license, express or implied, to any intellectual property rights.

THESE MATERIALS ARE PROVIDED "AS IS" WITH NO WARRANTY OR LIABILITY, EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHT, ACCURACY OR COMPLETENESS, OR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

# **Mouser Electronics**

**Authorized Distributor** 

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

# MACOM:

MAMG-100227-010C0L MAMG-1U0227-010C0L