# 10 W 2-Stage Hybrid GaN Module
# 225 - 2600 MHz

**MAMG-100227-010C0L**
**Rev. V6**

## Features

- Compact Size (14 x 18 $mm^2$)
- 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

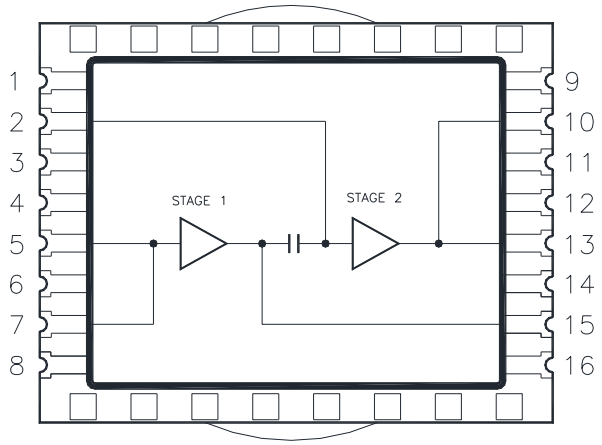
The MAMG-100227-010C0L is a broadband 2-stage GaN-on-Si hybrid power amplifier module in an air-cavity laminate package. A gold-plated copper heat sink is attached to the bottom side of the laminate substrate. The package can be accessed from the top or the bottom allowing for “live bug” or “dead bug”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

## Ordering Information[1]

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

1. All sample boards include a part soldered down to the board.

## Functional Schematic




## Pin Configuration[2,3]

| Pin # | Function | Pin # | Function |
|---|---|---|---|
| 1 | NC | 9 | GND |
| 2 | $V_{G2}$ | 10 | $V_{D2}$ |
| 3 | GND | 11 | GND |
| 4 | GND | 12 | GND |
| 5 | $RF_{IN}$ | 13 | $RF_{OUT}$ |
| 6 | GND | 14 | GND |
| 7 | $V_{G1}$ | 15 | $V_{D1}$ |
| 8 | GND | 16 | GND |

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

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

## Electrical Specifications[4]:
## $T_A$ = 25°C, $Z_O$ = 50 Ω, CW RF Signal, $I_{DQ1}$ = 40 mA, $I_{DQ2}$ = 100 mA

| Parameter | Test Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **28 V Specifications** | | | | | | |
| Output Power ($P_{OUT}$) | $P_{IN}$ = 16 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 16 dBm | 225 MHz<br>450 MHz<br>1400 MHz<br>2600 MHz | 39.5 | 41 | — | dBm |
| Power Gain ($G_P$) | $P_{IN}$ = 16 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 16 dBm | 225 MHz<br>450 MHz<br>1400 MHz<br>2600 MHz | — | 25<br>23<br>23<br>25 | — | dB |
| Drain Efficiency ($\eta_D$) | $P_{IN}$ = 16 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 16 dBm | 225 MHz<br>450 MHz<br>1400 MHz<br>2600 MHz | 46<br>39<br>30<br>33 | 50<br>43<br>37<br>38 | — | % |
| Input Return Loss ($I_{RL}$) | $P_{IN}$ = 16 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 18 dBm<br>$P_{IN}$ = 16 dBm | 225 MHz<br>450 MHz<br>1400 MHz<br>2600 MHz | — | -14<br>-15<br>-15<br>-8 | — | dB |
| 3rd Order Intermodulation Distortion (IM3) | 33.5 dBm/tone, $F_2$-$F_1$ = 1.25 MHz<br>31.0 dBm/tone, $F_2$-$F_1$ = 1.25 MHz | 225 MHz<br>450 MHz<br>1400 MHz<br>2600 MHz | — | -30<br>-31<br>-43<br>-36 | -26<br>-26<br>-26<br>-25 | dBc |
| Load Mismatch Tolerance ($VSWR_T$) | No Damage or Oscillations, All Phases | | — | 5:1 | — | — |
| **36 V Specifications** | | | | | | |
| Output Power ($P_{OUT}$) | $P_{IN}$ = 18 dBm | 320 MHz | 42.2 | 43 | — | dBm |
| Power Gain ($G_P$) | | | — | 25 | — | dB |
| Drain Efficiency ($\eta_D$) | | | 49 | 51 | — | % |

4. Measured in MACOM's evaluation circuit (see page 4).

## Thermal Characteristics

| Parameter | Symbol | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| Channel-to-Case Thermal Resistance[5] | $\Theta_{CH-C}$ | $T_{CASE}$ = 85°C, RF applied, $P_{DISS}$ = 22.5 W | °C/W | — | 4.35 | — |

5. The channel temperature ($T_{CH}$) is determined using Raman and simulation techniques. For more details about this measurement contact the local application team.

## Absolute Maximum Ratings[6,7]

| Parameter | Symbol | Absolute Maximum |
|---|---|---|
| Input Power | $P_{IN}$ | 27 dBm |
| Drain Supply Voltage | $V_D$ | 40 V |
| Gate Supply Voltage | $V_G$ | -4 V to 0 V |
| Supply Current | $I_{DS}$ | 1.6 A |
| Power Dissipation | $P_{DISS}$ | 32 W |
| Channel Temperature[8] | $T_{CH}$ | 250°C |
| Operating Temperature | $T_{OP}$ | -40°C to 85°C |
| Storage Temperature | TSTG | -65°C to 150°C |

6. Exceeding any one or combination of these limits may cause permanent damage to this device.
7. MACOM does not recommend sustained operation near these survivability limits.
8. Operating at nominal conditions with $T_{CH} \leq 210°C$ will ensure MTTF > 1 x $10^6$ hours.

## 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

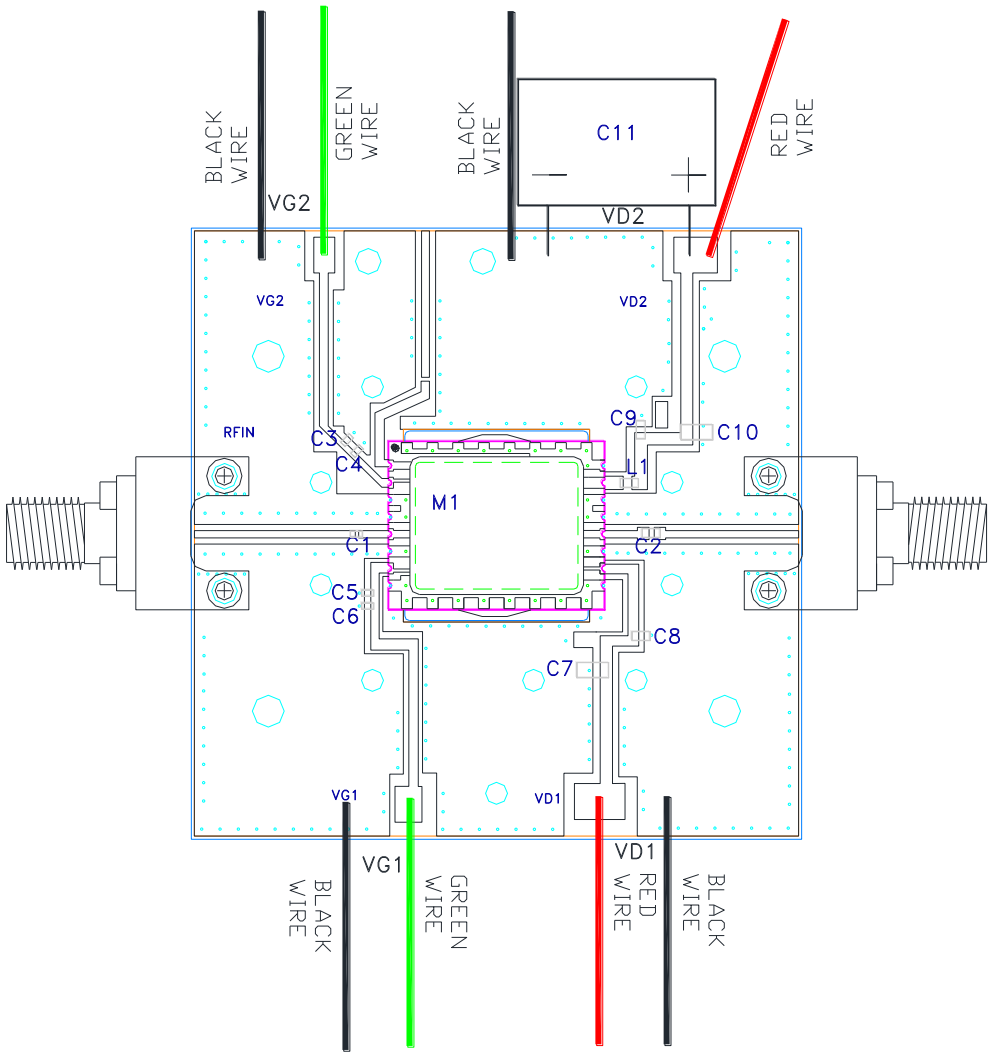
**Turning the device ON:**

1. Set $V_G$ to pinch-off ($V_P$), 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 $V_{GS}$.

## Evaluation Board and Component Layout

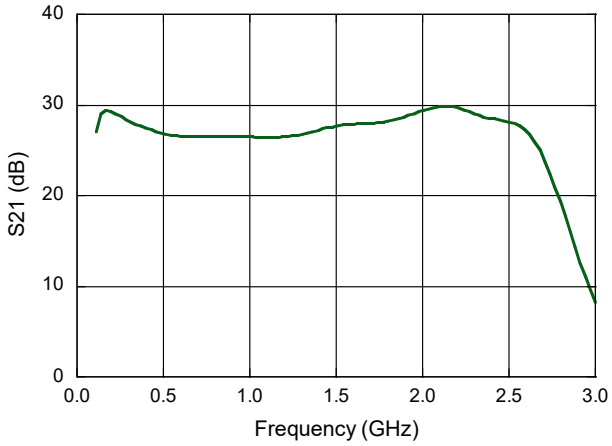



## Parts List

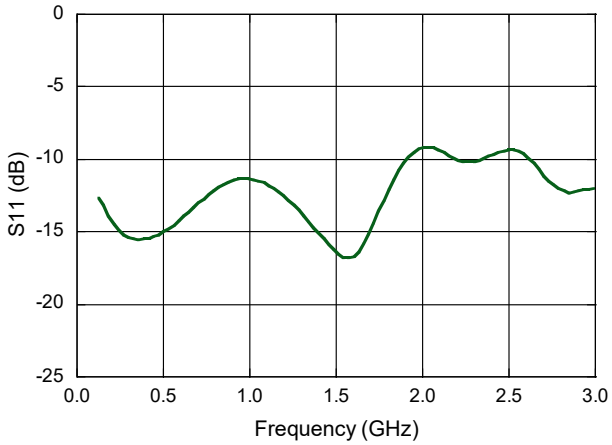
| Reference | Value | Case Style | Tolerance | Manufacturer | Part Number |
|---|---|---|---|---|---|
| L1 | 180 nH | 0603 | 5% | Coilcraft | 0603LS-181XJLC |
| C1 | 1000 pF | 0402 | 10% | Murata | GRM155R72A102KA01D |
| C2 | 1000 pF | 0603 | 10% | Murata | GRM188R72A102KA37D |
| C3,C6 | 1 µF | 0402 | 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 |

## Typical Small Signal Performance:
## $V_{DD}$ = 28 V, $I_{DQ1}$ = 40 mA, $I_{DQ2}$ = 100 mA, $T_A$ = 25°C

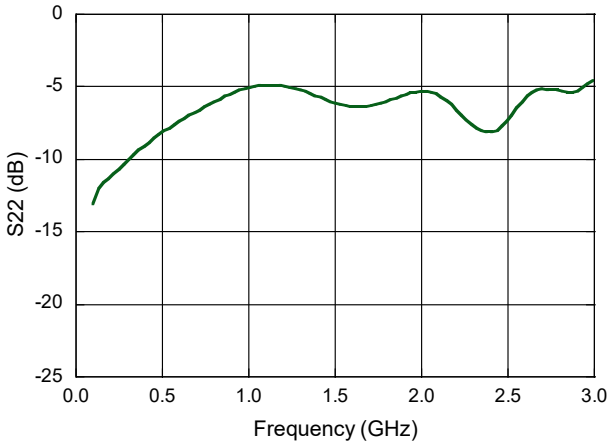
***Gain***




***Input Return Loss***



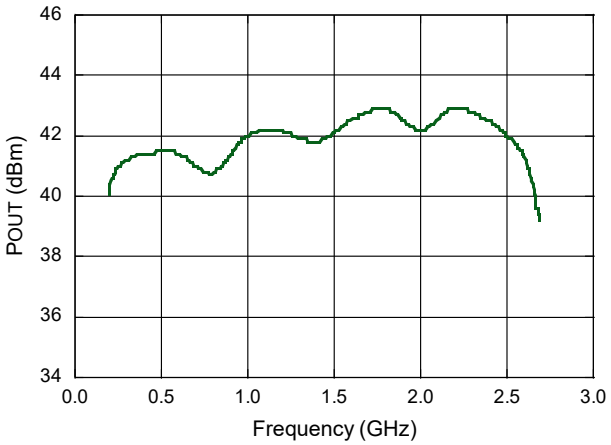

***Output Return Loss***



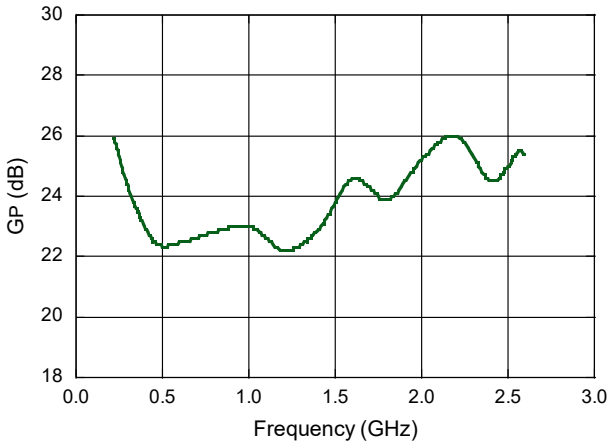
## Typical Large Signal Performance:

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

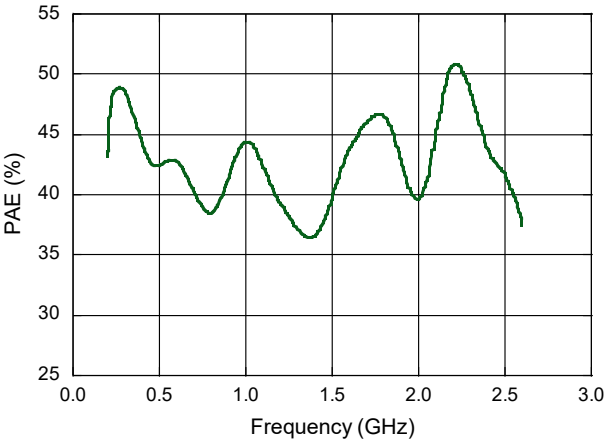
***Output Power***



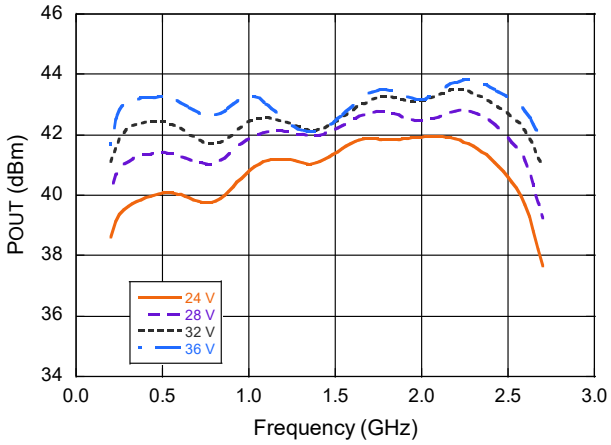

***Power Gain***




***Power Added Efficiency***

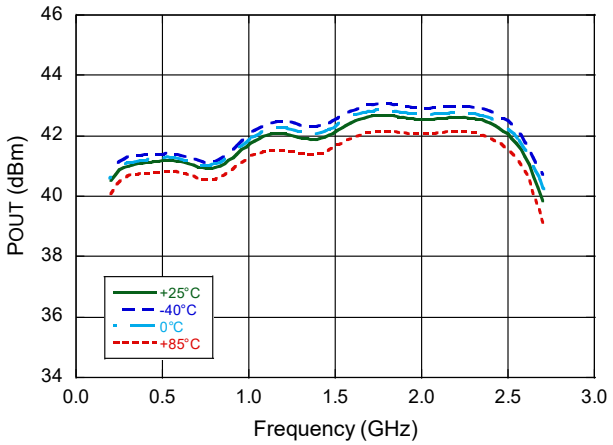



***Output Power vs. Voltage***

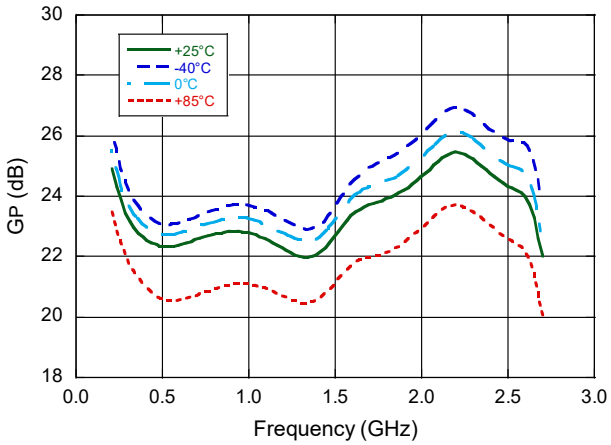


## Typical Large Signal Performance vs. Temperature:
## $V_{DD}$ = 28 V , $I_{DQ1}$ = 40 mA, $I_{DQ2}$ = 100 mA

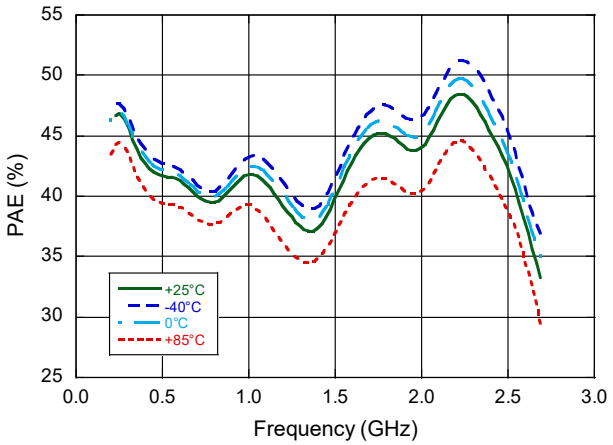
***Saturated Output Power vs. Temperature***



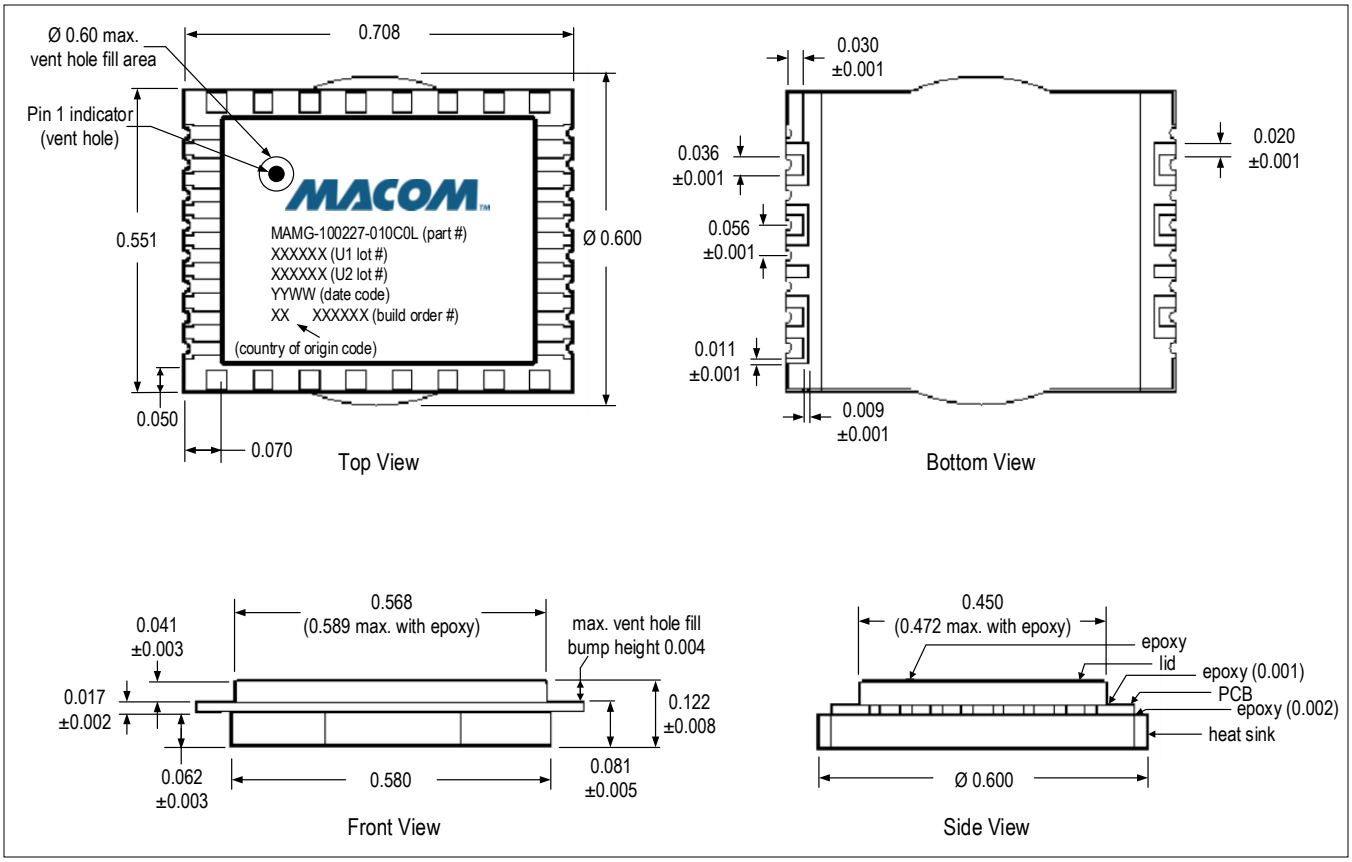

***Saturated Power Gain vs. Temperature***




***Saturated Power Added Efficiency vs. Temperature***



## Package Outline†




† 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.

# X-ON Electronics

Largest Supplier of Electrical and Electronic Components

***Click to view similar products for*** RF Amplifier ***category:***

***Click to view products by*** MACOM ***manufacturer:***

Other Similar products are found below :

A82-1 BGA622H6820XTSA1 BGA 728L7 E6327 BGB719N7ESDE6327XTMA1 HMC397-SX HMC405 HMC561-SX HMC8120-SX HMC8121-SX HMC-ALH382-SX HMC-ALH476-SX SE2433T-R SMA3101-TL-E SMA39 A66-1 A66-3 A67-1 LX5535LQ LX5540LL MAAM02350 HMC3653LP3BETR HMC549MS8GETR HMC-ALH435-SX SMA101 SMA32 SMA411 SMA531 SST12LP17E-XX8E SST12LP19E-QX6E WPM0510A HMC5929LS6TR HMC5879LS7TR HMC1126 HMC1087F10 HMC1086 HMC1016 SMA1212 MAX2689EWS+T MAAMSS0041TR MAAM37000-A1G LTC6430AIUF-15#PBF CHA5115-QDG SMA70-2 SMA4011 A231 HMC-AUH232 LX5511LQ LX5511LQ-TR HMC7441-SX HMC-ALH310