# MAAP-011145-STD

## Power Amplifier, 2 W
## 17.65 - 19.75 GHz

Rev. V2

### Features

- 25 dB Small Signal Gain
- 43 dBm Third Order Intercept Point (OIP3)
- >2 W Output P1dB
- 34.5 dBm Saturated Output Power
- Integrated Power Detector
- Bias 1330 mA @ 6 V
- Lead-Free 7 mm Cavity Package
- RoHS* Compliant and 260°C Reflow Compatible

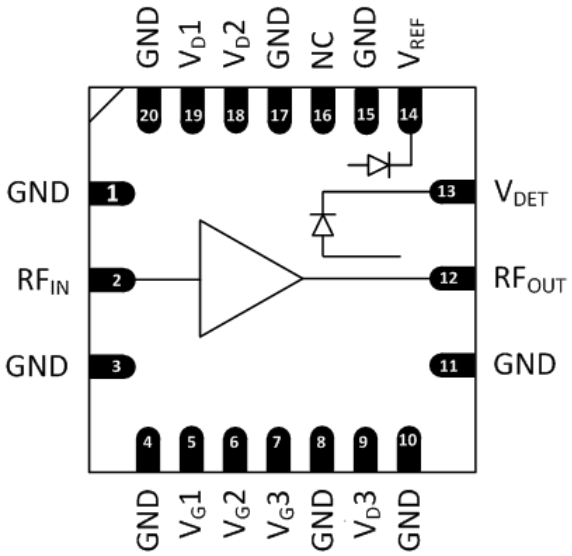
### Description

The MAAP-011145-STD is a power amplifier assembled in a 7 mm surface mount package with a temperature compensated integrated power detector operating from 17.65 to 19.75 GHz. The circuit provides 25 dB gain, 43 dBm OIP3, 2 W P1dB and 34.5 dBm saturated output power.

The device includes ESD protection and by-pass capacitors to ease the implementation and volume assembly of the packaged part.

This power amplifier is specifically designed for use in point-to-point radios for cellular backhaul applications in the 18 GHz band.

### Functional Schematic




### Pin Configuration[2]

| Pin No. | Function | Pin No. | Function |
|---|---|---|---|
| 1 | Ground | 11 | Ground |
| 2 | RF Input | 12 | RF Output |
| 3 | Ground | 13 | Power Detector |
| 4 | Ground | 14 | Reference |
| 5 | Gate 1 Bias | 15 | Ground |
| 6 | Gate 2 Bias | 16 | No Connection |
| 7 | Gate 3 Bias | 17 | Ground |
| 8 | Ground | 18 | Drain 2 Bias |
| 9 | Drain 3 Bias | 19 | Drain 1 Bias |
| 10 | Ground | 20 | Ground |
| | | 21[3] | Paddle |

2. All "No Connection" pins should be grounded.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

### Ordering Information[1]

| Part Number | Package |
|---|---|
| MAAP-011145-STD | Bulk Quantity |
| MAAP-011145-STR500 | 500 Piece Reel |
| MAAP-011145-001SMB | Sample Board |

1. Reference Application Note M513 for reel size information.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.



*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

• **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

## Electrical Specifications: $V_{DD}$ = 6 V, $I_{DQ}$[4] = 1330 mA, $T_A$ = +25°C

| Parameter | Units | Min. | Typ. | Max. |
|---|---|---|---|---|
| Small Signal Gain | dB | 22.7 | 26 | 28.3 |
| $P_{SAT}$ | dBm | 33.2 | 34.5 | — |
| Output IP3, +20 dBm SCL | dBm | 40.5 | 44 | — |
| Output IP3, +24 dBm SCL | dBm | 37.5 | 42 | — |
| P1dB | dBm | — | 34 | — |
| Input Return Loss | dB | — | 15 | — |
| Output Return Loss | dB | — | 10 | — |
| Detector $V_{diff}$, $P_{out}$ = +20dBm | V | 0.5 | 1.1 | 1.7 |
| Noise Figure | dB | — | 7 | — |
| Gain Ripple over frequency | dB | — | 2 | — |
| Gate Voltage | V | — | — | -0.60 |

4. Adjust $V_G1$,$V_G2$ and $V_G3$ between -1.2 and -0.6 V to achieve specified $I_{DQ}$ ($I_{DQ}$ = $I_D1$+$I_D2$+$I_D3$). $V_G1$,$V_G2$ and $V_G3$ are nominally the same voltage.



*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

- **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

## Absolute Maximum Ratings[5,6,7]

| Parameter | Rating |
|---|---|
| Input Power | +18 dBm |
| Drain Voltage ($V_D$1,2,3) | +7 V |
| Gate Voltage ($V_G$1,2,3) | -3 V |
| Drain to Gate Voltage ($V_D$-$V_G$) | +10 V |
| Current ($I_{DQ}$ = $I_D$1+$I_D$2+$I_D$3) | 2000 mA |
| Detector Pin | +6 V |
| Detector Reference Pin | +6 V |
| Junction Temperature | +175°C |
| Storage Temperature | -65°C to +150°C |

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. MACOM does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with $T_J \leq$ +150°C will ensure MTTF > 1 x $10^6$ hours.

## Maximum Operating Ratings[8,9]

| Parameter | Rating |
|---|---|
| $P_{DISS}$ | 11.2 W |
| Junction Temperature | +150°C |
| Operating Temperature | -40°C to +85°C |

8. Channel temperature directly affects device MTTF. Chanel temperature should be kept as low as possible to maximize lifetime. Thermal resistance, Θjc, is 5.8 °C/W.
9. For saturated performance, it is recommended that the sum of ($2V_{DD}$ + abs ($V_{GG}$)) < 15 V.

## 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 CDM class 2, HBM class 1B devices.

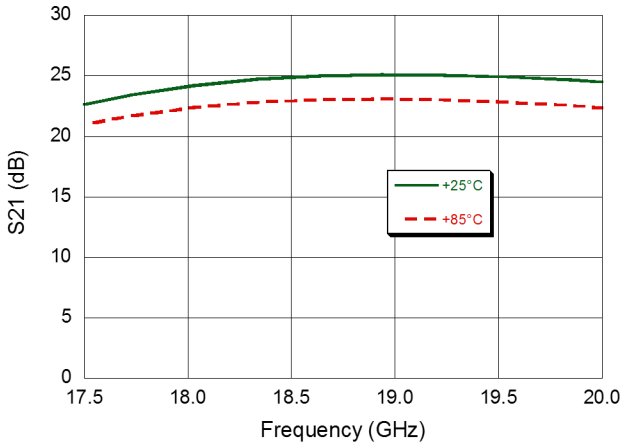


*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

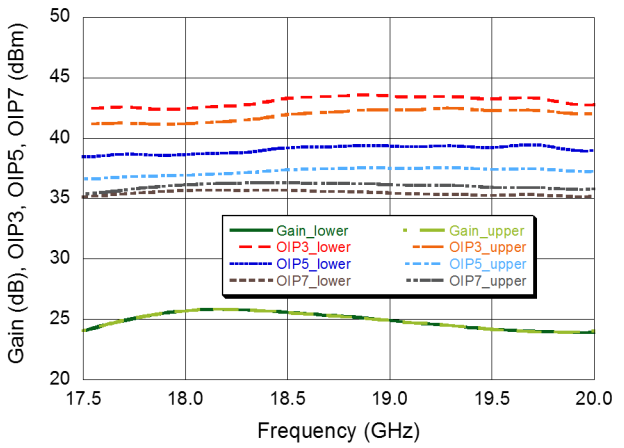
• **North America** Tel: 800.366.2266 / Fax: 978.366.2266
• **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
• **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

## Typical Performance Curves: 8 W Quiescent Bias, $V_D$ = 6 V

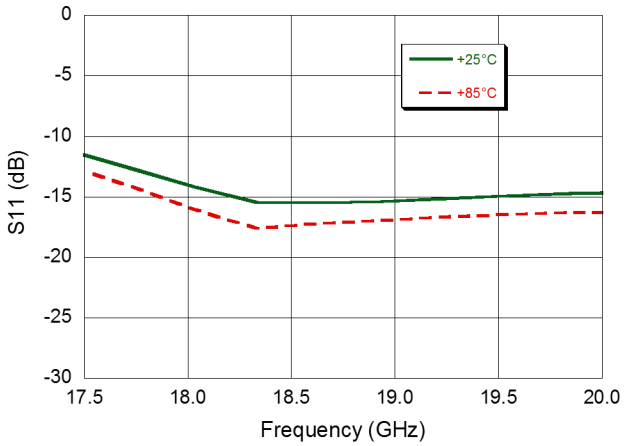
***Gain***



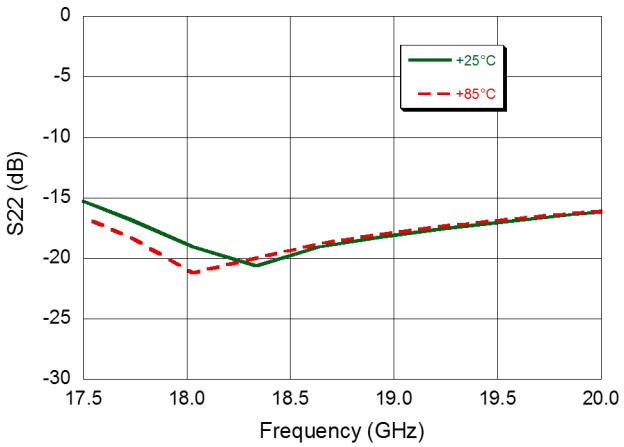

***Gain, OIP3, OIP5, OIP7 @ $P_{IN}$ = -2 dBm per tone***



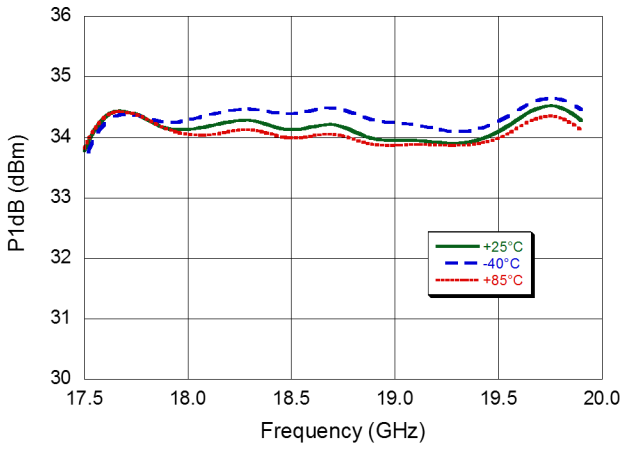

***Input Return Loss***



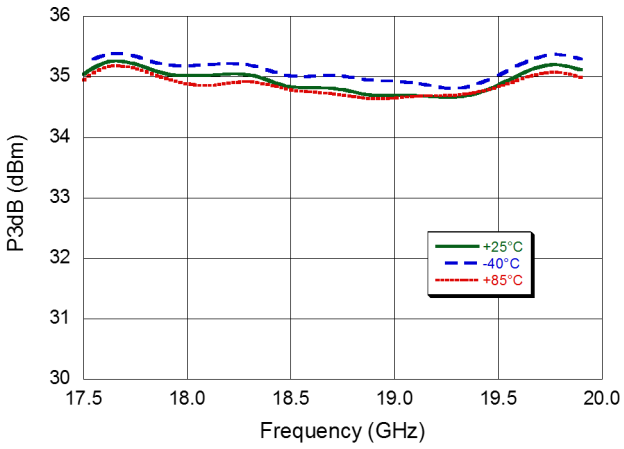

***Output Return Loss***




***P1dB***




***P3dB***



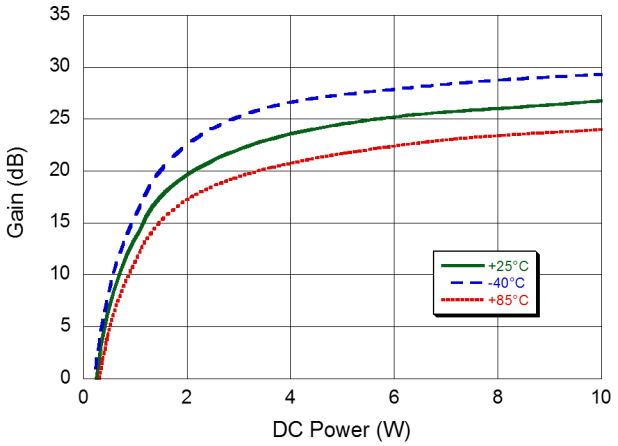



*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

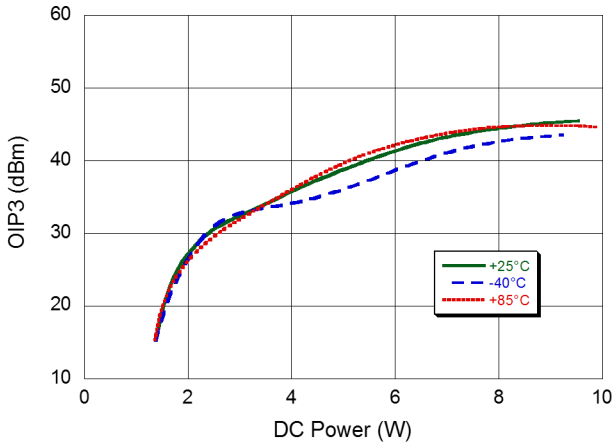
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

## Typical Performance Curves: $V_D$ = 6 V

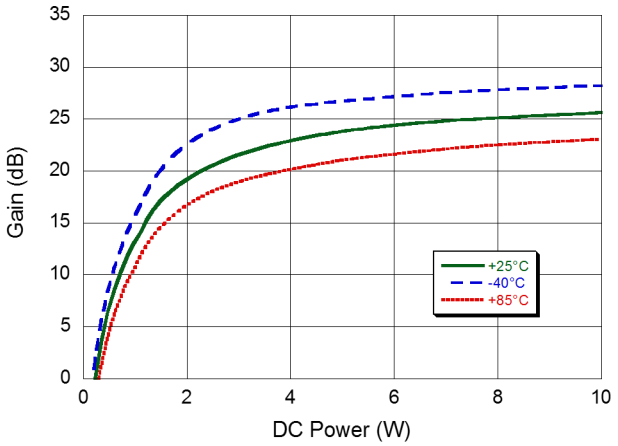
***Gain @ 17.7 GHz***



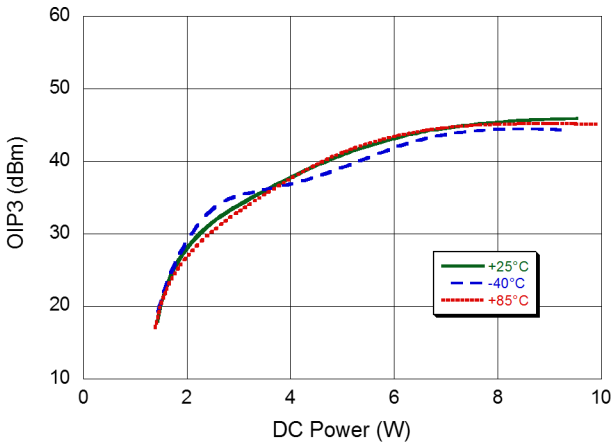

***OIP3 @ 17.7 GHz***



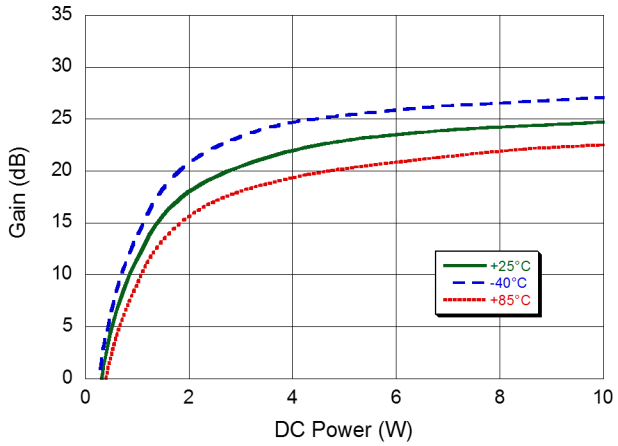

***Gain @ 18.7 GHz***



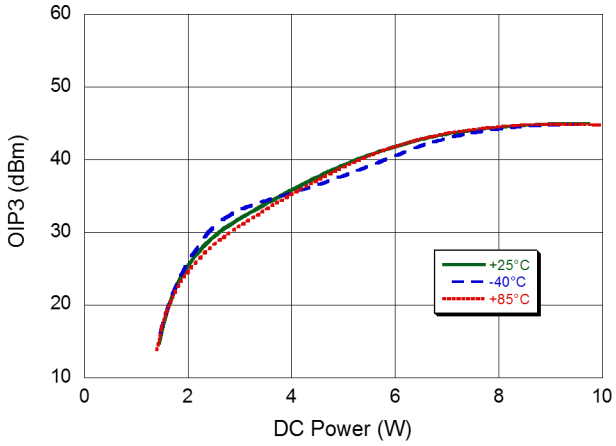

***OIP3 @ 18.7 GHz***




***Gain @ 19.7 GHz***




***OIP3 @ 19.7 GHz***



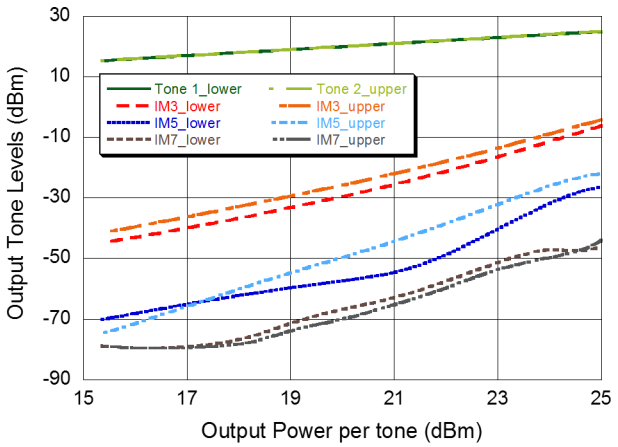



*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

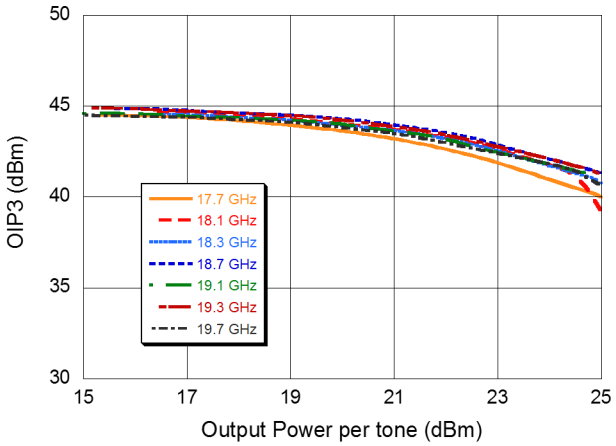
- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

## Typical Performance Curves: 8 W Quiescent Bias, $V_D$ = 6 V

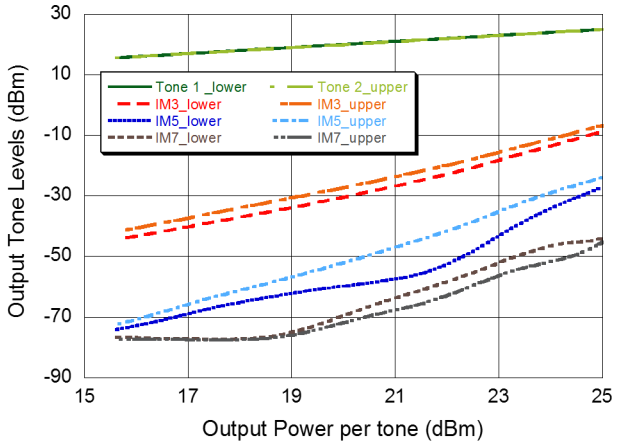
***Lower and Upper Intermodulation Tones @ 17.7 GHz***



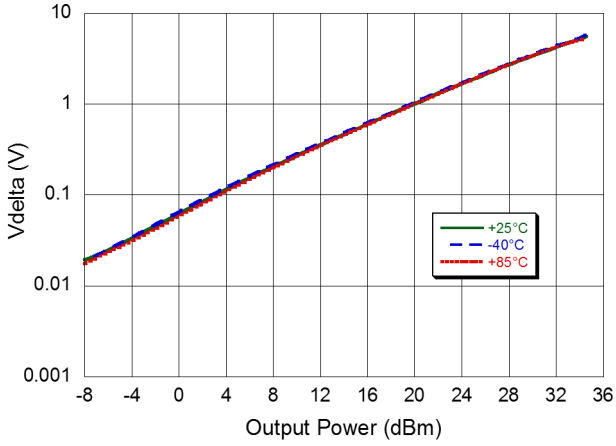

***OIP3 vs. Output Power***



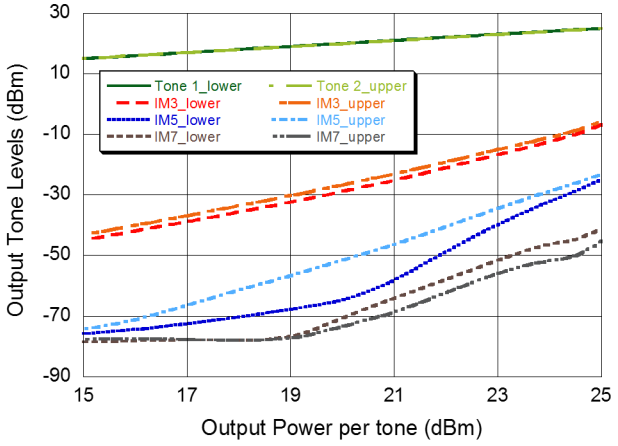

***Lower and Upper Intermodulation Tones @ 18.7 GHz***




***Detector Delta Voltage vs. Output Power***




***Lower and Upper Intermodulation Tones @ 19.7 GHz***






*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

- **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

## Biasing -

All gates should be pinched-off ($V_G$ < -2 V) before applying drain voltage ($V_D$ = 6 V). Then the gate voltages can be increased until the desired quiescent drain current is reached in each stage. The recommended quiescent bias is $V_D$ = 6 V, $I_D1$ = 190 mA, $I_D2$ = 380 mA and $I_D3$ = 762 mA. The performance in this datasheet has been measured with fixed gate voltage and no drain current regulation under large signal operation. It is also possible to regulate the drain current dynamically, to limit the DC power dissipation under RF drive. To turn off the device, the turn on bias sequence should be followed in reverse.

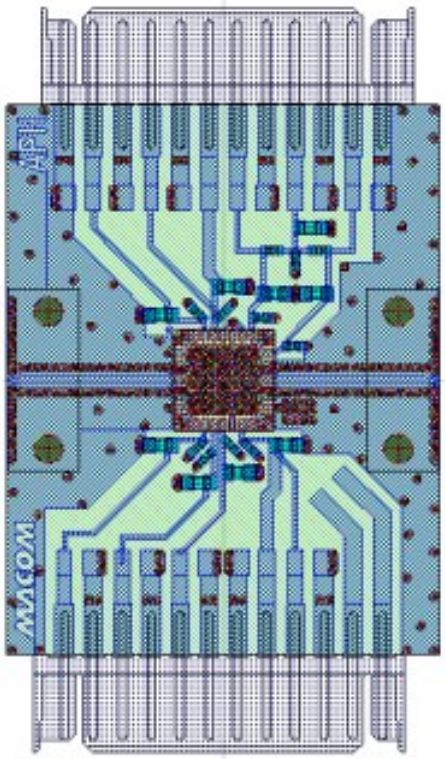
## Bias Arrangement -

Each DC pin ($V_D$1,2,3 and $V_G$1,2,3) needs to have bypass capacitance (120 pF and 10 nF) mounted as close to the MMIC as possible.

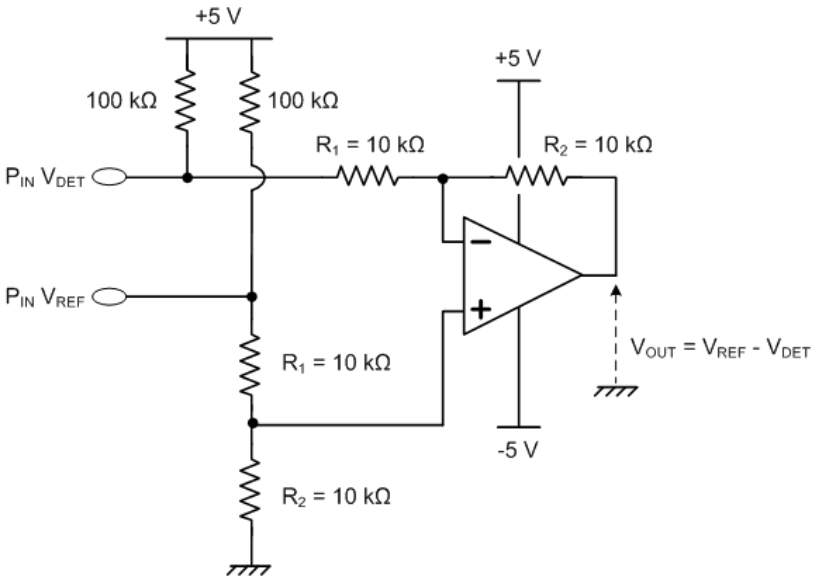
## Power Detector -

As shown in the schematic below, the power detector is implemented by providing +5 V bias and measuring the difference in output voltage with standard op-amp in a differential mode configuration.

## Evaluation Board Layout



## Application Schematic

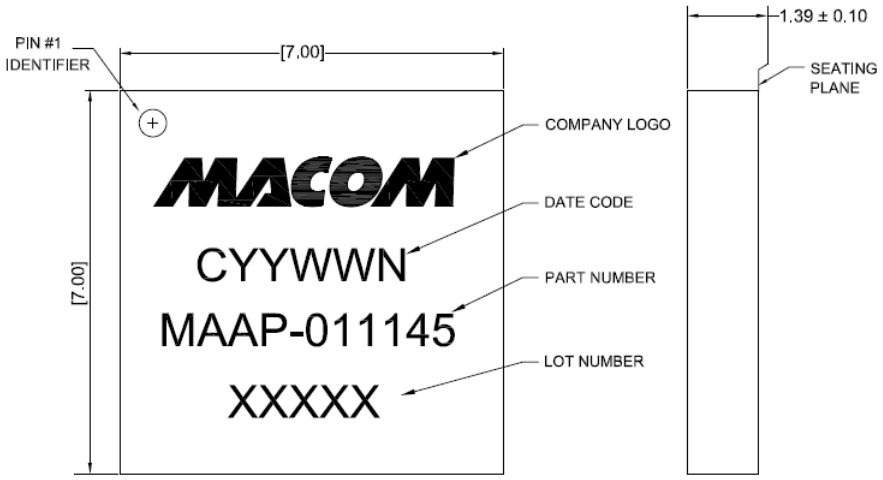




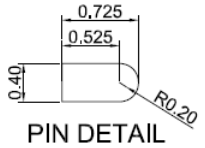

*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

- **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

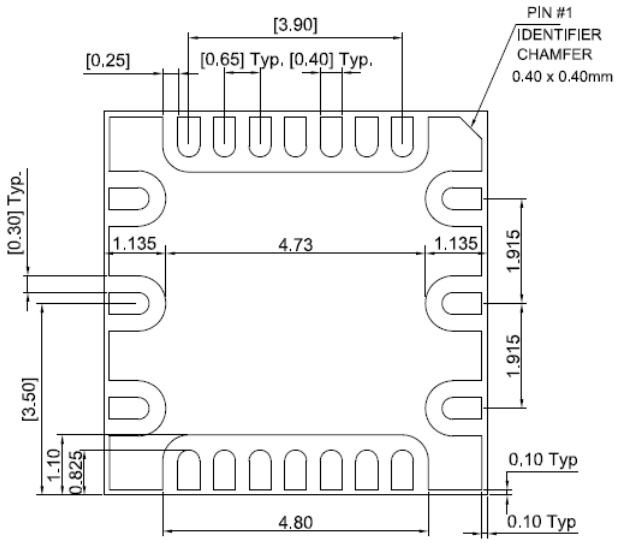
## Package Outline Drawing and Recommended Land Pattern†

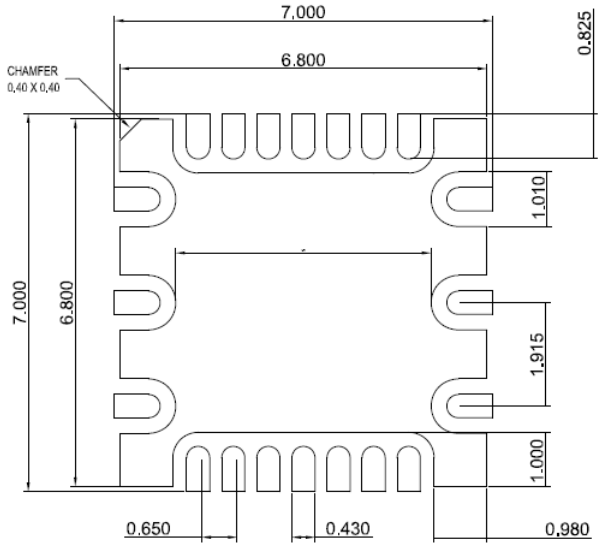



| Tolerances | |
|---|---|
| X | +/- .25 |
| .X | +/- .10 |
| .XX | +/- .05 |
| .XXX | +/- .01 |




PIN DETAIL




LANDING PATTERN

All dimensions are in mm.

† Meets JEDEC moisture sensitivity level 3 requirements.




*M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.*
Visit www.macom.com for additional data sheets and product information.

- **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

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

**Данный компонент на территории Российской Федерации**

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

**Офис по работе с юридическими лицами:**

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9