

## High IIP3 PIN Diode Variable Attenuator 0.8 - 1.0 GHz

#### Features

- 1.0 dB Insertion Loss, Typical
- 12 dB Return Loss, Typical
- 25 dB Attenuation, Typical
- 45 dBm IIP3, Typical (1MHz Offset, @ +0dBm Pinc)
- SOIC-8 Surface Mount Package
- RoHs Compliant

#### **Extra Features**

- Covers the following Bands:
  - GSM
    - AMPS
- Usable Bandwidth: 0.60 GHz to 1.20 GHz
- 1.5 dB Insertion Loss, Typical
- 1.8:1 VSWR, Typical
- 18.5 dB Attenuation, Typical

### **Description and Applications**

M/A-COM's MA4VAT904-1061T is a HMIC PIN Diode Variable Attenuator which utilizes an integrated 90 degree 3dB hybrid with a pair of Silicon PIN Diodes to perform the required attenuation function as D.C. Voltage (Current) is applied.

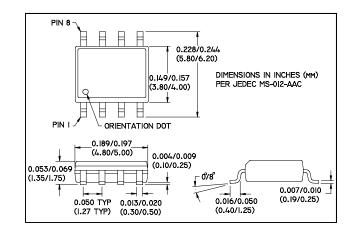
This device operates from 0 to 1.9 Volts at 1.89 mA typical control current for maximum attenuation. The user can add external biasing resistors to the bias ports for higher voltage requirements as required.

M/A-COM's MA4VAT904-1061T PIN Diode Variable Attenuator is designed for AGC Circuit Applications requiring:

Lower Insertion Loss

1

- Lower distortion through attenuation
- Larger dynamic range for wide spread spectrum applications



## **SOIC-8 PIN Configuration (Topview)**

| PIN | Function | Comments                     |  |  |  |
|-----|----------|------------------------------|--|--|--|
| 1   | DC1      |                              |  |  |  |
| 2   | GND      |                              |  |  |  |
| 3   | GND      |                              |  |  |  |
| 4   | RFin/out | Symetrical as RF Input/Ouput |  |  |  |
| 5   | RFout/in | Symetrical as RF Input/Ouput |  |  |  |
| 6   | GND      |                              |  |  |  |
| 7   | GND      |                              |  |  |  |
| 8   | DC2      |                              |  |  |  |

## Absolute Maximum Ratings @ +25 °C <sup>1,2</sup>

| Parameter                | Maximum Ratings   |  |  |
|--------------------------|-------------------|--|--|
| Operating Temperature    | -40 °C to +85 °C  |  |  |
| Storage Temperature      | -65 °C to +150 °C |  |  |
| Junction Temperature     | +175 °C           |  |  |
| RF C.W. Incident Power   | +33 dBm C.W.      |  |  |
| Reversed Current @ -30 V | 50nA              |  |  |
| Control Current          | 50 mA per Diode   |  |  |

1. All the above values are at +25 °C, unless otherwise noted.

2. Exceeding these limits may cause permanent damage.

- North America Tel: 800.366.2266
   Europe Tel: +353.21.244.6400
   India Tel: +91.80.43537383
   China Tel: +86.21.2407.1588
- Visit www.macomtech.com for additional data sheets and product information.

**PRELIMINARY**: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

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.

Rev. V4



## **High IIP3 PIN Diode Variable Attenuator** 0.8 - 1.0 GHz

Rev. V4

# Electrical Specifications @ +25 °C

| Parameter                                    | Frequency Band    | Unit | Min  | Тур             | Max |
|--|-------------------|------|------|-----------------|-----|
| No DC Bias RF Parameter                      | 1                 |      | L    |                 |     |
| Insertion Loss                               | 0.80 GHz—1.00 GHz | dB   | -    | 1.0             | 1.2 |
| Input Return Loss                            |                   | dB   | 11   | 12              | -   |
| Output Return Loss                           |                   | dB   | 11   | 12              | -   |
| P1dB   |                   | dBm  | 30 - |                 | -   |
| Input IP3                                    |                   | dBm  | 45   | 49              | -   |
| Control Voltage                              |                   | V    | -    | 0 V @ OuA       | -   |
| DC Bias RF Parameter                         |                   |      |      |                 |     |
| Maximum Attenuation                          | 0.80 GHz—1.00 GHz | dB   | 18.5 | 24              | -   |
| Input Return Loss @ Max Attenuation          |                   | dB   | 15   | 21              | -   |
| Output Return Loss @ Max Attenuation         |                   | dB   | 15   | 21              | -   |
| Input IP3                                    |                   | dBm  | 36   | 39              | -   |
| Control Voltage @ Max Attenuation            |                   | V    | -    | 1.9 V @ 1.89 mA | -   |
| Control Current@ Max Attenuation Bias = 1.9V |                   | mA   | 1.2  | 1.8             | 2.4 |

## Typical RF Performance Over Industry Designated RF Frequency Bands <sup>3,4</sup>

| Band |    | Freq    | I. Loss | Att. | R. Loss | IIP3  | Phase<br>-Relative- |
|------|----|---------|---------|------|---------|-------|---------------------|
|      |    | (MHz)   | (dB)    | (dB) | (dB)    | (dBm) | (Degree)            |
| AMPS | RX | 824-849 | 0.9     | 22   | 12      | 45    | -15°                |
|      | тх | 869-894 | 0.9     | 22   | 12      | 45    |                     |
|      |    |         |         |      |         |       |                     |
| GSM  | RX | 880-915 | 1.2     | 20   | 11      | 45    | -20°                |
|      | тх | 925-960 | 1.2     | 20   | 11      | 45    |                     |

3. All are typical values only.

4. Relative phase is the measured Insertion Phase difference between Insertion Loss and 15 dB Attenuation. (Please refer to the plots below)

- ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are
- North America Tel: 800.366.2266 Europe Tel: +353.21.244.6400 • India Tel: +91.80.43537383 • China Tel: +86.21.2407.1588
- Visit www.macomtech.com for additional data sheets and product information.

typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

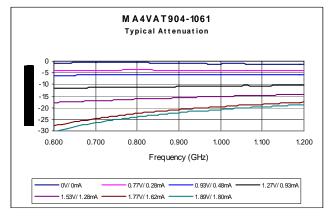


Rev. V4

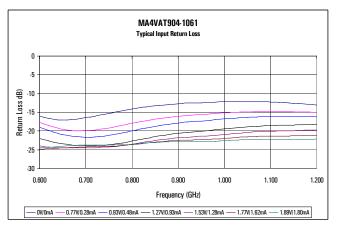
# High IIP3 PIN Diode Variable Attenuator 0.8 - 1.0 GHz

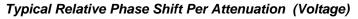
### Plots of Typical RF Characteristics @ +25 °C

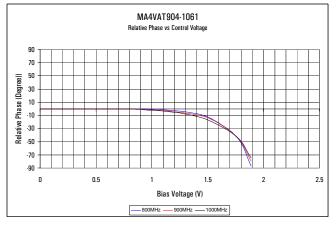
#### **Typical Insertion Loss & Attenuation**



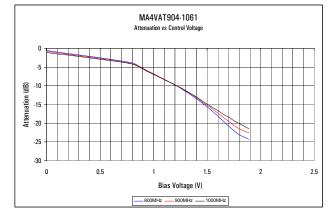
#### Typical Return Loss @ All Attenuation Levels



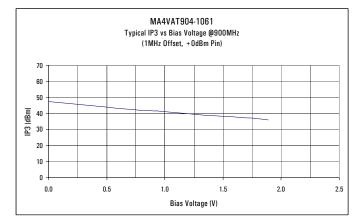




## Typical Attenuation vs Voltage



#### Typical IIP3 vs Attenuation



#### For Reference ONLY:

- Insertion Loss = 0.00 V @ 0.00 mA
- 5dB Attenuation = 0.94 V @ 0.49 mA
- 10dB Attenuation = 1.26 V @ 0.93 mA
- 15dB Attenuation = 1.50 V @ 1.22 mA
- 20dB Anttenuation = 1.77V @ 1.60 mA

3

ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product W/A-COM Technology

**PRELIMINARY**: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.

- • North America Tel: 800.366.2266
   • Europe Tel: +353.21.244.6400

   • India Tel: +91.80.43537383
   • China Tel: +86.21.2407.1588
- Visit www.macomtech.com for additional data sheets and product information.

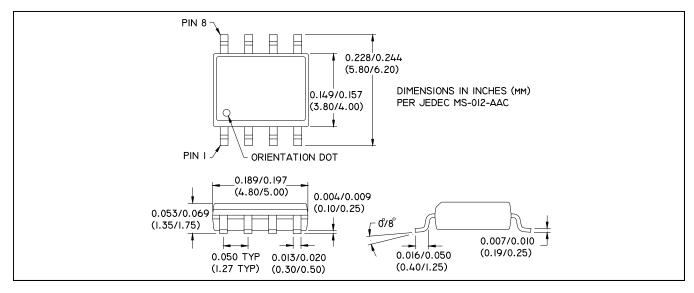
M/A-COM Technology Solutions Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice.

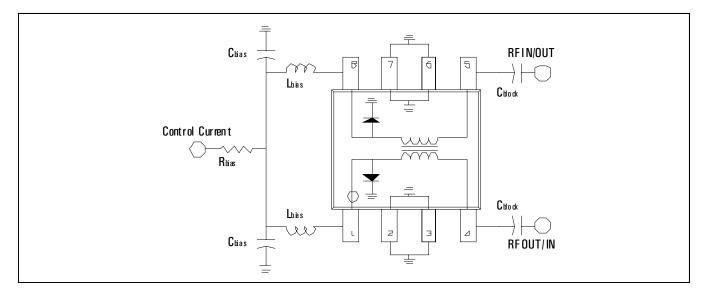


## High IIP3 PIN Diode Variable Attenuator 0.8 - 1.0 GHz

Rev. V4

### Package PIN Designation, External Components, and Equivalent Circuit





### **External Bias Components**

Rbias= 680 Ohms ( 1.66 V, @1.50 mA ) Lbias= 150 nH Cbias =100 pF Cblock =100 pF

4

- ADVANCED: Data Sheets contain information regarding a product M/A-COM Technology Solutions is considering for development. Performance is based on target specifications, simulated results, and/or prototype measurements. Commitment to develop is not guaranteed. PRELIMINARY: Data Sheets contain information regarding a product M/A-COM Technology Solutions has under development. Performance is based on engineering tests. Specifications are typical. Mechanical outline has been fixed. Engineering samples and/or test data may be available. Commitment to produce in volume is not guaranteed.
- North America Tel: 800.366.2266
   Europe Tel: +353.21.244.6400
   India Tel: +91.80.43537383
   China Tel: +86.21.2407.1588
- Visit www.macomtech.com for additional data sheets and product information.

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.