

MA4VAT904-1061T



High IIP3 PIN Diode Variable Attenuator 0.8 - 1.0 GHz

Rev. V4

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

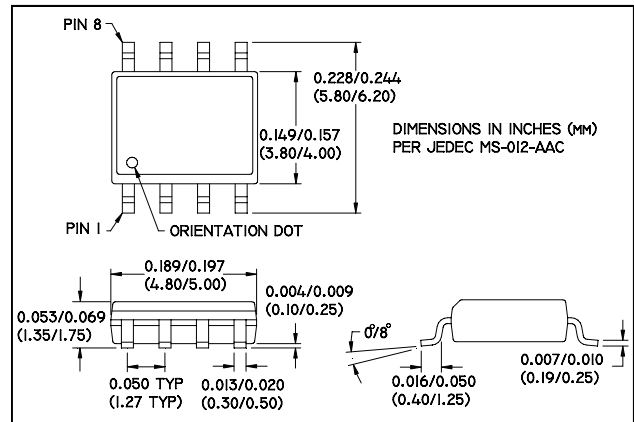
Description and Applications

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
- 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 | Symmetrical as RF Input/Ouput |
| 5 | RFout/in | Symmetrical as RF Input/Ouput |
| 6 | GND | |
| 7 | GND | |
| 8 | DC2 | |

Absolute Maximum Ratings @ +25 °C ^{1,2}

| 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.

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Electrical Specifications @ +25 °C

| Parameter | Frequency Band | Unit | Min | Typ | Max |
|--------------------------------------|-------------------|------|------|-----------------|-----|
| No DC Bias RF Parameter | | | | | |
| 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 @ 0uA | - |
| 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 ^{3,4}

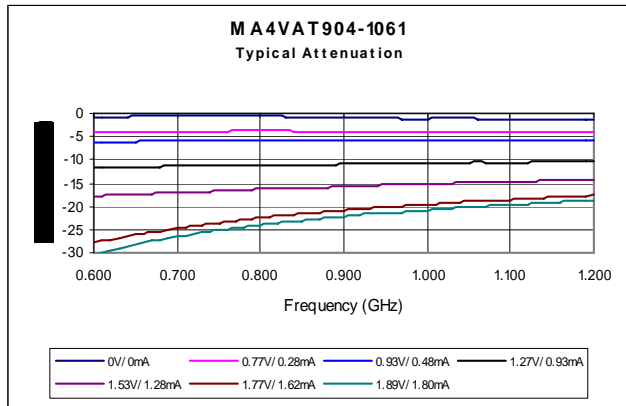
| Band | | Freq | I. Loss | Att. | R. Loss | IIP3 | Phase -Relative- |
|-------------|-----------|---------|---------|------|---------|-------|------------------|
| | | (MHz) | (dB) | (dB) | (dB) | (dBm) | (Degree) |
| AMPS | RX | 824-849 | 0.9 | 22 | 12 | 45 | -15° |
| | TX | 869-894 | 0.9 | 22 | 12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

3. All are typical values only.

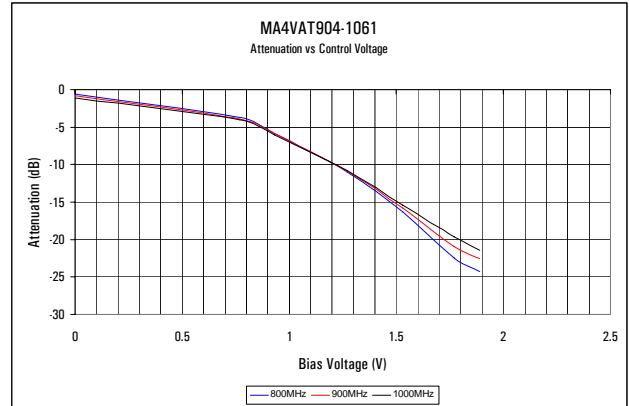
4. Relative phase is the measured Insertion Phase difference between Insertion Loss and 15 dB Attenuation. (Please refer to the plots below)

Plots of Typical RF Characteristics @ +25 °C

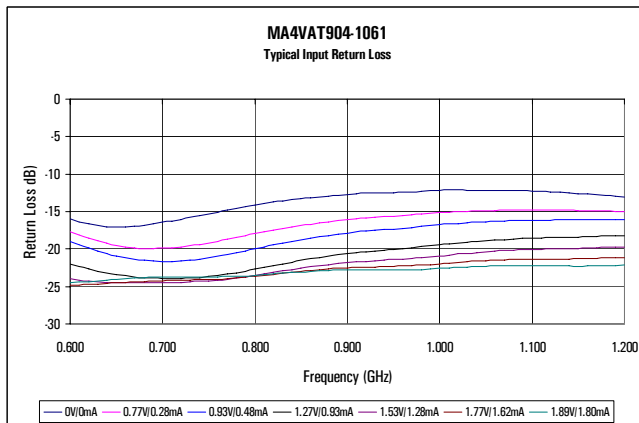
Typical Insertion Loss & Attenuation



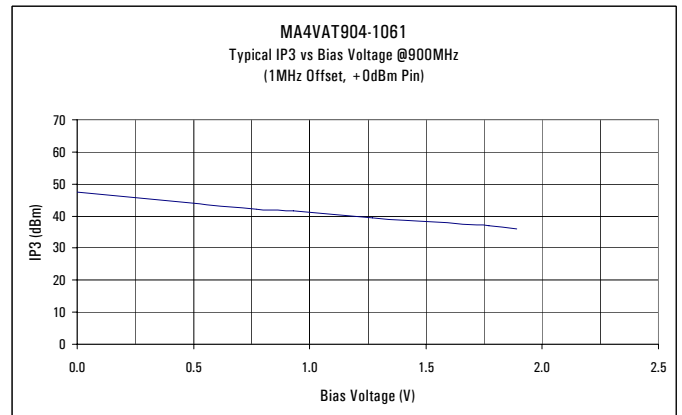
Typical Attenuation vs Voltage



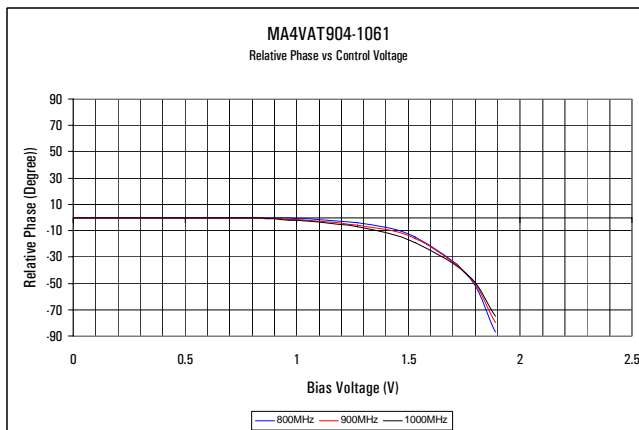
Typical Return Loss @ All Attenuation Levels



Typical IIP3 vs Attenuation



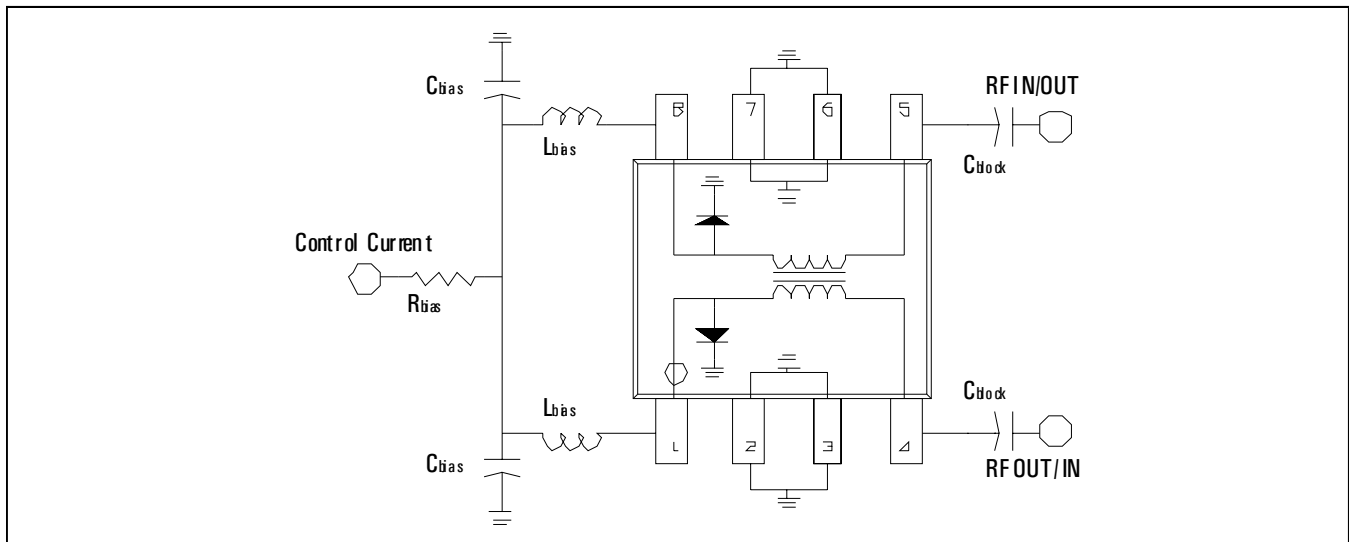
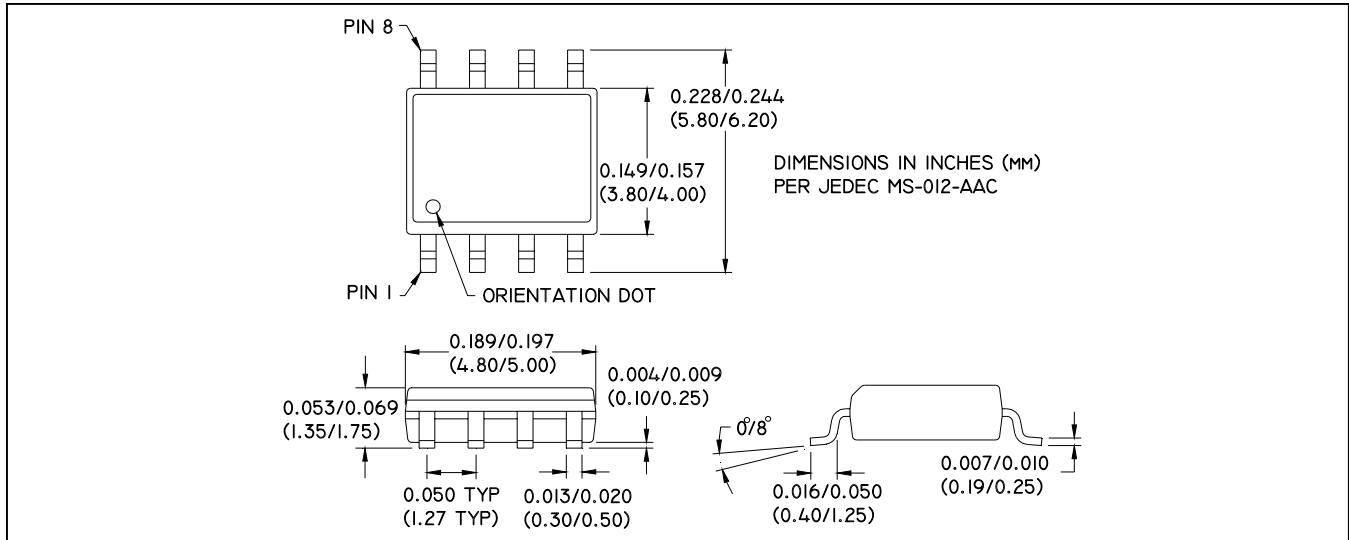
Typical Relative Phase Shift Per Attenuation (Voltage)



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 Attenuation = 1.77V @ 1.60 mA

Package PIN Designation, External Components, and Equivalent Circuit



External Bias Components

$R_{bias} = 680 \text{ Ohms (1.66 V, @1.50 mA)}$
 $L_{bias} = 150 \text{ nH}$
 $C_{bias} = 100 \text{ pF}$
 $C_{block} = 100 \text{ pF}$