

## HMIC PIN Diode Variable Attenuator 1.70 - 2.20 GHz

Rev. V3

#### **Features**

- RoHs and ELV compliant
- Bandwidth: 1.70 GHz to 2.20 GHz
- 1.2 dB Insertion Loss, Typical
- 1.4:1 VSWR, Typical
- 24 dB Attenuation, Typical
- 40 dBm IIP3, Typical (1MHz Offset, @ +0dBm Pinc)
- 0-1.5 Volt Control Voltage.
- User can add an External Resistor for higher D.C. Voltage requirements.

#### **Extra Features**

- Usable Bandwidth: 1.20 GHz to 2.50 GHz
- 1.5 dB Insertion Loss, Max
- 2:1 VSWR, Max
- 23 dB Attenuation, Max

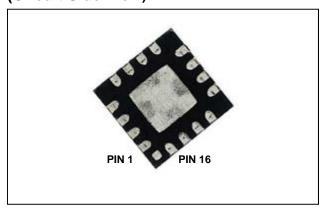
#### **Description and Applications**

M/A-COM's MA4VAT2000-1277T 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 Voltage (Current) is applied. This device operates from 0 to 1.5 Volts at 260 uA 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 MA4VAT2000-1277T 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

# MLP 3mm Package (Circuit Side View)



#### **PIN Configuration**

| PIN | Function      | PIN | Function |  |
|-----|---------------|-----|----------|--|
| 1   | GND           | 9   | DC2      |  |
| 2   | GND           | 10  | GND      |  |
| 3   | GND           | 11  | GND      |  |
| 4   | GND           | 12  | DC1      |  |
| 5   | GND           | 13  | GND      |  |
| 6   | <b>RF2</b> 14 |     | GND      |  |
| 7   | GND           | 15  | RF1      |  |
| 8   | GND           | 16  | GND      |  |

Center Paddle is RF and D.C. Ground RF Input/Output Ports are Functionally Symmetrical

### **Absolute Maximum Ratings**<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 | I -50nA I         |  |  |  |
| Control Current          | 50mA per Diode    |  |  |  |

- 1. All the above are at Room Temperature except as noted
- 2. Exceeding the above Limits may cause permanent damage

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#### Electrical Specifications @ +25 °C

| Parameter                            | Frequency Band      | Unit | Min | Тур           | Max |
|--------------------------------------|---------------------|------|-----|---------------|-----|
| No DC Bias Low Loss State            |                     |      |     |               |     |
| Insertion Loss                       | 1.70 GHz – 2.20 GHz | dB   | -   | 1.2           | 1.4 |
| Input Return Loss                    |                     | dB   | 11  | 16            | -   |
| Output Return Loss                   |                     | dB   | 11  | 16            | -   |
| P1dB                                 |                     | dBm  | 30  | 33            | -   |
| IIP3                                 |                     | dBm  | 37  | 40            | -   |
| Control Voltage                      |                     | V    | -   | 0V @ 0uA      | -   |
| DC Bias RF Attenuation State         |                     |      |     |               |     |
| Maximum Attenuation                  | 1.70 GHz – 2.20 GHz | dB   | 23  | 25            | -   |
| Input Return Loss @ Max Attenuation  |                     | dB   | 17  | 20            | -   |
| Output Return Loss @ Max Attenuation |                     | dB   | 17  | 20            | -   |
| IIP3                                 |                     | dBm  | 15  | 21            | -   |
| Control Voltage @ Max Attenuation    |                     | V    | -   | 1.50V @ 260uA | -   |

## 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)            |
| DCS        | RX | 1710-1785 | 1.2     | 23   | 13      | 40    | -20°                |
|            | TX | 1805-1880 | 1.2     | 23   | 13      | 40    |                     |
|            |    |           |         |      |         |       |                     |
| PCS        | RX | 1850-1910 | 1.2     | 23   | 13      | 40    | -200                |
|            | TX | 1930-1990 | 1.4     | 23   | 13      | 40    |                     |
|            |    |           |         |      |         |       |                     |
| UMTS       | RX | 1920-1980 | 1.4     | 23   | 11      | 40    | -25°                |
| WCDMA/CDMA | TX | 2110-2170 | 1.5     | 23   | 11      | 40    |                     |
|            |    | <u> </u>  |         |      |         | ,     |                     |
| TD-S-CDMA  | -  | 2010-2025 | 1.4     | 23   | 11      | 40    | -25°                |
|            |    | <u> </u>  |         |      |         | ,     |                     |
| SCDMA      | -  | 1800-2200 | 1.8     | 23   | 11      | 40    | -25°                |

<sup>3.</sup> All are typical values only.

<sup>4.</sup> Relative phase is the measured Insertion Phase Difference between Insertion Loss and the 20dB Attenuation State. (Please refer to the plots below)

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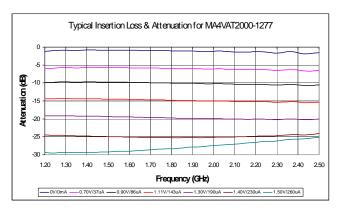


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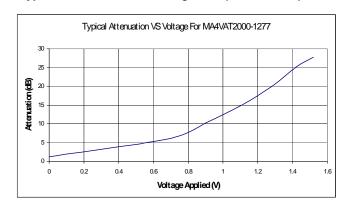
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### Plots of Typical RF Characteristics @ + 25 °C

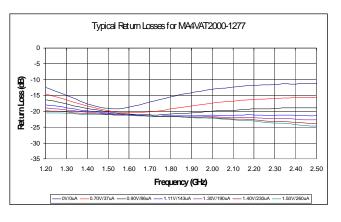
#### Typical Insertion Loss & Attenuation Plot



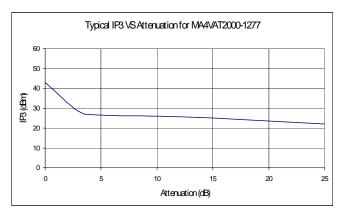
#### Typical Attenuation Vs Voltage Plot (@ 1950 MHz)



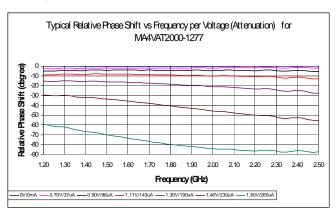
#### Typical Return Loss @ All Attenuation Levels Plot



#### Typical IIP3 Vs Attenuation Plot



## Typical Relative Phase Shift Per Attenuation (Voltage) Plot



#### For Reference ONLY:

Low Loss = 0V, @0uA
5 dB Attenuation = 0.90V, @86uA
10 dB Attenuation = 1.11V, @143uA
15 dB Attenuation = 1.30V, @190uA
20 dB Attenuation = 1.40V, @230uA
25 dB Attenuation = 1.50V, @260uA

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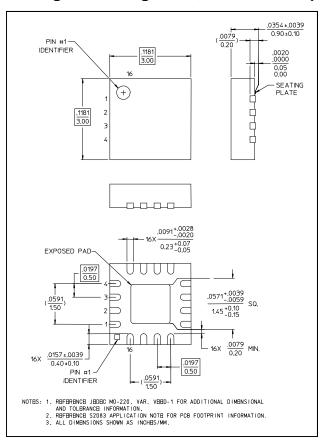
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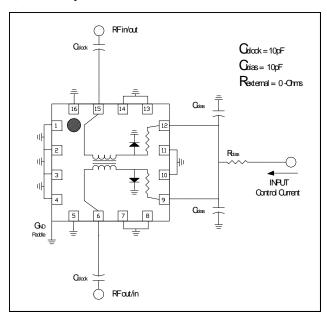


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### Package PIN Designation, External Components, and Equivalent Circuit





#### **Ordering Information**

| Part Number      | Package       |  |  |
|------------------|---------------|--|--|
| MA4VAT2000-1277T | Tape and Reel |  |  |

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