High IIP3 PIN Diode Variable Attenuator
1.7 - 2.0 GHz

Features
- RoHs and ELV compliant
- Bandwidth: 1.70 GHz to 2.00 GHz
- 1.4 dB Insertion Loss, Typical
- 1.4:1 VSWR, Typical
- 23 dB Attenuation, Typical
- 50 dBm Input IP3, Typical (1 MHz Offset, @ + 0 dBm Pinc)
- 0 - 2.77 Volts Control Voltage @ 3 mA Typical

Extra Features
- Covers the following Bands:
  - DCS
  - PCS
  - UMTS/WCDMA/CDMA
  - TD-SCDMA
- Usable Bandwidth: 1.50 GHz to 2.50 GHz
- 2.0 dB Insertion Loss, Typical
- 2:1 VSWR, Typical
- 18.5 dB Attenuation, Typical

Description and Applications
M/A-COM’s MA4VAT2007-1061T 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 2.77 Volts at 3.0mA 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 MA4VAT2007-1061T PIN Diode Variable Attenuator is designed for AGC Circuit Applications requiring:
- Lower Insertion Loss
- Lower distortion through attenuation
- Large dynamic range for wide spread spectrum applications

Absolute Maximum Ratings1,2
@ T = +25 °C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>-40 °C to +85 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 °C to +150 °C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>+175 °C</td>
</tr>
<tr>
<td>RF C.W. Incident Power</td>
<td>+33 dBm C.W.</td>
</tr>
<tr>
<td>Reversed Current @ -30 V</td>
<td>I -50nA I</td>
</tr>
<tr>
<td>Control Current</td>
<td>50mA per Diode</td>
</tr>
</tbody>
</table>

1. All the above are at room temperature except as noted
2. Exceeding the above limits may cause permanent damage

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.
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## Electrical Specifications @ +25 °C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Frequency Band</th>
<th>Unit</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>No DC Bias Low Loss State (Pin = +10dBm, except for P1dB, &amp; IP3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>1.70 GHz – 2.00 GHz</td>
<td>dB</td>
<td>-</td>
<td>1.4</td>
<td>1.6</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td></td>
<td>dBi</td>
<td>13</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td></td>
<td>dBi</td>
<td>13</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>P1dB</td>
<td></td>
<td>dBm</td>
<td>33</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>IIP3</td>
<td></td>
<td>dBm</td>
<td>50</td>
<td>52</td>
<td>-</td>
</tr>
<tr>
<td>Control Voltage</td>
<td></td>
<td>V</td>
<td>-</td>
<td>0V @ 0uA</td>
<td>-</td>
</tr>
<tr>
<td>DC Bias RF Attenuation State (Pin = +10dBm, except for P1dB, &amp; IP3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Attenuation</td>
<td>1.70 GHz – 2.00 GHz</td>
<td>dB</td>
<td>21</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>Input Return Loss @ Max Attenuation</td>
<td></td>
<td>dB</td>
<td>19</td>
<td>21</td>
<td>-</td>
</tr>
<tr>
<td>Output Return Loss @ Max Attenuation</td>
<td></td>
<td>dB</td>
<td>19</td>
<td>21</td>
<td>-</td>
</tr>
<tr>
<td>Input IP3</td>
<td></td>
<td>dBm</td>
<td>40</td>
<td>42</td>
<td>-</td>
</tr>
<tr>
<td>Control Voltage @ Max Attenuation</td>
<td></td>
<td>V</td>
<td>-</td>
<td>2.77V @ 3.00mA</td>
<td>-</td>
</tr>
<tr>
<td>Current @ Max Attenuation</td>
<td>Bias =2.77V</td>
<td>mA</td>
<td>2.5</td>
<td>-</td>
<td>4.5</td>
</tr>
</tbody>
</table>

## Typical RF Performance Over Industry Designated RF Frequency Bands

<table>
<thead>
<tr>
<th>Band</th>
<th>Freq</th>
<th>I. Loss</th>
<th>Att.</th>
<th>R. Loss</th>
<th>IIP3</th>
<th>Phase -Relative-</th>
</tr>
</thead>
<tbody>
<tr>
<td>(MHz)</td>
<td>(dB)</td>
<td>(dB)</td>
<td>(dB)</td>
<td>(dBm)</td>
<td>(Degree)</td>
<td></td>
</tr>
<tr>
<td>DCS</td>
<td>RX</td>
<td>1710-1785</td>
<td>1.6</td>
<td>22</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>TX</td>
<td>1805-1880</td>
<td>1.6</td>
<td>22</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>PCS</td>
<td>RX</td>
<td>1850-1910</td>
<td>1.6</td>
<td>21</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>TX</td>
<td>1930-1990</td>
<td>1.6</td>
<td>21</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>UMTS</td>
<td>RX</td>
<td>1920-1980</td>
<td>1.6</td>
<td>20</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>WCDMA/CDMA</td>
<td>TX</td>
<td>2110-2170</td>
<td>1.8</td>
<td>20</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>TD-S-CDMA</td>
<td>-</td>
<td>2010-2025</td>
<td>1.7</td>
<td>20</td>
<td>13</td>
<td>50</td>
</tr>
<tr>
<td>SCDMA</td>
<td>-</td>
<td>1800-2200</td>
<td>1.8</td>
<td>20</td>
<td>13</td>
<td>50</td>
</tr>
</tbody>
</table>

3. All are typical values only.
4. 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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1.7 - 2.0 GHz

Plots of Typical RF Characteristics @ + 25 °C

**Typical Insertion Loss & Attenuation Plot**

```
Frequency (GHz) | Attenuation (dB)
----------------|-----------------|
0.00V/0.00mA   | 0.00 dB          |
1.30V/0.95mA   | 1.30 dB          |
1.94V/1.78mA   | 1.94 dB          |
2.36V/2.42mA   | 2.36 dB          |
2.67V/2.90mA   | 2.67 dB          |
2.77V/3.00mA   | 2.77 dB          |
```

**Typical Attenuation Vs Voltage Plot**

```
Voltage Applied (V) | Attenuation (dB)
--------------------|-----------------|
0.00V/0.00mA       | 0.00 dB          |
1.30V/0.95mA       | 1.30 dB          |
1.94V/1.78mA       | 1.94 dB          |
2.36V/2.42mA       | 2.36 dB          |
2.67V/2.90mA       | 2.67 dB          |
2.77V/3.00mA       | 2.77 dB          |
```

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

```
Frequency (GHz) | Input Return Loss (dB)
----------------|------------------------|
0.00V/0.00mA   | 0.00 dB                |
1.30V/0.95mA   | 1.30 dB                |
1.94V/1.78mA   | 1.94 dB                |
2.36V/2.42mA   | 2.36 dB                |
2.67V/2.90mA   | 2.67 dB                |
2.77V/3.00mA   | 2.77 dB                |
```

**Typical IIP3 Vs Attenuation Plot**

```
Attenuation (dB) | IP3 (dBm)
----------------|---------|
 0.00V/0.00mA   | 1700MHz |
 1.30V/0.95mA   | 1850MHz |
 1.94V/1.78mA   | 2000MHz |
```

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

```
Frequency (GHz) | Relative Phase (degree)
----------------|-------------------------|
Low Loss        | 0.00V, @0.00mA         |
5 dB Attenuation| 1.30V, @0.95mA         |
10 dB Attenuation| 1.94V, @1.78mA        |
15 dB Attenuation| 2.36V, @2.42mA        |
20 dB Attenuation| 2.67V, @2.90mA        |
Max Attenuation  | 2.77V, @3.00mA        |
```

For Reference ONLY:
- Low Loss = 0.00V, @0.00mA
- 5 dB Attenuation = 1.30V, @0.95mA
- 10 dB Attenuation = 1.94V, @1.78mA
- 15 dB Attenuation = 2.36V, @2.42mA
- 20 dB Attenuation = 2.67V, @2.90mA
- Max Attenuation = 2.77V, @3.00mA
Package Pin Designation, External Components, and Equivalent Circuit

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA4VAT2007-1061T</td>
<td>Tape and Reel</td>
</tr>
</tbody>
</table>

External Bias Components

Rbias = 680 Ohms (2.77 V, 3.0 mA)
Lbias = 150 nH
Cbias = 100 pF
Cblock = 100 pF