

## 2.25 V Voltage Variable Absorptive Attenuator, 42 dB 1.8 - 2.5 GHz

Rev. V3

### Features

- Single Positive Voltage Control, 0 to +2.25 Volts
- 42 dB Typical Attenuation Range at 2.4 GHz
- Low DC Power Consumption
- Lead-Free SOT-25 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT-119

### Description

M/A-COM’s MAAVSS0001 is a GaAs MMIC voltage variable absorptive attenuator in a lead-free SOT-25 surface mount plastic package. M/A-COM fabricates the MAAVSS0001 with a proven monolithic GaAs 0.5 micron gate process that features full chip passivation for performance and reliability.

### Applications

The MAAVSS0001 is ideally suited for applications that require fine tuning, linear attenuation with voltage, and very low power consumption.

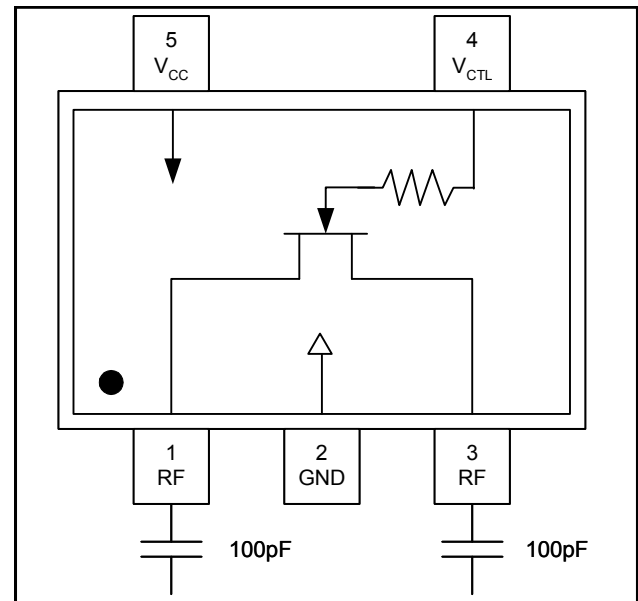
Typical applications for the MAAVSS0001 include automatic gain control circuits in satellite radio receivers and other wireless receivers.

### Ordering Information<sup>1</sup>

| Part Number       | Package                                   |
|-------------------|---|
| MAAVSS0001        | Bulk Packaging                            |
| MAAVSS0001TR-3000 | 3000 piece reel                           |
| MAAVSS0001SMB     | Sample Test Board<br>(Includes 5 Samples) |

1. Reference Application Note M513 for reel size information.

### Functional Schematic



### Pin Configuration

| Pin | Function         | Description         |
|-----|------------------|---------------------|
| 1   | RF               | RF (input / output) |
| 2   | GND              | Ground              |
| 3   | RF               | RF (input / output) |
| 4   | V <sub>CTL</sub> | Control Voltage     |
| 5   | V <sub>CC</sub>  | DC Supply Voltage   |

### Absolute Maximum Ratings<sup>2,3</sup> @ T<sub>A</sub> = +25°C (unless otherwise specified)

| Parameter                        | Absolute Maximum                                  |
|----------------------------------|---|
| Input Power                      | +21 dBm   |
| Supply Voltage V <sub>CC</sub>   | -1 V ≤ V <sub>CC</sub> ≤ +8 V                     |
| Control Voltage V <sub>CTL</sub> | -1 V ≤ V <sub>CTL</sub> ≤ V <sub>CC</sub> + 0.5 V |
| Operating Temperature            | -40°C to +85°C                                    |
| Storage Temperature              | -65°C to +150°C                                   |

2. Exceeding any one or combination of these limits may cause permanent damage to this device.

3. M/A-COM does not recommend sustained operation near these survivability limits.

\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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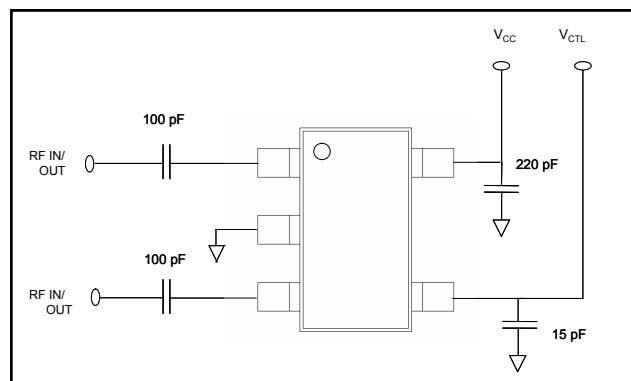
**Electrical Specifications:  $T_A = 25^\circ\text{C}$ , Frequency = 2.4 GHz,  $V_{CC} = 3.3\text{ V}$ ,  $Z_0 = 50\ \Omega$**

| Parameter                                 | Test Conditions <sup>4,5</sup>            | Units | Min. | Typ. | Max. |
|---|---|-------|------|------|------|
| Insertion Loss                            | $V_{CTL} = 2.25\text{ V}$                 | dB    | —    | 2.4  | 3.2  |
| Maximum Attenuation                       | $V_{CTL} = 0.5\text{ V}$                  | dB    | 37   | 42   | —    |
| Attenuation Slope                         | $0.75\text{ V} < V_{CTL} < 1.75\text{ V}$ | dB/V  | 24   | —    | —    |
| Return Loss                               | $0.0\text{ V} < V_{CTL} < 0.75\text{ V}$  | dB    | —    | 6    | —    |
|   | $0.75\text{ V} < V_{CTL} < 1.75\text{ V}$ | dB    | —    | 10   | —    |
|   | $1.75\text{ V} < V_{CTL} < 2.25\text{ V}$ | dB    | —    | 14   | —    |
| Input Power for 1dB Change in Attenuation | $0.75\text{ V} < V_{CTL} < 2.25\text{ V}$ | dBm   | —    | 10   | —    |
| Input 3rd Order Intercept Point           | $0.75\text{ V} < V_{CTL} < 2.25\text{ V}$ | dBm   | —    | 15   | —    |
| Switching Speed                           | 50% $V_{CTL}$ to 10% / 90% RF             | nS    | —    | 100  | —    |
| Transients                                | $V_{CTL} = 3\text{ V}$ , In-Band          | mV    | —    | 10   | —    |

4. External DC blocking capacitors are required on all RF ports.

5.  $V_{CC} = +3.3\text{ V}$  @ 50  $\mu\text{A}$  typical.  $V_{CTL} = 0\text{ V}$  to  $+2.25\text{ V}$  @ 50  $\mu\text{A}$  typical.

### Application Schematic



### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

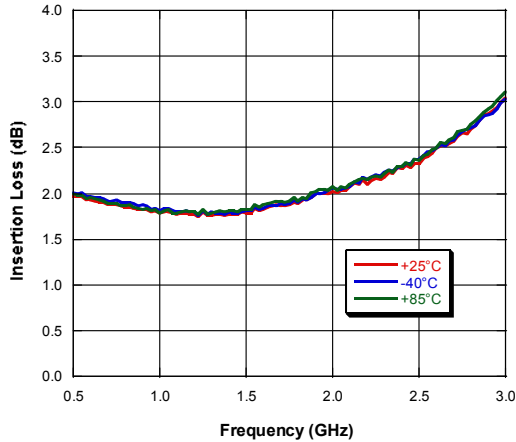
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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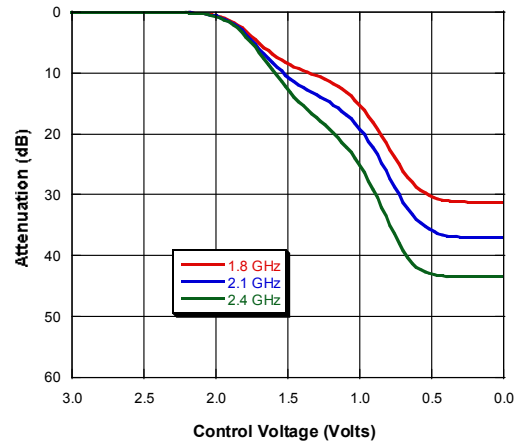
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### Typical Performance Curves

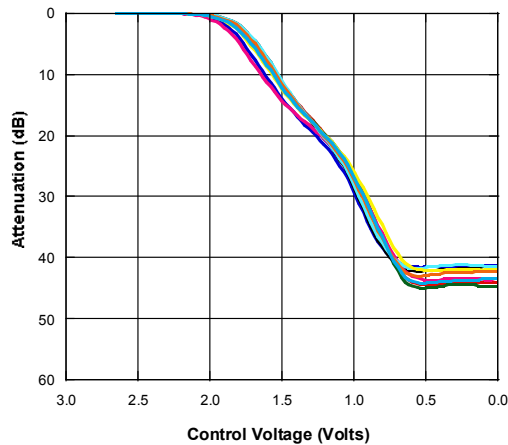
**Insertion Loss vs. Frequency  
@ 2.25 V Control Voltage**



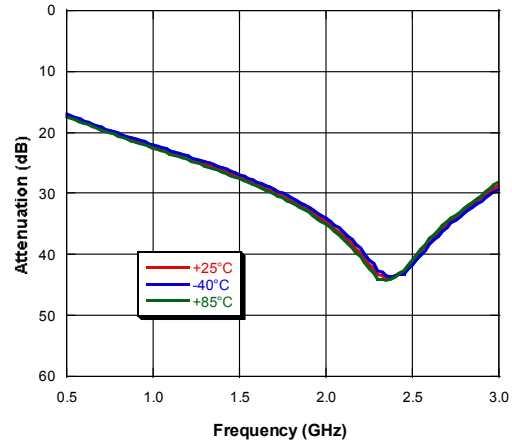
**Attenuation vs. Control Voltage @ +25°C**



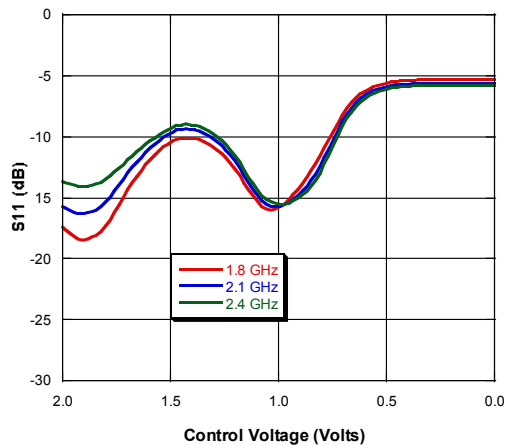
**Typical Device Variation, 2.4 GHz**



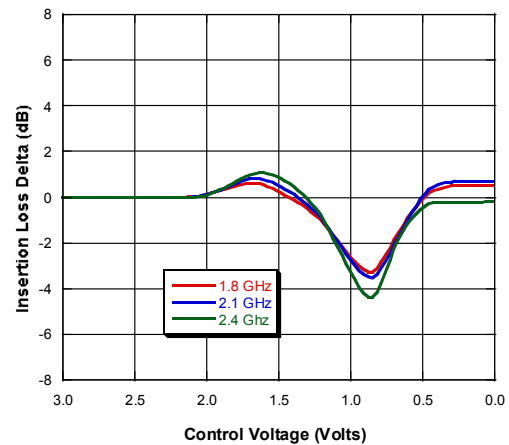
**Attenuation vs. Frequency @ 0.0 V Control Voltage**



**Return Loss vs. Control Voltage**

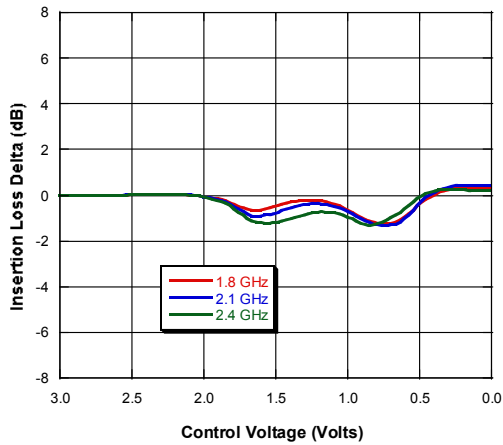


**Insertion Loss Delta Normalized to +25°C (-40°C)**

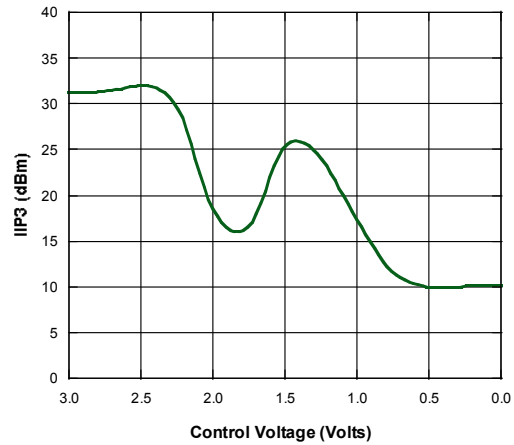


## Typical Performance Curves

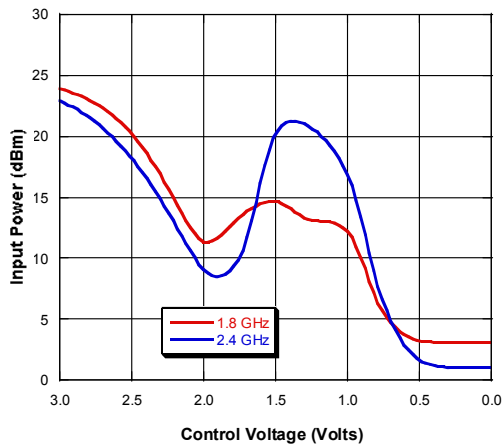
**Insertion Loss Delta Normalized to +25°C (+85°C)**



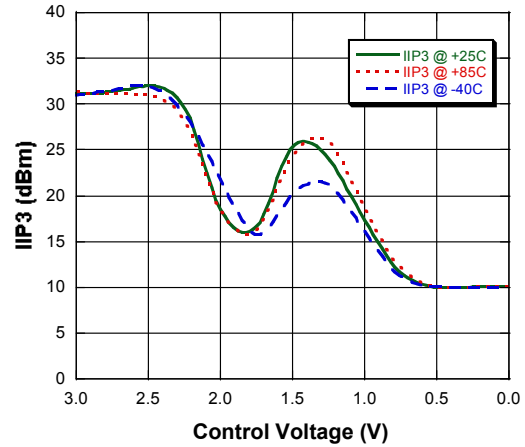
**Input IP3 vs. Control Voltage @ +25°C**



**Input Power for 1 dB Change in Attenuation**



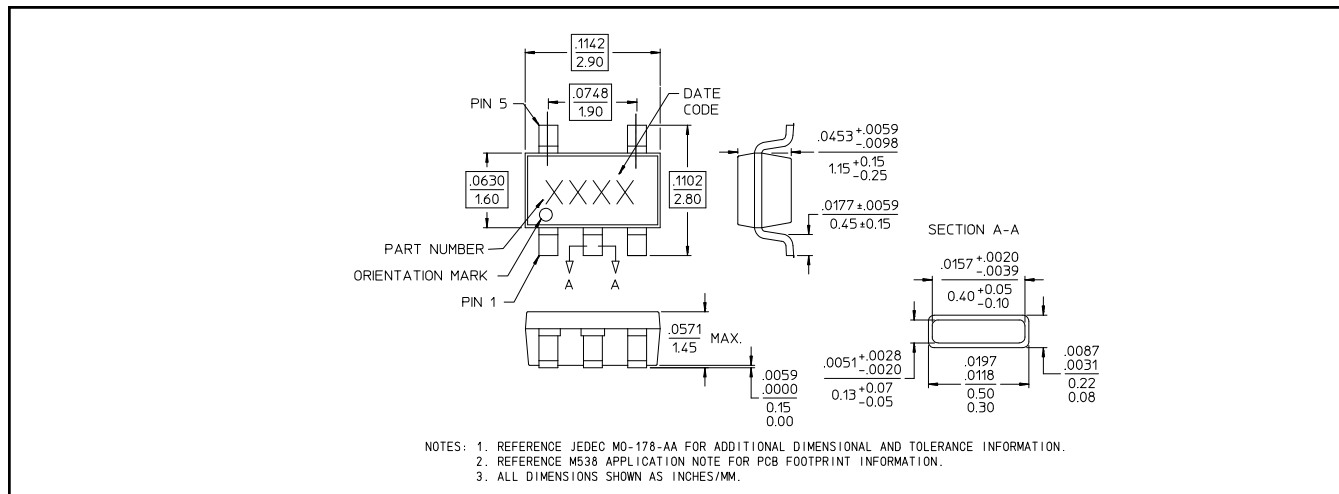
**Input IP3 vs. Control Voltage over Temperature**



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### Lead-Free SOT-25<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.

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