

# Digital Attenuator, 1-Bit, 10 dB Step DC - 2.0 GHz

**MAATSS0018  
V2**

## Features

- Single 10 dB Step
- Low Loss: 0.3 dB @ 900 MHz
- 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-266

## Description

M/A-COM's MAATSS0018 is a 1 bit, 10 dB step GaAs MMIC digital attenuator in a lead-free SOT-25 surface mount plastic package. The MAATSS0018 is ideally suited for use where high accuracy, very low power consumption and low intermodulation products are required. Typical applications include radio, wireless LANs, GPS equipment and other gain/level control circuits.

The MAATSS0018 is a GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

## Ordering Information

| Part Number  | Package         |
|--------------|-----------------|
| MAATSS0018   | Bulk Packaging  |
| MAATSS0018TR | 1000 piece reel |

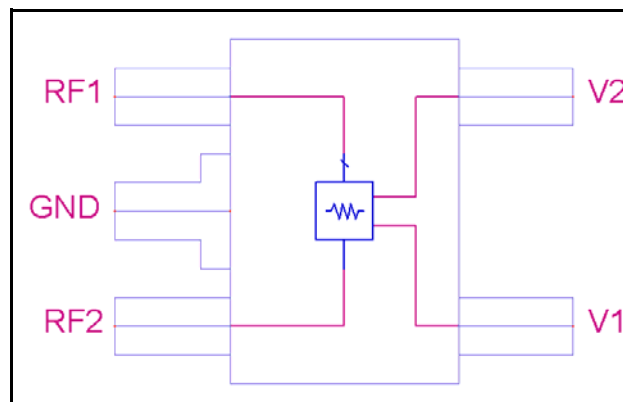
Note: Reference Application Note M513 for reel size information.

## Absolute Maximum Ratings<sup>1,2</sup>

| Parameter                               | Absolute Maximum               |
|-----------------------------------------|--------------------------------|
| Input Power<br>50 MHz<br>500 - 2000 MHz | +27 dBm<br>+34 dBm             |
| Control Voltage                         | -8.5 V ≤ V <sub>c</sub> ≤ +8 V |
| Operating Temperature                   | -40°C to +85°C                 |
| Storing Temperature                     | -65°C to +150°C                |

1. Exceeding any one or combination of these limits may cause permanent damage to this device.
2. M/A-COM does not recommend sustained operation near these survivability limits.

## Functional Block Diagram



## Pin Configuration

| Pin No. | Function | Description     |
|---------|----------|-----------------|
| 1       | RF1      | RF In/Out       |
| 2       | GND      | RF Ground       |
| 3       | RF2      | RF In/Out       |
| 4       | V1       | Control Voltage |
| 5       | V2       | Control Voltage |

## Truth Table<sup>3,4,5</sup>

| V1 | V2 | Attenuation State |
|----|----|-------------------|
| 0  | 1  | 10 dB             |
| 1  | 0  | Insertion Loss    |

3. For positive voltage control, external DC blocking capacitors are required on all RF ports (pins 1, 2 and 3)
4. Differential voltage, V(state 1) - V(state 0), must be +2.8 V minimum and less than 8 V.
5. 0 = -8 V to 0.2 V, 1 = -0.2 V to 8 V

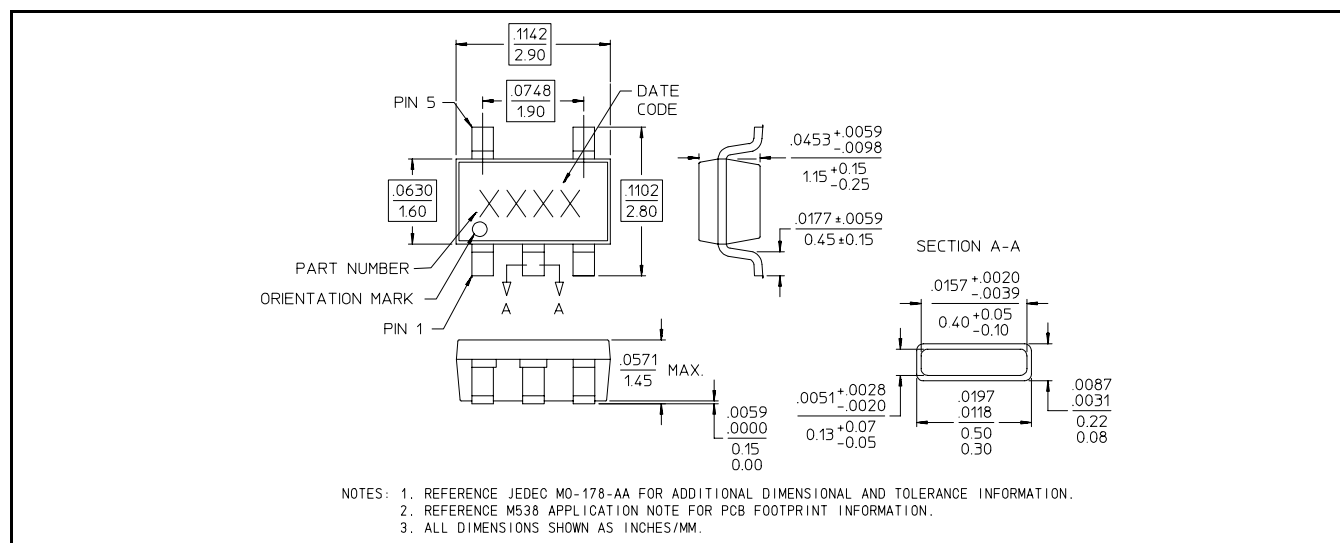
\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

**MAATSS0018**  
**V2**

**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ ,  $V_C = 0\text{ V} / -3\text{ V}$ ,  $Z_0 = 50\ \Omega$

| Parameter       | Test Conditions                              | Units | Min. | Typ.  | Max. |
|-----------------|----------------------------------------------|-------|------|-------|------|
| Insertion Loss  | 0 - 1 GHz                                    | dB    | —    | 0.3   | 0.45 |
|                 | 1 - 2 GHz                                    | dB    | —    | 0.5   | 0.7  |
| Attenuation     | DC - 2 GHz                                   | dB    | 9.5  | 10    | 10.5 |
| VSWR            | 0 - 2 GHz                                    | Ratio | —    | 1.4:1 | —    |
| IP <sub>3</sub> | 2 Tone @ 0 dBm, 5 MHz spacing                | dBm   | —    | 50    | —    |
| P1dB            | 1 GHz                                        | dBm   | —    | 28    | —    |
| Trise, Tfall    | 10% to 90% RF, 90% to 10% RF                 | nS    | —    | 5     | —    |
| Ton, Toff       | 50% Control to 90% RF, 50% Control to 10% RF | nS    | —    | 10    | —    |
| Transients      | In Band                                      | mV    | —    | 6     | —    |
| Control Current | Vc   = 3 V                                   | μA    | —    | 25    | —    |

## Lead-Free SOT-25<sup>†</sup>



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

## Handling Procedures

Please observe the following precautions to avoid damage:

## Static Sensitivity

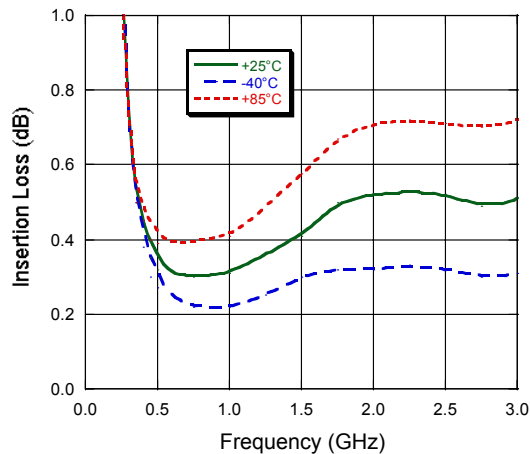
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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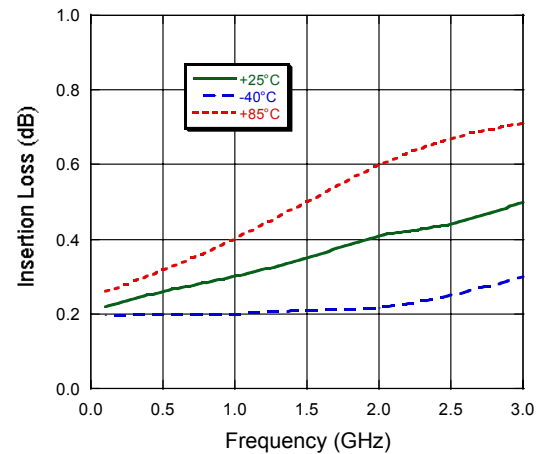
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V2**

**Typical Performance Curves (39 pF capacitors used for positive voltage control)**

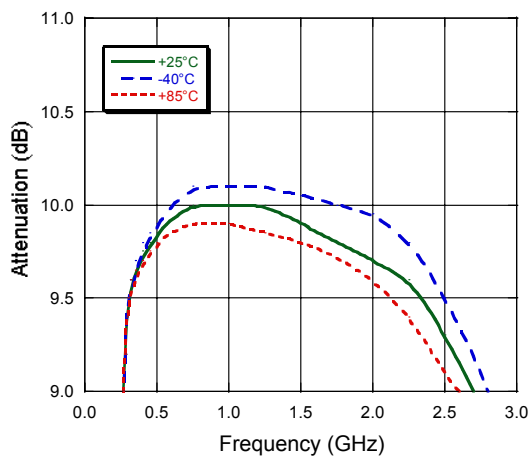
**Insertion Loss (Positive Control)**



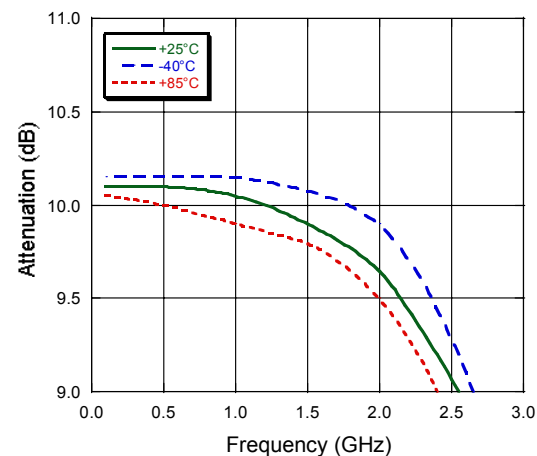
**Insertion Loss (Negative Control)**



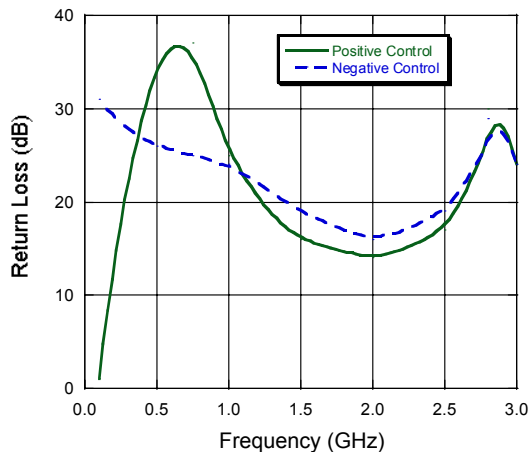
**Relative Attenuation (Positive Control)**



**Relative Attenuation (Negative Control)**



**Return Loss (Reference State)**



**Return Loss (10 dB State)**

