

## Features

- 0.5 dB Attenuation Steps to 15.5 dB
- Ultra Low DC Power Consumption
- Low Intermodulation Product: +45 dBm IP3
- Tape and Reel Packaging Available
- Temperature Stability: +/-0.15 dB from -40°C to +85°C
- Lead-Free SOIC-16 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT-280

## Description

M/A-COM's MAATSS0021 is a 5-bit, 0.5-dB step GaAs MMIC digital attenuator in a lead-free SOIC-16 surface mount plastic package. The MAATSS0021 is ideally suited for use where high accuracy, fast switching, very low power consumption and low intermodulation products are required at a low cost.

Typical applications include radio and cellular equipment, wireless LANS, GPS equipment and other gain/level control circuits.

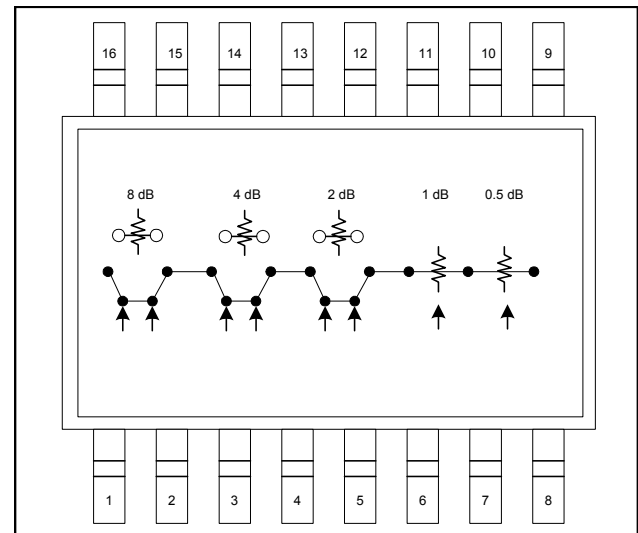
The MAATSS0021 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

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

| Part Number       | Package         |
|-------------------|-----------------|
| MAATSS0021        | Bulk Packaging  |
| MAATSS0021TR-3000 | 3000 piece reel |
| MAATSS0021SMB     | Sample Board    |

1. Reference Application Note M513 for reel size information.

## Functional Schematic



## Pin Configuration

| Pin No. | Function                | Pin No. | Function |
|---------|-------------------------|---------|----------|
| 1       | VC1                     | 9       | RF2      |
| 2       | $\overline{\text{VC1}}$ | 10      | Ground   |
| 3       | VC2                     | 11      | Ground   |
| 4       | $\overline{\text{VC2}}$ | 12      | Ground   |
| 5       | VC3                     | 13      | Ground   |
| 6       | $\overline{\text{VC3}}$ | 14      | Ground   |
| 7       | $\overline{\text{VC4}}$ | 15      | Ground   |
| 8       | $\overline{\text{VC5}}$ | 16      | RF1      |

## Absolute Maximum Ratings <sup>2,3</sup>

| Parameter                                 | Absolute Maximum               |
|---|--------------------------------|
| Input Power:<br>0.05 GHz<br>0.5 - 2.0 GHz | +27 dBm<br>+34 dBm             |
| Control Voltage                           | -8.5 V ≤ V <sub>C</sub> ≤ +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.

## Digital Attenuator, 15.5 dB, 5-Bit DC - 2.0 GHz

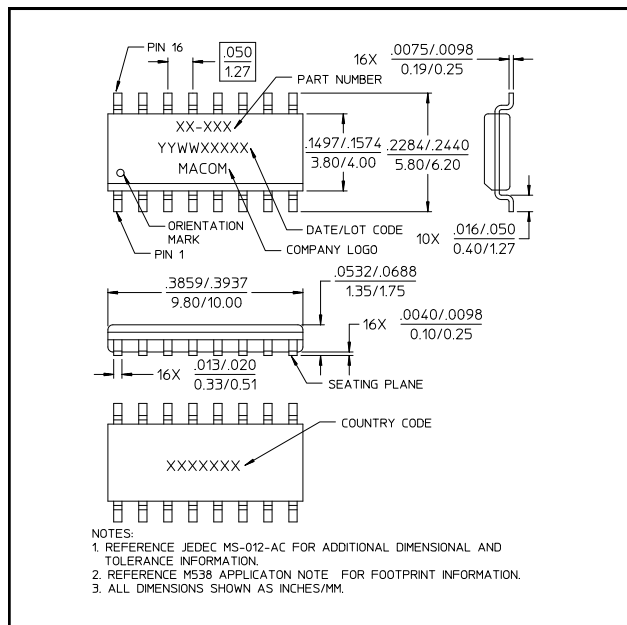
Rev. V1

### Electrical Specifications: $T_A = 25^\circ\text{C}$ , $Z_0 = 50 \Omega$

| Parameter                         | Test Conditions  | Units   | Min | Typ   | Max |
|-----------------------------------|--|---|-----|-------|-----|
| Reference Insertion Loss          | DC - 0.1 GHz   | dB  | —   | 1.1   | —   |
|                                   | DC - 0.5 GHz   | dB  | —   | 1.3   | —   |
|                                   | DC - 1.0 GHz   | dB  | —   | 1.5   | —   |
|                                   | DC - 2.0 GHz   | dB  | —   | 1.8   | 2.0 |
| Attenuation Accuracy <sup>4</sup> | DC - 2.0 GHz   | ± (0.30 dB +3% of Attenuation Setting in dB) dB |     |       |     |
| VSWR                              | (Any state)  | Ratio   | —   | 1.5:1 | —   |
| Trise, Tfall                      | 10% to 90% RF, 90% to 10% RF   | nS  | —   | 12    | —   |
| Ton, Toff                         | 50% Control to 90% RF, 50% Control to 10% RF   | nS  | —   | 18    | —   |
| Transients                        | In Band  | mV  | —   | 30    | —   |
| 1 dB Compression                  | Input Power, 0.05 GHz  | dBm   | —   | 22    | —   |
|                                   | Input Power, 0.5 - 2.0 GHz   | dBm   | —   | 27    | —   |
| IP <sub>2</sub>                   | 0.05 GHz   | dBm   | —   | 53    | —   |
|                                   | 0.5 - 2.0 GHz<br>Measured Relative to Input Power<br>(for two-tone input power up to +5 dBm) | dBm   | —   | 68    | —   |
| IP <sub>3</sub>                   | 0.05 GHz   | dBm   | —   | 40    | —   |
|                                   | 0.5 - 2.0 GHz<br>Measured Relative to Input Power<br>(for two-tone input power up to +5 dBm) | dBm   | —   | 45    | —   |

4. Attenuation accuracy specifications apply with negative bias control and low inductance grounding.

### Lead-Free SOIC-16<sup>†</sup>



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

### Truth Table

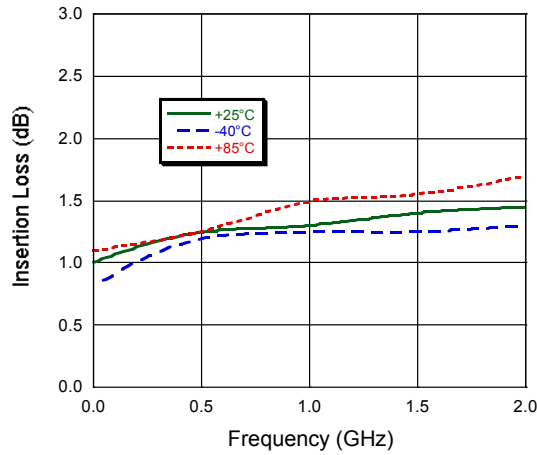
| Control Inputs   |                  |                  |     |                  |     |                  |     |           |
|------------------|------------------|------------------|-----|------------------|-----|------------------|-----|-----------|
| $\overline{VC5}$ | $\overline{VC4}$ | $\overline{VC3}$ | VC3 | $\overline{VC2}$ | VC2 | $\overline{VC1}$ | VC1 | Attenu.   |
| 1                | 1                | 1                | 0   | 1                | 0   | 1                | 0   | Reference |
| 0                | 1                | 1                | 0   | 1                | 0   | 1                | 0   | 0.5 dB    |
| 1                | 0                | 1                | 0   | 1                | 0   | 1                | 0   | 1 dB      |
| 1                | 1                | 0                | 1   | 1                | 0   | 1                | 0   | 2 dB      |
| 1                | 1                | 1                | 0   | 0                | 1   | 1                | 0   | 4 dB      |
| 1                | 1                | 1                | 0   | 1                | 0   | 0                | 1   | 8 dB      |
| 0                | 0                | 0                | 1   | 0                | 1   | 0                | 1   | 15.5 dB   |

0 = Vin Low = 0 V = 0 to -0.2 V @ 20  $\mu\text{A}$  maximum

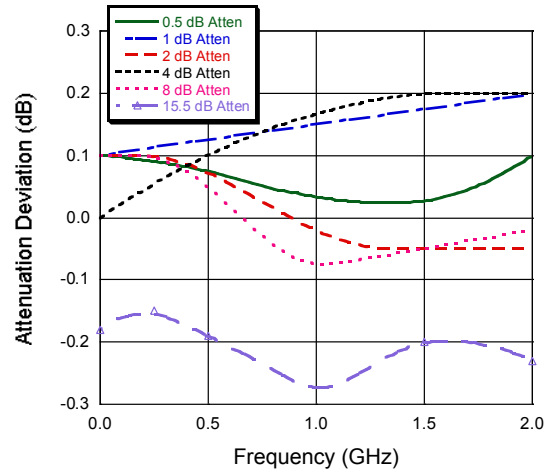
1 = Vin High = -5 V at 20  $\mu\text{A}$  to -8 V at 20  $\mu\text{A}$  maximum

## Typical Performance Curves

### Insertion Loss



### Attenuation Accuracy



### VSWR

