

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

Rev. V1

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.

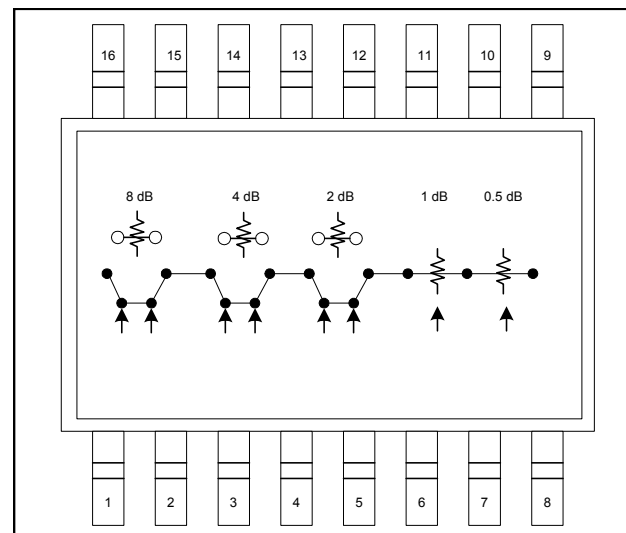
The MAATSS0021 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

Ordering Information ¹

| 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 | VC4 | 15 | Ground |
| 8 | $\overline{\text{VC5}}$ | 16 | RF1 |

Absolute Maximum Ratings ^{2,3}

| Parameter | Absolute Maximum |
|---|--|
| Input Power: 0.05 GHz 0.5 - 2.0 GHz | +27 dBm +34 dBm |
| Control Voltage | -8.5 V \leq V _C \leq +5 V |
| Operating Temperature | -40°C to +85°C |
| Storage Temperature | -65°C to +150°C |

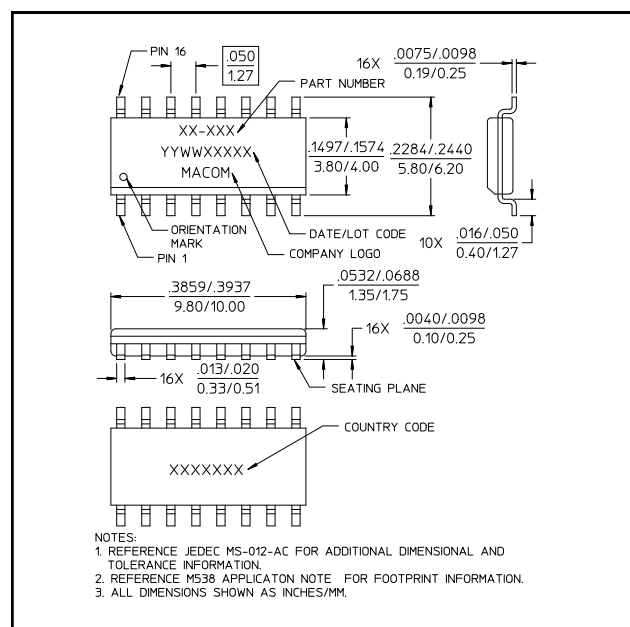
2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. M/A-COM does not recommend sustained operation near these survivability limits.

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

Rev. V1

| 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 ⁴ | 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 ₂ | 0.05 GHz | dBm | — | 53 | — |
| | 0.5 - 2.0 GHz Measured Relative to Input Power (for two-tone input power up to +5 dBm) | dBm | — | 68 | — |
| IP ₃ | 0.05 GHz | dBm | — | 40 | — |
| | 0.5 - 2.0 GHz Measured Relative to Input Power (for two-tone input power up to +5 dBm) | dBm | — | 45 | — |

Lead-Free SOIC-16[†]



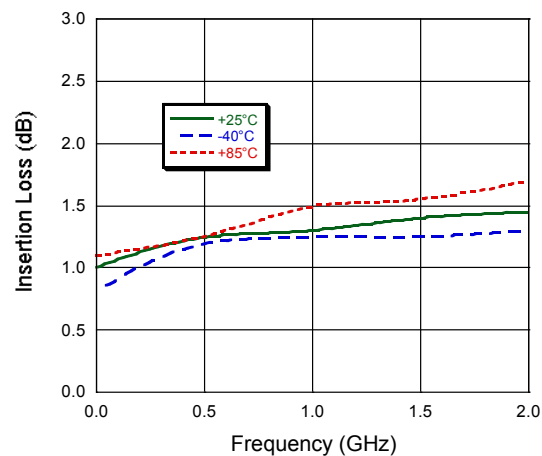
| Control Inputs | | | | | | | | |
|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-----------|
| $\overline{\text{VC5}}$ | $\overline{\text{VC4}}$ | $\overline{\text{VC3}}$ | $\overline{\text{VC3}}$ | $\overline{\text{VC2}}$ | $\overline{\text{VC2}}$ | $\overline{\text{VC1}}$ | $\overline{\text{VC1}}$ | Atten. |
| 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 μ A maximum
1 = Vin High = -5 V at 20 μ A to -8 V at 20 μ A maximum

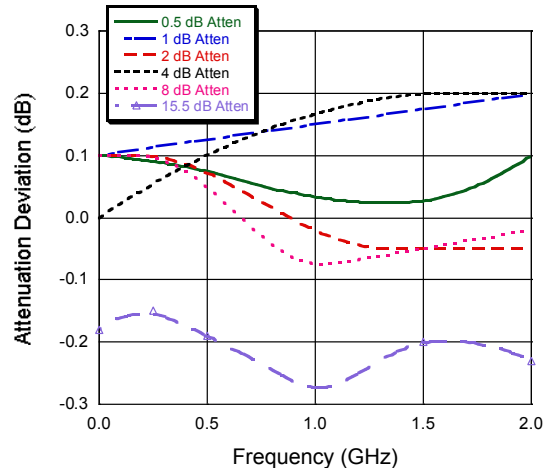
2

Typical Performance Curves

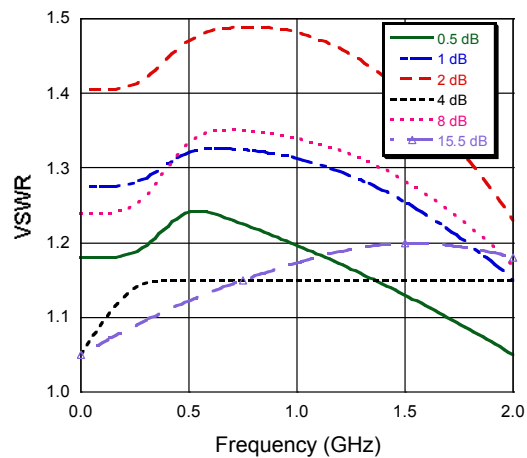
Insertion Loss



Attenuation Accuracy



VSWR



M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.