

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.

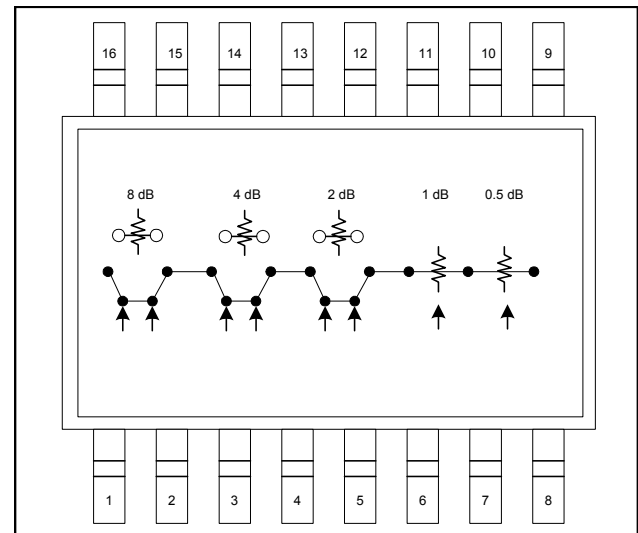
The MAATSS0021 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

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	$\overline{\text{VC4}}$	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.

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

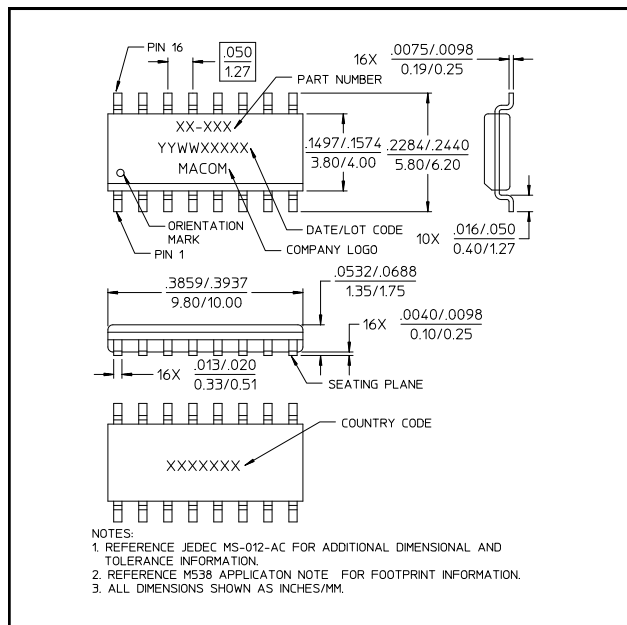
Rev. V1

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 ⁴	DC - 2.0 GHz	$\pm (0.30 \text{ dB} + 3\% \text{ of Attenuation Setting in dB}) \text{ dB}$			
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	—

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

Lead-Free SOIC-16[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.

Truth Table

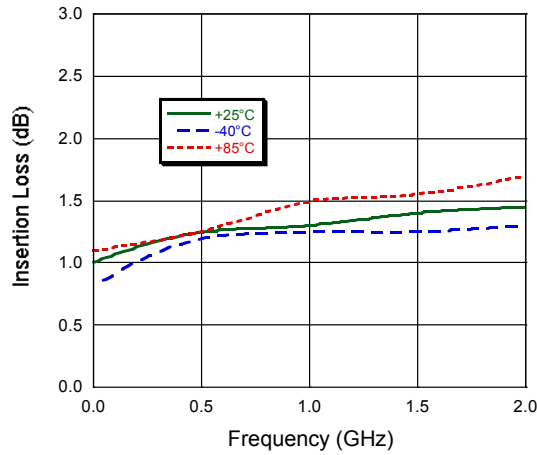
Control Inputs								
$\overline{VC5}$	$\overline{VC4}$	$\overline{VC3}$	VC3	$\overline{VC2}$	VC2	$\overline{VC1}$	VC1	Attenu.
1	1	1	0	1	0	1	0	Reference
0	1	1	0	1	0	1	0	0.5 dB
1	0	1	0	1	0	1	0	1 dB
1	1	0	1	1	0	1	0	2 dB
1	1	1	0	0	1	1	0	4 dB
1	1	1	0	1	0	0	1	8 dB
0	0	0	1	0	1	0	1	15.5 dB

0 = Vin Low = 0 V = 0 to -0.2 V @ 20 μA maximum

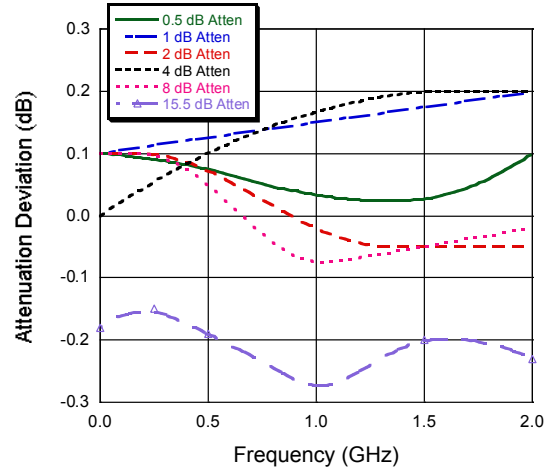
1 = Vin High = -5 V at 20 μA to -8 V at 20 μA maximum

Typical Performance Curves

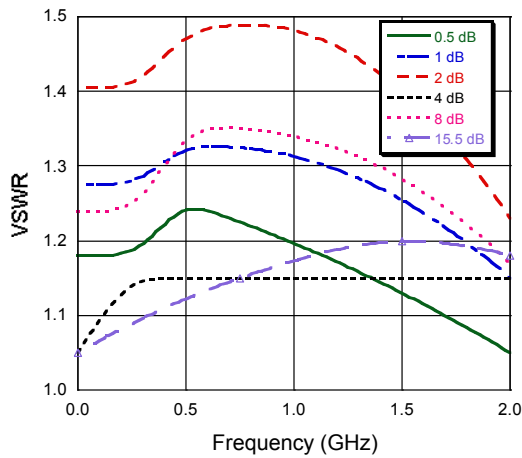
Insertion Loss



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.