

## Features

- Attenuation 2-dB Steps to 30 dB
- High Accuracy
- Low Intermodulation Product: +50 dBm IP3
- Low DC Power Consumption: 50  $\mu$ W
- Temperature Stability +/-0.15 dB: -40°C to +85°C
- Lead-Free SOIC-16 Plastic Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT-220

## Description

M/A-COM's MAADSS0009 is a 4-bit, 2-dB step GaAs MMIC digital attenuator in a lead-free SOIC 16-lead surface mount plastic package. The MAADSS0009 is ideally suited for use where high accuracy, fast switching, very low power consumption and low intermodulation products are required. Typical applications include radio and cellular equipment, wireless LANs, GPS equipment and other Gain/Level Control circuits.

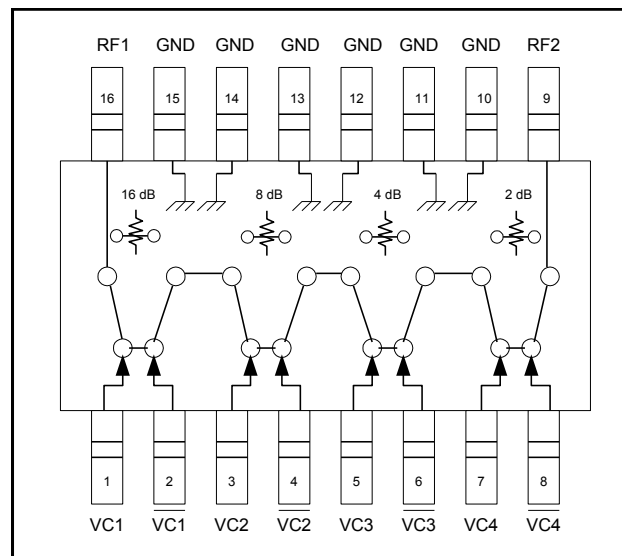
The MAADSS0009 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

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

Part Number	Package
MAADSS0009	Lead-Free SOIC 16-Lead
MAADSS0009TR-3000	3000 piece reel

1. Reference Application Note M513 for reel size information.

## Functional Schematic



## Pin Configuration

Pin No.	Function	Pin No.	Function
1	VC1	9	RF2
2	VC1	10	GND
3	VC2	11	GND
4	VC2	12	GND
5	VC3	13	GND
6	VC3	14	GND
7	VC4	15	GND
8	VC4	16	RF1

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

Parameter	Absolute Maximum
Input Power 50 MHz 500-2000 MHz	+27 dBm +34 dBm
Control Voltage	-8.5 V $\leq$ V <sub>C</sub> $\leq$ 5V
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, 30 dB, 4-Bit DC - 2.0 GHz

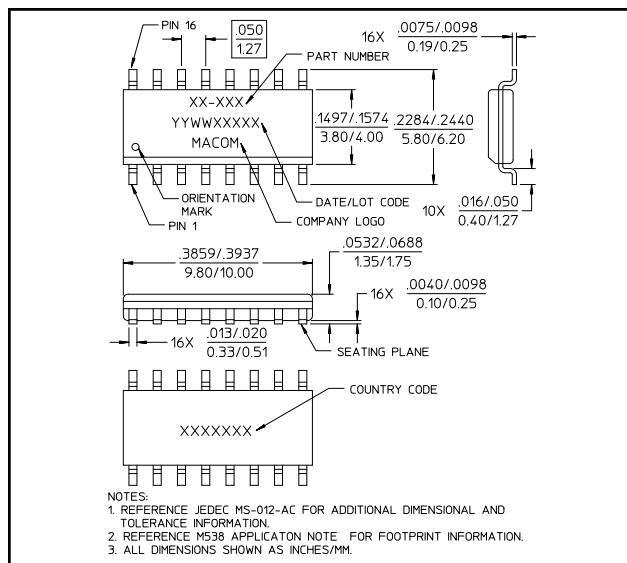
Rev. V1

**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ ,  $V_C = 0\text{ V} / -5\text{ V}$ ,  $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss (reference state)	DC - 0.5 GHz	dB	—	1.5	1.7
	DC - 1.0 GHz	dB	—	1.6	1.8
	DC - 2.0 GHz	dB	—	1.8	2.1
Attenuation Accuracy <sup>4</sup>	DC - 1.0 GHz DC - 2.0 GHz	± (0.15 dB + 3% of Atten Setting in dB) dB ± (0.30 dB + 4% of Atten Setting in dB) dB			
VSWR		Ratio	—	1.2:1	—
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	—	25	—
1 dB Compression	Input Power, 0.05 GHz	dBm	—	20	—
	Input Power, 0.5 - 2.0 GHz	dBm	—	28	—
IP <sub>2</sub>	Measured Relative to Input Power (For two-tone input power up to +5 dBm) 0.05 GHz	dBm	—	45	—
	0.5 - 2.0 GHz	dBm	—	68	—
IP <sub>3</sub>	Measured Relative to Input Power (For two-tone input power up to +5 dBm) 0.05 GHz	dBm	—	40	—
	0.5 - 2.0 GHz	dBm	—	50	—
Control Current	V <sub>C</sub>   = 5 V	μA	—		100

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.

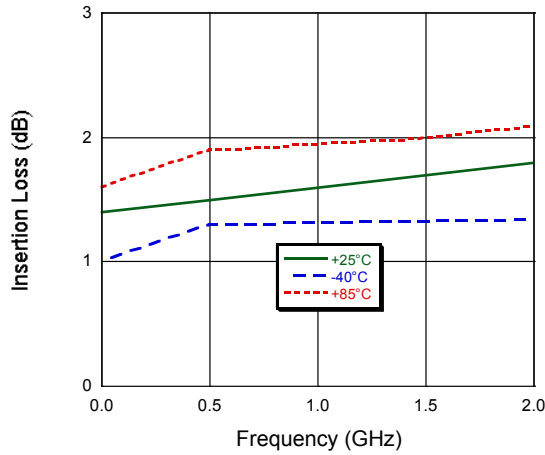
### Truth Table <sup>5</sup>

Control Inputs								Attenuation (dB)
$\overline{VC}$ 4	VC 4	$\overline{VC}$ 3	VC 3	$\overline{VC}$ 2	VC 2	$\overline{VC}$ 1	VC 1	
1	0	1	0	1	0	1	0	Reference State
0	1	1	0	1	0	1	0	2 dB
1	0	0	1	1	0	1	0	4 dB
1	0	1	0	0	1	1	0	8 dB
1	0	1	0	1	0	0	1	16 dB
0	1	0	1	0	1	0	1	30 dB

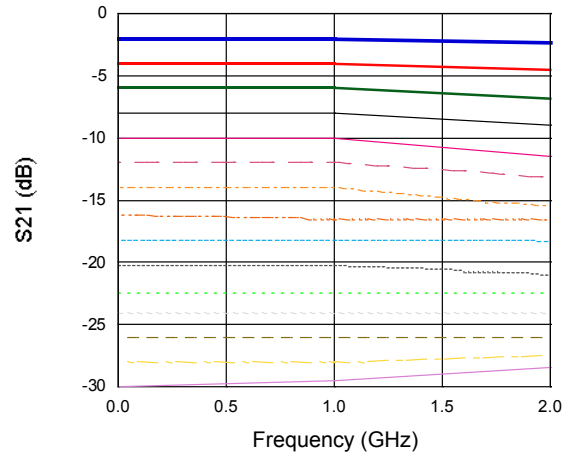
5. 0 = -0.2 V to 0 V, 1 = -8 V to -5 V.

## Typical Performance Curves

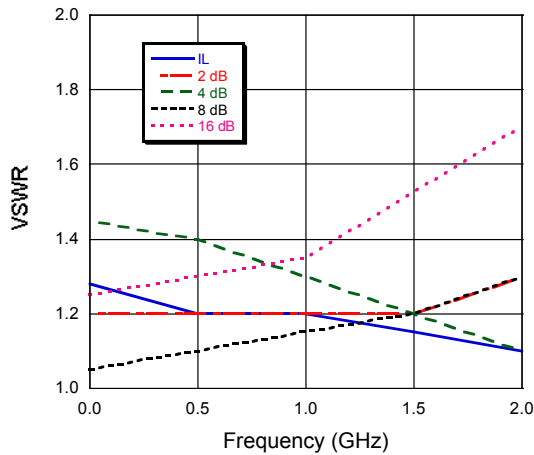
**Insertion Loss**



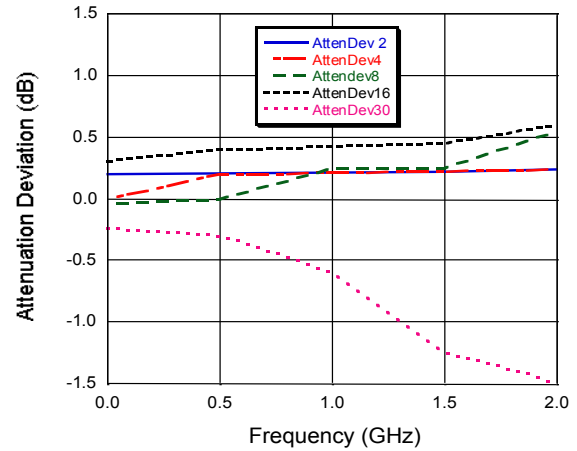
**Attenuation**



**VSWR**



**Attenuation Accuracy**



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.