MAADSS0009

Digital Attenuator, 30 dB, 4-Bit
DC - 2.0 GHz

Rev. V1

Features

- Attenuation 2-dB Steps to 30 dB
- High Accuracy
- Low Intermodulation Product: +50 dBm IP3
- Low DC Power Consumption: 50 µW
- 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.

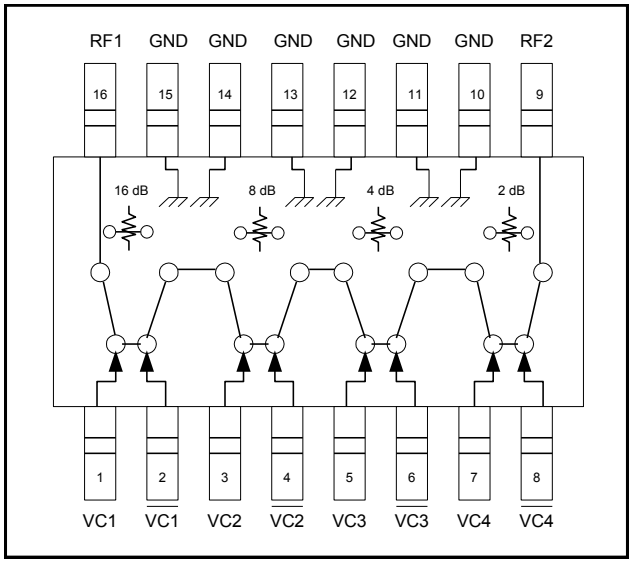
The MAADSS0009 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

Ordering Information[1]

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	$\overline{VC1}$	10	GND
3	VC2	11	GND
4	$\overline{VC2}$	12	GND
5	VC3	13	GND
6	$\overline{VC3}$	14	GND
7	VC4	15	GND
8	$\overline{VC4}$	16	RF1

Absolute Maximum Ratings [2,3]

Parameter	Absolute Maximum
Input Power 50 MHz 500-2000 MHz	 +27 dBm +34 dBm
Control Voltage	-8.5 V ≤ V_C ≤ 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.

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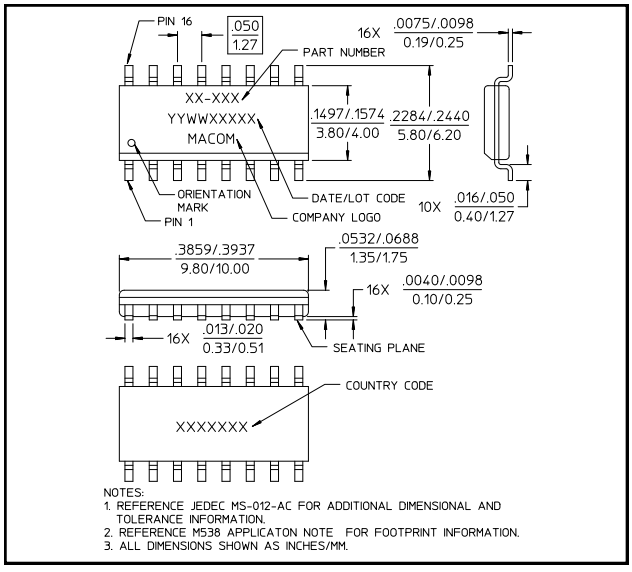
Electrical Specifications: T_A = 25°C, V_C = 0 V / -5 V, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Insertion Loss (reference state)	DC - 0.5 GHz DC - 1.0 GHz DC - 2.0 GHz	dB dB dB	— — —	1.5 1.6 1.8	1.7 1.8 2.1
Attenuation Accuracy [4]	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 Input Power, 0.5 - 2.0 GHz	dBm dBm	— —	20 28	— —
IP_2	Measured Relative to Input Power (For two-tone input power up to +5 dBm) 0.05 GHz 0.5 - 2.0 GHz	 dBm dBm	 — —	 45 68	 — —
IP_3	Measured Relative to Input Power (For two-tone input power up to +5 dBm) 0.05 GHz 0.5 - 2.0 GHz	 dBm dBm	 — —	 40 50	 — —
Control Current	$\|V_C\|$ = 5 V	µA	—		100

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.

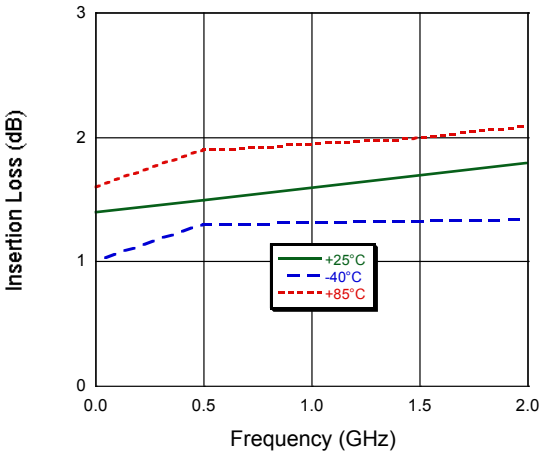
Truth Table [5]

Control Inputs								
$\overline{VC4}$	VC4	$\overline{VC3}$	VC3	$\overline{VC2}$	VC2	$\overline{VC1}$	VC1	Attenuation (dB)
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

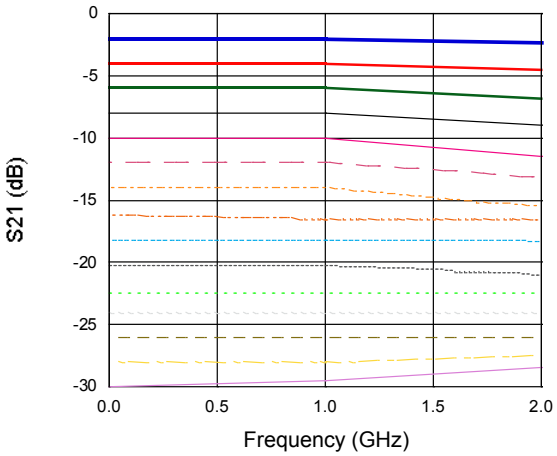
5. 0 = -0.2 V to 0 V, 1 = -8 V to -5 V.

Typical Performance Curves

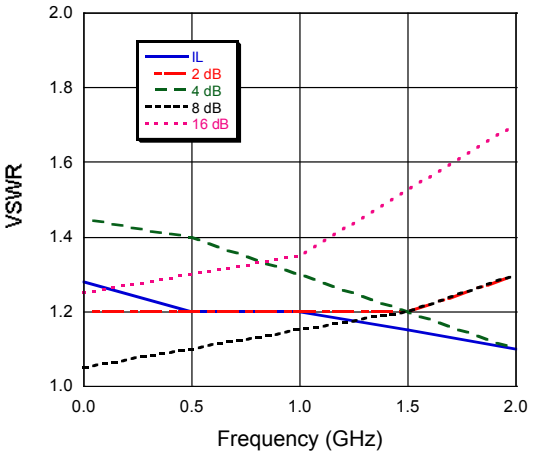
Insertion Loss



Attenuation



VSWR



Attenuation Accuracy