

Digital Attenuator, 1-Bit, 15 dB DC - 2.0 GHz

Rev. V2

Features

- Single 15-dB Step
- Low Loss, 0.3 dB Typical @ 900 MHz
- 2.5 to 5.0 Volt Operation
- Tape and Reel Packaging Available
- Lead-Free SOT-25 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of AT-267

Description

M/A-COM's MAADSS0008 is a 1-bit, 15-dB step GaAs MMIC digital attenuator in a lead-free SOT-25, 5 lead surface mount plastic package. The MAADSS0008 is ideally suited for use where high accuracy, very low power consumption and low intermodulation products are required.

Typical applications include wireless handsets, base stations, wireless LAN equipment, GPS receivers and any RF applications with automatic gain/level control circuits.

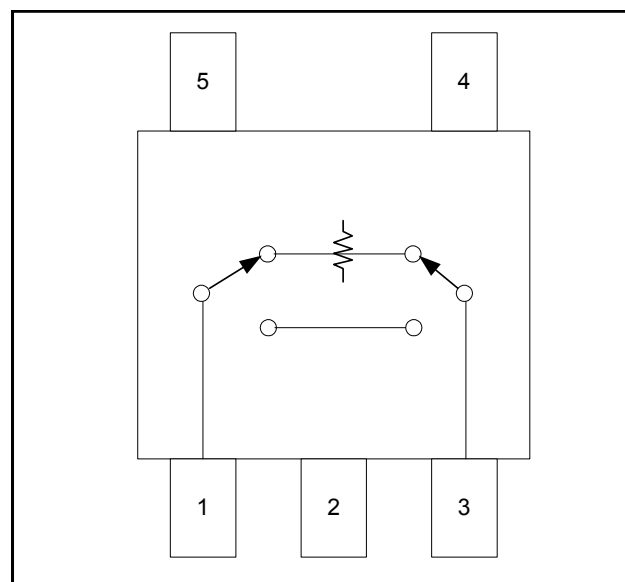
The MAADSS0008 is fabricated as a monolithic GaAs integrated circuit using a mature PHEMT process. The process features full chip passivation for performance and reliability.

Ordering Information ¹

Part Number	Package
MAADSS0008TR	1000 piece reel
MAADSS0008TR-3000	3000 piece reel
MAADSS0008SMB	Sample Board

1. Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

Pin No.	Function	Pin No.	Function
1	RF1	4	V1
2	Ground	5	V2
3	RF2		

Absolute Maximum Ratings ^{2,3}

Parameter	Absolute Maximum
Input Power	+21 dBm
Control Voltage	$ V_C \leq 8V$
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- 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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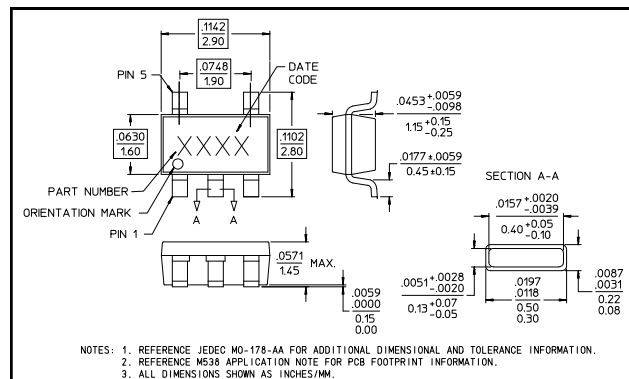
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Electrical Specifications⁴: $T_A = 25^\circ\text{C}$, $V_C = +2.5\text{ Volts}$, $Z_0 = 50\ \Omega$

Parameter	Test Conditions	Units	Min	Typ	Max
Insertion Loss (Reference State)	1.0 GHz	dB	—	0.3	0.4
	2.0 GHz	dB	—	0.4	0.5
Attenuation	1.0 GHz	dB	14.6	15.1	15.6
	2.0 GHz	dB	14.4	14.9	15.4
VSWR	1.0 GHz	Ratio	—	1.2:1	—
	2.0 GHz	Ratio	—	1.3:1	—
Input IP_3	1.0 GHz	dBm	40	50	—
	Insertion Loss State Attenuation State	dBm	40	50	—
P_{1dB}	1.0 GHz	dBm	24	26	—
	Insertion Loss State Attenuation State	dBm	20	23	—
Control Current	—	μA	—	—	10
Trise, Tfall	10% to 90% RF, 90% to 10% RF	nS	—	29	—
Ton, Toff	50% Control to 90% RF, 50% Control to 10% RF	nS	—	50	—
Transients	In-band	mV	—	10	—

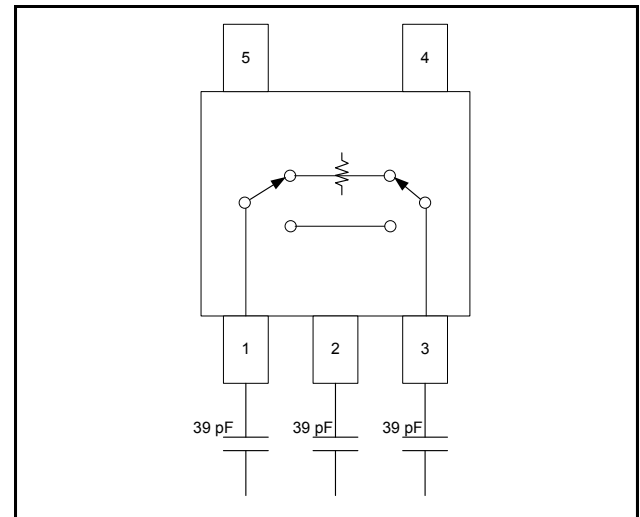
4. For positive voltage control, external DC blocking capacitors are required on all RF ports (pins 1, 2 and 3).

Lead-Free SOT-25[†]



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

Positive Control Voltage Schematic



Truth Table^{5,6}

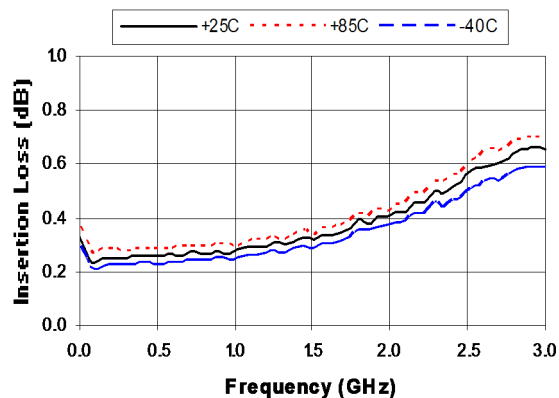
Mode (Control)	V1	V2	Attenuation
Positive ⁵	$0 \pm 0.2\text{V}$ $+2.5\text{V to } +5\text{V}$	$+2.5\text{V to } +5\text{V}$ $0 \pm 0.2\text{V}$	15 dB Reference State
Negative ⁶	$0 \pm 0.2\text{V}$ $-2.5\text{V to } -5\text{V}$	$-2.5\text{V to } -5\text{V}$ $0 \pm 0.2\text{V}$	Reference State 15 dB

5. External DC blocking capacitors are required as noted.

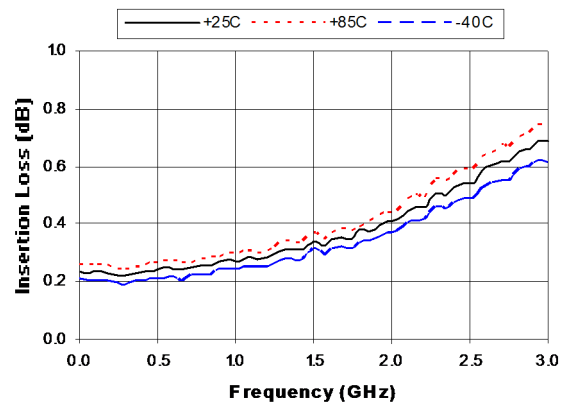
6. If negative control is used, DC blocking capacitors are not required on RF ports and ground.

Typical Performance Curves

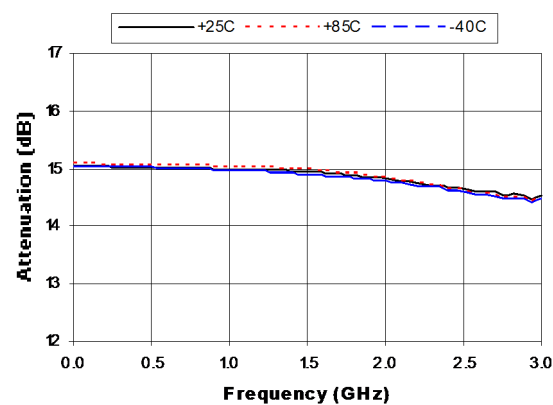
Insertion Loss with Negative Control



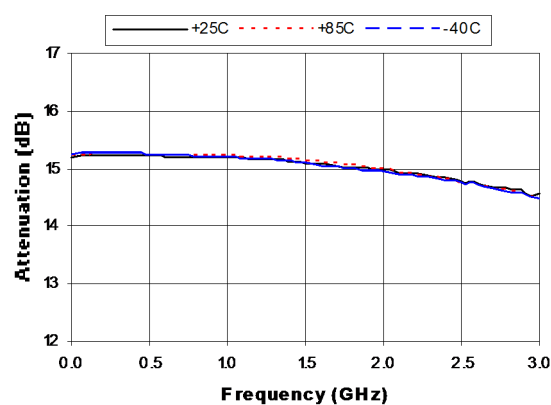
Insertion Loss with Positive Control



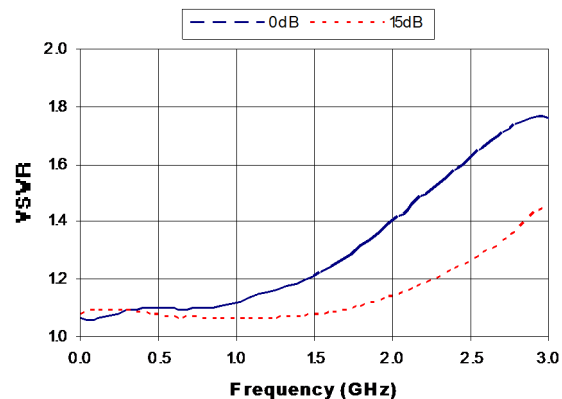
Attenuation with Negative Control



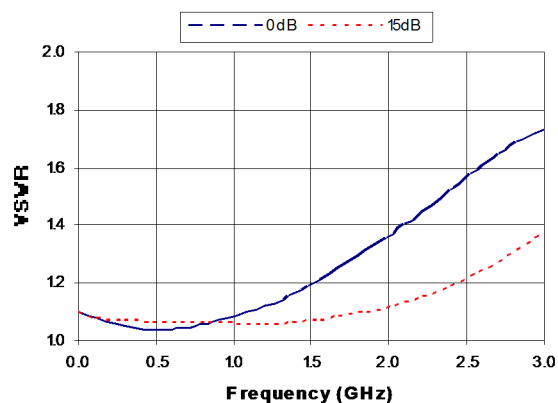
Attenuation with Positive Control



VSWR, 0 and 15 dB States with Negative Control at +25°C



VSWR, 0 and 15 dB States with Positive Control at +25°C



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