

## Features

- Attenuation: 2 dB Steps to 30 dB<sup>2</sup>
- Temperature Stability:  $\pm 0.18$  dB from  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  Typical
- Low DC Power Consumption
- Hermetic Surface Mount Package
- Integral TTL Driver
- 50 Ohm Nominal Impedance

## Description

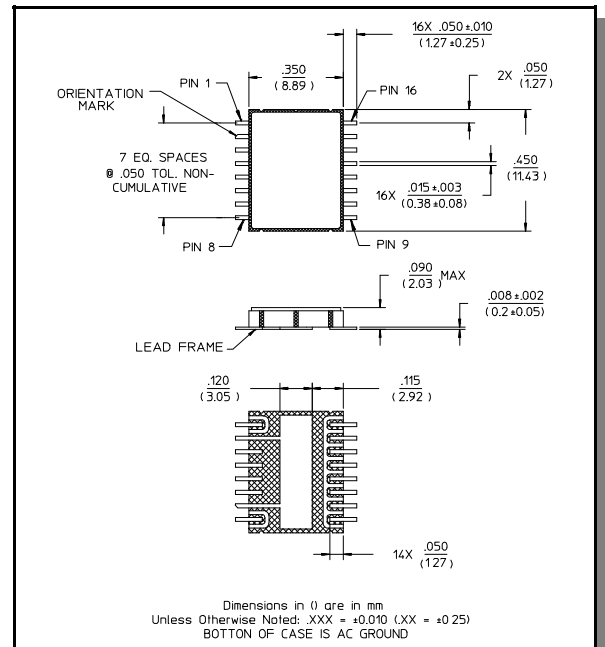
M/A-COM's AT-233 is a GaAs FET 4-Bit digital attenuator with a 2 dB minimum step size and 30 dB total attenuation. This attenuator and integral TTL driver is in a hermetically sealed ceramic 16-lead surface mount package. The AT-233 is ideally suited for use where accuracy, fast switching, very low power consumption and low intermodulation products are required. Typical applications include dynamic range setting in precision receiver circuits and other gain/leveling control circuits. Environmental screening is available. Contact the factory for information.

## Electrical Specifications: $T_A = 25^{\circ}\text{C}^1$

Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Reference Insertion Loss		DC - 0.5 GHz DC - 1.0 GHz DC - 2.0 GHz	dB dB dB	— — —	— — —	2.3 2.65 2.8
Attenuation Accuracy <sup>3</sup>	Any Single Bit  Any Combination of Bits	DC - 1.0 GHz DC - 2.0 GHz  DC - 1.0 GHz DC - 2.0 GHz	dB dB  dB dB	$\pm (0.2 + 3\%$ of attenuation setting in dB) $\pm (0.2 + 3\%$ of attenuation setting in dB) or $\pm 0.45$ dB, whichever is greater  $\pm (0.20 + 3\%$ of attenuation setting in dB) $\pm (0.25 + 4\%$ of attenuation setting in dB) or $\pm 0.45$ dB, whichever is greater	— —  — —	— —  — —
VSWR		DC - 2.0 GHz	Ratio	—	—	1.7:1
Trise, Tfall	10% to 90%	—	ns	—	10	—
Ton, Toff	50% Control to 90/10% RF	—	ns	—	30	—
Transients	In-Band (peak-peak)	—	mV	—	35	—
1 dB Compression <sup>4</sup>	Input Power	0.05 GHz 0.5 - 2.0 GHz	dBm dBm	— —	+20 +28	— —
Input IP3 <sup>4</sup>	For two tone input power Up to +5 dBm	0.05 GHz 0.5 - 2.0 GHz	dBm dBm	— —	+40 +50	— —
Input IP2 <sup>4</sup>	For two-tone input power Up to +5 dBm	0.05 GHz 0.5 - 2.0 GHz	dBm dBm	— —	+45 +68	— —

1. All specifications apply when operated with bias voltages of +5V or  $V_{CC}$  and  $-5.0\text{V}$  to  $-8.0\text{V}$  for  $V_{EE}$ , and 50 Ohm impedance at all ports unless otherwise specified.
2. Above reference insertion loss.
3. This attenuator is guaranteed monotonic.
4.  $V_{EE} = -5\text{V}$  for the typical numbers given.

## CR-12



**Electrical Specifications:  $T_A = 25^\circ\text{C}^1$**

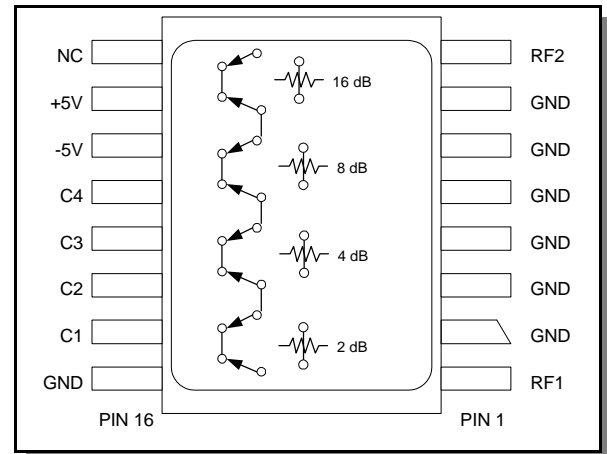
Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
$V_{CC}$		—	V	4.5	5.0	5.5
$V_{EE}$		—	V	-8.0	—	-5.0
$I_{CC}$	$V_{CC} = 4.5$ to $5.5$ V $V_{ctl} = 0$ to $0.8$ V, or $V_{CC} - 2.1$ V to $V_{CC}$	—	mA	—	—	4.0
$I_{EE}$	$V_{EE} = -5.0$ to $-8.0$ V	—	mA	—	—	1.0
$V_{ctl}$	Logic 0 (TTL)	—	V	0.0	—	0.8
	Logic 1 (TTL)	—	V	2.0	—	5.0
Input Leakage Current (Low)	0 to 0.8 V	—	$\mu\text{A}$	—	—	1.0
Input Leakage Current (High)	2.0 to 5.0 V	—	$\mu\text{A}$	—	—	1.0

**Absolute Maximum Ratings <sup>5</sup>**

Parameter	Absolute Maximum
Max Input Power 0.5 GHz 0.5 - 2.0 GHz	+27 dBm +34 dBm
Supply Voltages $V_{CC}$ $V_{EE}$	+5.5 V -8.5 V
Control Voltage	-0.5 V to $V_{CC} + 0.5$ V
Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +150°C

5. Operation of this device above any one of these parameters may cause permanent damage.

**Functional Schematic (Top View)**



**Truth Table**

Control Inputs				
C4	C3	C2	C1	Attenuation
0	0	0	0	Reference
0	0	0	1	2 dB
0	0	1	0	4 dB
0	1	0	0	8 dB
1	0	0	0	16 dB
1	1	1	1	30 dB

0 = TTL Low      1 = TTL High

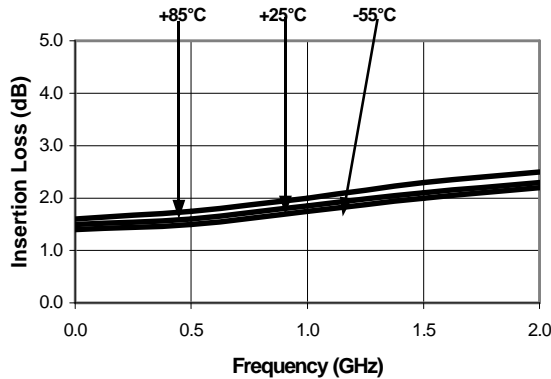
Specifications subject to change without notice.

■ North America: Tel. (800) 366-2266  
 ■ Asia/Pacific: Tel. +81-44-844-8296, Fax +81-44-844-8298  
 ■ Europe: Tel. +44 (1344) 869 595, Fax +44 (1344) 300 020

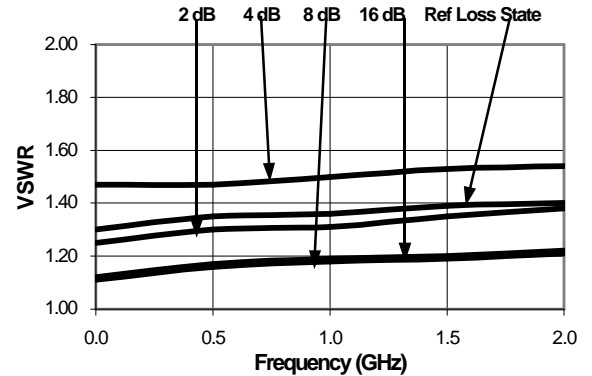
Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

Typical Performance Curves

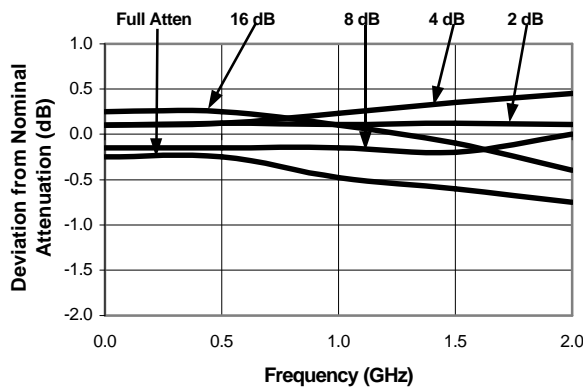
Ref. Insertion Loss vs. Frequency



VSWR vs. Frequency



Attenuation Accuracy vs. Frequency



Ordering Information <sup>6</sup>

Part Number	Package
AT-233 PIN	CR-12

6. Contact the factory for standard or custom screening requirements

Specifications subject to change without notice.

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

