# AT-232-PIN

# Digital Attenuator 30.0 dB, 4-Bit, TTL Driver, DC-2.0 GHz

#### Features

- Attenuation: 2 dB steps to 30 dB
- Temperature Stability: ± 0.18 dB from –55°C to +85°C Typical
- Low DC Power Consumption
- Hermetic Surface Mount Package
- Fast Switching Speed, 12 ns Typical
- 50 Ohm Nominal Impedance
- Lead-Free CR-6 Package
- 260°C Reflow Compatible
- RoHS\* Compliant

### Description

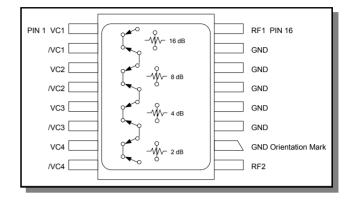
M/A-COM's AT-232-PIN is a GaAs FET 4-bit digital attenuator with a 2 dB minimum step size and 30 dB total attenuation. This attenuator is in a hermetically sealed ceramic 16-lead surface mount package. The AT-232-PIN is ideally suited for use where accuracy, fast switching, very low power consumption 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.

## **Ordering Information**

Part Number	Package		
AT-232-PIN	Bulk Packaging		

Note: 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	

The metal bottom of the case must be connected to  $\mathsf{RF}$  and  $\mathsf{DC}$  ground.

\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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## Electrical Specifications: From –55°C to +85°C<sup>1</sup>

Parameter	Test Conditions	Frequency	Units	Min	Тур	Max
Reference Insertion Loss	_	DC - 0.5 GHz DC - 1.0 GHz DC - 2.0 GHz	dB dB dB			2.0 2.3 2.5
Attenuation Accuracy <sup>2</sup>	Any Single Bit	DC - 1.0 GHz DC - 2.0 GHz	$\begin{array}{c} \pm (0.15 \ dB + 3\% \ of \ atten \ setting \ in \ dB) \ dB \\ \pm (0.2 \ dB + 3\% \ of \ atten \ setting \ in \ dB) \ dB \\ Or \pm 0.45 \ dB, \ whichever \ is \ greater \\ \pm (0.22 \ dB + 3\% \ of \ atten \ setting \ in \ dB) \ dB \\ \pm (0.25 \ dB + 4\% \ of \ atten \ setting \ in \ dB) \ dB \\ Or \pm 0.45 \ dB, \ whichever \ is \ greater \end{array}$			lB) dB ater
	Any Combination of Bits	DC - 1.0 GHz DC - 2.0 GHz				dB) dB
VSWR	—	DC - 2.0 GHz	Ratio	—	—	1.6:1
Trise, Tfall	10% to 90%	_	ns	—	12	—
Ton, Toff	50% Control to 90/10% RF	_	ns	—	18	—
Transients	In-Band (peak-peak)	_	mV	—	25	—
1 dB Compression	Input Power Input Power	0.05 GHz 0.5 - 2.0 GHz	dBm dBm		+20 +28	
Input IP3	For two-tone Input Power Up to +5 dBm	0.05 GHz 0.5 - 2.0 GHz	dBm dBm	—	+40 +50	—
Input IP2	For two-tone Input Power Up to +5 dBm	0.05 GHz 0.5 - 2.0 GHz	dBm dBm	—	+45 +68	
Input Leakage Current (Low)	-0.2 to 0V		μA	—	—	20
Input Leakage Current (High)	-8.0 to -5.0V	_	μA	—	—	200

1. All specifications apply when operated with control voltages of 0.0V to -5.0V.

2. This attenuator is guaranteed monotonic.

# Absolute Maximum Ratings <sup>3,4</sup>

Parameter	Absolute Maximum			
Max Input Power 0.05 GHz 0.5 - 2.0 GHz	+27 dBm +34 dBm			
Control Voltage	-8.5 V <u>&lt;</u> Vc <u>&lt;</u> +5 V			
Operating Temperature	-55°C to +125°C			
Storage Temperature	-65°C to +150°C			

3. Exceeding any one or combination of these limits may cause permanent damage to this device.

4. M/A-COM does not recommend sustained operation near these survivability limits.

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### **Handling Procedures**

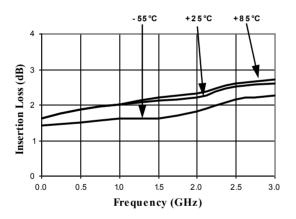
Please observe the following precautions to avoid damage:

### **Static Sensitivity**

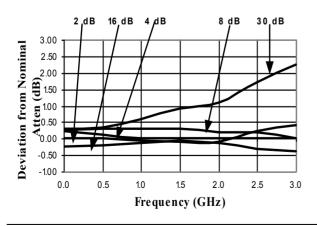
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## **Typical Performance Curves**

#### Ref. Insertion Loss vs. Frequency



#### Attenuation Accuracy vs. Frequency



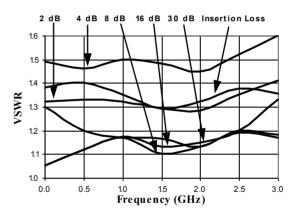
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# Truth Table (Digital Attenuator)

Control Inputs								
/VC4	VC4	/VC3	VC3	/VC2	VC2	/VC1	VC1	Atten. (dB)
-5V	0V	-5V	0V	-5V	0V	-5V	0V	Ref.
0V	-5V	-5V	0V	-5V	0V	-5V	0V	2 dB
-5V	0V	0V	-5V	-5V	0V	-5V	0V	4 dB
-5V	0V	-5V	0V	0V	-5V	-5V	0V	8 dB
-5V	0V	-5V	0V	-5V	0V	0V	-5V	16 dB
0V	-5V	0V	-5V	0V	-5V	0V	-5V	30 dB

#### VSWR vs. Frequency

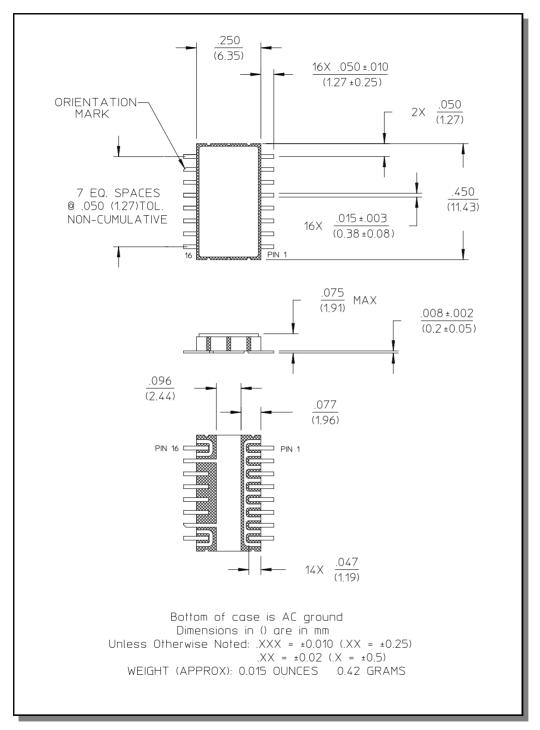


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# Lead-Free, CR-6 Ceramic Package<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.

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