

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

**AT-220  
V5**

## Features

- Attenuation 2-dB Steps to 30 dB
- High Accuracy
- Low Intermodulation Product: +50 dBm IP3
- Low DC Power Consumption: 50  $\mu$ W
- SOIC-16 Plastic Package
- Tape and Reel Packaging Available
- Temperature Stability  $\pm 0.15$  dB:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## Description

M/A-COM's AT-220 is a 4-bit, 2-dB step GaAs MMIC digital attenuator in a low cost SOIC 16-lead surface mount plastic package. The AT-220 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.

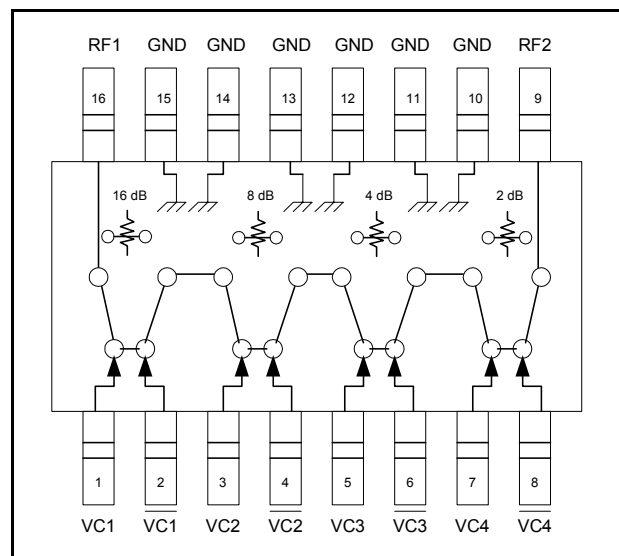
The AT-220 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

## Ordering Information

Part Number	Package
AT-220 PIN	SOIC 16-Lead Plastic Package
AT-220TR*	1000 piece reel

\* 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>1</sup>

Parameter	Absolute Maximum
Input Power: 50 MHz 500-2000 MHz	+27 dBm +34 dBm
Control Voltage	$-8.5\text{ V} \leq V_C \leq 5\text{ V}$
Operating Temperature	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
Storage Temperature	$-65^{\circ}\text{C}$ to $+150^{\circ}\text{C}$

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

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

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

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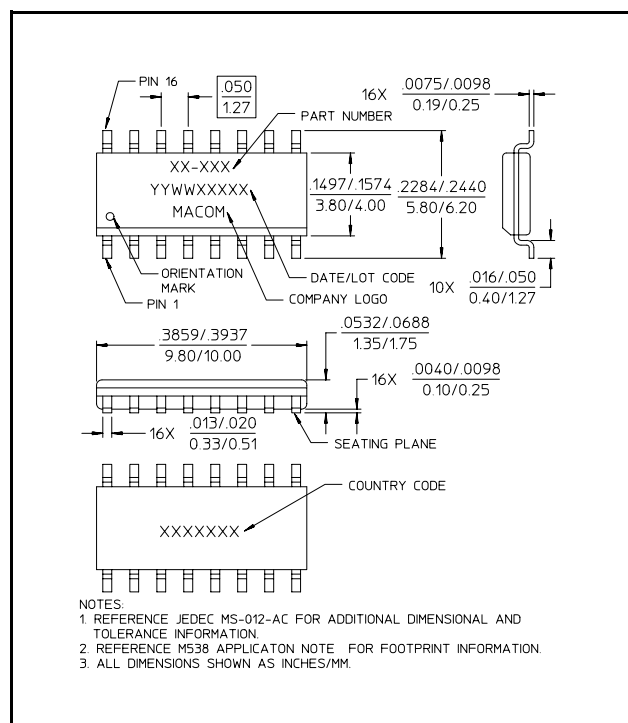
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**Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $V_C = 0\text{ V} / -5\text{ V}$ ,  $Z_0 = 50\ \Omega$**

Parameter	Test Conditions	Frequency	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>2</sup>		DC - 1.0 GHz DC - 2.0 GHz	$\pm (0.15\text{ dB} + 3\% \text{ of Atten Setting in dB})\text{ dB}$ $\pm (0.30\text{ dB} + 4\% \text{ of Atten Setting in dB})\text{ dB}$			
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 Input Power	0.05 GHz	dBm	—	20	—
		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_C  = 5\text{ V}$		$\mu\text{A}$	—		100

2. Attenuation accuracy specifications apply with negative bias control and low inductance grounding.

## SOIC-16



## Truth Table<sup>3</sup>

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

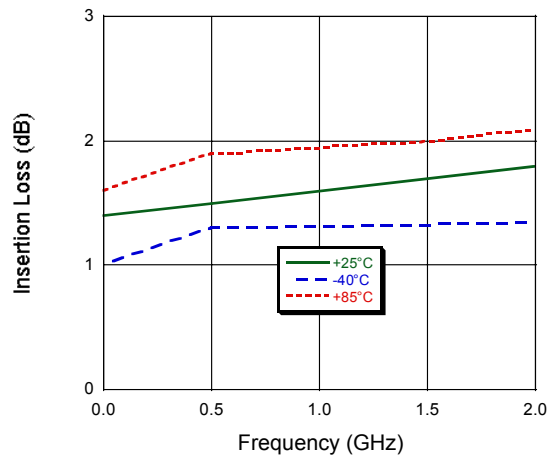
3. 0 = -0.2 V to 0 V, 1 = -8 V to -5 V.

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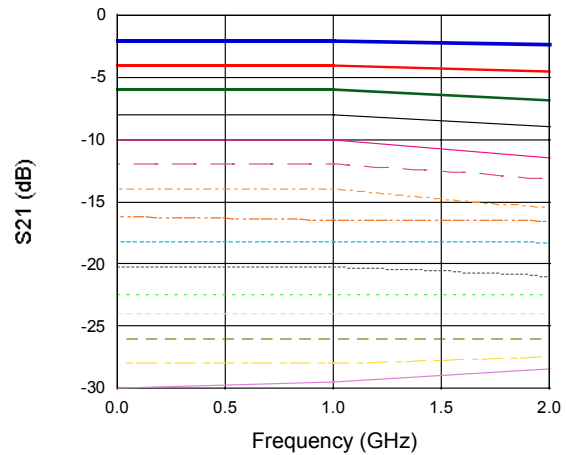
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## Typical Performance Curves

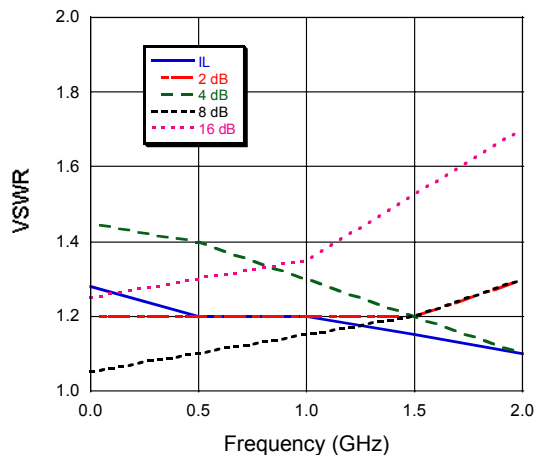
**Insertion Loss**



**Attenuation**



**VSWR**



**Attenuation Accuracy**

