

## Digital Attenuator, 4-Bit, Single Control 30 dB, 0.5 - 2.0 GHz

Rev. V7

### Features

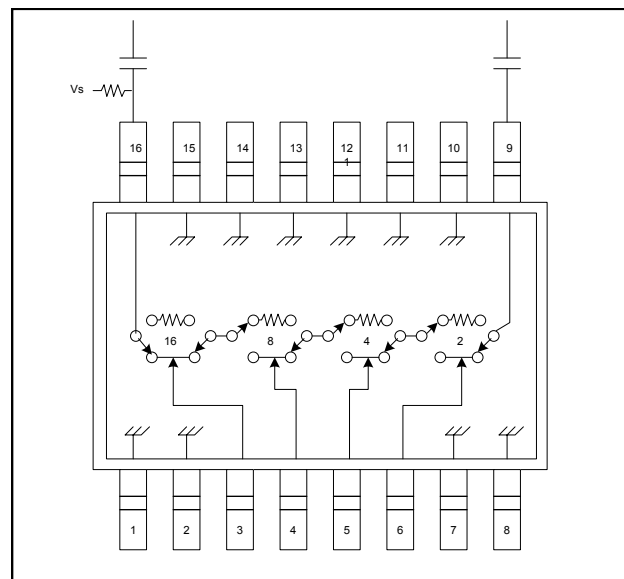
- Positive Single Control
- 2-dB Attenuation Steps to 30 dB
- Low DC Power Consumption
- TSSOP-16 Plastic Package

### Description

MACOM's AT-264 is a 4-bit, 2-dB step GaAs MMIC digital attenuator in a low cost TSSOP-16 surface mount plastic package. The AT-264 is ideally suited for use where high accuracy, very low power consumption and low intermodulation products are required. Typical applications include radio, cellular, wireless LANs, GPS equipment and other gain/level control circuits.

The AT-264 is fabricated using a mature 1 micron GaAs MESFET process. The process features full chip passivation for increased performance and reliability.

### Functional Schematic <sup>2,3</sup>



2. Blocking caps are required on all RF ports (39 pF used for data measurements).
3.  $V_s = +5 \pm 0.2$  VDC must be applied at RF1 or RF2 using a 10 K $\Omega$  or greater pull-up resistor.

### Ordering Information<sup>1</sup>

Part Number	Package
AT-264-PIN	Bulk Packaging
AT-264TR	1000 piece reel

1. Reference Application Note M513 for reel size information.

### Pin Configuration

Pin No.	Function	Pin No.	Function
1	Ground	9	RF2
2	Ground	10	Ground
3	VC1	11	Ground
4	VC2	12	Ground
5	VC3	13	Ground
6	VC4	14	Ground
7	Ground	15	Ground
8	Ground	16	RF1

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**Electrical Specifications<sup>4</sup>:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50\ \Omega$ ,  $V_S = 5\ \text{V}$** 

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Reference Insertion Loss	0.5 - 1.0 GHz	dB	—	2.0	2.4
	0.5 - 2.0 GHz	dB	—	2.2	2.6
Attenuation Accuracy	0.5 - 1.0 GHz	$\pm (0.15\ \text{dB} + 5\% \text{ of attenuation setting in dB})\ \text{dB}$			
	0.5 - 2.0 GHz	$\pm (0.3\ \text{dB} + 5\% \text{ of attenuation setting in dB})\ \text{dB}$			
VSWR	1.0 - 1.5 GHz	Ratio	—	1.5:1	—
	0.5 - 2.0 GHz	Ratio	—	1.9:1	—
Trise, Tfall	10% to 90% RF, 90% to 10% RF	ns	—	200	—
Ton, Toff	50% Control to 90% RF, 50% Control to 10% RF	ns	—	200	—
Transients	In Band	mV	—	75	—
1 dB Compression	Input Power, 0.5 GHz	dBm	—	25	—
	Input Power, 0.9 GHz	dBm	—	25	—
IP <sub>2</sub>	0.5 GHz	dBm	—	65	—
	0.5 - 2.0 GHz Measured Relative to Input (for two-tone Input Power up to +5 dBm)	dBm	—	71	—
IP <sub>3</sub>	0.5 GHz	dBm	—	43	—
	0.5 - 2.0 GHz Measured Relative to Input (for two-tone Input Power up to +5 dBm)	dBm	—	47	—
I <sub>c</sub>	$ V_c  = 5\ \text{V}$	$\mu\text{A}$	—	—	10
I <sub>vs</sub>	—	$\mu\text{A}$	—	—	20

4. External DC blocking capacitors are required on all RF ports. Loss varies at 0.003 dB/°C.

**Absolute Maximum Ratings<sup>5,6</sup>**

Parameter	Absolute Maximum
Input Power 50 MHz 500 - 2000 MHz	+27 dBm
	+34 dBm
Control Voltage	$-0.5\ \text{V} \leq V_c \leq 8.5\ \text{V}$
Operating Temperature	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temperature	$-65^\circ\text{C}$ to $+150^\circ\text{C}$

5. Exceeding any one or combination of these limits may cause permanent damage to this device.  
 6. MACOM does not recommend sustained operation near these survivability limits.

**Truth Table<sup>7</sup>**

VC1	VC2	VC3	VC4	Attenuation (dB)
1	1	1	1	Reference Insertion Loss
1	1	1	0	2
1	1	0	1	4
1	0	1	1	8
0	1	1	1	16
0	0	0	0	30

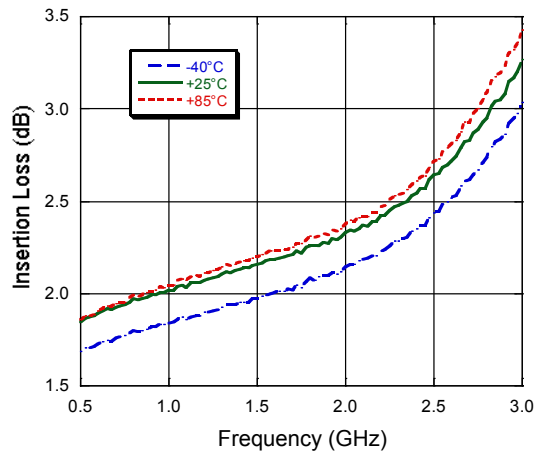
7. 0 =  $0 \pm 0.2\ \text{V}$ , 1 = +5 V

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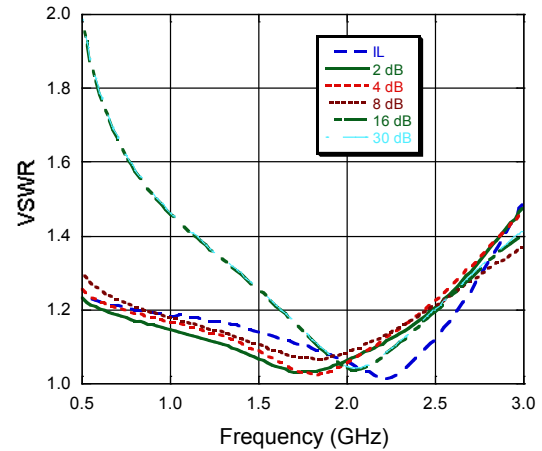
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### Typical Performance Curves

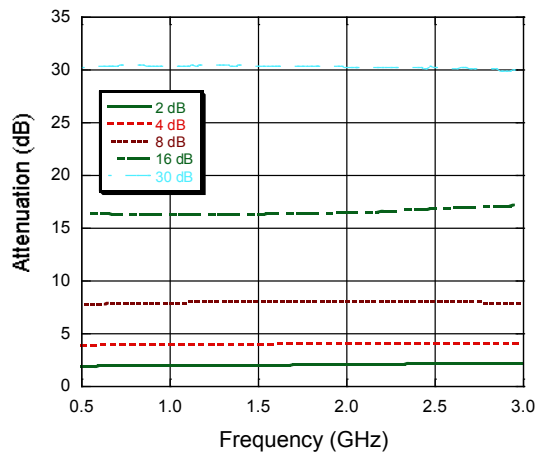
**Insertion Loss**



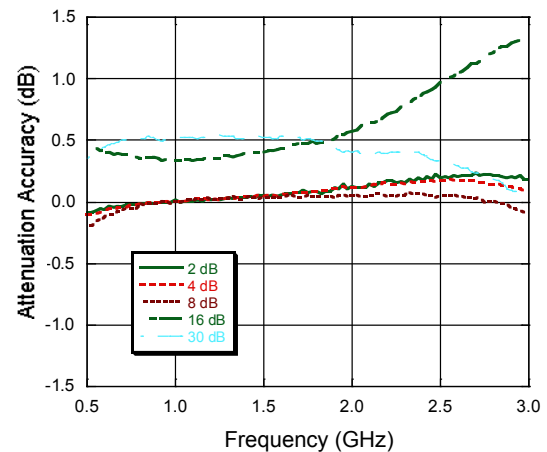
**VSWR**



**Attenuation**



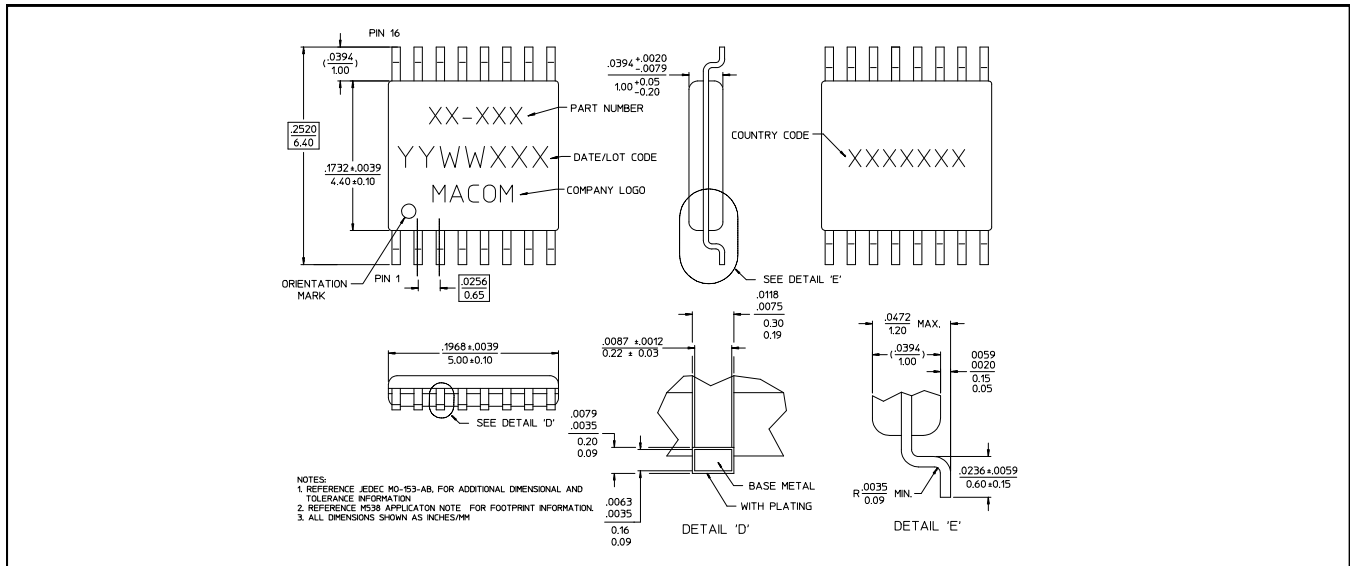
**Attenuation Accuracy**



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### TSSOP-16



### 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.

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