

**Voltage Variable Attenuator,  
824 - 960 MHz**

**AT65-0009  
V2**

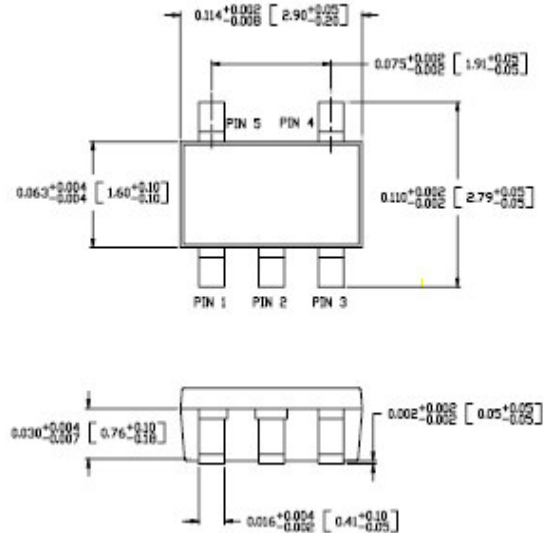
**Features**

- 25 dB Attenuation Range
- High IP3
- Excellent Linearity Performance
- Surface Mount SOT-25 Package
- Low Cost/High Performance
- 50 Ohm Nominal Impedance

**Description**

M/A-COM's AT65-0009 is an integrated voltage variable attenuator containing two PIN diodes and a passive glass quadrature hybrid. This device is packaged in a 5 leaded SOT plastic surface mount package. Maximum attenuation is typically achieved at 3.5 V bias using the suggested bias circuit. The AT65-0009 is ideally suited for GSM communication applications requiring variable attenuation in the 824 to 960 MHz bandwidth.

**SOT-25**



**Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50 \text{ Ohms}$ ,  $F = 824\text{-}960 \text{ MHz}$**

Parameter	Test Conditions <sup>1</sup>	Units	Min.	Typ.	Max.
Insertion Loss	$V_B = 0 \text{ V}$	dB	—	1.7	2.1
VSWR		Ratio	—	1.7	2.2
Attenuation Flatness Vs Frequency	0- 10 dB	dB	—	1.3	—
	0- 20 dB	dB	—	1.3	—
	0- 630 dB	dB	—	2.5	—
Switching Speed	50% Control to 90%/10% RF	$\mu\text{Sec}$	—	7.0	—
Input IP3	Two-tone 900 MHz, 905 MHz, +5 dBm $V_B = 0 \text{ V}$	dBm	—	40	—
Input IP2	Two-tone 900 MHz, 905 MHz, +5 dBm $V_B = 0 \text{ V}$	dBm	—	34	—
Attenuation	$I_B = 0.30 \text{ to } 0.45 \text{ mA}$	dB	25	28	—

1

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

• **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.

**Voltage Variable Attenuator,  
824 - 960 MHz**

**AT65-0009  
V2**

**Pin Configuration**

Pin No.	Function
1	RFIN, $V_{\delta}$
2	GND
3	RFOUT, $V_{\delta}$
4	GND
5	GND

**External Circuitry Parts <sup>1</sup>**

Part	Value	Purpose
C1	390 pF	DC Block
C2	390 pF	DC Block
C3	390 pF	By-pass
C4	390 pF	By-pass
L1	180 nH	RF Choke
L2	180 nH	RF Choke
R1	10 KOhm	Current Limiting
C5 <sup>2</sup>	1.5 pF	RF Tune
C6 <sup>2</sup>	1.5 pF	RF Tune

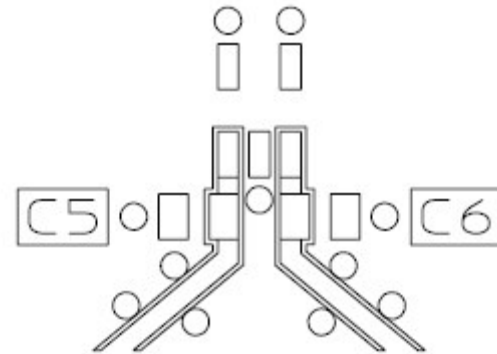
1. All external circuitry parts are readily available, low cost surface mount components (.060 in. x .030 in. or .080 in. x .050 in.).
2. See Application Note MA-C-05010008A for external tuning capacitor values to suit specific Communication Bandwidths. Insertion Loss will vary depending on tuning capacitor value chosen.

**Absolute Maximum Ratings <sup>3</sup>**

Parameter	Absolute Maximum
Max Input Power	+27 dBm
Operating Voltage	+ 5 Volts
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

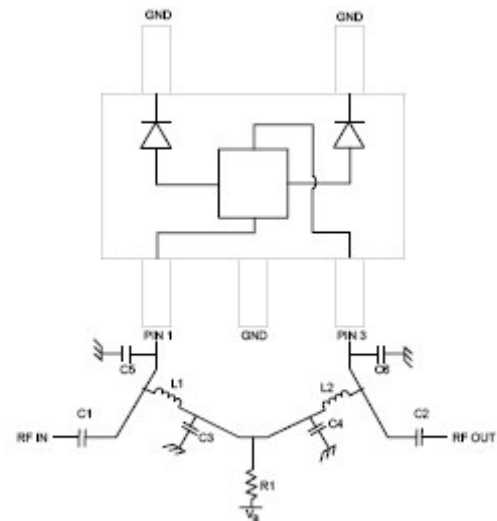
3. Exceeding any one or combination of these limits may cause permanent damage to this device.

**Recommended PCB Configuration <sup>4</sup>**



4. Circuit Material = FR-4, TETRA II, 0.031 inches thick.  
Line Width = 0.025 inches, Line Spacing = 0.0056 inches.

**Functional Diagram and Bias Circuitry**



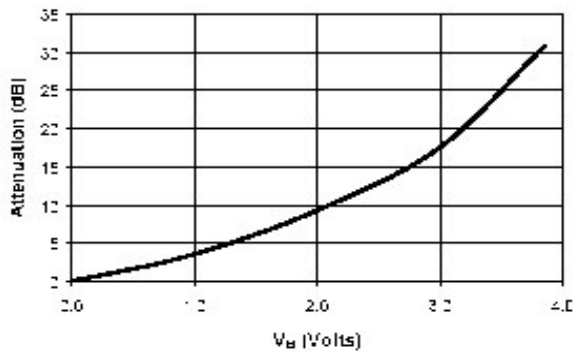
**Ordering Information**

Part Number	Package
AT65-0009	Bulk Packaging
AT65-0009TR	Tape and Reel (1K Reel)
AT65-0009-TB	Unit Mounted on Test Board

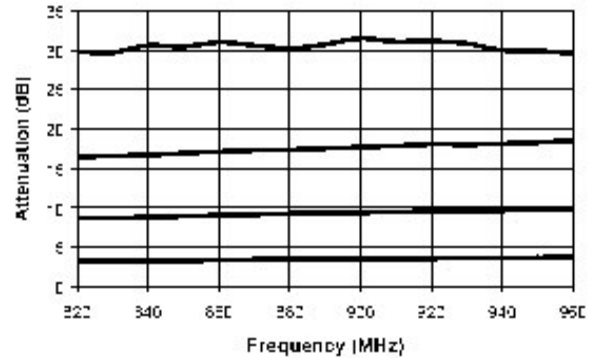
Note: Reference Application Note M513 for reel size information.

**Typical Performance Curves**

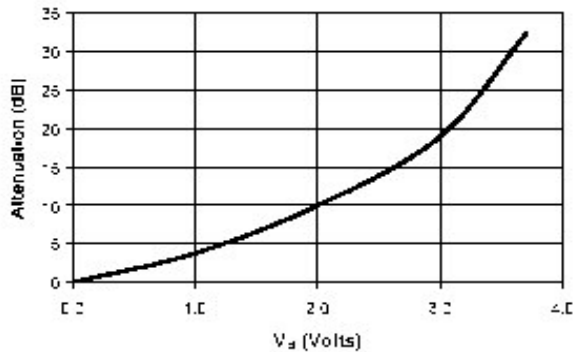
*Attenuation vs. Voltage with 1.5 pF  
Tuning Cap @ +25°C*



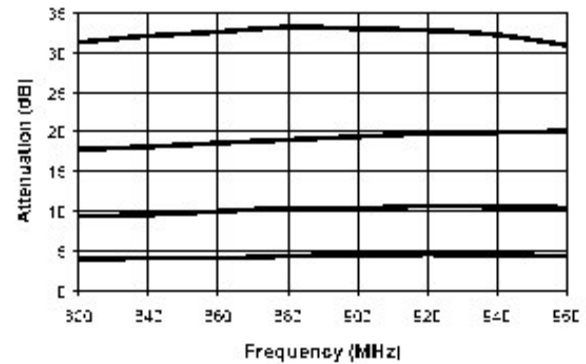
*Attenuation vs. Freq. With 1.5 pF  
Tuning Cap @ +25°C*



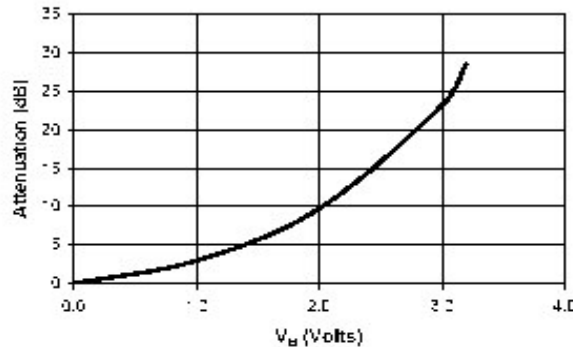
*Attenuation vs. Voltage with 1.5 pF  
Tuning Cap @ +85°C*



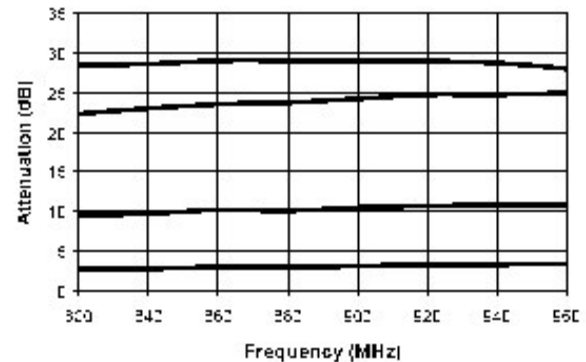
*Attenuation vs. Freq. With 1.5 pF  
Tuning Cap @ +85°C*



*Attenuation vs. Voltage with 1.5 pF  
Tuning Cap @ -40°C*



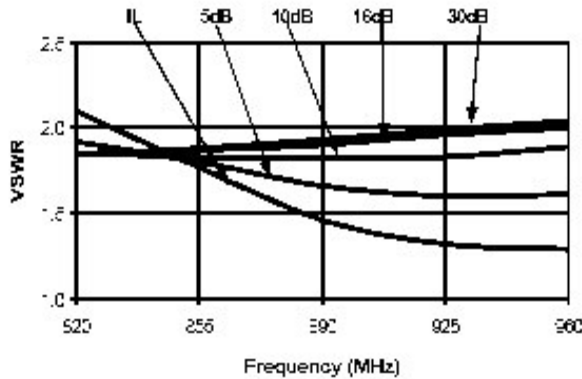
*Attenuation vs. Freq. With 1.5 pF  
Tuning Cap @ -40°C*



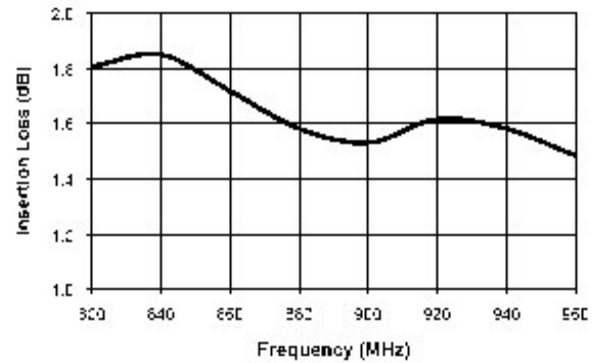
**Voltage Variable Attenuator,  
824 - 960 MHz**

**AT65-0009  
V2**

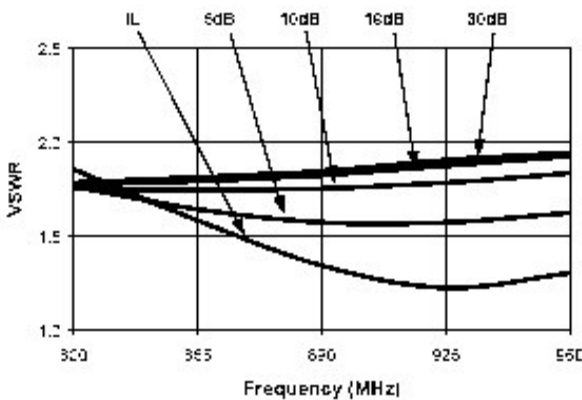
**VSWR vs. Freq. With 1.5 pF Tuning Cap @ +25°C**



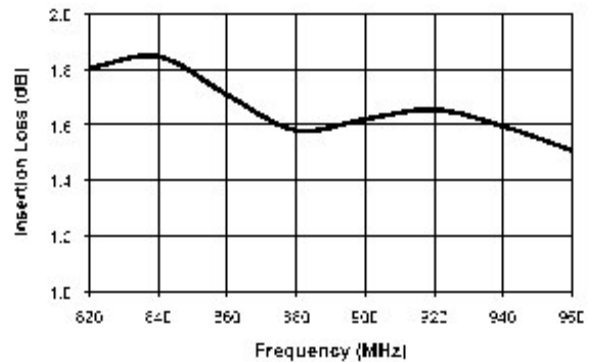
**Loss vs. Frequency @ +25°C  
No Tuning Cap (See Note 2)**



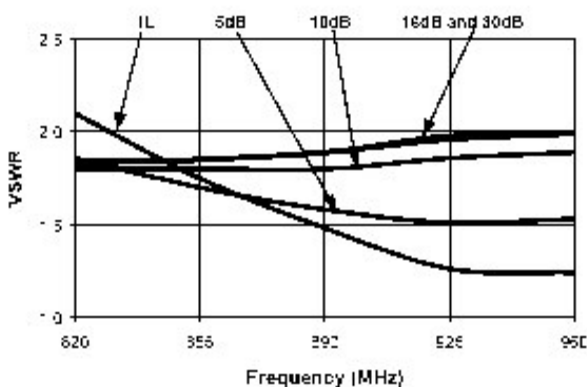
**VSWR vs. Freq. With 1.5 pF Tuning Cap @ +85°C**



**Loss vs. Frequency @ +85°C  
No Tuning Cap (See Note 2)**



**VSWR vs. Freq. With 1.5 pF Tuning Cap @ -40°C**



**Loss vs. Frequency @ -40°C  
No Tuning Cap (See Note 2)**

