

Rev. V3

#### **Features**

- 25 dB Attenuation Range
- High IP3
- Excellent Linearity Performance
- Low Cost/High Performance
- 50 Ohm Nominal Impedance
- Lead-Free SOT-25 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT65-0009

#### **Description**

M/A-COM's MAATCC0013 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 MAATCC0013 is ideally suited for GSM communication applications requiring variable attenuation in the 824 to 960 MHz bandwidth.

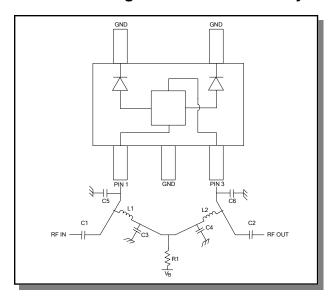
## **Ordering Information**

Part Number	Package
MAATCC0013	Bulk Packaging
MAATCC0013TR	1000 piece reel
MAATCC0013-TB	Sample Test Board

Note: Reference Application Note M513 for reel size information.

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

### **Functional Diagram and Bias Circuitry**



## **Pin Configuration**

Pin No.	Function		
1	RFIN, V <sub>B</sub>		
2	GND		
3	RFOUT, V <sub>B</sub>		
4	GND		
5	GND		

## External Circuitry Parts 1

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	nm Current Limiting	
C5 <sup>2</sup>	1.5 pF	RF Tune	
C6 <sup>2</sup>	1.5 pF	RF Tune	

- All external circuitry parts are readily available, low cost surface mount components (.060 in. x .030 in. or .080 in. x .050 in.)
- 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.
- 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
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Rev. V3

## Electrical Specifications: $T_A = 25$ °C, $Z_0 = 50\Omega$ , F = 824 to 960 MHz

Parameter	Test Conditions	Units	Min	Тур	Max
Insertion Loss	V <sub>B</sub> = 0 V	dB	_	1.7	2.1
VSWR		Ratio	_	1.7	2.2
Attenuation Flatness vs. Frequency	0 - 10 dB 0 - 20 dB 0 - 30 dB	dB dB dB		1.3 1.3 2.5	
Switching Speed	50% control to 90%/10% RF	usec	_	7.0	_
Input IP3	Two Tones 900 MHz, 905 MHz, +5 dBm $V_{\rm B}$ = 0 V	dBm	_	40	_
Input IP2	Two Tones 900 MHz, 905 MHz, +5 dBm $V_{\rm B} = 0~{\rm V}$	dBm	_	34	_
Attenuation	I <sub>B</sub> = 0.30 to 0.45 mA	dB	25	28	_

## Absolute Maximum Ratings 3,4

Parameter	Absolute Maximum
Max Input Power	+27 dBm
Operating Voltage	+5 V
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.
- M/A-COM does not recommend sustained operation near these survivability limits.

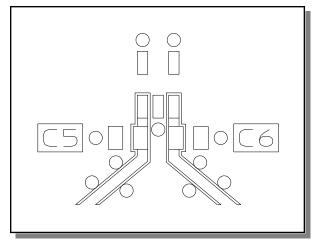
## **Handling Procedures**

Please observe the following precautions to avoid damage:

## **Static Sensitivity**

GMIC 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.

## Recommended PCB Configuration<sup>5</sup>



Circuit Material = FR-406, 0.031 inches thick.
 Line Width = 0.025 inches, Line Spacing = 0.0056 inches.

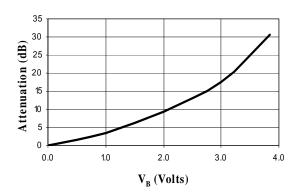
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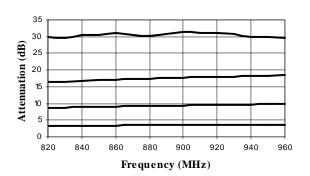
Rev. V3

## **Typical Performance Curves**

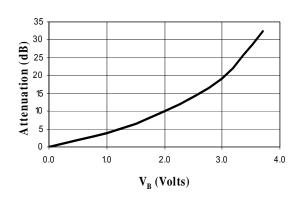
#### Attenuation vs. Voltage with 1.5 pF Tuning Cap @ +25°C



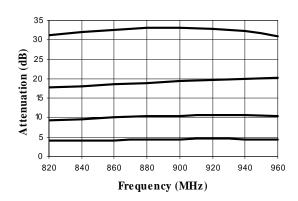
#### Attenuation vs. Freq. With 1.5 pF Tuning Cap @ +25°C



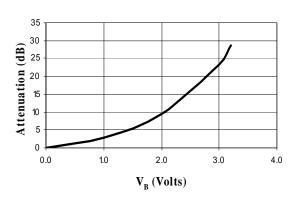
#### Attenuation vs. Voltage with 1.5 pF Tuning Cap @ +85°C



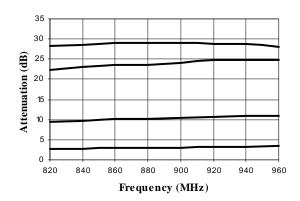
Attenuation vs. Freq. With 1.5 pF Tuning Cap @ +85°C



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



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



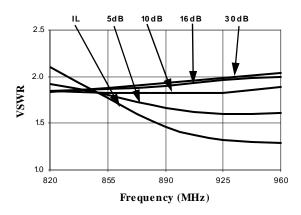
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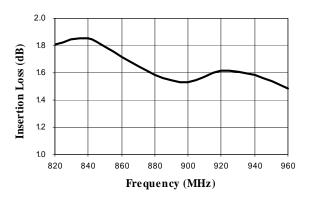
Rev. V3

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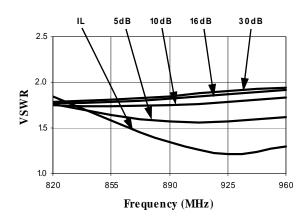
#### VSWR vs. Freq. With 1.5 pF Tuning Cap @ +25°C



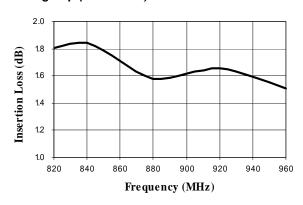
#### Loss vs. Frequency @ +25°C No Tuning Cap (See Note 2)



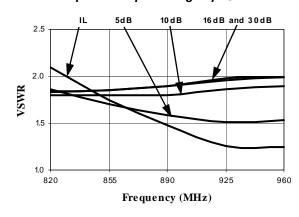
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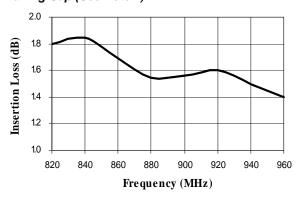
Loss vs. Frequency @ +85°C No Tuning Cap (See Note 2)



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



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



4

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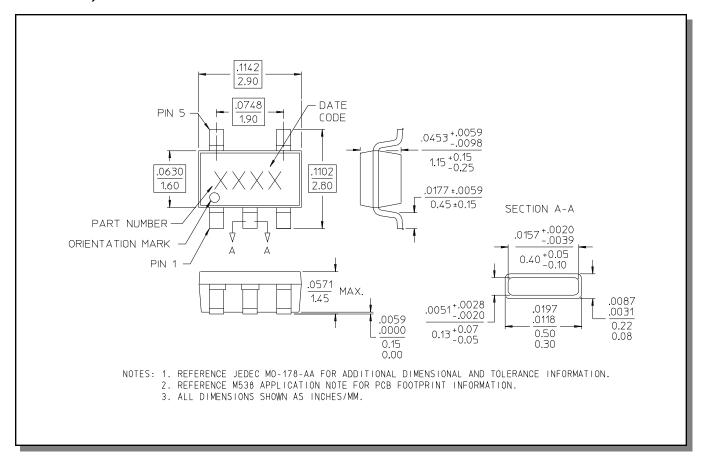
# MAATCC0013



Voltage Variable Attenuator 824 - 960 MHz

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## Lead-Free, SOT-25<sup>†</sup>



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

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