

# High IIP3 PIN Diode Variable Attenuator 0.8 - 1.0 GHz

Rev. V4

#### **Features**

- 1.0 dB Insertion Loss, Typical
- 12 dB Return Loss, Typical
- 25 dB Attenuation, Typical
- 45 dBm IIP3, Typical (1MHz Offset, @ +0dBm Pinc)
- SOIC-8 Surface Mount Package
- RoHs Compliant

#### **Extra Features**

- · Covers the following Bands:
  - GSM
  - AMPS
- Usable Bandwidth: 0.60 GHz to 1.20 GHz
- 1.5 dB Insertion Loss, Typical
- 1.8:1 VSWR, Typical
- 18.5 dB Attenuation, Typical

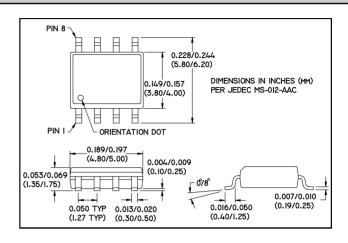
#### **Description and Applications**

M/A-COM's MA4VAT904-1061T is a HMIC PIN Diode Variable Attenuator which utilizes an integrated 90 degree 3dB hybrid with a pair of Silicon PIN Diodes to perform the required attenuation function as D.C. Voltage (Current) is applied.

This device operates from 0 to 1.9 Volts at 1.89 mA typical control current for maximum attenuation. The user can add external biasing resistors to the bias ports for higher voltage requirements as required.

M/A-COM's MA4VAT904-1061T PIN Diode Variable Attenuator is designed for AGC Circuit Applications requiring:

- Lower Insertion Loss
- Lower distortion through attenuation
- Larger dynamic range for wide spread spectrum applications



#### **SOIC-8 PIN Configuration (Topview)**

PIN	Function	Comments			
1	DC1				
2	GND				
3	GND				
4	RFin/out	Symetrical as RF Input/Ouput			
5	RFout/in	Symetrical as RF Input/Ouput			
6	GND				
7	GND				
8	DC2				

### Absolute Maximum Ratings @ +25 °C 1,2

Parameter	Maximum Ratings			
Operating Temperature	-40 °C to +85 °C			
Storage Temperature	-65 °C to +150 °C			
Junction Temperature	+175 °C			
RF C.W. Incident Power	+33 dBm C.W.			
Reversed Current @ -30 V	50nA			
Control Current	50 mA per Diode			

- 1. All the above values are at +25 °C, unless otherwise noted.
- 2. Exceeding these limits may cause permanent damage.

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#### Electrical Specifications @ +25 °C

Parameter	Frequency Band	Unit	Min	Тур	Max				
No DC Bias RF Parameter									
Insertion Loss	0.80 GHz—1.00 GHz	dB	-	1.0	1.2				
Input Return Loss		dB	11	12	-				
Output Return Loss		dB	11	12	-				
P1dB		dBm	30	-	-				
Input IP3		dBm	45	49	-				
Control Voltage		V	-	0 V @ OuA	-				
DC Bias RF Parameter			·						
Maximum Attenuation	0.80 GHz—1.00 GHz	dB	18.5	24	-				
Input Return Loss @ Max Attenuation		dB	15	21	-				
Output Return Loss @ Max Attenuation		dB	15	21	-				
Input IP3		dBm	36	39	-				
Control Voltage @ Max Attenuation		V	-	1.9 V @ 1.89 mA	-				
Control Current@ Max Attenuation Bias = 1.9V		mA	1.2	1.8	2.4				

### Typical RF Performance Over Industry Designated RF Frequency Bands <sup>3,4</sup>

Band		Freq	I. Loss	Att.	R. Loss	IIP3	Phase -Relative-
		(MHz)	(dB)	(dB)	(dB)	(dBm)	(Degree)
AMPS	RX	824-849	0.9	22	12	45	15°
	TX	869-894	0.9	22	12	45	
GSM	RX	880-915	1.2	20	11	45	-20°
	TX	925-960	1.2	20	11	45	

<sup>3.</sup> All are typical values only.

Relative phase is the measured Insertion Phase difference between Insertion Loss and 15 dB Attenuation. (Please refer to the plots below)

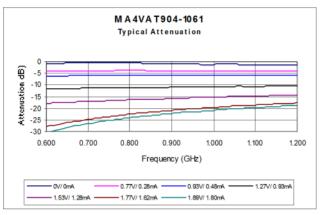


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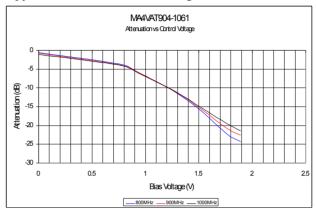
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#### Plots of Typical RF Characteristics @ +25 °C

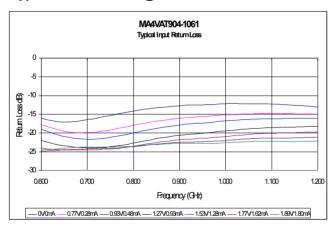
#### **Typical Insertion Loss & Attenuation**



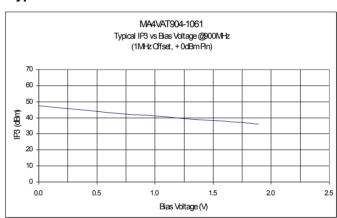
#### Typical Attenuation vs Voltage



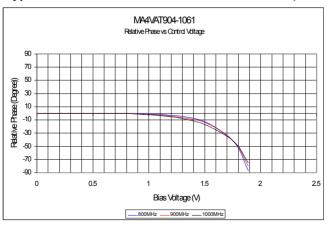
#### Typical Return Loss @ All Attenuation Levels



#### Typical IIP3 vs Attenuation



#### Typical Relative Phase Shift Per Attenuation (Voltage)



#### For Reference ONLY:

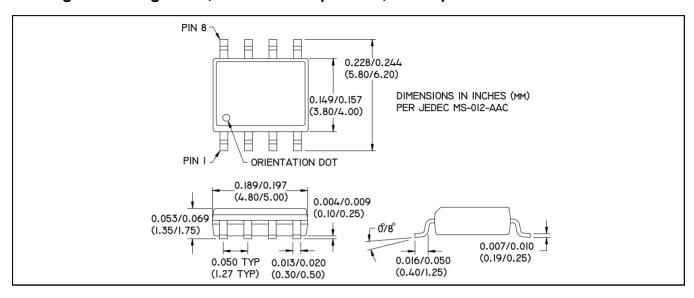
Insertion Loss = 0.00 V @ 0.00 mA
5dB Attenuation = 0.94 V @ 0.49 mA
10dB Attenuation = 1.26 V @ 0.93 mA
15dB Attenuation = 1.50 V @ 1.22 mA
20dB Anttenuation = 1.77V @ 1.60 mA

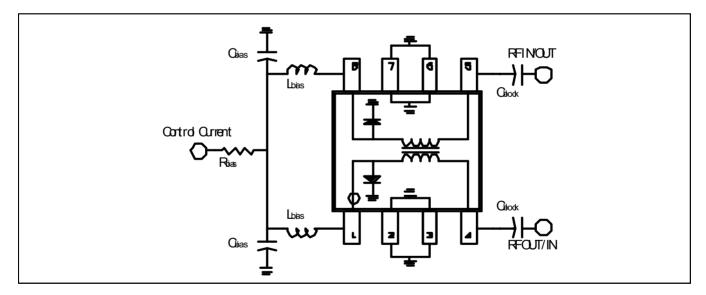


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#### Package PIN Designation, External Components, and Equivalent Circuit





#### **External Bias Components**

Rbias= 680 Ohms ( 1.66 V, @1.50 mA ) Lbias= 150 nH Cbias = 100 pF Cblock = 100 pF

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