

**Digital Attenuator, 31.5 dB, 6-Bit, TTL Driver  
DC - 4.0 GHz**

**AT90-0107  
V10**

**Features**

- Attenuation: 0.5 dB Steps to 31.5 dB
- Low DC Power Consumption
- Small Footprint, JEDEC Package
- Integral TTL Driver
- 50 ohm Impedance
- Test Boards are Available
- Tape and Reel Packaging Available

**Description**

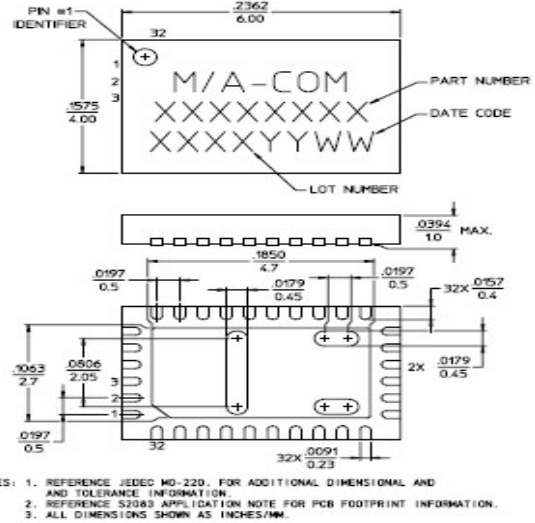
M/A-COM's AT90-0107 is a GaAs FET 6-bit digital attenuator with integral TTL driver. Step size is 0.5 dB providing a 31.5 dB total attenuation range. This device is in an FQFP-N plastic surface mount package. The AT90-0107 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required.

**Pin Configuration**

Pin No.	Function	Pin No.	Function
1	C8	17	NC
2	C4	18	NC
3	C2	19	NC
4	C1	20	NC
5	C0.5	21	NC
6	C16	22	NC
7	GND	23	NC
8	NC	24	NC
9	NC	25	NC
10	NC <sup>1</sup>	26	GND
11	GND	27	RF2
12	RF1	28	GND
13	GND	29	NC <sup>1</sup>
14	NC	30	-Vee
15	NC	31	NC
16	NC	32	+Vcc

1. Pins 10 & 29 must be isolated

**CSP-1**



**Ordering Information**

Part Number	Package
AT90-0107	Bulk Packaging
AT90-0107TR	Tape and Reel (1K Reel)
AT90-0107-TB	Units Mounted on Test Board

Note: Reference Application Note M513 for reel size information.

**Truth Table**

C16	C8	C4	C2	C1	C0.5	Attenuation
0	0	0	0	0	0	Loss, Reference
0	0	0	0	0	1	0.5 dB
0	0	0	0	1	0	1.0 dB
0	0	0	1	0	0	2.0 dB
0	0	1	0	0	0	4.0 dB
0	1	0	0	0	0	8.0 dB
1	0	0	0	0	0	16.0 dB
1	1	1	1	1	1	31.5 dB

0 = TTL Low; 1 = TTL High

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**Electrical Specifications:  $T_A = +25^\circ\text{C}$ ,  $V_{ee} = -5\text{ V} \pm 0.25\text{ V}$ ,  $V_{cc} = +5\text{ V} \pm 0.25\text{ V}$**

Parameter	Test Conditions	Frequency	Units	Min.	Typ.	Max.
Insertion Loss	—	DC - 4.0 GHz	dB	—	4.5	5.1
Attenuation Accuracy	Individual Bits 0.5-1-2-4-8-16 dB Any Combination of Bits 1 to 31.5 dB	DC - 4.0 GHz DC - 4.0 GHz	dB dB	— —	— —	$\pm(.3 + 7\%$ of atten setting) $\pm(.5 + 8\%$ of atten setting)
VSWR	Full Range	DC - 4.0 GHz	Ratio	—	2.0:1	2.2:1
Switching Speed	50% Cntl to 90%/10% RF 10% to 90% or 90% to 10%	— —	nS nS	— —	75 20	— —
1 dB Compression	— —	50 MHz 0.5 - 4.0 GHz	dBm dBm	— —	+21 +24	— —
Input IP3	Two-tone inputs up to +5 dBm	50 MHz 0.5 - 4.0 GHz	dB dB	— —	+35 +48	— —
I <sub>cc</sub>	V <sub>cc</sub> min to max, Logic "0" or "1" <sup>1,2</sup>	—	mA	—	6	—
-I <sub>ee</sub>	-V <sub>ee</sub> min to max, Logic "0" or "1" <sup>1,2</sup>	—	mA	—	-1	—
Thermal Resistance $\theta_{JA}$	—	—	$^\circ\text{C/W}$	—	15	—

1. Logic "0" = 0.0 - 0.8 V, sink current is 20  $\mu\text{A}$  maximum.
2. Logic "1" = 2.0 - 5.0 V, source current is 20  $\mu\text{A}$  maximum.

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

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 GHz	+27 dBm +34 dBm
Supply Voltages V <sub>cc</sub> V <sub>ee</sub>	+5.5V -8.5V
Logic Voltage <sup>4</sup>	-0.5V to V <sub>cc</sub> +0.5V
Operating Temperature	-40 $^\circ\text{C}$ to +85 $^\circ\text{C}$
Storage Temperature	-65 $^\circ\text{C}$ to +125 $^\circ\text{C}$

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

**Handling Procedures**

Please observe the following precautions to avoid damage:

**Static Sensitivity**

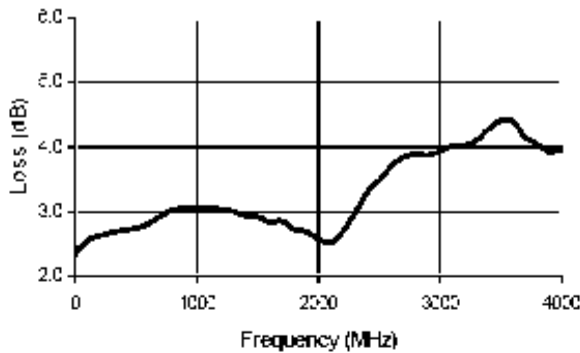
GMIC Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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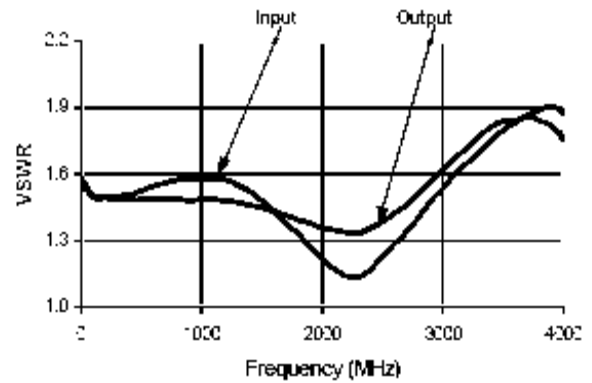
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**Typical Performance Curves @ 25°C**

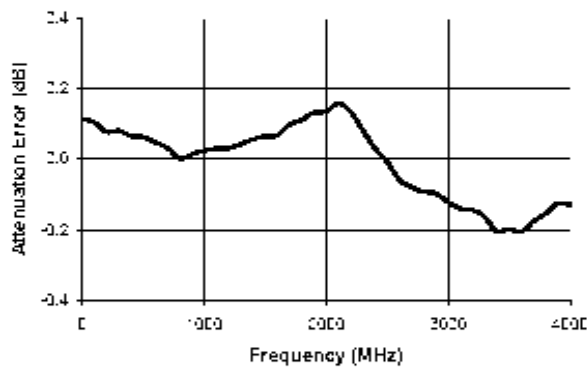
**Insertion Loss**



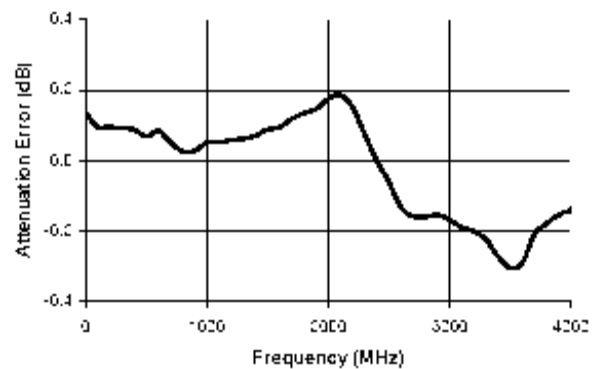
**VSWR @ Insertion Loss**



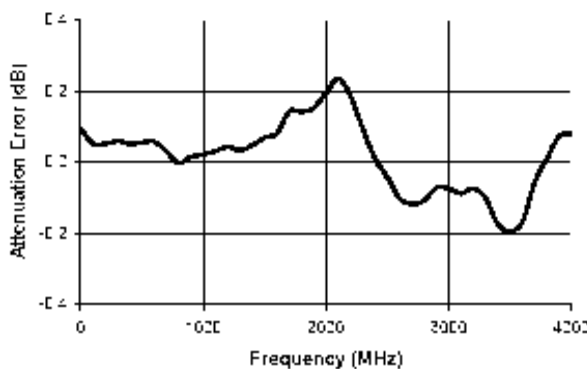
**Attenuation Error, 0.5 dB Bit**



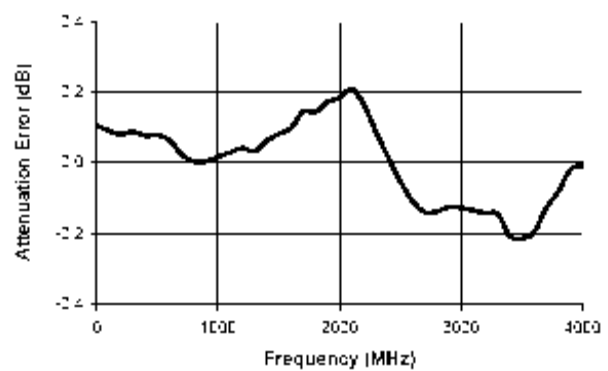
**Attenuation Error, 1 dB Bit**



**Attenuation Error, 2 dB Bit**



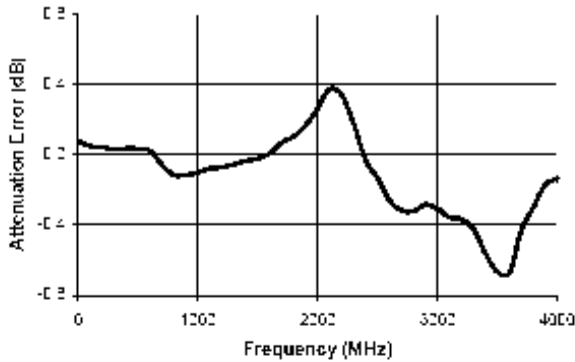
**Attenuation Error, 4 dB Bit**



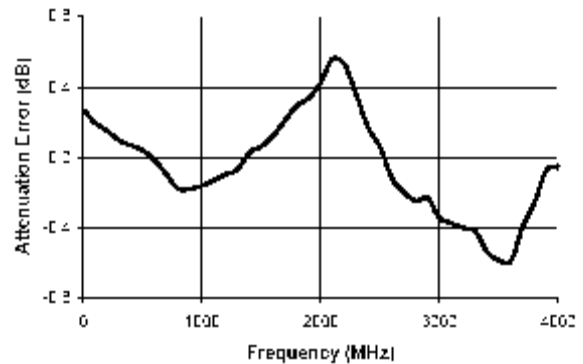
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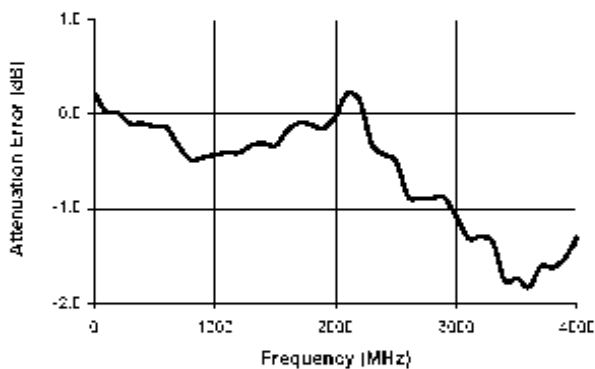
**Attenuation Error, 8 dB Bit**



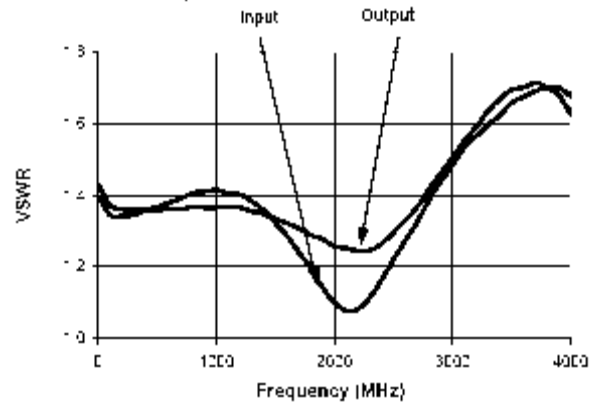
**Attenuation Error, 16 dB Bit**



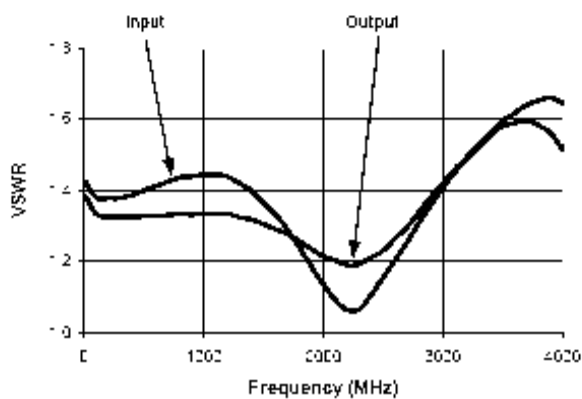
**Attenuation Error, Max. Attenuation**



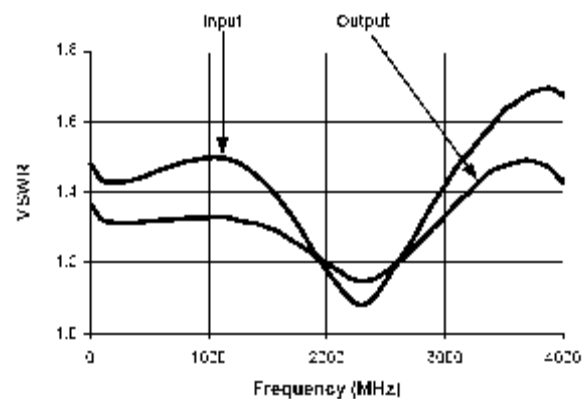
**VSWR, 0.5 dB Bit**



**VSWR, 1 dB Bit**



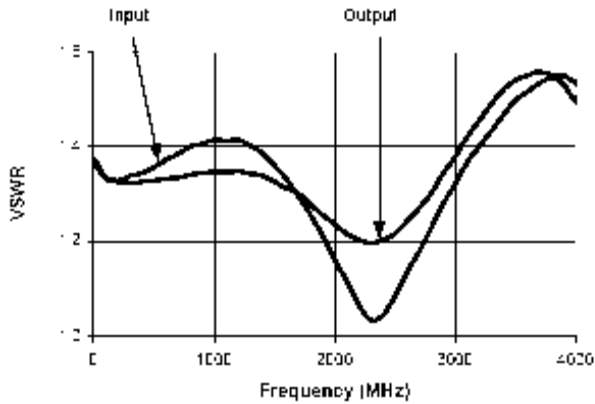
**VSWR, 2 dB Bit**



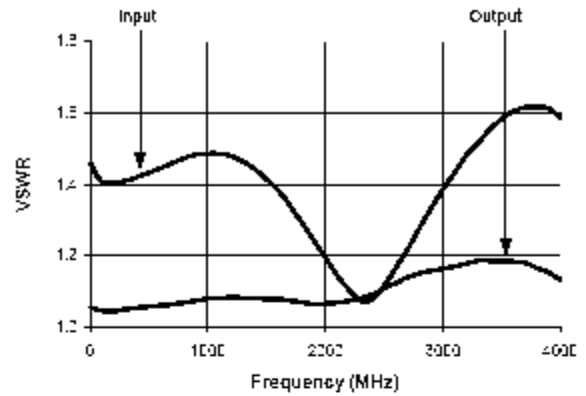
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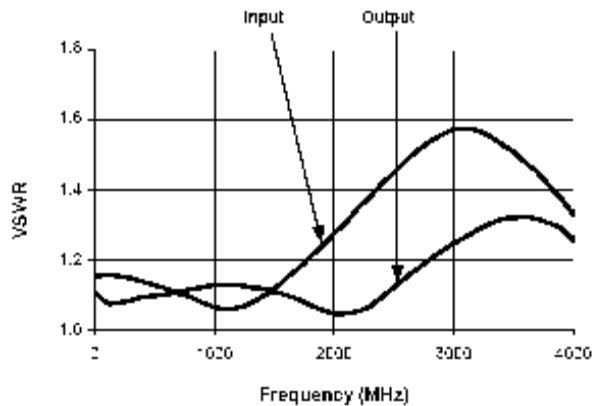
**VSWR, 4 dB Bit**



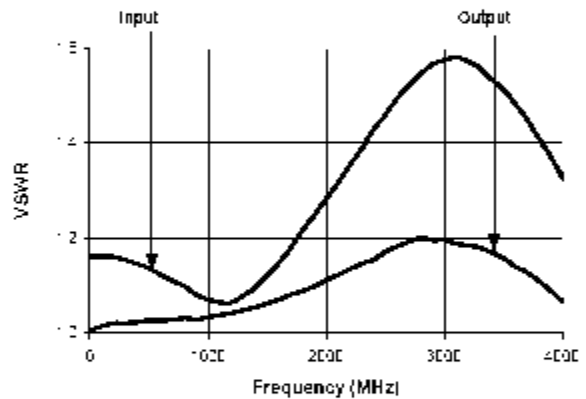
**VSWR, 8 dB Bit**



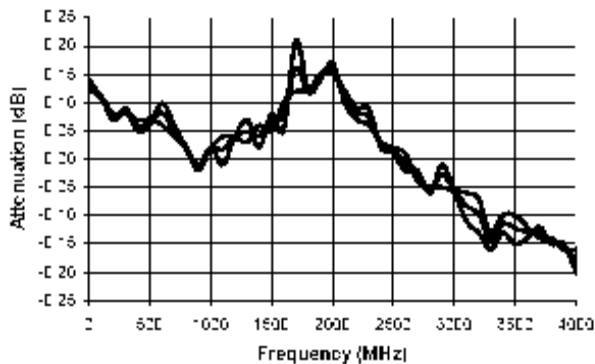
**VSWR, 16 dB Bit**



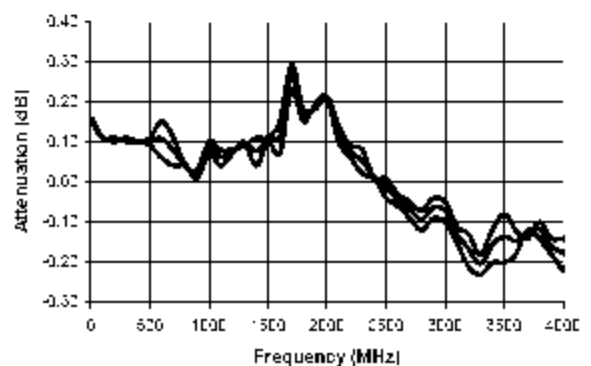
**VSWR, Max. Attenuation**



**Typical Attenuation Deviation vs. Temperature for 0.5 dB Bit**



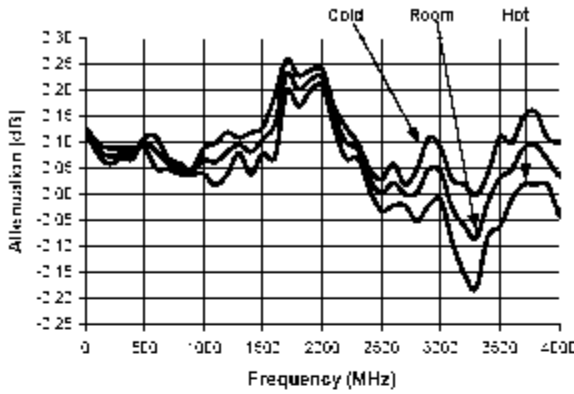
**Typical Attenuation Deviation vs. Temperature for 1 dB Bit**



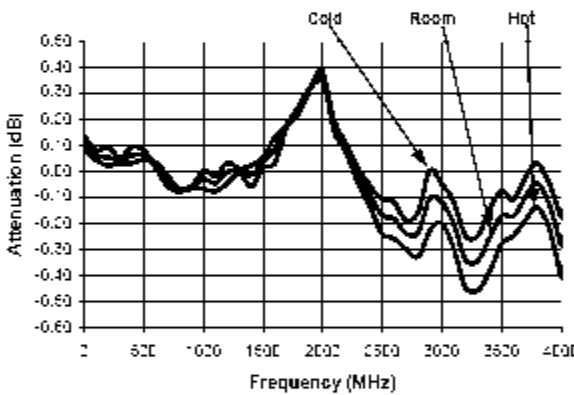
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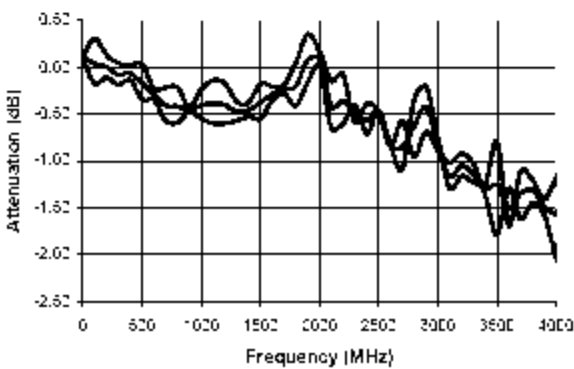
*Typical Attenuation Deviation vs. Temperature for 2 dB Bit*



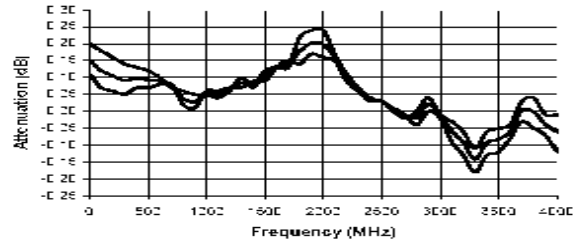
*Typical Attenuation Deviation vs. Temperature for 8 dB Bit*



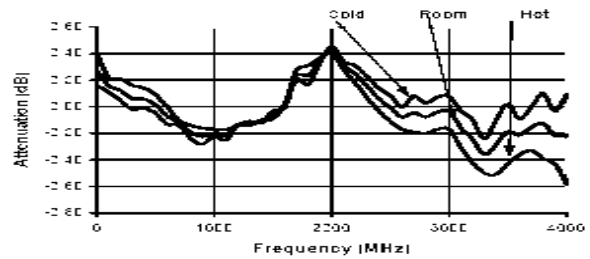
*Typical Attenuation Deviation vs. Temperature at Maximum Atten.*



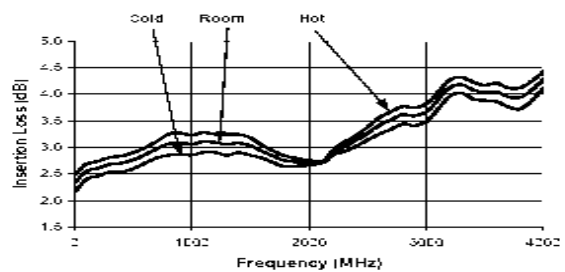
*Typical Attenuation Deviation vs. Temperature for 4 dB Bit*



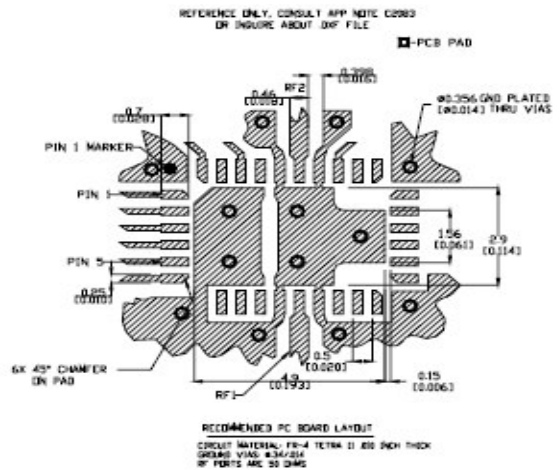
*Typical Attenuation Deviation vs. Temperature for 16 dB Bit*



*Insertion Loss vs. Temperature*



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



5. Application Note S2083 is available on line at [www.macom.com](http://www.macom.com)