

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

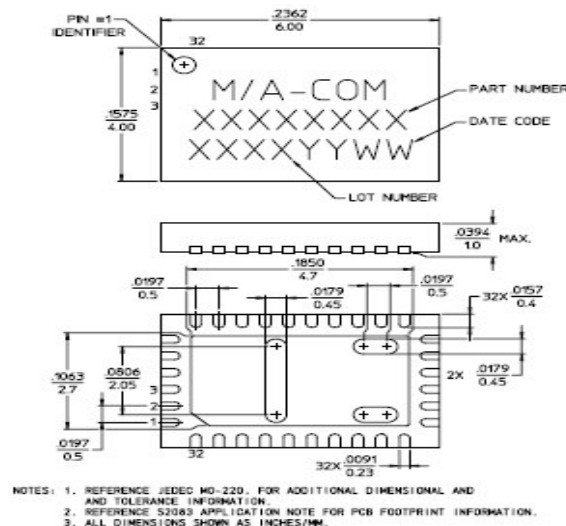
M/A-COM's AT90-0107 is a GaAs FET 6-bit digital attenuator with integral TTL driver. Step size is 0.5 dB providing a 31.5 dB total attenuation range. This device is in an FQFP-N plastic surface mount package. The AT90-0107 is ideally suited for use where accuracy, fast speed, very low power consumption 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 ¹	26	GND
11	GND	27	RF2
12	RF1	28	GND
13	GND	29	NC ¹
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 _{cc}	V _{cc} min to max, Logic "0" or "1" ^{1,2}	—	mA	—	6	—
-I _{ee}	-V _{ee} min to max, Logic "0" or "1" ^{1,2}	—	mA	—	-1	—
Thermal Resistance θ_{JA}	—	—	$^{\circ}\text{C/W}$	—	15	—

 1. Logic "0" = 0.0 - 0.8 V, sink current is 20 μA maximum.

 2. Logic "1" = 2.0 - 5.0 V, source current is 20 μA maximum.

Absolute Maximum Ratings ³

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 GHz	+27 dBm +34 dBm
Supply Voltages V _{cc} V _{ee}	+5.5V -8.5V
Logic Voltage ⁴	-0.5V to V _{cc} +0.5V
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.

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

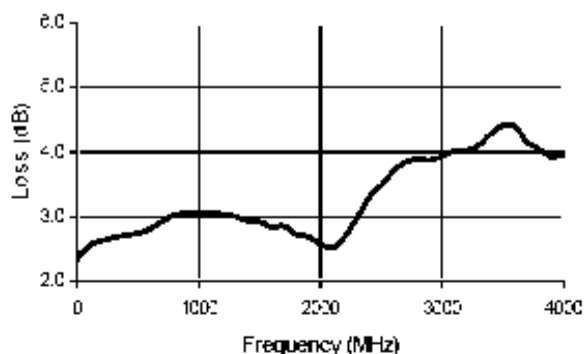
GMIC Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

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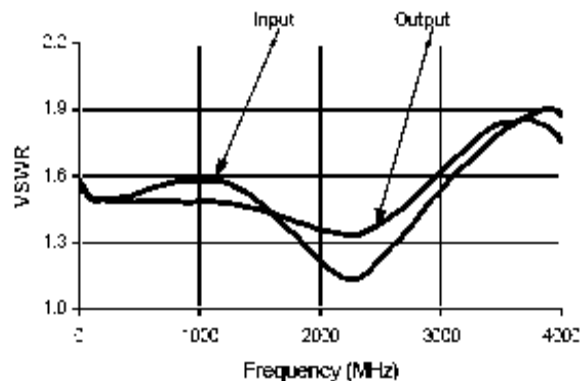
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Typical Performance Curves @ 25°C

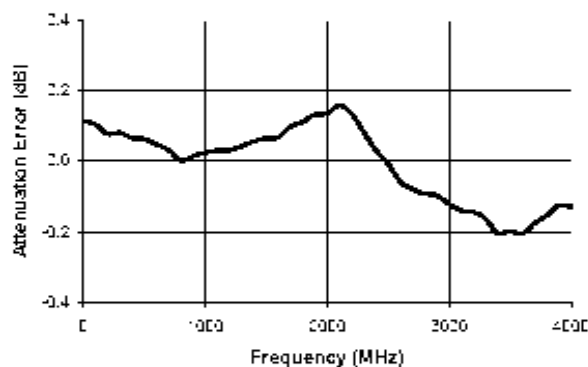
Insertion Loss



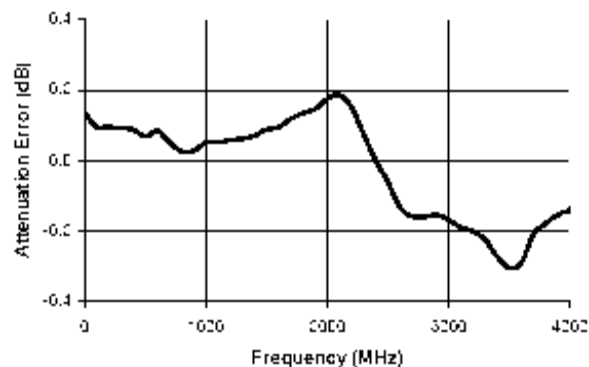
VSWR @ Insertion Loss



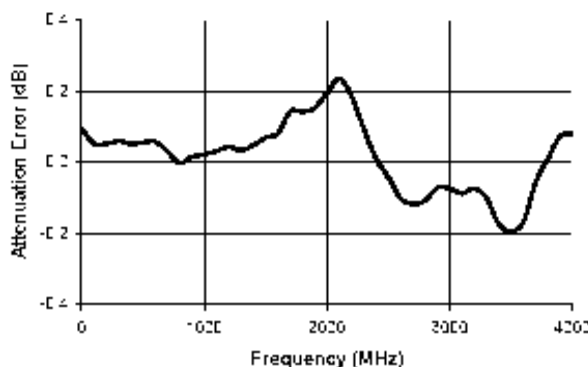
Attenuation Error, 0.5 dB Bit



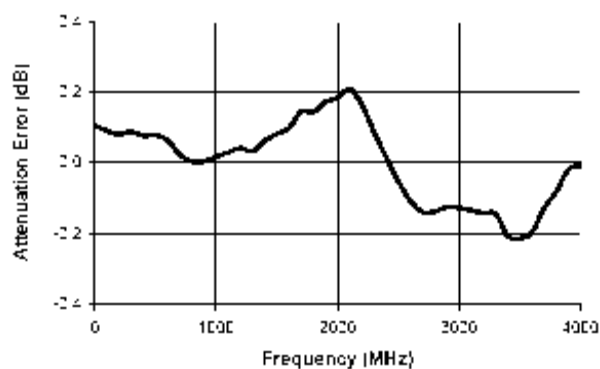
Attenuation Error, 1 dB Bit



Attenuation Error, 2 dB Bit



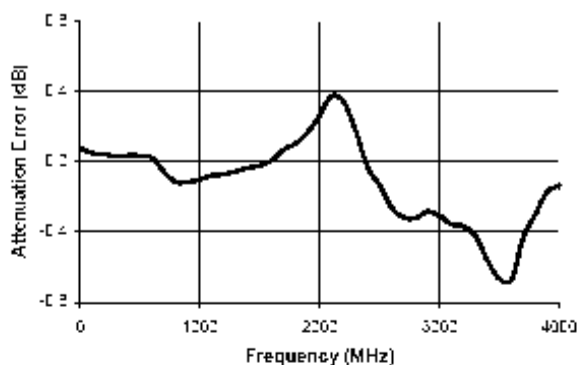
Attenuation Error, 4 dB Bit



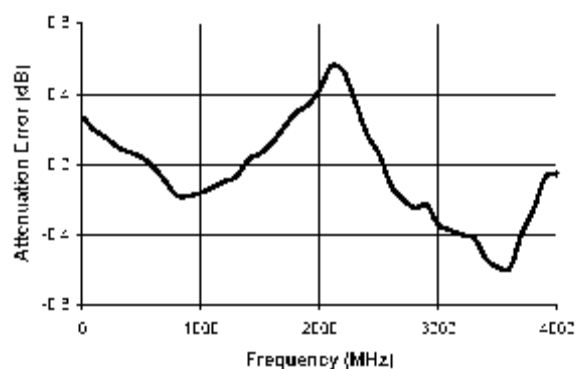
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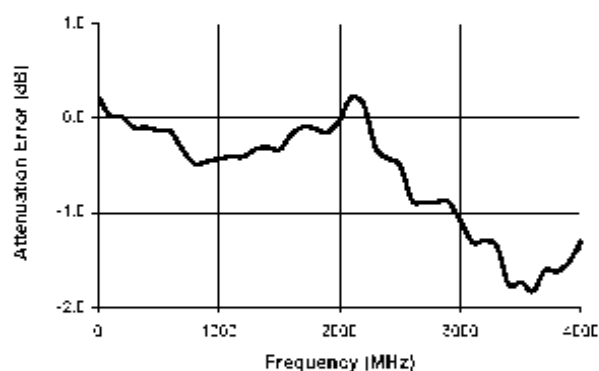
Attenuation Error, 8 dB Bit



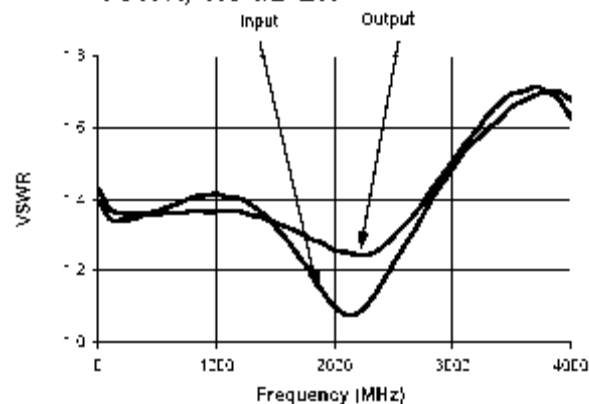
Attenuation Error, 16 dB Bit



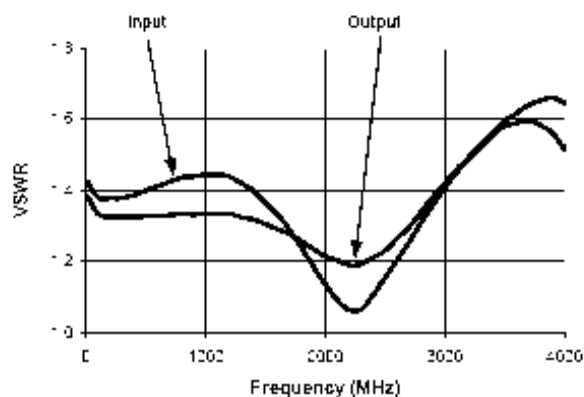
Attenuation Error, Max. Attenuation



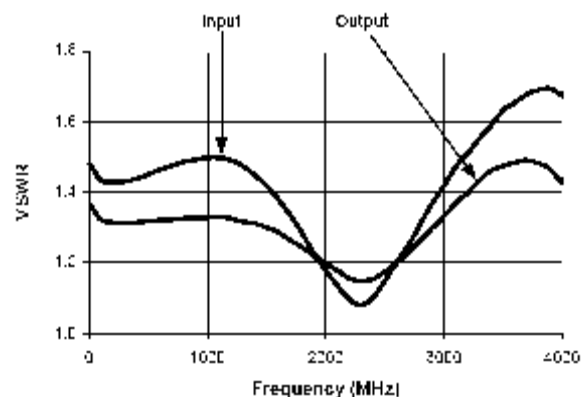
VSWR, 0.5 dB Bit



VSWR, 1 dB Bit

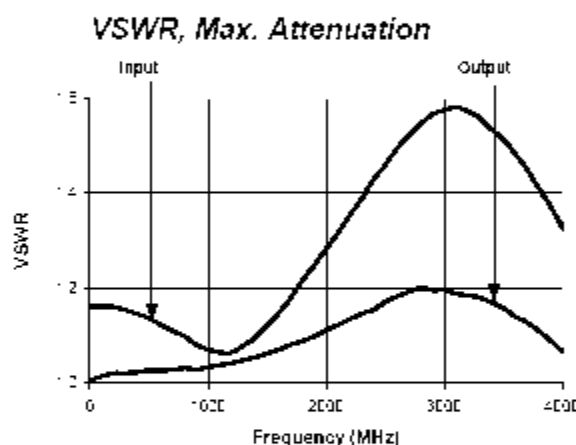
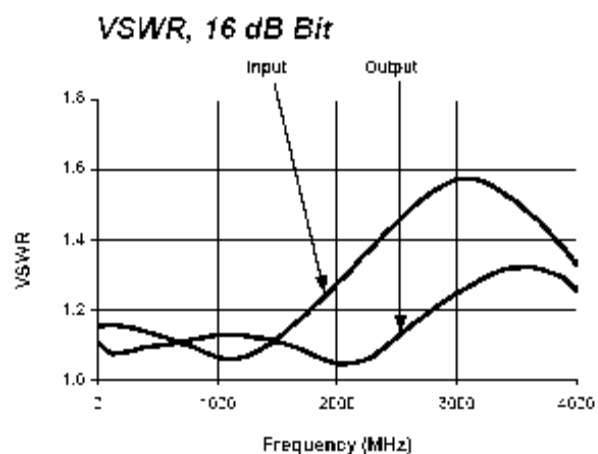
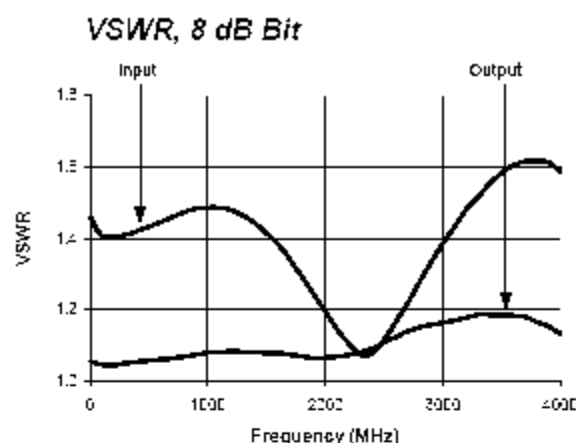
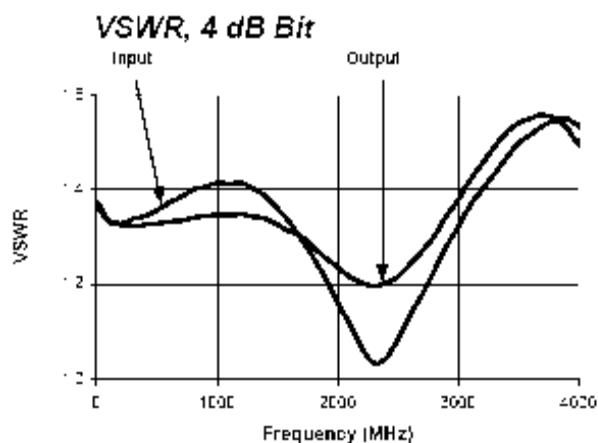


VSWR, 2 dB Bit

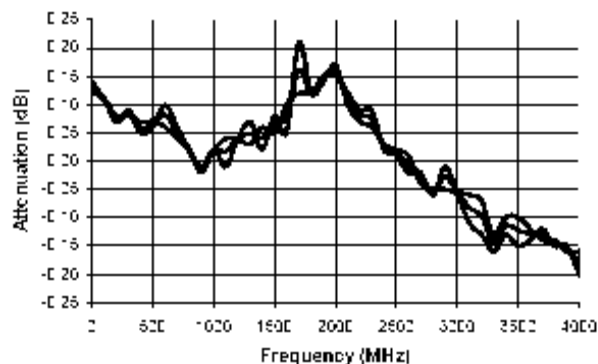


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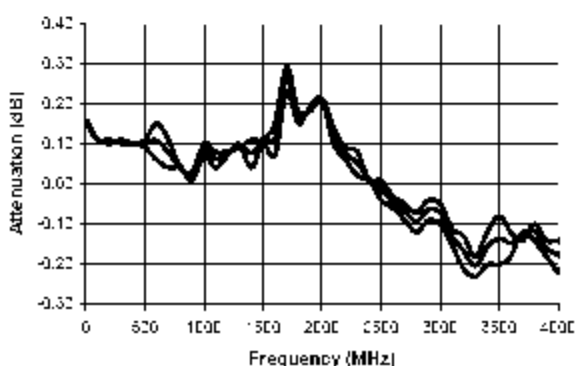
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**Typical Attenuation Deviation vs.
Temperature for 0.5 dB Bit**



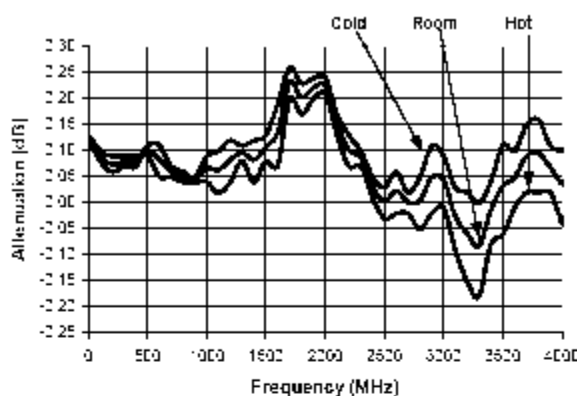
**Typical Attenuation Deviation vs.
Temperature for 1 dB Bit**



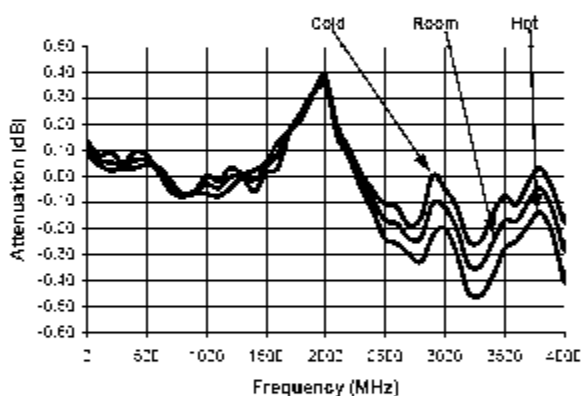
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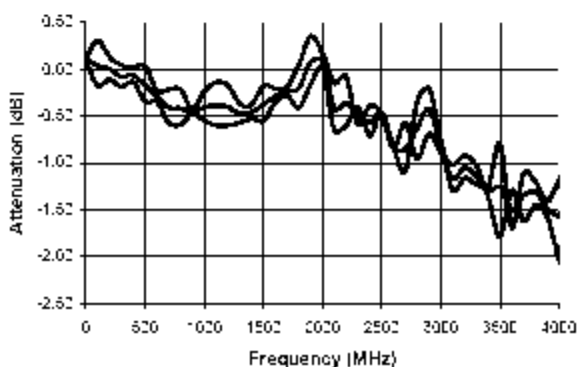
Typical Attenuation Deviation vs. Temperature for 2 dB Bit



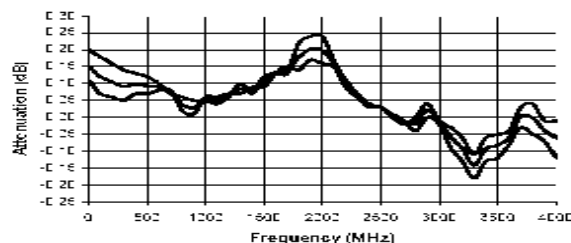
Typical Attenuation Deviation vs. Temperature for 8 dB Bit



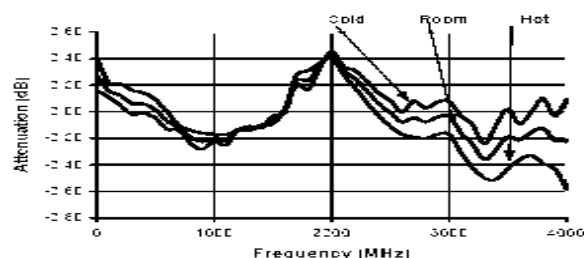
Typical Attenuation Deviation vs. Temperature at Maximum Atten.



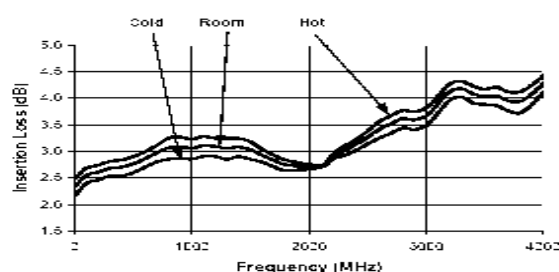
Typical Attenuation Deviation vs. Temperature for 4 dB Bit



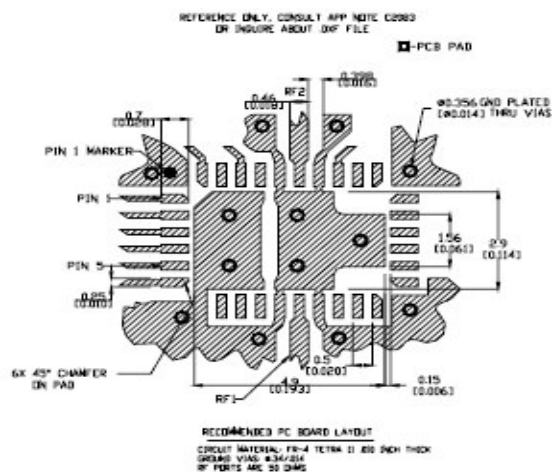
Typical Attenuation Deviation vs. Temperature for 16 dB Bit



Insertion Loss vs. Temperature



Recommended PCB Configuration⁵



5. Application Note S2083 is available on line at www.macom.com