

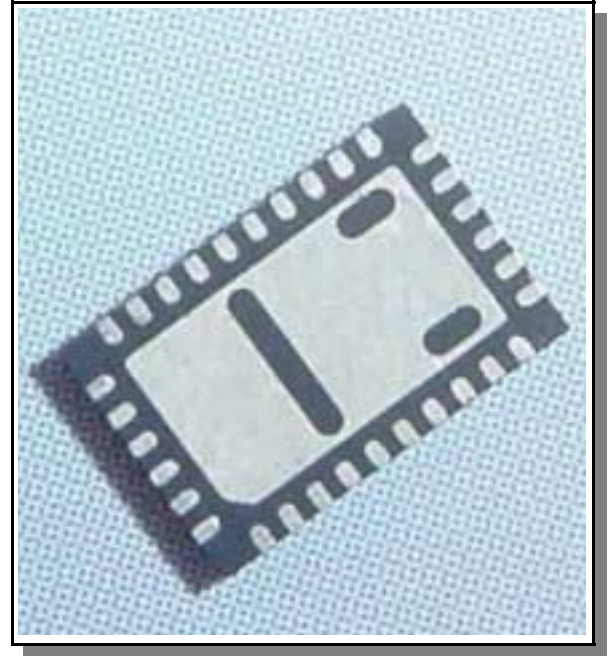
Features

- Attenuation: 0.5 dB Steps to 31.5 dB
- Single Positive Supply
- Contains internal DC to DC converter
- Low DC Power Consumption
- Small Footprint, JEDEC Package
- Integral TTL Driver
- 50 ohm Impedance

Description

M/A-COM's AT90-1107 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 AT90-1107 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required. For dual supply designs without switching noise, use AT90-0107.

CSP-1



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

Parameter	Test Conditions	Frequency	Units	Min	Typical	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 IP_3	Two-tone inputs up to +5 dBm	50 MHz 0.5-4.0 GHz	dBm dBm	— —	+35 +48	— —
$I_{CC}^{1,2}$	V_{CC} min to max, Logic "0" or "1" ^{3,4}	—	mA	—	8	—
Switching Noise	Generated from DC-DC Converter with recommended capacitors	3.5 MHz	dBm	—	-93	—
Thermal Resistance θ_{jc}	—	—	$^\circ\text{C/W}$	—	15	—

1. During turn-on, the device requires an initial "Turn-on Current". Once operational, I_{CC} will drop to the specified levels.
2. The DC-DC converter is guaranteed to start in 100 μs as long as the power supplies can provide a minimum of 100 mA "Turn-on Current".
3. Logic "0" = 0.0 - 0.8 V, sink current is 20 μA maximum.
4. Logic "1" = 2.0 - 5.0 V, source current is 20 μA maximum.

Pin Configuration

Pin #	Function	Pin #	Function
1	C8	17	NC
2	C4	18	NC
3	C2	19	+Vcc ⁶
4	C1	20	NC
5	C0.5	21	Cp ⁸
6	C16	22	NC
7	GND	23	Cp ⁸
8	NC	24	NC
9	NC	25	-Vee ⁷
10	NC ⁵	26	GND
11	GND	27	RF2
12	RF1	28	GND
13	GND	29	NC ⁵
14	NC	30	-Vee ^{7,9}
15	NC	31	NC
16	NC	32	+Vcc ^{6,10}

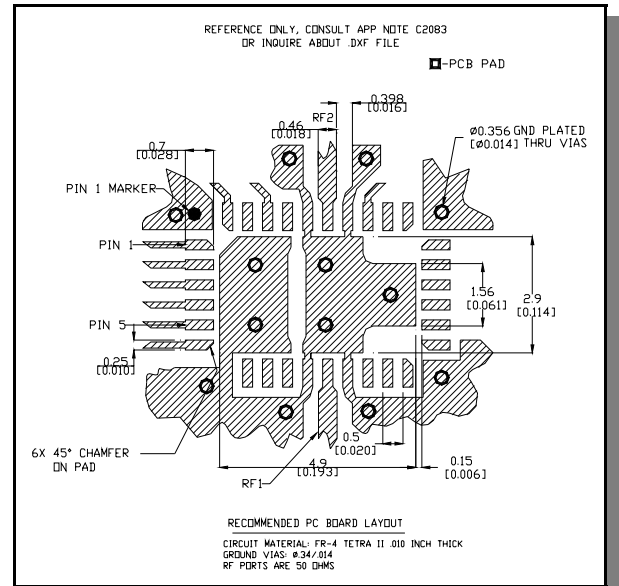
5. Pins 10 & 29 must be isolated
6. Pin 19 must be connected to Pin 32
7. Pin 25 must be connected to Pin 30
8. .01µF cap must be connected between Pins 21 and 23
9. -Vee is produced internally and requires a .1µF cap to GND. Generated noise is typical of switching DC-DC Converters.
10. +Vcc requires a .1µF cap to GND

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

Recommended PCB Layout ¹¹



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

Absolute Maximum Ratings ¹²

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 GHz	+27 dBm +34 dBm
+Vcc	+5.5V
Logic Voltages ¹³	-0.5 to +Vcc + 0.5V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

12. Operation of this device above any one of these parameters may cause permanent damage.
13. Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

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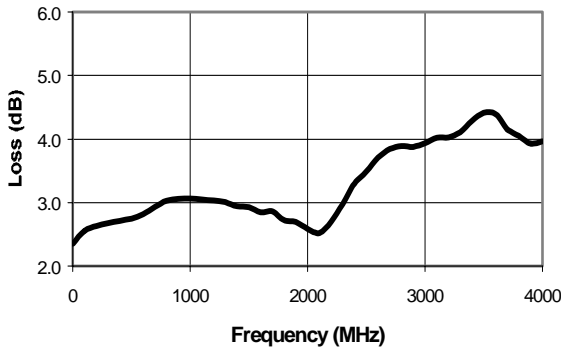
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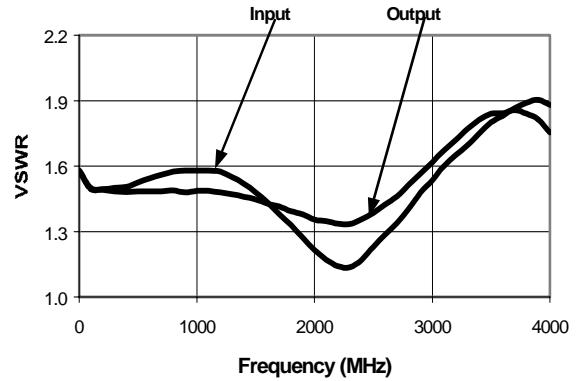


Typical Performance Curves

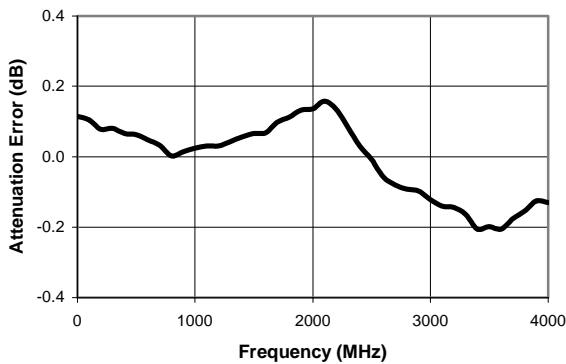
Insertion Loss



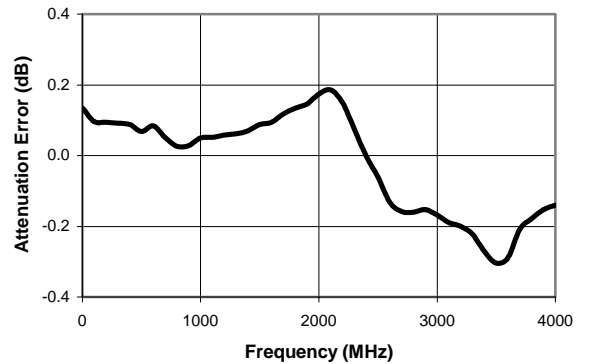
VSWR @ Insertion Loss



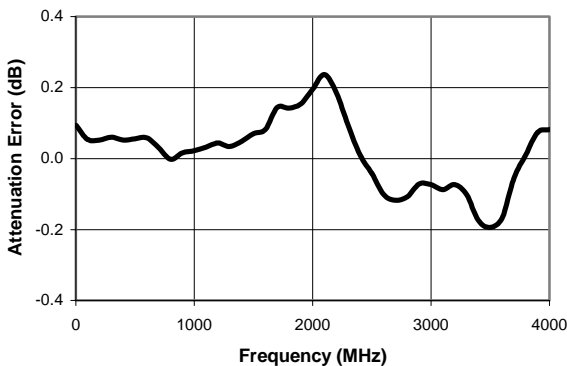
Attenuation Error, 0.5 dB Bit



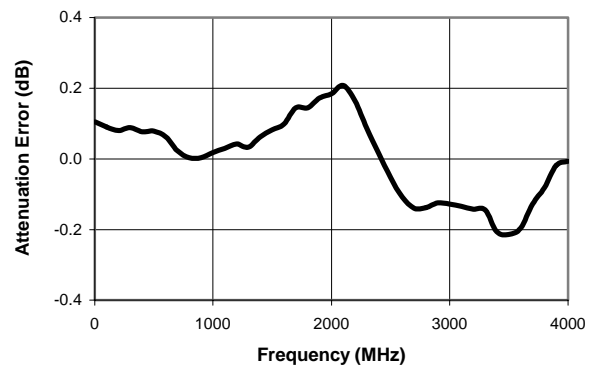
Attenuation Error, 1 dB Bit



Attenuation Error, 2 dB Bit



Attenuation Error, 4 dB Bit



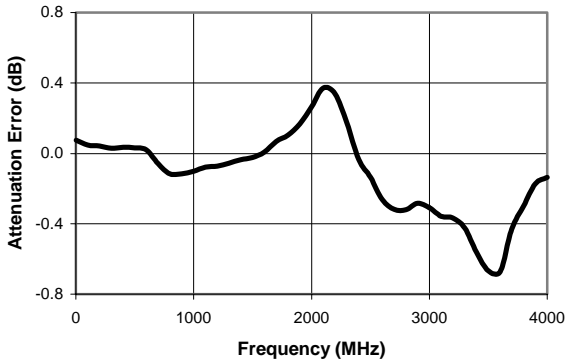
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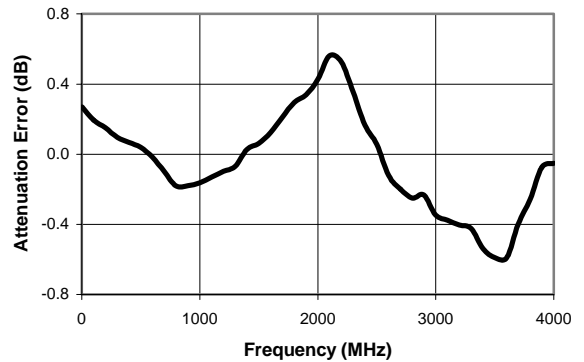
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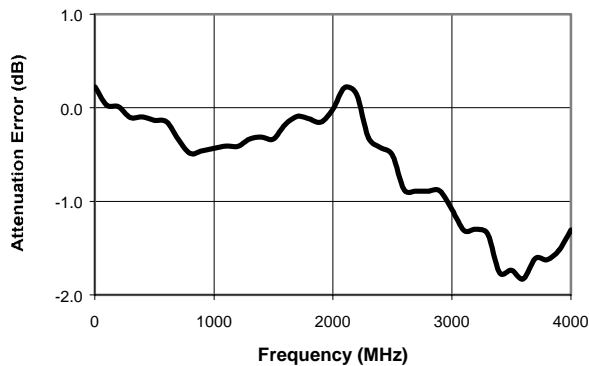
Attenuation Error, 8 dB Bit



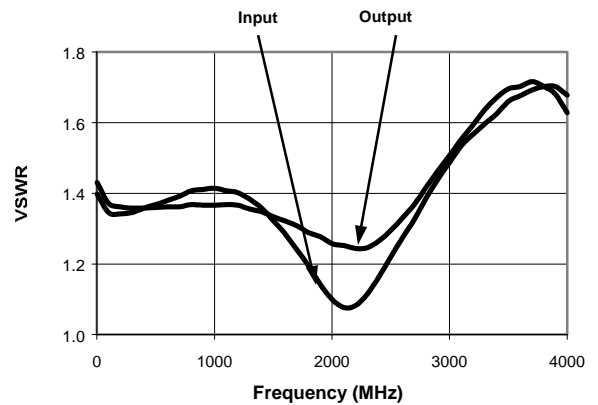
Attenuation Error, 16 dB Bit



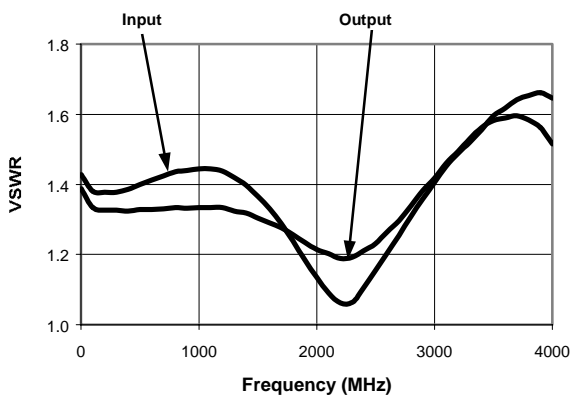
Attenuation Error, Max. Attenuation



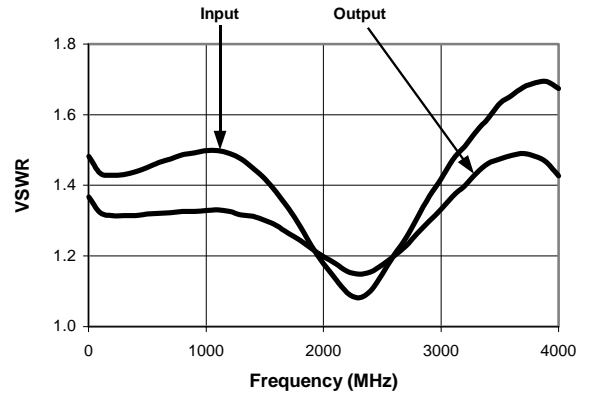
VSWR, 0.5 dB Bit



VSWR, 1 dB Bit



VSWR, 2 dB Bit



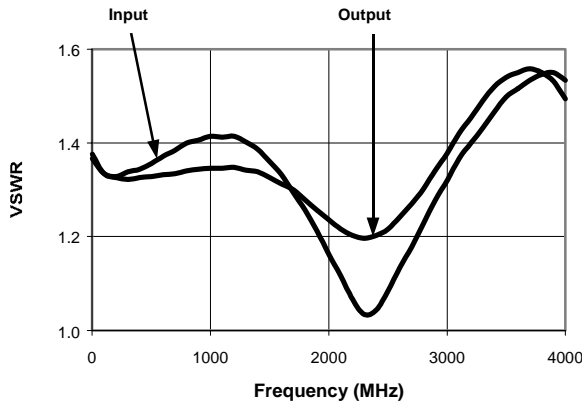
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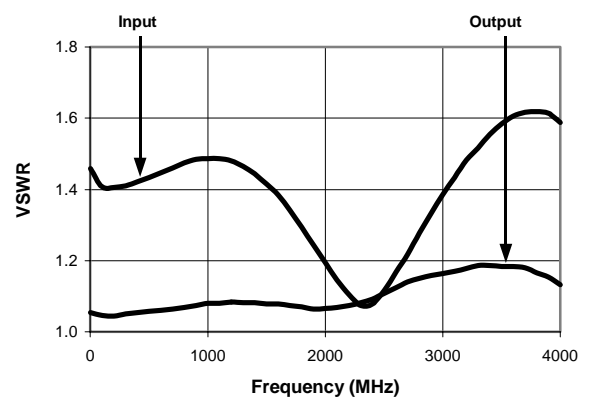
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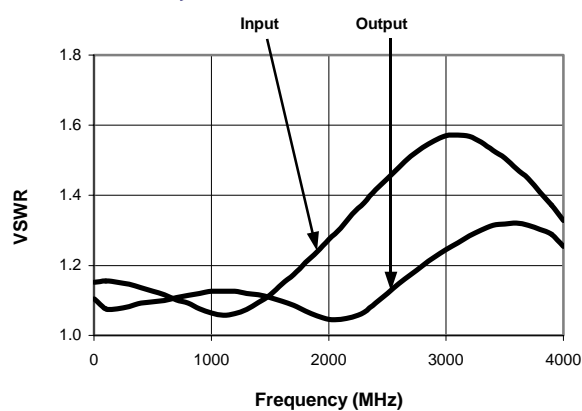
VSWR, 4 dB Bit



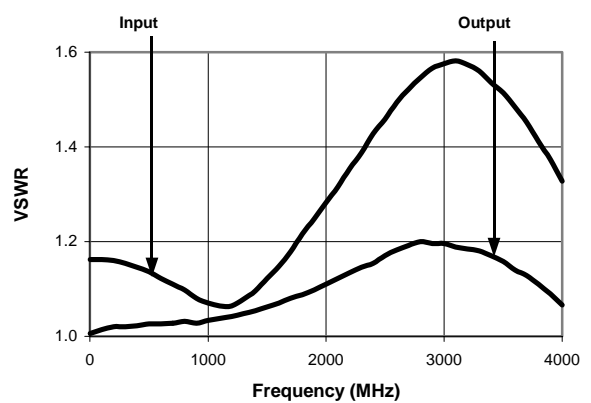
VSWR, 8 dB Bit



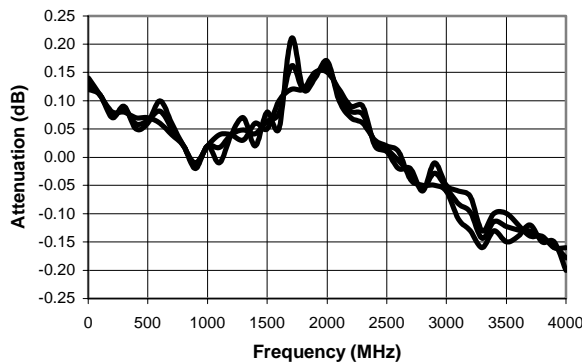
VSWR, 16 dB Bit



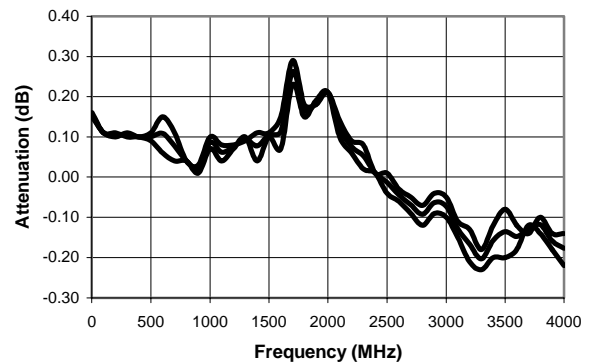
VSWR, Max. Attenuation



Typical Attenuation Deviation vs. Temperature for 0.5 dB Bit



Typical Attenuation Deviation vs. Temperature for 1 dB Bit



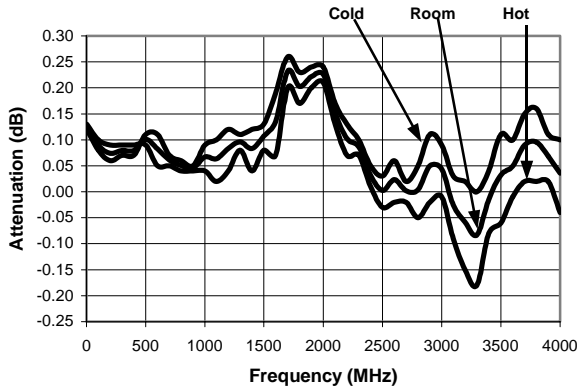
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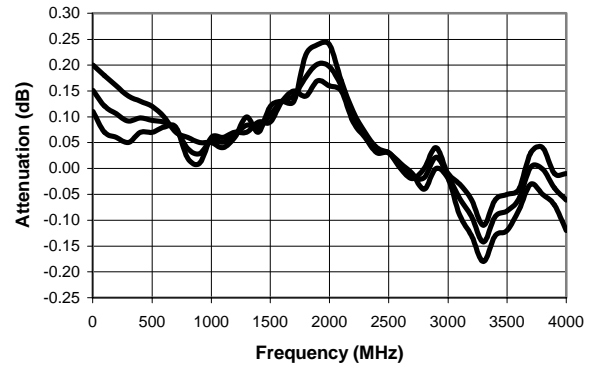
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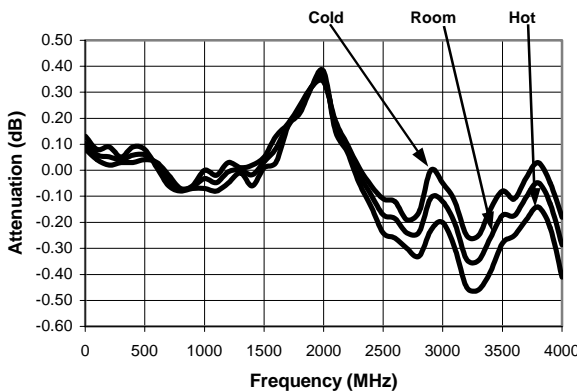
Typical Attenuation Deviation vs. Temperature for 2 dB Bit



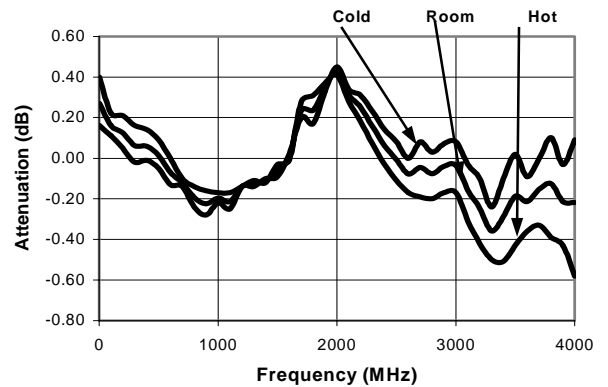
Typical Attenuation Deviation vs. Temperature for 4 dB Bit



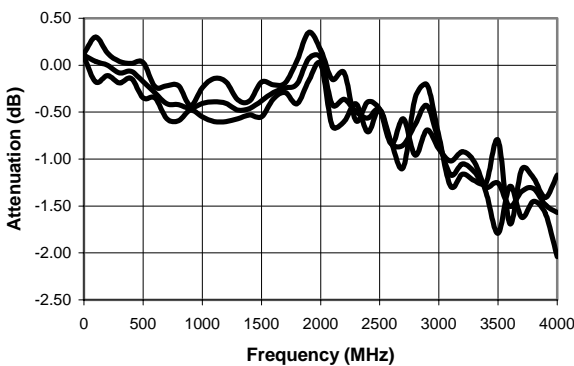
Typical Attenuation Deviation vs. Temperature for 8 dB Bit



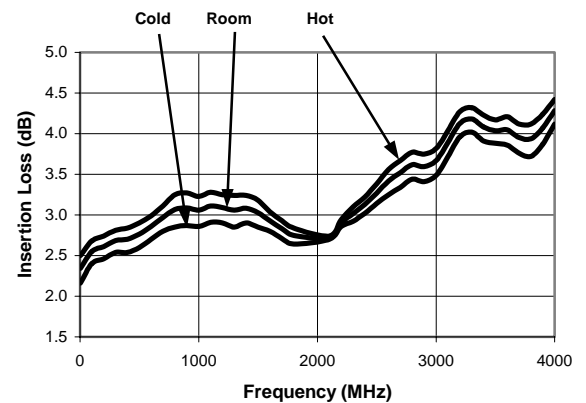
Typical Attenuation Deviation vs. Temperature for 16 dB Bit



Typical Attenuation Deviation vs. Temperature at Maximum Atten.



Insertion Loss vs. Temperature

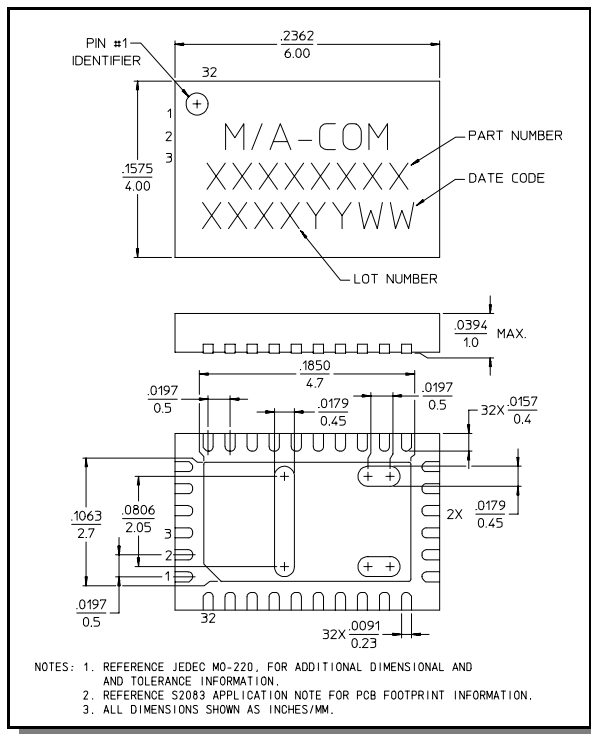


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CSP-1



Ordering Information

Part Number	Package
AT90-1107	Bulk Packaging
AT90-1107TR	Tape and Reel (1K Reel)
AT90-1107-TB	Units Mounted on Test Board

Note: Reference Application Note M513 for reel size information.

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