

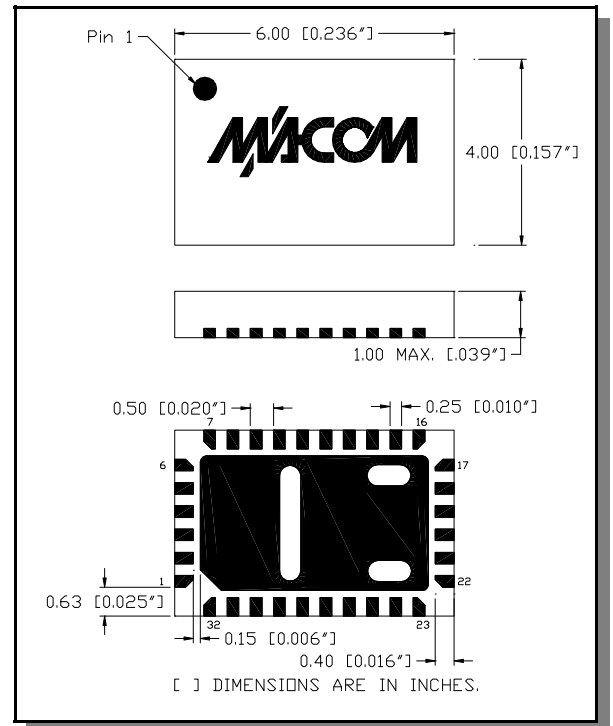
## Features

- Attenuation: 1 dB Steps to 15 dB
- Single Positive Supply
- Contains Internal DC to DC Converter
- Small Footprint, JEDEC Package
- Integral TTL Driver
- 50 Ohm Impedance
- Test Boards Available
- Tape and Reel Packaging Available

## Description

M/A-COM's AT90-1413 is a GaAs FET 4-Bit digital attenuator with integral driver. Step size is 1 dB providing a 15 dB attenuation range. This device is in an FQFP-N plastic surface mount package. The AT90-1413 is suited for single supply applications where accuracy, fast speed, low power consumption and low costs are required.

## CSP-1



## Electrical Specifications: $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Frequency	Units	Min.	Typ.	Max.
Insertion Loss	—	DC-2.5 GHz	dB	—	2.0	2.5
		DC-4.0 GHz	dB	—	2.5	3.0
Attenuation Accuracy	Individual Bits or Combination of Bits	DC-2.5 GHz	dB	—	—	$\pm(0.3+4\%$ of atten setting)
		DC-4.0 GHz	dB	—	—	$\pm(0.3+6\%$ of atten setting)
VSWR	Full Attenuation Range	DC-2.5 GHz	Ratio	—	1.5:1	1.8:1
		DC-4.0 GHz	Ratio	—	1.8:1	2.0:1
Switching Speed	50% Cntl to 90%/10% RF 10% to 90% or 90% to 10%	—	nS	—	75	150
		—	nS	—	20	50
1 dB Compression	—	50 MHz	dB	—	+21	—
		0.5-4.0 GHz	dB	—	+29	—
Input $IP_3$	Two-tone Inputs up to +5 dBm	50 MHz	dB	—	+35	—
		0.5-4.0 GHz	dB	—	+48	—
+Vcc	—	—	V	4.75	5.0	5.25
Logic "0"	Sink Current is 20 $\mu\text{A}$ max.	—	V	0.0	—	0.8
Logic "1"	Sink Current is 20 $\mu\text{A}$ max.	—	V	2.0	—	5.0
Icc	Vcc min to max, Logic "0" or "1"	—	mA	—	6	10

Pin Configuration

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

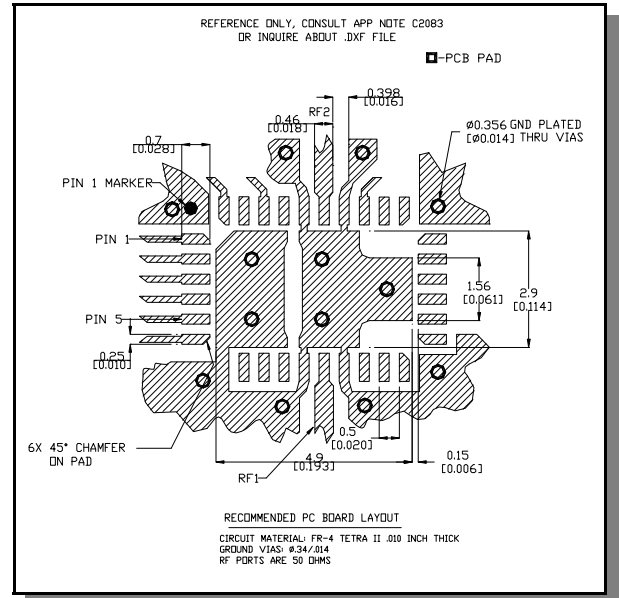
1. Pins 10 & 29 must be isolated.
2. Pin 19 must be connected to Pin 32.
3. Pin 25 must connect to Pin 30.
4. A .01 µF cap must be connected between Pins 21 and 23.
5. -Vee is produced internally and requires a .1 µF cap to GND
6. +Vcc requires a .1 µF cap to GND.

Truth Table

C8	C4	C2	C1	Attenuation
0	0	0	0	Loss, Reference
0	0	0	1	1.0 dB
0	0	1	0	2.0 dB
0	1	0	0	4.0 dB
1	0	0	0	8.0 dB
1	1	1	1	15.0 dB

0 = TTL Low; 1 = TTL High

Recommended PCB Layout<sup>7</sup>



7. Application Note C2083 is available on line at [www.macom.com](http://www.macom.com)

Absolute Maximum Ratings<sup>8</sup>

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 GHz	+27 dBm +34 dBm
+Vcc	+5.5V
Logic Voltages <sup>9</sup>	-0.5 to +Vcc + 0.5V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

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

Specifications subject to change without notice.

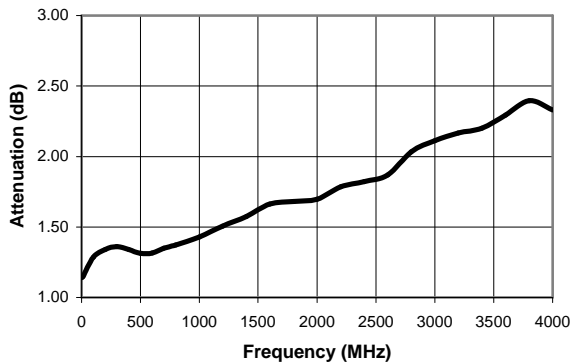
- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

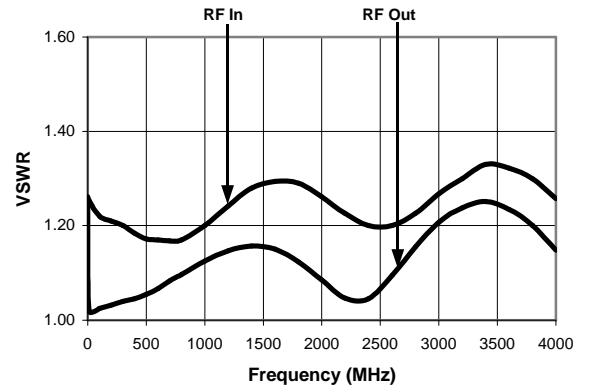


### Typical Performance Curves

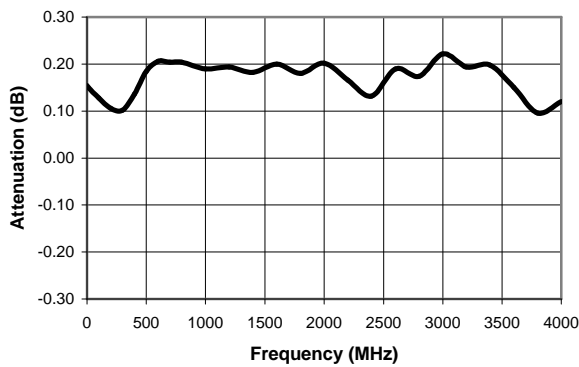
*Insertion Loss*



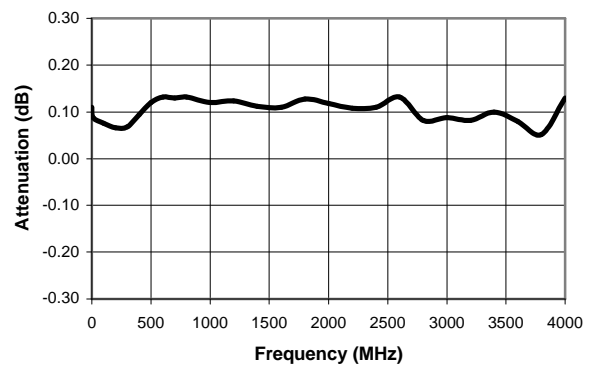
*VSWR @ Insertion Loss*



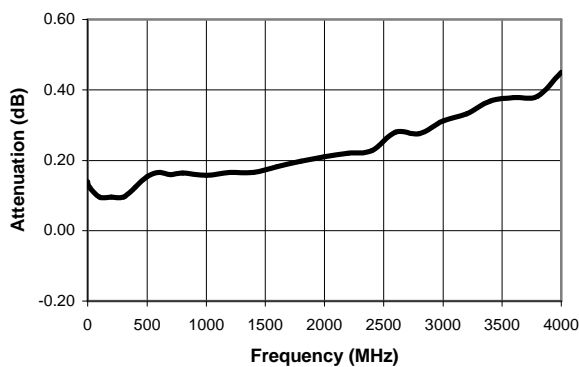
*Attenuation Error, 1 dB Bit*



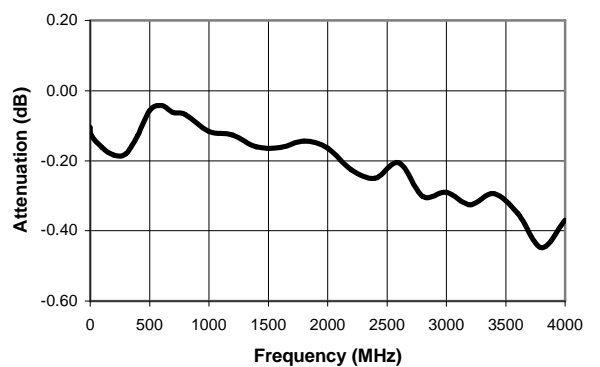
*Attenuation Error, 2 dB Bit*



*Attenuation Error, 4 dB Bit*



*Attenuation Error, 8 dB Bit*



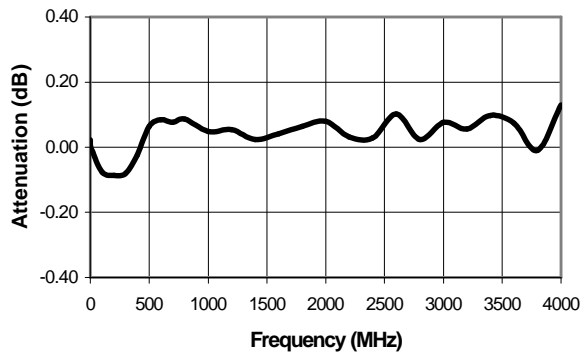
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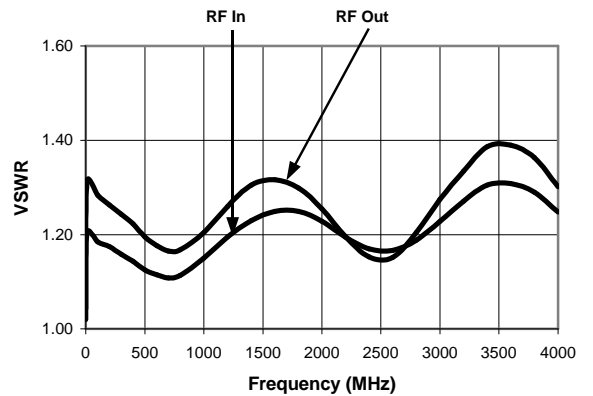
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Typical Performance Curves

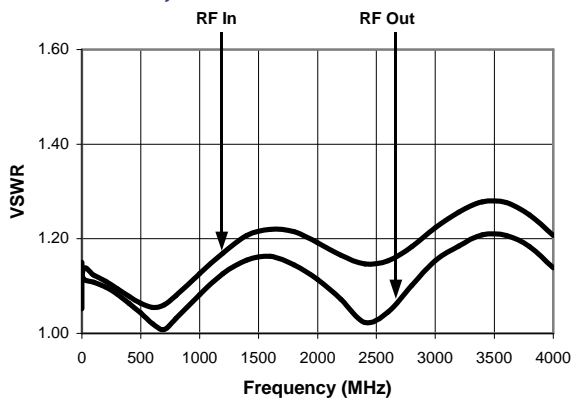
Attenuation Error, Max. Attenuation



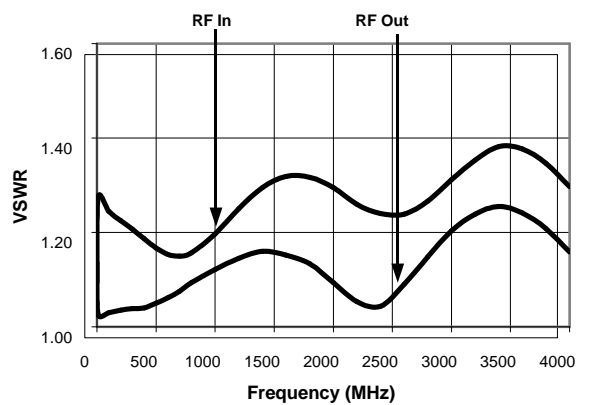
VSWR, 1 dB Bit



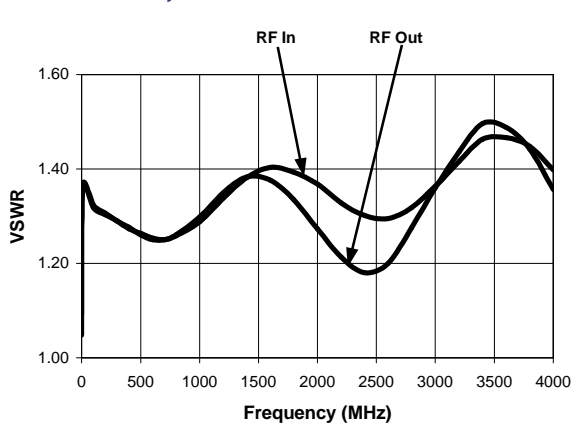
VSWR, 2 dB Bit



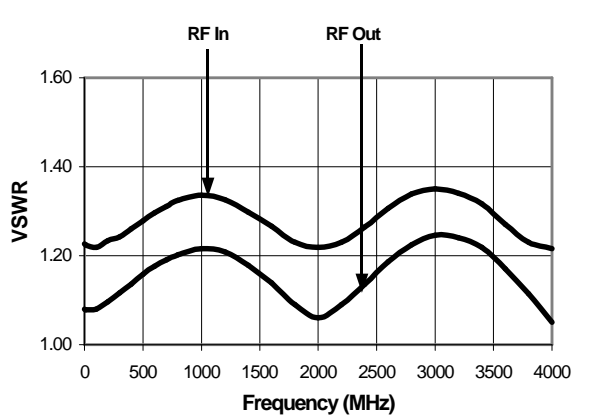
VSWR, 4 dB Bit



VSWR, 8 dB Bit



VSWR, Max. Attenuation



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## Ordering Information

Part Number	Package
AT90-1413	Bulk Packaging
AT90-1413TR	Tape and Reel (1K Reel)
AT90-1413-TB	Units Mounted on Test Board

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