



Digital Attenuator, 15 dB, 4-Bit, TTL Driver, DC - 4.0 GHz

V 1.00

AT90-1413

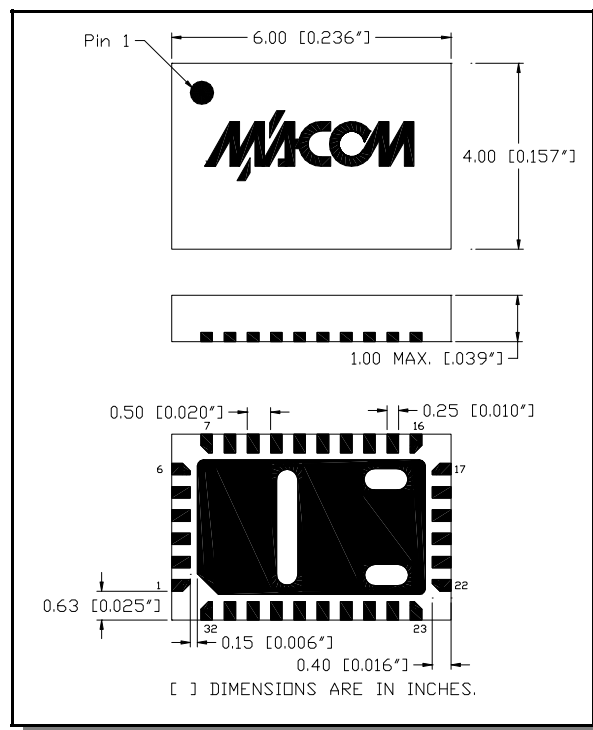
Features

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

Pin Configuration

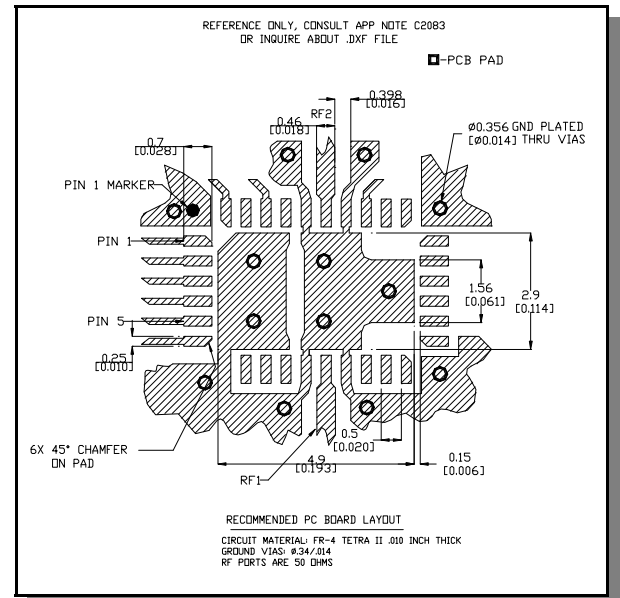
| Pin No. | Function | Pin No. | Function |
|---------|------------------|---------|---------------------|
| 1 | GND | 17 | N/C |
| 2 | C8 | 18 | N/C |
| 3 | C4 | 19 | +Vcc ² |
| 4 | C2 | 20 | N/C |
| 5 | C1 | 21 | Cp ⁴ |
| 6 | GND | 22 | N/C |
| 7 | GND | 23 | Cp ⁴ |
| 8 | N/C | 24 | N/C |
| 9 | N/C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

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 μ F cap must be connected between Pins 21 and 23.
5. -Vee is produced internally and requires a .1 μ F cap to GND
6. +Vcc requires a .1 μ F 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 ⁷

7. Application Note C2083 is available on line at www.macom.com

Absolute Maximum Ratings ⁸

| Parameter | Absolute Maximum |
|---|---------------------|
| Max. Input Power 0.05 GHz 0.5 - 4.0 GHz | +27 dBm +34 dBm |
| +Vcc | +5.5V |
| Logic Voltages ⁹ | -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

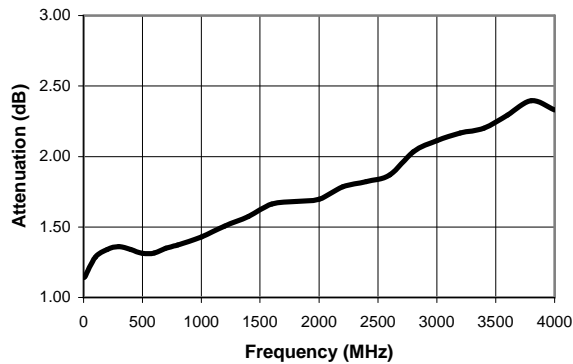
Visit www.macom.com for additional data sheets and product information.

tyco / Electronics

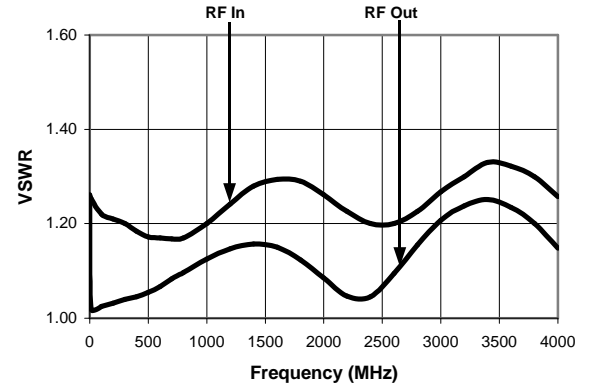
MACOM

Typical Performance Curves

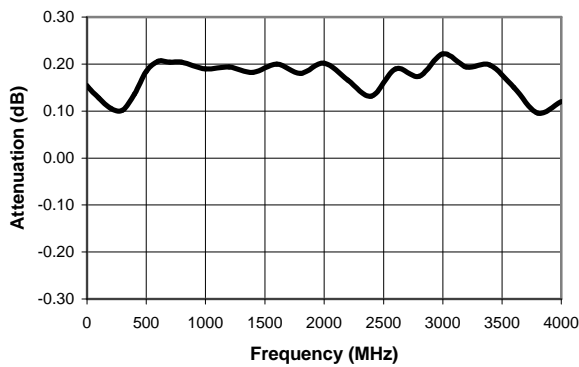
Insertion Loss



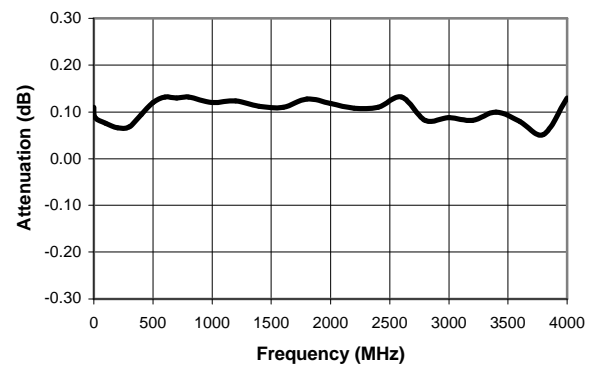
VSWR @ Insertion Loss



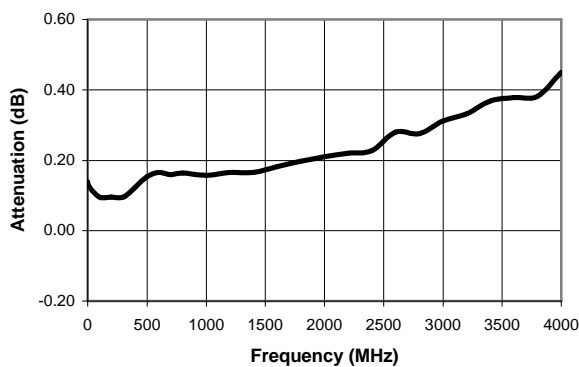
Attenuation Error, 1 dB Bit



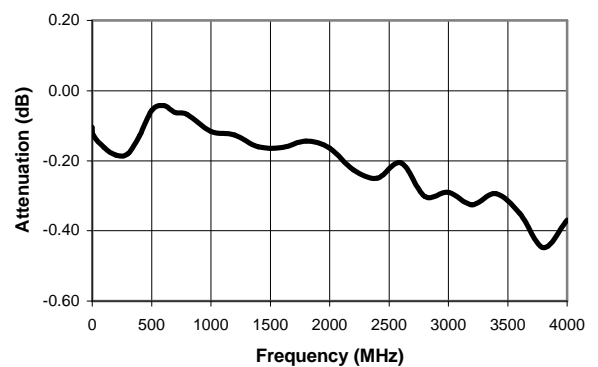
Attenuation Error, 2 dB Bit



Attenuation Error, 4 dB Bit



Attenuation Error, 8 dB Bit



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

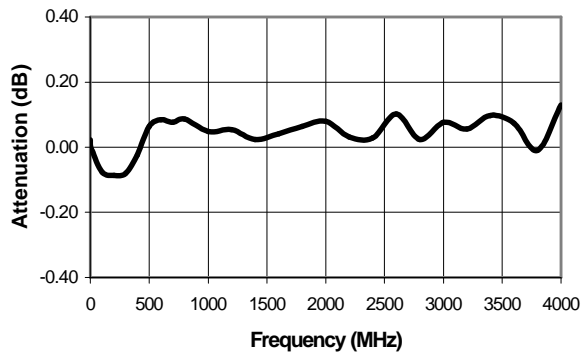
Visit www.macom.com for additional data sheets and product information.

tyco / Electronics

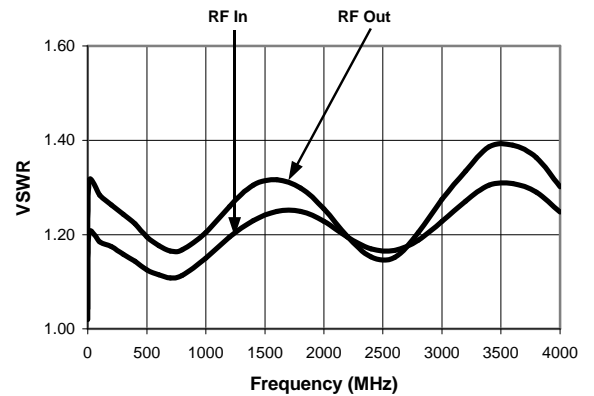
MACOM

Typical Performance Curves

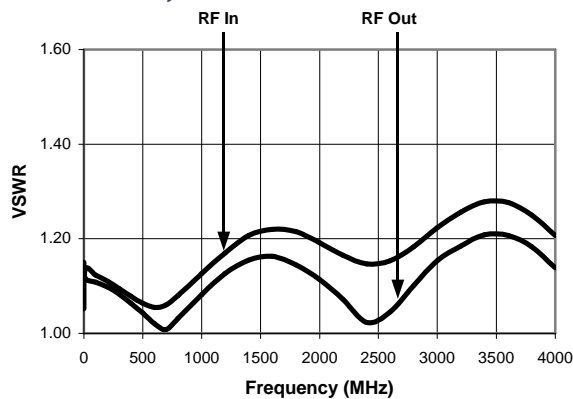
Attenuation Error, Max. Attenuation



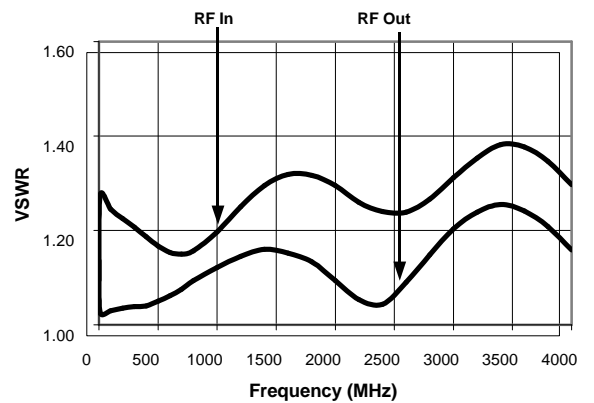
VSWR, 1 dB Bit



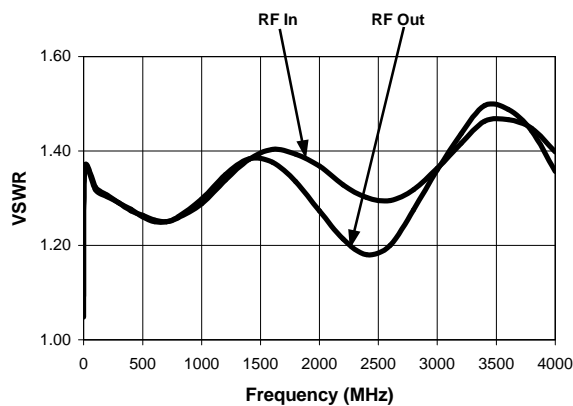
VSWR, 2 dB Bit



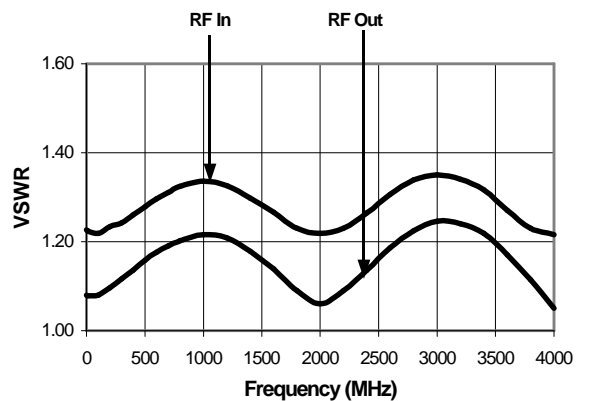
VSWR, 4 dB Bit



VSWR, 8 dB Bit



VSWR, Max. Attenuation



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 for additional data sheets and product information.

Ordering Information

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

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 for additional data sheets and product information.

tyco / Electronics

MACOM