

## Features

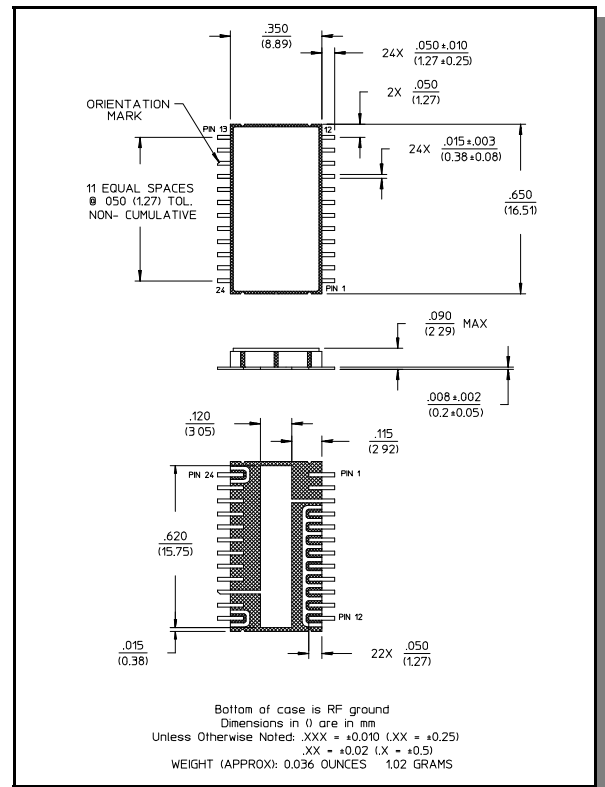
- Attenuation: 1 dB steps to 50 dB
- Temperature Stability:  $\pm 0.18$  dB from  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  Typical
- Low DC Power Consumption
- Hermetic Surface Mount Package
- Integral TTL Driver
- 50 Ohm Nominal Impedance

## Description

M/A-COM's AT-106 is a GaAs FET 6-bit digital attenuator with a 1 dB minimum step size and 50 dB total attenuation. This attenuator and integral TTL driver is in a hermetically sealed ceramic 24-lead surface mount package. The AT-106 is ideally suited for use where accuracy, fast switching, very low power consumption and low intermodulation products are required. Typical applications include dynamic range setting in precision receiver circuits and other gain/leveling control circuits. Environmental screening is available. Contact the factory for information.

## Electrical Specifications<sup>1</sup> (From $-55^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ )

## CR-13



| Parameter                         | Test Conditions   | Frequency  | Units              | Min   | Typ         | Max               |
|-----------------------------------|---|--|--------------------|---|-------------|-------------------|
| Reference Insertion Loss          | —   | DC - 0.5 GHz<br>DC - 1.0 GHz<br>DC - 2.0 GHz     | dB<br>dB<br>dB     | —<br>—<br>—   | —<br>—<br>— | 3.6<br>4.1<br>4.6 |
| Attenuation Accuracy <sup>2</sup> | Any Single Bit<br>Any Combination of Bits<br>(For attenuation to 26 dB)<br>Any Combination of Bits<br>(For attenuation 27 to 50 dB) | DC - 2.0 GHz<br>DC - 2.0 GHz<br><br>DC - 1.5 GHz | dB<br>dB<br><br>dB | $\pm (0.3 + 4\%$ of atten. setting)<br>$\pm (0.4 + 4\%$ of atten. setting)<br><br>$\pm (0.5 + 5\%$ of atten. setting) |             |                   |
| VSWR                              | —   | 0.05 - 0.10 GHz<br>0.101 - 2.0 GHz               | Ratio<br>Ratio     | —<br>—  | —<br>—      | 2.0:1<br>1.8:1    |
| Trise, Tfall                      | 10% to 90%  | —  | ns                 | —   | 9           | —                 |
| Ton, Toff                         | 50% Control to 90/10% RF  | —  | ns                 | —   | 45          | —                 |
| Transients                        | In-Band (peak-peak)   | —  | mV                 | —   | 40          | —                 |
| 1 dB Compression                  | Input Power<br>Input Power  | 0.05 GHz<br>0.5 - 2.0 GHz                        | dBm<br>dBm         | —<br>—  | +20<br>+28  | —<br>—            |
| Input IP3                         | For two-tone Input Power<br>Up to +5 dBm  | 0.05 GHz<br>0.5 - 2.0 GHz                        | dBm<br>dBm         | —<br>—  | +34<br>+46  | —<br>—            |
| Input IP2                         | For two-tone Input Power<br>Up to +5 dBm  | 0.05 GHz<br>0.5 - 2.0 GHz                        | dBm<br>dBm         | —<br>—  | +75<br>+79  | —<br>—            |
| Vcc                               | —   | —  | V                  | 4.5   | 5.0         | 5.5               |
| Vee                               | —   | —  | V                  | -8.0  | —           | -5.0              |

1. All specifications apply when operated with bias voltages of +5V for Vcc and  $-5.0\text{V}$  for Vee.  
2. This attenuator is guaranteed monotonic.

### Electrical Specifications (From -55°C to +85°C)

| Parameter                    | Test Conditions  | Frequency | Units | Min | Typ | Max |
|------------------------------|--|-----------|-------|-----|-----|-----|
| I <sub>cc</sub>              | V <sub>cc</sub> = 4.5 to 5.5V<br>V <sub>ctl</sub> = 0 to 0.8V, or V <sub>cc</sub> -2.1V to V <sub>cc</sub> | —         | mA    | —   | —   | 6.0 |
| I <sub>ee</sub>              | V <sub>ee</sub> = -5.0 to -8.0V  | —         | mA    | —   | —   | 1.0 |
| V <sub>ctl</sub>             | Logic 0 (TTL)  | —         | V     | 0.0 | —   | 0.8 |
| V <sub>ctl</sub>             | Logic 1 (TTL)  | —         | V     | 2.0 | —   | 5.0 |
| Input Leakage Current (Low)  | 0 to 0.8V  | —         | μA    | —   | —   | 1.0 |
| Input Leakage Current (High) | 2.0 to 5.0V  | —         | μA    | —   | —   | 1.0 |

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

| Parameter   | Absolute Maximum               |
|---|--------------------------------|
| Max Input Power<br>0.5 GHz<br>0.5 - 2.0 GHz           | +27 dBm<br>+34 dBm             |
| Supply Voltages<br>V <sub>cc</sub><br>V <sub>ee</sub> | +5.5V<br>-8.5V                 |
| Control Voltage <sup>4</sup>                          | -0.5V to V <sub>cc</sub> +0.5V |
| Operating Temperature                                 | -55°C to +125°C                |
| Storage Temperature                                   | -65°C to +150°C                |

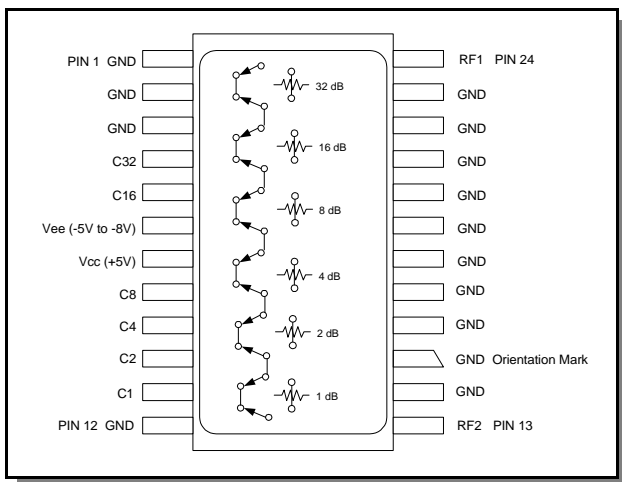
- Operation of this device above any one of these parameters may cause permanent damage.
- Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

### Truth Table

| Control Inputs |    |    |    |    |    |             |
|----------------|----|----|----|----|----|-------------|
| C6             | C5 | C4 | C3 | C2 | C1 | Attenuation |
| 0              | 0  | 0  | 0  | 0  | 0  | Reference   |
| 0              | 0  | 0  | 0  | 0  | 1  | 1 dB        |
| 0              | 0  | 0  | 0  | 1  | 0  | 2 dB        |
| 0              | 0  | 0  | 1  | 0  | 0  | 4 dB        |
| 0              | 0  | 1  | 0  | 0  | 0  | 8 dB        |
| 0              | 1  | 0  | 0  | 0  | 0  | 16 dB       |
| 1              | 0  | 0  | 0  | 0  | 0  | 32 dB       |
| 1              | 1  | 1  | 1  | 1  | 1  | 63 dB       |

0 = TTL Low      1 = TTL High

### Functional Schematic (Top View)



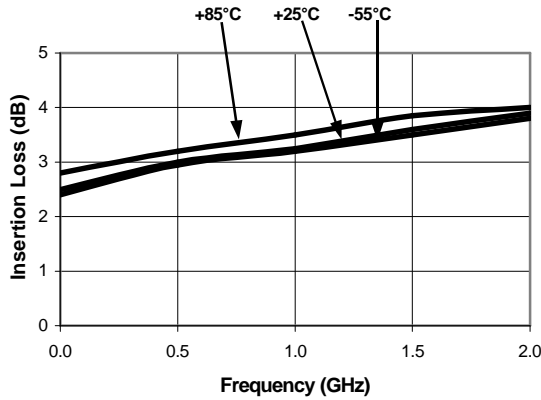
Specifications subject to change without notice.

- 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

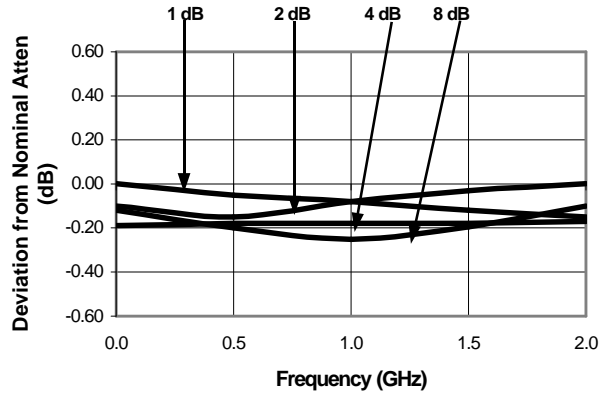
Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

Typical Performance Curves

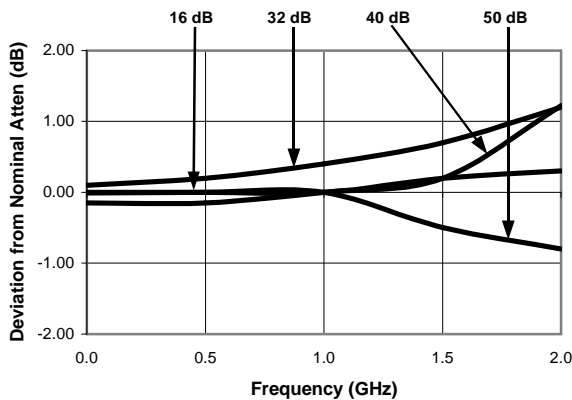
Insertion Loss vs. Frequency



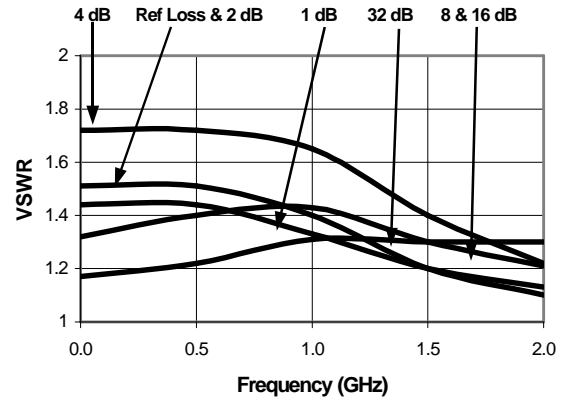
Attenuation Accuracy vs. Frequency



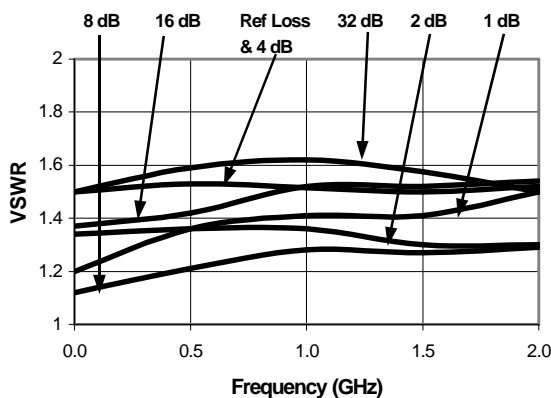
Attenuation Accuracy vs. Frequency



RF1 VSWR vs. Frequency



RF2 VSWR vs. Frequency



Ordering Information

| Part Number | Package |
|-------------|---------|
| AT-106 PIN  | CR-13   |

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