

**Digital Attenuator, 15.5 dB, 5-Bit  
DC-2.0 GHz**

**AT-280  
V5**

**Features**

- 0.5 dB Attenuation Steps to 15.5 dB
- Ultra Low DC Power Consumption
- Low Intermodulation Product: +45 dBm IP3
- SOIC-16 Plastic Package
- Tape and Reel Packaging Available
- Temperature Stability: +/-0.15 dB from -40°C to +85°C

**Description**

M/A-COM's AT-280 is a 5-bit, 0.5-dB step GaAs MMIC digital attenuator in a low cost SOIC 16-lead surface mount plastic package. The AT-280 is ideally suited for use where high accuracy, fast switching, very low power consumption and low intermodulation products are required at a low cost.

Typical applications include radio and cellular equipment, wireless LANS, GPS equipment and other gain/level control circuits.

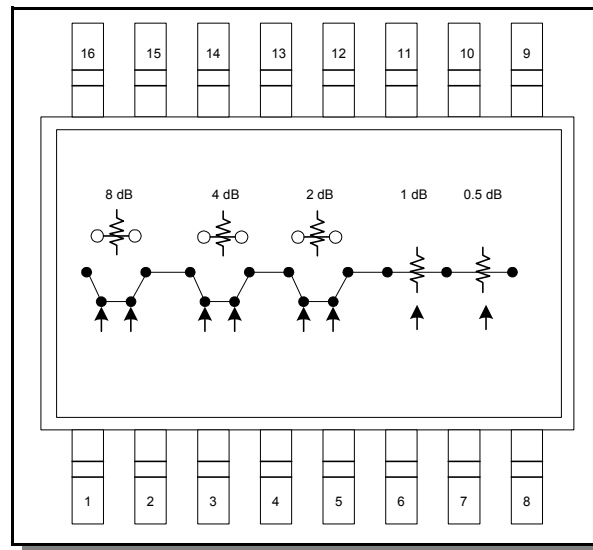
The AT-280 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

**Ordering Information <sup>1</sup>**

| Part Number | Package                                |
|-------------|--|
| AT-280      | SOIC 16-Lead                           |
| AT-280TR    | Forward Tape and Reel                  |
| AT-280SMB   | Sample Test Board (Includes 5 Samples) |

1. Reference Application Note M513 for reel size information.

**Functional Schematic**



**Pin Configuration**

| Pin No. | Function         | Pin No. | Function |
|---------|------------------|---------|----------|
| 1       | VC1              | 9       | RF2      |
| 2       | $\overline{VC1}$ | 10      | Ground   |
| 3       | VC2              | 11      | Ground   |
| 4       | $\overline{VC2}$ | 12      | Ground   |
| 5       | VC3              | 13      | Ground   |
| 6       | $\overline{VC3}$ | 14      | Ground   |
| 7       | $\overline{VC4}$ | 15      | Ground   |
| 8       | $\overline{VC5}$ | 16      | RF1      |

**Absolute Maximum Ratings <sup>2</sup>**

| Parameter                                 | Absolute Maximum                         |
|---|--|
| Input Power:<br>0.05 GHz<br>0.5 - 2.0 GHz | +27 dBm<br>+34 dBm                       |
| Control Voltage                           | -8.5 V $\leq$ V <sub>C</sub> $\leq$ +5 V |
| Operating Temperature                     | -40°C to +85°C                           |
| Storage Temperature                       | -65°C to +150°C                          |

2. Exceeding any one or combination of these limits may cause permanent damage to this device.

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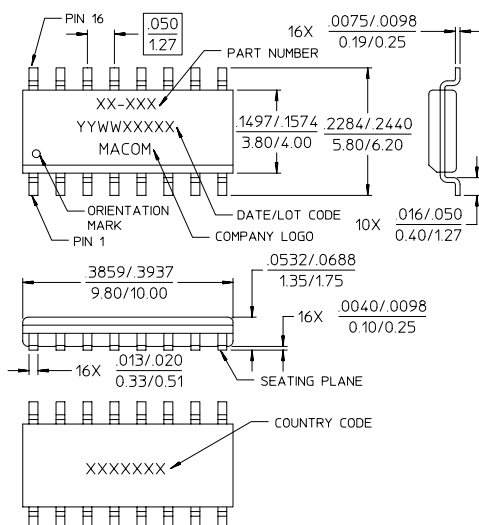
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**Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50 \Omega$**

| Parameter                         | Test Conditions  | Units  | Min   | Typ   | Max |
|-----------------------------------|--|--|-------|-------|-----|
| Reference Insertion Loss          | DC—0.1 GHz   | dB   | —     | 1.1   | 1.3 |
|                                   | DC—0.5 GHz   | dB   | —     | 1.3   | 1.5 |
|                                   | DC—1.0 GHz   | dB   | —     | 1.5   | 1.8 |
|                                   | DC—2.0 GHz   | dB   | —     | 1.8   | 2.0 |
| Attenuation Accuracy <sup>3</sup> | DC—1.0 GHz<br>DC—2.0 GHz   | $\pm$ (0.20 dB +3% of Attenuation Setting in dB) dB<br>$\pm$ (0.30 dB +3% of Attenuation Setting in dB) dB |       |       |     |
| VSWR                              | (Any state)  | Ratio  | 1.5:1 | 1.8:1 | —   |
| Trise, Tfall                      | 10% to 90% RF, 90% to 10% RF   | nS   | —     | 12    | —   |
| Ton, Toff                         | 50% Control to 90% RF, 50% Control to 10% RF   | nS   | —     | 18    | —   |
| Transients                        | In Band  | mV   | —     | 30    | —   |
| 1 dB Compression                  | Input Power, 0.05 GHz  | dBm  | —     | 22    | —   |
|                                   | Input Power, 0.5 - 2.0 GHz   | dBm  | —     | 27    | —   |
| IP <sub>2</sub>                   | 0.05 GHz   | dBm  | —     | 53    | —   |
|                                   | 0.5 - 2.0 GHz<br>Measured Relative to Input Power<br>(for two-tone input power up to +5 dBm) | dBm  | —     | 68    | —   |
| IP <sub>3</sub>                   | 0.05 GHz   | dBm  | —     | 40    | —   |
|                                   | 0.5 - 2.0 GHz<br>Measured Relative to Input Power<br>(for two-tone input power up to +5 dBm) | dBm  | —     | 45    | —   |

3. Attenuation accuracy specifications apply with negative bias control and low inductance grounding.

**SOIC-16**



NOTES:  
1. REFERENCE JEDEC MS-012-AC FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.  
2. REFERENCE M538 APPLICATION NOTE FOR FOOTPRINT INFORMATION.  
3. ALL DIMENSIONS SHOWN AS INCHES/MM.

**Truth Table<sup>4,5</sup>**

| Control Inputs          |                         |                         |     |                         |     |                         |     |             |
|-------------------------|-------------------------|-------------------------|-----|-------------------------|-----|-------------------------|-----|-------------|
| $\overline{\text{VC5}}$ | $\overline{\text{VC4}}$ | $\overline{\text{VC3}}$ | VC3 | $\overline{\text{VC2}}$ | VC2 | $\overline{\text{VC1}}$ | VC1 | Atten. (dB) |
| 1                       | 1                       | 1                       | 0   | 1                       | 0   | 1                       | 0   | Reference   |
| 0                       | 1                       | 1                       | 0   | 1                       | 0   | 1                       | 0   | 0.5 dB      |
| 1                       | 0                       | 1                       | 0   | 1                       | 0   | 1                       | 0   | 1 dB        |
| 1                       | 1                       | 0                       | 1   | 1                       | 0   | 1                       | 0   | 2 dB        |
| 1                       | 1                       | 1                       | 0   | 0                       | 1   | 1                       | 0   | 4 dB        |
| 1                       | 1                       | 1                       | 0   | 1                       | 0   | 0                       | 1   | 8 dB        |
| 0                       | 0                       | 0                       | 1   | 0                       | 1   | 0                       | 1   | 15.5 dB     |

4. 0 = Vin Low = 0 V = 0 to -0.2 V @ 20  $\mu\text{A}$  maximum  
5. 1 = Vin High = -5 V at 20  $\mu\text{A}$  to -8 V at 20  $\mu\text{A}$  maximum

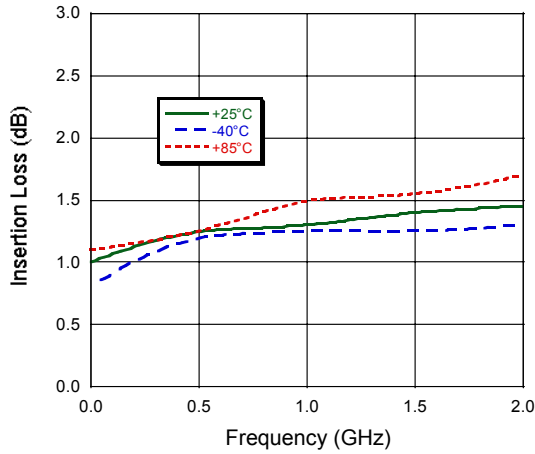
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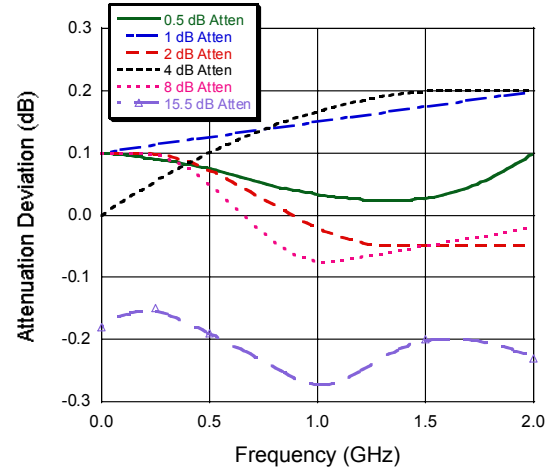
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**Typical Performance Curves**

**Insertion Loss**



**Attenuation Accuracy**



**VSWR**

