



AT20-0106 V7

Digital Attenuator 50.0 dB, 6-Bit, TTL Driver, DC-2.0 GHz

Features

- · Attenuation: 1 dB steps to 50 dB
- Temperature Stability: ± 0.18 dB from –40°C to +85°C Typical
- Low DC Power Consumption
- Surface Mount Package
- Integral TTL Driver
- · High Intercept Point
- Low Cost/High Performance
- 50 Ohm Nominal Impedance
- Lead-Free CR-13 Package
- 260°C Reflow Compatible

Description

M/A-COM's AT20-0106 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 ceramic 24-lead surface mount package. The AT20-0106 is ideally suited for use where accuracy, fast switching, 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. Available with enhanced performance as fully hermetic version. Environmentally screenable as P/N AT-106-PIN.

Ordering Information

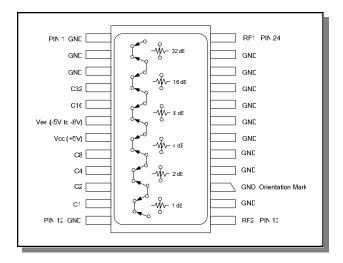
| Part Number | Package | | |
|---------------|-------------------|--|--|
| AT20-0106-PIN | Bulk Packaging | | |
| AT20-0106-TR | 1000 piece reel | | |
| AT20-0106-TB | Sample Test Board | | |

Note: Reference Application Note M513 for reel size

information.

Note: Die quantity varies.

Functional Schematic



Pin Configuration

| Pin No. | Function | Pin No. | Function | |
|---------|------------------|---------|----------|--|
| 1 | GND | 13 | RF2 | |
| 2 | GND | 14 | GND | |
| 3 | GND | 15 | GND | |
| 4 | C32 | 16 | GND | |
| 5 | C16 | 17 | GND | |
| 6 | Vee (-5V to -8V) | 18 | GND | |
| 7 | Vcc (+5V) | 19 | GND | |
| 8 | C8 | 20 | GND | |
| 9 | C4 | 21 | GND | |
| 10 | C2 | 22 | GND | |
| 11 | C1 | 23 | GND | |
| 12 | GND | 24 | RF1 | |

The metal bottom of the case must be connected to RF and DC ground.

^{*} Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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[•] Europe Tel: 44.1908.574.200 / Fax: 44.1908.574.300

Asia/Pacific Tel: 81.44.844.8296 / Fax: 81.44.844.8298





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Electrical Specifications: $T_A = 25^{\circ}C^1$

| Parameter | Test Conditions Frequency Units | | Units | Min | Тур | Max |
|-----------------------------------|---|--|----------------|---|-------------------|-------------------|
| Reference Insertion Loss | _ | DC - 0.5 GHz DC - 1.0 GHz DC - 2.0 GHz | dB dB dB | | 3.5 3.9 4.2 | 3.8 4.2 4.6 |
| Attenuation Accuracy ² | Any Single Bit Any Combination of Bits (For attenuation to 26 dB) Any Combination of Bits (For attenuation 27 to 50 dB) | DC - 2.0 GHz DC - 2.0 GHz DC - 1.5 GHz | dB dB dB | \pm (0.3 +4% of atten. setting) \pm (0.4 +4% of atten. setting) \pm (0.5 +5% of atten. setting) | | setting) |
| VSWR | VSWR — | | Ratio Ratio | | | 2.0:1 1.8:1 |
| Trise, Tfall | 10% to 90% | _ | ns | _ | _ | 50 |
| Ton, Toff | 50% Control to 90/10% RF | _ | ns | _ | _ | 150 |
| Transients | In-Band (peak-peak) | _ | mV | _ | 50 | _ |
| 1 dB Compression | Input Power Input Power | 0.05 GHz 0.5 - 2.0 GHz | dBm dBm | _ | +20 +28 | _ |
| Input IP3 | For two-tone Input Power Up to +5 dBm | 0.05 GHz 0.5 - 2.0 GHz | dBm dBm | _ | +34 +46 | |
| Input IP2 | Input IP2 For two-tone Input Power Up to +5 dBm | | dBm dBm | _ | +75 +79 | _ |
| Vcc | _ | _ | V | 4.5 | 5.0 | 5.5 |
| Vee | _ | _ | V | -8.0 | _ | -5.0 |
| Icc | Vcc = 4.5 to 5.5V Vctl = 0 to 0.8V, or Vcc – 2.1V to Vcc | _ | mA | _ | _ | 6.0 |
| lee Vee = -5.0 to -8.0V | | _ | mA | _ | _ | 1.0 |

^{1.} All specifications apply when operated with bias voltages of +5V for Vcc and -5.0V for Vee.

information.

^{2.} This attenuator is guaranteed monotonic.

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Absolute Maximum Ratings ^{3,4}

| Parameter | Absolute Maximum | | |
|---|--------------------|--|--|
| Max Input Power 0.5 GHz 0.5 - 2.0 GHz | +27 dBm +34 dBm | | |
| Supply Voltages Vcc Vee | +5.5V -8.5V | | |
| Control Voltage 5 | -0.5V to Vcc +0.5V | | |
| Operating Temperature | -40°C to +125°C | | |
| Storage Temperature | -65°C to +150°C | | |

- 3. Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.
- Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

Handling Procedures

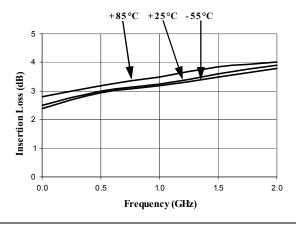
Please observe the following precautions to avoid damage:

Static Sensitivity

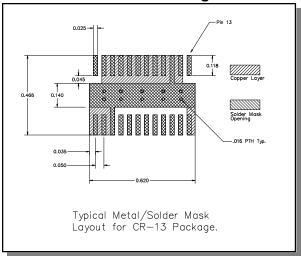
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves

Insertion Loss vs. Frequency



Recommended PCB Configuration

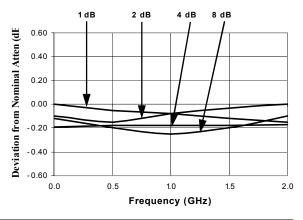


Truth Table (Digital Attenuator)

| Control Inputs | | | | | | |
|----------------|----|----|----|----|----|-------------|
| C6 | C5 | C4 | С3 | 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

Attenuation Accuracy vs. Frequency



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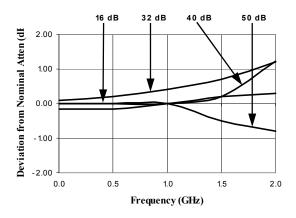


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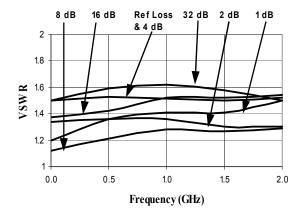
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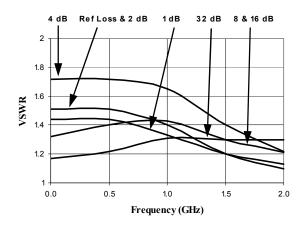
Attenuation Accuracy vs. Frequency



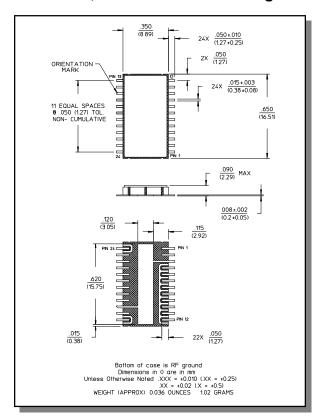
RF2 VSWR vs. Frequency



RF1 VSWR vs. Frequency



Lead-Free, CR-13 Ceramic Package[†]



[†] Reference Application Note M538 for lead-free solder reflow recommendations.

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