AT-213-PIN

Digital Attenuator
15.0 dB, 4-Bit, TTL Driver, DC-3.0 GHz

Rev. V5

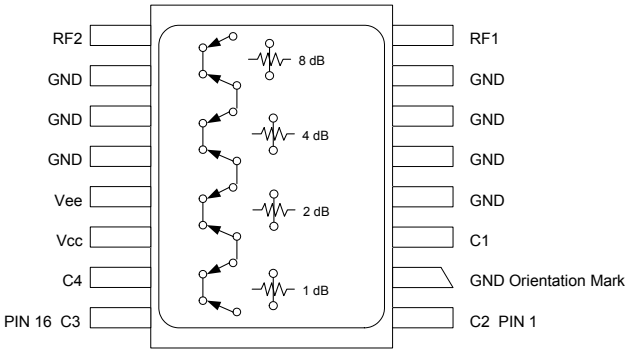
Features

- Attenuation: 1 dB steps to 15 dB
- Temperature Stability: ± 0.18 dB from –55°C to +85°C Typical
- Low DC Power Consumption
- Hermetic Surface Mount Package
- Integral TTL Driver
- 50 Ohms Nominal Impedance
- Lead-Free CR-11 Package
- 260°C Reflow Compatible
- RoHS* Compliant

Description

M/A-COM's AT-213-PIN is a 4-bit, 1 dB step digital attenuator in a hermetically sealed ceramic 16-lead surface mount package. The AT-213-PIN is ideally suited for use where high accuracy, fast switching, very low power consumption and low intermodulation products are required. Typical applications include dynamic range setting in a precision receiver circuits and other gain/leveling control circuits. Environmental screening is available. Contact the factory for information.

Functional Schematic



Ordering Information

Part Number	Package
AT-213-PIN	Bulk Packaging

Note: Reference Application Note M513 for reel size information.

Pin Configuration

Pin No.	Function	Pin No.	Function
1	C2	9	RF2
2	GND	10	GND
3	C1	11	GND
4	GND	12	GND
5	GND	13	Vee
6	GND	14	Vcc
7	GND	15	C4
8	RF1	16	C3

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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Electrical Specifications: T_A = -55°C to +85°C[1]

Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Reference Insertion Loss	—	DC - 0.5 GHz DC - 1.0 GHz DC - 2.0 GHz DC - 3.0 GHz	dB dB dB dB	— — — —	— — — —	1.7 1.9 2.2 2.5
Attenuation Accuracy [2]	Any Single Bit Any Combination of Bits	DC - 2.0 GHz DC - 3.0 GHz DC - 2.0 GHz DC - 3.0 GHz	± (0.15 dB +3% of atten setting in dB) dB ± (0.2 dB +3% of atten setting in dB) dB Or ± 0.4 dB, whichever is greater ± (0.2 dB +3% of atten setting in dB) dB ± (0.2 dB +3% of atten setting in dB) dB Or ± 0.4 dB, whichever is greater			
VSWR	—	—	Ratio	—	—	1.6:1
Trise, Tfall	10% to 90%	—	ns	—	9	—
Ton, Toff	50% Control to 90/10% RF	—	ns	—	40	—
Transients	In-Band (peak-peak)	—	mV	—	30	—
1 dB Compression	Input Power Input Power	0.05 GHz 0.5 - 3.0 GHz	dBm dBm	— —	+22 +28	— —
Input IP3	For two-tone Input Power Up to +5 dBm	0.05 GHz 0.5 - 3.0 GHz	dBm dBm	— —	+40 +50	— —
Input IP2	For two-tone Input Power Up to +5 dBm	0.05 GHz 0.5 - 3.0 GHz	dBm dBm	— —	+45 +68	— —
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	—	—	4.0
Iee	Vee = -5.0 to -8.0V	—	mA	—	—	1.0
Vctl Vctl	Logic 0 (TTL) Logic 1 (TTL)	— —	V V	0.0 2.0	— —	0.8 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

1. All specifications apply when operated with bias voltages of +5V for Vcc and –5.0V for Vee.
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 - 3.0 GHz	 +27 dBm +34 dBm
V_{CC}	-0.5V ≤ V_{CC} ≤ +7.0V
V_{EE}	-8.5V ≤ V_{EE} ≤ +0.5V
V_{CC} - V_{EE}	-0.5V ≤ V_{CC} - V_{EE} ≤ 14.5V
Vin[5]	-0.5V ≤ Vin ≤ V_{CC} + 0.5V
Operating Temperature	-55°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.
4. M/A-COM does not recommend sustained operation near these survivability limits.
5. 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.

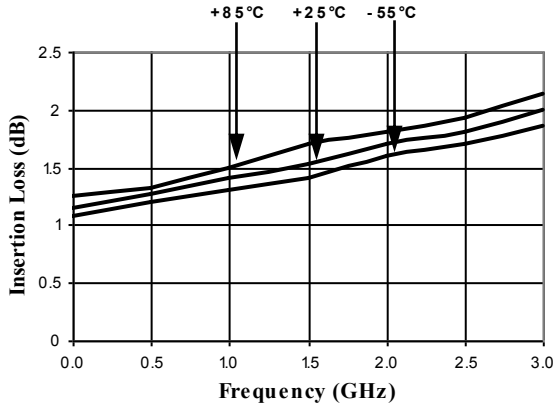
Truth Table (Digital Attenuator)

Control Inputs				
C4	C3	C2	C1	Attenuation
0	0	0	0	Reference
0	0	0	1	1 dB
0	0	1	0	2 dB
0	1	0	0	4 dB
1	0	0	0	8 dB
1	1	1	1	15 dB

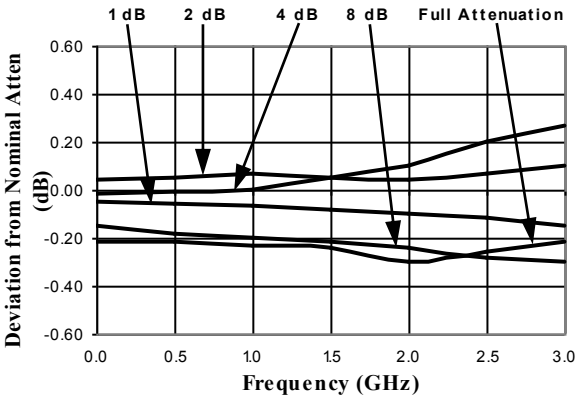
0 = TTL Low; 1 = TTL High

Typical Performance Curves

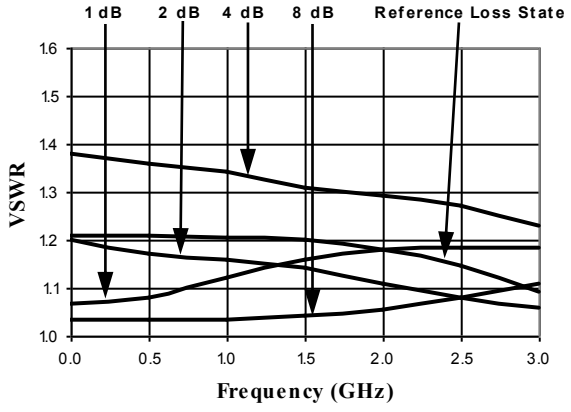
Ref. Insertion Loss vs. Frequency



Attenuation Accuracy vs. Frequency

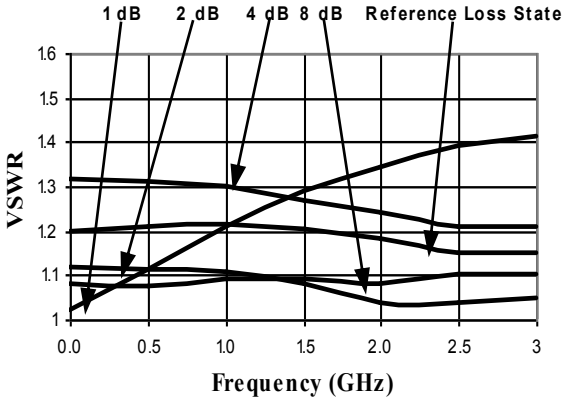


RF1 VSWR vs. Frequency

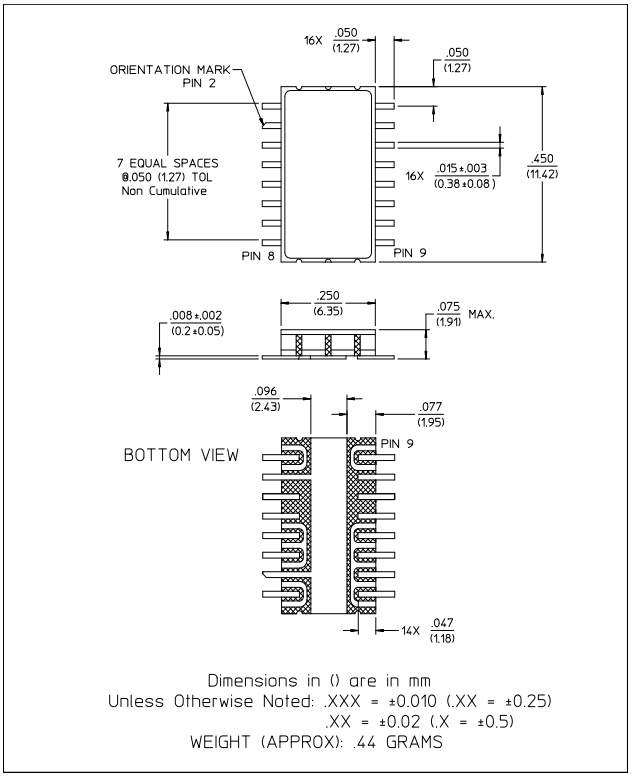


Typical Performance Curves

RF2 VSWR vs. Frequency



Lead-Free, CR-11 Ceramic Package†



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

Mouser Electronics

Authorized Distributor

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MACOM:
AT-213-PIN