

Digital Attenuator 31.5 dB, 6-Bit, TTL Driver, DC-2.0 GHz

Rev. V9

Features

- Attenuation: 0.5 dB steps to 31.5 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 Ohm Nominal Impedance
- Lead-Free CR-13 Package
- 260°C Reflow Compatible
- RoHS* Compliant

Description

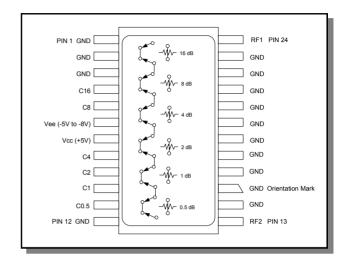
M/A-COM's AT-107-PIN is a GaAs FET 6-bit digital attenuator with a 0.5 dB minimum step size and 31.5 dB total attenuation. This attenuator and integral TTL driver is in a hermetically sealed ceramic 24-lead surface mount package. The AT-107-PIN is ideally suited for use where accuracy, fast switching, 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.

Ordering Information

Part Number	Package		
AT-107-PIN	Bulk Packaging		
AT-107-TB	Sample Test Board		

Note: Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration

Pin No.	Function	Pin No.	Function	
1	GND	13	RF2	
2	2 GND		GND	
3	GND	15	GND	
4	C16	16	GND	
5	C8	17	GND	
6	Vee (-5V to -8V)	18	GND	
7	Vcc (+5V)	19	GND	
8	C4	20	GND	
9	C2	21	GND	
10	C1	22	GND	
11	C0.5	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 2011/65/EU.

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

Parameter	Test Conditions	Frequency	Units	Min	Тур	Max
Reference Insertion Loss	_	DC - 0.5 GHz DC - 1.0 GHz DC - 2.0 GHz	dB — dB — dB —		_ _ _	3.2 3.6 4.0
Attenuation Accuracy ²	Any Single Bit Any Combination of Bits	DC - 1.0 GHz DC - 2.0 GHz DC - 1.0 GHz DC - 2.0 GHz	± (0.15 +3% of atten. setting in dB) dB ± (0.2 +3% of atten. setting in dB) dB ± (0.2 +3% of atten. setting in dB) dB or ± 0.4 dB, whichever is greater ± (0.2 +3% of atten. setting in dB) dB or ± 0.4 dB, whichever is greater			
VSWR	_	DC - 2.0 GHz	Ratio	_	_	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 Input Power	0.05 GHz 0.5 - 2.0 GHz	dBm dBm			_
Input IP3	For two-tone Input Power Up to +5 dBm	0.05 GHz 0.5 - 2.0 GHz	dBm dBm		+35 +48	_
Input IP2	For two-tone Input Power Up to +5 dBm	0.05 GHz 0.5 - 2.0 GHz	dBm — dBm —		+45 +79	_
Vcc		_	V 4.5 5.0		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
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	_	μА	_	_	1.0
Input Leakage Current (High)	2.0 to 5.0V	_	μА	_	_	1.0

All specifications apply when operated with bias voltages of +5V for Vcc and -5.0V for Vee.
 This attenuator is guaranteed monotonic.



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Absolute Maximum Ratings 3,4

Parameter	Absolute Maximum		
Max Input Power 0.05 GHz 0.5 - 2.0 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}	$-0.5V \le V_{CC} - V_{EE} \le 14.5V$		
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.
- 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

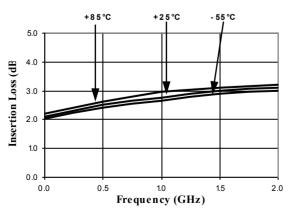
Please observe the following precautions to avoid damage:

Static Sensitivity

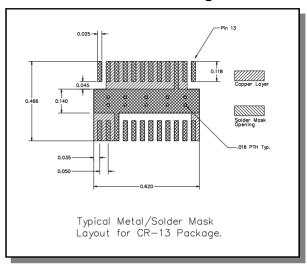
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Performance Curves

Insertion Loss vs. Frequency



Recommended PCB Configuration

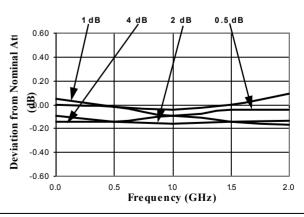


Truth Table (Digital Attenuator)

Control Inputs						
C6	C5	C4	С3	C2	C1	Attenuation
0	0	0	0	0	0	Reference
0	0	0	0	0	1	0.5 dB
0	0	0	0	1	0	1 dB
0	0	0	1	0	0	2 dB
0	0	1	0	0	0	4 dB
0	1	0	0	0	0	8 dB
1	0	0	0	0	0	16 dB
1	1	1	1	1	1	31.5 dB

0 = TTL Low; 1 = TTL High

Attenuation Accuracy vs. Frequency



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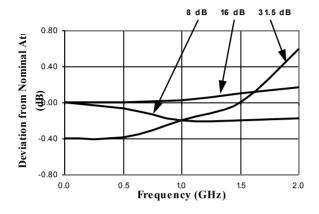


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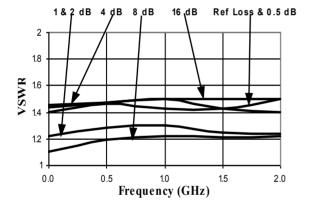
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Typical Performance Curves

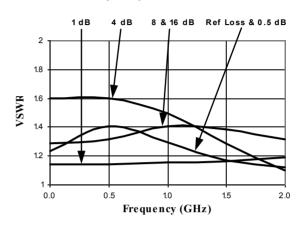
Attenuation Accuracy vs. Frequency



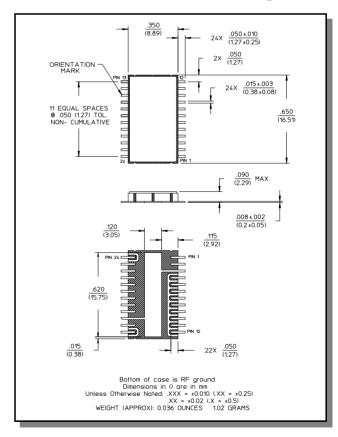
RF2 VSWR vs. Frequency



RF1 VSWR vs. Frequency



Lead-Free, CR-13 Ceramic Package[†]



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

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