

Rev. V4

Features

- Attenuation: 0.5 dB Steps to 15.5 dB
- Low DC Power Consumption
- Small Footprint, JEDEC Package
- Integral TTL Driver
- 50 ohm Impedance
- · Test Boards are Available
- Tape and Reel Packaging Available
- Lead-Free CSP-1 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of AT90-0283

Description

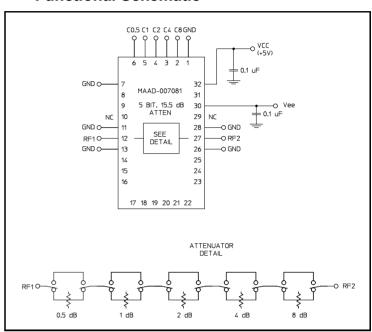
M/A-COM's MAAD-007081-000100 is a GaAs FET 5-bit digital attenuator with integral TTL driver. Step size is 0.5 dB providing a 15.5 dB total attenuation range. This device is in an PQFN plastic surface mount package. MAAD-007081-000100 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required.

Ordering Information

Part Number	Package
MAAD-007081-000100	Bulk Packaging
MAAD-007081-0001TR	1000 piece reel
MAAD-007081-0001TB	Sample Test Board

Note: Reference Application Note M513 for reel size information.

Functional Schematic



Pin Configuration¹

Pin No.	Function	Pin No.	Function
1	GND	17	NC
2	C8	18	NC
3	C4	19	NC
4	C2	20	NC
5	C1	21	NC
6	C0.5	22	NC
7	GND	23	NC
8	NC	24	NC
9	NC	25	NC
10	NC ²	26	GND
11	GND	27	RF2
12	RF1	28	GND
13	GND	29	NC ²
14	NC	30	-Vee
15	NC	31	NC
16	NC	32	+Vcc

The exposed pad centered on the package bottom must be connected to RF and DC ground. (For PQFN Packages)

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Visit www.macom.com for additional data sheets and product information.

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

^{2.} Pins 10 & 29 must be isolated

MAAD-007081



Digital Attenuator 15.5 dB, 5-Bit, TTL Driver, DC-3.5 GHz

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

Parameter	Test Conditions	Frequency	Units	Min	Тур	Max
Insertion Loss	_	DC - 3.5 GHz	dB	_	2.8	3.2
Attenuation Accuracy	Attenuation Accuracy Individual Bits 0.5-1-4-8 dB Individual Bit 2 dB Any Combination of Bits 1 to 15.5 dB		dB dB dB			±(.3 +5% of atten setting) ±(.4 +10% of atten setting) ±(.5 +7% of atten setting)
VSWR	Full Range	DC - 3.5 GHz	Ratio		1.6:1	1.8:1
Switching Speed	50% Cntl to 90%/10% RF 10% to 90% or 90% to 10%	=	ns ns	_	75 20	150 50
1 dB Compression	_	50 MHz 0.5 - 3.5 GHz	dBm dBm	1 1	+21 +29	
Input IP ₃	Two-tone inputs up to +5 dBm	50 MHz 0.5-3.5 GHz	dB dB	1 1	+35 +48	
Vcc Vee		_	V	4.75 -8.0	5.0 -5.0	5.25 -4.75
V _{IL} V _{IH}	LOW-level input voltage HIGH-level input voltage	_	V	0.0 2.0	_	0.8 5.0
lin (Input Leakage Current)	Vin = V _{CC} or GND	_	uA	-1.0	_	1.0
Icc (Quiescent Supply Current)	Vcntrl = V _{CC} or GND	_	uA	_	250	400
ΔIcc (Additional Supply Current Per TTL Input Pin)	V _{CC} = Max, Vcntrl = V _{CC} - 2.1 V	_	mA	_	_	1.0
lee	VEE min to max, Vin = V _{IL} or V _{IH}	_	mA	-1.0	-0.2	_
Thermal Resistance θjc	_	_	°C/W	_	15	_



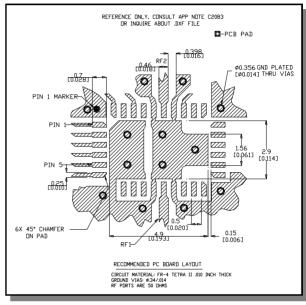
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Absolute Maximum Ratings 3,4

Parameter	Absolute Maximum	
Max. Input Power 0.05 GHz 0.5 - 3.5 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	-40°C to +85°C	
Storage Temperature	-65°C to +125°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.

Recommended PCB Configuration ⁶



 Application Note C2083 is available on line at www.macom.com

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.

Moisture Sensitivity

The MSL rating for this part is defined as Level 2 per IPC/JEDEC J-STD-020. Parts shall be stored and/or baked as required for MSL Level 2 parts.

Truth Table (Digital Attenuator)

C8	C4	C2	C1	C0.5	Attenuation
0	0	0	0	0	Loss, Reference
0	0	0	0	1	0.5 dB
0	0	0	1	0	1.0 dB
0	0	1	0	0	2.0 dB
0	1	0	0	0	4.0 dB
1	0	0	0	0	8.0 dB
1	1	1	1	1	15.5 dB

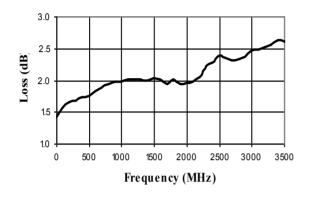
0 = TTL Low; 1 = TTL High



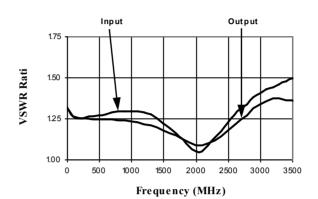
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Typical Performance Curves

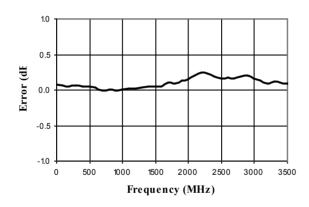
Insertion Loss



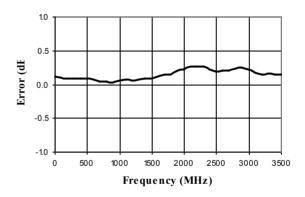
VSWR @ Insertion Loss



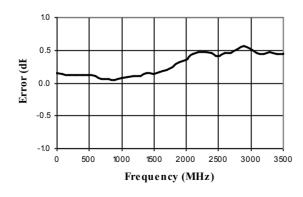
Attenuation Error, 0.5 dB Bit



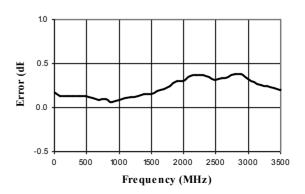
Attenuation Error, 1 dB Bit



Attenuation Error, 2 dB Bit



Attenuation Error, 4 dB Bit

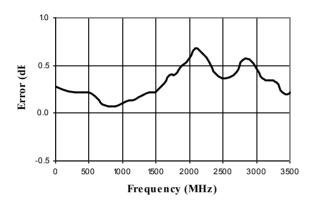




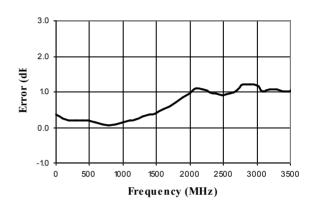
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Typical Performance Curves

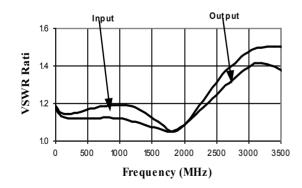
Attenuation Error, 8 dB Bit



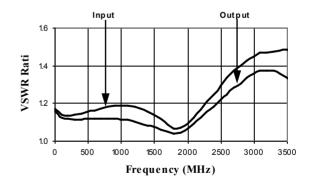
Attenuation Error, Max. Attenuation



VSWR, 0.5 dB Bit



VSWR, 1 dB Bit

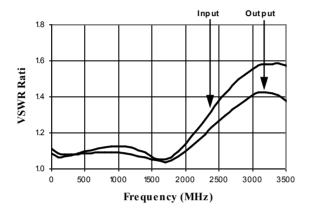




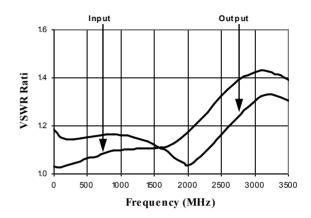
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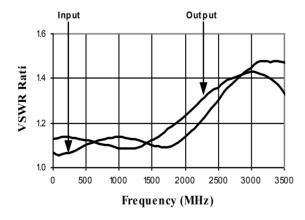
VSWR, 2 dB Bit



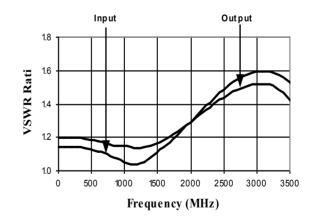
VSWR, 4 dB Bit



VSWR, 8 dB Bit



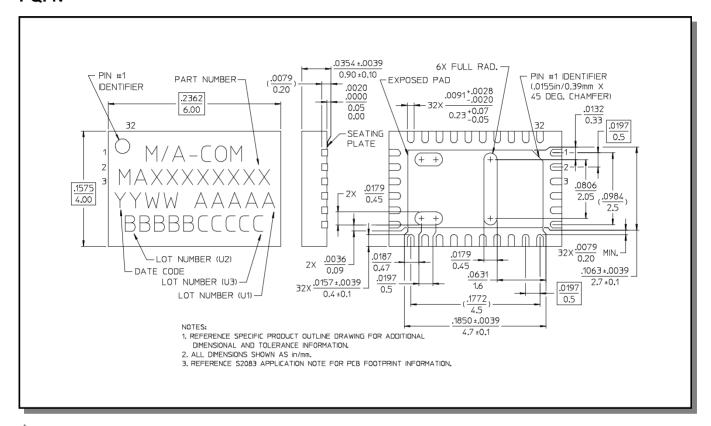
VSWR, Maximum Attenuation





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CSP-1, Lead-Free 4 x 6 mm, 32-lead PQFN[†]



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

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