tyco Electronics

RoHS Compliant

M/A-COM

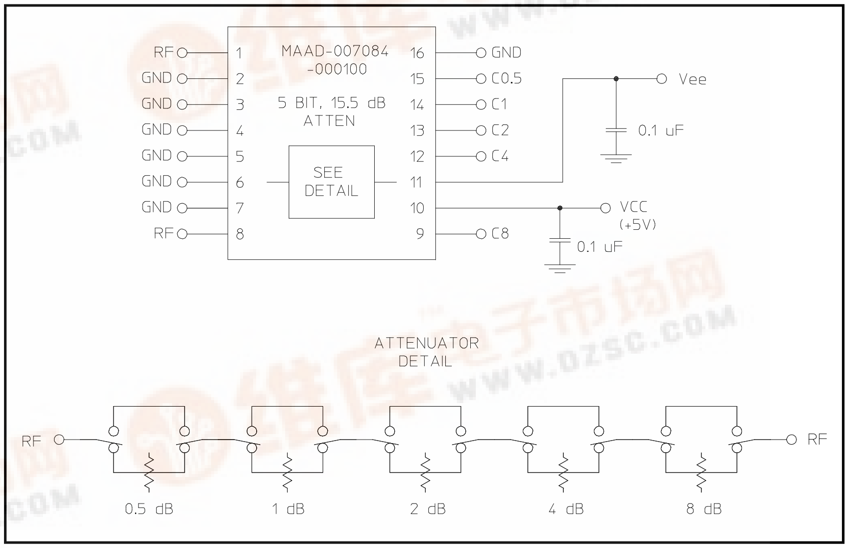
Digital Attenuator
15.5 dB, 5-Bit, TTL Driver, DC-2.0 GHz

MAAD-007084-000100
V2

Features

- Attenuation: 0.5 dB Steps to 15.5 dB
- Low DC Power Consumption
- Integral TTL Driver
- 50 ohm Impedance
- Test Boards are Available
- Tape and Reel Packaging Available
- Lead-Free SOW-16 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS* Compliant Version of AT65-0283

Schematic with Off-Chip Components



Description

M/A-COM's MAAD-007084-000100 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 a SOW-16 plastic surface mount package. The MAAD-007084-000100 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required.

Pin Configuration

Pin No.	Function	Pin No.	Function
1	RF	9	C8
2	GND	10	Vcc
3	GND	11	Vee
4	GND	12	C4
5	GND	13	C2
6	GND	14	C1
7	GND	15	C0.5
8	RF	16	GND

Ordering Information

Part Number	Package
MAAD-007084-000100	Bulk Packaging
MAAD-007084-0001TR	1000 piece reel
MAAD-007084-0001TB	Sample Test Board

Note: Reference Application Note M513 for reel size information.
Note: Die quantity varies.

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

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

• **North America** Tel: 800.366.2266 / Fax: 978.366.2266
• **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
• **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Electrical Specifications: T_A = 25°C, Z_0 = 50Ω

Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Insertion Loss	—	DC - 1.0 GHz DC - 2.0 GHz	dB dB	— —	2.5 2.7	2.7 3.0
Attenuation Accuracy	Any Bit Any Combination of Bits	DC - 2.0 GHz DC -2.0 GHz	dB dB	— —	— —	±(.3 +4% of atten) ± (.3 +6% of atten)
VSWR	Full Range	DC - 2.0 GHz	Ratio	—	1.5:1	2:1
Switching Speed[1]	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 - 2.0 GHz	dBm dBm	— —	+21 +29	— —
Input IP_3	Two-tone inputs up to +5 dBm	50 MHz 0.5-2.0 GHz	dB dB	— —	+35 +48	— —
Vcc Vee	— —	— —	V 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 V	0.0 2.0	— —	0.8 5.0
Iin (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[2] (Additional Supply Current Per TTL Input Pin)	V_{CC} = Max, Vcntrl = V_{CC} - 2.1 V	—	mA	—	—	1.0
I_{EE}	V_{EE} min to max, Vin = V_{IL} or V_{IH}	—	mA	-1.0	-0.2	—

1. Decoupling capacitors (.01 µF) are required on power supply lines.
2. For calculating ΔIcc, the number of TTL input pins is 6.

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 ≤ V_{CC} - V_{EE} ≤ 14.5V
Vin[5]	-0.5V ≤ Vin ≤ V_{CC} + 0.5V
Operating Temperature	-40ºC to +85ºC
Storage Temperature	-65ºC to +125ºC

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.

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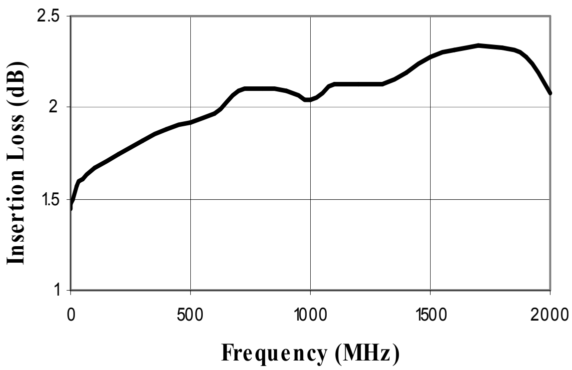
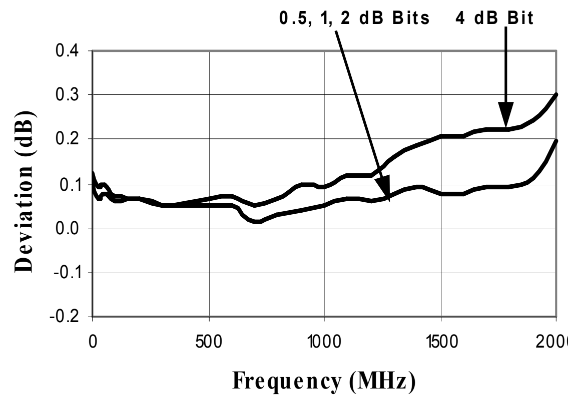
Typical Performance Curves

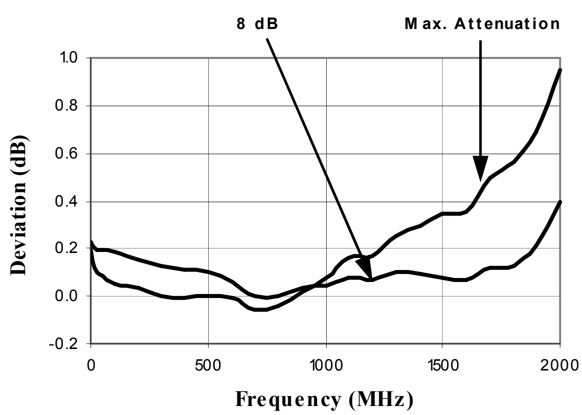
Insertion Loss



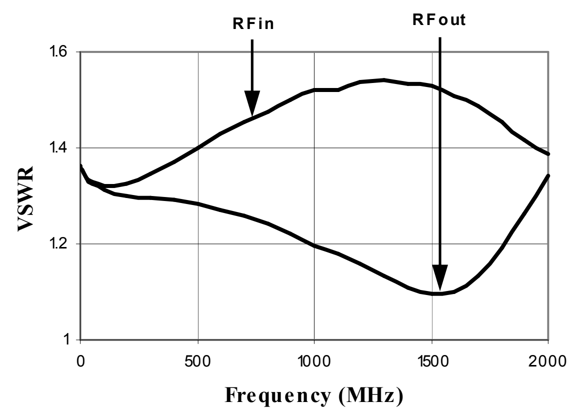
Attenuation Accuracy 0.5, 1, 2, and 4 dB Bits



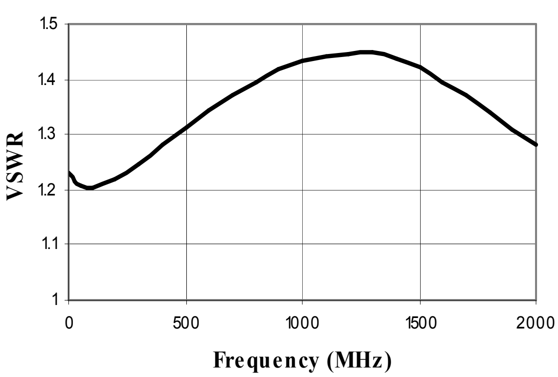
Attenuation Accuracy 8 dB Bit and Max. Attenuation



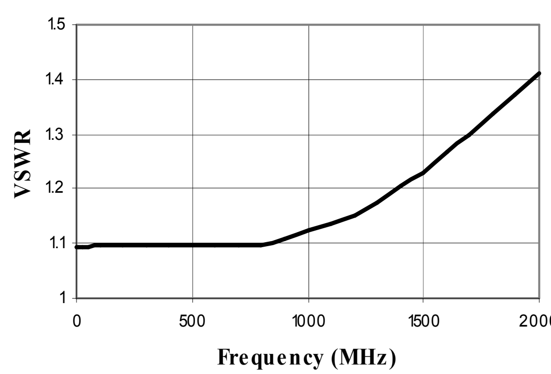
VSWR @ Insertion Loss



VSWR RF OUT 0.5, 1, 2, and 4 dB Bits



VSWR RF IN 0.5, 1, 2, 4, 8 dB Bits and Max. Attenuation



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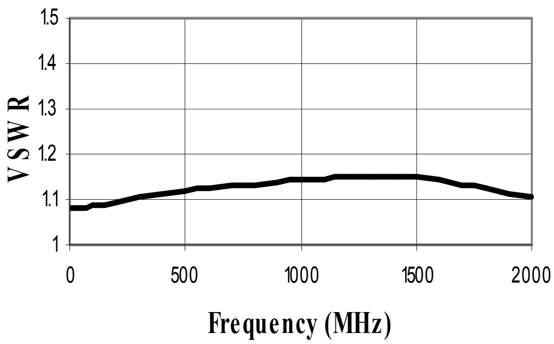
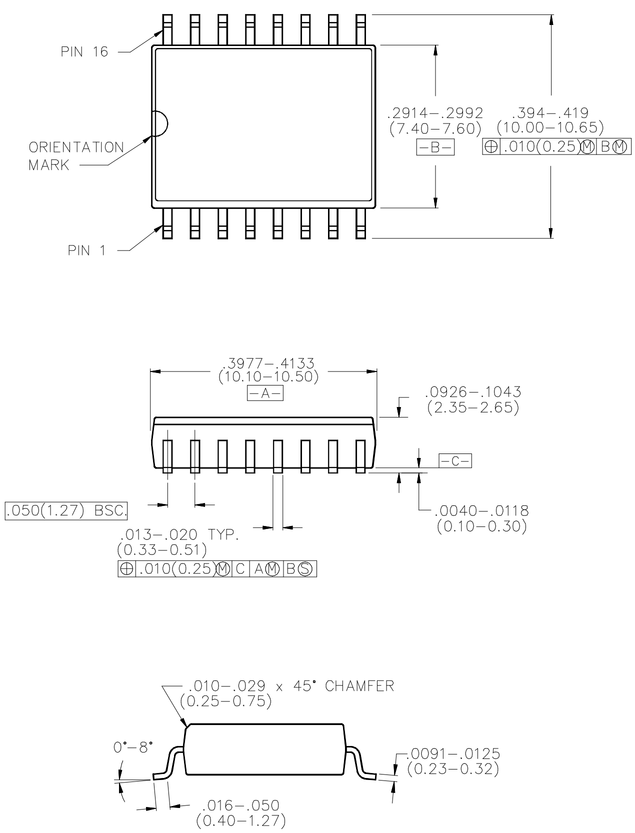
Typical Performance Curves

VSWR RF OUT 8 dB Bit and Max. Attenuation



Lead-Free, SOW-16†



Package outline conforms to JEDEC standard MS-013AA.

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

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