

Digital Attenuator 31.5 dB, 6-Bit, TTL Driver, DC-4.0 GHz

Rev. V5

Electrical Specifications: $T_A = +25^\circ\text{C}$, $V_{ee} = -5\text{ V} \pm 0.25\text{ V}$, $V_{cc} = +5\text{ V} \pm 0.25\text{ V}$

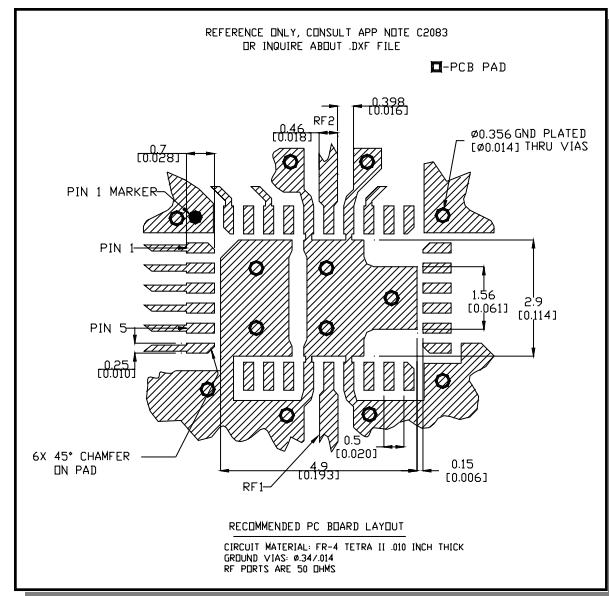
Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Insertion Loss	—	DC - 4.0 GHz	dB	—	4.5	5.1
Attenuation Accuracy	Individual Bits 0.5-1-2-4-8-16 dB Any Combination of Bits 1 to 31.5 dB	DC - 4.0 GHz DC - 4.0 GHz	dB dB	— —	— —	$\pm(.3 + 7\%$ of atten setting) $\pm(.5 + 8\%$ of atten setting)
VSWR	Full Range	DC - 4.0 GHz	Ratio	—	2.0:1	2.2:1
Switching Speed	50% Cntl to 90%/10% RF 10% to 90% or 90% to 10%	— —	ns ns	— —	75 20	— —
1 dB Compression	— —	50 MHz 0.5 - 4.0 GHz	dBm dBm	— —	+21 +24	— —
Input IP ₃	Two-tone inputs up to +5 dBm	50 MHz 0.5-4.0 GHz	dBm dBm	— —	+35 +48	— —
V _{IL} V _{IH}	LOW-level input voltage HIGH-level input voltage	— —	V V	0.0 2.0	— —	0.8 5.0
I _{in} (Input Leakage Current)	V _{in} = V _{CC} or GND	—	uA	-1.0	—	1.0
I _{cc} (Quiescent Supply Current)	V _{cntrl} = V _{CC} or GND	—	uA	—	250	400
ΔI_{cc} (Additional Supply Current Per TTL Input Pin)	V _{CC} = Max, V _{cntrl} = V _{CC} - 2.1 V	—	mA	—	—	1.0
I _{EE}	V _{EE} min to max, V _{in} = V _{IL} or V _{IH}	—	mA	-1.0	-0.2	—
Thermal Resistance θ_{jc}	—	—	$^\circ\text{C/W}$	—	15	—

Absolute Maximum Ratings^{3,4}

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 4.0 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
V _{in} ⁵	-0.5V ≤ V _{in} ≤ V _{CC} + 0.5V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

- 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 Configuration⁶



6. Application Note S2083 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.

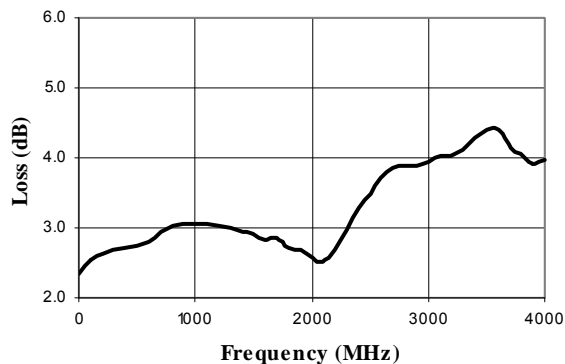
Truth Table (Digital Attenuator)

C16	C8	C4	C2	C1	C0.5	Attenuation
0	0	0	0	0	0	Loss, Reference
0	0	0	0	0	1	0.5 dB
0	0	0	0	1	0	1.0 dB
0	0	0	1	0	0	2.0 dB
0	0	1	0	0	0	4.0 dB
0	1	0	0	0	0	8.0 dB
1	0	0	0	0	0	16.0 dB
1	1	1	1	1	1	31.5 dB

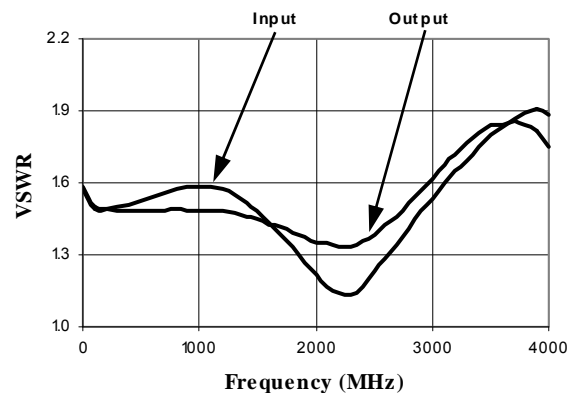
0 = TTL Low; 1 = TTL High

Typical Performance Curves

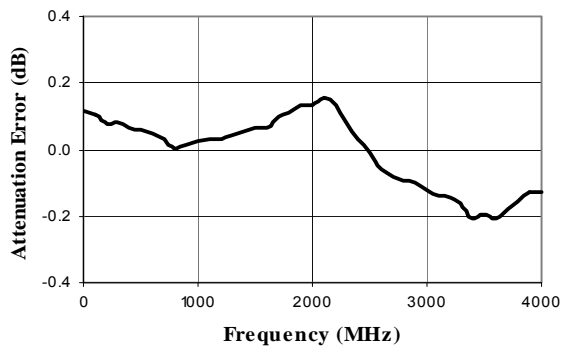
Insertion Loss



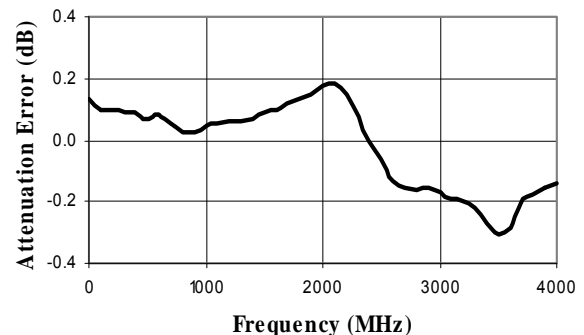
VSWR @ Insertion Loss



Attenuation Error, 0.5 dB Bit

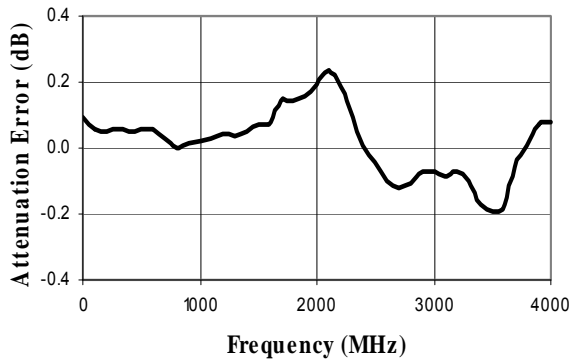


Attenuation Error, 1 dB Bit

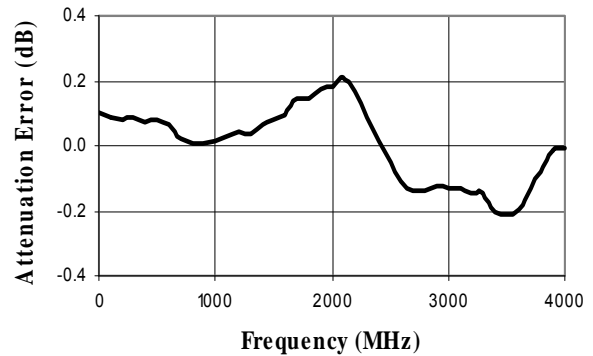


Typical Performance Curves

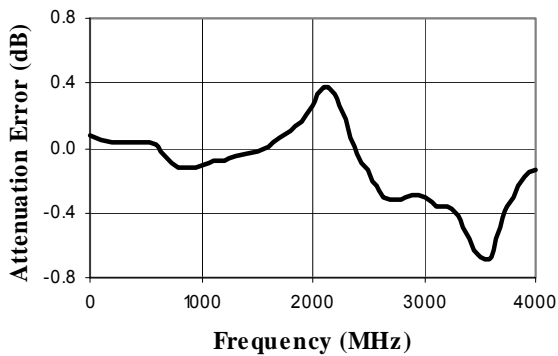
Attenuation Error, 2 dB Bit



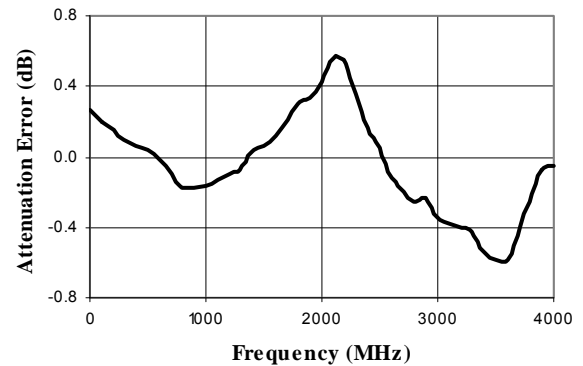
Attenuation Error, 4 dB Bit



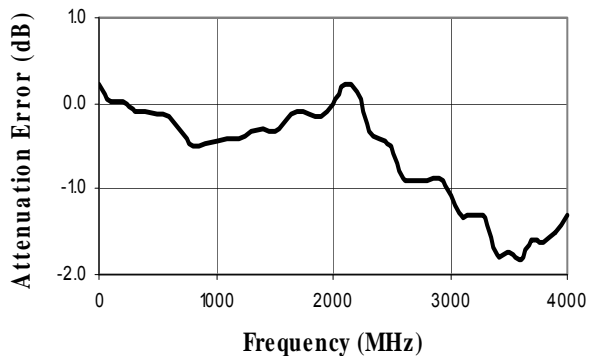
Attenuation Error, 8 dB Bit



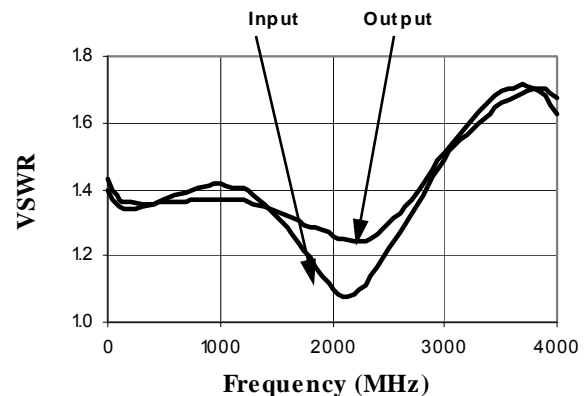
Attenuation Error, 16 dB Bit



Attenuation Error, Max. Attenuation

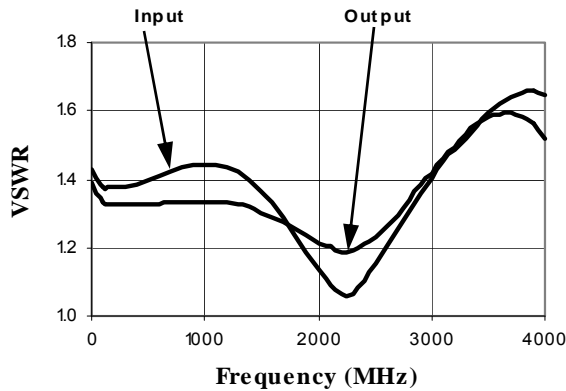


VSWR, 0.5 dB Bit

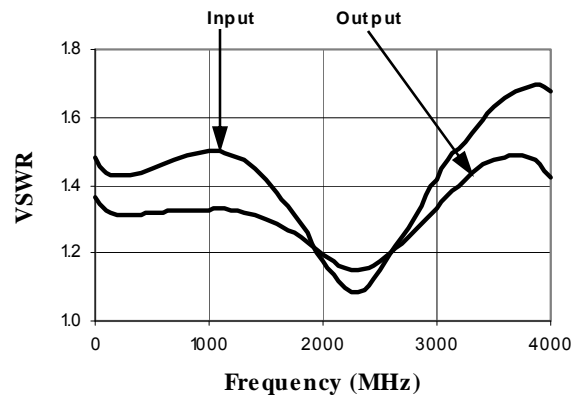


Typical Performance Curves

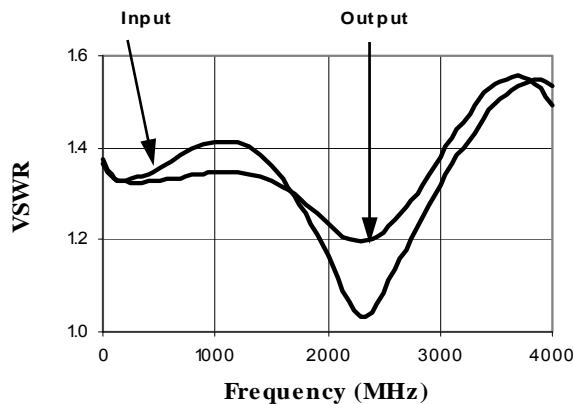
VSWR, 1 dB Bit



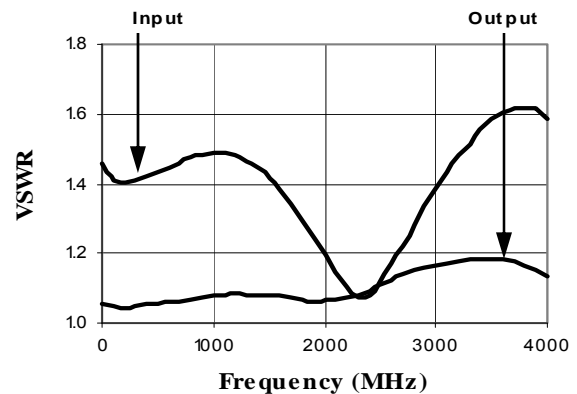
VSWR, 2 dB Bit



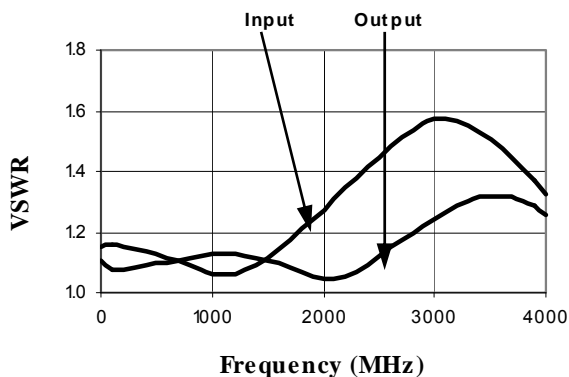
VSWR, 4 dB Bit



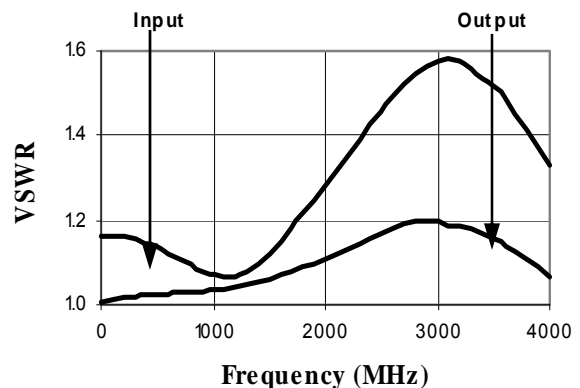
VSWR, 8 dB Bit



VSWR, 16 dB Bit

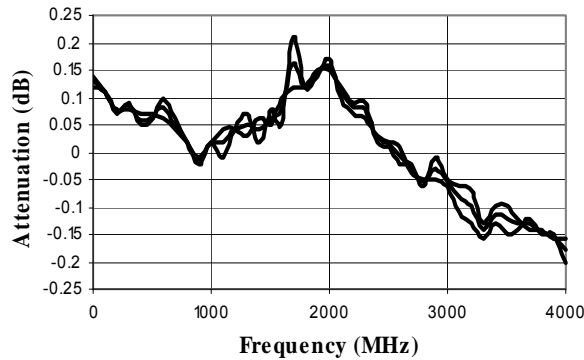


VSWR, Max. Attenuation

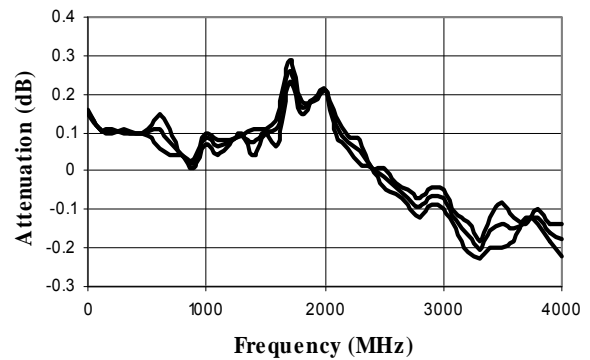


Typical Performance Curves

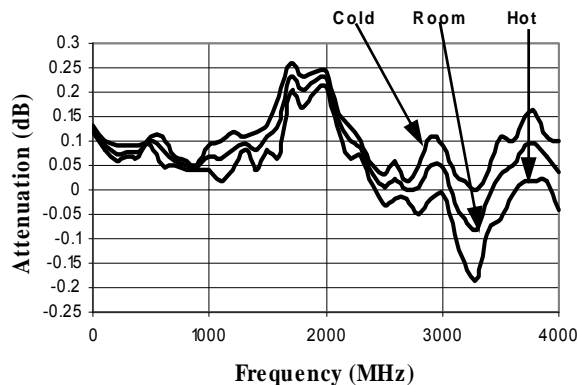
Typical Attenuation Deviation vs. Temperature for 0.5 dB Bit



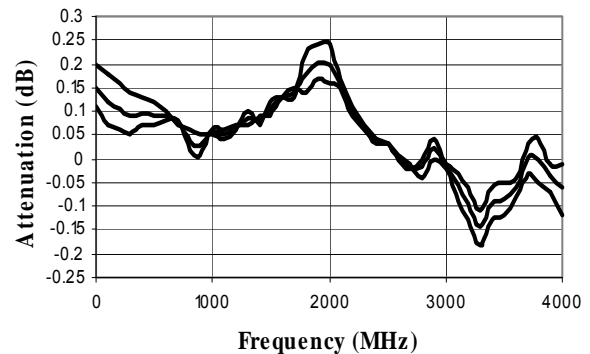
Typical Attenuation Deviation vs. Temperature for 1 dB Bit



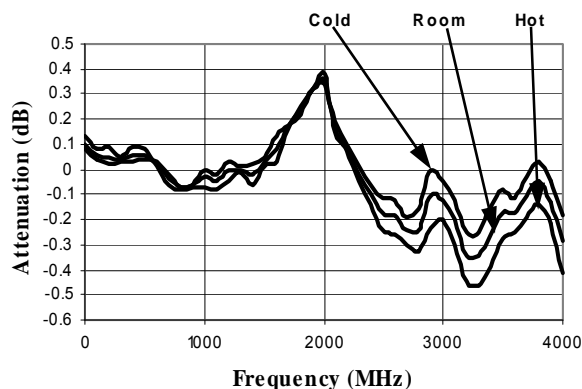
Typical Attenuation Deviation vs. Temperature for 2 dB Bit



Typical Attenuation Deviation vs. Temperature for 4 dB Bit



Typical Attenuation Deviation vs. Temperature for 8 dB Bit



Typical Attenuation Deviation vs. Temperature for 16 dB Bit

