

# Digital Attenuator, 31.5 dB, 6-Bit, TTL Driver DC - 2 GHz



**MAATCC0005**

Rev. V5

## Features

- Attenuation: 0.5 dB Steps to 31.5 dB
- Low DC Power Consumption
- Integral TTL Driver
- 50  $\Omega$  Impedance
- Lead-Free SMT Plastic SOIC, Wide Body, SOW-24
- Test Boards are Available
- Tape & Reel Packaging Available
- RoHS\* Compliant Version of AT65-0107

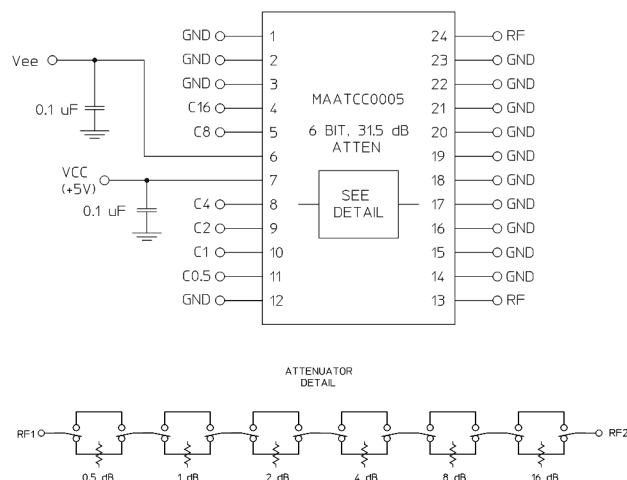
## Applications

- Aerospace & Defense
- ISM

## Description

The MAATCC0005 is a GaAs FET 6-bit digital attenuator with a 0.5 dB minimum step size and a 31.5 dB total attenuation range. This device is in a SOIC-24 wide body, plastic surface mount package. This attenuator is ideally suited for use where accuracy, fast speed, and very low power consumption are required.

## Schematic with Off-Chip Components



## Pin Configuration

Pin #	Function
1,2,3,12,14-23	GND
4	C16
5	C8
6	V <sub>EE</sub>
7	V <sub>CC</sub>
8	C4
9	C2
10	C1
11	C0.5
13	RF
24	RF

## Ordering Information<sup>1</sup>

Part Number	Package
MAATCC0005	Bulk Packaging
MAATCC0005TR	1000 piece reel
MAATCC0005-TB	Sample Test Board

1. Reference Application Note M513 for reel size information.

\* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

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## Electrical Specifications: $T_A = 25^\circ\text{C}$

Parameter	Test Conditions	Units	Min	Typ	Max
Insertion Loss	DC - 1 GHz DC - 2 GHz	dB	—	3.1 3.6	3.6 4.2
Attenuation Accuracy	Any Bit or Combination of Bits DC - 2 GHz	dB	$\pm(0.3 + 4\% \text{ of atten. max})$		
VSWR	Full Range, DC - 2 GHz	Ratio	—	1.8:1	2:1
Switching Speed	50% Cntl to 90%/10% RF 10% to 90% or 90% to 10%	ns	—	75 20	150 50
1 dB Compression	50 MHz 0.5 - 2.0 GHz	dBm	—	+21 +29	—
Input $IP_3$	Two-tone inputs up to +5 dBm 50 MHz 0.5 - 2.0 GHz	dB	—	+35 +48	—
$V_{CC}^2$ $V_{EE}^2$	—	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
Input Leakage Current	$V_{in} = V_{CC}$ or GND	$\mu\text{A}$	-1.0	—	1.0
Quiescent Supply Current	$V_{cntrl} = V_{CC}$ or GND	$\mu\text{A}$	—	250	400
$\Delta I_{CC}$ (Additional Supply Current Per TTL Input Pin)	$V_{CC} = \text{Max}$ , $V_{cntrl} = V_{CC} - 2.1 \text{ V}$	mA	—	—	1.0
IEE	$V_{EE}$ min to max, $V_{in} = V_{IL}$ or $V_{IH}$	mA	-1.0	-0.2	—

2. Decoupling capacitors (0.1  $\mu\text{F}$ ) are required on Power Supply lines.

## Absolute Maximum Ratings<sup>3,4</sup>

Parameter	Absolute Maximum
Input Power 0.05 GHz 0.5 - 2.0 GHz	+27 dBm +34 dBm
$V_{CC}$	$-0.5\text{V} \leq V_{CC} \leq +7.0\text{V}$
$V_{EE}$	$-8.5\text{V} \leq V_{EE} \leq +0.5\text{V}$
$V_{CC} - V_{EE}$	$-0.5\text{V} \leq V_{CC} - V_{EE} \leq 14.5\text{V}$
$V_{in}^5$	$-0.5\text{V} \leq V_{in} \leq V_{CC} + 0.5\text{V}$
Operating Temperature	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temperature	$-65^\circ\text{C}$ to $+125^\circ\text{C}$

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM 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.

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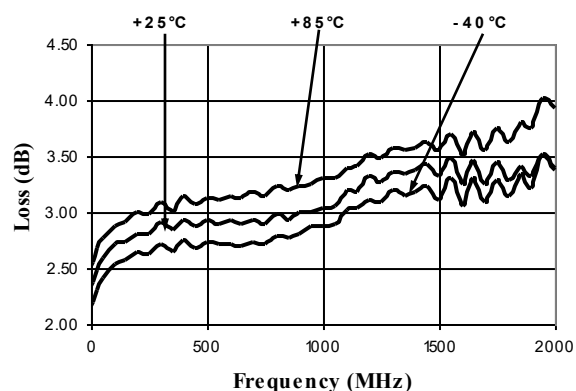
## Truth Table (Digital Attenuator)

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

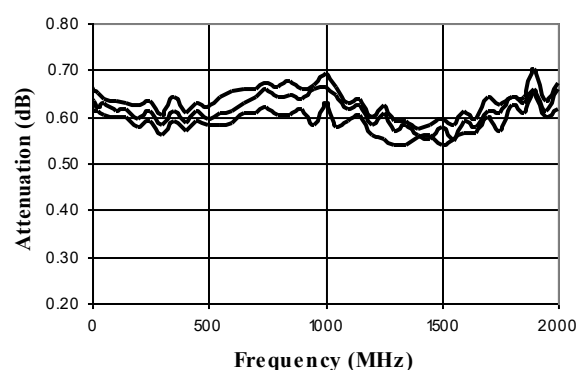
0 = TTL Low; 1 = TTL High

## Typical Performance Curves

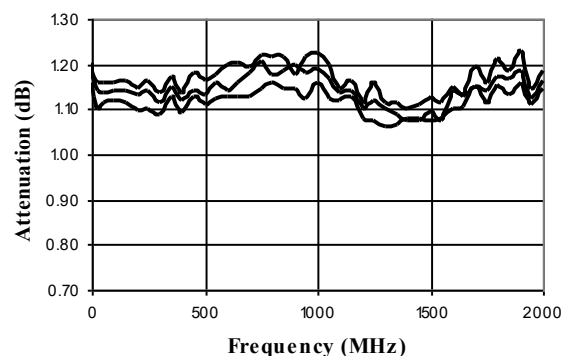
### Loss vs. Temperature



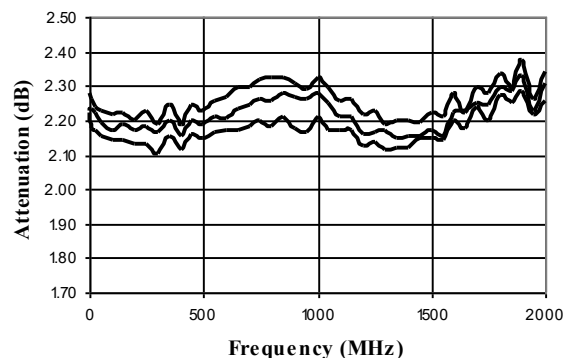
### 0.5 dB Bit vs. Temperature



### 1 dB Bit vs. Temperature

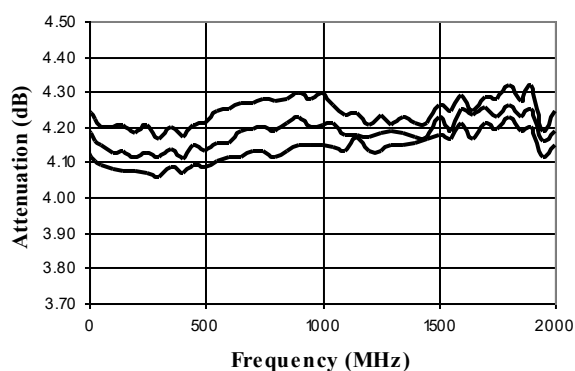


### 2 dB Bit vs. Temperature

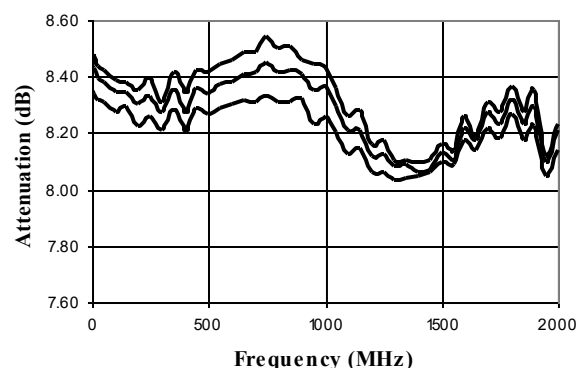


## Typical Performance Curves

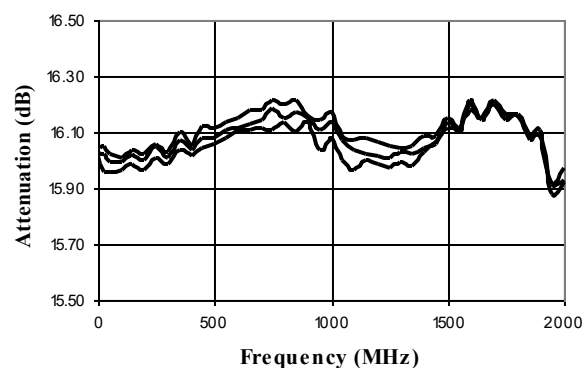
**4 dB Bit vs. Temperature**



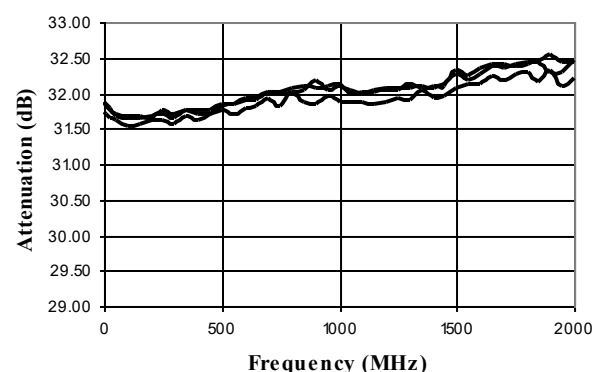
**8 dB Bit vs. Temperature**



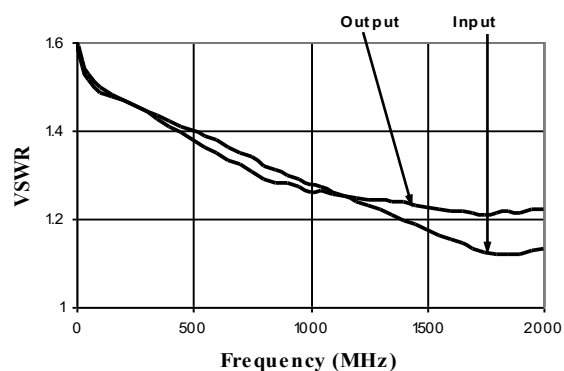
**16 dB Bit vs. Temperature**



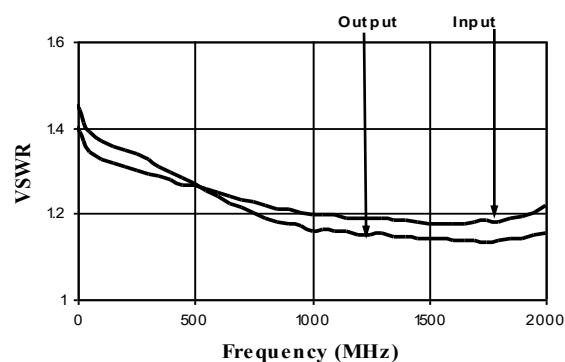
**Max Attenuation vs. Temperature**



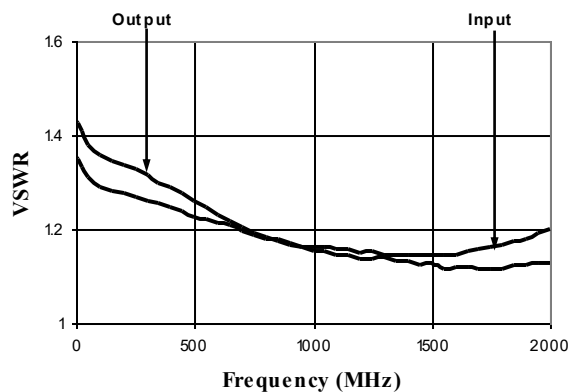
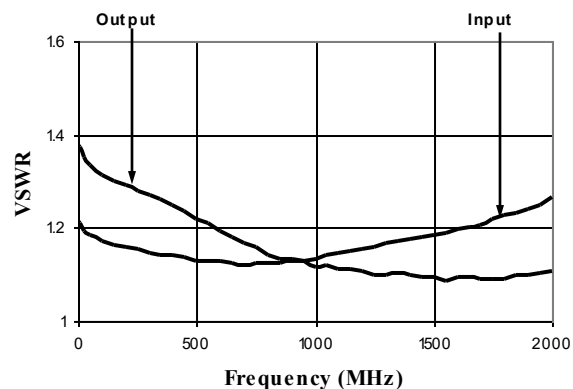
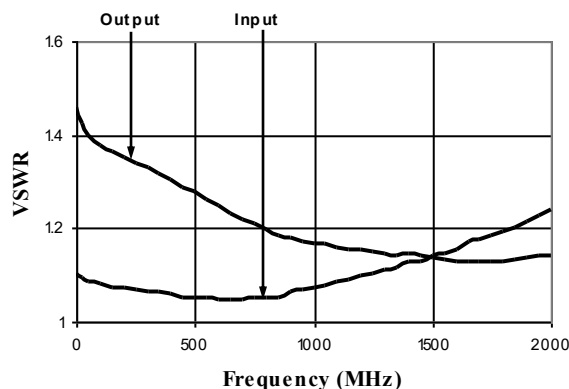
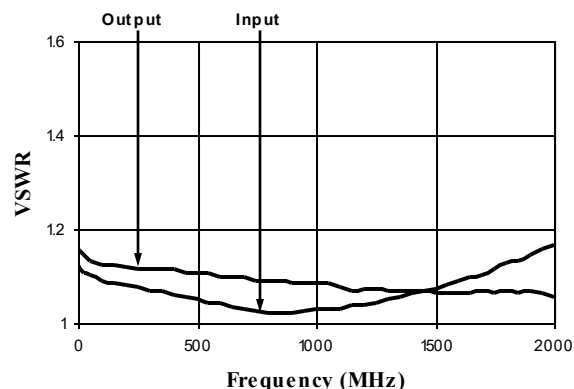
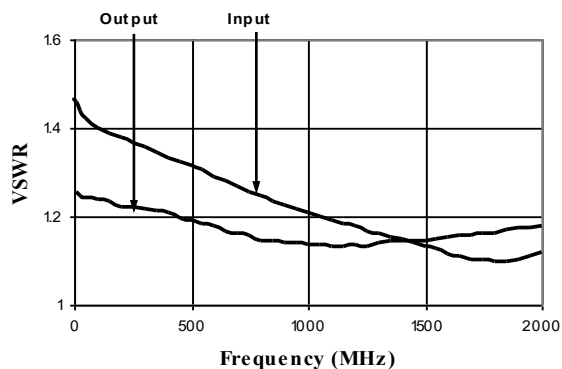
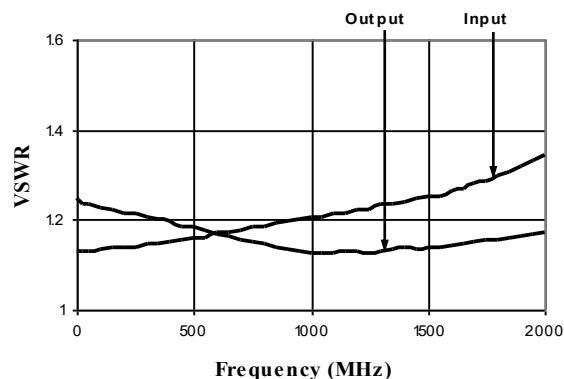
**VSWR @ Insertion Loss**



**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, Maximum Attenuation**


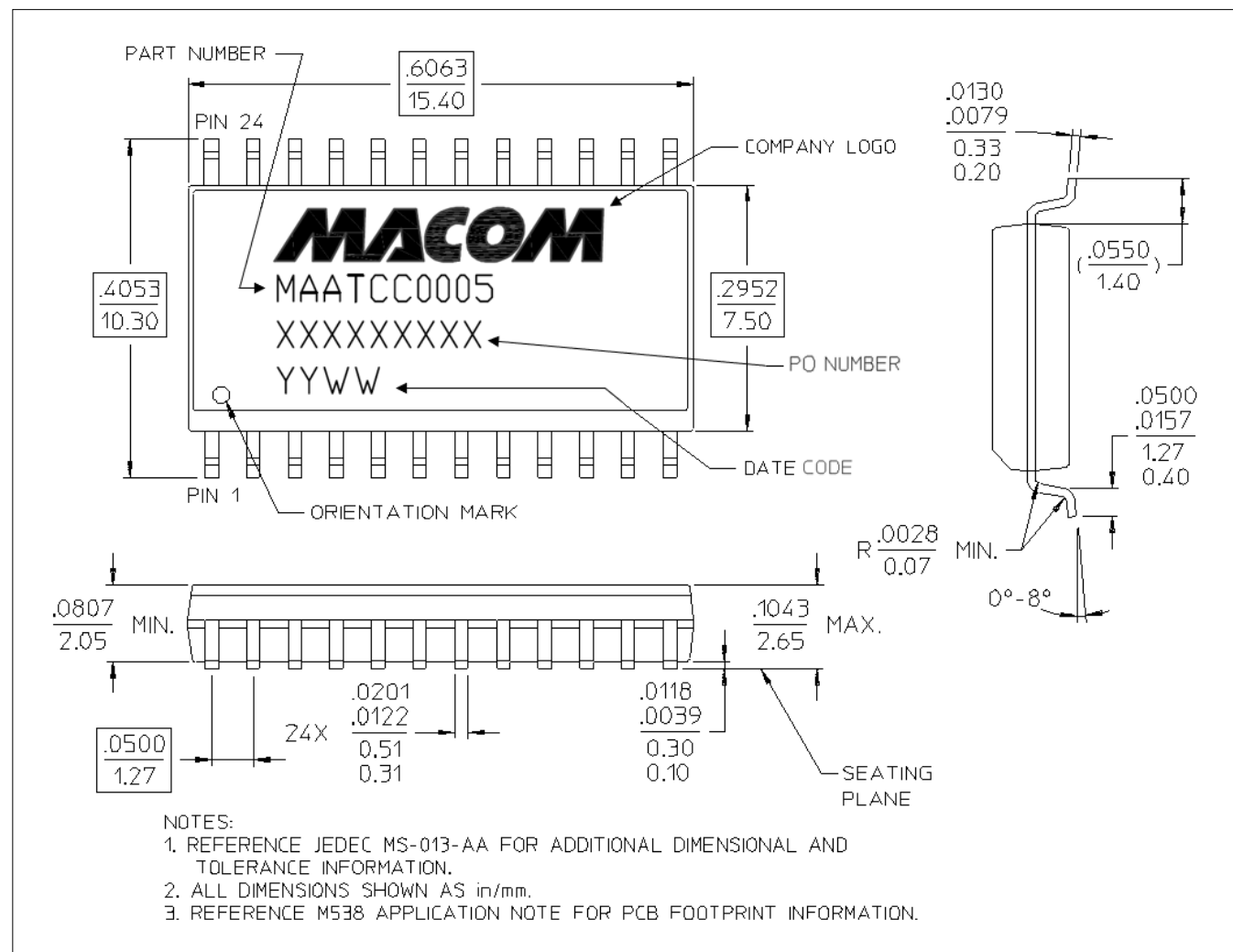
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## Lead-Free, SOW-24<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.

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