

## Features

- Attenuation: 0.5 dB Steps to 31.5 dB
- Low DC Power Consumption
- Plastic SOIC, Wide Body, SMT Package
- Integral TTL Driver
- 50 ohm Impedance
- Test Boards are Available
- Tape and Reel Packaging Available
- Lead-Free SOW-24 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT65-0107

## Description

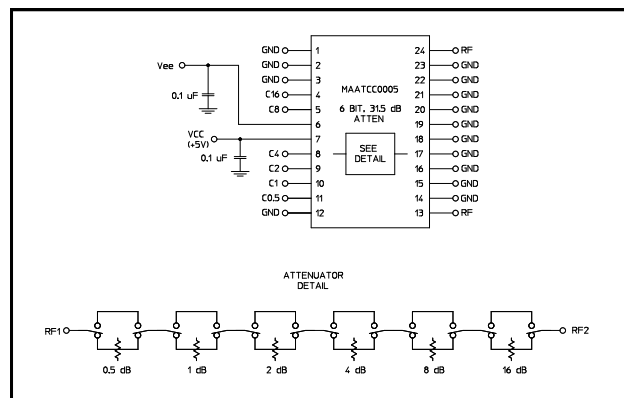
M/A-COM's MAATCC0005 is a GaAs FET 6-bit digital attenuator with a 0.5 dB minimum step size and a 31.5 dB total attenuation range. This device is in a SOIC-24 wide body, plastic surface mount package. The MAATCC0005 is ideally suited for use where accuracy, fast speed, very low power consumption and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

## Ordering Information

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

Note: Reference Application Note M513 for reel size information.

## Schematic with Off-Chip Components



## Pin Configuration

Pin No.	Function	Pin No.	Function
1	GND	13	RF
2	GND	14	GND
3	GND	15	GND
4	C16	16	GND
5	C8	17	GND
6	Vee	18	GND
7	Vcc	19	GND
8	C4	20	GND
9	C2	21	GND
10	C1	22	GND
11	C0.5	23	GND
12	GND	24	RF

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

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

Rev. V4

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

Parameter	Test Conditions	Frequency	Units	Min	Typ	Max
Insertion Loss	—	DC - 1.0 GHz	dB	—	3.1	3.6
		DC - 2.0 GHz	dB	—	3.6	4.2
Attenuation Accuracy	Any Bit or Combination of Bits	DC - 2.0 GHz	dB	—	—	$\pm(.3 + 4\% \text{ of atten.})$
VSWR	Full Range	DC - 2.0 GHz	Ratio	—	1.8:1	2:1
Switching Speed	50% Cntl to 90%/10% RF 10% to 90% or 90% to 10%	—	nS	—	75	150
		—	nS	—	20	50
1 dB Compression	—	50 MHz 0.5 - 2.0 GHz	dBm	—	+21	—
			dBm	—	+29	—
Input $IP_3$	Two-tone inputs up to +5 dBm	50 MHz 0.5-2.0 GHz	dB	—	+35	—
			dB	—	+48	—
$V_{CC}^1$	—	—	V	4.75	5.0	5.25
$V_{EE}^1$	—	—	V	-8.0	-5.0	-4.75
$V_{IL}$ $V_{IH}$	LOW-level input voltage HIGH-level input voltage	—	V	0.0	—	0.8
		—	V	2.0	—	5.0
$I_{in}$ (Input Leakage Current)	$V_{in} = V_{CC}$ or GND	—	$\mu\text{A}$	-1.0	—	1.0
$I_{CC}$ (Quiescent Supply Current)	$V_{ctrl} = V_{CC}$ or GND	—	$\mu\text{A}$	—	250	400
$\Delta I_{CC}$ (Additional Supply Current Per TTL Input Pin)	$V_{CC} = \text{Max}$ , $V_{ctrl} = V_{CC} - 2.1 \text{ V}$	—	mA	—	—	1.0
IEE	$V_{EE}$ min to max, $V_{in} = V_{IL}$ or $V_{IH}$	—	mA	-1.0	-0.2	—

1. Decoupling capacitors (.1  $\mu\text{F}$ ) are required on Power Supply lines.

### Absolute Maximum Ratings<sup>2,3</sup>

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 2.0 GHz	+27 dBm +34 dBm
$V_{CC}$	$-0.5\text{V} \leq V_{CC} \leq +7.0\text{V}$
$V_{EE}$	$-8.5\text{V} \leq V_{EE} \leq +0.5\text{V}$
$V_{CC} - V_{EE}$	$-0.5\text{V} \leq V_{CC} - V_{EE} \leq 14.5\text{V}$
$V_{in}^4$	$-0.5\text{V} \leq V_{in} \leq V_{CC} + 0.5\text{V}$
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.
- 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.

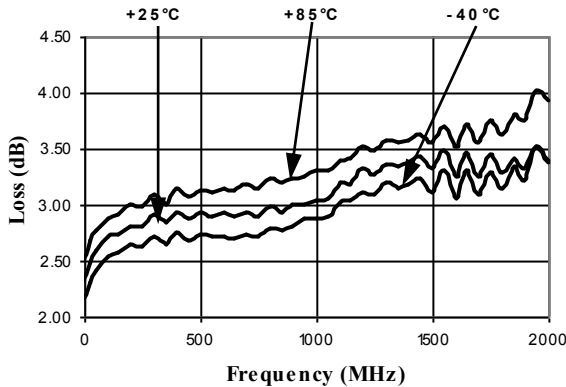
## Truth Table (Digital Attenuator)

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

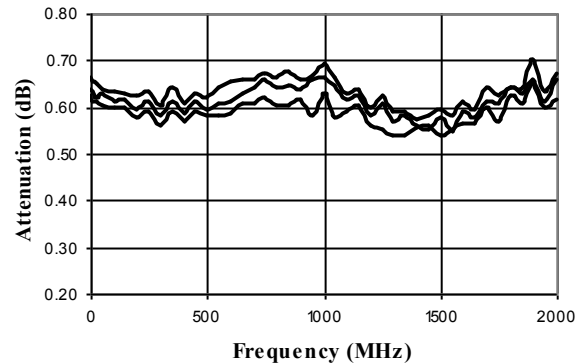
0 = TTL Low; 1 = TTL High

## Typical Performance Curves

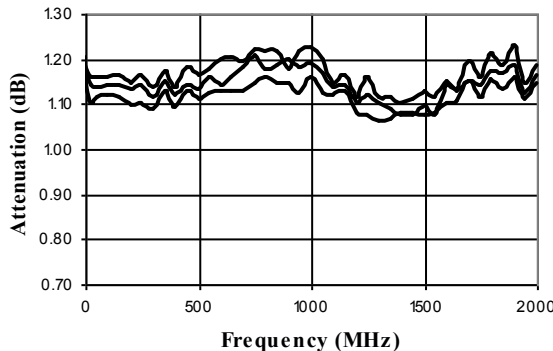
### Loss vs. Temperature



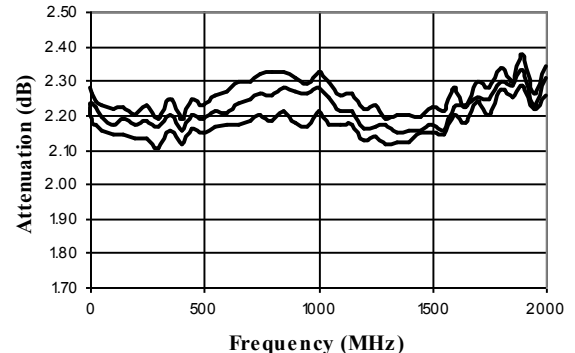
### 0.5 dB Bit vs. Temperature



### 1 dB Bit vs. Temperature

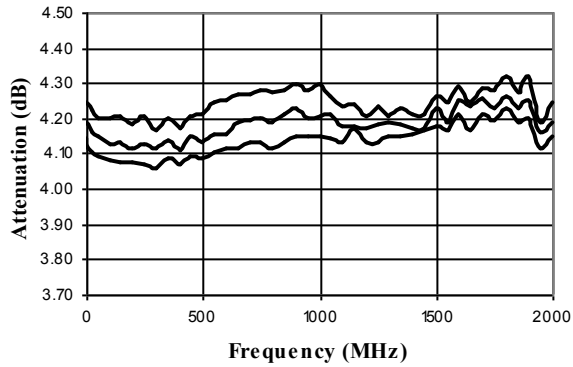


### 2 dB Bit vs. Temperature

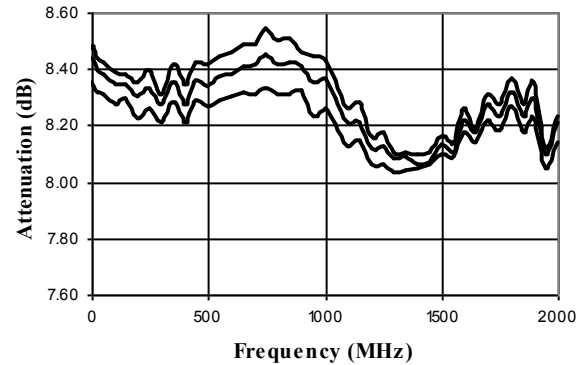


## Typical Performance Curves

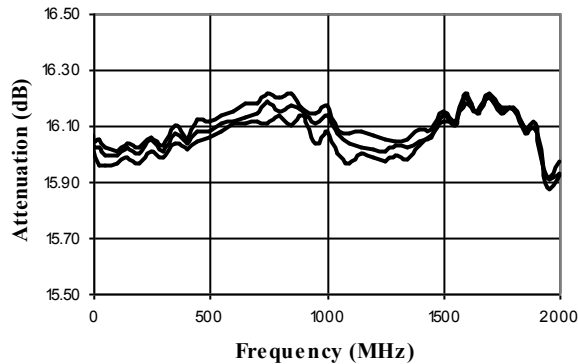
**4 dB Bit vs. Temperature**



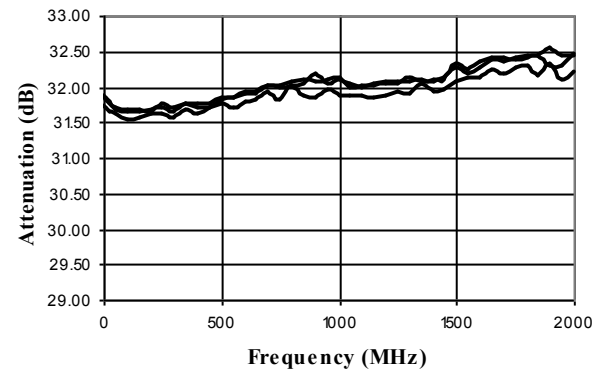
**8 dB Bit vs. Temperature**



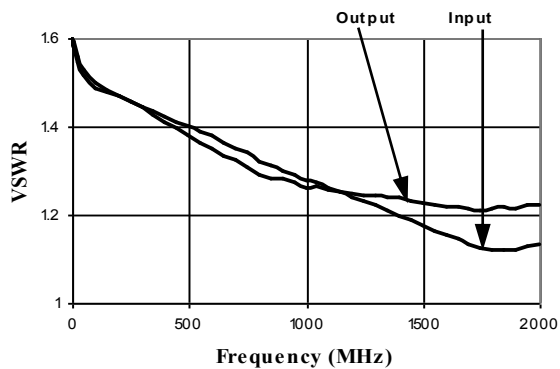
**16 dB Bit vs. Temperature**



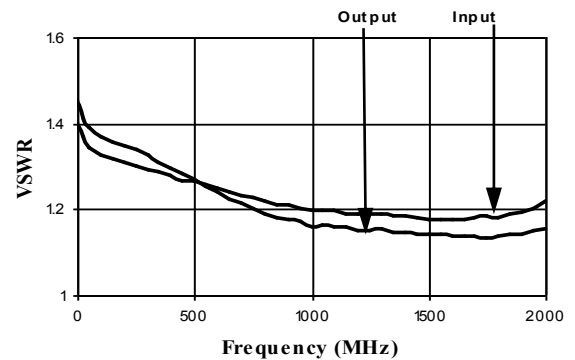
**Max Attenuation vs. Temperature**



**VSWR @ Insertion Loss**

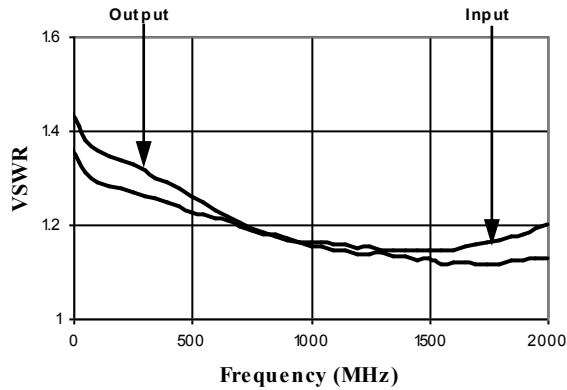


**VSWR, 0.5 dB Bit**

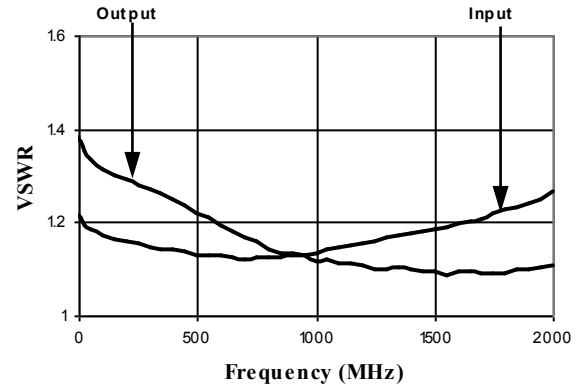


## Typical Performance Curves

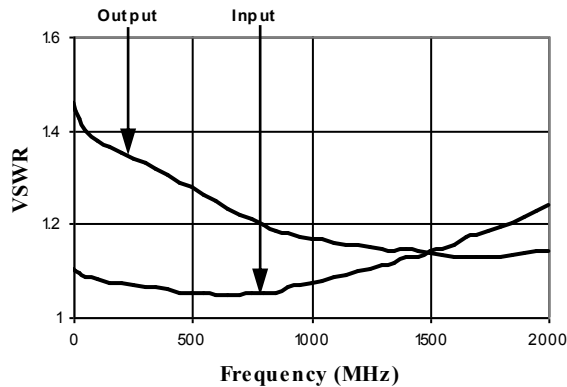
**VSWR, 1 dB Bit**



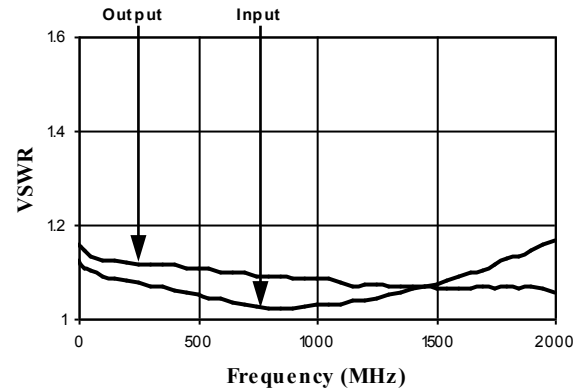
**VSWR, 2 dB Bit**



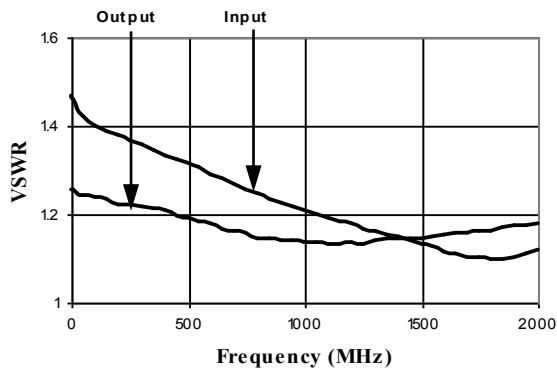
**VSWR, 4 dB Bit**



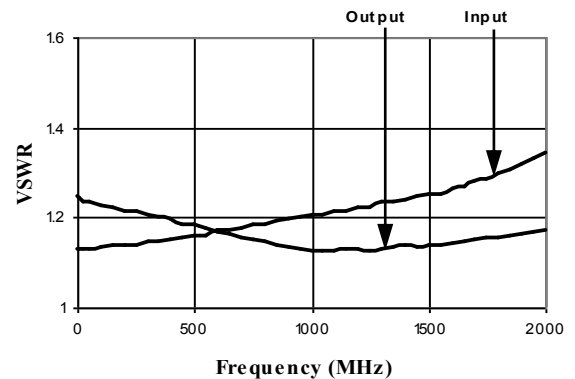
**VSWR, 8 dB Bit**



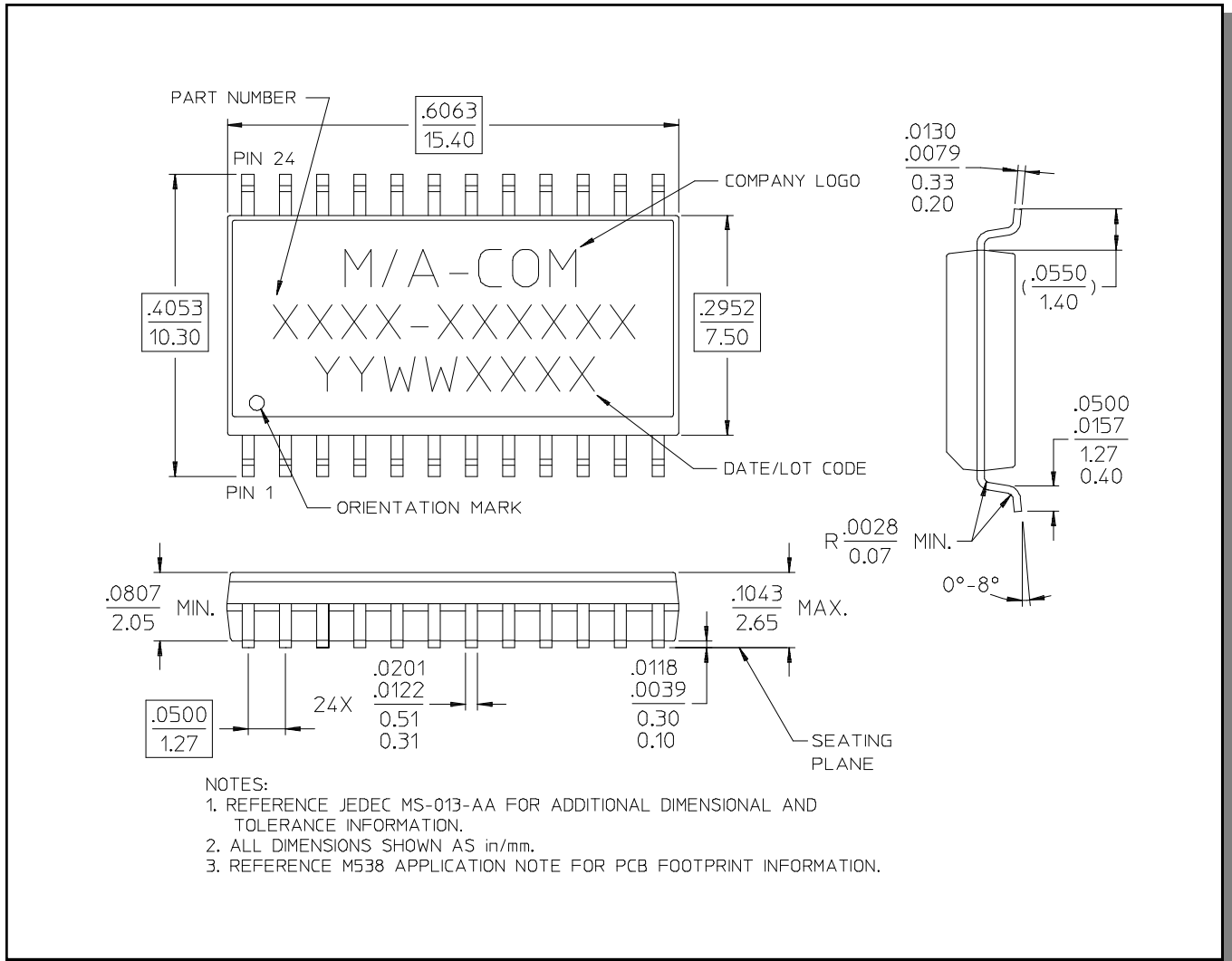
**VSWR, 16 dB Bit**



**VSWR, Maximum Attenuation**



**Lead-Free, SOW-24<sup>†</sup>**



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

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