

**Digital Attenuator, 15.5 dB, 5-Bit  
DC - 2.0 GHz**

**MAATSS0021  
V1**

**Features**

- 0.5 dB Attenuation Steps to 15.5 dB
- Ultra Low DC Power Consumption
- Low Intermodulation Product: +45 dBm IP3
- Tape and Reel Packaging Available
- Temperature Stability: +/-0.15 dB from -40°C to +85°C
- Lead-Free SOIC-16 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT-280

**Description**

M/A-COM's MAATSS0021 is a 5-bit, 0.5-dB step GaAs MMIC digital attenuator in a lead-free SOIC-16 surface mount plastic package. The MAATSS0021 is ideally suited for use where high accuracy, fast switching, very low power consumption and low intermodulation products are required at a low cost.

Typical applications include radio and cellular equipment, wireless LANS, GPS equipment and other gain/level control circuits.

The MAATSS0021 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

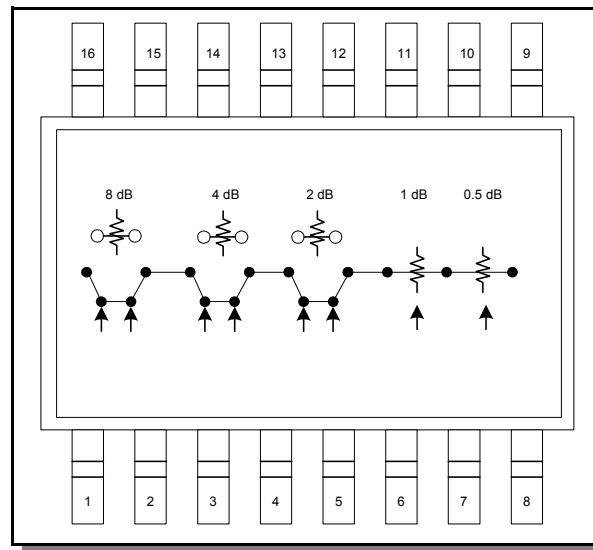
**Ordering Information**

Part Number	Package
MAATSS0021	Bulk Packaging
MAATSS0021TR-3000	3000 piece reel
MAATSS0021SMB	Sample Board

Note: Reference Application Note M513 for reel size information.

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

**Functional Schematic**



**Pin Configuration**

Pin No.	Function	Pin No.	Function
1	VC1	9	RF2
2	$\overline{VC1}$	10	Ground
3	VC2	11	Ground
4	$\overline{VC2}$	12	Ground
5	VC3	13	Ground
6	$\overline{VC3}$	14	Ground
7	$\overline{VC4}$	15	Ground
8	$\overline{VC5}$	16	RF1

**Absolute Maximum Ratings<sup>1,2</sup>**

Parameter	Absolute Maximum
Input Power: 0.05 GHz 0.5 - 2.0 GHz	+27 dBm +34 dBm
Control Voltage	-8.5 V ≤ V <sub>C</sub> ≤ +5 V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

1. Exceeding any one or combination of these limits may cause permanent damage to this device.
2. M/A-COM does not recommend sustained operation near these survivability limits.

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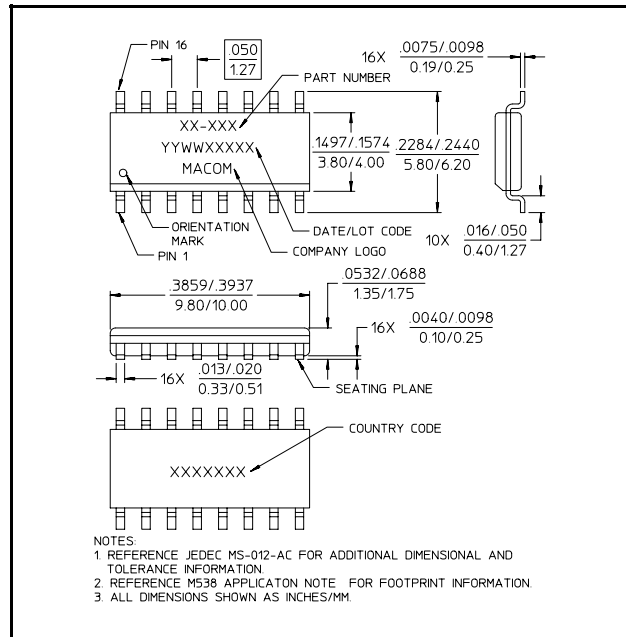
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**Electrical Specifications:  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50 \Omega$**

Parameter	Test Conditions	Units	Min	Typ	Max
Reference Insertion Loss	DC - 0.1 GHz	dB	—	1.1	—
	DC - 0.5 GHz	dB	—	1.3	—
	DC - 1.0 GHz	dB	—	1.5	—
	DC - 2.0 GHz	dB	—	1.8	2.0
Attenuation Accuracy <sup>3</sup>	DC - 2.0 GHz	± (0.30 dB +3% of Attenuation Setting in dB) dB			
VSWR	(Any state)	Ratio	—	1.5:1	—
Trise, Tfall	10% to 90% RF, 90% to 10% RF	nS	—	12	—
Ton, Toff	50% Control to 90% RF, 50% Control to 10% RF	nS	—	18	—
Transients	In Band	mV	—	30	—
1 dB Compression	Input Power, 0.05 GHz	dBm	—	22	—
	Input Power, 0.5 - 2.0 GHz	dBm	—	27	—
IP <sub>2</sub>	0.05 GHz	dBm	—	53	—
	0.5 - 2.0 GHz Measured Relative to Input Power (for two-tone input power up to +5 dBm)	dBm	—	68	—
IP <sub>3</sub>	0.05 GHz	dBm	—	40	—
	0.5 - 2.0 GHz Measured Relative to Input Power (for two-tone input power up to +5 dBm)	dBm	—	45	—

3. Attenuation accuracy specifications apply with negative bias control and low inductance grounding.

**Lead-Free SOIC-16†**



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

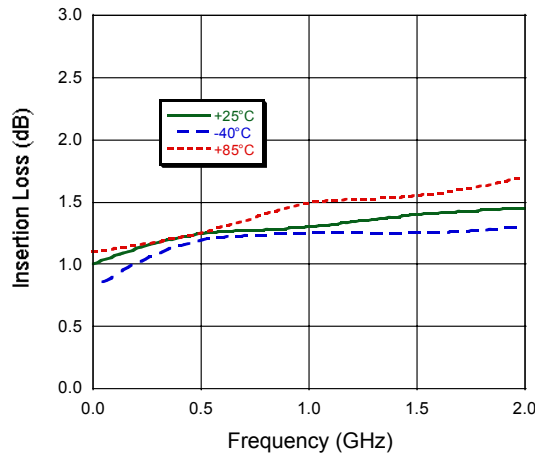
**Truth Table**

Control Inputs								
VC5	VC4	VC3	VC3	VC2	VC2	VC1	VC1	Atten.
1	1	1	0	1	0	1	0	Reference
0	1	1	0	1	0	1	0	0.5 dB
1	0	1	0	1	0	1	0	1 dB
1	1	0	1	1	0	1	0	2 dB
1	1	1	0	0	1	1	0	4 dB
1	1	1	0	1	0	0	1	8 dB
0	0	0	1	0	1	0	1	15.5 dB

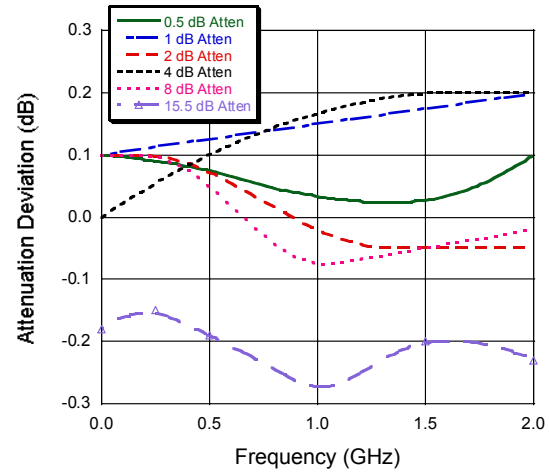
0 = Vin Low = 0 V to -0.2 V @ 20 μA maximum  
 1 = Vin High = -5 V at 20 μA to -8 V at 20 μA maximum

**Typical Performance Curves**

**Insertion Loss**



**Attenuation Accuracy**



**VSWR**

