

## Features

- 1-dB Attenuation Steps to 31 dB
- Ultra Low DC Power Consumption
- Low Intermodulation Products: IP3 = 50 dBm
- Tape and Reel Packaging Available
- Temperature Stability:  $\pm 0.15$  dB from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Lead-Free SSOP-20 Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- 260°C Reflow Compatible
- RoHS\* Compliant Version of AT-260

## Description

M/A-COM's MAATSS0020 is a 5-bit, 1-dB step GaAs MMIC digital attenuator in a lead-free SSOP-20 surface mount plastic package. The MAATSS0020 is ideally suited for use where high power 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.

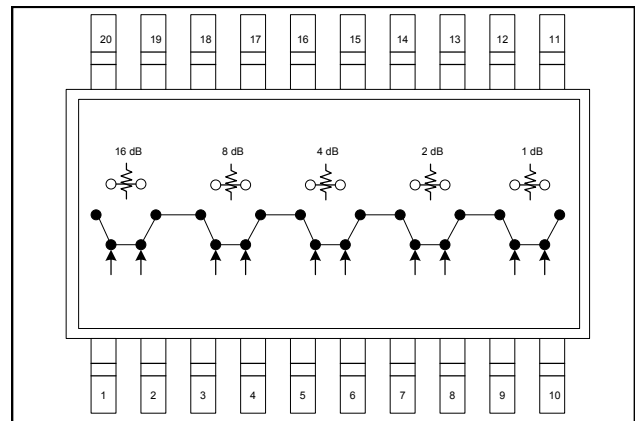
The MAATSS0020 is fabricated with a monolithic GaAs MMIC using a mature 1-micron process. The process features full chip passivation for increased performance and reliability.

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

Part Number	Package
MAATSS0020	SSOP 20-Lead
MAATSS0020TR-3000	3000 piece reel

1. Reference Application Note M513 for reel size information.

## Functional Schematic



## Pin Configuration

Pin No.	Function	Pin No.	Function
1	VC1	11	RF1
2	$\overline{\text{VC1}}$	12	Ground
3	VC2	13	Ground
4	$\overline{\text{VC2}}$	14	Ground
5	VC3	15	Ground
6	$\overline{\text{VC3}}$	16	Ground
7	VC4	17	Ground
8	$\overline{\text{VC4}}$	18	Ground
9	No Connection	19	Ground
10	$\overline{\text{VC5}}$	20	RF2

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

Parameter	Absolute Maximum
Input Power: 0.05 GHz 0.5 - 2.0 GHz	+27 dBm +34 dBm
Control Voltage	+5 V, -8.5 V
Operating Temperature	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
Storage Temperature	$-65^{\circ}\text{C}$ to $+150^{\circ}\text{C}$

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

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

## Digital Attenuator, 31 dB, 5-Bit DC - 2.0 GHz

Rev. V2

### 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	—	1.6	—
	0.1 - 0.5 GHz	dB	—	1.7	—
	0.5 - 1.0 GHz	dB	—	1.9	2.2
	1.0 - 2.0 GHz	dB	—	2.2	—
Attenuation Accuracy <sup>4</sup>	DC - 1.0 GHz DC - 2.0 GHz	$\pm (0.20\ \text{dB} + 3\% \text{ of Atten Setting in dB})\ \text{dB}$ $\pm (0.30\ \text{dB} + 3\% \text{ of Atten Setting in dB})\ \text{dB}$			
VSWR	(Any State)	Ratio	—	1.5:1	—
Trise, Tfall	10% to 90% RF, 90% to 10% RF	nS	—	8	—
Ton, Toff	50% Control to 90% RF, 50% Control to 10% RF	nS	—	15	—
Transients	In Band	mV	—	2	—
1 dB Compression	Input Power	dBm	—	20	—
	0.05 GHz 0.5 - 2.0 GHz	dBm	—	27	—
IP <sub>2</sub>	0.05 GHz	dBm	—	45	—
	0.5 - 2.0 GHz Measured Relative to Input Power (for two-tone input power up to +5 dBm)	dBm	—	60	—
IP <sub>3</sub>	0.05 GHz	dBm	—	34	—
	0.5 - 2.0 GHz Measured Relative to Input Power (for two-tone input power up to +5 dBm)	dBm	—	50	—

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

### Truth Table <sup>5</sup>

Control Inputs									Atten (dB)
VC 5	VC 4	VC 4	VC 3	VC 3	VC 2	VC 2	VC 1	VC 1	
1	1	0	1	0	1	0	1	0	Reference
0	1	0	1	0	1	0	1	0	1 dB
1	0	1	1	0	1	0	1	0	2 dB
1	1	0	0	1	1	0	1	0	4 dB
1	1	0	1	0	0	1	1	0	8 dB
1	1	0	1	0	1	0	0	1	16 dB
0	0	1	0	1	0	1	0	1	31 dB

5. 0 = Vin Low = 0 V = 0 to -0.2V @ 20  $\mu\text{A}$  maximum.  
1 = Vin High = -5V @ 20  $\mu\text{A}$  typical to -8 V @ 200  $\mu\text{A}$  maximum.

### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

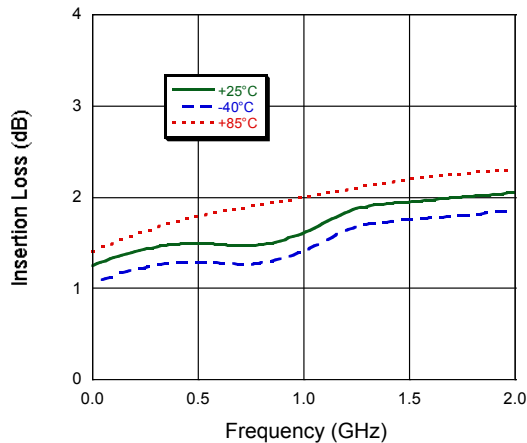
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## Digital Attenuator, 31 dB, 5-Bit DC - 2.0 GHz

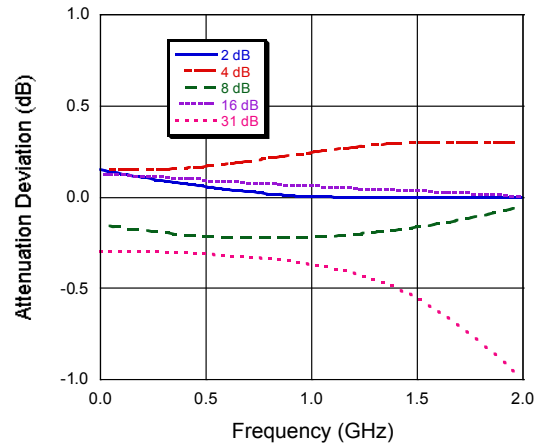
Rev. V2

### Typical Performance Curves

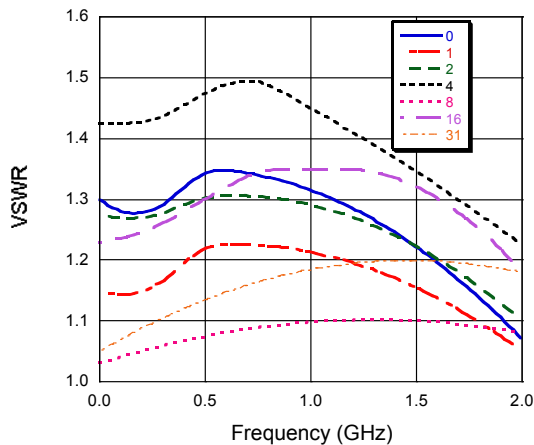
Insertion Loss



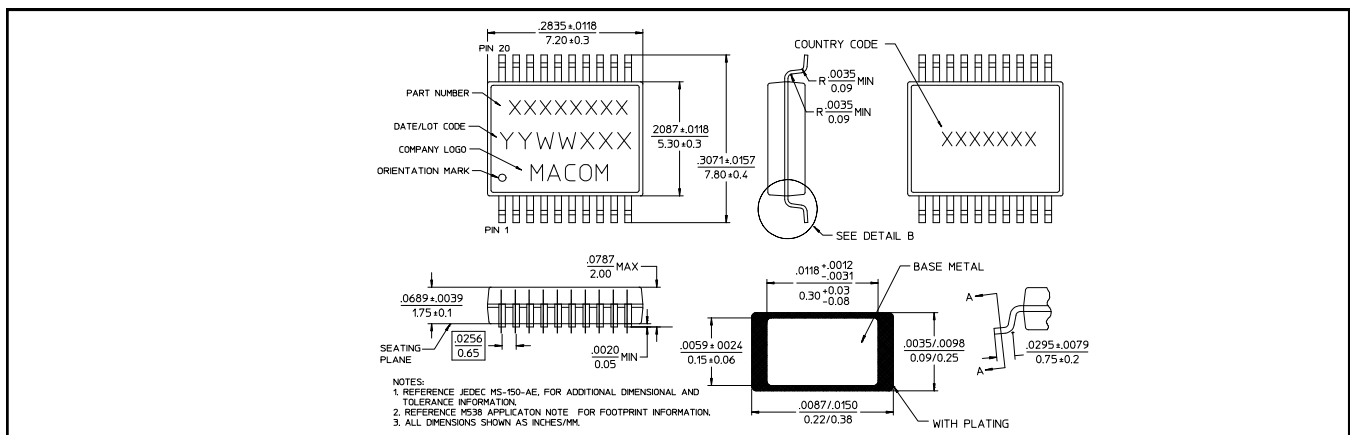
Attenuation Accuracy



VSWR



### Lead-Free SSOP-20 †



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

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