

**Digital Attenuator, 31 dB, 5-Bit, TTL Driver  
DC - 3.0 GHz**

**AT90-1263  
V12**

**Features**

- Attenuation: 1.0dB Steps to 31dB
- Single Positive Supply
- Contains internal DC to DC converter
- Low DC Power Consumption
- Small Footprint, JEDEC Package
- Integral TTL Driver
- 50 ohm Impedance

**Description**

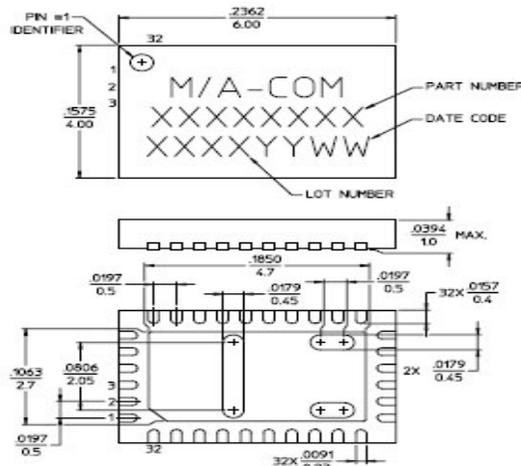
M/A-COM's AT90-1263 is a GaAs FET 5-bit digital attenuator with integral TTL driver. Step size is 1.0 dB providing 31 dB total attenuation range. This device is in an FQFP-N plastic surface mount package. The AT90-1263 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required. For dual supply designs without DC-DC converter noise, use AT90-0263.

**Pin Configuration**

Pin No.	Function	Pin No.	Function
1	GND	17	NC
2	C16	18	NC
3	C8	19	+Vcc <sup>2</sup>
4	C4	20	NC
5	C2	21	CP2 <sup>3</sup>
6	C1	22	NC
7	GND	23	CP1 <sup>3</sup>
8	NC	24	NC
9	NC	25	Vee <sup>4</sup>
10	NC <sup>1</sup>	26	GND
11	GND	27	RF2
12	RF1	28	GND
13	GND	29	NC <sup>1</sup>
14	NC	30	Vee <sup>5,6</sup>
15	NC	31	NC
16	NC	32	+Vcc <sup>2,7</sup>

1. Pins 10 & 29 must be isolated
2. Pin 19 must be connected to Pin 32
3. Pin 25 must be connected to Pin 30
4. .01µF cap must be connected between Pins 21 and 23
5. The negative voltage Vee is produced internally and requires a 0.1µF cap to GND. Generated noise is typical of switching DC-DC Converters.

**CSP-1**



NOTES: 1. REFERENCE JEDEC MO-220, FOR ADDITIONAL DIMENSIONAL AND TOLERANCE INFORMATION.  
2. REFERENCE S2093 APPLICATION NOTE FOR PCB FOOTPRINT INFORMATION.  
3. ALL DIMENSIONS SHOWN AS INCHES/MM.

**Ordering Information**

Part Number	Package
AT90-1263	Bulk Packaging
AT90-1263TR	1000 piece reel
AT90-1263-TB	Units Mounted on Test Board

Note: Reference Application Note M513 for reel size information.

**Truth Table**

C16	C8	C4	C2	C1	Attenuation
0	0	0	0	0	Loss, Reference
0	0	0	0	1	1.0 dB
0	0	0	1	0	2.0 dB
0	0	1	0	0	4.0 dB
0	1	0	0	0	8.0 dB
1	0	0	0	0	16.0 dB
1	1	1	1	1	31.0 dB

0 = TTL Low; 1 = TTL High

- **North America** Tel: 800.366.2266 / Fax: 978.366.2266
- **Europe** Tel: 44.1908.574.200 / Fax: 44.1908.574.300
- **Asia/Pacific** Tel: 81.44.844.8296 / Fax: 81.44.844.8298

Visit [www.macom.com](http://www.macom.com) for additional data sheets and product information.

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**Electrical Specifications: T<sub>A</sub> = 25°C**

Parameter	Test Conditions	Frequency	Units	Min.	Typ.	Max.
Insertion Loss	—	DC - 3.0 GHz	dB	—	3.5	3.8
Attenuation Accuracy	Individual Bits 1-2-4-8-16 dB Any Combination of Bits 1 to 31 dB	DC - 3.0 GHz DC - 3.0 GHz	dB dB	— —	— —	±(.3 +5% of atten setting) ±(.5+7% of atten setting)
VSWR	Full Range	DC - 3.0 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	150 50
1 dB Compression	— —	50 MHz 0.5 - 3.0 GHz	dBm dBm	— —	+21 +24	— —
Input IP3	Two-tone inputs up to +5 dBm	50 MHz 0.5 - 3.0 GHz	dB dB	— —	+35 +48	— —
+Vcc	—	—	V	4.75	5.0	5.25
Logic "0"	Sink Current is 20 µA max.	—	V	0.0	—	0.8
Logic "1"	Source Current is 20 µA max.	—	V	2.0	—	5.0
I <sub>cc</sub> <sup>9</sup>	V <sub>cc</sub> min to max, Logic "0" or "1"	—	mA	—	6	10
Turn-on Current <sup>10</sup>	For guaranteed start-up	—	mA	—	—	125
Switching Noise	Generated from DC-DC Converter with recommended capacitors	3.5 MHz	dBm	—	-93	—
Thermal Resistance θ <sub>JA</sub>	—	—	°C/W	—	35	—

**Absolute Maximum Ratings<sup>3</sup>**

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz 0.5 - 3.0 GHz	+27 dBm +34 dBm
Supply Voltages V <sub>cc</sub> V <sub>ee</sub>	-0.5V ≤ V <sub>cc</sub> ≤ 5.5V -8.5V ≤ V <sub>cc</sub> ≤ 0.5V
Logic Voltage <sup>4</sup>	-0.5V to V <sub>cc</sub> +0.5V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

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

4. Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

9. During turn-on, the device requires an initial start up current (I<sub>cc</sub>) specified as "Turn-on Current". Once operational, I<sub>cc</sub> will drop to the specified levels.

10. The DC-DC converter is guaranteed to start in 100 µs as long as the power supplies have the maximum turn-on current available for start up.

**Handling Procedures**

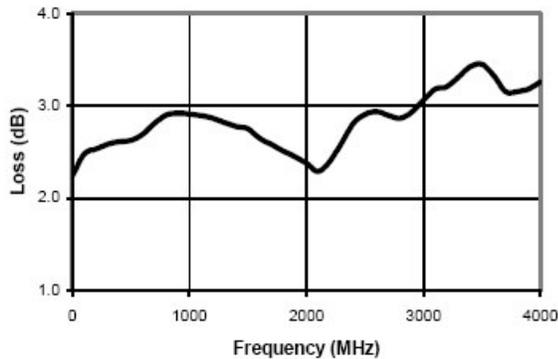
Please observe the following precautions to avoid damage:

**Static Sensitivity**

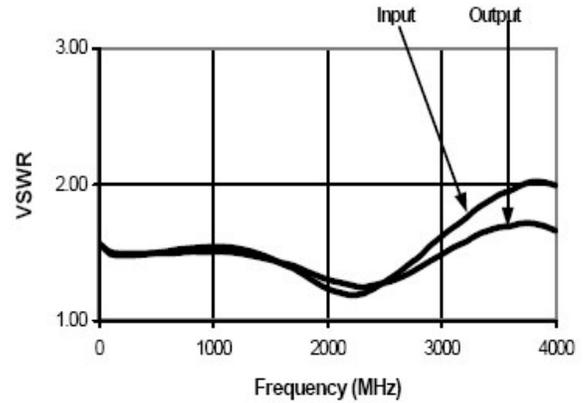
GMIC Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

**Typical Performance Curves @ 25°C**

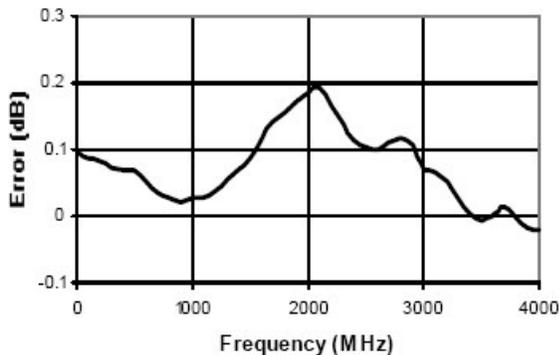
**Insertion Loss**



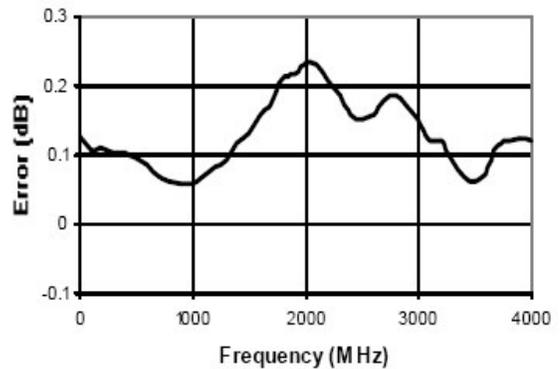
**VSWR @ Insertion Loss**



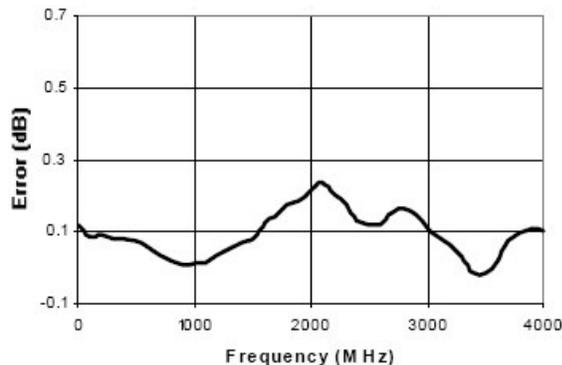
**Attenuation Error, 1 dB Bit**



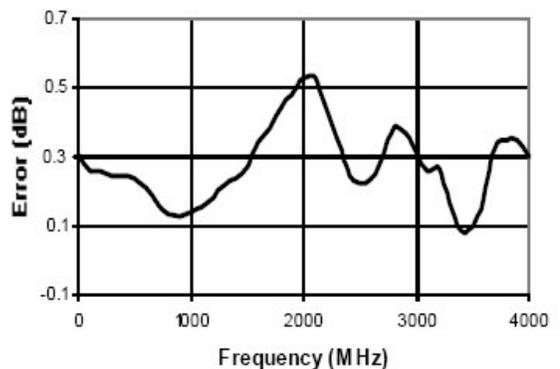
**Attenuation Error, 2 dB Bit**



**Attenuation Error, 4 dB Bit**



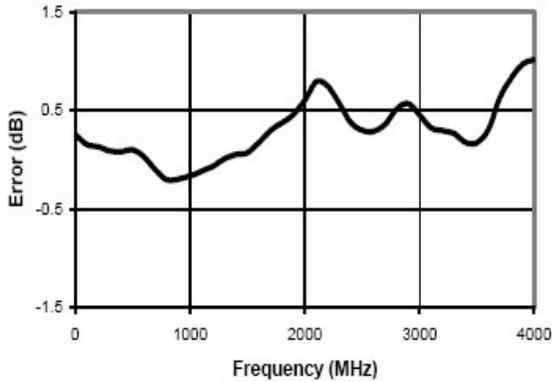
**Attenuation Error, 8 dB Bit**



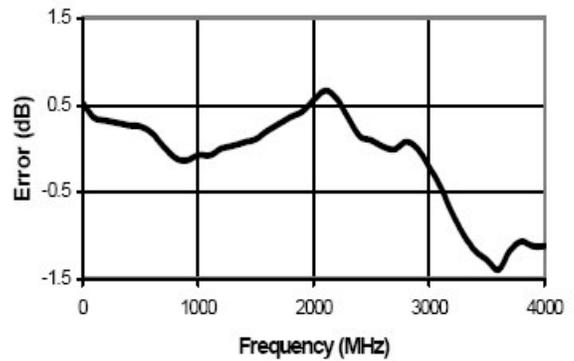
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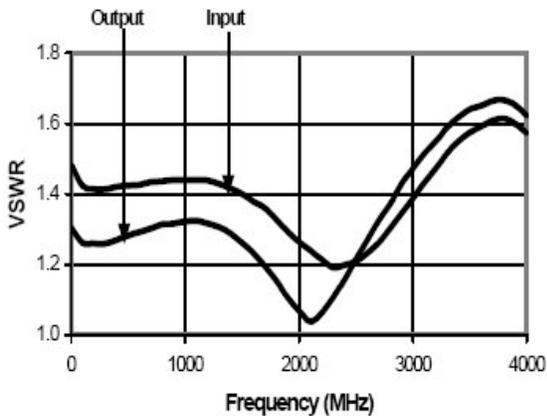
**Attenuation Error, 16 dB Bit**



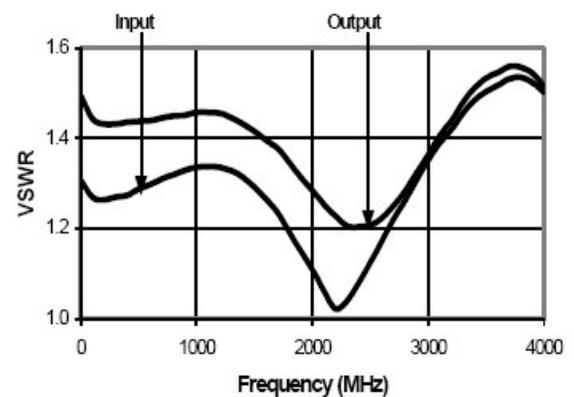
**Attenuation Error, Max. Attenuation**



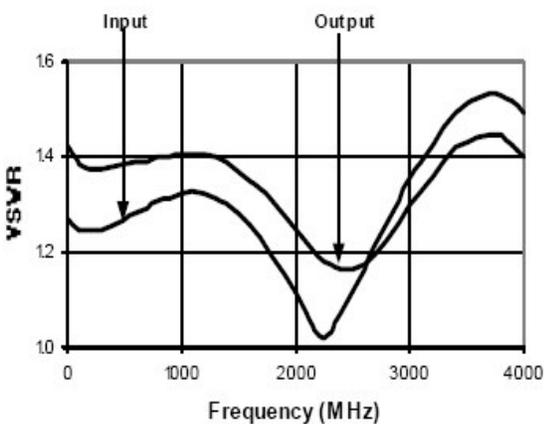
**VSWR, 1 dB Bit**



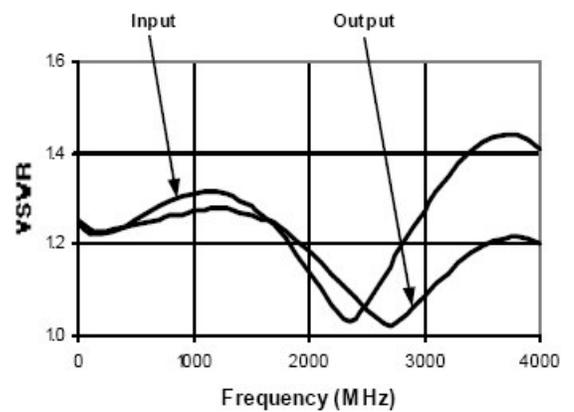
**VSWR, 2 dB Bit**



**VSWR, 4 dB Bit**



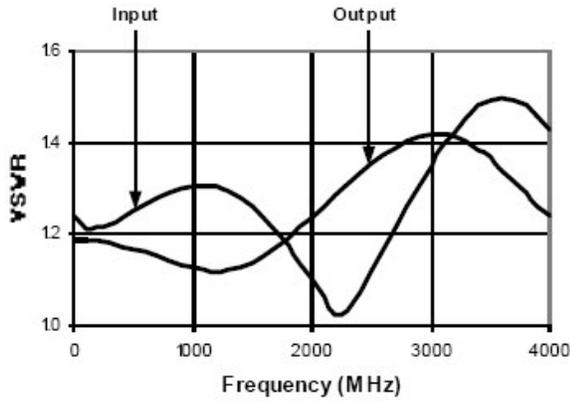
**VSWR, 8 dB Bit**



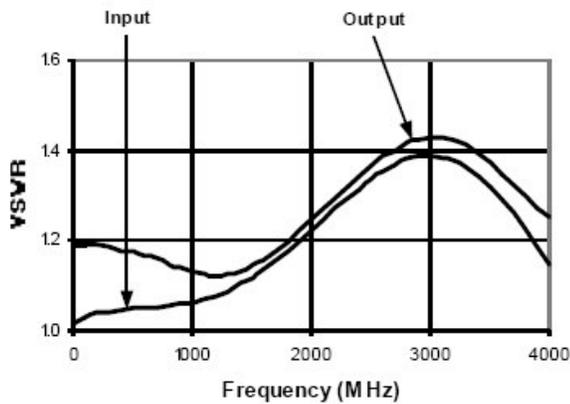
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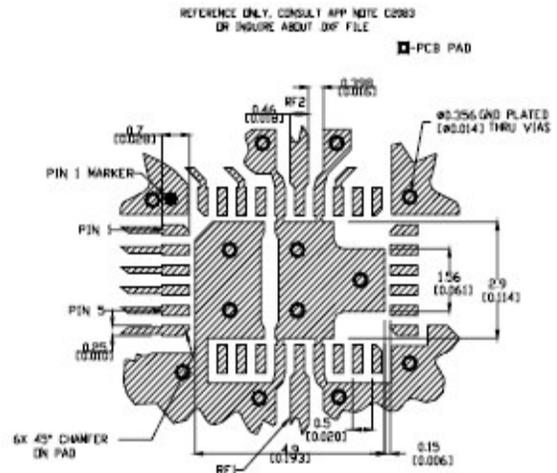
**VSWR, 16 dB Bit**



**VSWR, Maximum Attenuation**



**Recommended PCB Configuration5**



**RECOMMENDED PCB BOARD LAYOUT**  
CIRCUIT MATERIAL: FR-4 TETRA II 80 PPH THICK  
GROUND VIAS: #36/204  
RF PORTS ARE 50 OHMS

5. Application Note S2083 is available on line at [www.macom.com](http://www.macom.com)

**Block Diagram**

