

# Digital Attenuator, 15 dB, 4-Bit, TTL Driver, DC - 3.0 GHz

AT65-0413

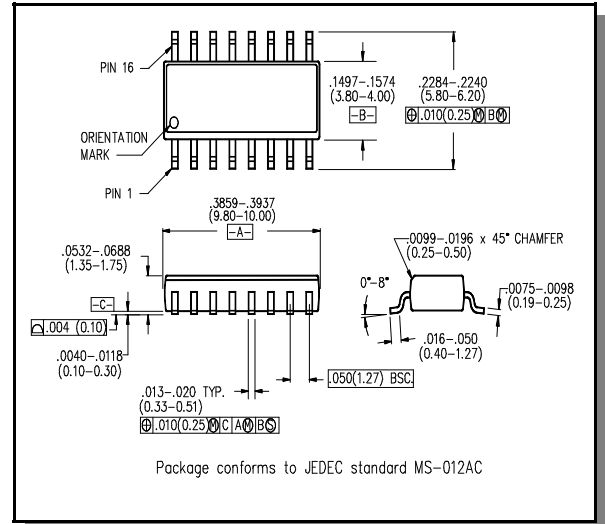
## Features

- Attenuation: 1.0 dB steps to 15 dB
- Low DC Power Consumption
- Integral TTL Driver
- 50 Ohm Impedance
- Temperature Stability:  $\pm 0.18$  dB from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  Typ.

## Description

M/A-COM's AT65-0413 is a GaAs FET 4-bit digital attenuator with a 1.0 dB minimum step size and a 15 dB total attenuation range. This device is in a SOIC-16 plastic surface mount package. The AT65-0413 is ideally suited for use where accuracy, fast speed, very low power consumption and low costs are required. Typical applications include dynamic range setting in precision receiver circuits and other gain/leveling control circuits.

## SO-16



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

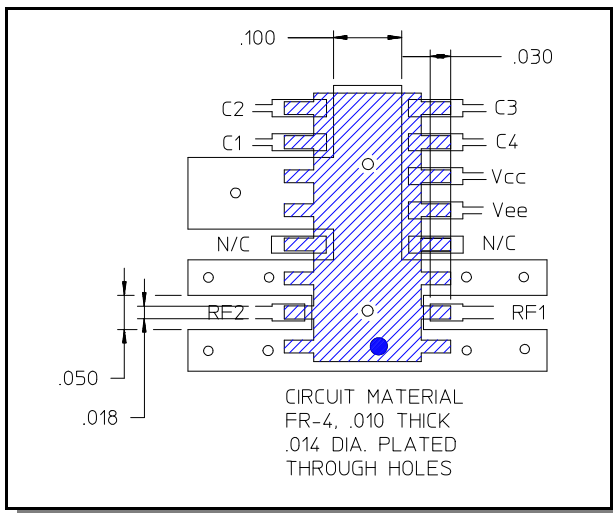
Parameter	Test Conditions	Frequency	Units	Min.	Typ.	Max.
Insertion Loss	—	DC - 0.5 GHz	dB	—	1.3	1.6
		DC - 2.0 GHz	dB	—	1.7	2.1
		DC - 3.0 GHz	dB	—	1.9	2.4
Attenuation Accuracy	Any Bit or Combination of Bits	DC - 3.0 GHz	dB	$\pm (.25 + 3\% \text{ of attenuation})$ or $\pm .55$ dB		
VSWR	Full Range	DC - 3.0 GHz	Ratio	—	—	1.6:1
Trise, Tfall Ton, Toff Transients	10% to 90% 50% Cntl to 90%/10% RF In-Band		nS	—	10	50
			nS	—	30	150
			mV	—	35	—
1 dB Compression	Input Power Input Power	0.05 GHz	dBm	—	+20	—
		0.5 - 3.0 GHz	dBm	—	+28	—
Input $IP_3$	Two-tone inputs up to +5 dBm	0.05 GHz	dBm	—	+40	—
		0.5 - 3.0 GHz	dBm	—	+50	—
Input $IP_2$	Two-tone inputs up to +5 dBm	0.05 GHz	dBm	—	+45	—
		0.5 - 3.0 GHz	dBm	—	+68	—
$V_{CC}$	—	—	V	4.5	5.0	5.5
$-V_{EE}$	—	—	V	-8.0	-5.0	-4.75
$V_{ctl}$	Logic (0) TTL	—	V	0.0	—	0.8
$V_{ctl}$	Logic (1) TTL	—	V	2.0	—	5.0
Input Leakage Current (Low) Input Leakage Current (High)	0 to 0.8 V	—	$\mu\text{A}$	—	—	20
	2.0 to 5.0 V	—	$\mu\text{A}$	—	—	20
$I_{CC}$	$V_{CC} = 4.5$ to $5.5\text{V}$ $V_{ctl} = 0$ to $0.8\text{V}$ , or $V_{CC} - 2.1\text{V}$ to $V_{CC}$	—	mA	—	—	4.0
$-I_{EE}$	$V_{EE} = -5.0$ to $-8.0\text{V}$	—	mA	—	—	-1

Pin Configuration

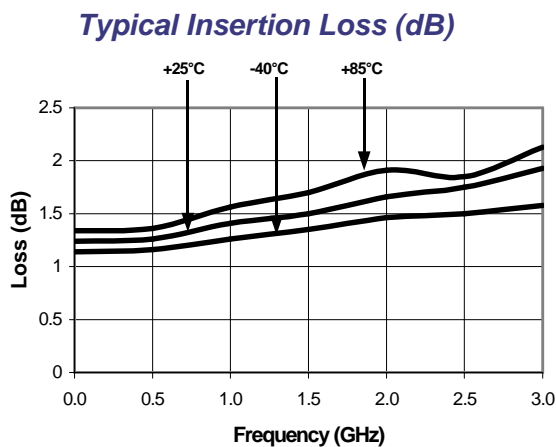
Pin #	Function	Pin #	Function
1	GND	9	C2
2	RF1	10	C1
3	GND	11	GND
4	N/C	12	GND
5	Vee	13	N/C
6	Vcc	14	GND
7	C4	15	RF2
8	C3	16	GND

N/C = No Connection

Recommended PCB Configuration



Typical Performance Curves



Absolute Maximum Ratings <sup>1</sup>

Parameter	Absolute Maximum
Max. Input Power 0.05 GHz	+27 dBm
0.5 - 3.0 GHz	+34 dBm
+Vcc	+5.5V
-Vee	-8.5V
Control Voltage <sup>2</sup>	-0.5 to Vcc + 0.5V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +125°C

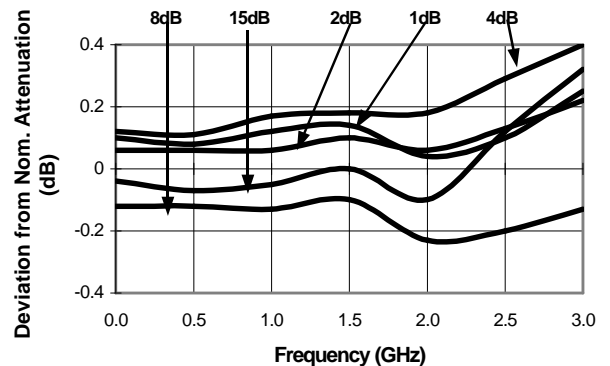
1. Operation of this device above any one of these parameters may cause permanent damage.
2. Standard CMOS TTL interface, latch-up will occur if logic signal is applied prior to power supply.

Truth Table

C1	C2	C3	C4	Attenuation
0	0	0	0	Loss, Reference
1	0	0	0	1.0 dB
0	1	0	0	2.0 dB
0	0	1	0	4.0 dB
0	0	0	1	8.0 dB
1	1	1	1	15.0 dB

0 = TTL Low; 1 = TTL High

Attenuation Accuracy @+25°C



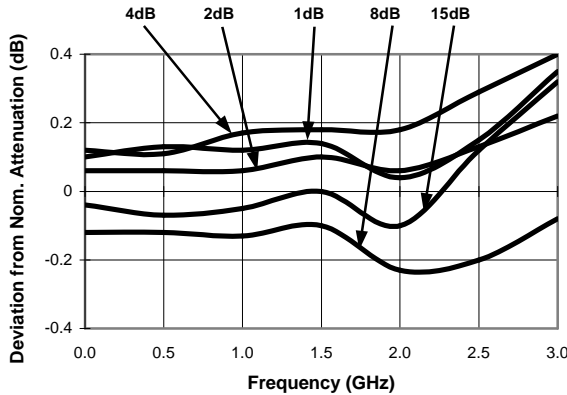
M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

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

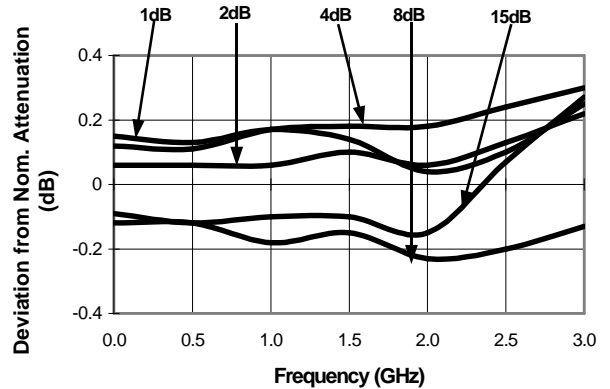
- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020

Typical Performance Curves

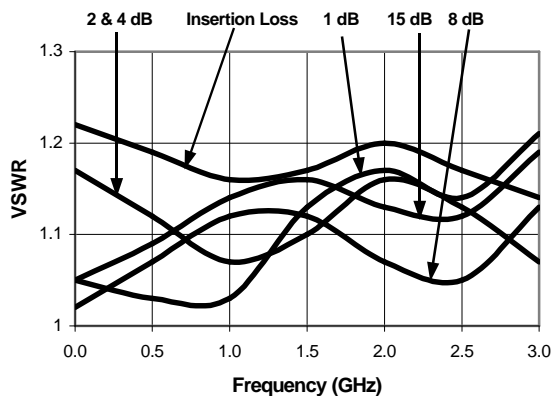
Attenuation Accuracy @ -40°C



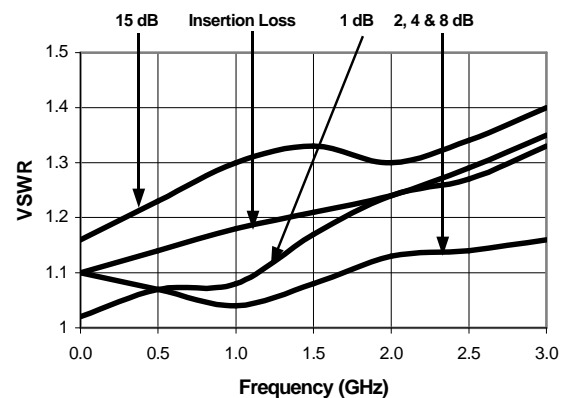
Attenuation Accuracy @ +85°C



RF1 VSWR vs. Frequency



RF2 VSWR vs. Frequency



Ordering Information

Part Number	Package
AT65-0413	SOIC-16 Lead Plastic
AT65-0413TR	Tape and Reel (1K Reel)
AT65-0413-TB	Unit mounted on a test board

M/A-COM Inc. and its affiliates reserve the right to make changes to the product(s) or information contained herein without notice. M/A-COM makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does M/A-COM assume any liability whatsoever arising out of the use or application of any product(s) or information.

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

- North America: Tel. (800) 366-2266
- Asia/Pacific: Tel.+81-44-844-8296, Fax +81-44-844-8298
- Europe: Tel. +44 (1344) 869 595, Fax+44 (1344) 300 020