RF2410

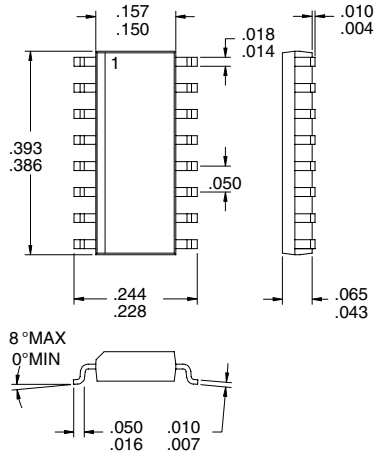
UHF PROGRAMMABLE ATTENUATOR

Typical Applications

- Power Control in Communication Systems
- CMOS Compatible Programmable Attenuators
- Commercial and Consumer Systems
- Portable Battery Powered Equipment

Product Description

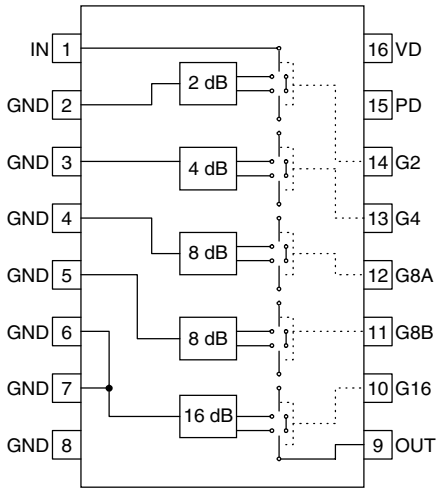
The RF2410 is a multistage monolithic programmable attenuator. The device is built using a Gallium Arsenide process technology and has an attenuation programmability over a 38dB range in 2dB steps. The attenuation is set by five bits of digital data. The input and output of the device have a low VSWR 50Ω match. The RF output can drive up to +10dBm. This unit is intended for use in systems that require RF transmit power control by digital means. A typical application is in dual mode IS-54/55 compatible cellular transceivers. No negative supply voltages are required, and the unit has a power down feature which reduces the current consumption to less than 0.5mA.



Package Style: SOP-16

Optimum Technology Matching® Applied

- ☐ Si BJT
- ☐ Si Bi-CMOS
- ☐ GaAs HBT
- ☐ SiGe HBT
- ☑ GaAs MESFET
- ☐ Si CMOS



Functional Block Diagram

Features

- Single 5V Supply
- 0dB to 38dB Attenuation Range
- 4 dB Insertion Loss
- 5-bit Digitally Controlled Attenuation
- Digitally Controlled Power Down Mode
- 500MHz to 2100MHz Operation

Ordering Information

RF2410	UHF Programmable Attenuator
RF2410 PCBA	Fully Assembled Evaluation Board

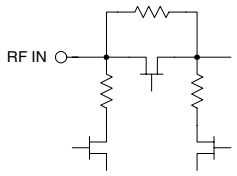
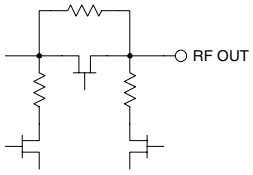
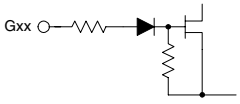
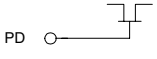
RF Micro Devices, Inc.
7625 Thorndike Road
Greensboro, NC 27409, USA
Tel (336) 664 1233
Fax (336) 664 0454
http://www.rfmd.com

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +7.0	V_{DC}
Power Down Voltage	-0.5 to V_{DD}+0.4	V_{DC}
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C

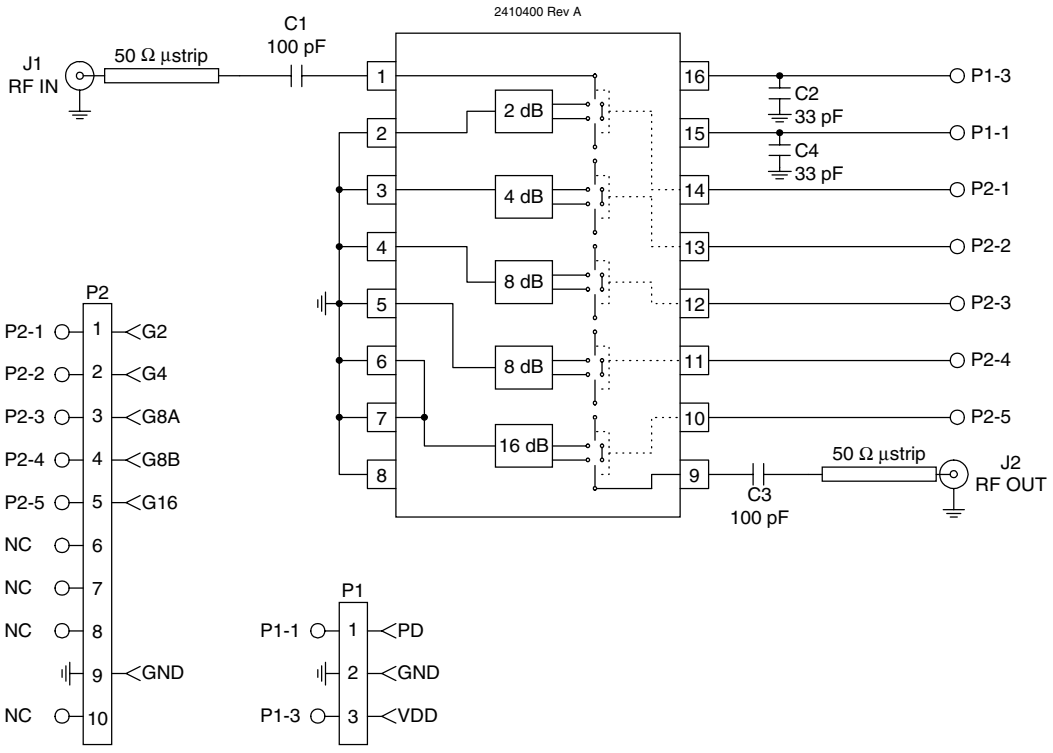
Caution! ESD sensitive device.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25°C and 5V at 900MHz
Frequency Range		500 to 1000		MHz	0dB to 38dB Attenuation Range
Frequency Range		500 to 2100		MHz	0dB to 20dB Attenuation Range
Insertion Loss		4	5.5	dB	
Attenuation Range		0 to 38		dB	
Gain Flatness		0.25		dB	In any 50MHz band
Input					
Input Impedance		50		Ω	
Input VSWR		1.3:1			
Input 1dB Compression	10	14		dBm	
Attenuation					
Attenuation Settings		2, 4, 8, 8, 16		dB	CMOS Level, 5 bits
Accuracy	1.0	2.0	3.2	dB	2dB Step
	2.9	4.0	5.4	dB	4dB Step
	6.7	8.0	9.8	dB	8dB Step (A)
	6.4	8.0	10.5	dB	8dB Step (B)
	14.1	16.0	19.3	dB	16dB Step
	35.0	38.0	42.0	dB	All bits on
Attenuation Control					
Attenuation "ON" Voltage	2.5	V_{DD}		V	Voltage Supplied to input
Attenuation "OFF" Voltage			0.3	V	Voltage Supplied to input
Current		0.4	1.0	mA	Into each control line
Response Time		<10		ns	
Output					
IM3	-30			dBc	With 0dBm output in each of 2 tones
Harmonic Output	-40			dBc	
Output Impedance		50		Ω	
Output VSWR		1.3:1			
Power Supply					
Voltage		5		V	Specifications
		4.5 to 6.0		V	Operating Limits
Current		6	12	mA	Operating
		0.4	0.75	mA	Power Down
Power Down					
Power "ON" Voltage	2.5	V_{DD}		V	Voltage supplied to input; device is "ON"
Power "OFF" Voltage			0.3	V	Voltage supplied to input; device is "OFF"

Pin	Function	Description	Interface Schematic
1	RF IN	RF Input. This pin is not DC blocked, and an external blocking capacitor is recommended. The value depends on the frequency used.	
2	GND	Ground connection. Keep traces physically short and connect immediately to the ground plane for best performance. Each ground pin should be connected to the ground plane individually, rather than using one trace and/or via for all ground pins. This will give better step accuracy.	
3	GND	Same as pin 2.	
4	GND	Same as pin 2.	
5	GND	Same as pin 2.	
6	GND	Same as pin 2.	
7	GND	Same as pin 2.	
8	GND	Same as pin 2.	
9	RF OUT	RF Output. This pin is not DC blocked, and an external blocking capacitor is recommended. The value depends on the frequency used.	
10	G16	Control pin for the 16dB attenuator. This pin has an internal pull-down resistor, so when the pin is not connected the attenuator will be turned off. For operating frequencies above 1GHz this bit should always be left "off".	
11	G8B	Control pin for the 8dB attenuator. This pin has an internal pull-down resistor, so when the pin is not connected the attenuator will be turned off.	Same as pin 10.
12	G8A	Control pin for the 8dB attenuator. This pin has an internal pull-down resistor, so when the pin is not connected the attenuator will be turned off.	Same as pin 10.
13	G4	Control pin for the 4dB attenuator. This pin has an internal pull-down resistor, so when the pin is not connected the attenuator will be turned off.	Same as pin 10.
14	G2	Control pin for the 2dB attenuator. This pin has an internal pull-down resistor, so when the pin is not connected the attenuator will be turned off.	Same as pin 10.
15	PD	Power Down control pin. This pin has an internal pull-up resistor to VDD of 10kΩ. When this pin is "low" the circuits are turned off. A "low" means as close to 0V as possible, to ensure minimum current consumption when turned off.	
16	VDD	Power supply pin. An external RF bypass capacitor is recommended.	

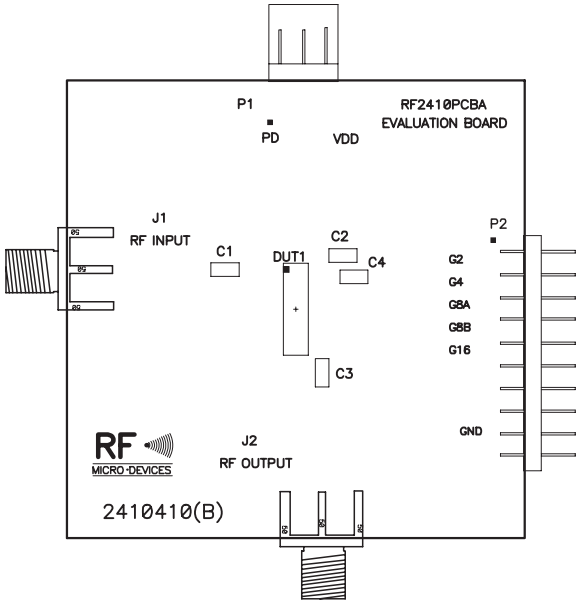
Evaluation Board Schematic

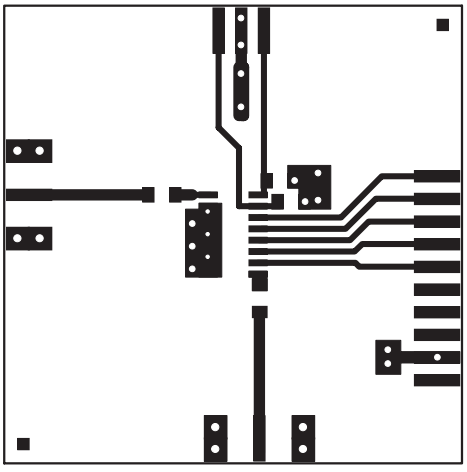
(Download Bill of Materials from www.rfmd.com.)



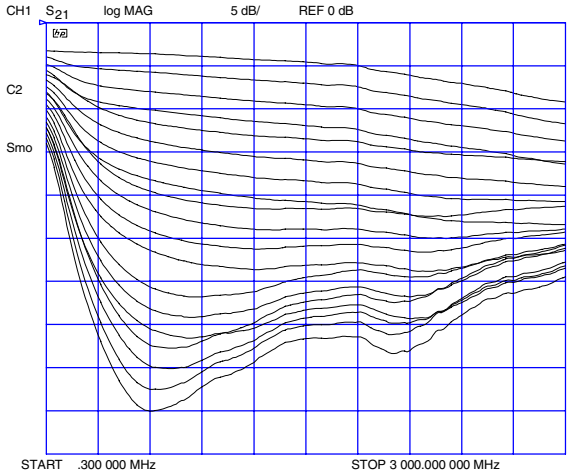
Evaluation Board Layout
Board Size 2.020” x 2.020”

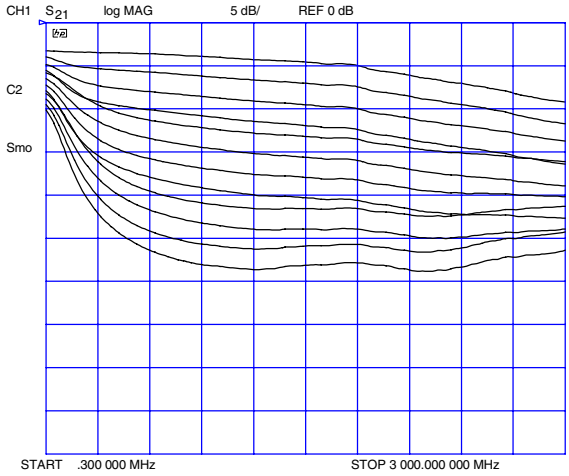
Board Thickness 0.031”, Board Material FR-4



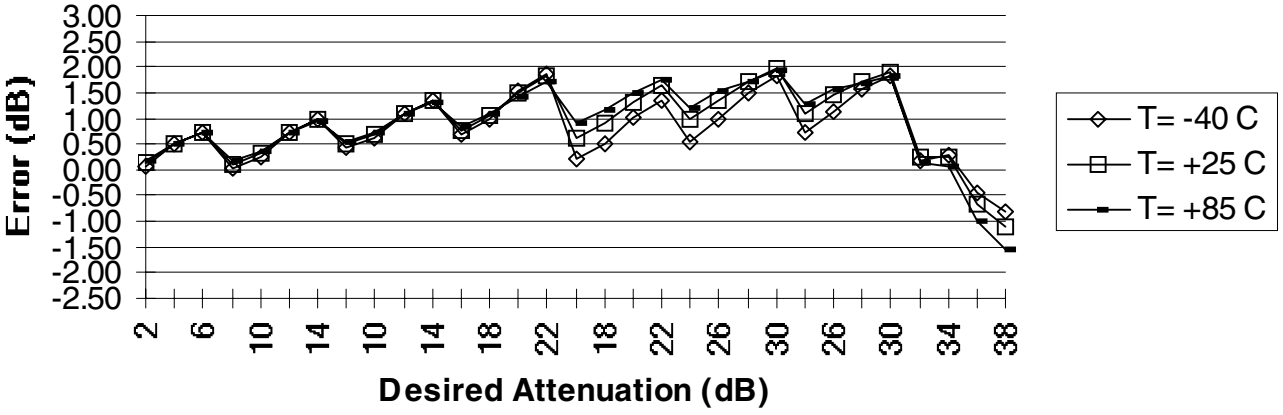


Attenuation vs. Frequency
1. Using All Bits, 2. Not Using G16



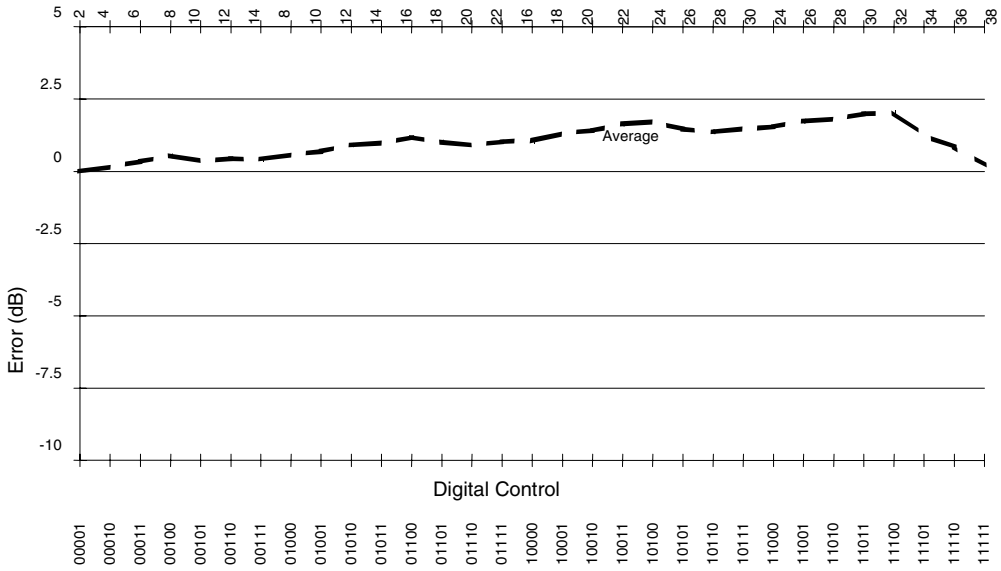


RF2410 Attenuation Error from Ideal over Temperature
900 MHz



Typical Characteristics at 900MHz

Attenuation Variation from Ideal



Typical Attenuation Error