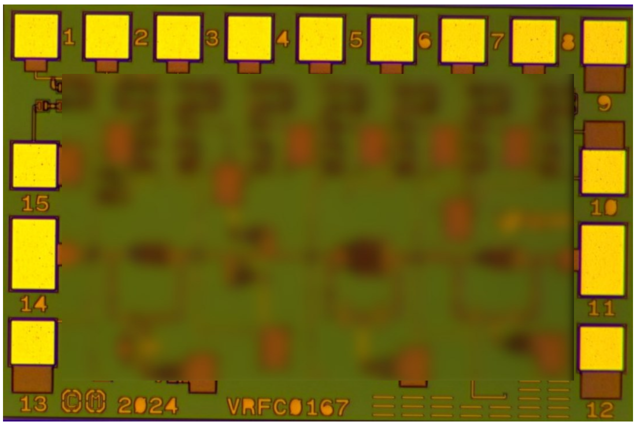
VRFC0167-BD

DC—10GHz 5 Bit GaAs MMIC Digital Control Attenuator

Datasheet v1

Features

- 5-Bit Digital Attenuator, 0.5 dB step
- 15.5 dB attenuation range
- Bit Error <= 1.8dB
- Frequency Range: DC to 10 GHz
- 50Ω matched RF ports
- Die size = 1.5mm x 1.0mm



Description

The VRFC0167-BD is a GaAs digital attenuator MMIC which operates over the frequency range of DC to 10GHz with an attenuation range of 15.5 dB. The attenuation is set with 0/1.5V control voltages.

Applications

- General Purpose
- Communications (commercial and military)
- Radars
- Cellular infrastructure

Electrical Specifications

T=+25°C, Vctrl = +1.5V / 0V

Parameter	Test Condition	Specification			Unit
		Min.	Typ.	Max.	
Frequency Bandwidth		DC	-	10	GHz
Reference Insertion Loss	Small Signal	1.9	-	2.9	dB
Bit Error	Relative to reference state	0.05	-	1.8	dB
I/P Return Loss	Small Signal		>17		dB
O/P Return Loss	Small Signal		>17		dB
Input P1dB		19	>22		dBm
IIP3	-5dBm Tone Power, 10MHz Spacing		>30		dBm
Vcrtl low level			0		V
Vctrl high level			+1.5		V
Vctrl Current	Reference / All States		0.4 / 3		mA

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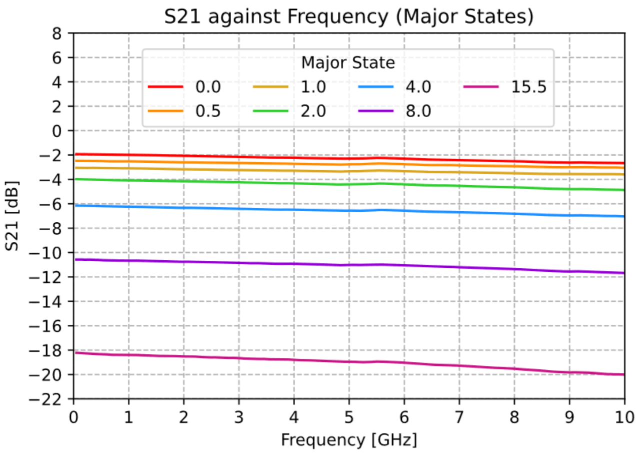
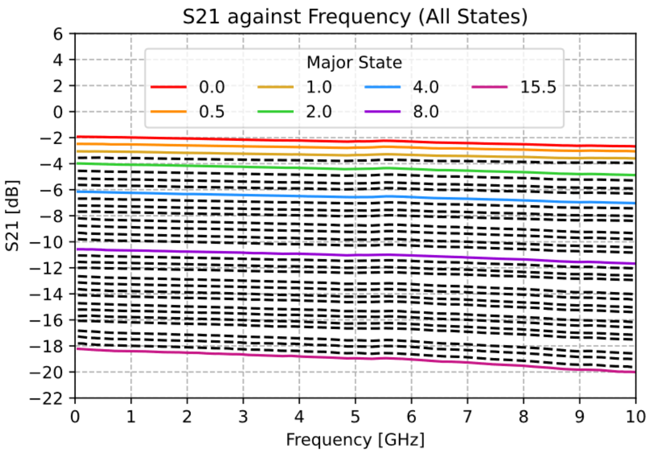
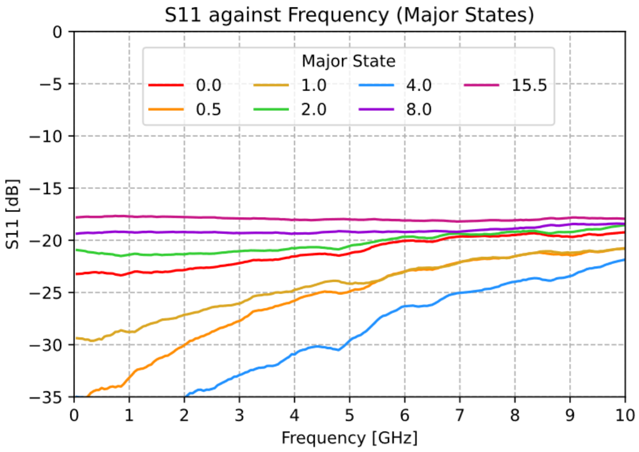
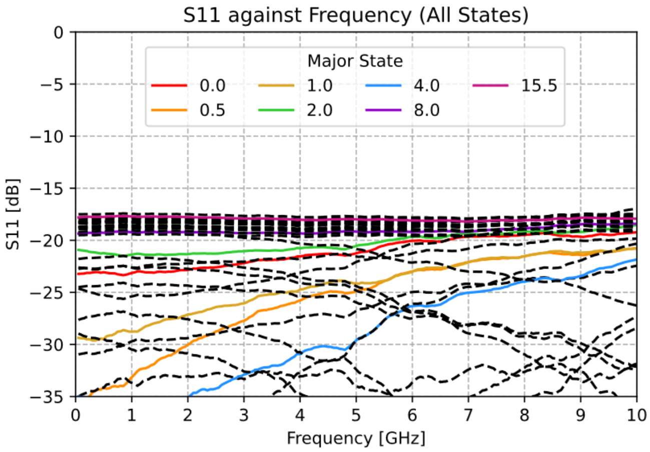
Measured Performance

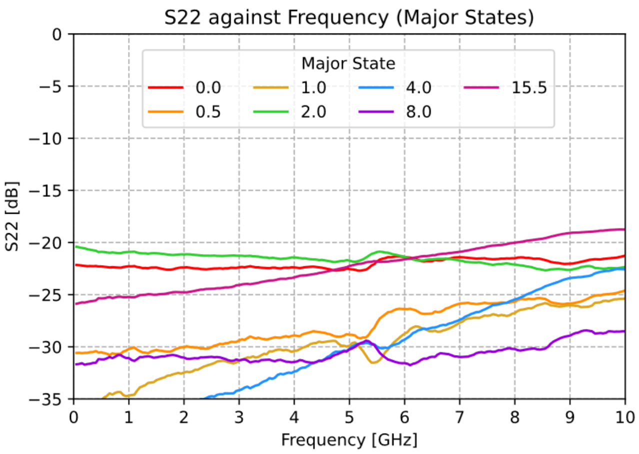
T=+25°C , VCTRL = +1.5V / 0V, I_C = 0.4mA (Reference State), (Reference Plane: Die including Bondwires)

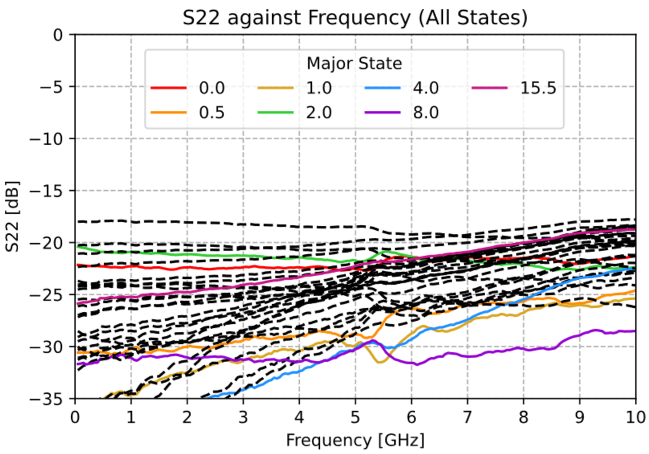












Measured Performance

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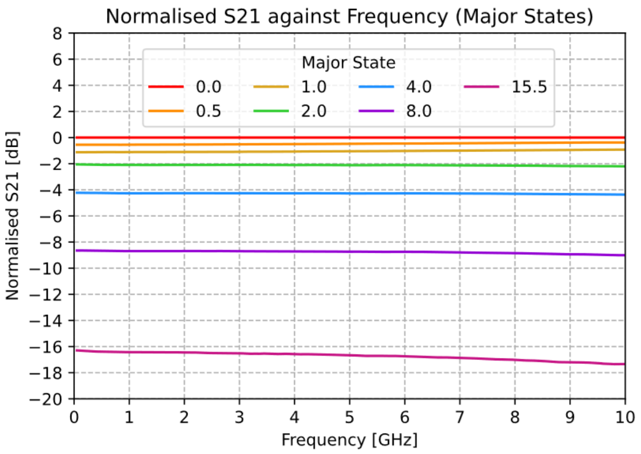

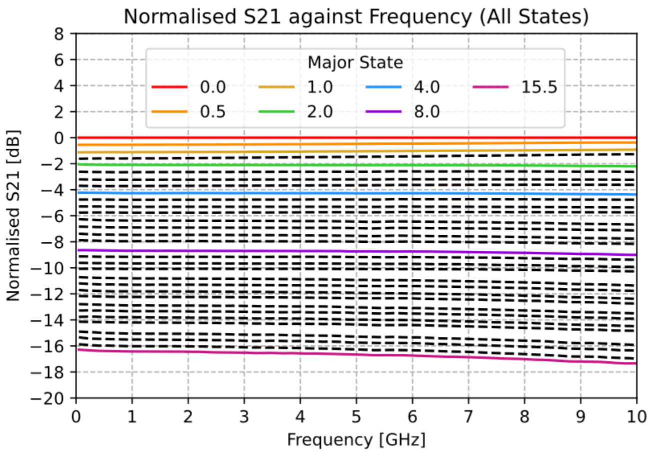

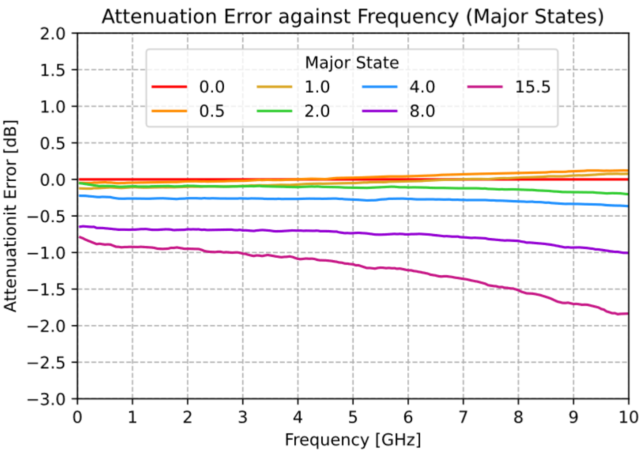

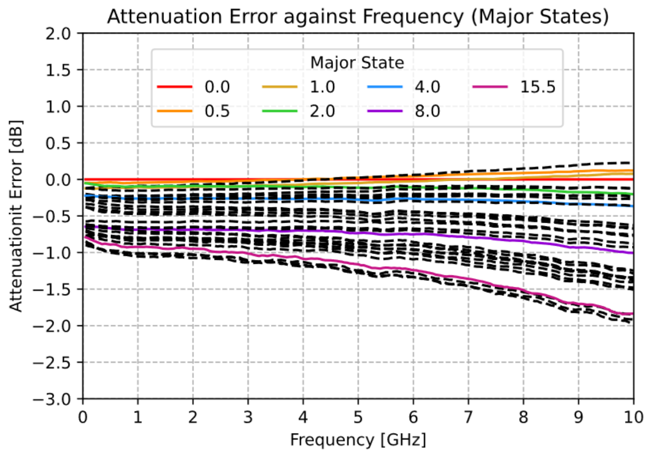

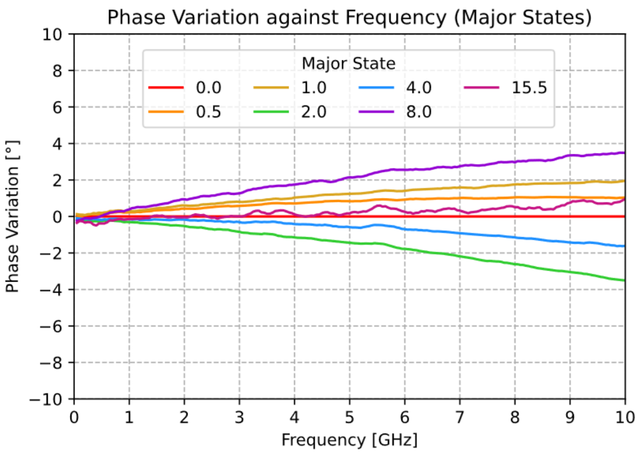

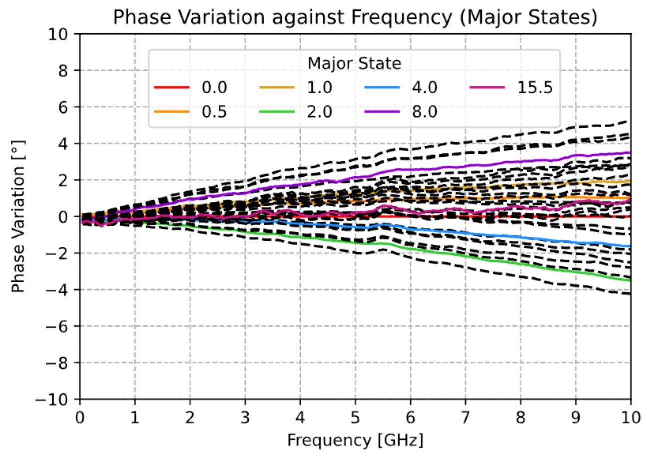

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Measured Performance

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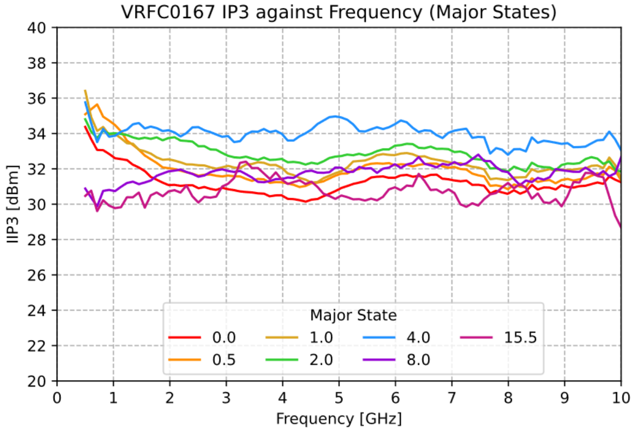
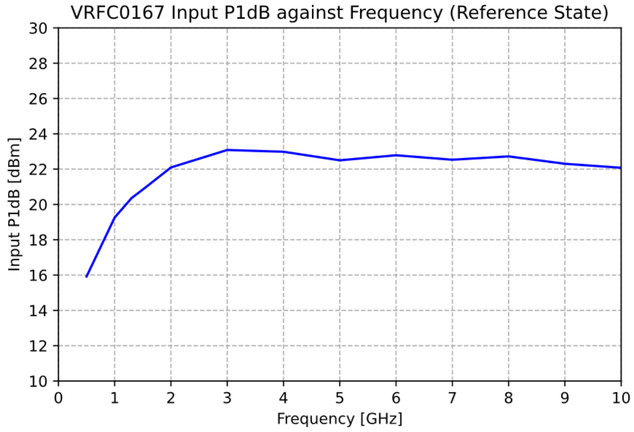
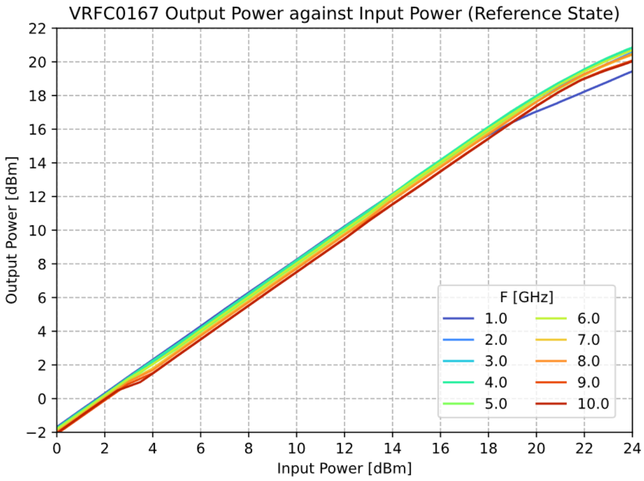
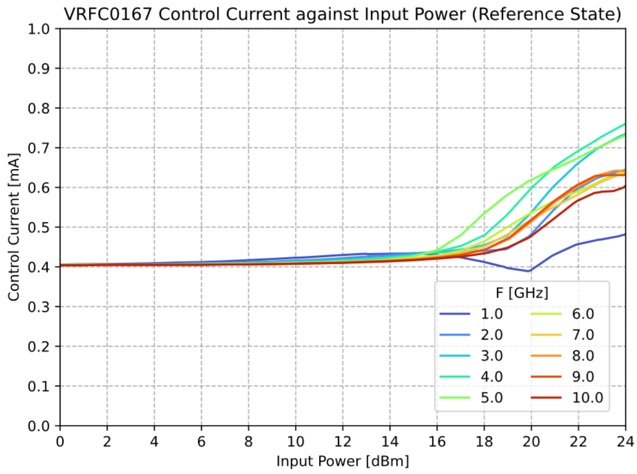








Major State	Insertion Loss [dB]			Normalised Attenuation [dB]		
	1GHz	5GHz	10GHz	1GHz	5GHz	10GHz
0dB	2.0	2.3	2.7	0	0	0
0.5dB	2.5	2.8	3.1	0.5	0.5	0.4
1dB	3.1	3.3	3.6	1.1	1.1	0.9
2dB	4.1	4.4	4.9	2.1	2.1	2.2
4dB	6.2	6.5	7.0	4.3	4.3	4.4
8dB	10.7	11.0	11.7	8.7	8.7	9.0
15.5dB	18.4	18.9	20.0	16.4	16.7	17.3

Truth Table

"1" = +1.5V, "0" = 0V

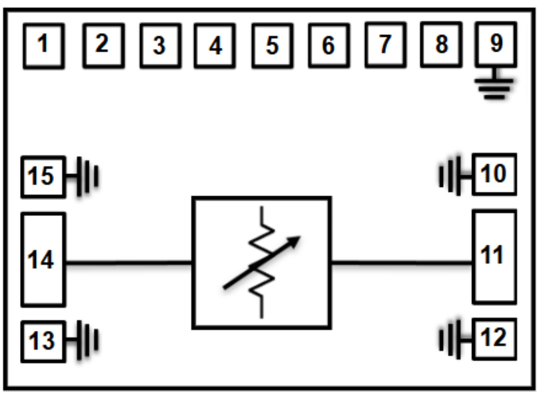
Attenuation [dB]	0.5dB bit	1dB bit	2dB bit		4dB bit		8dB bit	
	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 1	Pin 2
Reference State	0	0	0	1	0	1	0	1
0.5	1	0	0	1	0	1	0	1
1	0	1	0	1	0	1	0	1
2	0	0	1	0	0	1	0	1
4	0	0	0	1	1	0	0	1
8	0	0	0	1	0	1	1	0
15.5	1	1	1	0	1	0	1	0

Absolute Maximum Ratings [1][2]

Parameter	Value
Control Voltage	+4V
Input Power	25dBm
Junction Temperature	175°C
Storage Temperature	-40 to 85°C
Storage temperature	-55 to 150°C

[1] Operation outside these conditions may cause permanent damage to the device.

[2] Combination of maximum rating conditions may reduce the values. Device performance at these ratings is not implied.



Pin Configuration

Pin #	Description
1	8dB Bit Voltage Control
2	2dB Bit Complementary Voltage Control
3	0.5dB Bit Voltage Control
4	1dB Bit Voltage Control
5	2dB Bit Voltage Control
6	2dB Bit Complementary Voltage Control
7	4dB Bit Voltage Control
8	2dB Bit Complementary Voltage Control
9	Ground
10	RF Ground
11	Output RF
12	RF Ground
13	RF Ground
14	Input RF
15	RF Ground

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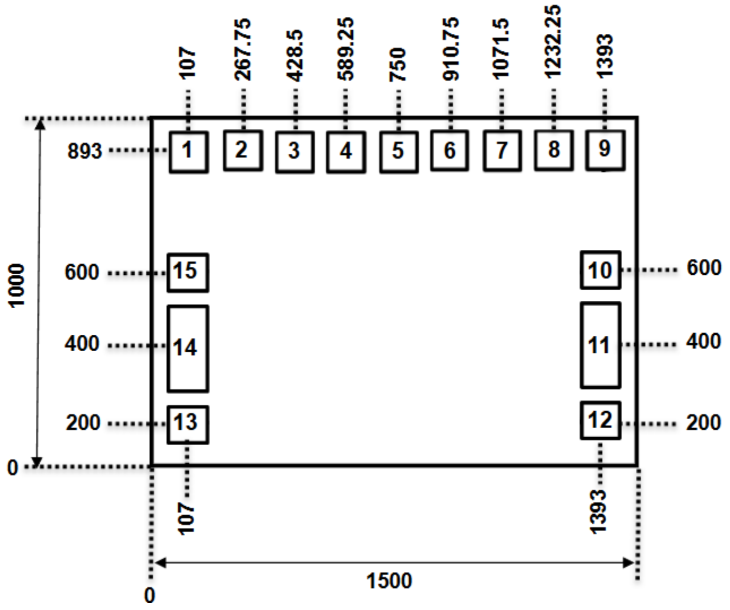
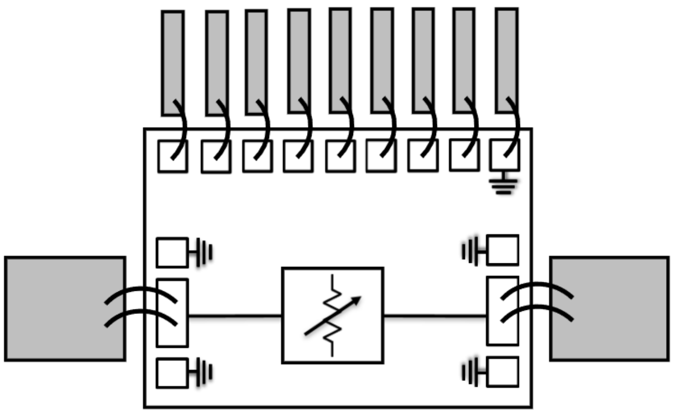
Assembly Diagram

Pad #	Location[3] (x,y)	
	X / um	Y / um
1	107	893
2	267.75	893
3	428.5	893
4	589.25	893
5	750	893
6	910.75	893
7	1071.5	893
8	1232.25	893
9	1393	893
10	1393	600
11	1393	400
12	1393	200
13	107	200
14	107	400
15	107	600



[3] From origin to centre of pad

Parameter	Value
GND bond pad opening	100um x 100um
VCTRL bond pad opening	100um x 100um
RF bond pad opening	100um x 160um
RF bond wire length	500um
Die size	1.5mm x 1mm
Die thickness	100um



Order Information

Part Number	Package
VRFC0167	Die in Gel Pack

GaAs devices are ESD sensitive and precautions should be observed during storage, handling, assembly and testing.