

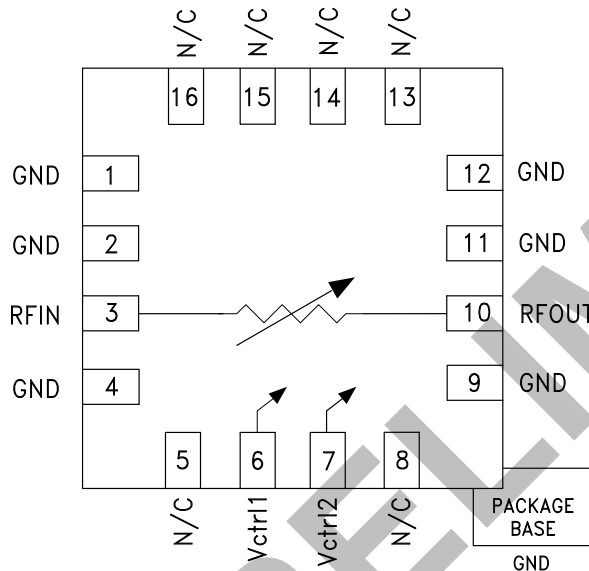
GaAs MMIC VOLTAGE-VARIABLE ATTENUATOR, 5 - 26.5 GHz

Typical Applications

The HMC712ALP3C is ideal for:

- Point-to-Point Radio
- VSAT Radio
- Test Instrumentation
- Microwave Sensors
- Military, ECM & Radar

Functional Diagram



Features

- Wide Bandwidth: 5 - 26.5 GHz
- Excellent Linearity: +28 dBm Input P1dB
- Wide Attenuation Range: 28 dB
- Absorptive Topology
- Singe or Dual Control Operation
- 16 Lead 3x3mm SMT Package: 9mm²

General Description

The HMC712ALP3C is an absorptive Voltage Variable Attenuator (VVA) which operates from 5 - 26.5 GHz and is ideal in designs where an analog DC control signal must be used to control RF signal levels over a 28 dB amplitude range. It features two shunt-type attenuators which are controlled by two analog voltages, Vctrl1 and Vctrl2. Optimum linearity performance of the attenuator is achieved by first varying Vctrl1 of the 1st attenuation stage from -5V to 0V with Vctrl2 fixed at -5V. The control voltage of the 2nd attenuation stage, Vctrl2, should then be varied from -5V to 0V, with Vctrl1 fixed at 0V. The HMC712ALP3C is housed in a RoHS compliant 3x3 mm QFN leadless package

However, if the Vctrl1 and Vctrl2 pins are connected together it is possible to achieve the full analog attenuation range with only a small degradation in input IP3 performance. Applications include AGC circuits and temperature compensation of multiple gain stages in microwave point-to-point and VSAT radios.

Electrical Specifications, $T_A = +25^\circ\text{C}$, 50 Ohm system

Parameter	Min.	Typ.	Max.	Units
Insertion Loss	5 - 10 GHz	3	TBD	dB
	10 - 15 GHz	3.5	TBD	dB
	15 - 26.5 GHz	5	TBD	dB
Attenuation Range	5 - 10 GHz	TBD	25	dB
	10 - 15 GHz	TBD	30	dB
	15 - 26.5 GHz	TBD	35	dB
Input Return Loss		10		dB
Output Return Loss		10		dB
Input Power for 1 dB Compression (any attenuation)		28		dBm
Input Third Order Intercept (Two-tone Input Power = 10 dBm Each Tone)		32		dBm

HMC712A* PRODUCT PAGE QUICK LINKS

Last Content Update: 02/23/2017

COMPARABLE PARTS

View a parametric search of comparable parts.

EVALUATION KITS

- HMC712A Evaluation Board

DOCUMENTATION

Data Sheet

- HMC712A: GaAs MMIC Voltage-Variable Attenuator, 5 - 26.5 GHz Preliminary Data Sheet

DESIGN RESOURCES

- HMC712A Material Declaration
- PCN-PDN Information
- Quality And Reliability
- Symbols and Footprints

DISCUSSIONS

View all HMC712A EngineerZone Discussions.

SAMPLE AND BUY

Visit the product page to see pricing options.

TECHNICAL SUPPORT

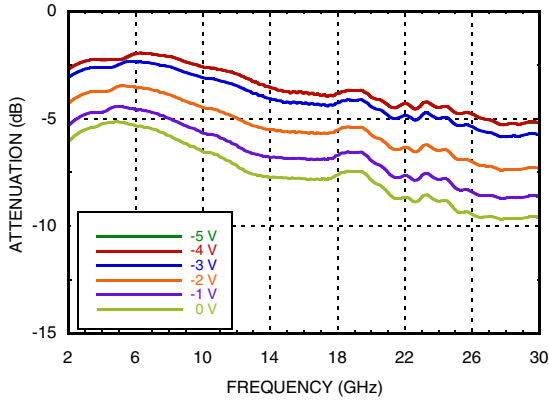
Submit a technical question or find your regional support number.

DOCUMENT FEEDBACK

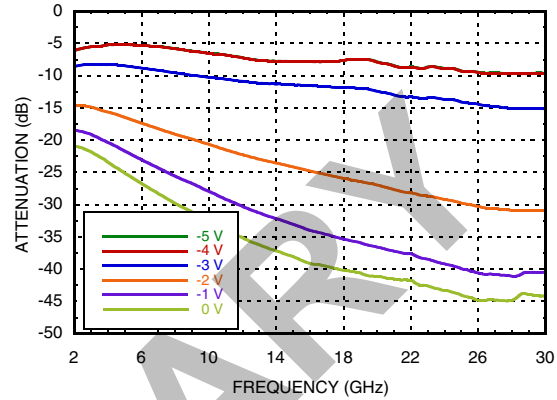
Submit feedback for this data sheet.

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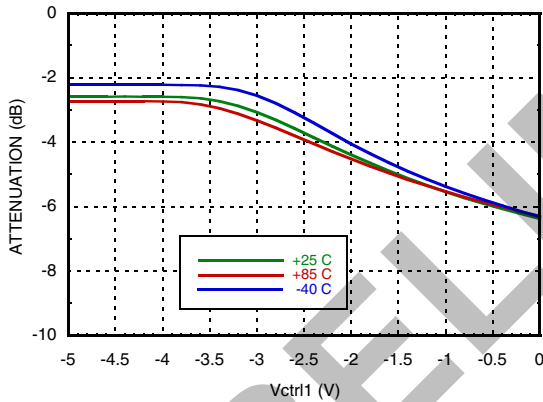
Attenuation vs. Frequency over Vctrl
Vctrl1 = Variable, Vctrl2 = -5V



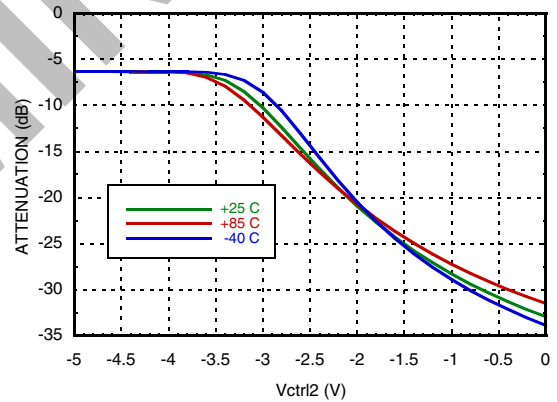
Attenuation vs. Frequency over Vctrl
Vctrl1 = 0V, Vctrl2 = Variable



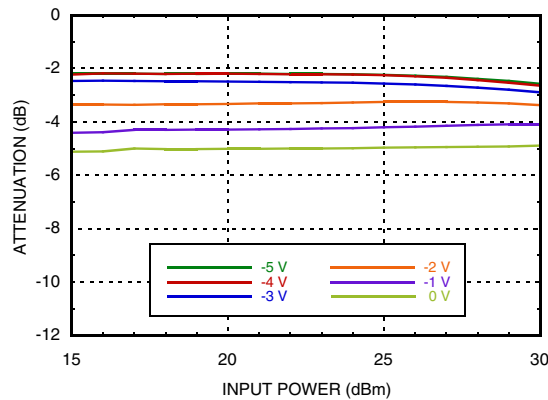
Attenuation vs. Vctrl1
Over Temperature @ 10 GHz, Vctrl2 = -5V



Attenuation vs. Vctrl2
Over Temperature @ 10 GHz, Vctrl1 = 0V

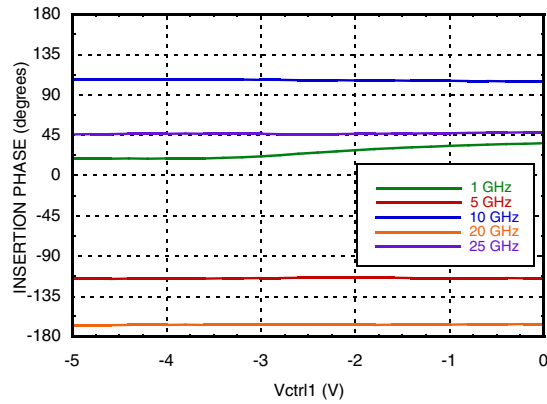


Attenuation vs. Pin @ 5 GHz
Vctrl1 = Variable, Vctrl2 = -5V

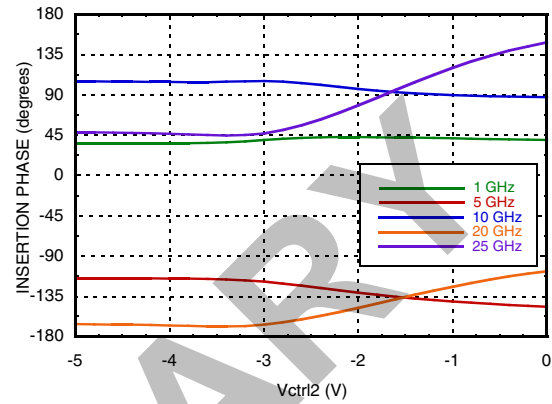


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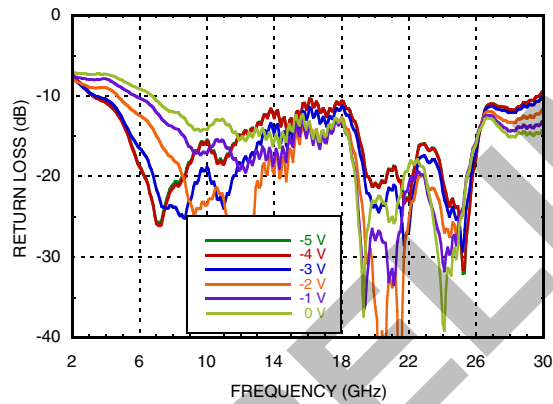
Insertion Phase vs. V_{ctrl1} , $V_{ctrl2} = -5V$



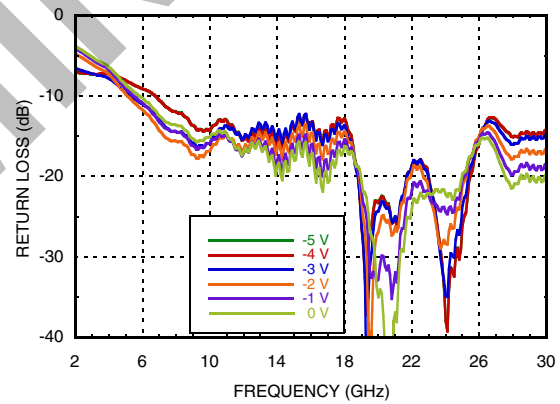
Insertion Phase vs. V_{ctrl2} , $V_{ctrl1} = 0V$



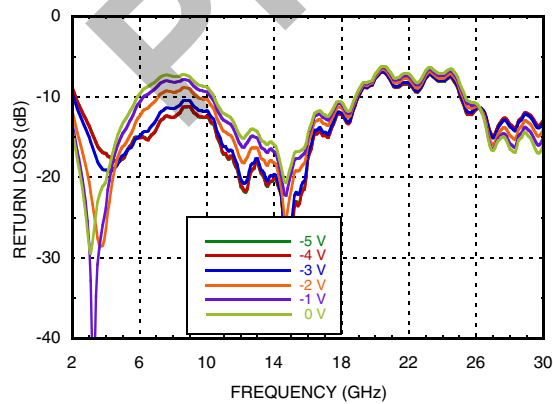
**Input Return Loss
 $V_{ctrl1} = \text{Variable}$, $V_{ctrl2} = -5V$**



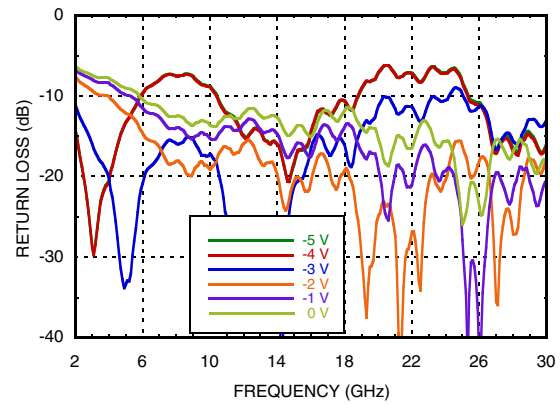
**Input Return Loss
 $V_{ctrl1} = 0V$, $V_{ctrl2} = \text{Variable}$**



**Output Return Loss
 $V_{ctrl1} = \text{Variable}$, $V_{ctrl2} = -5V$**

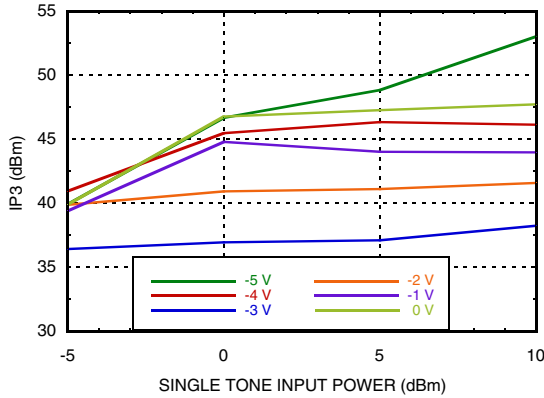


**Output Return Loss
 $V_{ctrl1} = 0V$, $V_{ctrl2} = \text{Variable}$**



GaAs MMIC VOLTAGE-VARIABLE ATTENUATOR, 5 - 26.5 GHz

Input IP3 vs Input Power @ 5 GHz
Vctrl1 = Variable, Vctrl2 = -5V



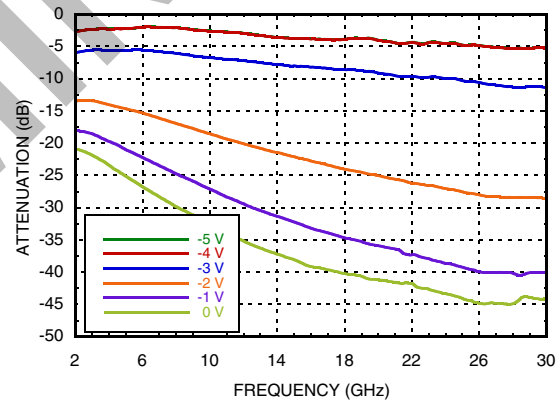
Worst Case Input IP3 vs. Input Power Over Frequency
Vctrl1 = -3V, Vctrl2 = -5V

TBD

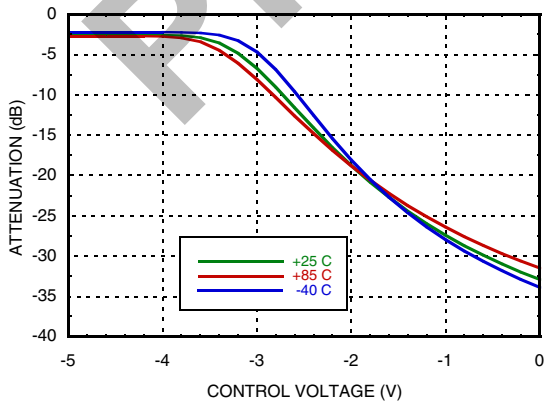
Worst Case Input IP3 vs. Input Power Over Temperature
Vctrl1 = -3V, Vctrl2 = -5V

TBD

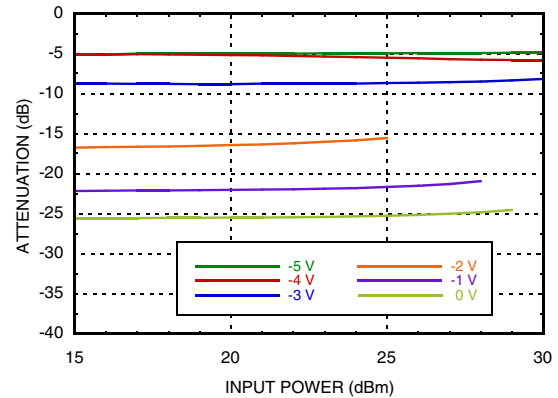
Attenuation vs. Frequency over Vctrl
Vctrl1 = Vctrl2

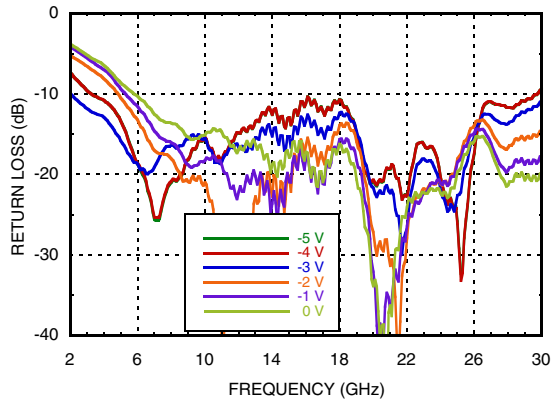
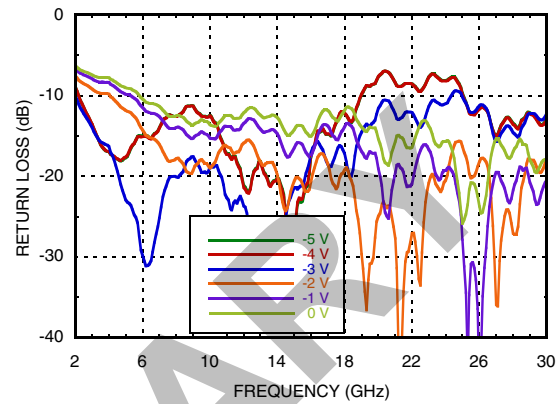
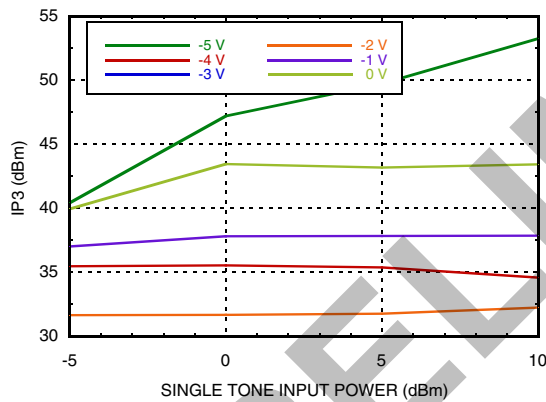


Attenuation vs. Vctrl over Temperature
 @ 10 GHz, *Vctrl1 = Vctrl2*



Attenuation vs. Input Power @ 5 GHz
Vctrl1 = 0V, Vctrl2 = Variable



**GaAs MMIC VOLTAGE-VARIABLE
ATTENUATOR, 5 - 26.5 GHz**
Input Return Loss, Vctrl1 = Vctrl2

Output Return Loss, Vctrl1 = Vctrl2

**Input IP3 vs Input Power @ 5 GHz
Vctrl1 = Vctrl2**

Absolute Maximum Ratings

RF Input Power	+30 dBm
Control Voltage Range	+0.3 to -6V
Channel Temperature	175 °C
Continuous Pdiss (T = 85 °C)	1W
Thermal Resistance (Channel to ground paddle)	66 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A

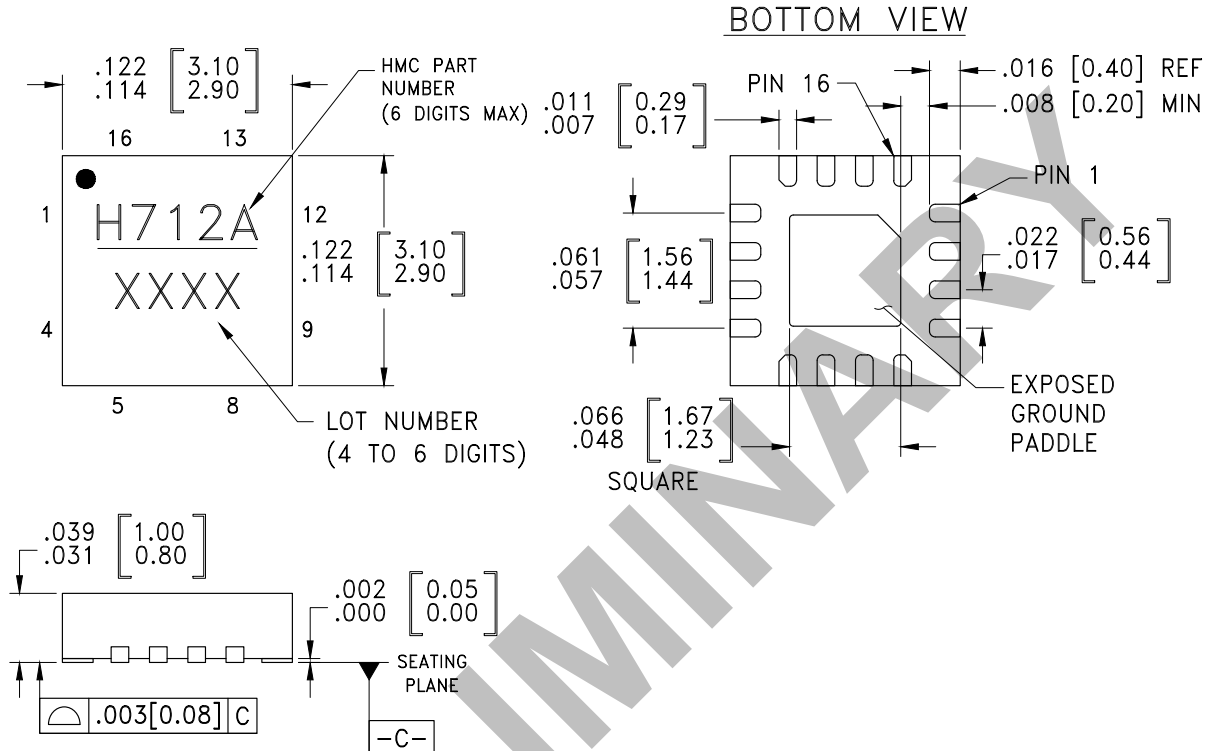
Control Voltages

Vctrl1	-5 to 0V @ 10 μA
Vctrl2	-5 to 0V @ 10 μA


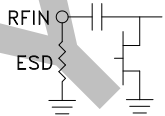
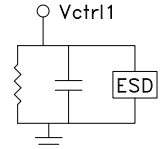
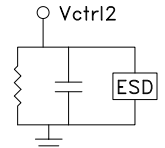
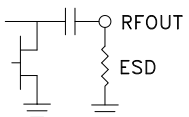

**ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS**

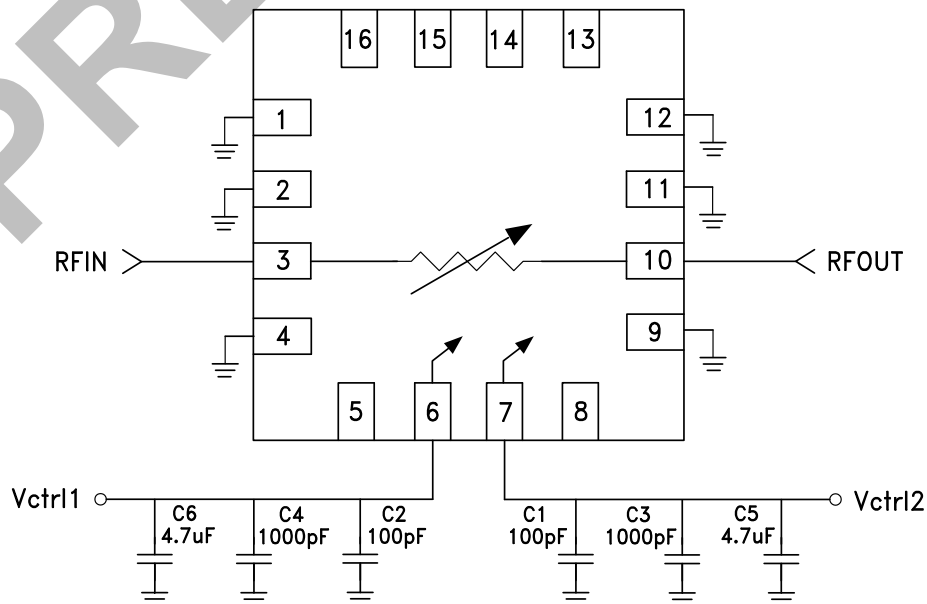
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Outline Drawing



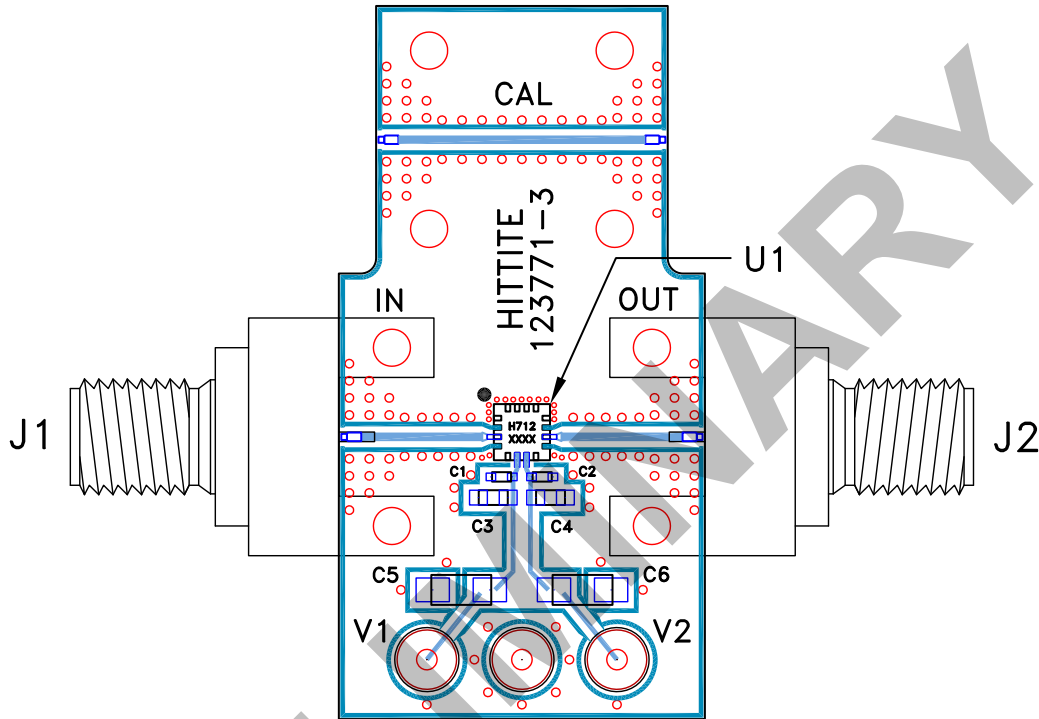
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Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 2, 4, 9, 11, 12 Ground Paddle	GND	Ground paddle must be connected to RF/DC ground.	
3	RFIN	This pin is DC coupled and matched to 50 Ohms. A blocking capacitor is required if RF line potential is not equal to 0V.	
5, 8, 13 - 16	N/C	These pins should be connected to PCB RF ground to maximize performance.	
6	Vctrl1	Control Voltage 1	
7	Vctrl2	Control Voltage 2	
10	RFOUT	This pin is DC coupled and matched to 50 Ohms. A blocking capacitor is required if RF line potential is not equal to 0V.	

Application Circuit


**GaAs MMIC VOLTAGE-VARIABLE
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Evaluation PCB



List of Materials for Evaluation PCB

Item	Description
J1, J2	PCB Mount SMA RF Connector
C1, C2	100 pF Capacitor, 0402 Pkg.
C3, C4	1000 pF Capacitor, 0603 Pkg.
C5, C6	4.7 μ F Capacitor, Tantalum
V1, V2	DC Pin
U1	HMC712ALP3C Voltage Variable Attenuator
PCB [1]	123771 Evaluation PCB

[1] Circuit Board Material: Arlon 25FR or Rogers 4350

The circuit board used in the final application should use RF circuit design techniques. Signal lines should have 50 Ohm impedance while the package ground leads and exposed paddle should be connected directly to the ground plane similar to that shown. A sufficient number of via holes should be used to connect the top and bottom ground planes. The evaluation circuit board shown is available from Analog Devices upon request.