HMC712ALP3CE

v02.0617

GaAs MMIC VOLTAGE-VARIABLE ATTENUATOR, 5 - 26.5 GHz

Typical Applications

The HMC712ALP3CE is ideal for:

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

Features

Wide Bandwidth: 5 - 26.5 GHz

Excellent Linearity: +28 dBm Input P1dB

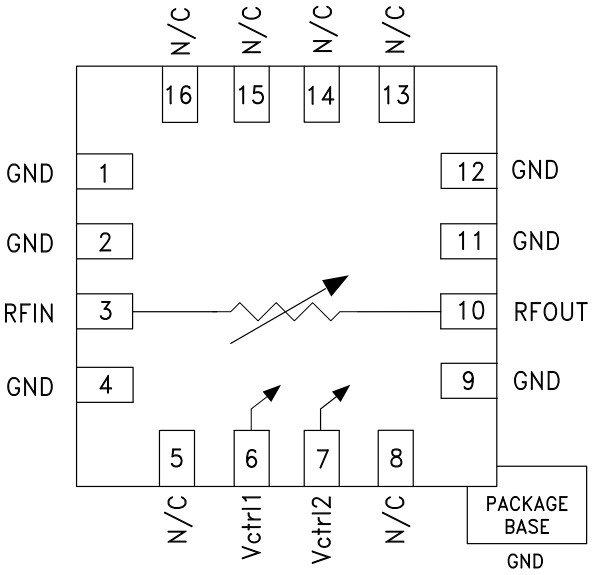
Wide Attenuation Range: 28 dB

Absorptive Topology

Singe or Dual Control Operation

16 Lead 3x3mm SMT Package: $9mm^2$

Functional Diagram



General Description

The HMC712ALP3CE 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 HMC712ALP3CE is housed in a RoHS compliant 3x3 mm QFN leadless package

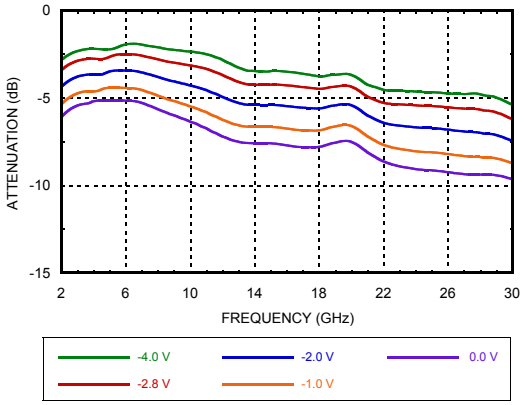
Furthermore, if the Vctrl1 and Vctrl2 pins are connected together it is possible to achieve the full analog attenuation range with only a small degradation in input IP3 performance. Applications include AGC circuits and temperature compensation of multiple gain stages in microwave point-to-point and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

Electrical Specifications, T_A = +25° C, 50 Ohm system

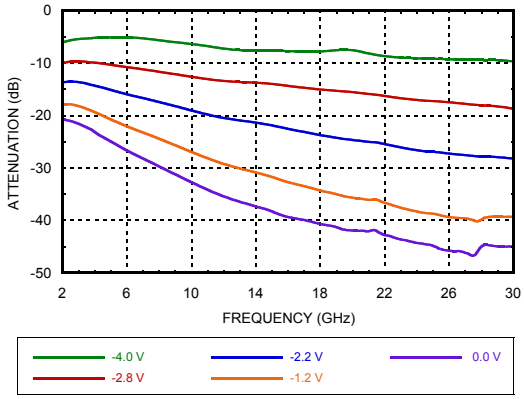
Parameter		Min.	Typ.	Max.	Units
Insertion Loss	5 - 10 GHz 10 - 15 GHz 15 - 26.5 GHz		2.3 3 4.2	3.5 4 5.7	dB dB dB
Attenuation Range	5 - 10 GHz 10 - 15 GHz 15 - 26.5 GHz	19 21 23	27 32 37		dB dB dB
Input Return Loss			12		dB
Output Return Loss			10		dB
Input Power for 1 dB Compression (any attenuation)			28		dBm
Input Third Order Intercept (Two-tone Input Power = 10 dBm Each Tone)			32		dBm

For price, delivery, and to place orders: Analog Devices, Inc., One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D

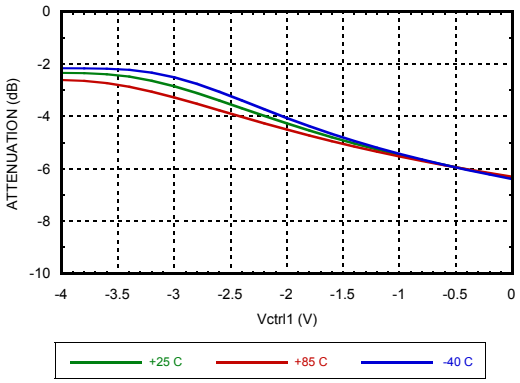
Attenuation vs. Frequency over Vctrl
Vctrl1 = Variable, Vctrl2 = -5V



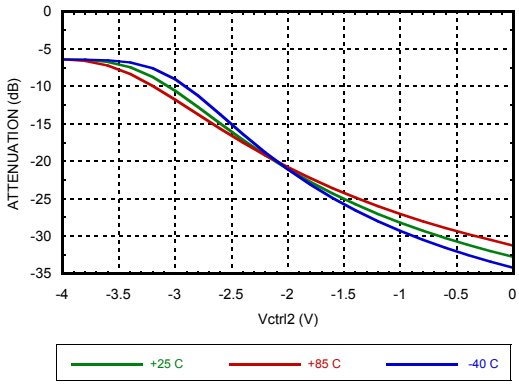
Attenuation vs. Frequency over Vctrl
Vctrl1 = 0V, Vctrl2 = Variable



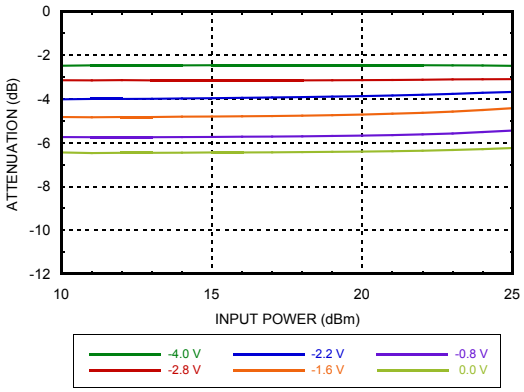
Attenuation vs. Vctrl1
Over Temperature @ 10 GHz, Vctrl2 = -5V



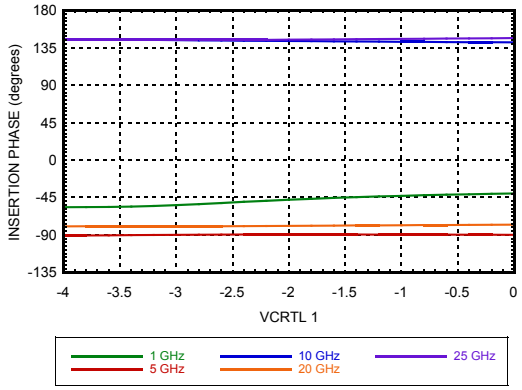
Attenuation vs. Vctrl2
Over Temperature @ 10 GHz, Vctrl1 = 0V



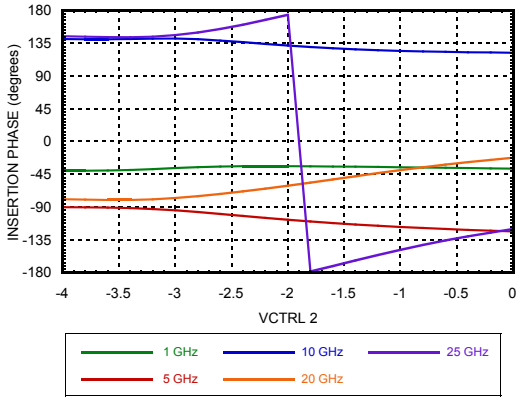
Attenuation vs. Pin @ 10 GHz
Vctrl1 = Variable, Vctrl2 = -5V



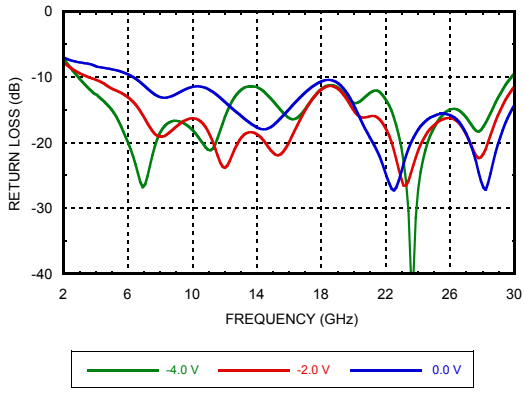
Insertion Phase vs. Vctrl1, Vctrl2 = -5V



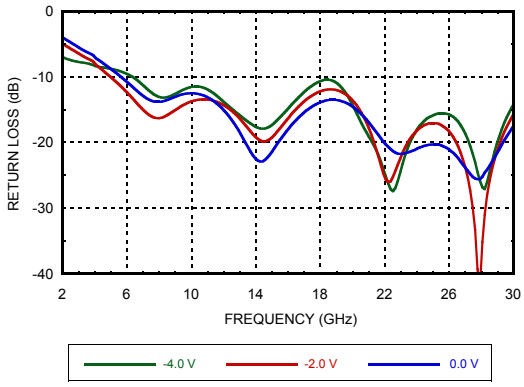
Insertion Phase vs. Vctrl2, Vctrl1 = 0V



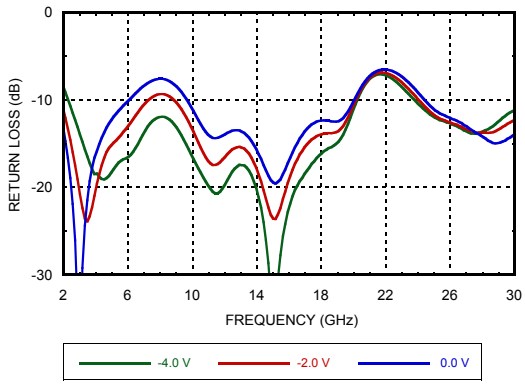
Input Return Loss
Vctrl1 = Variable, Vctrl2 = -5V



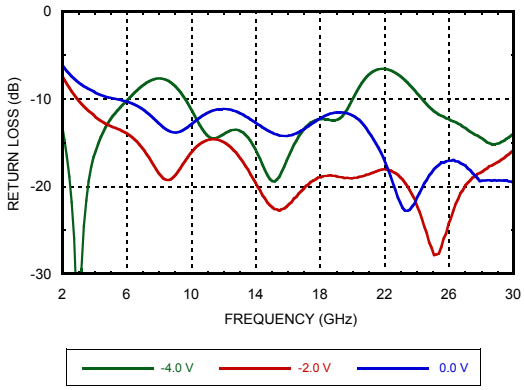
Input Return Loss
Vctrl1 = 0V, Vctrl2 = Variable



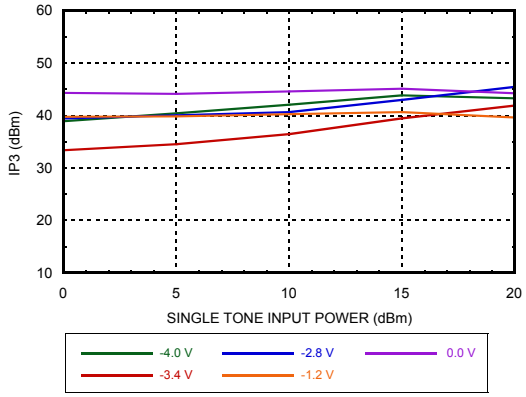
Output Return Loss
Vctrl1 = Variable, Vctrl2 = -5V



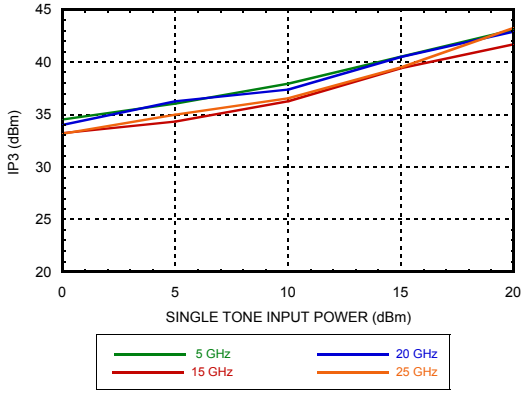
Output Return Loss
Vctrl1 = 0V, Vctrl2 = Variable



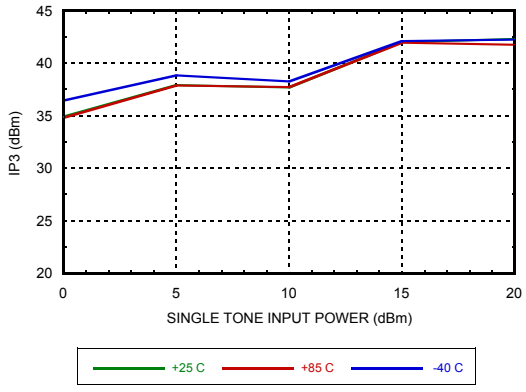
Input IP3 vs Input Power @ 10 GHz Vctrl1 = Variable, Vctrl2 = -5V



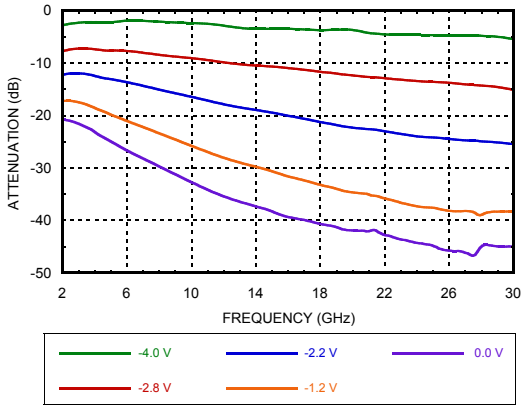
Input IP3 vs. Input Power Over Frequency Vctrl1 = -2.0V, Vctrl2 = -5V (Worst Case IP3)



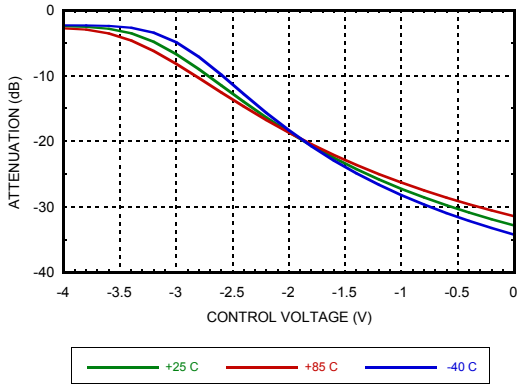
Input IP3 vs. Input Power Over Temperature @ 10 GHz, Vctrl1 = -2.0V, Vctrl2 = -5V



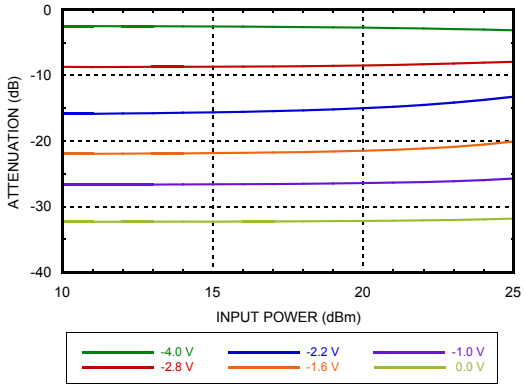
Attenuation vs. Frequency over Vctrl Vctrl1 = Vctrl2



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



Attenuation vs. Input Power over Vctrl Vctrl1 = Vctrl2



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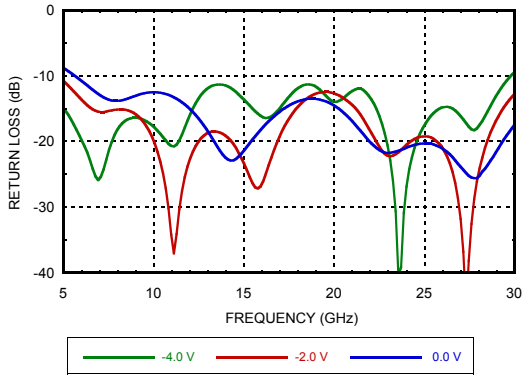
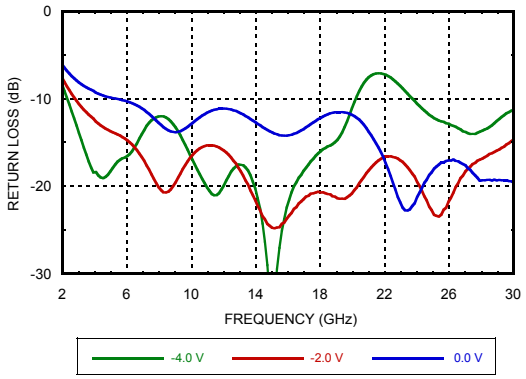
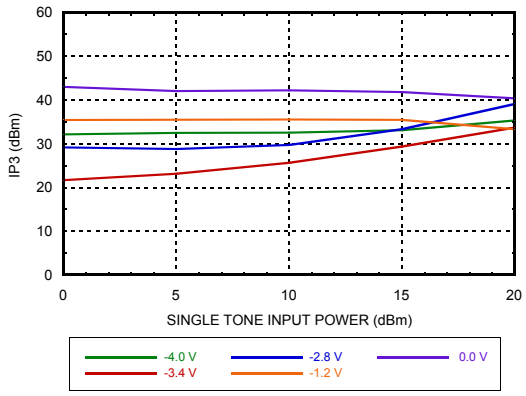
Input Return Loss, Vctrl1 = Vctrl2



Output Return Loss, Vctrl1 = Vctrl2



Input IP3 vs. Input Power Over Vctrl @ 10 GHz, Vctrl1 = Vctrl2



Absolute Maximum Ratings

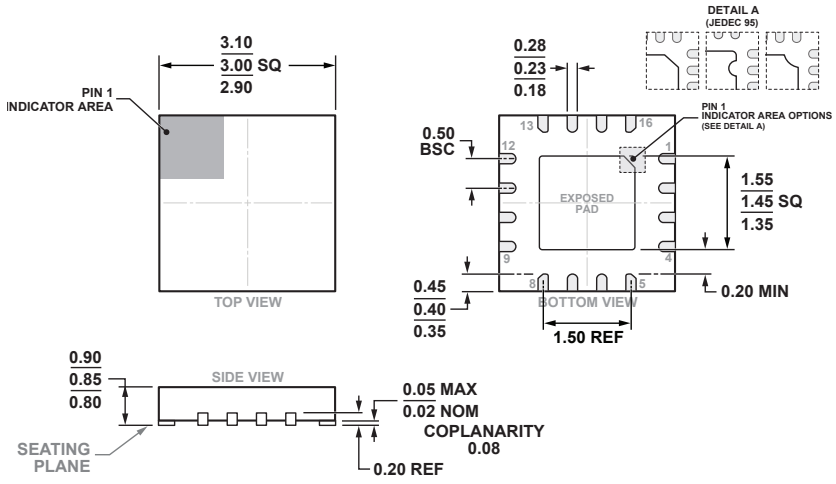
RF Input Power	+30 dBm
Control Voltage Range	+0.3 to -6V
Channel Temperature	175 °C
Continuous Pdiss (T = 85 °C)	1W
Thermal Resistance (Channel to ground paddle)	66 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 0 (Passed 150V)

Control Voltages

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

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



COMPLIANT WITH JEDEC STANDARDS MO-220-VEED-4

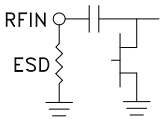
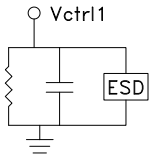
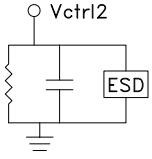
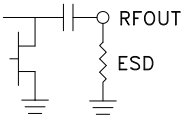
16-Lead Lead Frame Chip Scale Package [LFCSP]
3 x 3 mm Body and 0.85 mm Package Height
(CP-16-52)
Dimensions shown in millimeters

Package Information

Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [1]
HMC712ALP3CE	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 [2]	H712A XXXX

[1] 4-Digit lot number XXXX
[2] Max peak reflow temperature of 260 °C

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