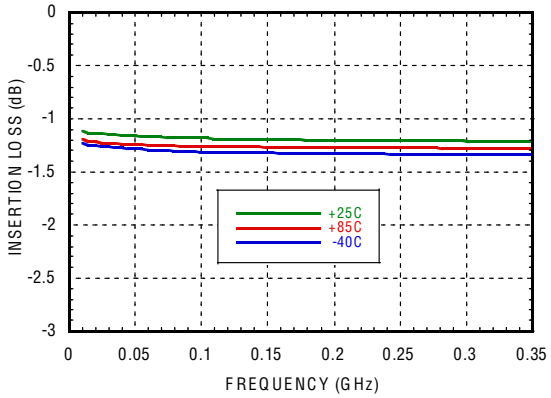
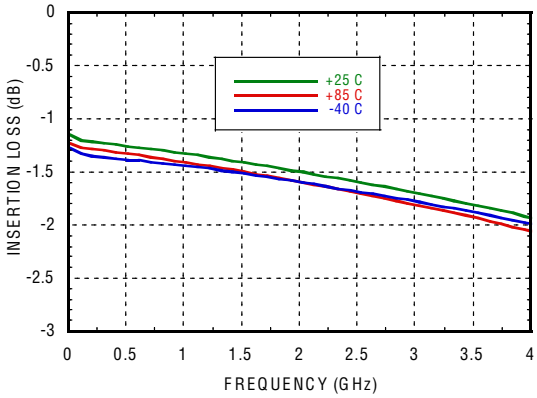
0.5 dB LSB GaAs MMIC 6-BIT DIGITAL POSITIVE CONTROL ATTENUATOR, DC - 3.8 GHz

Insertion Loss

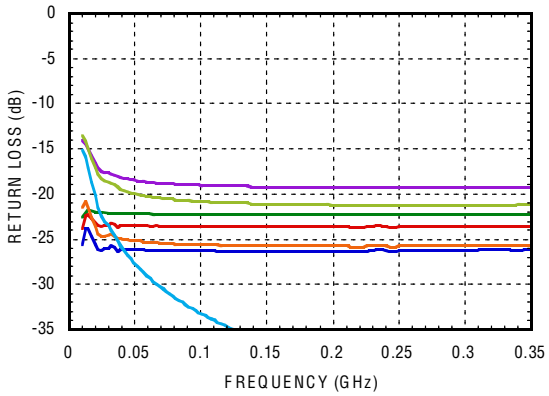


Insertion Loss



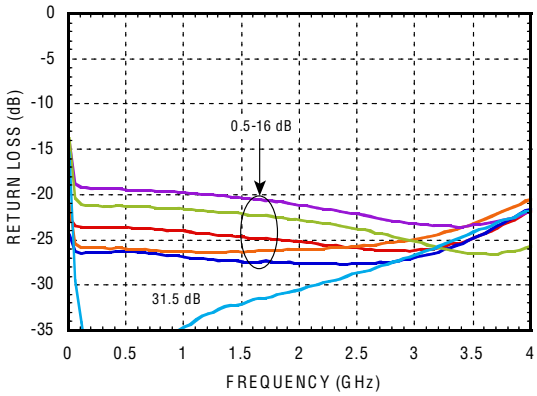
Return Loss RF1, RF2

(Only Major States are Shown)



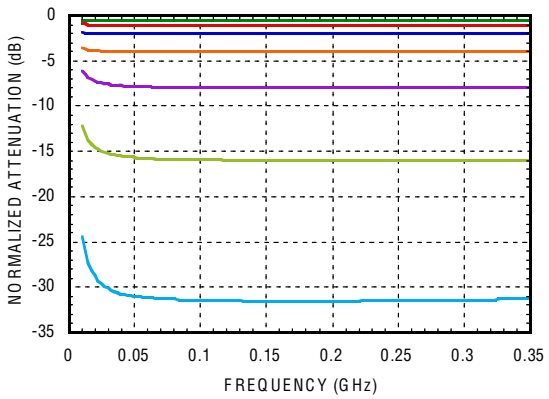
Return Loss RF1, RF2

(Only Major States are Shown)



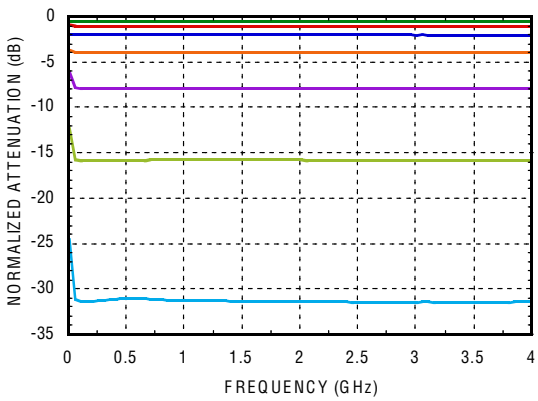
Normalized Attenuation

(Only Major States are Shown)



Normalized Attenuation

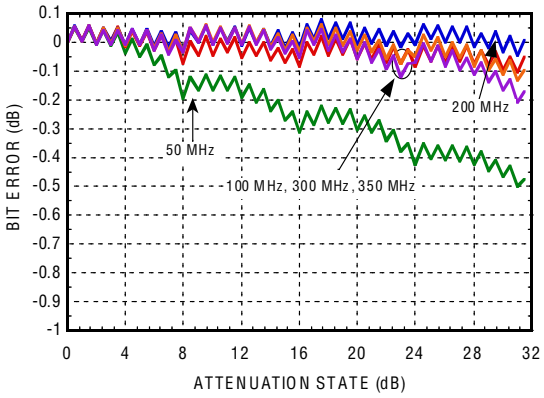
(Only Major States are Shown)



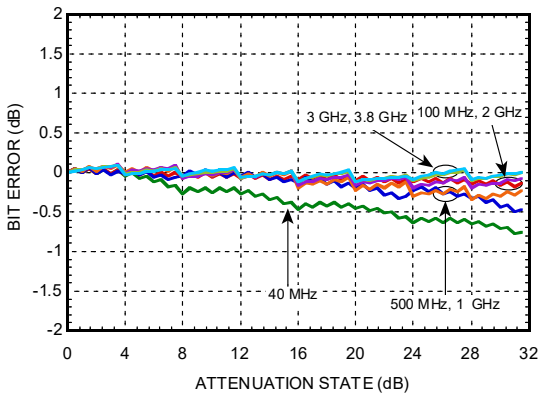
RoHS✓ EARTH FRIENDLY

0.5 dB LSB GaAs MMIC 6-BIT DIGITAL POSITIVE CONTROL ATTENUATOR, DC - 3.8 GHz

Bit Error vs. Attenuation State

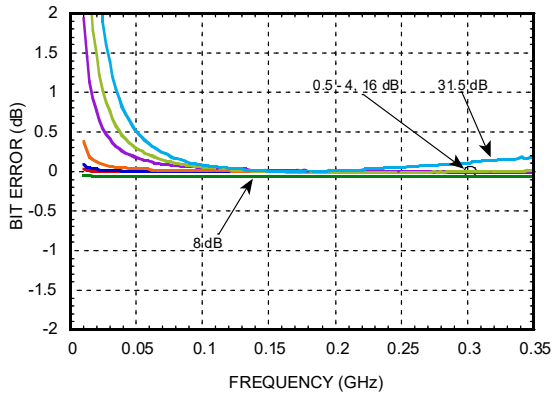


Bit Error vs. Attenuation State



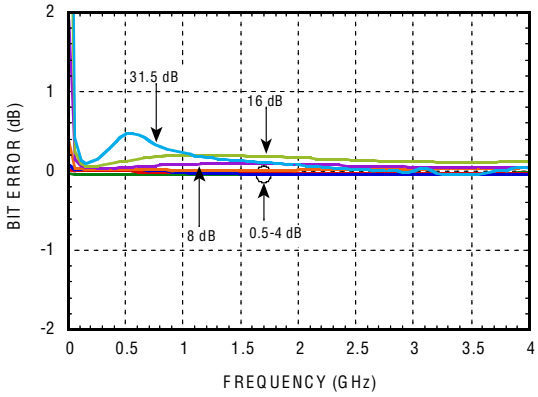
Bit Error vs. Frequency

(Only Major States are Shown)



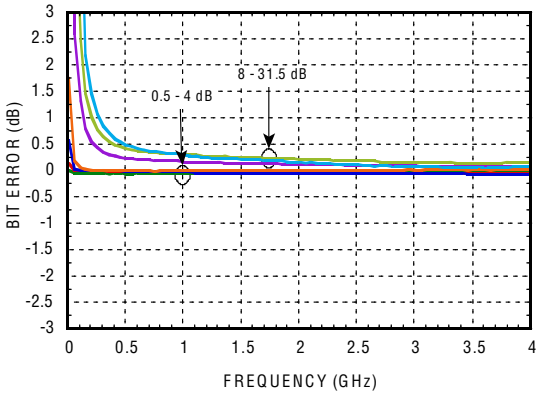
Bit Error vs. Frequency

(Only Major States are Shown)



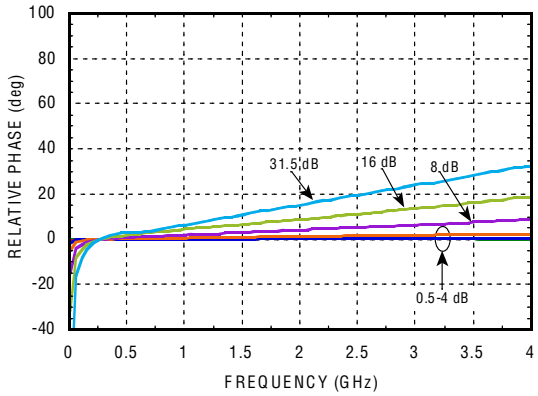
Bit Error vs. Frequency without AC Ground Caps

(Only Major States are Shown)

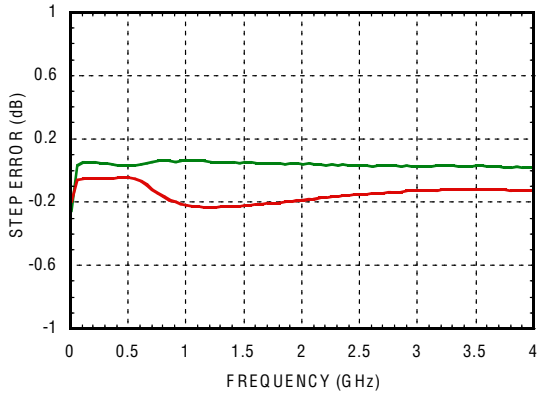


0.5 dB LSB GaAs MMIC 6-BIT DIGITAL POSITIVE CONTROL ATTENUATOR, DC - 3.8 GHz

Relative Phase vs. Frequency
(Only Major States are Shown)



Worst Case Step Error Between Successive Attenuation States



Bias Voltage & Current

Vdd = +5V ± 10%	
Vdd (V)	Idd (Typ.) (mA)
+4.5	2.4
+5.0	2.5
+5.5	2.6

Control Voltage

State	Bias Condition
Low	0 to +0.8 Vdc @ -5 uA Typ.
High	+ 2.0 to + 5.0 Vdc @ 40 uA Typ.
Note: Vdd = +5V	

Truth Table

Control Voltage Input						Attenuation State RF1 - RF2
V1 16 dB	V2 8 dB	V3 4 dB	V4 2 dB	V5 1 dB	V6 0.5 dB	
High	High	High	High	High	High	Reference I.L.
High	High	High	High	High	Low	0.5 dB
High	High	High	High	Low	High	1 dB
High	High	High	Low	High	High	2 dB
High	High	Low	High	High	High	4 dB
High	Low	High	High	High	High	8 dB
Low	High	High	High	High	High	16 dB
Low	Low	Low	Low	Low	Low	31.5 dB
Any combination of the above states will provide an attenuation approximately equal to the sum of the bits selected.						

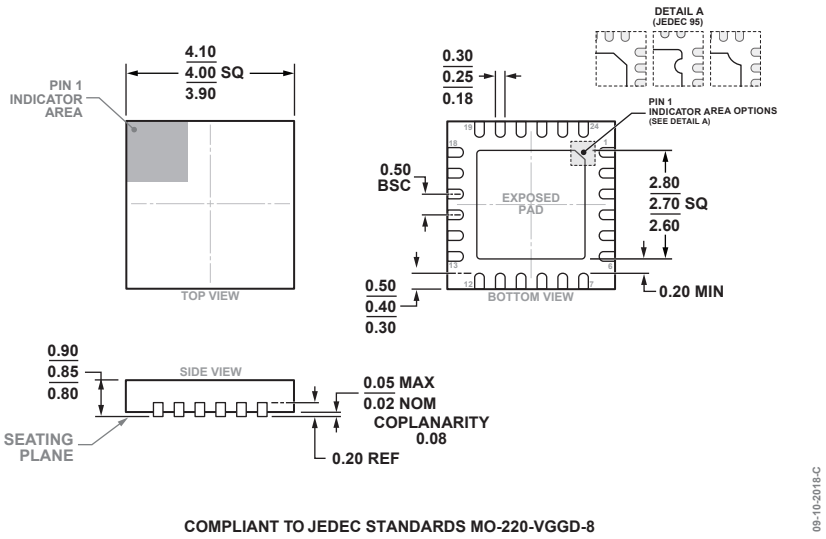
0.5 dB LSB GaAs MMIC 6-BIT DIGITAL POSITIVE CONTROL ATTENUATOR, DC - 3.8 GHz

Absolute Maximum Ratings

RF Input Power (DC - 3 GHz)	+28 dBm (T = +85 °C)
Control Voltage Range (V1 to V6)	-1V to Vdd +1V
Bias Voltage (Vdd)	+7V
Channel Temperature	150 °C
Continuous Pdiss (T = 85 °C) (derate 8.6 mW/°C above 85 °C)	0.56 W
Thermal Resistance	116 °C/W
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C
ESD Sensitivity (HBM)	Class 1A

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing



COMPLIANT TO JEDEC STANDARDS MO-220-VGGD-8

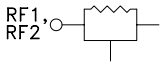
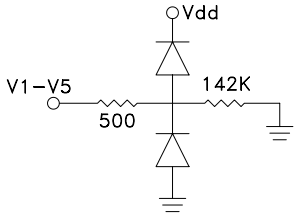
24-Lead Lead Frame Chip Scale Package [LFCSP]
4 mm × 4 mm Body and 0.85 mm Package Height
(CP-24-16)
Dimensions shown in millimeters

Package Information

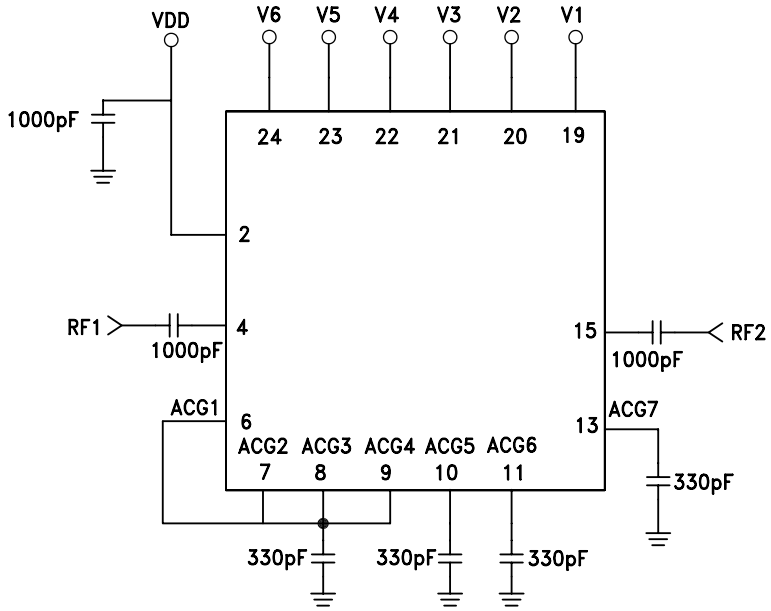
Part Number	Package Body Material	Lead Finish	MSL Rating	Package Marking [3]
HMC472ALP4	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL3 [1]	H472A XXXX
HMC472ALP4TR	Low Stress Injection Molded Plastic	Sn/Pb Solder	MSL3 [1]	H472A XXXX
HMC472ALP4E	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 [2]	H472A XXXX
HMC472ALP4ETR	RoHS-compliant Low Stress Injection Molded Plastic	100% matte Sn	MSL3 [2]	H472A XXXX

[1] Max peak reflow temperature of 235 °C
[2] Max peak reflow temperature of 260 °C
[3] 4-Digit lot number XXXX

Pin Descriptions

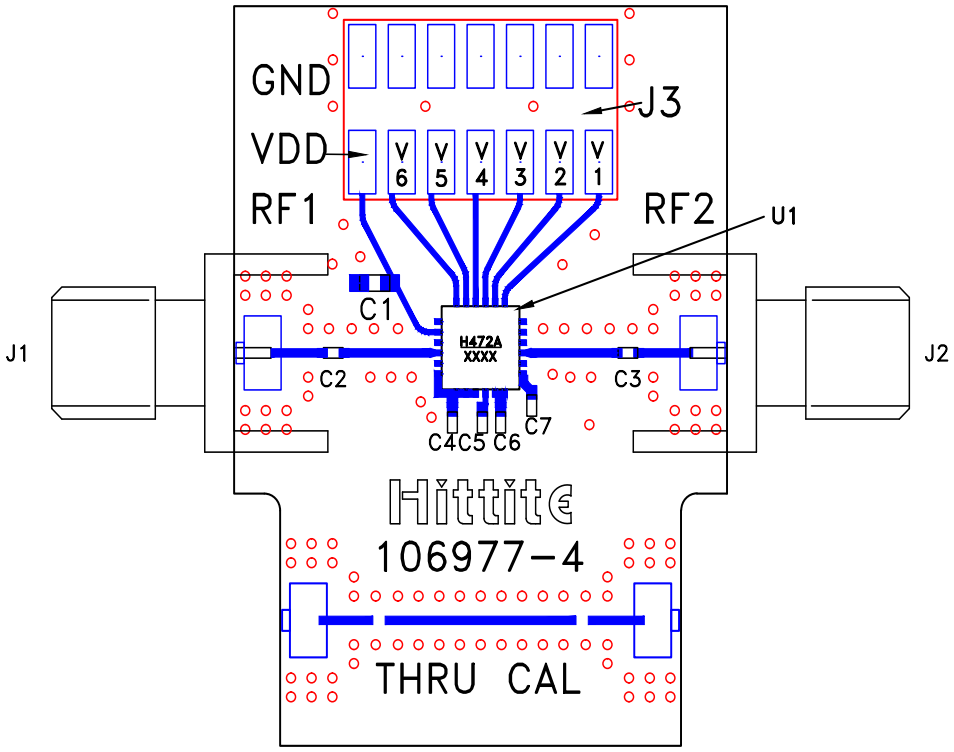
Pin Number	Function	Description	Interface Schematic
1, 3, 5, 12, 14, 16, 17, 18	N/C	These pins should be connected to PCB RF ground to maximize performance.	
2	Vdd	Supply Voltage.	
4, 15	RF1, RF2	This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required. Select value based on lowest frequency of operation.	
6 - 11, 13	ACG1 - ACG7	External capacitors to ground are recommended for low and high frequency operation. Select value for lowest frequency of operation. Place capacitor as close to pins as possible. For operation from 700 to 2700 MHz, these pins may be left unconnected.	
19 - 24	V1 - V6	See truth table and control voltage table.	
	GND	Package bottom has an exposed metal paddle that must also be connected to RF/DC Ground.	

Application Circuit



Note: For operations from 700 to 2700 MHz, pins 6 through 13 may be left unconnected.

Evaluation PCB



List of Materials for Evaluation PCB 107010 - HMC472ALP4 [1]

Item	Description
J1 - J2	PCB Mount SMA Connector
J3	14 Pin DC Connector
C1	1000 pF Capacitor, 0603 Pkg.
C2, C3	1000 pF Capacitor, 0402 Pkg.
C4 - C7	330 pF Capacitor, 0402 Pkg.
U1	HMC472ALP4E Digital Attenuator
PCB [2]	106977 Evaluation PCB

[1] Reference this number when ordering complete evaluation PCB

[2] Circuit Board Material: Rogers 4350

The circuit board used in the 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.