

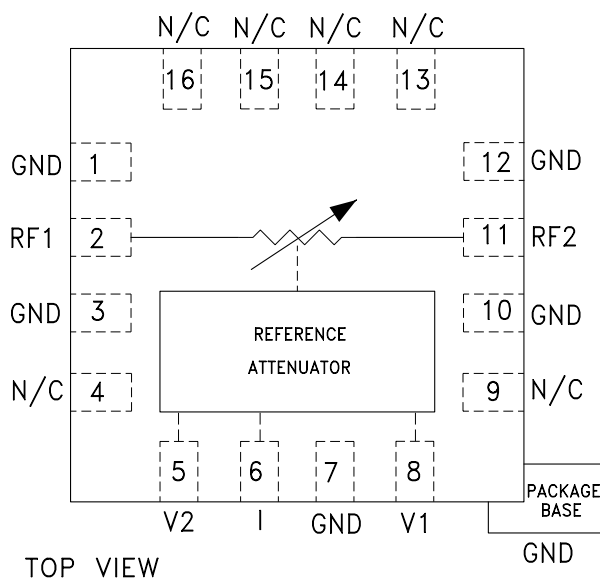
GaAs MMIC VOLTAGE-VARIABLE ATTENUATOR, DC - 14 GHz

Typical Applications

The HMC346LP3 is ideal for:

- Basestation Infrastructure
- Fiber Optics & Broadband Telecom
- Microwave Radio & VSAT
- Military Radios, Radar, & ECM
- Test Instrumentation

Functional Diagram



Features

- Wide Bandwidth: DC - 14 GHz
- Low Phase Shift vs. Attenuation
- 30 dB Attenuation Range
- Simplified Voltage Control
- 3 mm x 3 mm x 1 mm SMT Package

General Description

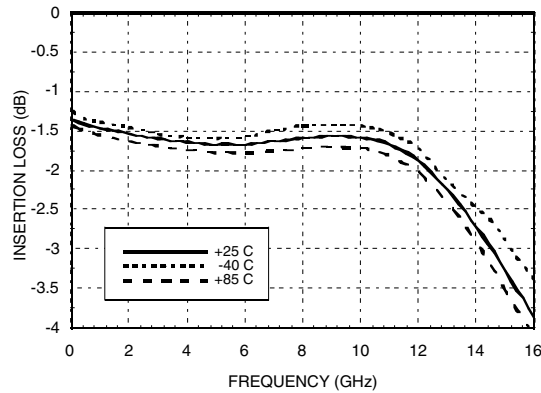
The HMC346LP3 is an absorptive Voltage Variable Attenuator (VVA) in a low cost leadless surface mount plastic package operating from DC - 14 GHz. It features an on-chip reference attenuator for use with an external op-amp to provide simple single voltage attenuation control, 0 to -3V. The device is ideal in designs where an analog DC control signal must control RF signal levels over a 30 dB amplitude range. This VVA is an excellent alternative to the HMC121C8.

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

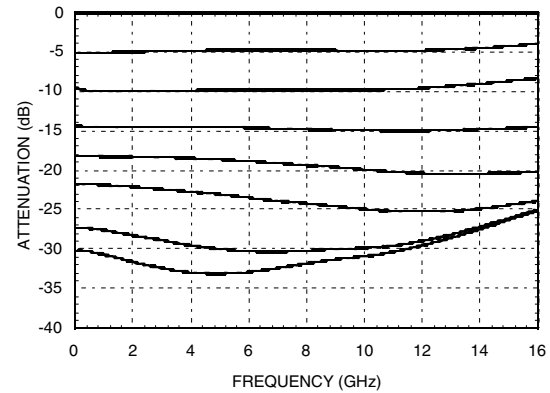
Parameter	Min	Typical	Max	Units
Insertion Loss				
DC - 10 GHz		1.7	2.2	dB
DC - 14 GHz		2.8	3.3	dB
Attenuation Range				
DC - 10 GHz	27	30		dB
DC - 14 GHz	22	27		dB
Return Loss				
DC - 14 GHz	5	10		dB
Switching Characteristics				
tRISE, tFALL (10/90% RF):		2		ns
tON, tOFF (50% CTL to 10/90% RF):		8		ns
Input Power for 0.25 dB Compression (0.5 - 8 GHz)				
Min. Atten:		+8		dBm
Atten. >2 dB:		-4		dBm
Input Third Order Intercept (0.5 - 8 GHz) (Two-tone Input Power = -8 dBm Each Tone)				
Min. Atten:		+25		dBm
Atten. >2 dB:		+10		dBm

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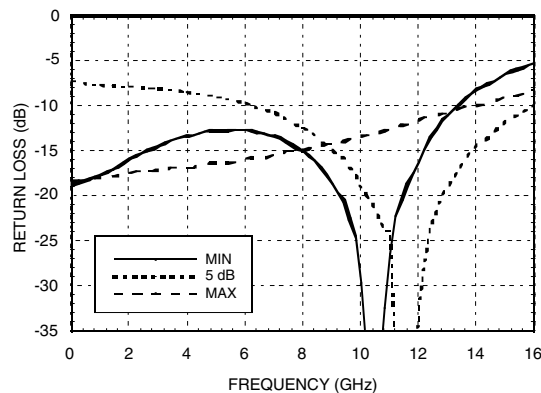
Insertion Loss vs. Temperature



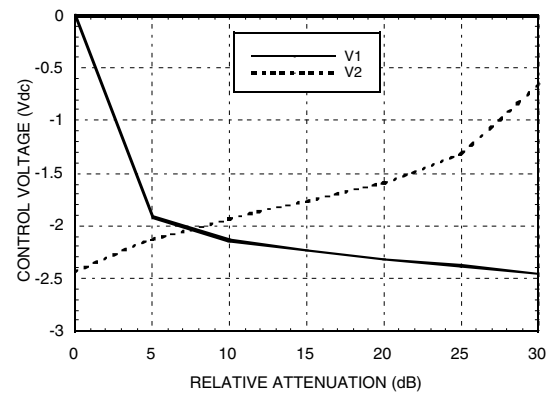
Relative Attenuation



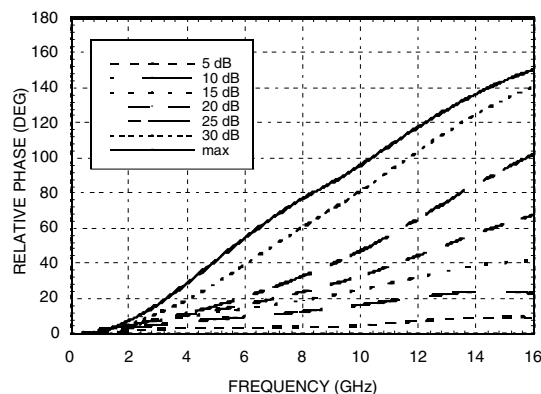
Return Loss vs. Attenuation



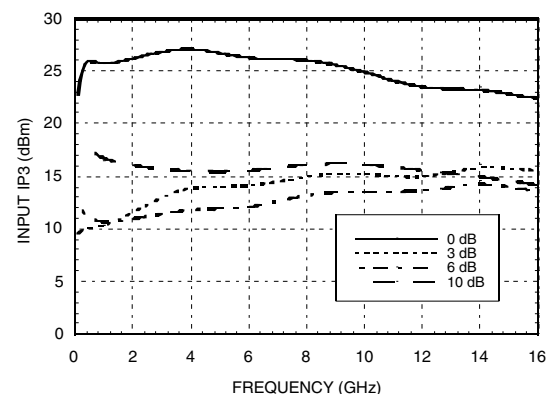
**Relative Attenuation vs.
Control Voltage @ 10 GHz**



Relative Phase



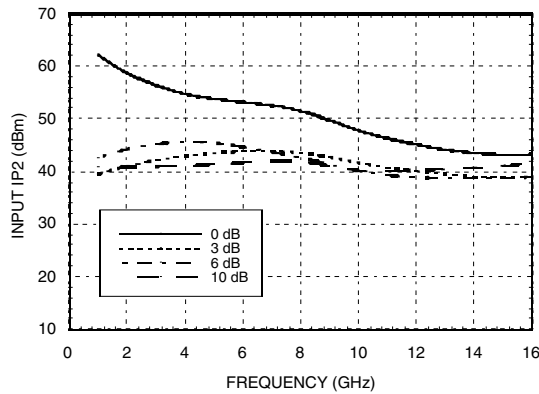
Input IP3 vs. Attenuation*



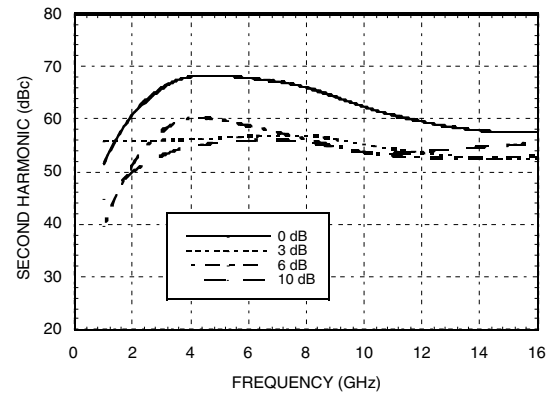
*Two-tone input power = -8 dBm each tone, 1 MHz spacing.

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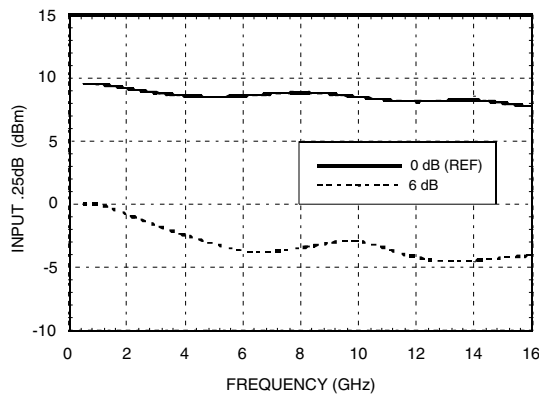
Input IP2 vs. Attenuation*



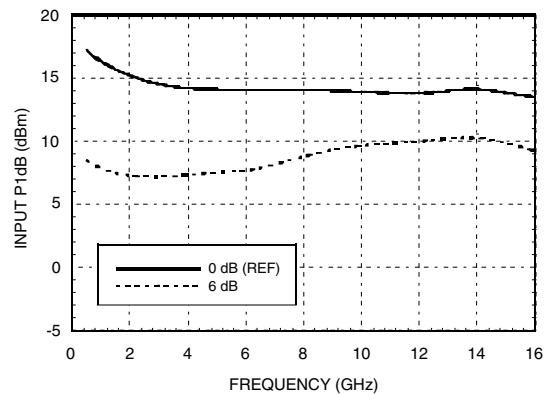
**Second Harmonic
vs. Attenuation, Pin = -8 dBm**



0.25 dB Compression vs. Attenuation



1 dB Compression vs. Attenuation



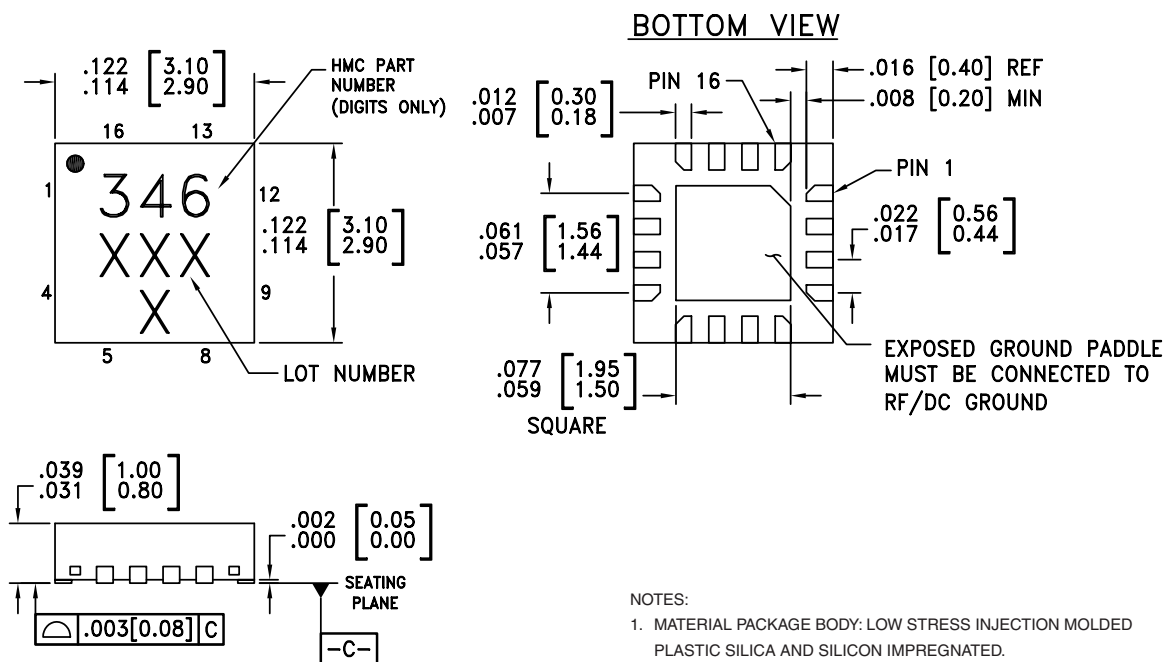
*Two-tone input power = -8 dBm each tone, 1 MHz spacing.

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Absolute Maximum Ratings

RF Input Power	+18 dBm
Control Voltage Range	+1.0 to -5.0 Vdc
Storage Temperature	-65 to +150 °C
Operating Temperature	-40 to +85 °C

Outline Drawing

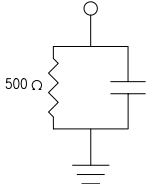
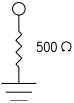


NOTES:

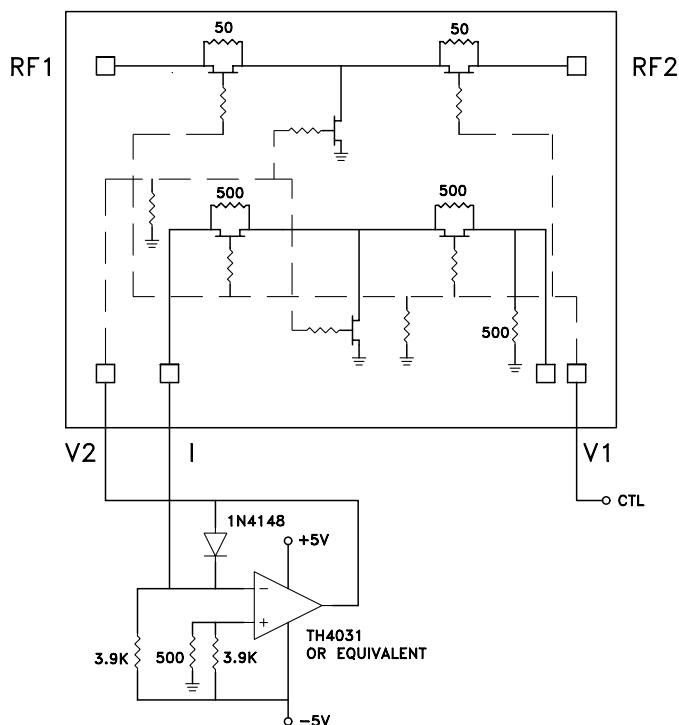
1. MATERIAL PACKAGE BODY: LOW STRESS INJECTION MOLDED PLASTIC SILICA AND SILICON IMPREGNATED.
2. LEAD AND GROUND PADDLE MATERIAL: COPPER ALLOY
3. LEAD AND GROUND PADDLE PLATING: Sn/Pb SOLDER
4. DIMENSIONS ARE IN INCHES [MILLIMETERS].
5. LEAD SPACING TOLERANCE IS NON-CUMULATIVE
6. PAD BURR LENGTH SHALL BE 0.15mm MAXIMUM.
PAD BURR HEIGHT SHALL BE 0.05mm MAXIMUM.
7. PACKAGE WARP SHALL NOT EXCEED 0.05mm.
8. ALL GROUND LEADS AND GROUND PADDLE MUST BE SOLDERED TO PCB RF GROUND.
9. REFER TO HITTITE APPLICATION NOTE FOR SUGGESTED PCB LAND PATTERN.

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Pin Descriptions

Pin Number	Function	Description	Interface Schematic
1, 3, 7, 10, 12	GND	Package bottom has exposed metal paddle that must also be connected to PCB RF ground.	
2, 11	RF1 RF2	This pin is DC coupled and matched to 50 Ohm. Blocking capacitors are required if the RF line potential is not equal to 0V.	
4, 9, 13, 14, 15, 16	N/C	This pin should be connected to PCB RF ground.	
5, 8	V2, V1	Control input (master).	
6	I	Control input (slave).	

Single-Line Control Driver

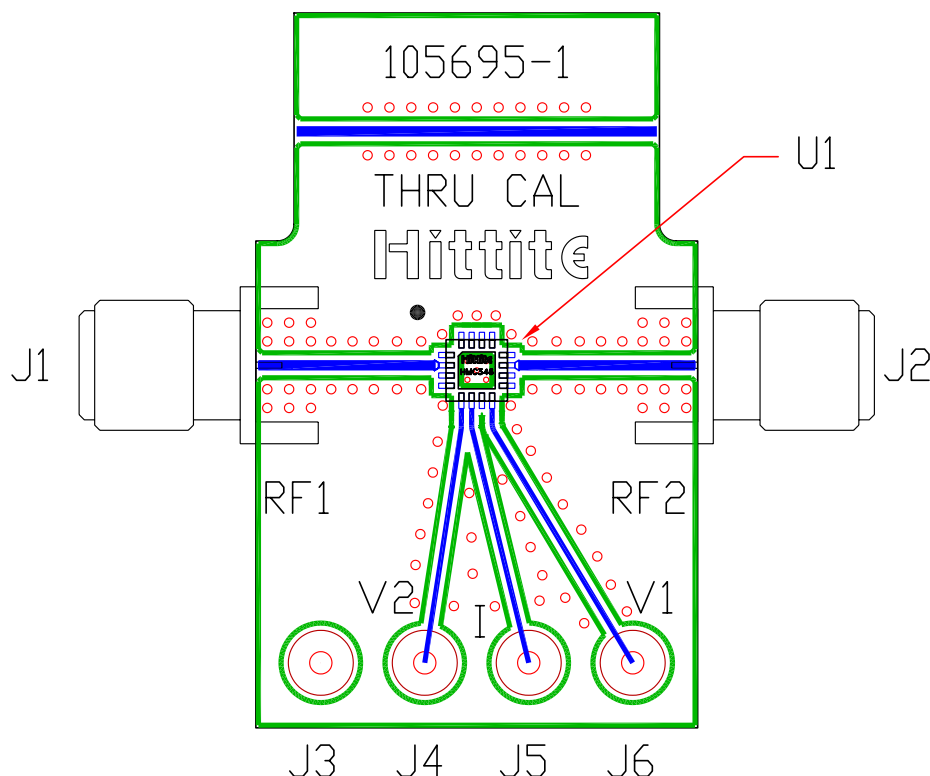


External op-amp control circuit maintains impedance match while attenuation is varied. Input control ranges from 0 Volts (min. attenuation) to -3.0 Volts (max. attenuation.)

For price, delivery, and to place orders, please contact Hittite Microwave Corporation:
12 Elizabeth Drive, Chelmsford, MA 01824 Phone: 978-250-3343 Fax: 978-250-3373
Order Online at www.hittite.com

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Evaluation PCB



The circuit board used in the final application should be generated with proper RF circuit design techniques. Signal lines at the RF ports should be 50 ohm impedance and the package ground leads and package bottom should be connected directly to the PCB RF ground plane, similar to that shown above. The evaluation circuit board shown above is available from Hittite Microwave Corporation upon request.

List of Material

Item	Description
J1 - J2	PC Mount SMA RF Connector
J3 - J6	DC Pin
U1	HMC346LP3 VVA
PCB*	105695 Evaluation PCB
* Circuit Board Material: Rogers 4350	