

# Analog Devices Welcomes Hittite Microwave Corporation

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## 1 dB LSB GaAs MMIC SMT 5-BIT DIGITAL ATTENUATOR, DC - 2.0 GHz

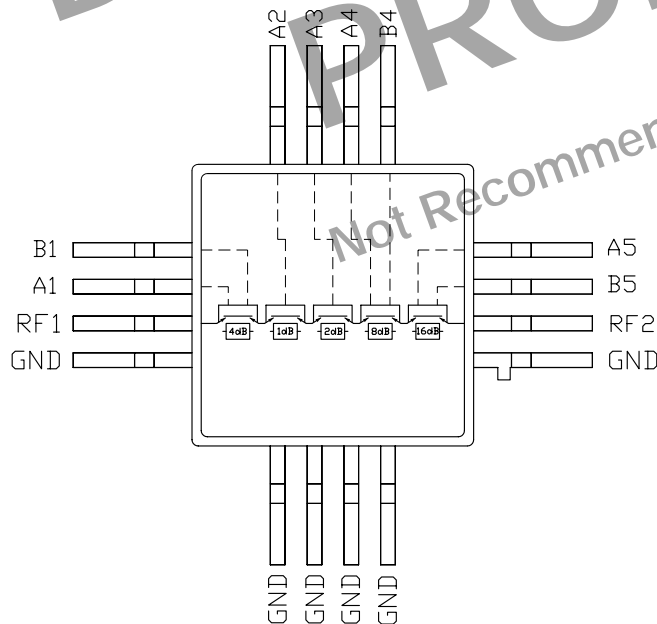
### Typical Applications

- Base station Infrastructure
- Portable Wireless
- CATV & DBS
- Military, Space & Test Equipment

### Features

- Bandwidth: DC - 2 GHz
- Low Insertion Loss: 5 dB
- 31dB Attenuation Range
- Fast Switching: 6 nS

### Functional Diagram



### General Description

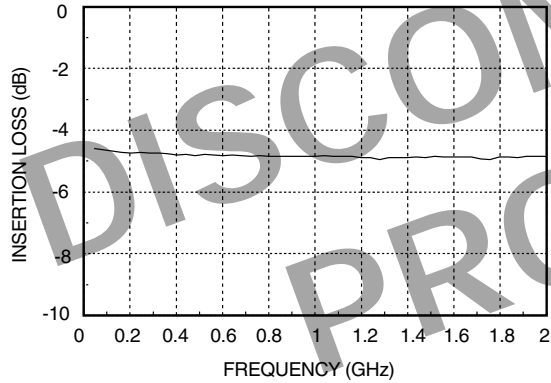
The HMC110G16 is a 5-bit surface mount hermetically sealed digital attenuator. Each bit is activated by applying a 0V control, and then disabled by applying -5V control to the specified control pin. The five primary attenuation states can be activated independently, or collectively for a maximum combined attenuation level of 31 dB. See the non-hermetic wide band DC - 6 GHz HMC110C14.

### Electrical Specifications, $T_A = +25^\circ C$ , With 0/-5V Control

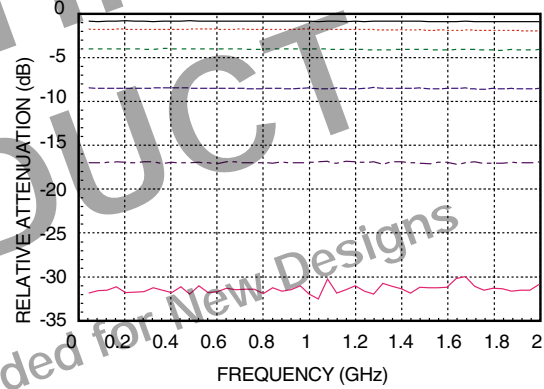
Parameter	Frequency	Min.	Typ.	Max.	Units
Insertion Loss	DC - 2 GHz		5	5.4	dB
Attenuation Range	DC - 2 GHz	27	31		dB
Return Loss	DC - 2 GHz	10	17		dB
Attenuation Accuracy:					
1 - 7 dB States	DC - 2 GHz	+/- 0.5 dB +/- 5% of Setting Max.			dB
8 - 15 dB States	DC - 2 GHz	+/- 0.6 dB +/- 5% of Setting Max.			dB
16 - 23 dB States	DC - 2 GHz	+/- 0.6 dB +/- 8% of Setting Max.			dB
24 - 31 dB States	DC - 2 GHz	+/- 0.6 dB +/- 10% of Setting Max.			dB
Switching Characteristics					
tRISE, tFALL (10/90% RF)	DC - 2 GHz		3		ns
tON, tOFF (50% CTL to 10/90% RF)			6		ns
Input Power for 0.2 dB Compression		Min Atten: Max Atten:		+22 +5	dBm dBm
Input Third Order Intercept		Min Atten: Max Atten:		+44 +32	dBm dBm

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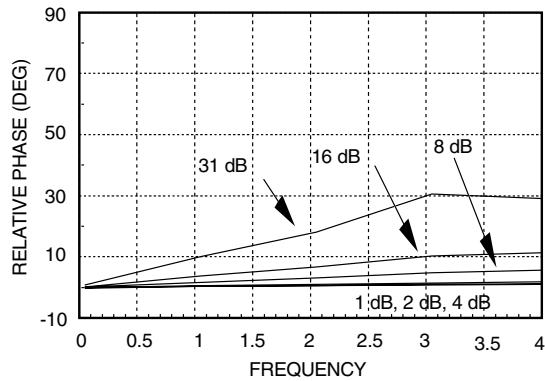
**Insertion Loss**



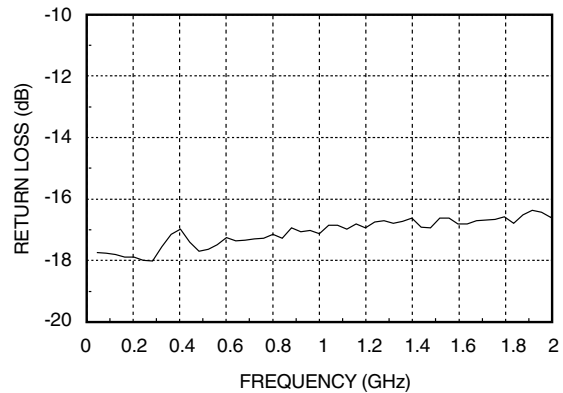
**Relative Attenuation**



**Relative Phase**



**Return Loss**



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### Truth Table

Control Input								Att Set	
4 dB Bit		1 dB		2 dB		8 dB Bit			16 dB Bit
A1	B1	A2	A3	A4	B4	A5	B5		
High	Low	High	High	High	Low	High	Low	Ref	
High	Low	Low	High	High	Low	High	Low	1dB	
High	Low	High	Low	High	Low	High	Low	2dB	
Low	High	High	High	High	Low	High	Low	4dB	
High	Low	High	High	Low	High	High	Low	8dB	
High	Low	High	High	High	Low	Low	High	16dB	

Any combination of the above states will provide an attenuation approximately equal to the sum of the bits selected.

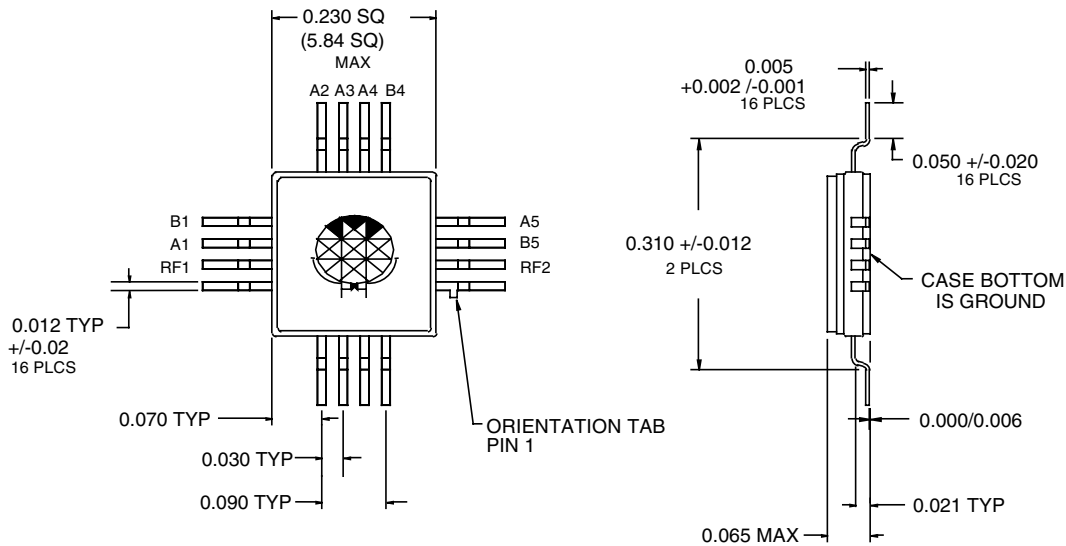
### Control Voltages

State	Bias Condition
Low	0 to -0.2V @ 20 uA Max.
High	-3V @50uA Typ to -8V @500 uA Max.

### Absolute Maximum Ratings

Control Voltage Range	+0.5 to -8.5 Vdc
Storage Temperature	-65 to +150 deg C
Operating Temperature	-55 to +125 deg C
RF Input Power (0.5 - 4 GHz)	
Insertion Loss State	+27 dBm
Any Attenuation State	+13 dBm

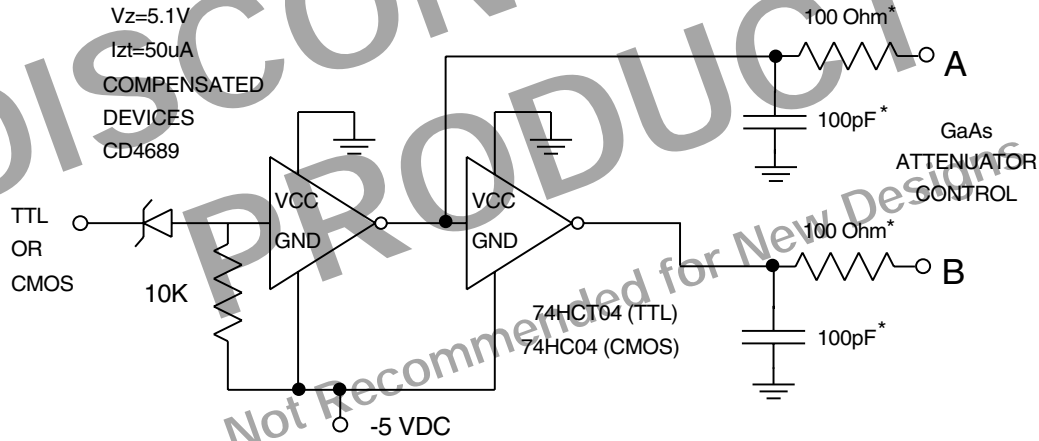
### Outline Drawing



- MATERIAL:  
A) PACKAGE BODY -ALUMINA LOADED BOROSILICATE GLASS (#7052 CORNING).
- PLATING: ELECTROLYTIC GOLD 50 MICRINCHES MINIMUM, OVER ELECTROLYTIC NICKEL 75 MICRINCHES MINIMUM.
- ALL UNLABELED LEADS ARE GROUND AND PACKAGE BOTTOM IS RF GROUND.

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### Suggested Driver Circuit



Simple driver using inexpensive standard logic ICs provides fast switching using minimum DC current.

\*Recommended values to suppress unwanted RF signals at A/B control lines. You may adjust for switching speed considerations.