

# GaAs IC 5 Bit Digital Attenuator With Serial-to-Parallel Driver DC–2 GHz



AA107-310

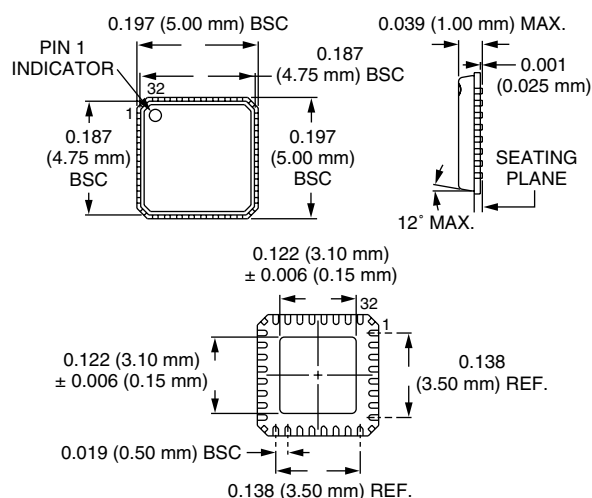
## Features

- Positive Voltage Operation (+5 V)
- MLF 5 x 5 mm Leadless Package
- Integrated Silicon Serial-to-Parallel Driver
- Attenuation 0.5 dB Steps to 15.5 dB

## Description

The AA107-310 is a GaAs FET IC 5 bit digital attenuator with a serial-to-parallel driver packaged in a 32 leadless exposed pad plastic package. It is particularly suited at IF frequencies where high attenuation accuracy, low insertion loss and low intermodulation products are required. Typical applications include base station, wireless and RF data and wireless local loop gain control circuits.

## MLF 5 x 5 (-310)



## Electrical Specifications at 25°C (V<sub>CC</sub> = +5 V)

Parameter <sup>1</sup>	Condition	Frequency <sup>2</sup>	Min.	Typ.	Max.	Unit
Insertion Loss <sup>3</sup>		DC–1.0 GHz		1.4	1.7	dB
		DC–2.0 GHz		1.7	2.2	dB
Attenuation Range <sup>4, 5</sup>				15.5		dB
Attenuation Accuracy <sup>4, 5</sup>		DC–1.0 GHz	± (0.2 + 3% of Attenuation Setting in dB)			dB
		DC–2.0 GHz	± (0.4 + 3% of Attenuation Setting in dB)			dB
VSWR (I/O)		DC–2.0 GHz		1.4:1	1.8:1	
Switching Characteristics <sup>6</sup>	Rise, Fall (10/90% or 90/10% RF) On, Off (50% CTL to 90/10% RF) Video Feedthru			50		ns
				100		ns
				50		mV
Input Power for 1 dB Compression		0.50–2.0 GHz	+24	+29		dBm
		0.05 GHz	+17	+22		dBm
Intermodulation Intercept Point (IP3)	For Two-tone Input Power +5 dBm	0.50–2.0 GHz	+44	+50		dBm
		0.05 GHz	+35	+40		dBm
Control Voltages	V <sub>Low</sub> = 0 to 0.2 V @ 20 μA Max. V <sub>High</sub> = -5 V @ 300 μA Max.					

## DC Electrical Characteristics at 25°C (V<sub>CC</sub> = +5 V)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage High	V <sub>IH</sub> (1)		3.5	5.0	V
Input Voltage Low	V <sub>IL</sub> (0)	0	0.5		V
Input Leakage Current	I <sub>L</sub>		±0.5		μA
Quiescent Current	I <sub>CC</sub>		500		μA
Supply Voltages	V <sub>CC</sub>		5.0		V

1. All measurements made in a 50 Ω system, unless otherwise specified.

2. DC = 300 kHz.

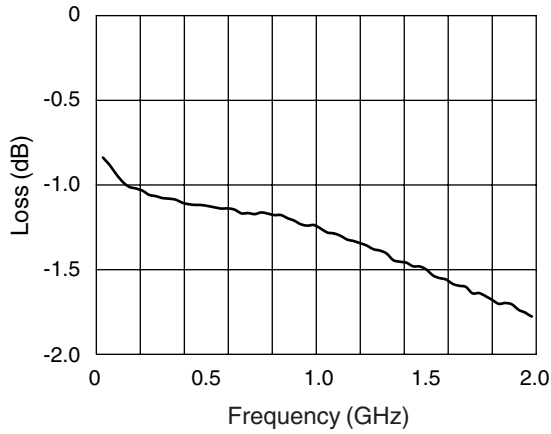
3. Insertion loss changes by 0.003 dB/°C.

4. Attenuation value referenced above insertion loss.

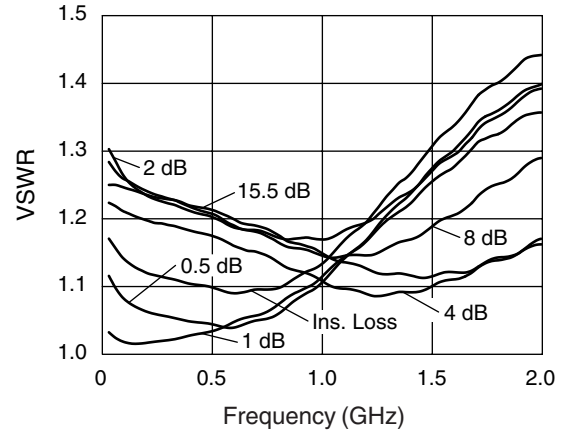
5. Exposed pad must be connected to RF ground to obtain specified attenuation.

6. Video feedthru measured with 1 ns risetime pulse and 500 MHz bandwidth.

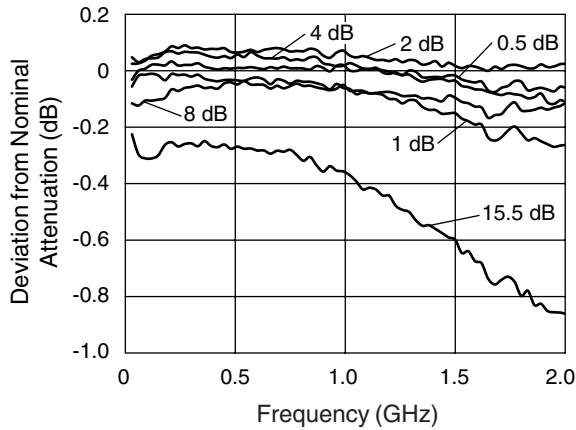
**Typical Performance Data (V<sub>CC</sub> = +5 V)**



**Insertion Loss vs. Frequency**



**VSWR vs. Frequency**



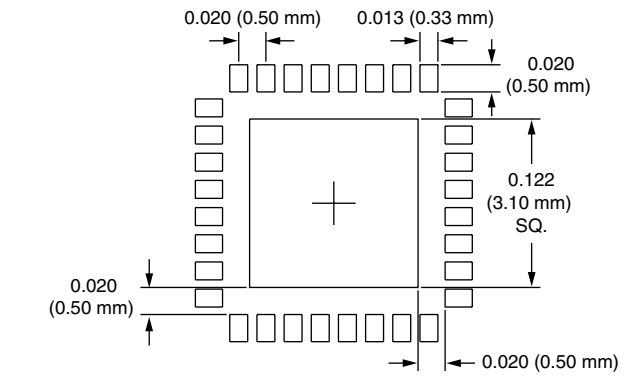
**Attenuation Accuracy vs. Frequency**

**Absolute Maximum Ratings**

Characteristic	Value
Supply Voltage (V <sub>CC</sub> )	-0.5 to +6 V
Input Voltage (V <sub>I</sub> )	-0.5 – V <sub>CC</sub> + 0.5 V
Power Dissipation (P <sub>D</sub> )	500 mW
Storage Temperature (T <sub>ST</sub> )	-65°C to +125°C
Operating Temperature (T <sub>OP</sub> )	-40°C to +85°C

**Surface Mount Land Pattern**

5 x 5 mm MLF 32 Lead



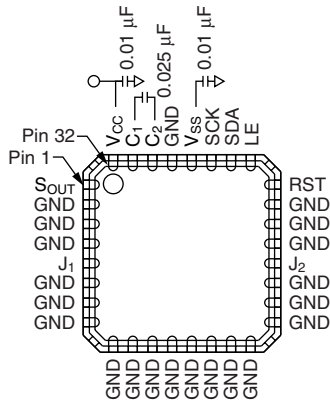
Dimensions in inches (mm).

**Truth Table**

Reset	Serial Data Input					J <sub>1</sub> –J <sub>2</sub> Attenuation
	0.5 dB	1 dB	2 dB	4 dB	8 dB	
1	0	0	0	0	0	Insertion Loss
1	1	0	0	0	0	0.5 dB
1	0	1	0	0	0	1 dB
1	0	0	1	0	0	2 dB
1	0	0	0	1	0	4 dB
1	0	0	0	0	1	8 dB
1	1	1	1	1	1	15.5 dB
0	X	X	X	X	X	Insertion Loss

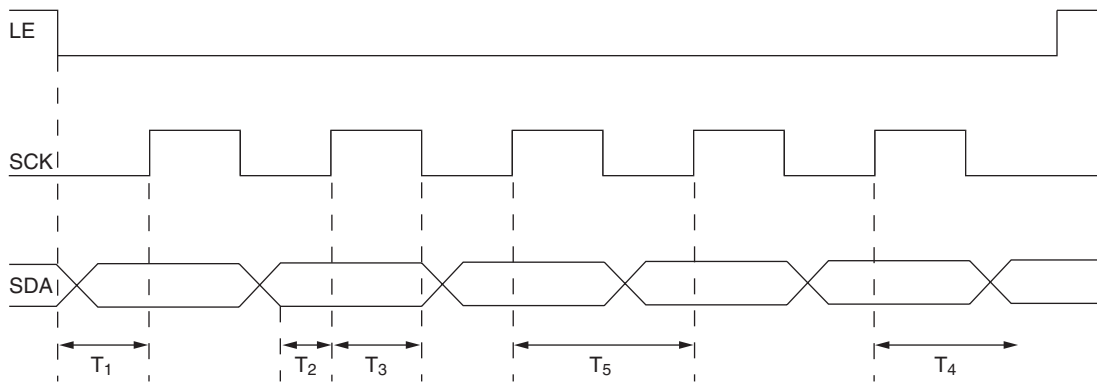
V<sub>IL</sub> (0) = 0 to 0.5 V.  
 V<sub>IH</sub> (1) = 3.5 to 5 V.  
 X = Don't Care.

**Pin Out**



Pin	Symbol	Function
1	S <sub>OUT</sub>	Serial Data Output
2–4	GND	Ground
5	J <sub>1</sub>	RF Input/Output
6–19	GND	Ground
20	J <sub>2</sub>	RF Input/Output
21–23	GND	Ground
24	RST	Reset
25	LE	Latch Enable
26	SDA	Serial Data Input
27	SCK	Serial Clock Input
28	V <sub>SS</sub>	Low Output Voltage Level
29	GND	Ground
30	C <sub>2</sub>	Charge Pump Capacitor
31	C <sub>1</sub>	Charge Pump Capacitor
32	V <sub>CC</sub>	Supply Voltage

**Timing Diagram**



Parameter	Symbol	Min.	Typ.	Max.	Unit
LE Setup Time	T <sub>1</sub>		15		ns
SDA Setup Time	T <sub>2</sub>		15		ns
SDA Hold Time	T <sub>3</sub>		10		ns
LE Hold Time	T <sub>4</sub>		10		ns
Clock Period	T <sub>5</sub>		60		ns