

DATA SHEET

# AA105-86, AA105-86LF: GaAs IC 4-Bit Digital Attenuator, 1 dB LSB 0.5–3.0 GHz

## Features

- Attenuation 1 dB steps to 15 dB with high accuracy
- Single positive control (3 to 5 V) for each bit
- Low DC power consumption
- Miniature, low-cost MSOP-10 plastic package
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

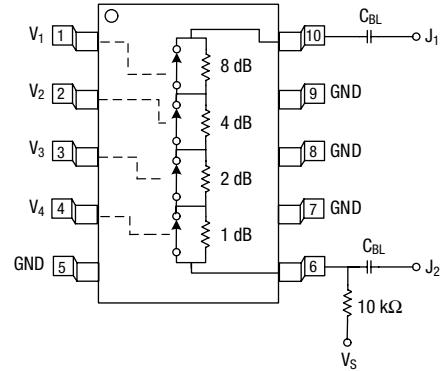
## Description

The AA105-86 is a 4-bit, single positive control GaAs IC FET digital attenuator. It requires DC blocking capacitors, positive supply voltage ( $V_S$ ) and four individual positive bit control voltages ( $V_1$ – $V_4$ ). The AA105-86 is particularly suited where high attenuation accuracy, low insertion loss and low intermodulation products are required. Typical applications include cellular radio, wireless data, and wireless local loop gain level control circuits.

**NEW** Skyworks offers lead (Pb)-free, RoHS (Restriction of Hazardous Substances)-compliant packaging.



## Pin Out



DC blocking capacitors ( $C_{BL}$ ) and biasing resistor must be supplied externally for positive voltage operation.  
 $C_{BL} = 47$  pF for operation >500 MHz.

**Electrical Specifications at 25 °C (0, 5 V)**

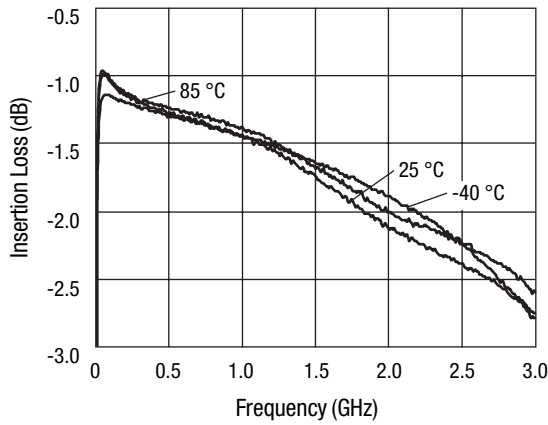
Parameter <sup>(1)</sup>	Condition	Frequency	Min.	Typ.	Max.	Unit
Insertion loss		0.5–1.0 GHz		1.5	1.8	dB
		1.0–2.0 GHz		2.1	2.4	dB
		2.0–2.5 GHz		2.4	2.7	dB
		2.5–3.0 GHz		2.7	3.0	dB
Attenuation range				15		dB
Attenuation accuracy <sup>(2)</sup>		0.5–1.0 GHz	± (0.2 + 2% of Attenuation setting in dB)			dB
		1.0–3.0 GHz	± (0.3 + 3% of Attenuation setting in dB)			dB
VSWR (I/O) <sup>(3)</sup>		0.5–2.5 GHz		1.5:1	2.0:1	
		2.5–3.0 GHz		1.7:1	2.2:1	
Switching characteristics	10/90% or 90/10% RF 50% CTL to 90/10% RF T <sub>RISE</sub> = 1 ns, BW = 500 MHz					
Rise, fall			180		ns	
On, off			270		ns	
Video feedthru				50		mV
Input power for 1 dB compression	V <sub>S</sub> = 3 V	0.5–3.0 GHz	20	24		dBm
	V <sub>S</sub> = 5 V	0.5–3.0 GHz	25	29		dBm
Intermodulation intercept point (IP3)	For two-tone input power +5 dBm V <sub>S</sub> = 3 V V <sub>S</sub> = 5 V	0.5–3.0 GHz	43	49		dBm
		0.5–3.0 GHz	44	50		dBm
Control voltages	V <sub>LOW</sub> = 0 to 0.2 V @ 20 µA max. V <sub>HIGH</sub> = 3 V @ 100 µA max. to 5 V @ 200 µA max. V <sub>S</sub> = V <sub>HIGH</sub> ± 0.2 V					

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

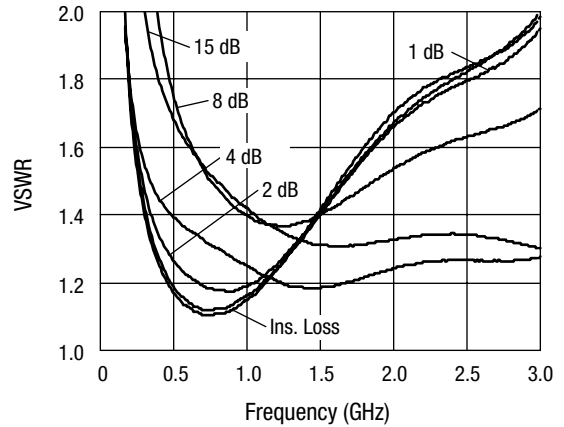
2. Attenuation referenced to insertion loss.

3. Input/output.

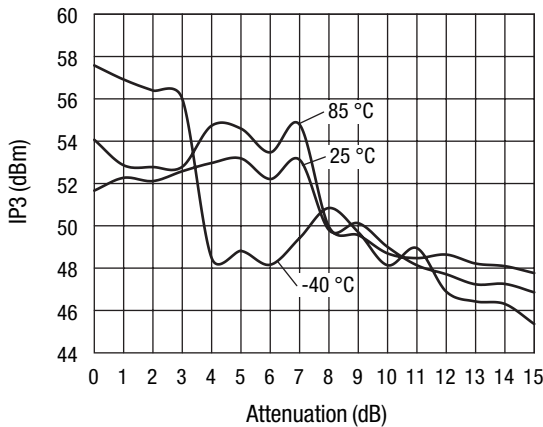
**Typical Performance Data (0, 5 V)**



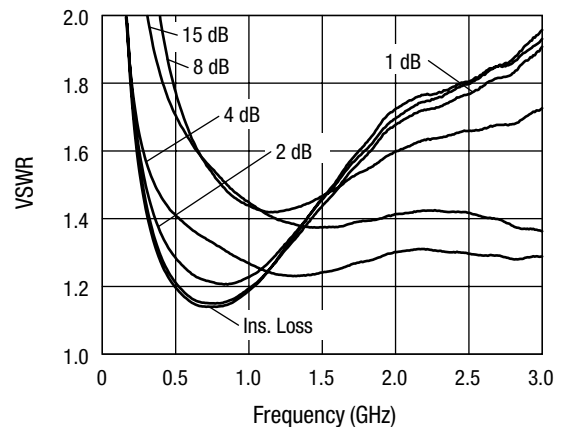
**Insertion Loss vs. Frequency**



**VSWR vs. Frequency (25 °C)**



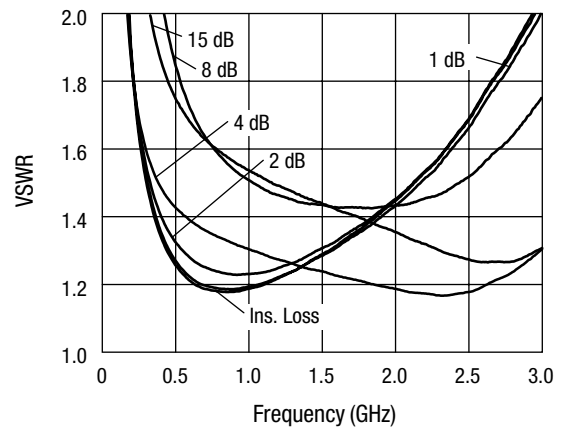
**IP3 vs. Attenuation and Temperature (500 MHz)**



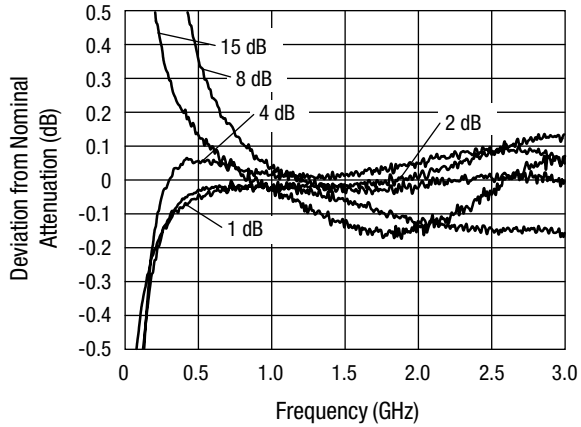
**VSWR vs. Frequency (85 °C)**

**Compression Point vs. Attenuation, Voltage, and Temperature**

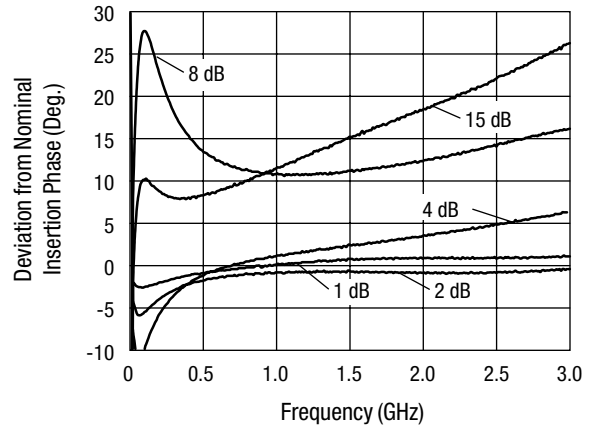
Attenuation State	Control Voltage (V)	Input Power @ 1 dB Compression		
		25 °C (dBm)	85 °C (dBm)	-40 °C (dBm)
Ins. loss	5	31.1	30.9	31.2
1 dB	5	31.3	31.4	31.3
2 dB	5	31	30.8	31.1
4 dB	5	32.5	31.4	33.6
8 dB	5	33	32.4	33.5
15 dB	5	29.9	28	31.4



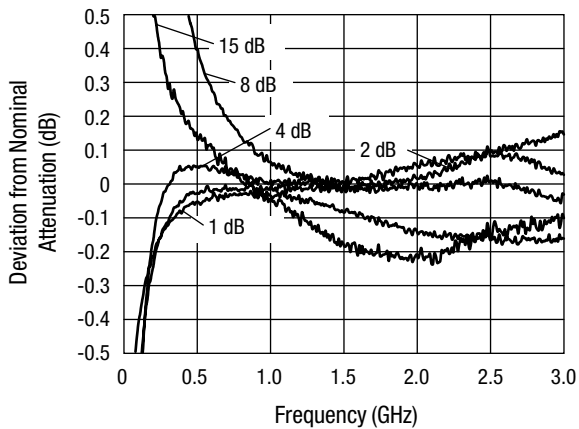
**VSWR vs. Frequency (-40 °C)**



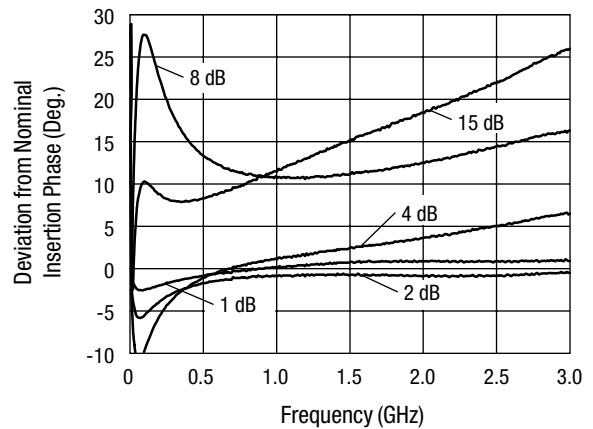
**Attenuation Accuracy vs. Frequency (25 °C)**



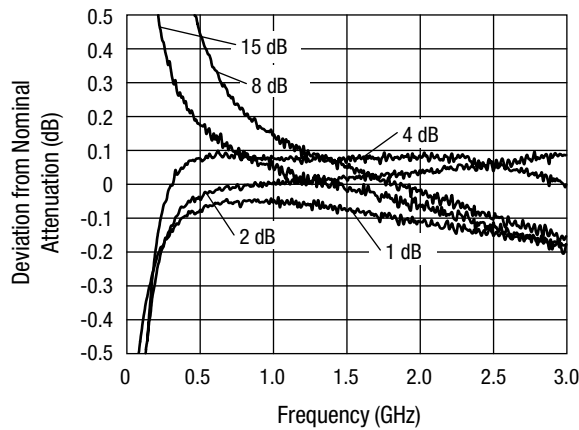
**Attenuation Phase Accuracy vs. Frequency (25 °C)**



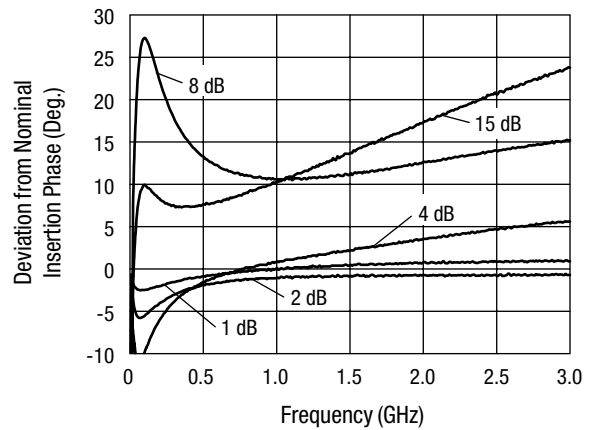
**Attenuation Accuracy vs. Frequency (85 °C)**



**Attenuation Phase Accuracy vs. Frequency (85 °C)**

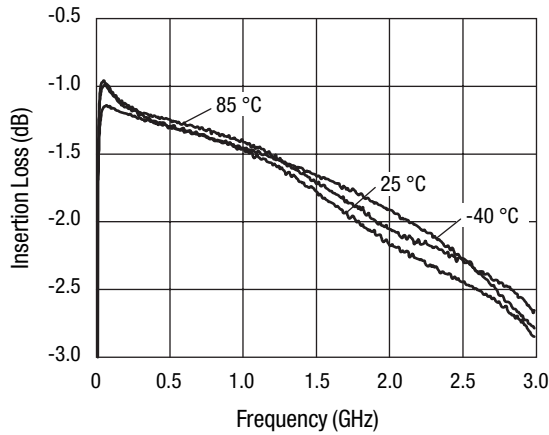


**Attenuation Accuracy vs. Frequency (-40 °C)**

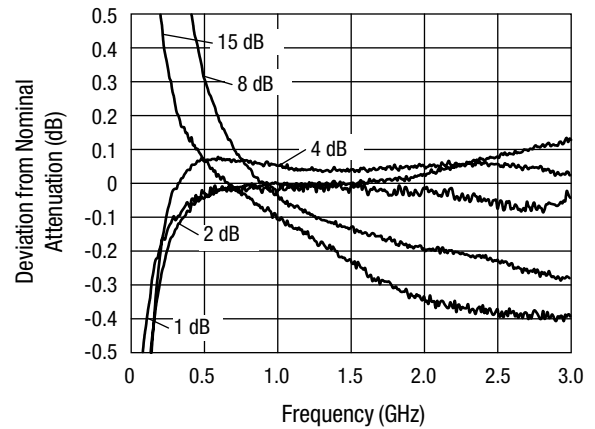


**Attenuation Phase Accuracy vs. Frequency (-40 °C)**

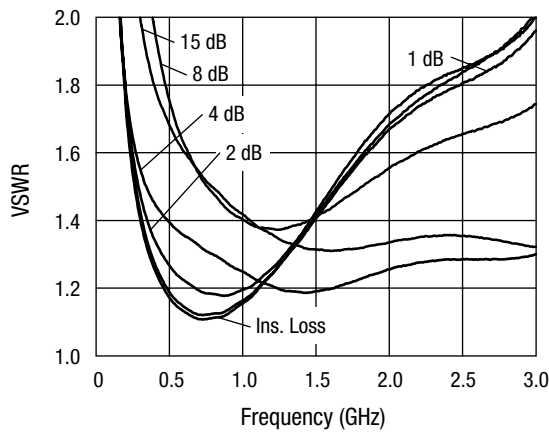
**Typical Performance Data (0, 3 V)**



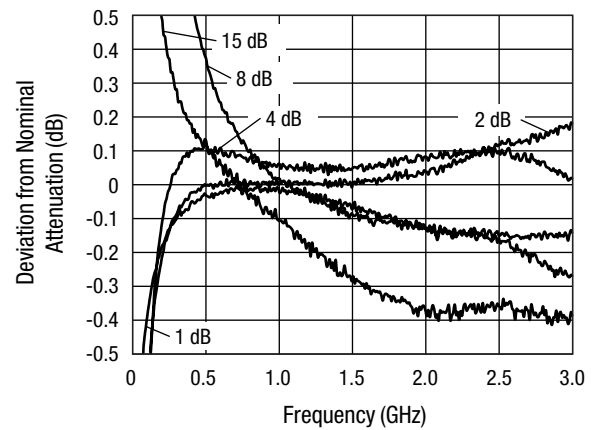
**Insertion Loss vs. Frequency**



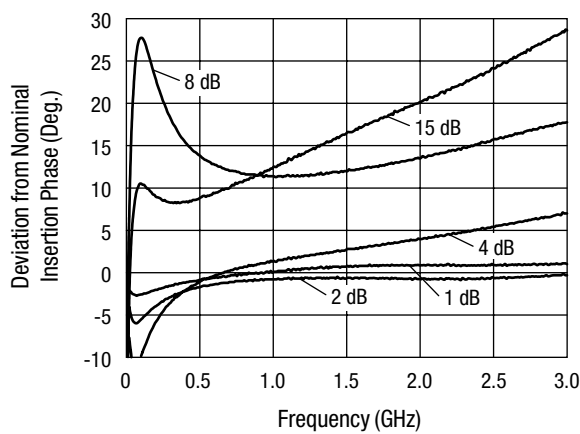
**Attenuation Accuracy vs. Frequency (25 °C)**



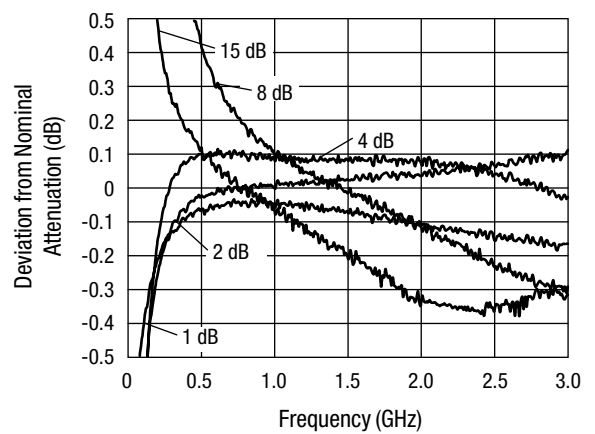
**VSWR vs. Frequency (25 °C)**



**Attenuation Accuracy vs. Frequency (85 °C)**



**Attenuation Phase Accuracy vs. Frequency (25 °C)**



**Attenuation Accuracy vs. Frequency (-40 °C)**



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