DATA SHEET

AA106-86, AA106-86LF: GaAs IC 5-Bit Digital Attenuator 0.5 dB LSB Positive Control 0.5–2.0 GHz

Features

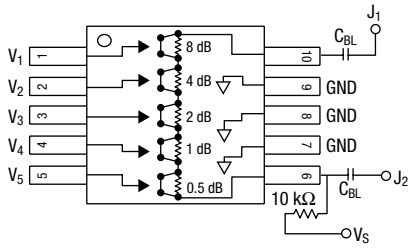
- Attenuation 0.5 dB steps to 15.5 dB with high accuracy
- Single positive control (3 to 5 V) for each bit
- Low DC power consumption
- Miniature low-cost MSOP-10 plastic package
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

Description

The AA106-86 is a 5-bit, single positive control GaAs IC FET digital attenuator in a low-cost MSOP-10 package. This attenuator has an LSB of 0.5 dB and a total attenuation of 15.5 dB. The attenuator requires external DC blocking capacitors, positive supply voltage (V_S) and five individual bit control voltages (V_1–V_5). The AA106-86 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, 3 V), (0, 5 V)

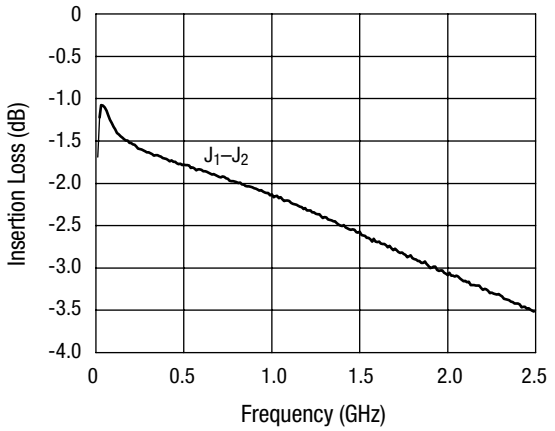
Parameter[1]	Frequency	Min.	Typ.	Max.	Unit
Insertion loss[2]	0.5–1 GHz 1.0–2 GHz		2 3	2.4 3.4	dB dB
Attenuation range			15.5		dB
Attenuation accuracy[3]	0.5–1 GHz 1.0–2 GHz	± (0.2 + 3% of Attenuation setting in dB) ± (0.3 + 5% of Attenuation setting in dB)			dB dB
VSWR (I/O)	0.5–2 GHz		1.5:1	2.0:1	

1. All measurements made in a 50 Ω system, unless otherwise specified.
2. Insertion loss changes by 0.003 dB/°C.
3. Attenuation referenced to insertion loss.

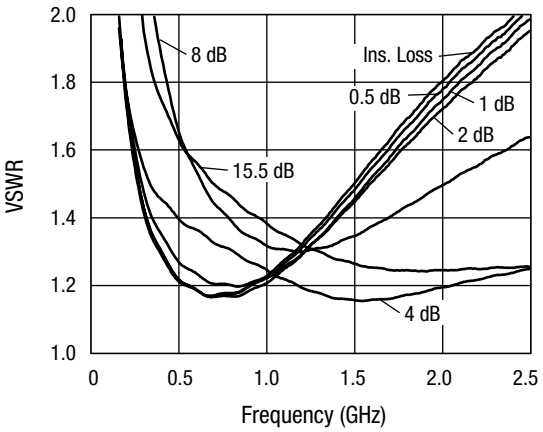
Operating Characteristics at 25 °C (0, 5 V)

Parameter	Condition	Frequency	Min.	Typ.	Max.	Unit
Switching characteristics						
Rise, fall	10/90% or 90/10% RF			150		ns
On, off	50% CTL to 90/10% RF			300		ns
Video feedthru	T_{RISE} = 1 ns, BW = 500 MHz			70		mV
Input power for 1 dB compression	V_S = 3 V	0.9–2 GHz		21		dBm
	V_S = 5 V	0.9–2 GHz		27		dBm
Intermodulation intercept point (IP3)	For two-tone input power 5 dBm					
	V_S = 3 V	0.9–2 GHz		41		dBm
	V_S = 5 V	0.9–2 GHz		45		dBm
Control voltages	V_{LOW} = 0 to 0.2 V @ 20 µA max. V_{HIGH} = 3 V @ 100 µA max. to 5 V @ 200 µA max. $V_S = V_{HIGH} \pm 0.2$ V					

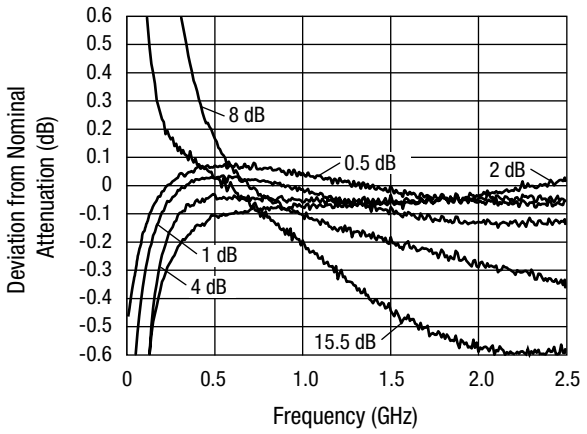
Typical Performance Data (0, 5 V)



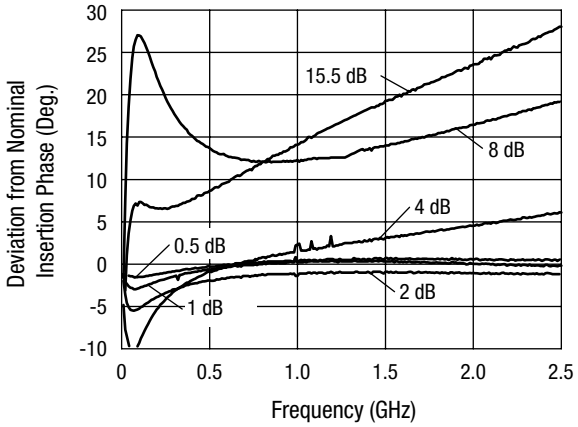
Insertion Loss vs. Frequency



VSWR vs. Frequency



Attenuation Accuracy vs. Frequency



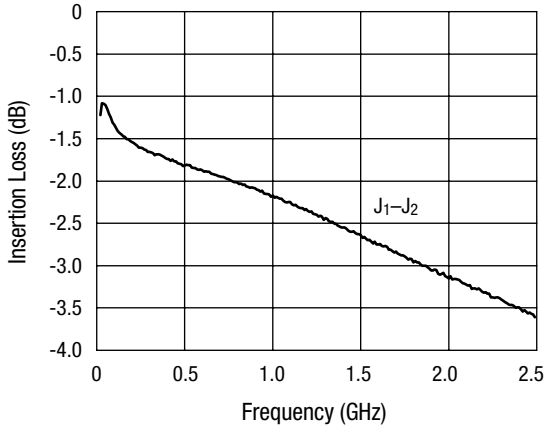
Attenuation Phase Accuracy vs. Frequency

Truth Table

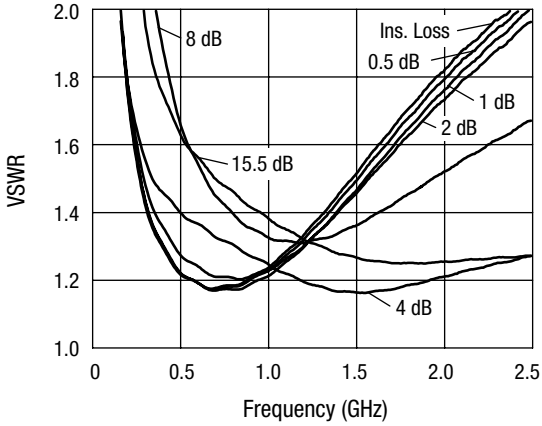
V_1	V_2	V_3	V_4	V_5	Attenuation
8 dB	4 dB	2 dB	1 dB	0.5 dB	J_1–J_2
V_{HIGH}	V_{HIGH}	V_{HIGH}	V_{HIGH}	V_{HIGH}	Reference I.L.
V_{HIGH}	V_{HIGH}	V_{HIGH}	V_{HIGH}	0	0.5 dB
V_{HIGH}	V_{HIGH}	V_{HIGH}	0	V_{HIGH}	1 dB
V_{HIGH}	V_{HIGH}	0	V_{HIGH}	V_{HIGH}	2 dB
V_{HIGH}	0	V_{HIGH}	V_{HIGH}	V_{HIGH}	4 dB
0	V_{HIGH}	V_{HIGH}	V_{HIGH}	V_{HIGH}	8 dB
0	0	0	0	0	15.5 dB max. atten.

V_{HIGH} = 3 to 5 V ($V_S = V_{HIGH} \pm 0.2$ V).

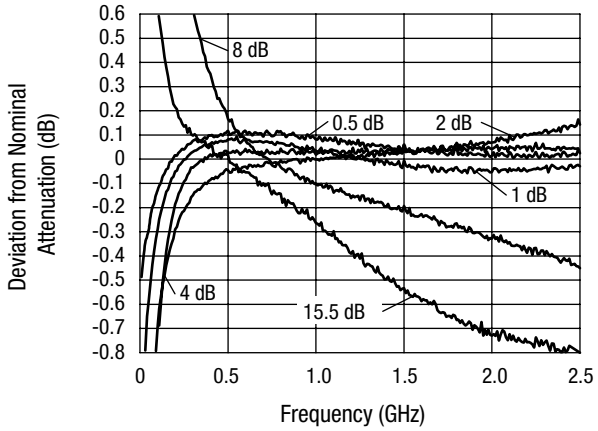
Typical Performance Data (0, 3 V)



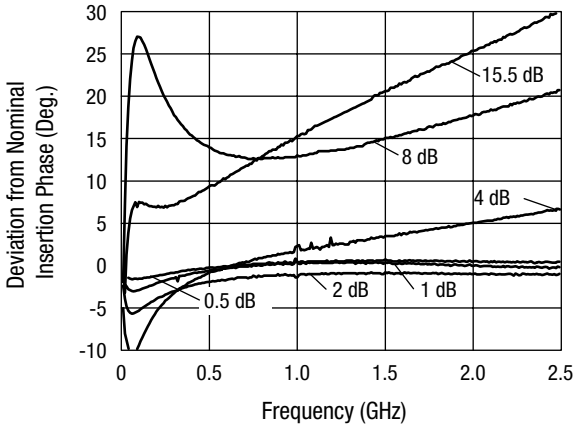
Insertion Loss vs. Frequency



VSWR vs. Frequency



Attenuation Accuracy vs. Frequency



Attenuation Phase Accuracy vs. Frequency

Absolute Maximum Ratings

Characteristic	Value
RF input power	1 W > 500 MHz 0/8 V 0.5 W @ 50 MHz 0/8 V
Supply voltage	8 V
Control voltage	-0.2 V, +8 V
Operating temperature	-40 °C to +85 °C
Storage temperature	-65 °C to +150 °C

Performance is guaranteed only under the conditions listed in the specifications table and is not guaranteed under the full range(s) described by the Absolute Maximum specifications. Exceeding any of the absolute maximum/minimum specifications may result in permanent damage to the device and will void the warranty.

CAUTION: *Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.*

Recommended Solder Reflow Profiles

Refer to the *"Recommended Solder Reflow Profile"* Application Note.

Tape and Reel Information

Refer to the *"Discrete Devices and IC Switch/Attenuators Tape and Reel Package Orientation"* Application Note.

MSOP-10