

DATA SHEET

# AA280-25, AA280-25LF: GaAs IC 5-Bit Digital Attenuator 0.5 dB LSB 300 kHz–2 GHz

## Features

- Attenuation 0.5 dB steps to 15.5 dB with high accuracy
- Low DC power consumption
- Low-cost SOIC-16 plastic package
- Available lead (Pb)-free and RoHS-compliant MSL-1 @ 260 °C per JEDEC J-STD-020

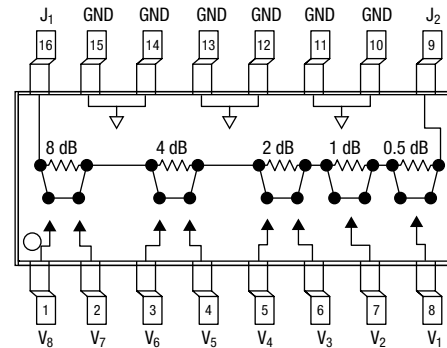
## Description

The AA280-25 is a 5-bit, GaAs IC FET digital attenuator in a low-cost SOIC-16 package. This attenuator has an LSB of 0.5 dB and a total attenuation of 15.5 dB. The AA280-25 is particularly suited where high attenuation accuracy, low insertion loss and low intermodulation products are required. Typical applications include cellular radio, wireless data, wireless local loop and other gain level control circuits.

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



## Pin Out



**Electrical Specifications at -40 °C to +85 °C (0, -5 V)**

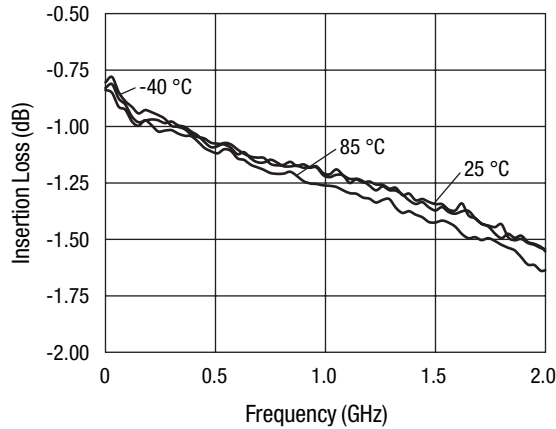
Parameter <sup>(1)</sup>	Condition	Frequency	Min.	Typ.	Max.	Unit
Insertion loss <sup>(2)</sup>		300 kHz–0.5 GHz		1.1	1.3	dB
		300 kHz–1.0 GHz		1.4	1.7	dB
		300 kHz–2.0 GHz		1.7	2.0	dB
Attenuation range				15.5		dB
Attenuation accuracy <sup>(2)</sup>		300 kHz–1.0 GHz	± (0.2 + 3% of Attenuation setting in dB)			dB
		300 kHz–2.0 GHz	± (0.4 + 3% of Attenuation setting in dB)			dB
VSWR (I/O) <sup>(3)</sup>		300 kHz–2.0 GHz		1.4:1	1.8:1	
Switching characteristics						
Rise, fall	10/90% or 90%/10% RF			15		ns
On, off	50% CTL to 90%/10% RF			25		ns
Video feedthru	T <sub>RISE</sub> = 1 ns, BW = 500 MHz			25		mV
Input power for 1 dB compression		0.5–2.0 GHz	24	29		dBm
		0.05 GHz	17	22		dBm
Intermodulation intercept point (IP3)	For two-tone input power 5 dBm	0.5–2.0 GHz	44	50		dBm
		0.05 GHz	35	40		dBm
Thermal resistance				85		°C/W
Control voltages	V <sub>Low</sub> = 0 to 0.2 V @ 20 µA max. V <sub>High</sub> = -5 V @ 300 µA max.					

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

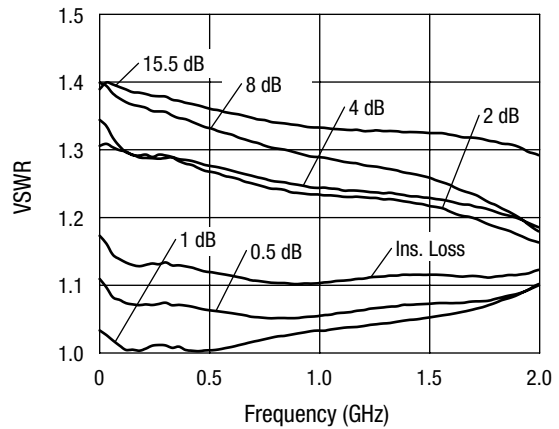
2. Attenuation referenced to insertion loss.

3. Input/Output.

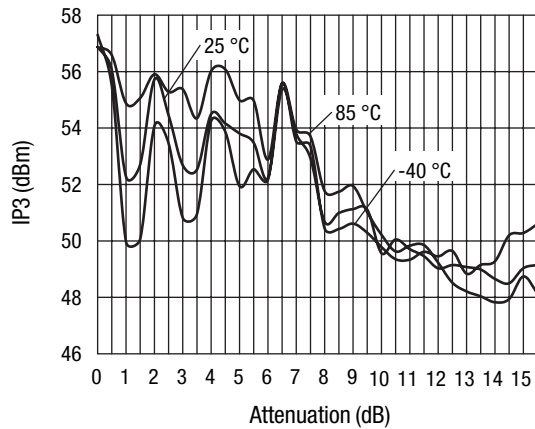
### Typical Performance Data (0, -5 V)



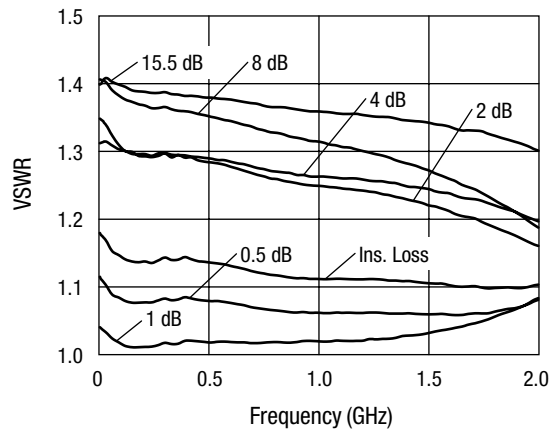
**Insertion Loss vs. Frequency**



**VSWR vs. Frequency (25 °C)**



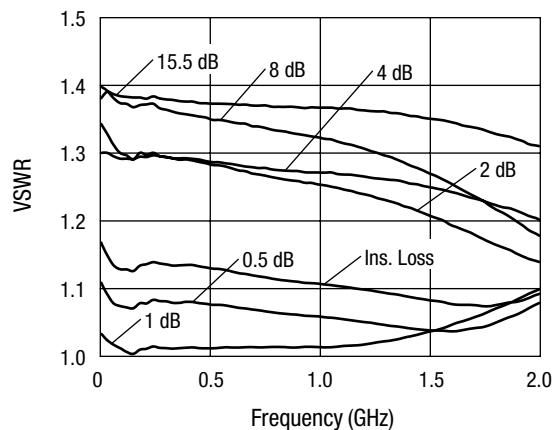
**IP3 vs. Attenuation and Temperature**



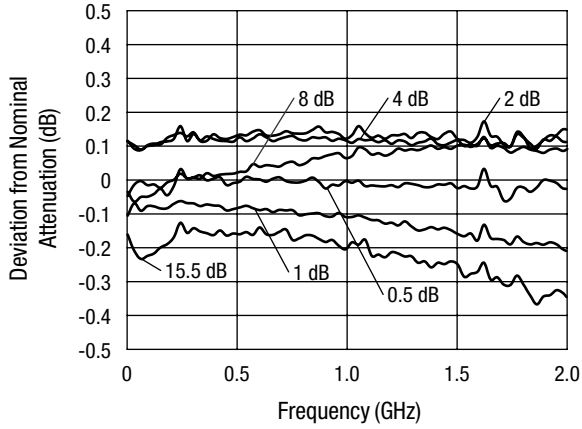
**VSWR vs. Frequency (85 °C)**

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

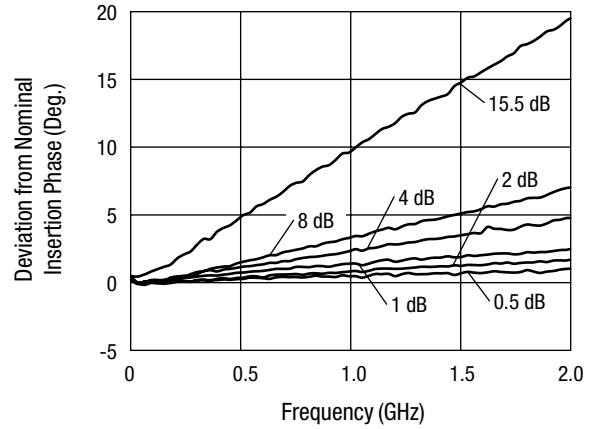
Attenuation State	Control Voltage (V)	Input Power @ 1 dB Compression		
		25 °C (dBm)	85 °C (dBm)	-40 °C (dBm)
Ins. loss	-5	28.3	28.1	29.1
0.5 dB	-5	28.5	28.3	29.4
1 dB	-5	28.7	28.7	29.6
2 dB	-5	28.4	28.3	29.1
4 dB	-5	32.9	32.9	33.9
8 dB	-5	36.8	36.8	36.8
15.5 dB	-5	32.7	32.1	32.8



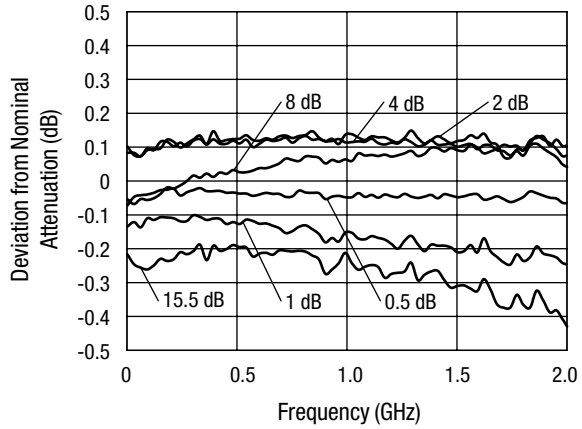
**VSWR vs. Frequency (-40 °C)**



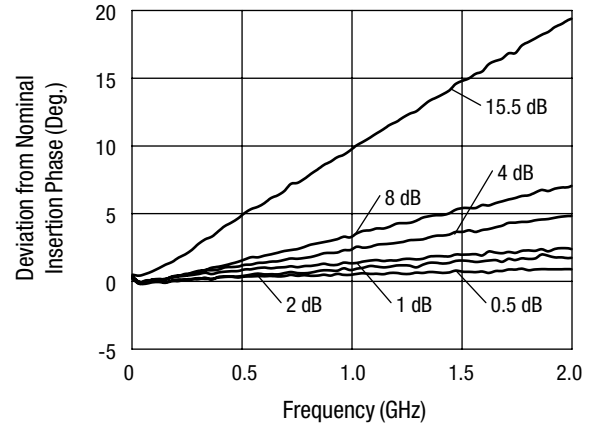
**Attenuation Accuracy vs. Frequency (25 °C)**



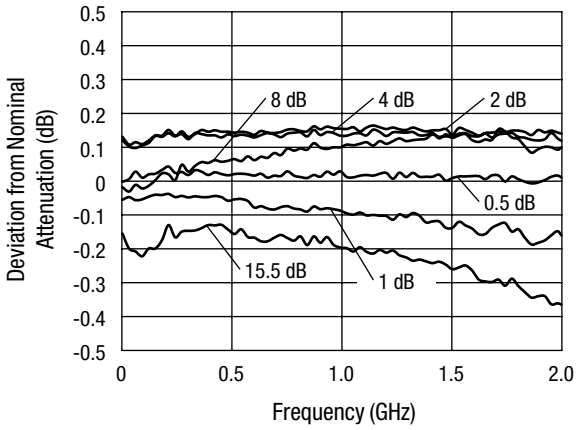
**Attenuation Phase Accuracy vs. Frequency (25 °C)**



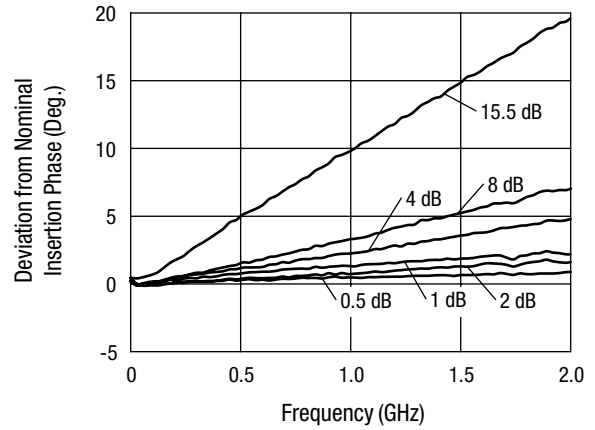
**Attenuation Accuracy vs. Frequency (85 °C)**



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

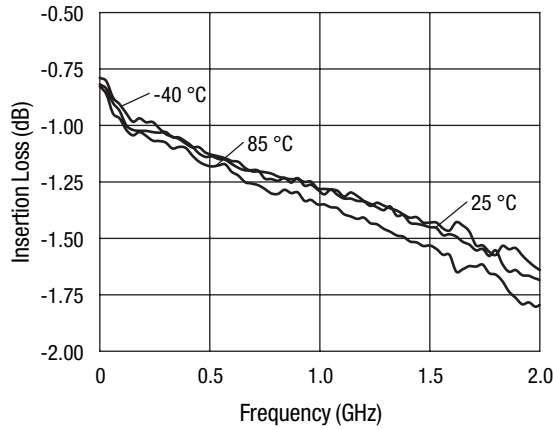


**Attenuation Accuracy vs. Frequency (-40 °C)**

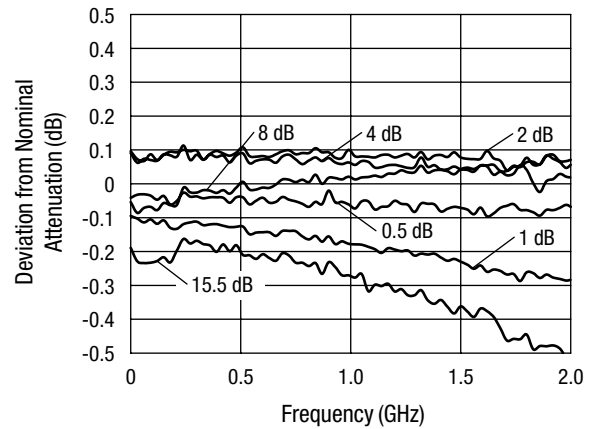


**Attenuation Phase Accuracy vs. Frequency (-40 °C)**

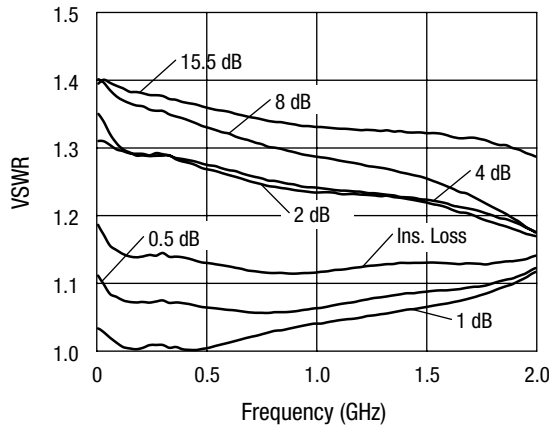
### Typical Performance Data (0, -3 V)



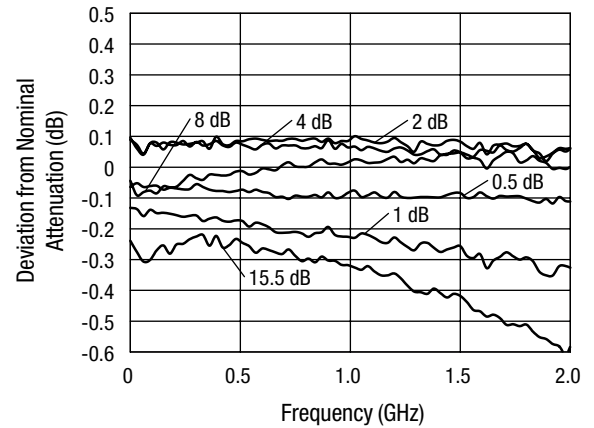
**Insertion Loss vs. Frequency**



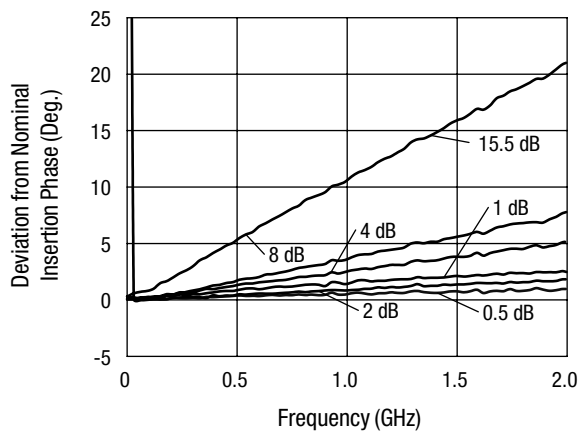
**Attenuation Accuracy vs. Frequency (25 °C)**



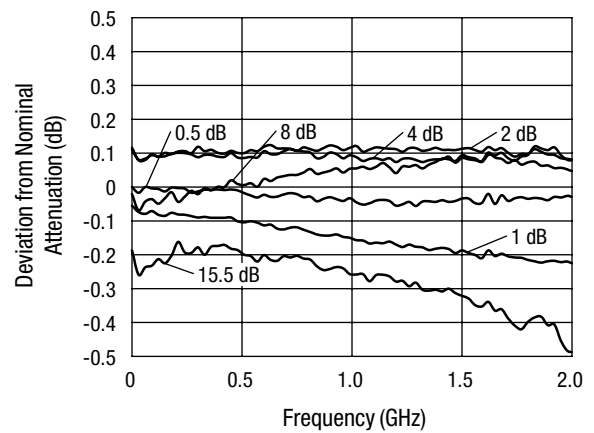
**VSWR vs. Frequency (25 °C)**



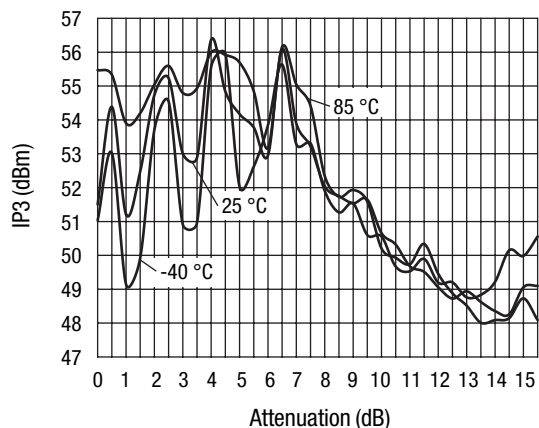
**Attenuation Accuracy vs. Frequency (85 °C)**



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



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

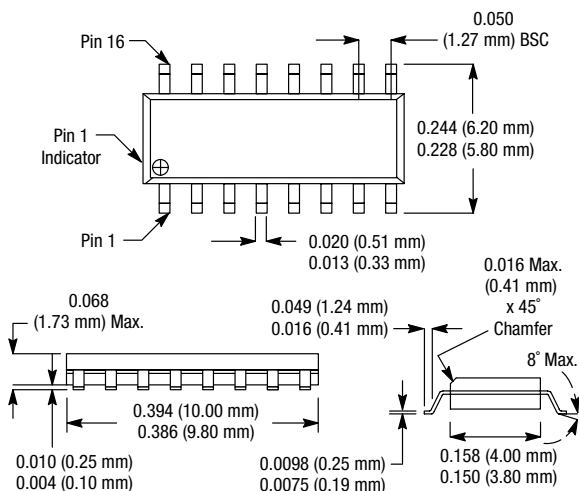


IP3 vs. Attenuation and Temperature

**Truth Table**

V <sub>1</sub>	V <sub>2</sub>	V <sub>3</sub>	V <sub>4</sub>	V <sub>5</sub>	V <sub>6</sub>	V <sub>7</sub>	V <sub>8</sub>	Attenuation J <sub>1</sub> -J <sub>2</sub>
0.5 dB Bit	1 dB Bit	2 dB Bit		4 dB Bit		8 dB Bit		
-5	-5	-5	0	-5	0	-5	0	Reference I.L.
0	-5	-5	0	-5	0	-5	0	0.5 dB
-5	0	-5	0	-5	0	-5	0	1 dB
-5	-5	0	-5	-5	0	-5	0	2 dB
-5	-5	-5	0	0	-5	-5	0	4 dB
-5	-5	-5	0	-5	0	0	-5	8 dB
0	0	0	-5	0	-5	0	-5	15.5 dB max. atten.

**SOIC-16**



**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	-3	22.7	23.3	24.2
0.5 dB	-3	23.5	24.2	25.1
1 dB	-3	24.6	25	25.9
2 dB	-3	22.9	23.4	24.3
4 dB	-3	31.6	31.8	33.1
8 dB	-3	31	28.7	26.4
15.5 dB	-3	25	24.4	25

**Absolute Maximum Ratings**

Characteristic	Value
RF input power	2.0 W > 500 MHz 0/-8 V 0.5 W > 50 MHz 0/-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.

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