

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

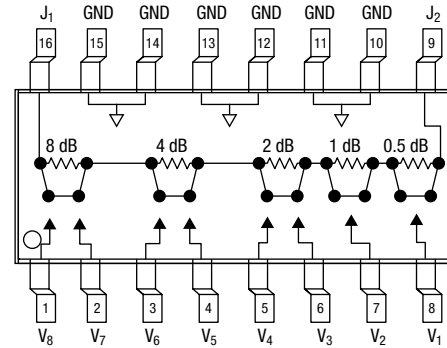
Description

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)

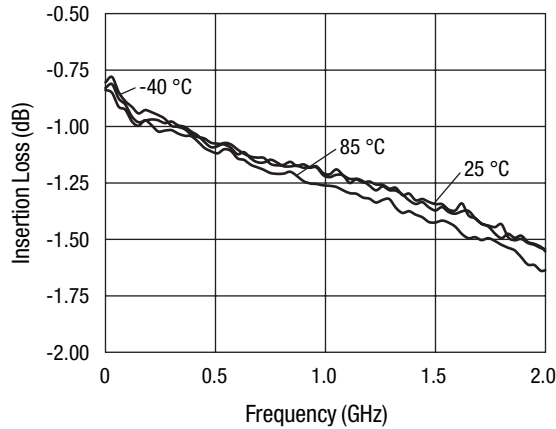
| Parameter ⁽¹⁾ | Condition | Frequency | Min. | Typ. | Max. | Unit |
|---------------------------------------|--|-----------------|---|-------|-------|------|
| Insertion loss ⁽²⁾ | | 300 kHz–0.5 GHz | | 1.1 | 1.3 | dB |
| | | 300 kHz–1.0 GHz | | 1.4 | 1.7 | dB |
| | | 300 kHz–2.0 GHz | | 1.7 | 2.0 | dB |
| Attenuation range | | | | 15.5 | | dB |
| Attenuation accuracy ⁽²⁾ | | 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) ⁽³⁾ | | 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 _{RISE} = 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 _{Low} = 0 to 0.2 V @ 20 µA max. V _{High} = -5 V @ 300 µA max. | | | | | |

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

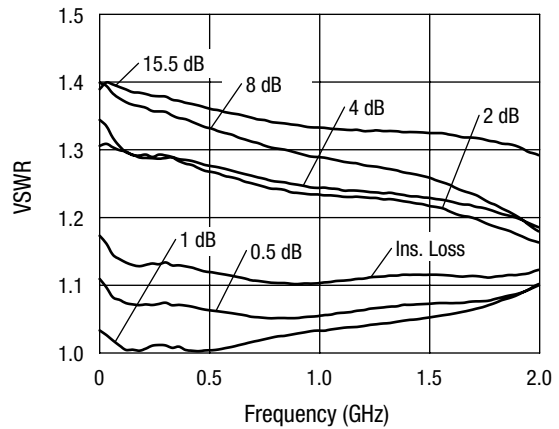
2. Attenuation referenced to insertion loss.

3. Input/Output.

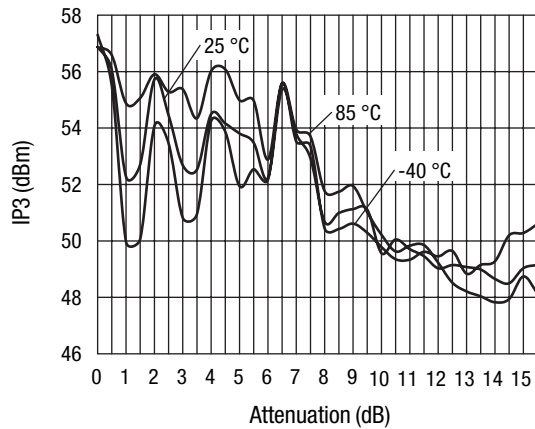
Typical Performance Data (0, -5 V)



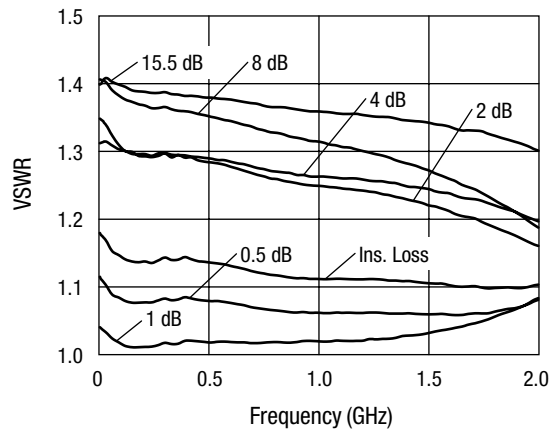
Insertion Loss vs. Frequency



VSWR vs. Frequency (25 °C)



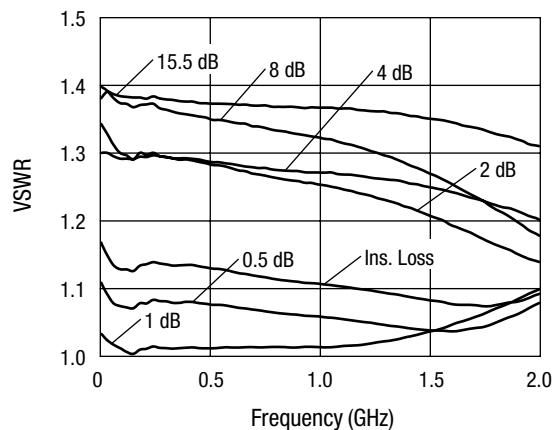
IP3 vs. Attenuation and Temperature



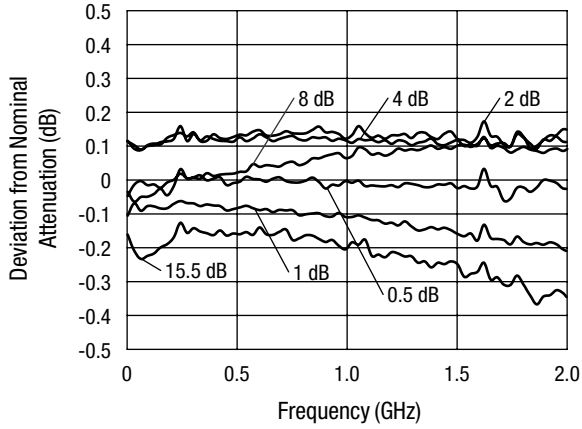
VSWR vs. Frequency (85 °C)

Compression Point vs. Attenuation, Voltage, and Temperature

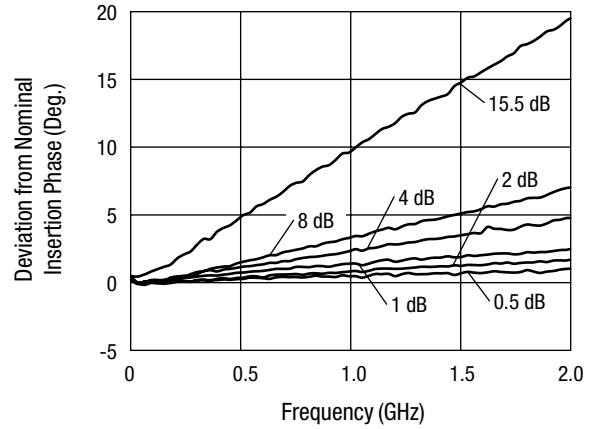
| Attenuation State | Control Voltage (V) | Input Power @ 1 dB Compression | | |
|-------------------|---------------------|--------------------------------|-------------|--------------|
| | | 25 °C (dBm) | 85 °C (dBm) | -40 °C (dBm) |
| Ins. loss | -5 | 28.3 | 28.1 | 29.1 |
| 0.5 dB | -5 | 28.5 | 28.3 | 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 |



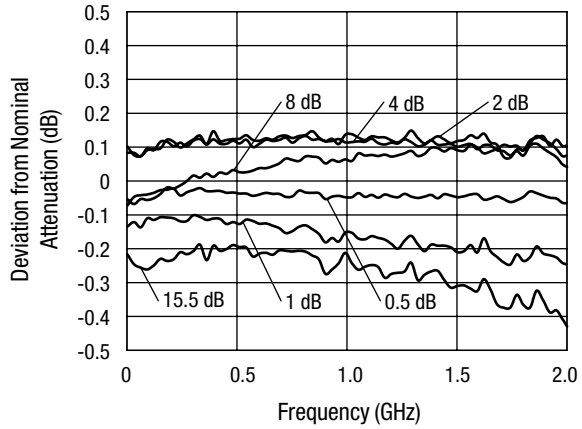
VSWR vs. Frequency (-40 °C)



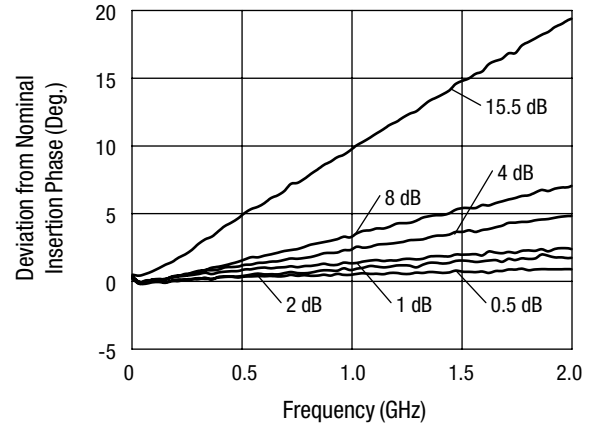
Attenuation Accuracy vs. Frequency (25 °C)



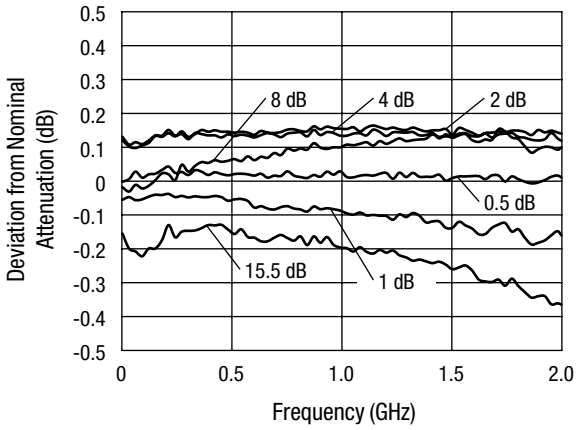
Attenuation Phase Accuracy vs. Frequency (25 °C)



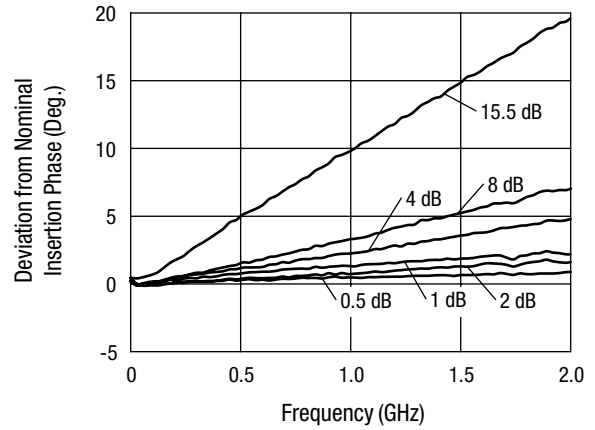
Attenuation Accuracy vs. Frequency (85 °C)



Attenuation Phase Accuracy vs. Frequency (85 °C)

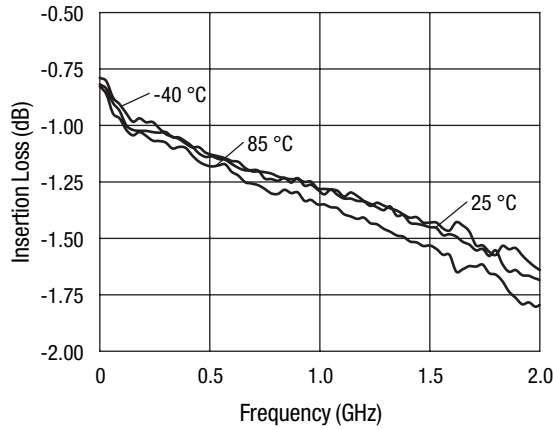


Attenuation Accuracy vs. Frequency (-40 °C)

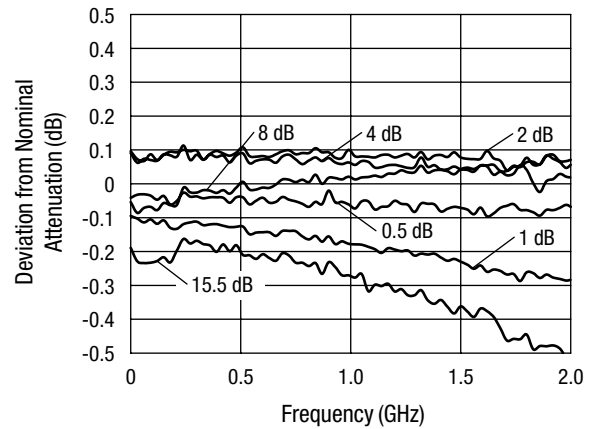


Attenuation Phase Accuracy vs. Frequency (-40 °C)

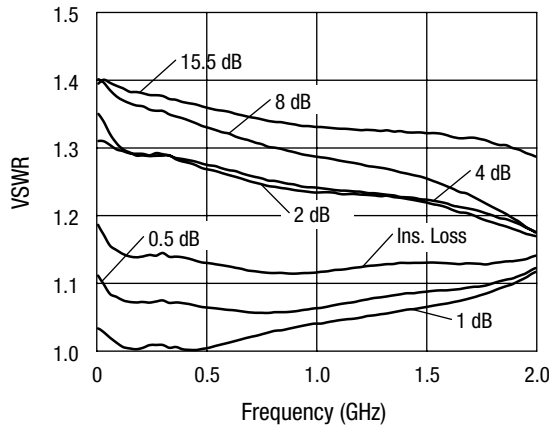
Typical Performance Data (0, -3 V)



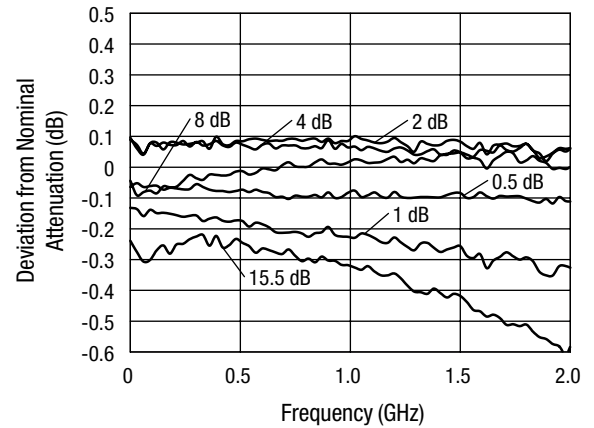
Insertion Loss vs. Frequency



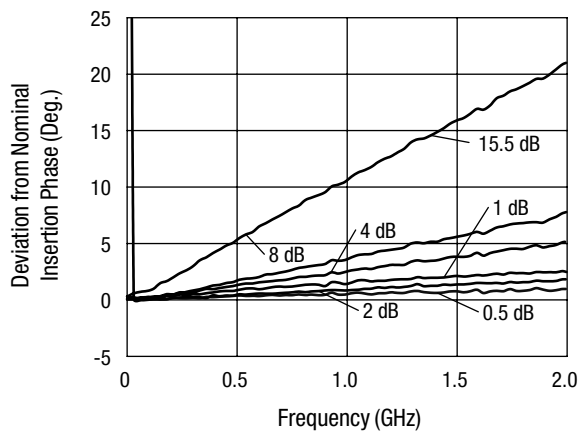
Attenuation Accuracy vs. Frequency (25 °C)



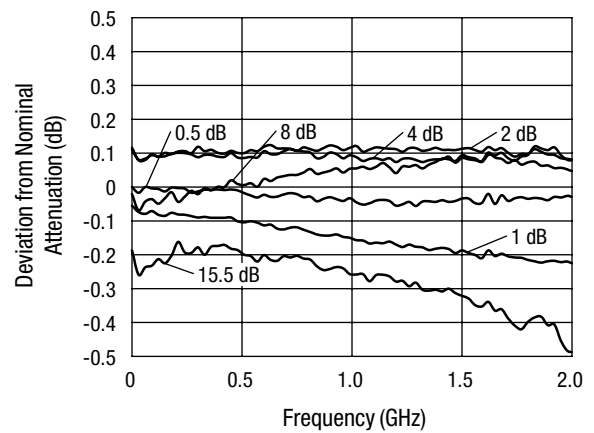
VSWR vs. Frequency (25 °C)



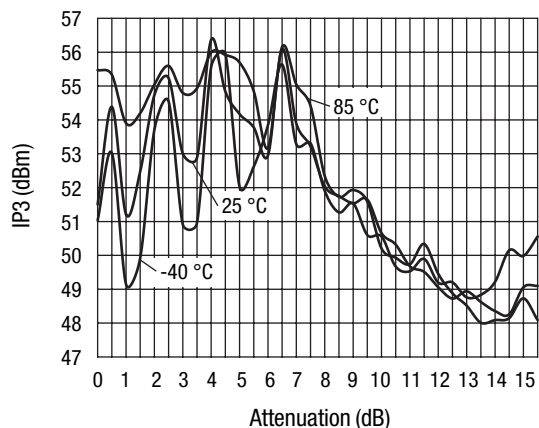
Attenuation Accuracy vs. Frequency (85 °C)



Attenuation Phase Accuracy vs. Frequency (25 °C)



Attenuation Accuracy vs. Frequency (-40 °C)

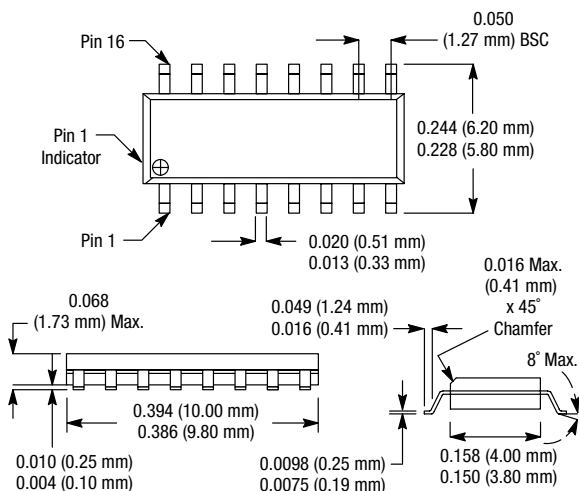


IP3 vs. Attenuation and Temperature

Truth Table

| V ₁ | V ₂ | V ₃ | V ₄ | V ₅ | V ₆ | V ₇ | V ₈ | Attenuation J ₁ -J ₂ |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---|
| 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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