0.1 GHz to 2.5 GHz 70 dB Logarithmic Detector/Controller

AD8313

FEATURES

Wide bandwidth: 0.1 GHz to 2.5 GHz min
High dynamic range: 70 dB to ±3.0 dB
High accuracy: ±1.0 dB over 65 dB range (@ 1.9 GHz)
Fast response: 40 ns full-scale typical
Controller mode with error output
Scaling stable over supply and temperature
Wide supply range: 2.7 V to 5.5 V
Low power: 40 mW at 3 V
Power-down feature: 60 mW at 3 V
Complete and easy to use

APPLICATIONS

RF transmitter power amplifier setpoint control and level monitoring
Logarithmic amplifier for RSSI measurement cellular base stations, radio link, radar

FUNCTIONAL BLOCK DIAGRAM

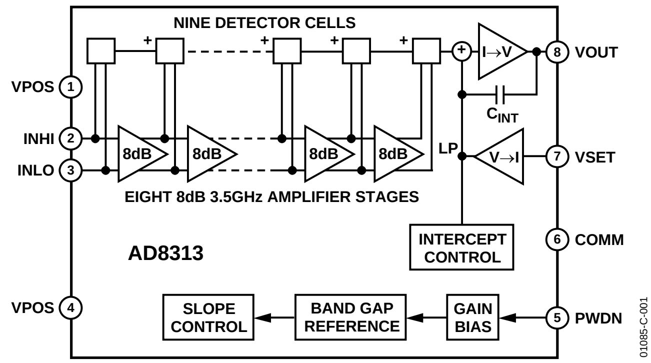

Figure 1.

GENERAL DESCRIPTION

The AD8313 is a complete multistage demodulating logarithmic amplifier that can accurately convert an RF signal at its differential input to an equivalent decibel-scaled value at its dc output. The AD8313 maintains a high degree of log conformance for signal frequencies from 0.1 GHz to 2.5 GHz and is useful over the range of 10 MHz to 3.5 GHz. The nominal input dynamic range is –65 dBm to 0 dBm (re: 50 Ω), and the sensitivity can be increased by 6 dB or more with a narrow-band input impedance matching network or a balun. Application is straightforward, requiring only a single supply of 2.7 V to 5.5 V and the addition of a suitable input and supply decoupling. Operating on a 3 V supply, its 13.7 mA consumption (for T_A = 25°C) is only 41 mW. A power-down feature is provided; the input is taken high to initiate a low current (20 μA) sleep mode, with a threshold at half the supply voltage.

The AD8313 uses a cascade of eight amplifier/limiter cells, each having a nominal gain of 8 dB and a −3 dB bandwidth of 3.5 GHz. This produces a total midband gain of 64 dB. At each amplifier output, a detector (rectifier) cell is used to convert the RF signal to baseband form; a ninth detector cell is placed directly at the input of the AD8313. The current-mode outputs of these cells are summed to generate a piecewise linear approximation to the logarithmic function. They are converted to a low impedance voltage-mode output by a transresistance stage, which also acts as a low-pass filter.

When used as a log amplifier, scaling is determined by a separate feedback interface (a transconductance stage) that sets the slope to approximately 18 mV/dB; used as a controller, this stage accepts the setpoint input. The logarithmic intercept is positioned to nearly −100 dBm, and the output runs from about 0.45 V dc at −73 dBm input to 1.75 V dc at 0 dBm input. The scale and intercept are supply- and temperature-stable.

The AD8313 is fabricated on Analog Devices' advanced 25 GHz silicon bipolar IC process and is available in an 8-lead MSOP package. The operating temperature range is −40°C to +85°C. An evaluation board is available.

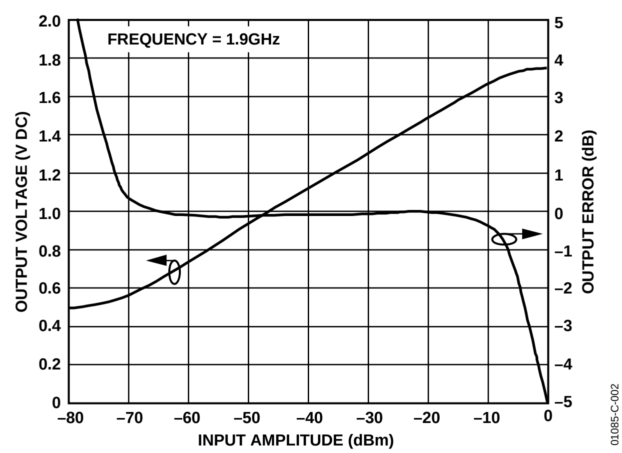

Figure 2. Typical Logarithmic Response and Error vs. Input Amplitude

Rev. D

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