

ABSTRACT

A Very High Frequency CMOS Variable Gain Amplifier.

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A fully differential CMOS Variable Gain Amplifier (VGA) consisting of an analog multiplier, current gain stages, and resistor loads is designed for very high frequency applications. The gain can be programmed from 0dB to 40dB with -3dB bandwidth greater than 200MHz and 500MHz in 0.5 μ m and 0.35 μ m CMOS process, respectively, for all range of gain. The Total Harmonic Distortion (THD) is below 0.3% for 1V_{pp} differential input and output voltages. These low distortion broadband features are benefited from the large linear range of the multiplier and the low impedance internal nodes in the current gain stages. In addition, common-mode feedback is not required due to these low impedance nodes. The gain control system consists of the 6dB fine-tuning by changing the analog control voltage of the multiplier, and 36dB digital coarse-tuning by switching and bypassing the current gain stage. Frequency compensation scheme based on capacitive feed-forward technique further improves the VGA bandwidth. The design in 0.5 μ m CMOS process has been fabricated through MOSIS and experimental results are in good agreement with the theoretical results.