Abstracts

A Novel, Linear Voltage Variable MMIC Attenuator

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Voltage variable attenuators (VVA's) for microwave applications that are fabricated using present technology and design methods feature a nonlinear relationship between the attenuation measured in dB and the control signal. To linearize this relationship it is necessary to employ external active linearization circuitry, which complicates the component, adding to its size and cost while reducing reliability. In this work we describe a novel VVA that features a linear attenuation-control voltage relationship without the need for external linearization. We accomplished this by connecting a number of FET segments in a unique fashion to form a composite FET. The channel resistance of the composite FET constitutes a prescribed function of its gate-source voltage. By careful design we synthesized the resistance functions that are necessay for realization of linear attenuators. The attenuator was fabricated using GaAs MMIC technology employing MESFET's as voltage variable resistors. It is completely passive and does not require a dc supply. The attenuation ranges from 2 to 15 dB over dc to 8 GHz while port impedance is kept close to 50 Omega. The deviation of the attenuation from a straight line is less than 0.2 dB. The chip can be used in applications such as amplitude modulators and temperature compensation circuits. The technique used can also be applied in the design of, for example, mixers, frequency multipliers, and vector modulators.

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