Abstracts

Design of Microwave GaAs MESFET's for Broad-Band Low-Noise Amplifiers

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As a basis for designing GaAs MESFET's for broad-band low-noise amplifiers, the fundamental relationships between basic device parameters, and two-port noise parameters are investigated in a semiempirical manner. A set of four noise parameters are shown as simple functions of equivalent circuit elements of a GaAs MESFET. Each element is then expressed in a simple analytical form with the geometrical and material parameters of this device. Thus practical expressions for the four noise parameters are developed in terms of the geometrical and material parameters. Among the four noise parameters, the minimum noise figure F/sub min/, and equivalent noise resistance R/sub n/, are considered crucial for broad-band Iow-noise amplifiers. A low R/sub n/ corresponds to less sensitivity to input rnismatch, and can be obtained with a short heavily doped thin active channel. Such a high channel doping-to-thickness (N/a) ratio has a potential of producing high power gain, but is contradictory to obtaining a low F/min/. Therefore, a compromise in choosing N and a is necessary for best overall amplifier performance. Four numerical examples are given to show optimization processes.

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