

Abstracts

Temperature-dependent small-signal and noise parameter measurements and modeling on InP HEMTs

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In this paper, we present detailed on-wafer S-parameter and noise parameter measurements and modeling of ZnP/InAlAs/InGaAs high electron mobility transistors (0.1- μ m gate length) at cryogenic temperatures. Various physical effects influencing small-signal parameters, especially the radio-frequency (RF) transconductance and RF output resistance and their temperature dependence, are discussed in detail. Accurate on-wafer noise parameter measurements are carried out from 300 to 18 K, and the variation of the equivalent noise temperatures of drain and source ($T_{sub d}$ and $T_{sub g}$) are modeled against temperature. Based on these models, a cryogenic low-noise amplifier in the K-alpha-band is developed with a record low noise temperature of 10 K.

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