Abstracts

Cryogenic Characteristics of Wide-Band Pseudomorphic HEMT MMIC Low-Noise Amplifiers

C.C. Yang, B.L. Nelson, B.R. Allen, W.L. Jones and J.B. Horton. "Cryogenic Characteristics of Wide-Band Pseudomorphic HEMT MMIC Low-Noise Amplifiers." 1993 Transactions on Microwave Theory and Techniques 41.6 (Jun./Jul. 1993 [T-MTT]): 992-997.

Two wide-band (8-18 GHz) single-stage MMIC low-noise amplifiers (LNA's) using 0.2-µm T-gate InGaAs pseudomorphic HEMT technology, designed and fabricated for room-temperature operation, were evaluated and compared at cryogenic temperatures below 20 K. One is a balanced design using 3-dB Lange couplers, and the other is a feedback design using a series RLC parallel feedback network. The gain flatness over the 8-18 GHz frequency band was maintained for both amplifiers at room and cryogenic temperatures, indicating that the topology for wide-band designs is insensitive to temperature of operation. As the physical temperature decreased from 297 K to below 20 K, the balanced LNA exhibited an average gain increase of 2 dB and as much as an eightfold reduction of noise temperature to 20 K, while the feedback LNA exhibited an average gain increase of less than 1 dB and an average fourfold reduction of noise temperature to 50 K. The negative feedback network of the feedback LNA resulted in less gain increase and less noise temperature reduction at cryogenic temperatures. The MMIC LNA's remained electrically and physically stable without adverse effects, such as breakage, at all test temperatures, and the measured results were repeatable.

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