

Abstracts

A Low-Noise Microwave Oscillator Employing a Self-Aligned AlGaAs/GaAs HBT (Short Papers)

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This paper studies the application of heterojunction bipolar transistors (HBT's) to low-noise microwave circuits. Design considerations and the low-noise performance of a Ku-band free-running oscillator using a self-aligned AlGaAs/GaAs HBT are described. The device has a novel structure in which by utilizing SiO₂ sidewalls the base surface area, which is the main cause of low-frequency noise, is drastically reduced. For a collector current of 1 mA, the fabricated device has base current noise power densities of $4 \times 10^{-20} \text{ A}^2/\text{Hz}$, $6 \times 10^{-21} \text{ A}^2/\text{Hz}$, and $2.5 \times 10^{-21} \text{ A}^2/\text{Hz}$ at baseband frequencies of 1 kHz, 10 kHz, and 100 kHz, respectively. The prototype oscillator operating at 15.5 GHz has a measured output power of 6 dBm and SSB FM noise power densities of -34 dBc/Hz at 1 kHz, -65 dBc/Hz at 10 kHz, and -96 dBc/Hz at 100 kHz off-carrier, respectively, without employing any high-Q elements such as a dielectric resonator. The results of this study demonstrate the suitability of HBT's for low-phase-noise microwave and millimeter-wave oscillator applications.

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