Abstracts

GaAs Heterojunction Bipolar Transistor Device and IC Technology for High-Performance Analog and Microwave Applications

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This paper discusses the GaAs/AlGaAs N-p-n heterojunction bipolar transistor (GaAs HBT) technology and its application to analog and microwave functions for high-performance military and commercial systems. In focused applications the GaAs HBT offers key advantages over alternative advanced silicon bipolar and III-V compound field-effect transistor (FET) approaches. The TRW GaAs HBT device and IC fabrication process, basic HBT dc and RF performance, examples of applications, and qualification work are presented and serve as a basis for addressing generaI technology issues. A relaxed 3µm emitter-up, self-aligned HBT IC process permits a combination of excellent transistor dc and RF performance including simultaneous f/sub T/, f/sub max/ /spl ap/ 20-40 GHz and dc current gain beta /spl ap/ 50-100 at useful collector current densities J/sub C/ /spl ap/ 3-10 kA/cm², Early voltage V/sub A/ /spl ap/ 500-1000 V, and MSI-LSI integration levels.These capabilities facilitate versatile dc-20 GHz analog/microwave as well as 3-6 Gbit/s digital, 2-3 Gs/s A/D conversion, and monolithically combined functions -- with producibility. In analog and microwave applications, key improvements are realized over Si bipolar and GaAs-related FET (such as MESFET and HEMT) approaches in combinations of operational frequency, power consumption, gain-bandwidth product, harmonic distortion, and phase (1/f) noise.

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