Abstracts

Thermal Stability Analysis of Multiple Emitter Finger Microwave AIGaAs/GaAs Heterojunction Bipolar Transistors

L.L. Liou, B. Bayraktaroglu and C.I. Huang. "Thermal Stability Analysis of Multiple Emitter Finger Microwave AIGaAs/GaAs Heterojunction Bipolar Transistors." 1993 MTT-S International Microwave Symposium Digest 93.1 (1993 Vol. I [MWSYM]): 281-284.

We developed a numerical electro-thermal model for AIGaAs/GaAs heterojunction bipolar transistors (HBTs) taking into account the nonuniform junction temperature rise due to self-heating. The model simulates both the dc current-voltage (I-V) characteristics and microwave performance of multi-emitter finger devices. The linear active region of the common-emitter I-V characteristics exhibits "current crush", where the collector current rapidly decays with increasing collector voltage due to the formation of highly localized hot spots within the device. It was also shown that a rapid fall off in the cut-off frequency and maximum frequency of oscillation occurs corresponding to the onset of this thermal instability. Methods of overcoming this instability using emitter ballast resistors and higher thermal conductivity substrates were discussed with corresponding effects on dc and microwave performance of the device.

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