Abstracts

Power performance of InP-based single and double heterojunction bipolar transistors

D. Sawdai, K. Yang, S.S.-H. Hsu, D. Pavlidis and G.I. Haddad. "Power performance of InP-based single and double heterojunction bipolar transistors." 1999 Transactions on Microwave Theory and Techniques 47.8 (Aug. 1999 [T-MTT] (Mini-Special Issue on Low-Power/Low-Noise Technologies for Mobile Wireless Communications)): 1449-1456.

The microwave and power performance of fabricated InP-based single and double heterojunction bipolar transistors (HBTs) is presented. The single heterojunction bipolar transistors (SHBTs), which had a 5000 /spl Aring/ InGaAs collector, had BV/sub CEO/ of 7.2 V and J/sub Cmax/ of 2/spl times/10/sup 5/ A/cm/sup 2/. The resulting HBTs with 2/spl times/10 /spl mu/m/sup 2/ emitters produced up to 1.1 mW//spl mu/m2 at 8 GHz with efficiencies over 30%. Double heterojunction bipolar transistors (DHBTs) with a 3000-/spl Aring/ InP collector had a BV/sub CEO/ of 9 V and J/sub c max/ of 1.1/spl times/10/sup 5/ A/cm/sup 2/, resulting in power densities up to 1.9 mW//spl mu/m/sup 2/ at 8 GHz and a peak efficiency of 46%. Similar DHBTs with a 6000 /spl Aring/ InP collector had a higher BV/sub CEO/ of 18 V, but the J/sub c max/ decreased to 0.4/spl times/10/sup 5/ A/cm/sup 2/ due to current blocking at the base-collector junction. Although the 6000 /spl Aring/ InP collector provided higher f/sub max/ and gain than the 3000 /spl Aring/ collector, the lower J/sub c max/ reduced its maximum power density below that of the SHBT wafer. The impact on power performance of various device characteristics, such as knee voltage, breakdown voltage, and maximum current density, are analyzed and discussed.

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