Abstracts

In/sub 0.5/(Al/sub x/Ga/sub 1-x/)/sub 0.5/ HEMTs for high-efficiency low-voltage power amplifiers: design, fabrication, and device results

Yu-Chi Wang, Jenn-Ming Kuo, Fan Ren, J.R. Lothian, Huan-Shang Tsai, J.S. Weiner, Hao-Chung Kuo, Chun-Hsiung Lin, Young-Kai Chen and W.E. Mayo. "In/sub 0.5/(Al/sub x/Ga/sub 1-x/)/sub 0.5/ HEMTs for high-efficiency low-voltage power amplifiers: design, fabrication, and device results." 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)): 1404-1412.

In/sub 0.5/(Al/sub x/Ga/sub 1-x/)/sub 0.5/ high electron-mobility transistors (HEMTs) are expected to have higher two-dimensional electron gas density and larger current drive capability than both Al/sub 0.23/Ga/sub 0.77/As and In/sub 0.5/Ga/sub 0.5/P HEMTs due to the improved conduction-band offsets. In this paper, we performed a systematic investigation of the electrical properties of In/sub 0.5/(Al/sub x/Ga/sub 1-x/)/sub 0.5/P (0/spl les/x/spl les/1) material system lattice matched to GaAs. By considering the conduction-band offset, direct-to-indirect-band electron transfer, donor-related deep levels, and Schottky barrier height, a relatively narrow range of the Al content 0.2/spl les/x/spl les/0.3 was found to be the optimum for the design of In/sub 0.5/(Al/sub x/Ga/sub 1-x/)/sub 0.5/ HEMTs. Under 1.2-V operation, power transistors with the optimum aluminum composition show high drain current density, high transconductance, and excellent power-added efficiency (65.2% at 850 MHz). These results demonstrate that InAlGaP HEMTs are promising candidates for high-efficiency low-voltage power applications.

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