High Power Density and Power Added Efficiency of $Al_{0.5}In_{0.5}P$/InGaAs Doped-channel HFETs

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Abstract

DX-center related problems limit x to ≤ 0.22 for Al_xGa_xAs Schottky layer system. In this study, $Al_{0.5}In_{0.5}P/In_{0.15}Ga_{0.85}As$ doped-channel HFETs (DCFETs) demonstrate a high breakdown voltage, a high power density, and a high linearity for microwave power device applications due to the improvement of a larger $\triangle E_c$ (0.45eV) and a wide bandgap AlInP Schottky layer. The device, biased at V_{ds}=3.0V and operated at 2.4 GHz, provided an output power density of 209 mW/mm, a power-added efficiency of 59 % and a linear power gain of 17 dB. Two-tone measurement reveals that the 3rd-order inter-modulation at an input power of 0 dBm is –29 dBc and the output intercept point (OIP_3) is 30.4 dBm for devices with a 1mm-wide gate.