Abstract

This work deals with the optimization of contact resistances in InGaAs/InP DHBTs and AlGaN/GaN HEMTs. To this end, the fabrication of TLM structures has been improved by developing a process using electron beam lithography. Additionally, an in situ pre-treatment in an Ar plasma is investigated for its effects. By utilizing special TLM geometries, improvements can be made in extraction accuracy (NTLM), the metal resistance of the structures can be studied (LTLM), and a simplified process can be developed (CTLM).

For InGaAs, the specific contact resistance ρ_c was determined to be reduced by up to 23% to $3{,}9 \cdot 10^{-8}$ Ωcm^2 through short plasma treatments. For GaN contacts, a combination of Ar plasma and optimized annealing at a doping concentration of $1{,}1 \cdot 10^{19}$ cm^{-3} resulted in an improvement of ρ_c to below $5 \cdot 10^{-7}$ Ωcm^2. Epitaxially grown AlGaN back barriers also enabled the reduction of leakage current in a HEMT structure and increased control effects.