InP/GaAsSb DHBT Emitter Etching Process Optimization with a Simultaneous fT/fMAX = 451/914 GHz and 86% Device Yield

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The present study contrasts three emitter etching process variants in InP/GaAsSb DHBT fabrication. Specifically, dry etching of the emitter mesa was studied for different inductively coupled plasma (ICP) powers with/without a prior Ar-sputtering electrode edge smoothing procedure facilitated in an electron-beam evaporator. Emitter etching significantly affects device yield and the scaling behavior of RF performance with emitter size. Excellent performance metrics are achieved with maximum cut-off frequencies fT/fMAX = 451/914 GHz and an 86% yield for a 300 W ICP power at 30 mTorr and 170°C (without Ar-pre-sputtering). The work highlights the importance of emitter etching on the scaling of performance metrics in the manufacturing of Type-II DHBTs.