

High-field Electron Mobility Model of Vertical Charge Transport in Al/Al₂O₃/GaN/AlGa_N/Ga_N Heterostructures

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Abstract. We present a high-field electron mobility model of vertical charge transport in Al/Al₂O₃/GaN/AlGa_N/Ga_N heterostructures that is, in detail, different from the standard high-field mobility model. The standard model was tailor-made for a 2DEG channel. The wurtzite group-III nitrides GaN and AlN are tetrahedrally coordinated semiconductors with a hexagonal Bravais lattice with four atoms per unit cell. The specific property of this crystal lattice is the induced sheet charge due to spontaneous and piezoelectric polarizations. The sheet charge results in an internal electric field in the crystal lattice. The internal electric field either decelerates or accelerates the vertical electron transport through GaN/AlGa_N/Ga_N heterostructures.