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Impact of Silicon Nitride Passivation Thickness on AlGaN \GaN Transport Properties and Device Performance HELEN JACKSON, JAMES PETROSKY, ROBERT HENGEHOLD, Air Force Institute of Technology, ZHAO-QIANG FANG, Wright State University Semiconductor Research Center — Silicon nitride passivation (Si_3N_4) on AlGaN\GaN heterojunction devices can improve performance by reducing electron traps at the surface. In this study, the effects of passivation layer thickness were investigated at various thicknesses (0, 20, 50 and 120 nanometers) on bare epilayer AlGaN\GaN structures with either an AlN nucleation layer or a GaN cap. Hall system measurements were used to observe changes in carrier concentration and mobility as a function silicon nitride thickness. Mobility changes were measured and carrier scattering mechanisms are analyzed both with and without Si_3 N_4. Capacitance voltage measurements were done to give information about the surface donor states and the Si_3N_4 charge at the interface. A monatomic decrease in saturation capacitance with increasing Si_3N_4 thickness was observed. Gate current measurements were done to examine the effect of Si_3N_4 on the gate leakage current and thus device performance.

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