

This paper shows a detailed characterization and estimation of the temperature-dependent on-resistance $R_{ON}(T)$ of AlN/GaN/AlGaIn high electron-mobility transistors (HEMTs) through dc and low-frequency (LF) S-parameter measurements. The measurements are carried out at different chuck temperatures (T_{chuck}) and the $R_{ON}(T)$ is calculated for different values of gate-source bias (V_{GS}) of HEMT grown on a silicon carbide (SiC) substrate. Furthermore, we also present the two-dimensional (2-D) physics-based numerical simulation results for the $R_{ON}(T)$ extraction of this device. Knowing $R_{ON}(T)$ values of the device for different source-drain lengths (L_{SD}), we propose a simplified method to extract the temperature-dependent series contact resistance $R_{se}(T)$ and channel sheet resistance $R_{sh}(T)$ of the GaN HEMT technology.