Hiposwitch- WP5 GaN Device Epitaxy

GaN epitaxial growth on 150 mm Si substrates

Goal:

- To provide 6" epitaxial wafers suitable for device operation up to 750V with substrate biased at ground or drain potential

Achievements:

- New buffer developed featuring:
    - > 750V vertical breakdown
    - > 600V voltage capability at a leakage current of 1µA/mm with grounded substrate
    - Excellent 2DEG behaviour
    - Reproducible low bow
    - Reproducible excellent crystal quality
    - Uniform layer thicknesses : st.dev below 2%

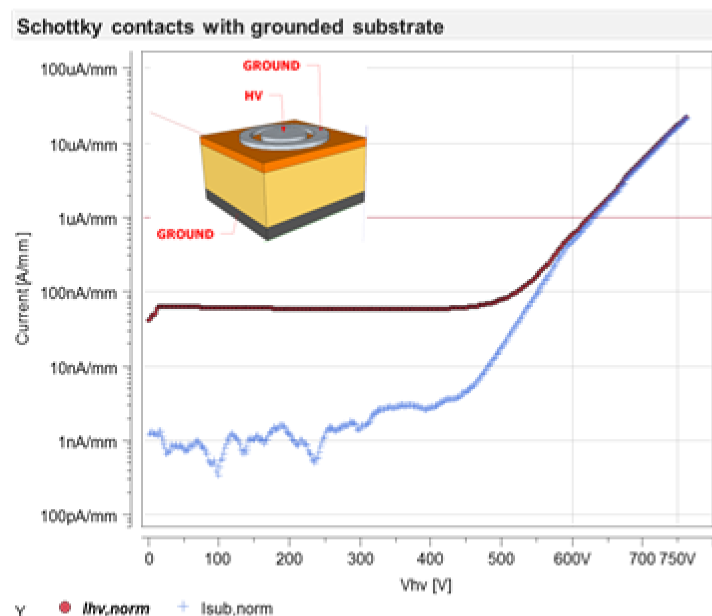

Figure 5.1. Off-state drain -current of GaN-HEMTs on grounded Si-substrate

Streamlining of the epitaxial growth sequence

Goal: To mitigate the Mg memory effect to allow a reproducible and efficient MOCVD process

An automated in-situ reactor cleaning procedure was developed for Planetary Reactors to avoid any impurity carry over. SIMS measurements of layers grown in a used reactor after the growth of a thick Mg-doped GaN layer and the in-situ clean show an Mg-concentration below the detection limit of mid-10^{15} cm^{-3}.