

## **Polarisation Super Junction Technology in Gallium Nitride – a platform for Integration of Power and Gate Drive technologies**

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A comprehensive overview of novel high voltage GaN field effect transistors (FETs) based on the Polarisation Superjunction (PSJ) concept is presented. Current challenges impeding wider adoption of GaN power switching transistors in applications and measured results of scaled-up, Sapphire based GaN PSJ-FETs of up to 3 kV are discussed. An insight into the future direction of GaN power semiconductor technology based on Polarisation Super Junction technology is highlighted. Transition from the conventional scheme of manufacturing circuits using discrete power components to that of a fully integrated power system-on-chip is anticipated to be a prerequisite to take advantage of the high-frequency power switching benefits offered by lateral GaN devices. Monolithic integration of gate drive circuitry with power devices is considered essential to enable stable high-frequency operation with efficiency and power densities unachievable with present techniques. Reduction in the overall bill of materials and cost enabled by using entirely GaN solutions can offer system level benefits in existing and emerging applications. The fundamental requirement of a semiconductor technology platform that enables simultaneous development of a wide range of high voltage and low voltage devices, including CMOS in GaN, as required for integration, is served by the Polarisation Super Junction (PSJ) platform and is described.