Superjunction (SJ) technology was commercially released for the first time in 1998 by Infineon. Today new players are entering the market, but the historical players keep their lead by decreasing production costs as much as possible or by introducing different technologies. The improvement of silicon SJ MOSFETs will keep these devices on the market and drive them towards standardization and popularization.

GaN-on-Si HEMTs are good competitors for silicon SJ MOSFETs in the 600/650V power device range. They offer new capabilities, such as higher switching frequencies, higher power density and an increasingly competitive manufacturing cost.

Such GaN devices have been mainly used in high-end telecom power supply applications. But in 2019 they entered the high-volume market for the first time with adoption of GaN HEMTs in 65W fast chargers. Thus Yole Développement projects that the GaN power business will reach beyond $350M by 2024. This would require a compound annual growth rate (CAGR) of 85%, driven mainly by consumer fast charger applications.

This report offers an in-depth analysis of the latest innovations in 600/650V power devices. It shows the differences between silicon SJ MOSFETs and GaN-on-Si HEMTs from the technical and economic viewpoints.

We have opened and analyzed about 50 devices from 13 of the main GaN and SJ market players to understand their technology innovations.

The GaN HEMT players presented in this report are: Transphorm, Panasonic, Infineon, Texas Instruments, GaN Systems, and Navitas.

The Superjunction players presented in this report are: Infineon, Toshiba, Vishay, STMicroelectronics, ON Semiconductor/Fairchild, Rohm, Central Semiconductor, and D3 Semiconductor.

The report includes detailed pictures of device structures, details on manufacturing processes and materials, comparison of electrical performance, and cost breakdown analysis of the process.
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