

## Future and Challenges in Silicon LDMOS for High-Power RF Applications

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Power amplifiers in cellular base station require the use of devices with high power gain, high linearity, and good efficiency. Together with good rf performance, many different aspects need also to be considered and optimized in the design, including:

- *High voltage operation*: the demand for high output power requires the use of devices able to operate in an rf environment with high voltage large signal.
- *Hot carrier reliability*: hot carrier degradation of the device performance needs to be minimized and the device has to be guaranteed for 20 years of continuous operation.
- *Thermal resistance*: because of the high-power operation, minimization of thermal resistance is a primary concern in the design of the device and package.
- *Thermal-electrical reliability*: high voltage and high temperature of operation makes these devices susceptible to catastrophic second breakdown phenomena. A large safety margin needs to be considered in the device design.

Silicon-based material is certainly not the material of choice for rf power devices, as other materials like SiC and GaN offer better material properties, at least in principle. However, because of the different device requirements and because of the different optimizations that are necessary, silicon is still the material most widely used in cellular base stations.

We will present an overview of the design optimization process for Agere Systems rf-LDMOS device, and a projection of the ultimate device performance that we believe can be achieved with the silicon-based LDMOS.