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Gallium Nitride Power Devices for Power Conversion Applications

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This presentation will deal with our work on gallium nitride (GaN) devices for power electronics. The breakdown field of GaN is around 3.3 MV/cm and its mobility can surpass 1000 cm²/V.s, making it an excellent candidate for power switches. The lateral HEMT (High Electron Mobility Transistor) architecture using GaN epitaxy on Silicon is increasingly successful, especially for applications at 650V or below. GaN free-standing wafers are also being used to develop components with a vertical geometry which leads to higher power density due to volume instead of surface conduction.

We have developed lateral normally-off GaN-on-Si MOSc-HEMTs (Metal Oxide Semiconductor channel HEMTs). Their advantage comes from the insulated gate technology results in extremely low gate current and a reduced temperature coefficient of its On-resistance, both of which are beneficial for the design of power converters. We will present a full micro inverter using our 100V and 650V MOSc-HEMTs for inclusion on an individual solar panel (DC 45V / AC 230V). The talk will also cover alternative lateral and vertical device architectures that can allow GaN to address new power conversion applications.

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