

Fully-Vertical GaN-on-SiC Trench MOSFETs

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Introductions

Similar to Si IGBT, vertical GaN power devices have the advantages of fast low resistances, and potential fast switching, and high-power handling capabilities. Fully-vertical devices can reduce device surface area, current crowding and sidewall leakage compared with quasi-vertical devices. Fully-vertical GaN-on-Si p-i-n diodes and trench MOSFETs have been demonstrated using complicated substrate engineering techniques. On the other hand, a conductive buffer can greatly simplify the fabrication process, which has been employed in fully-vertical GaN-on-Si and GaN-on-SiC diodes. In this work, we present the development of fully-vertical GaN-on-SiC trench MOSFETs directly grown on conducting SiC substrates. This is the first demonstration of fully-vertical GaN power MOSFETs on foreign substrates using conductive buffer layers.