

1000V Vertical JFET Using Bulk GaN

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Bulk GaN substrates with low defect density are now commercially available. This material enables the fabrication of vertical GaN devices with large breakdown voltages, and excellent electrical performance. In this paper, we present a 1000V Vertical JFET that has a positive threshold of 1V. The normally-off FET integrates a hetero-junction in the design to improve the transconductance and enable switching operation into the 10s of MHz.

A combination of horizontal and vertical channels with current blocking layers is used to support high frequency and high voltage operation. A range of breakdown voltage and on-resistance design can be realized by adjusting the drift region doping and thickness. The elimination of lattice mismatch supports the fabrication of large drift regions that allow for multi-kV operation.

The high frequency performance and low on-resistance of this device design will enable a new class of power electronics that are very efficient and very compact. Bulk substrates enable the true capabilities of the GaN material system.

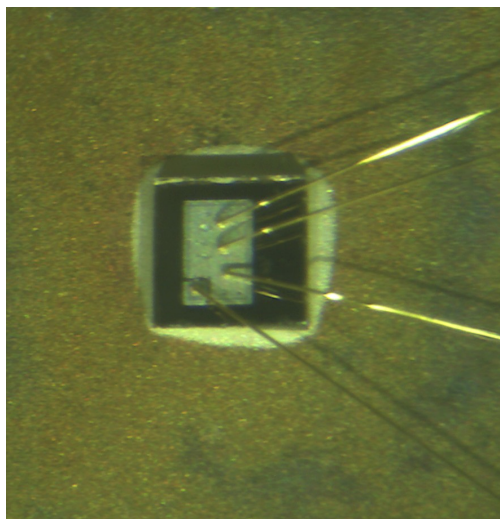


Figure 1. Die photo of a GaN vertical JFET.