ABSTRACT:

Modeling hot-electron injection and trapping in AlGaN/GaN power HFETs

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Gallium-Nitride (GaN) is becoming one of the key semiconductors for power devices. The high breakdown field allows to significantly reduce the extension of the drift region of FET devices compared to silicon, resulting in higher switching frequency that, in turn, leads to conversion system with reduced volume [1]. Most of the GaN devices today are based on the AlGaN/GaN heterojunction that creates a 2DEG in the drift region leading to low on-resistance. Under high drain-to-source bias, hot-electrons in the 2DEG are able to enter into the AlGaN layer and diffuse up to the passivation layer where they can get trapped leading to dynamic-Ron [2] and reliability issues. This effect poses a limit in the lateral field that can be realistically applied to the device. In this talk we analyze hot electron injection and trapping in the passivation layer employing a mixture of Monte Carlo transport simulations [3] and a TCAD simulation decks exploiting semi-analitical models developed and calibrated on Monte Carlo results.

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