

### WiPDA Tutorial Discusses Reliability Of GaN HEMTs For Space

At the upcoming IEEE Workshop On Wide Bandgap Power Devices & Applications ([WiPDA 2026](#)), October 26-28, 2026, a series of six tutorials will be presented on the first day on topics ranging from applications of AI, system packaging, and developing a SiC production flow, to a deep dive on GaN reliability and extreme environment applications.

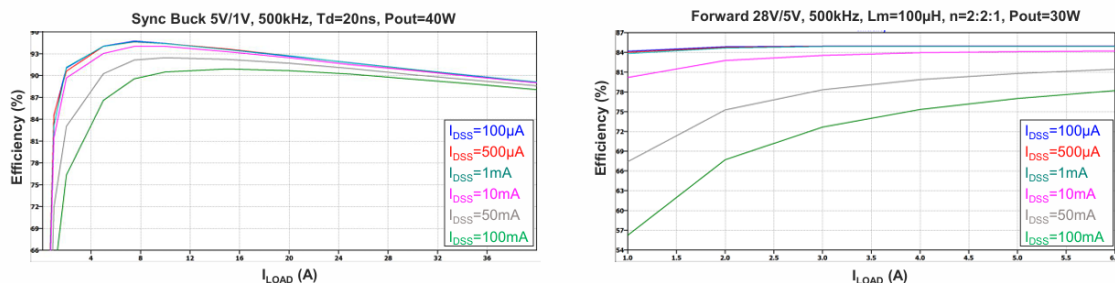
| Title                                                                                                                                   | Presenter       | Affiliation                       |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------|
| "How to Apply AI for Power Device Modeling and Design"                                                                                  | Peter Wilson    | University of Arkansas            |
| "Lab-to-Fab Transition of High-Voltage SiC MOSFETs in a Silicon Foundry"                                                                | Youngsang Kim   | Defense Microelectronics Activity |
| "Impacts of Electronic Component Packaging for Wide Bandgap Semiconductor Designs in More-Electric-Aircraft and Aerospace Environments" | Roger A. Brewer | Lockheed Martin                   |
| "Thermomechanical Reliability and Failure Mechanisms of GaN-on-Si Power Devices"                                                        | Shengke Zhang   | Efficient Power Conversion (EPC)  |
| "Radiation Effects and Reliability for Power GaN HEMT in Space Environments"                                                            | Eric Faraci     | Infineon Technologies AG, USA     |
| "Power GaN HEMTs at Cryogenic Temperatures: Static, Dynamic, and Reliability Characterization"                                          | Zheyu Zhang     | Rensselaer Polytechnic Institute  |

In his talk on "Radiation Effects and Reliability for Power GaN HEMT in Space Environments," Eric Faraci, applications engineer at Infineon Technologies, will discuss the development of Infineon's rad-hard GaN HEMTs, which are e-mode devices with a Schottky gate, and experimental results relating to their performance in SEE testing and in reliability testing.

The work covers a few generations of medium-voltage devices that were developed from the company's industrial-grade, CoolGaN devices, but with modifications to make them rad hard, particularly to SEEs. GaN HEMTs are known to be solid on TID performance, so SEEs like single-event burnout (SEB) are often the focus when discussing the radiation immunity of these devices. Faraci will touch on that, but more extensively on the issue of single-event leakage current (SELC).

He'll begin by outlining the benefits of E-mode GaN HEMTs versus other power switch devices for space and the results of radiation effects testing on Infineon's medium-voltage GaN devices. Among the data to be discussed are results demonstrating immunity to SEB, but then much more will be said on SELC. His data illustrates the impact of increasing SELC on  $I_{DSS}$  with successive generations of the COTS parts, its sensitivities in SEE testing, its dependency on system parameters and its system impact. A pair of graphs from a previous talk illustrate how SELC  $I_{DSS}$  affects converter efficiency in two example applications—a synchronous buck and a forward converter (Fig. 1).

#### SELC $I_{DSS}$ system impact



- SELC  $I_{DSS}$  increase is a gradual parametric degradation, with no clear pass/fail criteria
- Example power converters efficiency simulated with increasing  $I_{DSS}$  leakage current to model SELC effects demonstrate gradual loss of efficiency, first at light load then over entire load range
  - Exact efficiency decrease dependent on specifics of design

Fig 1. Impact of SELC  $I_{DSS}$  on converter efficiency in a synchronous buk and a forward converter.

Faraci's tutorial will also discuss GaN HEMT reliability in depth. He'll explain how the extrinsic branch of the FIT rate curve, which concerns failures due to defect density and/or process variation, and exhibits wide

discrepancy with failures, is the main concern for GaN HEMT reliability more so than the intrinsic branch, which concerns failure due to wear out, where devices fail uniformly.

He'll present reliability results for the company's first-gen rad-hard GaN device demonstrating FIT < 10 with  $V_{GS} = 5$  V drive voltage dependent on extrinsic branch. FIT results for gate and drain reliability are shown below for the Gen 1 device (Fig. 2).

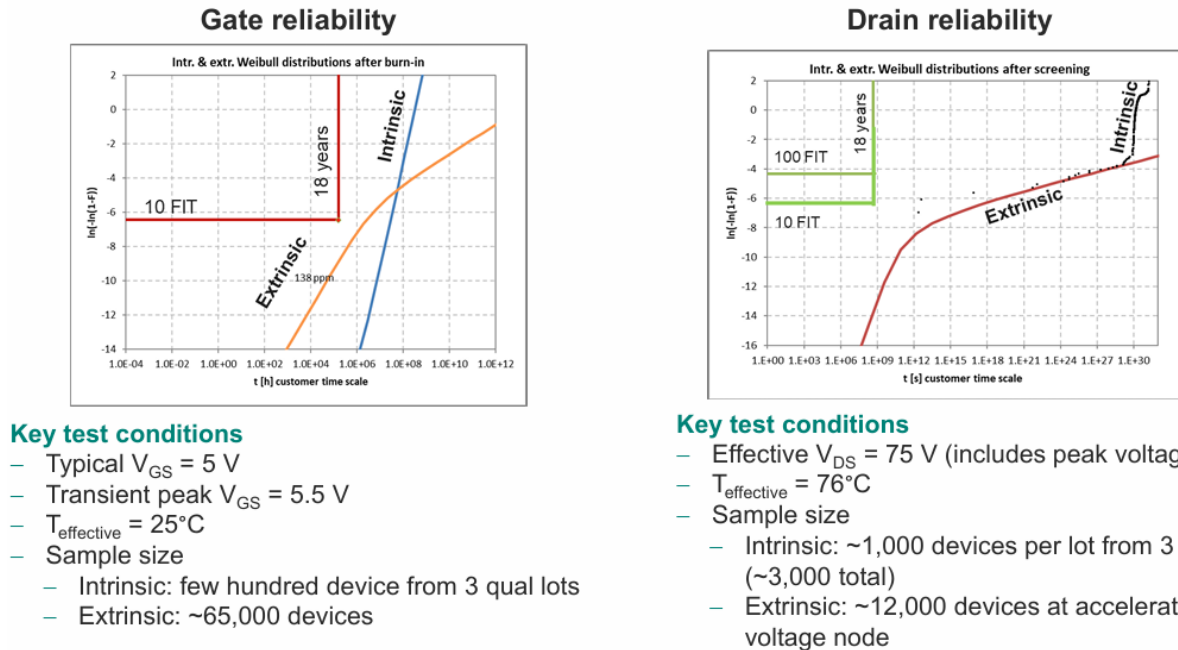


Fig. 2. FIT data for Infineon's first-gen rad-hard GaN HEMTs.

While the above results will be familiar to those who heard Eric's talk at PEASA in late July, he will also delve further into reliability aspects and show the progress that was made in reliability going from Gen 1 of the rad-hard GaN HEMTs to Gen 3. Some sample data is shown below. (Note that Gen 3 here actually refers to the company's second-generation devices.)

In his tutorial, Faraci will explain what Infineon does differently in its MIL-PRF-19500 JANS screening to achieve the low failure rates (FIT < 1) shown below for a second-gen rad-hard GaN device (Fig. 3).

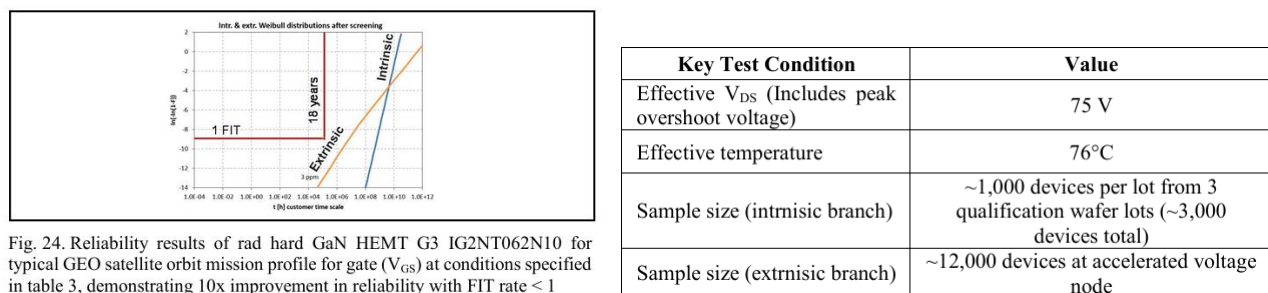


Fig. 24. Reliability results of rad hard GaN HEMT G3 IG2NT062N10 for typical GEO satellite orbit mission profile for gate ( $V_{GS}$ ) at conditions specified in table 3, demonstrating 10x improvement in reliability with FIT rate < 1

Fig. 3. Infineon's Gen 3 rad-hard GaN HEMTs have demonstrated FIT rates < 1.

For more information, contact the [presenter](#).