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NSREC Notes: Power Semiconductor Vendors Showcase Higher-Performance Reference Designs And New GaN Devices

by David G. Morrison, Editor, How2Power.com

At this year's IEEE Nuclear & Space Radiation Effects Conference (NSREC 2026) in San Juan, Puerto Rico, stalwarts of the space power industry exhibited their latest power semiconductors, ICs and reference designs. Building on the various products shown in previous years for powering satellite systems,[1-11] companies showed power converter reference designs with enhanced capabilites. For example, Texas Instruments exhibited full-bridge designs delivering higher power and compatibility with the VPX standard.

Meanwhile, Renesas showed a rad-tolerant BLDC motor drive reference design for driving stepper motors, featuring a new current sense amplifier. Other new devices were also in evidence. While not on display, Texas Instruments discussed its new offering for generating negative voltage rails at the point of load—a rad-hard inverting switched-cap converter with integrated LDO.

In addition to these ICs, there were new power switches. EPC Space highlighted an expansion of its portfolio in two directions with the introduction of the company's first, rad-tolerant (rather than rad-hard) GaN devices (HEMTs) and the company's first low-voltage GaN devices. Another exhibitor, Infineon exhibited a recently announced rad-hard GaN HEMT driver.

There were also a number of power-related papers and posters presented at NSREC 2026. A list of these is provided at the end of this article. Many of the power-oriented papers and posters listed in the conference sessions document radiation effects experiments on GaN and SiC power devices.

However, within the Data Workshop, which also presents posters, the work presented covers test results for a wider variety of devices. These included recently introduced power ICs as well as other analog and mixed-signal devices that may be useful in power electronics designs. As its name suggests, the findings reported in the Data Workshop are of a more commercial or practical nature than the research reported in the paper and poster sessions.

Reference Designs Address A Variety Of Requirements

In the Texas Instruments exhibit, the company built on its previous work in releasing space-grade PWM controllers, and half-bridge gate drivers, as well as previous reference design work in releasing a new 500-W reference design for converting 100 V to 12 V with >90% efficiency. This current-doubler full-bridge, PMP23661, is an upgrade of a ZVS design shown last year at NSREC.[1] That earlier reference design, the PMP23391, delivered 300 W while stepping down 28 V to 12 V with 92% efficiency.

The eval board for the PMP23661 reference design is shown in Fig. 1. In this design the controller and half-bridge drivers are chosen to meet radiation immunity for low earth orbit (LEO) with power ICs specifying a TID of 50 krad. These components can be swapped out with QMLP pin-to-pin grade equivalents to meet mission requirements for higher TID (100 krad) and SEE LET (75 MeVcm^2/mg) ratings.

For more information, see the PMP23661 page.

Another recently released reference design shown at the TI booth was the TIDA011004, which employs a ZVS full bridge in a 3U VPX card that delivers 300-W output while operating from a 28-V input. It produces three voltage rails: 12 V at 18 A, 5 V at 12 A and 3.3 V at 3 A. According to the company, this is the first power converter reference design from TI for VPX.

This 100-mm x 160-mm board represents a power converter that is both compact and in a standardized (VITA-62-compliant), modular format that supports both interoperability and scalability (Fig. 2). As Kenny Matthews, space power marketing engineer at TI noted, prior to the introduction of the VPX standard, the equivalent power suppy would be designed in custom form factors, with all the limits that customization imposes (single source, not necessarily scalable).

Fig. 1. The PMP23661 reference design is a full-bridge topology comprised of a TPS7H5005-SEP referenced on secondary ground that controls four TPS7H6005-SEP half-bridge gate drivers. The two drivers referenced to the primary side operate in PWM mode which allows for the design to achieve zero-voltage switching (ZVS) at higher loading conditions. On the secondary side the other driver controls a pair of secondary rectifiers in a current doubler to further improve the conversion efficiency.

This reference design uses rad-tolerant devices that are pin-to-pin compatible with rad-hard power devices offered by the company. So similar to the PMP23661 described above, the TIDA011004 provides scalability between mission profiles (LEO to GEO) while minimizing redesign effort. For more information, see the TIDA011004 page.

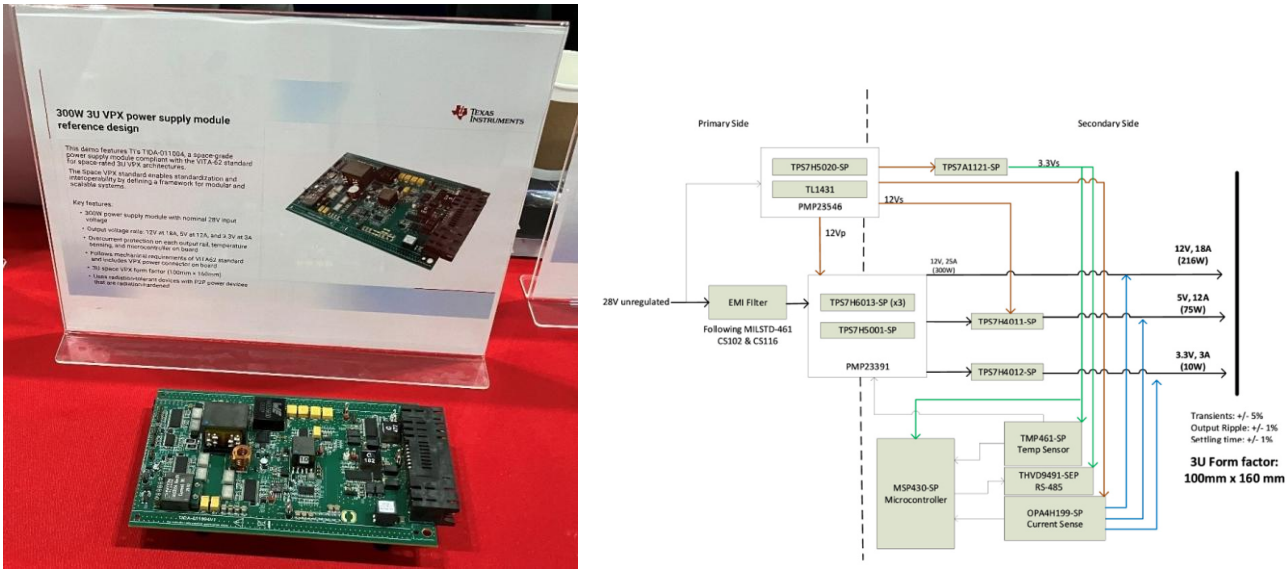


Fig. 2. The TIDA011004 reference design is a space-grade power supply module compliant with the VITA-62 standard for space-rated 3U VPX architectures. The eval board and block diagram are shown here.

In addition to the two newer reference designs described above, the company showed power management reference designs for AMD's Versal Core—described as the most powerful FPGA (or SoC) for space—and for AMD's Versal Edge, a lower-power FPGA. Both of these were shown at TI's booth last year.

Jason Clark, sector lead, Aerospace and Defense, Industrial Systems Team at TI, noted that the Edge power reference design from TI comes with a 50-page application note detailing specifications on meeting accuracy

and power-sequencing requirements. There is a separate white paper planned for the Versal Edge development board in partnership with Alpha Data. For more on the development board, see the ADM-VB630 page.

In addition to the power supply designs just described, TI also showed a rad-tolerant C2000 motor control reference design for driving three-phase BLDC motors, the solution implemented here in the TIDA 010984 is based on 200-V half-bridge GaN power stages (FETs + driver). The GaN HEMTs are supplied by another vendor. While the app note had been released by the time of the exhibit, the release of the complete reference design was then about a month away.

The associated board contains six power stages for driving two BLDC motors or a single stepper motor. The inclusion of the 200-V HB power stage is a unique element of this reference design which makes for a very compact, integrated solution.

Beyond these power management reference designs, the company also showed space-grade designs for ADCs, DACs and analog front ends containing both.

While the focus of the TI exhibit was on the most recent reference solutions for satellite systems, according to Javier Valle, Space Power product line manager at TI, overall, the company remains focused on expanding its power component portfolio for space to support all mission requirements. The company has the largest portfolio of rad-hard and rad-tolerant power devices in space plastic as the market drives demand in this area, but also continues to release ceramic devices for the missions where they are required.

Speaking about recent developments, Valle noted that the company has recently released the first space-rated inverter on the market. The TPS7H1301-SP/-SEP is a rad-hard, 3-V-to-6.3-V input, 400-mA inverting switched cap converter with integrated LDO. This part was created to simplify the distribution of negative voltage rails across a satellite's electrical power system (Fig. 3).

As Kenny Matthews explained, existing designs tend to rely on an auxiliary winding on the main power converter's transformer to generate the negative rail required in satellite power systems. This switched cap converter gives designers an option for generating this rail at the point of load, which offers greater layout flexibility and simplifies design architecture.

The IC also represents a more compact alternative to other POL options such as a buck-boost converter, which will require its own inductor and often need to be post regulated with a separate negative LDO. In addition, the TPS7H1301's integration of an LDO allows for precision in setting the output voltage versus the fixed stepdown ratios that would be obtained with a charge pump alone.

The TPS7H1301-SP/-SEP has been recently released on TI.com, where among other resources you'll find a data sheet with advanced information. The IC is available in rad-hard ceramic (-SP) and the company expects to release rad-tolerant (-SEP) and rad-hard QMLP (-SP) versions in the future.

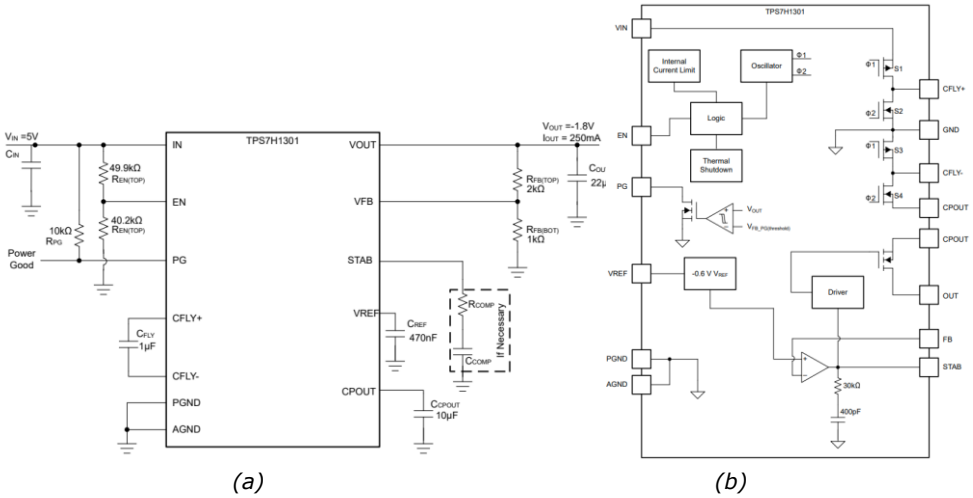
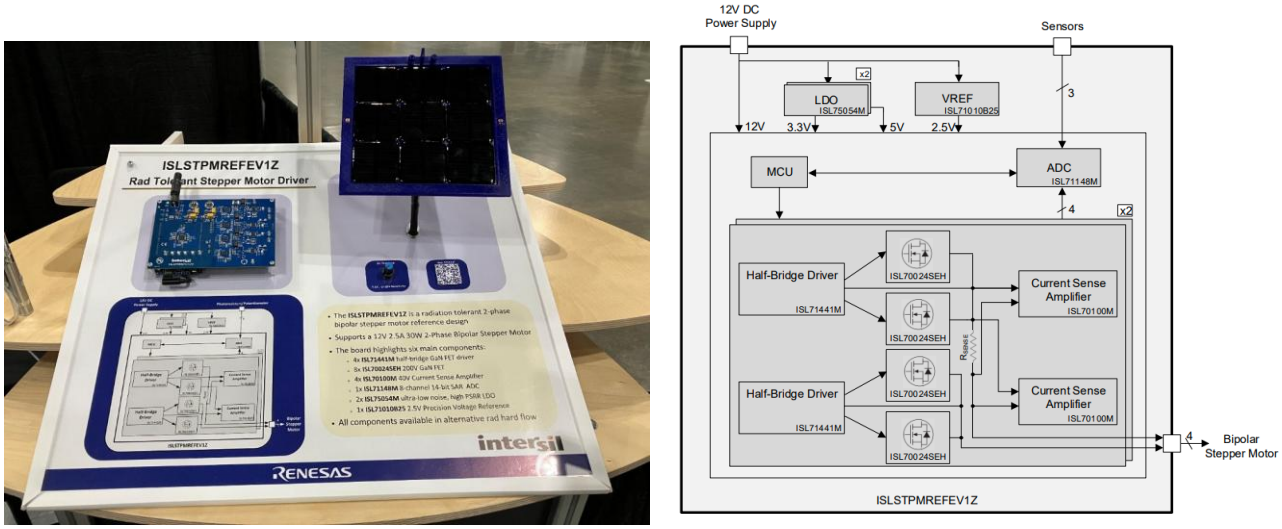


Fig. 3. The TPS7H1301-SP/-SEP 400-mA inverting switched cap converter. A poster was presented on this device in NSREC's Data Workshop. See DW-13 in the list below.

Stepper Motor Reference Design Leverages Current Sense Amplifier

At the Renesas booth, the company showed a new reference design for a BLDC motor drive—a rad-tolerant stepper motor driver. This design, ISLSTPMREFEV1Z, closes the loop with a current sense amplifier, the ISL70100M, which is a new part, according to Kiran Bernard, product line marketing for Intersil Space/Hi-Rel Products, Industrial Analog and Power Group.

The 40-V CSA is rad-tolerant device offered with a TID rating of 30 or 50 krad(Si) and a SEE characterization of no DSEE with RS+ = 42 V and V+ = 42 V at 43 MeV•cm^2/mg. The design also uses the company's half-bridge GaN FET drivers and 200-V GaN FETs, among other devices. See Fig. 4.



(a) (b)

Fig. 4. The ISLSTPMREFEV1Z radiation-tolerant stepper motor reference design. In the demo at NSREC 2026 (a), the company used the motor driver to position a solar panel to track a light source. A closeup of the block diagram is shown in (b).

In the demo shown at NSREC (Fig. 4), the motor driver was used to turn a small solar panel in response to movement of a light source directed at the panel. In other words, the panel turns toward the brightest light. For more on the reference design see the ISLSTPMREFEV1Z page. For more on the current sense amplifier, see the ISL70100M page.

GaN Device Portfolio Expands To Serve Different Mission Needs

At EPC Space's booth, the company presented information on its new rad-tolerant line of GaN power devices. This represents a new product category for EPC Space, which until now has offered only rad-hard devices. According to Robert Strittmatter, vice president, R&D Strategic Projects, these rad-tolerant devices are commercial parts from the parent company, EPC, which have been up-screened for SEE immunity to an LET of 37 MeV/(mg/cm^2) in Si with V_{DS} up to 80% of rated breakdown.

As Strittmatter notes, GaN devices are known to have inherent TID immunity, so they're not screened for total dose. The parts highlighted at NSREC are noted in Table 1. These are offered in QFN packages.

EPC Space also highlighted its newly released low-voltage GaN devices with ratings of 15, 25 and 40 V. The parts noted at NSREC are listed in Table 2. As with the rad-tolerant devices, these low-voltage rad-hard parts are offered in QFNs.

Rad hard by design, these devices are screened for SEE immunity up to an LET of 83.2 MeV/(mg/cm^2) with V_{DS} up to 100% of rated breakdown. Under neutron testing, they maintain a pre-radiation specification for up to 4 x 10^{15} neutrons/cm^2.

Table 1. EPC Space's Rad-Tolerant Devices publicized at NSREC. Additional devices are listed on the EPC Space website.

Part number	Package	Size (mm)	Voltage (V)	$R_{DS(ON)}$ typ. (m)	I_D (A)	Q_G (nC)	FoM R•Q_G
EPCS5001PA	PA	3 x 5	100	1.8	133	23	41
EPCS5005PA			100	3.1	63	12.3	38
EPCS5007PA			100	1	133	28	28
EPCS5004PA			150	3	133	22	66
EPCS5006PA			150	6	63	10.6	64
EPCS5003PA			200	5	133	21	105
EPCS5002PA			200	10	63	10.1	101
EPCS9001D	D	8.0 x 4.6	100	5	90	15	75

Table 2. EPC Space's rad-hard low-voltage products publicized at NSREC. Additional devices are listed on the company's website.

Part number	Package type	Size (mm)	Voltage (V)	$R_{DS(ON)}$ typ. (m)	I_D (A)	Q_G (nC)	FoM R•Q_G
EPC7050PC	PC	3.3 x 3.3	15	0.28	101	31	8.7
EPC7066PC			25	0.37		27	10.0
EPC7065PC			40	0.5		26	13.0

As Strittmatter observed these products target high-power computing applications in space where they may be used in bus converter or point-of-load converter applications. According to Strittmatter, these GaN FETs will not only outperform existing rad-hard silicon MOSFETs—the $R_{DS(ON)}$ x Q_g and $R_{DS(ON)}$ x area figures of merit of these rad-hard GaN devices are 100X lower—they'll also outperform the state-of-the-art commercial silicon MOSFETs.

Although EPC introduced commercial versions of these low-voltage GaN FETs first, these rad-hard versions were actually developed first, according to Bel Lazar, CEO of EPC Space. Their development was funded under DARPA's Space Power Conversion Electronics (SPCE) program, which aimed to create rad-hard POL converters for space to power compute assetts (For more information, see DARPA's SPCE page.)

As Lazar observed, some space applications have been relying on automotive-grade silicon for powering AMD's Versal SoC. So the availability of rad-hard GaN offers a big upgrade in terms of both electrical performance and radiation immunity. The rad-hard GaN parts will be priced around $100 each in quantities of 100 and significantly lower in high volumes, said Lazar. Their low cost (for rad hard) is attributed mainly to their use of plastic QFN packaging.

Rad-Hard GaN HEMT Driver For Low- Or High-Side Applications

At the Infineon booth, representatives of International Rectifier HiRel Products showed the company's recently announced RIC70115 rad-hard GaN HEMT driver (Fig. 5). This device drives both logic-level silicon MOSFETs and GaN HEMTs in low-side and high-side configurations. For more on the RIC70115, see "Radiation-Hardened GaN HEMT Driver For Satellite Applications" in the August issue of How2Power Today.

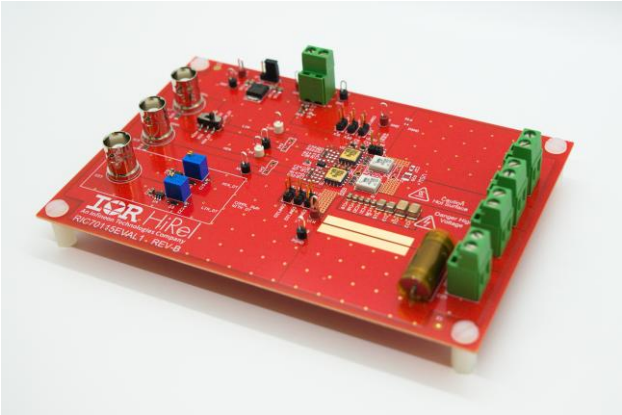


Fig. 5. An eval board for the RIC70115 rad-hard gate driver.

Selected Power-Related Papers And Posters from NSREC 2026:

(Titles, author information and abstracts are from NSREC 2026 website. See the "Technical Program" menu for links to the session lists of papers and posters.)

Session A: Single-Event Effects: Mechanisms And Modeling

A-1 "Low-loss Vertical β-Ga2O3 High-Power Diodes with Engineered Contacts: SEB Assessment and Field-Plate Effects," by S. Islam[1], P. Das[2], D. Ball[1], J. Speck[3], E. Farzana[2], D. Fleetwood[1], and R. Schrimpf[1], 1. Vanderbilt University, USA 2. Iowa State University, USA 3. University of California, USA

Vertical β-Ga_2O_3 diodes with engineered Pt/PtO_x/thin-Pt Schottky contacts exhibit reduced turn-on voltage. Single-event burnout is experimentally evaluated on structures with and without field plates. TCAD analysis provides insight into the responsible mechanisms.

A-4 "Study of Angular and Material Dependence of Single Event Effects in Enhancement-mode GaN HEMTs" by P. Maloney[1], A. Billa[1], B. Bolton[1], S. Hankinson[1], S. Shorina[1], H. Gingold[1], J. Gray[2], L. Massengill[2], D. McMorrow[3], D. Fleetwood[2], and E. Zhang[1], 1. University of Central Florida, USA 2. Vanderbilt University, USA 3. US Naval Research Laboratory, USA

Heavy-ion testing of enhancement-mode GaN HEMTs shows SELC and SEB thresholds depend strongly on incident angle and overlying metallization. SEM and SRIM reveal Cu interconnects amplify charge deposition, explaining reduced thresholds at near-normal incidence.

Session B: Single-Event Effects: Devices And Integrated Circuits

B-4 "Single-Event Leakage Current and Burnout in High-Voltage GaN and SiC PiN Diodes: A Comparative Analysis" by G. Mayberry[1], X. Zhao[2], H. Gingold[3], P. Maloney[3], S. Islam[1], A. Sengupta[4], X. Shen[5], A. Senarath[1], O. Meilander[1], B. Zhang[2], S. Hankinson[3], B. Bolton[3], W. Hubbard[6], S. Kosier[1], T. Roy[2], E. Zhang[3], D. Fleetwood[1], S. Pantelides[1], M. Ebrish[1], and R. Schrimpf[1], 1. Vanderbilt University, USA 2. Duke University, USA 3. University of Central Florida, USA 4. DLR, Germany 5. University of Memphis, USA 6. NanoElectronic Imaging, USA

High-voltage GaN and SiC vertical PiN diodes were tested for SEEs at similar voltages for a wide LET range. The lower SEE tolerance of GaN is attributed to lower defect-multiplication activation energies.

B-5 "Mechanism of Heavy-Ion Induced Leakage Current in GaN HEMTs Buffer Layers" by J. Gray[1], S. Shorina[2], J. Vielmette[1], D. Ball[1], E. Zhang[2], P. Maloney[2], H. Gingold[2], B. Bolton[2], S. Hankinson[2], A. Billa[2], H. Parra[2], J. Trippe[1], M. Alles[1], S. Kosier[1], D. Fleetwood[1], and R. Schrimpf[1], L. Massengill[1], 1. Vanderbilt University, USA 2. University of Central Florida, USA

Heavy ion irradiation enhances leakage currents in GaN-based HEMTs. Experimental analysis confirms a permanent drain-to-source leakage path through the buffer layer under the gate, enabled by defect-assisted hopping.

B-6 "Single-Event Burnout of AlN Diodes under Heavy-ion Irradiation" by C. Quiñones[1], J. Osheroff[2], P. Reddy[3], S. Mita[3], R. Kirste[3], R. Collazo[1], and Z. Sitar[1], 1. North Carolina State University, USA 2. NASA Goddard Space Flight Center, USA 3. Adroit Materials, USA

Single-event burnout was observed in AlN Schottky barrier and p-n junction diodes under heavy-ion irradiation. Burnout thresholds decreased with increasing ion LET, similar to trends in other wide-bandgap semiconductors.

Poster Session B

PB-6 "Characterization of Latent Gate Damage and Single-Event Leakage Current by Gate Charge Measurements of Irradiated Silicon Carbide Power MOSFETs" by A. Sengupta[1,2], R. Cadena[2], J. Vielmette[2], S. Islam[2], X. Zhao[3], D. Bal[2], A. Sternberg[2], J. Osheroff[4], J. Hutson[5], M. Alles[2], K. Galloway[2], A. Witulski[2], R. Schrimpf[2], and S. Kosier[2], 1. DLR, Germany 2. Vanderbilt University, USA 3. Duke University, USA 4. NASA Goddard Space Flight Center, USA 5. Lipscomb University, USA

Gate charge measurements reveal that latent gate damage and drain-gate single-event leakage current in SiC MOSFETs are strongly dependent on the particle energy and drain bias during irradiation and are precursors to single-event gate rupture.

Session D: Radiation Effects In Devices And Integrated Circuits

D-3 "Investigation of the Physical Mechanisms Responsible for TID and Electrical Stress Susceptibility in p-GaN Power HEMTs" by H. Couillaud[1], M. Gaillardin[1], L. Artola[2], and G. Hubert[2], 1. CEA, France 2. ONERA, France

Physical mechanisms contribution underlying static electrical parameter instabilities in a COTS p-GaN HEMT with Schottky gate contact are analyzed, focusing on the combined impact of total ionizing dose and several bias conditions.

D-5 "Heavy-Ion-Induced Degradation Dependence on Irradiation Temperature in GaN HEMTs" by K. Niskanen[1], A. Tallarico[2], A. Javanainen[1], A. Michez[3], J. Boch[4], F. Wrobel[4], R. Germanicus[5], and H. Kettunen[1], 1. University of Jyväskylä, Finland 2. Università di Bologna, Italy 3. Delphea, France 4. Université de Montpellier, France 5. Université de Normandie, France

The effect of temperature on the heavy ion response of gallium nitride high electron mobility transistors is presented. An order of magnitude higher degradation rate is observed at 363 K compared to room temperature irradiation.

Poster Session D

PD-3 "Capacitance Shifts in Multilayer Ceramic Capacitors Induced by Gamma Irradiation" by P. Muscat[1], H. Barnaby[1], G. Rodarte[1], C. Nies[2], M. Conway[3], D. West[2], H. Hairston[2], J. Neuendank[1], and Z. Adamany[1], 1. Arizona State University, USA 2. KYOCERA AVX, USA 3. KYOCERA AVX, United Kingdom

Total ionizing dose effects on capacitance were evaluated for X7R and C0G/NP0 multilayer ceramic capacitors using Co-60 gamma irradiation. X7R devices showed monotonic dose-dependent capacitance reduction, while C0G/NP0 capacitors remained stable.

PD-7L "Impact of Substrate Engineering on Total-Ionizing-Dose Response of GaN-Based High-Electron-Mobility Transistors" by O. Meilander, J. Kronenberg, X. Zhao, B. Bhuva, and M. Ebrish, Vanderbilt University, USA

TID effects are evaluated for GaN HEMTs fabricated on sapphire, SiC, and engineered substrates. After 1-Mrad(SiO_2) X-ray irradiation, SiC-based devices exhibit the least parameter shifts, suggesting that substrate-induced defects govern TID sensitivity in GaN HEMTs.

Session E: Environments, Facilities, And Dosimetry

Poster Session E

PE-5 "Investigation of the Energy-Dependent Response of Si IGBT and SiC Power MOSFETs to Fast Neutrons" by C. Cazzaniga[1], F. Principato[2], F. Pintacuda[3], X. Ledoux[4], M. Kastriotou[1], and C. Frost[1], 1. STFC, United Kingdom 2. Palermo University, Italy 3. STMicroelectronics, Italy 4. GANIL, France

Silicon IGBT and silicon carbide power MOSFETs have been studied with fast neutrons in the 2- to 40-MeV range at GANIL SPIRAL-2 where energy selection is possible. The results can be compared with atmospheric neutron tests.

Session F: Basic Mechanisms Of Radiation Effects

F-4 "High-Field-Induced Recovery of TID-Induced Threshold Voltage Shifts in SiC MOSFETs" by Z. Stone, M. Hu, D. Fleetwood, J. Trippe, S. Kosier, R. Schrimpf, D. Ball, R. Cadena, M. Alles, and L. Massengill, Vanderbilt University, USA

Threshold-voltage recovery in TID-irradiated SiC MOSFETs by high-field stress is highly repeatable to 1- Mrad(SiO2) cumulative dose. We find that Fowler–Nordheim electron injection reversibly cycles oxide defects between charged and neutral states without progressive degradation.

F-5 "Low-Frequency Noise and Heavy-ion Radiation Effects in Enhancement-Mode GaN Power HEMTs" by S. Shorina[1], E. Zhang[1], H. Parra[1], A. Billa[1], P. Maloney[1], B. Bolton[1], S. Hankinson[1], H. Gingold[1], J. Debnath[1], S. Islam[2], T. Liu[2], J. Gray[2], D. Fleetwood[2], and L. Massengill[2], 1. University of Central Florida, USA 2. Vanderbilt University, USA

Low-frequency noise in enhancement-mode power HEMTs increases after krypton irradiation, indicating radiation-activated trap generation near the channel and buffer layer. Nitrogen vacancy related defects are likely responsible for the increased noise.

Poster Session F

PF-2 "Electric-Field-Dependence of X-Ray TID-Induced Instabilities in Enhancement-Mode GaN HEMTs" by A. Billa, S. Shorina, P. Maloney, J. Debnath, H. Parra, B. Bolton, and E. Zhang, University of Central Florida, USA

X-ray total ionizing dose effects in enhancement-mode GaN HEMTs are examined under different post-irradiation electric fields. Threshold-voltage shifts and recovery depend strongly on bias history, with TCAD simulations linking field distribution to charge trapping stability.

PF-4 "Degradation mechanisms and radiation-induced material modifications in SiC power diodes" by H. Goncalves de Medeiros[1], N. Für[1], A. Erlebach[1], M. Belanche[1], J. Reuteler[1], K. Voss[2], and U. Grossner[1], 1. ETH Zurich, Switzerland 2. GSI, Switzerland

SELC and SEB degradation and their mechanisms in SiC power diodes are investigated through post-irradiation characterization with EDX, ultraviolet-visible photoluminescence (UVPL), and Raman spectroscopy. 3D-TCAD is employed to put the findings into perspective.

PF-5 "Onset of Degradation in COTS SiC Power Diodes Exposed to High-Energy Proton Irradiation" by N. Für, H. Goncalves de Medeiros, M. Nagel, M. Kirchbaumer, M. Belanche Guadas, R. Kupper, and U. Grossner, ETH Zürich, Switzerland

Based on high-energy (200 MeV) proton irradiation on COTS SiC power diodes, the impact of displacement-induced defect activation in radiation-induced damage and, in consequence, the limitations of standard derating practices are discussed.

PF-7 "Field-Assisted Charge Detrapping and Gain Recovering in a Standard NPN Bipolar Transistor" by I. Lopez Calle, European Space Agency (ESA), Netherlands

An intense electric field applied between collector and emitter accelerates charge detrapping and enables instantaneous gain recovery in irradiated bipolar COTS transistors. This approach supports hardness-assurance methodologies and rapid in-situ mitigation of bipolar COTS components.

Radiation Effects Data Workshop

(Titles, author information and abstracts are from NSREC 2026 website.)

DW-7 "SEE and Total Dose Results of the ISL73849SLH Radiation Hardened Single/Dual Phase Current Mode PWM Controller with PMBus & Telemetry" by W. Newman, M. Campanella, E. Thomson, W. Choroco, and C. Thomson, Renesas Electronics America, USA

We report the single event performance and low dose rate TID results of the radiation-hardened ISL73849SLH single-/dual-phase current-mode PWM controller with PMBus & telemetry.

DW-8 "Total Dose and Single-Event Effects Testing of the ISL73846 2MHz Double Ended PWM Controller with Synchronous Rectification" by M. Campanella, W. Newman, E. Thomson, C. Thomson, and T. Linder, Renesas Electronics America, USA

We report the single event effects and total ionizing dose test results for the ISL73846 2-MHz double-ended PWM controller with synchronous rectification.

DW-9 "Total Dose and Single-Event Effects Testing of the ISL75055 3A Source and Sink DDR Terminator/LDO with Buffered Reference" by M. Campanella, W. Newman, E. Thomson, C. Thomson, and D. Wackley, Renesas Electronics America, USA

We report the single event effects and total ionizing dose test results for the ISL75055 3-A source and sink DDR terminator/LDO with buffered reference.

DW-10 "Compendium of NASA Goddard Space Flight Center's Current Radiation Effects Test Results" by L. Ryder, K. Ryder, E. Wilcox, T. Carstens, S. Roffe, A. Wood, M. Campola, J. Osheroff, and M. Joplin, NASA Goddard Space Flight Center, USA

We present results and analysis investigating the effects of radiation on a variety of candidate spacecraft electronics to heavy ion- and proton-induced single-event effects (SEEs), proton-induced displacement damage dose (DDD), and total ionizing dose (TID).

DW-13 "Radiation Evaluation of the TPS7H1301-SP 3-V to 6.3-V Input, 400-mA, -6-V to -0.6-V Radiation-Hardened Switched Capacitor Voltage Inverter with Integrated Low Dropout Regulator" by A. Marinelarena, T. Lew, and M. Trevino, Texas Instruments, USA

Single events effects and total ionizing dose results for the TPS7H1301-SP 3-V to 6.3-V input, switched capacitor voltage inverter is summarized, showing robust SEE performance up to LET_{EFF} = 75 MeV-cm^2/mg and excellent TID performance up to 100 krad(Si).

DW-16 "Single Event Effects Susceptibilities of Select Commercial-Off-The Shelf Components for Space" by D. Lo and T. Tran, Northrop Grumman Systems Corporation, USA

We report the results of single event effects (SEEs) testing with heavy ions of COTS (commercial-off-the-shelf) electronic components considered for space missions.

DW-18 "SEE Test Results of Microchip's Radiation Hardened Resettable Latch-up Current Limiter LX7714" by J. Heun, E. Colmet-Daage, R. Stevens, D. Johnson, and O. Mansilla, Microchip Technology, USA

Microchip has developed the radiation-hardened LX7714 power switch to protect satellite power buses from destructive overcurrent events. This paper focuses on destructive single event latch-up (SEL) and single event transient (SET) test results.

DW-23 "A Combined, Radiation-Electrical Stress Characterization of Power GaN HEMTs" by J. Van Burger[1], J. Oarethu[1], C. Pham[1], N. French[1], N. Leak[2], S. Defaz[2], J. Saldivar[2], F. Luo[2], M. Salato[3], R. Strittmatter[4], J. Likar[1], and J. Kozak[1], 1. Johns Hopkins Applied Physics Lab, USA 2. Stony Brook University, USA 3. EPC Space, USA 4. EPC, USA

GaN HEMTs offer advantages for space power electronics because of increasing power density and TID resilience. Electrical and SEE stresses are now being combined to evaluate the impact on electrical parameter derating, and useful lifetime.

DW-24 "Angular and Energy Dependence of Heavy Ion Induced SEE in Commercial EPC eGaN Power Transistors" by P. Maloney[1], A. Billa[1], B. Bolton[1], S. Hankinson[1], H. Gingold[1], S. Shorina[1], D. Fleetwood[2], and E. Zhang[1], 1. University of Central Florida, USA 2. Vanderbilt University, USA

This paper reports angular heavy-ion single-event effects in commercial EPC enhancement-mode GaN power HEMTs, including SELC and SEB thresholds, based primarily on Xe irradiation at 16 and 20 MeV, with supporting Ag and Cu data.

DW-25 "Analysis of Heavy-Ion-Induced Current Waveforms in Si and SiC 1200 V Power Devices" by S. Taniguchi[1], H. Nakamoto[1], J. Furuta[2], R. Nakajima[1], A. Matsumoto[1], S. Onoda[3], and K. Kobayashi[1], 1. Kyoto Institute of Technology, Japan 2. Okayama Prefectural University, Japan 3. National Institutes for Quantum Science and Technology, Japan

We measured heavy-ion-induced current waveforms of 1200-V Si and SiC devices to investigate single event burnout mechanisms. The study evaluates the impact of material properties and structural differences on the failure process.

DW-26 "Total Ionizing Dose and Single Event Effects Results of the VPT Components 2N7561, 2N7555 and 2N7556 Power MOSFETs" by P. Benedetto, Arizona State University, USA

This paper shows the radiation results of the VPT Components RAD7234 die family of n-channel MOSFETs fabricated at LA Semiconductor, designed to be radiation-hardened to 100 krad(Si) and SEE immune to Xe (15 MeV/n beam).

DW-28 "TID and Proton SEE Characterization of a COTS Current Sense Amplifier, ADC, and DC- DC Converter" by B. Torres-Kulik, M. Mahmud, and D. Hiemstra, MDA Space, Canada

The total ionizing dose and proton single event effects characterization of a commercial-off-the-shelf current sense amplifier, analog to digital converter, and dc-dc converter is summarized.

DW-30 "Guide to the 2025 IEEE Radiation Effects Data Workshop Record" by D. Hiemstra, MDA Space, Canada

The 2025 Workshop Record has been reviewed and a table prepared to facilitate the search for radiation response data by part number, type or effect.

DW-34L "Single Event Burnout in Power MOSFETs induced by Thermal and 1.2-17 MeV Neutrons" by M. Cecchetto[1], M. Dentan[2], I. Slipukhin[1], M. Sacristan Barbero[3], R. Garcia[1], B. Lutz[4], A. Colangeli[5], E. Atukpor[6], S. Moindjie[7], D. Munteanu[7], and J. Autran[7], 1. CERN, Switzerland 2. CERN and CEA, Switzerland 3. Université de Montpellier – CERN, Switzerland 4. PTB, Germany 5. ENEA, Italy 6. Institut Laue-Langevin, France 7. Université de Rennes, France

Single-event burnout cross sections in power MOSFETs were characterized using thermal neutrons and monoenergetic neutrons from 1.2 to 17 MeV. Results reveal significant sensitivity in high-voltage devices, highlighting the critical impact of neutron-induced failures.

DW-37L "Total-Ionizing-Dose Response of 3.3 kV SiC MOSFETs for High-Voltage Power Applications" by F. Naveed, Y. Zhao, A. Hassan, and J. Dix, University of Arkansas, USA

The total-ionizing-dose response of 3.3-kV SiC MOSFETs was studied up to 2 Mrad(Si). Results show that leakage remains low, while capacitance-ratio degradation and threshold shifts reduce switching-relevant gate-drive margin.

DW-38L "Matched-Dose Evaluation of 1200 V Gen-3 SiC MOSFETs Under Total Ionizing Dose Exposure" by F. Naveed and J. Dix, University of Arkansas, USA

This work compares the matched-dose TID response of two commercial 1200-V Gen-3 SiC MOSFETs. The study evaluates threshold shift, conduction response, annealing recovery, leakage stability, capacitance behavior, and hard-switching FOM after 2-Mrad(Si) exposure.

DW-39L "Design of a Fast Crowbar Protection Circuit for Single Event Effect Testing" by C. Burt, N. Dodds, J. D'Amico, T. Aldaz, and J. Van Grinsven, Sandia National Laboratories, USA

We describe the design of a custom crowbar circuit that quickly removes power when a programmable current threshold is exceeded. This protects devices from permanent damage during single event latchup/burnout tests.

DW-40L "Compendium of Single-Event Effects Test Results for Candidate Electronics at NASA Johnson Space Center from 2025" by B. Dean[1], R. Rinderknecht[2], S. Martinez[1], K. Nguyen[1], E. Agarwal[1], D. Guinn[1], J. Pritts[1], B. Reddell[3], and R. Gaza[3], 1. Amentum, USA 2. CACI International, USA 3. NASA Johnson Space Center, USA

Single-event effect (SEE) test results produced by NASA JSC in 2025 for electronic components and devices, including memories, processors, integrated circuits, and other parts, are presented. Test environments include heavy ions and protons.

DW-41L "SEE and TID Characterization of a Radiation-Hardened 100V N-channel GaN transistor" by E. Reich, M. Cano, E. Faraci, and G. Gopalakrishnan, IR HiRel, Infineon, USA

Heavy-Ion SEE and TID radiation characterization was performed on the IR HiRel IG1N10T052 radiation-hardened 100-V n-channel GaN transistor. Device was shown to be suitable for operation in space radiation environments.

DW-42L "TID and Heavy-Ion SEE Characterization of a Radiation Hardened 17.1 V Buck Controller with Integrated Gate Drivers (RIC70847)" by M. Cano, G. Gopalakrishnan, and E. Faraci, 1. IR HiRel, Infineon, USA.

Heavy-Ion SEE and TID radiation characterization were performed on the IR HiRel RIC70847 17.1-V buck controller with integrated gate drivers. Device was shown to be suitable for operation in radiation environments, such as space.

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