

## Vendors Fired Up Latest Rad Hard Power Solutions At NSREC 2018

Those who made the trek to Kona, Hawaii last month for the IEEE Nuclear and Space Radiation Effects Conference ([NSREC 2018](#)), were not only treated to a high-quality technical program, they also had the opportunity to see and hear about the latest rad hard and rad tolerant electronic components for space. Among these were some of the latest power converter modules, power semiconductors, ICs and reference designs to implement reliable power systems in satellites and other spacecraft.

Microchip Technology showed two power products from its Microsemi division. One was the SA50-120 single- and triple-output 50-W rad hard dc-dc Converter. The SA50-120 series dc-dc converters utilize 120-V input and offer up to 50 W of output power in a low profile, small size, and radiation hardened design. This series of converters utilize switching regulators that use a peak-current-mode controlled single-ended forward converter topology with inherent single event immunity.

The SA50 series is said to be the only non-hybrid space grade dc-dc power converter module available on the market. The SA50 series is based on SMD technology which allows easy customization to meet specific customers' needs. According to company, the 8 × 10<sup>6</sup> hours MTBF and up to 87% efficiency is the highest of any space grade dc-dc solution on the market today.



In terms of radiation hardness, the converters specify a TID > 100 krad (Si) @ HDR and 100 krad (Si) @ LDR (< 10 mrad/sec) per MIL-STD-883 Method 1019.. They also specify SEE (SEGR, SEB, SET, SEL) immunity options of 89 MeV (hardened) or 37 MeV.cm<sup>2</sup>/mg (tolerant).



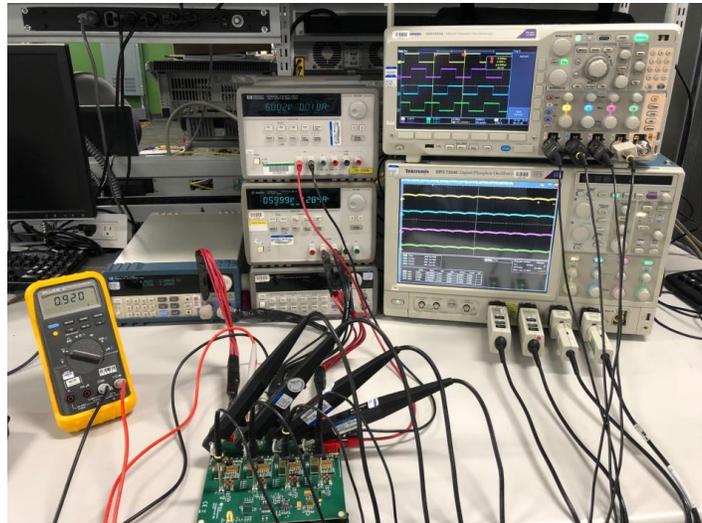
Target applications for this product series include satellite power buses, power distribution units, power conversion units, solid-state power amp electric conversion units.

The company also displayed its Microsemi JANS 100 krad LDR-Qualified Bipolar Transistors. Available from stock, these parts cut the lead time for LDR sensitive bipolar transistors by 5 months. Features include the availability of MIL-STD-19500 screening (JANS, JANTXV, and JANTX), the ability to place orders through standard JAN part numbers, optional new space screening for large volume, short operating life LEO constellations. In addition, these parts are LDR qualified at 10 mrad/sec and various packages are tested to avoid TID failure due to packaging.

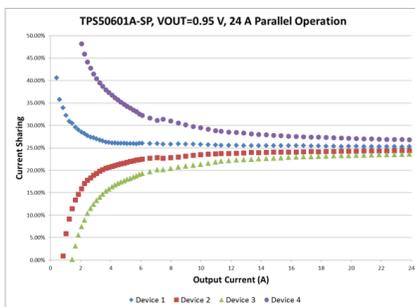
Customer Benefits include no procurement delays due to failed lots during TID qualification, no customer bill of material change required and LDR TID test data available on a per wafer basis to avoid lot to lot failures. The 2N2222A and 2N2907A models are available now with the 2N3700 and 2N2369A expected in stock by the end of 2018.

In April, Texas Instruments released the TPS50601A-SP, a rad hard 1.6-V to 6.3-V input, 6-A synchronous stepdown converter. At NSREC, the company demo'd this device by showing a 24-A solution to power the core voltage of a high current FPGA. The demo consisted of one mother board and four mini-TPS50601A-SP boards using space rated components for a real footprint estimation of 1.065 x 1.095 in = 1.17 in<sup>2</sup>.

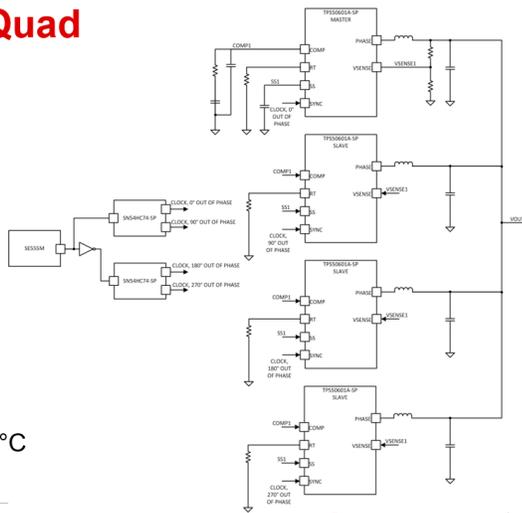
According to TI, this TPS50601A-SP offers the smallest 6-A footprint on the market. It specifies a ±1.5% tolerance on its voltage reference. In terms of its radiation performance, the part is SEL, SEGR, SEB free up to 75 MeV and VOUT SEFI free up to 65 MeV. It specifies all negative SETs with very low cross-section for SETs>5% at 65 MeV.



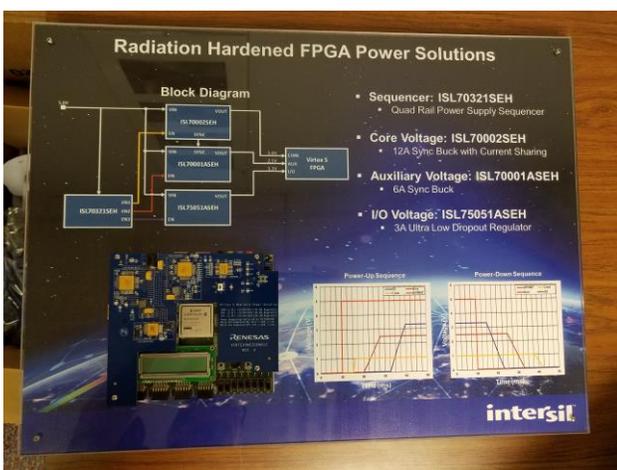
## TPS50601A-SP | 24 A Quad Parallel Operation



±0.5% current sharing at full load at 25 °C



Intersil, provided multiple demos of power-related components. Although the company is now part of Renesas, they continue to apply the Intersil brand to the company's military and aerospace products in recognition of Intersil's six decades of spaceflight leadership.



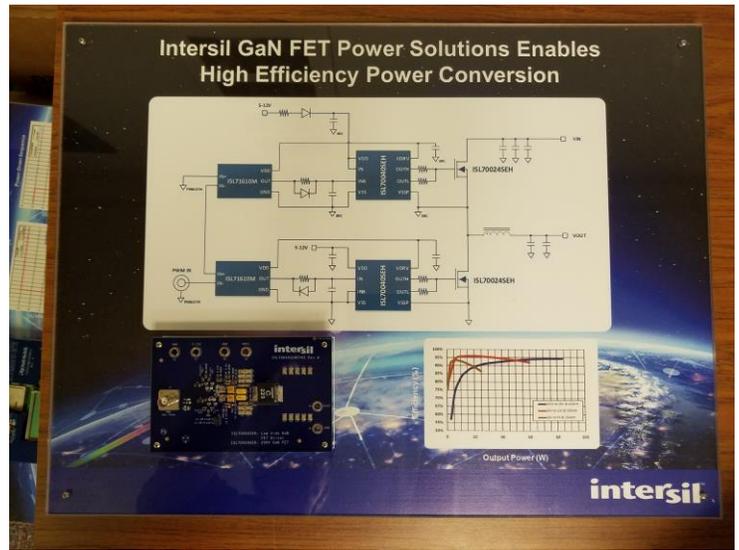
Josh Broline, director, Intersil Space/Hi-Rel Products, provided descriptions of the power component demos at NSREC. One was a rad hard FPGA power solution for Xilinx V5. This power solution utilizes the ISL70002SEH, a 12-A synchronous buck regulator with current share, to provide the core power rail of the Virtex-5 FPGA. It also included the ISL70001ASEH, a 6-A synchronous buck regulator, to power the auxiliary rail and the ISL75051ASEH, a 3-A LDO regulator, which supplies the I/O voltage.

Also, part of this demo was the ISL70321SEH quad power supply sequencer, which controlled the three devices to ensure the proper power up and down sequence required by the FPGA in order to avoid high current draw. The sequencer is a relatively new part as it was released last November. (See [Intersil Delivers Space Industry's First Radiation-Hardened Quad Power Supply Sequencers](#))

Another active demo was provided for the Intersil GaN FET 100-V half bridge reference design. This reference design, which used the recently released GaN FETs and low-side GaN FET driver, allows users to convert a typical 100-VDC voltage (provided by the solar panels) to an intermediate 28 V that is distributed around the spacecraft.

The design uses the ISL70024SEH 200V GaN FET and the ISL70040SEH driver to deliver up to 90 W of output power at 93% efficiency. Other voltage conversions are also possible, for example, a 28V input to generate 12V or 5V is feasible with very high efficiency. The FET and driver were introduced this past February. To read more about them, see ["Rad-Hard GaN Devices Propel Space Power Supplies To Higher Performance"](#)

The company also displayed its radiation tolerant plastic products for the next generation mega-constellations. These parts are intended to support the current shift in commercial space applications toward mega-constellation networks in low earth orbit (LEO), Renesas has released radiation tolerant plastic products that minimize cost yet still offer the reliability required by small satellite LEO missions. A 2U cube satellite frame was used to bolt on PCB eval boards containing the six released devices, which were announced last September.



At its booth, VPT highlighted its space products heritage and the recently introduced SVPL series of space-qualified point-of-load dc-dc converters (POLs), which were reported on in the last issue of the newsletter. (See ["Rad Hard POLs Feature Tight Regulation For Digital Processing Applications"](#)) One of the notable features of the SVPL POLs is that they're surface-mountable with gullwing packaging.

Exhibitors also showcased previously introduced power components. Cobham once again displayed its Power Distribution Modules (PDMs), a family of input regulator modules (IRMs) and isolated point-of-load modules (iPOLs)

that combine to form a compact, highly efficient power conversion system.