## *Rad-Hard GaN Devices Propel Space Power Supplies To Higher Performance*

Renesas Electronics' ISL70040SEH low-side GaN FET driver, ISL7023SEH 100-V, 60-A GaN FET and ISL70024SEH 200-V, 7.5-A GaN FET are being introduced as the space industry's first radiation-hardened, low-side GaN FET driver and GaN FETs that enable primary and secondary dc-dc converters in launch vehicles and satellites, as well as downhole drilling and high reliability industrial applications. These devices power ferrite switch drivers, motor control driver circuits, heater control modules, embedded command modules, 100-V and 28-V power conditioning, and redundancy switching systems.

The ISL7023SEH 100-V, 60-A GaN FET and ISL70024SEH 200-V, 7.5-A GaN FET use the base die manufactured by Efficient Power Conversion (EPC). According to the company, the GaN FETs provide up to 10 orders of magnitude better performance than silicon MOSFETs while reducing package size by 50%. They are also said to reduce power supply weight and achieve higher power efficiency with less switching power loss (see the figure).

At 5 mΩ ($R_{DSON}$) and 14 nC ($Q_G$), the ISL70023SEH enables the industry's best figure of merit (FOM), according to Renesas. Both GaN FETs require less heat sinking due to reduced parasitic elements, and their ability to operate at high frequencies allows the use of smaller output filters, which achieve excellent efficiencies in a compact solution size. Manufactured using a MIL-PRF-38535 Class V-like flow, the ISL70023SEH and ISL70024SEH offer guaranteed electrical specifications over the military temperature range and lot-by-lot radiation assurance for high dose rate 100 krad(Si) and low dose rate 75 krad(Si).

The ISL70040SEH low-side GaN FET driver powers the ISL7002xSEH GaN FETs with a regulated 4.5-V gate-drive voltage and splits the outputs to adjust FET turn-on and turn-off speeds. Operating with a supply voltage of 4.5 V to 13.2 V, the FET driver provides high current source and sink capability for high-frequency operation, while offering both inverting and non-inverting gate drive to provide flexibility in power supply designs.

The driver's fail-safe protection on the logic inputs eliminates unintentional switching when they are not actively driven. The ISL70040SEH provides reliable performance when exposed to total ionizing dose (TID) or heavy ions, and is immune to destructive single event effects (SEE) up to 16.5 V with linear energy transfer (LET) of 86 MeV•$cm^2$/mg. The GaN FET driver uses a MIL-PRF-38535 Class V manufacturing flow and wafer-by-wafer radiation assurance testing.

"We are pleased to see Renesas Electronics continue Intersil's six decades of spaceflight product development and leadership," said Alex Lidow, EPC's co-founder and CEO. "It is especially gratifying and exciting to see our innovative enhancement-mode gallium nitride-on-silicon (eGaN) FET technology at work with Renesas' new radiation-hardened GaN FET driver. These products demonstrate how eGaN technology increases the performance and reduces the cost for applications currently being served by [silicon] MOSFETs."

"Size, weight and power efficiency mean everything to designers and manufacturers of launch vehicles and satellites," said Philip Chesley, vice president of Industrial Analog and Power Business Division, Renesas Electronics Corporation. "The new ISL7002xSEH GaN FETs and ISL70040SEH GaN FET driver represent the most meaningful power management innovation we've seen in a long time for the spaceflight industry."

The ISL70023SEH 100-V, 60-A GaN FET or ISL70024SEH 200-V, 7.5-A GaN FET can be combined with the ISL70040SEH low-side GaN FET driver and the ISL78845ASEH PWM controller to create launch vehicle and satellite switched-mode power supplies.

The rad-hard ISL70023SEH and ISL70024SEH GaN FETs are available now in hermetically sealed 4-lead 9.0-mm x 4.7-mm SMD packages. For more on the ISL70023SEH, see www.intersil.com/products/isl70023seh. For more on the ISL70024SEH, see www.intersil.com/products/isl70024seh.

The rad-hard ISL70040SEH low-side GaN FET driver is available now in a hermetically sealed 8-lead 6-mm x 6-mm SMD package. For more information, see www.intersil.com/products/isl70040seh.

*For more news about rad hard power components, see How2Power.com's Space Power section.*


*Figure. The ISL7002xSEH GaN FETs and ISL70040SEH low-side GaN FET driver are radiation-hardened devices that promise to dramatically improve the performance of dc-dc converters in space applications versus those employing silicon MOSFETs. They give designers new options for reducing the size and weight or raising the efficiency of the power converters used in satellites and launch vehicles. The ISL7023SEH is a 100-V, 60-A GaN FET while the ISL70024SEH is a 200-V, 7.5-A GaN FET, both manufactured using die from EPC.*