

GeneSiC samples multi-kHz, ultra-high-voltage SiC thyristors to US researchers

Medical Design Technology

Performance advantages of the power devices are expected to spur key innovations in utility-scale power electronics hardware to increase the accessibility and exploitation of distributed energy resources (DER). *“Until now, multi-kV silicon carbide power devices were not openly available to US researchers to fully exploit the well-known advantages — namely 2–10kHz operating frequencies at 5–15kV ratings — of SiC-based power devices,”* says president **Dr Ranbir Singh**. *“GeneSiC has recently completed delivery of many 6.5kV/40A, 6.5kV/60A and 6.5kV/80A thyristors to multiple customers conducting research in renewable energy, army and naval power system applications. SiC devices with these ratings are now being offered more widely.”*

SiC-based thyristors offer 10x higher voltage, 100x faster switching frequencies and higher-temperature operation compared with conventional silicon-based thyristors. Targeted research applications include general-purpose medium-voltage power conversion (MVDC), grid-tied solar inverters, wind-power inverters, pulsed power, weapon systems, ignition control, and trigger control.

Ultra-high-voltage (>10kV) SiC device technology will play a revolutionary role in the next-generation utility grid, believes GeneSiC. Thyristor-based SiC devices offer the highest on-state performance for >5kV devices, and are widely applicable to medium-voltage power conversion circuits like fault-current limiters, AC-DC converters, static VAR compensators (SVCs) and series compensators. SiC-based thyristors also offer the best chance of early adoption due to their similarities to conventional power grid elements, adds the firm. Deploying these power semiconductor technologies could provide as much as a 25–30% reduction in electricity consumption through increased efficiencies in the delivery of electrical power.

“It is anticipated that large-scale markets in solid-state electrical sub-stations and wind turbine generators will open up after researchers in the power conversion arena will fully realize the benefits of SiC thyristors,” says **Singh**. *“These first-generation SiC thyristors utilize the lowest demonstrated on-state voltage drop and differential on-resistances ever achieved in SiC thyristors,”* he claims.

“We intend to release future generations of SiC thyristors optimized for gate-controlled turn-off capability and >10kV ratings,” **Singh** says. *“As we continue to develop high-temperature ultra-high-voltage packaging solutions, the present 6.5kV thyristors are packaged in modules with fully soldered contacts, limited to 150°C junction temperatures,”* he adds.

GeneSiC says it is committed to developing SiC-based devices for: (a) HV-HF SiC

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devices for power grid, pulsed power and directed-energy weapons; and (b) high-temperature SiC power devices for aircraft actuators and oil exploration.

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