PRODUCT NOTE

IGCT 4.5kV
Next generation 3

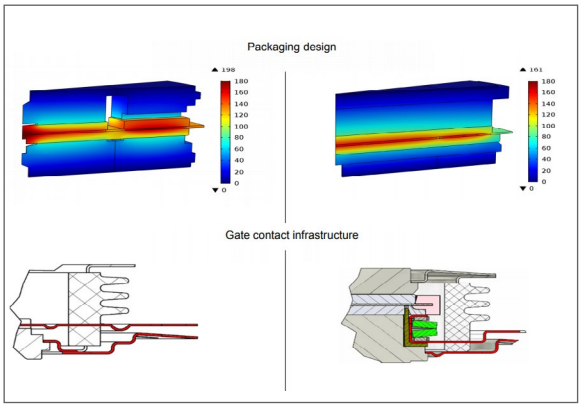
The IGCT is a semiconductor switch with low on-state loss, making it ideal for medium to the highest power inverters; an application that must strive to maximize power output and energy efficiency to deliver a competitive product.

01 Generation 3 IGCT

Although application-specific aspects including topology, switching frequency and output filters are principal contributors to inverter efficiency, the semiconductors themselves can make a significant contribution by offering low on-state and switching losses. In this respect, the IGCT is undoubtably the highest-performance silicon device architecture.

New IGCT, Generation 3
The expansion of power electronics into new fields of energy management and renewable energy sources is driving the need for more performance and higher efficiency semiconductors, while increasing demands for reliability and lower costs. The first such products are introduced as Generation 3 or HPT+ “High power technology” devices. Improvements have been done at gate contact infrastructure, what was moved to the device periphery. This measure improves the switching performance thanks to a lower gate circuit impedance.

Key benefits
The latest family member of IGCTs exhibit up to 30 percent higher turn-off capability compared to previous generation devices. By applying an outer gate ring structure, the use of a monolithic cathode side molly was possible. This allows for a more efficient and homogeneous wafer cooling on the cathode side compared to previous IGCT generation. By applying an asymmetric anode and cathode side pole piece the total thermal impedance was lowered. The result is a device with improved thermal performance and increased reliability.



02 Comparison of previous (left) with improved generation 3 design platform (right).

Applications

The outstanding performance makes the IGCT ideal for off-shore wind applications in the range of 10-15 MW+. Further key applications are STATCOMs, rail-interties, pumped hydro or medium voltage drives.

4500 V Reverse-Conducting (RC-IGCT) and Asymmetric (AS-IGCT) IGCT

The new IGCT devices have been developed to meet the ever-increasing demand for higher power capability coupled with lower operating losses. New devices offer more active area, larger controllable current, higher junction temperature and better cooling efficiency than the existing products. The devices are available in two variants, one optimized for medium switching frequency application, such as medium voltage drives and wind power converter, the second optimized for low switching frequency intended for use in Multi-Level Modular Converter (MMC) for e.g. static synchronous compensators (STATCOM) or pumped hydro plants.

Design features

- Device diameter increase within same footprint by making better use of raw silicon wafer
- Gate-circuit impedance minimization by changing to a gate contact infrastructure placed at the device periphery and by improving routing of the gate contact through the housing
- Moving the gate contact to the periphery for better cooling, as the pole piece trenches for conveying the gate signal no longer needed
- Increasing the maximum controllable current by adjusting the HPT+ platform for use with the IGCT process flow

Device	Switching frequency	Part number	Availability	Voltage rating	Turn-off current	Housing
AS-IGCT	low	5SHY 65L4521	Qualified, volume available	4500 V	6500 A	L size
AS-IGCT	medium	5SHY 65L4522	Qualified, volume available	4500 V	6000 A	L size
RC-IGCT	low	5SHX 36L4520	Samples now	4500 V	3600 A	L size
RC-IGCT	medium	5SHX 36L4521	Samples now	4500 V	3600 A	L size

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