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Fast Medium Voltage DC Solid-State Circuit Breaker

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Fast solid-state switching is an enabling technology for MVDC (Medium Voltage Direct Current) systems. Series- and parallel-connected IGBTs (insulate gate bipolar transistors) enable thousands of volts (up to 50 kV+) to switch hundreds of amps (up to 1000 A+) in less than 1 microsecond. These devices have characteristic power density of 200 MVA/m³ for a typical device rating of 4.5 kV and 600 A. The circuit breaker interfaces with generators, power converters, and energy storage devices such as batteries and capacitors. The circuit breakers are rackable and unrackable for safety and mechanical compatibility and can be uni-directional or bi-directional for load regenerating applications. A well-designed solid state circuit breaker, with inherent redundancy, can be expected to last for greater than 1 million cycles.

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