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Licensing Opportunity

TTO – Technology Transfer Office

A Gate Unit for Integrated Gate Commutated Thyristor

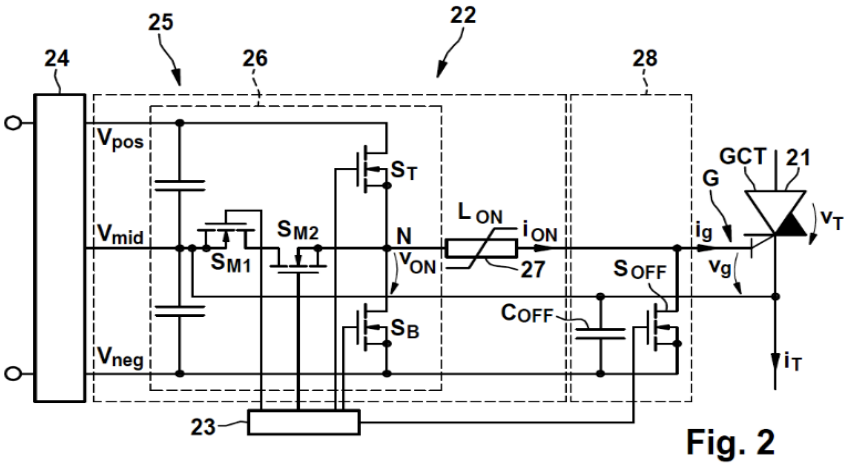

Fig. 2

An illustrative design of the gate unit for gate commutated thyristors

Ref. Nr

6.2241

Keywords

gate unit, gate driver, soft switching, power electronics, protection

Intellectual Property

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Publications

IGCT Gate Unit for Zero-Voltage-Switching Resonant DC Transformer Applications, IEEE Transactions on Industrial Electronics (2021)
10.1109/TIE.2021.3128923

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Description

A gate unit for integrated gate commutated thyristors (IGCTs) and method to operate it, optimized for a resonant soft switched DC-DC converter. Typically, IGCTs and corresponding gate units are used for hard-switching conditions and operating frequencies below 1kHz. The developed gate unit is tailored for soft-switching conditions and tested at switching frequencies up to 5kHz. While the OFF channel is fairly standard, several required functions are incorporated into the ON channel (turn-on pulse generation, back-porch operation with both positive and negative gate voltage, as well as retrigger function). A saturable inductor is driven intelligently to shape desired gate current in the operation. The presence of the local FPGA controller allows for various protection and condition health monitoring features to be implemented. Fiber-optical communication solves the insulation issues and allows for the exchange of information with the upper layer controller.

Advantages

Increased use of resonant converters for high-power DC-DC conversion allows for the optimization of various parts. IGCT gate units can be made much smaller and operational properties can be tailored for the soft-switching conditions, both zero-voltage switching and zero-current switching. Simplifications of the gate unit power stage greatly reduce costs and enhance reliability. The smaller size of the gate has a positive impact on the size of power conversion stages as well, as those can have better power density.

Applications

- Power semiconductors
- Power electronics
- Power systems
- DC grids
- DC-DC converters