

ENGINEERING
TOMORROW

Danfoss

Danfoss Silicon Power | DCM™1000

Ahead of the curve

– DCM™1000 customized power modules
for advanced power transmission

siliconpower.danfoss.com



Maximize the **potential of Si and SiC**

To power up the fast-growing fleet of HEVs, PHEVs and BEVs, Danfoss Silicon Power has developed a power module technology platform, DCM™1000, for traction applications.

The DCM™1000 platform addresses and solves critical issues to enhance the energy efficiency and performance of the electric drivetrain, while achieving high cost-efficiency.

With silicon (Si) and silicon carbide (SiC) being the main cost-drivers in power modules, our DCM™1000 platform aims at reducing the semiconductor surface. At the same time, it also increases power density, reliability, robustness and lifetime of the inverter. By selecting the best fitting chips from a competitive supplier base and by carefully selecting the power module components, package and electrical configuration, we are able to use the semiconductors to their full potential. In this way, we are able to drive down the overall cost of the half-bridge module.

Flexible solutions geared to your needs

Our DCM™1000 platform allows you to design the power module to fit your application, rather than designing your application to fit a standard power module. Our experts help you to custom tailor a solution that perfectly matches your system requirements on all essential parameters. The platform is based on a modular approach, which clears the path for scalable and cost-effective solutions that are easily integrated into the drivetrain design.



We help you customize your power solution

Danfoss Silicon Power works with a customized business model based on a philosophy of dialogue and freedom. It allows us to give you a flexibility never before seen in the world of power modules.

The highly skilled and specialized engineers at Danfoss Silicon Power work closely with you to design power modules for your specific drivetrain design, allowing you to scale your power solution according to your specifications.

As we are working with half-bridge power modules rather than fixed six-packs, we can enable flexible inverter design to fit into your motor space requirements. Keeping development time and overall costs down, we set you up with a solution that makes the most out of the silicon used and a solution which is scaled and dimensioned correctly to meet your performance targets.

DCM™1000

– A powerful combination of unique technologies



ShowerPower®

Enabling the highest power density

Smart and efficient thermal management is an essential part of the Danfoss technology platform that allows us to deliver higher system performance. Offering highly efficient direct liquid cooling, our patented ShowerPower® concept utilizes several meandering cooling channels to guide the coolant along the baseplate. This design improves thermal performance by creating a swirl effect in the cooling channels. This means that the coolant is constantly brought into contact with the surface that requires cooling. The concept almost doubles the effective heat transfer coefficient, to enable much higher current carrying capability.

Benefits

- Enables higher power density
- Increases system lifetime
- Eliminates the need for thermal interface material
- Reduces the semiconductor area needed to achieve the desired output
- More efficient than standard cooling
- Low differential pressure-drop
- Homogeneous cooling



Danfoss Bond Buffer®

Making the most out of semiconductors

Increase power density without derating the current - while actually improving reliability and prolonging the lifetime of the module. Danfoss Bond Buffer® is a breakthrough in bonding and joining technology that helps you raise the bar for system performance. Our patented DBB® concept is based on an innovative combination of copper wire bonding and sintered die attach that replaces traditional solder joints. DBB® technology enables power cycling capabilities that are 15 times higher than those seen in aluminum wire bonded power modules. This permits an operation at higher junction temperatures without the need for current derating. This increased power cycling capability makes it possible to optimize the dimensioning of the semiconductor area to increase the cost-effectiveness of the solution.

Benefits

- Reduces the semiconductor area for a more cost-effective solution
- Increased power density and thermal robustness
- Improved lifetime and reliability



Transfer molding

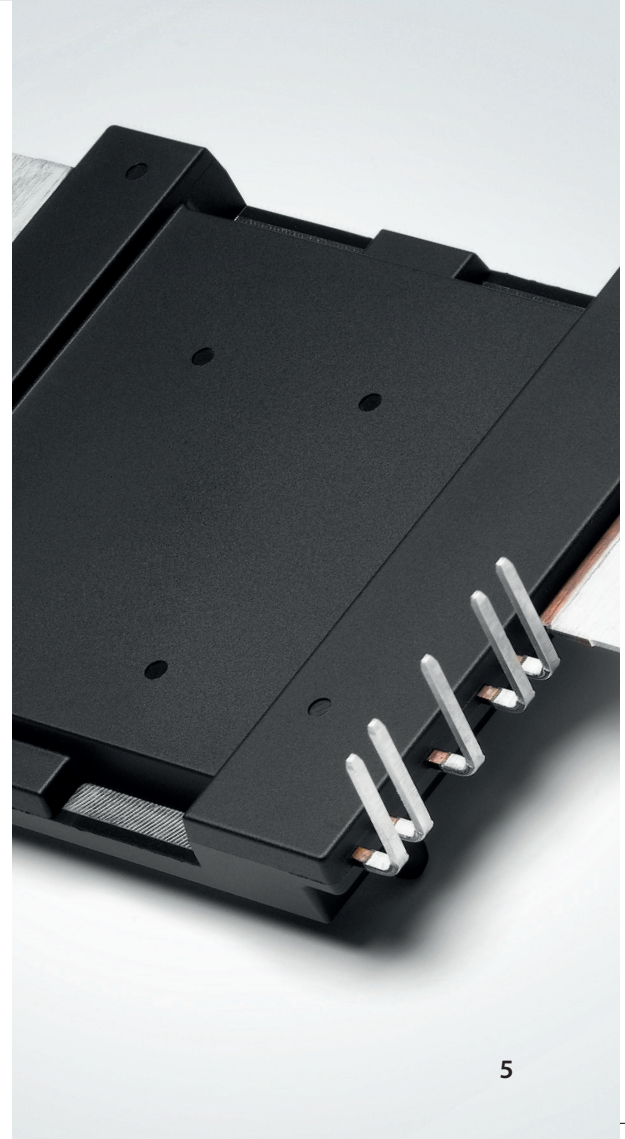
Robust packages for reliability and longer life

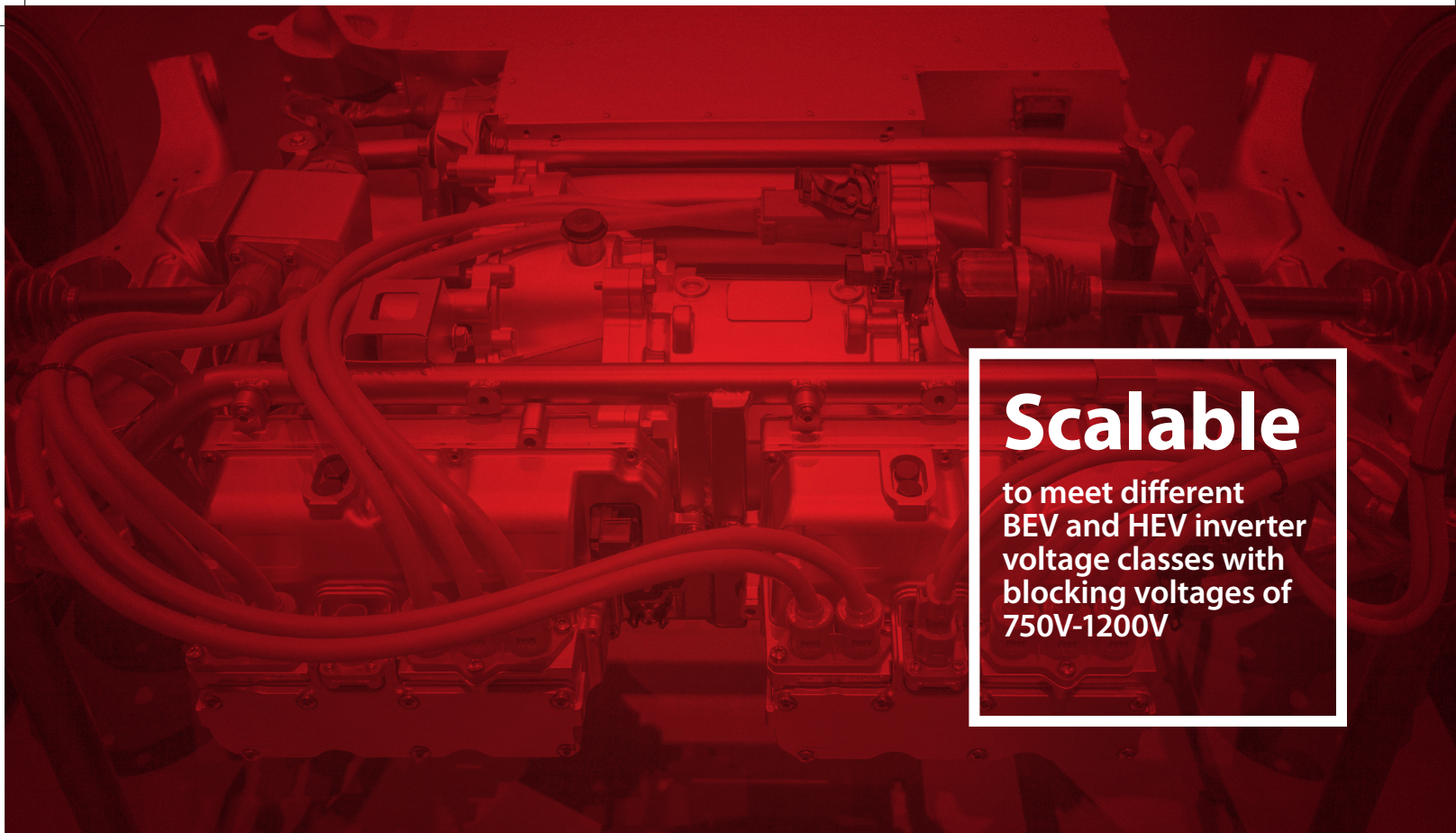
Hybrid electric and battery electric drivetrains operating under demanding conditions benefit from our unique transfer molded packaging design. Sealed and protected against vibrations and humidity, the inverter provides stable and reliable performance - even when subjected to mechanical shocks and damp environments.

Transfer molding in combination with our bond buffer technology allows for more extreme temperature cycling and higher junction temperatures to increase power density.

Benefits

- Superior mechanical robustness
- Stable at higher operation temperatures and temperature cycles
- Increased power density
- Protected against humidity
- Longer lifetime





Scalable

to meet different BEV and HEV inverter voltage classes with blocking voltages of 750V-1200V

Tried and tested technology, **designed to scale**



Tried and trusted technology, **designed to adapt**

The Danfoss Silicon Power technology platform is well-defined and based on known and proven technologies. It is also designed to be open enough to be scalable: In the same package, we can scale the power up or down to meet different BEV and HEV inverter voltage classes with blocking voltages of 750V-1200V, while having different output current classes from 350A-650A. This allows you to go with the same mechanical design throughout, while scaling it to meet the different voltage classes used in the application, resulting in a very cost-effective solution.



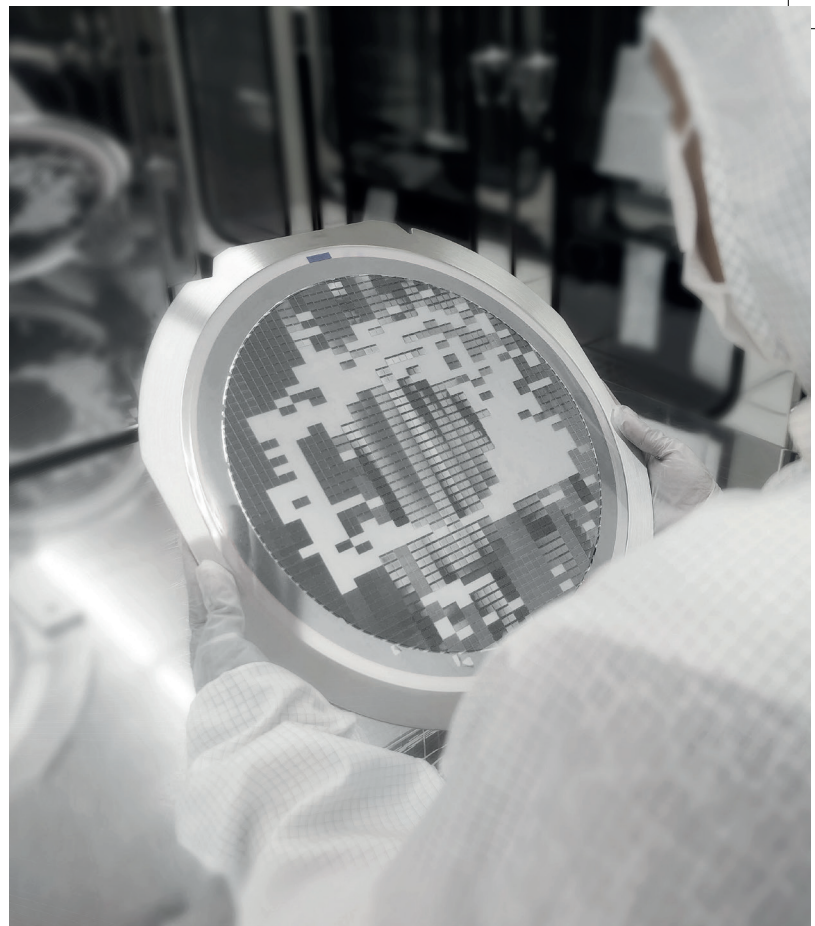
Design freedom for optimized performance

The DCM™1000 platform offers more compactness and freedom to design. With a range of mechanical designs, including a choice of configurations ranging from simple planar assemblies to advanced 3D setups, you can build a solution optimized for the desired performance that easily integrates into your motor design.

Choose your chip – we're fully compatible

Our power modules are semiconductor independent and compatible with any type of chip from any manufacturer that you choose to partner with. Danfoss is not tied to a particular chip manufacturer, which means we can accommodate both your first choice and your back-up provider in case of supply shortage.

On a system level, chip independence means that the DCM™1000 platform is Si and SiC compatible and covers a full range of IGBT and MOSFET applications for higher inverter efficiency. This flexibility allows you to use a mix of semiconductors, enhancing module performance while ensuring maximum efficiency, cost-effectiveness and supply security.



Higher output, faster charging

The DCM™1000 platform is based on a string of patented technologies for bonding, joining, cooling and packaging, which in combination allow for higher junction temperatures and more extreme temperature cycling. This makes it possible to increase power density and fulfil the EV market's requirement for higher output power and faster charging capabilities.

Quality that lasts

Going with the best-in-class solutions available to you via the DCM™1000 platform, helps you meet stringent reliability, performance and cost targets. Our power modules are based on quality components and patented technologies to achieve outstanding, measurable results in terms of reliable performance and robustness – all adding up to ensure a cost-effective solution that lasts.

Our certified processes are your assurance for consistent high quality and streamlined path from development to volume manufacturing.





About **Danfoss Silicon Power**

Danfoss Silicon Power is a subsidiary of the Danfoss Group, the largest industrial company in Denmark. Danfoss employs more than 26,000 people in over 100 countries within development, production, sales and support.

For over three decades, Danfoss Silicon Power has been helping top tier manufacturers and system suppliers meet stringent reliability, design and cost targets by designing, developing and manufacturing customized power modules for industrial, automotive and renewable applications.

Our state-of-the-art development and production plants in Utica, New York and in Flensburg, Germany boast 9,000 m² of cleanroom manufacturing area. It is here we design, prototype and manufacture today's and tomorrow's power solutions. Our ability to deliver large series production allows to meet the high demands of major industries.

Our research, development and production facilities in Flensburg and Utica are certified according to ISO 9001, IATF 16949, ISO 14001, ISO 50001 and OHSAS 18001. This enables us to quickly transfer development projects to high volume production that can be integrated seamlessly into our customers' supply chain with a consistent focus on quality.

Unique security of supply

Danfoss Silicon Power's global manufacturing footprint means we can offer unique supply chain support and risk mitigation, as you effectively achieve double sourcing when procuring from us.

Visit siliconpower.danfoss.com for further product information.

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