POWER ELECTRONICS FOR UPS SYSTEMS

SEMIKRON DANFOSS

Power Quality

Performance Range

The availability of infrastructure systems strongly depends on reliable power supplies, irrespective of whether these systems are servers and cloud storage systems, critical traffic control or hospital services.

Uninterruptable Power Supplies (UPS) ensure continuous operation of these critical systems. In Semikron Danfoss power modules, flexible topologies equipped with the latest IGBT and diode chips ensure maximum conversion efficiency for double conversion UPS systems. This efficiency can be further improved using Silicon Carbide technology.

LOW POWER AND MODULAR UPS SYSTEMS

10kVA - 125kVA

- Server Rooms
- Data Centres

High efficiency systems
Compact designs and high power density

Products
SEMITOP E1/E2
MiniSKiiP
SEMiX 5
SEMIPACK
Drivers

STANDALONE AND TOWER UPS SYSTEMS

100kVA - 5MVA

- Server Rooms
- Data Centres
- Hospitals and Critical Control Systems

High efficiency systems
Compact designs and high power density

Products
MiniSKiiP
SEMiX 5
SEMiX 3 Press-Fit
SEMITRANS
SEMITRANS 10
SEMITRANS 20
SEMIPACK
SKiiP 3/4 IPM
Drivers

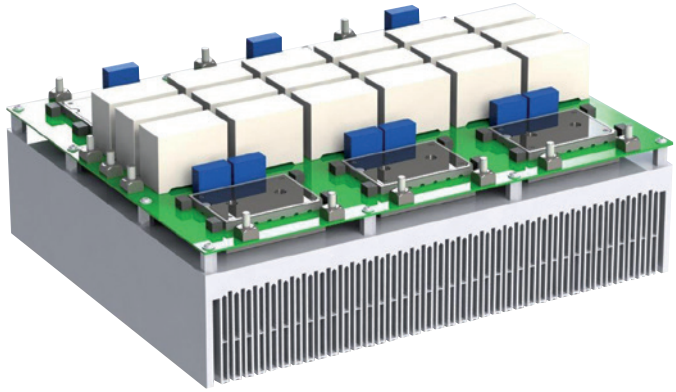
MiniSKiiP UPS: **Compact and Efficient** 100kVA Systems

UPS solutions for data centres today are based on modular UPS systems. In these systems several independent UPS modules in 19" frames are paralleled with single modules up to 100kVA. This achieves high scalability and easy implementation of redundancy.

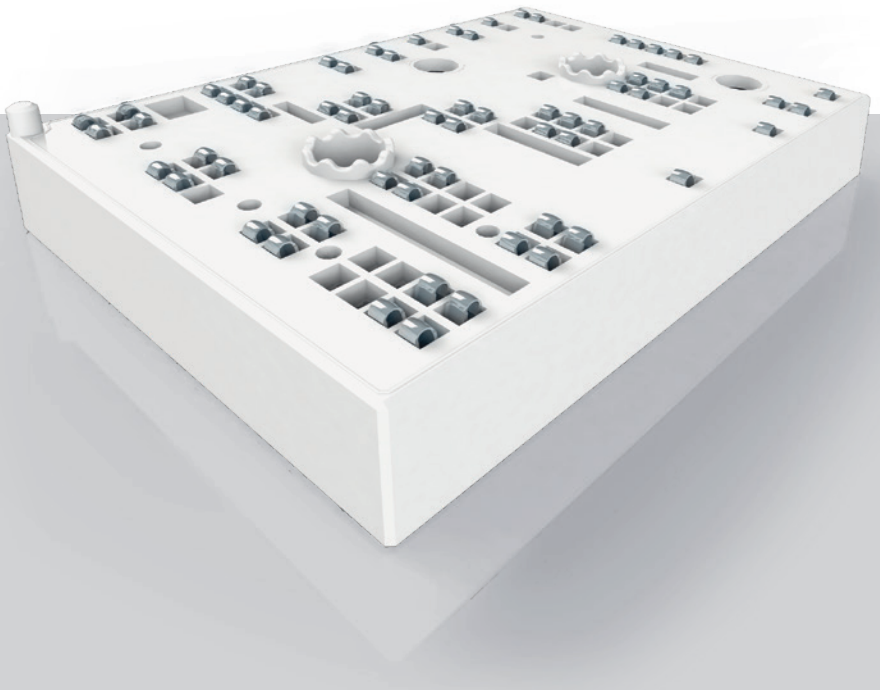
The MiniSKiiP UPS power modules are available as symmetrical boost for the input stage and 3-level NPC topology for the output side. Both are based on fast swiching 650V IGBTs to allow high switching frequency and high efficiency at the same time, up to 100kVA output power. Optional Silicon Carbide components can increase efficiency even further.

Key features

- High power density thanks to MiniSKiiP UPS Power Modules
- Designed for small power and 19'' based modular UPS systems with 100kVA
- Symmetrical Boost topology for battery control/rectification and 3-level NPC topology for the output stage
- Based on 650V IGBTs and Diodes, supporting up to 900V, optional Silicon Carbide components
- High power density system
- Easy mounting with just 2 screws per module thanks to SPRiNG technology, no soldering, not press-in process



100kVA and 19" ready MiniSKiiP UPS Application Sample



MiniSKiiP® 3
Up to 100kVA

PRODUCT HIGHLIGHT

Most Comprehensive UPS Portfolio

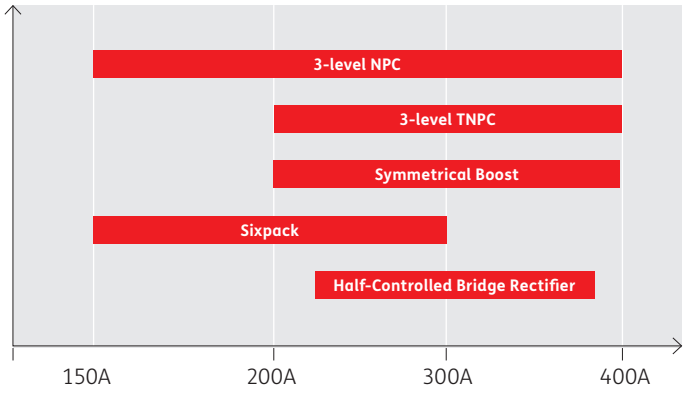
Highest UPS Power Density with SEMiX®5

With its comprehensive portfolio and its optimised design, the SEMiX 5 is ideal for high-performance inverter architectures. The press-fit contacts ensure fast and solder-free driver board assembly, increased reliability and reduced assembly cost. An adapter board for easy gate drive integration is also available.

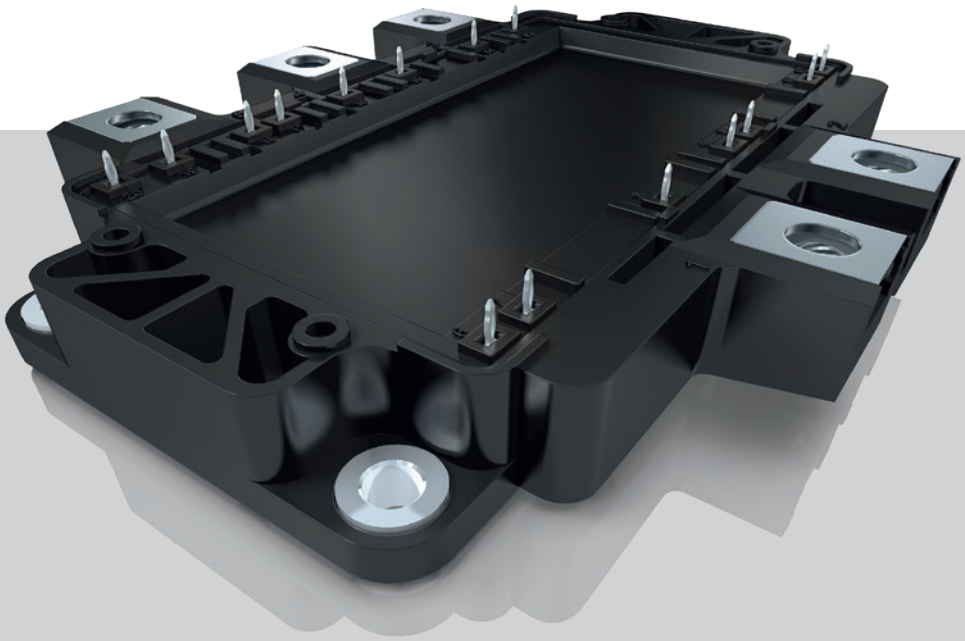
The internal chip layout is optimised for enhanced thermal performance, reducing operating temperatures and thus boosting reliability. The housing features rugged moulded power terminals for superior mechanical stability.

High power density thanks to comprehensive portfolio

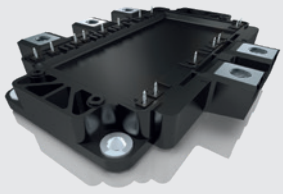
- Biggest range of NPC and TNPC up to 400A nominal current
- Exceeding the standard: higher power density thanks to higher nominal currents in the same package
- Full range of symmetrical boost portfolio for input and battery charging
- Ready to use 3-level stack designs and application samples up to 500kW



GENERATION IGBT7



SEMiX® 5
50kVA up to 500kVA



SEMiX® 5

50kVA up to 500kVA

Extended standard for superior thermal and dynamic performance

- Industry standard baseplate module
- 650V/1200V/1700V IGBT: 100A to 400A
- Sixpack, symmetrical boost, NPC and TNPC topologies
- Optimised module layout for maximum heat transfer and enhanced thermal and electrical diode performance
- Most complete 3-level and booster portfolio, up to 500kVA in parallel connection

MiniSKiiP®

20kVA up to 100kVA

Solder-free spring technology for minimum assembly time

- Full family of power modules up to 300kW
- 650V / 950V / 1200V / 1700V: 4A to 400A
  1200V Hybrid SiC: 50A to 150A
- Sixpack, twelvepack, H-bridge, half-bridge, 3-level and symmetrical boost topologies
- Easy and flexible PCB routing without pin holes
- MiniSKiiP UPS power modules for 100kVA 19″ based modular systems

Product Portfolio
IGBT and Rectifier Modules

SEMIPACK®
800V up to 2200V

Bipolar modules from the market leader

6 housing sizes SEMIPACK 1 to 6

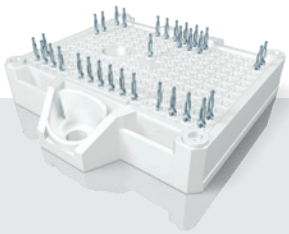
800V to 2200V: 20A to 1360A

Semikron Danfoss diode and thyristor chips

Diodes, thyristors in un-, half- and full-controlled topologies

Different technologies for certain packages: high reliability pressure contact or cost-effective wire bonded modules

Perfect for charging and bypass topologies



SEMITOP® E1/E2
8kVA up to 100kVA

Exceeding the standard for superior performance

PCB based and press-fit connected baseplate-less industry standard power module in two housing sizes

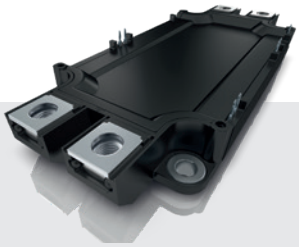
650V, 950V and 1200V: 10A to 200A

Standard and high speed IGBTs, IGBT T7
1200V Silicon Carbide: 40A to 250A

Sixpack, half-bridge, buck/boost/symmetrical boost and 3-Level NPC/TNPC topologies

Optimised mounting concept and pre-applied High Performance Thermal Paste provide lowest thermal resistance in class

Hybrid and full SiC modules up to 1200V/250A



SEMiX® 3 Press-Fit
100kVA up to 300kVA

Exceeding the standard for superior performance

Industry standard press-fit design with 17mm high housing

650V / 1200V /1700V IGBT: 225A to 700A
1200V Hybrid SiC: 600A

Half-bridge, split NPC and buck/boost topologies

Direct driver assembly

Available with integrated shunt resistor

SEMITRANS®
100kVA up to 600kVA

The proven power electronics package

Robust industry standard package for multiple sourcing in 6 housing sizes

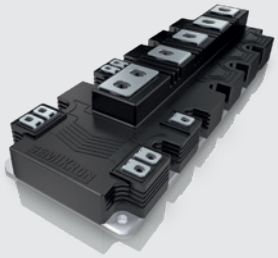
600V / 650V / 1200V / 1700V IGBT: 50A to 900A

1200V Hybrid and Full SiC: 125 to 500A

Half-bridge, single switch and buck/boost topologies, ready for TNPC / NPC / ANPC topology

Multiple IGBT sources including Generation 7 IGBT M7

Full power TNPC topology thanks to half-bridge and AC switch (common emitter) with increased free-wheeling diode rating



SEMITRANS® 10
300kVA up to 1MVA

Robust high power module

Established high power module package

1200V IGBT: 1400A
1700V IGBT: 1000A and 1400A

Half-bridge, split NPC and buck/boost topologies

Full second source thanks to alternative 1700V chip source and Generation 7 IGBT M7

SEMITRANS® 20
300kVA up to 1MVA

The new standard in high power

The latest industry standard power module for high power applications

1200V: 1400A
1700V: 1000A and 1200A

Half-bridge topology

Low stray inductance, high power density package

Increased reliability thanks to the latest packaging technology


27.5
0.0

Intelligent Power Modules – IPMs
The Most Powerful IPM in the Market

The SKiiP IPM product line sets a benchmark for high performance and robust inverter designs. Both SKiiP 3 and SKiiP 4 feature high power densities combined with flexible cooling options such as air or water cooling, also with customized heatsinks. Reliable driver technology, integrated current sensors and comprehensive protection functions complete the IPM design.

SKiiP 3 has propagated widely through the industrial drive segment. With its sixpack or half-bridge topologies, it covers a current range from 500A up to 2400A.

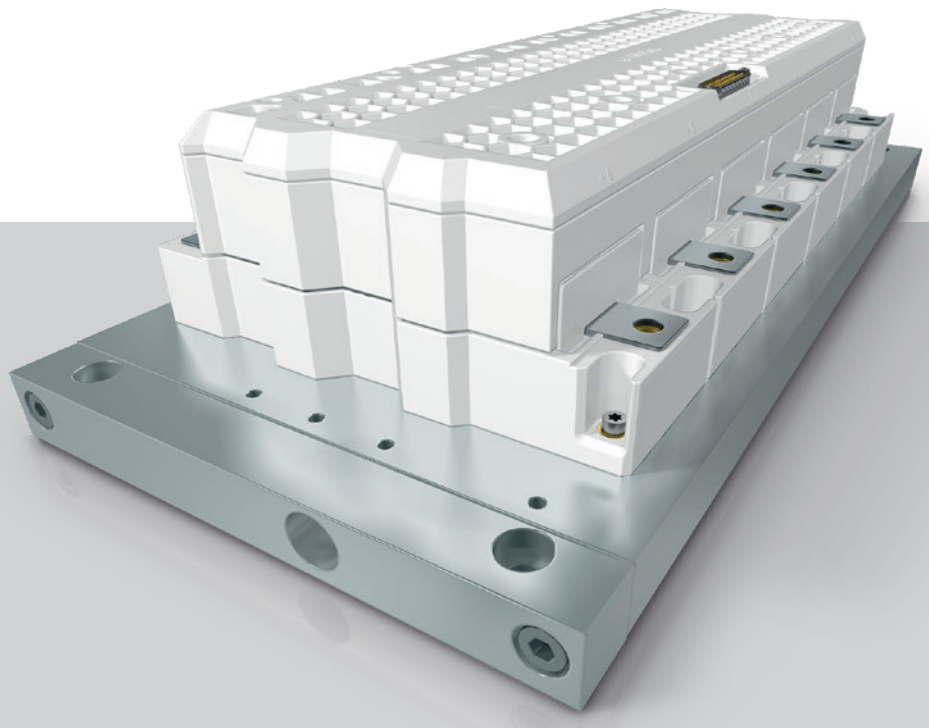
The SKiiP 4, available in half-bridge topology, has been optimized for highest power cycling requirements and covers the higher power range up to 3600A.

To ensure highest reliability and service life, the power circuitry is 100% solder-free. Sinter technology as die attach replaces the solder layer, which usually causes the limitation in lifetime. Hence, sintering improves power and thermal cycling capability.

The integrated gate driver in the SKiiP 4 has set new standards in terms of reliability and enhanced functionality through its CAN interface. The digital driver guarantees safe isolation between the primary and secondary side for both switching signals and parameter measurement. The CAN interface allows setting the SKiiP 4 configuration parameter and reading application parameter.

Key features

1200V and 1700V
Half-bridges and sixpacks
500A to 3600A
Flexible cooling options: air, water or customized cooling options
Paralleled operation for even higher output power possible



SKiiP®4
100kVA up to 2MVA

Power Electronic **Stack Platforms** for **Fully Qualified** Inverter Assemblies Tailored to Your **Specific Needs**

Standard Stacks

The Power Electronic Stacks enable our customers to succeed in dynamic markets and meet any global challenge. We deliver Rectifier-, IGBT- and SiC-based stacks for AC voltages from 380V to 690V. Our standard stacks cover an output current range from 70A to 4000A.

Water-Cooled IGBT Stacks
SKiiPRACK

Air-Cooled IGBT Stacks
SEMIKUBE
SEMIKUBE SlimLine

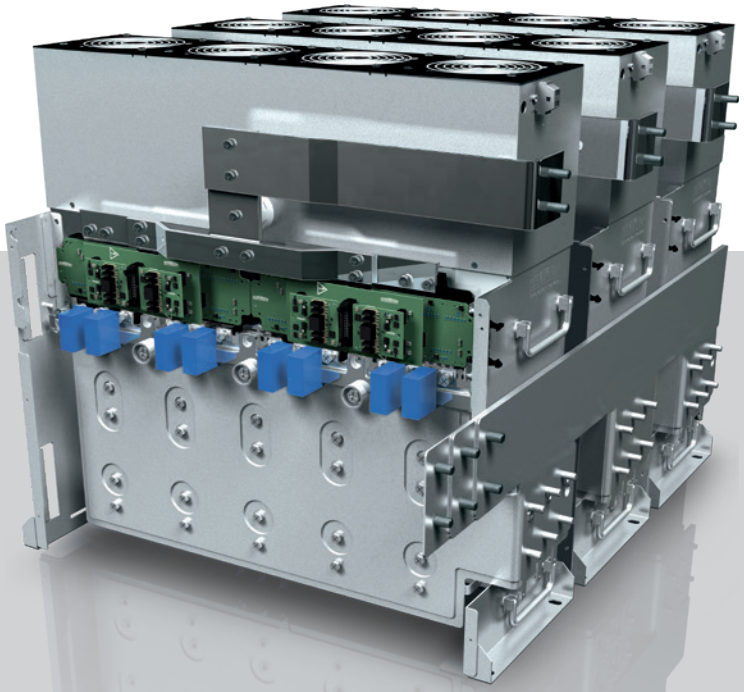
Diode/Thyristor Stacks
SEMISTACK CLASSIC B6U/B6C/W3C

Customised Stacks

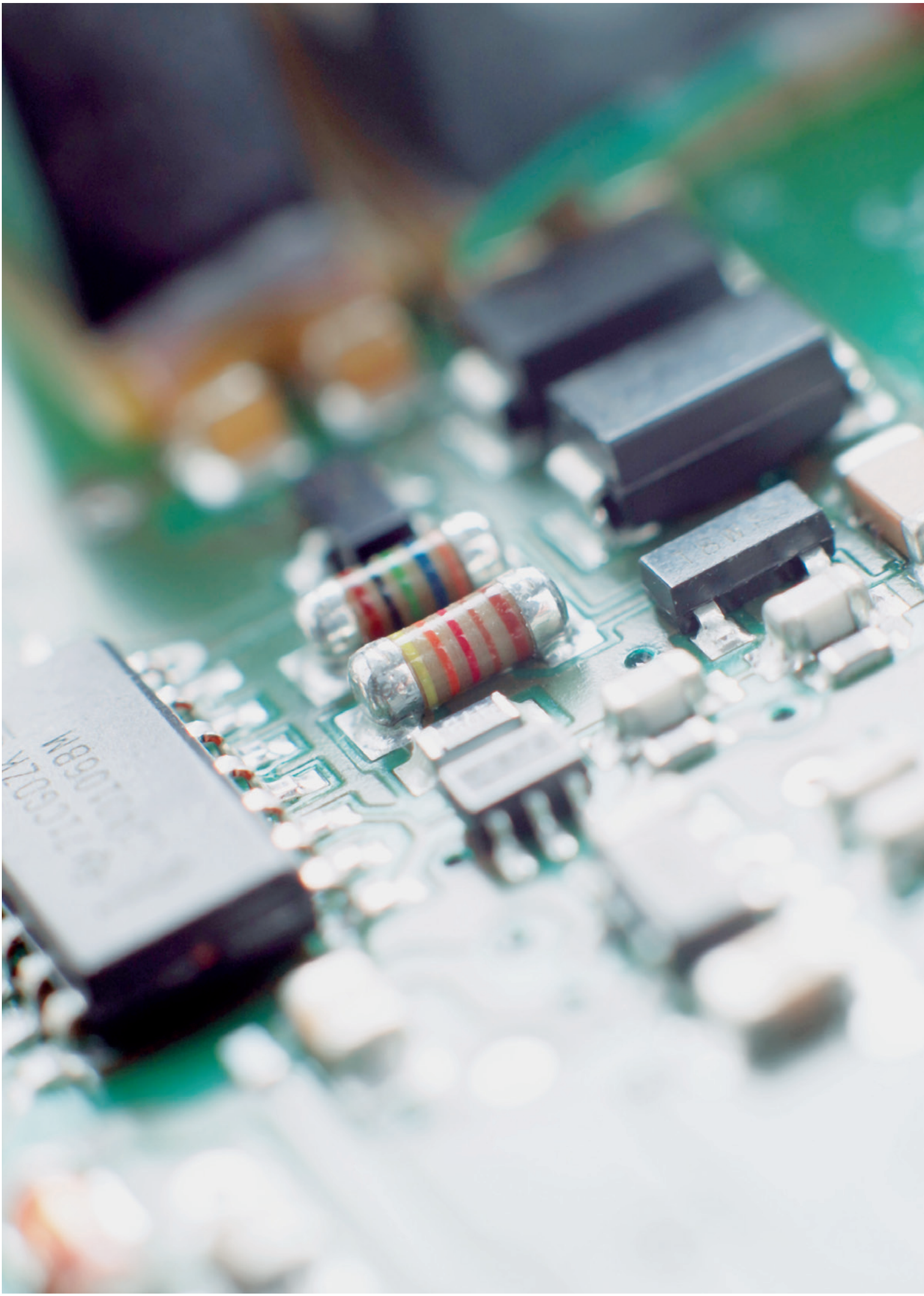
In addition to standard stacks, Semikron Danfoss has vast experience in developing customer-specific solutions. Engineers are available in our stack centres around the globe to offer specific solutions by adapting existing platforms or designing customized converters.

Four key factors for your succes

- Shortest time to market
- Cost savings in R&D, production and qualification
- Global Semikron Danfoss stack production footprint
- Highly experienced engineering team



Customer-Specific Stack
500kW, based on SEMiX 5 TMLI



Product Portfolio IGBT Driver
Above the Standard

The unique product portfolio enables access to all established industries with a one-stop solution that combines state-of-the-art power modules and driver electronics.

Our IGBT drivers are available as two- channel driver cores suitable for any standard semiconductor power module or as Plug-and-Play solutions, which perfectly fit the SEMiX 3 Press-Fit, SEMITRANS 10 and compatible modules.

Cost Efficient
Achieve outstanding system compactness and create space- and cost-effective inverter designs with our drivers, utilizing highly integrated ASIC technology. Isolated DC-link voltage and temperature sensor signals at the driver's interface along with over-voltage and over-temperature lockout also help to reduce system costs significantly.

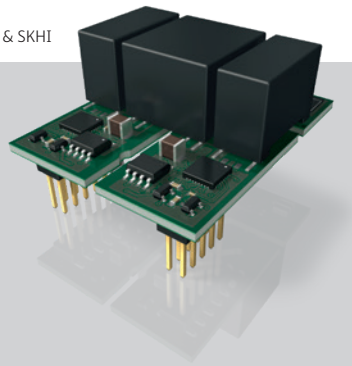
Time Efficient
More than 25 years of experience in developing innovative IGBT driver electronics enables Semikron Danfoss to have a short-term solution for almost every challenge related to driver electronics. Our Plug-and-Play drivers connect directly to most common standard IGBT modules. The IGBT driver cores fit with the adapter boards or application sample PCBs. For the latter, Semikron Danfoss shares the entire manufacturing data to decrease development time, speeding up the time-to-market.

Reliable
Our SKYPER and SKHI are well-known, highly robust and reliable IGBT driver solutions under demanding environmental conditions. Over many years of field operation experience the proprietary IGBT driver technology has been relentlessly developed further. This technology sets new standards for the essential features of safe gate control, reliable gate protection and reinforced insulation.

Key factors

Reinforced insulation for signal and power transmission
Two-channel driver
Up to 1700V transients
Up to 1500V continuous DC bus voltage
8Apk to 35Apk per channel
1W to 4.2W peak per channel
Suitable for multi-level topologies and Generation 7 IGBT

SKYPER & SKHI

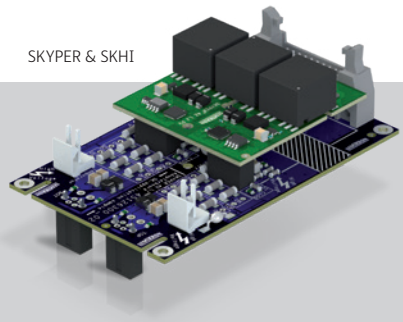


Driver Cores
Two-channel driver cores for PCB integration with Semikron Danfoss ASIC technology and integrated safety functions

SKYPER

Plug-and-Play Driver
Two-channel drivers for direct module mounting with electrical or optical interface

SKYPER & SKHI



Adapter Board and Application Samples
Adapter boards for driver core mounting to Semikron Danfoss IGBT and SiC modules

Thermal Interface Materials
Stay Cool – Heat Dissipation is Our Job

Semikron Danfoss was the first power module manufacturer on the market to offer power modules with pre-applied thermal interface material. With more than two decades of field experience and more than 17 million pre-printed modules in the field, benchmarks are being set. The modules with pre-applied TIM are printed in a clean environment on an automated and SPC controlled silkscreen and stencil printing line.

For each requirement, we offer the right choice of material. In addition to the standard silicone thermal grease, phase change materials and high performance thermal paste with improved thermal performance are also available.

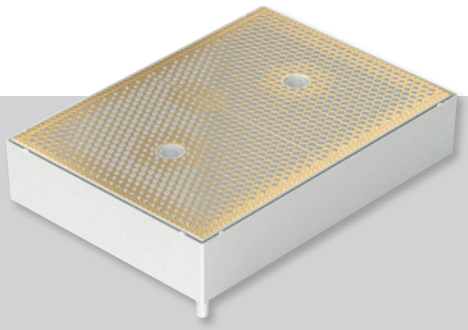
Semikron Danfoss offers either thermal grease or phase change materials depending on customer requirements (e.g. performance increase, reduced handling effort) and module type (with or without baseplate). Phase change materials have a solid consistency at room temperature, fully exploiting the advantages a non-smearing TIM layer offers, with no drawbacks. Baseplate-less modules, on the other hand, usually require a lower-viscosity material to help improve robustness during assembly. Here, thermal grease is the preferred solution.

Key features

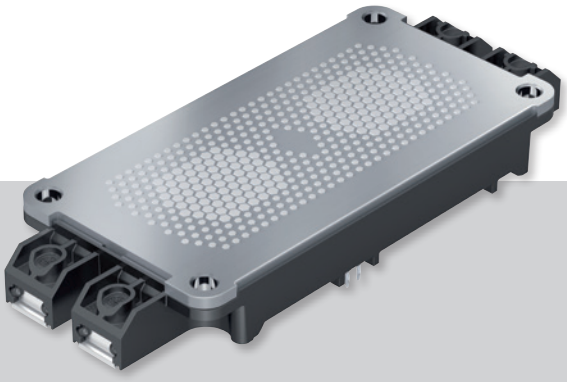
- Increased productivity thanks to reduced handling costs and improved logistics
- Low thermal resistance with optimised TIM layer thickness
- Improved lifetime and reliability
- Improved assembly robustness
- Modules can be shipped directly to the assembly line without any additional treatment processes
- Lower overall costs

Portfolio

- **P8:** Phase Change Material for highest performance
- **HT:** Phase Change Material for highest sink temperature
- **HPTP:** High Performance Thermal Paste
- **P12:** Standard Thermal Paste
- **HP-PCM:** High Performance Phase Change Material



Baseplate-less Power Modules



Baseplate Power Modules

www.semikron-danfoss.com/thermal-interface-materials

Semikron Danfoss is a global technology leader in power electronics. Our product offerings include semiconductor devices, power modules, stacks and systems. In a world that is going electric, Semikron Danfoss technologies are more relevant than ever. With our innovative solutions for automotive, industrial and renewable applications we help the world utilize energy more efficiently and sustainable and thus to significantly reduce overall CO_2 emissions – facing one of the biggest challenges today. We take care of our employees and create value for our customers by investing significantly in innovation, technology, capacity, and service to deliver best-in-industry performance and for a sustainable future.

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