SEMIKRON
innovation + service

Solar Energy

Power Electronics for Solar Inverters

PERFORMANCE RANGE

SEMIKRON's portfolio includes a wide range of products for efficient solar inverters in all power ranges: residential, industrial and utility scale applications. From individual modules, including dedicated drivers, to high power SKiiP 4 IPMs and ready-to-use power electronic stacks – SEMIKRON has the solution.

SEMIKRON offers a large portfolio of 3-level power modules, IPMs and power electronic stacks, which can reduce system costs significantly as well as optimize annual energy production, especially for increased DC voltages up to $1500V_{DC}$.

STRING INVERTERS

5kW - 300kW

- Residential
- Commercial/Industrial

$1500V_{DC}$ Capability
High efficiency
High reliability to reduce downtime

Products
SEMITOP E1/E2
MiniSKiiP
SEMiX 5
Drivers

CENTRAL INVERTERS

250kW - 6MW

- Commercial/Industrial
- Utility

$1500V_{DC}$ Capability
High efficiency
High reliability to reduce downtime

Products
SEMiX 5
SEMiX 3 Press-Fit
SEMITRANS
SEMITRANS 10
SEMITRANS 20
SKiiP 3/4 IPM
Drivers
Power Electronic Stacks


GENERATION
IGBT

Technology Highlight

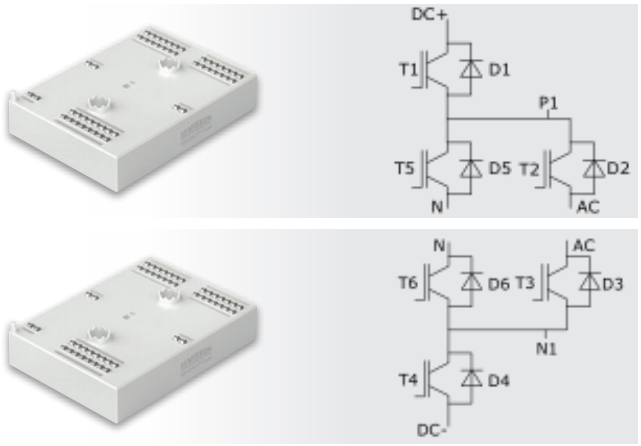
The New Benchmark 3-Level Topologies in Combination with Generation 7 IGBT Technology

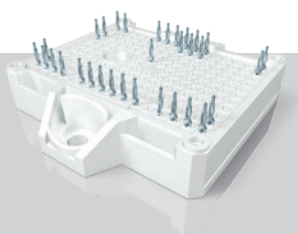
SEMIKRON has introduced 950V and 1200V Generation 7 IGBTs from two different manufacturers. Both Generation 7 IGBTs have fundamental improvements over the previous versions. Thanks to a new chip design, the chip size is an average of 25% smaller across all current classes. This technology allows higher current density and an approximately 20% reduction in saturation voltage $V_{ce,sat}$.

This new chip generation allows for compact inverters with unprecedented power density. The new 950V IGBTs, whether high or low switching frequency, are especially suited for use in 3-level topologies up to $1500V_{DC}$.

Additionally the Generation 7 IGBTs share the following features:

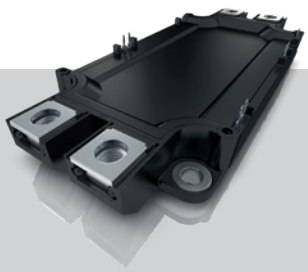
20% lower on-state voltage $V_{ce,sat}$
Operation junction temperature of 175°C during overload
About 25% smaller chip size
Optimized 950V chipset for $1500V_{DC}$ 3-level topologies



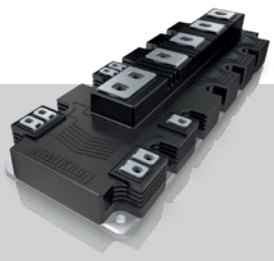


SEMITOP® E1/E2
8kW up to 225kW

MiniSKiiP®
20kW up to 300kW



SEMiX® 3 Press-Fit
100kW up to 400kW



SEMITRANS® 10
500kW up to 2MW

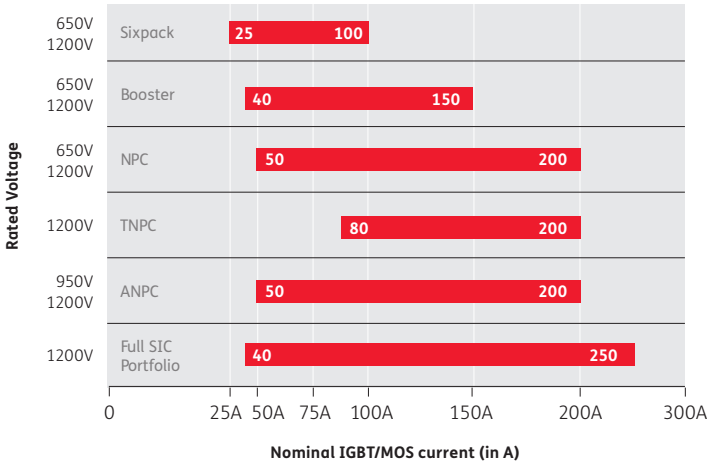
Product Highlight

Comprehensive 3-Level and Booster Module Family

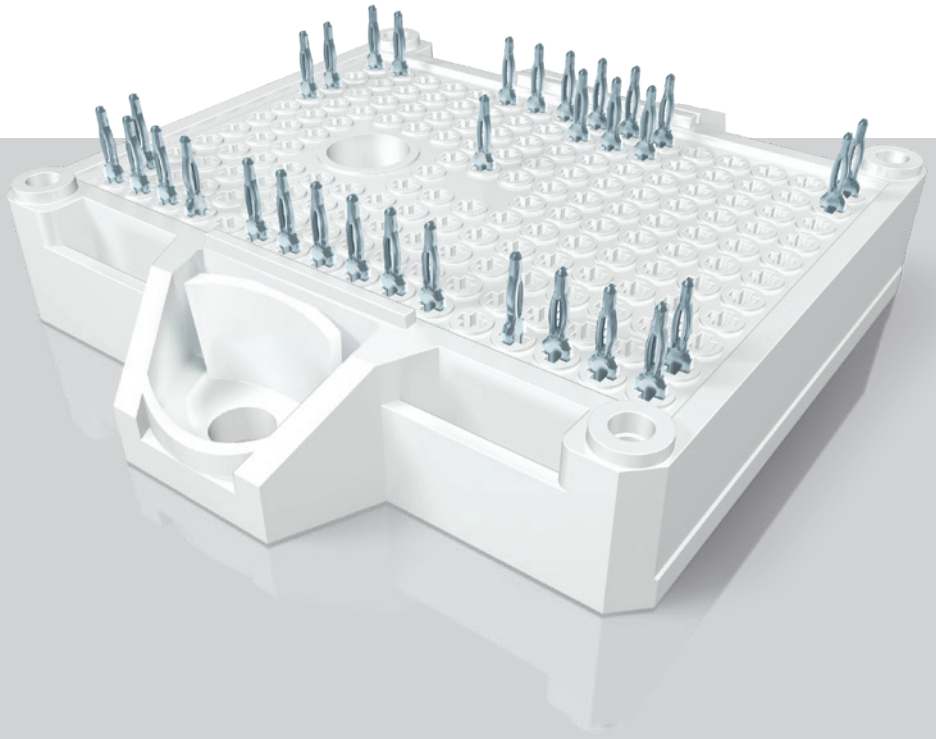
The SEMITOP E1/E2 packages provide supply chain security with a standard industrial design. Press-fit pins offer reduced manufacturing time and a low inductance design. Ideal for fast switching chips, such as SiC, the SEMITOP has a wide portfolio of topologies, ready for your string inverter design.
The SEMITOP E1/E2 family also includes latest 950V and 1200V Generation 7 IGBTs.

Key features

- Low stray inductance case
- Solder-free, press-fit assembly
- Optimised thermal performance
- Flexible architecture
- Available with Si, Full and Hybrid SiC



GENERATION IGBT 7



SEMITOP® E1/E2

8kW up to 225kW

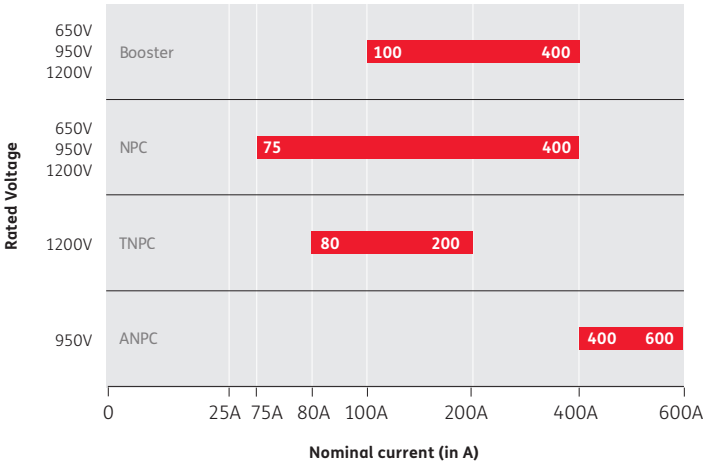
Product Highlight - Generation 7 IGBT Power Modules

The Power Density Master: New Levels Utilizing the latest Generation IGBT 7 Chips

For increased power density and high reliability, SEMIKRON now utilizes 950V IGBTs in the MiniSKiiPs. With this Generation 7 IGBT chip, both boosters and 3-level topologies have been optimized for the 1500V_{DC} market. Along with the existing portfolio, the MiniSKiiP provides a power dense design for the string inverter market up to a power range of 300kW without paralleling of modules.

Key features

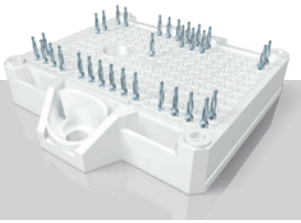
- Low stray inductance case
- Solder-free assembly
- Optimised thermal performance
- Flexible architecture
- Available with Si and Si/SiC Hybrid



GENERATION IGBT 7

MiniSKiiP®

20kW up to 300kW



SEMITOP® E1/E2

8kW up to 225kW

Exceeding the standard for superior performance

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

650V and 1200V: 10A to 100A
IGBT 4 and IGBT T7

CIB and sixpack topologies

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

Increased power density thanks to Generation 7 IGBT T7

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

MiniSKiiP®

20kW up to 300kW

Solder-free spring technology for minimum assembly time

Full family of power modules up to 300kW

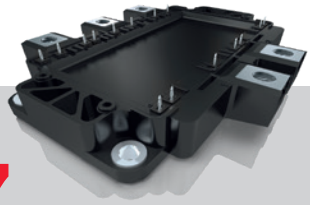
650V / 950V / 1200V / 1700V IGBT: 4A to 400A
1200V Hybrid SiC: 50A to 150A

Sixpack, twelvepack, H-bridge, half-bridge and 3-level topologies

Easy and flexible PCB routing without pin holes

Product Portfolio

Power Modules



SEMiX® 5

50kW up to 150kW

Extended standard for superior thermal and dynamic performance

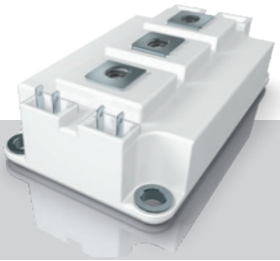
- Industry standard baseplate module
- 650V / 1200V / 1700V IGBT: 100A to 400A
- Sixpack, NPC and TNPC topologies
- Optimised module layout for maximum heat transfer
- Enhanced thermal and electrical diode performance

SEMiX® 3 Press-Fit

100kW up to 400kW

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 and split NPC topologies
- Direct driver assembly
- Available with integrated shunt resistor

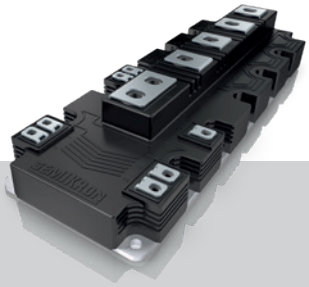


SEMITRANS®

25kW up to 1MW

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 brake chopper topology
- Multiple IGBT sources including Generation 7 IGBT M7
- Increased power range in 62mm thanks to portfolio extension in 1200V and 1700V half-bridges:
  1200V/600A
  1700V/500A



SEMITRANS® 10

500kW up to 2MW

Robust high power module

- Established high power module package
- 1200V IGBT: 1400A
  1700V IGBT: 1000A and 1400A
- Half-bridge and split NPC topologies
- Full second source thanks to alternative 1700V chip source and Generation 7 IGBT M7

SEMITRANS® 20

500kW up to 2MW

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

Intelligent Power Modules – IPMs

For Maximum Reliability

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 and water cooling, also with customized heat sinks. 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.

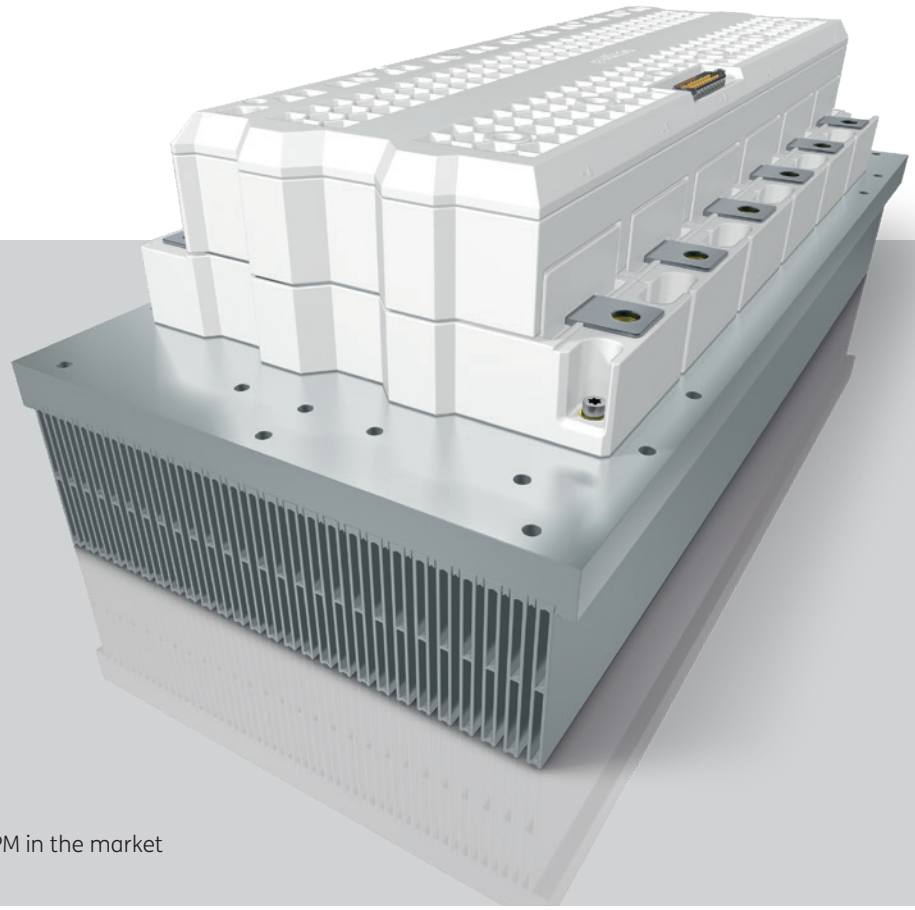
Key features

1200V and 1700V
Half-bridge and sixpack
500A to 3600A
Flexible cooling options: air, water or customized cooling options, high performance cooling, single and double side mounting water coolers
Paralleled operation for even higher output power possible
Special version for 1500V_{DC} available

The SKiiP 4, available in a 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 parameters and reading application parameters.

High performance cooling (HPC) technology has been introduced providing approximately 25% more output capability compared to standard water cooling. A double side mounting HPC water cooler is also available and enables an even higher power density.



SKiiP®4

500kW up to 3MW

The most powerful IPM in the market

Power Electronic Stack Platforms

Fully Qualified Inverter Assemblies Tailored to Your Specific Needs

Standard Stacks

SEMIKRON's 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 1000V. Our standard stacks cover an output current range from 70A to 4000A.

Water-Cooled IGBT Stacks
SKiiPRACK
SEMIKUBE MLI

Air-Cooled IGBT Stacks
SEMIKUBE
SEMIKUBE SlimLine

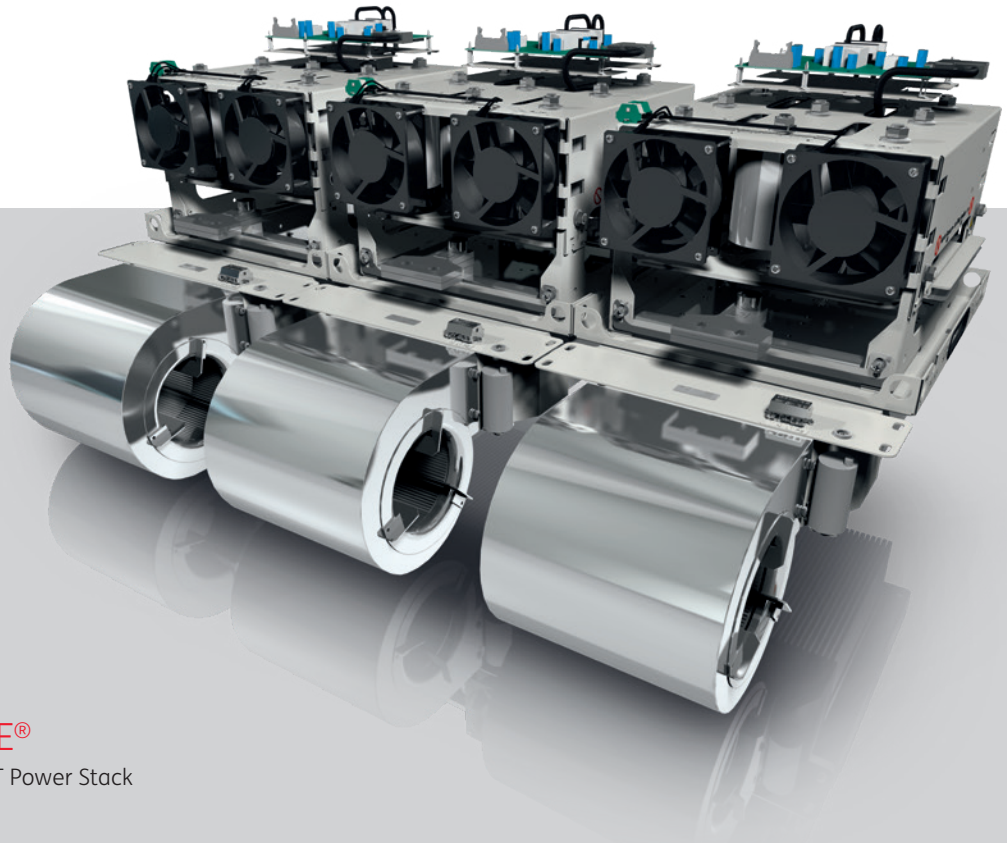
Diode/Thyristor Stacks
SEMISTACK CLASSIC B6U/B6C/W3C

Customised Stacks

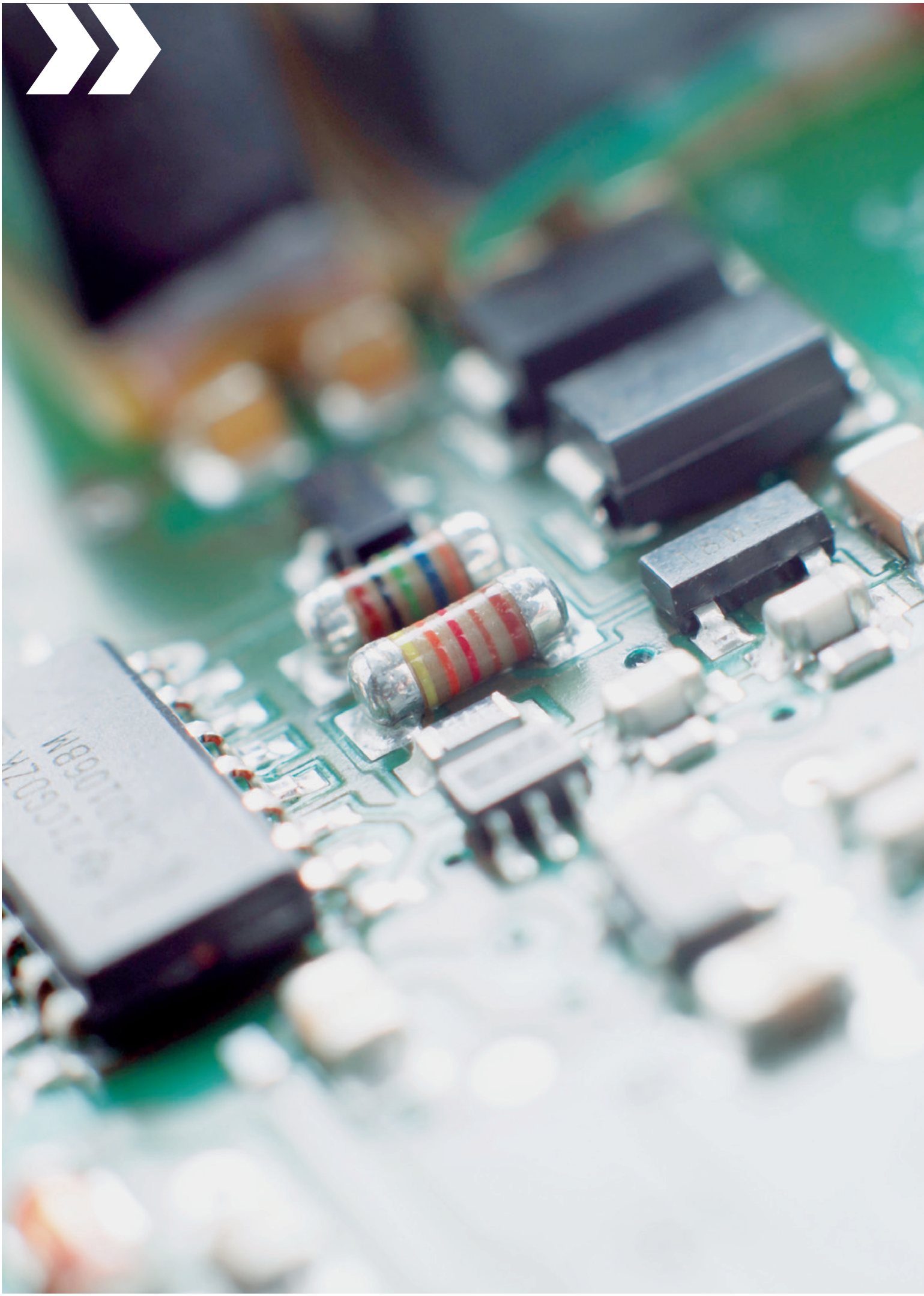
In addition to standard stacks, SEMIKRON has vast experience in developing customer-specific solutions. Engineers are available in our stack centres around the globe to offer specific solutions by adapting existing platforms or designing customized converters.

Four key factors for your succes

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



SEMIKUBE®
Air-cooled IGBT Power Stack



Product Portfolio IGBT Driver

Above the Standard

SEMIKRON's 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.

SEMIKRON's 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 SEMIKRON's 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 to have a short-term solution for almost every challenge related to driver electronics. SEMIKRON's Plug-and-Play drivers connect directly to most common standard IGBT modules. The IGBT driver cores fit with SEMIKRON's adapter boards or application sample PCBs. For the latter, SEMIKRON shares the entire manufacturing data to decrease development time, speeding up the time-to-market.

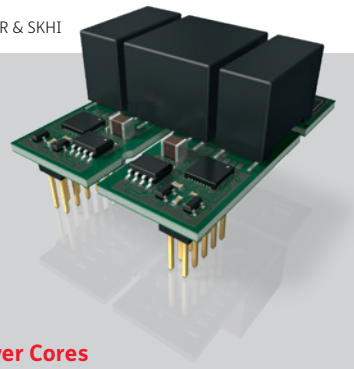
Reliable

SEMIKRON's 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

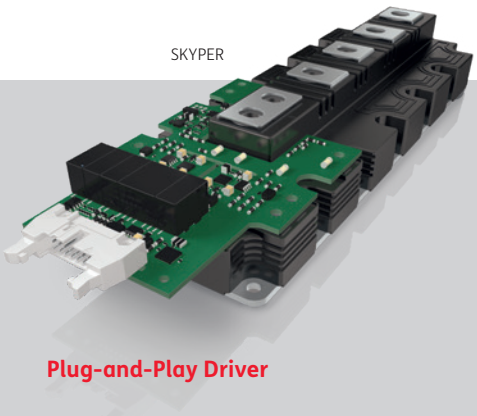
SKYPER & SKHI



Driver Cores

Two-channel driver cores for PCB integration with SEMIKRON ASIC technology and integrated safety functions

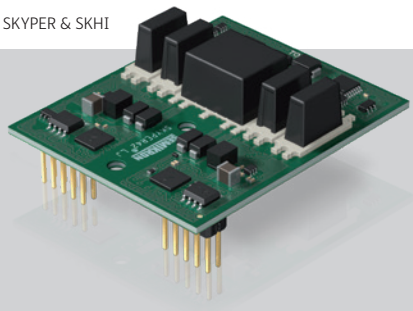
SKYPER



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 IGBT and SiC modules

Thermal Interface Materials

Stay Cool – Heat Dissipation is Our Job

SEMIKRON 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, SEMIKRON offers 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.

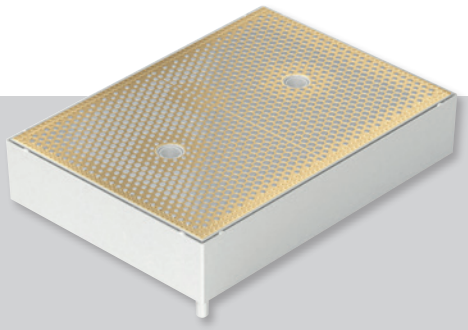
SEMIKRON offers either thermal grease or phase change materials depending on customer requirements (e.g. performance increase, reduced handling effort) and module type (with or without baseplate). Phase change materials have a solid consistency at room temperature, fully exploiting the advantages a non-smearing TIM layer offers, with no drawbacks. Baseplateless 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

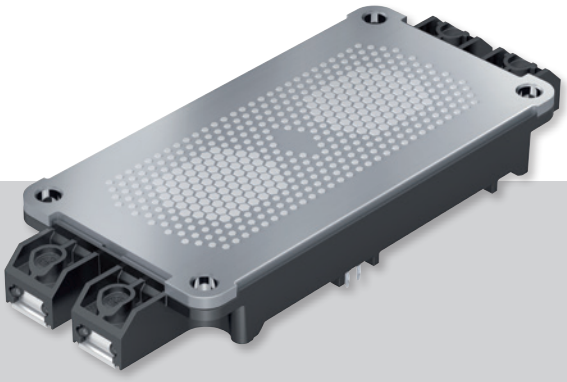
- Increased productivity thanks to reduced handling costs and improved logistics
- Low thermal resistance with optimised TIM layer thickness
- Improved lifetime and reliability
- Improved assembly robustness
- Modules can be shipped directly to the assembly line without any additional treatment processes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



Baseplate-less Power Modules



Baseplate Power Modules

www.semikron.com/thermal-interface-materials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SK 50 MLI 066
SK 30 MLI 066
SK 20 MLI 066
from 45,38 €
from 18,82 €
from 14,55 €
from 12,87 €

Service

Your 24/7 Online Service

SemiSel Simulation

Have you ever asked yourself “Have I selected the right power semiconductors?” Then you should check out SemiSel – SEMIKRON’s simulation tool for losses and temperatures, the perfect tool to help you select the right power semiconductors for the specific needs of your application. The first of its kind almost 20 years ago, SemiSel has been continually improved and now boasts lots of new features and functions.

Product range

Available for all SEMIKRON products:

- Rectifier diode and thyristor modules
- IGBT and fast diode modules
- SiC Schotty diodes and SiC MOSFET modules
- From 3A to 6000A rated current
- From 55V to 3300V devices

Key features

27 different power electronic circuits can be simulated
Simulations with different degrees of complexity, from simple nominal conditions to complex mission profiles
Cooling conditions for air and liquid cooled systems proposed to match the housing and devices selected
Efficiency and temperatures at a glance

Visit us at
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Online Shop

Our specialty lies in the delivery of expert support to small and medium-sized enterprises by offering them the following services:

Technical & sales support

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Worldwide shipping

- Fast shipping to more than 100 countries
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- Over 600 conventional SCRs, IGBT modules, bridge rectifiers and IPMs in stock

Transparency & efficiency

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- Instant quotes using the online quotation tool

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- Find a fully compatible SEMIKRON device for any other brand: shop.semikron.com/en/Cross-Reference-Search/

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