

# Solutions for UPS systems

Power components for high-quality systems







## Introduction

# Dependence on electricity

Our society has become so dependent on electricity that blackouts can cause serious consequences.

In emerging economies such as China and India, the grid is still very unstable. Several blackouts and disruptions during the day are not unusual.

Even highly developed countries such as Germany experience an average of 100 mains failures per year lasting less than 20 ms and about 30 failures lasting between 20 ms and 1 s.

Uninterruptible power supply (UPS) systems are an effective way of achieving reliable power supply. They compensate voltage fluctuations and short-term power failures irrespective of the quality of mains supply. They thus ensure reliable voltage supply for critical applications.

## Power availability and quality

UPS systems ensure a controlled flow of energy to a given application. They protect critical operating equipment and sensitive equipment that is vulnerable to loss of power by providing a filter function. This shields equipment against voltage distortions and fluctuations in frequency or amplitude. In addition, UPS systems ensure an uninterrupted flow of power to electronic devices in the event of a brief or even longer power outage.

UPS systems are in use in many areas, including

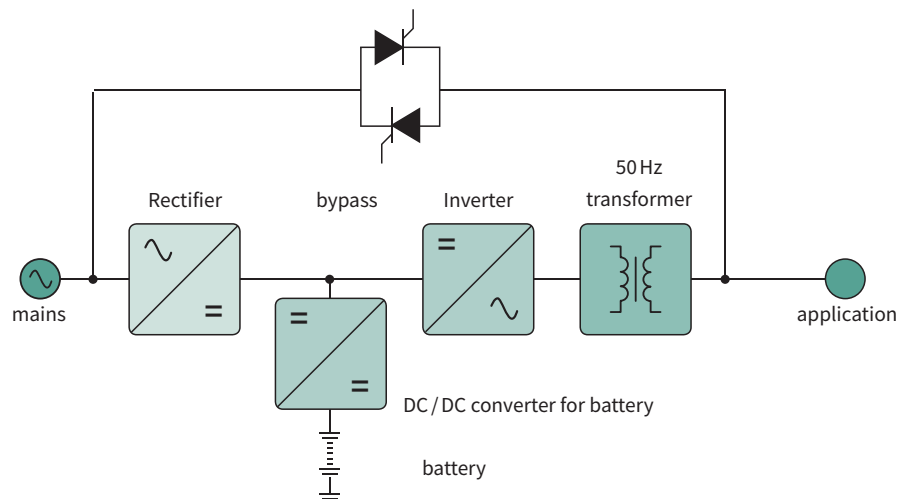
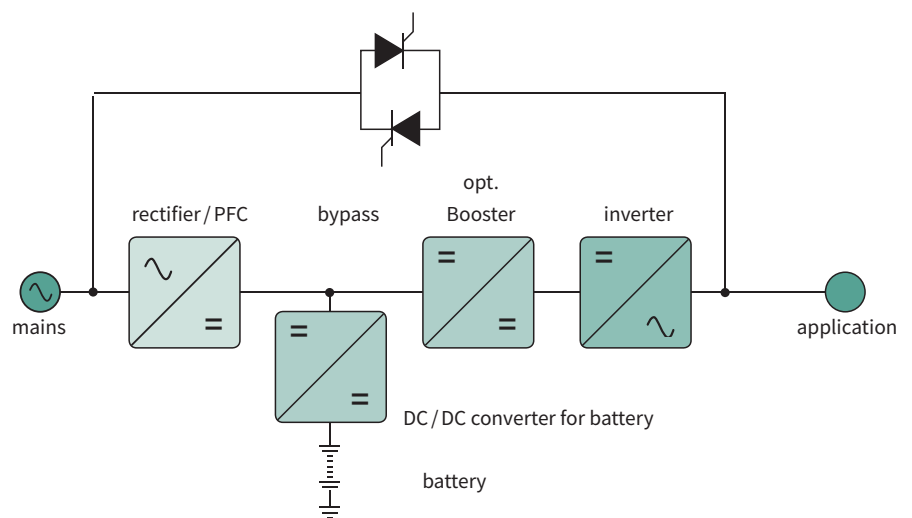
- › Telecommunications
- › Data centers
- › Process supply in the chemical and petrochemical industries
- › Aviation, air traffic control, traffic are an effective way of
- › Power supply in hospital, to operating rooms and intensive care units



## Power converter solutions

### Main component groups:

- > Rectifier to generate the DC-link voltage and thus supply the inverter
- > Inverter to generate the required voltage at the load
- > DC/DC converter for charging and discharging of the battery system
- > Optional stage to boost the voltage to archive sufficient output voltage
- > Switch to bypass the UPS in case of overload or system failure



# Applications and configurations



Discrete IGBTs

Low-power modules

Medium-power Modules



10 kVA

Inverter Output Power



High-power modules

Stacks and assemblies

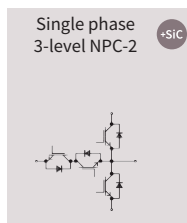
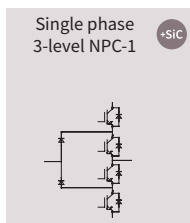
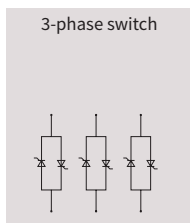
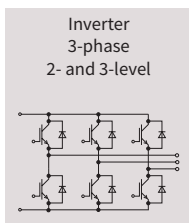
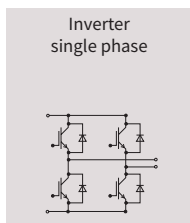
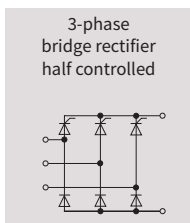
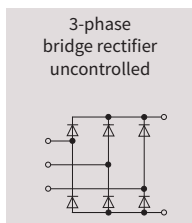
Thyristors and diodes



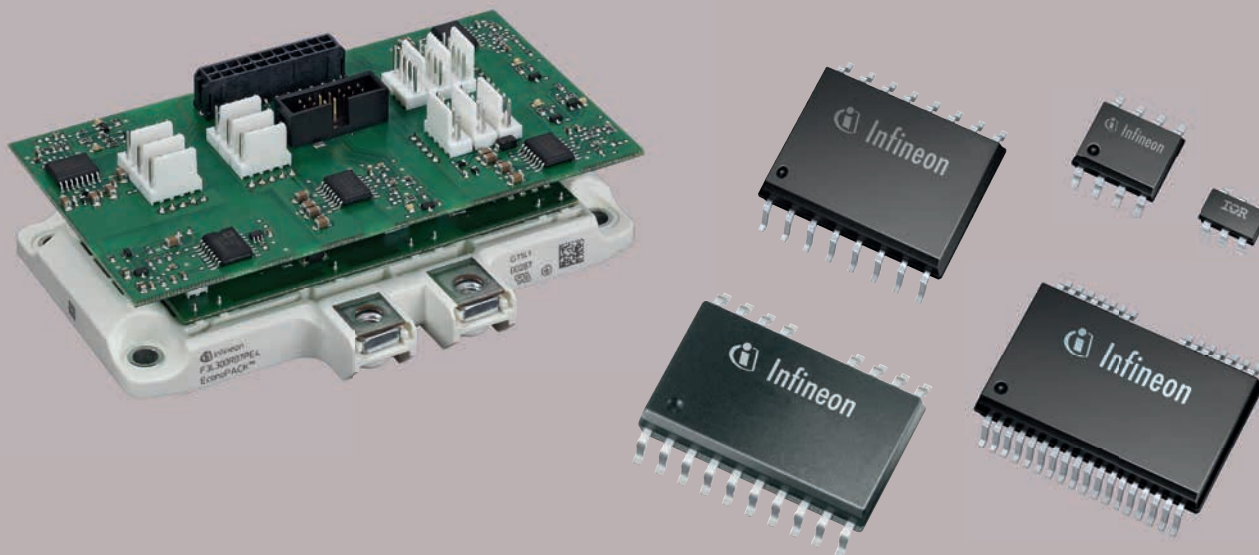
Inverter Output Power

2 MW

## Typical module and stack configurations







## Gate Driver ICs and boards

Infineon's Gate Driver ICs are the expert's choice. We offer over 200 devices with a wide range of topologies, voltage classes, current capabilities, switching speeds, and integrated protection features. By combining Infineon drivers with Infineon power devices, customers can quickly design and build efficient and robust systems.

The breadth and depth of the Infineon Gate Driver IC portfolio provides a solution for virtually every application. Visit the Gate Driver IC selection tool at [www.infineon.com/gatedriver](http://www.infineon.com/gatedriver)

EiceDRIVER™ boards are suitable for all IGBT modules up to 1700V. Outstanding protection measures and integrated fault management provide safe operation, even if used within noise-intense industrial environments. Furthermore, these boards are an attractive solution for the parallel connection of IGBT modules. Evaluation Boards are offered as an application support tool. These boards are accompanied by compressive application notes containing all information needed to test, modify and qualify a design for production.

### Features

- > Gate Driver Boards up to 1700 V
- > Gate Driver ICs from 20 V up to 1200 V
- > One-stop solution for drivers and power switches

### Applications

- > UPS for all power classes

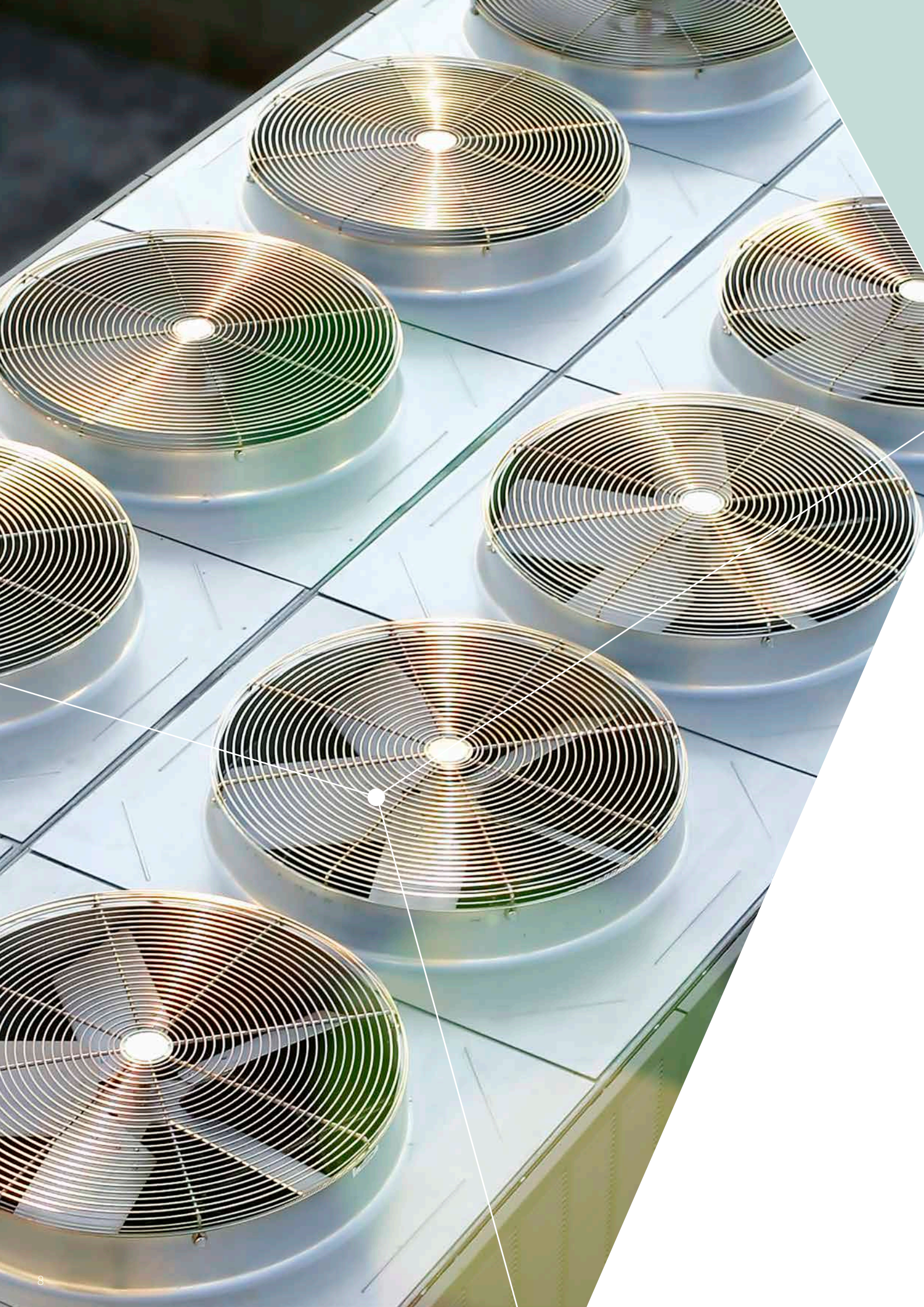
## Power availability and quality

With the new EconoPACK™ 4 and the PrimePACK™ IGBT modules, we continue to set the industry standards worldwide. These modules include the newest chip technology IGBT4 with enhanced power-cycling capability for longer lifetime and increased reliability. We have a global team of experienced application engineers providing advanced evaluation boards and design support to reduce our customers' time-to-market.

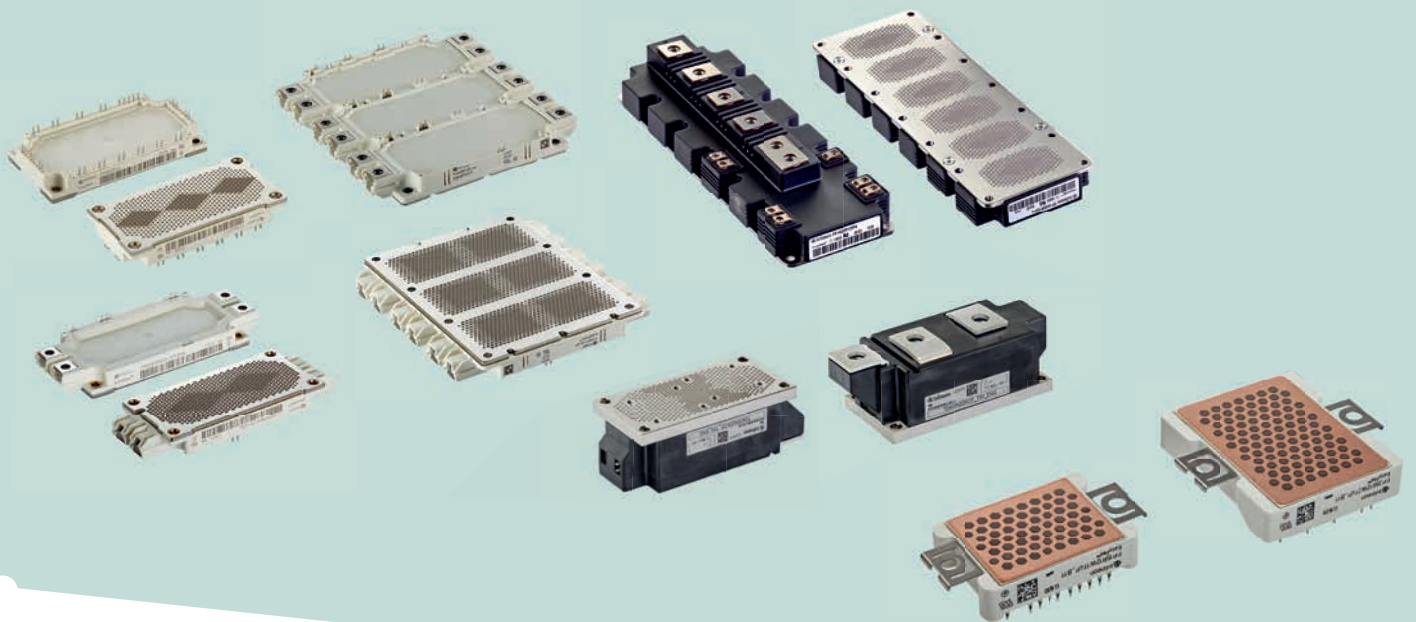












# Thermal Interface Material (TIM)

The only Infineon-qualified solution

## Features

- › Best-in-class thermal resistance
- › Pre-applied to Infineon modules
- › Dry to the touch
- › Optimized for dedicated Infineon modules

## Benefits

- › Reduced process time in manufacturing
- › Simplified mounting
- › Increased system reliability
- › Increased system lifetime
- › Optimized thermal management
- › Improved handling in case of maintenance

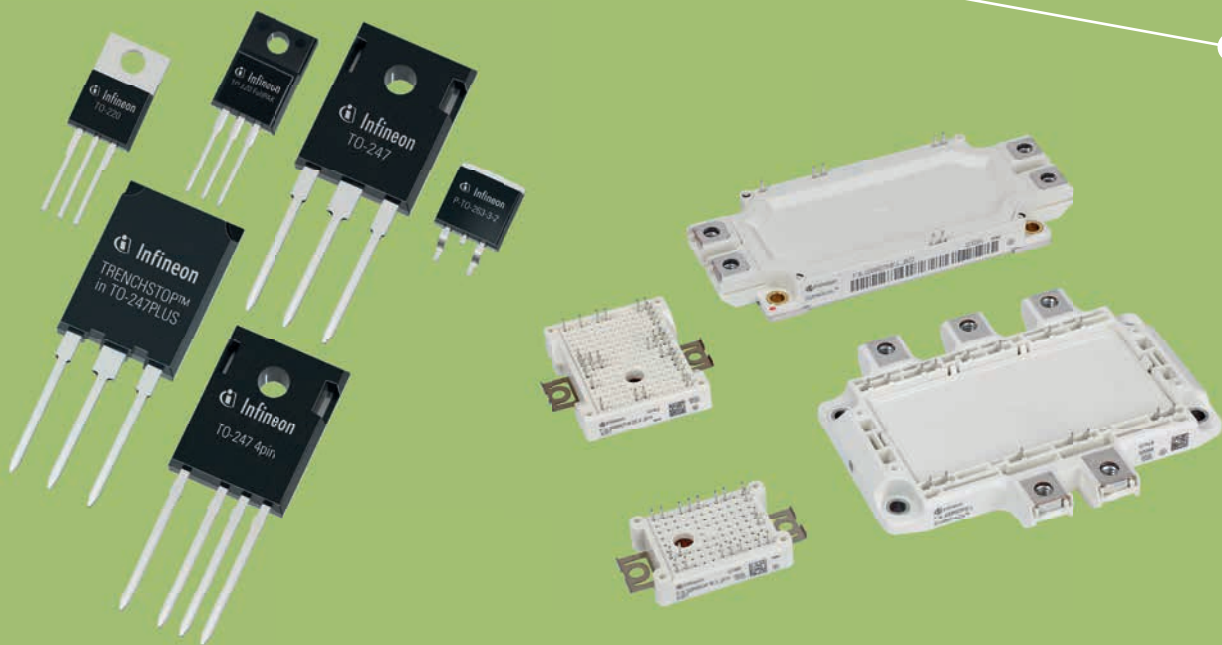
- › Broad Portfolio available:  
[www.infineon.com/TIM](http://www.infineon.com/TIM)

The demand for high power densities in power electronics poses great challenges to the thermal interface between the power module and the heat sink. In addition a short manufacturing process time is essential to make the production of converters more efficient. The easy handling and reproducible application of thermal interface material is one way to improve the manufacturing and obtain a stable process result.

A specially developed thermal interface material pre-applied to our power modules outperforms the general-purpose materials available. TIM not only provides the lowest thermal resistance, it also fulfills the highest quality standards for power modules to achieve the longest lifetime and highest system reliability.

TIM has been developed to fit most of our existing power module packages as well as upcoming future designs. Using modules with pre-applied TIM will enable reproducible thermal performance of power electronic applications.





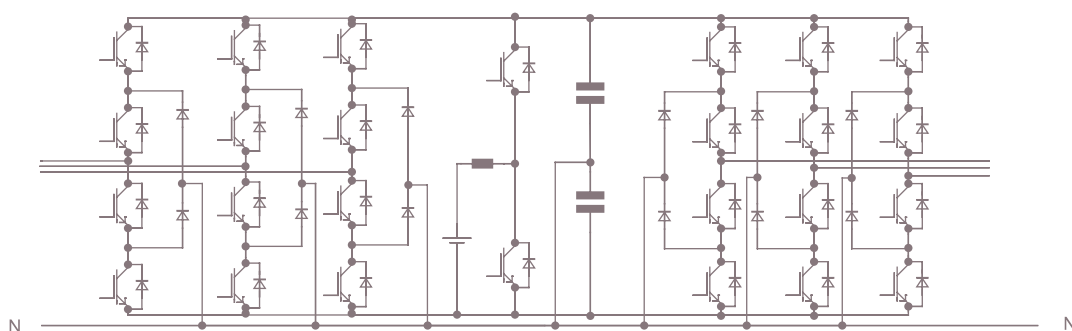
## High efficiency – a key feature

Our product portfolio includes components for the highest levels of energy efficiency. A trench gate structure and field stop concept in IGBT technology, partially equipped with SiC diodes, have improved the performance of power semiconductors in both switching and forward losses.

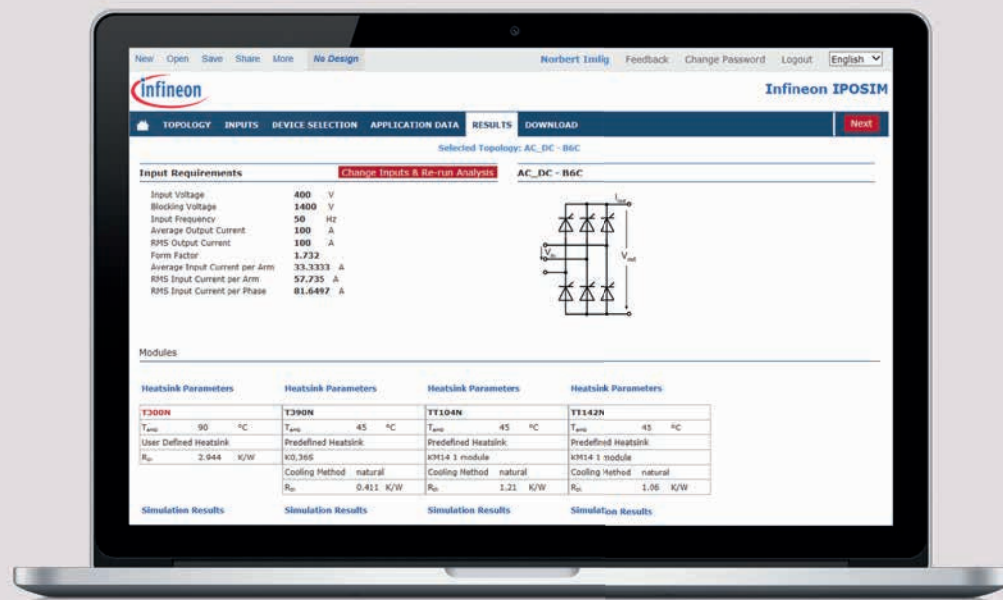
Combining these highly efficient semiconductor technologies with 3-level topologies in packages like EconoPACK™ 4, EasyPACK 1B and EasyPACK 2B, and now in EconoDUAL™ 3, helps to increase the efficiency of the whole UPS converter system. It also leads to higher power density and improves the reliability. Furthermore we offer modules with two different 3-level topologies optimized for different switching frequency ranges.

The new TRENCHSTOP™ 5 allows an additional dramatic improvement in both switching and conduction losses, whilst providing a breakthrough voltage of 650V.

The new low  $V_{ce(sat)}$  variant of TRENCHSTOP™ 5 L5 IGBT, optimized for frequencies of 50 - 60 Hz, provides the best combination of low conduction losses ( $V_{ce(sat)}$  of 1.05 V) and total switching losses to improve the efficiency of polarity switches in 3-level NPC 1 and NPC 2 topologies. TRENCHSTOP™ 5 in a new TO-247 4pin Kelvin Emitter package due to reduction in lead inductance achieved by implementing the 4th emitter-sense pin reduces switching losses by 20% under full load conditions.







# IPOSIM

The Infineon Power Simulation program for loss and thermal calculation of Infineon power modules and disk devices

IPOSIM is an easy to use yet sophisticated online simulation tool for loss and thermal calculation of Infineon power modules and disk devices.

IPOSIM helps you to select the right Infineon bipolar modules or disk devices for your rectifier or AC switch applications as well as suited IGBT modules for your inverter or DC converter applications. B2, B6, M3.2, M6, W1C, W3C, 2-Level, 3-Level, buck and boost topologies can be calculated.

IPOSIM performs a calculation of switching and conduction losses for all components, taking into account conduction and switching characteristics as well as thermal ratings. Where applicable, different control algorithms can be applied.

Thermal conditions can be adapted by user defined or predefined heat sinks. Beside single operation points complete load cycles may be calculated. Results will be shown in tabular and graphic representation and can be saved for later revision or printed as PDF file.

## Features

- > Calculation of thermal performance
- > Direct comparison between products
- > Calculation of complete load cycles
- > Save calculations for later revision

- > Where to find IPOSIM:  
[www.infineon.com/iposim](http://www.infineon.com/iposim)



# Where to buy

Infineon distribution partners and sales offices:

[www.infineon.com/WhereToBuy](http://www.infineon.com/WhereToBuy)

## Service hotline

Infineon offers its toll-free 0800/4001 service hotline as one central number, available 24/7 in English, Mandarin and German.

- › Germany ..... 0800 951 951 951 (German/English)
- › China, mainland ..... 4001 200 951 (Mandarin/English)
- › India ..... 000 800 4402 951 (English)
- › USA ..... 1-866 951 9519 (English/German)
- › Other countries ..... 00\* 800 951 951 951 (English/German)
- › Direct access ..... +49 89 234-0 (interconnection fee, German/English)

\* Please note: Some countries may require you to dial a code other than "00" to access this international number.  
Please visit [www.infineon.com/service](http://www.infineon.com/service) for your country!

[www.infineon.com](http://www.infineon.com)

Published by  
Infineon Technologies AG  
81726 Munich, Germany

© 2017 Infineon Technologies AG.  
All Rights Reserved.

Order Number: B133-H9042-V9-7600-EU-EC-P  
Date: 05/2017

### Please note!

THIS DOCUMENT IS FOR INFORMATION PURPOSES ONLY AND ANY INFORMATION GIVEN HEREIN SHALL IN NO EVENT BE REGARDED AS A WARRANTY, GUARANTEE OR DESCRIPTION OF ANY FUNCTIONALITY, CONDITIONS AND/OR QUALITY OF OUR PRODUCTS OR ANY SUITABILITY FOR A PARTICULAR PURPOSE. WITH REGARD TO THE TECHNICAL SPECIFICATIONS OF OUR PRODUCTS, WE KINDLY ASK YOU TO REFER TO THE RELEVANT PRODUCT DATA SHEETS PROVIDED BY US. OUR CUSTOMERS AND THEIR TECHNICAL DEPARTMENTS ARE REQUIRED TO EVALUATE THE SUITABILITY OF OUR PRODUCTS FOR THE INTENDED APPLICATION.

WE RESERVE THE RIGHT TO CHANGE THIS DOCUMENT AND/OR THE INFORMATION GIVEN HEREIN AT ANY TIME.

### Additional information

For further information on technologies, our products, the application of our products, delivery terms and conditions and/or prices, please contact your nearest Infineon Technologies office ([www.infineon.com](http://www.infineon.com)).

### Warnings

Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.