The Markets are Changing

Changing markets demand new solutions. Many markets are saturated, and products are being ever more replaceable and increasingly offering similar functionality thanks to growing standardization. Technological, regulatory and economic challenges along with growing functional complexity are a reality of numerous market segments, particularly for the industrial, automation, automotive and white goods (electronic household appliances for private and commercial use) segments.

Our Product Portfolio

- Semiconductors
- Displays & Boards
- Passive Components
- Storage Technologies
- Electromechanical Components
- Wireless Technologies

Committed to excellence

Consult – Know-how. Built-in.
The technical competence from Rutronik.
Worldwide and individual consulting on the spot:
by competent sales staff, application engineers and
product specialists.

The product portfolio from Rutronik.
Wide product range of semiconductors, passive and
electromechanical components, storage, displays & boards and
wireless technologies for optimum coverage of your needs.

The delivery service from Rutronik.
Innovative and flexible solutions: from supply chain management
to individual logistics systems.

Quality management without compromise
The integrated management system (IMS) encompasses
quality control, environmental protection and occupational
health and safety.

Content

- RUTRONIK POWER 4 - 9
- RUTRONIK24 19
- RUTRONIK SMART 73
- RUTRONIK EMBEDDED 74
- RUTRONIK AUTOMOTIVE 75

eMobility Application – Forklift Vehicle 40 – 41
- MOSFETs 42 – 44
- SiC Schottky Barrier Diodes 45
- Embedded Power ICs 46
- Passive Components 47 – 55
- Electromechanical Components 56 – 61

Home Appliance Application – Induction Hob 62 – 63
- AC/DC Modules/Adapters 64 – 65
- Intelligent Power Modules 66 – 67
- Passive Components 67 – 71
- Electromechanical Components 72

Follow us

- https://www.facebook.com/rutronik
- https://twitter.com/Rutronik
- https://www.youtube.com/user/Rutronik24
- https://rutronik-tec.com

Get your Rutronik App:
Trends in High-Performance Electronics

In addition to the trends in the market segments, there are also developments that are affecting the entire high-performance electronics sector. The most important of these developments are "digital power" also with the related topics of "functional safety" and "robustness". These have direct effects on operating conditions, technology and manufacturing methods.

Digital Power
One "power future trend" is that of "digital power", also referred to as "intelligent digital power". In electrical engineering, this buzzword refers to digitally controlled or monitored power supply units. In conventional switched-mode power supply units, an analog switch controls and monitors the output voltage. In digital power supply units, a microcontroller or DSP handles one or several of these functions. The control process is integrated into the controller at software level.

One of the major advantages of digitally-controlled switched power supply units over analog solutions is the option of being able to intervene in the control process at any time and to adapt it to the current needs of the power supply. While this increases the level of effectiveness of the digital PSU compared to an analog variant, this does also increase the amount of technical development work required, which is reflected in the costs. Digital technology aims to satisfy the needs of the ever more complex power supply systems.

Functional Safety and Robustness
Innovations that do not take safety into account cannot endure, which is why high functional safety and robustness are essential. In a robustness validation, for example, the reliability of electronic components is assessed by comparing the specific product requirements against the actual service life, taking into account the increase in efficiency.

The fundamental concept behind functional safety is the strategy for reducing actual risks. The goal is to create a safe system in that every reasonable measure has been taken to avoid damage to property and danger to people, ensuring traditional safety measures.

Effects
These trends cover many industries and are directly related to operating conditions, technologies and manufacturing processes. In other words, changes to operating conditions or other techniques or manufacturing processes will also mean the involvement of different requirements imposed upon the installed components. This can be more clearly illustrated in the example of energy storage. If the conditions in which a battery is operated or if new technologies or manufacturing processes are implemented, this gives rise to new requirements imposed upon the charging strategy or the battery management system.

The operating parameters are of critical importance to the service life of an energy storage facility within an application. While developers often have no influence on the operating conditions, there is scope for optimization in the battery management system, although this scope is often used inadequately. As a result, operating conditions are changed without implementing the battery management system accordingly. In this connection, the most frequent recorded electrical failures are due to defective or discharged starter batteries. Specifically in the automotive industry, such battery failures were mainly found in luxury vehicles until the year 2000. The main cause was the growth in electronic component use and other electricity consumers in the vehicles, because even in a parked vehicle, the starter battery is constantly being discharged by the monitoring and control electronics. While the currents involved here – referred to as "standby currents" – are low, the battery can suffer from deep discharge if left dormant for long periods of time. For manufacturers, this raises the question of whether this know-how needs to be developed internally or whether the market might offer a suitable solution.

The Answer – RUTRONIK POWER
RUTRONIK POWER is much more than a complete portfolio of power components for various voltage classes and different applications. RUTRONIK POWER also offers a selection of components for a variety of applications suitable for the respective circuit. This means that under every position in the block diagram, there are products from multiple selected suppliers in the respective product segments.

RUTRONIK accommodates as broad a range of requirements as possible here – whether low-cost or high-performance. For example, for a motor control circuit in the power range of 2KW, RUTRONIK offers appropriately designed IGBT modules, gate drivers as well as microcontrollers, driver modules, heatsinks and plug connectors.

For power semiconductors, RUTRONIK caters for everything today, from discrete to high-integration components, power ICs and power modules. As a broadline distributor, RUTRONIK offers all other components in addition to its power semiconductors, not only active but also electromechanical and passive components. The spectrum ranges from simple plug connectors to supercaps. This covers around 98% of the PCB. This also applies to other product segments such as high-current connectors supporting up to 1000A and supercaps supporting up to 3400 farad/cell.

But RUTRONIK POWER is much more than a broad selection of components. The decisive difference lies in RUTRONIK compiling relevant expertise, not only for individual products and technologies, but also on their compatibility with one another.

This helps to guarantee extensive support – with development at application level by professionally qualified Field Application Engineers (FAEs), Product Managers at component level and supply at the end of a product lifecycle lasting several years. FAEs are particularly important for technical customer support.

RUTRONIK’s experts advise and support activities ranging from the design-in process, the product evaluation and application development, the strategic marketing of product groups for which theoretical assistance is necessary, down to the development of logistics solutions with comprehensive system solutions that are optimized to the customer’s needs.

RUTRONIK gives absolute priority not only to reducing the prevailing complexity of the offer-range but also to providing support at the product development stage at application level with relevant technical expertise and vertical system solutions based on suitable components.
The product portfolio consists of decided manufacturers who are leaders in their respective fields and with some of whom the company has worked for decades. This ensures an extensive and consistent transfer of knowledge from the very start, both between the supplier and Rutronik as well as a collective exchange of expertise with the customer, for example concerning seminars, webinars and professional conferences.

The bundling of expertise and experience in the RUTRONIK POWER team guarantees that the customer receives extensive advice in respect of the overall application, the market and its requirements.

RUTRONIK’s experts have a profound understanding of all relevant factors, with specialists from a variety of fields supporting each other, enabling the benefit of synergies across teams to be utilized more effectively, because market segments overlap in numerous aspects – and customers benefit from such coordinated consulting.

This understanding of not only the customer’s requirements but also the technical options and the market conditions enables a precisely tailored solution to be developed – not off the shelf, but customized specifically to the customer’s needs.

Working with the customer and with its suppliers, RUTRONIK develops forward-looking approaches, thereby contributing to research and development at application level. This is why RUTRONIK provides tools for certified applications that stand out not only with their extraordinary functionality, quality and robustness but also with their energy efficiency. This is exactly what RUTRONIK POWER stands for.

The RUTRONIK POWER team consists of specialists from the active power semiconductors, passive, electromechanical and embedded segments, utilizing the company’s extensive product portfolio.

<table>
<thead>
<tr>
<th>ACTIVE</th>
<th>PASSIVE</th>
<th>EMECH</th>
<th>EMBEDDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Power Semiconductors</td>
<td>• Resistors</td>
<td>• Connectors &amp; Cables</td>
<td>• Power Supplies</td>
</tr>
<tr>
<td>• Inductivities</td>
<td>• Capacitors</td>
<td>• Relays, Batteries, Fuses, Switches, Heat Management</td>
<td></td>
</tr>
</tbody>
</table>

The RUTRONIK POWER team consists of specialists from the active power semiconductors, passive, electromechanical and embedded segments, utilizing the company’s extensive product portfolio.

RUTRONIK POWER serves as a single source for all components, from individual components to a basis for operational applications. But RUTRONIK POWER does not compete with its customers with their own components and applications, because the extensive range is combined into complete, vertically integrated system solutions.

RUTRONIK POWER serves as a single source for all components, from individual components to a basis for operational applications. But RUTRONIK POWER does not compete with its customers with their own components and applications, because the extensive range is combined into complete, vertically integrated system solutions.

The Advantages

RUTRONIK POWER serves as a single source for all components, from individual components to a basis for operational applications. But RUTRONIK POWER does not compete with its customers with their own components and applications, because the extensive range is combined into complete, vertically integrated system solutions.

The bundling of expertise and experience in the RUTRONIK POWER team guarantees that the customer receives extensive advice in respect of the overall application, the market and its requirements.

RUTRONIK’s experts have a profound understanding of all relevant factors, with specialists from a variety of fields supporting each other, enabling the benefit of synergies across teams to be utilized more effectively, because market segments overlap in numerous aspects – and customers benefit from such coordinated consulting.

This understanding of not only the customer’s requirements but also the technical options and the market conditions enables a precisely tailored solution to be developed – not off the shelf, but customized specifically to the customer’s needs.

Working with the customer and with its suppliers, RUTRONIK develops forward-looking approaches, thereby contributing to research and development at application level. This is why RUTRONIK provides tools for certified applications that stand out not only with their extraordinary functionality, quality and robustness but also with their energy efficiency. This is exactly what RUTRONIK POWER stands for.

<table>
<thead>
<tr>
<th>ACTIVE</th>
<th>PASSIVE</th>
<th>EMECH</th>
<th>EMBEDDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Power Semiconductors</td>
<td>• Resistors</td>
<td>• Connectors &amp; Cables</td>
<td>• Power Supplies</td>
</tr>
<tr>
<td>• Inductivities</td>
<td>• Capacitors</td>
<td>• Relays, Batteries, Fuses, Switches, Heat Management</td>
<td></td>
</tr>
</tbody>
</table>

Application Examples

Industrial Application – Frequency Inverter

eMobility Application – Forklift Vehicle

Home Appliance Application – Induction Hob
## Selection Guide

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Diode</th>
<th>MOSFet</th>
<th>IGBT Module</th>
<th>Brake Chopper</th>
<th>Gate Driver</th>
<th>AC/DC Converter Module</th>
<th>EMI Filter</th>
<th>Magnet Protection</th>
<th>Stacked Ductor</th>
<th>Relays and Contacts</th>
<th>Fuses</th>
<th>Current Transformers</th>
<th>Resistors</th>
<th>Capacitors</th>
<th>Inductors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Resistor (liquid-cooled)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Resistor (wire-wound)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Capacitor (Foil)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Capacitor (Electrolyte)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Resistor (wire-wound)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>FSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Power Supply</td>
<td></td>
</tr>
</tbody>
</table>

## Diagram

1. AC 380V/ 230V
2. PFC
3. Isolated Gate Driver
4. Microcontroller
5. Auxiliary Power Supplies DC/DC
6. AC 380V/ 230V
7. Brake Chopper
8. Inverter

Legend:
- Application: up to 5 KW
- Passive NO Type
- Active NO Type
- Selection Guide
- www.rutronik.com/POWER

## Components

- Infineon
- Littelfuse
- Recom
- Rohm
- ST
- Vishay
- AVX
- KEKO
- Varicon
- Littelfuse
- KRAH
- Murata
- Pulse
- Rubycon
- Sumida
- Vishay
- WIMA

## Applications

- Industrial
- eMobility
- Home Appliance
100V/40A Trench SBR® Delivers Industry-Leading, Ultra-Low Forward Voltage

The SBR40U100CT and SBR40U100CTFP offers industry-leading low forward voltage as well as optimal reverse leakage current at high temperatures. Indeed, these devices can improve efficiency by up to 2% while reducing operating temperature by as much as 10°C.

Ultra-Low Forward Voltage
- With ultra-low forward voltage (VF, TYP = 0.27V @ I = 2A, TA = 85°C), these two devices reduce conduction losses. Moreover, a unique property of them is that higher the temperature (TA = 85°C), these two devices reduce conduction losses.
- Higher the temperature (TA = 85°C), these two devices reduce conduction losses. Moreover, a unique property of them is that higher the temperature (TA = 85°C), these two devices reduce conduction losses.

Low Reverse Leakage Current
- These two devices have low reverse leakage current (IR, MAX = 0.5mA @ VD = 100V), which provides improved energy efficiency under nominal and extremely high temperatures.

Target Markets
- Rectifier
- Blocking Diode
- Freewheeling Diode
- Switching Diode

Excellent Thermal Transfer Properties
- The thermally efficient TO220AB and ITO-220AB packages allow these devices to operate reliably in volatile environments.

High, Forward Surge Current and Avalanche Ruggedness
- SBR40U100CT and SBR40U100CTFP have high average rectified output current (Io = 40A per device) and high forward surge current capability (ITM = 200A). In conjunction to the class-leading avalanche rating (EAS = 340mJ), excellent product reliability and operational ruggedness are resulted.

600V, 700V and 800V CoolMOS™ P7 Series

With the CoolMOS™ P7 product families, Infineon offers customers a one-stop shop for highly optimized high-voltage MOSFETs. These families supporting various SMPS applications over a wide power range from low as 5W all the way up to 10kW and beyond. These product families are the MOSFETs of choice for SMPS applications, providing the perfect match for today’s performance, usability and pricing demands. CoolMOS™ P7 product families offer the widest portfolio on the market in both standard and industrial grade. Customers can simply design, save cost and increase their competitiveness by selecting the perfect fit for their ease-of-use and price/performance requirements.

600V CoolMOS™ P7 –
- Optimized Balance between High Efficiency and Ease of Use
- Fully optimized for both soft (LLC) and hard switching (PFC, flyback) topologies
- Integrated ESD protection (>2kV HBM)
- Best-in-class efficiency and thermal performance
- Recommended for adapters, chargers, lights, audio systems, AUX power units, TVs, etc.

700V/800V CoolMOS™ P7 –
- A New Benchmark in Low-Power SMPS Applications
- Fully optimized for hard switching (flyback) topologies
- Integrated ESD protection up to 2kV (HBM)
- Best-in-class efficiency and thermal performance
- Recommended for adapters, chargers, lights, audio systems, AUX power units, TVs, etc.

Part Number | Maximum Average Rectified Current Io (A) | Peak Repetitive Reverse Voltage Vr (V) | Typical Forward Voltage Drop VF (V) | Maximum Reverse Current Irm (A) | Maximum Forward Surge Current Ifsm (A) | Maximum Operating and Storage Temperature Tj (°C) | Typical Junction Capacitance Cj (pF) | Non-Repetitive Avalanche Energy Eas (mJ)
---|---|---|---|---|---|---|---|---
SBR40U100CT | 20 | 100 | 0.61 | 0.5 | 200 | 150 | 250 | 340
SBR40U100CTFP | 20 | 100 | 0.61 | 0.5 | 200 | 150 | 250 | 340

Part Number | Maximum Average Rectified Current Io (A) | Peak Repetitive Reverse Voltage Vr (V) | Typical Forward Voltage Drop VF (V) | Maximum Reverse Current Irm (A) | Maximum Forward Surge Current Ifsm (A) | Maximum Operating and Storage Temperature Tj (°C) | Typical Junction Capacitance Cj (pF) | Non-Repetitive Avalanche Energy Eas (mJ)
---|---|---|---|---|---|---|---|---
IPD80R750P7 | 800 | 450 | 0.61 | 0.5 | 200 | 150 | 250 | 340
IPU80R900P7 | 2000 | 1800 | 0.61 | 0.5 | 200 | 150 | 250 | 340

*Coming soon, starting mid of 2017
Open Frame Solutions

When it comes to specific custom chassis designs or voltage combinations, that can’t be served from one of the former shown standards, an Open Frame PSU could be the best solution compared to a complete separate and fully custom designed PSU. The field of available solutions is various and there are many different combinations between AC or DC input and DC output possible. To give an idea about this area of PSU solutions. We show in the following table below only the big range in general. For the best compromise between size, power and availability, we support you in your projects as detailed as possible.

<table>
<thead>
<tr>
<th>Type</th>
<th>3.3V</th>
<th>5V</th>
<th>12V</th>
<th>18V</th>
<th>24V</th>
<th>36V</th>
<th>40V</th>
<th>48V</th>
<th>55V</th>
</tr>
</thead>
<tbody>
<tr>
<td>25W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87.5W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>175W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>225W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>240W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>320W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>350W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>650W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>700W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1100W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X: Indoor and medical safety

LED Drivers

FSP Group provides comprehensive and flexible LED Driver Solutions, that fits to your needs in lighting applications. FSP emphasizes on robust design, highest reliability and excellent dimming solutions. The LED Drivers are available from 5W up to 400W and 12V to 54V output voltage range. The LED Drivers are designed for indoor and outdoor applications.
SiC Power Devices

SiC is emerging as the most viable candidate in the search for the next-generation of low-loss technology due to its low ON resistance and superior characteristics at high temperatures. ROHM is one of the market leaders in the development of SiC power devices and modules for improved power savings in many applications like frequency inverter and power supplies.

SiC Schottky Barrier Diodes

SiC Schottky Barrier Diodes feature an ultra-low and temperature independent reverse recovery charge Qrr.

The wide band gap makes SiC diodes suitable for very fast switching frequencies and high break down voltages. Design engineers can fully utilize SiC performance advantages which lead to reduce losses, smaller inductance and lower total system cost.

Key Features
- Industry-leading low forward voltage (lowest in the market)
- High Speed recovery characteristics
- Lower Switching losses

Applications
- Renewable Energy/Energy Storage
- EV/HEV Inverter and Chargers
- Induction Heating/Welding
- PFC/SMPS
- HVDC

Lineup 2nd Generation

<table>
<thead>
<tr>
<th>Voltage</th>
<th>5A</th>
<th>6A</th>
<th>8A</th>
<th>10A</th>
<th>12A</th>
<th>15A</th>
<th>20A</th>
<th>30A</th>
<th>40A</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>650V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3rd Generation SiC SBD with high Ifsm capability just released</td>
</tr>
<tr>
<td>1200V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3rd Generation SiC SBD with high Ifsm capability just released</td>
</tr>
<tr>
<td>1700V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3rd Generation SiC SBD with high Ifsm capability just released</td>
</tr>
</tbody>
</table>

Packages

TO-220 2L
TO-220 AC 2L
TO-263AB2L
TO-3PFM
TO-247 3L
TO-268-2L

SiC MOSFET

ROHM Semiconductor’s line-up of 650V, 1200V and 1700V SiC MOSFETs are designed to deliver cost-effective and breakthrough performance in inverters and converters. The devices offer dramatically lower switching losses - up to 90% less compared to traditional SiC IGBT.

Key Features
- High-speed switching
- Qualified body-diode with low reverse recovery
- Low switching losses
- High temp. operation (Tj max=175°C)
- High reliability (e.g. Gate oxide)
- Low Vth shift

Applications
- PFC/SMPS/Aux Power Supply
- Renewable Energy Inverter/Converter
- EV/HEV Inverter and Chargers
- Induction Heating/Welding
- HVDC
- Motor Drivers

Lineup 2nd Generation

<table>
<thead>
<tr>
<th>Part No.</th>
<th>VDD [V]</th>
<th>RDS(son) typ. [mΩ]</th>
<th>Iaf [μA] @Vgs=15V</th>
<th>Iaf [μA] @Vgs=30V</th>
<th>Iaf [μA] @Vgs=45V</th>
<th>Tj [°C] max</th>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT2450KE</td>
<td>1200</td>
<td>500 to 1000</td>
<td>60</td>
<td>100</td>
<td>140</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2800KE</td>
<td>1200</td>
<td>450 to 900</td>
<td>50</td>
<td>85</td>
<td>120</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2160KE</td>
<td>1200</td>
<td>400 to 800</td>
<td>40</td>
<td>70</td>
<td>105</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2280KE</td>
<td>1200</td>
<td>350 to 700</td>
<td>30</td>
<td>55</td>
<td>85</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2450KE</td>
<td>1200</td>
<td>300 to 600</td>
<td>20</td>
<td>40</td>
<td>65</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
</tbody>
</table>

1700V SiC-MOSFET

ROHM Semiconductor develops a new 1700V series of SiC MOSFETs which makes SiC an option for new applications like AC/DC or DC/DC converters. e.g. Auxiliary Power Supplies.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>VDD [V]</th>
<th>RDS(son) non gate-latched [mΩ]</th>
<th>Iaf [μA] @Vgs=15V</th>
<th>Iaf [μA] @Vgs=30V</th>
<th>Iaf [μA] @Vgs=45V</th>
<th>Tj [°C] max</th>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT2412NZ</td>
<td>1700</td>
<td>460 to 920</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2430NZ</td>
<td>1700</td>
<td>410 to 820</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2450NZ</td>
<td>1700</td>
<td>360 to 720</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2470NZ</td>
<td>1700</td>
<td>310 to 620</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2490NZ</td>
<td>1700</td>
<td>260 to 520</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
</tbody>
</table>

SiC MOSFET

ROHM Semiconductor's line-up of 650V, 1200V and 1700V SiC MOSFETs is designed to deliver cost-effective and breakthrough performance in inverters and converters. The devices offer dramatically lower switching losses up to 90% less compared to traditional SiC IGBT.

Key Features
- High-speed switching
- Qualified body-diode with low reverse recovery
- Low switching losses
- High temp. operation (Tj max=175°C)
- High reliability (e.g. Gate oxide)
- Low Vth shift

Applications
- PFC/SMPS/Aux Power Supply
- Renewable Energy Inverter/Converter
- EV/HEV Inverter and Chargers
- Induction Heating/Welding
- HVDC
- Motor Drivers

Lineup 2nd Generation

<table>
<thead>
<tr>
<th>Part No.</th>
<th>VDD [V]</th>
<th>RDS(son) typ. [mΩ]</th>
<th>Iaf [μA] @Vgs=15V</th>
<th>Iaf [μA] @Vgs=30V</th>
<th>Iaf [μA] @Vgs=45V</th>
<th>Tj [°C] max</th>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT2450KE</td>
<td>1200</td>
<td>500 to 1000</td>
<td>60</td>
<td>100</td>
<td>140</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2800KE</td>
<td>1200</td>
<td>450 to 900</td>
<td>50</td>
<td>85</td>
<td>120</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2160KE</td>
<td>1200</td>
<td>400 to 800</td>
<td>40</td>
<td>70</td>
<td>105</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2280KE</td>
<td>1200</td>
<td>350 to 700</td>
<td>30</td>
<td>55</td>
<td>85</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2450KE</td>
<td>1200</td>
<td>300 to 600</td>
<td>20</td>
<td>40</td>
<td>65</td>
<td>175</td>
<td>TO-247</td>
<td>Dual Chip</td>
</tr>
</tbody>
</table>

1700V SiC-MOSFET

ROHM Semiconductor develops a new 1700V series of SiC MOSFETs which makes SiC an option for new applications like AC/DC or DC/DC converters. e.g. Auxiliary Power Supplies.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>VDD [V]</th>
<th>RDS(son) non gate-latched [mΩ]</th>
<th>Iaf [μA] @Vgs=15V</th>
<th>Iaf [μA] @Vgs=30V</th>
<th>Iaf [μA] @Vgs=45V</th>
<th>Tj [°C] max</th>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT2412NZ</td>
<td>1700</td>
<td>460 to 920</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2430NZ</td>
<td>1700</td>
<td>410 to 820</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2450NZ</td>
<td>1700</td>
<td>360 to 720</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2470NZ</td>
<td>1700</td>
<td>310 to 620</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
<tr>
<td>SCT2490NZ</td>
<td>1700</td>
<td>260 to 520</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>175</td>
<td>TO-248-2L</td>
<td>Dual Chip</td>
</tr>
</tbody>
</table>
The NCS3 series of DC/DC converters offers a single output voltage from input voltage ranges of 9-36V and 18-75V.

The NCS3 is housed in an industry standard package with a standard pinout.

The CRE1 series is a cost effective 1W DC/DC converter series in industry standard packages with industry standard pinout. Popular input and output voltages are available. The galvanic isolation allows the device to be configured to provide an isolated negative rail in systems where only positive rails exist.

**NCS3 Series**

Isolated 3W 4:1 Input Single Output DC/DC Converters

**CRE1 Series**

Isolated 1W Single Output Isolated DC/DC Converters

### Features & Benefits
- UL 60950 recognised
- 4:1 wide range voltage input
- Operating temperature range -40°C to 85°C with derating
- 1.5 kV<sub>ISO</sub> isolation 'Hi Pot Test'
- 3.3V, 5V, 12V & 15V outputs
- No electrolytic capacitors
- Continuous short circuit protection

### Applications
- Telecommunications
- Battery powered systems
- Process control
- Distributed power systems

### Features
- UL 60950 recognition pending
- Single isolated output
- 1kV<sub>DC</sub> or 3kV<sub>DC</sub> option 'Hi Pot Test'
- Wide temperature performance at full 1W load -40°C to 85°C

### Selection Guide

#### NCS3 Series

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage</th>
<th>Output Voltage</th>
<th>Minimum Load</th>
<th>Rated Input Current</th>
<th>Rated Input Current</th>
<th>Output Current</th>
<th>Efficiency 12V or 48V Input</th>
<th>Efficiency 24V Input</th>
<th>Ripple and Noise</th>
<th>MTTF&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCS3S1203SC</td>
<td>12</td>
<td>3.3</td>
<td>0</td>
<td>10</td>
<td>250</td>
<td>125</td>
<td>700</td>
<td>74</td>
<td>77</td>
<td>73</td>
</tr>
<tr>
<td>NCS3S1205SC</td>
<td>12</td>
<td>5</td>
<td>0</td>
<td>150</td>
<td>360</td>
<td>150</td>
<td>600</td>
<td>79</td>
<td>82</td>
<td>79</td>
</tr>
<tr>
<td>NCS3S1212SC</td>
<td>12</td>
<td>12</td>
<td>0</td>
<td>300</td>
<td>350</td>
<td>250</td>
<td>81</td>
<td>84</td>
<td>84</td>
<td>80</td>
</tr>
<tr>
<td>NCS3S1215SC</td>
<td>12</td>
<td>15</td>
<td>0</td>
<td>400</td>
<td>350</td>
<td>350</td>
<td>82</td>
<td>86</td>
<td>81</td>
<td>85</td>
</tr>
<tr>
<td>NCS3S4803SC</td>
<td>48</td>
<td>3.3</td>
<td>10</td>
<td>65</td>
<td>700</td>
<td>65</td>
<td>74</td>
<td>74</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>NCS3S4805SC</td>
<td>48</td>
<td>5</td>
<td>5</td>
<td>80</td>
<td>700</td>
<td>75</td>
<td>80</td>
<td>79</td>
<td>81</td>
<td>76</td>
</tr>
<tr>
<td>NCS3S4812SC</td>
<td>48</td>
<td>12</td>
<td>0</td>
<td>150</td>
<td>80</td>
<td>250</td>
<td>77</td>
<td>81</td>
<td>80</td>
<td>83</td>
</tr>
<tr>
<td>NCS3S4815SC</td>
<td>48</td>
<td>15</td>
<td>0</td>
<td>200</td>
<td>80</td>
<td>200</td>
<td>78</td>
<td>81</td>
<td>81</td>
<td>83</td>
</tr>
</tbody>
</table>

#### CRE1 Series

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Nominal Input Voltage</th>
<th>Output Voltage</th>
<th>Output Current</th>
<th>Load Regulation</th>
<th>Ripple &amp; Noise</th>
<th>Input Current at Rated Load</th>
<th>Efficiency</th>
<th>Isolation Capacitance</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRE1S0505DC</td>
<td>5</td>
<td>5</td>
<td>200</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>40</td>
<td>286</td>
</tr>
<tr>
<td>CRE1S0505SC</td>
<td>5</td>
<td>5</td>
<td>200</td>
<td>12</td>
<td>14</td>
<td>16</td>
<td>40</td>
<td>286</td>
</tr>
<tr>
<td>CRE1S0515SC</td>
<td>5</td>
<td>5</td>
<td>67</td>
<td>6</td>
<td>7.5</td>
<td>10</td>
<td>25</td>
<td>250</td>
</tr>
<tr>
<td>CRE1S1205SC</td>
<td>12</td>
<td>5</td>
<td>80</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>30</td>
<td>117</td>
</tr>
<tr>
<td>CRE1S1212SC</td>
<td>12</td>
<td>12</td>
<td>83</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>20</td>
<td>104</td>
</tr>
<tr>
<td>CRE1S2405SC</td>
<td>24</td>
<td>5</td>
<td>200</td>
<td>8.5</td>
<td>10</td>
<td>13</td>
<td>30</td>
<td>58</td>
</tr>
<tr>
<td>CRE1S2412SC</td>
<td>24</td>
<td>12</td>
<td>83</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>25</td>
<td>52</td>
</tr>
</tbody>
</table>

1) Calculated using MIL-HDBK-217 F/N2

---

16 Industrial | eMobility | Home Appliance
17 Industrial | eMobility | Home Appliance

www.rutronik.com/POWER
The MGJ1 series of DC/DC converters is ideal for powering 'high side' and 'low side' gate drive circuits for IGBTs and MOSFETs in bridge circuits. A choice of asymmetric output voltages allows optimum drive levels for best system efficiency. The MGJ1 series is characterised for high isolation requirements commonly seen in bridge circuits used in motor drives and inverters, while the MGJ1 industrial grade temperature rating and construction gives long service life and reliability.

### MGJ1 Series

**5.2kV<sub>DC</sub> Isolated 1W SM Gate Drive DC/DC Converters**

### Features & Benefits
- Patent pending
- Optimised bipolar output voltages for IGBT / MOSFET gate drives
- Reinforced insulation to UL 60950 recognition pending
- ANSI / AAMI ES60601-1 recognition pending
- 5.2kV<sub>DC</sub> isolation test voltage 'Hi Pot Test'

### Selection Guide
- Thermal shutdown
- Characterised partial discharge performance
- DC link voltage 3kV<sub>DC</sub>
- Ultra low coupling capacitance
- Surface mount package style
- Operation to 105°C
- Short circuit protection

### Order Code

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Nominal Input Voltage</th>
<th>Output Voltage 1</th>
<th>Output Voltage 2</th>
<th>Output Current 1</th>
<th>Output Current 2</th>
<th>Input Current at Rated Load</th>
<th>Output 1 Load Regulation</th>
<th>Output 2 Load Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGJ1D051505MPC</td>
<td>5V</td>
<td>15</td>
<td>.5</td>
<td>50</td>
<td>50</td>
<td>320</td>
<td>7</td>
<td>8.1</td>
</tr>
<tr>
<td>MGJ1D051510MPC</td>
<td>5V</td>
<td>15</td>
<td>.1</td>
<td>40</td>
<td>40</td>
<td>310</td>
<td>7.6</td>
<td>8.8</td>
</tr>
<tr>
<td>MGJ1D051905MPC</td>
<td>5V</td>
<td>19</td>
<td>.5</td>
<td>42</td>
<td>42</td>
<td>320</td>
<td>6.2</td>
<td>7.4</td>
</tr>
<tr>
<td>MGJ1D121505MPC</td>
<td>12V</td>
<td>15</td>
<td>.5</td>
<td>50</td>
<td>50</td>
<td>115</td>
<td>5.6</td>
<td>6.6</td>
</tr>
<tr>
<td>MGJ1D121509MPC</td>
<td>12V</td>
<td>15</td>
<td>.9</td>
<td>42</td>
<td>42</td>
<td>115</td>
<td>6.6</td>
<td>7.6</td>
</tr>
<tr>
<td>MGJ1D121905MPC</td>
<td>12V</td>
<td>19</td>
<td>.5</td>
<td>42</td>
<td>42</td>
<td>115</td>
<td>5.1</td>
<td>6</td>
</tr>
<tr>
<td>MGJ1D241505MPC</td>
<td>24V</td>
<td>15</td>
<td>.5</td>
<td>50</td>
<td>50</td>
<td>65</td>
<td>3.8</td>
<td>5.2</td>
</tr>
<tr>
<td>MGJ1D241509MPC</td>
<td>24V</td>
<td>15</td>
<td>.9</td>
<td>42</td>
<td>42</td>
<td>65</td>
<td>4.5</td>
<td>6</td>
</tr>
<tr>
<td>MGJ1D241905MPC</td>
<td>24V</td>
<td>19</td>
<td>.5</td>
<td>42</td>
<td>42</td>
<td>65</td>
<td>3.4</td>
<td>4.5</td>
</tr>
</tbody>
</table>

1) Components are supplied in tape and reel packaging; please refer to package specification section. Orderable part numbers are MGJ1D051505MPC-R7 (80 pieces per reel), or MGJ1D051509MPC-R13 (400 pieces per reel).

2) Calculated using MIL-HDBK-217 FN2 and Telcordia SR-332 calculation model with nominal input voltage at full load.

3) See ripple & noise test method. All specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.
High-Isoation DC/DC Converters for Gate Drivers

AC/DC inverters found in frequency inverter applications are often floated a few hundred volts. Most applications typically are using an isolation level which is twice the working voltage in order to remain safe. Taking into account the rapid switching rates and high floating voltages, converters with high degrees of isolation are needed to power up these gate drivers. Optocouplers act as a barrier for the control signal, but there is also a need for an insulator on the power side. RECOM’s specialized converters for gate-drivers combine the asymmetric voltages often necessary for optimized switching into one module. Whether IGBT or SiC MOSFET, RECOM’s specialized DC/DC converters are simple drop-in modules to extend the lifetime and reliability of these AC/DC inverters.

**IGBT**
- RxxP2xx, RxxPxx, RP, RH & RKZ series in a compact SIP7 case
- RV & RGZ series in a low profile DIP14 and mini DIP24 case
- +15V and -9V outputs
- Up to 6.4kVDC, isolation

**SiC**
- RxxP22005D, RKZ-xx2005D series in a compact SIP7 case
- +20V and -5V outputs
- Up to 6.4kVDC isolation
- 5V, 12V, 15V or 24V inputs

R-78 Series – Wide Input Switching Regulators for Battery-Driven Systems

RECOM’s R-78 series is the original non-isolated, high-efficiency switching regulator, designed as a pin compatible drop-in replacement for LM78 linear regulators with no heatsink required! They offer all the advantages of a switching regulator – high-efficiency, wide input voltage range, and accurate output voltage regulation - with a low cost for production quantities. The R-78 series offers a risk-free, pre-tested solution that makes designing a switching regulator circuit unnecessary. It meets all of the most commonly requested specifications yet makes no compromise in quality and reliability as it is guaranteed with a full 3-year warranty.

Applications best utilizing the R-78 switching converters include replacement of up to 3A linear regulators in power supplies (unlike linear regulators, Recom converters can be run continuously at 100% load without the need for derating), industrial 24VDC Power supplies, high voltage battery powered supplies (24V, 48V or 60V battery packs) and universal input power supplies (e.g. a 5V regulated output from any supply voltage between 9V and 72V).

**Features**
- Drop-in replacement for LM78xx
- Point-of-load
- Distributed supply systems
- Battery operated systems
- Controllers and sensors
- Positioning systems
- Robotics
- Medical
- Telecommunications
- Measurement equipment

**Applications**
- Drop-in replacement for LM78xx
- Wide input range 18V to 72V - can be used within 24V, 48V or 60V batteries
- 12V output for interface and display electronics
- 5V high current output for digital electronics
- Further decoupling filtering may be necessary between the converters

Typical Application Regulated Low Voltage Supplies
STSPIN Low-voltage Monolithic Motor Drivers Deliver Best-In-Class Performance for Battery-Operated Systems

ST’s new STSPIN low-voltage monolithic motor drivers with their 3x3mm QFN package are the smallest ICs in the world that integrate a power stage to drive stepper, single and double DC as well as 3-phase brushless DC motors. Furthermore, they are optimized for the requirements of battery-operated systems in terms of low input voltage, low noise, and minimal power consumption at full load as well as in standby conditions. Finally they provide accurate positioning and unprecedented smoothness of motion with up to 256 microsteps per full step.

Key Features & Benefits
- Extremely low operating voltage
- 1.8 – 10V, ideal for low-voltage, battery-operated motors
- High output current up to 1.3 ARMS for each full-bridge
- Energy saving and long battery life with best-in-class standby consumption down to 80nA
- Extreme position accuracy and motion smoothness with up to 256 microsteps per full step (STSPIN220)
- Maximum reliability UVLO, over-current and thermal protection
- Ultra-miniaturized 3x3mm QFN package

Targeted Applications
- Robotics
- Portable medical equipment
- Healthcare and wellness devices (shavers and toothbrushes)
- Portable printers
- Point of sale (POS) devices
- Toys

Resistors in Automation
Brake
Braking resistors for frequency converters have an overload capacity of up to 250xPnom. For the limitation of high inrush currents and the reduction of discharge time of DC-links.

Charge/Discharge
For the limitation of high inrush currents and the reduction of discharge time of DC-links.

<table>
<thead>
<tr>
<th>HPR 800 - 2500 High-Power Resistors in a Metal Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power rating: 750...2500W</td>
</tr>
<tr>
<td>Dimensions: 340x50x100...800x50x100mm</td>
</tr>
<tr>
<td>Resistance range: 90...330Ω</td>
</tr>
<tr>
<td>Tolerance: ±5%...±10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ZDFL Flat Oval with Srew Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power rating: 40...100W</td>
</tr>
<tr>
<td>Dimensions: 9x27x50...12x45x250mm</td>
</tr>
<tr>
<td>Resistance range: 22...100Ω</td>
</tr>
<tr>
<td>Tolerance: ±5%...±10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HWG Series Enclosed High Power Resistors with Protection Against Direct Contact, Assembled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power rating: 750...3000W</td>
</tr>
<tr>
<td>Dimensions: 485x95x170...845x185x170mm</td>
</tr>
<tr>
<td>Resistance range: on request</td>
</tr>
<tr>
<td>Tolerance: ±5%...±10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HPRF Series High-Power Resistors in a Metal Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power rating: 100...200W</td>
</tr>
<tr>
<td>Dimensions: 110x80x15...216x80x15mm</td>
</tr>
<tr>
<td>Resistance range: 12...200Ω</td>
</tr>
<tr>
<td>Tolerance: ±1%...±10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HPRU Series Wire Wound Resistors in Aluminum Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power rating: 150W/300W; standard/with cooling plate</td>
</tr>
<tr>
<td>Dimensions: 200x42.5x29mm</td>
</tr>
<tr>
<td>Resistance range: 1.0...250Ω</td>
</tr>
<tr>
<td>Tolerance: ±5%...±10%</td>
</tr>
</tbody>
</table>
Aluminium Electrolytic Capacitors for Rigid Applications
Focus Snap-In Series for DC-Link Circuits

**Ultra miniaturized**
- Case size: 20x25 to 35x60mm
- Capacitance: 390 to 2700μF
- Rated voltage: 400 to 450V
- Inverter

**High reliability**
- Multi pin
- Low thermal resistance
- High temperature
- High reliability
- Extreme performance

**Energy storage**
- Case size: 8x25 to 18x50mm
- Rated voltage: 10 to 500V
- Stud mounting
- Long life
- Higher power density (CV value) in same case size for
  - Case size: 22x25 to 35x60mm
  - Super long life
  - Low thermal resistance
  - High ripple current
  - Rated voltage: 350 to 450V

**Focus Snap-In Series for DC-Link Circuits**
- Rated voltage: 160 to 450V
- Screw type capacitors with stud mounting for reduced
  - Case size: 22x25 to 35x60mm

**Variants**
- **MXG 105°C 3000h**
  - Standard
  - Rated voltage: 10 to 500V
  - Capacitance: 39 to 68000μF
  - Case size: 20x25 to 35x60mm

- **HXG 105°C 3000h**
  - High Ripple
  - Miniaturized
  - Rated voltage: 400 to 450V
  - Capacitance: 65 to 680μF
  - Case size: 22x25 to 35x60mm

- **VXG 105°C 5000h**
  - Long life
  - Rated voltage: 10 to 500V
  - Capacitance: 47 to 5600μF
  - Case size: 22x25 to 35x60mm

- **VXR 105°C 7000h**
  - Super long life
  - Rated voltage: 160 to 450V
  - Capacitance: 39 to 220μF
  - Case size: 22x25 to 35x50mm

- **NXG 105°C 10000h**
  - Super long life
  - Rated voltage: 400 to 450V
  - Capacitance: 120 to 680μF
  - Case size: 20x45 to 35x50mm

**High Performance Radial Series and Special Terminals with Low Thermal Resistance**
For Your Applications with Special Demands

**Features**
- Up to 580V
- Stud mounting
- Multi pin
- Low thermal resistance
- High temperature
- High reliability
- Extreme performance

**Benefits**
- Miniaturized Snap-In capacitors utilizing high density foil to fit into low profile cases
- Higher power density (CV value) in same case size for high power inverters
- Screw type capacitors for very low thermal resistance and high ripple current
- Screw type capacitors with stud mounting for reduced mounting area and improved heat transfer

**Applications**
- Power supply
- Inverter
- Energy storage

**Variants**
- **HFG 105°C 5000h**
  - High ripple current
  - Added high capacitance items by increased case length (4pin)
  - Rated voltage: 350 to 450V
  - Capacitance: 390 to 2700μF

- **LUR 85°C 5000h**
  - Long life
  - Low thermal resistance
  - High ripple current
  - Rated voltage: 350 to 500V

- **LHR 105°C 5000h**
  - Long life
  - Low thermal resistance
  - High ripple current
  - Rated voltage: 350 to 450V

- **CXW 105°C 5000h**
  - Bigger than QXW series, but longer life
  - Same ripple as QXW series
  - Rated voltage: 400 to 450V
  - Capacitance: 12 to 220μF
  - Case size: 8x25 to 18x50mm

- **QXW 105°C 2000h**
  - Ultra miniaturized
  - Rated voltage: 400 to 450V
  - Capacitance: 12 to 220μF
  - Case size: 8x25 to 18x50mm

- **BXW 105°C 12000h**
  - Ultra miniaturized
  - Rated voltage: 160 to 450V
  - Capacitance: 10 to 820μF
  - Broad range of case sizes
AVX Film Capacitors

AVX offers wide range of film dielectric components including low power SMD solutions for the commercial and automotive industry and medium power film capacitors suited to all power electronic applications.

SMD Chip Film Capacitors

- Self healing property for high dielectric strength
- No piezo effect
- Low ESL/ESR
- Low DC Bias
- Excellent thermal behavior

Medium Power Capacitors

- Case Size: 1206 - 6054
- Working Voltage: 16V – 630V
- Capacitance: 1nF – 4.7µF

Features & Benefits

- High peak current capabilities
- High RMS current capabilities
- Lifetime > 100.000h
- Halogen free materials

Applications

- Automotive
- HEV and PHEV
- Inductive heating
- Industrial/Professional
- Renewable/Smart Energy
- Power Electronics
- Medical

Medium Power Film

- Case Size: Radial, Axial, custom
- Working Voltage: 75V – 3kV
- Capacitance: 0.01µF – 25500µF

Film Capacitors

Film capacitors satisfy a large variety of electronic applications, because the dielectrics have excellent electrical characteristics, high stability and a long life time.

DC-Link MKP1848 Family Series

DC-link capacitors act as energy buffer between the DC/DC converter and the AC/DC inverter. DC/DC converters are used in switch-mode power supplies.

Features & Benefits

- High peak current capabilities
- High RMS current capabilities
- Lifetime > 100.000h
- Halogen free materials

Applications

- Automotive AEC-Q200 approved
- MKP1848 – High density economic pack
- MKP1848S – Slim low building height design
- Broadest capacitance range in the market
- Proven reliability with zero field

For the following applications Vishay recommends these appropriate film capacitors:

AC Motor Drives

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Type</th>
<th>Function</th>
<th>Family</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC</td>
<td>RFI</td>
<td>X1</td>
<td>338 1</td>
<td></td>
</tr>
<tr>
<td>EMC</td>
<td>RFI</td>
<td>Y2</td>
<td>338 6</td>
<td></td>
</tr>
<tr>
<td>Buffer</td>
<td>DC-link</td>
<td>DC &amp; ripple</td>
<td>MKP1848</td>
<td></td>
</tr>
<tr>
<td>Snubber</td>
<td>AC &amp; Pulse</td>
<td>Reduce spikes</td>
<td>383 / 386M</td>
<td></td>
</tr>
</tbody>
</table>

Industrial UPS

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Type</th>
<th>Function</th>
<th>Family</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC (Input)</td>
<td>RFI</td>
<td>X2</td>
<td>339 (310Vdc)</td>
<td></td>
</tr>
<tr>
<td>EMC (Input)</td>
<td>RFI</td>
<td>Y2</td>
<td>338 6</td>
<td></td>
</tr>
<tr>
<td>EMC (Output)</td>
<td>AC &amp; Pulse</td>
<td>AC</td>
<td>383 / 375</td>
<td></td>
</tr>
<tr>
<td>Snubber</td>
<td>AC &amp; Pulse</td>
<td>Reduce spikes</td>
<td>MKP1848</td>
<td></td>
</tr>
<tr>
<td>Buffer</td>
<td>DC-link</td>
<td>DC &amp; ripple</td>
<td>MKP1848</td>
<td></td>
</tr>
</tbody>
</table>

3 Phase Solar String Inverter

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Function</th>
<th>Product Family</th>
<th>C-range</th>
<th>V-range</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC</td>
<td>X1</td>
<td>F 338 1</td>
<td>10V...1µF</td>
<td>440 Vac</td>
<td>2 and 4 Piss</td>
</tr>
<tr>
<td>EMC</td>
<td>Y2</td>
<td>RFI F 338 6</td>
<td>1µF...470µF</td>
<td>300 Vac</td>
<td>2 Piss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BFC2 338 6</td>
<td>1µF...470µF</td>
<td>300 Vac</td>
<td>2 Piss</td>
</tr>
</tbody>
</table>

Single Phase Solar String Inverter

<table>
<thead>
<tr>
<th>Capacitor</th>
<th>Function</th>
<th>Product Family</th>
<th>C-range</th>
<th>V-range</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC</td>
<td>X1</td>
<td>RFI F 339M</td>
<td>10µF...470µF</td>
<td>310 Vac</td>
<td>2 and 4 Piss</td>
</tr>
<tr>
<td>EMC</td>
<td>Y2</td>
<td>RFI F 339M</td>
<td>1µF...470µF</td>
<td>300 Vac</td>
<td>2 Piss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>BFC2 336 6</td>
<td>1µF...470µF</td>
<td>300 Vac</td>
<td>2 Piss</td>
</tr>
</tbody>
</table>

Industrieel Mobility | Home Appliance | www.rutronik.com/POWER
Keko Varicon is a Europe based manufacturer of overvoltage protection with over half a century of production history. Keko Varicon offers one of the widest ranges of varistors and dual function components that comprise both, a varistor and a capacitor. Keko Varicon is a ISO/TS 16949 certified company with UL, VDE approvals among others.

Features

- **Varistors for SPD Class I:**
  - High Iimp up to 12.5kA (10/350μs) – stacked varistors
  - High Inom up to 30kA (8/20μs) – stacked varistors

- **Varistors for SPD Class II & III:**
  - High Imax up to 45kA (8/20μs) – single disc varistors
  - High Inom up to 20kA (8/20μs) – single disc varistors

Available Product Series

- ZOV, ZOVR, ZOVS, ZOVH

Applications

- Up to 12.5kA (10/350 pulse)
- DC voltage range from 83V to 900V
- AC voltage range from 60V to 680V
- Custom design size and shape
- Traffic and railway signal systems
- Railroad equipment
- Mobile power supply stations
- Switch boards
- Power supplies and motor controls in transportation
- Industrial and consumer electrical equipment

Features

- Varistors for SPD Class I:
  - High limp up to 12.5kA (10/350μs) – stacked varistors
  - High Inom up to 30kA (8/20μs) – stacked varistors

AVX Ceramic Capacitors

AVX Ceramic Capacitors exhibit low parasitics and excellent EMI filtering capabilities. AVX MLC Capacitors are available in a wide range of values, styles, voltage ratings and dielectrics.

Features & Benefits

- Low ESR and ESL
- High Q/ Ultra low ESR series
- High reliability
- Flexible termination available for SMD
- Low inductance series capacitors
- SMPS Capacitors with excellent high frequency performance
- RoHS Compliant

Applications

AVX Capacitors are used in wide range of application sectors such as:
- Industrial/Professional
- Consumer
- Commercial
- Home appliances
- Automation
- Lighting
- Automotive (AEC-Q200)
- Renewable/Smart Energy

Some of the innovative AVX solutions include

- **FLEXITERM™** capacitors have superior resistance to both:
  - Mechanical stress (board flexure - 5mm bend test guaranteed) and
  - Thermal stress (increased temperature cycling performance, 3000 cycles and beyond).
- **FLEXISAFE** – Specifically designed with an industry leading set of safety features for safety critical applications. Combines FLEXITERM™ layer in conjunction with the cascade design.

Case Sizes

- SMT: 01005 - 2225 EIA
- SMT Array: 0508 2x Array
- 0508 4xArray
- 0612 4xArray
- Leaded: Axial and Radial
- Stacked

Electrical Characteristics

- Working Voltage: 4.0 - 5000Vdc
- Capacitance: 0.1pF - 1300µF
- Dielectric: NP0, X8R, X8L, X7R, X7S, X6S, X5R, Y5V

AVX Ceramic capacitors are available in single element 01005 to 2225 case size, multiple element 0508 and 0612 arrays. SMPS capacitors are supplied in stacked configuration with through-hole technology or SMT leads. Through-hole technology components are supplied as conformally epoxy coated axial and radial devices.
SIDEWINDER® Current Sensor
PA320XNL Series

The Pulse Sidewinder® products are the ultimate evolution of the Rogowski Coil principle for AC current sensing applications.

The Pulse Sidewinder® patent pending winding technique has been engineered to provide highly linear output voltage over a very wide dynamic range from 0.1 to 1000 A, making them especially suited for applications such as distributed power generation, renewable energy and storage, load balancing, power monitoring, advanced metering infrastructure (AMI), circuit breaker panels and smart meters.

Features
- 50/60 Hz, Single Phase, AC Current Sensor
- Dynamic Range from 0.1 to 1000 Amps
- Meets ANSI C12.20 Accuracy Class 0.2
- Meets IEC 62053-21 class 1
- Phase error < 0.05 degree
- Bandwidth 500KHz
- Immune to external AC magnetic fields
- Immune to DC current & DC magnetic field
- Very low temperature coefficient
- Patent pending

Applications
- Distributed power generation
- Renewable energy and storage
- Load balancing
- Power monitoring
- Advanced metering infrastructure (AMI)
- Circuit breaker panels
- Smart meters

SMT Power Inductors
Flat Coils – PG0871NL Series

Our high quality flat coil inductors come in a shielded, surface mount (SMT) construction type. Rectangular cross-section wire wound into a helical coil gives our flat coil technology high current capacity in a low profile. The core material is typically powdered iron with the associated soft-saturation and low-noise benefits. Use the table below to search through our flat coil inductor products and access datasheets.

Features
- Current Rating: up to 28Apk
- Inductance Range: 0.46µH to 10.5µH
- Height: 6.4mm max
- Footprint: 7.6x7.4mm max

Power Inductor Requirements for better SMPS Design
The demand for higher power efficiencies and the proliferation of distributed-power architecture has forced many design engineers – some of whom are more comfortable working in the digital domain to turn their attention to system power requirements. Since these power considerations are no longer the preserve of the hardware design engineer, this article gives a step-by-step explanation of the fundamental requirements of power inductors in switch-mode power supplies (SMPS).

The Pulse Sidewinder® products are the ultimate evolution of the Rogowski Coil principle for AC current sensing applications. The Pulse Sidewinder® patent pending winding technique has been engineered to provide highly linear output voltage over a very wide dynamic range from 0.1 to 1000 A, making them especially suited for applications such as distributed power generation, renewable energy and storage, load balancing, power monitoring, advanced metering infrastructure (AMI), circuit breaker panels and smart meters.
SUMIDA Chokes – Solutions for Every Application

SUMIDA offers a wide range of chokes in many different technologies for automotive, industrial, medical and consumer applications. The product spectrum covers standard types as well as custom solutions – designed and manufactured on a highest quality level.

Benefits
- Compact component sizes
- Operating currents up to 100A
- Low losses / high efficiency
- High frequencies
- For automotive, industrial, medical and consumer applications
- Production possibilities in Europe and Asia
- Innovative and cost effective solutions (DTC approach)
- Rapid prototyping of new, customized core and bobbin geometries

Applications
- Common Mode Chokes (CMC)
- Differential Mode Chokes (DMC)
- Storage (output) chokes
- Power Factor Correction (PFC) chokes
- Used in Switch Mode Power Supplies (SMPS) and inverter circuits

Versions
- Horizontal / vertical designs
- Toroid / E- / U- and other core shapes
- Drum and rod core designs
- SMD / THD or customized connection technologies
- Potted / varnished versions if needed

Special Features
- According to international safety standards
- Insulation Systems on request
- Wide selection of ferrite, amorphous metal-compound and iron powder materials
- Many different winding and finishing technologies available
- Customized (application-specific) solutions possible
- Wide range of existing standard solutions
- Flexible pinning
- Extensive test and qualification capabilities e.g. temperature, shock, vibration, AEC-Q200 etc.

New Relays Improve Frequency Inverter Performance

Energy efficiency is key in the design of industrial frequency inverters – and relays play a major role in ensuring that it is achieved. Important factors in component selection are long electrical life and coil isolation.

G6DN AC Series
Omrion Electronic Components recently unveiled a new compact and efficient power relay for frequency inverters, the G6DN, capable of switching 5A at 250VAC.

Features
- Smallest design of its specification – 5mm thick x 20mm x 12.5mm high
- Low coil power consumption – just 110mW
- Electrical life of 80K operations at 5A / 250VAC

G7J AC Series
For high current applications, the G7J is a high capacity, high dielectric strength relay.

Features
- Switching currents up to 25A
- Available with up to 4 poles for switching 3 phase currents
- No contact chattering for momentary voltage drops up to 50% of rated voltage
- Withstanding more than 4kV between contacts of different polarity and between coil and contacts
- Full disconnection isolation (3mm) via open contact
- PCB and Wallmount types available

Alternative AC Solutions
- G7Z: DIN rail mounting type, four pole relay with a capacity of up to 160A when 4 contacts in parallel.
- G7L: a PCB mounting type, 1 or 2 pole relay with 20A to 30A contact rating, full disconnection isolation (3mm) via open contact
- G6RL: just 12.3mm high, able to interrupt 10A at 250VAC with a dielectric strength of 5kV between the coil and the contacts
- G5Q: which offers 8kV withstand and can switch up to 10A

Signal relays are also used in frequency inverters for alarm signalling, to trigger a brake mechanism or to control the input to a PLC. As an alternative to an electro-mechanical solution, MOSFET relays G3VM are finding growing acceptance in these applications. For Output Switching the G3MC, an SSR Relay, is able to switch up to 2A/250VAC, and is just 4.5mm thick.
SheerPwr™ Circular Connector
PCB-to-Busbar & PCB-to-PCB Connectors

Repeated Low Resistance & High Mis-Alignment
SheerPwr™ Circular is a high-current, low-resistance interface designed for connecting busbars to circuit boards. It uses a robust and compliant power contact assembled in a circular orientation. The result is a power socket, designed to mate with traditional machined pins, which provides repeated low resistance, high mis-alignment and high current carrying capabilities.

- **Features**
  - Large beam deflection range handles up to ±0.64mm permanent mis-alignment
  - Redundant contact points
  - Large gatherability
  - AGT® silver plated contacts
  - Low 6.8mm connector height
  - Low halogen materials
  - Provides a minimum of 4.0mm of gatherability, increases with pin diameter

- **Benefits**
  - When fully mis-aligned, all of the beams still make contact with the pin
  - Low and stable resistance
  - For blind-mate applications
  - Lower resistance
  - 70Amps, 120Amps or 160Amps per contact
  - Compact size fits in many applications and allows for greater airflow
  - Meets JEDEC JS709 Electronics Industry Standards

**Product Range for Extruded Profile Heatsinks**
- Flat back and double sided fin heatsink
- Flat-, quadrangular-, angled-, U & T- shape profile heatsinks
- Cannulated fin heatsinks
- Profiles incl. extruded rails for ASSMANN WSW clip system
- Customized profile heatsinks (hollow profiles, extruded thread)

**Features of Extruded Profile Heatsinks**
- Wide standard product range
- Material AL6063, AL6060
- Thermal resistance from 16K/W down to >0.5K/W
- Processing by modern CNC-milling and drilling machines
- Industrial or special decoration surface finish
- Welded profiles
- Design and development of customized profiles

**Applications for Large Extruded Profiles**
- Power supplies
- Amplifier (decoration surface finish)
- Frequency inverters
- High power application

**Target Markets/Applications**
- AC/DC pluggable power supplies
- Pluggable circuit breakers
- Networking equipment
- Switches
- Server
- Storage
- Industrial
- Medical

**Electrical Performance**
- Contact resistance: 0.05 to 0.1mΩ
- Current rating (30°C temperature rise in still air): 3.6mm - 70A, 6mm - 120A, 8mm - 160A
- Operating voltage: depends on application
- Dielectric withstand voltage: 1000V

**Extruded Profile Heatsinks**
for High Power Frequency Inverter Applications

In the field of high power applications like frequency inverters, ASSMANN WSW components with the experience of more than 45 years in thermal management offers a large range of massive extruded standard profile heatsinks.

Special solutions and developments with alternative materials, specific profile dimensions, modern CNC machining with necessary milling work (punching, drilling, threading), special profile shapes like hollow profiles, welded heatsinks, special anodization for visual and decorative surfaces or special packaging are available according to customer’s application.

The heatsink development for any applications begins with the construction of a suitable profile heatsink. The application itself with the important factors like heat development and the available space for an aluminum heatsink are needed.

An additional important aspect is also to minimize the thermal resistance. A high surface roughness of the devices and the heatsink itself can be avoided by several methods, such as mechanical CNC surface treatment or using thermal interface materials, such as conductive paste, adhesive or foil which ASSMANN WSW carries in their production range as well.

**Selection Guide**

<table>
<thead>
<tr>
<th>Receptacle Pin Diameter</th>
<th>Press-fit to PCB</th>
<th>Mating Plug Pin Diameter</th>
<th>Style A Press-fit to PCB</th>
<th>Stack Height *</th>
<th>Style B Press-fit to Busbar</th>
<th>Stack Height *</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6mm</td>
<td>10132381-20360LF</td>
<td>3.6mm</td>
<td>1014847-3630LF</td>
<td>42mm</td>
<td>10316755XXXX0LF</td>
<td>45mm</td>
</tr>
<tr>
<td>6.0mm</td>
<td>10132381-20600LF</td>
<td>6.0mm</td>
<td>10145555XXXX0LF</td>
<td>Follows customer application</td>
<td>10136655XXXX0LF</td>
<td>Follows customer application</td>
</tr>
<tr>
<td>8.0mm</td>
<td>10132381-20800LF</td>
<td>8.0mm</td>
<td>1014847-3000LF</td>
<td>Follows customer application</td>
<td>10119665XXXX0LF</td>
<td>Follows customer application</td>
</tr>
</tbody>
</table>

* Other stack heights available upon request
The PwrBlade ULTRA® connector is the newest addition to the PwrBlade® product line. This new design offers an overall height reduction of 24% to reduce airflow impedance in high density power supplies. Three contact choices are available: High Power, Low Power and Signal. Ultra-high conductivity materials and new highly conductive plating, combine to produce an ultra-low resistance of just 0.4mΩ at end-of-life conditions. The result is the lowest profile power distribution connector capable of delivering more than 200 Amps per linear inch.

Features
- Up to 65A per contact for high power and up to 25A per contact for low power
- 9.6mm height
- Highly vented housing design
- Halogen-free housing material
- Operating temperature ranges from -40°C to 125°C
- Right angle header, right angle receptacle and vertical receptacle types
- Number and placement of power and signal contacts are configurable for customer needs
- Solder or press-fit tails

Electrical Performance
- High power contact current: Up to 65A per contact at 30°C T-rise in still air
- Low power contact current rating: Up to 25A per contact at 30°C T-rise in still air
- Operating voltage:
  - High power on 7.00mm pitch - 400V
  - High power on 5.00mm pitch - 200V
  - Low power on 3.50mm pitch - 218V
- Dielectric withstand voltage: High/low power contacts: 2500V

Benefits
- Provide excellent power density and multiple power voltage
- Low profile configuration ideal for 1U power supplies or power distribution system
- Maximizes heat dissipation for effective system cooling
- Meets next-generation environmental requirements
- Adaptable to extreme environments
- For both co-planar applications and backplane applications
- Design flexibility and choices for customers
- Termination flexibility

Electrical Performance
- Insulation resistance: > 1000mΩ max. at end of life
- Contact resistance
  - Power contact: 0.4mΩ max. at end of life
  - Signal contact: 20mΩ max. at end of life

PwrBlade ULTRA® Connector System

PwrMAX® Ortho Power Connector
100Amps, Orthogonal Application Power Connector

The PwrMAX® Ortho power connector offers a compact means for connecting up to 100A DC power in a pcb edge-to-pcb edge application. The blind mate connector offers low resistance to satisfy modern orthogonal systems architectures.

Features
- 100A per contact
- Supports airflow passage around and through the connector, eliminating midplane and backplane air blockage
- GCS™ plating technology
- Press-fit terminated
- Rugged chamfered housings
- Industry-proven contact design with 10 points of contact
- High temperature thermoplastic housing
- Halogen-free housing

Benefits
- Provides very low resistance and low voltage drop
- Supports both PCB and busbar applications
- Supports ± 3.5mm gatherability
- Provides superior and long term reliability
- Wide operating temperature from -40°C to +125°C
- Meets next generation environmental requirements

Electrical Performance
- Current Rating (30°C temperature rise in still air): up to 100A per contact
- Operating Voltage: up to 400VDC
- Dielectric Withstanding Voltage: 1800V
- Insulation Resistance: 10,000MΩ
- Contact Resistance: 0.3mΩ max. at end-of-life conditions

PwrMAX® Ortho Power Connector
100Amps, Orthogonal Application Power Connector

<table>
<thead>
<tr>
<th>Description</th>
<th>Mouting Style</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>PwrMAX® Ortho Right Angle Header</td>
<td>PCB boardlocks</td>
<td>10132640-001LF</td>
</tr>
<tr>
<td>PwrMAX® Ortho Right Angle Receptacle</td>
<td>PCB retention pegs</td>
<td>10132644-001LF</td>
</tr>
<tr>
<td>PwrMAX® Ortho Vertical Receptacle</td>
<td>PCB retention pegs</td>
<td>10133407-002LF</td>
</tr>
</tbody>
</table>

Part Numbers
Connectors for Energy Saving and Storage

**WP10 Series**
For compact hand-held devices such as smartphones, wearable devices and tablet PCs, the needs for larger battery capacity and faster charging are becoming prominent, and high current capable internal connectors are required to connect the battery and the power supply circuit.

**Features**
- 2 rows, 0.7mm stacking height, 2.2mm width
- Power terminals compatible with 10A power and 10A return.
- 2-point contact structure for all terminals to ensure reliable connection under twisting stress, and to enhance retention strength.
- Durable hold-down structure which has a lock area that enhances retention force, and adds protection to the mating surface to prevent damage to the plastic insulator. (Armored)
- Improved workability with a clear click feeling.
- Contact structure ensures high wear-resistance and high connection reliability.
- Pb-free. (Nickel barrier in contact finish prevents solder migration)

**Applicable Markets**
- Smartphones, wearable devices, tablet PCs, laptop PCs, digital still cameras, digital video cameras, and other compact hand-held devices

**DW07 Series**
JAE has developed and started general sales of the DW07 Series connector, which was designed for busbar connection of devices requiring high-current power lines.

**Features**
- Floating connection: The DW07 Series compensates for mis-alignment between the rigid busbars being connected
- Flexible current amount: The required electrical current can be attained by the number of connectors used.
- Attachment without using screws: Connector attaches easily with one hand by clipping onto mating holes in the busbar.

**Specifications**
- Contact Resistance: 0.13 mΩ max. (initial), 0.16 mΩ max. (post-test)
- Insertion Force: 120N max.
- Extraction Force: 50N max.
- Durability: 100 times
- Operating Temp.: -25°C to +105°C

**Applicable Markets**
- Electric conversion and energy storage applications, and other applications using busbars.
- Communication facilities and industrial equipment using busbars.

**KN01 Series**
The KN01 Series is a waterproof, lightweight, high-density rectangular connector with a great variety of wiring variation and superior operability. The insulator being a block style with an insert structure that can be customized to comply with various pin counts offers a great flexibility to meet broad customer demands.

**Features**
- Rack and pinion structure allows for little operating force for engagement.
- Enhanced safety where the lever is stationary before mating and dual lock to prevent incorrect operation after mating.
- Arrangement of insulator block, with insertion orientation selection (pin or socket insert can be selected based on application requirement), allows for suitable pin counts and arrangement.
- Insulator with EMI noise control shielding as an option in the lineup, to be allow combined use of power and signal lines in a single unit.

**Applicable Markets**
- Factory automation equipment, such as robotics, automation machines and other machine tools requiring environmental resilience.
- Industrial devices, communication devices, medical equipment and general devices requiring multi-contact wiring connection

High-current Connector for Green Energy

**DW Series**
Along with the expansion of green energy such as solar power generation, in order to stabilize current for electric power stations and to respond to the peak cut and shift in offices and HEMS at home for power-saving, the usage of storage battery systems to store electricity temporarily is increasing in a proactive manner.

Recently, the lithium-ion type storage battery is increasing for storage systems. Add to the power supply type, we have proposed a rack and panel type complex connector with a signal contact to check the condition of cell in consideration of the character which every cell has some variation in the amount of accumulation of electricity. The DW Series connector could reduce manufacturing work time for customers and is available in four kinds of product lineup including cable type for small-scale storage.

**Features & Benefits**
- Power and signal contacts in one robust insulator
- Easy to harness signal contact unit
- High reliability
- One side floats when mounted for easy mating
- Electric shock prevention
- Electrification countermeasure
- UL approved

**Applications**
- Storage Battery Systems
- Power Supply Systems
- Power Supply control equipment

**Electrical Characteristics**
- Current Rating: 150A-500A
- No of contacts: 1 to 2 pos.
- Operating temperature: -40°C to +105°C
### Selection Guide

#### Battery/Hybrid Module
- **Battery Load Switch**
- **Battery Management**
- **DC/DC Power Management**
- **Gate Driver**
- **3-Phase Inverter**
- **Position Sensing**
- **Current Sensing**
- **Hall & GMR Sensor**
- **Microcontroller**
- **Status Indication**
- **Digital Power Control**
- **User Interface**

#### Action
- **Battery**
- **Load Switch**
- **Management**
- **DC/DC**

#### Passive
- **Capacitor (Foil)**
- **Resistor**
- **MLCC**
- **Transformer**
- **Diode (Protection)**

#### Active
- **MOSFet (N-Channel)**
- **IGBT**
- **IGBT (Modul)**
- **MOSFet (Protected)**
- **Transistor (Bipolar)**
- **Transistor (Digital)**
- **Motor Control IC**
- **Motor Control IC (Embedded Power)**

#### Connectors
- **Heatsink (Extruded profile)**
- **Relay**
- **Connector**

#### Heatsink
- **(Round pin fin CPU)**
- **(Stamped finger shaped)**
- **(SMD & copper)**

#### Embedded
- **Resistor**
- **Varistor**
- **Capacitor (Foil)**
- **MLCC**
- **Capacitor (Electrolyte)**
- **Capacitor (Foil)**
- **Capacitor (EDLC)**
- **MLCC**
- **Varistor**
- **Resistor**
- **Capacitor (Foil)**

#### Legend
- **Application:** up to 60KW
- **Battery:** up to 1200Ah
- **24V | 48V | 80V**
- **Battery weight:** 2800 kg
- **Forkliftmotor**
- **Drivemotor**
- **Steerancemotor**
- **Tiltmotor**

### E-Mech

#### Passive
- **Capacitor (Foil)**
- **Resistor**
- **MLCC**
- **Transformer**
- **Diode (Protection)**

#### Active
- **MOSFet (N-Channel)**
- **IGBT**
- **IGBT (Modul)**
- **MOSFet (Protected)**
- **Transistor (Bipolar)**
- **Transistor (Digital)**
- **Motor Control IC**
- **Motor Control IC (Embedded Power)**

#### Connectors
- **Heatsink (Extruded profile)**
- **Relay**
- **Connector**

#### Heatsink
- **(Round pin fin CPU)**
- **(Stamped finger shaped)**
- **(SMD & copper)**

#### Embedded
- **Resistor**
- **Varistor**
- **Capacitor (Foil)**
- **MLCC**
- **Capacitor (Electrolyte)**
- **Capacitor (Foil)**
- **Capacitor (EDLC)**
- **MLCC**
- **Varistor**
- **Resistor**
- **Capacitor (Foil)**

### E-Mech

#### Passive
- **Capacitor (Foil)**
- **Resistor**
- **MLCC**
- **Transformer**
- **Diode (Protection)**

#### Active
- **MOSFet (N-Channel)**
- **IGBT**
- **IGBT (Modul)**
- **MOSFet (Protected)**
- **Transistor (Bipolar)**
- **Transistor (Digital)**
- **Motor Control IC**
- **Motor Control IC (Embedded Power)**

#### Connectors
- **Heatsink (Extruded profile)**
- **Relay**
- **Connector**

#### Heatsink
- **(Round pin fin CPU)**
- **(Stamped finger shaped)**
- **(SMD & copper)**

#### Embedded
- **Resistor**
- **Varistor**
- **Capacitor (Foil)**
- **MLCC**
- **Capacitor (Electrolyte)**
- **Capacitor (Foil)**
- **Capacitor (EDLC)**
- **MLCC**
- **Varistor**
- **Resistor**
- **Capacitor (Foil)**

### Selection Guide

#### Table

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Passive</th>
<th>Active</th>
<th>Embedded</th>
<th>Power Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Diagram

- **Application:** up to 60KW
- **Battery:** up to 1200Ah
- **24V | 48V | 80V**
- **Battery weight:** 2800 kg

---

**Contact:**
- [Rutronik](www.rutronik.com/POWER)
- [eMobility](www.rutronik.com/eMobility)
- [Home Appliance](www.rutronik.com/HomeAppliance)
MOSFETs and Gate Drivers for BLDC Motors

Brushless DC (BLDC) motor control provides improved performance, longer lifetime, reduced noise and greater ease of use when compared to equivalent mechanical solutions. Consequently, three phase BLDC motor systems are widely used in eMobility, forklifts, pumps, industrial automation, and white goods. The motor power will depend on the application's performance requirements. In BLDC motor systems, MOSFETs and Gate Drivers are typically configured in a three phase bridge arrangement to drive the DC motor and must be capable of handling start-up and stalled motor currents up to six times the continuous current rating of the motor.

### Features
- Iq up to 100A (Tj=25°C)
- Logic level for direct drive from MCU
- Avalanche Rugged (100% UIS)
- Low Figure of Merit (FOM)
- DMTH = 175°C max Tj
- AEC-Q101 Qualified
- Automotive Q-parts available

### Application Examples

**40V MOSFETs for BLDC Motors**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Vds (V)</th>
<th>Rsd (mΩ) @10V</th>
<th>Rsd (mΩ) @4.5V</th>
<th>Qg (nC)</th>
<th>Qgs (nC)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMTH4004SFS</td>
<td>40</td>
<td>2.3</td>
<td>-</td>
<td>69</td>
<td>14.2</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH4004SK3</td>
<td>40</td>
<td>2.6</td>
<td>-</td>
<td>69</td>
<td>14.2</td>
<td>TO252 (DPAK)</td>
</tr>
<tr>
<td>DMTH4004SCBTB</td>
<td>40</td>
<td>2.5</td>
<td>-</td>
<td>69</td>
<td>14.2</td>
<td>TO263 (D2PAK)</td>
</tr>
<tr>
<td>DMTH4004LKL3</td>
<td>40</td>
<td>2.4</td>
<td>4</td>
<td>83</td>
<td>11.2</td>
<td>TO252 (DPAK)</td>
</tr>
<tr>
<td>DMTH4004LPLS</td>
<td>40</td>
<td>2.4</td>
<td>4</td>
<td>83</td>
<td>11.2</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH4005SFS</td>
<td>40</td>
<td>2.3</td>
<td>-</td>
<td>49</td>
<td>13</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH4005SK3</td>
<td>40</td>
<td>2.5</td>
<td>-</td>
<td>49</td>
<td>13</td>
<td>TO252 (DPAK)</td>
</tr>
<tr>
<td>DMTH4005SCT</td>
<td>40</td>
<td>2.6</td>
<td>-</td>
<td>49</td>
<td>13</td>
<td>TO20</td>
</tr>
</tbody>
</table>

Typical Rsd and Qgs @ Vgs = 10V & Tj = 25°C

**60V MOSFETs for BLDC Motors**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Vgs (V)</th>
<th>Rsd (mΩ) @10V</th>
<th>Rsd (mΩ) @4.5V</th>
<th>Qgs (nC)</th>
<th>Qgs (nC)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMTH6004SFS</td>
<td>60</td>
<td>2.5</td>
<td>-</td>
<td>95</td>
<td>20</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH6004SK3</td>
<td>60</td>
<td>3</td>
<td>-</td>
<td>95</td>
<td>20</td>
<td>TO252 (DPAK)</td>
</tr>
<tr>
<td>DMTH6004SCBTB</td>
<td>60</td>
<td>2.5</td>
<td>-</td>
<td>95</td>
<td>20</td>
<td>TO263 (D2PAK)</td>
</tr>
<tr>
<td>DMTH6004SCT</td>
<td>60</td>
<td>3.1</td>
<td>4</td>
<td>96</td>
<td>21.4</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH6004PLS</td>
<td>60</td>
<td>2.5</td>
<td>3.3</td>
<td>96</td>
<td>21.4</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH6005LPLS</td>
<td>60</td>
<td>4.4</td>
<td>7.7</td>
<td>47</td>
<td>12.5</td>
<td>PowerDI5060</td>
</tr>
<tr>
<td>DMTH6005LKL3</td>
<td>60</td>
<td>4.5</td>
<td>7.9</td>
<td>47</td>
<td>12.5</td>
<td>TO252 (DPAK)</td>
</tr>
</tbody>
</table>

Typical Rsd and Qgs @ Vgs = 10V & Tj = 25°C

### Half-Bridge Gate Drivers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Offset Voltage Max (V)</th>
<th>Inputs</th>
<th>Output Current L+Typ (mA)</th>
<th>Output Current L-Typ (mA)</th>
<th>Internal Deadtime Typ (ns)</th>
<th>tON / tOFF Typ (ns)</th>
<th>tL / tH Typ (ns)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGD2103AS8</td>
<td>600</td>
<td>HIN, LIN*</td>
<td>210</td>
<td>360</td>
<td>520</td>
<td>680 / 150</td>
<td>100 / 50</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2104AS8</td>
<td>600</td>
<td>IN, SD</td>
<td>210</td>
<td>360</td>
<td>520</td>
<td>680 / 150</td>
<td>100 / 50</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2103AS8</td>
<td>600</td>
<td>HIN, LIN*</td>
<td>290</td>
<td>600</td>
<td>520</td>
<td>680 / 150</td>
<td>70 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2104AS8</td>
<td>600</td>
<td>IN, SD</td>
<td>290</td>
<td>600</td>
<td>520</td>
<td>680 / 150</td>
<td>70 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2108S8</td>
<td>600</td>
<td>HIN, LIN*</td>
<td>290</td>
<td>600</td>
<td>540</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2108S8</td>
<td>600</td>
<td>IN, SD</td>
<td>290</td>
<td>600</td>
<td>540</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2184S14</td>
<td>600</td>
<td>HIN, LIN*</td>
<td>290</td>
<td>600</td>
<td>540</td>
<td>500 / 500</td>
<td>680 / 270</td>
<td>40 / 20</td>
</tr>
<tr>
<td>DGD2184S14</td>
<td>600</td>
<td>IN, SD</td>
<td>190</td>
<td>2300</td>
<td>40</td>
<td>680 / 270</td>
<td>40 / 20</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2184S14</td>
<td>600</td>
<td>IN, SD</td>
<td>190</td>
<td>2300</td>
<td>40</td>
<td>680 / 270</td>
<td>40 / 20</td>
<td>S08</td>
</tr>
</tbody>
</table>

* = out of phase  # = Adjustable by external resistor  ^ = Enable low

### High-Side/Low-Side Gate Drivers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Offset Voltage Max (V)</th>
<th>Inputs</th>
<th>Output Current L+Typ (mA)</th>
<th>Output Current L-Typ (mA)</th>
<th>tON / tOFF Typ (ns)</th>
<th>tL / tH Typ (ns)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGD2110S16</td>
<td>500</td>
<td>HIN, LIN, SD</td>
<td>2500</td>
<td>2500</td>
<td>105 / 94</td>
<td>25 / 17</td>
<td>S016</td>
</tr>
<tr>
<td>DGD2110S16</td>
<td>600</td>
<td>HIN, LIN</td>
<td>250</td>
<td>600</td>
<td>160 / 150</td>
<td>70 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2106S8</td>
<td>600</td>
<td>HIN, LIN</td>
<td>290</td>
<td>600</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2106S8</td>
<td>600</td>
<td>HIN, LIN</td>
<td>290</td>
<td>600</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2181S8</td>
<td>600</td>
<td>HIN, LIN</td>
<td>290</td>
<td>600</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2181S8</td>
<td>600</td>
<td>HIN, LIN</td>
<td>290</td>
<td>600</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2181S8</td>
<td>600</td>
<td>HIN, LIN</td>
<td>290</td>
<td>600</td>
<td>220 / 200</td>
<td>100 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2190S8</td>
<td>600</td>
<td>HIN, LIN</td>
<td>4500</td>
<td>4500</td>
<td>140 / 140</td>
<td>25 / 20</td>
<td>S08</td>
</tr>
</tbody>
</table>

### Single Channel Drivers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Offset Voltage Max (V)</th>
<th>Inputs</th>
<th>Output Current L+Typ (mA)</th>
<th>Output Current L-Typ (mA)</th>
<th>tON / tOFF Typ (ns)</th>
<th>tL / tH Typ (ns)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>DGD2117S8</td>
<td>600</td>
<td>IN</td>
<td>290</td>
<td>600</td>
<td>125 / 105</td>
<td>75 / 35</td>
<td>S08</td>
</tr>
<tr>
<td>DGD2117S8</td>
<td>600</td>
<td>IN*</td>
<td>290</td>
<td>600</td>
<td>125 / 105</td>
<td>75 / 35</td>
<td>S08</td>
</tr>
</tbody>
</table>
SiC MOSFET
The Real Breakthrough in High-voltage Switching

Based on the advanced and innovative properties of wide bandgap materials, ST’s silicon carbide (SiC) MOSFET feature very low \( R_{DS(on)} \) per area for the 1200V rating combined with excellent switching performance, translating into more efficient and compact designs.

**Industry-leading 200°C Rating for More Efficient and Simplified Designs**

ST is among the first companies to produce high-voltage SiC MOSFET. This new family features the industry’s highest temperature rating of 200°C for improved thermal design of power electronics systems. Compared to silicon MOSFET, SiC MOSFET also feature significantly reduced switching losses with minimal variation versus the temperature.

**Key Features**
- Very low switching losses
- Low power losses at high temperatures
- Higher operating temperature (200°C)
- Body diode with no recovery losses
- Easy to drive

**SiC MOSFET vs. Silicon IGBT**

The table compares the 1200V, 80mΩ SCT30N120 SiC MOSFET with a trench field-stop IGBT of the same voltage rating and equivalent \( R_{DS(on)} \). You can see that the SiC MOSFET exhibits significantly reduced switching losses, even at high temperatures. This enables designers to operate at very high switching frequencies, reducing the size of passive components for smaller form factors. In addition, the variation of \( E_{ON} \) and \( E_{OFF} \) with temperature is very small.

**Key Benefits**
- Smaller form factor and lighter systems
- Reduced size/cost of passive components
- Higher system efficiency
- Reduced cooling requirements and heatsink size

**Target Applications**
- Solar inverters
- High-frequency power supplies
- Motor drives

**Switching Loss Comparison**

<table>
<thead>
<tr>
<th>Device</th>
<th>( V_{DS} ) [V]</th>
<th>( I_{D} ) [A]</th>
<th>( R_{DS(on)} ) [Ω]</th>
<th>( Q_{G} ) [μC]</th>
<th>( T_{J(\text{max})} ) [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCT30N060</td>
<td>1200</td>
<td>0.1</td>
<td>0.69</td>
<td>22</td>
<td>200</td>
</tr>
<tr>
<td>SCT30N120</td>
<td>1200</td>
<td>0.25</td>
<td>0.39</td>
<td>22</td>
<td>200</td>
</tr>
<tr>
<td>SCT30N200</td>
<td>1200</td>
<td>0.5</td>
<td>0.19</td>
<td>22</td>
<td>200</td>
</tr>
<tr>
<td>SCT30N300</td>
<td>1200</td>
<td>0.86</td>
<td>0.069</td>
<td>22</td>
<td>200</td>
</tr>
</tbody>
</table>

Note: * \( E_{ON} \) measured using the SiC intrinsic body diode

---

SiC Power Devices
A New Benchmark in Efficiency and Thermal Performance

SiC is emerging as the most viable candidate in the search for the next-generation low-loss technology due to its low ON resistance and superior characteristics at high temperatures.

**SiC – Schottky Barrier Diodes**

SiC Schottky Barrier Diodes feature an ultra low and temperature independent reverse recovery charge \( Q_{rr} \). The wide band gap makes SiC diodes suitable for very fast switching frequencies and high break down voltages. Design engineers can fully utilize SiC performance advantages which lead to reduce losses, smaller inductance and lower total system cost.

**Key Features**
- Industry-leading low forward Voltage (lowest in the market)
- High-Speed recovery characteristics
- Lower Switching losses

**Applications**
- Renewable Energy/
- Energy Storage
- EV/HEV Inverter and Chargers
- Induction Heating/ Welding
- PFC/ SMPS
- HVDC

**2nd Generation SiC SBD**

- 650V types in the range of 6A – 40A
- 1200V types in the range of 5A – 40A

**3rd Generation SiC SBD with high \( I_{rr} \), Capability**

- 650V types in the range of 2A – 10A
- 12A – 20A in development

The Revolution of SiC has started in the Automotive

ROHM SiC-SBD has a line up of automotive grade ones since 2012. This product lineup has opened the new market sector of automotive application for SiC-SBD.
The TLE984x product family integrates an ARM® Cortex®-M0 microcontroller core along with relay drivers, high-side switches, LIN transceiver and a power supply system that enables the device to operate at the vehicle battery level. The TLE984x family is the successor of the TLE983x family and is specifically designed to drive a wide range of LIN-slave automotive motor control applications via a relay or via a PNP MOSFET half-bridge.

**Features**
- Two protected low-side switches (min. 270mA)
- 5V/1.5V Internal supplies
- Up to five high-voltage inputs with wake up functionality
- External Supply (VDDEXT): 5V+/-2% @ 20mA
- Up to two protected high-side switches (min. 150mA)
- Boot ROM for startup firmware and Flash routines
- Nine 16-bit timers
- 40kB to 64kB flash memory for code and data
- 32 bit ARM® Cortex® M0 Core, 25/40MHz clock frequency
- On-chip oscillator and PLL for clock generation
- Independent programmable window watchdog
- Thumb® + Thumb-2® Instruction Set
- Capabilities for motor control
- One platform for relay or low-end PN FET DC Motor Control
- Two synchronous serial channel (SSC), compatible with SPI
- 250V/440V/305V AC
- Class X capacitors have unlimited capacitance and are connected between phase to neutral or phase to phase conductors.
- Class Y capacitors have increased electrical and mechanical safety and are installed between phase conductors and the shock protected earthed casing, thus bridging the insulation of the appliance.
- Metallized paper capacitors are neither actively nor passively flammable. The components are resin impregnated under vacuum and encapsulated with self-extinguishing cast resin. Thanks to the good oxidation behaviour of the paper dielectric, they have outstanding self-healing properties even with high energy pulses. WIMA metallized paper capacitors are specified for temperatures up to 110°C and are available with capacitances up to 1µF and voltage ranges from 250VAC up to 500VAC for class X1, X2 and Y2 applications.

**RFI Capacitors for Overvoltage Protection**

Radio interference suppression capacitors serve to reduce or suppress the HF voltage interference in electronic equipment. The RFI capacitors remain on the mains for an uninterrupted period of 10, 20 or more years and have to both protect the appliance against line-side surge voltages/ transients and suppress reactions of the appliance on the mains supply.

**Polypropylene Capacitors**
Polypropylene capacitors feature high capacitance values at smaller case sizes compared to metallized paper capacitors. They are available with capacitances from 100pF to 10µF and AC voltages of 300VAC, 305VAC and 440VAC for class X2, X1 and Y2. Based on the dielectric used they are highly cost-effective.

**WIMA MKP 4F – Metallized Polypropylene AC Filter Capacitors**
WIMA filter capacitors are designed on the basis of low-loss polypropylene film and exhibit high AC current capability at high frequencies as well as low ESL and ESR values.

**Features**
- New range of filter capacitors based on metallized polypropylene (PP) dielectric
- Printed circuit modules (PCM) from 27.5mm to 52.5mm
- Capacitances from 0.68µF to 75µF
- Nominal voltages from 230VAC to 440VAC

Due to their typical circuit position AC filter capacitors have to exhibit good high-frequency characteristics and at the same time high AC voltage capabilities. They in general fulfil two requirements:
- Low AC impedance to dissipate high-frequency interference signals
- Attenuation of transient voltage pulses caused e.g. by switching

**Radio Interference suppression capacitors are used to block and attenuate these voltage spikes and are defined in X and Y classes according to the demands they have to satisfy:**

**Class X**
- Class X capacitors have unlimited capacitance and are connected between phase to neutral or phase to phase conductors.

**Class Y**
- Class Y capacitors have increased electrical and mechanical safety and are installed between phase conductors and the shock protected earthed casing, thus bridging the insulation of the appliance.

**WIMA offers approved RFI capacitors with polypropylene dielectric as well as with metallized paper dielectric:**

**Metallized Paper Capacitors**
Metallized paper capacitors are neither actively nor passively flammable. The components are resin impregnated under vacuum and encapsulated with self-extinguishing cast resin. Thanks to the good oxidation behaviour of the paper dielectric, they have outstanding self-healing properties even with high energy pulses. WIMA metallized paper capacitors are specified for temperatures up to 110°C and are available with capacitances up to 1µF and voltage ranges from 250VAC up to 500VAC for class X1, X2 and Y2 applications.
DC-LINK Capacitors

The Alternative to Electrolytic Capacitors in Intermediate Circuit Applications

DC-Link capacitors are used in intermediate circuit applications in power electronics, e.g. power conversion technique where they couple different electrical grids to one DC voltage level. They should have a preferably high volume/capacitance ratio and nominal voltages ranging from 400V_{DC} to 1500V_{DC}. Also of importance is a high life time as well as a robust and safe terminating configuration.

In general aluminium electrolytic capacitors are used in power electronics due to their very high power density. However, in an increasing number of applications film capacitors with polypropylene film are selected.

Their Fundamental Advantages Towards Electrolytic Capacitors

- Three times higher dielectric voltage strength
- Very low dissipation factor (ESR)
- Very high insulation resistance
- Considerably higher reliability by outstanding self-healing properties
- Long life expectancy
- Temperature resistance up to -55°C
- Non-polarized construction
- High vibration and shock resistance
- Excellent mechanical stability

WIMA DC-LINK Capacitors

WIMA DC-LINK capacitors are constructed of low-loss, metallized polypropylene films. They are available in several product ranges both in prismatic and cylindrical shape versions.

WIMA DC-LINK MKP 4 Capacitors

are constructed of low-loss, metallized polypropylene films. They are available in several product ranges both in prismatic and cylindrical shape versions.

WIMA DC-LINK MKP 5 Capacitors

in cylindrical plastic cases are available with capacitances from 16µF to 269µF and with rated voltages of 500V_{DC} to 1300V_{DC}. They are provided with tinned wire terminations for PCB mounting.

WIMA DC-LINK MKP 6 Capacitors

have a cylindrical aluminium case. They are available with capacitances from 75µF to 4920µF and with rated voltages of 600V_{DC} to 1500V_{DC}. For bus bar mounting they are designed with M6 screw terminations and M12 screw bolt.

Customized solutions can be realized with WIMA DC-LINK HC with capacitance values from 140µF to 8250µF and voltage ranges from 450V_{DC} to 1500V_{DC}

In modern drive engineering the intermediate circuit capacitor manufactured on the basis of low-loss polypropylene film scores with its robustness, its insensitivity against high temperatures and its temperature adaptability. Above all, in cases where a high load transfer by an increasing intermediate circuit voltage occurs, reliable operation at high life time is permitted even without susceptible cascading of capacitances. Its tolerance towards highest ripple currents and the option of a low-inductive construction – values of approx. 10nH at a capacitance of 1000µF are possible – enable a low-resonance frequency response which is advantageous for the entire circuit.

Pulse Capacitors

For Good Contacts at High Pulse Ratings

An important construction criterion in the manufacture of reliable, self-healing capacitors for pulse applications is the current-carrying capacity of the contacts, i.e. the connection between the terminating wires and the electrodes.

MKP 10 Series

The construction principle of the series WIMA MKP 10 consists of a non-metallized dielectric film and a plastic film metallized on both sides acting as electrode. Thanks to the metallization on both sides, the electrical conductivity is considerably improved and the contact surface between the electrodes and the capacitor layer is doubled. This results in better contact and allows for high current and pulse loading capability. The properties of metallized capacitors such as excellent self-healing and high volume capacitance remain unchanged.

FKP 1 Series

The WIMA FKP 1 series was developed for extremely high pulse loads. It has an internal series connection. The metal foil electrodes are combined with a floating electrode metallized on both sides. As regards pulse loading capability, WIMA FKP 1 represents the high-end of capacitor technology. WIMA has now further developed the FKP 1 rage by using PCM 52.5mm which enables the voltage ranges 400V_{DC} to 6000V_{DC} to be supplemented by higher capacitance values. The rated capacitances now range from 100pF up to 4.7µF.

Snubber Capacitors

With Plates or Pin Terminations for Best Contacts

WIMA Snubber capacitors are available both as double-sided metallized pulse version – WIMA Snubber MKP – and for extremely high pulse ratings in self-healing film/foil technology – WIMA Snubber FKP. Their electrical performance as well as the manifold number of available connecting options makes the WIMA Snubber technology unique.

- Plates soldered directly to the schoopage for safe contacts at high RMS currents
- Low inductance construction achieved by end-surface contacts
- High pulse reliability due to double-sided metallization and/or film construction
- High voltage/overvoltage strength by internal series connection with self-healing metallized floating electrode
- Available in various contact configurations
- Flame retardant plastic case in accordance with UL 94 V-0
- Production sites ISO 9001:2008 certified

The Snubber capacitor range has been reworked. The capacitance range now comprises values from 0.047µF up to 8µF and voltage ranges of 700V_{DC} up to 3000V_{DC}

WIMA Snubber capacitors are manufactured under conditions of large volume production, but are also available in small quantities as individually configurable high-reliable components.
Ultracapacitors

Nesscap Energy is a world leader in ultracapacitor technology. We’re producing a large range of products which include single cells, ranging from 3F up to 3400F as well as modules with multiple voltage platforms from 5V up to 125V. Nesscap’s large-sized cylindrical EDLC cells range from 600F to 3400F in capacitance with operating voltage up to 3V. These cells were developed to meet market requirements for robustness, compact size, high energy density and long cycle life.

Features
- Large range of products
- Single cells from 3F up to 3400F
- Modules with multiple voltage platforms from 5V up to 125V
- Large-sized cylindrical EDLC cells (600F – 3400F) with operating voltage up to 3V
- High quality standards – compliance to RoHS, UL, REACH
- High performance power products with very low ESR and low RC time constant

Applications
- Driverless transport systems
- Hybrid drive train systems
- UPS- and backup systems
- Windmill pitch control
- Medical devices
- Harbor cranes
- Automotive
- Actuators
- Forklifts

N60™ Ultracapacitor

Nesscap Energy Inc. is proud to introduce the new N60™ 3V / 3400-farad ultracapacitor. This cell significantly raises the standard for power, energy, and overall performance, all within the industry-standard 60mm cylindrical form factor. N60™ delivers 42% greater power density and stores 40% more energy compared to Nesscap’s standard 2.7V / 3000-farad cells. N60™ represents a major step forward for the industry and further establishes Nesscap’s technology leadership and highly regarded product line.

Features
- Highly Efficient and Rugged Mechanical Design
- Exceptional shock and vibration performance
- Low Equivalent Series Resistance (ESR)
- Patented electrode technology enables lowest resistance possible
- Industry Standard 60mm Design
- Ease of use for integration or replacement of existing large-cell designs
- Wide Temperature Range
- Extremely reliable performance from -40°C to +65°C
- Long Operational Life
- 1,000,000 cycles (rated voltage to half-rated voltage)

Applications
- Automated guided vehicles
- Railway, tram & subway
- Windmill pitch control
- Hybrid truck & bus
- Power back-up
- Automotive
- Power grid
- Cranes

Nesscap Modules

Nesscap offers multi-cell modules with operating voltages of 5V, 16V, 48V, 64V, 86V and 125V in order to satisfy higher voltage requirements of many integrated systems. These standardized multi-cell modules can be simply connected in series to meet even higher voltage requirements. 5V modules are composed of two 2.7V / 3F (or two 2.7V / 3F) cells connected in series and typically used for AMR (Automatic Meter Reading) and other applications which require a small amount of capacitance and are mainly used for small pulse power or power back-up systems. 16V and higher-voltage modules are composed of large cylindrical cells targeting automotive and industrial applications such as transit buses and heavy-duty vehicles.

Overview Nesscap Modules

<table>
<thead>
<tr>
<th>Capcitance (F)</th>
<th>1.5–500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (V)</td>
<td>5–125</td>
</tr>
<tr>
<td>Form factor</td>
<td>Various standard and customized</td>
</tr>
<tr>
<td>Terminal type</td>
<td>Radial lead and internal thread</td>
</tr>
<tr>
<td>Major application</td>
<td>AMR, hybrid train, Windmill pitch control system, hybrid bus and vehicle, cranes, UPS- and back-up systems, driverless transport systems</td>
</tr>
</tbody>
</table>

Part Number | Rating | DC-ESR | Specific Energy | Specific Power | Weight |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NE03V3400ST001</td>
<td>3.0V 3400F</td>
<td>0.15 mΩ</td>
<td>Thru-Hole</td>
<td>11.5 Wh/kg</td>
<td>605 g</td>
</tr>
<tr>
<td>NE03V3400SM001</td>
<td>3.0V 3400F</td>
<td>0.15 mΩ</td>
<td>Welded</td>
<td>11.5 Wh/kg</td>
<td>595 g</td>
</tr>
</tbody>
</table>
XP™-Series XTRA Performance

XP™ products are engineered specifically for applications that operate over long durations in environments with high temperature and humidity. Proprietary product and manufacturing enhancements, designed into XP™, significantly reduce the likelihood of long term reliability issues resulting from prolonged operation in adverse environmental conditions. Under biased test conditions (2.7V, 90% relative humidity, 60°C), XP™ products deliver a 3 times improvement compared to benchmarked industry-standard cells. XP™ products are offered at capacitances ranging from 3F to 50F with dimensions and electrical specifications identical to those of Nesscap’s corresponding standard cells. All products have been extensively tested to ensure adherence to strict performance standards and will be compliant with RoHS, UL and REACH.

Features & Benefits
- Highly Efficient Rugged Component
  - Biased Humidity Test Conditions (at Vr, 60°C, and 90% RH)
- Low Equivalent Series Resistance (ESR)
  - Patented electrode technology and contact methods enables lowest resistance
- Wide Temperature Range
  - Very good temperature performance down to -40°C and up to +65°C

Applications
- Long Operational Life
  - Offers >500k cycles (nominal voltage down to half voltage)
- High Endurance
  - Endurance equal to standard series
  - Highly superior results at Biased Humidity Test

Product Overview XP™-Series

<table>
<thead>
<tr>
<th>Nesseq Part Number</th>
<th>RUTRONIK Part Number</th>
<th>Capacitance Rating</th>
<th>DC-ESR</th>
<th>Terminal Type</th>
<th>Max Leakage Current</th>
<th>Size</th>
<th>Biased Humidity Life*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESHR0003C0-002R7UC</td>
<td>KUK974</td>
<td>2.7V 3F</td>
<td>&lt;55 mΩ</td>
<td>Radial Lead</td>
<td>5µA</td>
<td>8x20mm</td>
<td>2,000 Hrs</td>
</tr>
<tr>
<td>ESHR0005C0-002R7UC</td>
<td>KUK973</td>
<td>2.7V 5F</td>
<td>&lt;35 mΩ</td>
<td>Radial Lead</td>
<td>8µA</td>
<td>10x20mm</td>
<td>2,500 Hrs</td>
</tr>
<tr>
<td>ESHR0006C0-002R7UC</td>
<td>KUK972</td>
<td>2.7V 6F</td>
<td>&lt;33 mΩ</td>
<td>Radial Lead</td>
<td>17µA</td>
<td>8x30mm</td>
<td>2,000 Hrs</td>
</tr>
<tr>
<td>ESHR0010C0-002R7UC</td>
<td>KUK971</td>
<td>2.7V 10F</td>
<td>&lt;30 mΩ</td>
<td>Radial Lead</td>
<td>23µA</td>
<td>10x30mm</td>
<td>2,500 Hrs</td>
</tr>
<tr>
<td>ESHR0025C0-002R7UC</td>
<td>KUK965</td>
<td>2.7V 25F</td>
<td>&lt;25 mΩ</td>
<td>Radial Lead</td>
<td>49µA</td>
<td>16x25mm</td>
<td>3,000 Hrs</td>
</tr>
<tr>
<td>ESHR0050C0-002R7UC</td>
<td>KUK970</td>
<td>2.7V 50F</td>
<td>&lt;16 mΩ</td>
<td>Radial Lead</td>
<td>73µA</td>
<td>18x40mm</td>
<td>3,000 Hrs</td>
</tr>
</tbody>
</table>

*Biased Humidity Test (at VR, 60°C, and 90% RH)

Aluminium Electrolytic Capacitors for Automotive Applications

Quality, Reliability, Robustness

Features
- High current, low ESR
- Rated voltage: 250 to 275V
- Capacitance: 30 to 56µF

Benefits
- Miniaturized Snap-In capacitors utilizing high density foil to fit into low profile cases
- Higher power density (CV value) in same case size for high power inverters
- Special series for demanding applications
- Customized solutions

Applications
- Charging circuits
- Power train
- DC/DC converter
- BILO control
- High voltage inverter

BXW 105°C 12000h
- Miniaturization
- Long lifetime
- AECQ-200 possible
- Rated voltage: 160 to 450V
- Capacitance: 10 to 820µF

RX30 130°C 4000h
- High current, low ESR
- Stable over lifetime
- Rated voltage: up to 4700µF
- Can be specified up to 150°C

HBX 125°C 3000h
- High current, low ESR
- High voltage inverter
- Rated voltage: up to 63V
- Capacitance: up to 56µF

MXG 105°C 3000h
- Multi pin terminal available
- AECQ-200 possible
- Rated voltage: up to 580V
- Capacitance: up to 6800µF

PEV 105°C 10000h
- Polymer Hybrid technology
- Stable over lifetime
- Rated voltage: up to 63V
- Capacitance: up to 330µF

PFV 125°C 4000h
- Polymer Hybrid technology
- High current, low ESR
- Stable over lifetime
- Rated voltage: up to 63V
- Capacitance: up to 470µF
- Can be specified up to 150°C

Features
- Multi pin
- High temperature
- Long lifetime
- High currents
- Snap-In capacitors with AECQ-200

Benefits
- Miniaturized Snap-In capacitors utilizing high density foil to fit into low profile cases
- Higher power density (CV value) in same case size for high power inverters
- Special series for demanding applications
- Customized solutions

Applications
- Charging circuits
- Power train
- DC/DC converter
- BILO control
- High voltage inverter
Resistors in eMobility Application

Brake
Braking resistors for hybrid and electric vehicles when the battery is fully charged and in recuperation mode.

Change/Discharge
To reduce high operating voltages of electric vehicles in the event of a crash; AECQ qualified.

FHPH Series
High-Power Resistors with Cooling Fins
- Power rating: 200W/400W/500W/1,000W
- Dimensions: 135x90x60...305x90x60mm
- Resistance range: 0.80...250Ω
- Tolerance: ±2...±10%

HPRS Series
High-Power Resistors in a Metal Casing
- Power rating: 100...200W
- Dimensions: 110x80x15...216x80x15mm
- Resistance range: 12...200Ω
- Tolerance: ±1%...±10%

LCPR Series
Liquid Cooled Power Resistors
- ≤ 20KW
- High power density with compact shape
- Low surface temperatures
- High packing density
- Pulse resistant
- High electric strength/inherently safe
- Suitable for most cooling liquids

ZDFL Series
Cement Coated Wire Wound Resistors with Two or More Lugs
- Power rating: 6...65W
- Dimensions: 9x45...21x120mm
- Resistance range: 39...160kΩ
- Tolerance: ±5%...±10%

AVX Multilayer Varistors

AVX varistors are ideal choice for circuit protection thanks to wide range of components from low capacitance varistors for high speed data lines or RF circuits up to high energy varistors. AVX varistors are also ideal choice for circuit protection thanks to wide range of components from low capacitance varistors for high speed data lines or RF circuits up to high energy varistors.

Features & Benefits
- Bi-directional transient voltage protection
- EMI Filtering in the off-state
- Very fast response (< 1ns)
- Multiple strikes capability
- High reliability
- No derating over operating temperature range
- RoHS Compliant
- High peak current and high energy series
- Low capacitance parts for RF, high speed data lines and capacitance sensitive applications
- Low leakage components for battery operated or leakage sensitive devices
- AEC-Q200 qualified automotive series

Electrical Characteristics
- Working Voltage: 3.0 - 385V
- Peak Current: up to 8000A
- Energy Rating: up to 15J
- Leakage Current: from 0.01μA
- Capacitance: 0.47pF - 30000pF (0.47μF and 1.0 μF for CapGuard)

Case Sizes
- SMT: 0201 - 3220 EIA
- SMT Array: 0405 2x Array, 0508 2x Array, 0612 4x Array
- Leaded: Axial and Radial

Applications
- Automotive (AEC-Q200)
- Consumer
- Commercial
- Home appliances
- Automation
- Lighting
- Industrial/Professional
- Renewable/Smart Energy
SMT Current Sense Transformer
PA1005.XXQNL Series

Our surface mount and through hole current sense magnetics are excellent solutions for low-cost regulation of switch mode power supplies. RoHS compliant and available with both reinforced and functional safety levels, our current sensing products are ideal for Smart Grid and other applications focused on energy management. View our current sensing products, request a custom design or view our Sidewinder® products for AC current sensing applications.

Features
- AEC-Q200 qualified
- Height: 5.5mm max
- Footprint: 8.4mm x 7.2mm max
- Current Rating: up to 20A
- Frequency Range: 50kHz to 1MHz

Applications
Current transformers serve one specific purpose – to detect alternating current (AC) or direct current (DC) in a wire in order to generate a proportional signal. Current sensing is especially critical for power metering applications. The technology behind current sensors (more specifically current sense transformers) comes in various forms
- Low resistance current shunts
- Current transformers with amorphous metal core
- Hall Effect devices
- Rogowski Coils
- Sidewinder products

Power Inductors
Offer High Temperature and High Current for the Best Power Solutions

The IHLP® inductor is different from most inductors. The inductor body is a soft magnetic composite (SMC), not a ferrite. It is made from an iron powder mixture and cemented together using a resin binder. This powder mixture, when pressed around the inductor coil, greatly enhances the electrical properties of the inductor and gives protection from environmental forces. After pressing, the component is cured in an oven to increase the bonding strength of the resin binders with the iron powder, yielding excellent electrical and physical properties.

Surface-Mount Inductors

<table>
<thead>
<tr>
<th>Type</th>
<th>Inductance min. (µH)</th>
<th>Inductance max. (µH)</th>
<th>DCR min. (mΩ)</th>
<th>DCR max. (mΩ)</th>
<th>Rated Current min. (A)</th>
<th>Rated Current max. (A)</th>
<th>Size in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>IHLP-01 series</td>
<td>0.047</td>
<td>22</td>
<td>0.75</td>
<td>129</td>
<td>1.9</td>
<td>80</td>
<td>1616 to 6767</td>
</tr>
<tr>
<td>IHLP-A1 series</td>
<td>0.047</td>
<td>22</td>
<td>0.75</td>
<td>129</td>
<td>1.9</td>
<td>80</td>
<td>1616 to 6767</td>
</tr>
<tr>
<td>IHLP-1A series</td>
<td>0.1</td>
<td>100</td>
<td>0.67</td>
<td>270</td>
<td>1.7</td>
<td>55</td>
<td>1212 to 6767</td>
</tr>
<tr>
<td>IHLP-11 series</td>
<td>0.1</td>
<td>100</td>
<td>0.67</td>
<td>270</td>
<td>1.7</td>
<td>55</td>
<td>1212 to 6767</td>
</tr>
<tr>
<td>IHLP-5A series</td>
<td>0.47</td>
<td>100</td>
<td>0.67</td>
<td>174</td>
<td>1.2</td>
<td>80</td>
<td>1616 to 6767</td>
</tr>
<tr>
<td>IHLP-51 series</td>
<td>0.47</td>
<td>100</td>
<td>0.67</td>
<td>174</td>
<td>1.2</td>
<td>80</td>
<td>1616 to 8787</td>
</tr>
</tbody>
</table>

Benefits
- High power
- Low profile
- Customized options available
- Using low-profile IHLP® inductors in your automotive applications helps you to go green

Applications
- Automotive
- DC/DC converters
- Filters for noise suppression
- DC/DC converters
- Power supplies for computers, notebooks, graphic cards, servers
- Class "D" amplifiers
- LCD TVs and portable MP3 speakers
- LED driver power
- Commercial LED lighting
- LCD display backlights
DC Power Relay development has seen very rapid development as new eco-applications like electric vehicles, solar panels and wind turbines have expanded the market. Designers of more traditional applications like fork lift trucks are able to benefit and are offered relays that are smaller, lighter and more efficient. Typical of the new DC power relay designs that are emerging is the Omron G9EN which uses proprietary sealing technologies and new magnetic control methods. The G9EN is the latest in Omron’s family of DC power relays, which also includes the G9EA, EB, EC and ED.

**Features**
- Available with voltage ratings of 12V, 24V, 48V, 80V, 100V and 400V<sub>DC</sub>
- Can switch 25A, 80A or 125A depending on the model
- Use a gas-filled construction with magnets to control the arc to reduce size
- Have overall dimensions of 28x64x50mm

**Benefits**
- Enables DC load interruption at high voltage and current up to 60A at 400V<sub>DC</sub>
- Is a class leader in size (28x64x50mm) and weight (140g)
- Features a non-polarized contact circuit to simplify the wiring and reduce errors

For the charge circuit, the very high in-rush currents on start-up can be an issue and a pre-charge circuit is often included to charge capacitors in the controller and inverter through a current limiting resistor. Omron has developed a relay, the G9EJ-1, specifically to switch in this circuit. It is a cost-effective solution that can support up to 150A at 400V<sub>DC</sub> capacitive short time carry current (1min).

Other Omron relay solutions worth considering for a fork lift truck motor charging units include the G7L and the G7J. These high capacity, high dielectric strength relays operate with no contact chattering for momentary voltage drops of up to 50% of the rated voltage.
Along with the increase in environmental consciousness, electric vehicles that do not emit CO$_2$ while driving have been strongly entering the market since 2010, and they are expected to continue increasing in popularity.

A crucial element for a switch to renewables, V2X technology enables using EVs as both vehicle and portable batteries.

**Features & Benefits**
- Short time charge in public (DC 500V: 15-30min for 80%)
- Intuitive and easy operability
- Designed for safety with usage by everyday people in mind
- Easy maintenance
- Durable and highly weather resistant
- High reliability and safety

**Electrical Characteristics**
- Current Rating: 125A for power, 2A for signal
- No. of contacts: 2 pos. for power, 7 pos. for signal
- Operating temperature: -30°C to +50°C
- DC Voltage Rating: 500V
- Durability: more than 10,000 times

**Features & Benefits**
- User friendly
- One-action operation allows easy usage
- Intuitive and easy operability
- Designed for safety with usage by everyday people in mind
- Easy maintenance
- Durable and highly weather resistant
- High reliability and safety

**Applications**
- Quick Charger for Electric Vehicles (CHAdeMO Protocol)

**Applications**
- Charger for Electric Vehicles / Connector with Lead Cable for V2H (Vehicle to Home) / V2X (Vehicle to Environment)
AC/DC Adapter & Desktop Adapters

Power Supply – The Heart of the System

Even when the PSU shouldn’t be integrated into the system itself, an AC/DC adapter is recommended. So the variety of possible applications is huge, same as our adapter provided by FSP Group. In our daily life we can find external AC/DC power supplies everywhere e.g. for mobile phones, tablets or even notebooks. Also a lot of medical devices are getting their power from AC/DC adapters. FSP’s AC/DC adapter wide range portfolio offers high efficiency, high altitude and slim size for special applications and medical applications as well.

Features

- Wattage: 5W – 400W
- Output DC Voltages: 5V – 44V
- Medical versions available

Typical Applications

Systems without an integrated PSU and a demand for more than 24V.
- Notebooks
- Medical Devices
- POS/POI
- Digital Signage
- Thermal Printers

Adapters

<table>
<thead>
<tr>
<th>Type</th>
<th>5W</th>
<th>10W</th>
<th>12W</th>
<th>15W</th>
<th>18W</th>
<th>20W</th>
<th>24W</th>
<th>25W</th>
<th>30W</th>
<th>35W</th>
<th>36W</th>
<th>40W</th>
<th>45W</th>
<th>50W</th>
<th>60W</th>
<th>65W</th>
<th>70W</th>
<th>75W</th>
<th>80W</th>
<th>84W</th>
<th>85W</th>
<th>90W</th>
<th>96W</th>
<th>100W</th>
<th>105W</th>
<th>120W</th>
<th>125W</th>
<th>135W</th>
<th>150W</th>
<th>180W</th>
<th>200W</th>
<th>220W</th>
<th>250W</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5V</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>220V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>250V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- AC Input C6, C8 and C14 available
- Multiple output available
- I/O Switch available for some products
- DC plug and cable length can be modified customized voltage configuration possible

Compact AC/DC Modules with Very Low no Load Power for Standby Circuits in Household Appliances

Home appliances such as induction hobs traditionally were designed with one large AC/DC power supply which have notoriously terrible efficiency at low loads. ERP and Energy Star regulations have made such designs a thing of the past. Standby circuits now should be driven by secondary, low power AC/DC converters. RECOM has met the market demand for ultra-low power in a highly efficient compact module that can easily be dropped into any design. RECOM’s low power AC/DC converter, along with a simple relay to a standby circuit can drastically reduce the amount of energy a device consumes in standby mode.

The RAC series is a compact and highly efficient modular solution that offers a wide range of output power options from 1 to 10 watts. These AC/DC modules feature standbys with output voltages from 19.5V to 24V, and for the 4W to 10W series ±12 and ±15V, dual outputs are also available. All series are CE, EN and UL certified and come with a 3 year warranty.

Features:
- Universal AC/DC input voltage up to 305VAC
- Regulated outputs
- Low output ripple & noise
- Operating temperature up to 85°C
- Short circuit, overload and overvoltage protection
- Ultra compact packages
- Optional flying wires
- Standard isolation up to 3kVDC
- 60335-1 certification
- Integrated class B filter
- RoHS compliant with CE and UL approvals
- 3 year warranty

Applications:
- Energy efficient products for Energy Star systems
- Industrial controls
- Board level power supply
- Remotely controlled and automated systems
- Test and measurement systems
- Audio-visual and lighting designs
- Stand-by power for household appliances
- Power supplies for panel mounting
- Instrument amplifiers
- Test and measure instrument equipment

Applications:
- Power for panel mounting
- Instrument amplifiers
- Test and measure instrument equipment
- Medical versions available
- Standard Isolation up to 3kV
- 27V
- 20V
- 24V
- www.rutronik.com/
Infineon’s Intelligent Power Modules (IPM)

Intelligent Power Modules designed by Infineon represent a functional product family that is dedicated to useful integration of electronics into power modules. Depending on the level of integration and power to be handled, Infineon offers a wide variety of semiconductors in different packages, voltage and current classes, and integrations. These Semiconductor products are separated in CIPOS™ Nano, CIPOS™ Micro, CIPOS™ Mini, CIPOS™ Mini-DCB and MIPAQ™ module families (from lowest to highest power capability).

All these families are highly integrated, compact power modules designed to drive motors in applications ranging from home appliances to fans, pumps and general purpose drives. These energy-efficient intelligent power modules integrate latest power semiconductor and control ICs technology leveraging Infineon’s advanced IGBTs, MOSFETs, next-generation gate driver ICs and state-of-the-art thermo-mechanical technology.

In today’s competitive, dynamic environment, there is constant pressure to find new ways to increase energy efficiency. At the same time, software’s increasingly important role in systems directly contributes to their complexity – and increases costs.

Integrated bootstrap functionality

One of the major challenges in today’s power electronics modules is the integration of high-end control functions.

As a result, Infineon has made the decision to integrate both IGBTs and bootstrap driver (BD) into one single module. This module, called iMOTION™, offers a fully integrated, self-protected control function, thus ensuring both high reliability as well as ease of use.

In the future, Infineon will continue to develop and improve its iMOTION™ modules, giving customers a high level of protection and performance.

Features:
- TRENCHSTOP™ IGBTs
- Dual-in-line molded module with full pack and DCB substrate
- PFC + inverter in one package
- Power capability: 2kW
- Various PFC switching available: 20kHz or 40kHz
- PFC topology: single switch boost
- Rugged SOI gate driver technology with stability against transient and negative voltage
- Integrated bootstrap functionality
- Over current shutdown
- Temperature monitor
- Under-voltage lockout at all channels
- Low side common emitter

Key Benefits:
- System size reduction with PFC integration into inverter module
- Cost down due to less BOM counts and less assembly cost
- Smaller and cheaper heatsink
- Possibility to design switching performance of PFC IGBT by using external driver circuit

Target Applications:
Refrigerators, washing machine, residential air-conditioners and other home appliances; Low power motor drives.

Due to DCB substrate the CIPOS™ Mini PFC + Inverter offers excellent thermal performance. Electrical appliances must comply with IEC61000-3-2 which limits harmonic current emissions.
A tradition of more than 50 years in the production of passive components has given Keko Varicon abundant experience and a large scale of knowledge needed by a high quality manufacturer in branches such as the telecommunications, AC lines and PCB board. All these have helped to make KEKO VARICON become a world-known and top of the art manufacturer in this sector. Household appliances, telecommunications, milking machines, alarm systems. High quality and relatively inexpensive varistors provide best protection against overvoltage surges for sophisticated equipment. Our products protect high end medical equipment, entertainment and consumer electronics, power supplies, energy meters, etc.

SV Series
Lead Style Epoxy Coated Square or Rectangular Shaped Varistors
- Full custom parameter designed medium voltage varistors
- AC voltage range from 60V to 550V
- Peak single pulse surge current up to 15kA

CV Series Transient Surge Suppressors, Disc Shaped Varistors
- It requires little mounting space due to radial lead construction

CV+ Series
Extended Version of CV Disc Shaped Varistors
- High current and energy capabilities

PV Series of Low & Medium Voltage Plastic – Encapsulated Varistors
- SMD Equivalent to leaded disc varistors
- Non-flammable thermoplastic encapsulation

DV Series of Medium Voltage Varistors
- SMD with very low profile

Series WSLT
Power Metal Strip® Surface-Mount Resistors

Vishay’s Power Metal Strip® current sensing resistors combine superior performance in high-temperature applications with a wide range of package sizes and a choice of resistance values from 0.0002Ω to 1Ω. These state-of-the-art products deliver overload capabilities equivalent to wirewound devices and temperature coefficients as low as 20ppm/°C.

Current sensing Power Metal Strip® resistors allow control circuitry to monitor the level of current in a circuit by translating current into a voltage that can be monitored easily. The devices work by resisting the current flow in a circuit to a calibrated level, thus allowing a voltage drop to be detected and monitored by control circuitry. The low resistance values of Power Metal Strip® resistors allow this function to be carried out with exceptional efficiency.

Key Benefits
- Wide range of package sizes (0603 to 5931)
- Wide resistance range (0.2mΩ to 1Ω)
- High-temperature performance (up to 275°C)
- Tight tolerances (down to ±0.1 %)
- Low temperature coefficients (down to ±20ppm/°C)
- Excellent overload capability (equivalent to wirewound)
- Automotive Grade qualified

Applications

Automotive
- Engine controls
- Anti-lock brakes
- Airbag
- Traction controls
- Multimedia
- Climate controls
- Electronic power steering
- Electric/hybrid vehicles

Industrial
- Power supplies
- Power tools
- Bar code scanners
- HVAC
- Other current detection

Medical and Instrumentation
- Monitoring systems
- Defibrillators
- Implantables
- Electronic scales
- Diagnostic equipment

Consumer Goods
- Home electronics
- White goods
- Gaming systems
- Lighting controls
- Video cameras
- Television

Telecom
- Cell phones
- Modems
- Pagers
- Base stations
- Bluetooth
- Switching circuits

Computer
- DC/DC converter
- Disk drives
- Power supplies
- Graphic cards
- PCMCIA
- Li-Ion battery management

www.rutronik.com/POWER
SUMIDA Power Inductors – Solutions for Every Application

SUMIDA offers a wide range of power inductors in many different technologies for automotive, industrial, medical and consumer applications. The product spectrum covers standard types as well as custom solutions – designed and manufactured on a highest quality level.

Benefits
- Compact solutions
- Covering wide operational temperature range
- Low losses / high efficiency
- High frequencies und high current types
- Cost effective production set-up

Applications
- DC/DC converters
- (Step-up / Step-down converters)
- POL power supplies
- EMI filter applications
- Input & output chokes
- Used in automotive, industrial, medical and consumer applications (e.g. LED head lights, ECUs, etc.)

Versions
- Ferrite and metal composite versions
- Shielded or non-shielded types
- Horizontal / vertical / low-profile types
- SMD / Pin-Type customized solutions
- Flat wire versions for high-current applications
- Low leakage-inductance types

Special Features
- According to international safety standards
- Wide range of AEC-Q200 products
- Operating temperature up to 150°C
- Insulation systems on request
- Customized component geometries possible
- Large selection of standard component families

New Relays Address Size & Cost Pressures

Switching relays are still central to induction and other electric hob design, providing the primary means of controlling the power to rings, hot plates and heating elements. Design of this key component needs to fully keep pace with the increasingly demanding regulations covering these appliances. For example, the 5th edition of IEC 60335-1 has now been published. At the same time, relay manufacturers need to recognise the numerous and conflicting pressures facing designers. They need to minimise the cost of the appliance and reduce size to create elegant products in ever smaller homes. Energy efficiency is also a constant demand.

G5NB-EL-HA
Omron has introduced new relay designs that are ideal for power switching in induction hobs. Latest addition is the G5NB-EL, one of the smallest PCB power relays in its class facilitating a size reduction.

Features
- Able to switch 7A at 250VAC
- Conformant to IEC 60335-1
- Just 7mm thick and 20.5mm deep x 15.3mm high
- Long electrical life

G2RL & G2RL-CV-HA
For the highest current loads, the G2RL and G2RL-CV-HA are recommended.

Features
- Supports loads up to 16A at 250VAC
- Conformant to IEC 60335-1, EN61810, UL508 and CA22.2
- 12.7x29x15.7mm
- Supports ambient temperatures of up to 105°C (-CV, -HA)
- High sensitivity version with a coil current of 250mW (rated at 10A)

G5Q-EL-HA
The G5Q is a further option and is an attractive alternative to sugar cube relays. It is a compact single-pole relay offering a higher load carrying capacity than the G5NB, but a smaller size than the G2RL.

Features
- Handles loads of up to 10A
- Rated at up to 105°C
- Just 10mm thick and 20.3mm long by 15.8mm
- Low coil current of 200mW (SPST-NO)
Stumped CPU Heatsinks

ASSMANN WSW components with the experience of more than 45 years in thermal management offers an alternative design to the ordinary extruded cross cut heatsinks for home appliance applications.

**Stamped CPU Heatsinks**

The newly designed "STAMPED CPU Heatsinks" are developed to improve the features for traditional passive cooling systems, because an overheating of the components which are included in home appliance applications will cause a shorter life time or, in the worst case, a break down of the total device.

Having a smaller surface than the traditional CROSS CUT heatsinks, the STAMPED CPU heat sinks bring equal or even better thermal energy flow in a passive cooling system. For traditional CPU heat sinks, inner cooling fins generate heat accumulation which results to less air flow based on heat radiation. The design of STAMPED heat sinks creates an improvement of air convection to optimize the exchange of heat with the ambient air.

**Standard Product Range**
- Different standard sizes available
- Already with or without mounted foil and solder pins
- Material AL1050

**Features & Benefits**
- Customized material thickness
- Alternative material alloy
- Modifications of dimensions
- Customized hole pattern, cut outs and perforations
- Special surface finish and packing

**Applications**
- Home appliance applications
- Industrial technology
- CPU processor unit (BGA / PGA)
- Telecommunication
- Network applications
RUTRONIK AUTOMOTIVE offers you a new range of bundled hardware, software and services. RUTRONIK AUTOMOTIVE brings together entire solutions to build applications for:

- Safety
- Drive Train
- Body Electronics
- Connected Car
- Connected Car
- eMobility

More information: www.rutronik.com/automotive
automotive@rutronik.com | Tel. +49 (0) 7231 801-1552

RUTRONIK EMBEDDED brings together entire solutions to build applications for:

- Digital Signage
- Transportation
- Industrial
- Control Medical

More information: www.rutronik.com/embedded
embedded@rutronik.com | Tel. +49 (0) 7231 801-1776
Specifications subject to change without notice. Please note, there could be some limitations for some franchised product lines in several countries. For more information, please contact our sales team.