100 kW SiC-Inverter
for
Automotive Application
Automotive SiC-MOSFET Inverter

Siliconcarbide (SiC) MOSFETs offer huge potentials for power electronic systems due to their significantly reduced conduction and switching losses and their capability for highest junction temperatures. Based on this novel semiconductor technology, a modular and compact 3-phase 800 V drive-inverter for automotive application with a maximum output power of 100 kW was designed and realized. Using four parallel MOSFETs per switch, the system provides a maximum phase current of 150 Arms.

The inverter demonstrates the advantages of SiC-semiconductors on system level:

- Highest power density
- Highest (part-load) efficiency
- Highest switching frequency
- Reduced cooling effort

Due to possible switching frequencies of up to 100 kHz, the SiC-inverter is suitable for machines and applications with highest electric frequencies like high-speed traction-motors, compressors and electric turbochargers.

Technical Data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Max. output power</td>
<td>100 kW (@ 800 V)</td>
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<tr>
<td>Max. switching frequency</td>
<td>100 kHz</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>200 to 800 VDC</td>
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</tbody>
</table>
| Max. phase current  | 150 A
| Weight              | 3.5 kg      |
| Power density       | 51 kW/l     |

Optimized for Highest Efficiency

For the realization of highest switching speeds and reduced switching losses, a low-inductance commutation design of the SiC-inverter is crucial. Despite the use of power-modules with classical aluminum bond-wire technology, a commutation inductance (powermodule ⇒ central DC-link capacitor) of < 12 nH was achieved in the SiC-inverter.

3D-FEM field simulation were carried out to visualize and optimize the transient current paths within the powermodule. Also a low inductive coupling between the power and the signal paths, leading to a robust module behavior, was achieved.

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Contact Us!

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