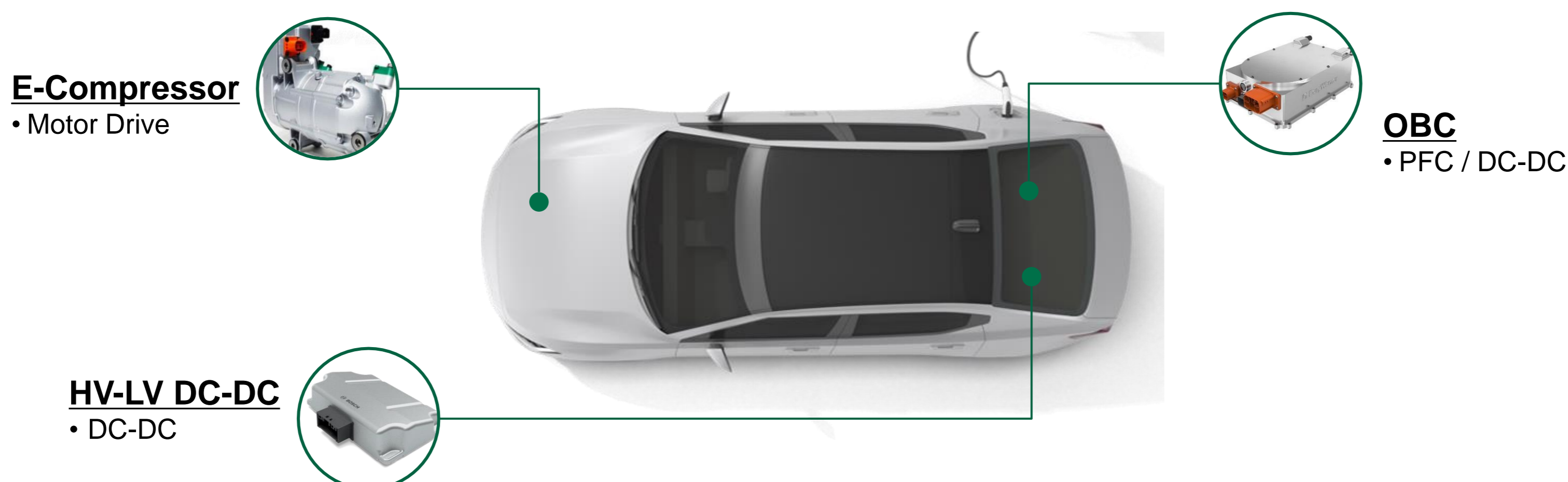


# TSPAK, Innovative Top-Side Cooling Package

The TSPAK offers superior thermal performance, high efficiency, power density and reliability, making it ideal for a variety of automotive applications such as on-board chargers (OBCs), DCDC converters, and e-compressors. With an industry-standard footprint of 14mm x 18.58mm, the TSPAK packages provide superior thermal performance and Kelvin source configuration to minimize gate noise and reduce turn-on losses by 60%, enabling higher-frequency operation and improved power density.

## Target Applications



## Key Features and Benefits of TSPAK

### TSPAK LF version

- Top-side cooling package with an exposed drain at the surface, allowing direct heat dissipation to the heatsink.
- Offers superior thermal performance and supports high current capabilities.

### TSPAK DBC version

- Integrates an isolated DBC ceramic pad on the surface, providing premium thermal performance and enhanced design flexibility.
- Features 3.6kV isolation voltage, extended creepage distance (5.23mm), and flexible mounting by directly connected to an external heatsink with thermal grease.

	Non-Isolated Design (LF version)	Isolated Design (DBC version)
Package		
Features	<ul style="list-style-type: none"> <li>• <b>Top-side cooling</b></li> <li>• High heat spread effect</li> <li>• Larger die size attachable than DBC version</li> <li>• <b>Design flexibility : Better Thermal Performance</b> <ul style="list-style-type: none"> <li>• Comparable creepage distance (4.85mm) vs. Comp.</li> </ul> </li> <li>• Industry standard package footprint (Pin-to-pin replacement)</li> <li>• Kelvin source Package</li> <li>• High temperature capability : <math>T_{j(max)} = 175^{\circ}\text{C}</math></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Top-side cooling</b></li> <li>• <b>Isolated substrate / High dielectric strength</b> <ul style="list-style-type: none"> <li>• Mounting flexibility with thermal grease</li> </ul> </li> <li>• <b>Design flexibility : Better Thermal Performance</b> <ul style="list-style-type: none"> <li>• <b>Longer creepage distance (5.23mm) vs. Comp.</b></li> </ul> </li> <li>• Industry standard package footprint (Pin-to-pin replacement)</li> <li>• Kelvin source Package</li> <li>• High temperature capability : <math>T_{j(max)} = 175^{\circ}\text{C}</math></li> </ul>
Benefits	<ul style="list-style-type: none"> <li>• High current capability by thick wire bonding</li> <li>• High power density : Smaller FOM factor</li> <li>• Improved EMI and Easy to design</li> <li>• Better thermal performance</li> <li>• Lower switching losses</li> </ul>	<ul style="list-style-type: none"> <li>• High current capability by thick wire bonding</li> <li>• Easy inverter replace during repair</li> <li>• Improved EMI and simplified design</li> <li>• High power density : Smaller FOM factor</li> <li>• Lower switching losses</li> </ul>

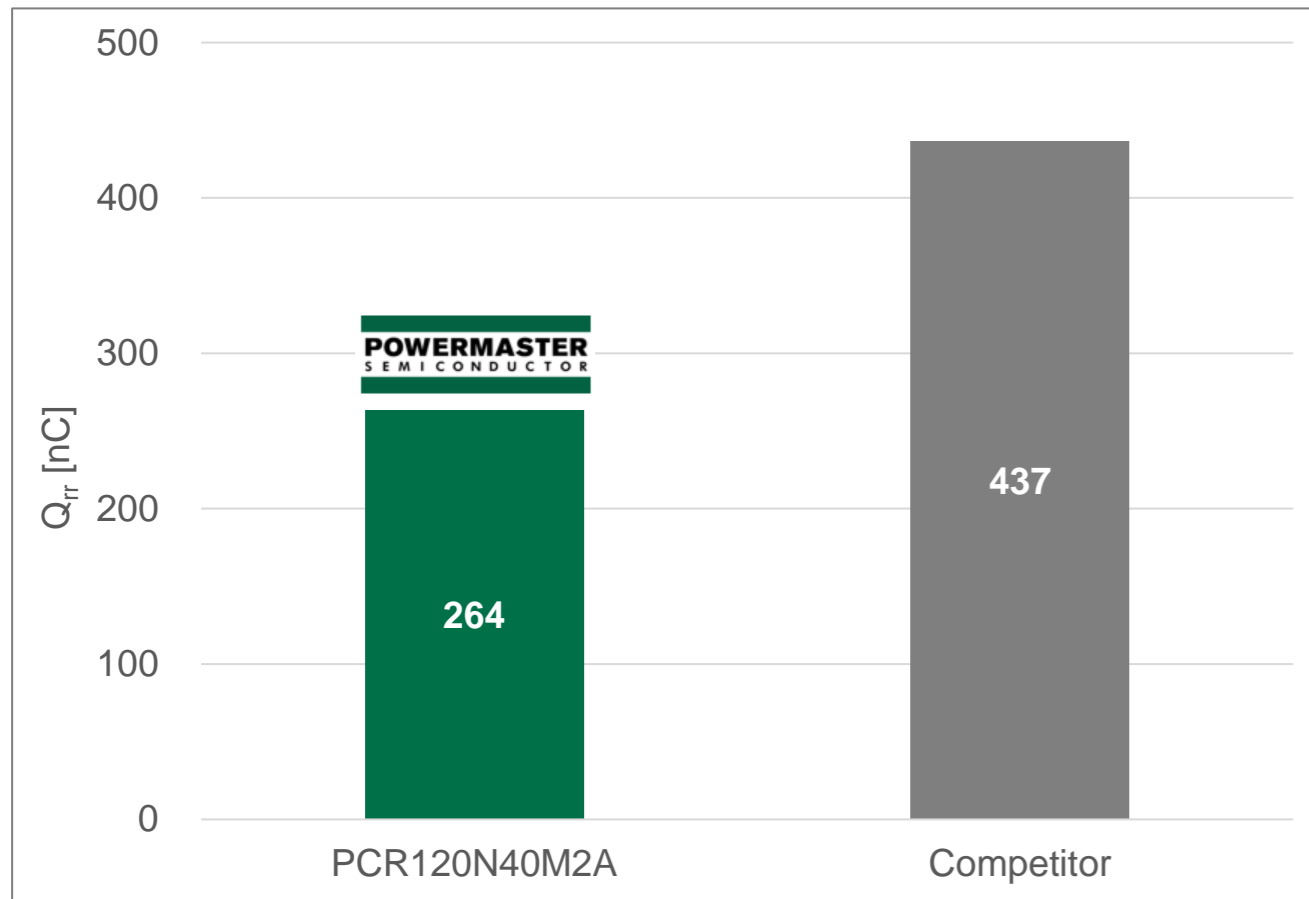


# Product Brief

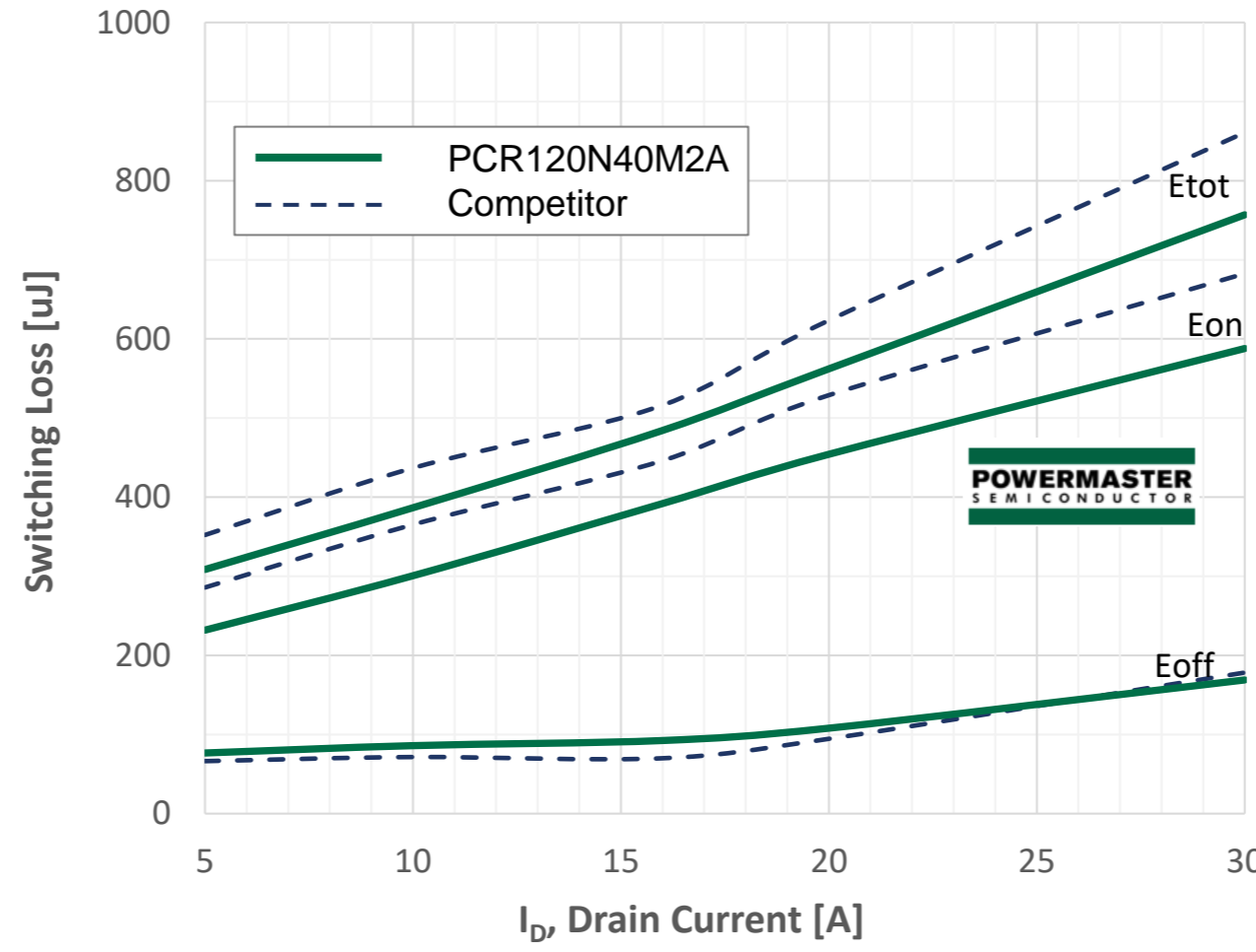
This innovative packaging leverages Power Master Semiconductor's latest generation of 1200V eSiC MOSFET (Gen2), employing cutting-edge technology to decouple a trade-off between specific on-resistance ( $R_{sp}$ ) and short-circuit withstand time (SCWT). Compared to the previous generation, the new 1200V eSiC MOSFETs deliver 20% reduction in  $R_{DS(ON)}$  and a 15% improvement in SCWT, as well as a 45% reduction in switching losses

## Performance Benchmark

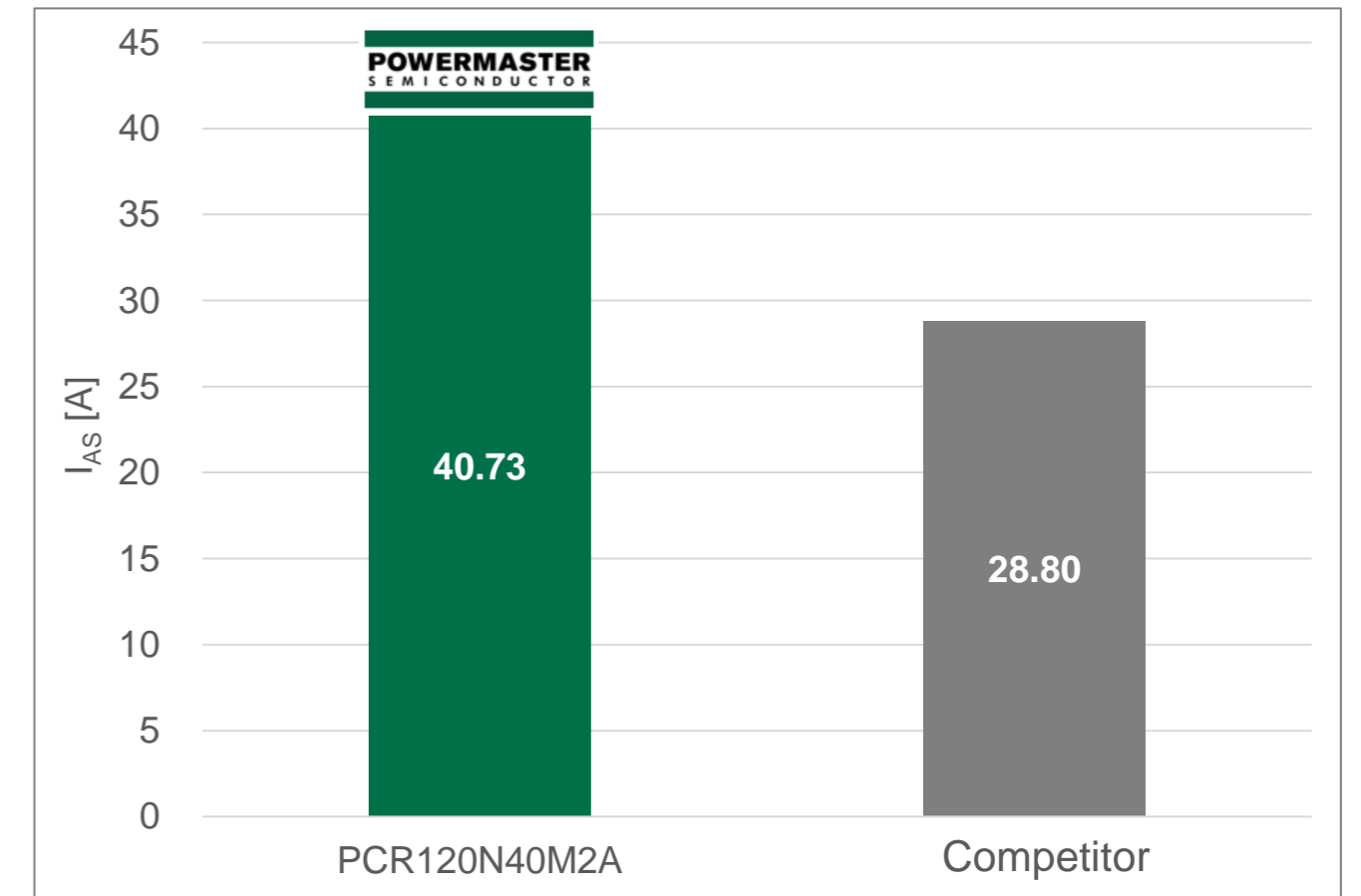
Body Diode Performance ( $Q_{rr}$ )



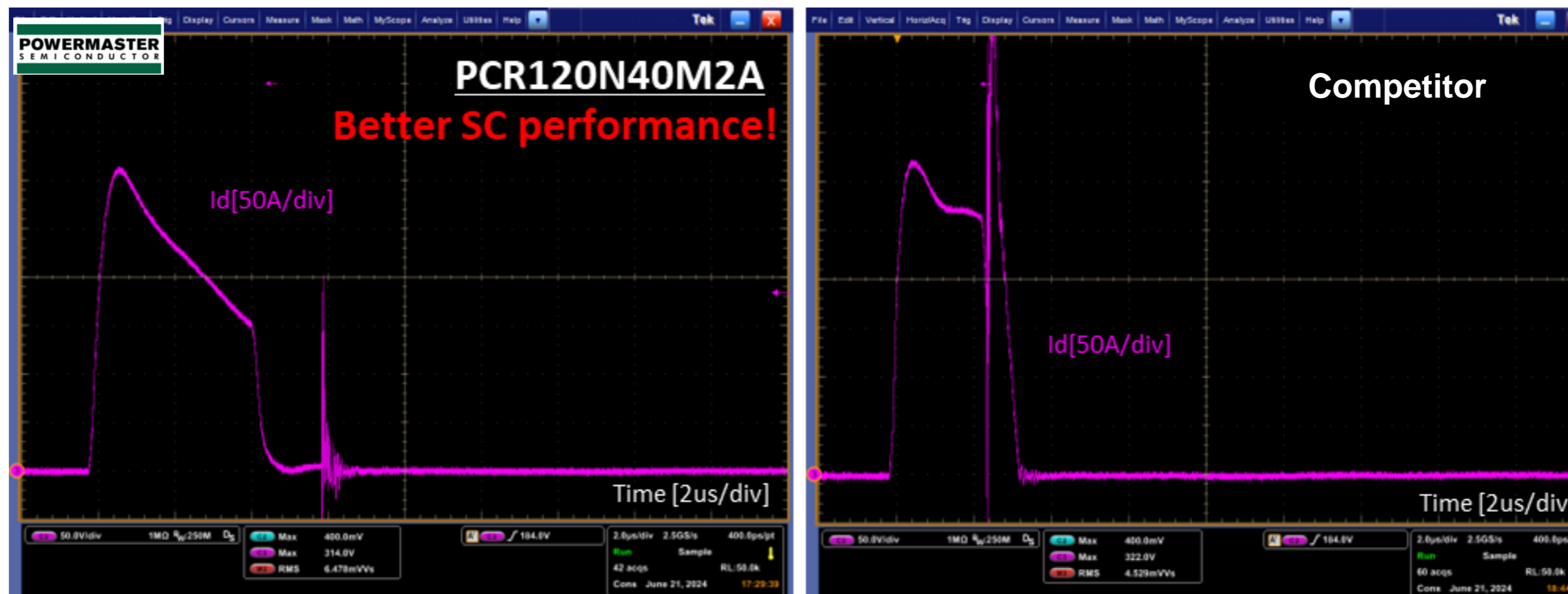
Switching Performance



UIS Ruggedness (Avalanche current)

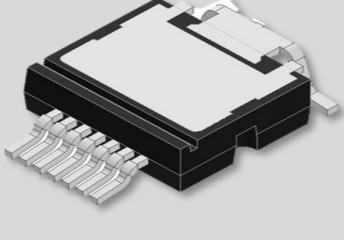
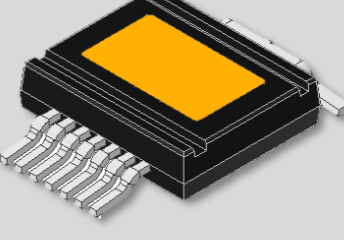


Short Circuit Withstand Time (SCWT)



## TSPAK - 1200V Gen2 eSiC MOSFET (Automotive Grade)



Package	TSPAK-LF Version	TSPAK-DBC Version
		
$R_{DS(ON)}_{typ}$		
21m $\Omega$	PCRZ120N21M2A	PCR120N21M2A
40m $\Omega$	PCRZ120N40M2A	PCR120N40M2A
60m $\Omega$	PCRZ120N60M2A	PCR120N60M2A

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