

Evaluation Kit

## For the **ShowerPower®** cooling principle with **P3 Module**

Danfoss ShowerPower® cooling technology is the answer to the issues that are associated with liquid cooling of power electronic components.

ShowerPower® offers highly efficient direct liquid cooling of standard flat-baseplate based power modules without temperature gradients across the power module assemblies.

The differential pressure drop is very low which allows for the use of small cost-effective pumps.

Direct liquid cooling eliminates the need of thermal interface materials that not only affect the thermal performance but also are prone to pump-out and dry-out effects that seriously limits long-term performance and reliability.

### Applications

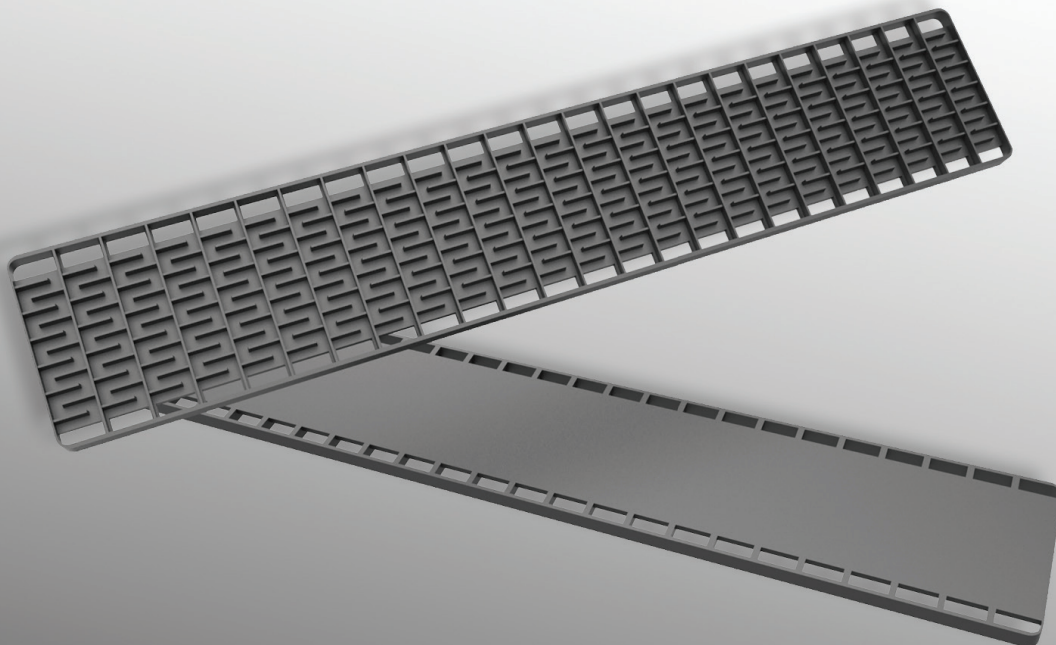
- Hybrid electric and fully electric vehicles
- Wind turbine converters and solar inverters
- Industrial drives

### Key features

- High thermal performance
- Low differential pressure drop
- Homogenous cooling

### Benefits

- Lowest cost on component and system level
- Best cooling performance reduces the amount of power semiconductors necessary to do the job
- Compact and lightweight solutions
- Elimination of the thermal interface material
- Standard flat baseplate modules
- The heart is a simple plastic part which enables large degrees of design freedom, even 3D assemblies



### Evaluation kit includes

The ShowerPower® Evaluation Kit includes the necessary parts for performing thermal tests on the ShowerPower® cooling principle. It comprises an aluminum bathtub, the

ShowerPower® plastic part, a sealing and an open P3 power module. The power module is open which enables infrared imaging of the power module under load.

### Simple plastic part



### The parts of the evaluation kit



### ShowerPower® evaluation kit



### Performance comparison

	Indirect liquid cooling		Direct liquid cooling	
	Air based	Liquid based	Pin-Fin	ShowerPower®
$R_{thJA}$	High	High	Low	Low
Pressure drop	N/A	High	Low	Low
TIM	Yes	Yes	No	No
Size	High	Medium	Low	Low
Base plate	Standard	Standard	Non-standard	Standard
$\Delta T$ temp. gradient	Yes	Yes	Yes	No

### Applications

