ENGINEERING TOMORROW



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 imagining of the power module under load.

Simple plastic part



ShowerPower® evaluation kit







Performance comparison

	Indirect liquid cooling		Direct liquid cooling	
	Air based	Liquid based	Pin-Fin	ShowerPower®
R _{thJA}	Hlgh	HIgh	Low	Low
Pressure drop	N/A	High	Low	Low
ТІМ	Yes	Yes	No	No
Size	High	Medium	Low	Low
Base plate	Standard	Standard	Non-standard	Standard
ΔT temp. gradient	Yes	Yes	Yes	No

Applications





250 kW hybrid bus traction inverter; 6 x P2 modules



Modular concept, transfer molded power modules with integrated liquid cooling. The modules are shown with transparent mold compound.

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