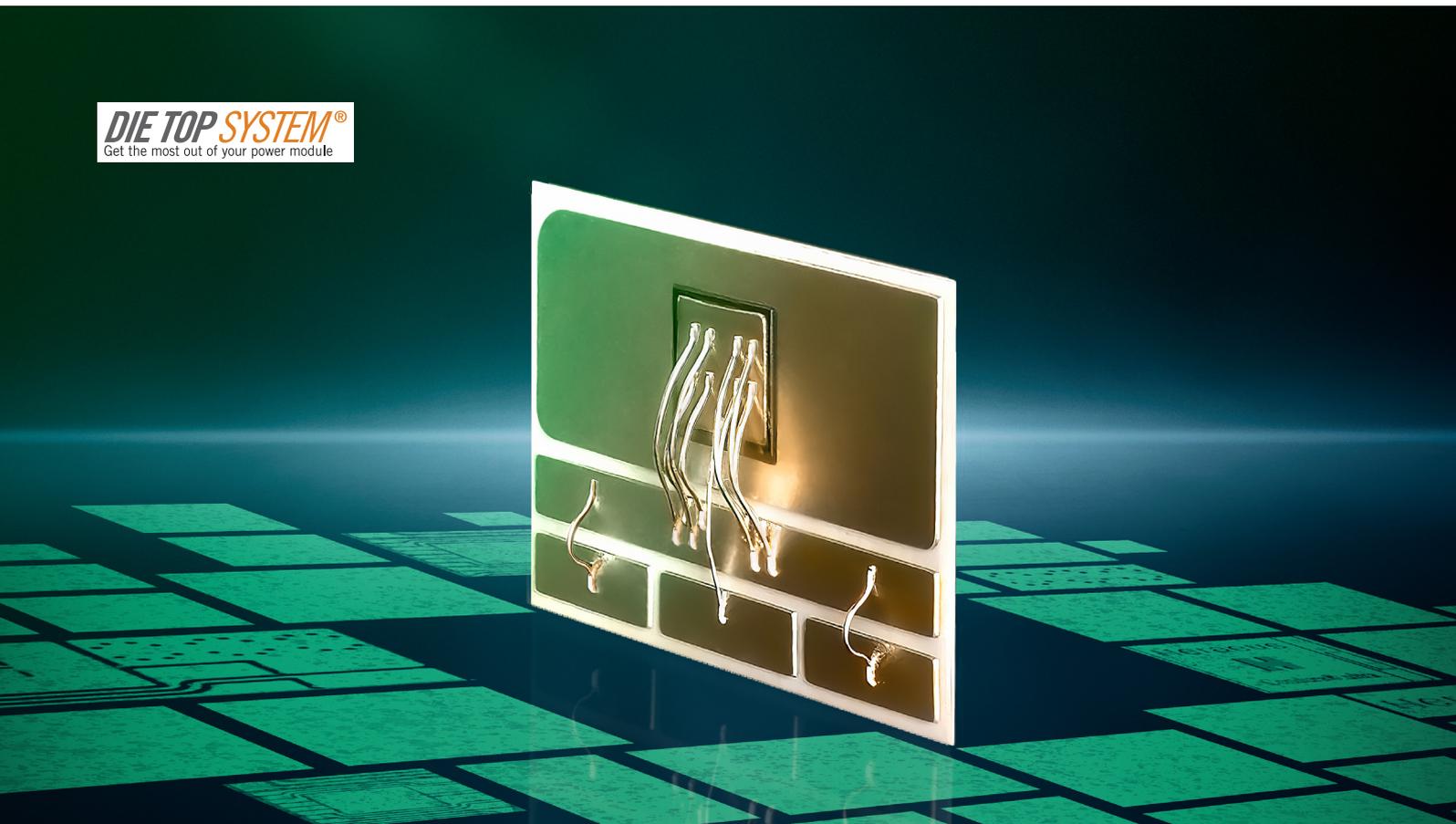


**DIE TOP SYSTEM®**  
Get the most out of your power module



## Die Top System (DTS®)

Now available in two variants to address different market needs.

Due to the continuous rise in power density, coupled with higher operating temperatures and demand for improved reliability, packaging materials are reaching their limits. The Heraeus Die Top System (DTS®) pushes those limits by combining copper wire with sinter technology, whilst offering superior flexibility.

DTS® significantly improves the electrical and thermal conductivity, the reliability of the die connection and optimizes the whole module performance while achieving competitive costs of ownership. Additionally, it simplifies industrialization, maximizes the profitability, and helps to bring the next generation of power modules faster to market.

The Die Top System is now available in two variants to address different needs:

**DTS® Gold:** The trusted solution for exceptional performance in premium applications.

**DTS® Silver:** The innovative solution for cost-efficient, high-performance applications.

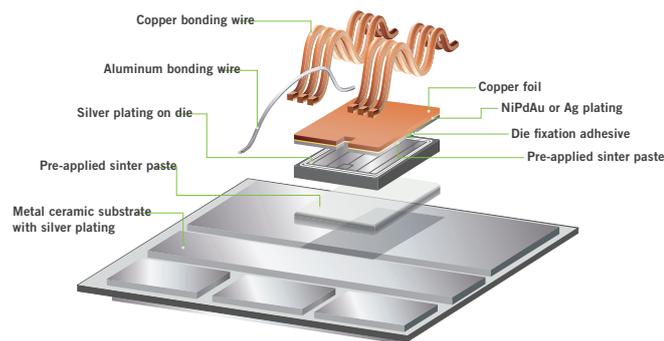
Key Benefits	DTS® Gold	DTS® Silver	Clip
Enables junction temperatures of over 200 °C	++	++	+
Reduction of chip size	++	++	+
Increased lifetime vs. solder die attach and aluminum wire	++	+	+
Competitive cost of ownership and outstanding cost per Ampere ratio	+	++	++
One step sintering (chip front and back side)	++	++	N/A
Design flexibility	++	++	-
CO <sub>2</sub> footprint	0	++	++

**Grading system:**  
Excellent: ++  
Good: +  
Okay: 0  
Complex: -

## Perfectly matched materials system

DTS family consist of:

- copper foil with functional surfaces
- pre-applied / pre-dried sinter paste
- matched Cu bonding materials
- one step sintering for Chip and DTS® possible by matched sinter paste systems (die attach sinter paste matches DTS® sinter paste and ensures no chemical cross reactions)



## Simplified industrialization

- DTS® pick and place:
  - Delivery in wafer frame like semiconductor dies
  - Ready and simple to use due to pre-applied sinter paste on the copper foil easy usage in existing pick and place equipment
- Die and DTS® are sintered together in one step using standard sinter equipment
- Use of wire bonding the most proven and flexible interconnect technology in electronics
- Faster implementation through Heraeus Electronics engineering services

## Superior flexibility

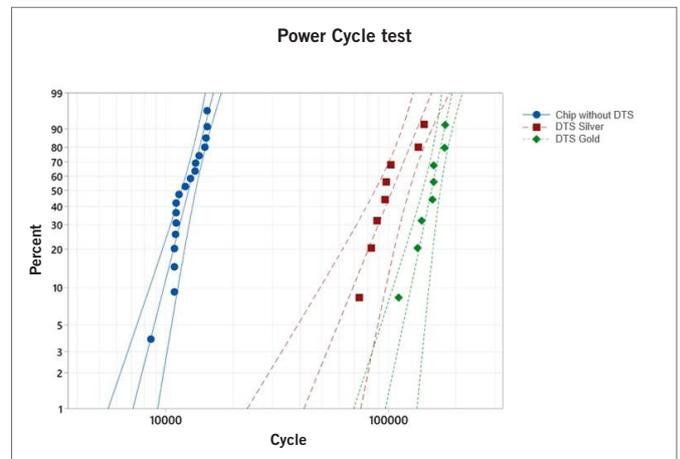
- DTS® is adaptable to most dies provided they have a sinterable top metallization (e.g NiAu, NiPdAu or NiAg)
- Enables Wide Band Gap semiconductors and future high temperature applications
- Customized DTS® layouts possible, finding the optimum design for nearly every chip

## Outstanding reliability

- Comparison power cycling capabilities on system level for sintered die and copper wire sintered die including DTS and soldered die and aluminium wire
- Power cycling parameter:

$$\begin{aligned}
 I_{\text{load}} &= 153\text{A} \\
 t_{\text{on}} &= 2\text{s} \\
 t_{\text{off}} &= 4\text{s} \\
 T_{\text{max}} &= 170\text{ °C} \\
 \Delta T_j &= 120\text{ K}
 \end{aligned}$$

## Test vehicle: IDC45D75E8DA



MSDS for relevant constituents of the DTS® (sinter paste, adhesive) are available upon request.

Heraeus and Semikron Danfoss cooperate in the field of DTS® and are owners of certain IP being of relevance for die top connection.

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