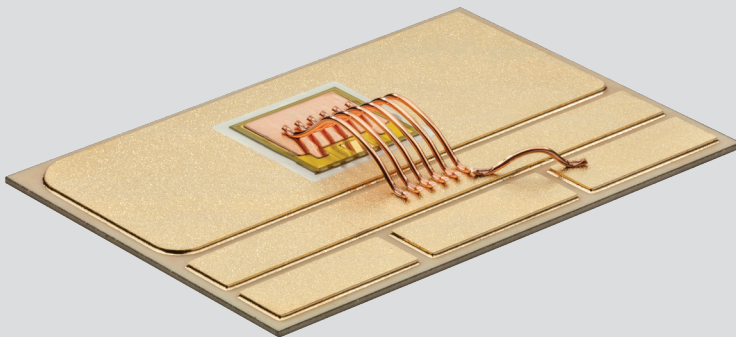


## **DIE TOP SYSTEM® DPIS<sup>(1)</sup>** the revolutionary die interconnection



### Facts<sup>(1)</sup>

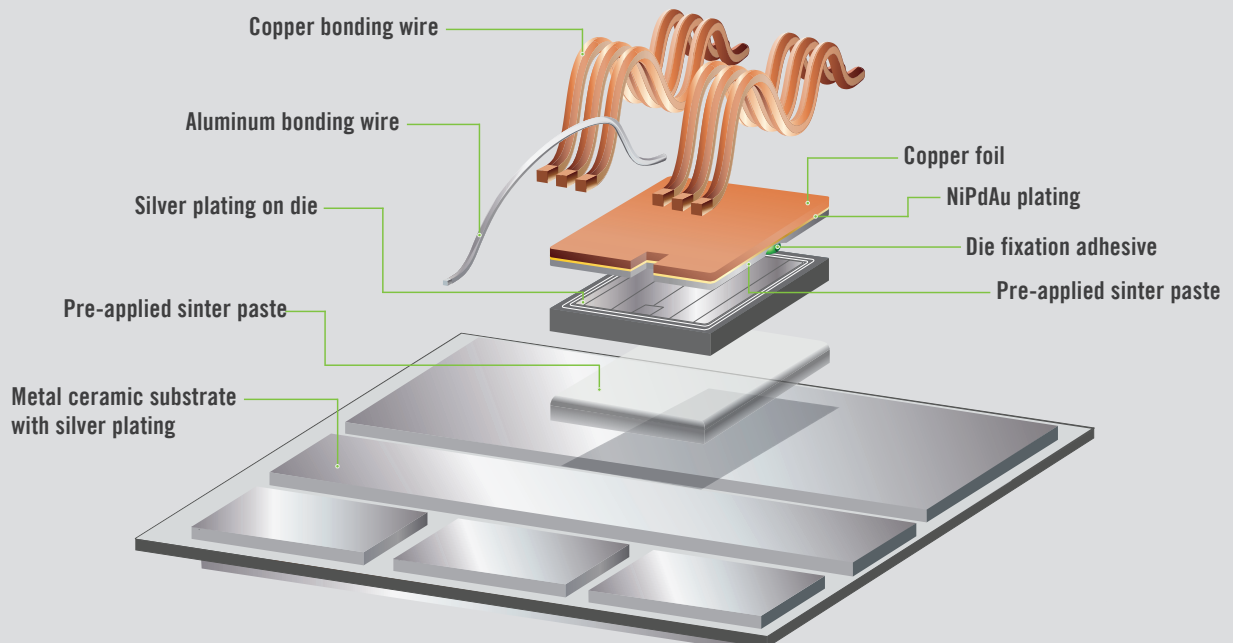
Die Top System (DTS®) enables use of Cu-wire in a combination with sinter technology, benefits:

- Increase of die current capability vs. Al-wire by > 50 %
- Increase of reliability vs. solder die attach / Al-wire of > 10x or die shrink respectively
- Less hot spots by lower and uniform temperature distribution across die
- Compatible for high temperature semiconductors, enabling junction temperatures of 200 °C
- Get more power out of the same module size
- Get same power out of shrunk module (die shrink)

## One component material solution

DTS® is one component consisting of:

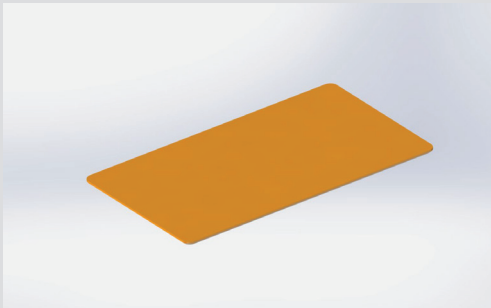
- Copper foil with functional surfaces
- Die fixation adhesive dots
- Pre-applied/ Pre-dried sinter paste
- Matched Cu bonding material



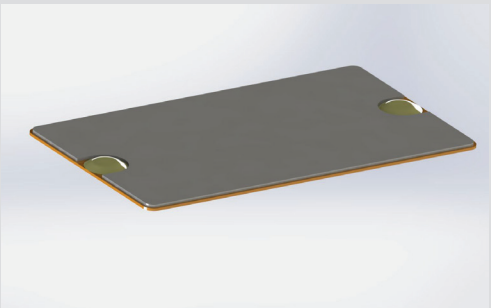
\*Picture: substrate layout by courtesy of Fraunhofer IISB

(1) Development Product Information Sheet, preliminary values

## DTS® is customized to the die<sup>(1)</sup> :

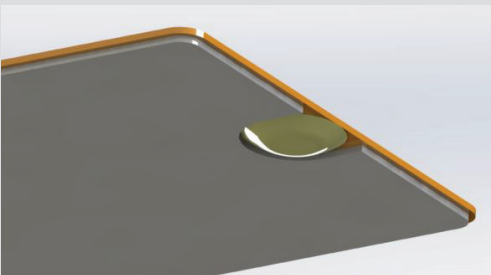


Bond substrate and functional surface	
Core material	Cu
Functional surfaces (optional)	NiPdAu, NiAu, NiAg
Thermal conductivity	250 - 390 W/mK
Tensile strength ( $R_m$ )	200 - 400 N/mm <sup>2</sup>
Hardness, adjustable by special treatment	40 - 200 HV



Pre-applied Ag-sinter layer	
Sinter paste type	ASP 034-04; ASP 338-14; ASP 338-28
Sinter pressure	10 - 30 MPa
Sinter temperature	230 - 280 °C
Sinter time	1 - 5 min
Thermal conductivity	>150 W/mK
Cleaning	Not needed

*Process parameters depend on customer design etc. - we can support you to find optimal process for your application*

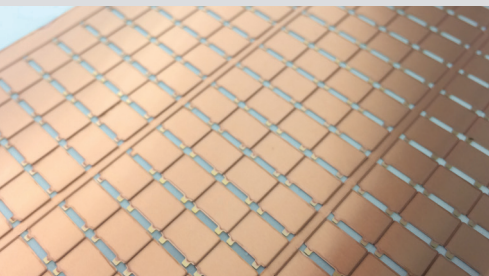
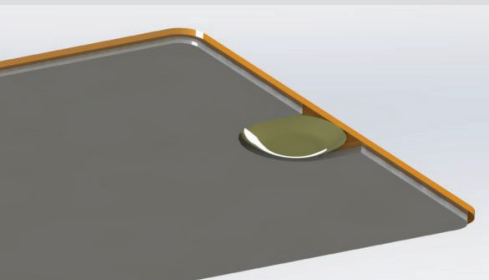
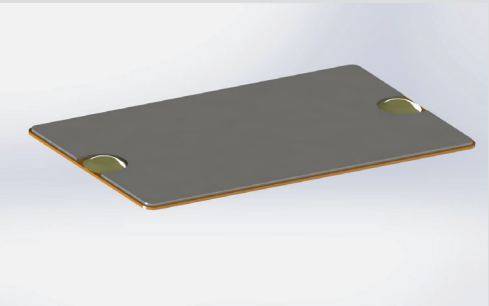
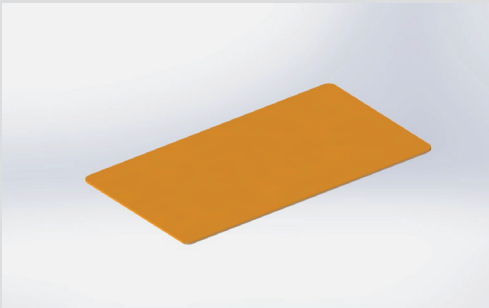


Pre-applied die fixation adhesive	
Adhesive type	B-stage <sup>(2)</sup>
Die placement conditions	80 - 150 °C Pressure depend on die size, e.g. 0.5 MPa for 5 x 7 mm
Cleaning	Not needed

(1) Development Product Information Sheet, preliminary values

(2) The adhesive is not sticky at room temperature. It is activated by heat (>80 °C during placement) and additional heat (during sintering) removes the majority of adhesive constituents

## DTS® Design Rules<sup>(1)</sup>



Bond substrate	
Thickness	30 - 200 μm
Aspect ratio thickness: width	1 : 3
Aspect ratio length: width	max. 3 : 1 <sup>(3)</sup>

Pre-applied Ag-sinter layer	
Typical dried thickness	30, up to 60 μm
Distance between Cu edge and sinter paste	Approx. 0.1 mm

Pre-applied die fixation adhesive	
Adhesive dot size	2 dots, diameter ≈ 0.9 mm
Adhesive height	Adapted to sinter paste thickness
Position	At the border of the die; proposal will be made based on die design

Package	
Package form	Semiconductor die wafer frame packed in vacuum sealed moisture barrier bags
Wafer size	12" outside, 8" inside
Pick and place	DTS® are singularized and ready for pick and place
Typical # of parts on one wafer	DTS® 3.5 x 3.5 mm: approx. 1,200 pcs DTS® 5 x 7 mm: approx. 600 pcs DTS® 10 x 10 mm: approx. 200 pcs


(1) Development Product Information Sheet, preliminary values

(3) For bigger parts depending on design up to 5 : 1

## DTS® Handling & Storage<sup>(1)</sup>

Handling and Storage	
<b>Shipping</b>	<b>Temperature<sup>(4)</sup>:</b> 5 - 40 °C <b>Humidity:</b> Keep packed at dry place
<b>Storage conditions</b>	<b>Room temperature<sup>(4)</sup>:</b> 15 - 25 °C <b>Humidity:</b> Keep originally packed at dry place
<b>Shelf life</b>	Originally packed: 2 month after shipment date <sup>(4)</sup>
<b>Processing</b>	<b>Open</b> the original package in clean room only.  <b>Floor life:</b> Total processing time after opening max. 2 days  Not used DTS® parts should be put back in the moisture barrier bag and should be stored in nitrogen atmosphere, max. storage time 2 weeks

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

**Heraeus** and  cooperate in the field of Danfoss BondBuffer® technology. Heraeus DTS® may be used under certain Danfoss and Heraeus IP rights. Details are set forth in a declaration to customers.

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(4) Aging tests are still running