

## ENGINEERING SERVICES

### Simulation

- › Thermal simulation
- › Thermo-mechanical stress simulation
- › Lifetime prediction

### Prototype Design

- › Electrical design
- › Mechanical design

### Material Analysis

- › Fatigue analysis
- › Root cause analysis

### Prototype Assembly

- › Power modules
- › LED modules
- › Documentation, traceability

### Process Optimization

- › Parameter definition
- › Yield optimization

### Testing and Qualification

- › Environmental tests
- › Thermal cycling tests
- › Active cycling tests

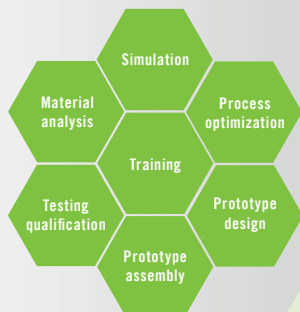
HET TRAINING ACADEMY

## Engineering Services Heraeus Electronics

- Heraeus Electronics is prepared to offer qualified engineering services
- Application Center and prototype shop for process development and module assembly
- Comprehensive scope of test capabilities combined with enhanced analytics
- Dedicated simulation competences including realistic material data
- HET Academy offers theoretical knowledge and practical experiences in seminars

## LET OUR SERVICES BECOME YOUR STRENGTH

Our state-of-the-art Application Center offers a range of services to develop customer solutions in Hanau, near Frankfurt am Main. The Application Center offers an infrastructure for simulation, design, prototyping, test and qualification of material systems in power electronic modules.

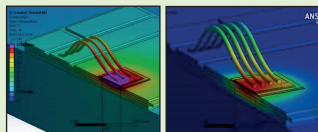


## SIMULATION

### SIMULATIONS SUPPORT TAILORED MATERIALS SOLUTIONS

#### MAIN OFFERINGS

- Identification of most important influence factors on system and product level
- Prediction of key properties (i.e. lifetime)
- Root cause analysis of fatigue mechanism in power modules
- Calculation of physical values (i. e. temperature) where no measurement method can be applied
- Simulation models which can be integrated in customers' system simulation



**Our deep knowledge of material behavior and measured data of processed materials are the key**

## TESTING

### PASSIVE THERMAL LOAD TESTS

- Environmental tests
- Thermal stress is brought in from the external side (environment)
- Temperature range -80 °C to 220 °C
- Various chamber systems available

### ACTIVE POWER CYCLING TESTS

- Module endurance tests
- Thermal stress is generated in the chip as in real use
- Current up to 660 A possible
- Break down criteria in accordance with new industry standards (e.g. LV/AQG324)



## PROTOTYPING

### PROTOTYPE LINE IN CLEAN ROOM ENVIRONMENT



#### AVAILABLE PROCESSES

- Screen printing
- Die placement
- Vacuum reflow soldering
- Sintering
- Drying
- Flux cleaning
- Wire bonding
- Module assembly
- Glueing
- Encapsulation

## MATERIAL ANALYSIS

### MAIN METHODS AND PROCEDURES

- Bonding wire and interconnection tests
- 3D optical profilometer (SISCAN)
- Scanning acoustic microscopy
- X-Ray
- Thermal analysis
- Surface analysis
- Elementary analysis of materials (metals, ceramics, compounds)
- Metallography



**Heraeus Electronics**  
Heraeus Deutschland GmbH & Co. KG  
Heraeusstraße 12-14  
63450 Hanau, Germany  
[www.heraeus-electronics.com](http://www.heraeus-electronics.com)

**Americas**  
Phone +1 610 825 6050  
[electronics.americas@heraeus.com](mailto:electronics.americas@heraeus.com)

**Asia Pacific**  
Phone +65 6571 7677  
[electronics.apac@heraeus.com](mailto:electronics.apac@heraeus.com)

**China**  
Phone +86 21 3357 5457  
[electronics.china@heraeus.com](mailto:electronics.china@heraeus.com)

**Europe, Middle East and Africa**  
Phone +49 6181 35 3069  
+49 6181 35 3627  
[electronics.emea@heraeus.com](mailto:electronics.emea@heraeus.com)

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