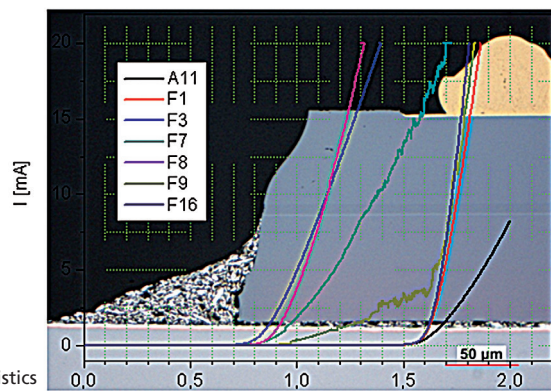
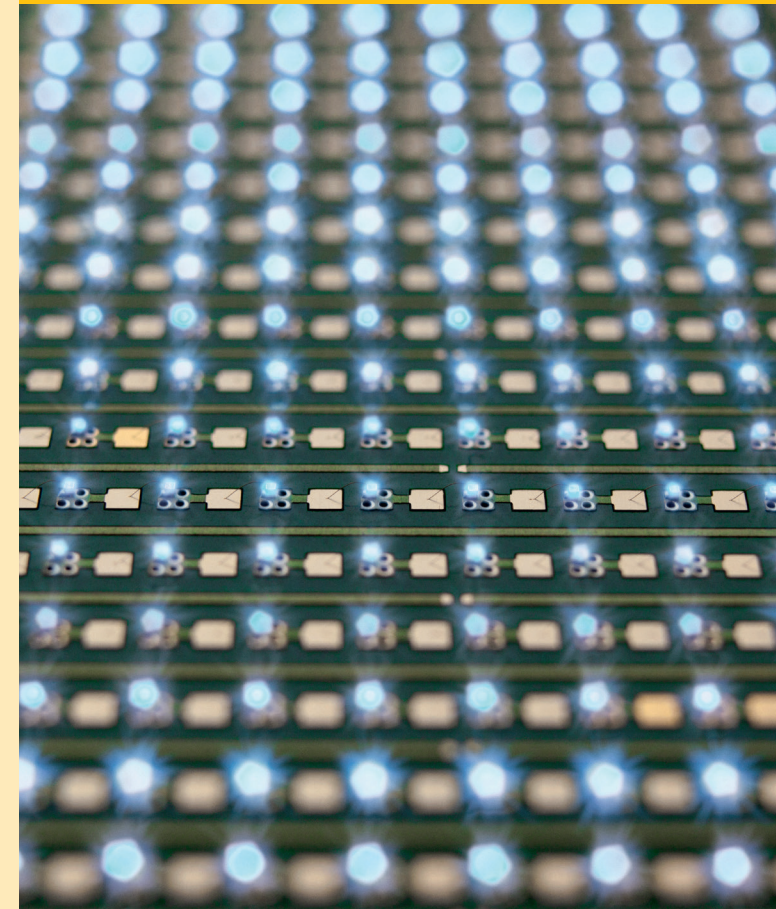


## SOLID STATE LIGHTING AND POWER LASERS



## SERVICES

### Design

- Optimized dimensions
- Material/component selection
- Heat dissipation
- Thermo mechanical compensation

### Process Development

- Batch reflow soldering
- Vapor phase soldering
- Thermode soldering
- Sintering
- Transient liquid phase bonding

### Characterization of LEDs

- Failure analysis
- Electrical and functionality
- Near/far field analysis
- P/n-junction temperature
- IR thermal analysis
- Accelerated aging
- Shock/vibration

For more information please go to  
[www.izm.fraunhofer.de/ssl](http://www.izm.fraunhofer.de/ssl)

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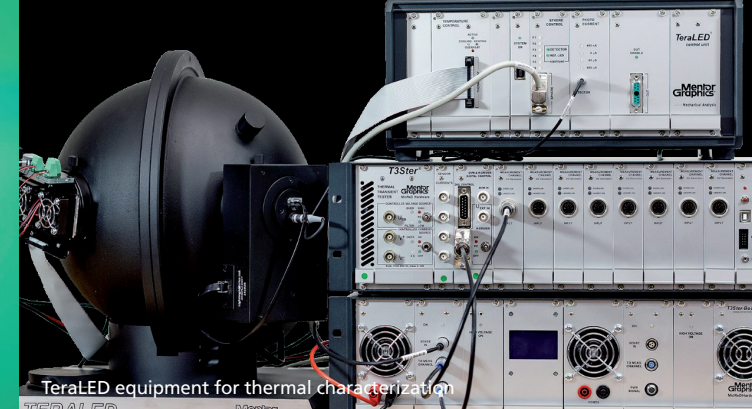
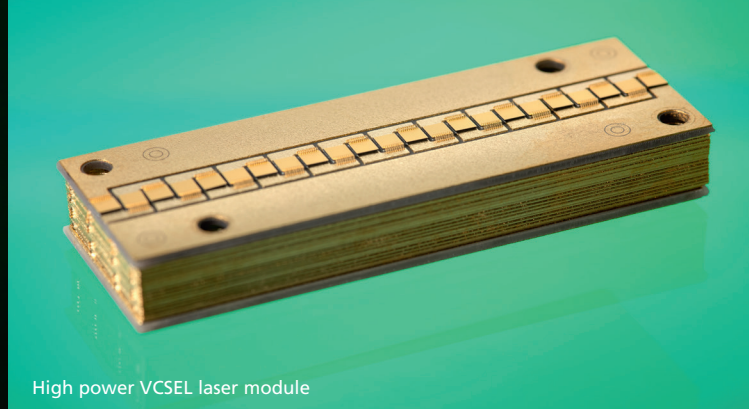
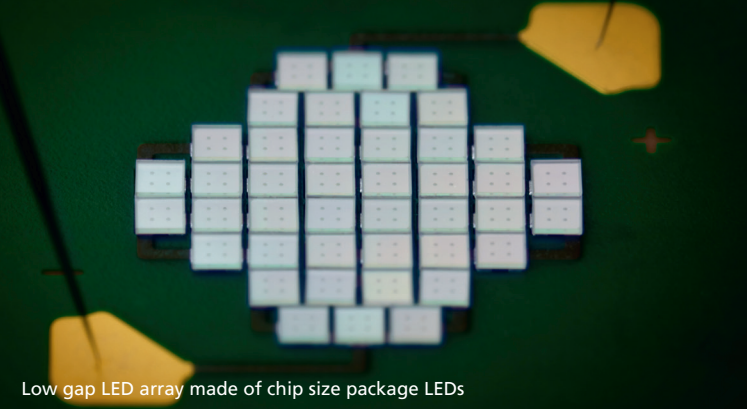
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## APPLICATIONS

Solid state lighting is very well established in general lighting and Fraunhofer IZM is happy to assist with the optimization and quality assurance in this field. However, our main area of expertise are the more challenging applications, such as:

- Outdoor lighting
- Sea water and similar lighting
- Automotive headlamps
- Endoscopy illumination
- Flat panel luminaires
- Horticulture
- LEDs on flexible substrates
- High power modules for production

On the other hand, with similar techniques as for high power LED modules, laser application can be addressed:

- IR VCSEL heater for curing processes
- Pump lasers for material processing
- Laser surface cleaning
- Ignition plug for large combustion engines

## ACTIVITIES AT FRAUNHOFER IZM

Fraunhofer IZM has been involved in LED development from the beginning of solid state lighting. Assembly processes for LEDs and lasers with highest power and power density were developed for LEDs in harsh environments or just to make mass production more reliable but cost-effective, too.

To solve the challenges various technologies were developed or improved at Fraunhofer IZM. Examples include fluxless soldering with SnAg and AuSn, sintering with and without pressure with silver but also other metals experimentally, and thermo compression bonding. For highly accurate assemblies thermode soldering or reflow soldering with self-alignment are used. Several small batch ovens are used for process development with specific gases, plasma or mechanical activation.

Fraunhofer IZM has years of experience and is able to support already in the design phase to avoid known failures regarding thermal load, thermomechanical stress, color quality and environmental aspects. The developed LEDs and modules, but also customer samples, can be characterized comprehensively. Electrical, thermal and optical analysis are possible. If required the samples can be aged accelerated.

## PROJECT DATA

### CoolLED

- 400 high power LEDs on 16 cm<sup>2</sup> cube
- 1200W electrical power
- Gapless combination possible

### Enlight

- Fully hermetic package
- 1200 lm out of 4 mm<sup>2</sup>
- Through silicon via technology

### High-Q-LED

- Process development for parallel assembly
- Panel level processes

### ADVANTAGES

- High power laser made out of VCSEL arrays
- Eutectic soldering & sintering

### FlipTheLED

- Chip size packaged LED
- Low gap arrays
- CTE compensation for direct board attach