

Webinar Wire Bonding 2016

Würth Elektronik Circuit Board Technology



Your Speaker

Dipl.-Ing. (FH), MBA Philipp Conrad

At Würth Elektronik CBT since 2008

Product Manager Wire Bonding

Cooperation with B&F Bonding since 2010



Agenda



Wirebonding

A large white circle with a red outline is positioned to the left of the text. A red line extends from the top-left of the circle, and another red line extends from the bottom-left of the circle. The text 'Wirebonding' is written in a large, white, sans-serif font on a solid red rectangular background.

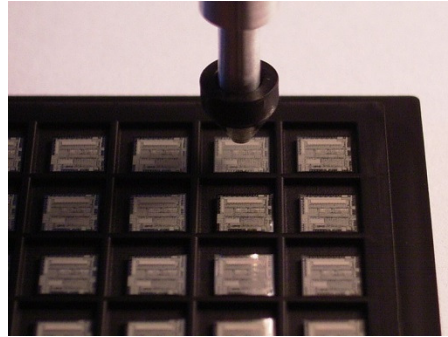
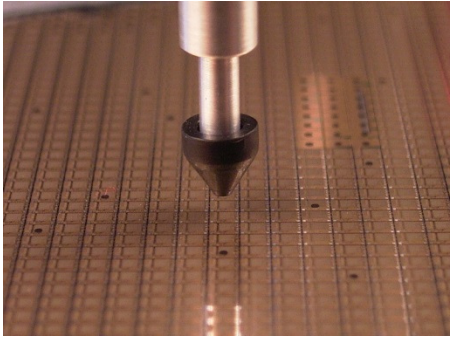
Quality Control

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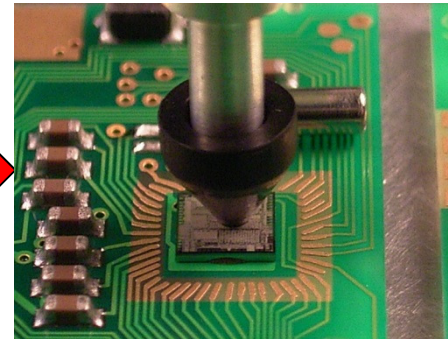
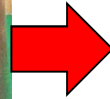
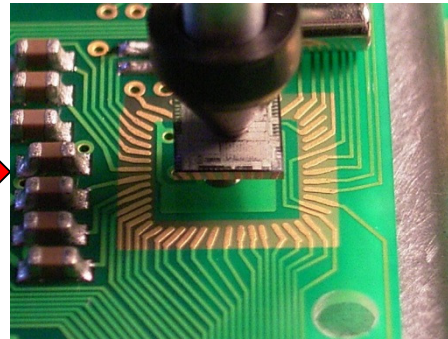
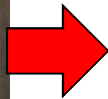
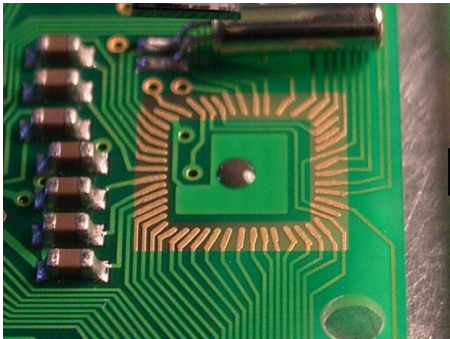
Applications

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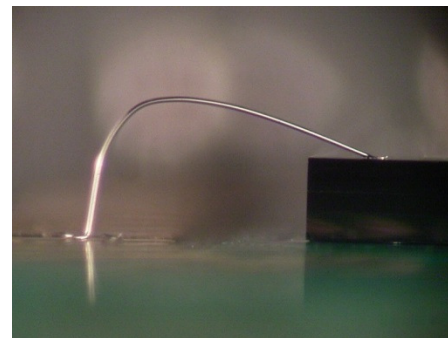
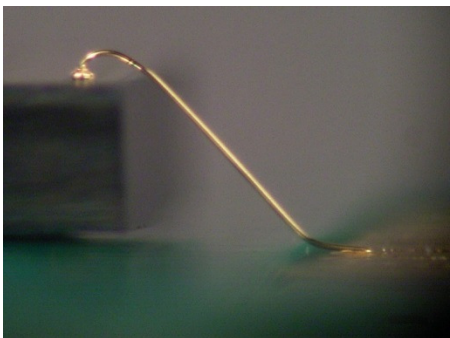
Wirebonding Process



Bare Die Pickup



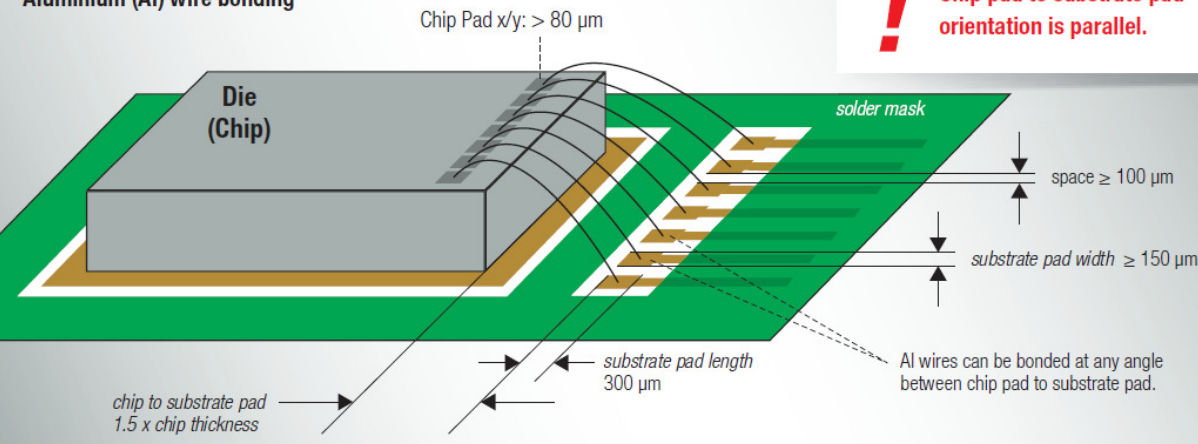
Bare Die Placement



Wirebonding (25µm Diameter)

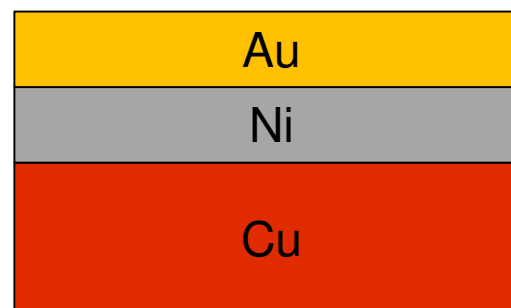
Wirebonding Design Rules

Design Rules for Aluminium (Al) wire bonding



! Chip pad to substrate pad orientation is parallel.

ENIG



0,05 – 0,1 µm

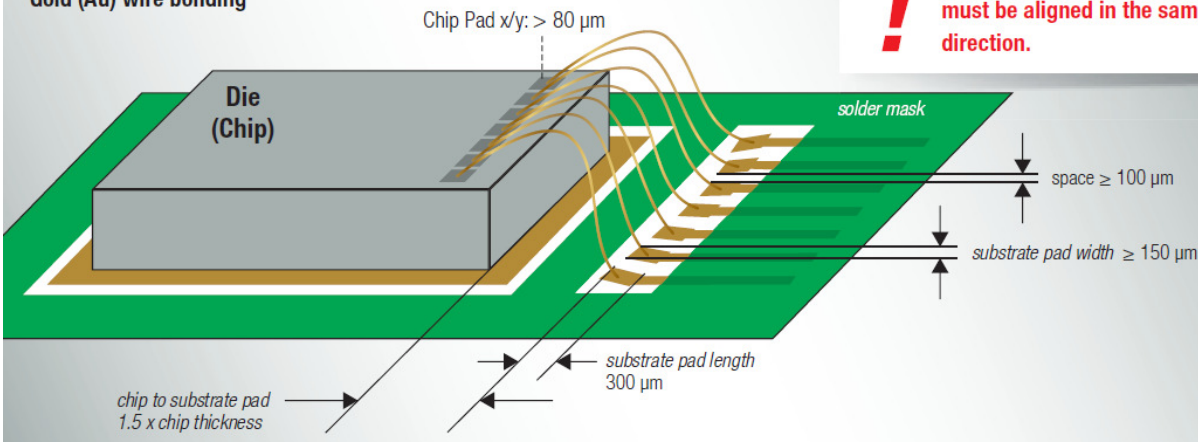
4 – 7 µm

Au

Ni

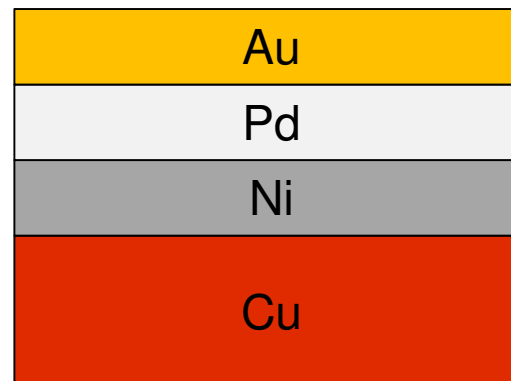
Cu

Design Rules for Gold (Au) wire bonding



! Chip pad to substrate pad must be aligned in the same direction.

ENEPIG



0,04 – 0,08 µm

0,1 – 0,2 µm

4 – 7 µm

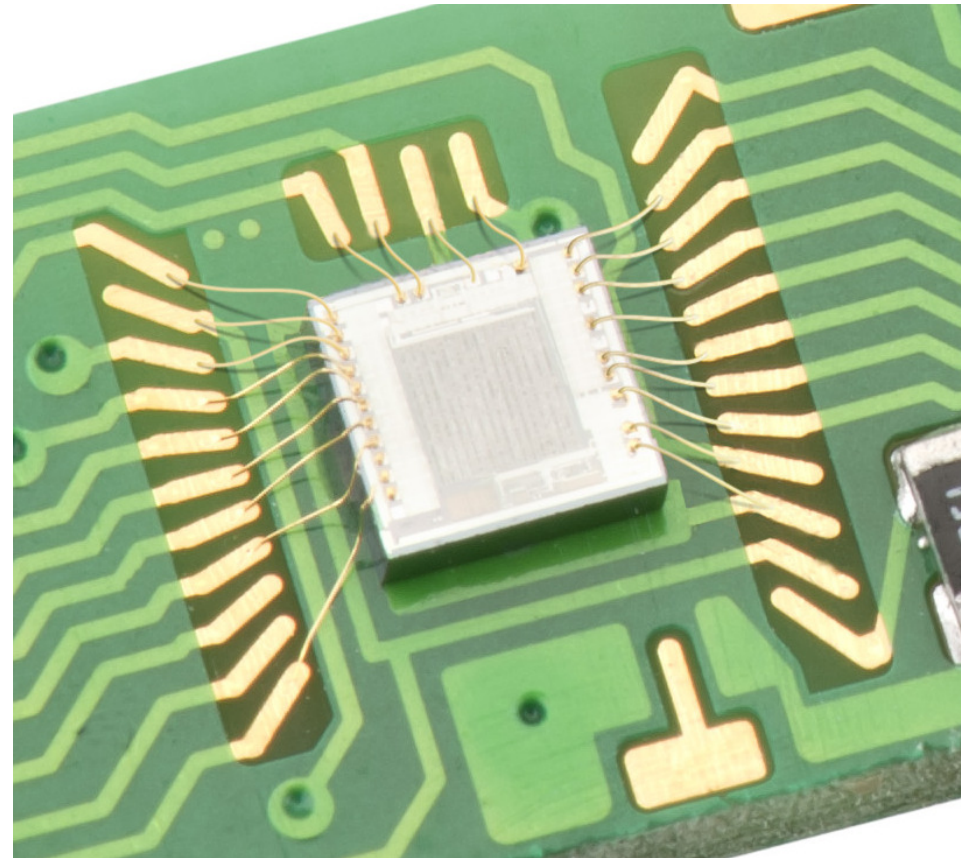
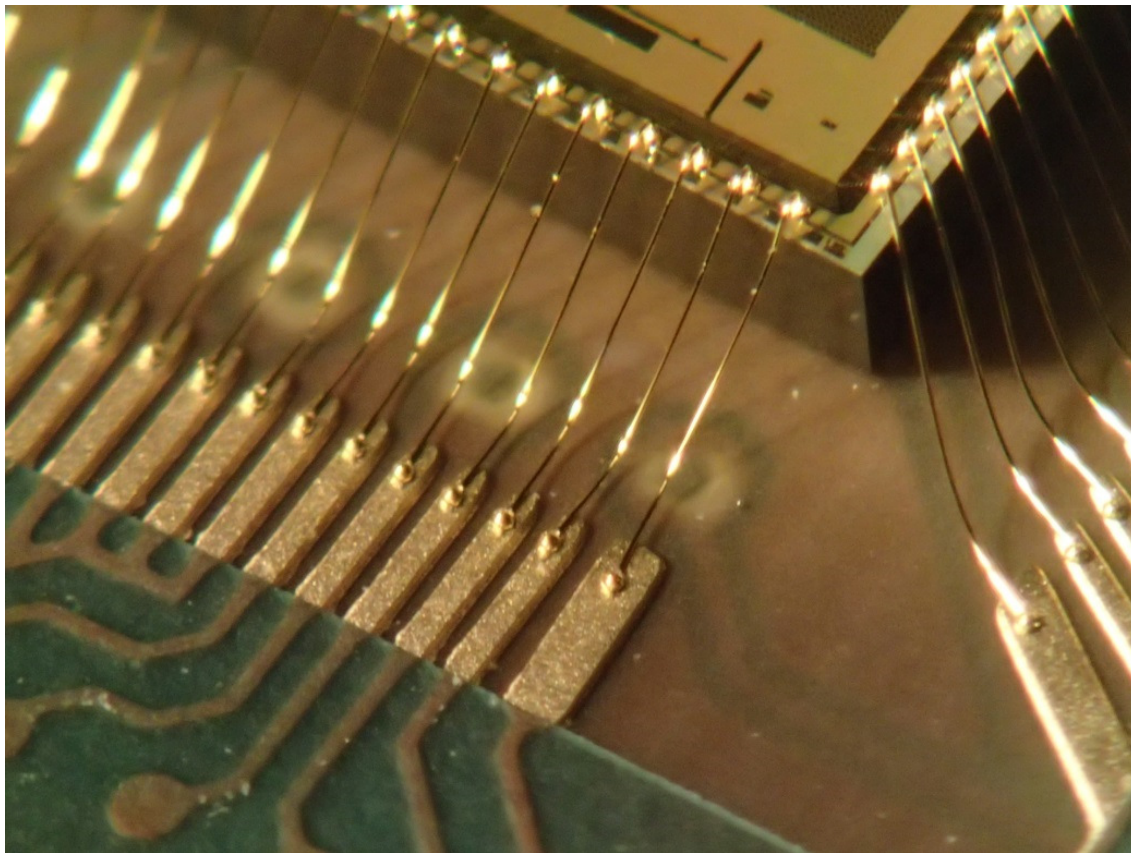
Au

Pd

Ni

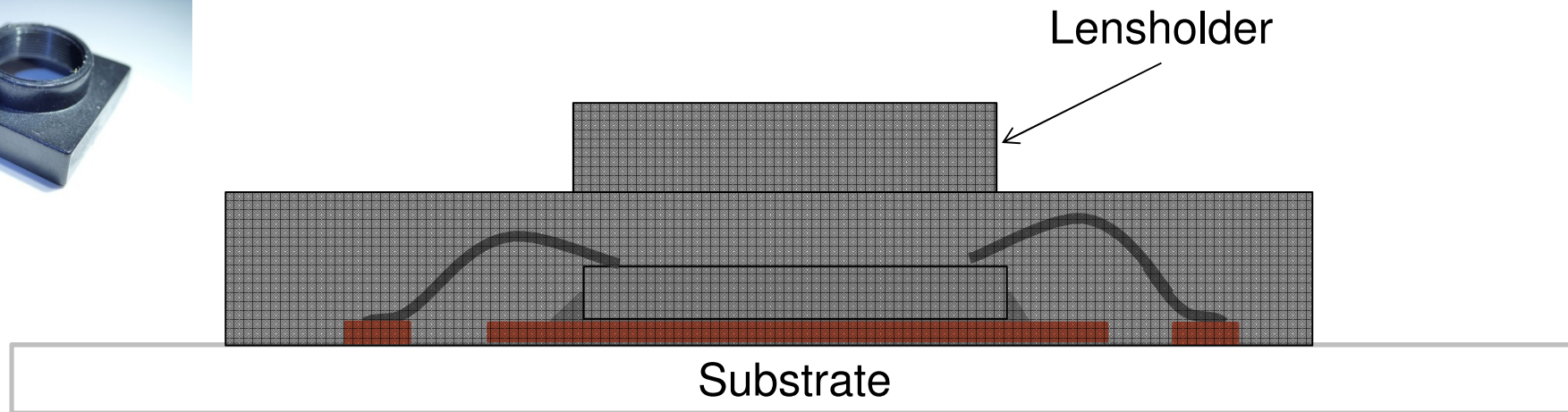
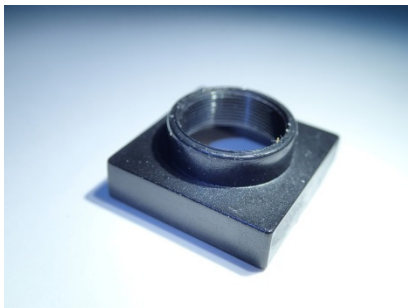
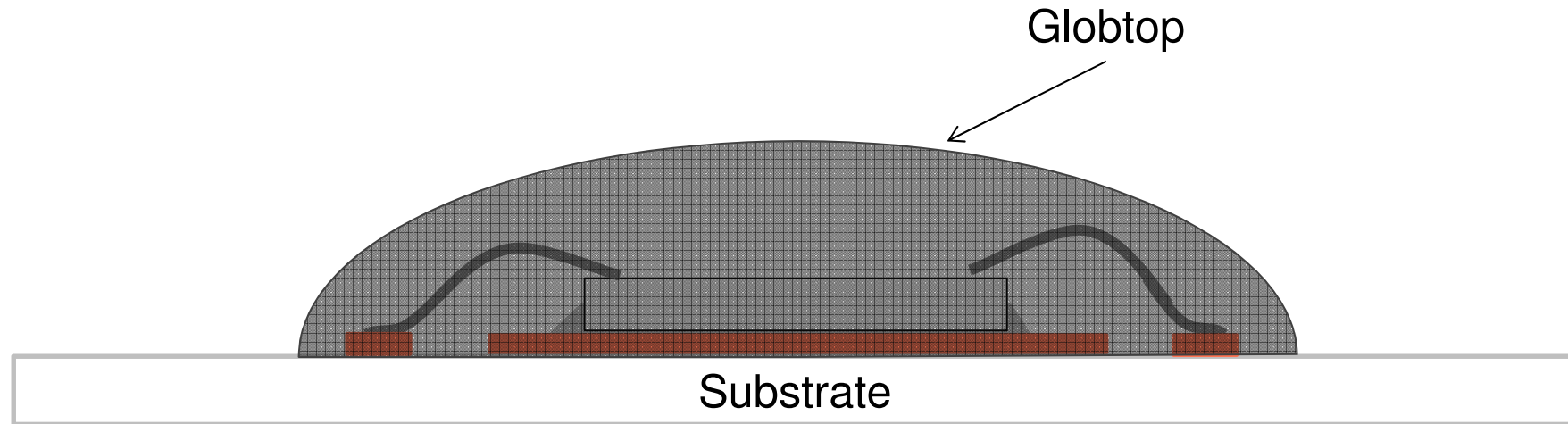
Cu

Gold Wire Bonding



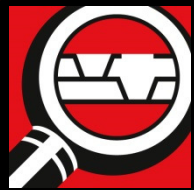
Source: B&F Bonding

Protection of Die and Wire Bonds



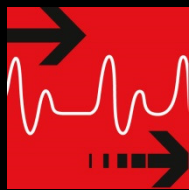
Wirebonding

Advantages of „wirebonded“ components?



Miniaturization

- Package replacement
- Space savings
- High Precision Positioning



Performance/ Function

- Thermal Management
- Short signal paths (HF)



Reliability

- Wirebond Tester
- Over 25 years Experience
- WE know HOW

Agenda



Wirebonding

A large, light red horizontal bar with a white circle on the left side. A thin red line extends from the top-left of the circle and continues down the left side of the bar.

Quality Control

A large, dark red horizontal bar with a white circle on the left side. A thin red line extends from the top-left of the circle and continues down the left side of the bar.

Applications

A large, light red horizontal bar with a white circle on the left side. A thin red line extends from the bottom-left of the circle and continues down the left side of the bar.

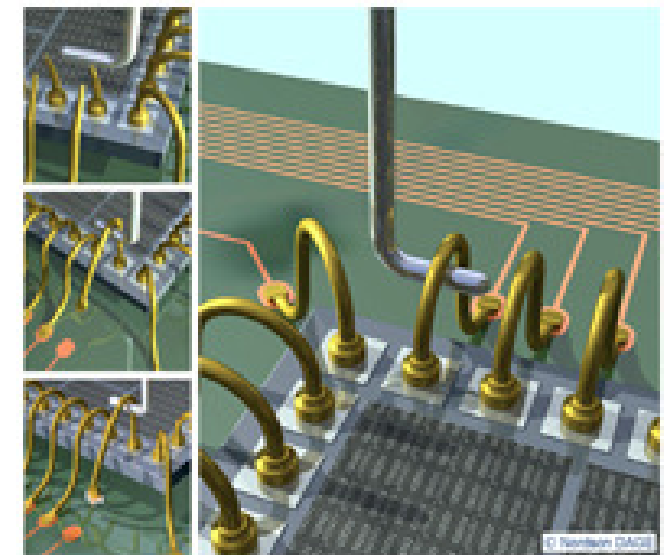
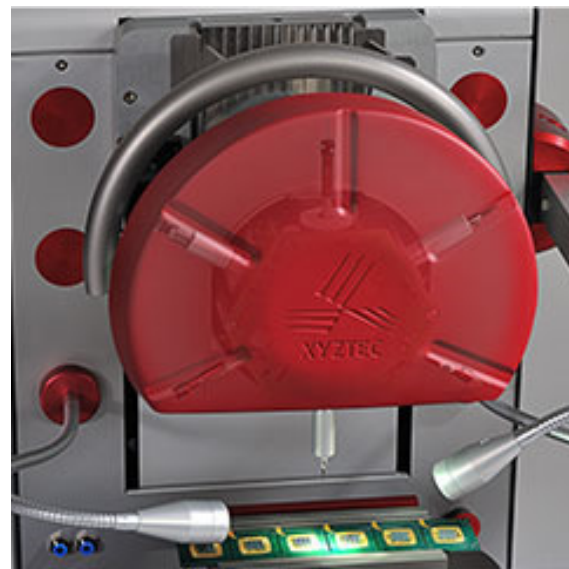
Quality Control

Wirebond Tester



Advantages XYZTec Wirebond-Tester (since 02/2016)

- WE** Automated Process
- WE** Standardized Test Process
- WE** Continuous Surface Quality Control
- WE** Online Test



Agenda



Wirebonding

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Quality Control

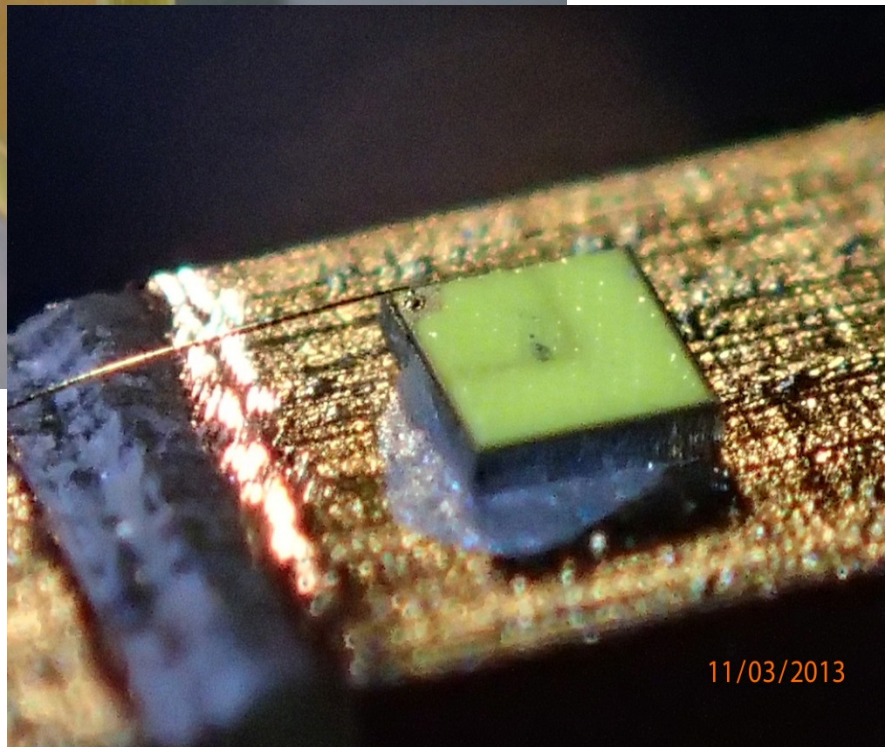
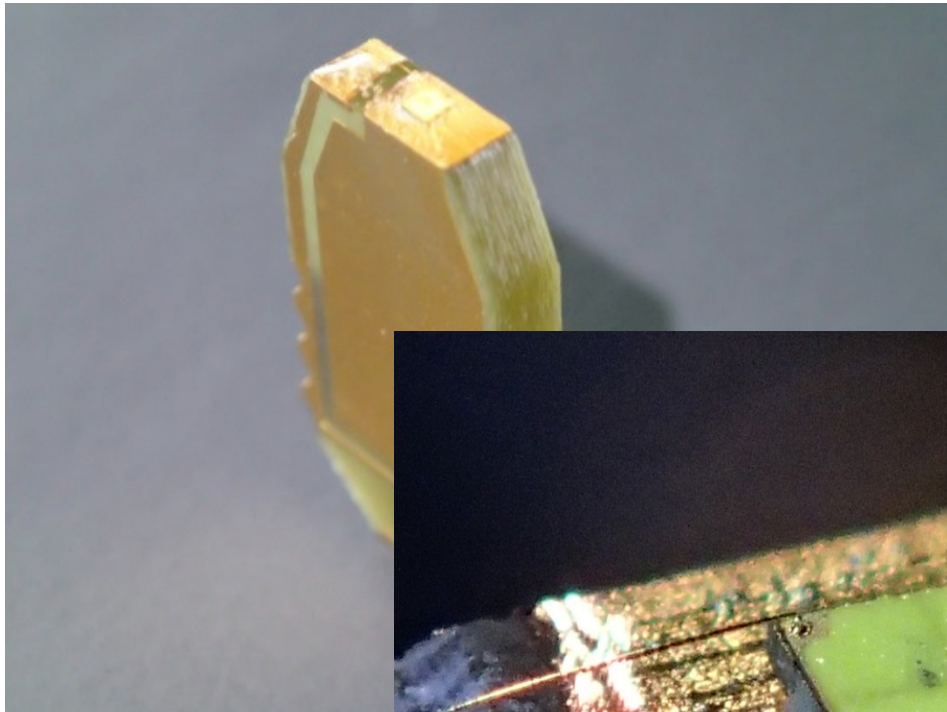
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Applications

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Applications

Internal Study: "WE LED"



- WE** Replacement for E10 Socket
- WE** PCB: Double Sided FR4, 2,4mm Core, Edge Plating
- WE** Bare die is glued to the edge of the PCB, wire bonded and encapsulated

Applications

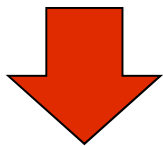
LED High Power Module

SMD LED or Bare die LED?

SMD LEDs

Advantages:

- Good availability
- Large range of various types and manufacturers available
- Tried and tested standard assembly process

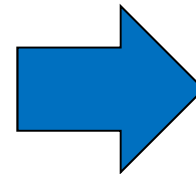


But:

Thermal resistance
 Junction layer → Solder pad 6,5 - 11 K/W
 (Datasheet OSRAM Golden DRAGON Plus)

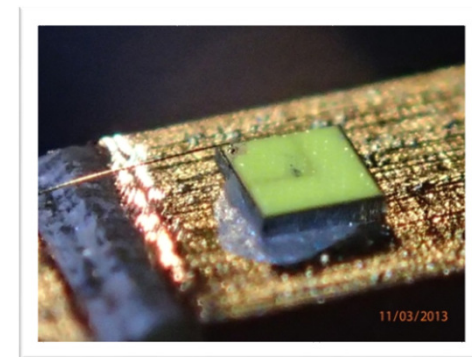


Source: OSRAM



Decision made on thermal considerations:

Use of bare dies
 (Thermal resistance casing eliminated)

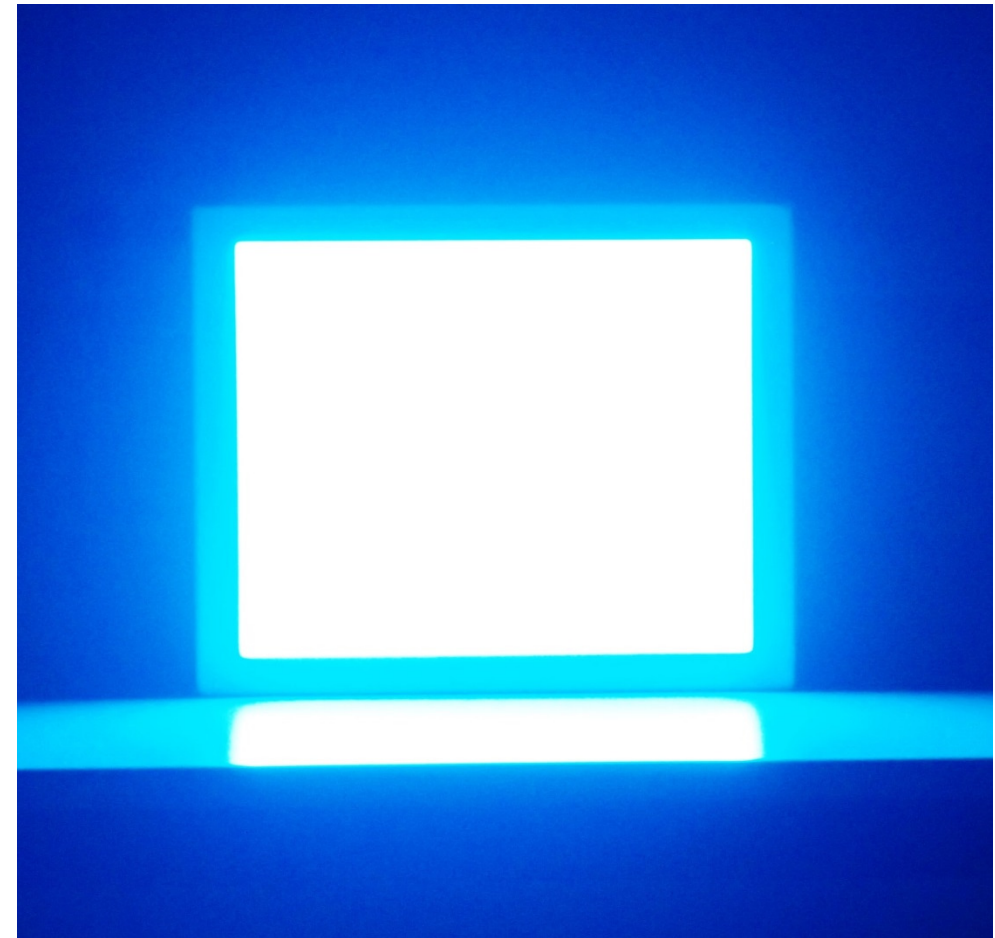
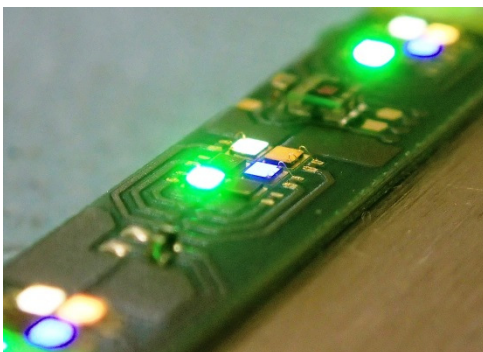
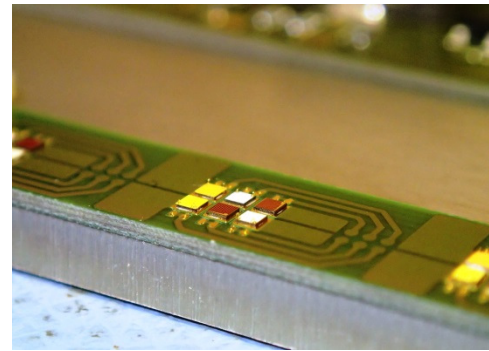
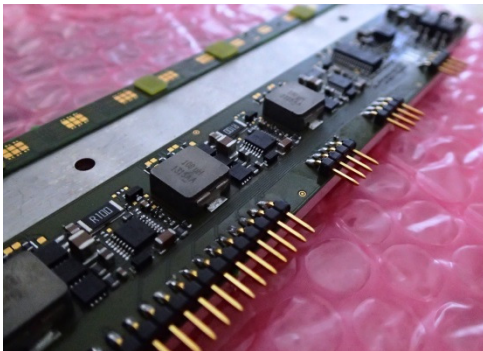


Applications

LED High Power Module



- PCB production
- Thermal management
- Sourcing bare die LED diodes in small quantities
- Placement and wire bonding of the diodes
- Encapsulation and protection of the diodes
- System solution



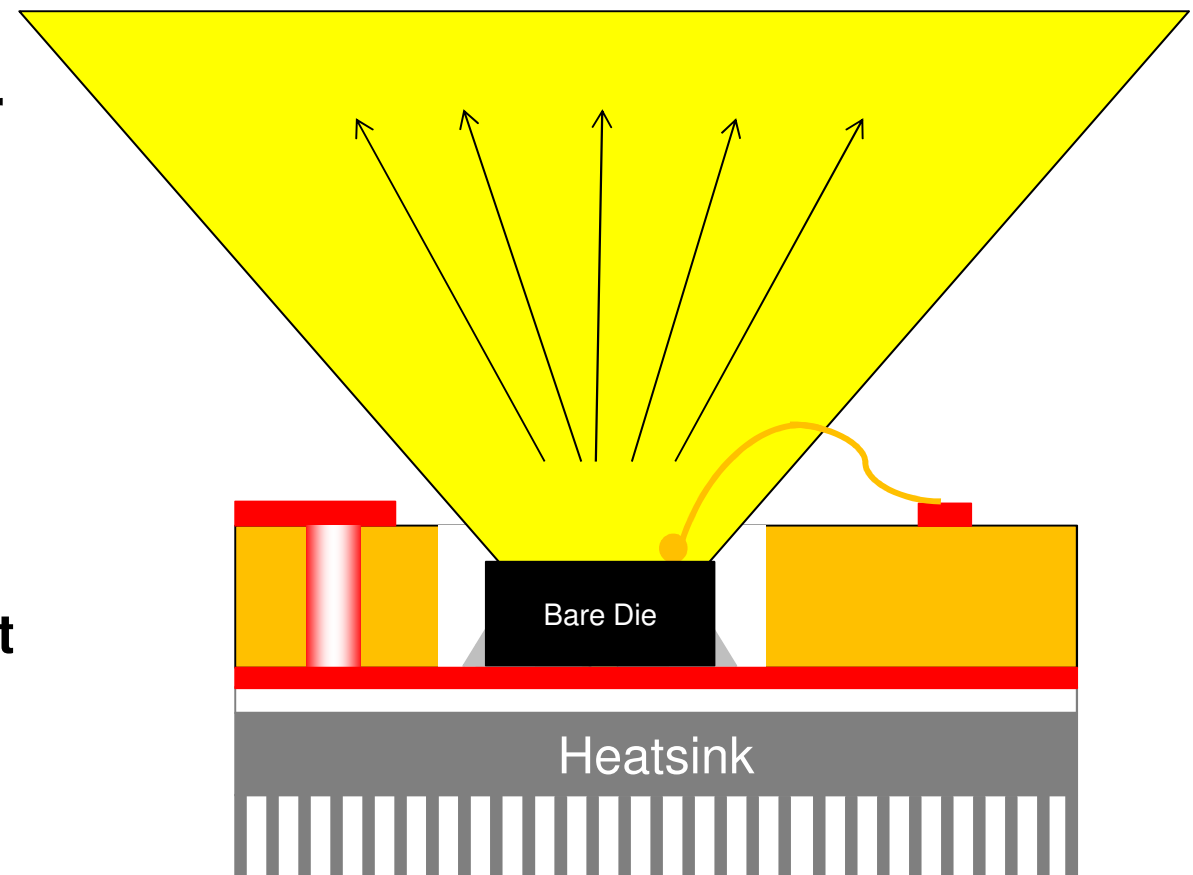
Applications

LED High Power Module



How will the assembly and connection technology be realised

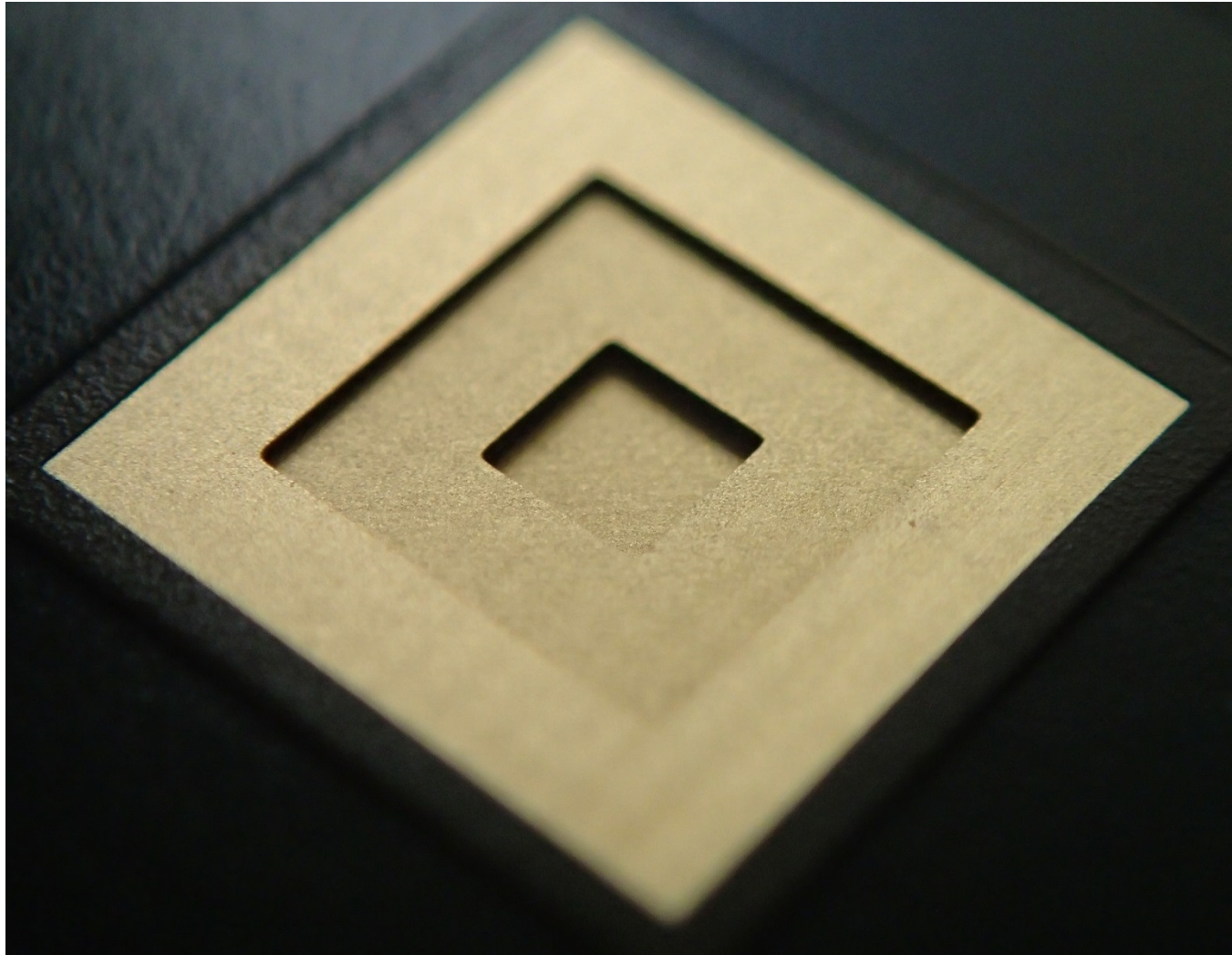
- **Double sided PCB or multilayer with individual bare die assembled and wire bonded**
- **Individual heatsinks glued**
- **Miniaturisation through reduction of the overall height**
- **Optimized thermal management**
- **Adjustment of the projection angle**



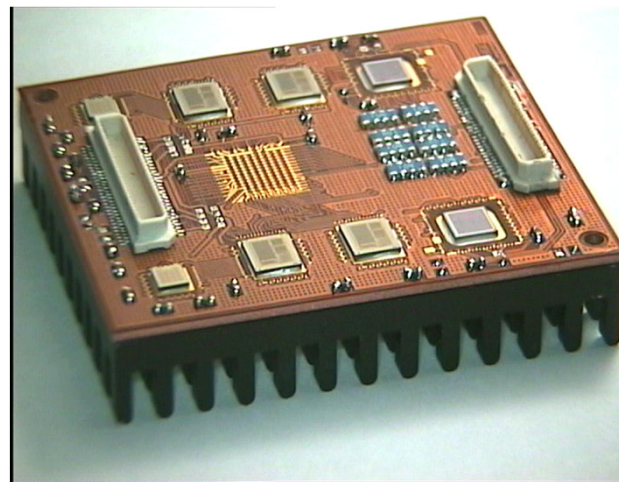
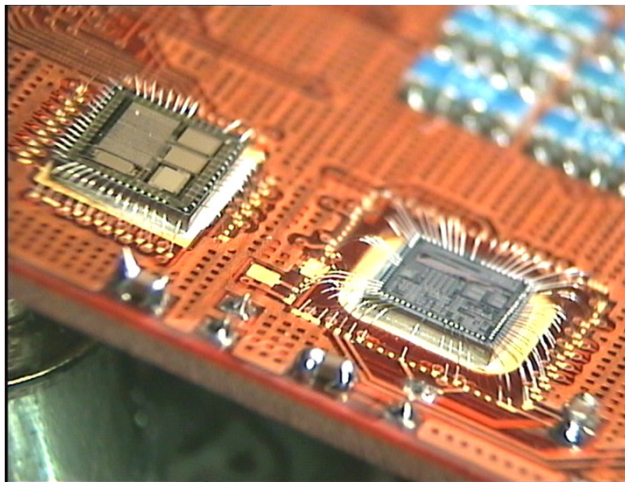
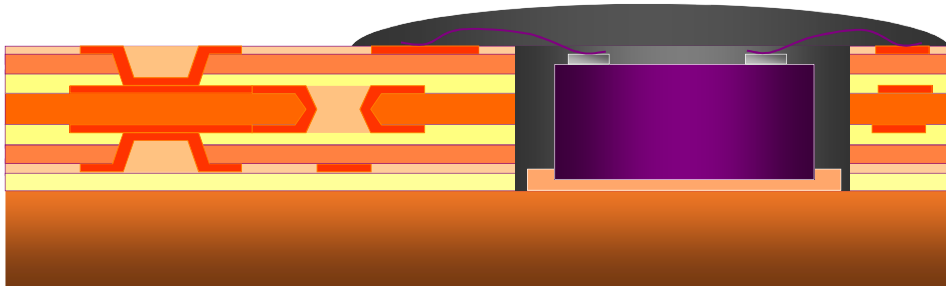
Referenzen



Testboard



Applications



- 4-Layer Flex with bare die directly wire bonded on a copper Heatsink 0.8 mm with ENIG-surface
- 2 Chips in Cavity
- AlSi-wire bonding

Source: UNI Heidelberg/CERN

Summary



High accuracy placement compared to SMD solder process

High accuracy placement of the bare die in following sectors:

- **Optoelectronics (3D Camera Systems)**
- **Sensor Applications**
- **Medical Applications**

Flexible design

Advantages of Wire Bonding

- **Miniaturisation**
- **Very good electrical connection**
- **Good mechanical and thermal stability**



Now it's your turn!

more
than you
expect

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