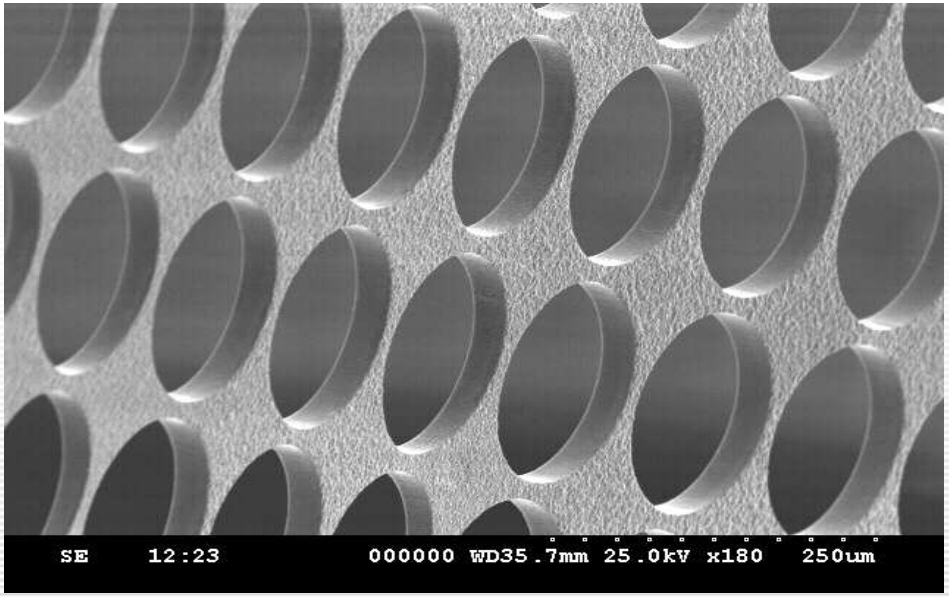
DEK

PLATINUM™

STENCIL




# Precision solder paste stencil for fine pitch printing applications

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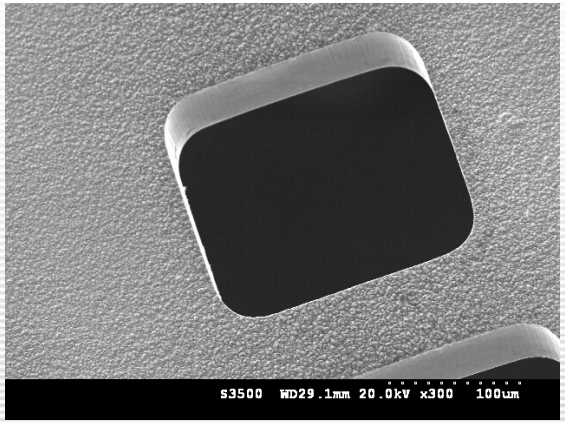
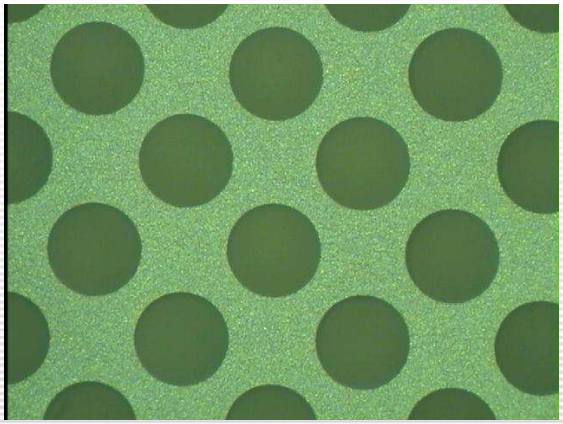
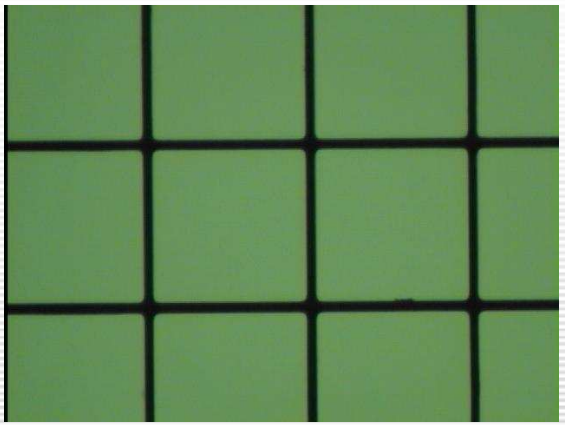
# Overview

- A Microengineered electroformed stencil manufactured using semiconductor fabrication processes techniques

- This high precision stencil is designed for Semicon printing applications and other fine pitch or high yield printing requirements



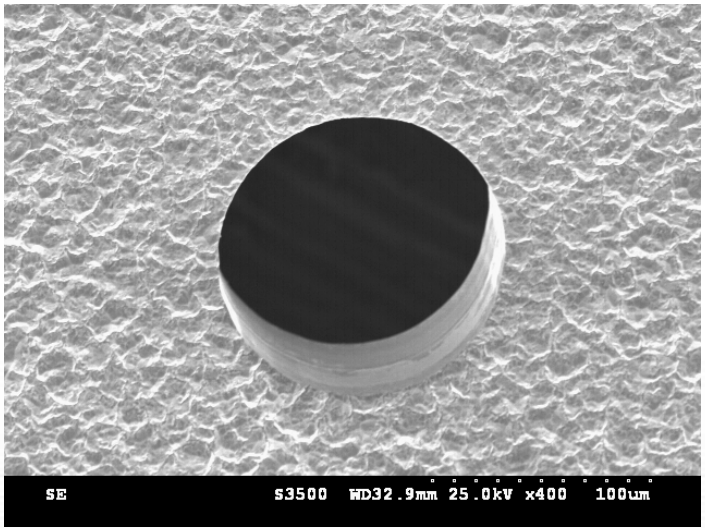





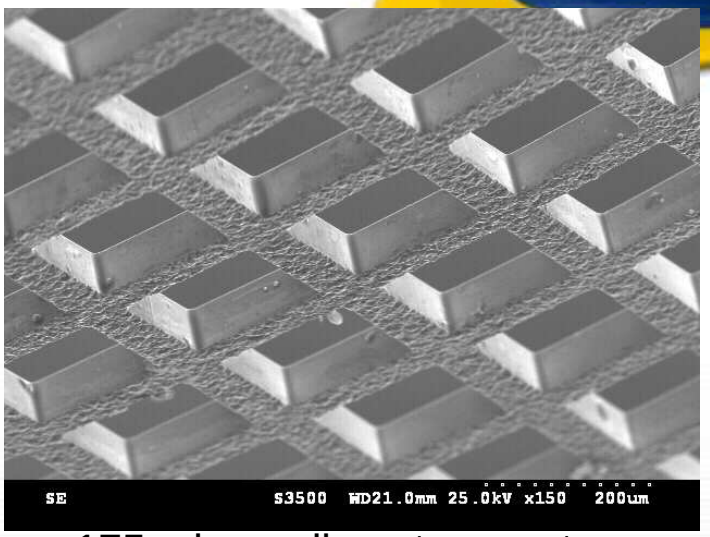
# Target Markets

- Wafer printing
  - Solder paste and ICA materials
- Flip-chip substrate bumping
  - Flux printing and paste printing
- Other fine pitch printing requirements

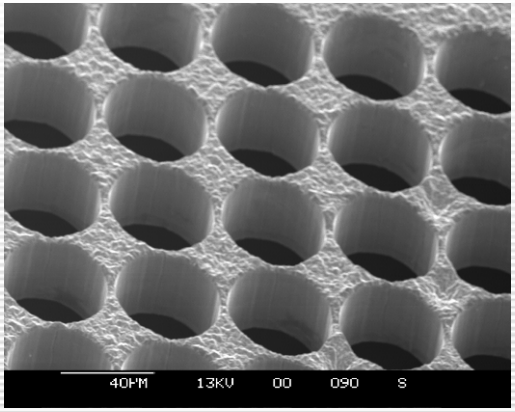
# Stencil apertures examples– SEM images



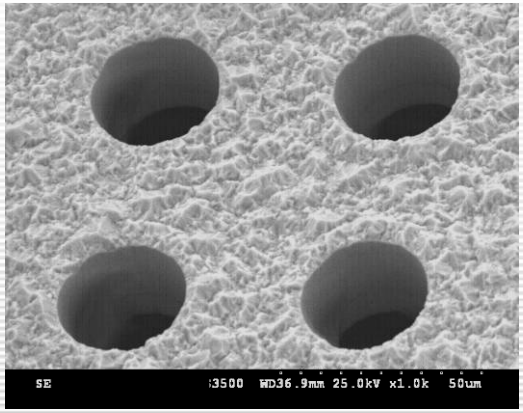

100 micron diameter aperture



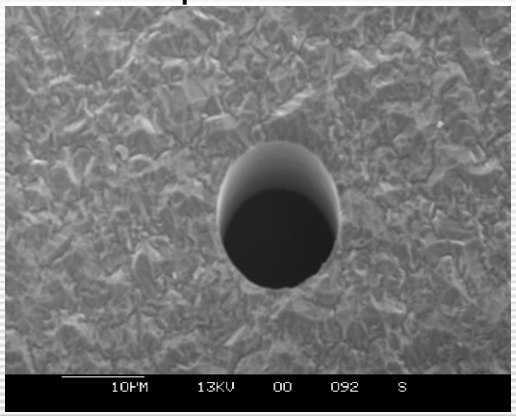

175 micron diameter aperture
225 micron pitch




50µm pitch 45µm diameter circular apertures




60µm pitch 30µm diameter circular apertures




7.5 µm diameter circular aperture

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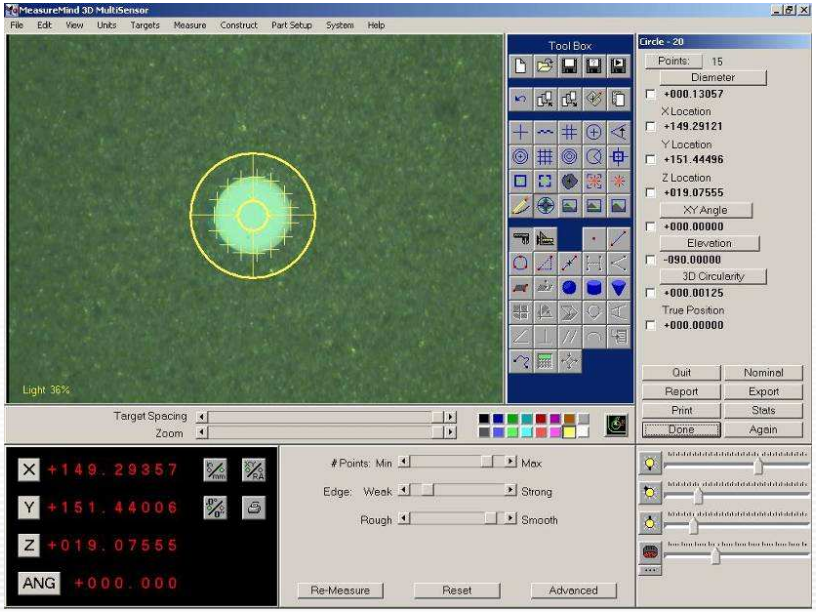
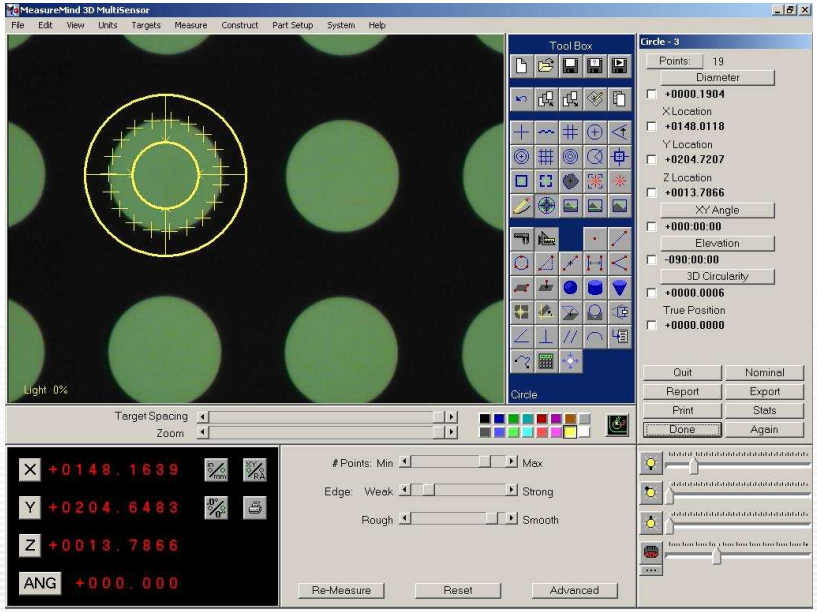
# High aperture tolerances



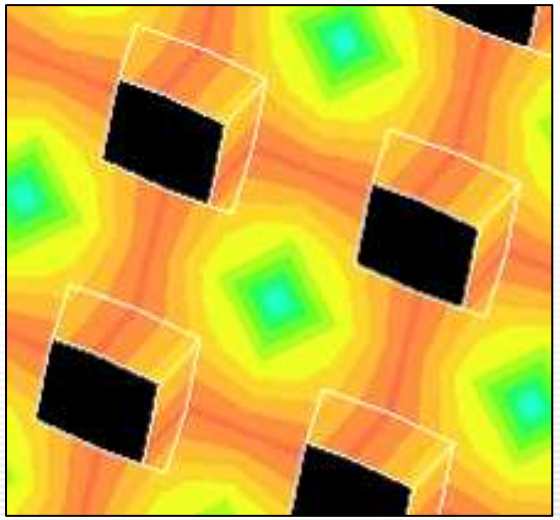




- Apertures tolerances within 3µm across 200mm diameter wafer for a 50µm thick stencil

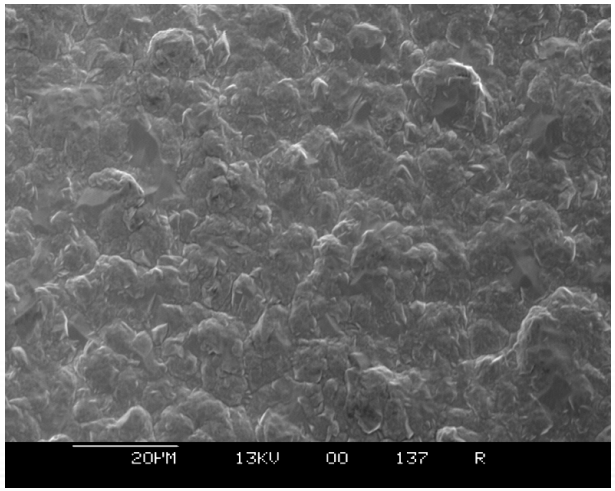
# Deformation from the mounting process

- Modelling studies detect only elastic deformation in the stencil from the mounting / framing process.

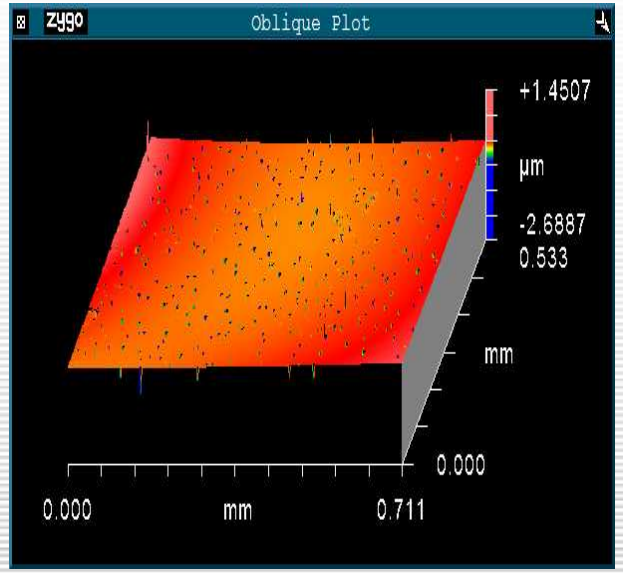
- Through tight process control all Platinum stencils will be better than 0.2 µm/mm deformation across the design area after mounting. This spec equates to less than +/- 40 µm on a 200mm diameter wafer.



# Surface roughness + stencil hardness




1000 times magnification




Interferometer surface scan

- Low surface roughness on top side and bottom side of stencil
  - Smooth squeegee side of stencils inhibits fine PSD solder pastes smearing on stencil surface during printing therefore allowing a lower print pressure.
  - Smooth substrate side improves the seal during printing onto wafers and allows an effective underside stencil cleaning process
- 10 measurements average, scan area 0.71mm x 0.53mm
  - Squeegee side
    - rms = 0.09875µm, Ra = 0.056µm
  - Board side
    - rms = 0.0694µm, Ra = 0.0388µm
- Stencil hardness 480-550HV (hardness Vickers)
  - Note: Stainless steel 220HV

# Competitive advantages

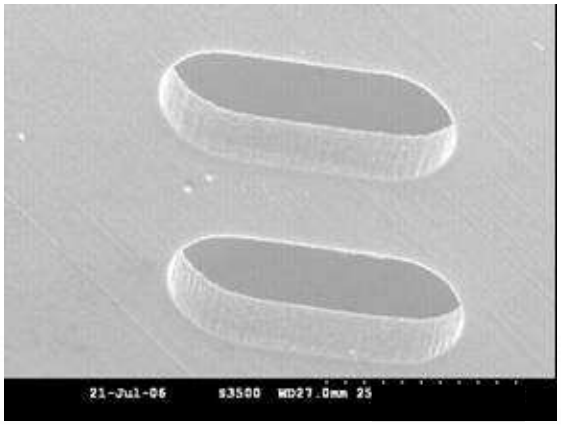
- Perfectly formed apertures with tight aperture tolerances across the whole stencil
- Smooth aperture sidewalls to aid paste release
- Good dimensional match to customer layout data
- Uniform thickness distribution across the design area to ensure each aperture prints the same volume of solder paste
- Smooth and flat substrate side of the stencil which minimises stencil cleaning frequency
  - In addition a smooth underside of the stencil can enable on-printer cleaning techniques not normally possible with conventional E-form stencils for wafer level printing

# Product Specifications

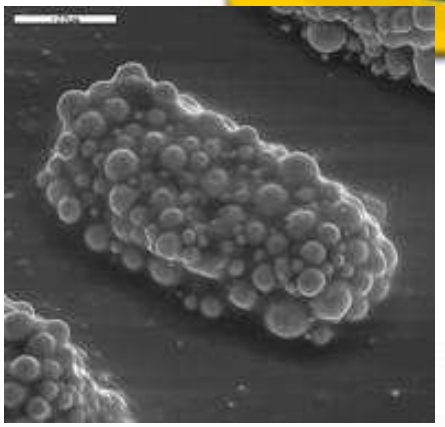
- Available thickness: 20 µm to 230 µm at 0.5 µm increments.
- Thickness Variation: +/- 5% of requested thickness, across the design area
- Aperture capability: >= 25 µm
- Aperture size tolerance:
  - <3 µm for 50 µm thick stencils
  - 4 µm for 50-100 µm thick stencils
  - 6 µm for 100-200 µm thick stencils
  - 8 µm for 200-230 µm thick stencils
- Positional Accuracy: 0.2 µm / mm
- Pitch: >= 50 µm

# What can this stencil achieve?

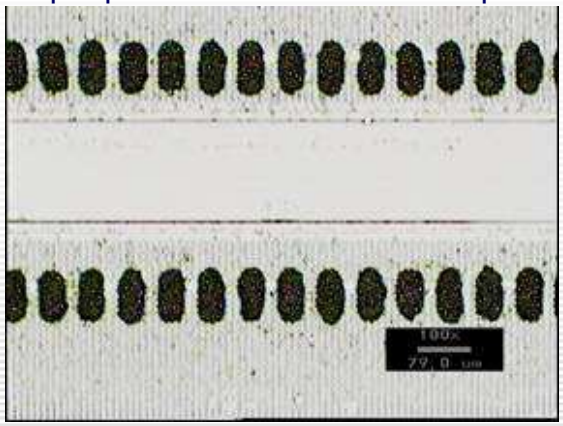
# Wafer printing - 60 micron pitch, 6-inch wafer (images courtesy of Technical University of Berlin)



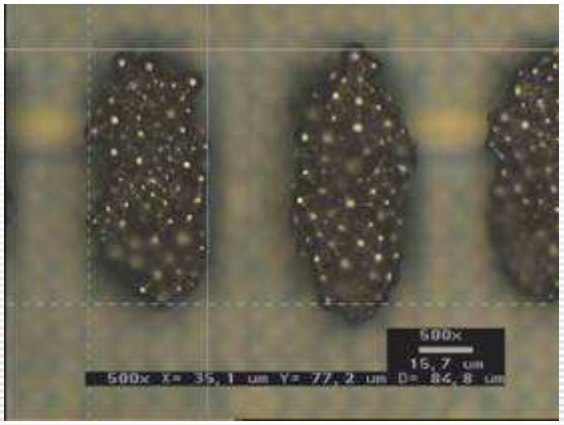

Electroformed nickel apertures 35µmx 80µm at 60µm pitch. Stencil thickness: 20µm



Developmental type 8 paste. Powder size range 2-8µm. Print deposits at 60µm pitch.




Wafer printing at 60µm pitch with type 8 paste.

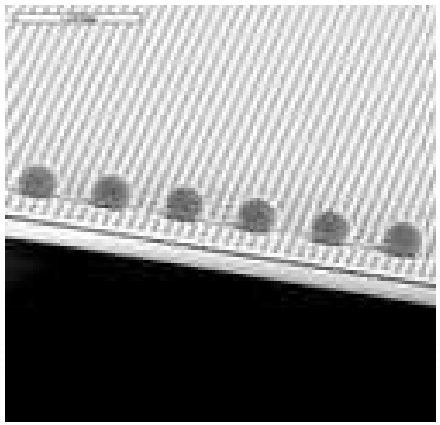


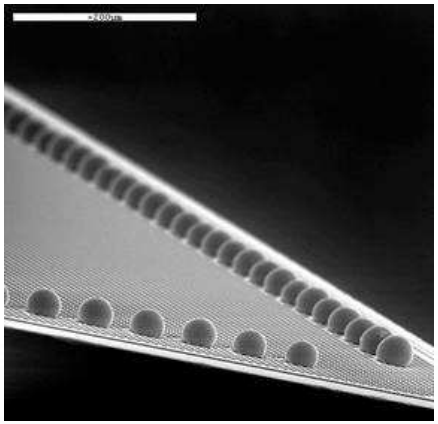

Wafer printing at 60µm pitch with type 8 paste.

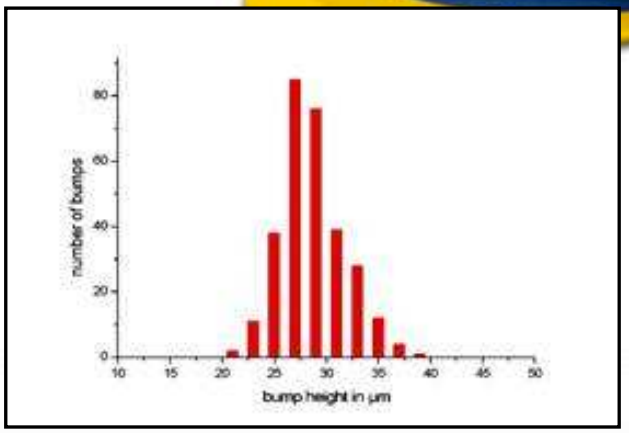
*Ref:erence*:

D. Manessis, R. Patzelt, A. Ostmann, R. Aschenbrenner, H. Reichl, R. W Kay, E. de Gourcuff "**Latest technological advancements in stencil printing processes for Ultra-fine-pitch flip chip bumping down to 60µm pitch**", IMAPS San Diego, Ca, 2006

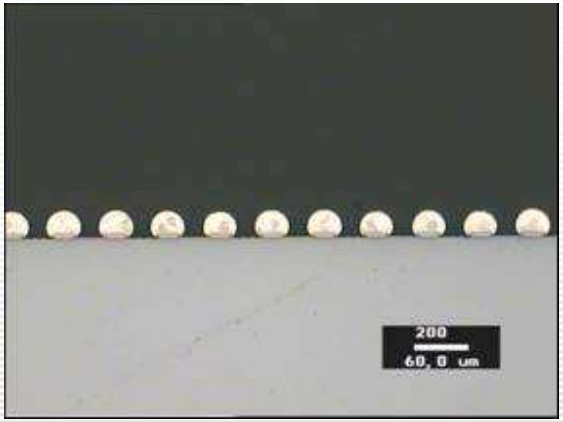
# Case Study – 60 micron pitch 6-inch wafer bumping (images courtesy of Technical University of Berlin)








. Bump height distribution at 60µm pitch, Average height: 28µm



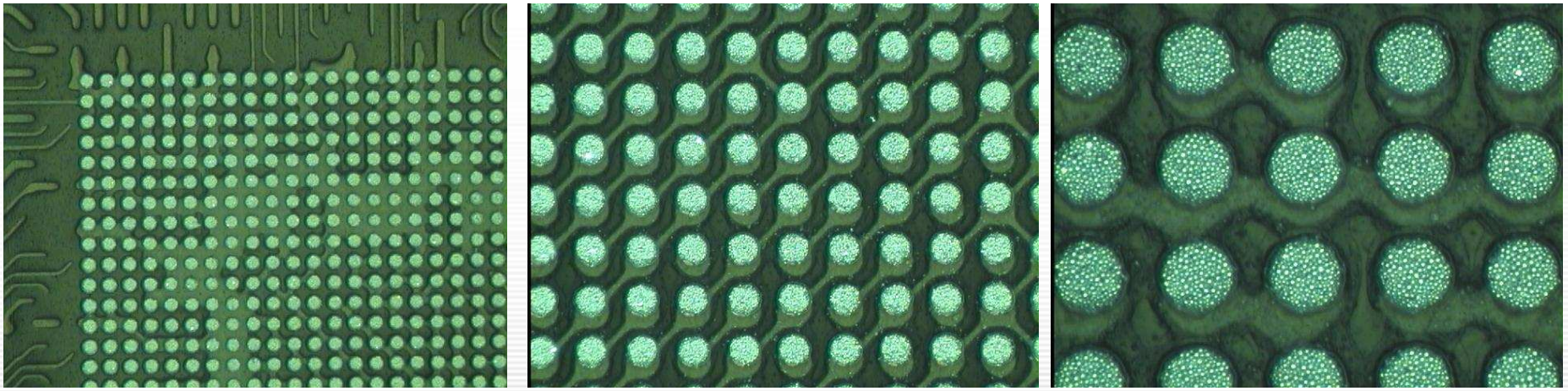

Cross section of bumped chip at 60µm pitch.

Shear mode for bumps at 60µm Pitch, fracture occurs in the solder

*Ref:erence*:

D. Manessis, R. Patzelt, A. Ostmann, R. Aschenbrenner, H. Reichl, R. W Kay, E. de Gourcuff "**Latest technological advancements in stencil printing processes for Ultra-fine-pitch flip chip bumping down to 60µm pitch**", IMAPS San Diego, Ca, 2006

# Flip Chip substrate - 150µm pitch



# Technical Contact / Questions?

**Dr. Robert Kay**
**Cheif Technical Officer**

115A Commonwealth Drive, #04-01, Singapore, 149596
Main Line: +65 6484 7010
Direct Dial: +65 6419 5852
Email: r.w.kay@microstencil.com
Internet: www.microstencil.com

MicroStencil Ltd, 13 Ladysneuk Rd, Stirling, UK
General enquires: sales@microstencil.com

DEK Printing Machines Ltd, 11 Albany Road,
Granby Industrial Estate, UK