Laser assisted Soldering and Flip-Chip attach for 3D-Packaging

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www.pactech.de
Content

• Short company profile
• Solder Ball Placement & Laser Reflow
  – Standard Process
  – Solder Jetting Process
• LAPLACE - Flip Chip Bonding
Pac Tech Corporate Profile

- 1995 Pac Tech GmbH established, Berlin-Germany
- 1997 1st Bumping facility in Nauen, Germany
- 2000 2nd Bumping facility in Fukui, Japan (Alpha Bumping Technologies - ABT, JV with Nagase)
- 2002, 3rd Bumping facility PacTech USA Inc., CA, USA
- 2005, Customer Service Center Thailand
- 2006, Pac Tech Asia (Penang, Malaysia - planned Q4)

- PT Germany: 125 employees
- PT USA, Inc.: 20 employees
- Sales Turnover 2005: 14 Million Euro (PT Germany)
- Shareholder Structure: NAGASE & CO., Ltd. Founders

Certified DIN EN ISO 9001; TS 16949 conform
NAGASE PROFILE

- HISTORY: Founded 1832, Incorporated 1917
- SALES: 5 billion US$
- STOCK: Listed TSE-1, OSE-1
- TYPE: Trading & Manufacturing
- FIELDS: Industrial & Consumer
- ITEMS: Electronics, Chemicals, Plastics, Pharmaceuticals, Beauty Care

www.nagase.co.jp
Certified DIN EN ISO 9001; TS 16949 conform

Locations Worldwide

Pac Tech USA Inc
Santa Clara, CA

Boston

Pac Tech GmbH
Nauen, Germany

Tokyo

Fukui

Pac Tech facilities

Distributor/ Sales Agent

Finland

Sweden

Denmark

France

Italy

Korea

Taiwan

Philippines

Taiwan

Thailand

Malaysia

Singapore

China

Israel

France

Pac Tech facilities

Distributor/ Sales Agent
Certified DIN EN ISO 9001; TS 16949 conform

Pac Tech Equipment
Bumping, Spin Coating, Gang Ball Placement, FC Assembly

- Wafer Bumping
- Wafer Level Packaging
- CSP, BGA, HDD

<table>
<thead>
<tr>
<th>NiAu-UBM Wafer Bumping</th>
<th>Solder Ball Placement/Reflow</th>
<th>Spin Coater</th>
<th>Flip Chip Assembly</th>
<th>Gang Ball Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>PacLine 200/300</td>
<td>SB²-Jet</td>
<td>SC 200/300</td>
<td>LAPLACE</td>
<td>GBP 200/300</td>
</tr>
</tbody>
</table>
Solder Ball Placement & Laser Reflow
Technical Needs for 3D-Packaging

• Low mechanical stress
• Low thermal stress
• Complex 3D-Packaging
• Soldering with special solder alloys
Advantages of Laser Soldering

• Localized heat
  – No thermal stress on the areas outside of bonding interface

• Short Laser Pulse
  – Low thermal stress on the chip/substrate and interconnection
SB² - Equipment

- Semiautomatic SB²-SM
- SB²-Jet LF with R2R
- SB²-Jet LF
- Automatic SB²-Jet
- ESD version of SB²-Jet
  For HGA & HSA Assembly

More than 200 machines installed.
SB²-SM Process (standard)

Placement & Reflow of Solder Balls
Laser Soldering SB²-Jet

Schematic Of The SB²-Jet Process
Bondhead of the SB²

Solder Jet and Repair Bondhead
SB²-Jet Advantages

- No tooling
- Solder ball diameters from 60µm to 760µm
- Solder alloys: SnPb, SnAg, SnAgCu, AuSn
- No flux
- No mechanical stress/contact
- No thermal stress
- No additional reflow
- No cleaning of flux residues
- Fine pitch applications (120µm)
SB²-Applications

- Wafer Bumping
- BGA/ CSP Bumping
- Wafer Level CSP Bumping
- Rework/ Repair
- Optoelectronic Packaging
- SAW, BAW
- MEMS & 3-D Packaging
- Hard Disk Drive (HGA, HSA)
- Camera Modules
3D – Assembly Configurations using SB\(^2\) – Jet

1.

2.

3.

4.

5.
3D – Assembly
Design Considerations
SB²-Aplications

Glassfiber Attachment  3D-BGA-Package (Cube)
Fluxless 3D-Ball Placement & Laser Reflow on Flex Suspension for HDD (HGA)

Hard Disk Drive
Fluxless 3D-Ball Placement & Laser Reflow on Flex Suspension for HDD (HGA)

Source: Seagate
Fluxless 3D-Ball Placement & Laser Reflow on Flex Suspension for HDD (HGA)
Fluxless 3D-Ball Placement & Laser Reflow on Flex Suspension for HDD (HGA)

- Silicon stator (non-moving, attached to suspension)
- Silicon rotor (moving, holds magnet and slider)
- Magnet/ bottom keeper
- Narrow beam flexure (connects rotor to stator)
- Read / write transducer
- Electrical connections to read / write slider
- Electrical connections to drive coil
- Suspension
Cross Section of a Flex Suspension
IV

LAPLACE 1

Laser assisted Flip Chip Bonding
LAPLACE
Equipment for FC and wafer to wafer attach
Flip-Chip-Laserbonder

*LAPLACE – High Precision*

Application: LCD Driver
Flip Chip & Capacitor Attach in Consumer Product
V

LAPLACE 2

Laser assisted Wafer to Wafer Bonding & soldering equipment
Certified DIN EN ISO 9001; TS 16949 conform

-Active wafer
-Wafer to Wafer Interconnection
-Lid wafer
Cycle/process flow

Gantry X, Y, Z

Vacuum Chuck θ  P-Sensor  Dual Camera
Laser Line Scanning Concept

Passive part of Laserline

Wafer

Laser Line Holder

Active part of Laserline

Scanning Direction

Scanning Speed: max 4-5 minutes per Wafer

Certified DIN EN ISO 9001; TS 16949 conform
## Contacts:

### Pac Tech GmbH

<table>
<thead>
<tr>
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