PHILIPS

Innovation Services

MEMS devices & micro-assembly

Greenhouse High-end PCBA & Micro-assembly factory

Thomas de Boer The Greenhouse, Philips Innovation Services April 11, 2017

Philips Innovation Services







Customer satisfaction of 4.5/5



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Position in Philips



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Our key areas of expertise



Technology laboratories

Development and manufacturing at Philips Innovation Services



MEMS Foundry Micro-fabrication 2650 m² clean room *ISO13485 certified* Micro-assembly die/board level 3500 m² ISO13485 certified

Det WD SE 23.7



Smart catheters, inand on-body devices workshop, 300 m² *ISO13485 certified*

High Tech Campus

'Strijp'

High Tech Campus



Greenhouse /ˈgriːnhaʊs/

noun: greenhouse; plural noun: greenhouses

"a building made mainly of glass, in which the temperature and humidity can be regulated for the cultivation of delicate or outof-season plants"

Source: Webster's New World College Dictionary

Greenhouse project involvement





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Micro-systems

Combination of high-end PCBA and micro-assembly





Electronics Design Services

- PCBA realization
 - Layout Services
 - Electronic Design Platform (CAD)
 - Design Library
 - Design for Assembly/Manufacturing (DfA/M)
- Component management
 - Systems, tools, configuration (Windchill, CAD integration
 - Centralized Part Data Management and definitions
 - Change Notifications and Obsolescence Management
 - Substance Management
- Wireless reliability and EMC compliance for products & systems
 - Design for EMX methodology
 - Wireless reliability (performance, coexistence, interference, FDA risk analysis)
 - Modeling & simulation







Carriers

- Conventional carriers
- Non standard carriers
- Next generation semicon based carriers



Standard PCB

Wafer Level Flex2Rigid



Fabric



Component placement



22 μm @ 3 σ Solder/glue $7 \ \mu m @ 3 \sigma$ Solder/glue 1.5 μm @ 3 σ Solder/glue/AuAu



Key technology competencies *Soldering*

- Conventional surface mount technology on wafer
- Very fine pitch board assembly to enable miniaturization
 - CSP with pitch down to 200 μm
 - Smallest passives 008004
- Fluxless soldering
 - High accuracy requirements w/ AuSn preforms
 - No flux residue allowed (optical requirements)
 - Minimal amount of voids allowed (thermal requirements)





Interconnect

- Au and Al wire bonding
 - Die to board/flex/lead frame
 - Die-to-Die
- Anisotropic conductive adhesives (ACF)
 - Typically used for chip to flex bonding
 - Very fine pitch capability
 - All connections made in one step
- Thermocompression bonding
 - Au/Au





Environmental protection

- Globtop and dam & fill
 - Corrosive & mechanical protection wire bonds
- Underfill
 - Mechanical protection flip chip interconnects
- Spray coating
 - PDMS
 - Water and gas protection
 - Conformal coating
 - Corrosion protection
- Parylene coating
 - Water vapor protection



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Testing

- Structural testing:
 - 3D paste inspection
 - 3D AOI Automated optical inspection
 - ICT Integrated circuit testing
 - Flying probe testing
 - 3D X-Ray
 - BST Boundary Scan Testing
 - Functional testing
- High voltage test / burn-in
- Stress test / burn-in









Micro assembly: examples





MEMS



MEMS





CMUT

MEMS CMUT sensor, Wire bonded on flex

Smart catheter Medical MEMS sensor, assembled on catheter tip



Medical sensor module Stacked wire bonding of sensors on PCBA layout, proto's, functional test

Hybrid (micro assembly + PCBA): examples





Laser module wire bonding on MCPCB



Sensor module

- 3 Stacked PCBA's 4x4 die placement, 40 & 300 μm gap
- Wire bonding within 300 μm gap
- Stitch bonding

Volume manufacturing competencies

- ISO 9001, ISO 13485
- Project management
- Product life cycle management (PTC Windchill)
- Purchasing, forecasting, MRP, quality management (SAP ERP)
- Routing, tracking, traceability (SAP MES)
- Change management
- Statistical process control (SPC)
- DfX, design for excellence
- Design of experiments (DoE)
- Risk management, FMEA
- Cpk analysis, yield improvement



More information?

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