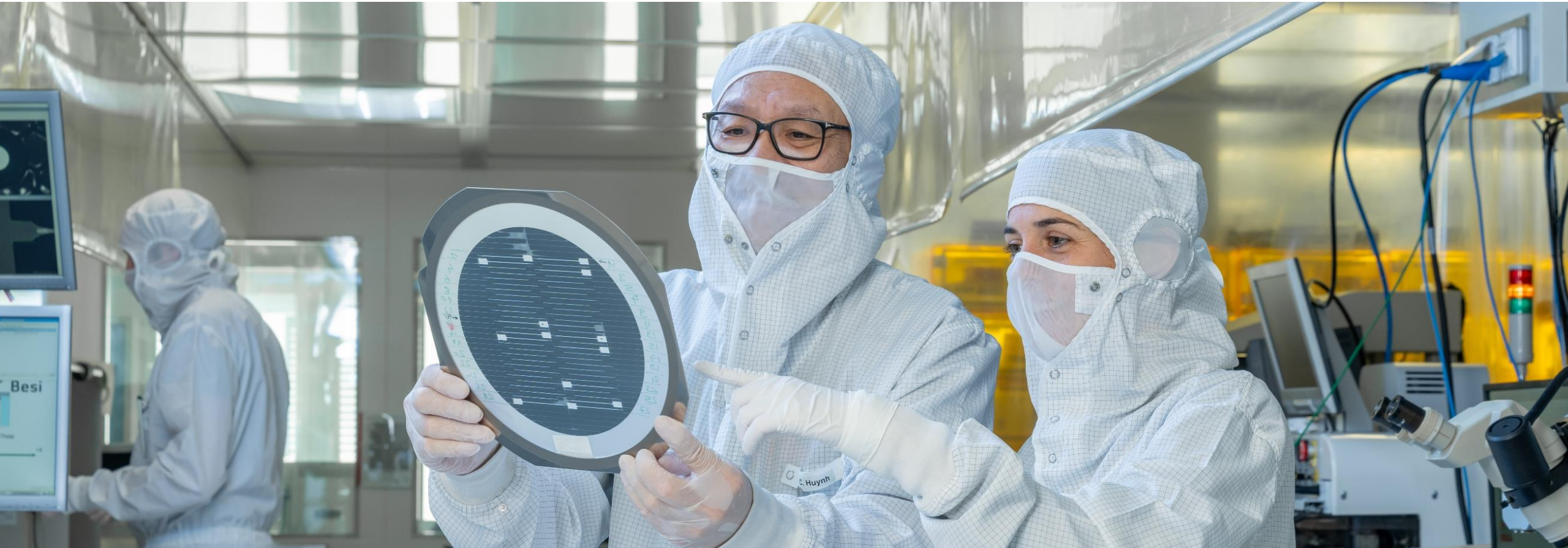




MICRODUL

Customized Swiss Microelectronics



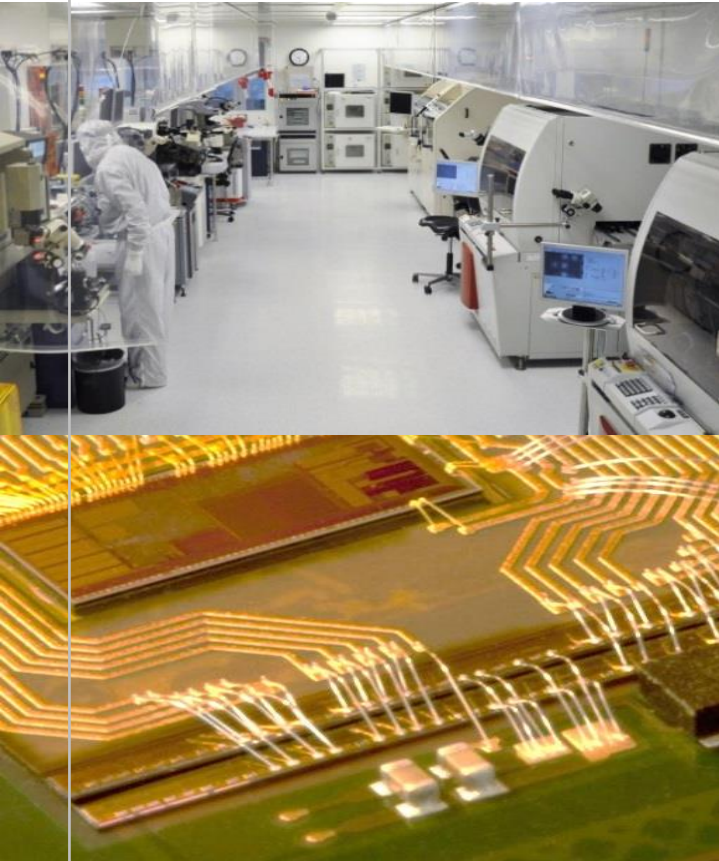
Photonics in Medtech_ext

16.09.2026 D. Thommen

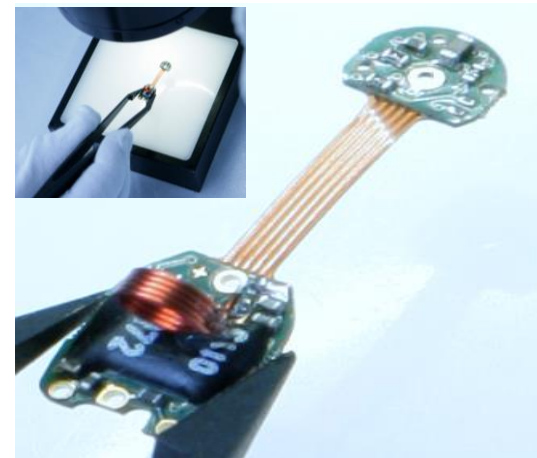
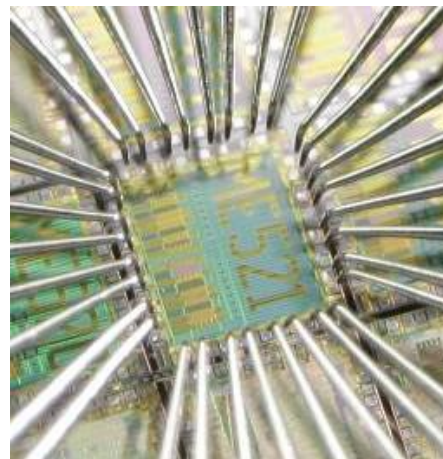
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Microdul Electronic Manufacturing Service

("no own products")



- Founded in 1991, Management Buy Out of Philips Semiconductors **Zürich/CH**
- Private Swiss company, 100+ employees
- ISO 9001: 2015 and **ISO 13485: 2016** (medical products)
- Experts in manufacture of **Active Implantable Medical Device >25 years**
- Prototype development → **mass production**
- **Ultra Low power ASIC design**

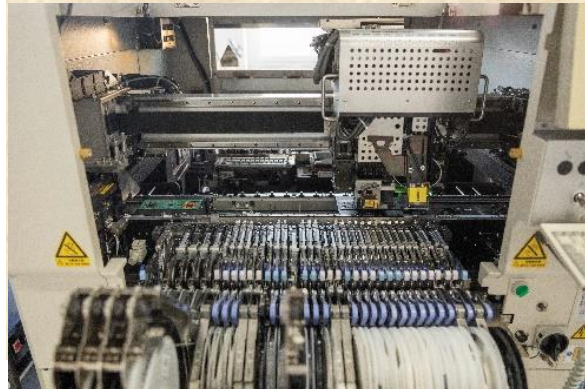


Process Equipment



Assembly

- SMD (008004) FlipChip
- Vacuum soldering
- Resistance welding
- X-Ray
- Automatic Opt. Inspection
- BGA balling
- Laser coding/cutting
- Manual assembly
- Silicone dispense and potting



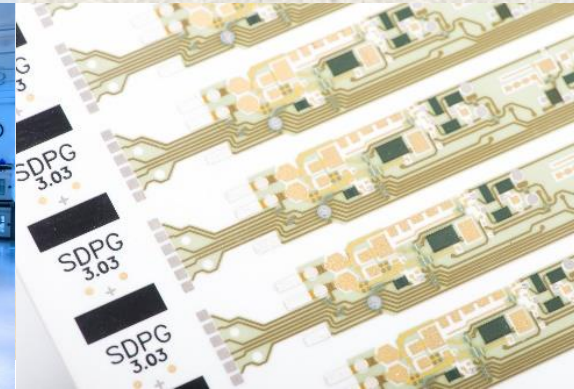
Clean Room

- ISO 5 Clean Room
- BioBurden contr. area
- Die bonding (wafer, tray, SMD (008004), heated head, UV)
- Wire bond (Al, Au, 17um - 350um)
- Dispensing, jetting (glue, underfill, globtop)
- Automated Optical Inspection & Meas.



Thick Film

- ISO 6 clean room
- Substrates 1" - 6"
- (Al_2O_3 , steel, Cu, Al) Screen print connector, resistors, PTC, heater, Au, vias)
- Laser trimming (active, passive)
- Firing w/ w/o N_2

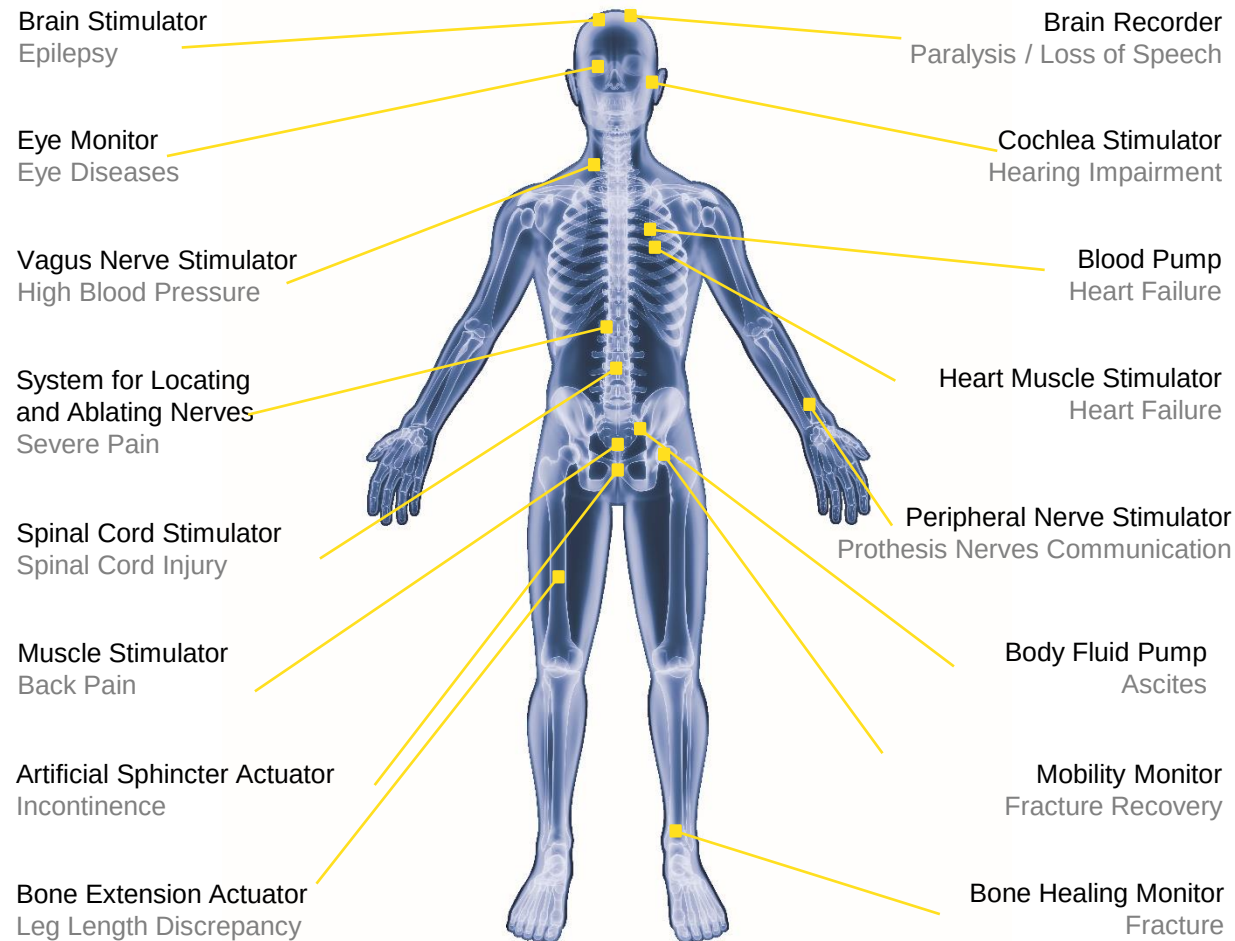


Electrical Test

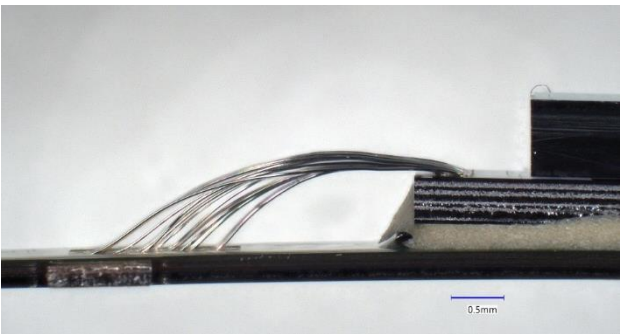
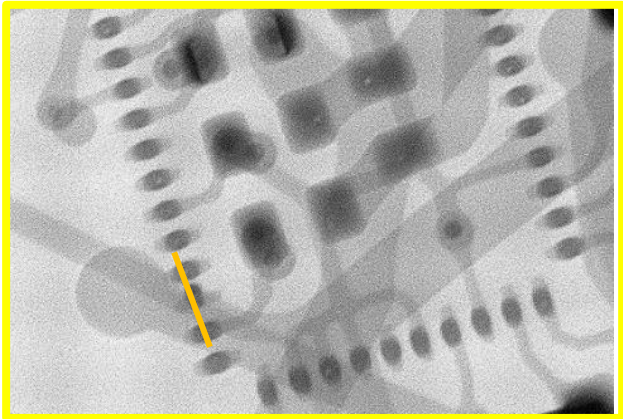
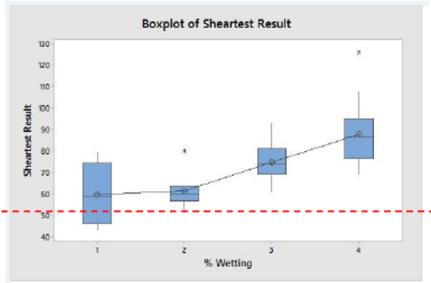
- ISO 6 clean room
- Wafer test 6" / 8"
- Final test
- Module test on NI (Labview)
- Reliability tests Burn-in, HTOL, THBS, TMCL



Class III microelectronics for Active Implantable Medical Devices

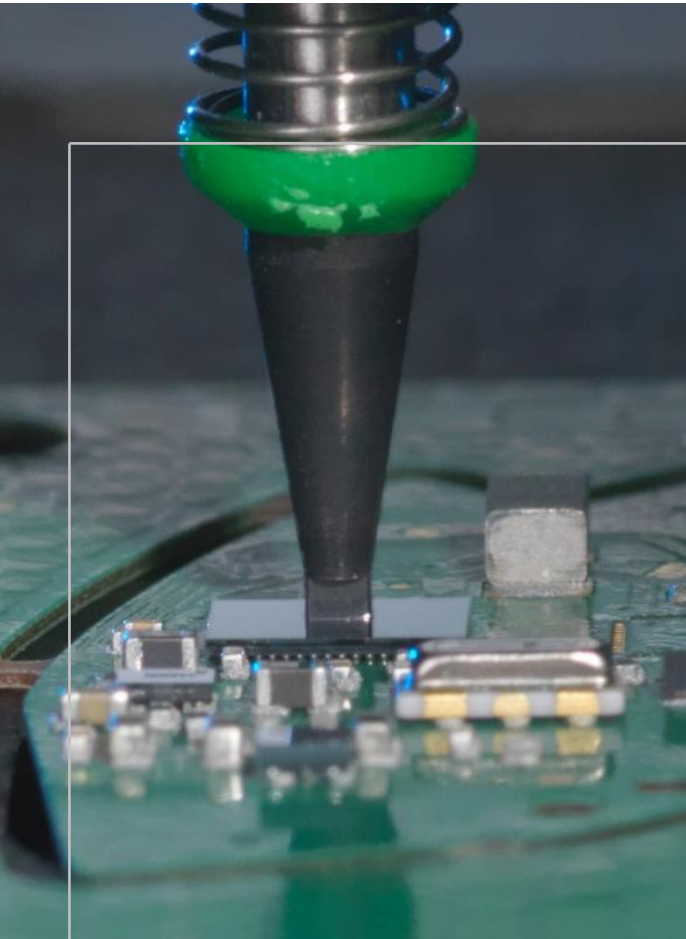


Tests / SPC (Statistical Process Control)



Tests	Solder	Glue	Weld	Wire bond	Cleaning	Components
X-Section	x	x				
Pull			x	x		
Shear	x	x		x		
Peel		x	x		x	
Visual	x	x	x			
X-Ray	x		x			
Ion					x	
Vibro	x	x	x	x		x
TMCL	x	x		x		
HTOL/Burn-in						x

Good practice: Medical devices



- **Requirements:** Development and production according to specification and standards.
- **Risk management** on Process Manufacturing Level
- **Traceability:** Components and process in complete manufacturing chain, detailed documentation
- **Reliability before innovation:** reuse of existing technologies and proven materials
- **Optimizations → requalification:**
Cost optimization during production = high effort
- **Process-development:** few, expensive samples = no large volume statistics
- **Long development times and high costs**

- **...+ photonics = device manufacturing more challenging**

Challenges: Photonics for Medical Devices

- **Integration:** combination of photonics, electronics and mechanics (fluidic) in biological environment
→ flexible substrates, personalized (individual), biocompatibility, biological fouling
- **Size and power consumption:** temperature, hot spots, battery replacement
- **Reliability tests:** material aging, failure rate, drift
- **Regulatory challenges:** biocompatibility, sterilisation, documentation
- **Hermetic packaging:** feedthrough optical fibre, windows

EMS Expectation:

- **Photonic chip assembly and packaging:** dedicated cleanroom area and personnel
- **Optical alignment :** expensive equipment, personnel, cumbersome handling of fibres
- **Prevent contamination of optical surfaces:** i.e. bleeding of adhesive...prevention and cleaning steps
- **Fine-pitch die attach:** wire bond, Flip chip
- **Hermetic packaging:** miniaturized optical feedthroughs, different sealing methods
- **Fluidic packaging:** sealing of dissimilar materials, control material variability
- **Automated calibration and optical end-of-line testing:** reliability,...

Applications: Photonics for Medical Devices

- **Optical imaging:** near target tissue
 - retina
 - brain tissue
 - cancer monitoring
- **Active nerve measurement / stimulation:** vagus, cochlear
 - higher selectivity → fewer side effects, better control
 - better spatial resolution
 -optogenetics
- **Biosensors (Lab-on-a-chip) / PIC:**
 - temperature, pressure
 - biomarker detection, drug monitoring...
- **Low-Level-Laser Therapy:** bone healing with Laser light (< 500mW)
 - wavelength, energy density, pulse rate
- **Photochemical Implants :** activation of medicine through light

Happy to answer your questions.



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Contract Manufacturer Implantable Medical Devices