Smart Implants: Packaging Challenges & Solutions
Topics

1. Smart Implants and Packaging Challenges
2. Enabling Miniaturisation Processes
3. Successfully Deployed Examples at Valtronic Group
What is a Smart Implant?

An implant that can provide biofeedback, such as measuring joint loads, detecting moisture or predicting infection.
Smart Implants: Packaging Challenges

- Quality & reliability
- Traceability
- Certification by notified body
- Powering the implant
- Sealing the electronics
- Ensuring biocompatibility
- Communicating with the outside

And last but not least…

Miniaturizing the electronic package
Why Miniaturize?

- Allows less invasive implantation
- Adds functionality in the same footprint
- Improves the comfort for the patient
Enabling Miniaturization Processes:

Chip on Board

1. Glue on substrate (FR4, Flex, G10 etc.)

2. Die attach

3. Wire bonding & testing

4. Coating & testing
Example: Implantable Microstimulator

for urinary incontinence

Die with pads redistributed to enable glue
Contains 2 SMD components & 2 Diodes
Measures: 15mn long – Diameter 2.5mm.
Enabling Miniaturisation Processes: Glued Flip-Chip with Gold Stud Bumps

1. Non Conductive Adhesive Placement

2. Die to Substrate Alignment

3. Crushing of the Bumps & Adhesive curing
Example: Retinal Implant

Cross section of Flip Chip Connection with Gold Stud bump and NCA

Gold stud bump Ø 80µm

Low stress Non-Conductive Adhesive

Retinal Implant:
Asic stimulation chip assembled by glued Flip Chip
Other Successfully Deployed Examples

Artificial Electronic Spinal Disc

This eDisc has embedded electronics with over 100 components in a volume of less than two cubic centimeters.

Developed & Produced at Valtronic USA
Other Successfully Deployed Examples

**Cochlear Implants: External & Internal devices**

- Wire-bonded Flex-Rigid with injection molding
- Codeveloped and Produced at Valtronic Switzerland
Other Successfully Deployed Examples

**Gastric Band for obesity treatment**

Micro-electronics & micro-mechanics with RF transmission

Codeveloped at Valtronic Switzerland. Produced at Valtronic Morocco
Other Successfully Deployed Examples

World’s smallest rechargeable two channel wireless IPG

3D-Chip Scale Package

Developed & Produced at Valtronic USA
The task: Substitution of Functional Deficits of Human Nervous System

Intelligent medical implant with electrodes stimulation

Glued Flip Chip & Wire bonding. Thin flex and high density SMD assembly with 0201 components

Developed & Produced at Valtronic Switzerland
Other Successfully Deployed Examples

*Implantable device to monitor and manage diabetic conditions*

Glued Flip Chip & Wire bonding. Thin flex and high density SMD assembly with 0201 components.

Codeveloped by Valtronic Romania & Switzerland. Produced in Switzerland.
Conclusion

- Smart implants provide many benefits to patients, surgeons, doctors…
- Packaging smart implants requires expertise in:
  - complex microelectronic & mechanical system integration
  - advanced assembly processes
- Valtronic Technologies has over 20 years of experience providing world-class engineering and manufacturing services

THANK YOU FOR YOUR ATTENTION!
ABOUT VALTRONIC TECHNOLOGIES - BACKUP
From development to production…

…Valtronic Group can provide either the **entire product** or **individual electro-mechanical functions** to help you bring your products to market.
From concept to product...

... or anywhere in between

- Feasibility study
- Development
- Prototypes
- Industrialisation
- Final series production

Engineering services

Contract Manufacturing
Three complementary capabilities…

… combining microelectronics, mechanics and software development

… with a focus on advanced medical and industrial devices
Benefits of partnering with us

- Extensive development and production expertise combining electronic and mechanical competencies for complete integration
- Extensive Design for manufacturing experience (DFM)
- Proven engineering and manufacturing processes
- Medical experience also valid for industrial devices
- Focus on innovation and industrialization
- Production facilities on three continents
Our quality competencies

- Quality plan
- Qualification plan (standard and customized)
- Risk analysis (PFMEA & DFMEA)
- Support for regulatory submission
- External audits (supplier, ESD, etc.)
- Statistical Process Control (SPC)


FDA inspected
Our Vision and Mission at Valtronic Technologies

Our Vision

• Improving the quality of life through technological innovation.

Our Mission

• To provide services and reliable products, with high added value, which respond to the specific needs of our clients and the requirements associated with their use.
• To become the key partner for OEM in the medical field and in all industries requiring products of great complexity and reliability.
Business areas... for medical

- **Neurostimulation**
  - vision implant processors
  - cochlear implants
  - implantable pain management

- **Drug delivery systems**
  - drug pumps
  - insulin pen
  - electronic ingestible pills

- **Imaging/endoscopy**
  - digital radiology
  - endoscope

- **Blood treatment**
  - autotransfusion machine
  - blood collection device

- **Medical monitoring**
  - artificial spinal disc
  - heart rhythm monitor

- **Orthopedics**
  - trauma
  - spine
  - small joint implants
We help to restore the human body

- Intracranial Pressure Monitor
- Artificial Retina Implant
- Cochlear Implant
- Dental Implant
- IPG Neurostimulator
- Smart Pill
- Gastric Band
- Spinal Implants
- Neurostimulator for Incontinence

Delivering solutions