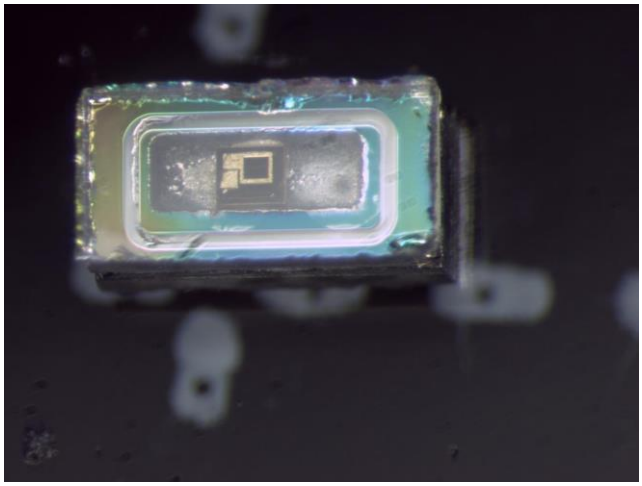
ACTive Implant for Optoacoustic Natural sound enhancement

SEVENTH FRAMEWORK PROGRAMME

Implantable Package

One of the core activities at CSEM in the project is the development of a package (i.e. housing) for a VCSEL. It has to be kept in mind that the human body reacts aggressively to foreign bodies and that certain materials used in the semiconductor industries may be toxic or even carcinogenic. Therefore, the package has to be hermetically sealed in order to prevent leaching of toxic substances and ingress of moisture, which might damage the internal electronics. Material choice for the package is for the same reasons limited to a small selection of metals, ceramics and polymers. Latter are, however, not suitable to protect the laser and internal electronics from moisture over a period of several years.



Micro package with a size of 1mm x 0.6 mm x 0.6 mm. The VCSEL can be seen through the sapphire lid.

Miniature Implantable Package

As new therapies require ever smaller medical devices, there is a need to shrink the implantable packages for the electronics and sensors or light sources such as a VCSEL. Current state-of-the-art sealing techniques generate much heat in the vicinity of the seam. Miniature packages can't provide enough space to keep the heat generated during sealing away from the internal components. Damage or reduced life time of the device is a consequence.

CSEM developed a new bonding technique for miniature medical packages made of sapphire which keeps the internal temperature during bonding below ~100 °C. Thus, packages as small as 0.6 mm x 0.6 mm x 1 mm as shown in above micrograph become feasible. As the package is made from optically transparent sapphire, it enables encapsulation of light sources and optical detectors.

Feedthroughs

The non-metallic character of the sapphire package allows the integration of electric feedthroughs without relying on chunky off-the-shelf feedthrough blocks made from ceramics or glass, eliminating a high temperature bonding step.

Our approach integrates the feedthroughs into the sapphire micro package. We can achieve pin to pin pitches of currently 0.3 mm with a pin size of approximately 0.2 mm.

If the applications allows it, wireless communication and remote powering may be implemented as the sapphire package does not interfere with electromagnetic waves in the RF range.

The development of such a package is essential to the cochlear implants and hearing aids based on the optoacoustic stimulation (i.e. light induced sound wave inside the cochlea).

For additional information, please contact info@action-project.eu or visit our website at www.action-project.eu

Project Partners

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