

Pulse oximeter based on a stretchable circuit board with soft encapsulation



*Interactive textile-integrated system for better visibility in road traffic
(Copyright: Wolfgang Langeder, UTOPE)*



EXPERTISE & SERVICES

Our customers have the choice between different types of cooperation: from direct project management to collaboration within the framework of a scientific-technical research project with sponsorship using funds from the EU, the federal government or the federal state. We offer the following services:

- Development and realisation of stretchable electronic systems
- Packaging and interconnection technology for stretchable electronics
- Qualification and reliability testing and failure analysis
- Rapid prototype development through to small series production
- Monitoring and management of large series production with industrial partners
- Licensing and technology transfer into industry
- Technical services, consultancy, training and studies
- Basic research

CONTACT

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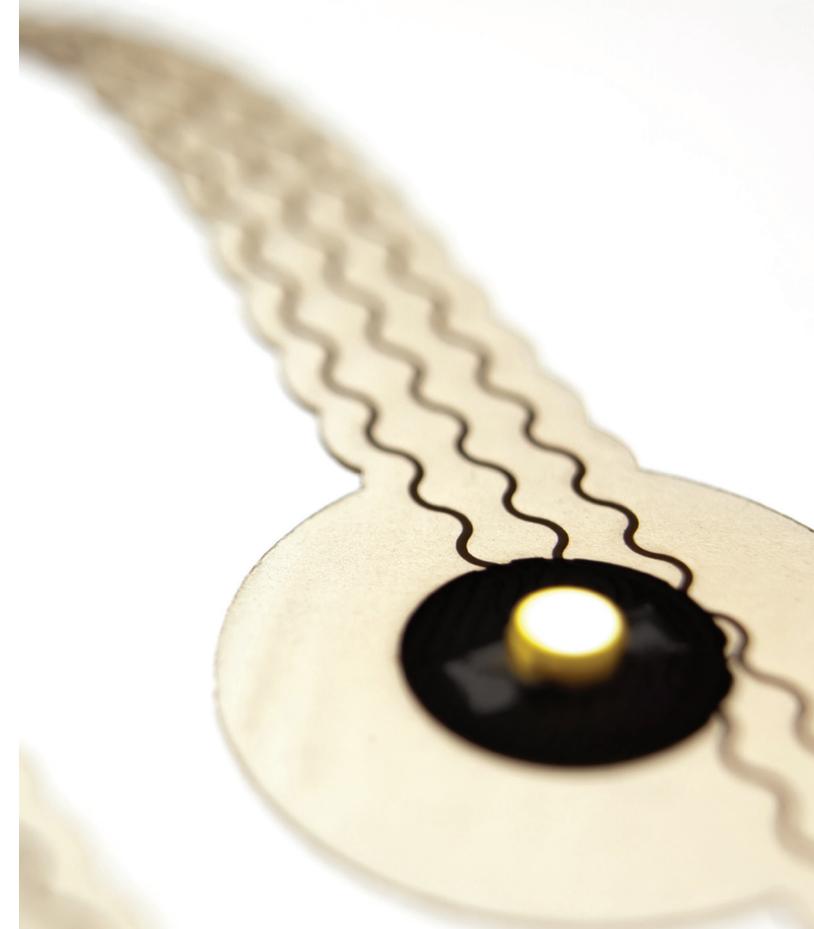


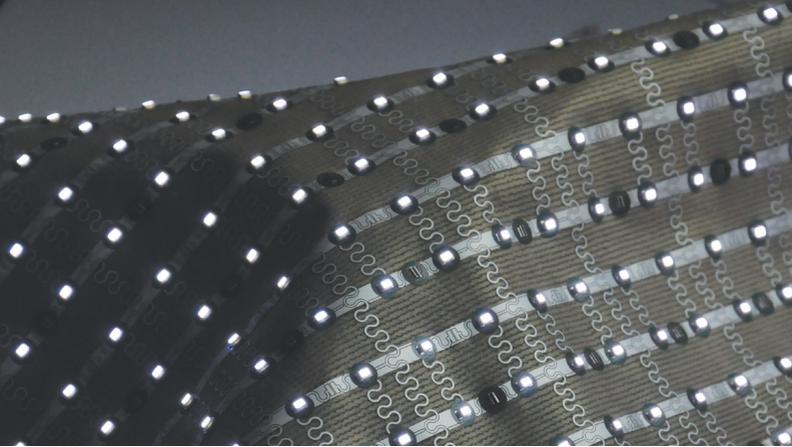
stretchable@izm.fraunhofer.de

www.stretchable-circuits.com

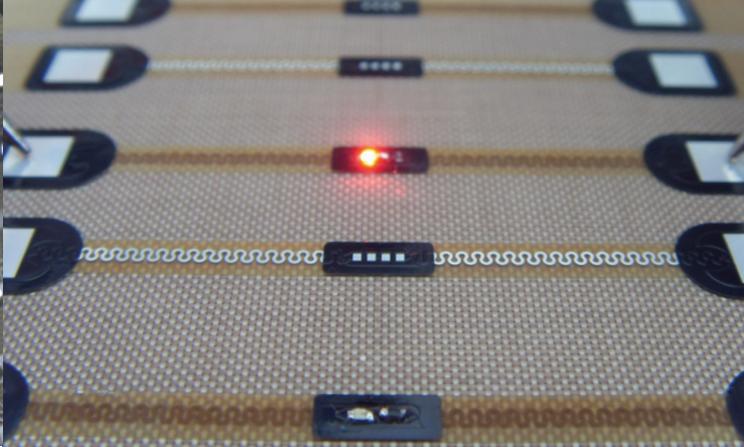
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STRETCHABLE ELECTRONIC SYSTEMS

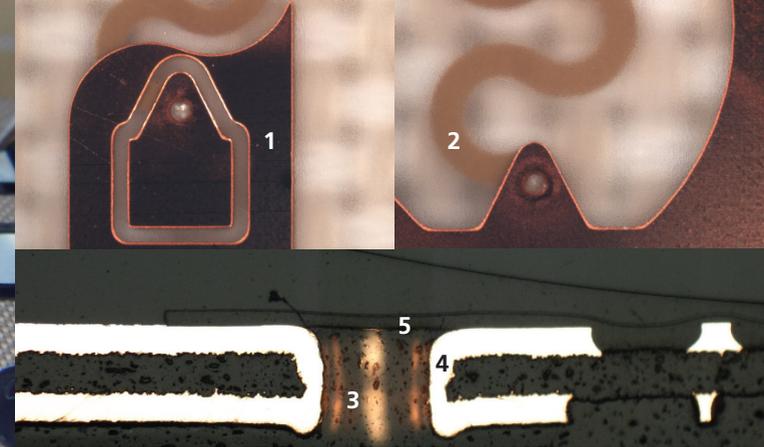




Freeform system with LEDs



2-layer plated-through stretchable circuit board



1 – upper copper layer 2 – lower copper layer 3 – polyurethane
4 – copper 5 – solder mask

STRETCHABLE ELECTRONIC SYSTEMS

Stretchable electronic systems enable new degrees of mechanical freedom in electronics. They can be stretched by up to 60 percent – suitable layouts can accommodate simultaneous stretching in different directions – without compromising the electronic function. Depending on requirements, a system can be stretched multiple times reversibly, or just one single time. It is expected that this technology will primarily find use in medical electronics, robotics and wearables.

The “Stretchable Circuit Board” (SCB) technology, developed at the Fraunhofer Institute for Reliability and Microintegration IZM, is based on conventional circuit board processes and materials that are completely compatible with circuit board production, ensuring a rapid transfer of technology into industry.

Alongside almost 10 years of expertise in the field of stretchable electronics, the Fraunhofer IZM offers a complete processing line for the manufacturing of large-area substrates in addition to component assembly and reliability testing. These provide fundamental prerequisites for R&D activities, prototype manufacturing and consultancy on series production with industrial manufacturers.

APPLICATIONS AND PROJECTS

Stretchable electronics can be used in a variety of fields. SCB technology offers a cost-effective and relatively straightforward alternative where expensive developments with flexible systems would be required to accommodate mechanical requirements or complex formations. In numerous national and international projects, the Fraunhofer IZM has developed and successfully demonstrated solutions for different areas of application:

- Sensor systems for medical applications, e.g. breathing frequency sensors for small children, a shoe insert with a pressure monitor for diabetes patients and pressure sensor systems used in compression therapy
- Lighting designs for freeform surfaces in vehicle interiors
- Portable systems for medical phototherapy
- Medical implants with galvanically isolated gold structures – a process variation of SCB technology
- 3D-compatible and electronic systems for one-off transformation in a thermo-forming process
- Textile electronics with sensor systems and LEDs

TECHNOLOGY

The stretchability of the electronic system is realised through

1. the use of polyurethane as a stretchable matrix material and as carriers for the conducting paths
2. the creation of copper conducting paths between the components as meanders. Substrates of this type can be stretched once by up to 300 percent. Stretching can be repeated on a cycle by a smaller percentage several ten thousands of times, before fatigue fractures occur in the copper.

Commercial electronic components are assembled using the usual mounting techniques on the stretchable circuit boards. These are equipped with localised solder resist masks and a well-networked surface metallisation of the contact surfaces (imm. Ag, imm. Sn, ENIG, ENIG).

A tin-bismuth alloy that melts at low temperatures is used as a soldering alloy. Following assembly and electrical bonding, the components are fixed mechanically with an epoxy-based glue (underfill) and are subsequently encapsulated in polyurethane.