

FRAUNHOFER INSTITUTE FOR INTEGRATED CIRCUITS IIS

PRESS RELEASE

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Flexible battery management system and BlueTEG: Self-powered energy harvesting sensor wristband

The Fraunhofer Institute for Integrated Circuits IIS presents two innovations in the area of integrated energy supplies: flexible battery management for complex battery systems and the energy-independent sensor armband BlueTEG.

Flexible battery management for complex battery systems

Battery systems for high voltages are comprised of a number of individual battery cells in order to attain system voltages of between 50 and 400 volts. The individual cells must be monitored separately by the battery management system to make use of the maximum available capacity of each cell and to guarantee safe operation. Furthermore, different battery technologies provide different cell voltages and peak currents and so the number of required battery cells depends on the battery technology in use. Thus, the battery management system must always be tailored to the specific number of individual battery cells and cell configurations.



The flexible battery management system from Fraunhofer IIS is capable of monitoring different configurations of battery cells. © Fraunhofer IIS

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The flexible battery management system of Fraunhofer IIS is able to work with different cell numbers and combinations. It can monitor any series or parallel connection of battery cells.

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A small electronics module at each cell detects cell parameters such as voltage and temperature. This cell module controls active balancing to ensure an equal state-of-charge of the different cells. Optimized bus communication between these electronic modules minimizes the need for wiring between the cells. Superordinate module controllers allow any combination of different modules, either in parallel or in series connection. Power switches in the module controllers execute the safety functions. The flexible battery management system is also capable of precisely predicting the remaining capacity and the state-of-health by means of shunt- or resistance-based current measurements. This allows run time or range forecasts to be made, which eliminates the need for a safety buffer. The advantage of this is that the maximum capacity of the battery cells can be used to its fullest.

First Bluetooth Low Energy wristband with thermoelectric energy supply

The BlueTEG sensor wristband measures sensor readings such as the ambient temperature or acceleration rates and transmits this data via Bluetooth to a smartphone or tablet PC. Integrated in a wristband, BlueTEG uses the temperature difference between the skin and the surrounding air to produce electrical energy to supply the electronic systems. It is the first Bluetooth module powered by thermal gradients between body and ambient temperature.

To this end, a conventional thermogenerator and a special voltage converter from Fraunhofer IIS are used. BlueTEG does not require a battery that needs to be recharged or exchanged, unlike conventional devices. It can be used with all types of body-worn or wireless sensor systems and can also be integrated in multifunctional or GPS watches, for example.

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The BlueTEG sensor wristband uses the temperature difference between the skin and the surrounding air to produce energy, and transmits data via Bluetooth. © Fraunhofer IIS

The **Fraunhofer-Gesellschaft** is the leading organization for applied research in Europe. At present, the Fraunhofer-Gesellschaft maintains 67 institutes and independent research units. The majority of the more than 23,000 staff are qualified scientists and engineers, who work with an annual research budget of 2 billion euros.

Founded in 1985, **Fraunhofer Institute for Integrated Circuits IIS** in Erlangen, Germany, ranks first among the Fraunhofer Institutes concerning headcount and revenues. As the main inventor of mp3 and universally credited with the co-development of AAC audio coding standard, Fraunhofer IIS has reached worldwide recognition. In close cooperation with partners and clients the Institute provides research and development services in the following areas: Audio & Multimedia, Communications Systems, Energy Management, IC Design and Design Automation, Imaging System, Medical Technology, Non-destructive Testing, Positioning, Safety and Security Technology, Sensor Systems plus Supply Chain Management.

About 830 employees conduct contract research for industry, the service sector and public authorities. Fraunhofer IIS with its headquarters in Erlangen, Germany, has further branches in Nuremberg, Fuerth, Wuerzburg, Ilmenau, Dresden, Bamberg, Deggendorf und Coburg. The budget of more than 108 million euros is mainly financed by projects. Less than 25 percent of the budget is subsidized by federal and state funds.

Detailed information on www.iis.fraunhofer.de.