

Energy Harvesting and Zero-Power Wake-Up Devices for Machine Monitoring

Fraunhofer ISIT has developed a novel MEMS energy harvesting device, that can harness energy from rotational and translational motion, as well as mechanical shocks and vibrations. The technology platform offers new opportunities to create customer specific highly efficient MEMS energy harvesting devices for machine monitoring.

Our solution

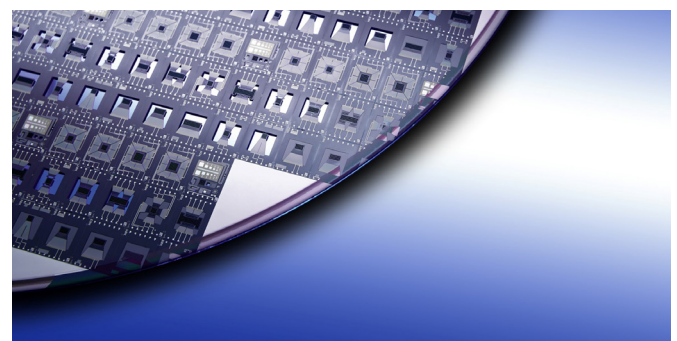
The MEMS energy harvesting devices generate a voltage from vibrations, mechanical shocks or can be used to harvest rotational and translational motion without contact. These devices are ideally suited for powering sensor nodes in confined spaces, such as within gearboxes, starter generators or crankshafts. The generated signal can also be used to monitor machine performance, such as rotation speed or vibration intensity. Additionally, the devices can also be used to initiate a zero-power wake-up, in which a sensor node can be awakened from deep sleep state by external mechanical or magnetic pulses. This technology can contribute to greatly extend battery life in IoT and IIoT applications.

Typical specifications (dependent on application)

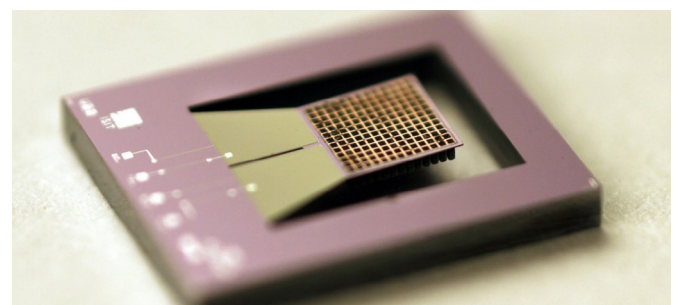
RMS power output in resonance	> 100 μ W
Resonance frequency range	300 Hz - 9 kHz
RMS power output at 30-50 Hz (pulse-like excitation)	1 ... 70 μ W
RMS open circuit voltage at 30-50 Hz (pulse-like excitation)	1 ... 6 V
Vacuum packaging	available

What we offer

- Customer-driven development of high performance MEMS energy harvesters
- Concept, design and characterization of components
- Pilot production in 8" / 200 mm MEMS fab
- Expertise in the development of innovative MEMS
- Partnership for industrial R&D projects



200 mm wafer with energy harvesting chips



Energy harvesting chip with integrated micromagnets

Energy Harvesting and Zero Power Wake Up Chips

MEMS R&D at Fraunhofer ISIT

Professional MEMS production line

- Development and production: 8" / 200 mm wafer technologies (silicon and glass)
- Cleanroom area: 1400 m²
- Critical Dimension: 0.35 micron and below
- Installed capacity: 800 wafers per month in one shift
- Chemical-mechanical polishing (CMP) facility: 200 m²
- Wafer grinding and dicing facility: 100 m²

PowderMEMS R&D laboratory

- Dedicated atomic layer deposition (ALD) tool for 8" / 200 mm wafers
- Custom tooling for automated filling of wafers with dry powders
- Optical and magneto-optical inspection for characterization and quality control
- Custom tooling for magnetization of 8" / 200 mm wafers

Contact

Dr.-Ing. Torben Dankwort
Agglomerated Microsystems
+49 4821 17-1472
torben.dankwort@
isit.fraunhofer.de

**Fraunhofer Institute for
Silicon Technology ISIT**
Fraunhoferstraße 1
25524 Itzehoe, Germany

www.isit.fraunhofer.de

