

# Magneto-Mechanical MEMS Energy Harvester

## Integrated Magnets for Versatile Applications

Fraunhofer ISIT  
Magneto-Mechanical  
MEMS Energy  
Harvester

- MEMS harvester for compact and cost-effective micro power solutions with high power density
- Design adaptable to meet individual use case requirements
- Harvesting of linear and rotary motion in resonance or at low frequencies
- Realization of near zero power wake-up for energy autonomous devices, e.g. sensor nodes
- Optional vacuum packaging for reduced damping and increased quality factor
- Integrated power module with ASIC rectifier and energy storage module

### Energy Harvester System with Integrated Magnets

Fraunhofer ISIT developed a compact, high-power, and versatile MEMS magneto-mechanical energy harvester. The unique wafer-level integration of micromagnets, enabled by ISIT's patented PowderMEMS technology, allows contactless energy harvesting in various excitation schemes. The harvested energy is transduced by high quality AlN or AlScN piezoelectric layers. The device allows for the mechanical and/or magnetic exploitation of linear and rotational motion, electromagnetic waves, and shock-like accelerations. In resonance, high power output  $>100 \mu\text{W}$  is achieved. Out of resonance, low frequencies can be harvested by up-conversion. Besides harvesting for power supply, the device can act as a zero power wake-up switch and magnetic field sensor.

### Examples of Applications

- Excitation via magnetic fields and mechanical vibrations/shocks
- energy autonomous sensor nodes
- zero power wake-up switch
- magnetic field sensor
- power transmission (e.g. active implants)

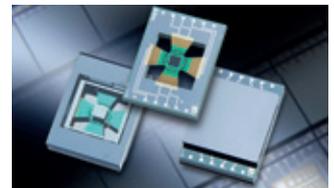
### Technical Specifications

Harvester Dimensions	6.0 x 8.0 mm <sup>2</sup>
RMS Power output in resonance	$> 100 \mu\text{W}$
RMS open-circuit voltage in resonance	$> 7 \text{ V}$
Resonance Frequency range	1 – 4 kHz
RMS Power output at 30–50 Hz (pulse-like excitation)	1 ... 50 $\mu\text{W}$
RMS open circuit voltage at 30–50 Hz (pulse-like excitation)	1 ... 4 V
Vacuum packaging	available

MEMS energy harvester with integrated micromagnets



Integrated harvesting and storage module



Capped and uncapped energy harvester chips

Contact us to explore the advantages of our technology in your application

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