

## Chip-integrable power conversion circuit extracts microwatts from body heat

Energy harvesting aims at replacing or complementing batteries using ambient heat by means of micro-Thermoelectric Generators (TEG), promising years of maintenance-free operation. TEGs can power self-recharging ultra-low power wireless systems (WSN), Body Area Networks (to monitor vital signs/ medical conditions) and industrial monitoring sensors. Appropriate DC-DC-Converter technology that is efficient at low voltage is crucial when it comes to latest higher efficiency and flexible thermoelectric structures that can provide useful levels of electrical power from temperature differentials in the range from 1 to 5 °C. Nevertheless, state of the art low voltage DC-DC converters have too high cold-start voltages for emerging high-impedance TEGs.



**Body heat of one finger can power a light emitting diode**

### Benefits

- High efficiency DC-DC converter technology for energy-autonomous embedded systems. Temperature difference of **1°C is enough** to start charging a super capacitor
- Ultra-low power **cold start capability** (10µW @ Rout=300Ohm), 10 times better than best-in-class device BQ25504
- Supports **'fit and forget'** rather than procedures for regular battery changes
- Operation at **remote and hardly accessible** locations as well as in hazardous environment.
- Simple design, **chip-integrable** with few external components
- Reduces **size and weight**
- Able to handle latest high-impedance **TEGs from Greenteg** (92 to 353 Ohm) and **Micropelt** (170 to 300 Ohm)
- Bridges the gap between the vision and what is currently possible
- Easy implementation of **power matching** by constant duty cycle without any measurements

### Cooperation options

Collaboration and license agreement.

### Development status

Technology is ready for upscaling.

Demonstrator is available.

### Energy Harvesting Applications:

- Autonomous, self-recharging ultra-low power **wireless system and networks**
- **Industrial monitoring**
- Monitor vital signs and specific medical conditions using low cost sensors; wearable health devices, **sport/ fitness hardware**
- **Portable** and consumer devices
- Bridge/ Structural **Health Monitoring** (SHM), Smart Building Controls
- **Environmental Monitoring**; air & water quality monitoring
- **Agricultural** monitoring/ livestock, sensor-based growth optimization
- **Smart textiles/** garments (able to sense stimuli from the environment and react or adapt to them in a predetermined way)
- **Entertainment System** Remote Controls, Toys and joke articles
- Life science; **self-powered lab-on-a-chip**
- **Security** and public safety

### Patent family status

There are patent applications and know-how related to this technology.

Contact: Johann Kreuter  
 T +43 1 501 75-513  
 F +43 1 501 75-903  
 E [j.kreuter@awsg.at](mailto:j.kreuter@awsg.at)  
 Our reference P1306862  
 Inventor Harald Dillersberger