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Auto-Polarity, Millivolt Voltage Step-Up Converter & Power Manager for Thermal Energy Harvesting Applications

MILPITAS, CA – June 7, 2010 – Linear Technology announces the [LTC3109](#), a highly integrated step-up DC/DC converter and power management IC designed to start up and run from millivolt input voltage sources such as thermoelectric generators (TEGs) and thermopiles. The device's groundbreaking and proprietary auto-polarity topology allows it to generate usable power from input voltages as low as +/- 30mV, enabling temperature differences as low as $\pm 1^{\circ}\text{C}$ to be harvested in lieu of traditional battery power. This makes it ideal for energy harvesting applications in which the input voltage polarity is unknown or is subject to reversal. Energy harvesters are well suited for applications requiring low average power, even with periodic pulses of higher load current. For example, in many wireless sensor applications the circuitry is only powered to take measurements and transmit data periodically with a low duty cycle.

The LTC3109 uses two standard compact step-up transformers to provide a complete power management solution. Its 2.2V LDO can power an external microcontroller, and its main output is pin selectable to one of four (2.35V, 3.3V, 4.1V or 5V) fixed voltages to power a sensor, data acquisition circuits and/or a wireless transmitter. A second switched output can be enabled by the host in order to power devices that do not have a micropower shutdown capability. The addition of a storage capacitor provides continuous power even when the input energy source is unavailable or intermittent. The LTC3109's extremely low quiescent current ($<7\mu\text{A}$) and high efficiency design ensure the fastest possible charge times for the output

reservoir capacitor. The combination of the LTC3109's leadless 4mm x 4mm QFN-20 package (or leaded SSOP-20) and very small external components ensure a highly compact solution for energy harvesting applications.

“Energy harvesting is an emerging technology with great potential, now poised to break out commercially. The release of the LTC3109, which was developed in cooperation with EnOcean, GmbH, enables a new generation of remote sensor products which can eliminate the need for wired power, batteries or routine maintenance for a wide variety of applications.”

“Cooperation between EnOcean and Linear Technology means huge advantages for both parties,” says EnOcean's CEO Markus Brehler. “Linear Technology benefits from EnOcean's expertise in energy harvesting for wireless applications, and we, in turn, see benefits in that this new Linear product is especially suitable for powering our energy harvesting wireless modules from small differences in temperature, independent of polarity.”

The LTC3109EUF is available in a 20-lead 4mm x 4mm QFN package and the LTC3109EGN is available in a SSOP-20 package. Pricing starts at \$3.95 each for 1,000-piece quantities. Industrial temperature grade versions, the LTC3109IUF and LTC3109IGN, are also available, priced starting at \$4.65 each for 1,000-piece quantities. All versions are available from stock. For more information, visit <http://www.linear.com/pr/3109>.

Photo Caption: Auto-Polarity, Ultralow Voltage Step-Up Converter & Power Manager

Summary of Features: LTC3109

- Operates from Inputs as Low as $\pm 30\text{mV}$
- Only $\pm 1^\circ\text{C}$ Needed across TEG to Harvest Energy
- Proprietary Auto-Polarity Architecture
- Complete Energy Harvesting Power Management System
 - Selectable V_{OUT} of 2.35V, 3.3V, 4.1V or 5V
 - 2.2V, 4mA LDO
 - Logic-Controlled Output
 - Energy Storage Capability for Operation during Power Interruption
- Power Good Indicator
- Uses Standard Compact Step-up Transformers
- Small, 20-Pin (4mm \times 4mm) QFN or SSOP Packages

About Linear Technology

Linear Technology Corporation, a manufacturer of high performance linear integrated circuits, was founded in 1981, became a public company in 1986 and joined the S&P 500 index of major public companies in 2000. Linear Technology products include high performance amplifiers, comparators, voltage references, monolithic filters, linear regulators, DC-DC converters, battery chargers, data converters, communications interface circuits, RF signal conditioning circuits, uModule[®] products, and many other analog functions. Applications for Linear Technology's high performance circuits include telecommunications, cellular telephones, networking products such as optical switches, notebook and desktop computers, computer peripherals, video/multimedia, industrial instrumentation, security monitoring devices, high-end consumer products such as digital cameras and MP3 players, complex medical devices, automotive electronics, factory automation, process control, and military and space systems.

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