bq25504: Efficient boost charger for nano power energy harvesting applications







The **bq25504** is a highly efficient boost charger IC for nano (ultra-low) power energy harvesting and management applications. The device manages microwatts (μ W) to milliwatts (mW) of power generated from a variety of sources such as solar, thermoelectric, electromagnetic and vibration energy. Its low quiescent current, high conversion efficiency, and flexibility in interfacing to a variety of energy sources and energy storage elements makes the IC unique to the market.

The device's unique properties can be best illustrated in a solar panel example. Under certain operating conditions, with comparable light intensity, the bq25504 can increase the usable harvested energy by 30% to 70%, which allows for the reduction in the solar panel collection area, the number of solar panels required and the charging time; all of which help to reduce the cost of end equipment solutions.

Features and benefits

- Low quiescent current (330nA typ) and high energy efficiency maximizes the energy extracted from the energy harvester.
- Maximum power point tracking (MPPT) optimizes energy extracted from DC harvesters such as solar panels and thermoelectric generators under varying light and thermal conditions respectively.
- User programmable settings allows the IC to be used with a variety of energy sources and energy storage elements (different battery chemistries or super capacitors).
- Low cold start voltage (330mV typ) allows the device to startup from single cell solar panels (under low light), TEG with low temperature differences and other low voltage sources.
- Battery OK indicator allows conditional enabling of external loads and protects the storage element.

Wireless sensor networks (WSN) applications

- Agriculture (gravity feed systems, water tank levels, pump levels)
- Air pollution
- Area monitoring
- Forrest fire detection
- Greenhouse monitoring
- Home and building automation

- Industrial monitoring
- Landslide detection
- Machine health monitoring (machinery condition-based systems)
- Structural monitoring (monitor movement within buildings and infrastructure, monitor assets, retrieve daily data)
- Structural and bridge monitoring
- Waste/water monitoring

Evaluation module

bq25504EVM-674 – Ultra-low-power boost converter with battery management for energy harvester applications.

This EVM is programmed from the factory for settings compatible with most MCUs and 3V coin cell batteries. The EVM is programmed to deliver a 3.1VDC maximum voltage (OV) for charging the storage element and the under voltage is programmed to 2.2VDC. The VBAT_OK indication toggles high when VSTOR ramps up at 2.8VDC and when VSTOR ramps down to 2.4VDC. The user's guide describes the bq25504 evaluation module (EVM), how to perform a stand-alone evaluation and allows the EVM to interface with the system and host.



For more information visit www.ti.com/bq25504

Important Notice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty or endorsement thereof.

The platform bar is a trademarks of Texas Instruments.

All other trademarks are the property of their respective owners.

A1222010

