



# Power Management Controller with Energy Harvesting Interface

## General Description

The EM8504 is an integrated power management solution for low power applications. It is specifically designed for efficient operation with Dye-Sensitized Solar Cells (DSSC) in the  $\mu\text{W}$  to  $\text{mW}$  range.

To optimize harvesting efficiency, the EM8504 incorporates a maximum power point tracking (MPPT) controller based on a fixed Voltage at Maximum Power Point (VMPP).

The EM8504 is capable of operating with a variety of elements as secondary energy storage, namely re-chargeable batteries, super-capacitors or conventional capacitors.

Using a non-rechargeable primary battery, the EM8504's on chip PMU offers a mechanism to extend battery life when assisted by a harvesting element.

To perform granular power management of multiple application components, the EM8504 provides four independent supply outputs: one power supply (VSUP) and three auxiliary supplies (VAUX).

The EM8504 is delivered in a standard QFN24 package.

## Applications

- | Energy harvesting equipped platforms
  - Solar charging
- | Wearable systems
- | Beacons and wireless sensor networks
- | Industrial and environmental monitoring
- | Battery operated platforms

## Main Features

- | Smart Power Management
  - Ultra-low quiescent current regulator (25nA)
  - 3 auxiliary supplies with high current drive capability
  - Programmable battery output voltage level up to 4.2V
- | Ultra-low input voltage and power
  - Cold-start: 0.3V /  $3\mu\text{W}$
  - Operating: 0.1V /  $1\mu\text{W}$
- | Ultra-low power solution
  - 15 nA in battery protection mode
  - 125 nA when supplying low power applications
- | Fast cold-start
  - Fast start-up using dual storage elements
  - Short Term Storage (STS) and Long-Term Storage (LTS)
  - Maintain STS in configurable voltage window when LTS is lower than minimum application voltage
- | MPPT
  - Fully embedded Maximum Power Point Tracking (MPPT), optimized for DSSC with fixed Voltage at Maximum Power Point (VMPP)
- | Primary Cell Life Time Extension
  - Lifetime of non-rechargeable battery on LTS (harvester assisted)
- | Flexible interface
  - SPI or I<sup>2</sup>C configuration interfaces
- | Configuration stored in E<sup>2</sup>PROM
  - No external passive components required
  - Default configuration values stored in E<sup>2</sup>PROM
- | Power Control
 

Extensive configurability of user scenarios:

  - Battery under and over voltage protection
  - Harvesting start/stop (through input pin)
  - STS and LTS voltage status registers
  - Charging start/stop as a function of harvester power

