

Highly Efficient, Regulated Dual-Output, Ambient Energy Manager for Source Voltage Level Configuration with Optional Primary Battery

Features

Ultra-low power start-up:

- Cold start from 380 mV input voltage and 3 μ W input power (typical)

Constant input voltage regulation:

- Optimized for intermittent and pulse power
- Selectable operating input voltage from 50 mV to 4.5V
- Up to 110 mA current extracted from the harvester

Integrated 1.2 V/1.8 V LDO regulator:

- Up to 20 mA load current
- Power gated dynamically by external control
- Selectable output voltage

Integrated 1.8 V - 4.1 V LDO regulator

- Up to 80 mA load current with 300 mV drop-out
- Power gated dynamically by external control
- Selectable or adjustable output voltage

Flexible energy storage management:

- Selectable or adjustable overcharge and overdischarge protection for any type of rechargeable battery or (super)capacitor
- Fast supercapacitor charging
- Indication when battery is running low
- Indication when output voltage regulators are available

Optional primary battery:

- Automatic switching to the primary battery when the secondary battery is exhausted

Integrated balun for dual-cell supercapacitor

Applications

- Door access systems
- Smart wearable sensors
- Smart switches home/building
- Point-of-Sales (POS)

Description

The AEM00940 is an integrated energy management circuit that extracts DC power to simultaneously store energy in a rechargeable element and supply the system with two independent regulated voltages. The AEM00940 allows to extend battery lifetime and ultimately eliminates the primary energy storage element in a large range of source such as pulse source, intermittent source, capacitive source and constant MPP source.

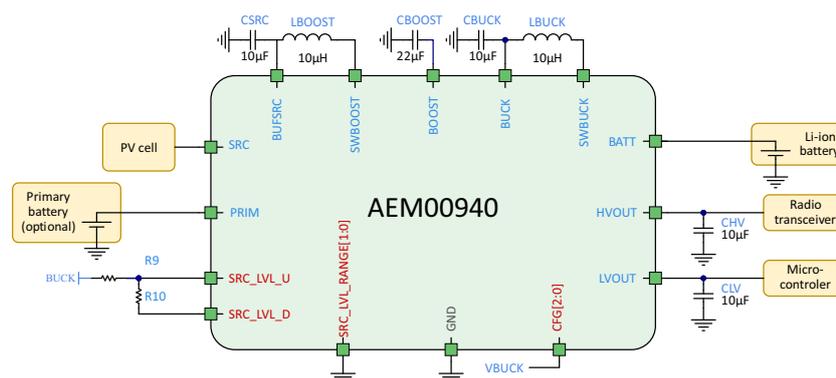
The AEM00940 harvests the available input current up to 110 mA while regulating the source at a voltage that is configured by the user. It integrates an ultra-low power boost converter to charge a storage element, such as a Li-ion battery, a thin film battery, a supercapacitor or a conventional capacitor.

Thanks to its selectable operating input voltage, it is possible to set a voltage at which the AEM00940 operates. This voltage is between 50 mV et 4.5 V. With its unique cold-start circuit, it can start operating with empty storage elements at an input voltage as low as 380 mV and an input power of just 3 μ W.

The low-voltage supply typically drives a microcontroller at 1.2 V or 1.8 V. The high-voltage supply typically drives a radio transceiver at a configurable voltage between 1.8 V and 4.1 V. Both are driven by highly-efficient LDO (Low DropOut) regulators for low noise and high stability.

Configuration pins determine various operating modes by setting predefined conditions for the energy storage element (overcharge or overdischarge voltages), and by selecting the voltage of the high-voltage supply and the low-voltage supply.

The chip integrates all the active elements for powering a typical wireless sensor. Five capacitors, two inductors and two resistors are required, available in the small 0402 and 0603 size, respectively. With only seven external components, integration is maximum, footprint and BOM are minimum, optimizing the time to-market and the costs of designs.



1. Functional Block Diagram

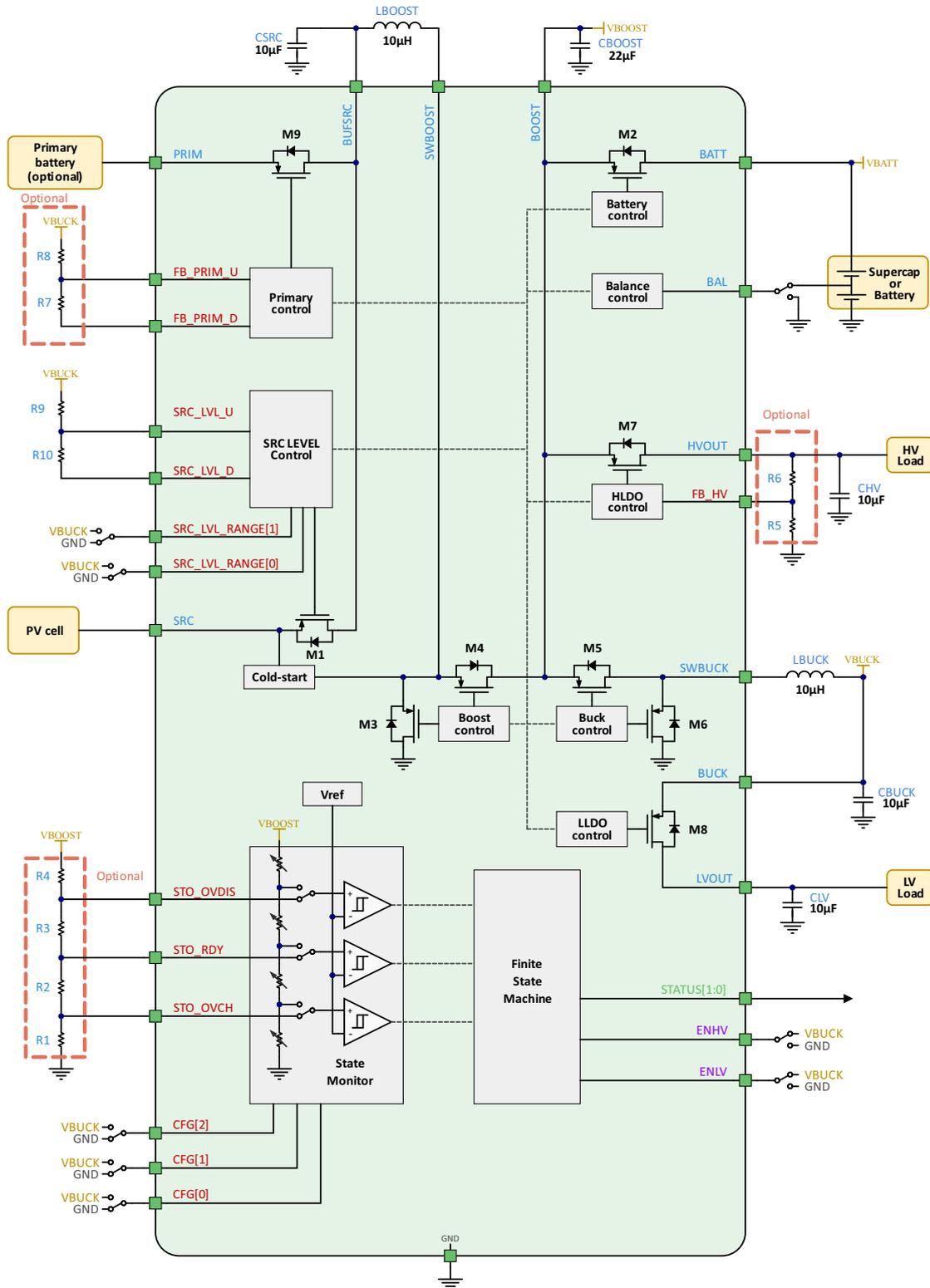


Figure 1: Functional block diagram