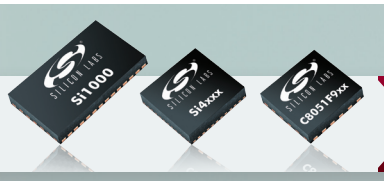


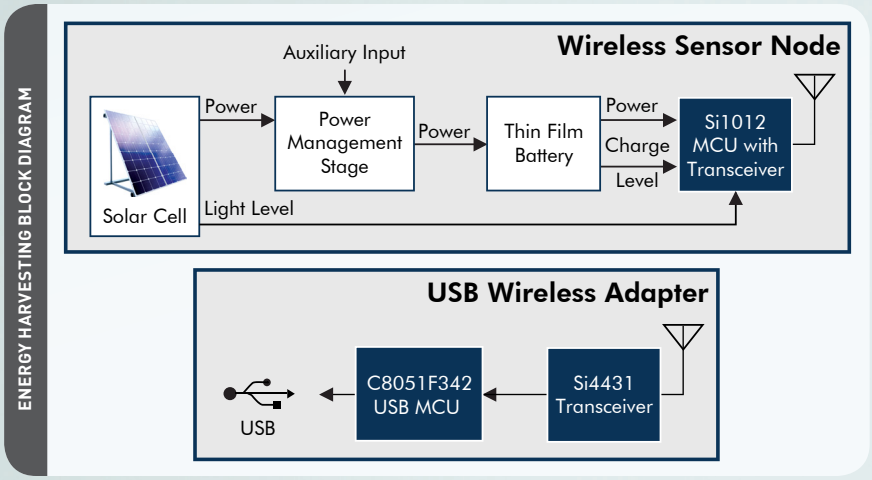
Energy Harvesting Solutions

www.silabs.com/energy-harvesting

COMPLETE ENERGY HARVESTING WIRELESS SENSOR SOLUTION

Silicon Labs' turnkey energy harvesting reference design features an extremely low power wireless sensor node that operates from a solar energy harvesting source, making it an ideal demonstration for wireless energy harvesting applications where batteries would be inconvenient to replace or expensive. At the heart of the system is the Si10xx single-chip wireless MCU, which performs both control and wireless interface functions at very low power levels. An auxiliary input allows the power management stage to accept an input from an alternative energy source (e.g., vibration, thermal or RF) when the solar cell input is bypassed. Integrated USB connectivity makes it easy to transfer data to a computer for processing.

- Turnkey wireless sensor node design
- Optimized for low power consumption
- Flexible design accommodates other harvested energy sources
- Integrated USB connectivity



SILICON LABS SOLUTIONS FOR ENERGY HARVESTING SYSTEMS

- C8051F9xx MCUs featuring the industry's lowest power consumption in all operating modes
- Si1xxx low power MCU with integrated sub-GHz transceiver, full operation to 0.9 V
- Low power, high sensitivity radio (-121 dB) transmitters, receivers and transceivers
- Radio has integrated power amp capable of +20 dBm output power or +13 dBm at 0.9 V operation
- Operating voltage down to 0.9 V (integrated dc-dc converter)
- Integrated microcontroller peripherals including 12-bit ADC, comparators, RTC, UART, SPI, I^2C, PWM and timers
- In-system programmable flash memory
- Integrated mixed-signal peripherals to remove the need for external components
- The industry's smallest package sizes
- Low MCU sleep mode current (10 nA) for longest battery life

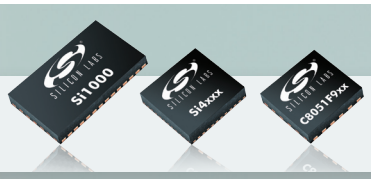
APPLICATIONS

- Home and building automation networks
- Industrial sensor networks
- Wireless sensor nodes
- Medical monitoring systems
- Infrastructure sensing systems
- Security systems
- Agriculture monitoring systems
- Asset monitoring/tracking devices

ENERGY HARVESTING SOLUTIONS

MORE INFORMATION AND DOCUMENTATION DOWNLOADS AT: www.silabs.com/energy-harvesting

SILICON LABS



MCU SOLUTIONS

Energy Harvesting Solutions

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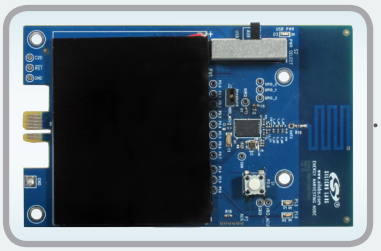
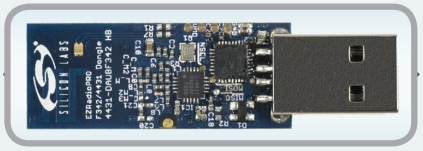
Energy Harvesting Reference Design

Part Number: ENERGY-HARVEST-RD

The wireless sensor node on the energy harvesting reference design measures temperature, light level and charge level. When a send button on the sensor node PCB is depressed, this data is transmitted to the USB wireless adapter. The USB wireless adapter then transfers the data to the Wireless Development Suite (WDS) software environment. An intuitive graphical user interface (GUI) displays the data (temperature, light level and charge level) for up to four wireless sensor notes. A solar cell on the wireless sensor node converts light to current that trickle-charges the thin film battery via a power management stage.



Wireless Sensor Node



Wireless USB Adapter

Wireless Development Suite GUI

Charging Times for Thin Film Battery

The thin film battery included in the reference design is rated at 700 uA/hours. Average times for fully charging an empty battery with no system load are listed below.

Electric Light
(50-200 Lux)

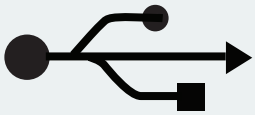
24 Hours

Office Window
(~1000 Lux)

6 Hours

Direct Sunlight
(100 K Lux)

2 Hours



USB Charging
(Limited to 3 mA)

30 Minutes

Silicon Labs' Products Optimized for Energy Harvesting Solutions

PART NUMBER	DESCRIPTION	SILICON LABS SOLUTION	CUSTOMER BENEFITS
Si1xxx Wireless MCU	Integrated low power MCU and RF transceiver	Full operation down to 0.9 V, small package with no external PA required	Single chip/reduced BOM/ reduced size
C8051F9xx Low Power MCU	Ultra low-power MCU product family	Stop mode as low as 10 nA, RTC on as low as 300 nA, active mode as low as 150 uA per MHz	Lowest power/ longest operating life
Si4xxx EZRadioPRO® ISM Band Radio	Sub-GHz ISM band transmitters, receivers and transceivers	Up to 141 dB link budget, 240-960 MHz continuous frequency range, +13/+20 dBm output power	Extended communication range
ENERGY-HARVEST-RD	Energy Haresting Reference Design	On-chip temperature sensor, reduce power by harvesting energy from solar, thermal, piezo and radio frequency waves	No need for batteries, reduces overall cost and size, improved reliability

SILICON LABORATORIES INC. | 400 W. CESAR CHAVEZ | AUSTIN, TX 78701 | 877-444-3032 | SILABS.COM/ENERGY-HARVESTING

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