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# ZERO POWER WIRELESS SENSORS

## Energy Harvesting-based Power Solutions

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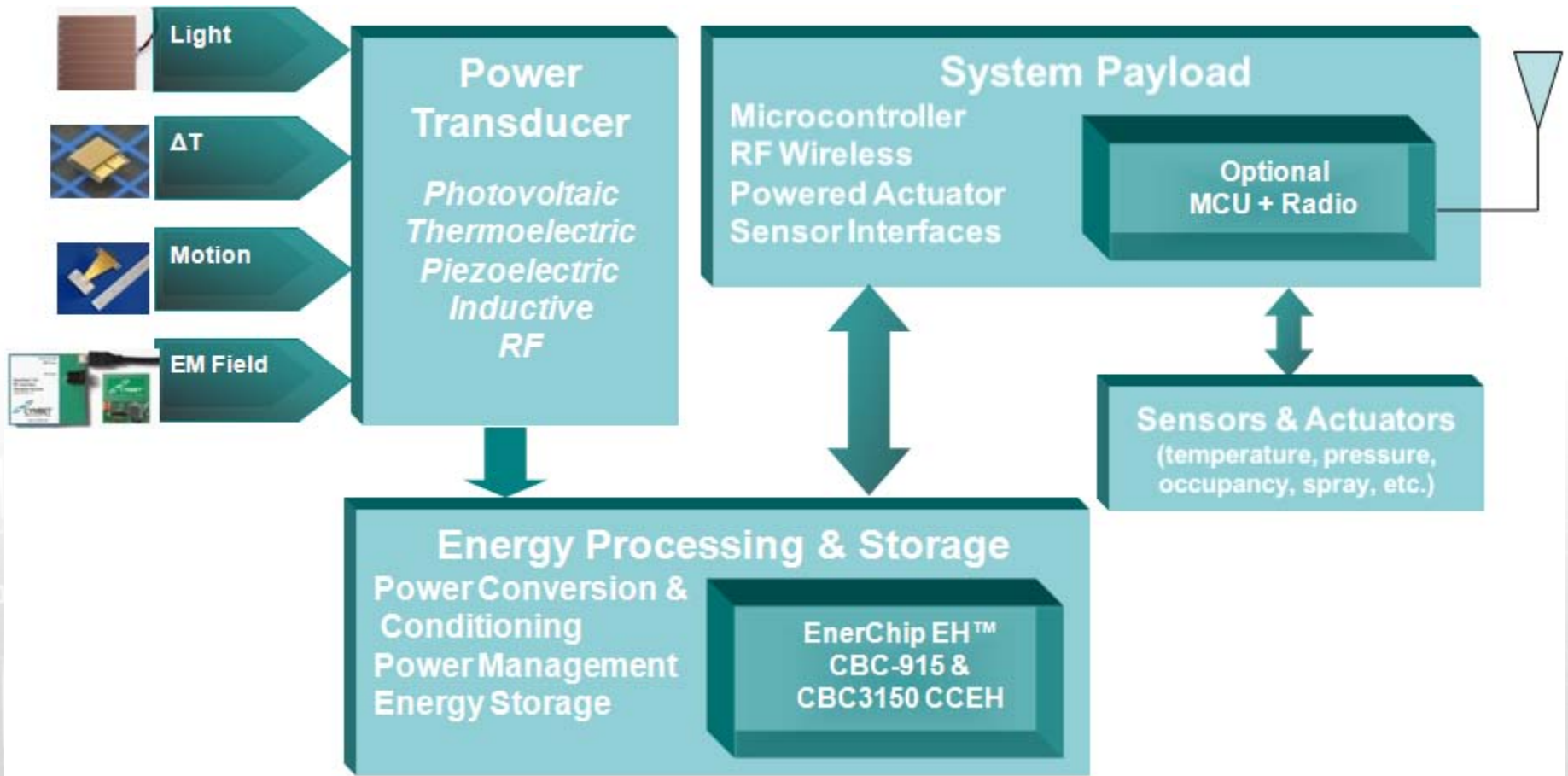
# Zero Power Sensors Overview

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- » Energy can be harvested from almost any environment:
  - » Light, vibration, flow, motion, pressure, magnetic fields, RF, etc.
- » Energy Harvesting applications include:
  - » Permanently powered wireless sensors,
  - » Hybrid & Active RFID, data logging and access control
- » Self-Powered Systems need reliable energy storage:
  - » Must have energy storage because EH Transducer energy source is not always available
  - » Self-Powered devices enable inaccessible remote placement and lower installation costs
  - » High battery cycle life enables extended operation – no more service calls
- » Ideal storage solution is a highly-efficient, eco-friendly, energy storage device that lasts the life of the product



# Zero Power Wireless Sensor Diagram



# Microchip XLP Solar EH Kit

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- » EH Application development platform
- » XLP 16-bit PIC24F16KA102 MCU
- » PICtail daughter boards including Wireless

Microchip XLP Solar EH Kit



XLP 16-bit Energy Harvesting Development Board  
(Part # DV164133)

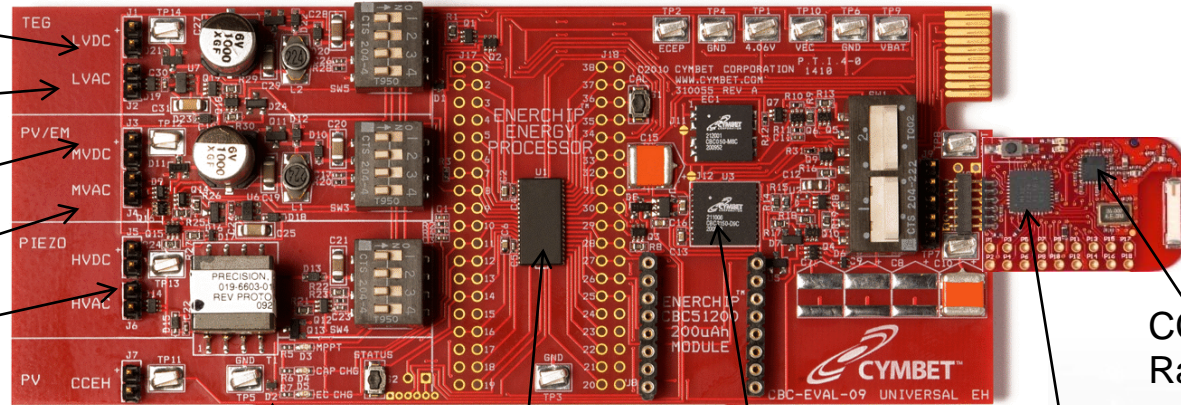
# EH for TI MSP430 LaunchPad Kit

- Semi Passive Tag Monitors Temperature Aberrations
  - Connects to Eval-10 Solar Harvesting Board
  - Easily Programmable for testing
  - EH power source allows for permanent power with no battery replacement
  - 100's of hours of run time with minutes of exposure to >200 Lux of indoor lighting



# EVAL-09 Universal Energy Harvesting Kit

Thermoelectric  
Generator (TEG)  
or  
RF Induction  
or  
Photovoltaic Cell  
or  
Electromagnetic  
or  
Piezoelectric  
Generator



Various  
Transducer  
Interface  
Electronics

Energy  
Processor  
CBC915

EnerChip  
Energy  
Storage

MSP430 with  
Temperature  
Sensor

CC2500  
Radio

Available at [www.avnetexpress.avnet.com](http://www.avnetexpress.avnet.com)  
keyword Eval-09



# Semi Passive RF Tag Applications

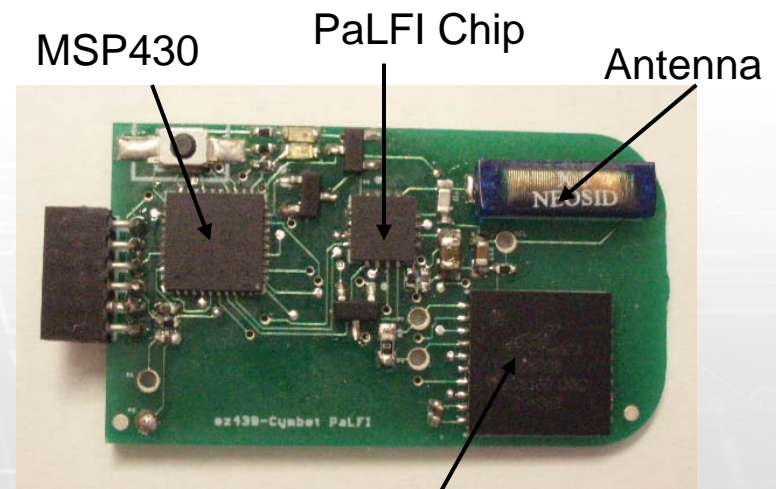
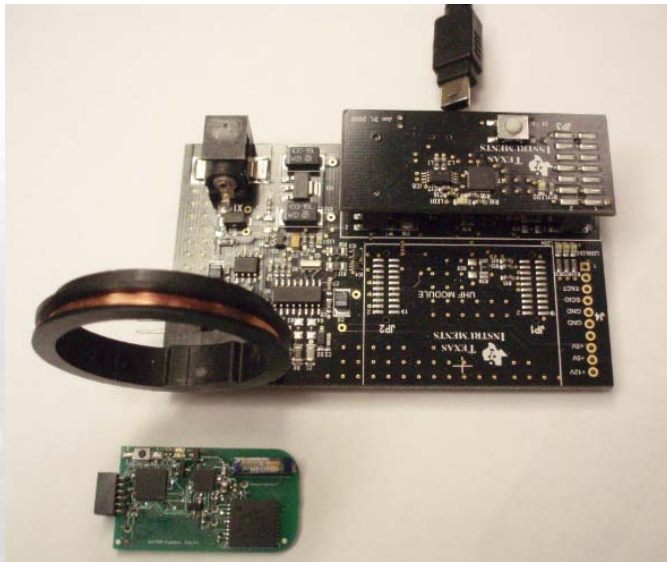
- Cold-chain time/temperature monitoring
- Smart patches – medical
  - Blood glucose monitoring
  - Body temperature
  - Moisture, pH, oxygen
- Service tags
  - Equipment calibration and servicing indicators
- Low duty cycle real-time locating systems



Data Logging Tag

# RF Charging and Comms - TI and Cymbet

- PaLFI EnerChip RF Tag
  - Data Logging, Line-End Programming, mailbox function, communication through MCU (read & write), passive wake-up via air or push button
  - EnerChip Battery charge function
  - Secure and encrypted communication



EnerChip CBC3150  
Solid State Battery

# EH Medical Applications

- » Wireless Patient Monitoring:
  - » Rechargeable micro-power source powers wireless sensors
  - » Eliminates wires & battery replacement
  
- » Patient ID & Tracking:
  - » Small size enables Active-RFID & RTLS
  - » Utilize near-field recharging
  
- » Smart Patches & Dressings:
  - » Administer medicine & monitor wound condition -temp, moisture, PH, etc.



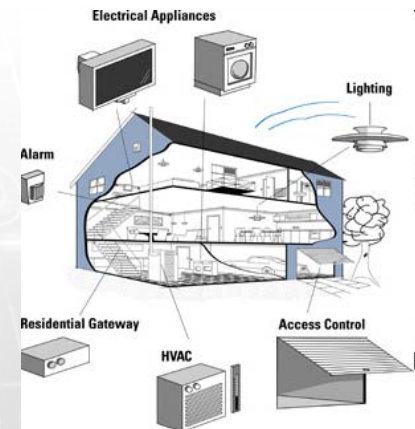
# EH Building Automation

- » HVAC sensors – occupancy, temp, humidity, CO2
- » Lighting Controls – Window light, room light, shade controls
- » Security – occupancy, intrusion detect, motion sensors, noise sensors, proximity, etc.
- » Utility monitoring, meter reading & off-peak control

*Example: Wireless Lighting Control*



*Example: Home Automation*

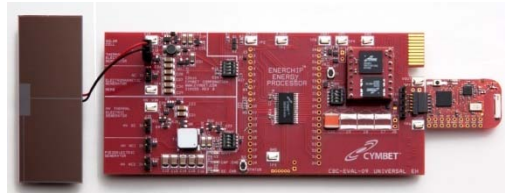


# EH-based Zero Power Evaluation Kits

TI eZ430-RF2500-SEH Kit



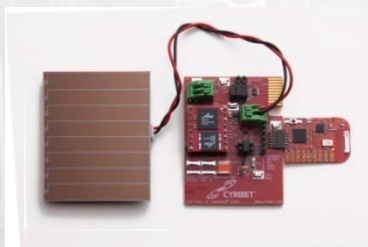
EVAL-09 Universal EH Transducer Using Energy Processor



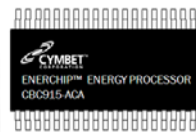
EVAL-11 Near-Field RF Induction Charging



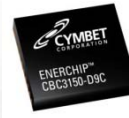
EVAL-10 Solar CCEH Kit



EnerChip EP CBC915 Energy Processor



EnerChip CBC3150 CCEH



CBC050 EnerChips

Microchip XLP Solar EH Kit



Available at [www.avnetexpress.avnet.com](http://www.avnetexpress.avnet.com)  
keyword: Eval-09, Eval-10, EVAL-11

