ZERO POWER WIRELESS SENSORS

Energy Harvesting-based Power Solutions

Steve Grady

VP Marketing

sgrady@cymbet.com

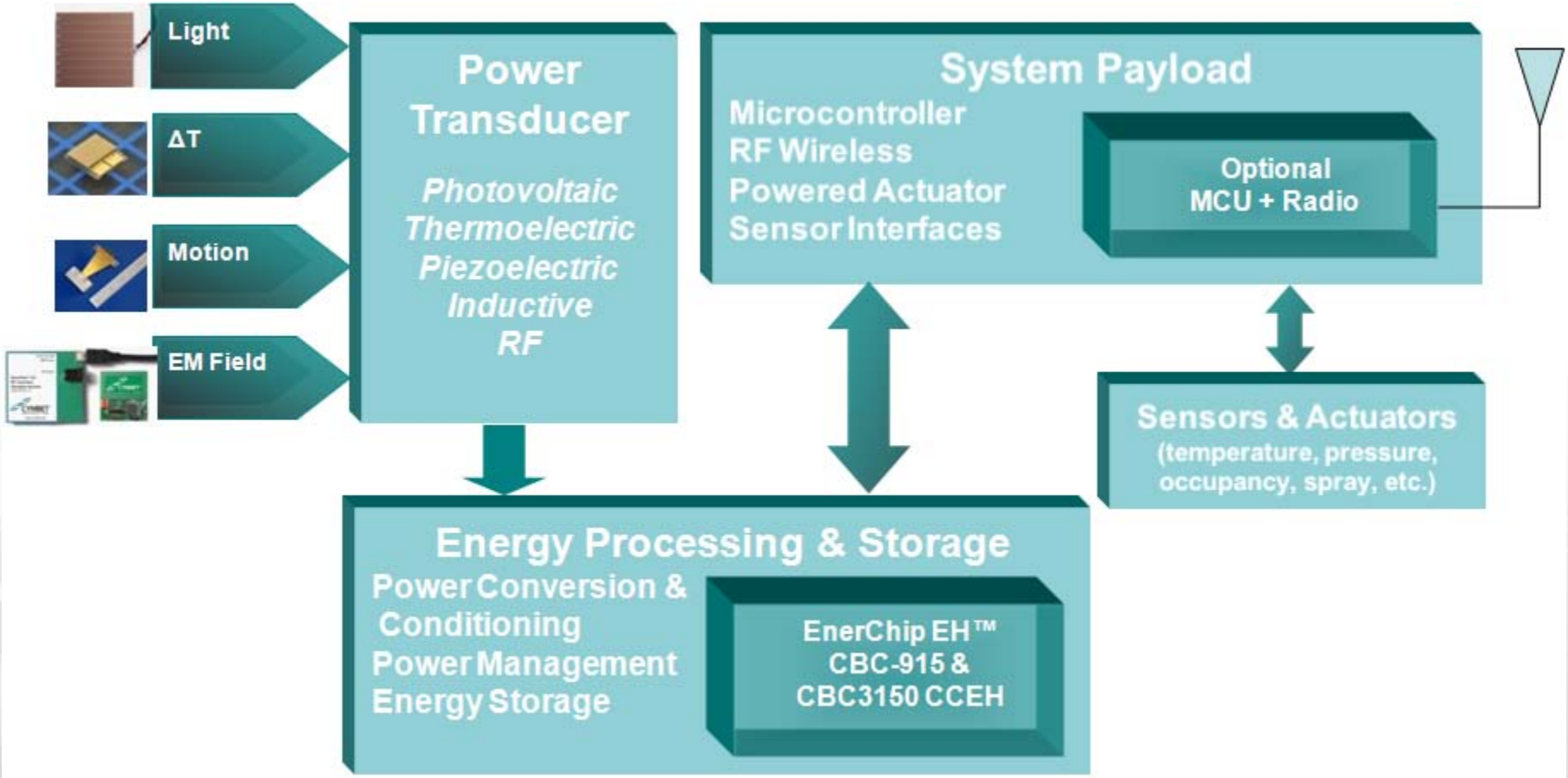
CYMBET™ CORPORATION

AVNET® electronics marketing

Zero Power Sensors Overview

- 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



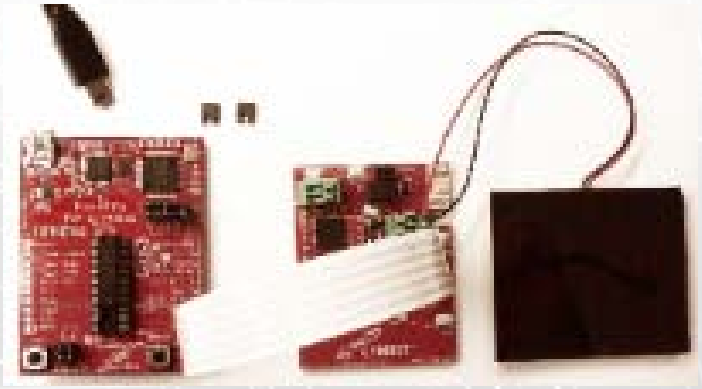
Microchip XLP Solar EH Kit

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

Microchip XLP Solar EH Kit

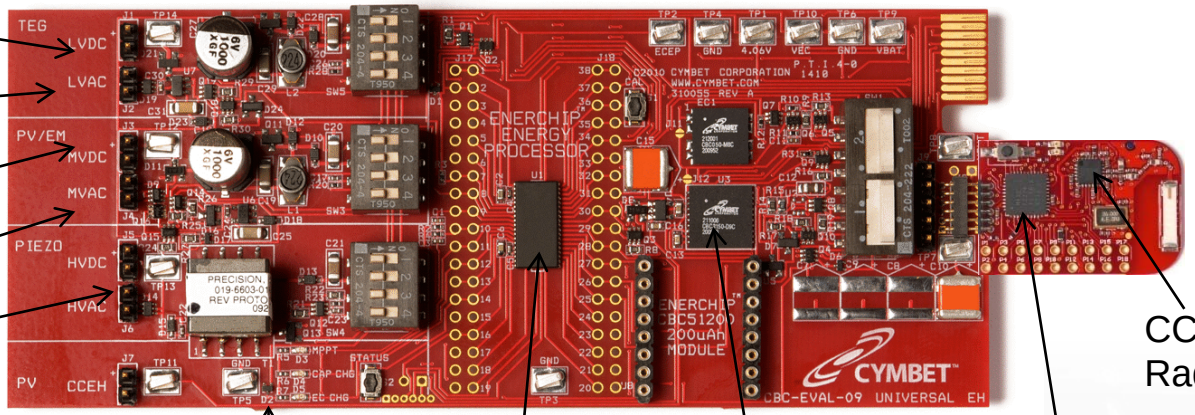
EH for TI MSP430 LaunchPad Kit

- 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



CC2500 Radio

Various Transducer Interface Electronics

Energy Processor CBC915

EnerChip Energy Storage

MSP430 with Temperature Sensor

Available at www.avnetexpress.avnet.com keyword Eval-09

CYMBET™ CORPORATION

POWER FORUM AN AVNET VIRTUAL CONFERENCE

AVNET electronics marketing

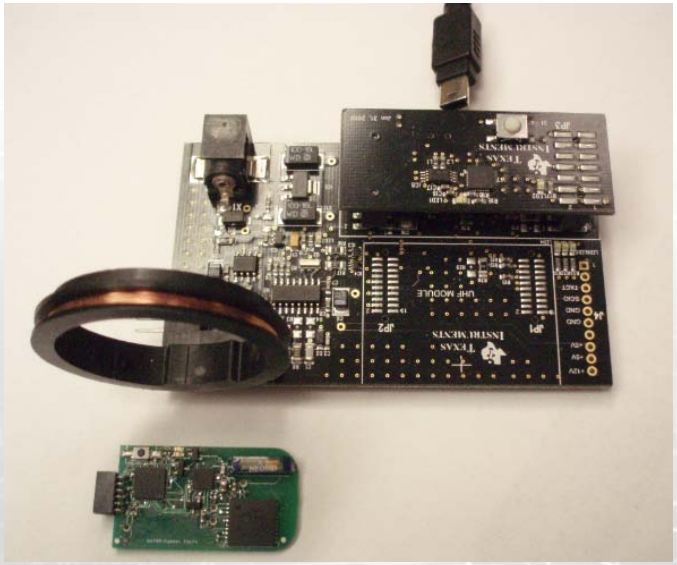
Semi Passive RF Tag Applications

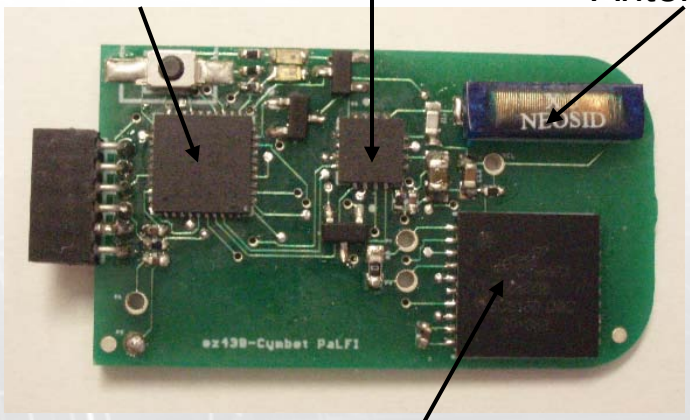
- Cold-chain time/temperature monitoring
- Smart patches – medical
  - Blood glucose monitoring
  - Body temperature
  - Moisture, pH, oxygen
- Service tags
  - Equipment calibration and servicing indicators
- Low duty cycle real-time locating systems

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





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

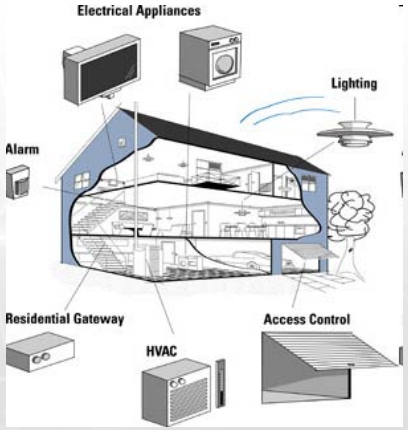
- Smart Patches & Dressings:
  - Administer medicine & monitor wound condition -temp, moisture, PH, etc.

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

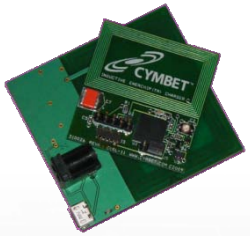


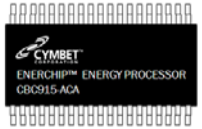
EH-based Zero Power Evaluation Kits

EVAL-09 Universal EH Transducer
Using Energy Processor

TI eZ430-RF2500-SEH Kit

EVAL-11 Near-Field RF
Induction Charging

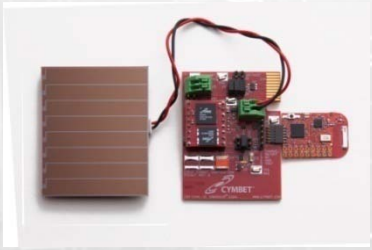




EnerChip EP CBC915
Energy Processor

EnerChip
CBC3150 CCEH

EVAL-10 Solar CCEH Kit



CBC050 EnerChips

Microchip XLP Solar EH Kit

Available at www.avnetexpress.avnet.com
keyword: Eval-09, Eval-10, EVAL-11

CYMBET™ CORPORATION

POWER FORUM
AN AVNET VIRTUAL CONFERENCE

AVNET electronics marketing