Extending Battery Life

Smart Metering Solutions
Silicon Labs Metering Solutions

- Meter Collector
- Electronic Meter
- Metering Transponder

- EZRadioPRO MCU
  - Isolators Modems
- EZRadioPRO MCU
  - Isolators
- EZRadioPRO MCU
  - Isolators FM Rx (RDS)

- Energy Displays
- Intelligent Thermostat
- Utility Load Control
- Print Load Control
# Metering System Requirements

<table>
<thead>
<tr>
<th>Control &amp; Calibration</th>
<th>C8051F9xx Low Power MCUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varies by type of meter, compensate for small variations in the measuring mechanism</td>
<td>✓</td>
</tr>
</tbody>
</table>

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<tr>
<th>Quantitative Measurement</th>
<th>C8051F9xx Low Power MCUs with embedded RTC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varies by meter type but includes temp sensors, flow sensors, shunt resistor, isolation transformer, current transformer, and time keeping</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communications</th>
<th>Si4x3x EZRadioPRO radios ISOmodem Embedded Modems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure parameters in the meter and transfer stored data to a host via wired or wireless connection</td>
<td>✓</td>
</tr>
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<tr>
<th>Power Management</th>
<th>C8051F9xx MCUs High efficiency PWM controller for AC/DC conversion</th>
</tr>
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<tbody>
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<td>Low-power and system robustness in the event of a primary source of energy goes down</td>
<td>✓</td>
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<th>Display</th>
<th>LCD controller capability</th>
</tr>
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<tbody>
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<td>Interface to low cost and low power LCD and LED displays in seven-segment, alphanumeric or matrix format</td>
<td>✓</td>
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<th>Synchronization</th>
<th>Si4x3x EZRadioPRO radios Si47xx FM Radio with RDS</th>
</tr>
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<tbody>
<tr>
<td>Reliable transmission of data to central hub to enable data analysis and accurate billing</td>
<td>✓</td>
</tr>
</tbody>
</table>
Control & Calibration - C8051F9xx MCUs

- Key element to metering design is ability to wake up quickly, capture measurements and go to sleep quickly

- C8051F9xx 8-bit core optimized for this environment
  - 170 uA/MHz active current @ 25 MHz
  - 600 nA sleep current with RTC active
  - 50 nA sleep current with RTC disabled
  - 25 MIPS operation with ~2µs wakeup from sleep
  - 3.3 µs analog acquisition time from lowest power mode

- Integrated battery monitoring
  - ADC can be utilized to detect battery failure and save results
  - Programmable output can supply power to other chips in the system (i.e. radio)

- Multiple internal clock sources
  - Multiple clock sources allow optimal clock planning for lowest power operation

- Integrated real-time clock with programmable alarm
  - Provides versatile mechanism for scheduling events
Communication - Wireless

- Most residential and industrial meters use short range wireless connectivity to send data to an aggregator
  - EZRadioPRO™ receivers and transceivers are ideal for this application
- Robust link performance — increased data reliability
  - Greatest sensitivity, programmable up to 20 dBm
  - Industry-leading link budget (138 dBm)
- Simplified system design — key features are built in
  - Simplified BOM and low operating currents
  - Integrated high-performance power amplifier and low-noise amplifier
- Increased communication range — more than 3km
  - Built-in antenna diversity algorithm
  - Packet handler, wake timer, low-battery detect enable additional features
EZRadioPRO Simplifies Wireless Design

Wireless Customer Needs

- Extended range
- Link robustness
- Reduced MCU loading
- Increased battery life

EZRadioPRO Solution

- Integrated +20 dBm PA High sensitivity -118 dBm
- Embedded antenna diversity
- Embedded packet handler
  Built-in wake timer
- Low sleep mode current 50 nA
  Fast wake-up support
Reduced MCU Loading

Competitive System Solutions
- Larger MCU memory requirement
- MCU awake to poll memory—more current
- ADC required for temp/battery sensor detect
- Reduced performance and battery life, cost, complicated design

EZRadioPRO System Solution
- Reduced MCU memory requirement
- MCU asleep while MCU qualifies data
- Integrated ADC, temp sensor, battery detect
- EZRadioPRO improves performance, reduces current and cost, eases design

When using EZRadioPRO the MCU is freed up to support customer specific processing requirements
Increased Battery Life

- **EZRadioPRO power saving features:** Multiple sleep modes support the most energy efficient configuration
  - Reduced Tx current consumption
  - Reduced wasted current during fast startup
  - Embedded functionality reduces MCU burden

- **F9xx power saving features:**
  - Integrated dc-dc converter powers MCU and EZRadioPRO
  - Fast startup times
  - Ultra low power sleep and active mode currents
  - MCU can sleep for up to 36hrs with no intermediate wake-up events

- Combination = lowest power solution
Complete Smart Metering IC Provider

- Broad portfolio of products ideal for intelligent metering
  - Ongoing strategic investment in metering market
- Products optimized for power and performance
  - Industry leading power/ performance ratio
- Backed by comprehensive tools and support
  - Software, reference designs and configuration tools
Thank You!

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