Intelligent Metering & Power Monitoring Solutions
Microchip Has the Technologies and Support You Need to Succeed…

The metering market is facing many challenges in today’s rapidly evolving world. Government regulations, competitive forces, technology innovations and end customer expectations are fueling unprecedented changes in this market. Having a “smart” partner who can help you stay current and allow you to react quickly will be the difference between success and failure.

With today’s meter designs, innovation rests in many areas – some driven by migrations from mechanical meters to first-time electronic intelligence, while others are driven by the advanced intelligence and two-way communications of smart meters and the demands of tomorrow’s smart grids. Microchip understands the design challenges facing meter designers, whether it’s increasing meter accuracy and reliability while lowering total system cost or engaging the end customer in their home as part of the home area network. Our solutions are used in millions of meters worldwide, Microchip wants to be a partner in your success, not just a vendor.

Microchip offers a complete portfolio of 8-, 16- and 32-bit microcontrollers (MCUs), 16-bit Digital Signal Controllers (DSCs), energy measurement integrated circuits (ICs), analog components, Flash memory, serial EEPROMs and wireless radio transceivers.

Our devices allow designers to:
- Directly drive inexpensive LED, LCD and OLED displays
- Add wireless communication for automated meter reading
- Implement anti-tampering techniques
- Manage low-power design with nanoWatt XLP technology
- Integrate real-time clock for advanced billing schemes
- Simplify meter calibration
- Integrate capacitive touch keys resulting in a fully-sealed design
- Implement temperature sensing at lower cost

Basic Smart Meter

Our free MPLAB® Integrated Design Environment provides a single platform for product development which shortens the time it takes to complete new designs or to modify existing designs to meet regional needs.

Microchip’s Metering Design Center features complete access to all of our metering application notes, software libraries, reference designs and other technical documentation to help engineers get their products to market quickly and efficiently.

Microchip’s global 24/7 technical support team, regional training centers and our local application teams are here to help you meet your customers’ expectations and schedules. We are committed to being part of your success.

Energy Measurement ICs
The MCP390X devices are highly accurate energy measurement analog front ends. When paired with a PIC® microcontroller, engineers have a complete, highly accurate solution for energy measurement in utility metering and other power monitoring applications.

The MCP3901 features two 16/24-bit resolution delta-sigma A/D converters, an internal voltage reference, and Programmable Gain Amplifiers (PGA) with gain up to 32. The 91 dB SINAD and -104 dB THD performance provides industry leading accuracy. Additionally, the new MCP3903 AFE includes six 16/24-bit delta-sigma Analog-to-Digital Converters (ADCs) make it ideal for three phase energy measurement. The MCP3905A, MCP3906A and MCP3909 include a dedicated active power calculation block giving a measurement error of 0.1% over either a 500:1 dynamic range or over a 1000:1 dynamic range.
Utility Metering Product Portfolio

Microcontrollers and Digital Signal Controllers
To enable a wide range of utility metering solutions, Microchip offers flexible microcontroller and digital signal controller platform solutions with a common MPLAB® Integrated Development Environment (IDE). The broad portfolio of 8-/16-/32-bit MCUs and DSCs lowers total system cost by enabling the appropriate level of integration to match utility metering system requirements and reducing battery life through eXtreme Low Power (XLP) performance. Design flexibility for adapting to changing or local system requirements is provided through our unique approach that allows easy migration across the entire MCU and DSC portfolio. Available utility metering solutions with free energy calculation firmware range from single-chip designs offering ease of use and smaller board space to a two-chip solution using Microchip’s energy measuring IC with any MCU or DSC. For more information visit: www.microchip.com/pic

Analog and Interface Devices
From devices for measuring temperature and signals to flow sensors and infrared interfaces, Microchip provides a wide portfolio of analog and interface components that are well suited for metering applications. Low power, precision operational amplifiers enable signal acquisition for accurate measurements of current, voltage, temperature or flow. Microchip’s family of digital temperature sensors provide accurate measurements to compensate for temperature drifts in meter components. Infrared interface devices provide a platform of products for developing a robust communication method for data gathering at meter locations. The Analog Front End (AFE) for three-phase energy metering offers industry leading accuracy. For more information visit: www.microchip.com/analog

Memory Products
For reliable data, code storage, endurance and low power, Microchip offers a broad range of memory devices, which include SRAM, EEPROM and Flash. By supporting a variety of densities that can operate over wide voltage and temperature ranges in very small packages, any metering application can be supported.

With SPI-compatible Serial SRAM devices, unlimited endurance and fast write times can be supported. When non-volatile memory is needed, Microchip has very high endurance Serial EEPROMs that have the highest Erase/Write cycle endurance in the industry. These devices are available with I²C™, SPI or Microwire serial interfaces to support any microcontroller serial port that has been selected.

For applications with higher-density memory requirements, Microchip’s SuperFlash® SPI, SQI™ and Parallel Flash products are ideal solutions. In designs that require a boot loader, SPI Flash can be used to store the boot code, making it available for download into shadow memory upon power-up. For applications that require execute-in-place, the higher bandwidth SQI Flash and Parallel Flash have that capability. SuperFlash products also support cost effective non-volatile memory data storage solutions while offering industry-leading features coupled with fixed and fast program/erase times, ultra-low power consumption, high endurance and excellent reliability. For more information visit: www.microchip.com/memory

I²C™ Real-Time Clock/Calendar (RTCC)
For the various timekeeping needs, Microchip now offers the MCP794XX family of Real-Time Clocks which have a usable amount of non-volatile SRAM, EEPROM, a battery switchover circuit for backup power and sleep currents down to nA. For accurate timekeeping this family has a digital trimming circuit with a wide adjustment range to compensate for crystal frequency drift that can occur over temperature. In the event of a power failure, the RTCC has a power-fail timestamp that can log the time that main power was lost and the time that it was restored. A Unique ID with a MAC Address is also included in protected memory to provide a unique identifier when communicating over wired or wireless interfaces. For more information visit: www.microchip.com/clock

Wired Communications for Smart Grid
Power line repeaters collect data from power meters using wired communications such as RS-485 and Power Line Carrier (PLC) technology. This data is transmitted to concentrators for processing and subsequent transmission to utility companies using power line modems (PLM) and Ethernet among other technologies. The dsPIC® Digital Signal Controller (DSC) general purpose family is well suited for low cost energy meters due to its fast and efficient CPU, DMA channels and small package footprints. The PIC32MX6 family has both the performance needed to process automated meter reading data and a rich set of connectivity features including UARTs, SPIs, USB and Ethernet. For more information visit: www.microchip.com/powerline

Wireless Communications for Smart Grid
The proposed Smart Grid initiatives are placing the meter as the hub of communication from the home to the utility provider. Enabling communication within the grid is key to presenting, monitoring and controlling usage of our precious resources. Microchip provides development platforms to enable wireless communication of ZigBee® networks including the Smart Energy Profile, Wi-Fi® connectivity and sub-GHz AMI solutions. See all of Microchip’s wireless solutions at: www.microchip.com/wireless

Complete Technical Resources for Metering Designs
Engineering resources are often limited, which makes access to existing application reference designs and technical documentation critical in reducing time to market. Microchip’s Utility Meter Design Center at: www.microchip.com/meter offers material that walks through all of the building blocks and considerations in creating a utility metering design. The design center also features complete access to all of Microchip’s metering application notes, reference designs and other technical documentation to help engineers get their products to market quickly and efficiently.

Development Systems
Low-cost and easy-to-learn development tools can save designers time, money and engineering resources. Microchip offers a number of development boards and evaluation kits that demonstrate the capabilities of its silicon solutions for utility metering and power monitoring applications. For more information visit: www.microchip.com/tools

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Need for Device Level Messaging Specification (DLMS)
The energy market is being liberalized and there are multiple vendors providing energy measurement solutions. This has created a need for interoperability among different metering systems, power grids and products. DLMS is emerging as the standard of choice in smart metering and it addresses interoperability among:
- All energy types – electricity, gas, heat, water
- All communication media – RS-232, RS-485, PSTN, GSM, GPRS, IPv4 PPP, PLC

Device Level Messaging Specification (DLMS) For 16-bit MCUs

ZigBee® Solutions
Microchip is providing ZigBee Smart Energy Profile Suite which includes the Smart Energy Profile (SEP) along with the ZigBee PRO stack and ZigBee Cluster Library. Using Microchip's SEP suite, customers can easily develop their applications and reduce the time to market.
As a member of the ZigBee Alliance, Microchip offers certified ZigBee Compliant Platform (ZCP) for the ZigBee PRO, ZigBee RF4CE and ZigBee Residential protocol stacks. The ZCP is a required starting point for customers to develop a ZigBee Compliant Product. The ZCPs ensure interoperability with the ZigBee industry standard. Microchip’s ZigBee Compliant Platforms consist of the 2.4 GHz IEEE 802.15.4 compliant MRF24J40/MA/MB transceiver products, PIC® microcontrollers and the certified firmware protocol stacks.

SEP Suite Includes
- ZigBee Smart Energy Profile Application
- Certified ZigBee PRO Stack
- Supports PIC24 and PIC32 MCU and dsPIC33 DSC families
- ZigBee Cluster Library (ZCL)
- Royalty-free ZigBee protocol stack
- Source-code format, allowing designers to customize their products
- Efficient footprint for entire ZigBee protocol

Get Started In 3 Easy Steps
1. Purchase Microchip’s Explorer 16 Development Board
2. Download DLMS evaluation library. User guide and examples projects will be provided for understanding the library and its implementation.
3. Download a trial version of the DLMS Explorer for in-house testing of the meter. DLMS Explorer is a Windows® based DLMS client application with user friendly GUI.

For download instructions, visit:
www.microchip.com/dlms

DMS Solution
Microchip has partnered with Kalki Communication Technologies Ltd. (Kalkitech) to offer the DLMS library for 16-bit PIC MCUs and dsPIC DSCs.

Features
- DLMS UA certified
- PC Client Test Tools for testing and validating the DLMS implementation
- Supports serial profile
- Support for IEC 62056-21 Mode E Implementation
- AES-128 encryption
- Getting Started example codes

Support
- FREE DLMS Evaluation Library
- FREE DLMS Explorer Trial Version

Learn more at:
www.dlms.com
www.microchip.com/DLMS
www.microchip.com/meter
www.microchip.com/zigbee
Utility Metering Development Tools

**MCP3901 ADC Evaluation Board for 16-bit MCUs**
(MCP3901EV-MCU16)

This evaluation board for 16-bit MCUs provides the ability to evaluate the performance of the MCP3901 dual channel ADC. It also provides a development platform for 16-bit PIC MCU-based applications using existing 100-pin PIM systems. A LabVIEW software interface enables viewing of the MCP3901 performance via USB interface.

**MCP3903 Evaluation Board for 16-bit MCUs**
(ADM00310)

This evaluation board for 16-bit PIC MCUs provides the ability to evaluate the performance of the MCP3903 six channel sigma-delta ADC. It also provides a development platform for 16-bit MCU-based applications, using existing 100-pin PIM systems.

**MCP3909 3-Phase Energy Meter Reference Design**
(MCP3909RD-3PH1)

This reference design is a fully functional 3-phase energy meter including PC software used for automated calibration. The reference design consists of two boards: the main metering board with the MCP3909 devices and PIC18F2520 that performs the power calculations, and the USB interface module which uses the PIC18F4550. The meter design contains serially accessible registers and is intended to be flexible and upgraded with a variety of PIC MCUs using the included firmware.

**MCP3905A Energy Meter Evaluation Board**
(MCP3905EV)

This evaluation board allows the user to test a variety of energy meter designs. On the input side, high voltage line and load AC-plug headers are included, along with mounting holes for shunts, current transformers and screw-type connections for wiring. On the output side, a large prototype area is included along with optical isolation and a standard PICtail™ header for experimenting with a variety of PIC MCUs-based energy meter designs.

**MCP3905A Energy Meter Reference Design**
(MCP3905RD-PNI)

This low-cost energy meter board acts as a stand-alone energy meter or as the analog front-end design for LCD MCU-based meters. The MCP3905A design is specified with an energy measurement error of 0.1% typical across 1:500 dynamic range for high accuracy energy meter designs. The board is compliant with EMC requirements per energy metering standards IEC62053 and legacy IEC61036, IEC1046 and IEC687.

**MCP3909/dsPIC33F Advanced 3-Phase Energy Meter Reference Design**
(MCP3909RD-3PH3)

This fully functional energy meter reference design has many advanced features such as harmonic analysis, per phase distortion information, sag detection, four quadrant energy measurement, and active and reactive power calculation. Using the 16-bit dsPIC33FJ64GP206, this reference design takes advantage of the dsPIC33F by performing all calculations in the DSP engine. All output quantities are calculated in the frequency domain yielding a large number of outputs for a variety of meter designs.

**PICDEM™ LCD 2 Demonstration Board**
(DM163030)

This board demonstrates the main features of the LCD Flash PIC MCUs with power management functions. The board comes populated with the PIC18F85J90, and supports other PIC16 and PIC18 LCD devices via a plug-in module, (sold separately). The included 3V LCD glass has icons, bar graphs and digits simulating many common applications. Tutorial firmware and documentation are provided. The kit is a complete solution, ready for development right out of the box.

**Explorer 16 Development Board**
(DM240001/ DM240002) and MRF24J40MA PICtail™ Plus Daughter Board (AC164134-1)

This board offers an economical way to evaluate Microchip's 16- and 32-bit MCUs, and dsPIC33F DSC families, as well as the new DLMS software stack. Developers are able to create IEEE 802.15.4™/ZigBee and IEEE 802.11™/Wi-Fi wireless communication applications by adding wireless PicTail daughter cards to the Explorer 16 board.

**MRF24J40MB PicTail™/PicTail Plus Daughter Board**
(AC164134-2)

This daughter board for the MRF24J40MB 2.4 GHz IEEE Std. 802.15.4™ 20 dBm RF transceiver module can be used with multiple development boards. For 8-bit MCU development, use the PIC18 Explorer Board (DM183032). For 16-bit MCU development use the Explorer 16 Development Board (DM240001). Supporting software stacks and application notes are available at: [www.microchip.com/wireless](http://www.microchip.com/wireless).

**8-bit Wireless Development Kit – 2.4 GHz IEEE 802.15.4 (DM182015-1)**

This kit provides a cost-effective method of evaluating and developing low-power wireless applications based on Microchip’s wireless protocols.

Kit includes two PIC18 wireless development boards with PIC18F46J50 XLP MCU, two MRF24J40MA transceiver PICtail daughter boards, two LCD and two RS-232 serial accessory boards, two USB A to Mini-B cables and two RS-232 serial cables.

[www.microchip.com/get/eumeter](http://www.microchip.com/get/eumeter)