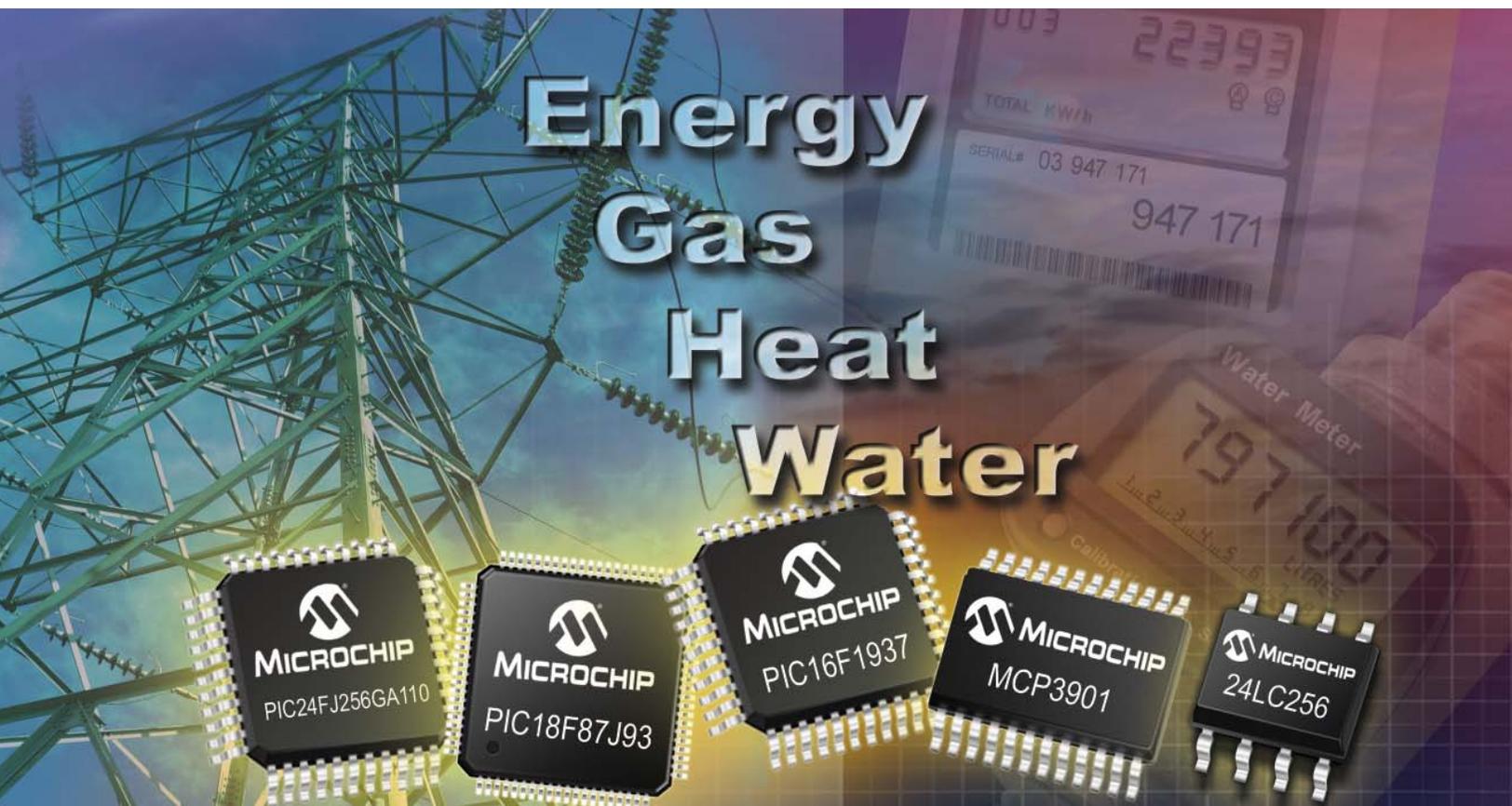




Complete Utility Metering Solutions



Design Innovation in Energy, Gas, Water and Heat Meters

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. With millions of meters worldwide utilizing Microchip's solutions, we understand the design challenges you face every day whether it is increasing the meter accuracy and reliability while lowering total system cost or engaging the end customer in their home as part of the Home Area Network. Microchip wants to be your partner, not just your vendor.

Microchip offers a complete portfolio of 8-, 16- and 32-bit microcontrollers, 16-bit digital signal controllers, energy measurement integrated circuits (ICs), analog components and serial EEPROMs.

Our devices allow designers to:

- Directly drive inexpensive LED and LCD 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
- mTouch™ sensing solutions enable designers to easily integrate touch-sensing functionality into their designs

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.

In addition, our Metering Design Center features complete access to all of Microchip's 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.



Utility Metering Solutions and Development Systems

Energy Measurement ICs

The MCP390X devices are highly accurate energy measurement analog front ends. When these ICs are 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 a programmable gain amplifier (PGA) with gain up to 32. The 91 dB SINAD and -104 dB THD performance make it ideal for energy measurement applications. The MCP3905A, MCP3906A and MCP3909 feature similar performance in addition to a dedicated active power calculation block giving a measurement error of 0.1% over a 1000:1 dynamic range.

Microcontrollers with LCD Drivers

Most metering designs require user interfaces that are low cost and easy to use. Microcontrollers with on-board liquid crystal display (LCD) modules combine the control and interface functions in a single device.

Microchip's PIC18F87J90 and PIC16F193X/194X series of 8-bit microcontrollers provide high-performance and cost-effective solutions for metering applications. Both families offer Flash program memory, low power consumption and integrated LCD control with a variety of features and package options.

8-/16-/32-bit Microcontrollers and 16-bit Digital Signal Controllers

Engineers require a variety of controller options to select the optimum price and performance for their applications. Microchip offers hundreds of 8-, 16- and 32-bit microcontrollers and 16-bit digital signal controllers for metering designs with numerous choices of memory types and sizes, pin counts, peripherals and much more.

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.

Serial Memory Products

Microchip offers the broadest range of Serial EEPROM devices (from 128 bits to 1 Mbit) over the widest operating voltage (1.7 to 5.5V) and temperature ranges (Up to 150°C). Microchip offers a wide selection of innovative packages including small SOT-23 and SC-70 packages, as well as CSP and die options. SPI-compatible Serial SRAM devices are available in 64 and 256 Kbit options and up to 20 MHz. For more information visit: www.microchip.com/memory.

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 AML 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 the reader 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 demonstrates the capabilities of its silicon solutions for utility metering and power monitoring applications.

MCP3909 and PIC18F85J90 Single Phase Energy Meter Reference Design (MCP3909RD-1PH1)



The MCP3909 and PIC18F85J90 Single Phase Energy Meter Reference Design is a fully functional single phase meter. The design uses a half wave rectified power supply circuit and a shunt current sensing element. A single MCP3909 acts as the analog front end measurement circuitry. The PIC18F85J90 directly drives the LCD glass and displays active energy consumption and can be used to create custom calibration setups. The firmware available on the reference design is intended for flexibility in upgrading to various PIC microcontrollers.

Utility Metering Development Systems

MCP3909 and PIC18F25K20 Single Phase Energy Meter Reference Design (MCP3909RD-PM1)



The MCP3909 and PIC18F25K20 Low Cost Power Monitor is a fully functional single phase meter. The design is intended to be low cost and uses a shunt current sensing element. A single MCP3909 acts as the analog front end measurement circuitry. The LCD module is used to display RMS current, RMS voltage, power factor and active power. The meter design is intended to be flexible and able to be upgraded to a variety of PIC microcontrollers.

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



The MCP3901 ADC 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 based applications using existing 100-pin PIM systems. A LabVIEW software interface enables viewing of the MCP3901 performance via USB interface.

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 microcontrollers using the included firmware.

MCP3905A Energy Meter Reference Design (MCP3905RD-PM1)



This low-cost energy meter board acts as a stand-alone energy meter or as the analog-front-end design for LCD microcontroller-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)



The MCP3909/dsPIC33F Advanced 3-phase Energy Meter Reference Design is a fully functional energy meter reference design with many advanced features such as harmonic analysis, per phase distortion information, sag detection, four quadrant energy measurement, and active and reactive power calculation. It uses Microchip's 16-bit MCU 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.

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 microcontroller-based energy meter designs.

PICDEM™ LCD 2 Demonstration Board (DM163030)



The PICDEM LCD 2 Board demonstrates the main features of the LCD Flash 28-, 40-, 64- and 80-pin PIC microcontrollers 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)



The Explorer 16 Development Board offers an economical way to evaluate Microchip's 16- and 32-bit microcontrollers, and dsPIC33F DSC Families. 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 using the associated software protocol stack.

Product Specifications

Energy Measurement ICs (IEC Compliant)

Device	Measurement Error	Dynamic Range	Interface	V _{REF} Drift	Active Power Calculation Block	Supply Voltage Range (V)	Temperature Range (C°)	Packages
MCP3901	–	91 dB	SPI	15ppm	No	4.5-5.5V	-40 to +85°C	20-SSOP, 20-QFN
MCP3905A	0.1%	500:1	Pulse Output	15ppm	Yes	4.5-5.5V	-40 to +85°C	24-SSOP
MCP3906A	0.1%	1000:1	Pulse Output	15ppm	Yes	4.5-5.5V	-40 to +85°C	24-SSOP
MCP3909	0.1%	1000:1	SPI, Pulse Output	15ppm	Yes	4.5-5.5V	-40 to +85°C	24-SSOP

Recommended 8-bit PIC® Microcontrollers

Device	Flash Program Memory (bytes)	Data RAM (bytes)	EEPROM Data Memory (bytes)	I/O	ADC Channel (Resolution)	Comparators	MSSP (I ² C™ or SPI)/ Serial USART	CCP/ECCP	LCD Segments	Timers 8/16-bit	Real Time Clock	Pins
PIC16F722	3.5k	128	–	25	11	–	1/1	2/-	–	2/1	Timer 1	28
PIC16F1827	7k	384	256	16	12	2	2/1	2/2	–	4/1	Timer 1	18
PIC16F690	7k	256	256	18	12	2	1/1	-/1	–	2/1	Timer 1	20
PIC16F1933	7k	256	256	25	11	2	1/1	2/3	60	4/1	Timer 1	28
PIC16F886	14k	368	256	25	11	2	1/1	1/1	–	2/1	Timer 1	28
PIC16F727	14k	368	–	36	14	–	1/1	2/-	–	2/1	Timer 1	40/44
PIC16F887	14k	368	256	36	14	2	1/1	1/1	–	2/1	Timer 1	40/44
PIC16F1937	14k	512	256	36	14	2	1/1	2/3	96	4/1	Timer 1	40/44
PIC16F1947	28k	1024	256	53	17	3	2/2	2/3	184	4/1	Timer 1	64
PIC18F65J90	32k	2048	–	51	12 (10-bit)	2	1/2	2	132	1/3	Timer 1	64
PIC18F65J11	32k	2048	–	52	12 (10-bit)	2	1/2	2	–	1/3	Timer 1	64
PIC18F85J90	32k	2048	–	67	12 (10-bit)	2	1/2	2	132	1/3	Timer 1	80
PIC18F66J90	64k	3923	–	51	12 (10-bit)	2	1/2	2	132	1/3	HW RTCC*	64
PIC18F66J93	64k	3923	–	51	12 (12-bit)	2	1/2	2	132	1/3	HW RTCC	64
PIC18F66J11	64k	3930	–	52	11 (10-bit)	2	2/2	5	–	2/3	Timer 1	64
PIC18F86J90	64k	3923	–	67	12 (10-bit)	2	1/2	2	192	1/3	HW RTCC	80
PIC18F86J93	64k	3923	–	67	12 (12-bit)	2	1/2	2	192	1/3	HW RTCC	80
PIC18F66J16	96K	3930	–	52	11 (10-bit)	2	2/2	5	–	2/3	Timer 1	64
PIC18F67J90	128k	3923	–	51	12 (10-bit)	2	1/2	2	132	1/3	HW RTCC	64
PIC18F67J93	128k	3923	–	51	12 (12-bit)	2	1/2	2	132	1/3	HW RTCC	64
PIC18F67J11	128k	3930	–	52	11 (10-bit)	2	2/2	5	–	2/3	Timer 1	64
PIC18F87J90	128k	3923	–	67	12 (10-bit)	2	1/2	2	192	1/3	HW RTCC	80
PIC18F87J93	128k	3923	–	67	12 (12-bit)	2	1/2	2	192	1/3	HW RTCC	80

Recommended 16-bit PIC® Microcontrollers

Device	Flash Program Memory (bytes)	Data RAM (bytes)	EEPROM Data Memory (bytes)	I/O	ADC Channel (Resolution)	Comparators	I ² C™/SPI/ Serial USART	CCP/PWM	LCD Segments	Timers 8/16-bit	Real Time Clock	Pins
PIC24FJ128GA106	128K	16K	–	53	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC*	64
PIC24FJ128GA108	128K	16K	–	69	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	80
PIC24FJ128GA110	128K	16K	–	85	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	100
PIC24FJ192GA106	192K	16K	–	53	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	64
PIC24FJ192GA108	192K	16K	–	69	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	80
PIC24FJ192GA110	192K	16K	–	85	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	100
PIC24FJ256GA106	256K	16K	–	53	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	64
PIC24FJ256GA108	256K	16K	–	69	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	80
PIC24FJ256GA110	256K	16K	–	85	16 (10-bit)	3	3/3/4	9/9	–	5	HW RTCC	100

*RTCC: Real Time Clock and Calendar

Product Specifications

Recommended dsPIC® Digital Signal Controllers (DSC)

Device	Flash Program Memory (bytes)	Data RAM (bytes)	EEPROM Data Memory (bytes)	I/O	Analog (Resolution)	Comparators	I ² C™/SPI/Serial USART	OC/PWM	LCD Segments	Timers 16-/32-bit	Pins
dsPIC33FJ64GP206A	64K	8K	–	53	18 (10-bit @ 1.1 Msps) (12-bit @ 500 ksps)	–	1/2/2	8	–	5	64
dsPIC33FJ128GP206A	128K	8K	–	53	18 (10-bit @ 1.1 Msps) (12-bit @ 500 ksps)	–	1/2/2	8	–	5	64
dsPIC30F30F6014A	144K	8K	4K	68	16 (12-bit @ 200 ksps)	–	1/2/2	8	–	5/2	80

Recommended 32-bit PIC® Microcontrollers

Device	Flash Program Memory (bytes)	Data RAM (bytes)	EEPROM Data Memory (bytes)	I/O	ADC Channel (Resolution)	Comparators	I ² C™/SPI/Serial USART/USB	CCP/PWM	LCD Segments	Timers 8/16-bit	Real Time Clock	Pins
PIC32MX440F128H	128K	32K	–	51	16 (10-bit @ 1 Msps)	2	2/1/2/1	5	–	5/1	HW RTCC	64
PIC32MX340F128H	128K	32K	–	53	16 (10-bit @ 1 Msps)	2	2/2/2/0	5	–	5/1	HW RTCC	64

Recommended Analog and Interface Solutions

Analog-to-Digital Converters

Part #	Resolution (bits)	Maximum Sampling Rate (samples/sec)	# of Input Channels	Interface	Supply Voltage Range (V)	Typical Supply Current (µA)	Typical INL	Temperature Range (°C)	Features
MCP3421/2/3/4	18 to 12	4 to 240	1/2/2/4 Diff	I ² C™	2.7 to 5.5	155	10 ppm	-40 to +125	PGA, VREF
MCP3425/6/7/8	16 to 12	15 to 240	1/2/2/4 Diff	I ² C	2.7 to 5.5	155	10 ppm	-40 to +125	PGA, VREF
MCP3201/2/4/8	12	100k	1/2/4/8 SE	SPI	2.7 to 5.5	400	+/-1 LSB	-40 to +85	

Op Amps

Part	# per pkg	GBWP (kHz)	I _q Typical (µA)	V _{os} Max (mV)	Operating Voltage (V)	Temperature Range (°C)
MCP602	2	2,800	230	2000	2.7 to 6.0	-40 to +125
MCP6272	2	2,000	170	3000	2.0 to 6.0	-40 to +125
MCP6292	2	10,000	1000	3000	2.4 to 6.0	-40 to +125

Temperature Sensors

Part #	Typical Accuracy (°C)	Maximum Accuracy @ 25°C (°C)	Maximum Temperature Range (°C)	V _{cc} Range (V)	Maximum Supply Current (µA)	Interface
MCP9800	0.5	1	-55 to +155	2.7 to 5.5	400	I ² C
TCN75A	0.5	1	-55 to +125	2.7 to 5.5	400	I ² C
TC77	0.5	3	-55 to +125	2.7 to 5.5	400	SPI

Recommended Serial Memory

Device	Memory Type	Bus	Density (bits)	Operating Voltage	Max Standby Current (@5.5V, 85°C)	Max. Clock Frequency	Typical E/W Endurance	Typical Meter Selection	Typical Packages in Meters
93LC46B	EEPROM	µwire	1K	2.5V to 5.5V	1 µA	3 MHz	>1M cycles	Heat	8-SN, 8-P
24LC02B	EEPROM	I ² C™	2K	2.5V to 5.5V	1 µA	400 KHz	>1M cycles	Gas, Water	5-OT, 8-SN, 8-MS, 8-ST
24LC024	EEPROM	I ² C	2K	2.5V to 5.5V	1 µA	400 KHz	>1M cycles	Water	8-SN, 8-MS, 8-ST
93LC66B	EEPROM	µwire	4K	2.5V to 5.5V	1 µA	3 MHz	>1M cycles	Heat	8-SN, 8-P
24LC08B	EEPROM	I ² C	8K	2.5V to 5.5V	1 µA	400 KHz	>1M cycles	Electricity	8-SN, 8-MS, 8-ST
24LC16B	EEPROM	I ² C	16K	2.5V to 5.5V	1 µA	400 KHz	>1M cycles	Electricity	8-SN, 8-MS, 8-ST
24LC64	EEPROM	I ² C	64K	2.5V to 5.5V	1 µA	400 KHz	>1M cycles	Electricity, Heat	8-SN, 8-MS, 8-ST
24LC128	EEPROM	I ² C	128K	2.5V to 5.5V	1 µA	1 MHz	>1M cycles	Electricity, Gas	8-SN, 8-MS, 8-ST
24LC256	EEPROM	I ² C	256K	2.5V to 5.5V	1 µA	1 MHz	>1M cycles	Electricity	8-SN, 8-MS, 8-ST
25AA256	EEPROM	SPI	256K	1.8V to 5.5V	1 µA	10 MHz	>1M cycles	Electricity	8-SN, 8-MS, 8-ST
24LC512	EEPROM	I ² C	512K	2.5V to 5.5V	1 µA	1 MHz	>1M cycles	Electricity, Water	8-SN, 8-SM
25AA512	EEPROM	SPI	512K	1.8V to 5.5V	10 µA	20 MHz	>1M cycles	Electricity	8-SN, 8-SM
24LC1025	EEPROM	I ² C	1M	2.5V to 5.5V	5 µA	1 MHz	>1M cycles	Electricity, Water	8-SN, 8-SM
25AA1024	EEPROM	SPI	1M	1.8V to 5.5V	12 µA	20 MHz	>1M cycles	Electricity	8-SM
23K640	SRAM	SPI	64K	2.7V to 3.6V	4 µA	20 MHz	∞	Electricity	8-SN, 8-ST
23K256	SRAM	SPI	256K	2.7V to 3.6V	4 µA	20 MHz	∞	Electricity	8-SN, 8-ST

Product Specifications and Utility Metering Resources

Recommended Wireless Solutions

IEEE 802.15.4 Transceivers/Modules

Product	Pin Count	Freq. Range	Sensitivity	Power Output	RSSI	Tx Pwr	Rx Pwr	Clock	Sleep	MAC	MAC Feature	Encryption	Interface	Packages
MRF24J40	40	2.405-2.48	-95	0	Yes	23	19	20 MHz	Yes	Yes	CSMA-CA	AES128	4-wire SPI	40/QFN
MRF24J40MA	12	2.405-2.48	-95	0	Yes	23	19	20 MHz	Yes	Yes	CSMA-CA	AES128	4-wire SPI	12/Module
MRF24J40MB	12	2.405-2.475	-102	20	Yes	130	25	20 MHz	Yes	Yes	CSMA-CA	AES128	4-wire SPI	12/Module
MRF24J40MC	12	2.405-2.475	-102	20	Yes	130	25	20 MHz	Yes	Yes	CSMA-CA	AES128	4-wire SPI	12/Module

Sub-GHz Transceivers/Modules

Product	Pin Count	Freq. Range	Sensitivity	Power Output	RSSI	Tx Pwr	Rx Pwr	Clock	Sleep	Interface	Packages
MRF49XA	16	433/868/915	-110	7	Yes	15 mA @ 0 dBm	11	10 MHz	Yes	4-wire SPI	16/TSSOP
MRF89XA	32	868/915/950	-113	12.5	Yes	25 mA @ 10 dBm	3	12.8 MHz	Yes	4-wire SPI	32/TQFN

IEEE 802.11 Modules

Product	Pin Count	Freq. Range	Sensitivity	Power Output	RSSI	Tx Pwr	Rx Pwr	Clock	Sleep	MAC	MAC Feature	Encryption	Interface	Packages
ZG2100MC	36	2.412-2.484	-91	10	Yes	156	85	25 MHz	0.1	Yes	802.11	WPA, WPA-2, WEP	4-wire SPI	36 Module
ZG2101MC	36	2.412-2.484	-91	10	Yes	156	85	25 MHz	0.1	Yes	802.11	WPA, WPA-2, WEP	4-wire SPI	36 Module

Application Notes & Tech Briefs

Metering

- AN939 Designing Energy Meters with the PIC16F873A
- AN994 IEC Compliant Active-Energy Meter Design Using the MCP3905/6
- AN1013 Gas and Water Metering with the PIC16F91X Family
- AN1300 Designing with the MCP3901 Dual Channel Analog-to-Digital Converters
- TB1092 Designing Heat Meters Using PIC16F9XX Microcontrollers

Communications

- AN833 Microchip TCP/IP Stack Application Note
- AN979 Interfacing I²C Serial EEPROMs to PIC18 Devices
- AN1255 Microchip ZigBee® PRO Feature Set Protocol Stack

Display

- AN234 Hardware Techniques for PIC® Microcontrollers
- AN529 Multiplexing LED Drive and 4x4 Keypad Sampling
- AN557 Four Channel Digital Voltmeter with Display and Keyboard
- AN563 Using PIC16C5X Microcontrollers as LCD Drivers
- AN587 Interfacing PIC® Microcontrollers to an LCD Module
- AN658 LCD Fundamentals Using PIC16C92X Microcontrollers
- TB029 Complementary LED Drive
- TB062 High Power IR LED Driver Using the PIC16C781/782

Temperature Sensing

- TB3016 Using the PIC® MCU CTMU for Temperature Measurement

Security

- AN583 Implementation of the Data Encryption Standard Using PIC17C42
- AN821 Advanced Encryption Standard Using the PIC16XXX
- AN953 Data Encryption Routines for PIC18 Microcontrollers

Timekeeping

- AN582 Low-Power Real-Time Clock
- AN590 A Clock Design Using the PIC16C54 for LED Displays and Switch Inputs
- AN615 Clock Design Using Low Power/Cost Techniques
- AN649 Yet Another Clock Featuring the PIC16C924
- AN1155 Run-Time Calibration of Watch Crystals
- TB028 Technique to Calculate Day of Week

Miscellaneous

- AN606 Low-Power Design Using PIC® Microcontrollers
- AN828 Measuring Temperature with the PIC16F84A Watchdog Timer
- AN851 A Flash Bootloader for PIC16 and PIC18 Devices
- AN871 Solving Thermal Measurement Problems Using the TC72 and TC77 Digital Silicon Temperature Sensors
- AN913 Interfacing the TC77 Thermal Sensor to a PIC® Microcontroller
- AN981 Interfacing a MCP9700 Analog Temperature Sensor to a PIC® Microcontroller
- ADN011 Flexible Integrated Temp Sensors Lower System Costs
- TB008 Transformerless Power Supply Temperature Sensing

Visit the Utility Metering Design Center

- Recommended Products
- Application Notes
- Reference Designs
- Technical Documentation
- Development Tools

www.microchip.com/meter

Support

Microchip is committed to supporting its customers in developing products faster and more efficiently. We maintain a worldwide network of field applications engineers and technical support ready to provide product and system assistance. In addition, the following service areas are available at www.microchip.com:

- **Support** link provides a way to get questions answered fast: <http://support.microchip.com>
- **Sample** link offers evaluation samples of any Microchip device: <http://sample.microchip.com>
- **Forum** link provides access to knowledge base and peer help: <http://forum.microchip.com>
- **Buy** link provides locations of Microchip Sales Channel Partners: www.microchip.com/sales

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Tel: 949-462-9523

Santa Clara

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Toronto

Mississauga, Ontario

Tel: 905-673-0699

EUROPE

Austria - Wels

Tel: 43-7242-2244-39

Denmark - Copenhagen

Tel: 45-4450-2828

France - Paris

Tel: 33-1-69-53-63-20

Germany - Munich

Tel: 49-89-627-144-0

Italy - Milan

Tel: 39-0331-742611

Netherlands - Drunen

Tel: 31-416-690399

Spain - Madrid

Tel: 34-91-708-08-90

UK - Wokingham

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Training

If additional training interests you, then Microchip can help. We continue to expand our technical training options, offering a growing list of courses and in-depth curriculum locally, as well as significant online resources – whenever you want to use them.

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