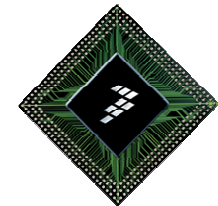




November 11, 2010

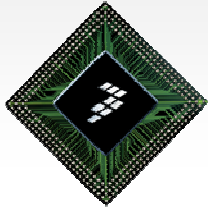
# Introducing New MPC830x Cost-Effective PowerQUICC Portfolio for IP-Networking and Industrial Applications



Nikola Pejicic, FAE  
Arrow Electronics



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## MPC830x Agenda

- ▶ Portfolio overview
- ▶ Product introduction
- ▶ Product enablement
- ▶ Reference designs & demos
- ▶ Product subsystem details
- ▶ Hands on with MPC8308-RDB
- ▶ Q&A



# Introducing the MPC830x PowerQUICC II Pro Portfolio

At 800 DMIPS for under \$10, the MPC830x portfolio with high-performance industrial connectivity extends the PowerQUICC family down into cost competitive fanless small footprint networking and industrial solutions.

## ► MPC8308 – 266 to 400 MHz

- Performance/price optimized MPC8308 combines [32/16-bit DDR2 memory controller supporting ECC](#), [2 x Gigabit Ethernet](#), [PCI Express](#), [USB](#) and [eSDHC](#) targeting smart metering gateways, wireless media gateways, factory automation & test/measurement equipment. In mass production today.

## ► MPC8309 – 266 to 400 MHz

- Richly featured with [programmable multi-protocol QUICC Engine](#), [CAN](#), [USB](#), [eSDHC](#), [PCI](#) and [IEEE® 1588 support](#) for networking, industrial control, factory automation and test/measurement equipment

## ► MPC8306/S – 133 to 266 MHz

- MPC8306 integrates [programmable multi-protocol QUICC Engine](#), [CAN](#), [USB](#), [eSDHC](#) and [IEEE® 1588 support](#) ideal for entry level industrial control, factory automation and test/measurement equipment
- MPC8306S features [programmable multi-protocol QUICC Engine \(HDLC/TDM, 10/100\)](#) and [USB](#) targeting entry level networking equipment such as base station line cards and branch access gateways

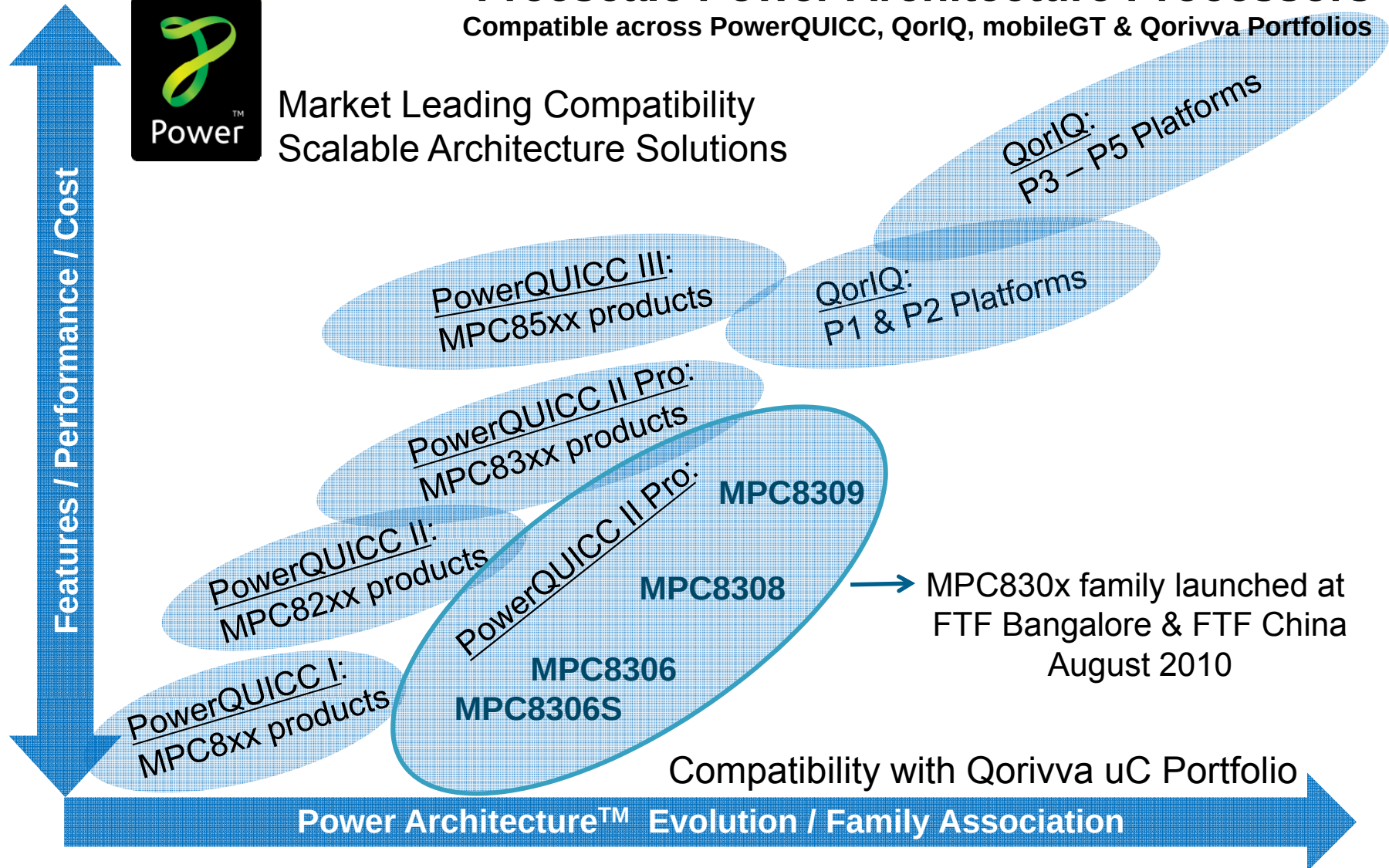
**All products are supported with Freescale's industrial longevity commitment**

# Freescal Power Architecture Processors

Compatible across PowerQUICC, QorIQ, mobileGT & Qorivva Portfolios



Market Leading Compatibility  
Scalable Architecture Solutions



# MPC830x Target Applications

## ► Networking / Telecom

- Entry-Level Line Cards
- Customer Premises Equipment
- Wireless LAN Access Point
- VoIP PBX & Intercom Systems
- Smart Grid Utility Access Gateway
- Wireless Media Access Point
- Smart Energy Gateway, Home Area Network
- Home Surveillance Systems
- Tele-Health Medical Gateway



## ► Industrial

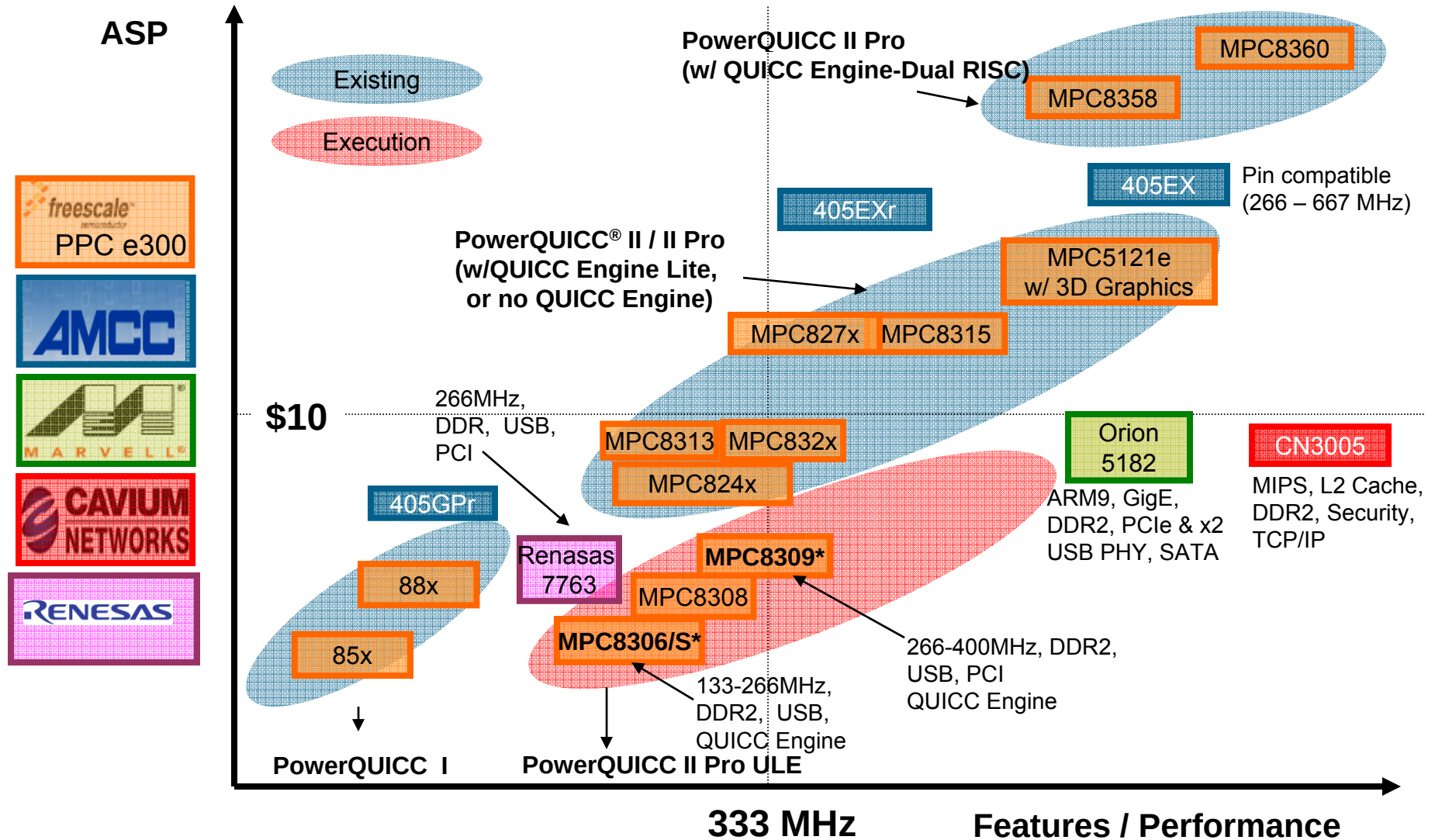
- Programmable Logic Controllers
- Process Automation Controllers
- Gateways, Bridges and Hubs
- Intelligent I/O & Drives
- Operator Interface terminals
- Test & Measurement
- Robotics

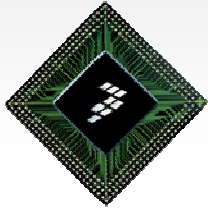


## MPC830x Value Proposition

| Features                                               | Benefits                                                                                                        |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| High-performance e300 core, at 1.99 DMIPS/MHz          | Power® Architecture offers the most efficient instruction set which minimizes power to accomplish a given task. |
| Cost effective power consumption                       | Enables low-cost packaging and enclosure design which are small, have limited air flow and require no fans.     |
| Comprehensive third-party ecosystem                    | Faster time-to-market                                                                                           |
| Migration path                                         | Improved performance/cost migrating from PowerQUICC® or PowerQUICC II.<br>Common architecture eases migration   |
| Rich set of peripherals                                | Allows the flexibility to address a wide range of applications and reduced system cost                          |
| QUICC Engine programmability for Multiprotocol support | Can support Industrial protocols like Profibus, EtherCAT etc with uCode modifications.                          |
| Sub \$10 pricing                                       | Demonstrates that Power® Architecture can deliver very attractive price/performance ratios.                     |

# Competitive Landscape





## MPC830x Agenda

- ▶ Portfolio overview
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- ▶ Product Enablement
- ▶ Reference designs & demos
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- ▶ Q&A



## Processing

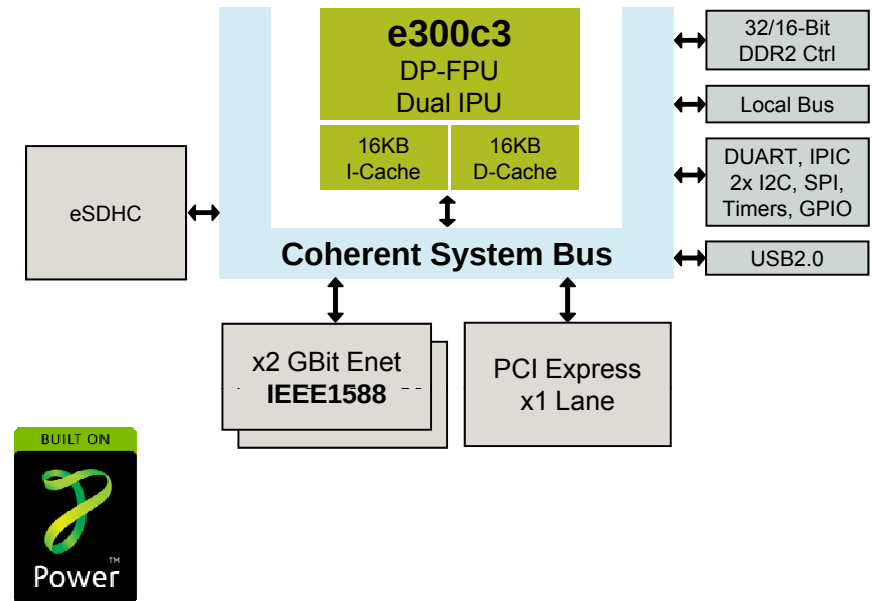
- Power Architecture™ e300c3 CPU
  - ♦ Double Precision FPU
  - ♦ 16K I/D L1 cache
- ♦ Multi-channel DMA controller

## Connectivity

- x1 PCI Express Controller v1.0a
- x2 10/100/1000Mbps Gbit Ethernet MAC (MMI/RMMI)
  - IEEE1588 protocol support
- x2 128-channel HDLC/TDM
- x1 USB2.0 OTG Controller
- x1 Secure Digital Host Controller (eSDHC)
- x2 UART, x2 I2C, SPI
- 64 Muxed GPIO
  - 3 Dedicated GPIO

## Memory Interface

- 32/16-Bit DDR2 Controller with ECC Support
- ♦ Enhanced Local Bus
  - ♦ Both NAND / NOR flash boot support
  - ♦ Non-muxed 25-bit addr, 16/8-bit data, 4-CS



- **Performance:** Upto 800 DMIPS @ 400MHz
- **Power:** Sub-1.3W @ 333MHz CPU
- **Package:** 473 MAPBGA, 19x19mm, 0.8mm pitch

In mass production  
10Ku resale pricing starting at **\$9.94**

Networking with Gigabit Ethernet, PCI Express, USB, eSDHC & DDR w/ ECC

## Processing

- Power Architecture™ e300c3 CPU
  - ♦ Double Precision FPU
  - ♦ 16K I/D L1 cache
- ♦ Programmable Multi-Protocol QUICC Engine™ (QE)
  - ♦ Micro-code support for industrial protocols
- ♦ Multi-channel DMA controller

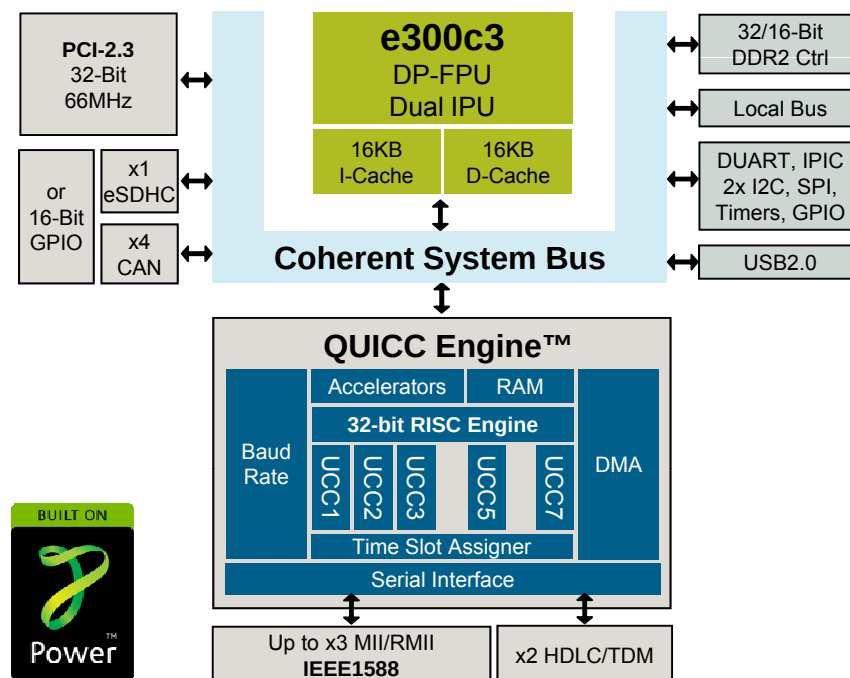
## Connectivity

- x1 PCI-2.3 Controller, 32-bit @ 66Hz
- x3 10/100Mbps Ethernet MAC (MMI/RMMI)
  - IEEE1588 protocol support
- x2 128-channel HDLC/TDM
- x1 USB2.0 OTG Controller
- x1 Secure Digital Host Controller (eSDHC)
- x4 CAN2.0B
- x4 UART, x2 I2C, SPI
- 64 Muxed GPIO
  - ♦ MUX'd 16 GPIO with eSDHC / x4 CAN

## Memory Interface

- 32/16-Bit DDR2 Controller with ECC Support
- ♦ Enhanced Local Bus
  - ♦ Both NAND / NOR flash boot support
  - ♦ Muxed 26-bit addr, 16/8-bit data, 8-CS

## MPC8309



- **Performance:** Upto 800 DMIPS @ 400MHz
- **Power:** Sub-1.6W @ 333MHz CPU, 200MHz QE
- **Package:** 489 MAPBGA, 19x19mm, 0.8mm pitch

Sampling Now, Qualification Feb 2011  
10Ku resale pricing starting at \$8.55

Networking / Industrial Connectivity with Fast Ethernet, PCI-2.3, CAN & DDR w/ ECC

# MPC8306

## Processing

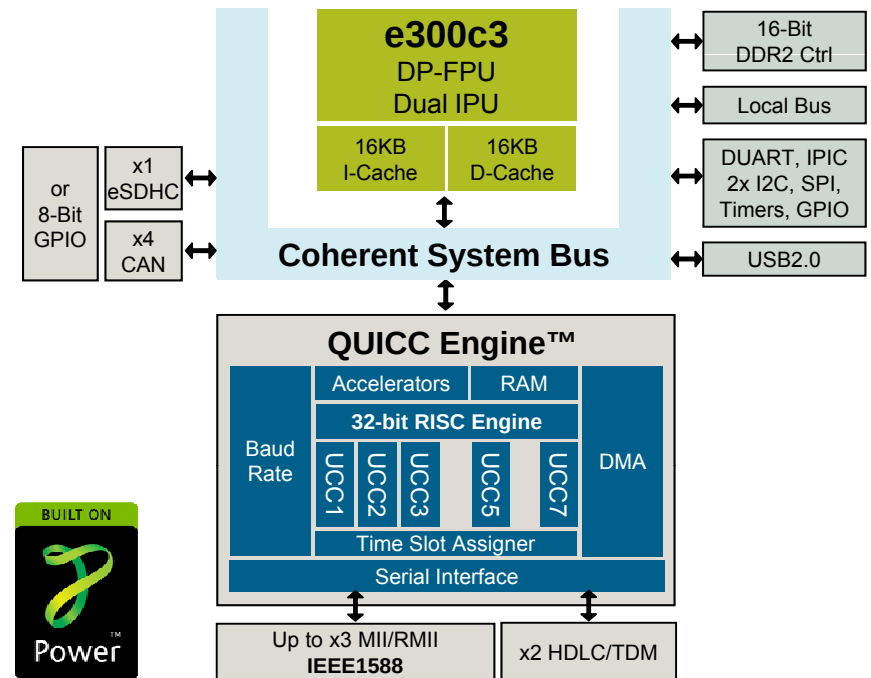
- Power Architecture™ e300c3 CPU
  - ♦ Double Precision FPU
  - ♦ 16K I/D L1 cache
- ♦ Programmable Multi-Protocol QUICC Engine™ (QE)
  - ♦ Micro-code support for industrial protocols
- ♦ Multi-channel DMA controller

## Connectivity

- x3 10/100Mbps Ethernet MAC (MMI/RMMI)
  - IEEE1588 protocol support
- x2 128-channel HDLC/TDM
- x1 USB2.0 OTG Controller
- x1 Secure Digital Host Controller (eSDHC)
- x4 CAN2.0B
- x4 UART, x2 I2C, SPI
- 56 Muxed GPIO
  - ♦ MUX'd 8 GPIO with eSDHC / x4 CAN

## Memory Interface

- 16-Bit DDR2 Controller
- ♦ Enhanced Local Bus
  - ♦ Both NAND / NOR flash boot support
  - ♦ Muxed 26-bit addr, 16/8-bit data, 8-CS



- **Performance:** Upto 530 DMIPS @ 266MHz
- **Power:** Sub-1.2W @ 266MHz CPU, 200MHz QE
- **Package:** 369 MAPBGA, 19x19mm, 0.8mm pitch

Sampling Now, Qualification Nov 2010  
10Ku resale pricing starting at \$7.29

Entry-Level Networking / Industrial Connectivity with Fast Ethernet, CAN & IEEE1588

# MPC8306S

## Processing

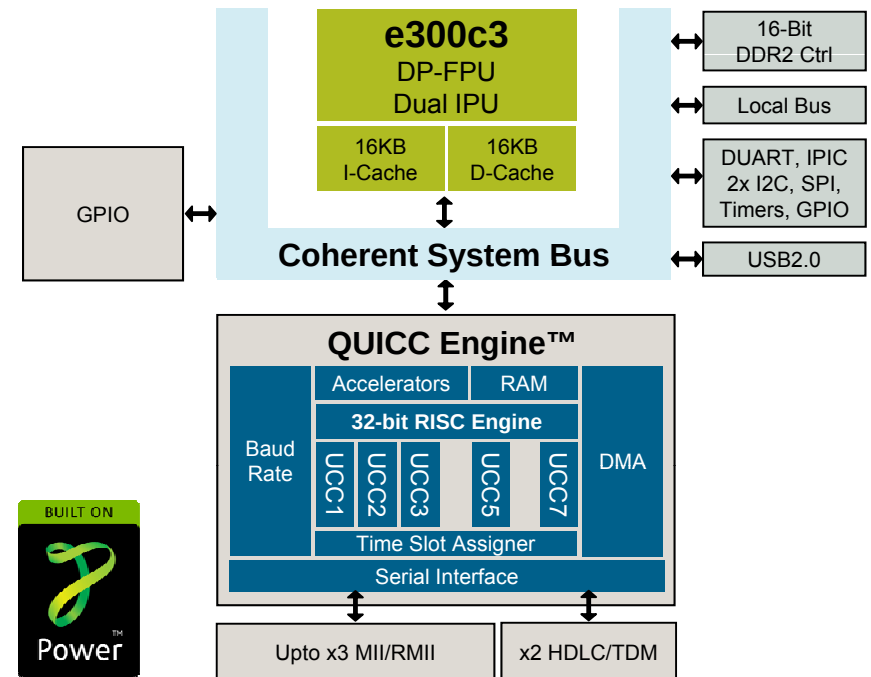
- Power Architecture™ e300c3 CPU
  - ♦ Double Precision FPU
  - ♦ 16K I/D L1 cache
- ♦ Programmable Multi-Protocol QUICC Engine™ (QE)
  - ♦ Micro-code support for industrial protocols
- ♦ Multi-channel DMA controller

## Connectivity

- x3 10/100Mbps Ethernet MAC (MMI/RMMI)
- x2 128-channel HDLC/TDM
- x1 USB2.0 OTG Controller
- x4 UART, x2 I2C, SPI
- 56 Muxed GPIO
  - ♦ 8 Dedicated GPIO

## Memory Interface

- 16-Bit DDR2 Controller
- ♦ Enhanced Local Bus
  - ♦ Both NAND / NOR flash boot support
  - ♦ Muxed 26-bit addr, 16/8-bit data, 8-CS

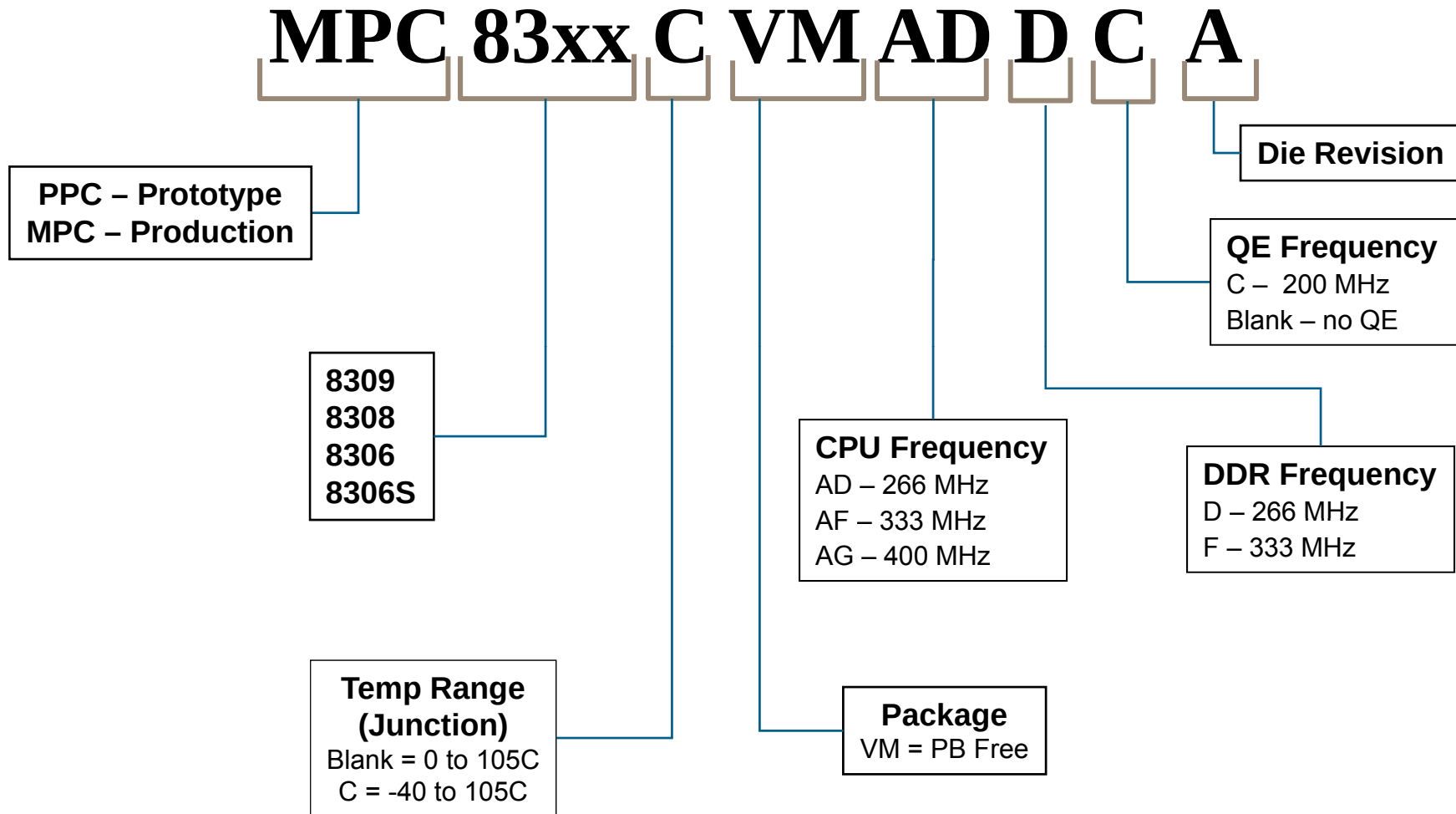


- **Performance:** Upto 530 DMIPS @ 266MHz
- **Power:** Sub-1.2W @ 266MHz CPU, 200MHz QE
- **Package:** 369 MAPBGA, 19x19mm, 0.8mm pitch

Sampling Now, Qualification Nov 2010  
10Ku resale pricing starting at \$6.99

Entry-Level Networking / Industrial Protocols with Fast Ethernet, USB, HDLC & TDM

# MPC83xx - Part Numbering Scheme



# MPC8306/S and MPC8309 Development Schedule

| Planned SoC Milestones        | MPC8306/S     | MPC8309       |
|-------------------------------|---------------|---------------|
| General Samples Rev 1.1 (PPC) | Sept.15, 2010 | Oct. 15, 2010 |
| Qualification (MPC)           | Nov. 30, 2010 | Feb. 15, 2011 |

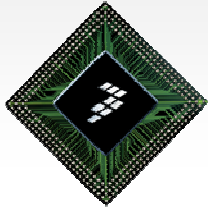
| Enablement & Documentation Milestones |                |              |
|---------------------------------------|----------------|--------------|
| SoC Factsheets                        | Aug. 1, 2010   | Aug 1., 2010 |
| MPC830x Eval Kit Factsheet            | August 1, 2010 |              |
| Hardware Specification (NDA)          | NOW            | NOW          |
| Reference Manual (Ver. 1.0)           | NOW            | Oct 30, 2010 |
| (MPC830x eval kit) w/ Linux® BSP      | Dec 15, 2010   | Dec 15, 2010 |

**Key Documentation available before Alpha samples**  
**Product Brief, Hardware Spec, User manual, Errata**



# MPC830x Feature Overview

|                                              | MPC8308                                        | MPC8309                                    | MPC8306                                    | MPC8306S                                   |
|----------------------------------------------|------------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------------|
| Core<br>Max Freq                             | e300c3 w/ DP-FPU<br>400 MHz (800MIPS)          | e300c3 w/ DP-FPU<br>400 MHz (800MIPS)      | e300c3 w/ DP-FPU<br>266 MHz (530MIPS)      | e300c3 w/ DP-FPU<br>266 MHz (530MIPS)      |
| L1 Cache I/D                                 | 16K / 16K                                      | 16K / 16K                                  | 16K / 16K                                  | 16K / 16K                                  |
| DRAM Ctrl                                    | 32/16-bit DDR2<br>ECC Support                  | 32/16-bit DDR2<br>ECC Support              | 16-bit DDR2                                | 16-bit DDR2                                |
| Memory Bus                                   | Non-muxed 25-bit addr<br>& 16/8-bit data, 4-CS | Muxed 26-bit addr &<br>16/8-bit data, 8-CS | Muxed 26-bit addr &<br>16/8-bit data, 8-CS | Muxed 26-bit addr &<br>16/8-bit data, 8-CS |
| PCI / PCIe                                   | PCI Express 1.0a x1                            | 32-bit PCI-2.3 @66MHz                      | -                                          | -                                          |
| Ethernet                                     | 2x 10/100/1000 Mbps<br>IEEE1588                | 3x 10/100 Mbps<br>IEEE1588                 | 3x 10/100 Mbps<br>IEEE1588                 | 3x 10/100 Mbps                             |
| HDLC                                         | -                                              | 2x, Normal/Bus modes                       | 2x, Normal/Bus modes                       | 2x, Normal/Bus modes                       |
| USB                                          | 1x USB2 OTG                                    | 1x USB2 OTG                                | 1x USB2 OTG                                | 1x USB2 OTG                                |
| UART                                         | x2                                             | x4                                         | x4                                         | x4                                         |
| SPI                                          | x1                                             | X1                                         | x1                                         | x1                                         |
| SD/SDIO                                      | x1                                             | x1                                         | x1                                         | -                                          |
| CAN2.0A/B                                    | -                                              | x4                                         | x4                                         | -                                          |
| Package<br>Body / Pitch                      | 473 MAPBGA<br>19x19 mm / 0.8 mm                | 489 MAPBGA<br>19x19 mm / 0.8 mm            | 369 MAPBGA<br>19x19 mm / 0.8 mm            | 369 MAPBGA<br>19x19 mm / 0.8 mm            |
| Power                                        | Sub-1.3W @ 333 MHz                             | Sub-1.6W @ 333 MHz                         | Sub-1.2W @ 266 MHz                         | Sub-1.2W @ 266 MHz                         |
| 10Ku Resale Pricing<br>(Starting Production) | <b>\$9.94</b>                                  | <b>\$8.55</b>                              | <b>\$7.29</b>                              | <b>\$6.99</b>                              |



## MPC830x Agenda

- ▶ Portfolio overview
- ▶ Product introduction
- ▶ Product enablement
- ▶ Reference designs and demos
- ▶ Product subsystem details
- ▶ Q&A

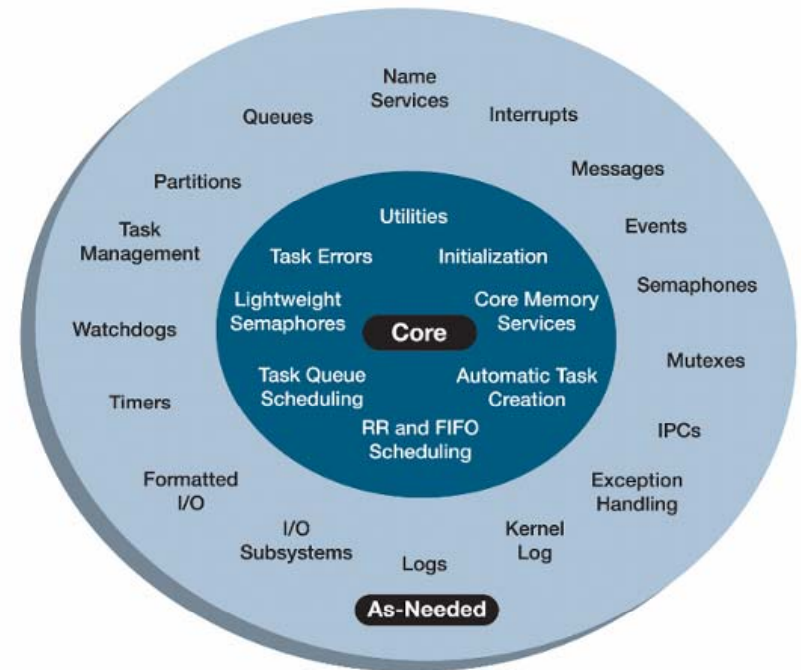
## MPC830x Tools and Board Support Package

- ▶ CodeWarrior Development Studio for Power Architecture
  - Linux and Windows hosted versions available
- ▶ MPC8308 Linux Board Support Package
  - U-Boot 2009.11-rc1
  - Linux 2.6.29.6
  - DLMS Client Application
- ▶ MPC8306/S Linux Board Support Package
  - U-boot 2010.03
  - Linux 2.6.35
- ▶ MPC8309 Linux Board Support Package
  - U-boot 2010.03
  - Linux 2.6.35

## ► Freescale MQX ([www.freescale.com/mqx](http://www.freescale.com/mqx))

Pre-integrated & production quality

- **Portable from high-performance MPUs to low-cost MCUs**
- **Real-time critical processing support**
  - Full priority based pre-emptive scheduler
- **Real-time TCP/IP Communication Suite (RTCS)**
  - TCP/IP, FTP, Telnet, DHCP, SNMP
- **USB Host - HID, MASS, HUB**
- **USB Device - HID, MASS, CDC**
- **MS-DOS File System (MFS)**
- **HTTP Web Server**
- **PC Host Tools**
  - Application Generator Tool
  - Performance Tool
  - Remote Debug Tool
- **BSP I/O Driver: CAN, UART etc...**
- **Complete access to full production source code**
  - Customer maintain rights to source modifications

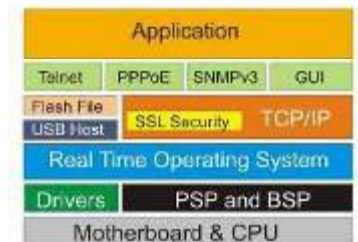


**Ultimate Value:** Freescale offers a complete optimized solution for hardware, software and tools on multi-architecture product families providing a best-in-class cost model (MQX is complementary with Freescale silicon purchase and backed up with a cost-effective support model)

Past Customer Problem



Freesale's Solution



## Pre-production port available for MPC8308

# Freescalé MQX Support Plan

|                                                                                                      | Base          | Level 2<br>Standard | Level 2<br>Premium |
|------------------------------------------------------------------------------------------------------|---------------|---------------------|--------------------|
| On Line Support Page Access                                                                          | Yes           | Yes                 | Yes                |
| Maintenance Releases                                                                                 | Quarterly     | Immediate           | Immediate          |
| Training Discount                                                                                    | Regular Price | 10 % Discount       | 20 % Discount      |
| Response Time                                                                                        | No            | 48 Hours            | 24 Hours           |
| Email - Standarized response on getting started and softw are labs                                   | Yes           | Yes                 | Yes                |
| Email - Support on development of standard configuration on FSL Boards                               | No            | Yes                 | Yes                |
| Email - Detailed support on customer's hardw are, intergration and optimization of application code. | No            | No                  | Yes                |
| Remote Debug Sessions                                                                                | No            | No                  | 10 hours           |
| Phone Support                                                                                        | No            | No                  | Yes                |
| Term                                                                                                 | Unlimited     | 6 Months            | 12 Months          |
| Price                                                                                                | <b>Free</b>   | <b>\$3,000</b>      | <b>\$12,000</b>    |

► **Level 2 Standard:** For developers with relatively simple applications or in a prototyping phase. Problems must be reproducible on a standard Freescale EVB.

► **Level 2 Premium:** More complicated applications, are using communication protocols, or are on a tight time line.

# 830x enablement

## ► Documentation / collateral

- Available online

## ► Enablement & Demos

1. MPC8308 RDB
2. MPC830x Carried card with MPC8306/08/09 SOMs
3. Smart Metering in the home featuring (Nucleus Metering + 8308 Energy Gateway running DMLS/COSEM stack)
4. 8308 based Network Video Recorder (upto 12 channels of video)
5. 8308 based Wireless Media Gateway

## ► Training

- 830x Eval kit board bring-up using Linux BSP + Codewarrior development tools
- Smart metering demo
- Whitepaper



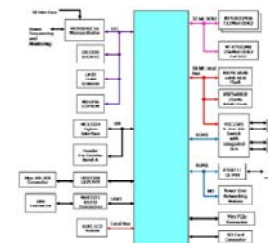
Carrier Card  
Covers all MPC830x  
products



MPC8308/8306/  
8309 SOM

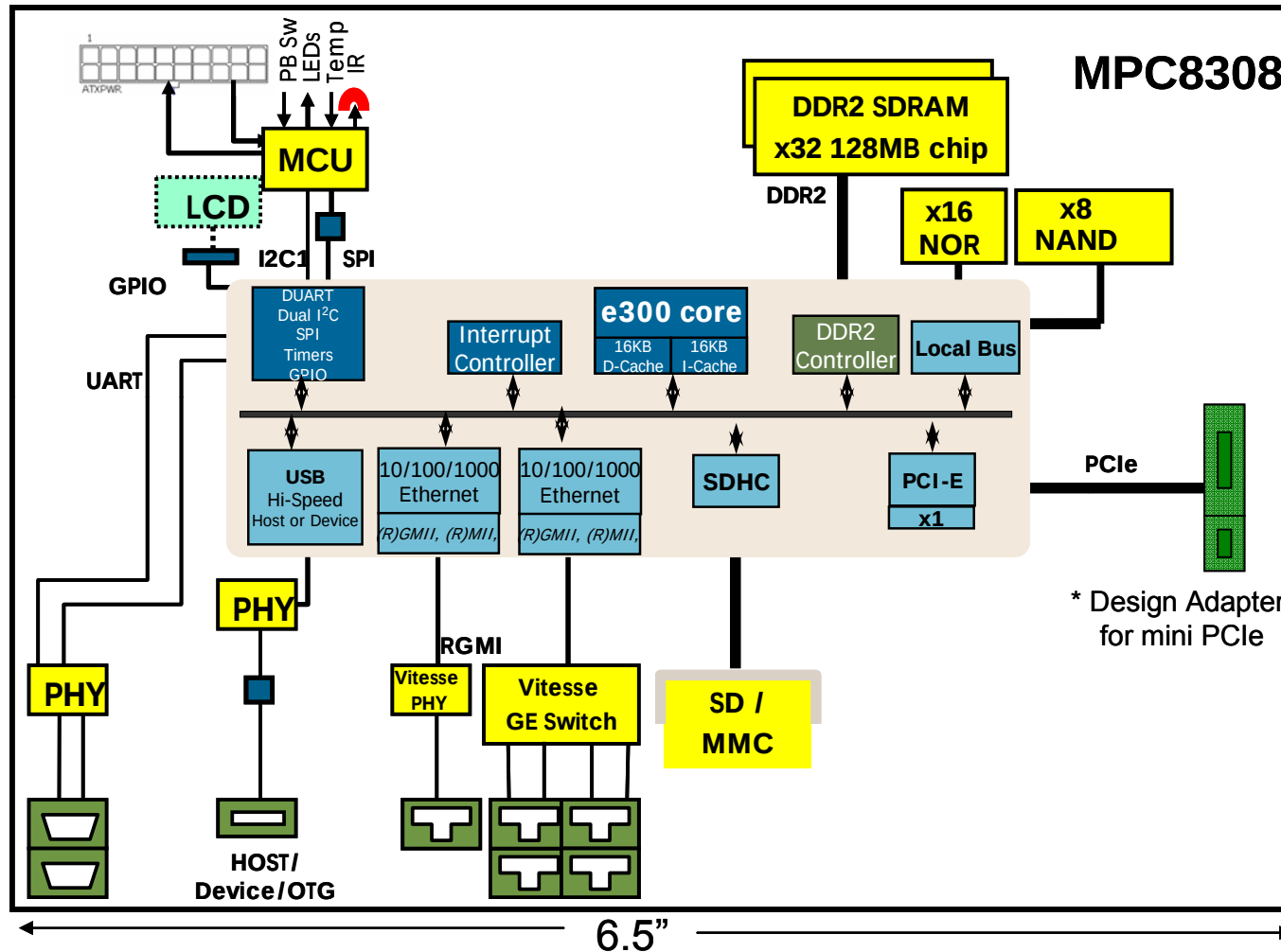


MPC8308 Linux  
based Wireless  
Media Gateway



MPC8308  
based Smart  
Energy  
Gateway

# MPC8308-RDB mini-ITX low-cost eval board - \$299 resale



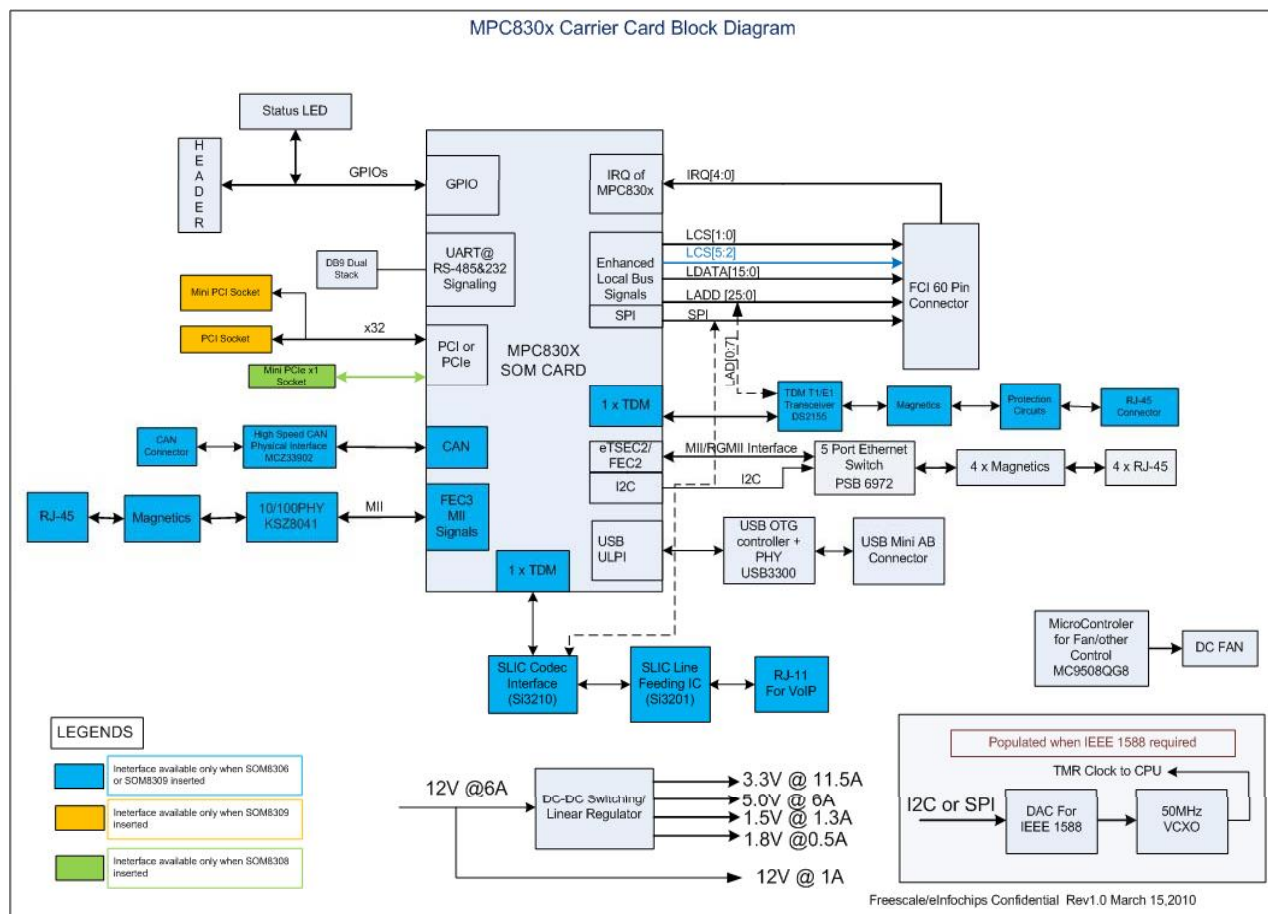
- Available NOW
- With Linux BSP, optimized drivers
- Code-Warrior: 6 month license
- MQX RTOS available October 1<sup>st</sup>



| 1pc pricing            | MPC8308-KIT | MPC8306-KIT | MPC8309-KIT |
|------------------------|-------------|-------------|-------------|
| Carrier card + SoM KIT | \$789       | \$759       | \$779       |

# MPC830x Eval Kit

The Solutions People



- Available for orders on [freescale.com](http://freescale.com)
- Schematics, Gerber files & User guide will be provided
- Will come with Linux BSP & drivers
- MQX port will be available
- SOMs MPC8308, MPC8306, MPC8309 all are interchangeable with common carrier board

Carrier card (17 x 17 cm) – mini ITX form factor SoMs (8 x 8 cm)

# Features of MPC8308 SOM Card

- **CPU:**
  - Freescale's PowerQUICC™ II Pro based SoC MPC8308 (e300 core up to 400 MHz)
- **System Memory:**
  - 256 MB DDR2 SDRAM, x32-bit interface @266 MHz speed
- **Boot/Program Memory:**
  - Dynamic Boot Mode control thru KA2 Microcontroller
  - 8 MB NOR flash, x16 interface
  - 1 GB NAND Flash, x8 interface
  - 256 Kbits (32Kbits x8) I2C EEPROM
- **Network:**
  - On Board 10/100/1000 Mbps RGMII Ethernet Interface
  - 2<sup>nd</sup> RGMII port available on Board-to-Board Connector
- **2x UART:**
  - On-Board RS232 connectivity through 3-Pin Header; RS232 connectivity available on Board-to-Board connector
  - On-Board RS485 Full Duplex Transceiver; connectivity through DB9 on Carrier Card
- **Storage:**
  - On-Board Micro-SD Card Connector
  - USB 2.0 Host/Device/OTG connectivity through Carrier Card
- **Board-to-Board Connectivity**
  - x1 PCIe
  - Local Bus
  - USB Host/Device/OTG
  - Ethernet (eTSEC-2)
  - GPIO & Interrupt
  - RS232 & RS485
  - IEEE1588 Timer Support
- **Power Supply: 5V @ 1.2A**
  - 5V Supply Input either through External adapter or from Carrier Card
- **Dimension: 90mm x 70mm**
- **Operating Temperature:**
  - -40 deg C to +85 deg C

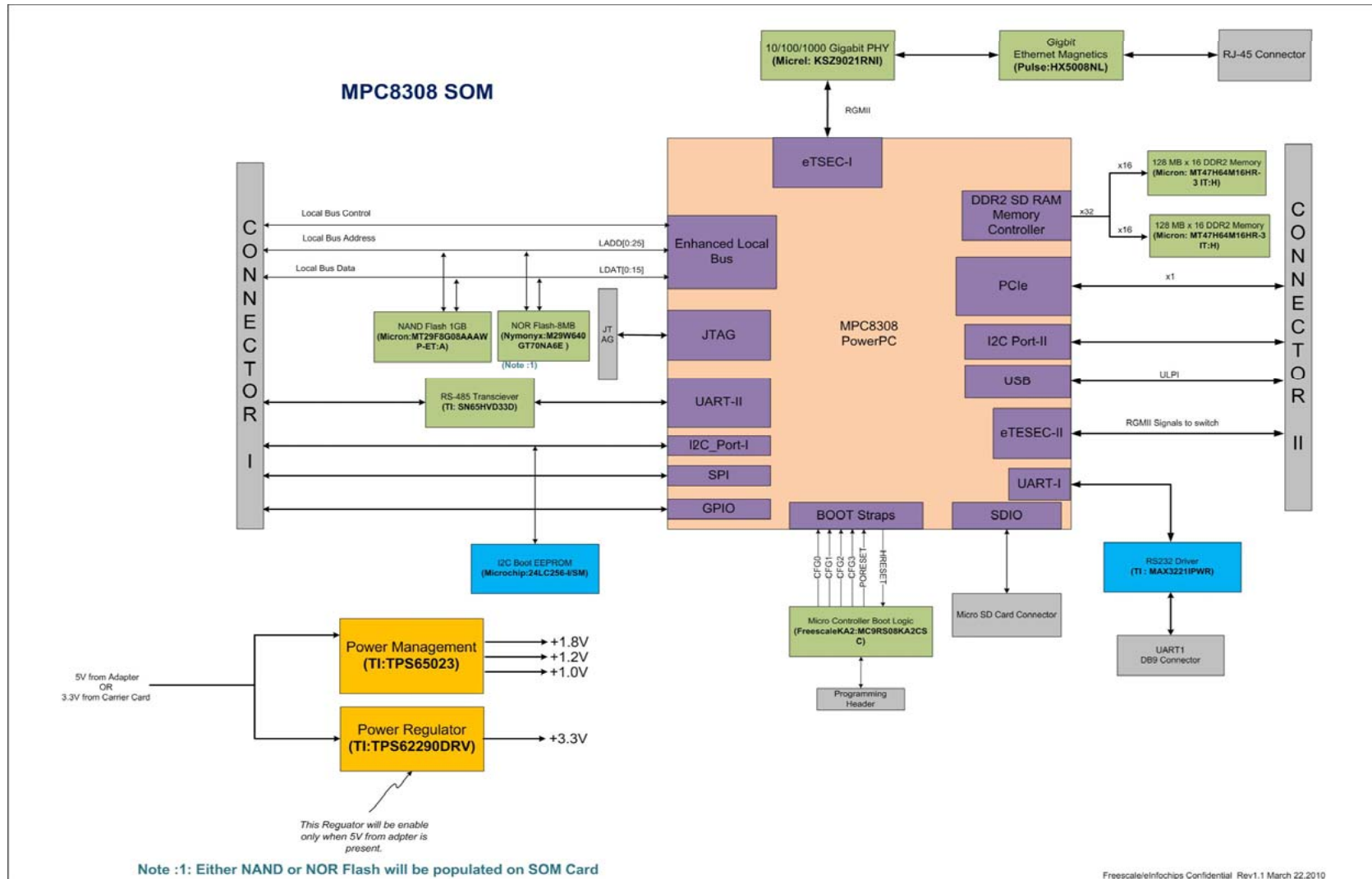


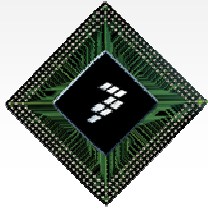
Top View

# Feature matrix for 3 SoMs

| Particulars                   | MPC8306 SOM                                                                                                                                                                                                | MPC8308 SOM                                                                                                                                                                                    | MPC8309 SOM                                                                                                      |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>CPU speed</b>              | Upto 266MHz                                                                                                                                                                                                | Upto 400MHz                                                                                                                                                                                    | Upto 400MHz                                                                                                      |
| <b>DDR Memory</b>             | 16 bit DDR2 upto 266/333MHz (1 Gigabit)                                                                                                                                                                    | 32-bit (w/ ECC) DDR2 @ 266MHz (2 Gigabit)                                                                                                                                                      | 16/32 bit DDR/2 upto 266/333MHz With & without ECC                                                               |
| <b>Local Bus</b>              | 16bit w/NAND/NOR.I2c boot support (Muxed addr/data bus)                                                                                                                                                    | 16bit w/NAND/NOR.I2c boot support                                                                                                                                                              | 16bit w/NAND boot support (Muxed addr/data bus)                                                                  |
| <b>PCI</b>                    | NA                                                                                                                                                                                                         | x1 PCI Express v1.0a                                                                                                                                                                           | 1-32 bit upto 66MHz (2.3)                                                                                        |
| <b>HDLC/TDM (using QEULE)</b> | X2 TDM PROFIBUS support via ucode<br>TDM1: T1/E1 Framer interface on carrier card<br>TDM2: SLIC interface on carrier card                                                                                  | NA                                                                                                                                                                                             | X2 TDM/HDLC PROFIBUS support via ucode                                                                           |
| <b>Ethernet (using QEULE)</b> | <ul style="list-style-type: none"> <li>FEC1 MII: 10/100 Network interface on SOM</li> <li>FEC2 MII: 5-port switch via Carrier Card</li> <li>FEC3 MII: 10/100 Network Interface via Carrier Card</li> </ul> | <ul style="list-style-type: none"> <li>eTSEC1, RGMII: one 10/100/1000 BaseT RJ-45 interface on SOM</li> <li>eTSEC2, RGMII: five 10/100/1000 BaseT RJ-45 interfaces via Carrier Card</li> </ul> | <ul style="list-style-type: none"> <li>X3 10/100 MII/RMII (OR)</li> <li>X2 10/100 MII/RMII + IEEE1588</li> </ul> |
| <b>USB</b>                    | USB 2.0 high speed host/device/OTG                                                                                                                                                                         | USB 2.0 high speed host/device/OTG                                                                                                                                                             | USB 2.0 high speed host/device/OTG                                                                               |
| <b>SDIO</b>                   | YES upto 4GB                                                                                                                                                                                               | YES upto 4GB                                                                                                                                                                                   | YES                                                                                                              |
| <b>CAN</b>                    | X4 YES (x1 is interfaced to transceiver on Carrier Card)                                                                                                                                                   | NA                                                                                                                                                                                             | X4 YES                                                                                                           |
| <b>Others</b>                 | 1x DUART (One RS-232 One RS-232 supports up to 115200 bps for console display other as RS-485 ), DMA, 2x I2C, SPI, INTERRUPT, 2x TIMERS                                                                    | DUART interface: (One RS-232 supports up to 115200 bps for console display & other as RS-485)                                                                                                  | 2x DUART, DMA, 2x I2C, SPI, INTERRUPT, 2x TIMERS                                                                 |

# MPC8308 SOM – block diagram

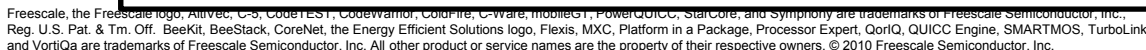




## MPC830x Agenda

- ▶ Portfolio overview
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- ▶ Q&A

e.g. connectivity to wearable medical monitors







## MPC830x Time to Market Acceleration

Home Energy Gateway / Data Concentrator

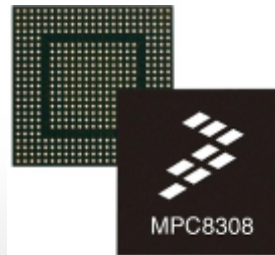
### Reference Design Application Stacks



- ▶ Energy gateway reference design supporting ZigBee, Wi-Fi, PLC, PLM, M-Bus, GPRS etc.
- ▶ Running DLMS/COSEM Client Stack from Kalki Technologies (IEC 62056)

Turnkey solutions

### MPC830x



- ▶ e300 Power Architecture running up to 400 MHz
- ▶ WAN/LAN interfaces including Gigabit Ethernet, PCI Express, eSDHC, USB, UART, SPI
- ▶ Cost-Effective wireless router solution

Optimized solution for  
energy gateway / concentrator

### Software & Hardware Enablement



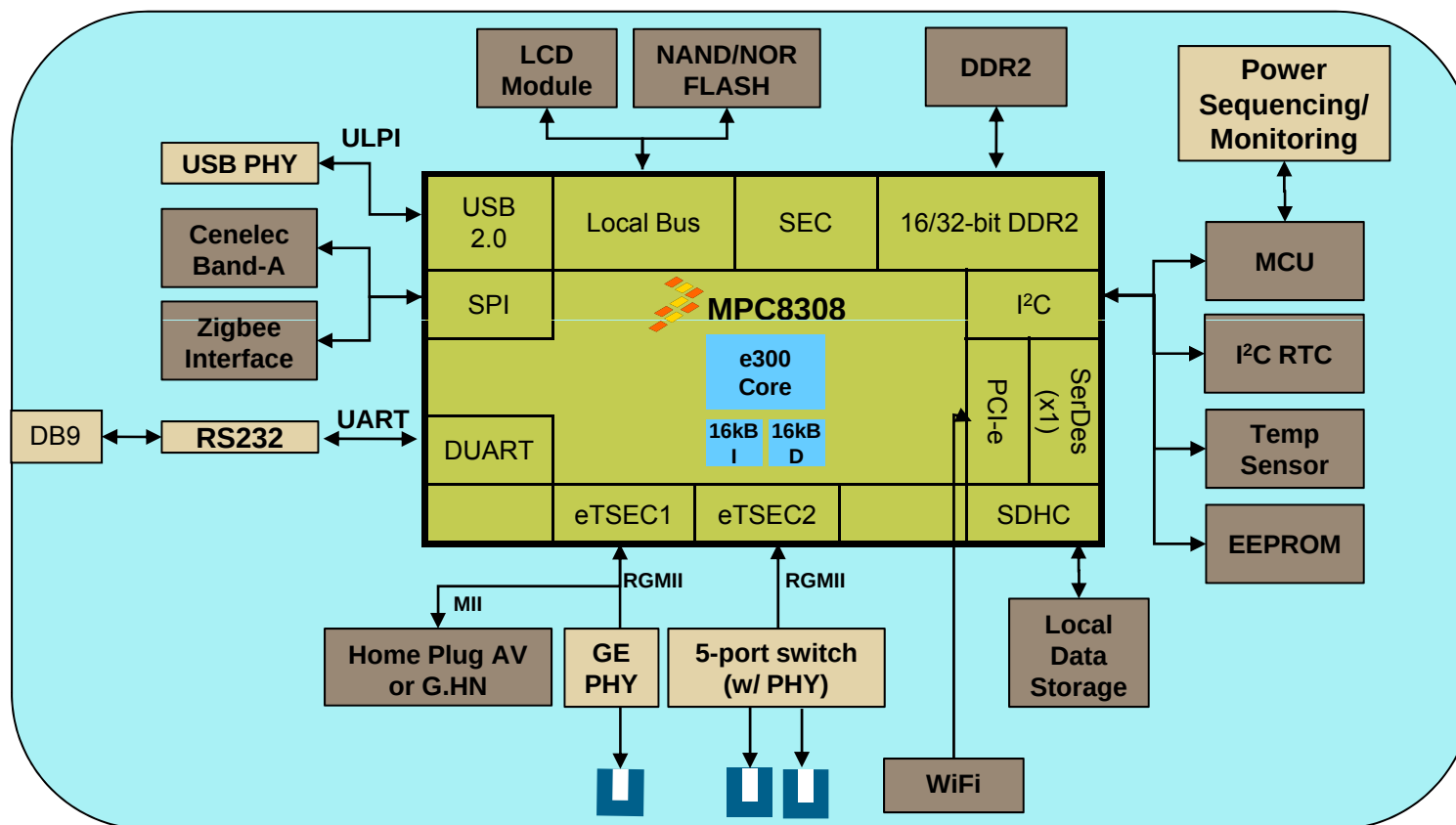
- ▶ Complimentary MQX RTOS, provides continuity with the Kinetis / ColdFire+ uC product family
- ▶ CodeWarrior 8.8 development tools available
- ▶ MPC8308-RDB (\$299) running gateway applications

Rapid  
Prototyping / Development

Migration Path to Enterprise Class QorIQ / PowerQUICC Solutions



# Energy Gateway System Diagram (MPC8308)



# Linux based MPC8308 Platform solution

- **11n WiFi +USB NAS GE port home gateway**

- Ralink 1x1 11n WiFi
- Realtek GbE 5 port switch RTL8366S(optional)
- IdealBT NAS software
- NTFS/FAT32 file system support

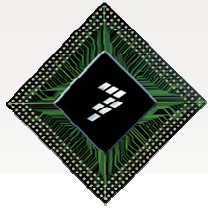
- **USB NAS**

- Completed SOC solution, 2GE port.
- Support both BT engine and MLDonkey engine
- USB NAS software bundle package
- NTFS/FAT32 file system support



## Summary

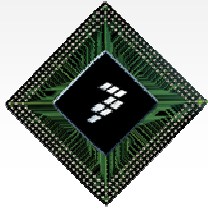
| Features                                      | Benefits                                                                                                  |
|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| High-performance e300 core, at 1.92 DMIPS/MHz | Less MHz needed to get the job done or extra CPU headroom to perform other tasks                          |
| Best-in-class power consumption               | Enables fanless, “green” and low-cost designs and improves reliability                                    |
| Comprehensive third-party ecosystem           | Faster time-to-market                                                                                     |
| Migration path                                | Improved performance/cost migrating from PowerQUICC or PowerQUICC II. Common architecture eases migration |
| Rich set of peripherals                       | Allows the flexibility to address a wide range of applications and reduced system cost                    |
| Sub \$10 pricing                              | Reduces BOM Cost                                                                                          |



## Freescale Product Longevity Program

- ▶ The embedded market needs **long-term product support**
  - Freescale has a longstanding track record of providing long-term production support for our products
- ▶ Freescale offers a **formal product longevity program**
  - A broad range of devices are made available for a minimum of **10 or 15 years from the time of launch**
  - Participating Freescale products are listed at [www.freescale.com/productlongevity](http://www.freescale.com/productlongevity)





## MPC830x Agenda

- ▶ Portfolio overview
- ▶ Product introduction
- ▶ Product enablement
- ▶ Reference designs & demos
- ▶ Product subsystem details
- ▶ Q&A

# e300 Core

## Enhanced core (e300) features:

- 32-bit PowerPC Classic architecture
- Superscalar (3 IPC)
- 16KB I/D caches with Parity
- Classic PPC MMUs
- Double precision FPU
- On-chip debug support (JTAG/COP)



## Power Management

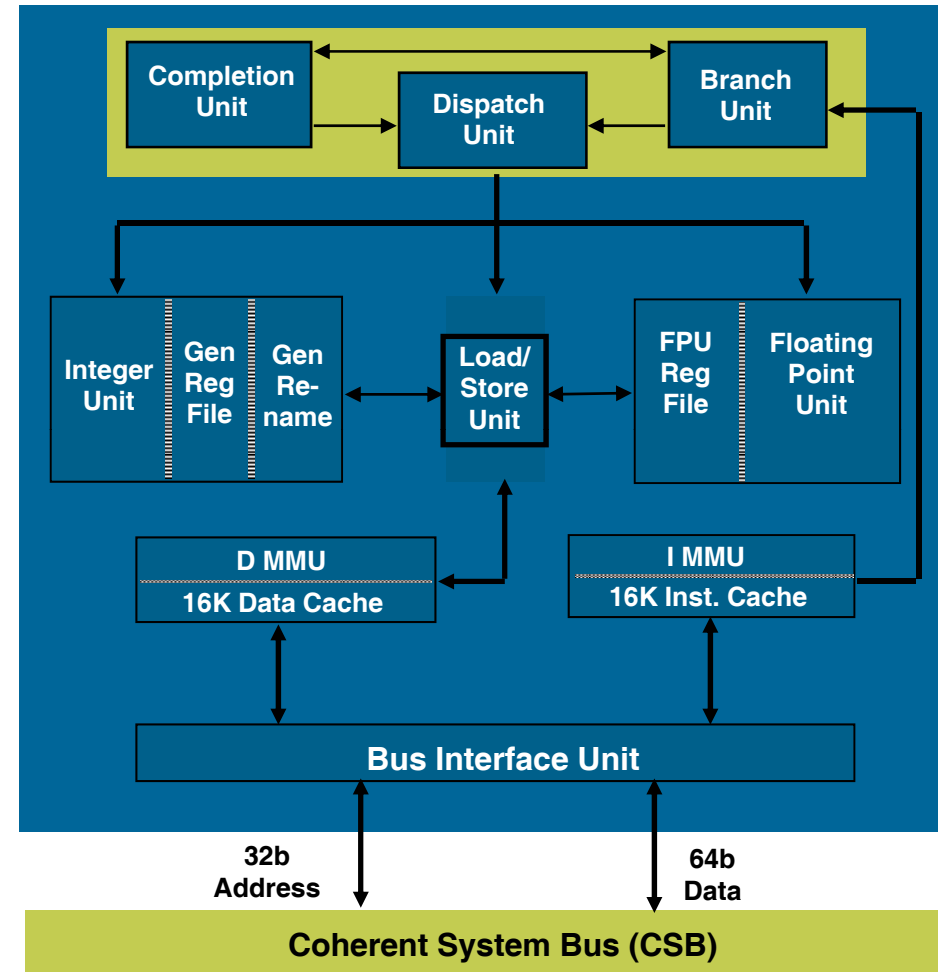
- Dynamic power management on decode
- Low power static design
- Nap, doze and sleep modes

## Performance

- 400 MHz - 768 DMIPS – MPC8308, MPC8309
- 333 MHz - 640 DMIPS – MPC8308, MPC8309
- 266 MHz – 511 DMIPS – MPC830x

## New features:

- 16Kbyte Instruction and 16Kbyte Data Cache
  - 8-way set associative Cache with Parity
- Added performance features (extensions)
- Up to 400 MHz operation
- 90 nm technology



**Available on all MPC830x products**

# QUICC Engine

## ► QUICC Engine Features

- 32-bit RISC controller for flexible support of the communications peripherals
- Separate PLL for operating frequency that is independent of system's bus and e300 core frequency for power and performance optimization
- Executes code from internal IRAM
- Slave bus for CPU access of registers and multiuser RAM space
- 48 Kbytes Instruction RAM, 16 Kbytes multiuser RAM
- Serial DMA channel for receive and transmit on all serial channels
- Five UCCs:
  - 10/100 Mbps Ethernet/IEEE® Std. 802.3® through MII and RMII interfaces
  - HDLC/Transparent (bit rate up to QUICC Engine operating frequency / 8)
  - HDLC Bus (bit rate up to 10 Mbps)
  - Asynchronous HDLC (bit rate up to 2 Mbps)
  - 2x TDM interfaces supporting up to 128 channels, each running at 64 Kbps

**Available on MPC8306/S and MPC8309**



## Dual Gigabit Ethernet Ports

- ▶ Enhanced Three-speed (10/100/1000) Ethernet controllers (eTSEC)
- ▶ Dual IEEE 802.3, 802.3u, 802.3x, 802.3z, 802.3ac compliant controllers
- ▶ MII and RGMII physical interfaces
- ▶ Full and half-duplex support (1000 Mbps only supports full duplex)
- ▶ IEEE 802.3x flow control mechanism
- ▶ Buffer descriptors are backwards compatible with 8260 and 860T
- ▶ Extended Programming Model Features
  - Supports Hash, Broadcast, and Multicast address recognition
  - Supports Promiscuous mode
- ▶ Jumbo frame support up to 9.6KB
- ▶ RMON statistics support
- ▶ MII management interface for control and status
- ▶ Programmable CRC generation and checking
- ▶ Interrupt coalescing for reducing core intervention

**Available on MPC8308**

# Enhanced Local Bus Controller (eLBC)

## ► eLBC Features

- Used to interface to Memories (NOR, NAND), SRAM, ASICs, FPGA, and any other memory mapped device
- MPC8308:
  - Non Multiplexed 25-bit address and 8/16-bit data
  - 4 chip selects support four external slaves
- MPC8306/S, MPC8309:
  - Multiplexed 26-bit address and 8/16-bit data
  - 8 chip selects support four external slaves
- 16-, and 8-bit port sizes are controlled by an on-chip memory controller
- General purpose chip select machine (GPCM)
- Three user programmable machines (UPM)
- NAND Flash controller machine (FCM)
- Supports automatic, hardware-based single bit ECC
- Default boot ROM chip select

**Available on all MPC830x products**

## Enhanced Secure Digital Host Controller (eSDHC)

### ► eSDHC Features

- Compatible to SD Host Controller Standard Specification version 2.0
- Compatible with the MMC System Specification version 4.0
- Compatible with the SD Memory Card Specification version 2.0, and supports High Capacity SD memory cards
- Compatible with the SDIO Card Specification version 1.2
- Designed to work with SD Memory, miniSD Memory, SDIO, miniSDIO, SD Combo, MMC, MMCplus, and RS-MMC cards
- SD bus clock frequency up to 33 MHz
- Supports 1-/4-bit SD and SDIO modes, 1-/4-bit MMC modes
- Up to 133 Mbps data transfer for SD/SDIO/MMC cards using 4 parallel data lines

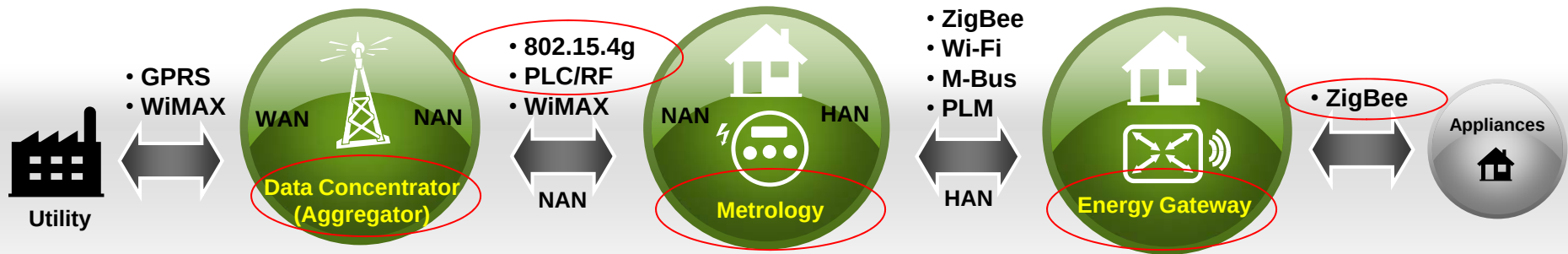
**Available on MPC8306, MPC8308, MPC8309**

## ► FlexCAN module Features

- Full implementation of the CAN protocol specification version 2.0B
- Up to 64 flexible message buffers of zero to eight bytes data length
- Powerful Rx FIFO ID filtering, capable of matching incoming IDs
- Programmable loop-back mode supporting self-test operation
- Global network time, synchronized by a specific message
- Short latency time due to an arbitration scheme for high-priority messages
- 2-Wire interface to external PHY (independent of transport medium)

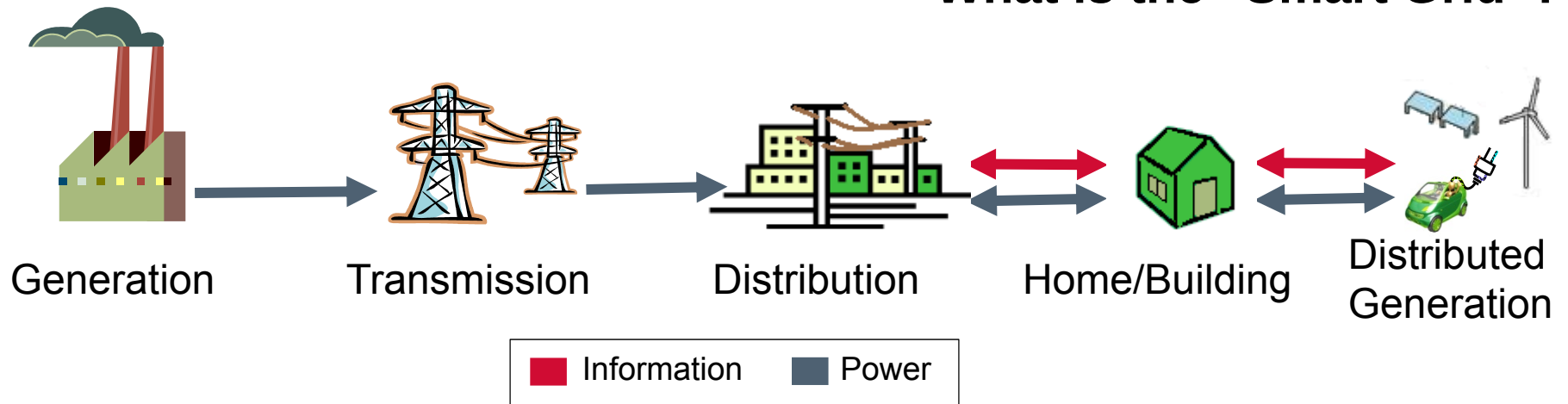
**Available on MPC8306 and MPC8309**

# Freescal in the “Smart Grid”



| Utility / NAN                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Metrology                                                                                                                                                                                                                                                                                                                                        | Home Area Network (HAN)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Data Concentrator (Aggregator) <ul style="list-style-type: none"> <li>P20x0</li> <li>P10xx</li> <li>MPC831x</li> <li><b>MPC8308</b></li> </ul> </li> <li>Interfaces to NAN <ul style="list-style-type: none"> <li>802.15.4g Radio</li> <li>WiMAX</li> <li>PLM</li> </ul> </li> <li>Interfaces to Utility <ul style="list-style-type: none"> <li>WiMAX</li> <li>GPRS</li> <li>DLMS/COSEM library</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Low End Metering <ul style="list-style-type: none"> <li>LL/LH/AC</li> </ul> </li> <li>Water, Gas &amp; Heat <ul style="list-style-type: none"> <li>GW</li> </ul> </li> <li>Smart 1-3ph Metering <ul style="list-style-type: none"> <li>EM256</li> <li>Joule 512</li> <li>Volta 1MB</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Smart Energy Gateway <ul style="list-style-type: none"> <li>P101x</li> <li>MPC831x</li> <li><b>MPC8308</b></li> <li>i.MX</li> </ul> </li> <li>HAN Interfaces <ul style="list-style-type: none"> <li>ZigBee</li> <li>Wi-Fi</li> <li>GPRS</li> <li>M-Bus</li> <li>HomePlug Green PHY</li> </ul> </li> <li>Appliance Technology <ul style="list-style-type: none"> <li>8-32bit MCUs &amp; DSPs</li> <li>Touch Sensor</li> </ul> </li> <li>RF4CE (wireless control)</li> </ul> |

## What is the “Smart Grid”?

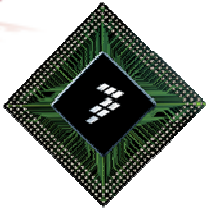


Smart Grid consist of end-to-end, bi-directional flow of energy and communication capabilities from generation to consumption to:

- ▶ Improve power reliability and quality
- ▶ Increase resiliency of the grid
- ▶ Increase capacity through optimized generation efficiency
- ▶ Allow easier use of renewable energy and distributed generation
- ▶ Reduce consumption on a per user basis
- ▶ Increase consumer choice



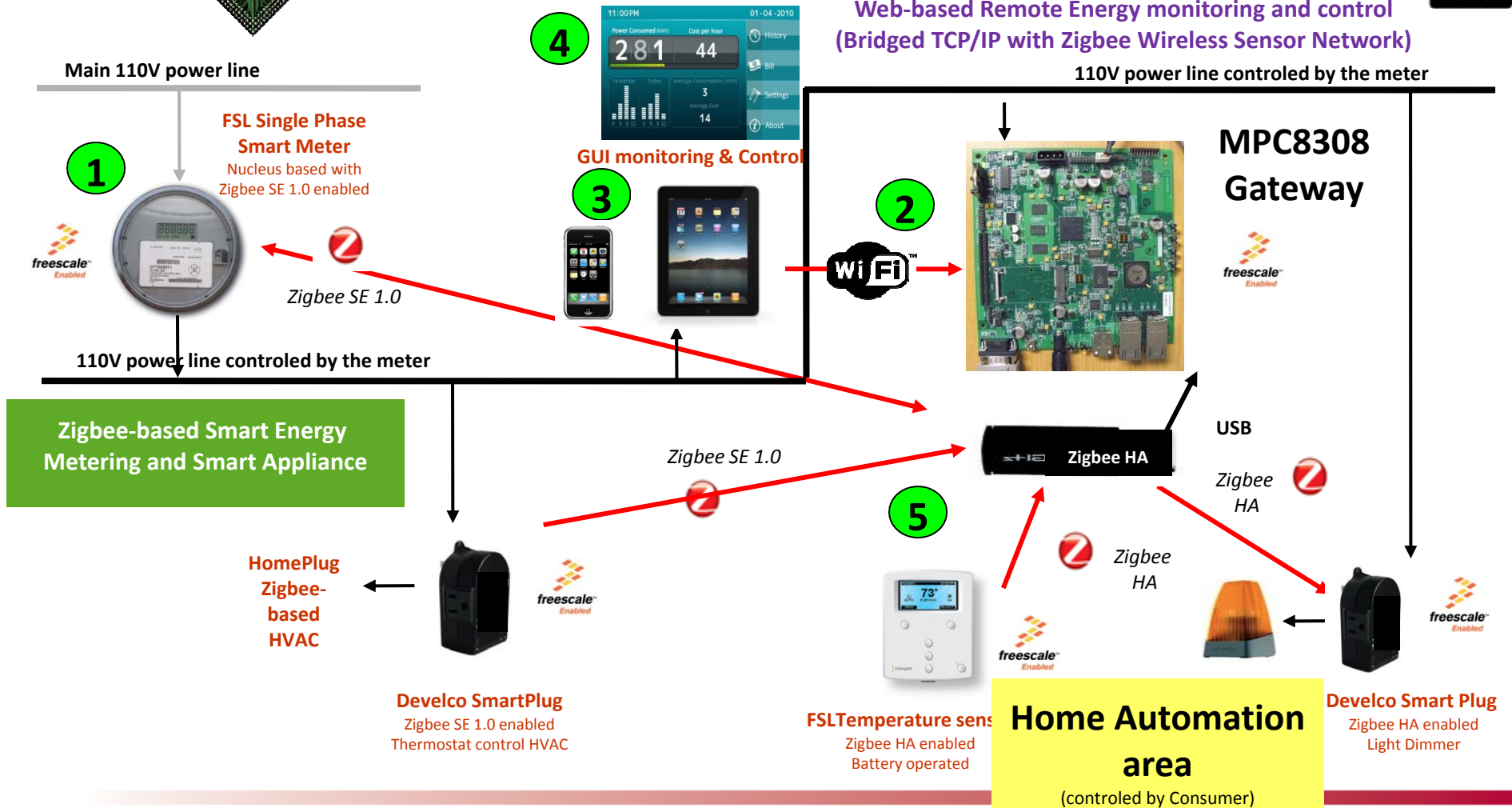
Networking



# 8308 Smart Energy Gateway Demo



Web-based Remote Energy monitoring and control  
(Bridged TCP/IP with Zigbee Wireless Sensor Network)

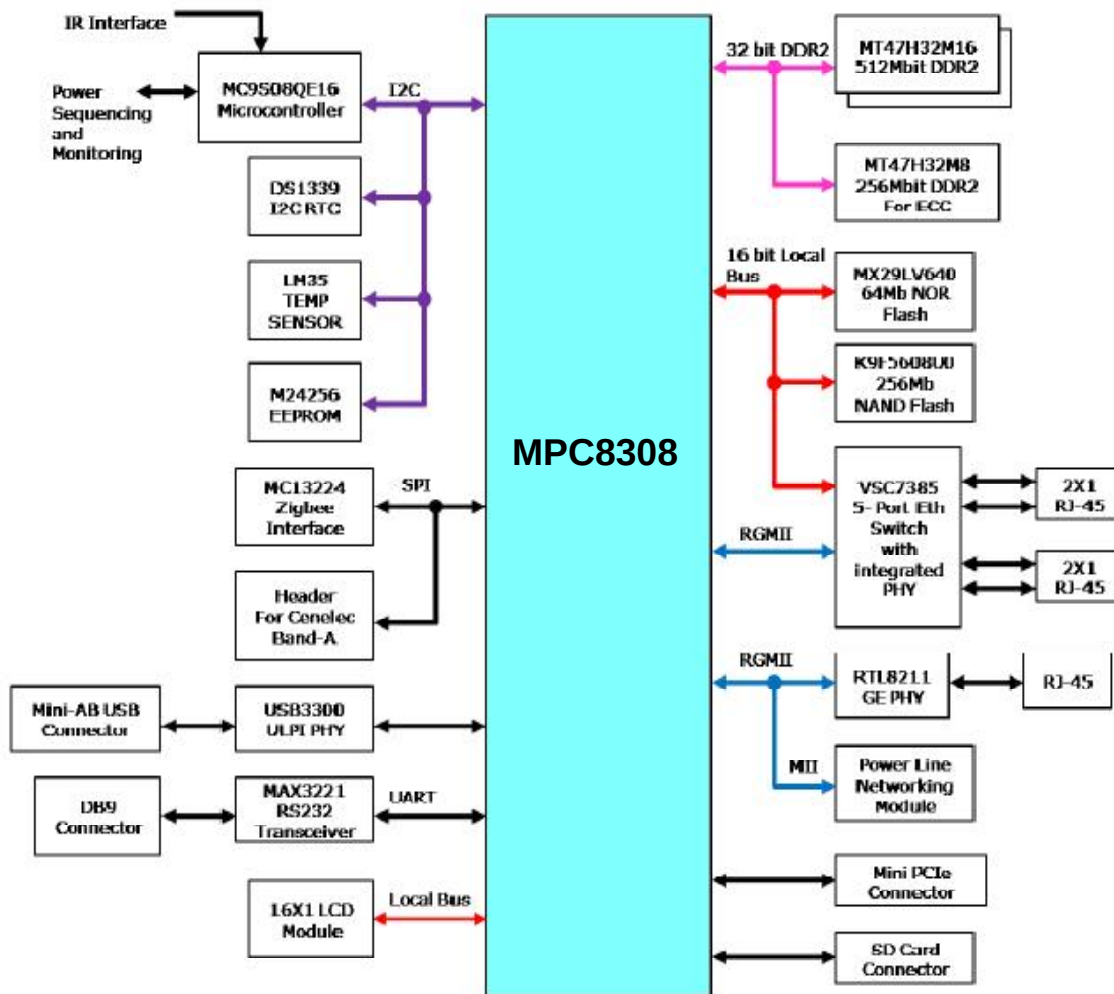




## MPC8308 – Smart Energy Gateway

- Smart Metering with Zigbee sensors
- Seamless Wireless Connectivity (TCP/IP & Zigbee Stack)
  - Remote Monitoring of meters
  - Remote Control of Smart Appliances
  - Anywhere, Anytime
- Simple GUI — Easy to Use
  - With any Smart Internet Devices (iPhone, iPad ..)
- Integration of four software blocks
  - TCP-IP—AP/WLAN Wireless internet connect
  - Zigbee WSN — Wireless Sensor Network (WSN)
  - DLMS industry standard for utility meters
  - web-based GUI (Java) Ease of Use

# Smart Energy Metering Gateway Demo

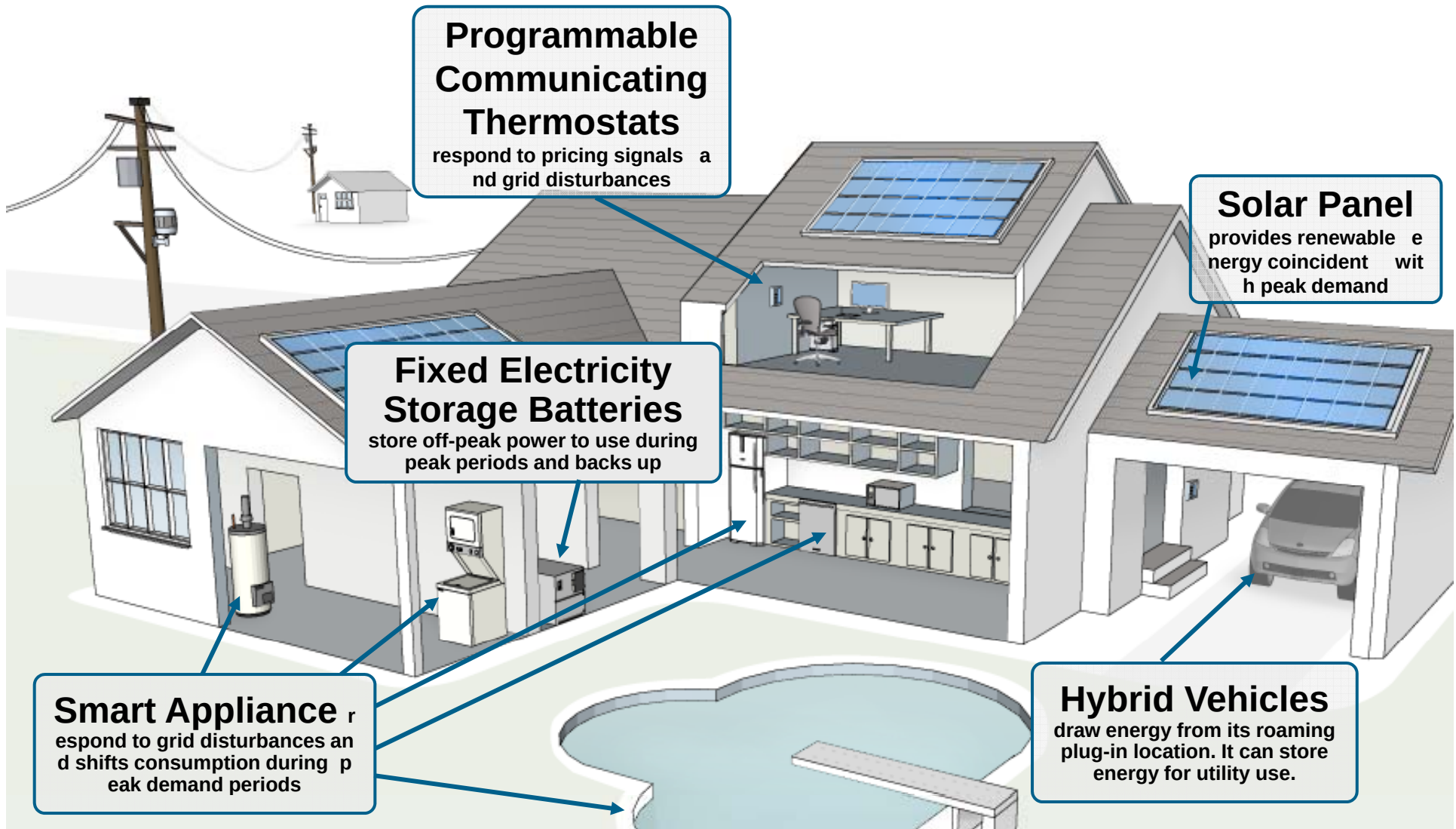


Partner with:



- ▶ Running DLMS/COSEM Client protocol stack
- ▶ PPC8308-LI
- ▶ Available Demo on Demand Q4 2011

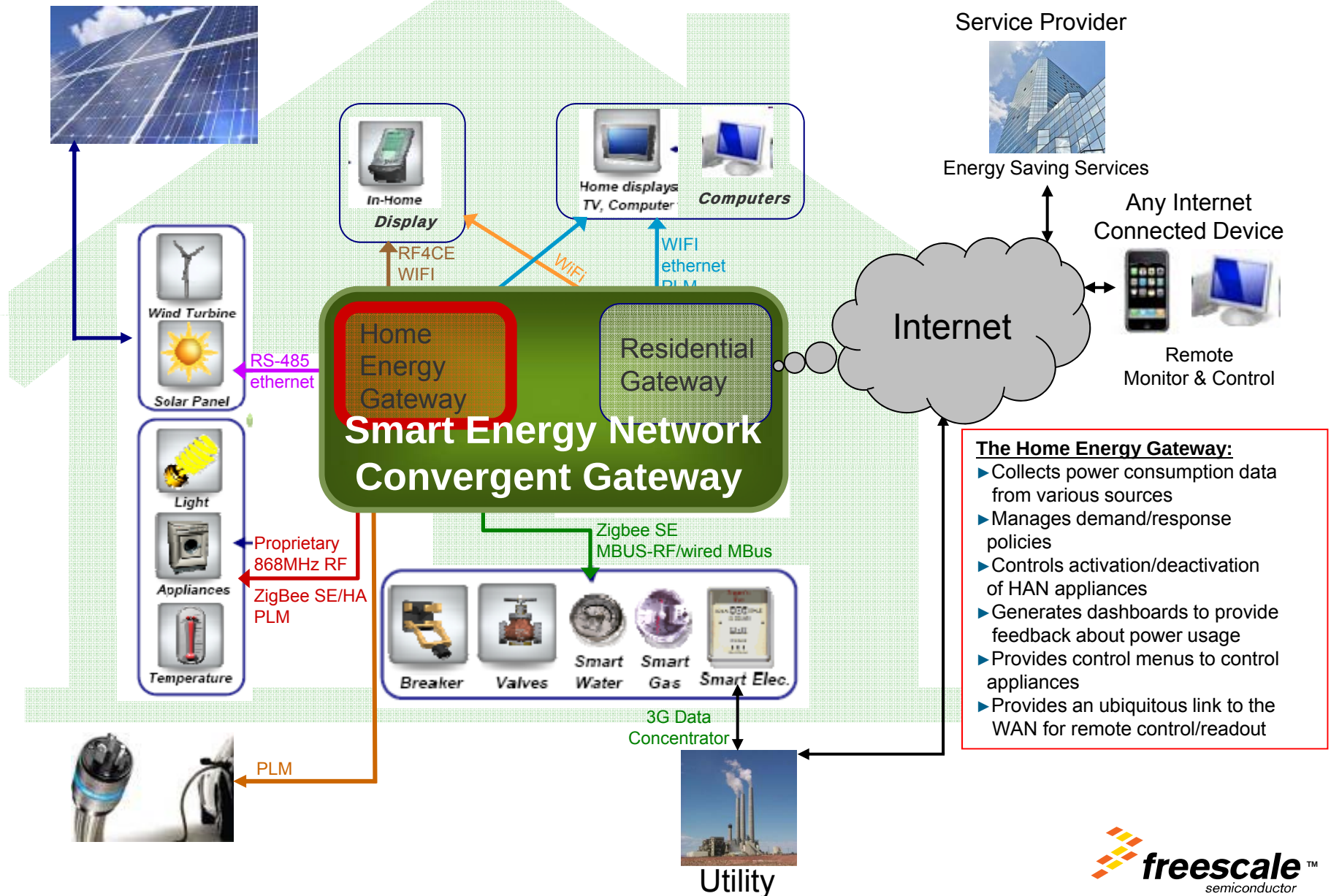
## Where ZigBee Enables Smart Grid



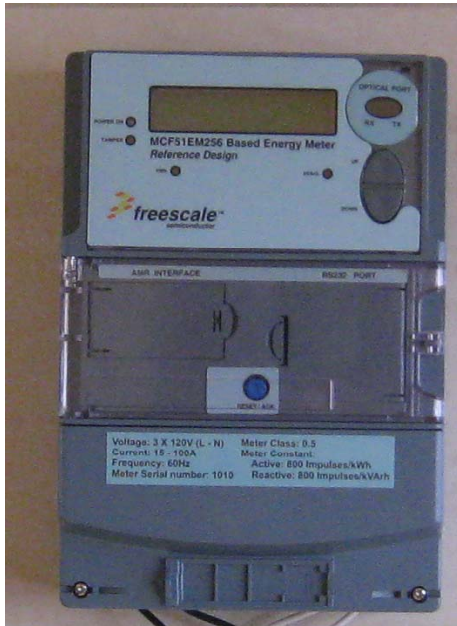
Source: wsj.com

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# Smart Energy Network Gateway in the Home Area Network



## 3-ph Power Meter Based on MCF51EM256 (Nucleus)



- ▶ Key Features
- ▶ Complete solution for 1-phase, 3-phase, 110V and 230V electricity meters for all global regions
- ▶ Full working reference design is available for loan and evaluation
- ▶ Able to achieve class 0.5 or better for active energy, 2 for reactive
- ▶ Software source code is supplied as a CodeWarrior project
  - Direct use in a metering application
- ▶ Designed and tested against: IEC 62053-22 , IEC 62053-23
  - Electro Static Discharge (ESD), tested per IEC 61000-4

This advanced single phase power meter shows the complete reference solution for next generation of power metering.

The 32-bit CFV1 family LCD-enabled microcontroller with advanced 16-bit ADC, battery backed standby RAM, Real-time clock and Programmable Delay Block allows effective design of both the single phase and multiphase power meters.

Various versions of sensing elements (and proper analog front ends) will show all typical methods of measuring voltage and current

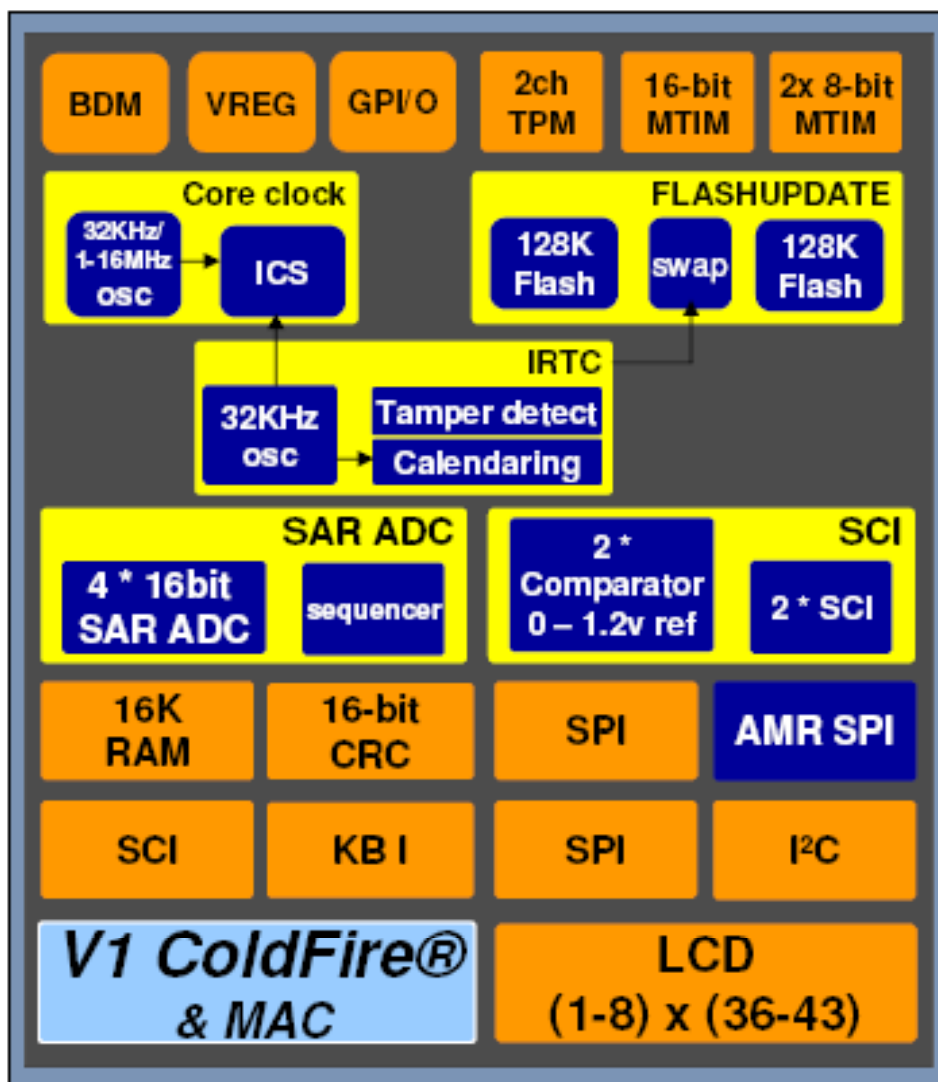
### Featured Products

- ▶ MCF51EM256
- ▶ MQX

### Key Markets

- ▶ Power Metering
- ▶ Automated Meter Reading
- ▶ Smart Grids





## Nucleus – MCF51EM1000/512/256/128 Benefits Metrology & RTC

### ► Coldfire V1 Core

- 32-bit MAC (16x16 signed/unsigned)
- 50MHz performance providing power calculation and communications capability

### ► IRTC

- Own External battery supply pin and own external Osc
- Provides a real time calendar to allow utilities to implement different tariffs
- Tamper detection mechanism to detect fraud

### ► FLASHUPDATE

- Implements a robust method of code update
- No meter readings can be lost
- No code runaway upon power outage

### ► AMR SPI

- Provides a 5v interface to external AMR modems

### ► Comparators with internal programmable reference

- Allows a simpler optical interface

### ► 16-bit high speed SAR ADC

- Simultaneous conversion
- CT Compensation

### ► Low Power

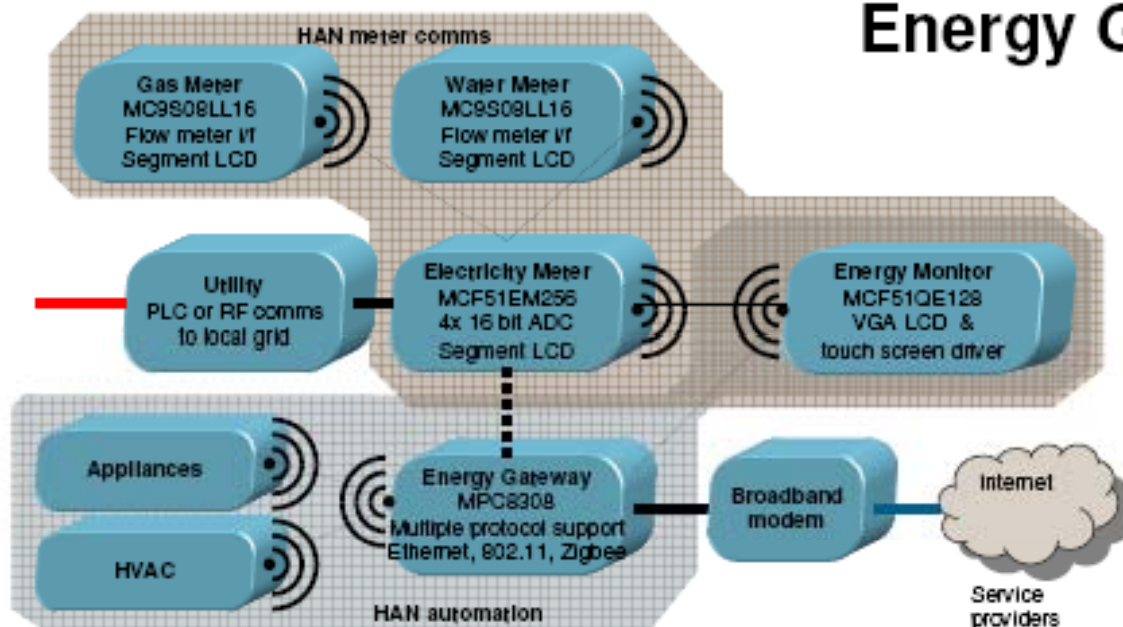
- The industry's benchmark low power implementation

### ► Packages

- 80LQFP, 100LQFP

### ► Samples: Aug'08, MC Qual: Apr'09, Prod: May'09

# Energy Gateway using MPC8308



- Optimized meter measurement; electricity, water, gas
- Energy gateway for access to services and bridge between meters and home area network (HAN)
- Low cost energy monitor with integrated ZigBee PRO

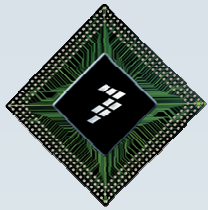
## Supplied by Freescale

Metrology, connectivity, user interfaces and appliance controller all integrated into a smart home system

- MCF51EM256 – optimized high accuracy metrology
- MC9S08LL16 – low power metering
- MPC8308 – communications and security
- MC13224V – 2.4Ghz RF , ZigBee PRO SE
- MCF51QE128 – low power, low cost 32 bit controller

- Reference designs demonstrate match to each application needs
- Future proofed connectivity products
- Roadmap supporting future system needs
- Long term expertise in appliances and metrology
- FSL industrial lifetime and auto quality provide longevity





## More Information

### ➤ MPC830x family:

- [MPC8306/S Product Summary Page](#)
- [MPC8308 Product Summary Page](#)
- [MPC8309 Product Summary Page](#)

**THANK YOU !**