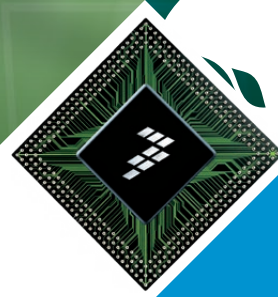


# When Reliability, Safety and Security Matter, Trust Power Architecture<sup>®</sup> Technology



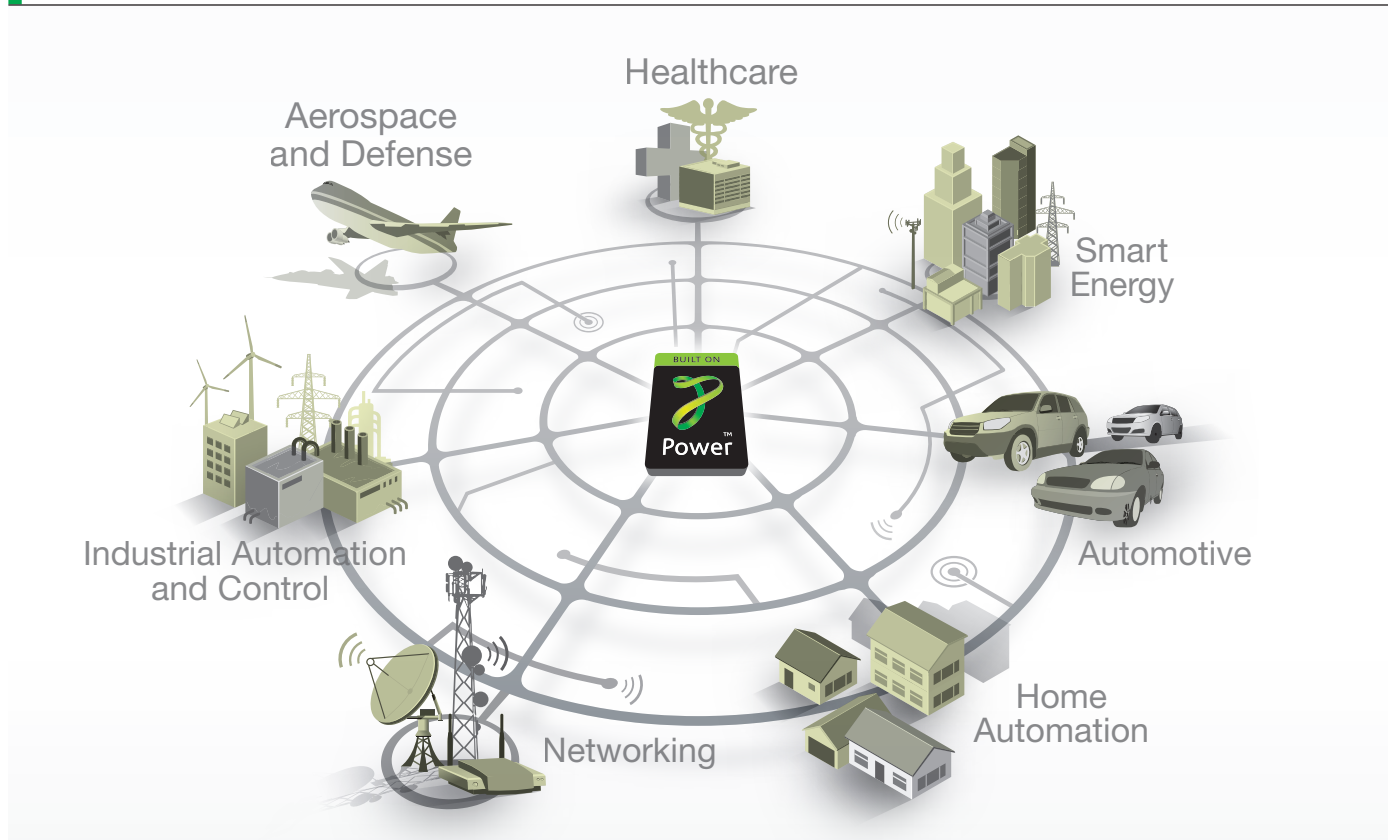


# 25 Years of Innovation

Power Architecture® technology offers solutions from the smallest MCU used in automobiles to the highest performance chips for applications like data networks and supercomputers. Initially developed by IBM, Motorola and Apple over 25 years ago, Power Architecture technology has become the preferred platform for many mission-critical and long-lived applications within the military, aerospace, networking, industrial and

automotive markets. To illustrate this leadership, Power Architecture technology is found in more than half of all cars manufactured worldwide. It processes the vast majority of all email, phone calls and multimedia downloads over the Internet. Jumbo jets, unmanned defense systems and water treatment plants use it for reliable operation under the harshest conditions. Banks trust it with your money and hospitals trust it for life-critical applications.

## Freescal Applications Built on Power Architecture Technology



We offer the largest portfolio of processors built on Power Architecture technology, as well as the broadest scalability of any architecture, with single-, dual- and multicore performance from 100 to 50,000+ million instructions per second (MIPS). With hundreds of processors ranging from MCUs for simple pumps to very high-performance processors for complex aerospace applications, our Power Architecture portfolio scales to ease software and hardware reuse across many platform types and performance levels. Even after enormous leaps in technology and capabilities, processors built on Power Architecture technology remain compatible from generation to generation, simplifying migration effort. Architectural consistency, from the first PowerQUICC communications processor to the newest QorIQ multicore processor, helps

ensure customer processor investments remain backward- and forward-compatible, helping reduce development and support costs.

Continuous innovation develops more intelligent and cost-effective solutions. System size and versatility are improved by integrating a wide variety of memory types and interfaces, such as Ethernet, USB 2.0, CAN, PCI, SPI and many others. Some highly integrated controllers and processors are priced below six dollars (USD) and consume fewer than 1.5 watts of power, allowing fanless high temperature operation. A broad array of features and tools enables development of safe and secure systems that can withstand hacking, cloning, tampering and soft errors in the harsh environments typically found in manufacturing and process applications.

Our Power Architecture portfolio is noted for its high quality and very low parts per million (PPM) defects. Because industrial, healthcare, networking and automotive applications ship for many years after launch, and need long-term product support, our formal Product Longevity Program makes a broad range of devices available for a minimum of 10 or 15 years from the time of launch. Participating products, terms and conditions are described at [freescale.com/productlongevity](http://freescale.com/productlongevity).

This brochure offers an overview of our Power Architecture portfolio to help guide you to the right processing solution for your specific application. For more information, visit [freescale.com/Power](http://freescale.com/Power).

## Freescale Applications Built on Power Architecture Technology

Code-Compatible Cores								
	Power PC 601	Power PC 603E	e200	e300	e506	e600 AltiVec	e5500	e6500 AltiVec
 NETWORKING INDUSTRIAL					PowerQUICC III MPC85xx Up to 1.5 GHz	MPC86xx(D) 1.5 GHz	QorIQ P5 Up to 2 GHz	QorIQ AMP Series T1-T5 Up to 2.5 GHz
	PowerQUICC II MPC8xx Up to 133 MHz	PowerQUICC II MPC82xx Up to 400 MHz		PowerQUICC II Pro MPC83xx 800 MHz	QorIQ P1/P2/P3/P4 Up to 1.5 GHz	QorIQ Qonverge PSC913x at 1.2 GHz (+DSP)		
 AUTOMOTIVE			Qorivva MPC57xx Up to 264 MHz	mobileGT MPC51xx/52xx Up to 400 MHz				
			Qorivva MPC56xx Up to 300 MHz					
	MPC5xx 40 MHz		Qorivva MPC55xx Up to 144 MHz					

# Freescale Power Architecture Portfolios



**“With the number one position in wired and wireless markets and over 300 million communications processors shipped, we lead innovation in next-generation networking infrastructure.”**



## QorIQ Processing Platforms

With the number one position in wired and wireless markets and over 300 million communications processors shipped, we lead innovation in next-generation networking infrastructure. Analyst group Gartner ranked Freescale number one with 53 percent of the market in 2010, separating us from our closest competitor by more than 40 percent. (Source: Gartner, Inc., “Market Share: Semiconductor Applications, Worldwide 2010,” Gerald Van Hoy et al, March 30, 2011.)

Whether it’s for the world’s networks, the smart grid, the automated factory, the intelligent hospital or aerospace and defense—get your high-performance communications and computing systems to market easier with our advanced QorIQ platforms. The product families include the QorIQ communications platform (the evolution of our leading PowerQUICC line), as well as the QorIQ Qonverge platform that includes DSP integration. While initially designed for the networking market, these high-performance system-on-chip (SoC) solutions have gained popularity in the industrial marketplace as well.

We have designed our QorIQ platforms to “think” like your system, offering all the building blocks for innovation in a highly integrated architecture that includes multiple cores, accelerators, security and more. This multiprocessing architecture is supported by our VortiQa software and comprehensive ecosystem solutions—simplifying multicore development and accelerating your time to market.

The QorIQ communications platforms provide a coherent multicore migration path from single core to multicore—and from 32-bit to 64-bit. These platforms consist of the P series and the Advanced Multiprocessing (AMP) series. The P1 through P4 families scale from single-core devices all the way to eight-core devices based on the e500mc 32-bit Power Architecture core. The P5 family introduces embedded 64-bit processing with the e5500 core scaling up to 2.2 GHz.

Our most recent innovation in next-generation processing is the QorIQ AMP series based on the multi-threaded 64-bit e6500 Power Architecture core, which also reintroduces our highly popular AltiVec technology vector processing engine. With Internet traffic increasing at a staggering rate, the AMP series of processors integrates a host of acceleration engines and power management systems to boost performance and power efficiency. Additionally, we offer the AMP series at a 28 nm process node for lower cost and improved power consumption.

## PowerQUICC Communications Processors

The PowerQUICC families offer a wide range of low-power and high-performance solutions to support networking in a variety of environments—from traditional core and residential access equipment to a wide range of industrial applications. The MPC830x portfolio targets applications where size, power and cost are critical, with optimization for entry-level networking equipment, factory automation and smart energy gateways. These processors incorporate the e300c3 core built on Power Architecture technology at frequencies from 133 to 417 MHz.

Architectural enhancements to the e300c3 core enable more parallel operations for significant performance improvements. For example, the PowerQUICC MPC8309 processor delivers an impressive 835 DMIPS core performance for less than 1.6 watts, starting below eight dollars (USD MSRP at 10K units). Critical control applications benefit from its double-precision floating point unit, ECC-protected DRAM memory and extensive connectivity (Ethernet, CAN, UART, SPI, I<sup>2</sup>C, PCI, USB and GPIO). New enablement tools for developers include the compact TWR-MPC8309 Tower System, a cost-effective, modular development platform for the rapid prototyping of robust industrial applications.

The MPC830x family supports a wide variety of communications protocols and interfaces, including Ethernet, EtherNet/IP™, PROFINET, CAN, PCI Express®, Serial RapidIO®, ATM, HDLC, USB and PCMCIA. By leveraging QUICC Engine technology, the MPC8309 and MPC8306 PowerQUICC processors can also integrate industrial protocols like PROFIBUS and PROFINET on the same chip as the control application. This further reduces design complexity and system cost by eliminating expensive FPGAs or ASICs for the protocols. More information on the industrial MPC830x PowerQUICC family, as well as the portfolio of available software and hardware enablement tools, is available at [freescale.com/industrialnetworking](http://freescale.com/industrialnetworking).

## Qorivva MCUs



Our automotive-qualified 32-bit processors built on Power Architecture technology are ideal for automotive applications such as powertrain control, body electronics, safety and chassis, and instrument cluster applications.

From single- to multicore solutions, Qorivva 32-bit MCUs offer scalable, highly integrated solutions with the quality and long-term reliability necessary for automotive applications. Our commitment

to quality drives us to develop the most innovative, safe and secure products. Qorivva 32-bit MCUs targeted for use in functional safety applications are SafeAssure solutions.

Additionally, Qorivva 32-bit MCUs deliver reduced development costs through use of a consistent architecture, greater feature integration and software and tool reuse. The next generation of Qorivva MCUs are built using a unique 55 nm non-volatile memory (NVM) process for improved power efficiency and cost effectiveness, and features an innovative multicore architecture. Qorivva MCUs include leading-edge integration and performance capabilities, including configurable peripheral sets such as flexible timers and motor control systems. Digital signal processing capabilities provide additional functionality. With these features, Qorivva MCUs provide the freedom to architect the ideal solution for particular automotive applications.

Qorivva 32-bit MCUs are included in our Product Longevity Program, making a broad range of devices available for a minimum period of 15 years for automotive customers.

## Host Processors

Our Power Architecture host processors employ e600 Power Architecture cores to deliver breakthrough performance, connectivity and integration for embedded networking, telecom, aerospace and defense, storage and industrial computing applications.

The MPC744x and MPC864x general-purpose host processors offer performance from 500 MHz to 1.8 GHz, including a dual-core option. Our e600 core includes the AltiVec technology vector processing engine, which enables dramatic acceleration in performance-driven, high-bandwidth computing and communications applications such as machine vision and image processing.



### SafeAssure Program Functional Safety. Simplified.

Our SafeAssure functional safety program is designed to help system manufacturers more easily achieve system compliance with International Standards Organization (ISO) 26262 and International Electrotechnical Commission (IEC) 61508 functional safety standards. The program highlights our solutions—hardware and software—that are optimally designed to support functional safety implementations and come with a rich set of enablement collateral. For more information, visit [freescale.com/SafeAssure](http://freescale.com/SafeAssure).





**“We have longstanding, deep relationships with the embedded ecosystem to provide optimal solutions to our customers, helping them get to market easier and faster.”**

# A Comprehensive and Thriving Ecosystem

Over its 25-year technology history, a large and thriving product development ecosystem has evolved to support the application of Power Architecture technology. We actively participate in the ongoing development of the instruction set architecture within Power.org and develop our own core technologies built for embedded application use. We have engineered our very streamlined, power-efficient e200 cores for automotive MCUs (and also openly license this core through our partner, IPEXtreme). Our e500mc cores are optimized for use in multicore networking applications. One of our latest core innovations is the new e6500 64-bit multithreaded core for very high-performance computing and communications.

We have longstanding, deep relationships with the embedded ecosystem to provide optimal solutions to our customers, helping them get to market easier and faster. Examples include:

- Extensive support by CodeWarrior tools and tools from partners such as Green Hills and Wind River.
- Support from widely-used real-time operating systems such as Freescale MQX™ RTOS, Green Hills INTEGRITY® RTOS, ENEA OSE, Mentor Graphics, QNX Neutrino® RTOS and Wind River VxWorks® RTOS.
- Support for Linux® OS and collaboration within the open source community to support additional platforms built on Power Architecture technology.
- Many other development and modeling tools, such as Swell PEG GUI development suite, FreeMASTER debug software, and several initialization and pin configuration tools.
- Collaboration with other industry leaders in forums such as Power.org.

In short, Power Architecture technology has broad software application support, with over 1,000 internal software engineers and our strong alliances with leading software vendors to help ensure software support is available when each processor starts shipping.

Whether you're designing a high-end networking application or an automotive system, you'll find the integration expertise and comprehensive ecosystem you need with our Power Architecture solutions.

For more information, visit [freescale.com/Power](http://freescale.com/Power)



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