



Freescale
Power Architecture™
Product Portfolio
At a Glance



freescale.com/powerarchitecture

 **freescale™**
semiconductor

Overview

It's in more than half of all car models in the world. It makes the network go—processing every e-mail, phone call and multimedia download. Jumbo jets, air traffic control and unmanned defense systems use it for reliable operation even under the harshest conditions. It's Power Architecture™ technology, and Freescale offers the broadest Power Architecture product portfolio in the world. Our portfolio ranges from very high-performance processors based on Freescale's e600 core, used in robust networking equipment, to high-precision microcontrollers based on the e200 core, specialized for automotive applications.

Freescale combines our high-performance cores built on Power Architecture technology in single and multi-core configurations with the right degree of integration and hardware acceleration to build system-on-chip (SoC) solutions that fit the market needs. The PowerQUICC® communications processors are a prime example of our extensive integration expertise. These processors may leverage high-speed interconnects, such as Ethernet and RapidIO® technology, as well as application accelerators, such as security, pattern matching and QUICC Engine™ technology.

In addition, the Freescale Power Architecture portfolio is noted for its high quality and very low parts per million (PPM) defects. Several members of the portfolio are AEC-Q100 qualified, a stringent automotive quality and temperature range specification.

This document provides a quick review of Freescale's Power Architecture product portfolio, helping to guide you to the right processing solution for your specific application. For more information about any of the products listed, please visit www.freescale.com/powerarchitecture.

Networking

- MPC51XX
- MPC52XX
- MPC603e
- MPC7XX
- MPC7XXX
- MPC8XX *PowerQUICC I*
- MPC82XX *PowerQUICC II*
- MPC83XX *PowerQUICC II Pro*
- MPC85XX *PowerQUICC III*
- MPC86XX



Automotive

- MPC5XX
- MPC51XX
- MPC52XX
- MPC55XX



Industrial

- MPC5XX
- MPC51XX
- MPC52XX
- MPC55XX
- MPC6XX
- MPC7XX
- MPC7XXX
- MPC8XX *PowerQUICC I*
- MPC82XX *PowerQUICC II*
- MPC83XX *PowerQUICC II Pro*
- MPC85XX *PowerQUICC III*
- MPC86XX



Consumer

- MPC51XX
- MPC52XX
- MPC7XXX
- MPC8XX *PowerQUICC I*
- MPC82XX *PowerQUICC II*
- MPC83XX *PowerQUICC II Pro*



High-Performance Power Architecture Processors

General-purpose processors based on the e600 cores, built on Power Architecture technology, offer performance from 500 MHz to 1.8 GHz, including a dual-core option.



These processors are ideal for networking, aerospace and defense, storage and pervasive computing applications, such as home media, printers, computer clusters and gaming systems.



MPC7XXX Family

Processors

MPC7410, MPC7457, MPC7447A, MPC7448

Family Technical Specifications

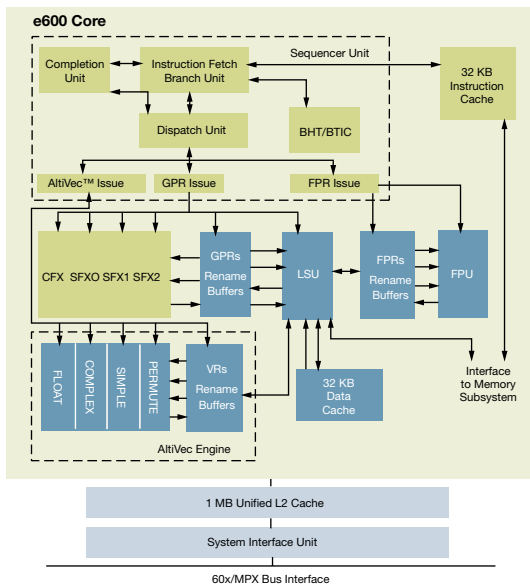
- e600 core, built on Power Architecture technology
- 500 MHz to 1.7 GHz performance
- Up to 3910 MIPS (million instructions per second)
- 256 KB to 1 MB L2 cache
- 32 KB instruction cache/
32 KB data cache
- 128-bit implementation of Freescale's AltiVec™ technology
- Up to 200 MHz high bandwidth 64-bit MPX/60x bus
- Full symmetric multiprocessing (SMP) support (except MPC7410)

- 360-pin high coefficient thermal expansion (HiCTE) ball grid array (BGA) or land grid array (LGA); 360- or 484-pin flip chip ceramic ball grid array (FC-CBGA)
- Fully compatible host bridges available from Tundra Semiconductor and Marvell

Applications

- High-performance networking, telecom and storage
- Image processing and printing
- Aerospace and defense control systems
- Industrial automation

MPC7448 Block Diagram





MPC86XX Family

Processors

MPC8610, MPC8641, MPC8641D

Family Technical Specifications

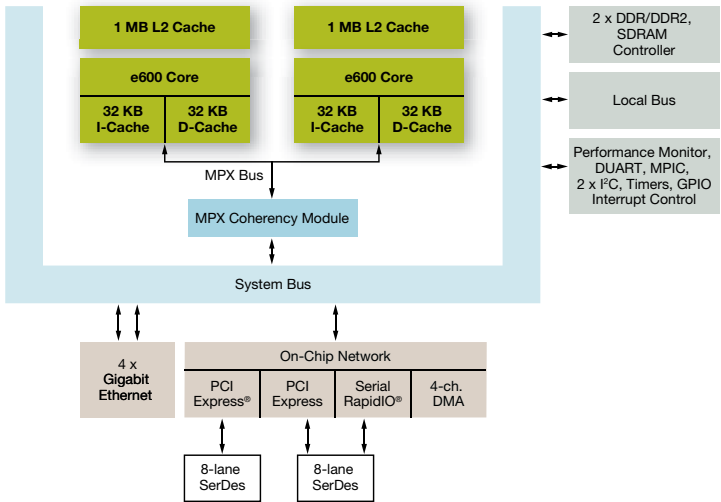
- Dual or single e600 core, built on Power Architecture technology
- Up to 1.5 GHz performance per core
- Up to 3450 DMIPS per core
- Up to 1 MB L2 cache per core
- 32 KB instruction cache/
32 KB data cache per core
- 64-bit double data rate (DDR) and DDR2 memory controllers with built-in error code correction (ECC)
- 128-bit implementation of AltiVec technology per core
- Up to 600 MHz high-bandwidth 64-bit MPX/60x bus

- Serial RapidIO fabric interfaces (MPC8610/D)
- PCI Express® interfaces
- Quad 10/100/1000 Ethernet controllers (MPC8641/D)
- LCD controller (MPC8610)
- Dual Fast Infra-Red Interfaces (MPC8610)
- Dual synchronous serial interface I²S/AC97 audio (MPC8610)
- Full SMP support
- 1023-pin flip-chip HiCTE BGA (MPC8641/D), 783-pin PBGA (MPC8610)

Applications

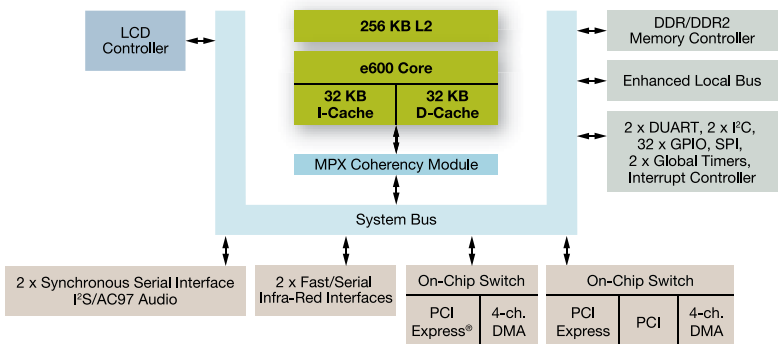
- Wireless infrastructure
- Enterprise routing
- Access/aggregation
- Pervasive computing
- Point of sale terminals
- Robotic vision
- Graphical displays

MPC8641D Block Diagram



■ Core ■ I/O

MPC8610 Block Diagram



■ Core ■ Accelerators ■ I/O

PowerQUICC Communications Processors

Highly integrated processors, built on Power Architecture technology, offer performance ranging from 50 MHz to 1.5 GHz with specialized accelerators and I/O that speed and secure communications in the home, office and infrastructure.





MPC8XX PowerQUICC I Family

Processors

MPC823, MPC823E, MPC850, MPC852T, MPC853T, MPC855T, MPC857DSL, MPC857T, MPC859DSL, MPC860, MPC862, MPC866, MPC870, MPC875, MPC880, MPC885

Family Technical Specifications

- Embedded 8xx core, built on Power Architecture technology
- Up to 133 MHz performance
- Up to 176 MIPS
- 8 KB dual-port RAM
- Up to 16 KB instruction cache/ up to 8 KB data cache
- Communications Processor Module (CPM) with DSP processing, communications processing, implements up to 16 virtual Serial DMA (SDMA) channels and two general-purpose independent DMA (IDMA) channels for memory/memory and peripheral/ memory transfers
- Up to four serial communication controllers (SCC)
- Inter-integrated circuit (I²C)
- Up to two serial management controllers (SMC)

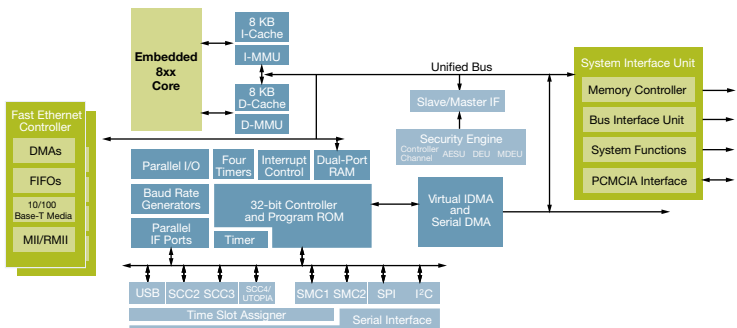
Additional Technical Specifications (selected parts)

- Up to two fast 10/100 Ethernet ports
- ATM support (UTOPIA)
- Up to 64-channel high-level data link control support (HDLC)
- USB 2.0 (full/low speed)
- On-chip security engine
- Personal Computer Memory Card International Association (PCMCIA) controller
- 256-pin mold-array process ball grid array (MAPBGA), 256-pin PBGA and 357-pin PBGA packaging

Applications

- Small office/home office (SOHO) and enterprise routers
- Wireless local area network (WLAN)
- Home networking equipment
- Factory automation

MPC885 Block Diagram





MPC82XX PowerQUICC II Family

Processors

MPC8241, MPC8245, MPC8247, MPC8248, MPC8250, MPC8255,
MPC8260, MPC8264, MPC8265, MPC8266, MPC8270, MPC8271, MPC8272,
MPC8275, MPC8280

Family Technical Specifications

- 603e core, built on Power Architecture technology
- Up to 450 MHz performance
- Up to 855 MIPS
- Up to 64 KB dual-port RAM
- 16 KB instruction cache/
16 KB data cache
- CPM
- Up to four SCCs
- Up to three fast communication controllers (FCC)
- Peripheral Component Interconnect (PCI) interface
- Up to three 10/100 Ethernet ports
- Up to two SMCs

Additional Technical Specifications (selected parts)

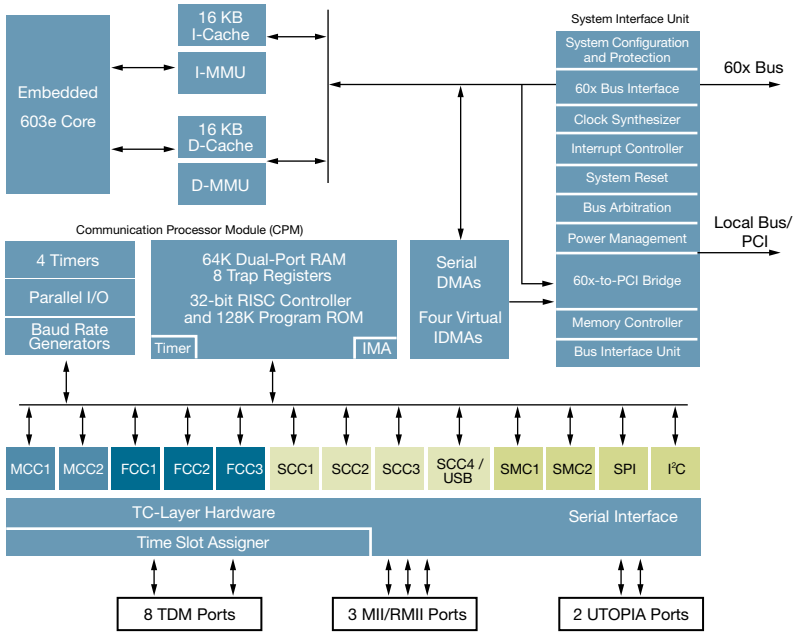
- USB
- ATM support (UTOPIA)
- I²C
- Up to 256-channel HDLC support
- On-chip security engine
- 480-pin tape ball grid array (TBGA) and 516-pin PBGA

Applications

- Residential gateways
- Voice-over-Internet Protocol (VoIP) systems
- Telecom switching equipment
- Cellular base stations
- DSL access multiplexers (DSLAMs)

MPC82XX PowerQUICC II Family, continued

MPC8280 Block Diagram





MPC83XX PowerQUICC II Pro Family

Processors

MPC8313E, MPC8314E, MPC8315E, MPC8321E, MPC8323E, MPC8343E, MPC8347E, MPC8349E, MPC8358E, MPC8360E, MPC8377E, MPC8378E, MPC8379E

Family Technical Specifications

- e300 core, built on Power Architecture technology
- Up to 667 MHz performance
- Up to 1260 MIPS
- Up to 32 KB instruction cache/
up to 32 KB data cache
- Up to two PCI interfaces
- Up to two USB controllers
- Dual 10/100/1000 Ethernet controllers
- Up to two high-speed USB controllers
- SATA controllers (MPC8315E, MPC8377E, MPC8379E)
- I²C
- Integrated security engine
- Supports IEEE® 1588 timing synchronization protocol (MPC8313E and MPC8360E only)
- 516-pin PBGA (MPC8323E)
- 516-pin TE-PBGA (MPC8313E)
- 620-pin PBGA or 672-pin TBGA packaging (MPC8343E/8347E/8349E)
- 740-pin TBGA packaging (MPC8358E/8360E)

QUICC Engine Technology Specifications (MPC8321E, MPC8323E, MPC8358E and MPC8360E only)

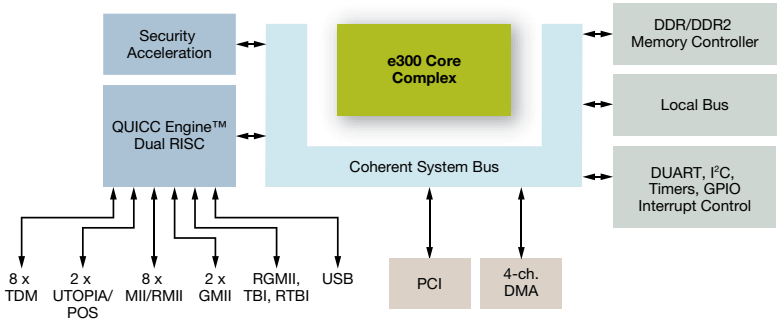
- Up to 500 MHz performance
- Up to two 10/100/1000 Ethernet controllers
- Up to eight 10/100 Ethernet controllers
- Two UTOPIA/Packet over SONET (POS) physical layer (PHY) Level 2 ports with up to 128 logical PHYs
- Multi-channel communication controller (MCC)
- Two serial peripheral interface (SPI) ports

Applications

- Wireless base station controllers
- DSLAMs
- Routers and switches
- Printing and imaging
- Network attached storage (NAS)
- Digital media servers
- Residential gateways

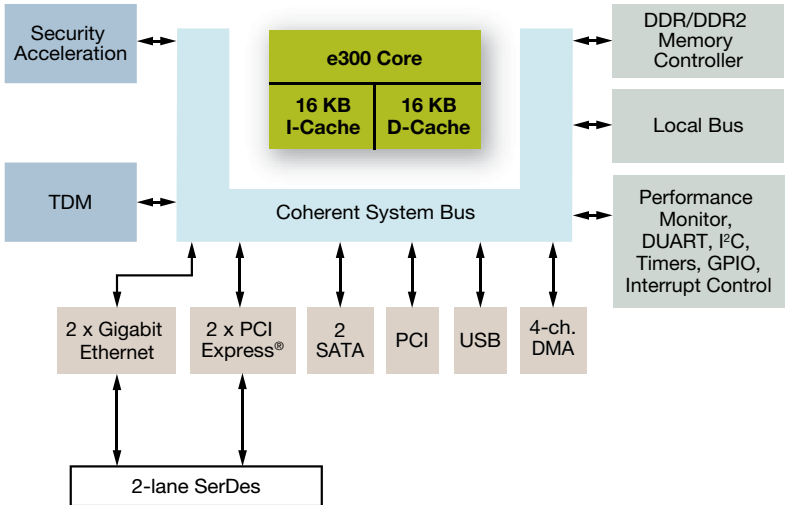
MPC83XX PowerQUICC II Pro Family, continued

MPC8360E Block Diagram



■ Core ■ Accelerators ■ I/O

MPC8315E Block Diagram



■ Core ■ Accelerators ■ I/O



MPC85XX PowerQUICC III Family

Processors

MPC8533E, MPC8540E, MPC8341E, MPC8543E, MPC8544E, MPC8545E, MPC8547E, MPC8548E, MPC8555E, MPC8560E, MPC8567E, MPC8568E, MPC8572E

Family Technical Specifications

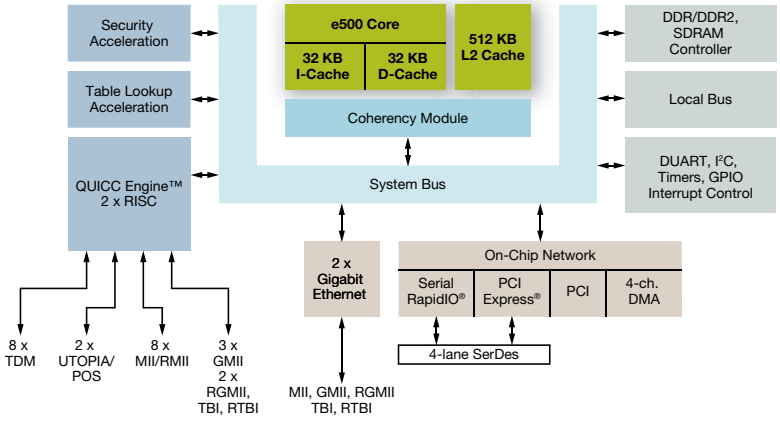
- e500 core, built on Power Architecture technology
- Up to 1.5 GHz performance
- Up to 3450 MIPS
- Up to 1 MB L2 cache
- 32 KB instruction cache/
32 KB data cache
- DDR or DDR1/DDR2 SDRAM memory controllers
- Multiple PCI interface support, including PCI, PCI-X and PCI Express®
- RapidIO fabric technology (MPC8540, MPC8560, MPC8543E, MPC8548E)
- e500 dual core (MPC8572E) with DDR2/DDR3 SDRAM memory controllers, Pattern Matching Engine
- Table Lookup Unit (MPC8568E and MPC8572E)
- Up to two I²C interfaces
- Up to four Gigabit Ethernet controllers
- UTOPIA II ATM support (MPC8555E and MPC8560 only)
- Integrated security engine
- 783-pin FC-PBGA packaging (MPC8533E, MPC8540, MPC8541E, MPC8543E, MPC8544E, MPC8545E, MPC8547E, MPC8548E, MPC8555E, MPC8560)
- 1023-pin FC-PBGA packaging (MPC8567E, MPC8568E, MPC8572E)

Applications

- Enterprise networking
- Telecom transmission
- 3G wireless infrastructure
- Storage subsystems
- High-end printing and imaging

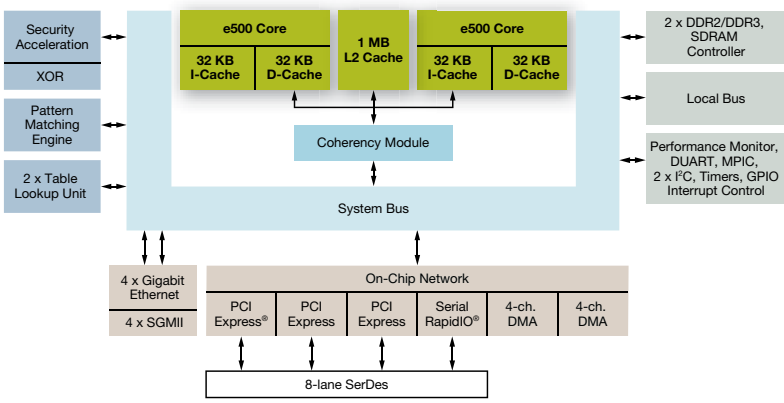
MPC85XX PowerQUICC III Family, continued

MPC8568E Block Diagram



■ Core ■ Accelerators ■ I/O

MPC8572E Block Diagram



■ Core ■ Accelerators ■ I/O

Freescal Feature

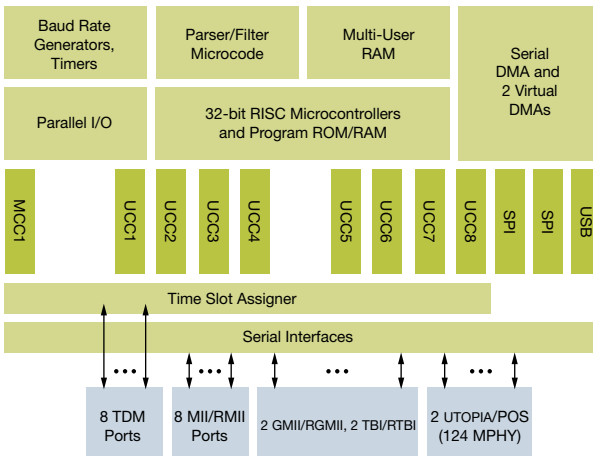
QUICC Engine Technology

QUICC Engine technology is an acceleration module integrated on-chip that frees the Power Architecture core to focus on control-plane processing. QUICC Engine technology features two RISC engines that deliver up to four times the data throughput of the original CPM. It scales up to 500 MHz and supports DDR memory and Gigabit Ethernet.

Key Features

- Next-generation CPM
- Powerful switching/termination/interworking/parsing engine offloads CPU, speeds broadband applications
- Flexible protocol (IP, ATM, Ethernet, etc.) and interface support (time division multiplexing (TDM), Synchronous Optical Network (SONET)/SDH, Ethernet, etc.) enables support for virtually any access equipment
- Software and microcode compatibility with previous PowerQUICC CPMs accelerating time to market
- QUICC Engine operates between 200 MHz and 500 MHz
- Optimized dual 32-bit RISC engines provide balanced flexibility and performance
- Eight unified communication controllers (UCCs) support virtually any interface
- MCC
- 2 x SPI (with management data input/output support), one full/low speed USB
- Integrated accelerators boost performance and simplify programming

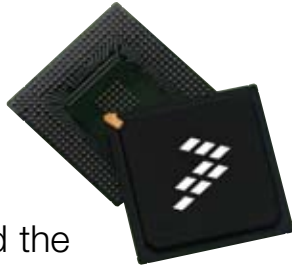
QUICC Engine™ Block Diagram





Microcontrollers Built on Power Architecture Technology

Highly specialized microcontrollers, built on Power Architecture technology, offer performance options from 40 MHz to 600 MHz with the right embedded memories and the capability to address a wide range of applications.





MPC5XX Family

Microcontrollers

MPC555, MPC561, MPC562, MPC563, MPC564, MPC565, MPC566

Family Technical Specifications

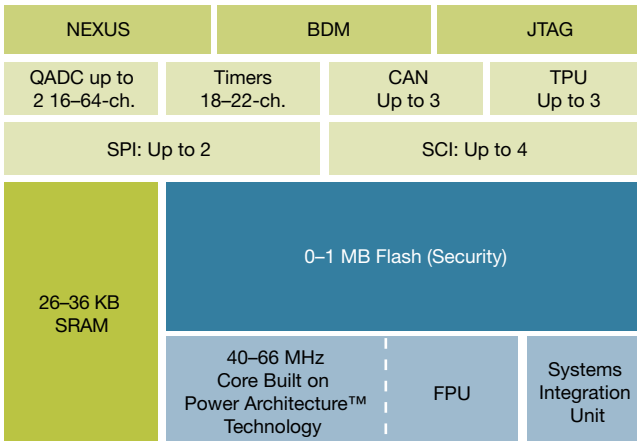
- Up to 66 MHz performance
- Up to 150 MIPS
- Up to 1 MB flash
- Up to 36 KB SRAM
- Floating point unit (FPU)
- Up to two queued serial modules (QSMCM), each with one queued SPI and two serial communications interfaces (SCI)
- Up to three controller area network (CAN) modules (TOUCAN)
- Up to three time processor units
- Up to two queued analog-to-digital converters
- Up to two enhanced queued analog systems with analog multiplexers (MPC565 and MPC566 only)
- Operating temperature: -40°C to +125°C

- Qualified to automotive Q100 requirements
- 272-pin or 388-pin PBGA packaging

Applications

- Multi-point fuel injection control
- Electronically controlled transmissions
- Direct diesel injection (DDI)
- Gasoline direct injection (GDI)
- Avionics
- Robotics
- Motion control
- Turbine control
- Utilities/power management
- Alternative energies
- Autonomous vehicles

MPC565 Block Diagram





MPC51XX Family

Microcontrollers

MPC5121e, MPC512x

Family Technical Specifications

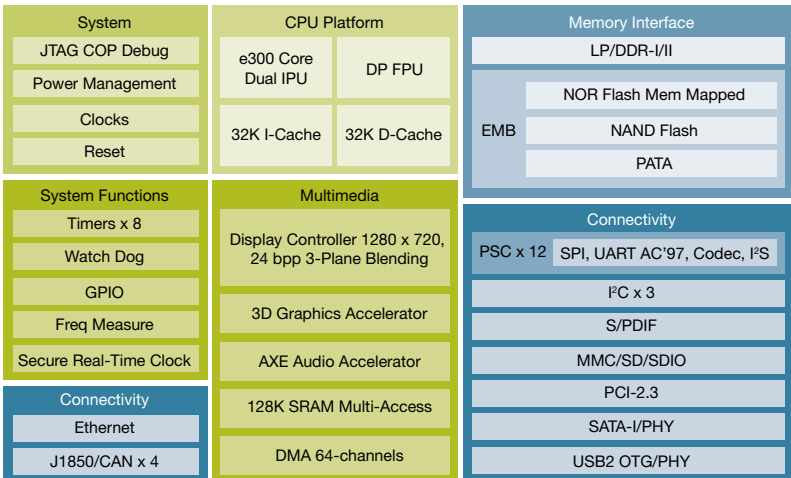
- e300 core, built on Power Architecture technology
- Up to 400 MHz and 760 MIPS
- 32 KB I/D cache
- Double precision FPU
- Instruction and data MMU
- PowerVR® MBX Lite 2-D/3-D Graphics Engine
- DIU Integrated Display Controller supports up to XGA resolution
- AXE core, a 32-bit RISC audio accelerator engine
- SDRAM/DDR1/DDR2 memory controller
- External memory bus controller
- 10/100 Fast Ethernet MAC
- 12 programmable serial controllers (PSC)
- Up to three I²Cs

- PCI 2.3 interface
- 64-channel intelligent DMA I/O controller
- USB 2.0 OTG, with PHY
- NAND flash controller
- SATA/PATA
- Up to four CANs
- S/PDIF serial audio interface
- SDHC–MMC/SD/SDIO card host controller
- -40°C to +125°C extended junction temperature range
- 516-pin TEPBGA package

Applications

- Telematics control units
- Industrial automation and control
- Set-top boxes
- Surveillance and security systems

MPC5121e Block Diagram





MPC52XX Family

Microcontrollers

MPC5200, MPC5200B

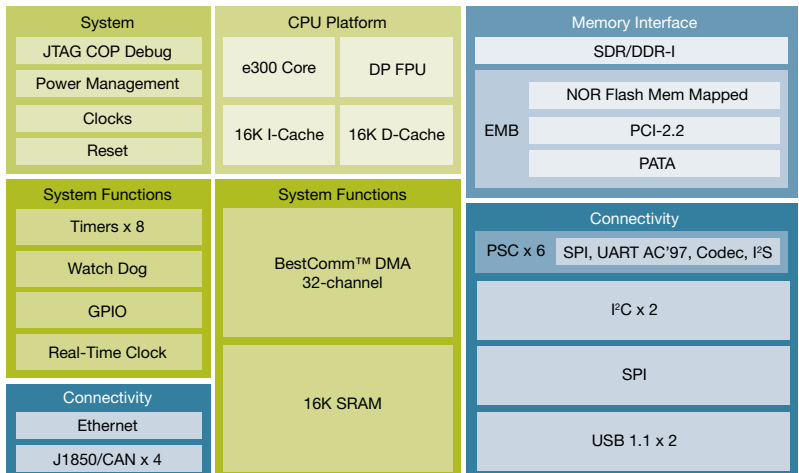
Family Technical Specifications

- e300 core, built on Power Architecture technology
- Up to 400 MHz performance
- Up to 760 MIPS
- -40°C to +85°C extended temperature range
- 16 KB instruction cache/
16 KB data cache
- Instruction and data MMU
- DDR memory controller
- Double precision FPU
- 10/100 Ethernet MAC
- Six PSCs
- Up to two I²C
- PCI 2.2 interface
- BestComm™ intelligent DMA I/O controller
- 272-pin PBGA packaging

Applications

- Telematics control units
- Industrial automation and control
- Set-top boxes
- Surveillance and security systems

MPC5200B Block Diagram





MPC55XX Family

Microcontrollers

MPC551X, MPC5533, MPC5534, MPC5553, MPC5554, MPC5561, MPC5565, MPC5566, MPC5567

Family Technical Specifications

- e200z6, e200z3 or e200z1 cores, built on Power Architecture technology
- Dual core option (MPC551X only)
- Up to 132 MHz performance
- -40°C to +125°C extended temperature range (-55°C option)
- Up to 3 MB embedded flash
- Up to 128 KB SRAM
- Up to two enhanced timer processor units (eTPU)
- Up to six controller area network modules
- 208, 324 or 416-pin PBGA packaging; 144 pin LQFP package (MPC551X only)
- Variable-length encoding (VLE) for MPC551X, MPC5533, MPC5534, MPC5565, MPC5566 and MPC5567
- FlexRay™ option (MPC551XG, MPC5561 and MPC5567 only)
- 10/100 Ethernet MAC (FEC) option (MPC5553, MPC5566 and MPC5567 only)

Applications

- Multi-point fuel injection control
- Electronically controlled transmissions
- Direct diesel injection (DDI)
- Gasoline direct injection (GDI)
- Robotics
- Motion control
- Utilities/power management
- Alternative energies
- Gateway
- Central body controllers
- Chassis control
- Any model-based design using RAppID and MATLAB®/Simulink

MPC5567 Block Diagram

GPI/O		JTAG		NEXUS	
5 CAN		3 DSPI		32-ch. eTPU	
2 x 40-ch. ADC		2 eSCI		14.5K SRAM	
24-ch. eMIOS		32-ch. DMA		FlexRay™	
				(FEC) Ethernet	
2 MB Flash		8 KB U-Cache		64 KB SRAM	
SPE	e200z6 Core		MMU	32-bit External Bus	

Freescale Feature

Power Architecture Core Licensing

Freescale is working with intellectual property (IP) specialist IPextreme to openly license the e200 core family built on Power Architecture technology to SoC designers. The licensable e200 cores include the e200z0, e200z1, e200z3 and e200z6 cores.

The cores may offer low interrupt latency, low-power design through clock gating, variable cache sizes, variable MMU sizes, static debug through Nexus1, real-time debug through Nexus2/3 and an AMBA® AHB™ bus interface unit. The cores also may include Power ISA features, such as Signal Processing Engine (SPE) for DSP-like functions and VLE for extensive code density.

While the e200 core family is an ideal platform for automotive applications, its performance range and standard embedded features make it very adaptable for a number of uses in aerospace and defense, industrial, networking

and consumer applications.

Consider the e200 core platform for:

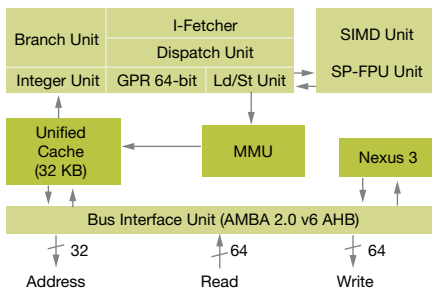
- High-performance, real-time environments where there is a need for increased system processing capabilities
- Low-power, low-cost and time to market-sensitive embedded applications needing complex real-time control
- Harsh environments needing support for temperature ranges anywhere from -40°C to +125°C

IPextreme makes it straight-forward to integrate the e200 core IP by delivering complete IP in EDA-neutral packaging. IPextreme also provides expert customer support and maintenance for the e200 core technology.

For more information about licensing these cores, visit

www.freescale.com/e200licensing.

e200z6 Core Block Diagram



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