QorIQ Communications Platforms

QorIQ P2010 and P2020 Processors

Overview

The QorIQ mid-performance tier, which includes the P2020 (dual-core processor) and P2010 (single-core processor) communications processors, delivers high single-threaded performance per watt for a wide variety of applications in the networking, telecom, military and industrial markets. These P2 devices deliver dual- and single-core frequencies up to 1.2 GHz on a 45 nm technology low-power platform.

The QorIQ P2020 and P2010 dual- and single-core products are pin compatible with the QorIQ P1 family devices in the value-performance tier, offering four interchangeable cost-effective solutions. Scaling from a single-core processor at 533 MHz (P1011) to a dual-core processor at 1.2 GHz (P2020), the two tiers of devices together deliver an impressive 4.5x aggregate frequency range within the same pinout.

The P2010 and P2020 devices are software compatible, sharing the e500 Power Architecture® core and peripherals, as well as being fully software compatible with the existing PowerQUICC processors. This enables customers to create a product with multiple performance points from a single board design. The P2020 and P1020 dual-core processors support symmetric and asymmetric multiprocessing, enabling customers to scale performance through either thread-level or application-level parallelism.

The P2020 and P2010 processors have an advanced set of features for ease of use. The optional integrated security engine supports the cryptographic algorithms commonly used in IPsec, SSL, 3GPP and other networking and wireless security protocols. The 64-bit memory controller offers future proofing against memory technology migration with support for both DDR2 and DDR3. It also supports error correction codes, a baseline requirement for any high-reliability system. Other memory types such as flash are supported through the 16-bit local bus, USB, SD/MMC and SPI.

The P2010 and P2020 processors integrate a rich set of interfaces, including SerDes, Gigabit Ethernet, PCI Express®, RapidIO® technology and USB. The three 10/100/1000 Ethernet ports support advanced packet parsing, flow control and quality of service features, as well as IEEE® 1588 time stamping.

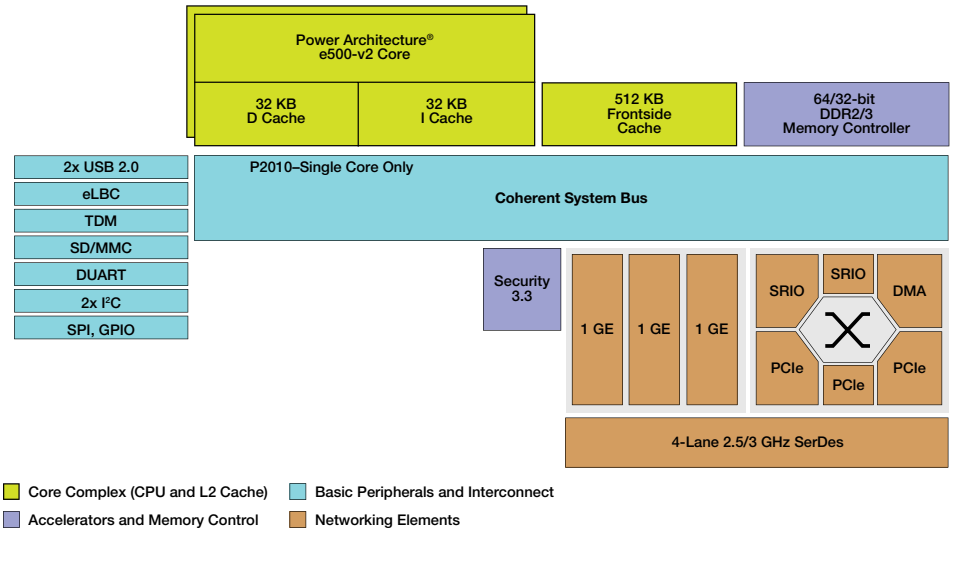
Target Applications

The P2010 and P2020 processors serve in a wide range of applications, notably those with tight thermal constraints. With an available junction temperature range of –40 °C to +125 °C, the devices can be used in power-sensitive defense, aerospace and industrial applications, and less protected outdoor environments. They enable various combinations of data plane and control plane workloads in networking and telecom applications that require higher performance but want to avoid the complexity of partitioning the application across many cores. The devices' primary target applications are networking and telecom linecards. The P2 devices, with their low power budget and high single-threaded performance, are uniquely well-suited for control plane applications.

QorIQ P1 and P2 Family Comparison Chart

Device	Cores	Top Core Frequency	L2 Size	DDR 2/3 Support	GE Ports	SerDes	PCI Express®	Serial RapidIO®	TDM
P1011	1	800 MHz	256 KB	32-bit with ECC	3	4	2	N/A	Yes
P1020	2	800 MHz	256 KB	32-bit with ECC	3	4	2	N/A	Yes
P2010	1	1200 MHz	512 KB	64-bit with ECC	3	4	3	2	N/A
P2020	2	1200 MHz	512 KB	64-bit with ECC	3	4	3	2	N/A

QorIQ P2020/P2010 Communication Processors



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Control plane applications tend to be more sequential in nature and thus lose scaling efficiency with increasing number of threads or cores. Both P2 devices, with their low power, efficient dual-issue out-of-order e500 core, Power Architecture technology and high 1.2 GHz frequency, offer a level of single-threaded performance that is a perfect fit for control plane applications.

The networking linecard requires an optimal combination of good performance to manage a large amount of control plane traffic balanced against low power and cost. With convenient I/O, flexible core configurations and an onboard security block, the P2010 and P2020 processors are well-suited for this application, which involves controlling ASICs, managing exceptions and routing table maintenance.

The P2010 and P2020 processors are also well-suited for LTE and WiMAX channel card applications. With dual-core performance in single-core power budgets, the P2 devices facilitate the "flattening" of the wireless network hierarchy. The dual Serial RapidIO interfaces allow direct connection to the DSPs (such as the MSC8156 DSP) that implement layer 1 processing as well as redundant backplane connections.

Technical Specifications

- Dual (P2020) or single (P2010) high-performance Power Architecture e500 cores
  - 36-bit physical addressing
  - Double-precision floating-point support
  - 32 KB L1 instruction cache and 32 KB L1 data cache for each core
  - 800 MHz to 1.2 GHz clock frequency
- 512 KB L2 cache with ECC. Also configurable as SRAM and stashing memory.
- Three 10/100/1000 Mb/s enhanced three-speed Ethernet controllers
  - TCP/IP acceleration and classification capabilities
  - IEEE 1588 support
  - Lossless flow control
  - R/G/MII, R/TBI, SGMII
  - FIFO interfaces
- High-speed interfaces supporting various multiplexing options
  - Four SerDes to 3.125 GHz multiplexed across controllers
  - Three PCI Express interfaces
  - Two Serial RapidIO interfaces
  - Two SGMII interfaces
- High-Speed USB controller (USB 2.0)
  - Host and device support
  - Enhanced host controller interface
  - ULPI interface to PHY
- Enhanced secure digital host controller (SD/MMC)
- Serial peripheral interface
- Integrated security engine (SEC 3.1) (optional)
  - Crypto algorithm support includes 3DES, AES, RSA/ECC, MD5/SHA, ARC4, Kasumi, Snow 3G and FIPS deterministic RNG
  - Single pass encryption/message authentication for common security protocols (IPsec, SSL, SRTP, WiMAX)
  - XOR acceleration
- 64-bit DDR2/DDR3 SDRAM memory controller with ECC support
- Programmable interrupt controller compliant with OpenPIC standard
- Two four-channel DMA controllers
- Two I^2C controllers, DUART, timers
- Enhanced local bus controller
- 16 general-purpose I/O signals
- Package: 689-pin wirebond power-BGA (TEPBGA2)

Software and Tools Support

- Enea®: Real-time operating system support
- Green Hills®: Complete portfolio of software and hardware development tools, trace tools and real-time operating systems
- Mentor Graphics®: Commercial-grade Linux® solution
- P2020 development system, P2020 reference design board and P2020 COM Express development board

For more information, visit freescale.com/QorIQ

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