## Cortex™ Family Processor Specifications

<table>
<thead>
<tr>
<th>Processor</th>
<th>Cache (Inst/Data)</th>
<th>Memory Management</th>
<th>Bus Interface</th>
<th>DSP</th>
<th>L2 Cache</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARM Cortex-A57</td>
<td>48K – 32K</td>
<td>MMU + TrustZone® + SMP</td>
<td>AMBA® 4 ACE</td>
<td>Yes</td>
<td>Integrated</td>
</tr>
<tr>
<td>ARM Cortex-A53</td>
<td>8K – 64K</td>
<td>MMU + TrustZone + SMP</td>
<td>AMBA 4 ACE</td>
<td>Yes</td>
<td>Integrated</td>
</tr>
<tr>
<td>ARM Cortex-A9</td>
<td>32K – 32K</td>
<td>MMU + TrustZone + SMP</td>
<td>AMBA 4 AXI™</td>
<td>Yes</td>
<td>Separate</td>
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<tr>
<td>ARM Cortex-A8</td>
<td>16K – 64K</td>
<td>MMU + TrustZone + SMP</td>
<td>AMBA 3 AXI</td>
<td>Yes</td>
<td>Integrated</td>
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<tr>
<td>ARM Cortex-A7</td>
<td>16 – 32K</td>
<td>MMU + TrustZone + SMP</td>
<td>AMBA 3 AXI</td>
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<td>Separate</td>
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<tr>
<td>ARM Cortex-A5</td>
<td>8K – 64K</td>
<td>MMU + TrustZone + SMP</td>
<td>AMBA 4 AXI™</td>
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<tr>
<td>ARM Cortex-R7</td>
<td>4K – 64K</td>
<td>MMU + TrustZone + SMP</td>
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<tr>
<td>ARM Cortex-R4</td>
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<td>MMU + TrustZone + SMP</td>
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<tr>
<td>ARM Cortex-M7</td>
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<td>MMU + TrustZone + SMP</td>
<td>AMBA 3 AXI</td>
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<td>ARM Cortex-M6</td>
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<td>MMU + TrustZone + SMP</td>
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<tr>
<td>ARM Cortex-M1</td>
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<td>MMU + TrustZone + SMP</td>
<td>AMBA 3 AXI</td>
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<tr>
<td>ARM Cortex M0+</td>
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<td>MMU + TrustZone + SMP</td>
<td>AMBA 3 AXI</td>
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<tr>
<td>ARM Cortex-M0</td>
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<td>MMU + TrustZone + SMP</td>
<td>AMBA 3 AXI</td>
<td>Yes</td>
<td>—</td>
</tr>
</tbody>
</table>

### Other

- AArch64, 64-bit ISA, Virtualization, Advanced NEON, Cryptography, Emerging standards support SCU, ECC, (Error-Correcting Code), LPAE, ACP (Accelerator Coherency Port)
- AArch64, 64-bit ISA, Virtualization, Advanced NEON, Cryptography, Emerging standards support SCU, ECC, LPAE, ACP
- 32-bit ISA, Virtualization, NEON, SMP, VFPv4, Thumb-2
- 32-bit ISA, NEON, VFPv4, Thumb-2
- 32-bit ISA, Virtualization, NEON, SMP, VFPv4 LPAE, Thumb-2
- MPCore, NEON, TrustZone, FPU, GIC, ACP
- ECC, FPU, SM, MPCore, GIC, Lockstep, LLPP, ACP
- ECC, FPU, Dual-core, Lockstep, LLPP, ACP
- ECC, FPU, Lockstep
- NVIC
- NVIC, Optimized for FPGA
- NVIC, Micro Trace Buffer, Single-cycle I/O
Current implementations of the three series are:

The ARM Cortex-A Series of applications processors for rich OS and user applications.
- The ARM Cortex-A57 processor — High performance multicore processor featuring AArch64 execution
- The ARM Cortex-A53 processor — Lowest power ARM 64-bit multicore processor
- The ARM Cortex-A15 processor — High performance multicore processor featuring full hardware virtualization
- The ARM Cortex-A9 processors — Single and multicore processors for high-performance applications
- The ARM Cortex-A8 processor — Applications processor supporting high frequency and power efficient design
- The ARM Cortex-A7 processor — Most efficient application class processor for entry level mobile devices
- The ARM Cortex-A5 processors — Lowest power, smallest area multicore processor for internet applications

The ARM Cortex-R Series of embedded processors for real-time systems
- The ARM Cortex-R7 processor — High performance single and multi-core real-time processor for LTE-Advanced baseband, storage and automotive safety systems
- The ARM Cortex-R5 processor — High performance single and dual core, real-time processor for mobile baseband, storage, industrial and automotive applications
- The ARM Cortex-R4 processor — Embedded processor for networking, wireless imaging, automotive and storage

The ARM Cortex-M Series of deeply embedded processors optimized for cost sensitive applications
- The ARM Cortex-M4 processor — Specifically designed for high efficiency Digital Signal Control applications
- The ARM Cortex-M3 processor — 32-bit processor for high-performance microcontroller and ASIC implementation
- The ARM Cortex-M1 processor — First ARM processor designed specifically for optimal implementation as a soft core in FPGAs
- The ARM Cortex-M0+ processor — World’s most energy-efficient processor for ultra low-power applications
- The ARM Cortex-M0 processor — Smallest processor for low power and mixed signal applications
The ARM Cortex-A57 processor is ARM’s highest performance processor based on the ARMv8 architecture featuring AArch64 execution. The Cortex-A57 processor is designed to further extend the capabilities of future mobile and enterprise computing applications.

- Highly scalable, up to 2.5GHz performance
- Full application compatibility with all Cortex-A series processors
- Out-of-order superscaler pipeline
- Tightly-coupled low-latency level-2 cache with ECC (up to 1MB)
- Floating point
- NEON™ technology for multi-media and SIMD processing
The ARM Cortex-A53 processor is the lowest power 64-bit processor available and has been designed to provide the optimum blend of high levels of performance with high levels energy-efficiency. The Cortex-A53 will enable advanced applications to be brought into the mainstream using power-efficient performance based on ARM 64-bit technology.

- Highly scalable, up to 1.2GHz performance
- Full application compatibility with all Cortex-A series processors
- Out-of order superscaler pipeline
- Tightly-coupled low-latency level-2 cache with ECC (up to 2MB)
- Floating point
- NEON technology for multi-media and SIMD processing
The ARM Cortex-A15 MPCore™ processor delivers unprecedented processing capability, combined with low power consumption to enable compelling products in a wide range of new and existing ARM markets ranging from mobile computing, high-end digital home, servers and wireless infrastructure.

• Highly scalable, up to 2.5GHz performance
• Full application compatibility with all Cortex-A series processors
• Out-of-order superscaler pipeline
• Tightly-coupled low-latency level-2 cache (up to 4MB)
• Floating point
• NEON technology for multi-media and SIMD processing
• Available as a quad-core hard macro implementation
The ARM Cortex-A9 MPCore™ processor implements the full richness of the widely supported ARMv7 architecture and accounts for more than one third of all smartphone shipments.

- Out-of-order, speculating 8-stage pipeline
- 16, 32 or 64KB four way associative L1 caches
- Floating point
- NEON technology for multi-media and SIMD processing
- Available as speed or power optimized hard macro implementations
The ARM Cortex-A8 processor can meet the requirements for power-optimized mobile devices needing operation in less than 300mW; and performance-optimized consumer applications requiring 2000 Dhrystone MIPS.

- Frequency from 600MHz to 1GHz and above
- High-performance, Superscalar microarchitecture
- NEON technology for multi-media and SIMD processing
- Binary compatibility with ARM926EJ-S™, ARM1136™ and ARM1176JZ-S™ processors
The ARM Cortex-A7 MPCore processor is the most efficient application processor ARM has ever developed and dramatically extends ARM’s low-power leadership in future entry level smart phones, tablets and other advanced mobile devices.

- Architecture and feature set identical to the Cortex-A15 processor, enabling big.LITTLE configuration
- Less than 0.5mm$^2$, using 28nm process technology
- Full application compatibility with all Cortex-A series processors
- Tightly-coupled low-latency level-2 cache (up to 4MB)
- Floating point
- NEON technology for multi-media and SIMD processing
The ARM Cortex-A5 MPCore processor is smallest, most energy efficient ARM multicore applications processor. The Cortex-A5 processor builds on ARM’s technology leadership in multiprocessing to deliver the outstanding performance and power scalability required to deliver rich user experiences to a wide range of applications.

• Full application compatibility with Cortex-A8, Cortex-A9 and classic ARM processors
• Multiprocessing capability for scalable, energy efficient performance
• Optional floating-point or NEON units for media and signal processing
• High performance memory system including caches and memory management unit
• High-value migration path from ARM926EJ-S™ and ARM1176JZ-S™ processor
The ARM Cortex-R7 MPCore processor brings new levels of extreme performance to the Cortex-R family of processors. The Cortex-R7 processor is binary compatible with Cortex-R4 and Cortex-R5 processors, preserving and encouraging investment in software development.

- Advanced superscaler, out-of-order pipeline offers 50% performance uplift
- Support for operating frequencies above 1GHz on 28nm low power process
- Configurable caches, Tightly Coupled Memory (TCM), FPU can be sized to match requirements
- ECC support for both soft and hard error detection
- Symmetric and asymmetric multiprocessing supported
- Dual-core lock-step configuration for safety critical systems
The ARM Cortex-R5 processor is based on ARMv7 architecture and targets high volume, deeply embedded, real-time critical applications such as HSPA and LTE mobile baseband processing, hard disk drives, solid state storage and dependable automotive and industrial systems.

- Builds on capabilities of Cortex-R4
- Integrated I/O coherency improves simplicity and reliability of firmware when using hardware accelerators
- Low latency peripheral interface provides fast and deterministic access to peripherals and hardware accelerators
- Extended ECC features support error-checking on all interfaces
- Configurable caches, Tightly Coupled Memory, FPU can be sized to match requirements
- Dual configuration in split or lock-step
The ARM Cortex-R4 processor is the first deeply embedded processor to be based on the ARMv7 architecture and is targeted at very high volume deeply embedded applications such as hard-disk drives, inkjet printers and automotive safety systems.

- Configurable caches, Tightly Coupled Memory, system for deterministic response to real-time events
- Full support for ECC
- Support for operating frequencies above 600MHz on 40nm low power process
- Optional Floating Point Unit (FPU) supporting both single and double precision with full IEEE compatibility
- Dual-core lock-step configuration for safety critical systems
The ARM Cortex-M4 processor provides a high-performance, easy-to-use solution for digital signal control (DSC) applications, while maintaining the industry leading low-power, high-efficiency capabilities of the ARM Cortex-M family of processors for advanced microcontroller (MCU) applications.

High performance 32-bit core with all the features of the Cortex-M3 processor, plus:

- Single-cycle multiply-accumulate (MAC) unit
- Optimized single instruction multiple data (SIMD) unit
- Saturating arithmetic instructions
- Optional single precision floating point unit (FPU)
The ARM Cortex-M3 processor has been specifically developed to provide a high-performance, low-cost platform for a broad range of applications including microcontrollers, automotive body systems, industrial control systems and wireless networking.

- Code compatible with all Cortex-M0 and Cortex-M0+ processors
- Thumb®-2 ISA
- Harvard architecture to allow simultaneous data and instruction accesses
- Integrated sleep modes
- Scalable Nested Vectored Interrupt Controller (NVIC) providing fast, deterministic interrupt response
- Fully configurable debug & trace options
- Optional Memory Protection Unit (MPU)
- Configurable Wake-up Interrupt Controller (WIC) enables only interrupts which require monitoring to retain power
The ARM Cortex-M1 processor is the first ARM processor designed specifically for implementation as a soft core in FPGAs. The Cortex-M1 processor targets all major FPGA devices and includes support for leading FPGA synthesis tools, allowing the designer to choose the optimal implementation for each project. Typical applications include automotive, wireless base station, aerospace and industrial control.

- Code compatible with all Cortex-M series processors
- Scalable Nested Interrupt Controller (NVIC)
- Very small processor and software footprint to meet the area budget of the smallest FPGA devices
The ARM Cortex-M0+ processor is the most energy efficient ARM processor available. It builds on the very successful Cortex-M0 processor, retaining full instruction set and tool compatibility, while further reducing energy consumption and increasing performance. The Cortex-M0+ processor comes with a wide selection of options to provide flexible development.

- Ultra low gate count
- Code compatible with all Cortex-M series processors
- Optional Micro Trace Buffer (MTB)
- Low latency single-cycle IO
- Integrated sleep modes
- Scalable Nested Vectored Interrupt Controller (NVIC) providing fast deterministic interrupt response
The ARM Cortex-M0 processor is the smallest ARM processor available. The exceptional low power, small gate count and code footprint of the processor enables MCU developers to achieve 32-bit performance at an 8-bit price point, bypassing the step to 16-bit devices.

- Ultra low gate count
- Code compatible with all Cortex-M series processors
- Thumb-2 ISA
- Integrated sleep modes
- Scalable Nested Vectored Interrupt Controller (NVIC) providing fast deterministic interrupt response
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