Marvell ARMADA 166E Application Processor

Industry's First Application Processor with Integrated EPD Controller
Scalable to 800 MHz for Cost-Sensitive, High-Performance eReaders and eBooks

MARVELL®

▶ PRODUCT OVERVIEW

Marvell®'s ARMADA™ 100 series is a family of application processors targeted at mass market opportunities in computing and consumer devices. The ARMADA 166E member of this family is the world's first application processor with an integrated EPD controller, targeted at cost-sensitive, high-performance eReaders and eBooks. The CPU core is powered by Marvell Sheeva™ technology and is completely ARMv5 and XScale compliant. Core speeds up to 800 MHz and a direct path to LP-DDR as well as commodity DDR2 SDRAM memory enable fast rendering of advanced content and layouts (large PDFs, newspapers, magazines, textbooks). A multimedia coprocessor powered by WMMX™ 2 technology and a graphics engine support up to D1 resolution video and rich GUIs. Integrated southbridge support for standard peripherals, MLC NAND, USB2.0 HS OTG with PHY, a 5-in-1 card reader, and a 10/100 Ethernet MAC can dramatically lower total BOM cost.

The key differentiator in the ARMADA 166E is the integrated EPD controller, which includes advanced features such as parallel and partial-update capability, as well as retaining a traditional software programming model. The integrated controller provides significant BOM cost reduction by eliminating an external controller and its associated flash and DDR memories. It has the capability to drive large 1600x1200 EPD displays and supports high-performance features such as parallel and partial-refresh capabilities.

Like other members in the ARMADA 100 series, the ARMADA 166E supports low-power modes, including a "zero-power mode" where the processor state is retained in DDR memory while the SoC power is completely shut off, extending battery life in eReaders and eBooks.
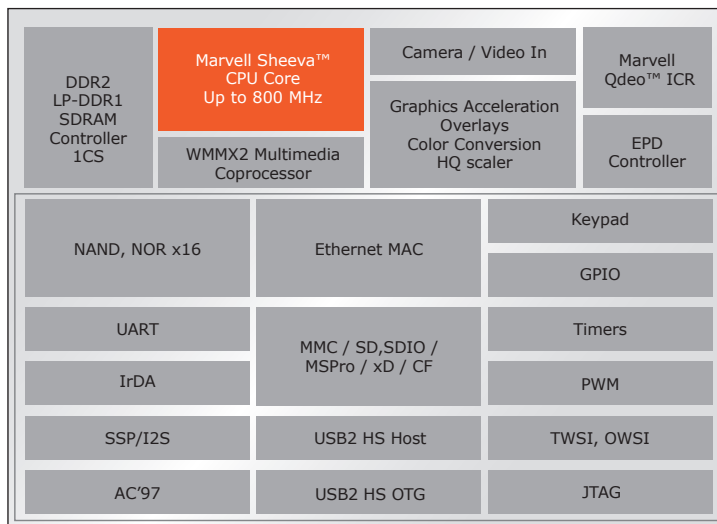
▶ BLOCK DIAGRAM

Fig 1. Marvell ARMADA 166E Application Processor

▶ APPLICATIONS

Marvell's ARMADA eReader platforms enable large or small manufacturers to quickly develop eReader systems for a wide variety of end markets, from basic book readers to subscription content devices to dedicated enterprise and educational devices. EPD panels of multiple sizes are supported and the ARMADA platform also supports LCD screens, allowing for flexibility of implementation. With Marvell's proven Wi-Fi/Bluetooth SoCs and HSDPA modem technology, connectivity to the WLAN or WWAN is a snap. Power management solutions from Marvell provide efficient switching regulators and power-factor correction for AC-DC adapters. Marvell also offers full development systems and turnkey reference designs, as well as Linux, Android™, and Windows® Embedded CE board support packages (BSPs) for eReaders.

▶ **FEATURES**

| **BENEFITS** |

- Integrated high-performance EPD controller
- Support for high-resolution panels, partial- and parallel-update modes, and fast updates
- Simplified UMA architecture
- Strategic roadmap

- Elimination of external controller with associated NAND and DDR provides BOM and power reduction, as well as significant BOM savings
- Refreshing only changed pixels in a parallel fashion improves performance, especially for displays up to 1600x1200
- Unified memory architecture enables simple programming model of traditional frame-buffer rendering techniques
- Marvell investment in EPD market provides support for next-generation products. OEMs can take advantage of significant code reuse

- Marvell Sheeva core and support for fast DDR SDRAM
  – L2 cache and direct path to LP-DDR memory up to 200 MHz and DDR2 memory up to 400 MHz
- WMMX2 SIMD co-processor
- Extensive clock gating and low-voltage 55 nm process
- "Zero-power" suspend-to-DDR mode

- Faster CPU speeds and more efficient MIPS/MHz than competition brings richer features to mainstream tiers while retaining full ARM® v5TE and XScale compatibility
- L1 and L2 caches and fast DDR2 speeds provide memory bandwidth for video and graphics
  – Targeting support for up to MPEG-4 and H.264 D1 video, 30 fps
- Clock-gating and low SoC voltages support efficient MIPS/mW to reduce power consumption and extend battery life
- Suspend-to-DDR mode supports extended battery life during periods of inactivity

- Highly integrated SoC
  – 5-in-1 card reader for SD/MMC, xD, Sony Memory Stick PRO™, and CF
  – Support for DDR2/LV-DDR2, and raw and managed MLC NAND; boot from NOR/NAND/MMC/SD/SPI and download from USB
  – SSPs, UARTs, IrDA, 10/100 Ethernet MAC
  – USB 2.0 OTG with PHY
  – AC97, PWM, one-wire and two-wire serial interfaces (OWSI, TWSI)

- Highly integrated SoC helps enable low BOM and save PCB space, helping device manufacturers to improve margins
- Support for DDR2 allows OEMs flexibility to take advantage of commodity memory pricing vs. mobile SDRAM/DDR

- Integrated multimedia acceleration
  – WMMX2 technology
  – Graphics acceleration
- LCD support up to WUXGA, 24 bpp
- ITU-656 camera input
- Qdeo™ Intelligent Color Remapping (ICR)

- Integrated HW components enable high-quality still-image and video on high-resolution displays
- WMMX2 accelerates multimedia without external chip along with familiar programming model
- Graphics accelerator enhances GUI effects for differentiation
- Support for video conferencing and for content from cameras and personal media players
- Qdeo ICR enhances color to make vivid images without hue shifts or clipping while preserving skin-tones. Part of the award-winning Qdeo suite of video processing

- Complete software offerings from drivers to GUI level
- Software compatibility with ARMv5, XScale, WMMX2
- Hardware reference designs for multiple vertical segments

- Optimized BSPs, middleware for Windows Embedded CE and linux, as well as GUIs with Android, Adobe® FlashLite, or Silverlight for Embedded offer flexibility for system design
- Software compatibility enables access to established wealth of applications and software ecosystem
- Turnkey reference designs enable fast time-to-market

THE MARVELL ADVANTAGE: Marvell chipsets come with complete reference designs which include board layout designs, software, manufacturing diagnostic tools, documentation, and other items to assist customers with product evaluation and production. Marvell's worldwide field application engineers collaborate closely with end customers to develop and deliver new leading-edge products for quick time-to-market. Marvell utilizes world-leading semiconductor foundry and packaging services to reliably deliver high-volume and low-cost total solutions.

ABOUT MARVELL: Marvell is a leader in storage, communications, and consumer silicon solutions. Marvell's diverse product portfolio includes switching, transceiver, communications controller, processor, wireless, power management, and storage solutions that power the entire communications infrastructure, including enterprise, metro, home, storage, and digital entertainment solutions. For more information, visit our Web site at www.marvell.com.