Case Study

Freescale and Amazon Write a New Chapter in Digital Reading

The Kindle Paperwhite brings together the pleasures of traditional reading with the convenience of e-reader technology

Reading the Way It Was Meant to Be

The Amazon Kindle Paperwhite once again transforms the e-reading experience, making it more like reading a physical book than ever before. With weeks instead of hours of battery life, faster page turns than ever, a no-glare display and built-in front-lighting, the Kindle Paperwhite makes it possible to enjoy reading electronically anywhere, anytime. There's no worrying about constantly recharging or waiting for pages to turn, or struggling to see in bright daylight or after dark.

Since introducing the first Kindle e-reader in 2007, Amazon has taken advantage of every advance in processing and display technology to enhance performance, regularly introducing new models to constantly improve the reading experience. Over time, the technology inside the device has become more highly integrated, making it lighter and easier to hold comfortably when reading—while at the same time controlling the cost to produce it.

Today, millions of people around the world rely on Amazon Kindle devices for e-reading. According to the latest available market share statistics**, more people choose the Kindle family of e-readers over any other dedicated e-reading technology, including tablets, smartphones and other manufacturers' dedicated e-readers. It has proved the ideal choice for those who want the convenience of access to an infinite number of books and publications on a single device, without sacrificing the pleasure of an authentic reading experience.

The Technology Behind the Screen

The latest display and processing technologies enable the Kindle Paperwhite to offer several features that dramatically enhance e-reading:

- **Eight-week battery life:** The dramatic shift from hours to weeks of battery life is the result of processor optimizations that allow an extremely low-power standby mode. For example, low-leakage technology in the processor minimizes the amount of current that may leak out when the device is on. Also, hardware acceleration internal to the processor allows for faster processing and updating of the panel, shortening the time the device needs to operate in a higher power state.

- **Faster processing:** The latest Kindle Paperwhite offers 25% faster processing than before, to refresh content faster when someone touches the screen to turn the page. (Page turning is further enhanced by no-flash capabilities that prevent the distraction of the screen flashing black every time a page is turned.)

Challenge:

Deliver an e-reader with the high performance and long battery life needed to eliminate all barriers to a natural reading experience.

Solution:

The Freescale i.MX 6SoloLite applications processor enables up to eight weeks of battery life*, the fastest-ever page turns and a display that works equally well in bright sun or dark indoor conditions.

Benefit:

Readers who choose Kindle Paperwhite can simply immerse themselves in the pleasures of reading, without technology limitations impinging on their experience.

*A single charge can last up to eight weeks (based on a half hour of reading per day with wireless off and the light setting at ten).
**"Kindle Share of E-book Reading at 55%," *Publishers Weekly*, Nov 9, 2012

- **Glare-free screen:** The high-contrast E Ink electronic paper display (EPD) features a non-reflective surface that makes it easy to read, even in bright sunlight.

- **Built-in front-lighting:** A patented front-lit design guides light in toward the display instead of projecting it out at the eyes the way back-lit tablets do. This makes it possible to read comfortably for hours.

Amazon Makes It Possible. Freescale Makes It Work.

Amazon has powered its Kindle e-readers with Freescale i.MX applications processors since the early days of the devices. Every Kindle e-reader that has shipped has contained i.MX applications processors. First-, second- and third-generation Kindle e-readers were based on i.MX31 and i.MX35 applications processors. In subsequent versions, Amazon employed the i.MX508, which introduced an integrated controller to speed page turns, reduce power requirements and lower costs. The latest version of the Kindle Paperwhite incorporates an even more advanced Freescale applications processor, the i.MX 6SoloLite. This applications processor improves on the i.MX508 by incorporating a higher-performance EPD controller, new faster processor core from ARM®, and support for faster and lower power memory.

Part of the ARM Cortex®-A9 core-based i.MX 6 family of scalable processors, the i.MX 6SoloLite is a single-core applications processor that foregoes extensive use of LVDS, MIPI, HDMI and other features in favor of targeted integration of EPD and LCD controllers. The i.MX 6SoloLite applications processor extends performance advantage of EPD panels which are bi-stable and don't require power while displaying content on the screen; this eliminates the high battery demand typically placed on LCD or other displays that require a constant power supply. As a result, it's possible to read on the Kindle Paperwhite for up to eight weeks on a single charge.

Freescale: Innovation for Consumer Applications

Freescale delivers system solutions, including reference designs, to help develop cutting-edge consumer applications. Our technology includes a complete range of microcontrollers and application processors built on ARM technology with broad operating system support. Among these are Kinetis microcontrollers, which support a range of real-time operating systems (RTOS) such as Freescale MQX™ RTOS and i.MX applications processors for Android™ and Linux® operating systems. Add to that our Xtrinsic sensing solutions—designed with the right combination of high-performance sensing capability, processing capacity and customizable software. With a comprehensive ecosystem of tools, software, technology and services, Freescale helps facilitate innovation and shorten your design cycle.

Amazon: Makers of the World's Best-Selling and Most-Advanced E-Reader

Amazon.com, Inc., a Fortune 500 company based in Seattle, opened on the World Wide Web in July 1995 and today offers Earth's Biggest Selection. Amazon.com, Inc. seeks to be the Earth's most customer-centric company, where customers can find and discover anything they might want to buy online, and endeavors to offer its customers the lowest possible prices. Amazon.com and other sellers offer millions of unique new, refurbished and used items in categories such as Books; Movies, Music & Games; Digital Downloads; Electronics & Computers; Home & Garden; Toys, Kids & Baby; Grocery; Apparel, Shoes & Jewelry; Health & Beauty; Sports & Outdoors; and Tools, Auto & Industrial. Amazon's Kindle Paperwhite is the world's best-selling and most advanced e-reader.
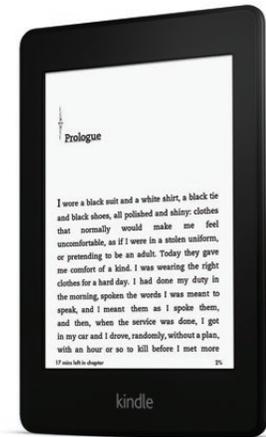
Freescale Technology for Amazon Kindle Paperwhite

- i.MX 6SoloLite applications processor

Freescale Development Tools for Amazon Kindle Paperwhite

- i.MX 6 series software and development tools

For more information on Freescale's consumer solutions, visit freescale.com/iMX

To learn more about how Amazon Kindle e-readers are powered by Freescale technology, visit freescale.com/Kindle