

AMD in Embedded: Proven Leadership and Solutions

A long history of high-performance low-power solutions for embedded applications

For over two decades AMD has been a leader in the embedded market: in the early 1990's with the introduction of the Am386 and Am486 and their adoption in embedded designs, and followed in 1995 with the introduction of the Am5x86 processor. The AM5x86 processor was one of the fastest and most universally-compatible upgrade paths for users of 486 systems when it was introduced. AMD continued to expand their E86 (Embedded x86) product family in the late 90's with the release of the Élan™SC520 microcontroller for data communications, telecommunications, and information appliance markets. The ÉlanSC520 microcontroller extended the options available to embedded systems designers by providing fifth-generation x86 performance and was designed to run both 16-bit and 32-bit software.

The AMD embedded group grew significantly in early 2000 with the acquisition of Alchemy Semiconductor for its Alchemy line of MIPS processors for the hand-held and portable media player markets. In order to augment its existing line of embedded x86 processor products, AMD also purchased the AMD Geode™ business in August 2003 which was originally part of National Semiconductor. During the second quarter of 2004, AMD launched the new low-power AMD Geode™ NX processors which were based on the AMD-K7™ Thoroughbred architecture with speeds up to 1.4 GHz. These AMD Geode NX processors offered a high performance option in the AMD Geode product line that was still sufficiently low power to be designed into fan-less applications. This technology was used in a variety of embedded systems (casino slot machines and customer kiosks for instance) and several UMPC designs in the Asian markets.

In mid-2005 AMD introduced its 64-bit processors into its embedded product line starting with the AMD Opteron™ processor. Leveraging the high throughput enabled by HyperTransport™ technology and Direct Connect Architecture, these server class processors have been used in high end telecom and storage applications. In 2006 AMD added the AMD Athlon™, AMD Turion™ and Mobile AMD Sempron™ processors to its embedded product line. Leveraging the same 64-bit instruction set and Direct Connect Architecture as the AMD Opteron processor, but at lower power levels, these processors have been used in a variety of traditional embedded applications such as industrial controls, Point of Sale systems and thin clients. Throughout 2007 and into 2008 AMD has continued to add both single and dual-core processors to its embedded product line and now offers a full range of embedded 64-bit solutions starting at single-core 8W TDP processors for fan-less designs, and up to multi-processor systems leveraging multi-core AMD Opteron™ processors, all supporting longer than standard availability. AMD has worked with many embedded customers throughout the years to develop solutions to meet their needs. After listening to input from our customers, AMD introduced the ASB1 family of processors in 2009. These processors are designed with unique computing features and a thin, compact form factor to help enable new and uncompromising embedded designs. ASB1 processors are available as single-core and dual-core options and packaged in a small footprint, lidless 812-ball BGA (Ball Grid Array) package.

In July 2006 AMD announced the acquisition of ATI Technologies, Inc. This acquisition helped AMD begin rounding out its embedded portfolio with chipset and discrete graphics technologies. These technologies provided customers with a one-stop-shopping option for their processor, chipset and discrete graphics needs for their embedded application. Leveraging the acquired chipset and graphics technology, in February 2007 AMD announced the release of the AMD 690 series integrated graphics chipset and, shortly thereafter, released the AMD M690T for embedded

designs. This release enabled AMD to offer a complete processor and chipset solution for embedded applications. Embedded customers were able to purchase and get support for their complete solution from a single source helping them to minimize costs and shorten development times. The M690T was followed by the M690E specifically for embedded applications. In 2008 and 2009, AMD continued to add new integrated chipset options with the introduction of the AMD 780E and SB710 chipset which provided a high-performance embedded platform solution that targeted applications leveraging sophisticated 3D graphics and hardware video decode, such as emerging digital signage, casino gaming, IP Set-top box, kiosk and Point of Sale applications. And in mid-2009 AMD launched the SR5690 and SP5100 chipset targeted at enterprise level embedded applications such as telecommunications, storage, test and measurement, medical imaging and industrial automation.

Prior to the acquisition, ATI's embedded division had already introduced the ATI Mobility Radeon™ X300, ATI Mobility Radeon™ X600 and M54 GPUs. Incorporating enhanced 3D acceleration, programmable shaders, expanded display output options and support for the high-speed PCI Express® bus, these GPUs led to key design wins in the casino gaming market. In order to target embedded applications that required higher performance graphics than an integrated graphics controller could offer, the ATI Radeon E2400 GPU was announced in 2008. It was the first ATI Radeon discrete graphics processor specifically designed for the embedded market with a planned five year supply availability. It was followed in 2009 by the ATI Radeon E4690 discrete GPU. These graphics controllers provided not only exceptional 2D, 3D and multimedia graphics performance, but also the broadest range of display output interfaces and filled a wide performance range targeting low, mid and high-end embedded visual computing applications in gaming (casino, pachinko / pachislot), consumer (advanced set top boxes), digital signage, technical computing, industrial, medical and military / avionics. The AMD embedded discrete graphics solutions offer not only graphics processors with integrated memory in advanced chip scale packages, but are also available in MXM modules to offer more flexibility and are supported by an ecosystem of evaluation boards, development tools and software drivers.

The focus of the AMD embedded group on being customer-centric has helped them to address many of the concerns of the embedded market early on. One unique concern that many embedded designers have is ensuring that their designs can be built and supported for multiple years which requires extended product longevity from their suppliers. AMD addresses this with its AMD64 longevity program. AMD embedded products have a planned availability of a minimum of five years of active manufacturing, plus another two years of possible "end of life" commitment. One of the first examples of AMD's commitment to make embedded solutions available for a longer-than-standard timeframe was the SC520 which was shipped for nearly 10 years and was only recently discontinued. Many of AMD's high demand embedded products have the potential to surpass the 5 year minimum availability model, such as the AMD Geode™ LX processor family, which is planned to ship for 10 years thru 2015.

AMD has a long history of working with their customers and looking at the embedded market needs to develop solutions that provide an optimum balance between power consumption and performance. Developing innovative and differentiated solutions for the embedded markets has many challenges: from determining software and hardware compatibility, to design, form factor, manufacturing and environmental issues. To make this simpler, AMD is one of a very few experienced companies which has generated a portfolio of silicon solutions using the x86 architecture and the infrastructure of hardware, software and systems to deliver compelling solutions for embedded markets. The AMD embedded product portfolio has grown to include over 50 processor, chipset and discrete graphics solutions and a broad range of design tools, including Development Boards (DBs) and Reference Design Kits (RDks), to help designers make maximum use of the established world of x86 software applications. The features offered by the AMD embedded product portfolio, such as low power and high-performance, generally offer good value to solutions providers. Working with an experienced company like AMD, that is established in these markets helps designers produce the next-generation embedded systems quickly, easily, and efficiently.

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