High-end graphics for embedded computing

Basic motherboards

High-end graphics

Fast innovation rates

Maximum investment security

Lower costs

kontron

High-end graphics for embedded computing

Kontron basic motherboards with integrated high-end graphics

Until recently, embedded system developers who needed high-end embedded graphics had to settle for consumer motherboards that do not meet the demands on energy consumption, cooling and longer availability required by the embedded market. Kontron has responded by developing motherboards with integrated high-end graphics features for embedded applications. These motherboards offer high end-graphics features for embedded applications whilst allowing OEMs to keep up with fast innovation rates.

Contents

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# High-end graphics for embedded computing

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The trend towards high-end graphics

There are two main reasons for the trend towards high-end graphics in embedded systems. The first comes from the development of increasingly sophisticated graphics technology for the large consumer driven market of PC-based gaming systems, as well as consumer targeted applications, such as HD-TV. These markets are important drivers behind the development of high-end graphics features that thereby become available for professional and embedded applications. The second reason is the general development in hardware technology such as the PEG (PCI Express Graphics) interface which permits easy addition of advanced graphics capabilities. Moreover, with PCI Express on board, the internal busses are no longer the bottleneck when it comes to forwarding data from video sources to the CPU and the graphics engine. Processor vendors have also been working on smaller sized, highly integrated and more power-efficient solutions that are ideal for embedded computing applications due to lower thermal cooling requirements. These trends, in combination with new market demands, have led to comparatively low-power designs with sophisticated graphics performance that are ideal for many embedded applications.

What are high-end embedded graphics?

In embedded computing, the term "high-end graphics" refers to the most sophisticated graphics features available on the embedded market. These include support for multiple screens, the ability to quickly switch between different displays, higher resolution panel support, 3D graphics, including DirectX® 10, accelerated decoding of HD video data for enhanced playback and fast updating of video displays. Support for DVI, HDMI and the new DisplayPort in combination with analog VGA or digital LVDS are also high-end graphics features. Typical embedded applications requiring high-end graphics include medical and industrial image processing, gaming and entertainment machines, POS/POI terminals, facility management and digital signage.
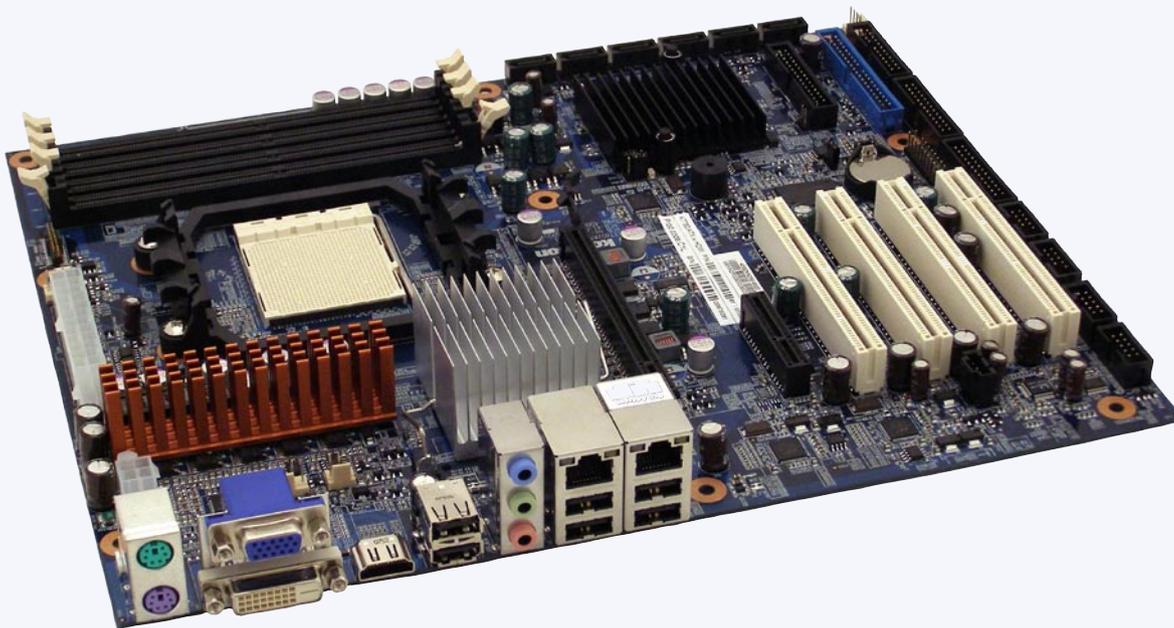
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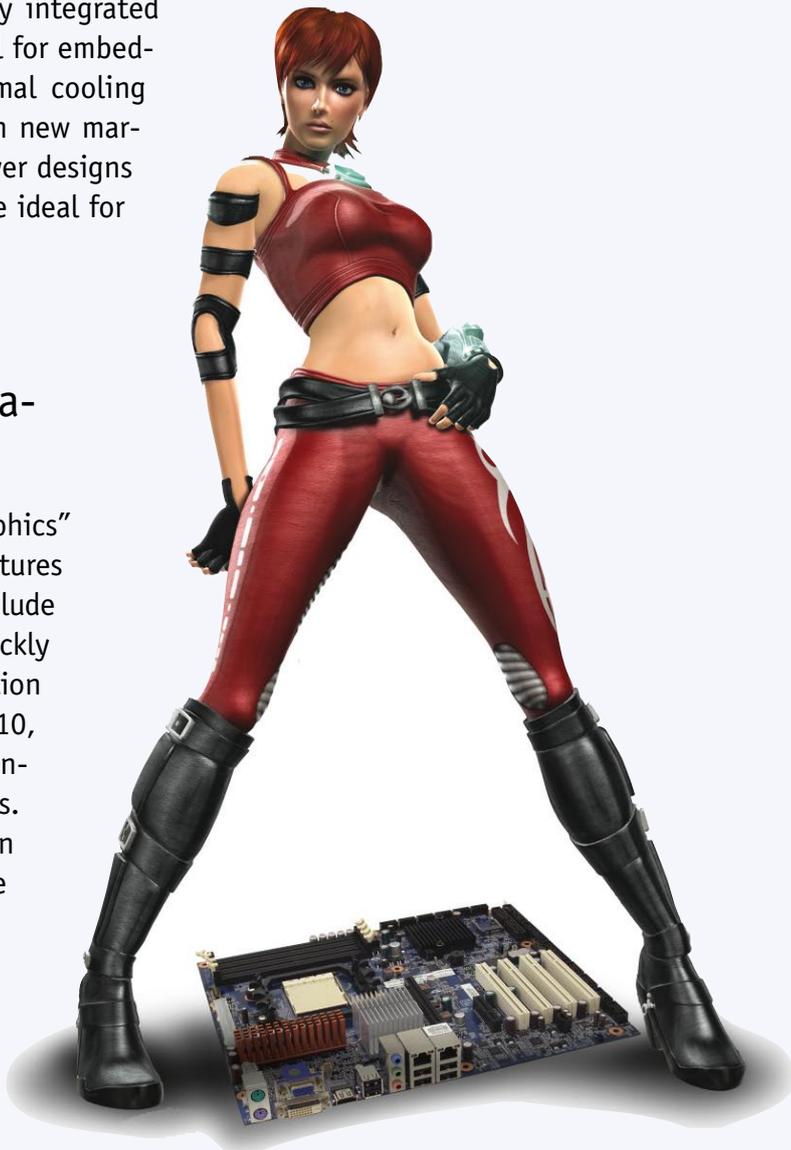
High-end graphics and long-term availability

Until recently, graphics have always been a problem for developers of such applications. If they were looking for powerful graphics with long-term availability for their embedded designs they found that such solutions simply did not exist. Standard consumer graphics cards are often discontinued after just a few months, following the typical lifecycles of standard motherboards intended for the consumer market.

The trouble with consumer boards

OEMs that rely on consumer boards face significant expenditure during their products' lifecycles. New graphic processing units (GPUs) and new GPU architectures appear on the market approximately every six months. As soon as they are incorporated into a consumer board, the previous boards are often no longer supported. OEMs are forced to buy new consumer boards for their embedded systems even though their embedded applications are designed for longer innovation cycles. Together with monthly driver updates, the frequent innovation cycle for consumer boards negatively affects system reliability and increases total cost of ownership. Parallel to this, the power demands of consumer graphics cards have grown exorbitantly with high-end cards currently consuming up to 200 Watts and even more for peak power. In some cases, fan failures cause further reliability problems and reduce the board's MTBF.

The option of designing proprietary graphics capabilities can be even more problematic since the components used could be discontinued before the finished design goes to market. At the same time, the expense and design risks involved in implementing the latest GPUs are enormous. Embedded computing boards with integrated high-end graphics remove a lot of these risks and reduce costs. Major factors are: extended availability, reduced energy consumption and optimized cooling concepts.

Figure 1: The Kontron KT780/ATX basic motherboard with integrated ATI Radeon HD 3200 graphics

Basic motherboards with integrated high-end graphics

Today, high performance graphics are available on the embedded chipset and embedded computing vendors support these technologies on their motherboards. The Kontron KT780/ATX basic motherboard, for example, offers cost-optimized AMD Phenom™ Quad Core processor performance and the latest AMD 780 chipset with integrated high-end graphics features on a compact ATX form factor. The term "basic" does not refer to a reduced feature set. It is a market segment definition. On the one hand, every computing store offers motherboards at attractive prices, but the configurations they offer are only available on a short-term basis. They are designed for consumer and office PCs that do not rely on identical configurations over time. At the other extreme, there are embedded motherboards that are available in the same configuration for periods of five years or more. Basic motherboards offer a new middle way between these two product segments since they are motherboards offered in the same configuration for up to 3 years. These motherboards are an attractive solution for companies who need boards that will be available beyond the typical lifecycle of consumer boards, but whose applications have a higher innovation rate than typical embedded boards and therefore require boards with only a reduced longevity of 2-3 years. Examples include POS/POI applications that feature graphics as a USP (Unique Selling Point). These applications have to be visually up to date and have a lifecycle less than the typical embedded applications. Developments in graphics performance make it necessary to upgrade these systems to a far more powerful solution with next generation, new features at least every two to three years. Many users experienced this with the introduction of HD-video: the necessary CPU and GPU performance for decoding the signals as well as new protocols, such as HDCP (High-bandwidth Digital Content Protection), made it necessary to exchange the complete hardware basis.
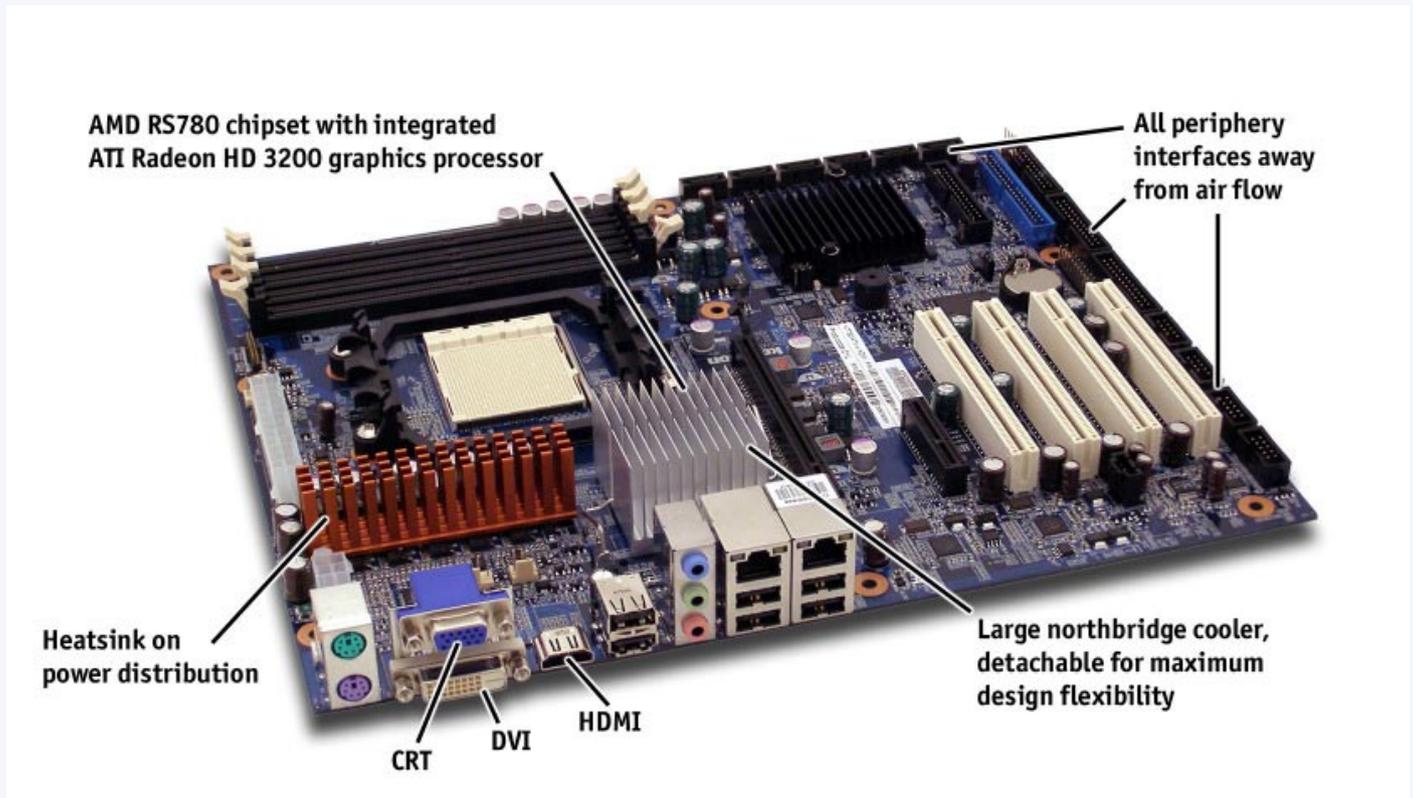
The Kontron KT780/ATX basic motherboard exactly meets these demands. It outstrips the longevity of any consumer motherboard, thus reducing the design risk. At the same time it offers a reduced longevity compared with embedded motherboards. Together, these factors reduce the total cost of ownership for embedded applications with relatively fast innovation cycles.

The KT780/ATX basic motherboard in details

With CPU technology up to quad-core, the KT780/ATX motherboard delivers the performance required for life-like graphics, crystal-clear digital media and serious mega-tasking. The additional bandwidth of the AMD RS780 PCI Express 2.0 chipset with integrated ATI Radeon HD 3200 graphics processor gives the Kontron motherboard the required bandwidth for supporting high-end graphics features such as DirectX® 10, dual display, integrated DVI, HDMI (optional) and CRT, as well as internal TMDS (Transition Minimized Differential Signaling) and VESA DisplayPort functionality. Moreover, hardware based video signal decoding routines for MPEG2 or H.264 HD video are integrated into the northbridge. This dramatically reduces CPU load when playing HD videos. This means that applications requiring less processing performance can save costs by using a price and performance optimized processor whilst still benefiting from many high-end graphics features.

Exactly like high-end consumer boards, basic motherboards from Kontron offer a broad range of interfaces onboard like SATA, PATA, USB 2.0, PCI, PCI Express (x16 PEG and x4) and Gigabit Ethernet. They also offer features such as SATA RAID 0/1/5/10 support for enhanced data safety. But they exceed the latest consumer boards with extended embedded features such as LPT and COM interfaces. Moreover, the KT780

basic motherboard offers the energy-saving features and optimized cooling concept required by embedded applications.

Figure 2: The Kontron KT780/ATX basic motherboard in details

Lower energy consumption

The Kontron KT780/ATX features the latest AMD chipset with 65 nm technology. The extremely dense design reduces energy consumption by minimizing the switching current through the transistors, reducing dissipation loss. And by integrating high-end graphic features into the northbridge on the basic motherboard, most applications will no longer require an additional graphics card. This not only saves space, but also energy consumption and the burden on system cooling. This is of particular interest to power-sensitive embedded applications such as POS/POI and digital signage that require compact, space saving designs. In idle mode the AMD RS780 uses as little as 0.95 W, including the integrated DirectX® 10 GPU. It is also attractive for a broader range of embedded applications since it offers the chance to incorporate high-end graphics features into either existing or new applications without increasing energy consumption and the hardware footprint.

For applications that nonetheless require additional graphics cards, the Kontron KT780/ATX basic motherboard supports PCI Express 2.0 graphics enabling expansion cards to be connected via high speed PCI Express graphics slots as needed. The PCI Express graphics card runs in parallel with the integrated graphics to either boost graphics performance via cross fire by approximately 150 percent or connect up to four independent monitors. Furthermore, users can switch between the integrated and the PCI Express graphics card without rebooting the system. This is particularly interesting for applications that need to power different displays alternately.

Optimized cooling concept and board quality

Another feature that differentiates basic motherboards from consumer motherboards is the sophisticated cooling concept. The fins on the northbridge heatsink are typically larger than those found on a consumer board. Moreover, the heatsink is detachable and enables, for example, the motherboard to be housed in a fully enclosed casing with conduction cooling. Another major source of heat is the power distribution unit on the motherboard. Unlike consumer boards, this unit on the KT780/ATX also has a heatsink for optimal cooling. For system designs that use fan cooling, all of the expansion sockets on the KT780/ATX are located at the motherboard's periphery to ensure that cables do not obstruct the air flow over the processor, chipset and power distribution unit. For enhanced board quality, Kontron uses a high-speed digital logic motherboard design with a multi-layer stacking PCB. This ensures signal integrity, reduces radiation, improves signal quality and aids in the decoupling of the power bus, resulting in high quality electromagnetic compatibility and superior motherboard quality and performance.

From basic motherboards to embedded motherboards

This sophisticated cooling concept together with low energy consumption and medium-term availability make the Kontron KT780/ATX the standard solution that is tailor-made for embedded applications with high-end graphics. As well as offering "basic" high-end processor and graphics performance, Kontron also provides long-term availability for "embedded" ATX, Flex-ATX and Mini-ITX motherboards.
With its footprint of just 17 cm x 17 cm, the Kontron KT690/mITX, for example, is extremely small, but nonetheless delivers increased computing power and better performance-per-watt, thanks to the AMD Sempron™ single core and AMD Turion™ 64 X2 dual core processors. The Kontron mini-ITX motherboard also offers increased graphics performance with the integrated Radeon™ X1250 Graphics Core.

Figure 3: The Kontron KT690/mITX embededded motherboard

Summary

With the new class of basic ATX motherboards based on the latest AMD CPUs and chipsets, Kontron has taken the initiative and responded to the market need for an embedded solution with defined longevity and high-end graphics with outstanding computing performance. Together, Kontron's basic and embedded motherboards are set to meet the growing need for high-end graphics in embedded applications.

Author´s Bio

Jens Wedenborg works Sales and Marketing at Kontron technology A/S in Denmark, where he is responsible for developing marketing strategies and looking after sales partnerships. He has a degree in History and Economics from the University of Copenhagen and more than 11 years experience at managerial level in both B2B and consumer electronics.

About Kontron

Kontron designs and manufactures standard-based and custom embedded and communications solutions for OEMs, systems integrators, and application providers in a variety of markets. Kontron engineering and manufacturing facilities, located throughout Europe, North America, and Asia-Pacific, work together with streamlined global sales and support services to help customers reduce their time-to-market and gain a competitive advantage. Kontron's diverse product portfolio includes: boards and mezzanines, Computer-on-Modules, HMIs and displays, systems, and custom capabilities. Kontron is a Premier member of the Intel® Embedded and Communications Alliance. The company is a recent three-time VDC Platinum vendor for Embedded Computer Boards. Kontron is listed on the German TecDAX stock exchange under the symbol „KBC". For more information, please visit: www.kontron.com.

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