

Small form factor infotainment system designers integrate new graphics capabilities

By Christine Van De Graaf

Infotainment systems have evolved into smaller, more space-constrained designs, and require improved graphics capabilities, long-term availability, and cost-effective embedded computing solutions. It is important to recognize when and where to upgrade from using an add-on graphics card to doing a completely new design that takes advantage of next-generation SFF platforms that offer flexible and highly optimized native graphic functionalities.

The design requirements for today's POS/POI interactive terminals, digital signage, gaming, and other infotainment applications now need the support of advanced high-definition imaging, video, and display interfaces. [In-vehicle infotainment is another example taking off in the consumer market. See sidebar on page 13.] The push toward increased graphics-intensive infotainment applications is twofold – the latest processor architectures now feature more advanced graphic capabilities and the end-user public has come to expect that these systems provide the same high-level graphics and sophisticated interactivity found in other consumer electronics. Furthermore, infotainment systems have evolved into smaller, more space-constrained designs, while at the same time need long-term availability and cost-effective embedded computing solutions. Satisfying consumer expectations and integrating new processor graphics functionality in a small form factor infotainment system brings a whole new set of design considerations. This discussion will highlight several types of typical infotainment application examples, and present the deciding factors that determine when to upgrade legacy systems with an add-on graphics card or to do a totally new design that takes advantage of flexible and highly optimized native graphic functionalities.

Infotainment meets improved graphics performance

Graphics performance is an embedded computing capability that has traditionally lagged

behind other advancements. In the past six months, that reality has changed. System designers now have access to embedded boards and modules based on new graphics-intensive processor architectures that allow them to develop rich visual infotainment applications and eliminate the need for a dedicated graphics card. For example, the AMD Embedded G-Series is the first processor family to integrate a new Fusion Accelerated Processing Unit (APU) that merges x86 computing capabilities with the parallel computing power of a General-Purpose Graphics Processing Unit (GPGPU) in a single computing unit. Dual processing had previously been the domain of high-performance multicore designs, but is now available to designers of low-power SFF (25 W to 35 W max. systems) applications. The AMD G-Series incorporates DirectX 11-capable discrete-level graphics, a parallel processing engine, and UVD 3.0, which is a dedicated high-definition video acceleration block. The AMD APUs include five different performance/power versions, providing a broad, single-platform approach that enables OEMs to precisely match their application requirements and allows development of a complete product line from low to high end on a single embedded platform without the need to adapt the OS and software to different chipsets. This

design uses the Fusion Controller Hub (A55M), which makes it easy for designers to move from a legacy to an AMD-based solution.

Another boon for designers is that the new AMD G-Series processors operate at 9 W or 18 W. This lower power is an ideal thermal platform for fanless and rugged low-power applications, such as outdoor infotainment and kiosk systems or advertising panels.

SFF graphic enablers: COM Express Type 6-based modules

The new PICMG COM Express Type 6 pin-out standard was adopted in August 2010 and was developed specifically to support additional graphics and display capabilities now featured in the latest processor architectures (Figure 1). Type 6 enables native support for the expanded list of new display interfaces, keeping pace with other industry graphics standards. Type 6 supports advanced graphics options by offering three new ports that are dedicated to new Digital Display Interfaces (DDIs). These interfaces are helpful in reducing cable and noise issues and provide enhanced image resolution, compared to traditional analog signal interfaces. DDIs are now separated from the PCI Express Graphics (PEG) port, which allows for the parallel use of integrated high-definition graphics resulting in higher bandwidth, greater than 1 GHz, and reduced latency due to the increased PCI Express speed. Intel has selected PEG as its high-speed bus for external graphics cards. Additionally, Type 6 allows a graphics card to be used either for connecting additional displays or as a GPGPU.

Important for infotainment developers is Type 6 pin-out support for the digital display DisplayPort standard from the Video Electronics Standards Association (VESA). Compared to HDMI, DisplayPort is a universal interconnect and is royalty-free. DisplayPort has a much higher data transfer rate of 17.28 Gbps compared to 2.835 Gbps with LVDS and 4.95 Gbps with DVI. Adding to its flexibility, DisplayPort's auxiliary channel can be used for a broad range of multimedia peripherals including touch-panel displays and USB connections.

Legacy add-on or new design

Because of the availability of new graphics technologies and embedded platforms, many infotainment system OEMs will be faced with the same decision: Should I upgrade my existing application with an add-on carrier board or does a new design make sense? These decisions ultimately come down to cost, which takes in multi-

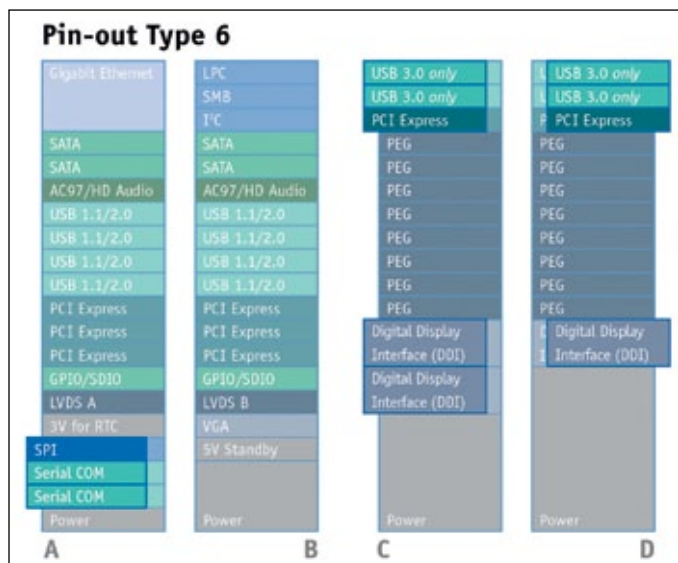


Figure 1 | Type 6 replaces legacy PCI pins in favor of using them to support digital display interfaces and additional PCI Express lanes.

ple factors. The factors to evaluate include the platforms or technologies the current design is based upon, if any customization is needed, the length of time an application will be deployed, how many units are or will be deployed, and what are the power/performance/ruggedization requirements, product roadmap, and go-to-market and user demands for the application.

Where add-on cards make sense

Add-on graphics cards are viable for cost-sensitive systems with shorter product life expectations of two to three years and do not have to contend with harsh environmental conditions, such as indoor digital signage and hotel or business information boards. These infotainment applications typically use current television technology, which is updated frequently. Even though these types of systems need to meet high consumer visual expectations, they rarely require customization and do not need extended shock and vibration ruggedization. These types of digital signage applications are most likely using a motherboard or an SBC, so upgrading the system with a graphics add-on card or carrier board that allows designers to add graphics memory, graphics processing capabilities, and other types of display support may be the most cost-effective solution to set up multi-monitor systems that will most likely change on a regular basis.

The disadvantages of add-on cards are that they usually require a right-edge connector. In space-constrained SFF designs, an edge connector takes up more space (card-edge boards are typically 3" to 5" taller) and exposes it to additional shock and vibration that can lead to signal integrity issues. Plus, graphics card technology changes quickly, often resulting in potential support and maintenance issues. Designing graphics capabilities onto a carrier board is a more rugged, long-term option, but does require additional development time and resources. And, carrier boards are more difficult to swap in and out if new functionality changes are needed, as opposed to having the needed features integrated directly onto the module or board.

When applications benefit from a new design

By comparison, many infotainment applications such as POS/POI terminals can take embedded computing and graphics requirements to the extreme. These systems have long life requirements of seven years or more and their designs will support as many as several hundred deployed units. With almost constant use, these systems must be very rugged and may require moderate to major levels of customization. POS/POI and other interactive kiosks can benefit from new design development based on the increased graphics performance and interface support delivered in the latest SFF Computer-on-Modules (COMs) (Figure 2). COMs based on AMD's Embedded G-Series processors give infotainment OEMs a notable advance, providing native high-performance graphics directly into the silicon and eliminating the need for an add-on graphics card.

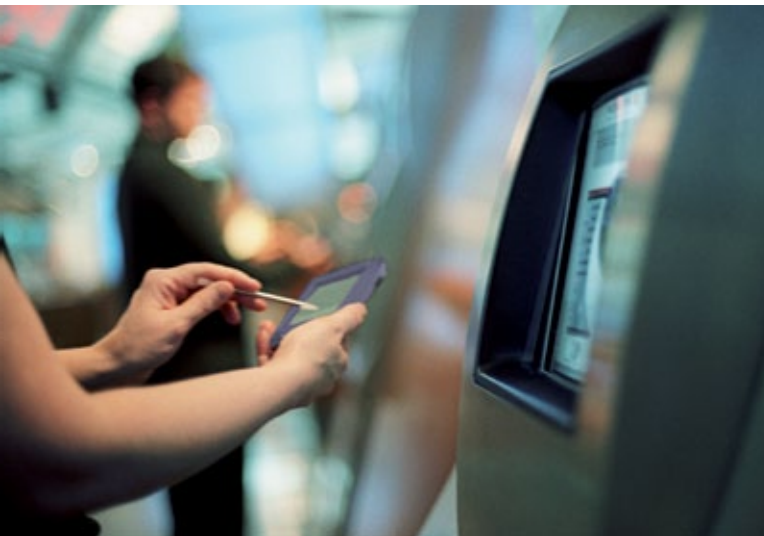


Figure 2 | POS/POI designs can take advantage of the native high-performance graphics capabilities integrated in new SFF COMs that also support long product life and rugged requirements.

Power savings are an additional benefit derived from integrated graphics technology. For example, COMs that incorporate the Universal Video Decoder 3.0 enable the CPU to “unload” when decoding video streams. Furthermore, rather than having to use separate graphics add-on cards that add to the power and system footprint, new graphics-intensive SFFs can now support decoding of up to three HD videos in parallel, and as many as four displays are supported by a rich variety of interfaces including DisplayPort, DVI, HDMI, LVDS, and VGA.

Deciding to go with a new COM design provides customization advantages. A custom design is frequently needed to add interfaces and switching circuits, and can be accomplished on the COM’s carrier board. When carrier board design is complete, customization can be applied to multiple generations through plug-and-play by swapping out one CPU module for the latest version. This developmental approach is optimal for systems that require scalability from generation to generation, and also works for expected alterations in dynamic markets within a single generation.

SFFs deliver rich graphics for infotainment applications

Infotainment designs are evolving to meet the high visual and graphics expectations of an increasingly electronics-savvy consumer. OEMs must make sound economical decisions based on multiple factors when upgrading or adding new products. Welcome news for designers is that they now have access to an unprecedented level of graphics integration and standards support that creates a new foundation for delivering high-performance multimedia content in a power-efficient, small form factor platform suitable for a broad range of infotainment applications. New SFF COMs such as the Kontron microET express-OH provide the necessary native graphics support, parallel processing, and low power consumption designers of infotainment systems require to deliver the rich visual experience users have come to expect. [SFF](#)



***Christine Van De Graaf** is the Product Manager for Kontron America’s Embedded Products Business Unit. Christine has more than 10 years of experience working in the embedded computing technology industry and holds an MBA in marketing management from California State University, East Bay, Hayward.*

Kontron

510-284-1100

christine.vandegraaf@us.kontron.com

www.kontron.com