



Board Games

The Qseven definition extends computer on module applications to small and mobile systems.

By Gerhard Gilch.

Since the first computer on module (COM) definition appeared in 1999, the technology has found its way into most embedded computer applications.

Following the introduction of the Intel Atom, pc technology became less power hungry and this trend continues in new COM developments. However, not every COM concept is optimally suited and, to accommodate mobile and power saving technologies, a new COM definition – Qseven – was adopted in July 2008.

While most module standards are fitted with ‘board to board’ plug connectors, Qseven employs an MXM card plug with 230 pins on a 0.5mm grid. Because this plug is also used for fast laptop graphics cards, it can handle the high data transmission rates required by PCI Express graphics. Three manufacturers offer this plug in two heights and in a rotated variant, giving flexibility when designing carrier boards.

However, Qseven COM is not held by the card plug, instead it is mounted using four screws and a spacer, providing high shock and vibration resistance.

Only the latest interfaces are used in

Qseven and legacy interfaces – such as parallel IDE and PCI – have been omitted in order to reduce cost and complexity.

Software API

To enable compatibility between Qseven modules from various manufacturers, the specification defines not only the hardware, but also an integrated software interface for embedded functions. The programming of the watchdog timer, the i²c bus and lcd brightness, together with access to the bios user memory area and the recording of system temperature, are all controlled integrally. Qseven is the first, and so far the only, COM definition which allows users to make software adjustments if they have to change supplier.

All four COM definitions – COM Express, XTX, ETX and Qseven – support direct control of a flat display by low voltage differential signalling (lvds), but modules require additional information from the connected display in order to set the output format and data timing functions. Qseven achieves this using DisplayID (see www.vesa.org), with one of the VESA standardised data formats

read in from the display unit via the i²c bus and interpreted by the video bios. While this is technically possible with other definitions, it is not fixed in their specifications. Implementation is, therefore, dependent upon manufacturer and this reduces module compatibility.

COM Express and Qseven support as standard Intel’s Serial Digital Video Out (SDVO) format. With this interface, using either an appropriate encoder or a proprietary ADD-2 plug in card, an additional DVI or TV out interface can be implemented. With ETX and XTX, no SDVO signals are envisaged – a few manufacturers do provide the signals, but only via proprietary cable interfaces.

New chipsets, such as Intel’s US15W system controller hub, do not support analogue video signals. Instead, digital video interfaces such as DisplayPort and TDMS are offered. With Qseven, the necessary signals are provided at the SDVO connections. The interface ultimately used is then a function of the baseboard design.

DisplayPort, one of the newest VESA definitions, is considered as the ‘prime candidate’ to succeed the HDMI interface.



By contrast to HDMI, DisplayPort is a free standard and, in comparison to DVI, TDMS and LVDS, offers an extendable, packet based protocol which can transmit additional information, together with the picture data. Four differential circuits allow up to 10.8Gbit/s can be transmitted, compared to 4.95Gbit/s with DVI and 2.835Gbit/s with lvds. Additionally, future high resolution displays can be controlled.

PCI Express

PCI Express is a serial differential communications circuit supporting a bidirectional data transmission rate of 2.5Gbit/s using two cable pairs. In

contrast to the parallel PCI bus, which supports only 13Mbit/s, one device can be connected per lane and faster devices can accommodate more lanes. The PCI Express Graphics port consists of 16 PCI Express lanes, reserved for control by external graphics cards. After



as well as the mechanics and cooling concept, are identical. ETX applications without an ISA bus can use XTX modules without problems. Qseven and COM Express, however, are new definitions and are not compatible with ETX or XTX.

Whilst COM Express allows a maximum

the ISA bus. By turning its back on the PCI bus and vga, Qseven has moved a step closer to its 'legacy free' goal.

The absence of parallel, floppy and PS/2 ports should not bother most system designers, since there are adequate USB peripherals. However, the absence of serial interfaces could be concern, since these are popular industrial interfaces.

It is here that the XTX form factor can score over COM Express. As with ETX, 2x COM, 1x LPT, 1x floppy (shared with LPT) and PS/2 keyboard/mouse ports are supported, as are PCI Express, SATA and HDA. This forms a bridge between the old and new computer worlds. But even with a Qseven based design,

classic serial interfaces can still be implemented on carrier boards using the low pin count port; basically an ISA bus with a few limitations, reconfigured for serial signals.

It is clear that the PCI and EIDE parallel interfaces will disappear from Intel's chip development programmes. The situation with respect to the ISA bus is a little more complex; while it will be manufactured, it may have to do without certain functions, depending on chipset arrangements. This may limit ETX module installation options.

Shedding the ISA bus and the addition of serially differential interfaces makes XTX the logical successor to ETX. COM Express, with its flexible pin configuration, is already orientated to a future without PCI bus and IDE. So, the Type 5's unusual plug arrangement (2 x 220pins) is being omitted in favour of additional Ethernet and PCI Express ports, allowing COM Express to offer the maximum possible I/O performance. In terms of performance and power requirements, Qseven remains an attractive solution for all future mobile and battery operated applications.

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Gerhard Gilch, Congatec

allowing for data overheads (10 databits need to be transmitted to provide 8 userbits), Qseven and XTX applications support data transfer rates of around 8Gbit/s per direction. COM Express provides up to 44Gbit/s, of which 32Gbit/s are reserved for optional external graphics.

Compatibility

With the difference between ETX and XTX being in the plug definition, a large degree of compatibility between the two is guaranteed. ETX uses a 100pin plug exclusively for the ISA bus, whilst XTX has four PCI express lanes, 4x SATA, two additional USBs and high definition audio on the same plug. The remaining signals,

power consumption of 188W and ETX/XTX modules use up to 40W, processors such as the Atom Z5xx with US15W chipsets require less than 5W. It is likely that future product development will result in x86 processor platforms drawing even less power. In contrast to module standards currently in use, Qseven is designed to have a maximum power consumption of 12W for mobile and battery operated applications and the interface layout has been orientated towards the latest mobile chipsets.

'Legacy free' vs 'legacy'

COM Express has not only moved towards fast interfaces with a viable future, but has also shed antiquated ports – such as

