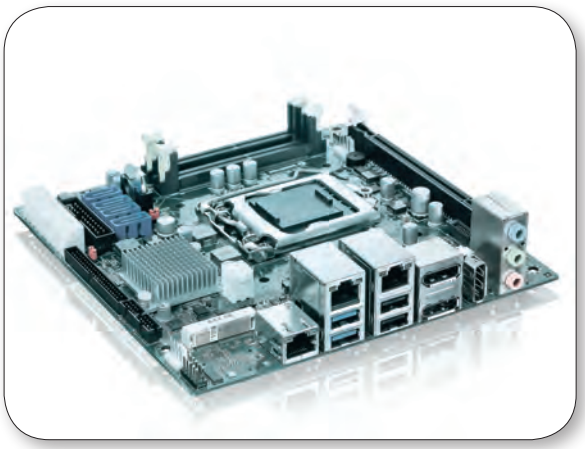
Motherboards for safe operation in harsh industrial environments

By Peter Müller, Kontron

In harsh industrial environments, can high quality motherboards from brand manufacturers do the job as dependably as purpose-designed embedded motherboards? What is really needed for operation in these applications?



Embedded motherboard mITX-KBL-S-C236 with a socketed 7th generation Intel Core processor

Standard PC technology based on 32- and 64-bit x86 processors has been used for computing-intensive industrial applications for decades due to its favorable price-performance ratio. The computer boards ("motherboards") can be installed in so-called industrial PCs or directly in the respective devices. But with the complexity of many industrial applications and high levels of interdependence between devices, it is essential to ensure highest availability and reliability. Even small errors and failures can cause large and expensive damage. Thus, stringent quality standards are a prerequisite. In addition, customers demand an extended lifecycle management with long-term support of ten years or more.

A distinction must be made between a general high-quality standard on the one hand and the special "embedded" challenges that arise from the harsh and varying conditions found in industrial environments. The former can be achieved through sophisticated design and production processes and the use of high quality parts and components.

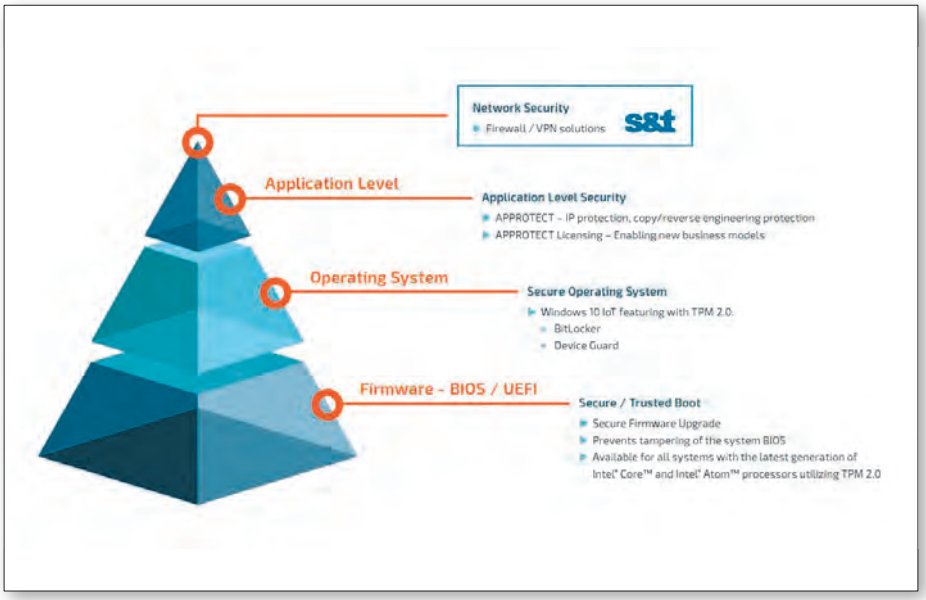
Even so, a motherboard is not the same as an embedded motherboard. Embedded systems in harsh industrial environments and elsewhere have their own set of rules. They must be suitable for permanent use in critical environments. Indispensable for use in industrial environments is the ability to operate in extended temperature ranges of up to 60°C, and a high degree of robustness, which means insensitivity to moisture, dust, shock and vibration.

While existing motherboard designs can be "upgraded" relatively easily by additional measures such as varnish and coating or more elaborate housings, the protective measures for insensitivity to shock and vibration would have to have been established at the initial design phase. Finally, the quality of support over the entire operating period must not be taken for granted.

Depending on the specific application, embedded motherboards also require special features such as safe operation within extended temperature ranges, RTC (Real Time Clock), additional serial interfaces/GPIOs, and optional remote maintenance connections. There are often additional security features necessary such as Trusted Platform Module (TPM). And if special interfaces are to be implemented on the motherboard or via a plugin card, then software and integration know-how of the manufacturer is a further requirement. In general, today's embedded motherboards are widely scalable. On the one hand from Intel Atom processors to Xeon processors in terms of computing power and energy consumption, and on the other from Mini-ITX to ATX when it comes to size. The actual format is usually determined by the type and number of expansion options required on the board. Derived from the original AT and later the ATX form factor, today the usual formats for embedded motherboards are ATX (305 x 244 mm²), Flex-ATX (299 x 191mm²) and Mini-ITX (170 x 170 mm).

Common to all are the standardized ATX power connector, and compatibility of the mounting or mounting holes. This also applies to the formerly very popular micro-ATX form factor, which however has nowadays largely been replaced by the smaller Flex-ATX format.

Although trends favor smaller systems and thus clearly tend towards Mini-ITX as "the" standard, the two larger formats still serve a useful purpose, especially when it comes to replacing existing legacy systems: There are still four slots for conventional memory available instead of the mini-ITX motherboards' two slots. Also, the number of PCIe or even classic, parallel PCI slots is significantly higher with ATX (5 to 6) or Flex-ATX (2 to 3) than with Mini-ITX boards. At best, these provide space for a single, 4-lane+ capable "big" PCIe



Kontron Security Pyramid: 3 levels of security from trusted boot to secure application execution.

slot, if at all. However, the need for such slots - for example, to connect a discrete graphics card - has greatly decreased due to the power of current integrated graphics systems. For most other requirements, space-saving X1 and X4 PCIe connectors are sufficient. They fit the smaller Pico-ITX boards in 2.5 "(100 x 72 mm²) format.

Embedded motherboards are a cost-effective and efficient solution for many types of industrial computing applications and can rely on X86 technologies where there are no overly demanding communication interface requirements. For harsh industrial environments, however, even good quality standard motherboard solutions from IT manufacturers are usually unsuitable due to their simpler design and lack of robustness. Furthermore, the typical business models of the IT industry are a bad fit for the consulting- and support-intensive business of the system integrators and manufacturers found in mechanical engineering. IT manufacturers also often lack the necessary appreciation for the special requirements motherboards face in the harsh environment of industrial production.

A manufacturer with proven experience in the specific needs of the manufacturing industry can greatly reduce project risk. The extensive experience makes products meet market requirements and challenges from the get-go, and improves the consulting and support qualities enormously, providing an invaluable advantage. ■

Product News

■ IBASE: fanless motion control system for smart machine automation

IBASE Technology announce the MAI602-M4D80 motion control system that can be used in various factory production applications such as automated optical inspection, semiconductor wafer handling, packaging and material handling systems. The MAI602-M4D80 is powered by 7th/6th Gen Intel Core i7/i5/i3 desktop processors and has a 4-axis motion control PCIe card that meets the performance and positioning accuracy requirements of high-performance servo/step motors. For use in visual inspection applications, the motion control card has a camera integrated with a position comparison trigger.

News ID 6488

■ Axiomtek: smart display module fits the thinnest integrated displays

Axiomtek is proud to introduce the SDM300S, a signage computer module following the newest Intel Smart Display Module Small (Intel SDM-S) architecture. The Axiomtek's SDM300S is powered by the onboard Intel Pentium processor N4200 and Celeron processor N3350 with the Intel HD Graphics 505 or 500 chipset. The sleekest all-in-one display module measures only 100 x 60 mm (roughly the size of a credit card), which makes for a thinner display. Whether externally plugged in to a display or built in, the high-performance smart display module is optimized for digital signage, interactive kiosks, point of sale and video walls.

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