

Selection Factors for Industrial Embedded PCs

A successful product selection is a balanced combination of three important elements: Hardware, Software and Vendors

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All embedded PCs are not created equal. Each has been designed for a specific application. And just because a manufacturer adds a bullet on their data sheet stating that the product can be used for industrial applications, does not mean that it is necessarily so. Selecting a standard, off-the-shelf board from the wide variety of products on the market requires forethought and screening to match your application requirements.

Product Selection: A three-legged stool

A successful product selection is a balanced combination of hardware, software and the vendor. You can visualize this concept like a 3-legged stool with one leg as the hardware component, the next as the software component, and the last as the supplier. If any one of these legs come up short, then the project could tip and fall. This manifests itself as missed project deadlines, late product introduction, poor technical support, late deliveries, cost overruns, and other non-planned surprises.

Software

Embedded PCs allow customers to get their product to market quicker while leveraging the vast software infrastructure and programmer knowledge base. More and more, software is the driving issue with embedded system design. Whether it is Linux, Microsoft's Windows® CE or XP Embedded, a real-time executive or even DOS, the software strategy needs to be carefully considered.

The advantage of selecting an embedded PC is that the same standard PC software environment is also available on boards optimized for deeply embedded applications. A programmer can use their existing knowledge base with a wide

variety of software options. This increases productivity and shortens product development time.

Does your embedded PC vendor have a relationship with Microsoft and with a Linux supplier? Do they

have a development kit to help jump-start your application? Are tools available to develop and debug your application code? Can the technical support staff answer your initial configuration questions satisfactorily? Is there sample code and are drivers available? Can they provide advanced training or do they have a strategic relationship another provider with that capability?

Hardware

Design and manufacture of an embedded PC is not based upon a single technological breakthrough, but rather a combination of innovative technology, features, and manufacturing expertise. Key issues are

There are essential questions that need answers before you select an embedded PC.

processor performance, PC compatibility, the correct I/O mix for the application, long-term availability of the silicon, extended temperature operation, support of solid state disk (SSD) storage rather than rotational

PC-Based Architectures Easiest to Use

The unprecedented success of the x86 architecture in both office and laptop PCs has resulted in dramatic improvements in price/performance, power dissipation, and smaller size. For many industrial applications, a PC-based solution is one of the easiest system architectures to use.

The popularity of an embedded PC is in the ability of a user to buy off-the-shelf hardware and customize it with software. The net result is that the amount of time available to develop an embedded system has decreased significantly with times now as short as 3 to 6 months.

This open architecture standard has been adapted for industrial applications to become the embedded PC. Embedded PCs are available world wide in all sizes, shapes, configurations, performance levels, and prices. Options range from including a single board computer adaptation to full systems including the display and enclosure.

Many companies that embed a PC could design the hardware themselves. Yet with corporate down sizing and improved efficiencies developed in the 1990s, they feel comfortable with outsourcing. The difficult question is "Which product should I select?" The obvious answer is "the product which meets my specifications."

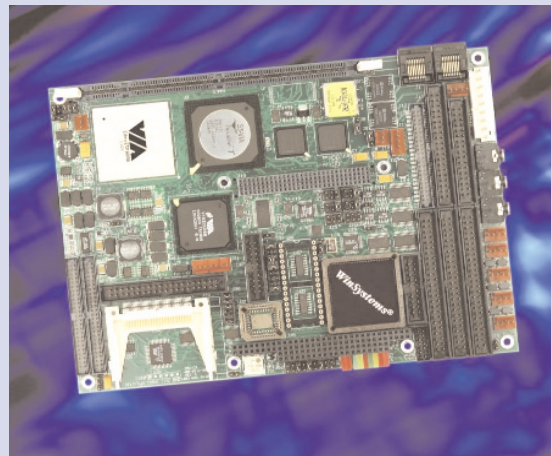
media, LAN, WAN and/or wireless support, low power consumption, small size, and future expansion capability.

An embedded PC's core is based upon a x86-compatible CPU/chipset. For most major silicon manufacturers, this means a derivative of their desktop design and product offerings. Intel, AMD and Via Technologies have specialized divisions in their companies that offer selected desktop products for the embedded market. This provides stability and a longer availability. Ask your vendor if any of the chips they are using are obsolete and what are their plans for dealing with it.

Selection of the I/O mix, operational temperature range, SSD support, board size and other technical features are fairly straightforward. However, expansion options are numerous. It is always good practice to have a way of expanding the features and/or capabilities of a system should the requirements change. Typically it can be done with serial or bus expansion boards. Serial expansion can be with USB, Ethernet, Firewire or the traditional RS-232/432 COM port. Bus expansion can be PC/104, ISA, or PCI cards. Selection of the preferable expansion solution is a function of size, speed, functionality, availability of off-the-shelf products, ruggedness, and packaging.

Other embedded PC selection factors include solid state disk support rather than rotational media, operation with or without a display, and extended temperature operation without the use of fans. If the application is in a

rugged environment, be sure to ask if the board can be obtained with latching connectors if it will be subject to shock and vibration. Also ask if the board can have a conformal coating applied.



WinSystems' fanless 1 GHz SBC balances the conflicting goals of fast operating speed, low power, and wide temperature operation.

Embedded PC Vendor

The true measure of a company's customer support is when something goes wrong. Their quick reaction time, diagnosis of the problem and resolution actions are key. Hopefully you will never need to experience this, but you need to anticipate the possibility. But how do you know if your vendor will respond satisfactorily?

You are entering a business partnership with your vendor. You need to have confidence that your trust will be translated into a long-term relationship with them. Support during design in, especially over the phone is a good indicator. Look for application notes and other documentation. Also, find out how long the company has been in business, whether they build in house or out-source manufacturing, Dun and Bradstreet rating, employee turnover, etc. Look at external factors

such as ratings by independent companies such as VDC and other industry recognition of the company or its employees.

Ask about the manufacturing process. Is it done in-house or outsourced to an assembly house? Who purchases the parts and are they qualified for the specific board? Do they use the most advanced routing techniques to maximize component placement while reducing noise, crosstalk, and interference? Has the board has been subjected to long-term stress testing at the temperature extremes to verify conformance

to specifications? Can they repair and replace BGA and other surface mount parts inhouse? Are lots traced during production? Do they have a bar code system?

Conclusion

There is a shortage of skilled, knowledgeable hardware and software engineers to work on an ever-growing number of industrial embedded projects. Because of that fact, companies are moving from proprietary in-house designs to purchased products based upon the PC architecture. The key to the embedded PC's

success as an alternative to a proprietary design is that it has become a technology transfer tool that allows a system designer to open up seemingly endless applications that previously were unattainable. There are many questions that need answers before you select an embedded PC. Get to know your vendor and choose them wisely. They can be your best friend or worst nightmare.

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