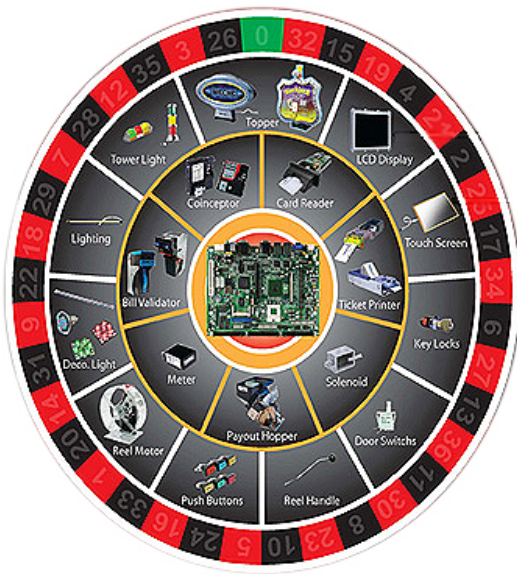


On-board Integration of Embedded Gaming Products



WIN Enterprises WHITE PAPER



www.win-ent.com

On-board Integration of Embedded Gaming Products

Commercial and Embedded Components

The casino/amusement gaming industry can be shortsighted in its approach to product design. Often OEM products are based on motherboards and embedded appliances built with commercial-grade components -- commercial-grade versus embedded-grade components. Commercial-grade products have their place; they are typically lower in cost than comparable embedded components. But because they are not guaranteed for long life, they present a risky choice if one of the OEM's goals is a reasonable long life for the product.

Commercial-grade components can be expected to begin going end-of-life relatively quickly. Eighteen to twenty-four months from introduction to obsolescence would be typical. If the component was close to its end-of-life (EOL) at the time it was chosen for the motherboard design this could happen much sooner. An unexpected EOL can mean a redesign to keep the motherboard and solution-level product viable. If the goal is to market a successful OEM product with a two- to five-year life cycle the OEM should insist on boards designed with embedded components.

Embedded components are chronologically listed on a component manufacturer's embedded roadmap. Purchasing from an embedded roadmap means two things: 1) the component is guaranteed for long-life – anywhere from 3 to 7 years life; and 2) the component manufacturer will inform the customer when the component is going EOL. This enables an original design manufacturer (ODM), like WIN Enterprises, to make a last buy of the component in to carry production forward while it evaluates replacement parts. This provides a seamless transition to the new component.

MB-62000 Gaming Board

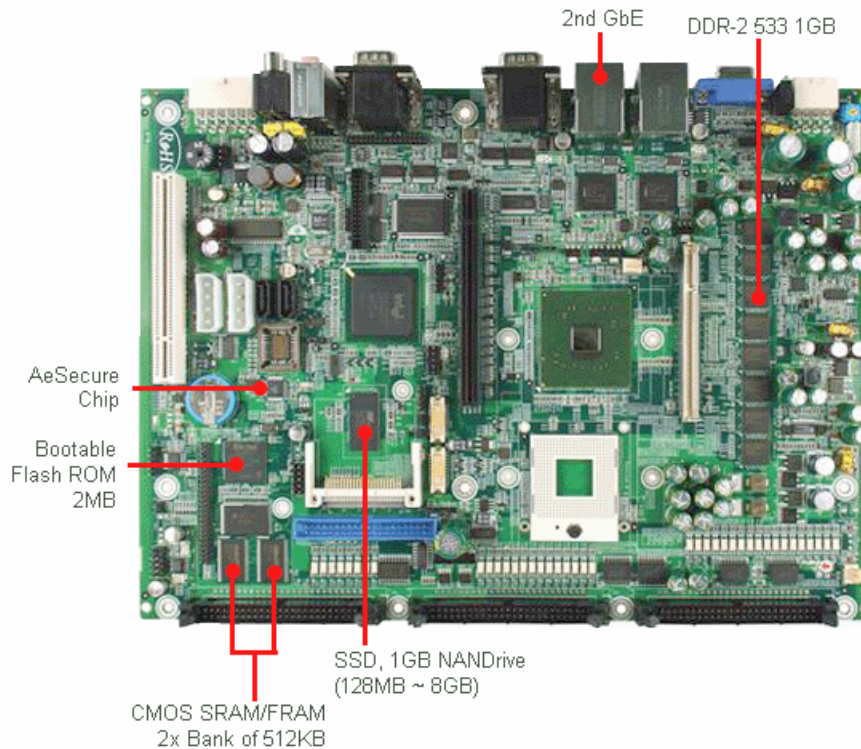


FIGURE 1. MB-62000: Single board computer (SBC) design specifically for casino and arcade gaming applications, such as Video slot machines (class II/III), Video lottery terminals, Amusement game machines, master unit of roulette machine, Downloadable gaming terminal, high-end vending machines, ATMS/Cash machines, and Kiosks. Benefits to gaming manufacturers include single-board design that features integration, economical assembly, and purchasing costs.

Design Continuity

Although utilizing common components provides for some economies of scale, gaming is generally a low volume embedded market. Using standard components across several products enables orders to be aggregated and eases the inventory task. The end-customer benefits to a well-rationalized design approach are increased quality and reliability and decreased costs.

For instance, WIN Enterprises uses a single FPGA type across its gaming products. The FPGA uses a common FPGA driver and API. This enables a greater depth of expertise of the FPGA hardware and its software providing more trouble-free, reliable operation, and faster problem resolution.

Reliability

In addition to employing industry standard environmental and stress tests, WIN increases reliability by designing with fewer connections, such as sockets, slots, cards, connectors, and wires. The fewer the connections, the fewer contact problems. Those functions typically provided by add-on cards are integrated into the motherboard. As gaming machine can see a lot of player jostling and repositioning on the gaming floor, the fewer connections the better.

WIN routes all gaming I/O through the PCI bus. This enables greater communication speed than that allowed by a COM or USB port. This means less latency for smoother play. It also reduces the numbers of cables and software protocols required.

WIN uses the HDD for storage of non-volatile data. HDDs are mechanical components and not reliable over time for the storage of the frequently changing data as is found in the gaming environment. Solid State Drives (SSD) also have write-cycle limitations not exceeding more than 100,000 times. This limited number of 'writes' is not suitable for the storage of sensitive and ever changing gaming information such as credits and wins. All WIN gaming platforms feature built-in Solid State Non-Volatile RAM (NVRAM) that has unlimited access cycles and which are virtually immune to storage crash problems. This is a feature particularly suitable for Casino/Amusement gaming devices which often see 24 x 7 use.

Security

WIN gaming products have a range of on-board security features. These are implemented to ensure the integrity of the gaming data, storage contents, communications, and transactions. WIN uses a custom BIOS across its gaming products.

Security features include:

TPM - Trusted Platform Module. This is an industry standard and published [specification](#) detailing a [secure cryptoprocessor](#) that can store [cryptographic keys](#) for the protection of information.

FPGA - A Field-Programmable Gate Array is an [integrated circuit](#) designed to be configured after purchase—hence the term "[field-programmable](#)." FPGAs are used to implement any logical function that an ASIC (application-specific integrated circuit) could perform. The ability to update the functionality after shipping; to perform [partial re-configuration](#) of a portion of the design; and the low non-recurring engineering costs relative to ASIC design, provide advantages to the OEM when upgrading its gaming application.

aeSecure is a proprietary security feature from WIN Enterprises in the FPGA. It behaves like a combination lock that locks important data stored inside the FPGA.

Crypto Memory allows the OEM to burn additional security features into the system and place it on board for software authentication purposes.

NVRAM protects important data from system crashes caused by power interruptions.

An **Onboard Flash** drive is non-removable media, ideal for the storage of applications. Some contents can even be stored in a hidden partition.

Flexibility

WIN solutions offer a range of different storage options like: IDE/SATA HD, CF/SD card, NANDrive, USB drive, DOM, etc. The use of FPGA provides flexibility to support unique hardware requirements. Multiple FPGAs can be supported through the WIN Gaming API to increase the OEM's gaming I/O options to more than 100 Inputs and Outputs.

Custom Solutions

WIN maintains an in-house hardware/firmware/ software development team that can address an OEM's unique technical requirements. Semi-customization of FPGA functions is also supported. Like all WIN services, which include design, manufacturing, software installation, testing and drop shipping, you purchase just as much or little as you require.

Real-time Control

The use of an FPGA means that some gaming functions do not involve the CPU at all. This reduces CPU overhead and increases overall system performance. Most FPGA features can be directly controlled through the PCI bus with memory mapped I/O. This approach provides very fast response times (i.e., <100nS) with extremely little communication latency to provide smoother game play.

De-bounce and interrupts on input events can be managed at the FPGA level and software does not have to poll the input status all the time.

Timers with interrupts can be programmed using the FPGA. Timers can be used for reminders or to trigger other events. In addition, event counting is reliably maintained without incurring software overhead.

State machine intelligence can be accessed on request, such as:

- Count and stop with timeout (hopper application)
- Motor control and stop control
- NVRAM Mirroring
- Access to sample code with interrupt can be provided

Conclusion

By taking a well-rationalized, integrated approach to board design using embedded-grade components across its gaming product line, WIN is able to offer economical, secure devices with excellent reliability and performance. Use of FPGA provides feature flexibility and easier product upgrades. Non-volatile storage makes WIN devices highly reliable and virtually crash proof.

###