Chapter 1
Design and Implementation of the Embed Computer Based on CompactPCI Express Bus

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ABSTRACT

Due to the development of embed computer, improvement the bandwidth of computer is required, in order to break the choke point of the bus’ development. The text brings a hardware design method of computer based on CompactPCI Express bus, introduces the architecture of system and principle, goes into descriptions about the design of Switchboard, bridgeboard and rapid serial single PCB etc. The use of CompactPCI Express bus improves the bandwidth of computer system, reduces power, improves the performance of system, adapt the requirement of development.

INTRODUCTION

Along with the development of information equipment, as the core of the system, the embedded computer need to handle larger, more sources, higher precision, faster speed of information flow, thereby the data bus bandwidth has been puted forward higher requirements. At present the popular CompactPCI bus in the new application requirements in the industrial control and other special areas, have become relatively backward, it is difficult to adapt to the computer system for high bandwidth, low power consumption and other aspects of the development, development space is very limited. CompactPCI Express bus emerge as the times require, it is a kind of brand-new buses,
has obvious advantages, its high transmission performance, makes Gigabit Network and serial ATA completely satisfy the requirement of high speed access and enter the practical state of load.

CompactPCI Express bus is the current hot research, has a very broad application prospects.

**COMPACTPCI EXPRESS BUS**

CompactPCI Express bus is a third generation high performance IO bus, the bus structure to take the fundamental changes, mainly manifested in two aspects: one is from the parallel bus to serial bus (first and second generation IO bus is a parallel bus), two is a point-to-point interconnect. In 2005 July CompactPCI Express PICMG EXP.0 R1.0 published draft, the draft based on the third generation bus PCI Express electrical characteristics based on the combination of CompactPCI bus mechanical structure form, which in the implementation of PCI-E bus architecture, break through the bandwidth at the same time, for the computer to provide a highly reliable, modular and fast dynamic reorganization of solution.

CompactPCI Express evolved from PCI Express bus and CompactPCI bus, it inherited not only the traditional advantage of its own family’s products, and fully absorb the advantages of other bus standard, has a distinct technical advantage, can fully solve the CompactPCI bus technology problems. First of all, it is difficult with that, the PCI and CompactPCI all devices sharing the same bus of different resources, CompactPCI Express bus using peer-to-peer technology, can assign a exclusive channel bandwidth for each device, without the need for sharing resources between such equipment, fully ensure the device’s bandwidth resource, improving the data transmission rate. Secondly, CompactPCI Express bus uses a unique dual transfer mode, greatly improving the speed of data transmission. The physical layer is provided on the 1 ~ 32 speed optional channel bandwidth characteristics make it can easily achieve almost " unlimited" expanding the transmission capacity. CompactPCI Express bus system, link (Link) is a physical connection between two devices, each link use point-to-point method to interconnect two equipment. A link is equivalent to a bus which just hang only one device. A link includ a plurality of channels, can choose the channel number X1, X2, X4, X8, X16 or X32. The X1 model peak bandwidth can reach 0.5 Gbps, has greatly exceeded the peak bandwidth, X16 model can achieve 8Gbps. Flexibility and extensibility. CompactPCI Express bus can extend into the system outside, using special cable to connect a variety of peripherals directly with the CompactPCI Express bus within system. Secondly, compared with the CompactPCI bus, CompactPCI Express bus signal line number reduced by almost 75%, data will accelerate and the data does not require synchronization. At the same time as the printed board line less, so that by increasing the number of the line to upgrade bus width method is easier to realize, at the same time, the line between the interval can be more broadly, reducing mutual crosstalk. Finally, the software layer remains compatible with CompactPCI. Cross platform compatible is a very important characteristic of CompactPCI Express bus, and it provides a smooth upgrade platform for the majority of users.

In view of so many advantages, the CompactPCI Express technology becomes a current hot research topic at home and abroad.

**SYSTEM PRINCIPLE**

CompactPCI Express bus embedded computer uses the modular design; the module can be replaced conveniently. By CPU plate, bottom plate, plate, mixed bus interchange bridge plate, CompactPCI Express bus, CompactPCI bus peripheral plate outer panel and a power supply. System principle block diagram as shown in Figure 1.
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