



APPLICATION NOTE 9.8

SMSC's LAN9000 Ethernet Family
Non-PCI 10/100Mbps Ethernet Solutions

I/O-Based (Non-DMA) Non-PCI Embedded Ethernet Solutions

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PRELIMINARY



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1 INTRODUCTION

SMSC's LAN9000 non-PCI Ethernet and Fast Ethernet controllers are targeted for embedded computing applications. The LAN9000 I/O-based (non-DMA) architecture and patented Memory Management Unit (MMU) together provide a high-performance networking solution with less system complexity and lower system cost than solutions using PCI-based DMA architectures borrowed from general purpose computing platforms.

2 PCI OR NON-PCI?

Though the PCI bus is the most prevalent bus in standard PC desktops, it is not necessarily the bus of choice for embedded designs. The PCI bus is certainly commonplace and versatile, but embedded systems need not be unnecessarily burdened by the complexity and cost of PCI. The LAN9000 generic (ISA-like) bus interface is compatible with all popular embedded processor architectures (StrongARM, ARM, MIPS, SH, PowerPC, 68K, Coldfire, etc.). In conjunction with the patented MMU, the non-PCI LAN9000 solution achieves high performance, cost-effective Ethernet or Fast Ethernet connectivity.

3 DMA OR STRING I/O?

Think back to the PC before the introduction of PCI bus-mastering IDE controllers, String I/O was the solution of choice for data transfers between the IDE disk drives and the processor because *String I/O transfers are faster than conventional ISA DMA transfers.*

The SMSC LAN9000 Ethernet Family retains this performance advantage and combines it with the benefits of a patented MMU. The MMU controls and manages the allocation of packet buffer memory to transmitted and received packets. An internal Arbiter controls and manages I/O between the packet buffer memory, the host-side Bus Interface Unit (BIU) and the network-side Ethernet Protocol Handler (EPH). The LAN9000 architecture maximizes throughput while minimizing CPU overhead and overall system cost.

4 LAN9000 BENEFITS

Many Ethernet controllers must statically reserve packet buffer memory for the transmit and receive functions. The LAN9000 MMU can dynamically respond to changing in network traffic by allocating and deallocating memory in real time with no CPU intervention. This capability has several significant benefits:

- Because the allocation is based on the real time traffic, LAN9000 maximizes the utilization of the available memory.
- Because CPU intervention is not required, CPU cycles can be more effectively applied to CPU-intensive functions rather than to memory allocation bookkeeping.
- Because CPU intervention is not required, interrupt latency will not be affected and real time responsiveness will not be diminished.

The LAN9000 architecture provides additional performance-enhancing features not available with other Ethernet controllers. The benefits to system performance are self-evident.

- Auto-Increment Mode
 - packet I/O with reduced CPU overhead
- Early Transmit /Receive Mode
 - packet transmit/receive with reduced MAC latency
- Transmit Interrupt Mitigation
 - packet transmit with reduced interrupt service overhead
- 32 Bit Access Mode
 - direct bus access to packet buffer memory
 - available on 91C1xx devices

5 CONCLUSION

The SMSC LAN9000 Ethernet Family offers an architecture and feature set that are perfectly matched to the requirements of high performance, cost effective Ethernet-enabled embedded systems.

Please contact your local SMSC Representative or Distributor for more information, or visit our web site at www.smc.com/embedded.