intel

Intel® 82541ER Gigabit Ethernet Controller

Entry-level Gigabit connection designed for embedded applications

Product Overview

The Intelligent Way to Connect

- Enhanced power management for reduced power applications
- High-performance PHY technology meets IEEE 802.3ab specifications
- Footprint compatibility with other Intel[®] PRO Connections for flexible designs

The Intel® 82541ER Gigabit Ethernet Controller provides optimized Gigabit networking for PCI designs. This highly efficient controller, with enhanced power management, consumes less than 1.0W of power at Gigabit speeds. When no signal is detected on the wire, the controller reduces power consumption by switching to 100 or 10Mbps and powering down the physical-layer circuitry (PHY). When a signal is detected, the controller automatically negotiates the connection to Gigabit, if available.

The Intel 82541ER combines Intel's fifth-generation Gigabit MAC design with fully integrated state-ofthe-art PHY technology, which meets or exceeds IEEE 802.3ab specifications for Bit Error Rate performance. In addition, the controller provides a direct Peripheral Component Interconnect (PCI) designed to be compliant with the PCI 2.3 bus up to 66MHz. Packaged in a 15x15mm PBGA, the Intel 82541ER Gigabit Ethernet Controller is footprint-compatible with the Intel® 82551ER and 82551QM Fast Ethernet Controllers, and Intel® 82562EX and 82562EZ devices. Footprintcompatibility allows for a flexible Gigabit Ethernet or Fast Ethernet implementation on the same motherboard layout. The Intel 82541ER Gigabit Ethernet Controller architecture is optimized to deliver both highperformance networking and PCI bus efficiency with the lowest power and smallest size. Using state logic design with a pipelined DMA Unit and 128-bit-wide buses for the fastest performance, the 82541ER controller handles Gigabit Ethernet traffic with low network latency and minimal internal processing overhead. The controller's architecture includes independent transmit and receive queues to limit PCI bus traffic, and a PCI interface that maximizes the use of bursts for efficient bus usage. A 64KB, on-chip packet buffer maintains superior performance as available PCI bandwidth changes.

Advanced interrupt moderation hardware manages interrupts generated by the 82541ER controller to further improve system efficiency. In addition, using hardware acceleration, the controller also offloads tasks from the host processor, such as TCP/UDP/IP checksum calculations and TCP segmentation.

Applications

The Intel 82541ER Gigabit Ethernet Controller is designed for use in the following applications:

- Printer LAN Connections
- Security Appliances for Enterprise Networking (VPN, firewall, intrusion detection systems)
- Industrial PCs, Interactive Clients (POS, kiosk, ATM, gaming)
- Communications and networking devices requiring improved performance over 10/100 Ethernet



Intel in Communications

PCI Bus Features PCI rowsion 2.3, 32-bit, 33/66MHz Application flexibility for embedded board designs CLKRUN# Signal PCI clock suspension for low-power designs Gligabit MAC Features 64K8 configurable RX and TX packet FIFO No external FIFO memory requirements; FIFO size tunable to the application Reduced frame loss due to receive FIFO overrun Programmable host memory receive buffers (2568 to 16KB) Efficient usage of system resources Low-latency transmit and receive queues Network packets handled without waiting or buffer overflow Gigabit PHY Features EffE 802 3ab Auto-Negotiation Automatic link configuration including speed, duplex, and flow control State-of-the-art DSP/analog architecture Implements digital adaptive equalization, echo, cross-talk and baseline wander cancellation Rebus System resources No boots 1000Mb/s performance in noisy environments PHY detects polarity Easier network installation and maintenance PHY detects polarity Easier network installation and maintenance PHY detectames Increased throughput and lower CPU utilization; Compatible with large send offload on RX and TX and TX interrupt generated by RX and TX operations, resulting in lower CPU utilization Jumbo frame support to to 16KB High throughput for large data transfers on networks supporting jumbo frames Power Management Violations Supports power-down states without software assistance Low power in standby statadby Supports power-down	Features	Benefits
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Intel supported drivers

Linux*, FreeBSD*, Windows NT* 4.0, Windows* XP Embedded, Windows CE.NET, DOS*

Characteristics

Electrical	
Typical targeted power dissipation	 Less than 1.0W at D0 1000Mbps 100 mW at D3 100Mbps 50 mW at D3 wake up disabled
Environmental	
Operating temperature	0°C to 70°C (without need for heat sink)
Storage temperature	-65°C to 140°C
Physical	
Package	196-pin PBGA, 1mm ball pitch, 15x15mm (simplifies PCB designs)
Footprint compatible with Intel® 82540EM Gigabit Ethernet Controller	Enables easy migration

Order Code

■ GD 82541ER

For more information, contact your Intel® sales representative.

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