RTL8111G

Integrated 10/100/1000M Ethernet Controller for PCI Express Applications

General Description

The Realtek RTL8111G-CG/RTL8111GS-CG 10/100/1000M Ethernet controller combines a triple-speed IEEE 802.3 compliant Media Access Controller (MAC) with a triple-speed Ethernet transceiver, PCI Express bus controller, and embedded memory. With state-of-the-art DSP technology and mixed-mode signal technology, the RTL8111G/RTL8111GS offers high-speed transmission over CAT 5 UTP cable or CAT 3 UTP (10Mbps only) cable. Functions such as Crossover Detection and Auto-Correction, polarity correction, adaptive equalization, cross-talk cancellation, echo cancellation, timing recovery, and error correction are implemented to provide robust transmission and reception capability at high speeds.

The RTL8111G/RTL8111GS supports the PCI Express 1.1 bus interface for host communications with power management, and complies with the IEEE 802.3u specification for 10/100Mbps Ethernet and the IEEE 802.3ab specification for 1000Mbps Ethernet. It supports an auxiliary power auto-detect function, and will auto-configure related bits of the PCI power management registers in PCI configuration space. The RTL8111G/RTL8111GS features embedded One-Time-Programmable (OTP) memory. The RTL8111G/RTL8111GS provides a built-in switching regulator (RTL8111GS) or LDO regulator (RTL8111G).

Advanced Configuration Power management Interface (ACPI)—power management for modern operating systems that are capable of Operating System-directed Power Management (OSPM)—is supported to achieve the most efficient power management possible. PCI MSI (Message Signaled Interrupt) and MSI-X are also supported.

In addition to the ACPI feature, remote wake-up (including AMD Magic Packet and Microsoft Wake-Up Frame) is supported in both ACPI and APM (Advanced Power Management) environments. To support WOL from a deep power down state (e.g., D3cold, i.e., main power is off and only auxiliary exists), the auxiliary power source must be able to provide the needed power for the RTL8111G/RTL8111GS.

The RTL8111G/RTL8111GS supports Protocol offload. It offloads some of the most common protocols to NIC hardware in order to prevent spurious wake-up and further reduce power consumption. The RTL8111G/RTL8111GS can offload ARP (IPv4) and NS (IPv6) protocols while in the D3 power saving state.

The RTL8111G/RTL8111GS supports the ECMA (European Computer Manufacturers Association) proxy for sleeping hosts standard. The standard specifies maintenance of network connectivity and presence via proxies in order to extend the sleep duration of higher-powered hosts. It handles some network tasks on behalf of the host, allowing the host to remain in sleep mode for longer periods. Required and optional behavior of an operating proxy includes generating reply packets, ignoring packets, and waking the host.

The RTL8111G/RTL8111GS supports IEEE 802.3az-2010, also known as Energy Efficient Ethernet (EEE). IEEE 802.3az-2010 operates with the IEEE 802.3 Media Access Control (MAC) Sublayer to support operation in Low Power Idle mode. When the Ethernet network is in low link utilization, EEE allows systems on both sides of the link to save power.

The RTL8111G/RTL8111GS is fully compliant with Microsoft NDIS5, NDIS6 (IPv4, IPv6, TCP, UDP) Checksum and Segmentation Task-offload (Large send and Giant send) features, and supports IEEE 802 IP Layer 2 priority encoding and IEEE 802.1Q Virtual bridged Local Area Network (VLAN). The above features contribute to lowering CPU utilization, especially benefiting performance when in operation on a network server.

The RTL8111G/RTL8111GS supports Receive-Side Scaling (RSS) to hash incoming TCP connections and load-balance received data processing across multiple CPUs. RSS improves the number of transactions per second and number of connections per second, for increased network throughput.

The device features inter-connect PCI Express technology. PCI Express is a high-bandwidth, low-pin-count, serial, interconnect technology that offers significant improvements in performance over conventional PCI and also maintains software compatibility with existing PCI infrastructure.

The RTL8111G/RTL8111GS is suitable for multiple market segments and emerging applications, such as desktop, mobile, workstation, server, communications platforms, and embedded applications.

Features

Hardware

- Integrated 10/100/1000M transceiver
- Auto-Negotiation with Next Page capability
- Supports PCI Express 1.1
- Supports pair swap/polarity/skew correction
- Crossover Detection & Auto-Correction
- Supports 1-Lane 2.5Gbps PCI Express Bus
- Embedded OTP memory
- Supports hardware ECC (Error Correction Code) function
- Supports hardware CRC (Cyclic Redundancy Check) function
- Transmit/Receive on-chip buffer support
- Supports PCI MSI (Message Signaled Interrupt) and MSI-X
- Supports 25MHz or 48MHz Oscillator
- Built-in switching regulator (RTL8111GS) and LDO regulator (RTL8111G)
- Supports power down/link down power saving/PHY disable mode
- Customized LEDs
- Controllable LED Blinking Frequency and Duty Cycle
- 32-pin QFN 'Green' package
- Supports EMAC-393 ECMA ProxZzzy Standard for sleeping hosts
- Supports LTR (Latency Tolerance Reporting) and OBFF (Optimized Buffer Flush/Fill)
- Supports 16-set 128-byte Wake-Up Frame pattern exact matching
- Supports Microsoft WPD (Wake Packet Detection)

IEEE

- Fully compliant with IEEE 802.3, IEEE 802.3u, IEEE 802.3ab
- Supports IEEE 802.1P Layer 2 Priority Encoding
- Supports IEEE 802.1Q VLAN tagging
- Supports IEEE 802.3az-2010 (EEE)
- Supports Full Duplex flow control (IEEE 802.3x)

Software Offload

- Microsoft NDIS5, NDIS6 Checksum Offload (IPv4, IPv6, TCP, UDP) and Segmentation Task-offload (Large send v1 and Large send v2) support
- Supports jumbo frame to 9K bytes
- Supports quad core Receive-Side Scaling (RSS)
- Supports Protocol Offload (ARP & NS)

Applications

- PCI Express 10/100/1000M Ethernet on Motherboard, Notebook, or Embedded systems