

Cadence Design IP: Automotive Ethernet

Cadence delivers the highest-quality Media Access Controller (MAC) Design IP for Ethernet-based automotive connectivity. Cadence provides a competitive edge with intelligence based on a long history of designing Ethernet IP and contributing to the standards for Ethernet and extensions for the automotive industry.

Ethernet-Based Automotive Applications for IVN

The automotive industry is trending towards Ethernet for in-vehicle networking (IVN) based on open IEEE standards driven by the Open Alliance SIG to develop a simpler but more powerful Automotive E/E-Architecture.

Demand for deterministic, high-performance bandwidth features, and low-cost cabling solutions, is accelerating market penetration of Ethernet-based networks. Ethernet for IVN provides the lowest-cost cabling solution for the Automotive Industry with low-weight, single pair, unshielded twisted cable.

Cadence enhancements to the Ethernet standard help support automotive requirements to improve in-vehicle safety, comfort, and infotainment, and significantly reduce network complexity and cabling costs.

Cadence Automotive Gigabit Ethernet MAC Design IP

The Cadence Ethernet MAC supports three different operating speeds (10/100/1000M) and is widely licensed for high-volume production.

The Cadence Ethernet MAC enables:

- Deterministic real-time data transfer for safety-critical applications, such as reliable anti-lock braking
- High data bandwidth, accurate timing, and Quality of Service (QoS) to synchronize and transmit audio/video streams, using Audio Video Bridging (AVB) for camera-based driver assist systems

The Cadence Automotive Ethernet MAC hardware solution enables the highest quality synchronization of multiple media streams by supporting two key hardware standards:

IEEE 802.1AS - Time stamping over Ethernet using the Precision Time Protocol (PTP) to support real-time high-speed data transfer for safety-critical and other automotive applications.

IEEE 802.1Qav - Priority queuing and traffic shaping to distribute packets evenly in time over Ethernet to ensure high QoS.

A high QoS is needed so that Ethernet can be used in strictly deterministic embedded applications for time-, safety- and mission-critical systems. High QoS enables unified Ethernet communication of critical data without traffic congestion in shared networks.

The commitment of Cadence to Ethernet IP enables the automotive industry to develop and support key Ethernet standards while evolving to higher Ethernet speeds.

Ethernet IP Standards

Cadence acts on insights gained from membership in the OPEN Alliance SIG, participation in IEEE 802.3 standards meetings, 802.3 working groups, and co-editing the 802.3ah, 802.3ap, and 802.3ba standards. Early visibility into standards under development enables Cadence to identify and adapt to important changes to the published standards ahead of the curve.

Key Features

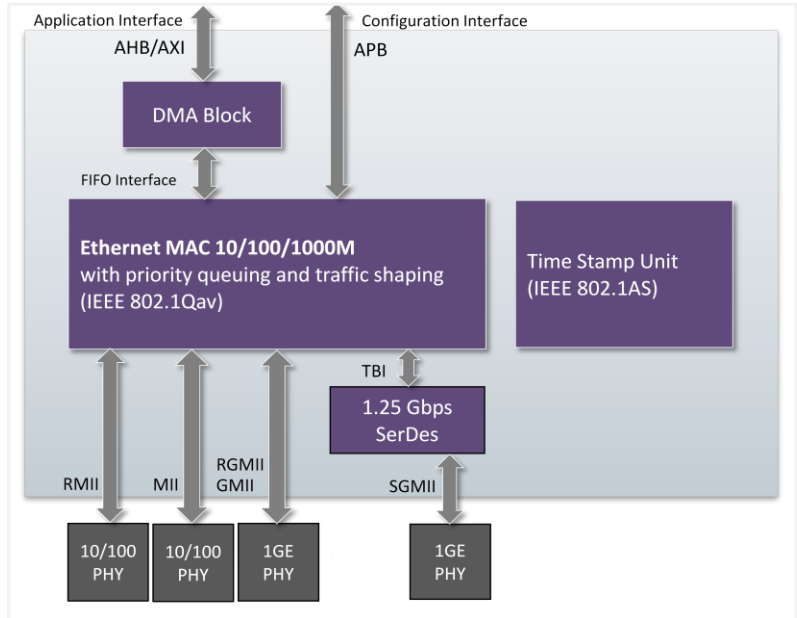
10/100/1000M Ethernet MAC

- Configurable 10, 100, and 1,000 Mbps (1Gbps) operation in full- and half-duplex modes
- Compatible with IEEE standard 802.3
- Support for 802.3az for Energy-Efficient Ethernet
- Support for 802.1AS Precision Time Protocol (PTP) for timing and synchronization for time-sensitive applications
- Recognition of IEEE 1588 and 802.1AS PTP frames
- Support for 802.1Q VLAN tagging with recognition of incoming VLAN and priority-tagged frames
- Support for 802.1Qav Forwarding and Queuing for Time-Sensitive Streams (FQTSS) to ensure Quality of Service (QoS)
- Supports IEEE 802.1AS and 802.1Qav specifications for Audio Video Bridging (AVB)
- Support for 802.1Qbb priority-based flow control
- Support for up to 8 priority queues on transmit and receive
- Full duplex flow control with recognition of incoming pause frames and hardware generation of transmitted pause frames
- Automatic pad and cyclic redundancy check (CRC) generation on transmitted frames
- Receive and transmit IP, TCP, and UDP checksum offload
- Address checking logic for 4 or 32 specific 48-bit addresses, 4 type IDs, promiscuous mode, external address checking, hash matching of uni-cast and multi-cast destination addresses, and wake-on-LAN
- Interrupt generation to signal receive and transmit completion or errors
- Support for both IPv4 (with IP options) and IPv6 (with extension headers) packet types
- Support for physical layer management through MDIO interface
- Support for jumbo frames up to 10,240 bytes
- Programmable IPG stretch

Supported Interfaces

- 10/100/1000M Ethernet MAC supports AHB/AXI bus master DMA to the host and MII, RMII, SGMII, GMII, and RGMII interface to the PHY
- Support for MII and RMII interface to the PHY layer for 10/100M operation
- Support for GMII, RGMII, and SGMII interface to the PHY layer for 1G Ethernet operation
- Ten-bit interface (TBI) to the physical medium attachment (PMA) layer
- Statistics counter registers for RMON/MIB

Figure 1: 10/100/1000M Ethernet MAC Design IP for Automotive Connectivity



- Configurable interface to the application side: either an external FIFO interface or an AMBA AHB/AXI™ bus master DMA interface to external memory

Silicon-Proven and Scalable

Cadence is renowned for its Ethernet IP domain knowledge and design implementation, and a proven record of designing, delivering, and supporting high-quality Ethernet IP. Cadence Ethernet IP is UNH-tested and silicon-proven in dozens of high-volume commercial products.

World-Class Quality, Early Availability

Cadence is consistently one of the first suppliers to market with IP for the newest, most advanced Ethernet standards optimized for maximum performance and functionality. Leveraging membership and participation in the OPEN Alliance SIG and IEEE 802.3 standards community, Cadence IP solutions reliably conform to the latest standards to give customers the highest confidence in their Ethernet implementations.

Deliverables

- Verilog HDL
- Cadence RTL Compiler synthesis scripts
- Verilog test bench
- User's Guide with full programming interface, and parameterization and synthesis instructions
- TLM model (optional)

Cadence is a member of the OPEN Alliance SIG (www.opensig.org).



Cadence is transforming the global electronics industry through a vision called EDA360. With an application driven approach to design, our software, hardware, IP, and services help Customers realize silicon, SoCs, and complete systems efficiently and profitably. www.cadence.com