Ultra Low-Latency 10Gbit/s Ethernet MAC

CT1009-XGMAC - Product Brief - Version 1.9 – 5th April 2019

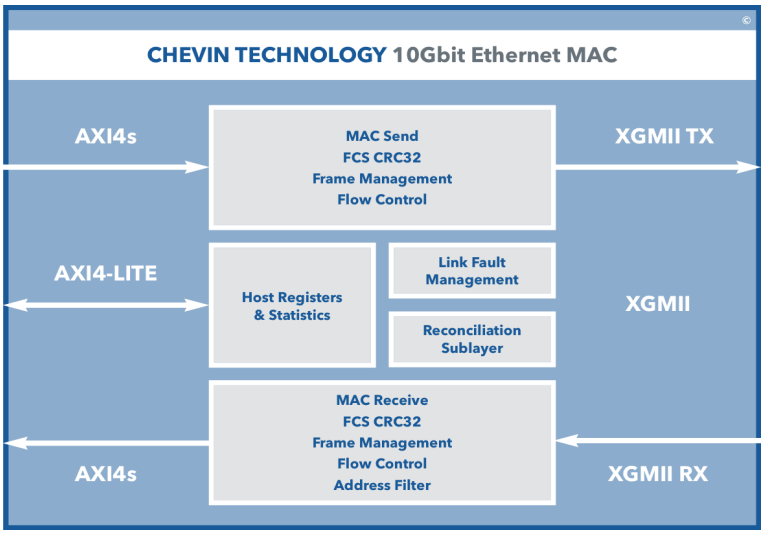
The Chevin Technology XGMAC IP core provides high performance, Ultra low-latency 10Gbit/s Ethernet connectivity in Xilinx FPGAs. The XGMAC user guide and reference design simplifies the FPGA integration process, and can be used directly with an external or internal PCS . We recommend using Chevin Technology's XGPCS to achieve the lowest possible latency.

The application side can be driven by any logic that generates and decodes Ethernet frames. The XGMAC manages frame timing, CRC32 Checksum insertion and generation, and manages the lower layer fault handling and XGMII interface coding. Flow control provides back pressure to peer node and is handled automatically by the XGMAC in both directions independently. A detailed statistics block provides a running count of frames sent and received with individual 64bit counters for different frame sizes, types and checksum errors.

Achieve smoother, faster integration with the Chevin Technology reference design on an AlphaData boards; ADMPCIE KU3, ADM-PCIE-8V3, ADM-PCIE-9V3, or a Xilinx KC705 development board, and a simple "ping" command line with the ICMP/ARP options. Use standard software TCP/UDP tools when integrated with Chevin Technology's XGTCP IP core.

Key Features

- Designed to IEEE 802.3-2008 Specification
- Low Latency 44.8 ns
- Integrated FCS CRC32 check/generate
- Small Footprint, 2749 LUTs
- Flow Control option with Pause packets
- Programmable max frame length
- Reconciliation Layer -Local /Remote Faults
- Programmable Inter Frame Gap
- Deficit Idle Count for maximum throughput
- Cut-through mode for lowest latency
- Store-and-forward for minimum app load
- MAC address filtering options
- Detailed traffic analysis statistics collection
- Optional MDIO master for controlling PHY



Latency Figures

First byte App IF to first byte XGMII	**25.6ns**
First byte XGMII to first byte App IF	**19.2ns**
Full Round trip time, *including* MAC/PCS/PMA AppTX -> SFP+ (wire) -> AppRX	**160 ns**

FPGA Resource Figures

XGMAC - Cut-through	**2749 LUTs**
XGMAC (Store&Fwd, with stats)	**2900 LUTs**
Options: Store & Forward	**4 BRAMs**

Deliverables

- Encrypted RTL/VHDL source code for simulation
- Encrypted compiled netlist
- Datasheet & User Guide to assist integration
- Reference Designs for Alpha-Data boards

ADM-PCIE-KU3, ADM-PCIE-8V3, ADM-PCIE-9V3

- Simulation Test bench
- Build scripts for Vivado
- Support for integration into FPGA

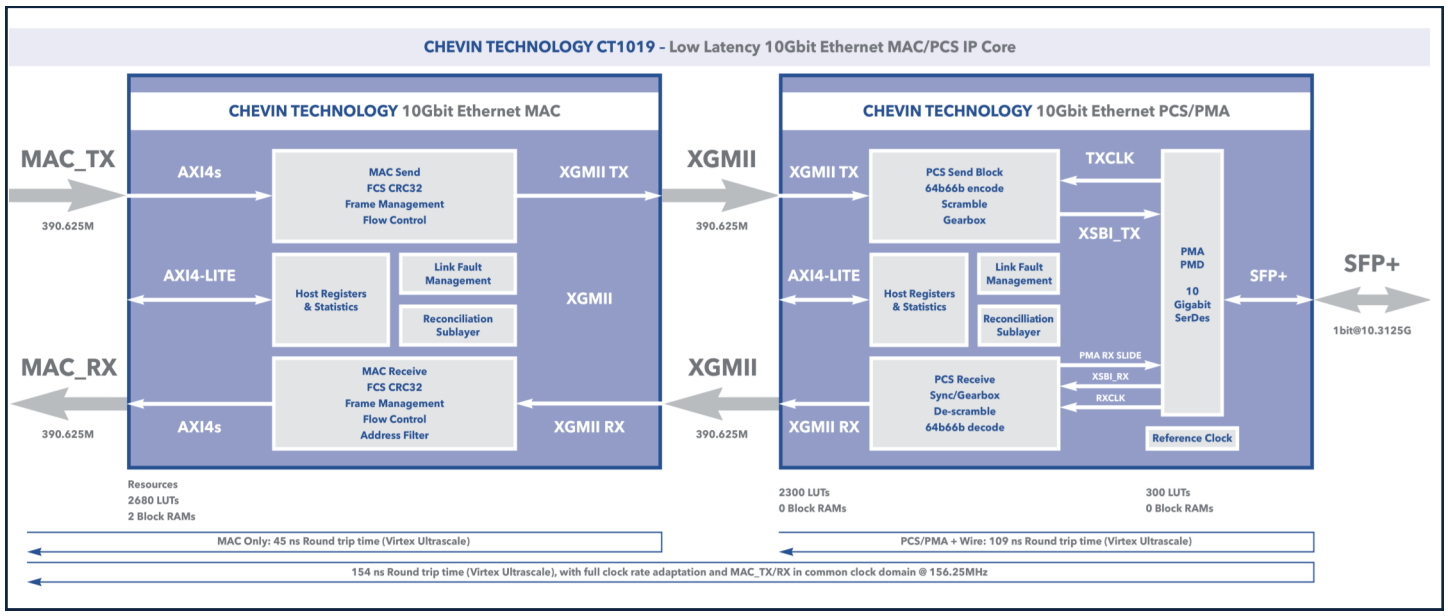
Chevin Technology
The Bradfield Centre
184 Cambridge Science Park, Milton Road,
Milton, Cambridge CB4 0GA, UK
Phone: +44(0) 1223 817009
Email: ip@chevintechnology.com
www.chevintechnology.com

10Gbit/s Ethernet MAC
XGMAC - Integration in FPGA

A simple host interface allows control and configuration of the XGMAC registers and statistics block.
The reference design include sa UART host interface port and example host software to drive this interface and can be used to speed up integration work.
The 64bit XGMII interface connects directly to any XGMII compatible PHY preferably utilizing Kintex, Virtex and UltraScale devices' 10Gbit capable SerDes (Multi Gigabit Transceivers) that provide the lowest latency, power, board size and cost, and the best overall performance.

We recommend pairing the XGMAC with Chevin Technology's XGPCS, an ultra-low-latency 10GBASE-R block for SFP+ Direct Attach copper cable or SR/LR Fiber connection.

The application side connects directly to user logic which can be user logic FIFOs to AXI4 standard interfaces or shared via an arbiter to other stack layers such as TCP/IP, UDP/IP, ICMP and ARP, also supplied by Chevin Technology, for a more integrated FPGA solution.



Chevin Technology IP Cores

UDP/IP Offload Engine

TCP/IP Offload Engine

10 & 25G Ethernet MAC

10 & 25G Ethernet PCS/PMA

10 & 25G LL Ethernet MAC & PCS/PMA

ICMP/ARP—10&25G Support Library

UDT4– 10 & 25G UDT4 Server

6Gbit/s SSD Host Ctrl SATA v 3.2

Markets

- Defence
- Scientific
- Aerospace
- Cybersecurity
- Medical
- Finance
- Telecoms
- Broadcast
- Data Centre

Applications

- Artificial Intelligence
- Machine Learning
- Video Imaging
- Image/Signal Processing
- Internet Security Monitoring
- Data Storage & Capture Systems
- Trade Execution & Monitoring
- HPC/Big Data Systems
- Data Mining

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