

10Gbit/s LL Ethernet MAC/PCS

Ultra Low-Latency Ethernet IP for FPGAs

CT10**-10GbE-LL-MAC/PCS

Product Brief - Version 1.1 – 1st April 2019



The Chevin Technology **10G LL MAC/PCS** combines the **10G MAC** and **10G PCS** IP cores to obtain the lowest possible latency while simplifying the integration of 10Gbit/s Ethernet connectivity in Xilinx Virtex® UltraScale™ FPGAs.

Ultra-low latency is achieved on the PCS block by using only the PMA function in FPGA Multi-Gigabit transceivers and moving all PCS functions to code that is optimized for 10GBASE-R. This allows the data to take the shortest, therefore the lowest, latency path to and from the wire.

The MAC manages frame timing, CRC32 Checksum insertion and generation, and manages the lower layer fault handling and xGMII interface coding. Chevin Technology's MAC/PCS is xGMII compatible with a 64bit interface at 390.625MHz. 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 AlphaData boards; ADM-PCIE-8V3, ADM-PCIE-9V3, Xilinx Virtex® UltraScale™ and UltraScale+™ development boards.

Use standard software TCP/UDP tools when integrated with Chevin Technology's XGTCP or XGUDP IP cores.

Key Features

- Designed to IEEE 802.3by 25GBASE-R
- Ultra Low Latency 153.8 ns packet Round Trip Time (RTT) in Virtex® UltraScale™
- Integrated FCS CRC32 check/generate
- 5153 LUTs (MAC 2749 & PCS 2404LUTs)
- Flow Control option with Pause packets
- Deficit Idle Count / Programmable IFG– Minimize IFG
- Cut-through mode for minimum latency
- Store-and-forward for minimum app load
- Fault Management, BER monitoring
- Statistics counters for frames and bytes sent/ received, size bins, FCS errors, broadcast

Latency Figures

Round trip delay (Ultrascale)

MAC(in) -> SFP28 (wire) -> MAC(out) 153.8ns

FPGA Resource Figures

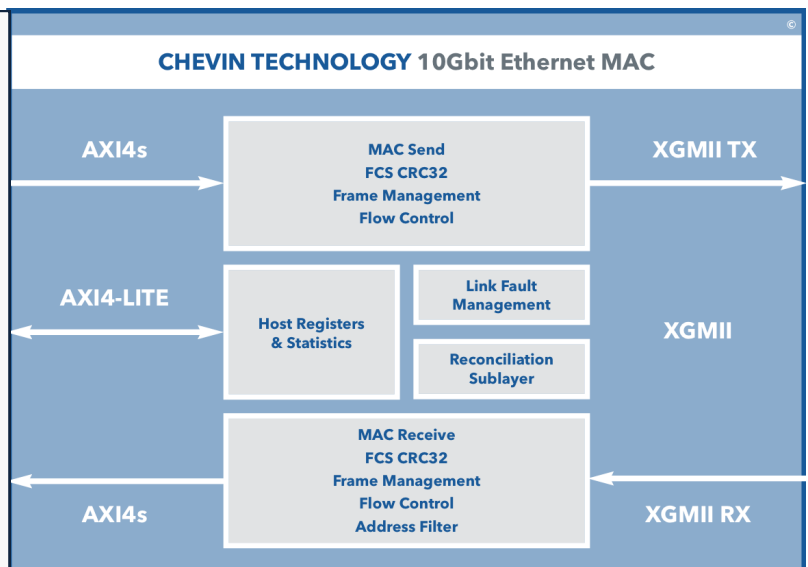
Device: Virtex® UltraScale™ xcvu095 -2

10GPCS/PMA 2404 LUTs

10GMAC 2749 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-8V3, ADM-PCIE-9V3
- Simulation Test bench
- Build scripts for Vivado
- Support for integration into FPGA



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10G LL MAC/PCS

Integration in FPGA

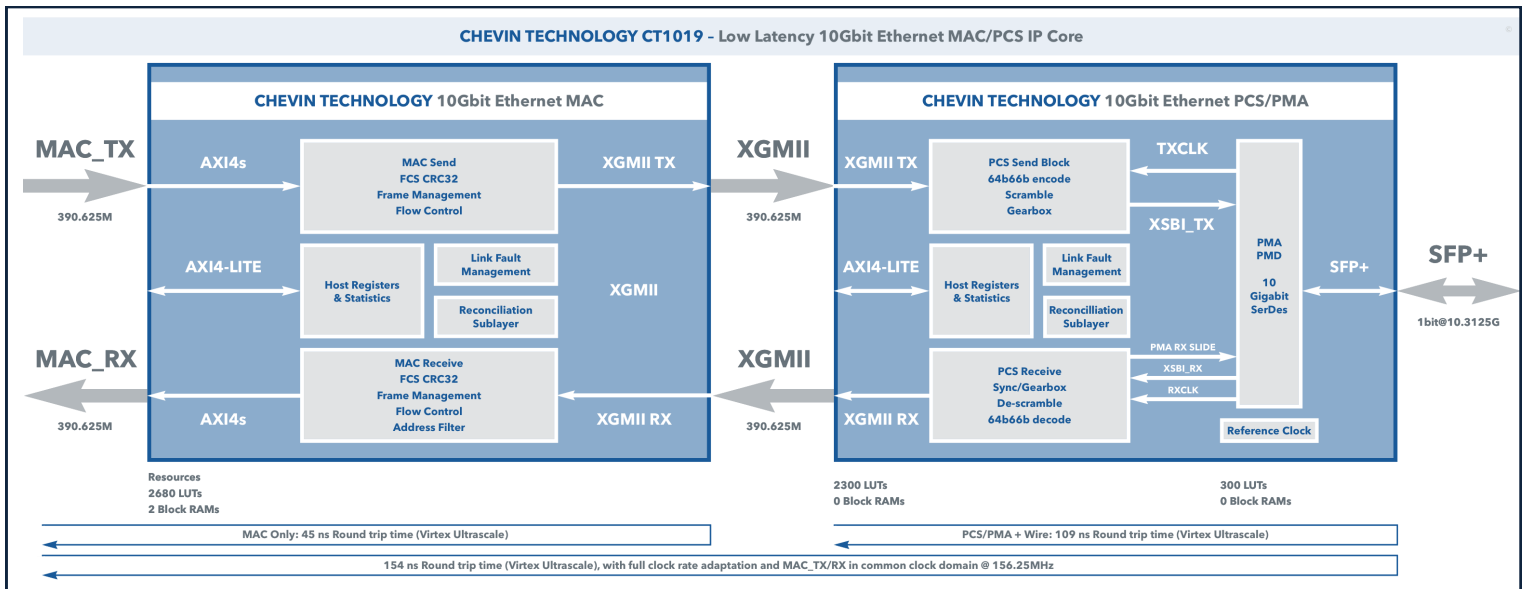


The reference design includes a top level wrapper for the IP and includes build scripts and constraints.

A simple host interface makes it possible to read and write registers for monitoring purposes, and can be used to speed up integration work.

The 64bit xGMII interface connects directly to any xGMII compatible PCS, preferably utilizing Virtex® UltraScale™ devices that are 10Gbit capable. This combination provides the lowest possible latency, power, board size and cost, and the best overall performance.

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 MAC & PCS/PMA
- ICMP/ARP – 10&25G support library
- UDT4 – 10&25G UDT4 Server
- 6Gbit/s SSD Host Ctrl SATAv3.2

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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