XGE High Performance Ethernet - Preliminary

CRITICAL IO

XGE4420-XMC-FF-G Data Sheet: Dual Port 40Gb Ethernet XMC (front MPO optical)

XGE4420 XMC

The XGE4420-XMC provides 40Gb Ethernet (40GbE) connectivity for embedded systems with the ultra-high performance characteristics that are essential for data intensive real-time systems. It provides high performance RDMA and Streaming protocol in addition to 100% compatibility and interoperability with all industry standard Ethernet infrastructures and protocols.

The XGE4420-XMC provides a dual port 40GbE TOE XMC with a PCIe x8 host interface. The XGE4420 offloads TCP/IP, RDMA, and UDP Direct Stream protocols to dedicated silicon protocol engines with each port capable of 10,000 MB/s (10 GB/s) of sustained bidirectional throughput*.

XGE Hardware Offload Advantage

Ethernet interfaces can stifle the performance of even the most powerful embedded CPUs when trying to move data at high rates at full wire speed.   This is due to the significant overhead caused by the TCP/IP protocol stack (i.e. "software stack") in traditional Ethernet implementations. This problem gets many times worse when attempting to leverage the performance of 10 GbE. The XGE series offloads most of the network protocol processing to dedicated silicon protocol engines and frees the I/O protocol processing from the host CPU. The XGE product family differentiates itself from typical Ethernet NICs by delivering high sustained throughput, maximum host processor offload, ultra-low latency, and solid deterministic behavior.

UDP Direct Stream Support

UDP Direct Streaming send/receive allows extremely efficient large sends and receives of UDP data directly from application level buffers, completely avoiding the standard O/S network stack and associated data copies. The application send/receive buffers may be located in host CPU memory, or in any other PCIe addressable memory, such as the memories attached to PCIe connected Graphic Processing Units (GPUs). UDP Direct Streaming is fully compatible with standard UDP.

RDMA Support

When used in conjunction with a Data Center Ethernet (DCE) switches, XGE Interfaces supports the Ethernet Remote Direct Memory Access (RDMA) protocol. RDMA allows data movement directly between application memories without any CPU involvement. RDMA provides a mechanism for extremely efficient data transfer with ultra-low microsecond level board to board latencies on DCE enabled Ethernet networks.

PRELIMINARY
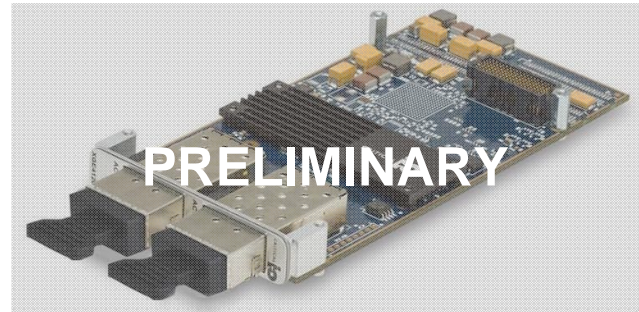
XGE4420-XMC-FF-G Features:

- **Dual Port 40GbE interface**
- **XMC with PCIe x8 Gen 2/3 host interface**
- **Simultaneous line rate throughput on both ports**
- **UDP direct streaming support**
- **RDMA support (with DCE enabled switches)**
- **100% standard Ethernet compatibility**
- **Standard Sockets programming interface**
- **Highly efficient large send/receive offload**
- **Very low host processor overhead**
- **Ultra low latency and high determinism**
- **Zero Copy / Direct Data Placement (into app memory)**
- **Very low power consumption**
- **Air and rugged conduction cooled versions available**
- **Software drivers for Linux, VxWorks, and Windows**

Extensive Software Support & Capability

Critical I/O supplies all the hardware, drivers, libraries, and protocol support you'll need for rapid system development without wasting your time debugging drivers. All software has been highly optimized to deliver maximum performance, reliability, and capability.

The XGE4420 hardware is accompanied by an extensive offering of software libraries and device drivers with support for a multitude of embedded / real-time operating systems as well as mainstream OS platforms (VxWorks, Linux, and Windows).

Compatibility

The XGE interface provides 100% standard 40 Gb Ethernet connectivity. The XGE sockets interface model maintains full compatibility with all applications, including both custom user applications as well all "pre-built" network applications such as NFS, FTP, Telnet, etc..

XGE4420 XMC (dual front panel optical) Technical Specifications (preliminary)

Controller Architecture	Hardware protocol offload processor
Ethernet Rates	40 Gbps/port (1/10 Gbps support also available - contact Critical I/O)
Data Transfer Rate	10,000 MB/s (10 GB/s) (*per port, full-duplex, aggregate rate limited by PCIe host interface)
Topology	Switched & point to point
Protocol Support	TCP, UDP, IP, UDP Direct Streaming, RDMA, all other standard network protocols
Host Bus Interface	PCI-Express x8 (x8, x4, x2, x1 supported), PCIe 3.0 (PCIe 1 and 2 compatible), 8/5/2.5GT/s (Note: PCIe G3 operation requires a properly designed VITA 61 host board)
Ports	Two optical front panel ports, 40GBase-SR, (inquire for other optical interfaces)
Connectors	Two QSFP optical transceivers (MPO connectors)
Form Factor	XMC with VITA 42 connectors, VITA 42.3 (supports PCIe Gen 1/2) XMC with VITA 61 connectors (supports PCIe Gen 1/2/3)
Power Requirements	+5VDC at 2.5A (max) or +12VDC at 1.25A (max)
Power Consumption	8.5 Watts (typical)
Temperature	Operating: 0C to +55C; Storage: -40C to +85C (contact Critical I/O for extended temp)
Humidity	10-90% non condensing
Supported Host Processors	x86, PowerPC
Vibration (random)	VITA 47 Class V2: 0.04g2/Hz peak (5-2000 Hz)
Shock	VITA 47 Shock Class OS1: 20g Peak sawtooth (11ms duration)
Software Support	Drivers: VxWorks, Linux, Windows (protocol support varies by OS, contact Critical I/O)
Model Number	XGE4420-XMC-FF-G (VITA 42 connectors) XGE4420-XMC6-FF-G (VITA 61 connectors)
Model Description	Dual ported 40 Gigabit Ethernet TOE XMC, front MPO optical, commercial temp, air-cooled hardware, RoHS LEAD FREE assembly
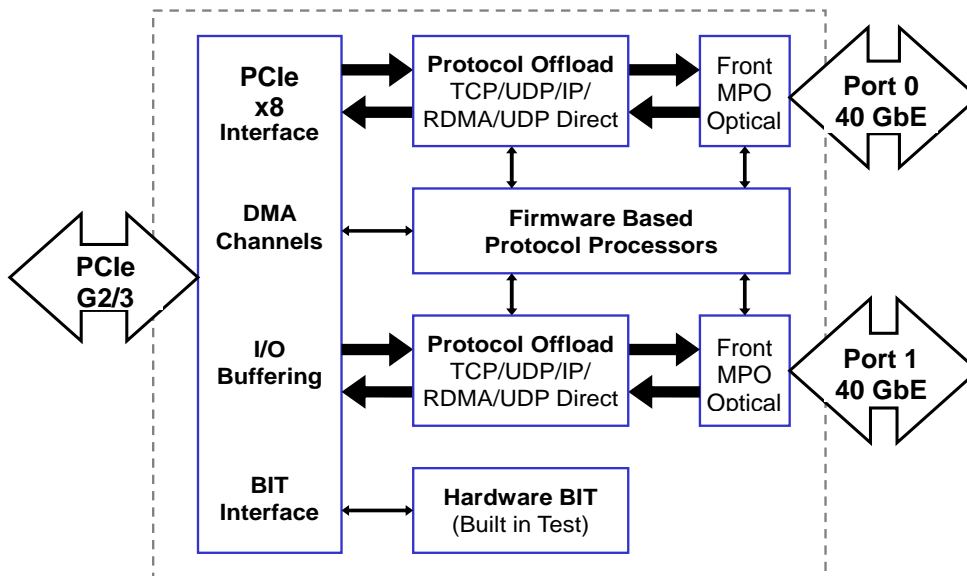
Block Diagram: *Functional block diagram for the XGE4420 XMC by Critical I/O. This XMC provides two independent 40Gb Ethernet ports, each with integrated protocol offload hardware. Dedicated hardware offload provides full duplex operation at wire-speed, up to 10,000 MB/s (10 GB/s) per port*.*