



T6 ASIC

High Performance, Dual Port Unified Wire 1/10/25/40/50/100Gb Ethernet Controller

Enables TCP, UDP, iSCSI, iWARP and FCoE Offload over Single Unified Wire with SR-IOV, EVB/VNTag, DCB and in-line TLS/SSL

Highlights

- PCI Express Gen3 x16
- Ultra-low latency user-space I/O
- Supports up to 1M connections
- Full TCP and UDP offload
- Full iSCSI, FCoE offload
- Full NVMe over fabrics (NVMe) offload
- Full iWARP RDMA offload
- Full TLS/SSL, IPsec, SMB 3.X crypto offload
- Advanced security protocol acceleration
- AES, SHA1 and SHA2 offload
- EVB, Flex10, VNTags
- PCI-SIG SR-IOV
- Integrated media streaming offload
- HW based firewall
- NAT offload
- Traffic filtering & management
- IEEE 1588v2 Precision Time Protocol
- Software Compatible with T4 and T5

Applications

Datacenter Networking

- Scale out servers and NAS systems
- Consolidate LAN, SAN and cluster networks
- Enhanced network and server security

Cloud Computing

- Virtualization features to maximize cloud scaling and utilization
- Runs InfiniBand, FibreChannel applications unmodified over Ethernet
- Cloud-ready functional and management features
- Secure Sockets offload
- QoS and Traffic Management

Networked Storage

- Enable high performance NAS systems and Ethernet-based SANs
- Develop shared-storage systems providing both file and block level services
- Build high performance storage backend fabrics using Ethernet
- Encrypt all communication and data at rest

High Performance Computing

- Very low latency Ethernet
- High performance RDMA support
- Increase cluster fabric bandwidth
- Deploy Ethernet-only networking for cluster fabric, LAN and SAN

Specifications

Host Interface

- PCI-E Gen3 x16
- MSI-X, MSI and support for legacy pin interrupts

Security

- AES 128/256 and SHA1/SHA2 offload
- TLS/SSL, IPsec and SMB 3.X crypto support
- Full offload and lookaside co-processor modes

Overview

Chelsio's T6 is a dual port Unified Wire, 1/10/25/40/50/100 Gb Ethernet Network Interface Controller ASIC with a x16 PCI Express 3.0 host bus interface, optimized for storage, cloud computing, HPC, virtualization and other data center networking applications.

The sixth-generation T6 ASIC technology from Chelsio runs all the host software of its predecessor, T5, as-is, thus enabling leveraging of all the prior software investment. T6 offers all the features of T5, and in addition adds support for integrated offload of IPsec, TLS/SSL and SMB 3.X crypto.

Software support for T6 is provided in source form with no licensing fee and is inboxed with Linux, FreeBSD, Windows and other OSes.

T6 provides sub micro-second end-to-end latency, while offloading the host CPU from a variety of typical storage, networking, and cloud related protocols. This will enable savings in host CPU acquisition costs, power and operational costs, and dramatically increases system performance.

A large portion of offloads enabled by T6 are based on standard TCP, IP, UDP protocols (such as iSCSI and iWARP), and thus can operate with a software peer, or be replaced with a software solution at lower performance, thus providing the requisite reliability for enterprise customers, and allowing incremental installs in the data center. It further allows for T6 to be able to work with any legacy switch infrastructure and does not rely on new features such as DCB, PFC, ETS, etc.

T6 supports IEEE standards-based link aggregation/failover features, as well as inter-adapter failover techniques that make it ideal for critical network applications requiring redundancy and high-availability capabilities.

T6 also includes an integrated Traffic Manager for robust and flexible flow control, traffic management and QoS.

FCoE and iSCSI support in T6 benefit from high reliability features that include memory ECC, data path CRC and T10-DIX offload, in addition to the checksums and CRC available at different protocols layers. High performance iSCSI and FCoE provide a drop-in replacement upgrade from legacy SANs to converged networks.

The Unified Wire Solution

T6 enables a unified wire for LAN, SAN and cluster applications, built upon a high bandwidth and low latency architecture along with a complete set of storage and cluster protocols operating over Ethernet (iSCSI, NVMe, FCoE and iWARP). A unified wire means having the ability to utilize all offload or non-offload protocols at the same time, over the same link, using the exact same firmware, host software, and adapter. Thus, a given system using T6 can be easily targeted at different vertical markets and a variety of useful functions enabled (i.e. dial the bandwidth to a given application and assign access control, while offloading only part of the traffic). T6 Ethernet-only networking thus reduces the infrastructure costs in network adapters, cables, switches, rack space, power, equipment spares, management tools, planning, networking staff and installation.



Sixth-Generation Protocol Offload Engine

T6 is Chelsio's sixth-generation TCP offload (TOE) design, fifth-generation iSCSI design, and fourth-generation iWARP (RDMA) implementation. With support for the 8 Gbps PCIe Gen3 data rate, it provides 128Gbps of raw bandwidth. Also provides support for PCIe SR-IOV virtualization with embedded virtual switch.

Complete and Flexible TCP Offload

The T6 transport engine executes programmable firmware and is configurable with hundreds of registers for protocol parameters, RFC compliance and offload control. T6 can offload protocol processing per connection, per-server, per-interface, while simultaneously providing complete stateless offload for non-offloaded connections (processed by operating systems stack running on host CPU). T6 also provides a flexible direct data placement capability for regular TCP sockets, with all the benefits of zero-copy and kernel bypass without rewriting the applications.

High Performance Security Offload

T6 introduces ground breaking TLS/SSL performance with inline cryptographic functions leveraging Chelsio's proprietary TCP/IP offload engine. Chelsio's full offload TLS/SSL is uniquely capable of 100Gb line rate performance. In addition, T6 can be used in a traditional co-processor lookaside mode to accelerate IPsec, TLS/SSL with AES, SHA1 and SHA2 processing.

Packet Switching and Routing

T6 integrates a 140-port high performance L2-L3 packet switch with integrated access control and flow control support, which allows switching traffic from any of the ports or host queues or physical or virtual functions to each other. The switch can further provide multicast and replication functions in ingress or egress direction. Typical use is for a very high performance OVS offload.

Robust, Proven Solution

Subjected to thousands of hours of compatibility testing, over a decade of stress testing by several OEM test suites and production deployment in servers, storage systems and cluster computing, Chelsio's robust, stable protocol offload technology delivers proven performance in a wide range of environments.

Server Offload

T6 can offload up to 4k connections without using external memories, thus enabling cost effective applications, with low real estate requirements. On introduction, only 256 offloaded connections are supported in mem-free mode.

Software Drivers

Chelsio offers a full suite of protocol software drivers with the T6. See www.chelsio.com/support for the latest information.

Ordering Information

Part Number	Description	Package	Power
T6ASIC2100G	All Ethernet speeds, full featured	33x33	14W
T6ASIC2100G-SO	All Ethernet speeds, server offload only	33x33	12W
T6ASIC250G	1/10/25/50Gb, full featured	27x27	9W
T6ASIC250G-SO	1/10/25/50Gb, server offload only	27x27	7W

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High Performance RDMA

- Ultra-low latency and line rate bandwidth
- Enhanced RDMA primitives including Atomics & Immediate data
- iWARP support in standard OFED
- Microsoft Network Direct support
- Native support for Windows Server 2012-R2, 2016, Azure Stack, Storage Replica, Storage Spaces Direct, Client RDMA, SMB-Direct
- Support for NFS-RDMA, Lustre-RDMA, NVIDIA's GPU-Direct, Hadoop-RDMA

UDP & Multicast Offload

- UDP Sockets API
- Low user-to-user latency
- Multicast replication on ingress or egress

Virtualization

- PCI-SIG SR-IOV
- 256 Virtual and 8 Physical functions
- 264 port virtual switch
- EVB, VEPA, Flex10, VNTag
- 512 MAC addresses
- NVGRE, VXLAN and GENEVE support

TCP/IP Full Offload

- Full TCP stack including IPv4 & IPv6
- Extensive RFC compliance, fully featured
- VLAN support up to 4096 VLAN IDs
- Load balancing and failover capabilities

iSCSI

- iSCSI initiator and target mode stack
- CRC32 offload generation verification
- iSCSI proxy switching based on SCSI CDB
- Full HBA offload
- T10 DIF/DIX support

FCoE

- Full FCoE offload (Initiator or Target)
- Open FCoE offload (Initiator)
- CRC32 offload generation & verification
- Ingress & Egress ACL (Access Control List)
- T10 DIF/DIX support

Stateless Offloads

- TCP/UDP IPv4/6 checksum offload
- TSO, LSO and GSO for IPv4 & IPv6
- VLAN filtering, insertion & extraction
- Line rate packet filtering and attack protection
- Nanosecond granularity 64b timestamping
- Ethernet Routing (packet header rewrite)
- Packet Tracing and Packet Sniffing

Ethernet

- IEEE 802.3bj (100 GbE over copper/backplane)
- IEEE 802.3ba (40/100 GbE)
- IEEE 802.3ae (10 GbE)
- IEEE 802.3az Energy Efficient Ethernet
- IEEE 802.3z (1GbE)
- IEEE 802.1p Priority
- IEEE 802.1Q VLAN Tagging
- IEEE 802.1Qbg EVB/VEPA
- IEEE 802.1BR Bridge Port Extension
- IEEE 802.1Qau Congestion Notification
- IEEE 802.3x Flow Control
- IEEE 802.3ad Load-balancing & Failover
- Ethernet II and 802.3 encapsulated frames
- Multiple MAC addresses per interface
- Jumbo Frames up to 9.6 Kbytes

Physical and Environmental

- Pkg 33x33mm or 27x27mm, 1mm pitch
- Fully RoHS Compliant
- Operating Temp: 0° to 55° C or 32° to 131° F
- Operating Humidity: 5 to 95%
- Airflow: 200 lf/m
- Typical power: 7-14W depending on SKU