Product Brief

Intel® Ethernet 700 Series Network Adapters

Intel® Ethernet Network Adapter X710-T2L/T4L for OCP 3.0

Dual and quad-port energy-efficient OCP NIC 3.0 adapters for NBASE-T and 10GBASE-T networks

Key Features

- OCP NIC 3.0 Small Form Factor
- Energy Efficient Ethernet (EEE) / IEEE 802.3az enabled
- Backward compatible with multi-speed support for 5/2.5/1GbE, 10GBASE-T, and 100BASE-TX
- PCI Express (PCIe) 3.0 x8
- Network Virtualization offloads including VxLAN, GENEVE, NVGRE, MPLS, and VxLAN-GPE with Network Service Headers (NSH)
- Intel® Ethernet Flow Director for hardware-based application traffic steering
- Dynamic Device Personalization (DDP) enables increased packet processing efficiency for NFV and Cloud deployments
- Data Plane Development Kit (DPDK) optimized for efficient packet processing
- Excellent small packet performance for network appliances and Network Functions Virtualization (NFV)
- I/O virtualization innovations for maximum performance in a virtualized server

Overview

Simplify technology transitions with the Intel® Ethernet Network Adapter X710-T2L and X710-T4L for OCP 3.0. Autonegotiation between port speeds provides maximum flexibility in dual and quad-port 10GBASE-T configurations. These low-power adapters also support Energy Efficient Ethernet to efficiently reduce power consumption during periods of low data activity.

The X710-T2L and X710-T4L for OCP 3.0 are part of the Intel® Ethernet 700 Series, the foundation for server connectivity; providing broad interoperability, critical performance optimizations, and increased agility for Communications, Cloud, and Enterprise IT network solutions.

- **Interoperability** - Multiple speeds and media types for broad compatibility backed by extensive testing and validation.
- **Optimization** - Intelligent offloads and accelerators to unlock network performance in servers with Intel® Xeon® processors.
- **Agility** - Both Kernel and Data Plane Development Kit (DPDK) drivers for scalable packet processing.

The OCP NIC 3.0 specification defines a standardized design for a new generation of network adapters. Simple and straightforward form factors, clear manageability requirements, and improved serviceability help simplify deployment for current and emerging capabilities.

All Intel® Ethernet 700 Series Network Adapters include these feature-rich technologies:

Flexible and Scalable I/O for Virtualized Infrastructures

Intel® Virtualization Technology (Intel® VT), delivers outstanding I/O performance in virtualized server environments.

I/O bottlenecks are reduced through intelligent offloads, enabling near-native performance and VM scalability. These offloads include Virtual Machine Device Queues (VMDq) and Flexible Port Partitioning using SR-IOV with a common Virtual Function driver for networking traffic per Virtual Machine (VM). Host-based features supported include:

VMDQ for Emulated Path: VMDQ, enables a hypervisor to represent a single network port as multiple network ports that can be assigned to the individual VMs. Traffic handling is offloaded to the network controller, delivering the benefits of port partitioning with little to no administrative overhead by the IT staff.

SR-IOV for Direct Assignment: Adapter-based isolation and switching for various virtual station instances enables optimal CPU usage in virtualized environments.

- Up to 128 virtual functions (VFs), each VF can support a unique and separate data path for I/O related functions within the PCI Express hierarchy.
- Use of SR-IOV with a networking device, for example, allows the bandwidth of a single port (function) to be partitioned into smaller slices that can be allocated to specific VMs or guests, via a standard interface.

Intel® Ethernet Adaptive Virtual Function (Intel® Ethernet AVF): Customers deploying mass-scale VMs or containers for their network infrastructure now have a common VF driver. This driver eases SR-IOV hardware upgrades or changes, preserves base-mode functionality in hardware and software, and supports an advanced set of features in the Intel® Ethernet 700 Series.

Enhanced Network Virtualization Overlays (NVO)

Network virtualization has changed the way networking is done in the data center, delivering accelerations across a wide range of tunneling methods.

VxLAN, GENEVE, NVGRE, MPLS, and VxLAN-GPE with NSH Offloads: These stateless offloads preserve application performance for overlay networks, and the network traffic can be distributed across CPU cores, increasing network throughput.

Flexible Port Partitioning (FPP)

FPP leverages the PCI-SIG SR-IOV specification. Virtual controllers can be used by the Linux host directly and/or assigned to virtual machines.

- Assign up to 63 Linux host processes or virtual machines per port to virtual functions.
- Control the partitioning of per-port bandwidth across multiple dedicated network resources, ensuring balanced QoS by giving each assigned virtual controller equal access to the port's bandwidth.

Network administrators can also rate limit each of these services to control how much of the pipe is available to each process.

Greater Intelligence and Performance for NFV and Cloud deployments

Dynamic Device Personalization (DDP) customizable packet filtering, along with enhanced Data Plane Development Kit (DPDK), support advanced packet forwarding and highly-efficient packet processing for both Cloud and Network Functions Virtualization (NFV) workloads.

- DDP enables workload-specific optimizations, using the programmable packet-processing pipeline. Additional protocols can be added to the default set to improve packet processing efficiency that results in higher throughput and reduced latency. New protocols can be added or modified on-demand and applied at runtime using Software Defined Firmware or APIs, eliminating the need to reset or reboot the server. This not only keeps the server and VMs up, running, and computing, it also increases performance for Virtual Network Functions (VNFs) that process network traffic that is not included in the default firmware. Download DDP Profiles
- DPDK provides a programming framework for Intel® processors and enables faster development of high-speed data packet networking applications.

Advanced Traffic Steering

Intel® Ethernet Flow Director (Intel® Ethernet FD) is an advanced traffic steering capability. Large numbers of flow affinity filters direct receive packets by their flows to queues for classification, load balancing, and matching between flows and CPU cores.

Steering traffic into specific queues can eliminate context switching required within the CPU. As a result, Intel® Ethernet FD significantly increases the number of transactions per second and reduces latency for cloud applications like memcached.

Features	Description
General	
RJ45 connections over CAT5e, CAT6, CAT6A cabling	• Ensures compatibility with cable lengths up to 100 meters. Two or four ports for maximum flexibility.
Energy Efficient Ethernet (EEE)	• IEEE 802.3az enabled for reduced power consumption. Note: Enabled for 10/5/2.5/1GBASE-T, but not for 100BASE-TX
Load balancing on multiple CPUs	• Increases performance on multi-processor systems by efficiently balancing network loads across CPU core when used with Receive-Side Scaling (RSS) from Microsoft* or scalable I/O on Linux.
Protect, Detect and Recover	• The Intel Ethernet 700 Series implements a design philosophy of platform resiliency with 3 attributes supporting the NIST Cybersecurity Framework: Protect, Detect and Recover. These attributes verify the firmware and critical device settings with built-in corruption detection and automated device recovery to return the device to its originally programmed state.
Support for most network operating systems	• Enables broad deployment for different applications.
Time Sync (IEEE 1588*, 802.1as)	• Enables networked Ethernet equipment to synchronize internal clocks according to a network master clock; endpoint can then acquire an accurate estimate of the master time by compensating for link latency.
OCP NIC 3.0 adapter	• Compatible with systems that support OCP NIC 3.0 Small Form Factor adapters.
I/O Features for Multi-Core Processor Servers	
Intel® Ethernet Flow Director (Intel® Ethernet FD)	• An advanced traffic steering capability increases the number of transactions per second and reduces latency for cloud applications like Memcached.
MSI-X support	• Minimizes the overhead of interrupts. • Load-balancing of interrupt handling between multiple cores/CPUs.
Multiple Queues: 1,536 Tx and Rx queues per device	• Network packet handling without waiting for buffer overflow providing efficient packet prioritization. • Actual number of queues will vary depending upon software implementation.
Tx/Rx IP, SCTP, TCP, and UDP checksum offloading (IPv4 IPv6) capabilities	• Lower processor usage. • Checksum and segmentation capability extended to new standard packet type.
Virtualization Features	
VMDQ	• Up to 256 maximum VMDQ VMs supported. • Offloads the data-sorting based on MAC addresses and VLAN tags, functionality from the Hypervisor to the network silicon, improving data throughput and CPU usage.
PCI-SIG SR-IOV Implementation (128 per device)	• Integrated with Intel® VT for Directed I/O (Intel® VT-d) to provide data protection between VMs by assigning separate physical addresses in the memory to each VM. • 128 per device (64 per port for Dual Port adapter, 32 per port for Quad Port adapter)
Virtual Machine Load Balancing (VMLB)	• VMLB provides traffic load balancing (Tx and Rx) across VMs bound to the team interface, as well as fault tolerance in the event of switch, port, cable, or adapter failure.
Advanced Packet Filtering	• 1536 exact matched packets (unicast or multicast). • 512 hash entries each for unicast and multicast. • Lower processor usage. • Promiscuous (unicast and multicast) transfer mode support. • Optional filtering of invalid frames.
VLAN support with VLAN tag insertion, stripping and packet filtering for up to 4096 VLAN tags	• Ability to create multiple VLAN segments.
VxLAN, NVGRE, GENEVE, VxLAN-GPE+NSH, MPLS	• Preserves application performance in network virtualized environments.
Manageability Features	
Preboot Execution Environment (PXE) Support	• Enables system boot via the LAN (32-bit and 64-bit). • Flash interface for PXE image.
Unified Extensible Firmware Interface (UEFI)	• Enables new technologies during the pre-OS boot process and addresses legacy BIOS limitations on hardware.
Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON) Statistic Counters	• Easy system monitoring with industry-standard consoles.
Watchdog Timer	• Gives an indication to the manageability firmware or external devices that the controller or the software device driver is not functioning.
Supported Management Implementations	• RBT • MCTP • RBT+MCTP
NC-SI (DSP0222)	• Supports NC-SI 1.1 for Pass-Through and Control traffic.
MCTP (DSP0236)	• Supports MCTP 1.2.
MAC address provisioning	• Provisions one or more MAC addresses per NC-SI capable device that can be used for out of band management.
Temperature reporting (ASIC)	• Reports temperature of Intel® Ethernet Controller.
Estimated power consumption reporting	• Reports estimated power consumption of the adapter, excluding transceiver modules.
Firmware inventory and update	• Allows firmware updates before OS boot.
Secure firmware	• Prevents the execution and update of unsigned and unauthenticated firmware components.
NC-SI package addressing	• Assigns a unique ID to each Ethernet controller sharing a single NC-SI physical connection to prevent addressing conflicts.

Specifications

General

Connections	RJ45 Copper
RJ45 Copper	2.5GBASE-T and 5GBASE-T: 100 m using CAT5e, CAT6, or CAT6A 10GBASE-T: 55 m using CAT6, 100 m using CAT6A 100BASE-TX and 1000BASE-T: 100 m using CAT5e, CAT6, or CAT6A

Power Consumption

	Dual Port		Quad Port	
Link Speed / Traffic	Typical Power	Max Power	Typical Power	Max Power
100 Mbps	4.9 W	5.3 W	6.2 W	6.8 W
1GbE	5.6 W	6.1 W	7.2 W	7.6 W
2.5GbE	6.5 W	6.6 W	10.2 W	11.4 W
5GbE	7.0 W	7.1 W	11.2 W	12.5 W
10GbE	8.8 W	9.5 W	13.4 W	14.2 W

Thermals and Airflow

	Heatsink to Port (0 - 65 °C) Minimum LFM	Heatsink to Port (0 - 55 °C) Minimum LFM	Port to heatsink (0 - 35 °C) Minimum LFM
Dual Port	200 LFM	100 LFM	100 LFM
Quad Port	330 LFM	200 LFM	100 LFM

Technical Features

Storage Temperature	-40 °C to 70 °C (-40 °F to 158 °F)
Storage Humidity	Maximum: 90% non-condensing relative humidity at 35 °C
LED Indicators	LINK (green = 10Gbps; yellow = 5/2.5/1Gbps, 100Mbps) ACTIVITY (blinking green = transmitting or receiving data; off = no link)

Intel Regulatory

FCC Class A for World Wide EMC/EMI	Commercial usage
Safety	UL 62368-1 and CAN/CSA C22.2 No. 62368-1-14 - Audio/video, information and communication technology equipment Part 1: Safety requirements European Group Differences and National Differences according to EN 62368-1:2014
RoHS-compliant	Product is compliant with EU RoHS Directive 2 2011/65/EU (Directive 2011/65/EU) and its amendments (e.g. 2015/863/EU)

Adapter Features

Data Rate Supported Per Port	10/5/2.5/1Gbps and 100Mbps
Bus Type/Bus Width	PCIe 3.0 x8
Interrupt Levels	INTA, MSI, MSI-X
Hardware Certifications	FCC A, cULus, CE, VCCI, BSMI, RCM, KCC, EEE
Controller	Intel® Ethernet Controller X710-AT2 (Dual Port) Intel® Ethernet Controller X710-TM4 (Quad Port)

Physical Dimensions

Dimensions	115 mm x 76 mm (OCP NIC 3.0 Small Form Factor)

Product Order Code

Configuration	Product Code
Dual port	X710T2LOCPV3
Quad port	X710T4LOCPV3

Supported Operating Systems

For a complete list of supported network operating systems for Intel® Ethernet 700 Series Adapters visit:
intel.com/support/EthernetOS

Warranty

Intel limited lifetime warranty for retail Ethernet Products, 90-day money-back guarantee (US and Canada).

Customer Support

For customer support options in North America visit:
intel.com/content/www/us/en/support/contact-support.html

Product Information

For information about Intel® Ethernet Products and technologies, visit: intel.com/ethernetproducts

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