

## Product Brief

Intel® Ethernet 700 Series Network Adapters



# Intel® Ethernet Network Adapter XXV710-DA2T



**25/10/1Gb Ethernet with hardware-enhanced IEEE 1588 Precision Time Protocol (PTP) for high clock-phase accuracy synchronization across networks.**

### Key Features

- Onboard high-precision oscillator for greater phase accuracy
- Dual SMA connectors for connecting to external timing sources/recipients
- Dynamic Device Personalization (DDP) enables increased packet processing efficiency for NFV and cloud deployments
- Data Plane Development Kit (DPDK) optimized for efficient packet processing
- PCI Express (PCIe) 3.0, x8

Increasing growth in 5G and edge deployments is driving demand for high-precision timing synchronization across the network. Most of these deployments will use 1588 Precision Time Protocol (PTP) to ensure the required phase accuracy across the network. The Intel® Ethernet Network Adapter XXV710-DA2T with hardware-enhanced IEEE 1588 PTP meets these requirements in a standards-based PCI Express Ethernet adapter that provides greater flexibility and lower total cost of ownership than today's single-purpose PTP appliances.

The Intel Ethernet Network Adapter XXV710-DA2T increases IEEE 1588 PTP phase accuracy through a combination of hardware enhancements and software optimizations.

**Onboard high-precision oscillator with up to 2,500<sup>1</sup> times tighter accuracy:** Provides greater phase accuracy than a standard Ethernet adapter and better holdover during clock interruption.

**Dual SubMiniature version A (SMA) coaxial connectors:** Allow connection to external timing sources, such as GPS signaling devices and to timing recipients, allowing the NIC to act as a grandmaster and as a timing source for other equipment. The output capability provides a way to audit the phase accuracy of each node.

**Software-defined pins (SDPs):** User-configurable I/O pins drive the SMAs and provide built-in timing coordination between ports.

**Standard Linux support:** Linux PTP utility provides support for multiple PTP profiles and use of SDPs for sync via 1 pulse per second (1pps) input and output signals.

The XXV710-DA2T is part of the Intel® Ethernet 700 Series Network Adapters. These adapters are the foundation for server and appliance connectivity, providing broad interoperability, critical performance optimizations, and increased agility for Communications, Cloud, and Enterprise IT network solutions.

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 such as 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), enabling near-native performance and VM scalability. 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 ports 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 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 built into the adapter. It consists of a large number of flow affinity filters that 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
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### General

SFP28 Connectivity	<ul style="list-style-type: none"> <li>Includes two SFP28 connectors that support SFP28 Direct Attach Copper, 25GBASE-SR and 25GBASE-LR physical media as well as SFP+ Direct Attach Copper, 10GBASE-SR, and 10GBASE-LR physical media.</li> </ul>																																			
Network Standard Physical Layer Interfaces <sup>2</sup>	<ul style="list-style-type: none"> <li>25GBASE-SR/LR (optical transceivers)</li> <li>25GBASE-CR (DAC). Automatically enables no-FEC, BASE-R FEC and RS-FEC to support CA-N, CA-S and CA-L cables</li> <li>10GBASE-SR/LR (optical transceivers)</li> <li>10GbE SFP+ DAC</li> </ul>																																			
SubMiniature version A (SMA) connectors	<ul style="list-style-type: none"> <li>Two coaxial connectors, each capable of being configured as a 1PPS (one pulse per second) input or output.</li> </ul> <p>Supported 1PPS input signal (50 ohm single-ended):</p> <table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Max</th> <th>Units</th> </tr> </thead> <tbody> <tr> <td>VIH</td> <td>1.65</td> <td>5.5</td> <td>V</td> </tr> <tr> <td>VIL</td> <td>-0.3</td> <td>0.8</td> <td>V</td> </tr> </tbody> </table> <p>Note: Assumes a 50 ohm termination. Parameters specified as measured at termination.</p> <p><b>Caution:</b> For 1PPS devices that output greater than 3.3V and have no series protection on their output, extended transmission to the adapter, while the adapter is powered down or when the adapter is already transmitting, may cause permanent damage to the adapter.</p> <p>Supported 1PPS output signal (50 ohm single-ended):</p> <table border="1"> <thead> <tr> <th></th> <th></th> <th>Min</th> <th>Typical</th> <th>Max</th> <th>Units</th> </tr> </thead> <tbody> <tr> <td>Terminated (50 ohms)</td> <td>VOH</td> <td>1.8</td> <td>2.4</td> <td>2.6</td> <td>V</td> </tr> <tr> <td rowspan="2">Unterminated</td> <td>VOH</td> <td>3.6</td> <td>5</td> <td>5.2</td> <td>V</td> </tr> <tr> <td>VOL</td> <td>-0.3</td> <td>0</td> <td>0.3</td> <td>V</td> </tr> </tbody> </table>		Min	Max	Units	VIH	1.65	5.5	V	VIL	-0.3	0.8	V			Min	Typical	Max	Units	Terminated (50 ohms)	VOH	1.8	2.4	2.6	V	Unterminated	VOH	3.6	5	5.2	V	VOL	-0.3	0	0.3	V
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Interoperability with other 25GbE switches and network adapters	<ul style="list-style-type: none"> <li>Delivers wide interoperability with SFP+, SFP28 and QSFP28 switches and network adapters in the market, enabling smooth adoption and upgrades to 25GbE within customers' network infrastructure.</li> </ul>																																			
Load balancing on multiple CPUs	<ul style="list-style-type: none"> <li>Increases performance on multi-processor systems by efficiently balancing network loads across CPU cores when used with Receive-Side Scaling (RSS) from Microsoft or scalable I/O on Linux.</li> </ul>																																			
Protect, Detect and Recover	<ul style="list-style-type: none"> <li>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.</li> </ul>																																			
Support for most network operating systems	<ul style="list-style-type: none"> <li>Enables broad deployment for different applications.</li> <li>1588 PTP capabilities only available in Linux</li> </ul>																																			
Hardware-enhanced IEEE 1588 PTP	<ul style="list-style-type: none"> <li>Onboard high-precision oscillator enables tighter phase accuracy and better holdover during master clock interruptions.</li> </ul>																																			
Data Rate Supported Per Port	<ul style="list-style-type: none"> <li>Optical: 1/10/25GbE</li> <li>Direct Attach: 10/25GbE</li> </ul>																																			
Bus Type/Bus Width	<ul style="list-style-type: none"> <li>PCIe 3.0 x8</li> </ul>																																			
Interrupt Levels	<ul style="list-style-type: none"> <li>INTA, MSI, MSI-X</li> </ul>																																			
Hardware Certifications	<ul style="list-style-type: none"> <li>FCC A, UL, CE, VCCI, BSMI, RCM, KCC</li> </ul>																																			
RoHS-compliant	<ul style="list-style-type: none"> <li>Product is compliant with EU RoHS Directive 2011/65/EU (Directive 2011/65/EU) and its amendments (e.g. 2015/863/EU)</li> </ul>																																			
Controller	<ul style="list-style-type: none"> <li>Intel® Ethernet Controller XL710-BM2</li> </ul>																																			

### I/O Features for Multi-Core Processor Servers

Intel® Ethernet Flow Director (Intel® Ethernet FD)	<ul style="list-style-type: none"> <li>An advanced traffic steering capability increases the number of transactions per second and reduces latency for cloud applications like memcached.</li> </ul>
MSI-X support	<ul style="list-style-type: none"> <li>Minimizes the overhead of interrupts.</li> <li>Load-balancing of interrupt handling between multiple cores/CPU's.</li> </ul>
Multiple Queues: 1,536 Tx and Rx queues per device	<ul style="list-style-type: none"> <li>Network packet handling without waiting for buffer overflow providing efficient packet prioritization.</li> <li>Actual number of queues will vary depending upon software implementation.</li> </ul>
Tx/Rx IP, SCTP, TCP, and UDP checksum offloading (IPv4, IPv6) capabilities	<ul style="list-style-type: none"> <li>Lower processor usage.</li> <li>Checksum and segmentation capability extended to new standard packet type.</li> </ul>

Features	Description
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### Virtualization Features

VMDQ	<ul style="list-style-type: none"> <li>• Up to 256 maximum VMDQ VMs supported.</li> <li>• 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.</li> </ul>
PCI-SIG SR-IOV Implementation (128 per device)	<ul style="list-style-type: none"> <li>• Provides an implementation of the PCI-SIG standard for I/O Virtualization. The physical configuration of each port is divided into multiple virtual ports. Each virtual port is assigned to an individual VM directly by bypassing the virtual switch in the Hypervisor, resulting in near-native performance.</li> <li>• 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.</li> <li>• 64 per port for dual port.</li> </ul>
Virtual Machine Load Balancing (VMLB)	<ul style="list-style-type: none"> <li>• 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.</li> </ul>
Advanced Packet Filtering	<ul style="list-style-type: none"> <li>• 1536 exact matched packets (unicast or multicast).</li> <li>• 512 hash entries each for unicast and multicast.</li> <li>• Lower processor usage.</li> <li>• Promiscuous (unicast and multicast) transfer mode support.</li> <li>• Optional filtering of invalid frames.</li> </ul>
VLAN support with VLAN tag insertion, stripping and packet filtering for up to 4096 VLAN tags	<ul style="list-style-type: none"> <li>• Ability to create multiple VLAN segments.</li> </ul>
VxLAN, NVGRE, GENEVE, VxLAN-GPE+NSH, MPLS	<ul style="list-style-type: none"> <li>• Preserves application performance in network virtualized environments.</li> </ul>

### Manageability Features

Preboot Execution Environment (PXE) Support	<ul style="list-style-type: none"> <li>• Enables system boot up via the LAN (32-bit and 64-bit).</li> <li>• Flash interface for PXE image.</li> </ul>
Unified Extensible Firmware Interface (UEFI)	<ul style="list-style-type: none"> <li>• Enables new technologies during the pre-OS boot process and addresses legacy BIOS limitations on hardware.</li> </ul>
Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON) Statistic Counters	<ul style="list-style-type: none"> <li>• Easy system monitoring with industry-standard consoles.</li> </ul>
Signed UEFI option ROM compatible with HTTP(S) boot	<ul style="list-style-type: none"> <li>• Provides additional network management capability.</li> </ul>
Watchdog Timer	<ul style="list-style-type: none"> <li>• Gives an indication to the manageability firmware or external devices that the controller or the software device driver is not functioning.</li> </ul>

## Technical Specifications

Airflow	Class 3 (2 W) SFP28 25GbE modules			
Media Type	FEC enabled	Ambient temperature	LFM	
Extended Temp (85 °C)	Yes	55 °C	200	
Extended Temp (85 °C)*	Yes	65 °C	550	
Class 2 (1.5 W) SFP28 25GbE modules				
Media Type	FEC enabled	Ambient temperature	LFM	
Commercial Temp (70 °C)	No	55 °C	525	
Extended Temp (85 °C)	Yes	55 °C	200	
Commercial Temp (70 °C)	Yes	55 °C	550	
Extended Temp (85 °C)*	Yes	65 °C	250	
*At the upper end of this temperature range, oscillator accuracy may drop below 20ppb.				
Storage Humidity	Maximum: 90% non-condensing relative humidity at 35 °C			
Storage Temperature	-40 °C to 70 °C (-40 °F to 158 °F)			
LED Indicators	<ul style="list-style-type: none"> <li>• LINK (solid) and ACTIVITY (blinking)</li> <li>• LINK SPEED (green = 25Gbps; yellow = 10Gbps)</li> </ul>			
Operating Temperature	0 °C to 65 °C (32 °F to 149 °F)			

## Power Consumption

Media Type	Typical Power	Maximum Power*
Direct Attach	9.2 W	10 W
Optics (Class 3, 2 W)	14.2 W	15.2 W

\*Maximum Power data represents the maximum measured values with typical SKU silicon across all valid voltage and temperature corners, and not theoretical maximums.

## Physical Dimensions

Dimension	167 mm x 69 mm
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## Product Order Code

XXV710DA2TLG1P5

## Supported Operating Systems

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

Enhanced PTP features are supported under Linux only.

## Intel® Ethernet Optics

Combine proven, reliable Intel® Ethernet Optics with Intel Ethernet 700 Series and 500 Series Network Adapters for dependable interoperability and consistent performance across the network. Learn more at [intel.com/ethernet](https://www.intel.com/ethernet)

## Warranty

Intel limited lifetime hardware warranty, 90-day money-back guarantee (US and Canada) and worldwide support.

## Customer Support

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

1. 20 ppb TCXO (10 °C to 70 °C) vs. typical 100 ppm crystal
2. For best timing accuracy, use media that do not require FEC, including 25Gbps/10Gbps CA-25G-N Direct Attach, 10Gbps/1Gbps SR Optics (Commercial Temp), 10Gbps/1Gbps LR Optics (Commercial Temp), 25Gbps Active Optical Cables (Commercial Temp), 1000BASE-T

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