Intel

Intel Xeon Gold 5412U Processor (PK8071305120401)

Datasheet

Product Overview

- The Intel Xeon Gold 5412U is a 4th Gen Intel Xeon Scalable processor designed for enterprise, network, edge, and general-purpose server workloads.
- It provides 24 cores and 48 threads, with a 2.10 GHz base frequency, up to 3.90 GHz Intel Turbo Boost frequency, 45 MB cache, and a 185 W TDP.
- Built on Intel 7 process technology, the processor supports a single-socket platform, eight DDR5 memory channels, and up to 4 TB of memory.
- The processor supports DDR5-4400 memory with ECC and provides 80 PCI Express 5.0 lanes for network adapters, storage, and accelerator connectivity.
- Intel DL Boost, Intel AMX, AVX-512, two AVX-512 FMA units, and one default DSA device support AI, data-plane, and analytics workloads.
- Hardware security features include Intel SGX with Intel SPS, Total Memory Encryption, Boot Guard, Control-Flow Enforcement Technology, and Intel virtualization technologies.

Product Highlights

- **24-Core Server Compute:** 24 cores and 48 threads provide parallel processing capacity for enterprise, network, edge, and general-purpose server workloads.
- **2.10 to 3.90 GHz Frequency Range:** The processor combines a 2.10 GHz base frequency with up to 3.90 GHz Intel Turbo Boost frequency for responsive burst performance.
- **DDR5 and PCIe 5.0 Expansion:** Eight DDR5-4400 memory channels and 80 PCIe 5.0 lanes support high-throughput memory and I/O designs in single-socket servers.
- **AI and Security Acceleration:** Intel AMX, Intel DL Boost, DSA, SGX with Intel SPS, TME, Boot Guard, and VT-d support selected AI, data-movement, and protected workloads.

Detailed Features



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Component	Specification
Processor	Intel Xeon Gold 5412U, 24 cores / 48 threads
Ordering Information	PK8071305120401, FC-LGA16A Tray, Spec Code SRMGJ
Frequency and Cache	2.10 GHz base, up to 3.90 GHz turbo, 45 MB cache
Memory	Up to 4 TB DDR5-4400, 8 channels, ECC supported
Power and Expansion	185 W TDP, 1S Only, PCIe 5.0 with 80 lanes

Balanced Single-Socket Compute

The 5412U combines 24 physical cores with 48 threads and a 185 W TDP. This balance suits enterprise, network, edge, and general-purpose servers that need parallel compute within a single-socket platform.

Versatile 4th Gen Xeon Design

The 5412U combines Intel AMX, Intel DL Boost, AVX-512, and PCIe 5.0 expansion for selected AI, analytics, data-plane, and infrastructure workloads.

Responsive Frequency and Cache Profile

The 2.10 GHz base frequency can reach up to 3.90 GHz with Intel Turbo Boost Technology 2.0. A 45 MB cache helps keep frequently accessed data close to the cores, supporting responsive service workloads.

Single-Socket Platform Efficiency

The processor is specified for 1S Only scalability and uses the FCLGA4677 socket. A single-socket design can simplify platform topology and reduce system complexity in enterprise, edge, storage, and network-function deployments.

High-Capacity ECC Memory

The processor supports up to 4 TB of DDR5-4400 memory across eight channels, with ECC support for server-class reliability. This gives single-socket systems room for virtualized network functions, caches, analytics, and service containers.

PCIe 5.0 I/O for Data-Plane Devices

Eighty PCIe 5.0 lanes provide direct expansion capacity for Ethernet adapters, storage controllers, accelerators, and other high-bandwidth devices. The lane budget helps designers build balanced I/O around a single processor socket.

Acceleration for AI and Data Movement

Intel AMX and DL Boost support selected AI and inference workloads, while one default DSA device supports data movement. AVX-512 and two AVX-512 FMA units add vector processing capability for supported applications.

Security and Virtualization Foundation

The processor includes Intel SGX with Intel SPS, Total Memory Encryption, Boot Guard, Control-Flow Enforcement Technology, AES instructions, VT-x, VT-d, and Extended Page Tables. These capabilities help protect workloads and support virtualized server platforms.

Technical Specifications

Product Specifications

Feature	Value
User SKU	INTL-5412U
Intel ordering code	PK8071305120401
Intel Spec Code	SRMGJ
Processor model	Intel Xeon Gold 5412U Processor
Product collection	4th Gen Intel Xeon Scalable Processors
Code name	Products formerly Sapphire Rapids
Vertical segment	Server
Processor number	5412U
Lithography	Intel 7
Marketing status	Launched
Launch date	Q1 2023
Embedded Options Available	No
Total cores	24
Total threads	48

Feature	Value
Processor base frequency	2.10 GHz
Max turbo frequency	3.90 GHz
Cache	45 MB
TDP	185 W
Scalability	1S Only
Sockets supported	FCLGA4677
Package carrier	E1B
Package size	77.5 mm x 56.5 mm
DTS max	94 °C
TCASE	81 °C
Max memory size	4 TB
Memory types	Up to DDR5-4400 MT/s 1DPC and 2DPC
Max memory channels	8
ECC memory supported	Yes
PCI Express revision	5
Max PCI Express lanes	80
Intel DL Boost	Yes
Intel Data Streaming Accelerator	1 default device
Intel Advanced Matrix Extensions	Yes
Intel Speed Select Technology - Core Power	Yes
Intel Speed Select Technology - Turbo Frequency	Yes
Intel Speed Select Technology - Base Frequency	Yes
High Priority Cores	8
High Priority Core Frequency	2.30 GHz
Low Priority Cores	16
Intel Resource Director Technology	Yes
Intel Speed Shift Technology	Yes
Intel Turbo Boost Technology	2.0
Intel Hyper-Threading Technology	Yes
Instruction set extensions	Intel AMX, Intel SSE4.2, Intel AVX, Intel AVX2, Intel AVX-512

Feature	Value
AVX-512 FMA units	2
Intel SGX	Yes with Intel SPS
Default maximum SGX EPC size	128 GB
Intel Total Memory Encryption	Yes
Intel AES New Instructions	Yes
Intel QuickAssist Software Acceleration	Yes
Intel Control-Flow Enforcement Technology	Yes
Intel Trusted Execution Technology	Yes
Intel Boot Guard	Yes
Intel Platform Firmware Resilience	Yes
Intel Run Sure Technology	Yes
Intel Virtualization Technology	VT-x, VT-d, and VT-x with EPT
Shipping media	Tray
Stepping	S3

Product Comparison

Feature	Intel Xeon Gold 5412U / PK8071305120401	Intel Xeon Gold 5411N / PK8071305121801	Intel Xeon Gold 5415+ / PK8071305118701
Processor family	4th Gen Intel Xeon Scalable	4th Gen Intel Xeon Scalable	4th Gen Intel Xeon Scalable
Network or edge positioning	Single-socket general-purpose processor	N-series, single-socket processor	General-purpose Sapphire Rapids processor
Total cores	24	24	8
Total threads	48	48	16
Processor base frequency	2.10 GHz	1.90 GHz	2.90 GHz
Max turbo frequency	3.90 GHz	3.90 GHz	4.10 GHz
Cache	45 MB	45 MB	22.5 MB
TDP	185 W	165 W	150 W
Scalability	1S Only	1S Only	2S
Max memory size	4 TB	4 TB	4 TB
Memory channels	8	8	8
Memory support	DDR5-4400 1DPC and 2DPC	DDR5-4400 1DPC and 2DPC	DDR5-4400 1DPC and 2DPC
ECC memory	Yes	Yes	Yes
PCI Express	5, 80 lanes	5, 80 lanes	5, 80 lanes
Default accelerator devices	DSA: 1	QAT: 2; DLB: 2; DSA: 1	QAT: 1; DLB: 1; DSA: 1; IAA: 1
Intel AMX	Yes	Listed in instruction set extensions	Yes
Intel DL Boost	Yes	Yes	Yes
Best-fit role	Single-socket enterprise, network, and edge server	Single-socket network and edge server	High-frequency general-purpose server

Accessories

Category	Accessories
Included Accessories	- Intel Xeon Gold 5412U processor - Tray shipping media
Optional Accessories	- FCLGA4677-compatible server board and CPU heatsink solution - DDR5 ECC memory and PCIe 5.0 network or storage adapters

Support & Warranty

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