

# White Paper for

# **KR6298V2 Series Servers**

#### Powered by Intel Processors

For KR6298-X2-A0-R0-00 and KR6298-X2-C0-R0-00

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## Applicable Model

Model	Maintenance	Cooling
KR6298-X2-A0-R0-00	Rear access	Air cooling
KR6298-X2-C0-R0-00	Rear access	Liquid cooling

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# Abstract

This document describes the KR6298V2 Intel-based server's appearance, features, performance parameters, and software and hardware compatibility, providing indepth information of KR6298V2.

# **Intended Audience**

This white paper is intended for pre-sales engineers.

# **Symbol Conventions**

The symbols that may be found in this document are defined as follows.

Symbol	Description
	A potential for serious injury, or even death if not properly
DANGER	handled
	A potential for minor or moderate injury if not properly
WARNING	handled
	A potential loss of data or damage to equipment if not
CAUTION	properly handled
$\bigcirc$	Operations or information that requires special attention
	to ensure successful installation or configuration
NOTE NOTE	Supplementary description of document information

## **Revision History**

Version	Date	Description of Changes
V1.0	2025/04/23	Initial release

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# **1** Product Overview

The KR6298V2 series AI server is a new-generation open accelerator computing server. It offers a compelling set of features such as superior performance, ultimate scalability, high energy efficiency, broad compatibility, and an open ecosystem and is suitable for typical AI application scenarios, including large-scale model training, natural language processing, speech recognition, image processing, and recommendation.

The KR6298V2 Intel-based system features an advanced topology design that aligns with the OCP Accelerator Module (OAM) Design Specification v1.1/v1.5. The system supports eight 54 V OAMs in a 6U space, with any two of them enabling direct P2P data communication, achieving a bidirectional interconnect bandwidth of up to 896 GB/s. Besides, the server is compatible with AI chips from various manufacturers, providing customers with a diverse range of solution choices. Powered by two 4<sup>th</sup>/5<sup>th</sup> Gen Intel Xeon Scalable processors (SPR/EMR), the server supports an interconnect bandwidth of up to 4,000 Gbps, achieving an ultimate OAM: IB for computing: IB for storage devices ratio of 8:8:2. It supports the exchange of computing and storage data using the Remote Direct Memory Access (RDMA) technology, effectively addressing the communication needs such as pipeline parallelism and data parallelism of large-scale models. The discrete 12 V PSUs for the motherboard and 54 V PSUs for the OAMs offer a higher system energy efficiency ratio. The refined layered and isolated airflow design realizes the optimal cooling efficiency. In addition, the excellent and reliable redundancy design, including N+N redundancy of PSUs and N+1 redundancy of middle and rear fan modules, makes the system perfect for data center deployment, providing customers with unprecedented reliability and stability.

The liquid-cooling server model KR6298-X2-C0-R0-00, based on the air-cooling server model KR6298-X2-A0-R0-00, employs cold-plate liquid cooling on the motherboard (CPU+memory) and GPU, and addresses the problem of poor heat dissipation of high-power GPU and CPU. It builds a high-performance, low-PUE (Power Usage Effectiveness) green data center and an intelligent computing center for customers to meet the market demand for low-carbon liquid-cooling AI servers especially under the background of low carbon consumption.

Besides, the cold-plate liquid cooling system on the motherboard (CPU+memory) and GPU used by model KR6298-X2-C0-R0-00, employs current sharing design to ensure the heat dissipation of the the motherboard (CPU+memory) and GPU modules. The system supports a maximum inlet temperature of 45°C (113°F). In addition, by reducing the number of rear fans, the server works with less system power consumption and noise, achieving the best heat dissipation efficiency. With the function of system leak detection, BMC can continuously monitor system parameters and leakage, trigger alarms, and implement protective measures to avoid downtime caused by liquid leakage.



Figure 1-1 KR6298V2 Intel-Based System

# **2** Features

### **2.1 Scalability and Performance**

- Features the 4<sup>th</sup>/5<sup>th</sup> Gen Intel Xeon Scalable processors (SPR/EMR), with up to 64 cores per processor, the max base frequency of 3.9 GHz, the max Turbo frequency of 4.2 GHz, an L3 cache up to 6.25 MB per core, and 3 UPI links per CPU at up to 20 GT/s, delivering unrivaled processing performance.
  - With the processor cache hierarchy optimization, a larger L2 cache of private 1 MB per core is provided, so that memory data can be put and processed directly in L2 cache, improving the memory access performance and reducing the demand for L3 cache capacity.
  - Supports Intel Turbo Boost Technology 2.0 and automatically scales CPU speeds up to the max Turbo frequency at peak workloads, allowing processor cores to exceed the max thermal design power (TDP) for a limited time.
  - Supports Intel Hyper-Threading Technology, allowing up to 2 threads to run on each core to improve the performance of multi-threaded applications.
  - Supports Intel Virtualization Technology that provides hardware assist for the virtualization software, allowing the operating system to better use hardware for handling virtualized workloads.
  - Supports Intel Advanced Vector Extensions 512 (Intel AVX-512), significantly accelerating the workloads that are strongly floating point compute intensive.
- Supports up to 32 DDR5 ECC DIMMs (4,800 MT/s or 5,600 MT/s, RDIMMs), delivering superior speed, high availability, and a memory capacity up to 4 TB.
- Flexible drive configurations provide elastic and scalable storage solutions to meet different capacity and upgrade requirements.
- Delivers all-SSD configuration, bringing higher I/O performance over all-HDD configuration or HDD-SSD mixing configuration.
- Offers 24 Gbps Serial Attached SCSI (SAS 4.0), doubling the data transfer rate of internal storage of 12 Gbps SAS (SAS 3.0) solution and maximizing the performance of storage I/O-intensive applications.

- With the Intel integrated I/O technology, the processors integrate the PCIe 5.0 controller to significantly reduce I/O latency and enhance overall system performance.
- Brand new CXL 2.0 technology built on PCIe 5.0 enables resource sharing among different PCIe devices.
- Up to 12 PCIe 5.0 expansion slots (populated with up to 11 PCIe expansion cards).
- One hot-plug OCP slot that can flexibly support one 10/25/100 Gb OCP 3.0 card.

### 2.2 Availability and Serviceability

- Supports hot-swap SAS/SATA/NVMe drives and RAID cards with RAID levels 0/1/1E/10/5/50/6/60, RAID cache and data protection enabled by the super-capacitor in case of power failures. Supported RAID levels vary with RAID cards.
- SSDs are much more reliable than traditional HDDs, increasing system uptime.
- The BMC management network port on the rear panel enables remote BMC O&M, improving O&M efficiency.
- Up to 2 hot-swap 12 V PSUs with 1+1 redundancy and 6 hot-swap 54 V PSUs with 3+3 redundancy; 6 hot-swap middle fan modules with N+1 redundancy and 6 rear hot-swap fan modules in model KR6298-X2-A0-R0-00 or 5 rear hot-swap fan modules in model KR6298-X2-C0-R0-00 with N+1 redundancy, improving system availability.
- The BMC monitors system parameters in real time and sends alerts in advance, enabling technicians to take appropriate measures to ensure stable system operation and minimize system downtime.
- Online memory diagnosis helps service technicians quickly locate the failed DIMMs, improving maintenance efficiency.

### **2.3 Manageability and Security**

- The BMC monitors system operating status and enables remote management.
- The Network Controller Sideband Interface (NC-SI) feature allows a network port to serve as a management port and a service port. The NC-SI feature is disabled by default and can be enabled/disabled through the BIOS or BMC.
- The industry-standard UEFI improves the efficiency of setup, configuration and update, and simplifies the error handling process.

- Intel Platform Firmware Resilience (PFR) further protects BMC and BIOS firmware from malicious tampering, detects and automatically restores corrupted firmware, thus avoiding intrusions into the system.
- Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM) provide advanced encryption.
- Intel Trusted Execution Technology provides enhanced security through hardware-based resistance to malicious software attacks.
- The firmware update mechanism based on digital signatures prevents unauthorized firmware updates.
- UEFI Secure Boot protects the system from malicious bootloaders.
- Hierarchical password protection in BIOS ensures system boot and management security.
- BIOS Secure Flash and BIOS Lock Enable (BLE) reduce attacks from malicious software on the BIOS flash region.
- Dual-image mechanism for BMC and BIOS recovers firmware upon detection of corrupted firmware.
- BMC Secure Boot protects BMC from malicious tampering.
- Flexible BMC access control policies improve BMC management security.
- Chassis intrusion detection enhances physical security.



The NC-SI port supports the following features:

- The NC-SI port can be bonded to any network port of the OCP 3.0 card or of PCIe NIC that supports NC-SI.
- Supports the enablement/disablement and configuration of Virtual Local Area Network ID (VLAN ID). VLAN is disabled by default.
- Supports IPv6 and IPv4 addresses. IP address, subnet mask, default gateway, and prefix length of IPv6 address can be configured.



UEFI mode is supported by default. If Legacy mode is needed, contact our Customer Service.

## 2.4 Energy Efficiency

- Equipped with 80 Plus Titanium power supplies of different power efficiency levels, with power efficiency up to 96% at a load of 50%.
- Supports two 12 V PSUs with 1+1 redundancy and six 54 V PSUs with 3+3 redundancy, supports AC/DC power input, improving power conversion efficiency.
- Features the high-efficiency single-board voltage regulator down (VRD) solution, reducing DC-DC conversion loss.
- Supports Proportional-Integral-Derivative (PID) intelligent fan speed control and intelligent CPU frequency scaling, conserving energy.
- Offers a fully-optimized system cooling design with energy-efficient cooling fans, lowering energy consumption from system cooling.
- Provides power capping and power control measures.
- Supports staggered spin-up of drives, reducing power consumption during server startup.
- Supports Intel Intelligent Power Capability (IIPC) to optimize energy usage in the processor cores by turning computing functions on only when needed.
- Supports the 4<sup>th</sup>/5<sup>th</sup> Gen Intel Xeon Scalable processors (SPR/EMR), consuming less energy per core, improving energy efficiency, and reducing operation cost per unit.

# System Parts Breakdown

Figure 3-1 Exploded View



Item	Feature	Item	Feature
1	2.5-Inch Drive	14	Switch Board
2	2.5-Inch Drive Backplane	15	PDB (with rear fan connectors)
3	Middle Fan Module	16	System Mid-plane Board
4	Middle Top Cover	17	Motherboard
5	Rear Top Cover	18	PCIe Riser Module (PCIe expansion card × 1 + motherboard liquid- cooling tubes)
6	Air Duct	19	Motherboard Liquid-Cooling Module (CPU + DIMM)
7	Reinforcement Crossbar	20	Motherboard Liquid-Cooling Module (CPU)
8	PCIe Riser Module (PCIe expansion card × 2)	21	CPU
9	PCIe Riser Module (PCIe expansion card × 1 + OCP 3.0 card × 1)	22	CPU Heatsink
10	PSU (12 V PSU × 2 + 54 V PSU × 6)	23	GPU BOX
11	Rear Fan Module	24	Chassis

12	LP Card	25	E3.S Drive Backplane
13	DC-SCM Board	26	E3.S SSD

# **4** Logical Diagram

## 4.1 System Logical Diagram

#### Figure 4-1 Motherboard Logical Diagram



- Two 4<sup>th</sup>/5<sup>th</sup> Gen Intel Xeon Scalable processors (SPR/EMR).
- Up to 32 DIMMs.
- Up to 3 UPI links per CPU at up to 20 GT/s.
- Up to 12 PCIe 5.0 expansion slots. CPU0 supports 1 single-host OCP 3.0 card or CPU0 and CPU1 support 1 socket-direct OCP 3.0 card.

- Multiple local storage configurations are supported through different drive backplanes.
- The motherboard integrates the Emmitsburg (EBG) Platform Controller Hub (PCH) to support 3 USB 3.0 ports, 1 USB 2.0 port, eight 2.5-inch SATA 3.0 drives or 2 SATA M.2 or 2 NVMe M.2 SSDs, and 1 or 2 TF cards via 1 TF card adapter.
- The DC-SCM board integrates an AST2600 management chip and supports 1 VGA port, 1 BMC management network port, 1 system/BMC serial port, 1 TF card slot, and other connectors.

### 4.2 PCIe Logical Diagram



Figure 4-2 PCIe Topology Logical Diagram

• The PCIe switch employs Broadcom's latest Atlas2 104-lane PCIe switch chip in internal Synthetic Switch (iSSw) mode.

- PE0/PE2/PE3/PE4 of each CPU is connected to 2 PCIe switches, and each PCIe switch has 2 uplink ports and 6 downlink ports; the 6 downlink ports can be connected to 2 GPUs, 2 NICs and 2 NVMe drives, maximizing PCIe utilization.
- The system can be equipped with 8 OCP accelerator modules in application scenarios of large-scale AI training such as search, recommendation, Natural Language Processing (NLP), Computer Vision (CV) and autopilot. It can meet the computing power demand of large-scale AI training applications and match the AI application needs of cloud service supplier, Intelligent Virtual Assistant (IVA), finance and education and research.

# **5** Hardware Description

## 5.1 Front Panel

## 5.1.1 24 × 2.5-Inch Drive Configuration

Figure 5-1 Front View



Item	Feature
1	Power Button and LED
2	2.5-Inch Drive Bay
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover
7	Ear Latch
8	UID/BMC RST Button and LED
9	LEDs

## 5.1.2 16 × 2.5-Inch Drive Configuration

Figure 5-2 Front View



Item	Feature
1	Power Button and LED
2	2.5-Inch Drive Bay
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover
7	Ear Latch
8	UID/BMC RST Button and LED
9	LEDs

## 5.1.3 16 × E3.S SSD Configuration

Figure 5-3 Front View



ltem	Feature
1	Power Button and LED
2	E3.S Drive Bay
3	VGA Port
4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover
7	Ear Latch
8	UID/BMC RST Button and LED
9	LEDs

#### 5.1.4 8 × 2.5-Inch Drive Configuration

Figure 5-4 Front View



4	USB 3.0 Port
5	USB 2.0 Port
6	Server Fixing Screw Cover
7	Ear Latch
8	UID/BMC RST Button and LED
9	LEDs

## 5.2 Rear Panel

#### 5.2.1 KR6298-X2-A0-R0-00

Figure 5-5 Rear View



Item	Feature	Item	Feature
1	LP Card Slot	8	USB 3.0 Port
2	UID/BMC RST Button and LED	9	BMC Management Network Port
3	OCP 3.0 Card Hot-Plug Button and LED	10	PCIe Riser Module (PCIe Slot 10 and 11)
4	PCIe Slot 9	11	12 V PSU
5	OCP 3.0 Card (occupies PCIe slot 8)	12	54 V PSU
6	System/BMC Serial Port	13	Rear Fan
7	VGA Port	-	-

#### 5.2.2 NF5698-M7-C0-R0-00

Figure 5-6 Rear View



Item	Feature	Item	Feature
1	LP Card Slot	9	BMC Management Network
			Port
2	LED	10	System/BMC Serial Port
3	Motherboard Liquid Outlet	11	12 V PSU
4	Motherboard Liquid Inlet	12	54 V PSU
5	PCIe Slot 8	13	Rear Fan
6	VGA Port	14	GPU Liquid Inlet
7	USB 3.0 Port	15	GPU Liquid Outlet
8	PCIe Riser Module (PCIe Slot 10 and 11)	-	-

## **5.3 LEDs and Buttons**

Table 5-1 LED and Button Description

Item	lcon	Feature	Description	
1		Power Button and LED	<ul> <li>Power LED:</li> <li>Off = No power</li> <li>Solid green = Power-on state</li> </ul>	

Item	lcon	Feature	Description
			<ul> <li>Solid orange = Standby state</li> <li>Power button:         <ul> <li>Press and release the button to power on the system from the standby state</li> <li>Press and hold the button for 6 seconds to force a shutdown from the power-on state</li> </ul> </li> </ul>
2		System Status LED	<ul> <li>Off = Normal</li> <li>Blinking red (1 Hz) = A warning error is detected on CPU, memory, power supply, drive, fan, etc.</li> <li>Solid red = A critical error is detected on CPU, memory, power supply, drive, fan, etc.</li> </ul>
3		Memory Status LED	<ul> <li>Off = Normal</li> <li>Blinking red (1 Hz) = A warning error occurs</li> <li>Solid red = A critical error occurs</li> </ul>
4	5	Fan Status LED	<ul> <li>Off = Normal</li> <li>Blinking red (1 Hz) = A warning error occurs</li> <li>Solid red = A critical error occurs, including fan failure and fan absence</li> </ul>
5	4	Power Status LED	<ul> <li>Off = Normal</li> <li>Blinking red (1 Hz) = A warning error occurs</li> <li>Solid red = A critical error occurs</li> </ul>

Item	lcon	Feature	Description
6	<i><b></b></i>	System Overheat LED	<ul> <li>Off = CPU/PCH/Memory temperature normal</li> <li>Blinking red (1 Hz) = A warning error occurs, including Proc Hot, resulting in CPU throttling</li> <li>Solid red = A critical error occurs, including CPU thermal trip/PCH Hot/MEM Hot, etc.</li> </ul>
7		Network Status LED	<ul> <li>Off = No network connection</li> <li>Blinking green = Network connected with data being transmitted</li> <li>Solid green = Network connected without data being transmitted</li> <li>Note:</li> <li>It only indicates the status of the self- developed OCP card.</li> </ul>
8	UID	UID/BMC RST Button and LED	<ul> <li>UID/BMC RST LED:         <ul> <li>Blinking blue (4Hz) = PFR authentication fails and can not be recovered.</li> <li>Solid blue = The UID LED is activated by the UID button or via the BMC</li> <li>Gradually turning blue within 2 seconds and then gradually turning off within 2 seconds = PFR is booting normally (Note: The server can be powered on only after this LED turns off.)</li> <li>UID/BMC RST Button:                 <ul> <li>Short press the button to start the UID.</li> <li>Long press the button for 6</li> </ul> </li> </ul> </li> </ul>

ltem	lcon	Feature	Description
			seconds to force a BMC reset.



- Warning error: It indicates an error that may lead to redundancy, degradation or failure and have a minor impact on system operation. Pay attention to the warning error.
- Critical error: It indicates an error that may lead to a crash, restart or component failure and have a major impact on normal use. Fix the critical error directly.

#### **5.4** Port Description

Table 5-2 Port Description

Item	Port	Description	
1	VGA Port	Enables you to connect a display terminal, for	
		example, a monitor, to the system.	
2	USB 3.0 Port	Enables you to connect a USB 3.0 device to the	
_		system.	
2		Enables you to connect a USB 2.0 device to the	
2	036 2.0 PUIL	system.	
4	System/BMC Serial Port	<ul> <li>Enables you to capture system or BMC logs and debug the BMC.</li> <li>Enables you to print system logs.</li> </ul>	
5	BMC Management Network Port	Used to manage the server. Note: It is a Gigabit Ethernet port that supports 10 Mbps, 100 Mbps and 1,000 Mbps auto-negotiation.	
6	OCP Network Port	Enables you to connect the system to the network.	

#### **5.5** Processors

- Supports two 4<sup>th</sup> Gen Intel Xeon Scalable processors.
- The processors used in a server must be of the same model.

For specific system processor options, consult your local sales representative or refer to <u>7.2 Hardware Compatibility</u>.

#### 5.5.1 KR6298-X2-A0-R0-00

Figure 5-7 Processor Locations



#### 5.5.2 KR6298-X2-C0-R0-00

Figure 5-8 Processor Locations



## 5.6 Memory

#### 5.6.1 Identification

To determine DIMM characteristics, refer to the label attached to the DIMM and the following figure and table.

Figure 5-9 DIMM Identification



Item	Description	Example
1	Capacity	<ul> <li>16 GB</li> <li>32 GB</li> <li>64 GB</li> <li>128 GB</li> <li>256 GB</li> </ul>
2	Rank(s)	<ul> <li>1R = Single rank</li> <li>2R = Dual rank</li> <li>2S2R = Two ranks of two high stacked 3DS DRAM</li> <li>2S4R = Four ranks of two high stacked 3DS DRAM</li> <li>4R = Quad rank</li> </ul>
3	Data width of DRAM	<ul> <li>x4 = 4 bits</li> <li>x8 = 8 bits</li> </ul>
4	DIMM slot type	PC5 = DDR5
5	Maximum memory speed	<ul> <li>4,800 MT/s</li> <li>5,600 MT/s</li> </ul>
6	CAS latency	<ul> <li>SDP 4800B = 40-39-39</li> <li>3DS 4800B = 46-39-39</li> <li>SDP 5600B = 46-45-45</li> <li>3DS 5600B = 52-45-45</li> </ul>
7	DIMM type	R = RDIMM

#### 5.6.2 Memory Subsystem Architecture

The server supports 32 DIMM slots and 8 memory channels per CPU.

Within a channel, populate the DIMM slot with its silk screen ending with D0 first and second the DIMM slot with its silk screen ending with D1. For instance, within CPU0 Channel 0, populate CPU0\_C0D0 first and second CPU0\_C0D1.

CPU	Channel ID	Silk Screen
	Chammed 0	CPU0_COD0
	Channel 0	CPU0_COD1
	Channel 1	CPU0_C1D0
	Channel I	CPU0_C1D1
	Channel 2	CPU0_C2D0
	Channel 2	CPU0_C2D1
	Channel 2	CPU0_C3D0
CDUIO	Channel 3	CPU0_C3D1
CPUU	Channel 4	CPU0_C4D0
	Channel 4	CPU0_C4D1
	Channel F	CPU0_C5D0
	Channel 5	CPU0_C5D1
	Channel 6	CPU0_C6D0
		CPU0_C6D1
	Channel 7	CPU0_C7D0
		CPU0_C7D1
	Channel 0	CPU1_COD0
		CPU1_COD1
	Channel 1	CPU1_C1D0
		CPU1_C1D1
	Channel 2	CPU1_C2D0
		CPU1_C2D1
	Channel 2	CPU1_C3D0
		CPU1_C3D1
CPUT	Channel 4	CPU1_C4D0
	Channel 4	CPU1_C4D1
	Channel 5	CPU1_C5D0
	Channel 5	CPU1_C5D1
	Chappel 6	CPU1_C6D0
		CPU1_C6D1
	Channel 7	CPU1_C7D0
		CPU1_C7D1

Table 5-3 DIMM Slot List

#### 5.6.3 Compatibility

Refer to the following rules to configure the DDR5 DIMMs.

# 

- A server must use DDR5 DIMMs with the same part number (P/N code). All DDR5 DIMMs operate at the same speed, which is the lowest of:
  - Memory speed supported by a specific CPU.
  - Maximum operating speed of a specific memory configuration.
- Mixing DDR5 DIMM specifications (capacity, bit width, rank, height, etc.) is not supported.
- For specific system memory options, consult your local sales representative or refer to <u>7.2 Hardware Compatibility</u>.
- DDR5 DIMMs can be used with the 4<sup>th</sup> Gen Intel Xeon Scalable processors (Sapphire Rapids). The maximum memory capacity supported is identical for different CPU models.
- The total memory capacity is the sum of the capacities of all DDR5 DIMMs.

# 

Maximum number of DIMMs supported per channel ≤ Maximum number of ranks supported per channel/Number of ranks per DIMM

Item		Value			
Capacity per DDR5 DIMM (GB)		16	32	64	128
Туре		RDIMM	RDIMM	RDIMM	RDIMM
Rated speed (MT/s)		4,800/5,600	4,800/5,600	4,800/5,600	4,800/5,600
Operating voltage (V)		1.1	1.1	1.1	1.1
Maximum number of DDR5 DIMMs supported in a server <sup>1</sup>		32	32	32	32
Maximum capacity of DDR5 DIMMs supported in a server (GB) <sup>2</sup>		512	1,024	2,048	4,096
Actual speed (MT/s)	1DPC <sup>3</sup>	4,800/5,600	4,800/5,600	4,800/5,600	4,800/5,600
	2DPC	4,400	4,400	4,400	4,400

#### Table 5-4 DDR5 DIMM Specifications

Iten	n	Value						
1.	The maximum number of DDR5 DIMMs supported is based on the dual-CPU configuration.							
2.	It indicates the maximum memory capacity supported when all the DIMM slots are populated with DDR5 DIMMs.							
3.	DPC (DIMM Per Chann	el) is the number of DIMMs per memory channel.						
The	he information above is for reference only. Consult your local sales							

#### 5.6.4 DIMM Population Rules

representative for details.

General population rules for DDR5 DIMMs:

- Install DIMMs only when the corresponding processor is installed.
- Install dummies in the empty DIMM slots.

Population rules for DDR5 DIMMs in specific modes:

- Memory sparing
  - Follow the general population rules.
  - Each channel must have a valid online spare configuration.
  - Each channel can have a different online spare configuration.
  - Each channel with a DIMM installed must have a spare rank.
- Memory mirroring
  - Follow the general population rules.
  - Each processor supports 4 integrated memory controllers (iMCs). Each iMC has 2 channels to be populated with DIMMs. Installed DIMMs must be of the same capacity and organization.
  - In a multi-processor configuration, each processor must have a valid memory mirroring configuration.

#### 5.6.5 DIMM Slot Layout

Up to 32 DDR5 DIMMs can be installed in a server, and a balanced DIMM configuration is recommended for optimal memory performance. DIMM configuration must be compliant with the DIMM population rules.

Figure 5-10 DIMM Slot Layout



Table 5-5 DDR5 DIMM Population Rules (Dual-CPU Configuration)

DDR	QTY	2	4	8	12	16	24	32
	C0D0	•	•	•	•	•	•	•
	C0D1						•	•
	C1D0					•	•	•
	C1D1							•
	C2D0			•	•	•	•	•
	C2D1						•	•
	C3D0				•	•	•	•
CDUID	C3D1							•
CPUU	C4D0			•	•	•	•	•
	C4D1						•	•
	C5D0				•	•	•	•
	C5D1							•
	C6D0		•	•	•	•	•	•
	C6D1						•	•
	C7D0					•	•	•
	C7D1							•
	C0D0	•	•	•	•	•	•	•
	C0D1						•	•
	C1D0					•	•	•
	C1D1							•
	C2D0			•	•	•	•	•
	C2D1						•	•
	C3D0				•	•	•	•
CDU1	C3D1							•
CPUT	C4D0			•	•	•	•	•
	C4D1						•	•
	C5D0				•	•	•	•
	C5D1							•
	C6D0		•	•	•	•	•	•
	C6D1						•	•
	C7D0					•	•	•
	C7D1							•
# 5.7 Storage

## 5.7.1 Drive Configurations

# 

For the physical drive No. of each configuration, see <u>5.7.2 Drive Numbering</u>.

Configuration	Front Drives	Internal Drives	Drive Management Mode
24 × 2.5-Inch Drive Configuration (8 × NVMe + 16 × SAS/SATA)	<ul> <li>Drive bays with physical drive No.</li> <li>0 to 7 support</li> <li>NVMe drives only</li> <li>Drive bays with physical drive No.</li> <li>8 to 23 support</li> <li>SAS/SATA drives only</li> </ul>	M.2 SSD on the M.2 adapter	<ul> <li>NVMe drives: switch board</li> <li>SAS/SATA drives: 1 RAID card</li> </ul>
16 × 2.5-Inch Drive Configuration (16 × SAS/SATA)	Drive bays with physical drive No. 0 to 15 support SAS/SATA drives only	M.2 SSD on the M.2 adapter	SAS/SATA drives: 1 or 2 RAID cards
16 × 2.5-Inch Drive Configuration (8 × NVMe + 8 × SAS/SATA)	<ul> <li>Drive bays with physical drive No.</li> <li>0 to 7 support</li> <li>NVMe drives only</li> <li>Drive bays with physical drive No.</li> <li>8 to 15 support</li> <li>SAS/SATA drives</li> <li>only</li> </ul>	M.2 SSD on the M.2 adapter	<ul> <li>NVMe drives: switch board</li> <li>SAS/SATA drives: PCH</li> </ul>
8 × 2.5-Inch Drive	Drive bays with physical drive No. 0 to	M.2 SSD on the	NVMe drives: switch board
NVMe)	7 support NVMe drives only	M.2 adapter	NVMe drives: 2 tri- mode RAID cards

#### Table 5-6 Drive Configurations

Configuration	Front Drives	Internal Drives	Drive Management Mode
8 × 2.5-Inch Drive Configuration (8 × SAS/SATA)	Drive bays with physical drive No. 0 to 7 support SAS/SATA drives only	-	SAS/SATA drives: 1 RAID card

#### 5.7.2 Drive Numbering

#### 1. 8 × 2.5-Inch Drive Configuration (8 × SAS/SATA Drive)

Figure 5-11 Drive Numbering



Physical Drive	Drive No. Identified by the	Drive No. Identified by an 8i
No.	ВМС	RAID Card
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7

#### 2. 8 × 2.5-Inch Drive Configuration (8 × NVMe Drive)

• 8 NVMe drives are connected to the switch board via a drive backplane.

#### Figure 5-7 Drive Numbering



Physical Drive	Drive No. Identified by the	Drive No. Identified by a RAID
No.	ВМС	Card
0	0	-
1	1	-
2	2	-
3	3	-
4	4	-
5	5	-
6	6	-
7	7	-

• 8 NVMe drives are connected to 2 Tri-Mode RAID cards via a drive backplane.

Figure 5-8 Drive Numbering



Physical Drive	Drive No. Identified by the	Drive No. Identified by 2 Tri-
No.	ВМС	Mode RAID Cards
0	0	0
1	1	1
2	2	2
3	3	3
4	4	0
5	5	1
6	6	2
7	7	3

#### 3. 16 × 2.5-Inch Drive Configuration (16 × SAS/SATA drive)

• 16 SAS/SATA drives are connected to one 16i-RAID card via the drive backplanes.

Figure 5-9 Drive Numbering



Physical Drive	Drive No. Identified by the	Drive No. Identified by a 16i
No.	вмс	RAID Card
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	11	11
12	12	12
13	13	13
14	14	14
15	15	15

• 16 SAS/SATA drives are connected to two 8i-RAID cards via the drive backplanes.

Figure 5-10 Drive Numbering



Physical	Drive No. Identified by the	Drive No. Identified by two 8i
Drive No.	ВМС	RAID Cards
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	0
9	9	1
10	10	2
11	11	3
12	12	4
13	13	5
14	14	6
15	15	7

# 4. 16 × 2.5-Inch Drive Configuration (8 × NVMe drive + 8 × SAS/SATA drive)

Figure 5-11 Drive Numbering



Physical	Drive No. Identified by the	Drive No. Identified by a RAID
Drive No.	ВМС	Card
0	0	-
1	1	-
2	2	-
3	3	-
4	4	-
5	5	-
6	6	-
7	7	-
8	8	-
9	9	-
10	10	-
11	11	-
12	12	-
13	13	-
14	14	-
15	15	-

# 5. 24 × 2.5-Inch Drive Configuration (8 × NVMe drive + 16 × SAS/SATA drive)

Figure 5-12 Drive Numbering



Physical Drive	Drive No. Identified by the	Drive No. Identified by a 16i	
No.	ВМС	RAID Card	
0	0	-	
1	1	-	
2	2	-	
3	3	-	
4	4	-	
5	5	-	
6	6	-	
7	7	-	
8	8	0	
9	9	1	
10	10	2	
11	11	3	
12	12	4	
13	13	5	
14	14	6	
15	15	7	
16	16	8	

Physical Drive No.	Drive No. Identified by the BMC	Drive No. Identified by a 16i RAID Card
17	17	9
18	18	10
19	19	11
20	20	12
21	21	13
22	22	14
23	23	15

#### 5.7.3 Drive LEDs

#### 1. SAS/SATA Drive LEDs

Figure 5-13 SAS/SATA Drive LEDs



#### Table 5-7 SAS/SATA Drive LED Description

Activity LED ( 1)	Locator/Error LED (②)			Description
Green	Blue	Red		•
		RAID	RAID not	
Off	Off	created	created	Drive absent
		Solid on	Off	
Solidon	Off	Off		Drive present but
	011	UII		not in use
Elaching	Off	Off		Drive present and
Flashing	011			in use
Elaching	Solid pink		Copyback/Rebuild	
Flashing			in progress	
Solid on	iolid on Solid on Off		Drive selected but	
				not in use
Elaching	Solid on	olid on Off		Drive selected and
Flashing	50110 011			in use
Off				Drive selected but
		n Off		failed

Activity LED ( 1)	Locator/Error LED ( ② )		Description
Green	Blue Red		•
Any status	Off	Solid on	Drive failed

#### 2. NVMe Drive LEDs

Figure 5-14 NVMe Drive LEDs



VMD is not supported by default.

When the NVMe drive is connected to the switchboard via a backplane, RAID is not supported. Only the activity LED functions.

Table 5-8 NVMe Drive LED Description

Activity LED ( ① )	Description	
Green		
Off	Drive absent	
Solid on	Drive present but not in use	
Flashing	Drive present and in use	

When the NVMe drive is connected to a tri-mode RAID card via a backplane, RAID is supported. The drive LED descriptions are indicated in the following table.

|--|

Activity LED ( 1)	Error LED	(②)	Description
Green	Blue	Red	•
Off	Off	Off	Drive absent
Solid on	Off	Off	Drive present but not in use
Flashing	Off	Off	Drive present and in use
Flashing	Solid pink	(	Copyback/Rebuild/Initializing/Verifying in progress
Solid on	Solid on	Off	Drive selected but not in use
Flashing	Solid on	Off	Drive selected and in use
Any status	Solid on	Off	Drive selected but failed

Activity LED ( 1)	Error LED	(②)	Description
Green	Blue	Red	
Any status	Off	Solid	Drive failed
Any status	UII	on	

#### 5.7.4 RAID Cards

The RAID card provides functions such as RAID configuration, RAID level migration, and drive roaming. For specific RAID card options, consult your local sales representative or refer to <u>7.2 Hardware Compatibility</u>.

#### 5.8 Network

NICs provide network expansion capabilities.

- The system supports the OCP card. Users can select the OCP cards as needed.
- The PCIe expansion slots support PCIe NICs. Users can select the PCIe NICs as needed.
- For specific NIC options, consult your local sales representative or refer to <u>7.2</u> <u>Hardware Compatibility</u>.

#### 5.9 I/O Expansion

#### 5.9.1 PCIe Expansion Cards

The PCIe expansion cards provide system expansion capabilities.

- KR6298-X2-A0-R0-00 supports up to 12 PCIe 5.0 expansion slots; KR6298-X2-C0-R0-00 supports up to 11 PCIe 5.0 expansion slots.
- Supports up to 11 PCIe expansion cards.
- For specific PCIe expansion card options, consult your local sales representative or refer to <u>7.2 Hardware Compatibility</u>.

#### **5.9.2 PCIe Slots Locations**

#### 1. KR6298-X2-A0-R0-00

Up to 12 PCIe expansion slots are supported, as shown in the following figures.

Figure 5-15 PCIe Slot Locations - 12 PCIe Expansion Slots



Figure 5-16 PCIe Slot Locations - Including a Dedicated Slot for the OCP 3.0 Card



- PCIe slot 8 to 11: up to 3 single-width FHHL cards (inserted in PCIe slot 8, 10 and 11) or 1 dual-width FHHL card (inserted in PCIe slot 8; occupying PCIe slot 8 and 9) + 2 single-width FHHL cards (inserted in PCIe slot 10 and 11)
- PCIe slot 8: 1 optional OCP 3.0 card.
- PCIe slot 0 to 7: up to 8 HHHL cards.

#### 2. KR6298-X2-A0-R0-00

Up to 11 PCIe slots are supported, as shown in the following figures.

Figure 5-17 PCIe Slot Locations-11 PCIe Slots



Figure 5-18 PCIe Slot Locations - Including a Dedicated Slot for the OCP 3.0 Card



- PCIe slot 8, 10 and 11: up to 3 single-width FHHL cards (inserted in PCIe slot 8, 10 and 11) or 1 dual-width FHHL card (inserted in PCIe slot 10; occupying PCIe slot 10 and 11) + 1 single-width FHHL cards (inserted in PCIe slot 8)
- PCIe slot 8: 1 optional OCP 3.0 card.
- When PCIe slot 9 is occupied by motherboard liquid tubes, it can no longer be inserted with a card.
- PCIe slot 0 to 7:up to 8 HHHL cards.

#### 5.9.3 PCIe Riser Module

#### 1. KR6298-X2-A0-R0-00

• PCIe riser module (PCIe slot 8 and PCIe slot 9) supports two x16 single-width FHHL PCIe expansion cards or one x16 dual-width FHHL PCIe expansion card inserted in PCIe slot 8.

Figure 5-19 PCIe Riser Module (PCIe Slot 8 + PCIe Slot 9)



• PCIe riser module (OCP 3.0 slot and PCIe slot 9) supports one x16 single-width FHHL PCIe expansion card that occupies PCIe slot 9 and one OCP 3.0 card that occupies PCIe slot 8.

Figure 5-20 PCIe Riser Module (PCIe Slot 9 + OCP 3.0 Slot)



• PCIe riser module (PCIe slot 10 and PCIe slot 11) supports two x16 single-width FHHL PCIe expansion cards.



Figure 5-21 PCIe Riser Module (PCIe Slot 10 + PCIe Slot 11)

#### 2. KR6298-X2-C0-R0-00

• PCIe riser module (PCIe slot 10 and PCIe slot 11) supports two x16 single-width FHHL PCIe expansion cards or one x16 dual-width FHHL PCIe expansion card inserted in PCIe slot 10.

Figure 5-22 PCIe Riser Module (PCIe Slot 10 + PCIe Slot 11)



- PCIe riser module (PCIe slot 8 and PCIe slot 9):
  - Supports one x16 single-width FHHL PCIe expansion card or one OCP 3.0 card.
  - When PCIe slot 9 is occupied by liquid cooling tubes, it can no longer be

inserted with a card.

Figure 5-23 PCIe Riser Module (PCIe Slot 8)



# 5.9.4 PCIe Slot Description

PCIe Slot	Owner	PCle	Connector	Bus	Port No	Form
r cie Stot	owner	Standard	Width	Width	POIC NO.	Factor
Slot 0	SWA	PCle 5.0	x16	x16	S0	HHHL
Slot 1	SWA	PCIe 5.0	x16	x16	S5	HHHL
Slot 2	SWB	PCle 5.0	x16	x16	S0	HHHL
Slot 3	SWB	PCle 5.0	x16	x16	S5	HHHL
Slot 4	SWC	PCIe 5.0	x16	x16	52	HHHL
Slot 5	SWC	PCle 5.0	x16	x16	S1	HHHL
Slot 6	SWD	PCIe 5.0	x16	x16	52	HHHL
Slot 7	SWD	PCIe 5.0	x16	x16	S1	HHHL
Slot 8	CPU0	PCle 5.0	x16	x8/x16	PE1	FHHL
Slot 9	NA	NA	NA	NA	NA	NA
Slot 10	CPU1	PCle 5.0	x16	x8/x16	PE1	FHHL
Slot 11	CPU1	PCle 5.0	x16	x8	PE1	FHHL
OCP 3.0 Slot						CEE
(occupies	CPU0	PCle 5.0	x16	x16	PE1	
slot 8)						UCP 5.0
OCP 3.0 Slot				vQ		CEE
(occupies		PCle 5.0	x16	X0 V0		
slot 8)	CPUT			70		009 3.0

# 5.10 PSUs

- Up to two 12 V PSUs and six 54 V PSUs.
- When the server is configured with two 12 V PSUs and six 54 V PSUs, the 12 V PSUs support 1+1 redundancy and the 54 V PSUs support 3+3 redundancy.
- Supports AC or DC power input.
- The PSUs are hot-swappable.
- The server must use 12 V PSUs with the same part number (P/N code) and 54 V PSUs with the same part number (P/N code).
- The PSUs feature short-circuit protection.



- When the OAM GPU module is installed, at least one 54 V PSU must be used to boot the server.
- When the OAM GPU module is installed, at least three 54 V PSUs must be used to ensure proper system running and help avoid system crash.

Figure 5-24 PSU Locations



## 5.11 Fan Modules

- The server supports 6 middle 6056 fan modules and 6 rear 8086 fan modules in model KR6298-X2-A0-R0-00 or 5 rear 8086 fan modules in model KR6298-X2-C0-R0-00.
- The fan modules are hot-swappable.

- Middle fan modules and fan modules support N+1 redundancy, which means that the server can continue working when a middle and a rear fan fail. In that case, the maximum ambient temperature supported is 30°C (86°F).
- Supports intelligent fan speed control.
- The server must use middle fan modules with the same part number (P/N code) and rear fan modules with the same part number (P/N code).



Middle fan modules in models KR6298-X2-A0-R0-00 and KR6298-X2-C0-R0-00 bear the same part number (P/N code).

Figure 5-25 Middle Fan Modules

Figure 5-26 Rear Fan Modules (KR6298-X2-A0-R0-00)



Figure 5-27 Rear Fan Modules (KR6298-X2-C0-R0-00)



# 5.12 Boards

#### 5.12.1 Motherboard

Figure 5-28 Motherboard Layout



Item	Feature	Item	Feature
1	GPU Module Power Connector	23	Left Control Panel Connector
2	OCP 3.0 Card Hot-Plug Button and LED Connector	24	MCU COM2 Connector
3	OCP 3.0 Card Power Connector	25	MCU COM3 Connector
4	Right Control Panel Connector	26	Smart NIC Power Connector
5	Smart NIC Connector	27	PDB Sideband Connector
6	XDP Connector	28	Smart NIC Sideband Connector
7	MCIO x8 Connector	29	Leak Detection Connector
8	SGPIO2 Connector	30	RAID Key Connector

Item	Feature	Item	Feature
9	Chassis Temperature Sensor Connector	31	Motherboard Power Connector
10	Inlet Temperature Sensor	32	OCP 3.0 Card Sideband
11	Connector	22	
11	Riser I <sup>2</sup> C Connector	33	SATA Connector
12	BP I <sup>2</sup> C Connector	34	Button Cell Battery Socket
13	Riser (dedicated for RAID	35	NVI ink Connector (reserved)
	card) Power Connector	55	
14	MCU COM5 Connector	36	System TF Card Connector
15	MCU COM4 Connector	37	DC-SCM Connector
16	PCle Riser Power Connector	38	M.2 Riser SATA Connector
17	BP Power Connector	39	M.2 Riser Power Connector
18	TSOM I <sup>2</sup> C Connector	40	Intrusion Switch Connector
19	SGPIO1 Connector	41	PDB SGPIO Connector
20	SGPIO0 Connector	42	MCU COM1 Connector
21	CMOS Jumper	43	MCU COM0 Connector
22	CPU VPP1 Connector	-	-

#### 5.12.2 DC-SCM Board

Figure 5-29 DC-SCM Board



Item	Feature	Item	Feature
1	UID/BMC RST Button and LED	6	TCM/TPM Connector
2	TF Card Slot	7	BMC Management Network
			Port
3	BMC RTC Battery Connector	8	USB 3.0 Port
	(Reserved)		
4	Board to Board PHY Connector	9	VCA Doct
	(Reserved)		VGA POIL
5	Front Panel USB Type-C Port	-	-
	Connector (Reserved)		

## 5.12.3 Drive Backplanes

• SAS/SATA/NVMe Drive Backplane

Figure 5-30 SAS/SATA/NVMe Drive Backplane



Item	Feature	Item	Feature
1	MCIO x8 Connector	4	Slimline x4 Connector
2	VPP Connector	5	BMC_I <sup>2</sup> C Connector
3	Backplane Power Connector	-	-

• E3.S SSD Backplane

Figure 5-31 E3.S SSD Backplane



Item	Feature	Item	Feature
1	MCIO x8 Connector	3	Backplane Power Connector

Item	Feature	Item	Feature
2	BMC_I <sup>2</sup> C Connector	4	VPP Connector

# System Specifications

# 6.1 Technical Specifications

Table 6-1	Technical	Specifications
-----------	-----------	----------------

Item	Description		
Form Factor	6U rack server		
Chipset	Intel Emmitsburg		
Processor	<ul> <li>Two 4<sup>th</sup>/5<sup>th</sup> Gen Intel Xeon Scalable processors (SPR/EMR):</li> <li>Up to 64 cores per processor</li> <li>Max base frequency of 3.9 GHz and max Turbo frequency of 4.2 GHz</li> <li>3 UPI links per CPU at up to 20 GT/s per link</li> <li>TDP up to 385 W</li> </ul>		
Memory	<ul> <li>Up to 32 DIMMs</li> <li>8 memory channels per processor</li> <li>Up to 2 DIMM slots per channel</li> <li>Speed up to 5,600 MT/s</li> <li>Supports RDIMMs</li> <li>Supports ECC</li> </ul>		
Storage	<ul> <li>Front:</li> <li>24 × 2.5-inch drive (16 × 2.5-inch SAS/SATA drive + 8 × 2.5-inch NVMe drive) or</li> <li>16 × 2.5-inch SAS/SATA drive or</li> <li>16 × 2.5-inch drive (8 × NVMe drive + 8 × SAS/SATA drive) or</li> <li>16 × E3.S SSD or</li> <li>8 × 2.5-inch SAS/SATA/NVMe drive</li> <li>Internal:</li> <li>Up to 2 M.2 SSDs</li> </ul>		

Item	Description		
	• Up to 2 TF cards		
	• 1 optional 10/25/100 Gb OCP 3.0 card		
Network	• Standard 1/10/25/40/100/200 Gb PCIe NICs		
	• 100/200/400 Gb HCA cards		
	Model: KR6298-X2-A0-R0-00		
	• Supports a maximum of 12 PCIe expansion slots. Up to 11 PCIe expansion cards, including 1 optional OCP 3.0 card that occupies PCIe slot 8		
	PCIe Slot 0 to PCIe Slot 7: Up to 8 HHHL PCIe expansion cards		
	• PCIe slot 8 to 11: Up to 3 single-width FHHL cards populated in PCIe slot 8, 10, and 11. Also, PCIe slot 10 and 11 can be populated with 2 single-width FHHL cards and PCIe slot 8 can be populated with 1 dual-width FHHL card that occupies PCIe slot 8 and slot 9.		
I/O Expansion	Model: KR6298-X2-C0-R0-00		
	• Supports a maximum of 11 PCIe expansion slots. Up to 11 PCIe expansion cards, including 1 optional OCP 3.0 card that occupies PCIe slot 8.		
	PCIe Slot 0 to PCIe Slot 7: Up to 8 HHHL PCIe expansion cards		
	• PCIe slot 8, 10 and 11 can be populated with 3 single- width FHHL cards. Also, PCIe slot 8 can be populated with 1 single-width FHHL card and PCIe slot 10 can be populated with 1 dual-width FHHL card that occupies PCIe slot 10 and 11.		
	For details, see <u>5.9 I/O Expansion</u> .		
	Front:		
	• 1 × VGA port		
Port	• 1 × USB 3.0 port		
	• 1 × USB 2.0 port		
	Rear:		

Item	Description				
	• 2 × USB 3.0 port				
	• 1 × BMC management network port				
	• 1 × system/BMC serial port				
	• 1 × VGA port				
	Note:				
	OS installation on the USB storage media is not recommended.				
	Integrated VGA on the DC-SCM board with a video memory of 64 MB and a maximum 16M color resolution of 1 020 x 1 200 at				
	Notes:				
Display	• The integrated VGA can support a maximum resolution of 1,920 × 1,200				
	only when the video driver matching the OS version is installed; otherwise, only the default resolution of the OS is supported.				
	When the front and rear VGA ports are both connected to monitors, only				
	the monitor connected to the front VGA port works.				
	• UEFI				
System	• BMC				
Management	• NC-SI				
	• KSManage				
	Intel Platform Firmware Resilience (PFR)				
	<ul> <li>Trusted Platform Module (TPM) 2.0 and Trusted Cryptography Module (TCM)</li> </ul>				
	Intel Trusted Execution Technology				
	• Firmware update mechanism based on digital signatures				
Security	UEFI Secure Boot				
	Hierarchical BIOS password protection				
	• BIOS Secure Flash and BIOS Lock Enable (BLE)				
	BMC and BIOS dual-image mechanism				
	Chassis intrusion detection				

# 6.2 Environmental Specifications

#### Table 6-2 Environmental Specifications

Item	Description
	• Operating: 10°C to 35°C (50°F to 95°F)
Temperature	<ul> <li>Cold plate liquid inlet temperature: ≤45°C (113°F)</li> </ul>
remperature	• Storage (packed): -40°C to 70°C (-40°F to 158°F)
	<ul> <li>Storage (unpacked): -40°C to 55°C (-40°F to 131°F)</li> </ul>
	• Operating: 10%RH to 90% RH
Relative Humidity (RH, non-condensing)	• Storage (packed): 10%RH to 93% RH
,	• Storage (unpacked): 10%RH to 93% RH
	≤3,048 m (10,000 ft)
Operating Altitude	<ul> <li>0 to 900 m (0 to 2,953 ft): Operating temperature ranges from 10°C to 35°C (50°F to 95°F)</li> </ul>
	<ul> <li>900 to 3,050 m (2,953 to 10,007 ft): The maximum allowable temperature derated by 1°C per 300 m (1°F per 546.81 ft)</li> </ul>
	Maximum growth rate of corrosion film thickness:
Corrosive Gaseous	<ul> <li>Copper coupon: 300 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013)</li> </ul>
Contaminants	<ul> <li>Silver coupon: 200 Å/month (compliant with the gaseous corrosivity level of G1 defined in ANSI/ISA-71.04-2013)</li> </ul>
	Noise levels are within the limits defined by OSHA and occupational health and safety regulations in China. Listed is noise measured at a server operating temperature of 25°C (77°F):
Acoustic Noise	• Idle:
	- 8.7 Bel
	Operating:

E	NOTE

- Standard operating temperature
  - 10°C to 35°C (50°F to 95°F) is the standard operating temperature range at an altitude of 0 to 900 m (0 to 2953 ft). Derate the maximum allowable temperature by 1°C per 300 m (1°F per 546.81 ft) at an altitude of 900 to 3,048 m (2,953 to 10,000 ft). No direct sustained sunlight is permitted. The maximum operating altitude is 3,050 m (10,007 ft) and the maximum temperature gradient is 20°C/h (36°F/h), both varying with different system configurations.
  - Any fan failure or operations above 30°C (86°F) may lead to system performance degradation.
- This document lists the LWAd of the product at a 25°C (77°F) ambient environment. All measurements are conducted in conformance with ISO 7779 (ECMA 74) and declared in conformance with ISO 9296 (ECMA 109). The listed sound levels apply to the standard configuration. Additional options may result in increased sound levels. Contact your sales representative for more information.
- The sound levels shown here were measured based on the specific configurations of a server. Sound levels vary with server configuration. These values are for reference only and subject to change without notice.
- Product conformance to cited normative standards is based on sample testing, evaluation, or assessment. This product or family of products is eligible to bear the appropriate compliance logos and statements.

# 6.3 Physical Specifications

Table 6-3 Physical Specifications

Item	Description
	• With mounting ears: 482 × 263 × 890 mm (18.98 × 10.35 × 35.04 in.) (W × H × D)
Dimensions	<ul> <li>Without mounting ears: 447 × 263 × 860 mm (17.60 × 10.35 × 33.86 in.) (W × H × D)</li> </ul>
	<ul> <li>Outer packaging: 740 × 448 × 1,200 mm (29.13 × 17.64 × 47.24 in.) (W × H × L)</li> </ul>

Item	Description			
	<ul> <li>Installation requirements for the cabinet are as follows:</li> </ul>			
	<ul> <li>General cabinet compliant with the International Electrotechnical Commission 297 (IEC 297) standard</li> </ul>			
Installation	- Width: 482.6 mm (19 in.)			
Requirements	- Depth: Above 1,000 mm (39.37 in.)			
	Installation requirements for the server rails are as follows:			
	<ul> <li>Static rail kit: Distance between the front and rear mounting flanges ranges from 609 to 914 mm (23.98 to 35.98 in.)</li> </ul>			
	• 24 × 2.5-inch drive			
	- Net weight: 90 kg (198.42 lbs)			
Weight	<ul> <li>Gross weight: 125 kg (275.58 lbs) (including server, packaging box, rails and accessory box)</li> </ul>			
	Note:			
	The weight of a server varies with the server configurations.			

# **7** Operating System and Hardware Compatibility

This section describes the OS and hardware compatibility of the server. For the latest compatibility configuration and the component models not listed in this document, contact your local sales representative.

# U IMPORTANT

- Using incompatible components may cause the server to work abnormally, and such failures are not covered by technical support or warranty.
- Hardware compatibility may vary by the model. Contact your sales representative for detailed hardware configurations during the pre-sales phase.
- The server performance is strongly influenced by application software, middleware and hardware. The subtle differences in them may lead to performance variation in the application and test software.
  - For requirements on the performance of specific application software, contact your sales representatives to confirm the detailed hardware and software configurations during the pre-sales phase.
  - For requirements on hardware performance consistency, define specific configuration requirements (for example, specific drive models, RAID cards, or firmware versions) during the pre-sales phase.

# 7.1 Supported Operating Systems

#### Table 7-1 Supported Operating Systems

OS Version	(
Red Hat Enterprise Linux 8.8	F
Ubuntu 20.04	ι

# 7.2 Hardware Compatibility

#### 7.2.1 CPU Specifications

The server supports two 4<sup>th</sup> Gen Intel Xeon Scalable processors. The 84XX series supports up to 4,800 MHz.

Model	Cores	Threads	Base Frequency (GHz)	Max. Turbo Frequency (GHz)	Cache (MB)	TDP (W)
8480+	56	112	2.0	3.8	105	350
8470	52	104	2.0	3.8	105	350
8468	48	96	2.1	3.8	105	350
8468V	52	104	2.1	3.8	105	350
6530	32	64	2.1	4.0	160	270
8462Y+	32	64	2.8	4.10	60	300
8452Y	36	72	2.0	3.20	67.5	300
6448Y	32	64	2.1	4.10	60	225
6444Y	16	32	3.6	4.00	45	270
6442Y	24	48	2.6	4.00	60	225
6438Y+	32	64	2.0	4.00	60	205
5418Y	24	48	2.0	3.80	45	185

Table 7-2 CPU Specifications

#### 7.2.2 Memory Specifications

The server supports up to 32 DDR5 DIMMs. Each processor supports 8 memory channels with up to 2 DIMMs per channel. RDIMMs are supported.

Table	7-3	DIMM	Specifications
rubic	, ,	Durant	Specifications

Туре	Capacity (GB)	Frequency (MHz)	Data Width	Organization
RDIMM	32	4,800	64 bits	2R x8
RDIMM	64	4,800	64 bits	2R x4
RDIMM	96	4,800	64 bits	2R x4

## 7.2.3 Drive Specifications

#### Table 7-4 SATA SSD Specifications

Туре	Capacity	Max. Qty.
SATA SSD	240 GB	16
SATA SSD	480 GB	16
SATA SSD	960 GB	16
SATA SSD	1.92 TB	16
SATA SSD	3.84 TB	16
SATA SSD	7.68 T	16

#### Table 7-5 U.2 NVMe SSD Specifications

Туре	Capacity	Max. Qty.
U.2 NVMe SSD	960 GB	8
U.2 NVMe SSD	1.68 TB	8
U.2 NVMe SSD	1.92 TB	8
U.2 NVMe SSD	3.2 TB	8
U.2 NVMe SSD	3.84 TB	8
U.2 NVMe SSD	6.4 TB	8
U.2 NVMe SSD	7.68 TB	8

#### Table 7-6 M.2 SSD Specifications

Туре	Capacity	Max. Qty.
M.2 SATA SSD	240 GB	2
M.2 SATA SSD	480 GB	2
M.2 PCle SSD	960 GB	2
M.2 PCIe SSD	1.92 TB	2
M.2 PCIe SSD	3.84 TB	2

#### 7.2.4 SAS/RAID Card Specifications

Table 7-7 RAID Card Specifications

Туре	Description
RAID Card	RAID_PM8204_RA_8_2GB_SAS3_PCIe3
	RAID_PM8204_RA_8_4GB_SAS3_PCIe3
	RAID_L_8R0_9560-8i_4G_HDM12G_PCIe4
	RAID_L_16R0_9560-16i_8GB_SMSAS3_PCle4

## 7.2.5 NIC Specifications

Table 7-8 OCP Card Specifications

Туре	Description	Speed (Gbps)	Port Qty.
OCP 3.0 Card	NIC_I_10G_X710T2L_RJ_0CP3x8_2_XR_M7	10	2
	NIC_BRCM_10G_57416_RJ_OCP3x8_2_XR	10	2
	NIC_M_25G_MCX631432AN_LC_OCP3x8_2_XR	25	2
	NIC_M_100G_MCX623436AN_LC_OCP3x16_2_XR	100	2
	NIC_I_100G_E810CQDA2_LC_OCP3x16_2_XR_M7	100	2
	NIC_M_200G_MCX753436MS_LC_OCP3x16_2_XR	200	2

Table 7-9 PCIe NIC Specifications

Туре	Description	Speed (Gbps)	Port Otv.
PCIe NIC	NIC_Vostok_I350_1G_RJ_PCIEx4_4	1	4
	NIC_Vostok_X710_10G_LC_PCIEx8_2_M7	10	2
	NIC_M_25G_MCX631102AN_LC_PCIEx8_2_XR	25	2
	NIC_M_100G_MCX623105A_LC_PCIEx16_XR	100	1
	NIC_M_100G_MCX623106AN_LC_PCIEx16_2_XR	100	2
	NIC_I_100G_E810CQDA2_LC_PCIEx16_2_XR_M7	100	2
	NIC_M_200G_MCX623105AN_LC_PCIEx16_XR	200	1
	NIC_M_200G_755106AS_LC_PCIEx16_2_XR	200	2

#### 7.2.6 HBA/HCA Card Specifications

Туре	Description	Speed (Gbps)	Port Qty.
HCA Card	HCA_M_1-HDR100_MCX653105A-ECAT_PCIE	100	1
	HCA_M_2-HDR100_MCX653106A-ECAT_PCIE	100	2
	HCA_M_1-HDR200_MCX653105A-HDAT_PCIE_NV	200	1
	HCA_M_2-HDR200_MCX653106A-HDAT_PCIE	200	2
	HCA_NV_1-NDR200_MCX75310AAS-HEAT_PCIE	200	1
	HCA_NV_1-NDR_MCX75310AAS-NEAT_PCIE	400	1

#### 7.2.7 GPU/Graphics Card Specifications

Table 7-11 GPU Specifications

Туре	Description	Max. Qty.
0.4M	ASIC_I_96GB_HL225H_8192b	8
UAM	ASIC_I_96GB_HL225B_8192b	8

#### 7.2.8 PSU Specifications

The server supports up to two 12 V PSUs with 1+1 redundancy and six 54 V PSUs with 3+3 redundancy that follow the Intel Common Redundant Power Supply (CRPS) specification. The PSUs share a common electrical and structural design that allows for hot-swap and tool-less installation into the server with the PSUs locking automatically after being inserted into the power bay. The CRPS PSUs are 80 Plus Titanium rated with various output powers, allowing customers to choose as needed.

The following rated 110 Vac, 230 Vac power supplies are supported:

- 12 V power supply:
  - 3,200 W Titanium PSU: 1,400 W (110 Vac), 3,200 W (230 Vac)
- 54 V power supply:
  - 2,700 W Titanium PSU: 1,200 W (110 Vac), 2,700 W (230 Vac)
  - 3,200 W Titanium PSU: 1,400 W (110 Vac), 3,200 W (230 Vac)
- Input voltage range:

- 110 Vac: 90 to 132 V
- 230 Vac: 180 to 264 V

# **8** Regulatory Information

# 8.1 Safety

#### 8.1.1 General

- Strictly comply with local laws and regulations while installing the equipment. The safety instructions in this section are only a supplement to local safety regulations.
- To ensure personal safety and to prevent damage to the equipment, all personnel must strictly observe the safety instructions in this section and on the device labels.
- People performing specialized activities, such as electricians and electric forklift operators, must possess qualifications recognized by the local government or authorities.

#### 8.1.2 Personal Safety

- Only personnel certified or authorized by us are allowed to perform the installation procedures.
- Stop any operation that could cause personal injury or equipment damage. Report to the project manager and take effective protective measures.
- Working during thunderstorms, including but not limited to handling equipment, installing cabinets and installing power cords, is forbidden.
- Do not carry the weight over the maximum load per person allowed by local laws or regulations. Arrange appropriate installation personnel and do not overburden them.
- Installation personnel must wear clean work clothes, work gloves, safety helmets and safety shoes, as shown in <u>Figure 8-1</u>.




• Before touching the equipment, put on ESD clothes and ESD gloves or an ESD wrist strap, and remove any conductive objects such as wrist watches or metal jewelry, as shown in Figure 8-2, in order to avoid electric shock or burns.



Figure 8-2 Removing Conductive Objects

How to put on an ESD strap (Figure 8-3).

- 1. Put your hand through an ESD wrist strap.
- 2. Tighten the strap buckle to ensure a snug fit.
- 3. Plug the alligator clip of the ESD wrist strap into the corresponding jack on the grounded cabinet or grounded chassis.

#### Figure 8-3 Wearing an ESD Wrist Strap



- Use tools correctly to avoid personal injury.
- When moving or lifting equipment above shoulder height, use lifting devices and other tools as necessary to avoid personal injury or equipment damage due to equipment slippage.
- The power sources of the server carry a high voltage. Direct contact or indirect contact through damp objects with the high-voltage power source is fatal.
- To ensure personal safety, ground the server before connecting power.
- When using ladders, always have someone hold and guard the bottom of the ladders. In order to prevent injury, never use a ladder alone.
- When connecting, testing or replacing optical fiber cable, avoid looking into the optical port without eye protection in order to prevent eye damage from laser light.

### 8.1.3 Equipment Safety

- To ensure personal safety and prevent equipment damage, use only the power cords and cables that come with the server. Do not use them with any other equipment.
- Before touching the equipment, put on ESD clothing and ESD gloves to prevent static electricity from damaging the equipment.
- When moving the server, hold the bottom of the server. Do not hold the handles of any module installed in the server, such as PSUs, fan modules, drive modules, or motherboard. Handle the equipment with care at all times.
- Use tools correctly to avoid damage to the equipment.
- Connect the power cords of active and standby PSUs to different PDUs to ensure high system reliability.

• To ensure equipment safety, always ground the equipment before powering it on.

### 8.1.4 Transportation Precautions

Contact the manufacturer for precautions before transportation as improper transportation may damage the equipment. The precautions include but not limited to:

- Hire a trusted logistics company to move all equipment. The transportation process must comply with international transportation standards for electronic equipment. Always keep the equipment being transported right-side up. Avoid collision, moisture, corrosion, packaging damage or contamination.
- Transport the equipment in its original packaging.
- If the original packaging is unavailable, separately package heavy and bulky components (such as chassis, blade servers and blade switches), and fragile components (such as optical modules and PCIe cards).
- Power off all equipment before shipping.

### 8.1.5 Manual Handling Weight Limits



Observe local laws or regulations regarding the manual handling weight limits per person. The limits shown on the equipment and in the document are recommendations only.

<u>Table 8-1</u> lists the manual handling weight limits per person specified by some organizations.

Table 8-1 Manual Handling Weight Limits per Person

Organization	Weight Limit (kg/lbs)
European Committee for Standardization (CEN)	25/55.13
International Organization for Standardization (ISO)	25/55.13
National Institute for Occupational Safety and Health (NIOSH)	23/50.72
Health and Safety Executive (HSE)	25/55.13
General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (AQSIQ)	Male: 15/33.08 Female: 10/22.05

# **9** Limited Warranty

This limited warranty applies only to the original purchasers of our products who are direct customers or distributors of us ("Customer").

We warrant all our hardware products, if properly used and installed, to be free from defects in material and workmanship within the warranty period. The term "Hardware Product" is limited to the hardware components and required firmware. The term "Hardware Product" DOES NOT include software applications or programs, and DOES NOT include products or peripherals that are not supplied by us. We may, at our discretion, repair or replace the defective parts. Repair or replacement parts may be new, used, or equivalent to new in performance and reliability. Repair or replacement parts are warranted to be free of defects in material or workmanship for ninety (90) calendar days or for the remainder of the warranty period of the product, whichever is longer.

Service offerings may vary by geographic region. Please contact your representative to identify service levels and needs for your region.

# 9.1 Warranty Service

Our warranty service includes 24 × 7 remote technical support, RMA (Return Material Authorization) Service, ARMA (Advanced Return Material Authorization) Service, 9 × 5 × NBD (Next Business Day) Onsite Service and 24 × 7 × 4 Onsite Service.

### 9.1.1 Remote Technical Support

The 24 × 7 remote technical support can be obtained through hotline, e-mail, and Service Portal<sup>\*1</sup>. Through hotline and e-mail support, our engineers help customers diagnose the causes of malfunctions and provide solutions. Service Portal<sup>\*1</sup> provides access to firmware, customized update files, and related manuals for Hardware Products. Customer may also access the Service Portal<sup>\*1</sup> to submit an RMA request or an ARMA request for parts replacement or repair.

Information needed when requesting support:

- Contact name, phone number, e-mail address
- System serial number, part number, model and location (address) of the product needing service
- Detailed description of problem, logs (SELs and blackbox logs, and any other related logs from OS), screenshot of issue, pictures of damaged/faulty parts, etc.

### 9.1.2 RMA Service

**Standard Replacement**: When a hardware failure occurs, Customer may submit an RMA request to us via e-mail or Service Portal<sup>\*1</sup>. We will review and approve the RMA submission at our own discretion, and provide an RMA number and return information that Customer may use to return the defective part(s) for the RMA service. We will ship out replacement part(s) within one (1) business day after receiving the defective part(s) and cover one-way shipment.

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- Customer should return the defective parts in original packaging to our designated service center at their own expense.
- After our further diagnosing and testing, if the defective parts conform to our repair policy, we will ship out the repair or replacement parts at our own expense; otherwise, we will return the defective parts at Customer's expense.
- If Customer needs to designate a logistics company, allocation of the shipping cost to us/Customer will be redefined.

### 9.1.3 ARMA Service

**Advanced Replacement**: If a problem with our hardware products cannot be resolved via hotline or e-mail support and replacement part(s) are required, we will ship out replacement part(s) in advance within one (1) business day. Customer should return defective part(s) within five (5) business days after receiving the replacement(s). The shipping cost coverage varies by region. Contact your sales representative for details.

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- Customer should return the defective parts in original packaging to our designated service center.
- We will ship out the replacement parts at our own expense after completing remote diagnosis.
- If Customer needs to designate a logistics company, allocation of the shipping cost to us/Customer will be redefined.

### 9.1.4 9 × 5 × NBD Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time

Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.

# 

 $9 \times 5 \times \text{NBD}$ : Our service engineer typically arrives at the customer's data center on the next business day. Service engineers are available on local business day from 9:00 am to 6:00 pm local time. Calls received/dispatches after 5:00 pm local time will require an additional day for the service engineer to arrive.

### 9.1.5 24 × 7 × 4 Onsite Service

When we ultimately determine that an onsite service call is required to repair or replace a defect, the call will be scheduled in accordance with the Response Time Commitment. The response time is measured from the time when the remote troubleshooting is completed and logged to the arrival of a service engineer and parts to Customer location for repair.

# 

 $24 \times 7 \times 4$ : Our service engineer typically arrives at the customer site within 4 hours. Service engineers are available at any time, including weekends and local national holidays.

# 9.2 Our Service SLA

We offer a variety of Service Level Agreements (SLA)\*<sup>2</sup> to meet customer requirements.

- RMA Service
- ARMA Service
- 9 × 5 × NBD Onsite Service
- 24 × 7 × 4 Onsite Service

# 9.3 Warranty Exclusions

We do not guarantee that there will be no interruptions or mistakes during the use of the products. We will not undertake any responsibility for the losses arising from any operation not conducted according to instructions intended for Hardware Products. The Limited Warranty does not apply to

- expendable or consumable parts, such as, but not limited to, batteries or protective coatings that are designed to diminish over time, unless failure has occurred during DOA period due to a defect in material or workmanship;
- any cosmetic damage, such as, but not limited to, scratches, dents, broken plastics, metal corrosion, or mechanical damage, unless failure has occurred during DOA period due to a defect in material or workmanship;
- damage or defects caused by accident, misuse, abuse, contamination, improper or inadequate maintenance or calibration or other external causes;
- damage or defects caused by operation beyond the parameters as stipulated in the user documentation;
- damage or defects by software, interfacing, parts or supplies not provided by us;
- damage or defects by improper storage, usage, or maintenance;
- damage or defects by virus infection;
- loss or damage in transit which is not arranged by us;
- Hardware Products that have been modified or serviced by non-authorized personnel;
- any damage to or loss of any personal data, programs, or removable storage media;
- the restoration or reinstallation of any data or programs except the software installed by us when the product is manufactured;
- any engineering sample, evaluation unit, or non-mass production product that is not covered under warranty service;
- any solid-state drive (SSD) which has reached its write endurance limit.

In no event will we be liable for any direct loss of use, interruption of business, lost profits, lost data, or indirect, special, incidental or consequential damages of any kind regardless of the form of action, whether in contract, tort (including negligence), strict liability or otherwise, even if we have been advised of the possibility of such damage, and whether or not any remedy provided should fail of its essential purpose.

<sup>\*1</sup> Service Portal availability is subject to customer type and customer location. Please contact your representative to learn more.

<sup>\*2</sup> Not all SLA offerings are available at all customer locations. Some SLA offerings may be limited to geolocation and/or customer type. Please contact your representative to learn more.

# **10** System Management

# **10.1 Intelligent Management System**

BMC, a remote server management system, supports mainstream management specifications in the industry such as IPMI 2.0 and Redfish 1.13. BMC features high operational reliability, easy serviceability for different business scenarios, accurate and comprehensive fault diagnosis capabilities, and industry-leading security reinforcement capabilities.

BMC supports:

- IPMI 2.0
- Redfish 1.13
- SNMP v1/v2c/v3
- HTML5/Java remote consoles (Keyboard, Video, Mouse)
- remote virtual media
- login via web browsers
- intelligent fault diagnosis

#### Table 10-1 BMC Features

Feature	Description		
<b>Feature</b> Management Interface	Description         Supports extensive remote management interfaces for various server O&M scenarios. The supported interfaces include:         IPMI         SSH CLI         SNMP         HTTPS         Web GUI		
	• Redfish		
	RESTful		
	• Syslog		

Feature	Description		
Accurate and	IDL, a fault diagnosis system, offers accurate and		
Intelligent Fault	comprehensive hardware fault location capabilities, and		
Location	outputs detailed fault causes and handling suggestions.		
	Supports rich automatic remote alert capabilities, including		
Alert	proactive alerting mechanisms such as SNMP Trap		
Management	(v1/v2c/v3), email alerts and syslog remote alerts to ensure		
	24 × 7 reliability.		
	Supports HTML5- and Java-based remote console to remotely		
Remote Console	control and operate the monitor/mouse/keyboard of the		
KVM	server, providing highly available remote management		
	capabilities without on-site operation.		
Virtual Network	Supports mainstream third-party VNC clients without relying		
Console (VNC)	on Java, improving management flexibility.		
Domoto \/irtual	Supports virtualizing images, USB devices, folders and local		
Remote virtuat	media devices as media devices of remote servers,		
Media	simplifying OS installation, file sharing, and other O&M tasks.		
	Supports the visual management interface developed by us,		
Web GUI	displaying abundant information of the server and		
	components, and offers easy-to-use Web GUIs.		
	Supports automatic crash screenshot and crash video		
Crash Screenshot	recording (video needs to be enabled manually) to capture		
and Crash Video	the last screen and video before crash; provides manual		
Recording	screenshot, which can quickly capture the screen for easy		
	inspection at scheduled time		
Dual Elash and	Supports dual flash and dual image, enabling automatic		
Dual Image	flash failover in case of software or flash corruption,		
Duat intage	improving operational reliability.		
Power Capping	Supports power capping, increasing deployment density and		
	reducing energy consumption.		
	Supports both IPv4 and IPv6, enhancing network deployment		
	flexibility.		
	Supports auto-switching between the dedicated		
Auto-Switching	management network port and shared management		
of Management	network port, providing customers with flexible network		
Network Port	deployment solutions for different management network		
	deployment scenarios.		
	• Supports the reliable dual watchdog mechanism for		
BMC Self-	hardware and software, enabling automatic restoration		
Diagnosis and	of BMC in case of BMC abnormality.		
Self-Recovery			
System	Provides a thermal protection mechanism, which is		
	automatically triggered when the BMC is abnormal to		

Feature	Description		
	ensure that the fan operates at safe speeds to avoid system overheating.		
	• Supports self-diagnosis of processors, memory modules, and storage devices of BMC, and automatically cleans the workload to restore to normal when the device usage rate is too high.		
Power Control	Supports virtual power buttons for power on/off, power cycle and reset.		
UID LED	Supports remote lighting of the UID LED for locating the server in the server room.		
Secure Firmware Update	Supports firmware update based on secure digital signatures, and mismatch prevention mechanism for firmware from different manufacturers and firmware for different models; supports firmware update of BMC/BIOS/CPLD/PSU.		
Serial Port Redirection	Supports remote redirection of the system serial port, BMC serial port and other serial ports, and directs the server-side serial port output to the local administrator via the network for server debugging.		
Storage Information Display	Displays RAID logical array information and drive information, and supports remote RAID creation for improved deployment efficiency.		
User Role Management	Supports user detail management based on user roles and flexible creation of user roles with different privileges, provides more user roles to allow administrators to grant different privileges to O&M personnel.		
Security Features	Adopts the industry-leading server security baseline standard V3.0. SSH, HTTPS, SNMP and IPMI use secure and reliable algorithms. BMC offers capabilities including secure update and boot and security reinforcement mechanisms such as anti-replay, anti-injection, and anti-brute force.		
Double Factor Authentication	Supports double factor authentication for local BMC users. Users need to log in to the BMC with both password and certificate, thus to prevent attacks caused by password leakage.		
Configuration Exporting and Importing	To import and export the existing system configurations.		

Feature	Description
System Information Display	Displays the server basic information such as the information and health status of major server components, including CPU, memory, power supply, device inventory, hard drive, network adapter, and security chip.
Fan Management	Displays the status, current speed, duty ratio, and other information of a fan module. You can select the fan control mode and preset the speed for each fan module in the Manual Fan Control mode.
Power Policy	To set how the server operating system reacts under the BMC's control when AC power is reconnected to the server.
One-Key Erasing	To perform non-recoverable erasing on all storage devices of the server, preventing data leakage when the server is to be retired.
System Lockdown	After this feature is enabled, some parameters of the server cannot be set and some operations cannot be performed on the server.

# 10.2 KSManage

The server is compatible with the latest version of KSManage, a new-generation infrastructure O&M management platform for data centers.

Built on cutting-edge O&M concepts, KSManage provides users with leading and efficient overall management solutions for data centers to ensure advanced infrastructure management. This platform provides a rich set of functions such as centralized asset management, in-depth fault diagnosis, component fault early warning, intelligent energy consumption management, 3D automatic topologies, and stateless automatic deployment. With these functions, users can implement centralized O&M of servers, storage devices, network devices, security devices, and edge devices, effectively improving O&M efficiency, reducing O&M costs, and ensuring the secure, reliable, and stable operation of data centers. KSManage offers:

- lightweight deployment in multiple scenarios and full lifecycle management of devices
- high reliability and on-demand scalability enabled by 1 to N data collectors
- intelligent asset management and real-time tracking of asset changes
- comprehensive monitoring for overall business control
- intelligent fault diagnosis for reduced maintenance time
- second-level performance monitoring for real-time status of devices

- batch configuration, deployment and update, shortening the time needed to bring the production environment online
- improved firmware version management efficiency
- standardized northbound interfaces for easy integration and interfacing

### Table 10-2 KSManage Features

Feature	Description		
Home	• Display of basic information (data centers, server rooms, cabinets, assets and alerts), quick addition of devices and custom home page		
Assets	<ul> <li>Batch asset import, automatic asset discovery, and full lifecycle management of assets</li> <li>Management of the full range of our server family, including general-purpose rack servers, AI servers, multi-node servers, edge servers and all-in-one servers</li> <li>Management of our general-purpose disk arrays and distributed storage devices</li> <li>Management of network devices (switches, routers, etc.), security devices (firewalls, load balancers, etc.), cabinets and clouds</li> <li>Management of data centers</li> <li>Asset warranty information management, asset inventory reports for server acceptance, asset attribute expansion, etc.</li> </ul>		
Monitor	<ul> <li>Display of real-time alerts, history alerts, blocked alerts and events</li> <li>Fault prediction of drives and memories</li> <li>Custom inspection plan and inspection result management</li> <li>Notification record viewing</li> <li>Intelligent fault diagnosis and analysis, automatic fault reporting and repair ticket viewing</li> <li>Trap management and Redfish management</li> </ul>		

Feature	Description		
	• Management of monitoring rules, such as alert rules, notification rules, blocking rules, alert noise reduction rules, compression rules and fault reporting rules, and redefinition of the above rules.		
	• Quick start of firmware update, OS installation, power management, drive data erasing and stress test		
	<ul> <li>Batch firmware update (BMC/BIOS/RAID Card/NIC/Drive/HBA Card/MB CPLD/BP CPLD/PSU)</li> </ul>		
	Batch firmware configuration (BMC/BIOS)		
Control	Batch RAID configuration and OS deployment for servers		
	Secure and quick drive data erasing		
	CPU and memory stress test		
	Automatic firmware baseline management		
	BMC and BIOS snapshot management		
	Repositories for update files		
	<ul> <li>Overview of data center power consumption trend chart and carbon emission trend chart</li> </ul>		
	• Setting of server dynamic power consumption policies and minimum power consumption policies		
Energy Efficiency	• Server temperature optimization, utilization optimization, power consumption characteristics analysis, power consumption prediction, load distribution, etc.		
	Carbon asset and carbon emission management		
Log	Fault log record management		
	Diagnosis record and diagnosis rule management		
Topologies	<ul> <li>Centralized management of multiple data centers and panoramic 3D views, including dynamic display of power consumption, temperature, alerts and cabinet capacity of the data center</li> <li>Notwork topologies</li> </ul>		
	INETWORK TOPOLOGIES		

Feature	Description	
Reports	<ul> <li>Management of warranty information reports, alert reports, asset reports, hardware reports and performance reports</li> <li>Export of reports in .xlsx format</li> </ul>	
System	<ul> <li>Password management, alert forwarding and data dump</li> <li>Customized KSManage parameters</li> </ul>	
Security	Security control of KSManage via a set of security policies such as user management, role management, authentication management (local authentication and LDAP authentication) and certificate management.	

# **10.3 KSManage Tools**

Table 10-3 Features of KSManage Tools

Feature	Description
KSManage Kits	A lightweight automatic batch O&M tool for servers, mainly used for server deployment, routine maintenance, firmware update, fault handling, etc.
KSManage Boot	A unified batch management platform for bare metals, with features including firmware management, hardware configuration, system deployment and migration, stress test and in-band management
KSManage Server CLI	Fast integration with third-party management platforms, delivering a new O&M mode of Infrastructure as Code (IaC)
KSManage Driver	Operates under the OS and gets system asset and performance information via the in-band mode, providing users with more comprehensive server management capabilities
KSManage Server Provisioning	Offers users with RAID configuration, intelligent OS installation, firmware update, hardware diagnosis, secure erasing and software upgrade, using the TF card as the carrier

# Certifications

### Table 11-1 Certifications

Country/Region	Certification	Mandatory/Voluntary
International	СВ	Voluntary
EN	CE	Mandatory
	FCC	Mandatory
0.5.	UL	Voluntary
Canada	IC	Mandatory
Canada	CUL	Voluntary
Korea	КС	Mandatory
	EAC	Mandatory
Eurasian Economic Union	EAC-RoHS	Mandatory
	FSS	Mandatory
China Taiwan	BSMI	Mandatory

# **12** Appendix A

# **12.1 Operating Temperature Specification** Limits

Table 12-1 Operating Temperature Specification Limits

Configuration	Max. Operating Temp. 35°C (95°F)	Max. Operating Temp. 28°C (82.4°F)
24 × 2.5-Inch Drive Configuration	• 8 × 2.5-inch NVMe drive + 16 × 2.5-inch SATA drive	• 8 × 2.5-inch NVMe drive + 16 × 2.5-inch SATA drive
	• RDIMMs ≤32	• RDIMMs ≤32
	• CPU TDP ≤350 W	• CPU TDP ≤350 W
	• 10 PCle expansion cards (except 400 Gb CX7 HCA cards)	• 10 PCIe expansion cards (including 400 Gb CX7 HCA cards)
	• 8 × OAM	• 8 × OAM
	• 16 SATA drives	• 16 SATA drives
	• RDIMMs ≤32	• RDIMMs ≤32
16 × 2.5-Inch Drive Configuration	• CPU TDP ≤350 W	• CPU TDP ≤350 W
	• 10 PCle expansion cards (except 400 Gb CX7 HCA cards)	• 10 PCIe expansion cards (including 400 Gb CX7 HCA cards)
	• 8 × OAM	• 8 × OAM
	• 8 NVMe drives + 8 SATA drives	• 8 NVMe drives + 8 SATA drives
	• RDIMMs ≤32	• RDIMMs ≤32
	• CPU TDP ≤350 W	• CPU TDP ≤350 W
	• 10 PCle expansion cards (except 400 Gb CX7 HCA cards)	• 10 PCIe expansion cards (including 400 Gb CX7 HCA cards)

Configuration	Max. Operating Temp. 35°C (95°F)	Max. Operating Temp. 28°C (82.4°F)
	• 8 × OAM	• 8 × 0AM
8 × 2.5-Inch Drive Configuration	<ul> <li>8 NVMe drives or 8 SATA drives</li> </ul>	• 8 NVMe drives or 8 SATA drives
	• RDIMMs ≤32	• RDIMMs ≤32
	• CPU TDP ≤350 W	• CPU TDP ≤350 W
	• 10 PCle expansion cards (except 400 Gb CX7 HCA cards)	• 10 PCIe expansion cards (including 400 Gb CX7 HCA cards)
	• 8 × OAM	• 8 × OAM



- The maximum operating temperature will drop by 5°C (9°F) if a single fan fails.
- Single fan failure may affect system performance.
- When the server is equipped with 400 Gb NICs or HCA cards, the maximum operating temperature supported is 28°C (82.4°F).

# 12.2 Model

Certified Model	Description
KR6298-X2-A0-R0-00	Global

# **12.3 RAS Features**

The server supports a variety of RAS (Reliability, Availability, and Serviceability) features. By configuring these features, the server can provide greater reliability, availability, and serviceability.

# **12.4 Sensor List**

Sensor	Description	Sensor Location
Inlet_Temp	Air inlet temperature	Chassis Air Inlet

Sensor	Description	Sensor Location
Outlet_Temp	Air outlet temperature	Chassis Air Outlet
CPUx_VR_Temp	CPUx VR temperature	CPUx
		x indicates the CPU number
		with a value of 0 - 1
CPUx_Temp	CPUx core temperature	CPUx
		x indicates the CPU number
		with a value of 0 - 1
CPUx_DTS	CPU_DTS temperature	CPUx
	(CPU margin temperature	x indicates the CPU number
	before CPU reaches the	with a value of 0 - 1
	throttling frequency)	
CPUx_DIMM_T	The maximum	CPUx
	temperature among	x indicates the CPU number
	DDR5 DIMMs of CPUx	with a value of 0 - 1
PCH_Temp	PCH temperature	Motherboard
PSU_Inlet_Temp	PSU temperature	PSU
PVNN_MAIN_CPUx	CPU voltage	CPUx
		x indicates the CPU number
		with a value of 0 - 1
AV_PSUx_VIN	PSUx input voltage	PSUx
		A indicates the voltage
		value. PSU3 and PSU7 are
		12 V; PSU0, PSU1, PSU2,
		PSU4, PSU5, and PSU6 are
		54 V.
		x indicates the PSU number
		With a value of 0 - 7
	PSUX output voltage	PSUX
		A indicates the voltage
		PS04, PS05, and PS06 are
		54 V.
		x indicates the PSO humber
	System 12 V/yoltage	
515_12V	System 12 v voltage	Motherheard
	system HSC)	Motherboard
	System 5 V voltage	Motherboard
	System 3.3 V voltage	Motherboard
	PCH core voltage	Motherboard
		Motherboard
	F CIT LUGIC VULLAYE	Motherboard

RTC_Battery     Motherboard RTC battery voltage     Motherboard       Total_Power     Total power     /	RTC_Battery		
voltage     Monterboard       Total_Power     Total power     /		erboard RTC battery	Motherbeard
Total_Power     Total power     /		ige	Motherboard
	Total_Power	l power	/
AV_PSUX_PIN PSUX Input power PSUX	AV_PSUx_PIN	input power	PSUx
A indicates the voltage			A indicates the voltage
value. PSU3 and PSU7 are			value. PSU3 and PSU7 are
12 V; PSU0, PSU1, PSU2,			12 V; PSU0, PSU1, PSU2,
PSU4, PSU5, and PSU6 are			PSU4, PSU5, and PSU6 are
54 V.			54 V.
x indicates the PSU number			x indicates the PSU number
with a value of 0 - 7			with a value of 0 - 7
AV_PSUx_POUT     PSUx output power     PSUx	AV_PSUx_POUT	coutput power	PSUx
A indicates the voltage			A indicates the voltage
value. PSU3 and PSU7 are			value. PSU3 and PSU7 are
12 V; PSU0, PSU1, PSU2,			12 V; PSU0, PSU1, PSU2,
PSU4, PSU5, and PSU6 are			PSU4, PSU5, and PSU6 are
54 V.			54 V.
x indicates the PSU number			x indicates the PSU number
with a value of 0 - 7			with a value of 0 - 7
CPU_Power Total CPU power /	CPU_Power	l CPU power	/
(obtained through ME)		ained through ME)	
Memory_Power Total memory power /	Memory_Power	l memory power	/
(obtained through ME)		ained through ME)	
FANx_F_Speed, FANx speed in rpm FANx	FANx_F_Speed,	k speed in rpm	FANX
FANx_R_Speed x indicates the fan numbe	FANx_R_Speed		x indicates the fan number
with a value of 0 - 11			with a value of 0 - 11
RAID_Temp PCIe RAID card (not mezz	RAID_Temp	RAID card (not mezz	
card) temperature		) temperature	
(Max temp. will be taken RAID card		temp. will be taken	RAID card
in case of multiple RAID		se of multiple RAID	
Cards, including SAS,		s, including SAS,	
	LIDD MAY Tomp	, and HBA)	
HDD_MAX_temp Maximum temperature	HDD_MAX_Temp		-
		ing all unives	
tomporature	OCP_RAID_Temp		-
among all NV/Me drives	NVML_Temp	ng all NVMe drives	-
	OCD NIC SED Tomo		
SEP module		nodule	OCP NIC SFP module
PCIe_NIC_SEP_TTemperature for PCIe_NIC	PCIe NIC SFP T	perature for PCIe NIC	
SFP module		module	PCIe NIC SFP module

Sensor	Description	Sensor Location
OCP_NIC_Temp	OCP NIC temperature (Max temp. will be taken in case of multiple OCP NICs)	OCP NIC
PCIE_NIC_Temp	PCIe NIC temperature (Max temp. will be taken in case of multiple PCIe NICs)	PCIe NIC
FAN_Power	Total fan power	-
P12V_CPUx_DIMM	CPUx DIMM voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCIN_CPUx	CPUx core voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCFA_FIVR_CPUx	UPI IIO voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCINFAON_CPUx	CPUx boot voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCFA_EHV_CPUx	Controller voltage	CPUx x indicates the CPU number with a value of 0 - 1
PVCCD_HV_CPUx	Memory controller voltage	CPUx x indicates the CPU number with a value of 0 - 1
CPUx_Status	CPUx status	CPUx x indicates the CPU number with a value of 0 - 1
PSU_Redundant	PSU redundancy status	-
FanX_Status	FanX status	FanX X indicates the fan number with a value of 0 - 11
CPUx1_Cx2Dx3	DIMM silkscreen	Motherboard x1 indicates the CPU number with a value of 0 - 1 x2 indicates the channel number with a value of 0 - 7

Sensor	Description	Sensor Location
		x3 indicates the DIMM slot
		number with a value of 0 -
		1
PSU_Mismatch	Monitored PSU model	
	mismatch	
POST_Status	System firmware and	_
	POST status	
CPU_Config	CPU configuration status	
	(mixing of CPUs, or	_
	primary CPU not	
	installed)	
SEL_Status	SEL status	-
PCIe_Status	The status of all PCIe	
	devices (including PCIe	-
	bus, slots and cards)	
PWR_CAP_Fail	Power capping failure	-
AV_PSUx_Status	PSUx status	PSUx
		A indicates the voltage
		value. PSU3 and PSU7 are
		12 V; PSU0, PSU1, PSU2,
		PSU4, PSU5, and PSU6 are
		54 V.
		x indicates the PSU number
		with a value of 0 - 7
K_HDDx	HDD	HDDx
		K denotes front, internal
		and rear, with a value of
		F/I/R respectively
		x indicates the drive
		number
BMC_Boot_Up	BMC boot up complete	-
BIOS_Boot_Up	BIOS boot up complete	-
FAN_Redundant	Fan redundancy status	-
Sys_Health	System health status	-
ACPI_PWR	ACPI Power status	-
Intrusion	Chassis intrusion activity	-
LeakageSensor	Leak detection	Top cover
ME_FW_Status	ME health status	-
TPM_Verify	TPM verification status	-
System_Error	System error	-
CPUx_PMEM_DIMM_T	Non-volatile memory	
	temperature	

Sensor	Description	Sensor Location
		x indicates the CPU number
		with a value of 0 - 1
BMC_Status	BMC status (including	
	chips, components and	-
	self-test status)	
GPUx_Temp	GPUx core temperature	GPUx
		x indicates the GPU number
		with a value of 0 - 7
MEM_ResourceRate	Memory utilization rate	-
CPU_ResourceRate	CPU utilization rate	-
	FPGA temperature on	-
DELTA_FPGA_Temp	Delta-Next board	
	CD11	GPUx
GPUx_Mem_Temp	GPU memory	x indicates the GPU number
	temperature	with a value of 0 - 7
	PCIe switch temperature	-
DELTA_PCSW_Temp	on Delta-Next board	
	Retimer temperature on	-
DELTA_RTx_Temp	Delta-Next board	
SWB_Inlet_Temp	Maximum inlet	Upper chassis
	temperature of switch	
	board	
SWB_PCIEIN_Temp	Maximum inlet	Upper chassis
	temperature of PCIe slots	
	on switch board	
MBP_GPUOUT_Temp	Average outlet	-
	temperature of GPU on	
	mid-plane board	
MBP_PSUIN_Temp	Average inlet	-
	temperature of PSUs on	
	mid-plane board	
PDB_FANIN_Temp	Average inlet	Lower chassis
	temperature of rear 8086	
	fans on PDB board	
PDB_PSUIN_Temp	Average inlet	Lower chassis
	temperature of PSUs on	
	PDB board	
	PCIe HCA card	
	temperature (Max temp.	
PCIE_HCA_Temp	will be taken in case of	PCIe slot
	multiple PCIe HCA	
	cards)	

Sensor	Description	Sensor Location	
PCIe_HCA_SFP_T	HCA card optical module temperature	PCIe slot	
FPGA_Card_Temp	PCle FPGA card temperature	PCIe slot	
HBA_Temp	PCle HBA card temperature	PCIe slot	
UBB54PB_Temp	UBB board 54 V PSU chip temperature	PDB board	
GPUx_Tlimit_Temp	GPU Tlimit temperature	GPUx x indicates the GPU number with a value of 0 - 7	
AV_PSUx_IOUT	Power supply output current	PSUx A indicates the voltage value. PSU3 and PSU7 are 12 V; PSU0, PSU1, PSU2, PSU4, PSU5, and PSU6 are 54 V. x indicates the PSU number with a value of 0 - 7	
SNIC_SFP_Temp	Smart NIC optical module temperature	PCIe slot	
SNIC_NIC_Temp	Smart NIC temperature	PCIe slot	
Max_NVSW_Temp	Deltanext board NVSW temperature	Deltanext board	
Retimer_Temp	Retimer chip temperature	UBB board	
GPU_Total_Power	GPU total power	-	
CPUx_Power	CPU total power	CPUx x indicates the CPU number with a value of 0 or 1	

# **13** Appendix B Acronyms and Abbreviations

# 13.1 А-Е

Α

AC	Alternating Current
ACPI	Advanced Configuration and Power Interface
AD	App Direct
AI	Artificial Intelligence
ANSI	American National Standards Institute
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China
ARMA	Advanced Return Material Authorization
ARS	Address Range Scrub
AVX	Advanced Vector Extensions

В

BIOS	Basic Input Output System
BIS	Bureau of Indian Standards
BLE	BIOS Lock Enable
вмс	Baseboard Management Controller
ВР	Backplane
BSMI	The Bureau of Standards, Metrology and Inspection

CAS	Column Address Strobe
СВ	Certification Body
ссс	China Compulsory Certificate
CE	Conformitè Europëenne
CECP	China Energy Conservation Program
CEN	European Committee for Standardization
CLI	Command-Line Interface
СМОЅ	Complementary Metal-Oxide-Semiconductor
CPLD	Complex Programmable Logic Device
CPS	Crow Pass
CPU	Central Processing Unit
CRPS	Common Redundant Power Supply
CSP	Cloud Service Provider
CV	Computer Vision
CXL	Compute Express Link

### D

DC	Direct Current
DCMI	Data Center Manageability Interface
DDR5	Double Data Rate 5
DIMM	Dual In-line Memory Module
DL	Deep Learning
DMPU	Data Mining Processing Unit
DPC	DIMM Per Channel

С

DRAM	Dynamic Random Access Memory
DTS	Digital Thermal Sensor

Ε

EAC	Eurasian Conformity
EBG	Emmitsburg
ECC	Error-Correcting Code
ECMA	European Computer Manufacturers Association
EMR	Emerald Rapids
ESD	Electrostatic Discharge

# 13.2 F - J

### F

FCC	Federal Communications Commission
FHFL	Full-Height Full-Length
FHHL	Full-Height Half-Length
FPGA	Field Programmable Gate Array
FRU	Field-Replaceable Unit
FW	Firmware

### G

GPIO	General Purpose Input/Output
GPU	Graphics Processing Unit
GUI	Graphical User Interface

### HBA Host Bus Adapter HCA Host Channel Adapter HDD Hard Disk Drive HHHL Half-Height Half-Length HSC Hot Swap Controller HSE Health and Safety Executive HTML HyperText Markup Language HTTPS HyperText Transfer Protocol Secure

#### I

Н

IB	InfiniBand
IC	Industry Canada
ID	Identification
IEC	International Electrotechnical Commission
IIPC	Intel Intelligent Power Capability
ІМС	Integrated Memory Controller
IOPS	Input/Output Operations Per Second
IP	Internet Protocol
IPMI	Intelligent Platform Management Interface
ISO	International Organization for Standardization
iSSw	internal Synthetic Switch
IVA	Intelligent Virtual Assistant

J

JTAG	Joint Test Action Group
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90

# 13.3 К-О

К

КС	Korea Certification
кум	Keyboard Video Monitor

### L

LAN	Local Area Network
LCD	Liquid Crystal Display
LDAP	Lightweight Directory Access Protocol
LED	Light Emitting Diode
LOA	Letter of Authority
LP	Low Profile
LRDIMM	Load-Reduced Dual In-line Memory Module

### М

МВ	Motherboard
ME	Management Engine
ММ	Memory Mode

### Ν

NC-SI	Network Controller Sideband Interface
NIC	Network Interface Card
NIOSH	National Institute for Occupational Safety and Health
NLP	Natural Language Processing
NOM	Norma Oficial Mexicana

NUMA	Non-Uniform Memory Access
NVMe	Non-Volatile Memory Express

0

OAM	OCP Accelerator Module
ОСР	Open Compute Project
OS	Operating System
OSHA	Occupational Safety and Health Administration

# 13.4 P-T

### Ρ

РСН	Platform Controller Hub
PCIe	Peripheral Component Interconnect Express
PDB	Power Distribution Board
PDU	Power Distribution Unit
PFR	Platform Firmware Resilience
РНҮ	Physical
PID	Proportional-Integral-Derivative
PMem	Persistent Memory
POST	Power-On Self-Test
PSU	Power Supply Unit
PXE	Pre-boot Execution Environment

R

RAID	Redundant Arrays of Independent Disks
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RAS	Reliability, Availability, Serviceability
RCM	Regulatory Compliance Mark
RDIMM	Registered Dual In-line Memory Module
RDMA	Remote Direct Memory Access
RH	Relative Humidity
RHEL	Red Hat Enterprise Linux
RMA	Return Material Authorization
RST	Reset
RTC	Real Time Clock

### S

SABS	South African Bureau of Standards
SAS	Serial Attached SCSI
SATA	Serial Advanced Technology Attachment
SCM	Secure Control Module
SCSI	Small Computer System Interface
SDDC	Single Device Data Correction
SEL	System Event Log
SFP	Small Form-Factor Pluggable
SGPIO	Serial General Purpose Input/Output
SGX	Software Guard Extensions
SII	The Standards Institution of Israel
SLA	Service Level Agreement
SN	Serial Number
SNMP	Simple Network Management Protocol
SPR	Sapphire Rapids

SSD	Solid State Drive
SSH	Secure Shell
Syslog	System Log

Т

тсм	Trusted Cryptography Module
TDP	Thermal Design Power
TF	TransFlash
ТМЕ	Total Memory Encryption
ТРМ	Trusted Platform Module

# 13.5 U - Z

### U

UEFI	Unified Extensible Firmware Interface
UID	Unit Identification
UKCA	UK Conformity Assessed
UL	Underwriters Laboratories
UPI	Ultra Path Interconnect
USB	Universal Serial Bus

V

VGA	Video Graphics Array
VLAN	Virtual Local Area Network
VMD	Volume Management Device
VNC	Virtual Network Console

VNNI	Vector Neural Network Instructions
VPP	Virtual Pin Port
VRD	Voltage Regulator-Down

Х

XDP	eXtend Debug Port
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