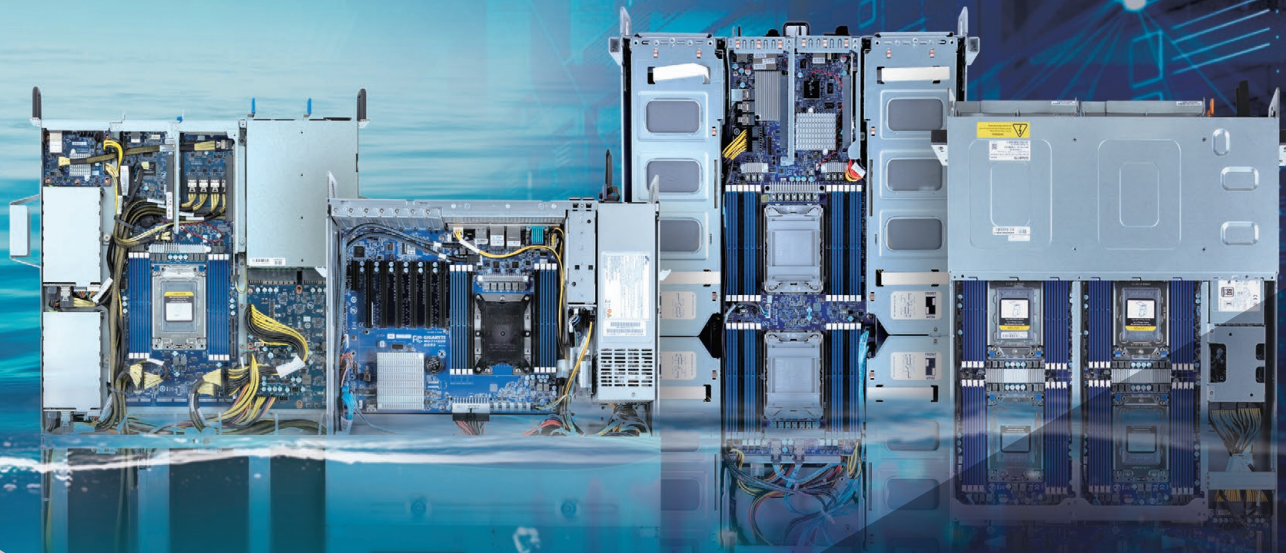


GIGABYTE™



Single-phase Immersion Cooling

One Stop Solution

Data centers must be reimagined if they are to sustain the compute performance required to continue quantum leaps in discoveries and provide timely insights. To keep pace, GIGABYTE has researched and developed a new approach that goes beyond air cooled infrastructure, and into a method that dissipates heat better, Single-phase Immersion Cooling. This has proven to be more energy efficient and scalable for deployments across the globe, while being environmentally friendly and safe. For this new approach, GIGABYTE has created a one stop solution.



GIGABYTE Single-phase Immersion Cooling Solution

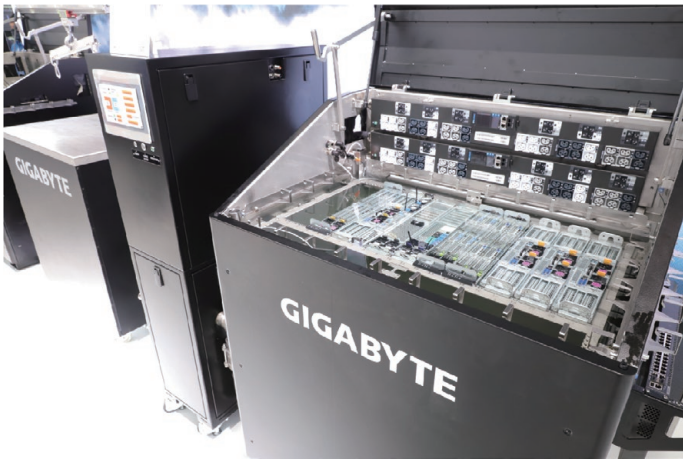
Dandy Yeh, Founder and Chairperson of GIGABYTE, stated, "GIGABYTE has always been focused on improving server performance. Today, in the face of cooling issues for CPUs and GPUs with higher and higher computing performance, we are not only working with industry-leading partners to help companies care for their operations and sustainable development, we have also developed single-phase immersion cooling products, allowing users to deploy green computing quickly."

The effects of the pandemic have brought many changes to traditional business models. Large-scale remote work and a shift to online activities is widespread. Coupled with mainstream e-commerce and financial technologies, the need for big data and cloud computing has greatly increased, leading to "resilience challenges" for data centers of large companies. At the same time, Taiwan aims to realize the goal of net-zero emissions by 2050. Therefore, while attempting to reduce the power consumption of data centers, improving energy efficiency has become an urgent matter for all IT infrastructures. To remedy this, GIGABYTE has launched a one-stop solution for single-phase immersion cooling by leveraging expertise in high-performance computing and cooling designs.

"Net-zero emissions cannot be delayed. Our single-phase immersion cooling products are not only compact in size and comprehensive, allowing for fast deployment, but also able to reduce the total cost of ownership (TCO) for our customers. We are able to overcome the traditional high costs associated with new data centers and become an accelerator for corporate net-zero emissions," said Dandy Yeh.

In 2022, GIGABYTE dipped its toes into immersion cooling, and has since gone all in. For its efforts, GIGABYTE has received the recognition of academia, scientific research institutes, government agencies, and corporate customers, including the adoption of GIGABYTE's immersion computing products by internationally renowned foundries and telecommunication giants.

GIGABYTE possesses a complete server product line and a wealth of manufacturing experience, and it has directly translated into the success of new immersion cooling solutions as customers' demand for green computing continues to grow.



▲ A1P0-EB0 Tank



▲ A103-CC0 Tank



▲ Overhead view of A1P0-EB0 Tank



▲ 4U POC Tank & IT Lift

Charting a New Path with Advanced Cooling

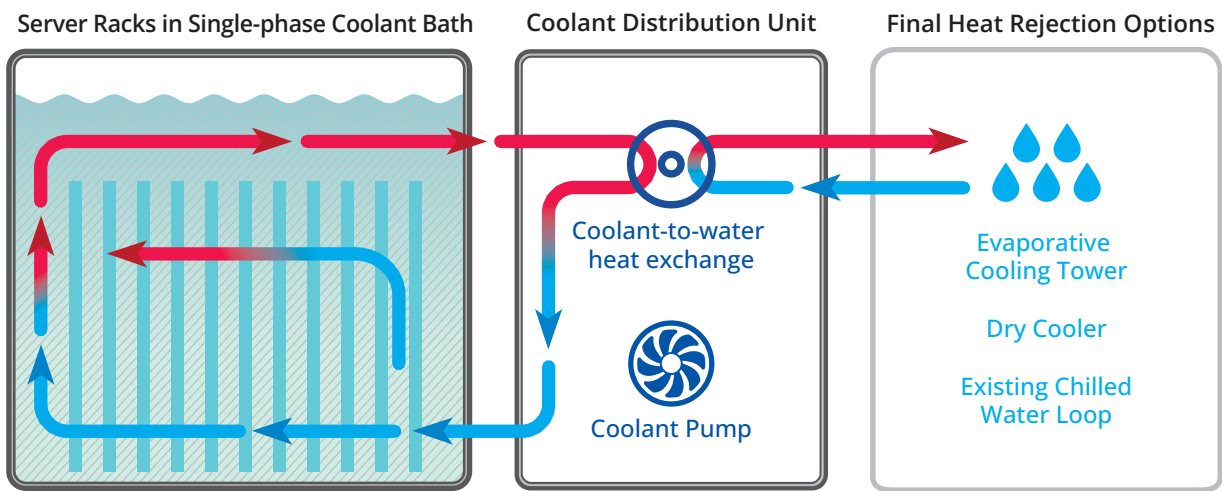
Reliability, availability, and serviceability are all traits found in the best data centers of today and tomorrow. As IT hardware and technology continue to improve, they are also making it tough for current data centers to be sustainable with the traditional fans, HVAC, and hot/cold aisles.

Why? A major reason - increase in rack power density. For each new generation of chips, the die size is shrunk while the number of transistors has increased, and this translates to higher performance, but also more heat. For instance, a GPU dense server can support CPUs and GPUS up to 300W TDP each component, but new generations of hardware are increasing the TDP by 25% or more, which is unsustainable in the same footprint. Consequently, servers are reaching thermal limitations. To maintain the same hardware density, a more efficient cooling approach is needed.

Data center architects realize this and quantify this efficiency using power usage effectiveness (PUE). PUE is a ratio that compares how much power enters the data center to the power delivered to IT equipment. Ideally, the PUE value would be 1.0; however, traditional air-cooled data centers achieve a PUE of ~1.65, which isn't horrible, but it shows room for improvement. Single-phase immersion cooling can achieve a PUE in the ballpark of 1.02-1.03.

How it Works

Single-phase immersion cooling redefines the data center from how IT equipment is cooled to the reduction in the amount and complexity of the data center infrastructure. By submerging IT equipment into a dielectric liquid bath, heat is removed faster than air while no damage or degrading occurs to all components. The liquid coolant with a higher specific heat capacity than air can quickly remove the heat. The heat given off by CPUs, GPUs, and other components is transferred directly to the liquid or via a heatsink. The warm liquid is then pumped out by a coolant distribution unit (CDU) or dry cooler. In the CDU cases, a second transfer occurs as the heat is then transferred to facility water. The resulting cooled coolant is pumped back into the immersion tank while the warmed water continues on to a heat exchanger to be expelled. And the cycle continues. Also, as the name implies, the fluid in the immersion tank does not change state, so there is no evaporation or condensation occurring, which ensures operator safety and allows for easy servicing of the tank and IT equipment.



▲ Heated coolant exits top of rack. Coolant returns to rack cooled at user-specified temperature.

The GIGABYTE One Stop Immersion Solution

“ Immersion Tank + Immersion Ready Server + Coolant + Service ”

GIGABYTE aims to give customers a hub to design and acquire all the necessary technology to deploy a single-phase immersion cooling data center. As a leader in enterprise technology, GIGABYTE has the ability to leverage current server designs to accommodate new specialized servers for immersion cooling deployments in tanks provided by GIGABYTE or its other global immersion partners. The first wave of immersion ready servers came as a result of customers' requests so it's best to contact a GIGABYTE sales representative to start the path to joining the immersion era.



Compatibility



Scalability



High Performance



Power Efficiency



Lower TCO



High Availability

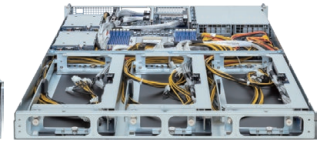
Immersion Ready Servers

G292-Z45-ICU1/ICM1

G292-Z43-ICU1/ICM1

G293-Z42-IAP1

G153-Z10-IAE1



Workloads	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics
Form Factor	2U	2U	2U	1U
Processor	AMD EPYC 7003 series Dual processors	AMD EPYC 7003 series Dual processors	AMD EPYC 9004 series Dual processors	AMD EPYC 9004 series Single processor
Memory	16 x DDR4 RDIMM/LRDIMM	16 x DDR4 RDIMM/LRDIMM	24 x DDR5 RDIMM slots	12 x DDR5 RDIMM
Networking	2 x 1GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	1 x MLAN
Storage Bays	8 x 2.5" SATA/SAS	4 x 2.5" Gen4 NVMe/SATA 4 x 2.5" SATA/SAS	4 x 2.5" SATA/SAS 4 x 2.5" Gen5 NVMe/SATA	4 x 2.5" Gen5 NVMe (internal)
Expansion Slots	8 x dual-slot GPUs 2 x low-profile slots	16 x single-slot GPUs 2 x low-profile slots	8 x dual-slot GPUs 2 x low-profile slots	6 x single-slot GPUs 1 x low-profile slot
Power Supply	[ICU1] Dual 2200W Platinum [ICM1] Dual 2200W Titanium	[ICU1] Dual 2200W Platinum [ICM1] Dual 2200W Titanium	Dual 3000W Titanium	Dual 2000W Platinum

G292-280-IAY1/IAP1

G293-S45-IAP1

R283-SF0-IAL1

R283-ZF0-IAL1



Workloads	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics
Form Factor	2U	2U	2U	2U
Processor	3rd Gen Intel Xeon Scalable Dual processors	4th/5th Gen Intel Xeon Scalable Intel Xeon CPU Max Series Dual processors	4th/5th Gen Intel Xeon Scalable Intel Xeon CPU Max Series Single processor	AMD EPYC 9004 series Dual processors
Memory	24 x DDR4 RDIMM/LRDIMM	16 x DDR5 RDIMM slots	32 x DDR5 RDIMM	24 x DDR5 RDIMM
Networking	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	1 x MLAN	1 x MLAN
Storage Bays	4 x 2.5" Gen4 NVMe/SATA 4 x 2.5" SATA/SAS	8 x 2.5" SATA/SAS	12 x 3.5"/2.5" Gen5 NVMe/SATA	8 x 3.5"/2.5" Gen5 NVMe/SATA 4 x 3.5"/2.5" SATA/SAS4
Expansion Slots	8 x dual-slot GPUs 2 x low-profile slots	8 x dual-slot GPUs 2 x low-profile slots	4 x dual-slot GPUs 1 x FHHL slot 1 x OCP 3.0 slot	4 x dual-slot GPUs 1 x FHHL slot 1 x OCP 3.0 slot
Power Supply	[IAY1] Dual 3200W Platinum [IAP1] Dual 3000W Titanium	Dual 3000W Titanium	Dual 2700W Titanium	Dual 2700W Titanium

Immersion Ready Servers

H263-S64-IAW1

H273-Z82-IAW1

H262-Z6B-ICU1/ICP1

S251-300-IBC1/IBH1



Workloads	HPC, HCI, hybrid/private cloud	HPC, HCI, hybrid/private cloud	HPC, HCI, hybrid/private cloud	Storage
Form Factor	2U 4-Node	2U 4-Node	2U 4-Node	2U
Processor	4th/5th Gen Intel Xeon Scalable Dual processors per node	AMD EPYC 9004 series Dual processors per node	AMD EPYC 7003 series Dual processors per node	2nd Gen Intel Xeon Scalable Single processor
Memory	64 x DDR5 RDIMM	96 x DDR5 RDIMM	64 x DDR4 RDIMM/LRDIMM	8 x DDR4 RDIMM/LRDIMM
Networking	4 x MLAN, 1 x CMC	8 x 1GbE LAN, 4 x MLAN	8 x 1GbE, 4 x MLAN, 1 x CMC	2 x 1GbE LAN, 1 x MLAN
Storage Bays	8 x 2.5" Gen4 NVMe/SATA	8 x 2.5" Gen4 NVMe/SATA	8 x 2.5" Gen4 NVMe/SATA	24 x 3.5" SATA/SAS 2 x 2.5" SATA on rear side
Expansion Slots	4 x low-profile slots 4 x OCP 3.0 slots 4 x M.2 slots (optional)	4 x low-profile slots 4 x OCP 3.0 slots 4 x M.2 slots (optional)	8 x low-profile slots 4 x OCP 3.0 slots 4 x M.2 slots	7 x low-profile slots 1 x M.2 slot
Power Supply	Dual 3000W Titanium Optional 2+1 redundant PSU	Dual 3000W Titanium	[ICU1] Dual 2200W Platinum [ICP1] Dual 3000W Titanium	[IBC1] Dual 1300W Platinum [IBH1] Dual 1300W Titanium

TO15-S40-IA01

TO15-S41-IA01

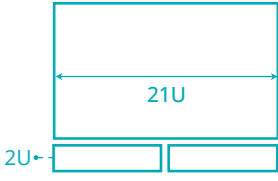
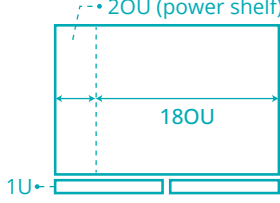

TO15-Z40-IA01

TO15-Z20-IA01



Workloads	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics	HPC, AI, ML, data analytics
Form Factor	10U	10U	10U	10U
Processor	4th/5th Gen Intel Xeon Scalable Intel Xeon CPU Max Series Dual processors	4th/5th Gen Intel Xeon Scalable Intel Xeon CPU Max Series Dual processors	AMD EPYC 9004 series Dual processors	AMD EPYC 9004 series Single processor
Memory	24 x DDR5 RDIMM	16 x DDR5 RDIMM	24 x DDR5 RDIMM	12 x DDR5 RDIMM
Networking	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN	2 x 10GbE LAN, 1 x MLAN
Storage Bays	4 x E1.S Gen5 NVMe	4 x E1.S Gen5 NVMe	4 x E1.S Gen5 NVMe	4 x E1.S Gen5 NVMe
Expansion Slots	4 x dual-slot GPUs 2 x low-profile slots 2 x M.2 slots (optional)	8 x single-slot GPUs 2 x low-profile slots 2 x M.2 slots (optional)	4 x dual-slot GPUs 2 x low-profile slots 2 x M.2 slots (optional)	4 x dual-slot GPUs 2 x low-profile slots 2 x M.2 slots 2 x M.2 slots (optional)
Power Supply	From 48V DC single busbar	From 48V DC single busbar	From 48V DC single busbar	From 48V DC single busbar

Immersion Tanks

	A1P0-EB0	A1O3-CC0	A1P0-EA0
			
Hardware Capacity	21U + 2U x 2 (EIA)	180U + 20U (power shelf) + 1U x 2 (EIA)	12U (EIA)
Cooling Power	80 KW		40 KW
Unit Size	Tank: W1.16 x D0.91 x H1.49 m CDU: W0.48 x D0.86 x H1.62 m		W0.87 x D1.2 x H1.56 m
Unit Weight	Tank: 450 kg (w/o coolant), CDU: 325 kg		300 kg (w/o coolant)
Coolant Volume	750 Liter (615 kg)		400 Liter (320 kg)
Power Plug	PDU: IEC 60309 63A – 3P+N+E, 6H, plug x2 CDU: IEC 60320 C19	PDU: IEC 60309 32A – 3P+N+E, 6H Power shelf: : IEC 60309 63A – 3P+N+E, 6H CDU: IEC 60320 C19	PDU: IEC 60309 32A – 3P+N+E, 6H, plug x2
Input Power Spec	3P+N+E 63A, 380-415VAC, 50/60Hz x2 1P+N+E 15A, 220-240VAC, 50/60Hz x1	3P+N+E 32A, 380-415VAC, 50/60Hz x1 3P+N+E 63A, 380-415VAC, 50/60Hz x1 1P+N+E 15A, 220-240VAC, 50/60Hz x1	3P+N+E 32A, 380-415VAC, 50/60Hz x2
Depth Supported	900 mm		900 mm
Cooling Pipe Size	2" clamp fitting (Tube OD 50.8 mm / Flange OD 63.9 mm)		PT 1-1/4" Male Adaptor (Pipe OD 42.7 mm)
Cooling Water Inlet	20-35°C		20-35°C
Cooling Water Flow	240 LPM		100 LPM



▲ A1P0-EB0 / A1O3-CC0 Tank



▲ A1P0-EA0 Tank

POC Tank, Accessories and Coolants

4U POC Tank

Hardware Capacity	4U
Cooling Power	7 KW
Unit Size	W1.0 x D1.2 x H1.35 m
Unit Weight	400 kg (w/o coolant)
Coolant Tank Volume	185 Liter (151 kg)
Power Plug	IEC 60309 32A – 3P+N+E, 6H, plug x1
Input Power Spec	3P+N+E 32A; 380-415VAC; 50/60Hz
Depth Supported	950 mm
Cooling Type	dry cooler



IT Lift

Dimension	W1.15 x D0.85 x H1.53 m
Unit Weight	200 kg
Max Loading	70 kg
Input AC	100-240V~,50/60Hz,3.5A
Power Plug	US 10A 125V
Chassis Spec	EIA & OCP compatible



IT Dry Rack

Dimension	W1.23 x D0.63 x H1.25 m
Unit Weight	75 kg
Support Size	EIA 19" & OCP 21" compatible
Support Space	20U or 200U
Load Capacity	Under 800 kg



Coolants



Shell

Immersion Cooling Fluid S3 X
Immersion Cooling Fluid S5 X

ExxonMobil

SpectraSyn™ 6



SynFluid® PAO 4 cST





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