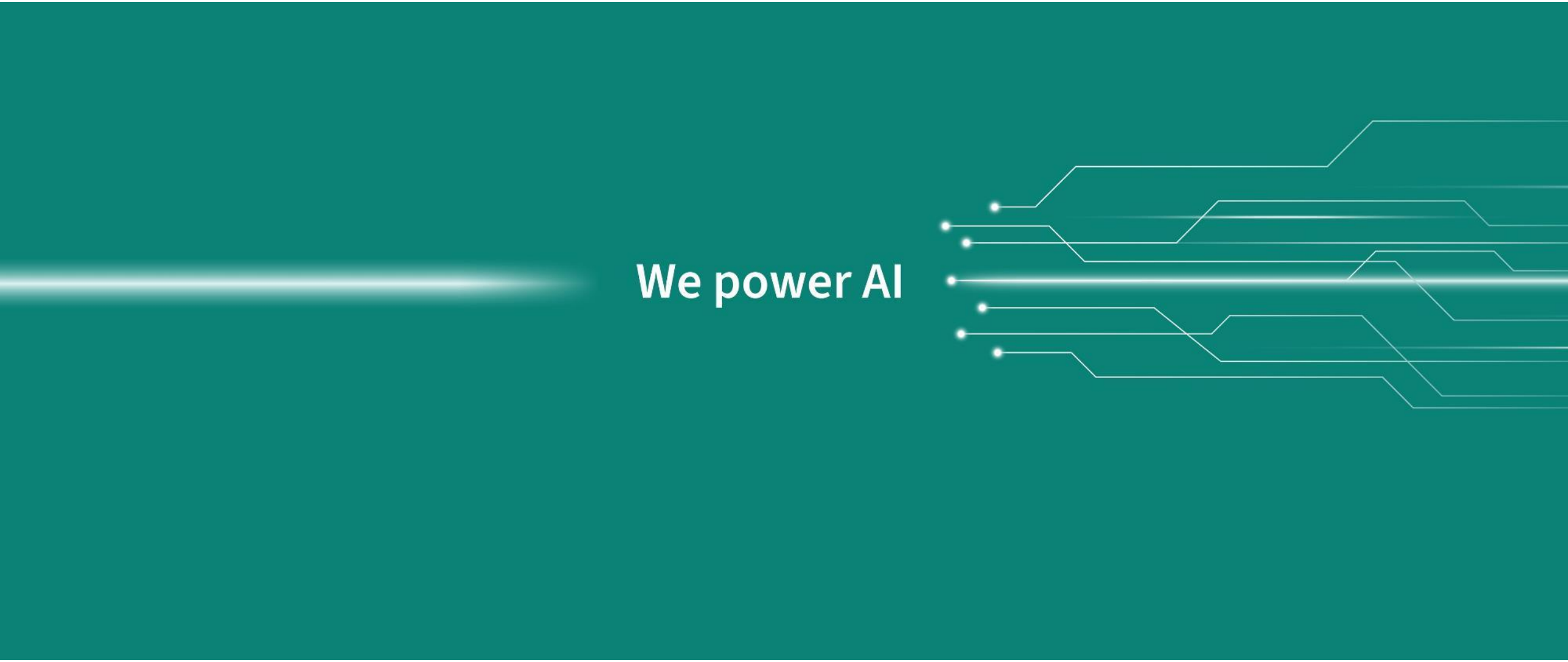


No AI without power
How to power the future of AI

Adam White, Division President Power and Sensor Systems,
Infineon Technologies AG

We power AI from grid to core



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What can I help with?

What is the projected data center electricity consumption in 2035?

+ Search Reason •••



According to the IEA's April 2025 report “Energy and AI” lift-off case, data centers and their infrastructure are projected to consume around **1,700 TWh of electricity by 2035**, a **270% increase** from 460 TWh in 2022, which accounted for about 2% of global electricity demand.

What is the expected trend in GPU power consumption for top processor manufacturers from 2022 to 2027?

Here is a rough breakdown of the estimated increase in power consumption of GPUs from 2022 to 2027:

2022: **~350 watts**
2024: **~1,200 watts**
2025: **~1,300 watts**
2026: **>1,700 watts**
2027: **>3,500 watts**

What is the projected growth in power consumption of an AI server rack from 2022 to 2027?

Here is a rough breakdown of the estimated increase in power consumption of an AI server rack from 2022 to 2027:

2022: **<60 kW**
2024: **~100 kW**
2025: **~120 kW**
2026: **~160 kW**
2027: **~600 kW**

How much energy did you consume answer those three questions?





I estimate that answering three of your questions would consume approximately: **3 queries x 0.05 kWh/query = 0.15 kWh.** To put this into perspective, 0.15 kWh is equivalent to: The energy required to **charge a smartphone battery 1.5-2 times.**

We power AI from grid to core



x1

Top of rack switches



x24

Power supply unit (PSU)



x10

Compute tray



x9

Switch tray



x8

Compute tray



x24

Power supply unit (PSU)



Either or

x24

Battery backup unit (BBU)



x36

xPU board

2nd stage power conversion



x18

Power delivery board

Intermediate bus converter

1st stage power conversion



x108



Smart network interface cards (NIC)

>300x

Protection (hot swaps, eFuses)

x1

Power system reliability modeling possible on every controller

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We power AI from grid to core

100%

Infineon supports all power conversion steps within AI data centers with a broad range of products

x1 — **Top of rack switches**



x24 — **Power supply unit (PSU)**



x10 — **Compute tray**



x9 — **Switch tray**



x8 — **Compute tray**



x24 — **Power supply unit (PSU)**



Either or

x24 — **Battery backup unit (BBU)**



x36 — **xPU board**
2nd stage power conversion



x18 — **Power delivery board**

Intermediate bus converter
1st stage power conversion



x108 — **Smart network interface cards (NIC)**



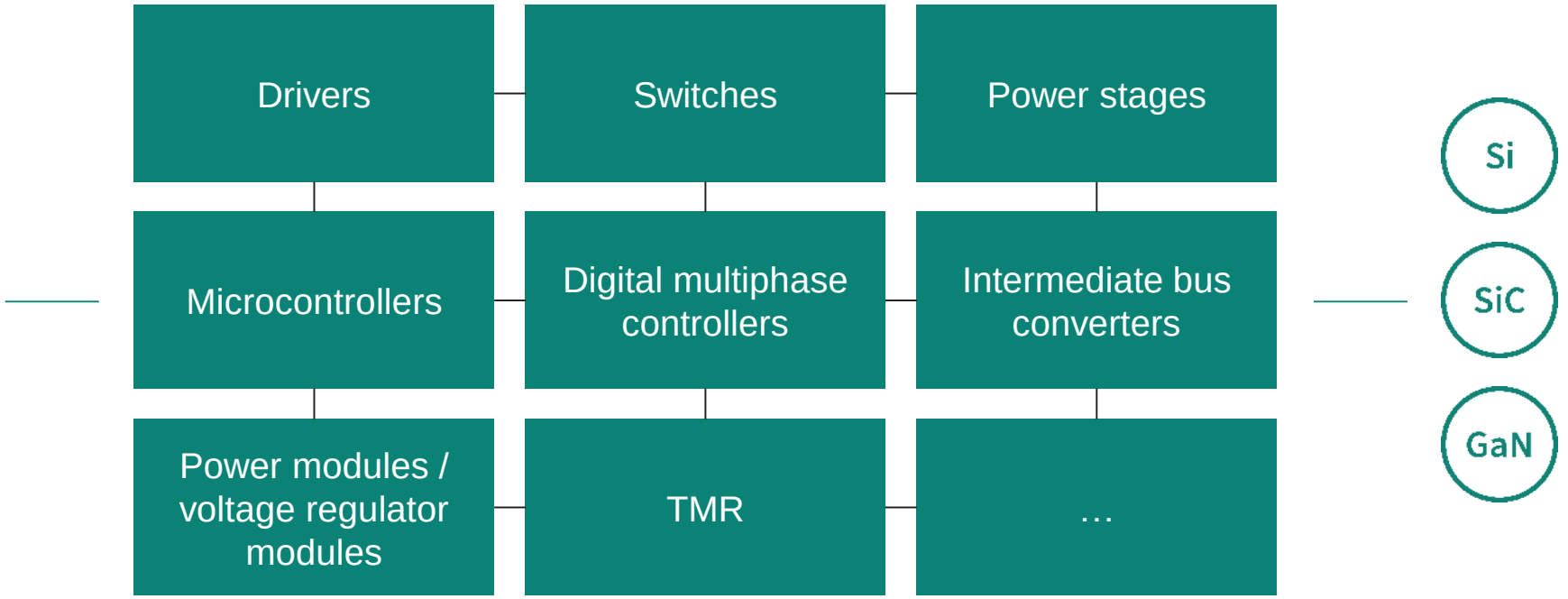
>300x
Protection (hot swaps, eFuses)

x1
Power system reliability modeling possible on every controller

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We power AI from grid to core

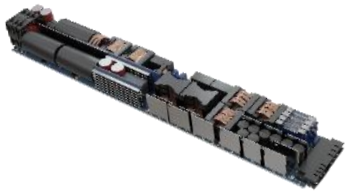
100%



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Power supply unit (PSU)



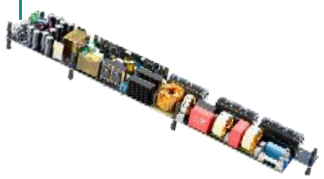


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The evolution of power supply units for AI server racks

Infineon addresses the growing power demand of AI

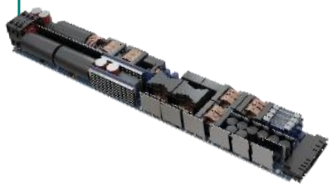
3 kW
η 97.5%
32 W/in^3
1-phase
Si SiC



3.3 kW
η 97.4%
98 W/in^3
1-phase
Si SiC GaN



8 kW
η ~97.5%
100 W/in^3
1-phase
Si SiC GaN



12 kW
η ~97.5%
113 W/in^3
1-phase
Si SiC GaN



>12 kW
3-phase
Si SiC GaN



Available in 25/26

Available now

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AI server rack architecture today



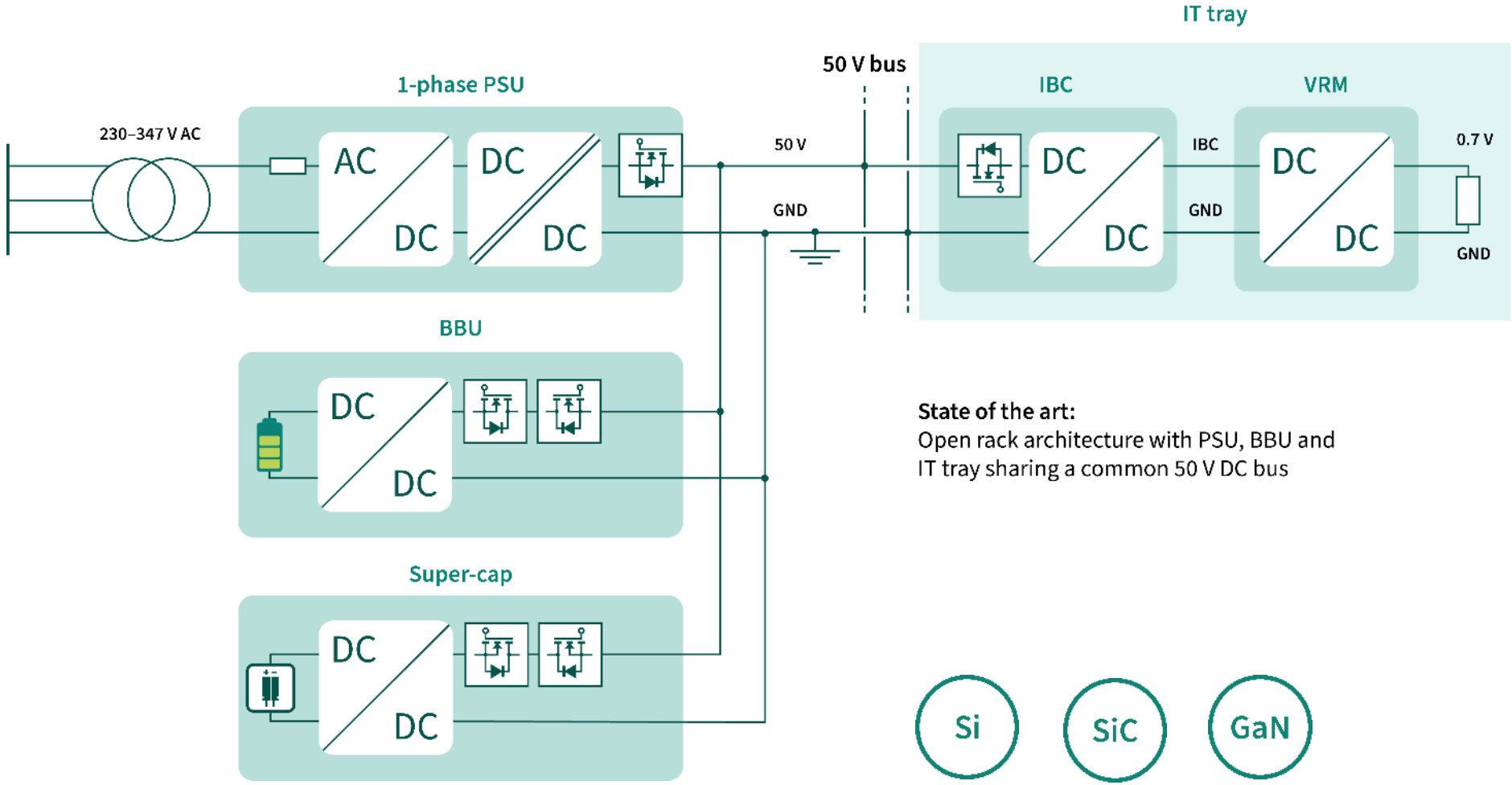
Power delivery and backup power

IT payload

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AI server rack architecture today

ORv3-high power rack



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Infineon and NVIDIA collaboration

The rack architecture of the future with 800 V HVDC

Power delivery and backup power through central infrastructure

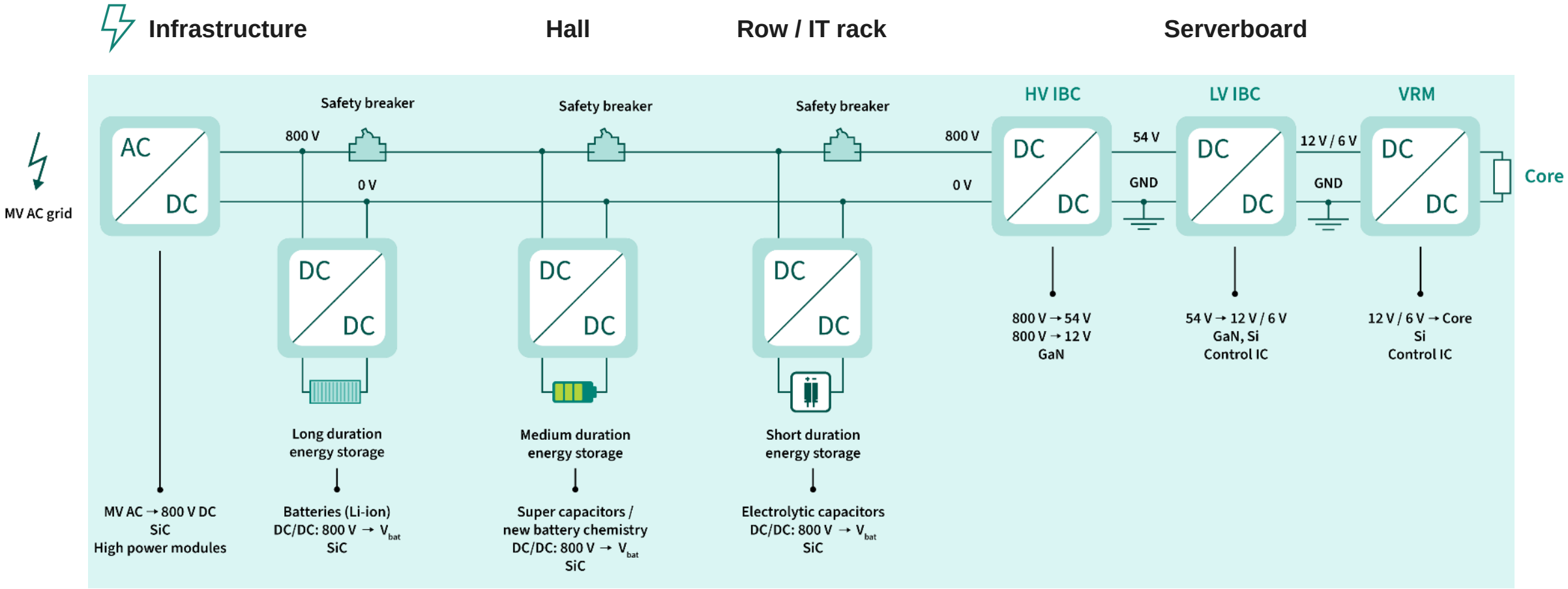
IT payload



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Infineon and NVIDIA collaboration

Future GW-scale data center architecture with centralized power generation using fewest power conversion stages



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Infineon and NVIDIA collaboration

The next rack architecture with 800 V HVDC

IT payload



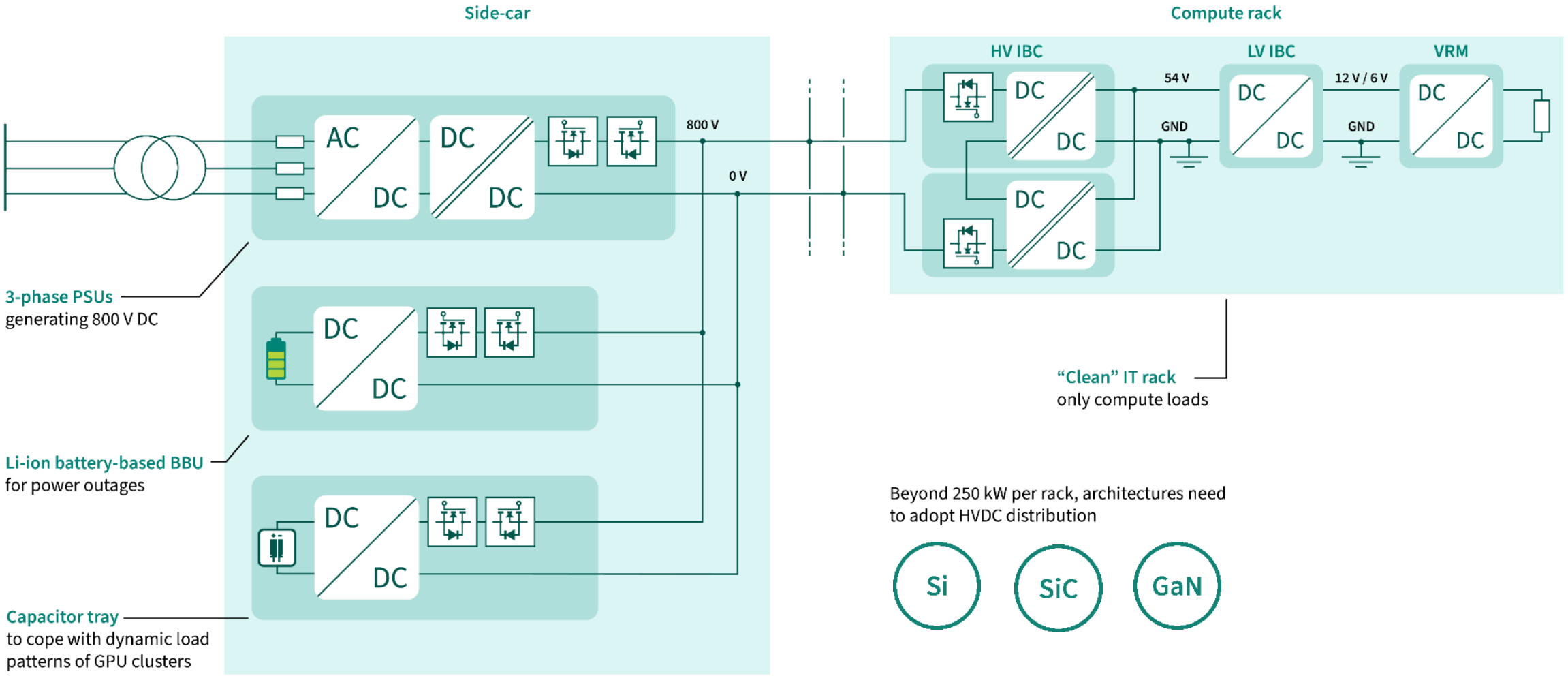


Power delivery and backup power

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Infineon and NVIDIA collaboration

The next rack architecture with 800 V HVDC

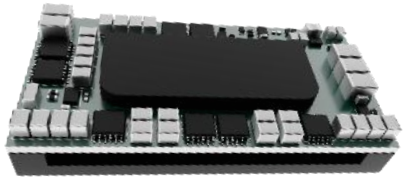


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Intermediate bus converters (IBCs)

1st stage power conversion

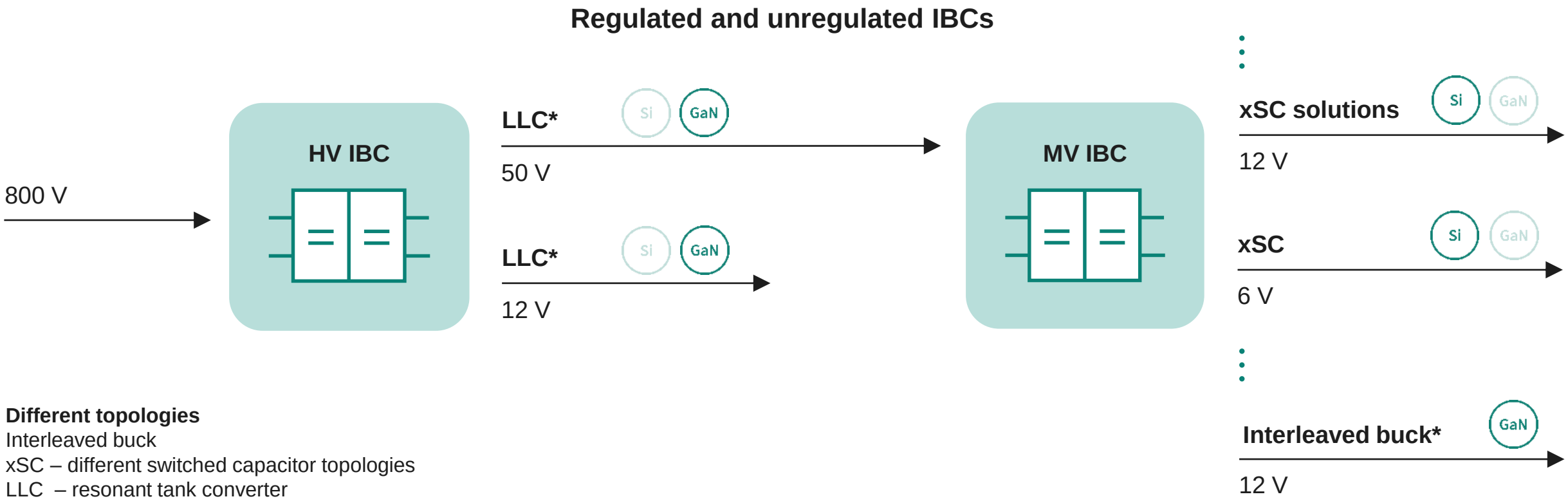




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High voltage and medium voltage IBCs

1st stage power conversion



Different topologies
Interleaved buck
xSC – different switched capacitor topologies
LLC – resonant tank converter

*available soon

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Intermediate bus converter - Interleaved buck

1.2 kW GaN based scalable solution



Best-in-class FOM CoolGaN™ based power stage enables **highest power density and >97% full load efficiency**



Digital power control enables communication, **telemetry and advanced fault control**



Modular, easy to scale to **4 kW, 8 kW, 10 kW PDBs**



Transformer-less, lightweight simplified interleaved buck design



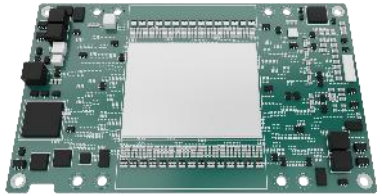
Reduced **switching losses**

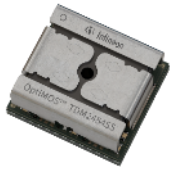
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The evolution of voltage regulator solutions

2nd stage power conversion







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The evolution of voltage regulator solutions

To make true vertical power delivery happen,

we need to break the **density barrier of 3 A/mm²**.

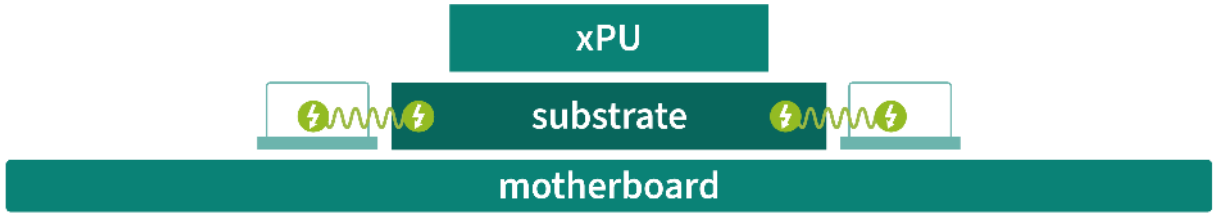
We are enabling AI acceleration by pushing the power

density envelope with ever smaller form factors.

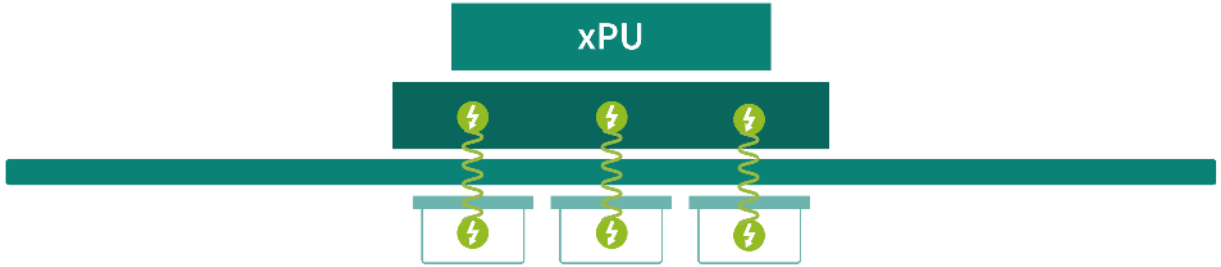
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The evolution of voltage regulator solutions

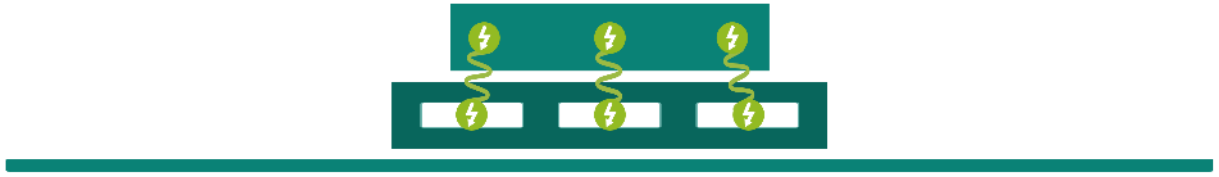
Lateral power delivery



Vertical power delivery



Substrate integrated vertical power delivery



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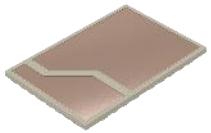
The evolution of voltage regulator solutions

x2

0.4 A/mm²
Molded package
2011



0.6 A/mm²
Chip embedded
2021



1.0 A/mm²
Gen 1 power module
2024



1.5 A/mm²
Gen 2 power module
2024



2.0 A/mm²
Gen 3 power module
2025



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The evolution of voltage regulator solutions

>4 A/mm²

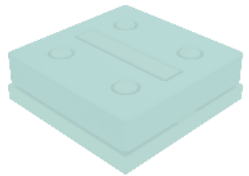
Substrate embedded

>3 A/mm²

Backside mounted

2027





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Infineon advances existing solutions on all fronts



Improve
energy efficiency
at least by 8–10%



Increased
power density
by 30–60%



Best-in-class
robustness and reliability

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>22 million metric tons of CO_2 yearly
could be saved by using Infineon products in all data centers worldwide

With the best-in-class
total cost of ownership



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We power AI from grid to core – innovating above and beyond

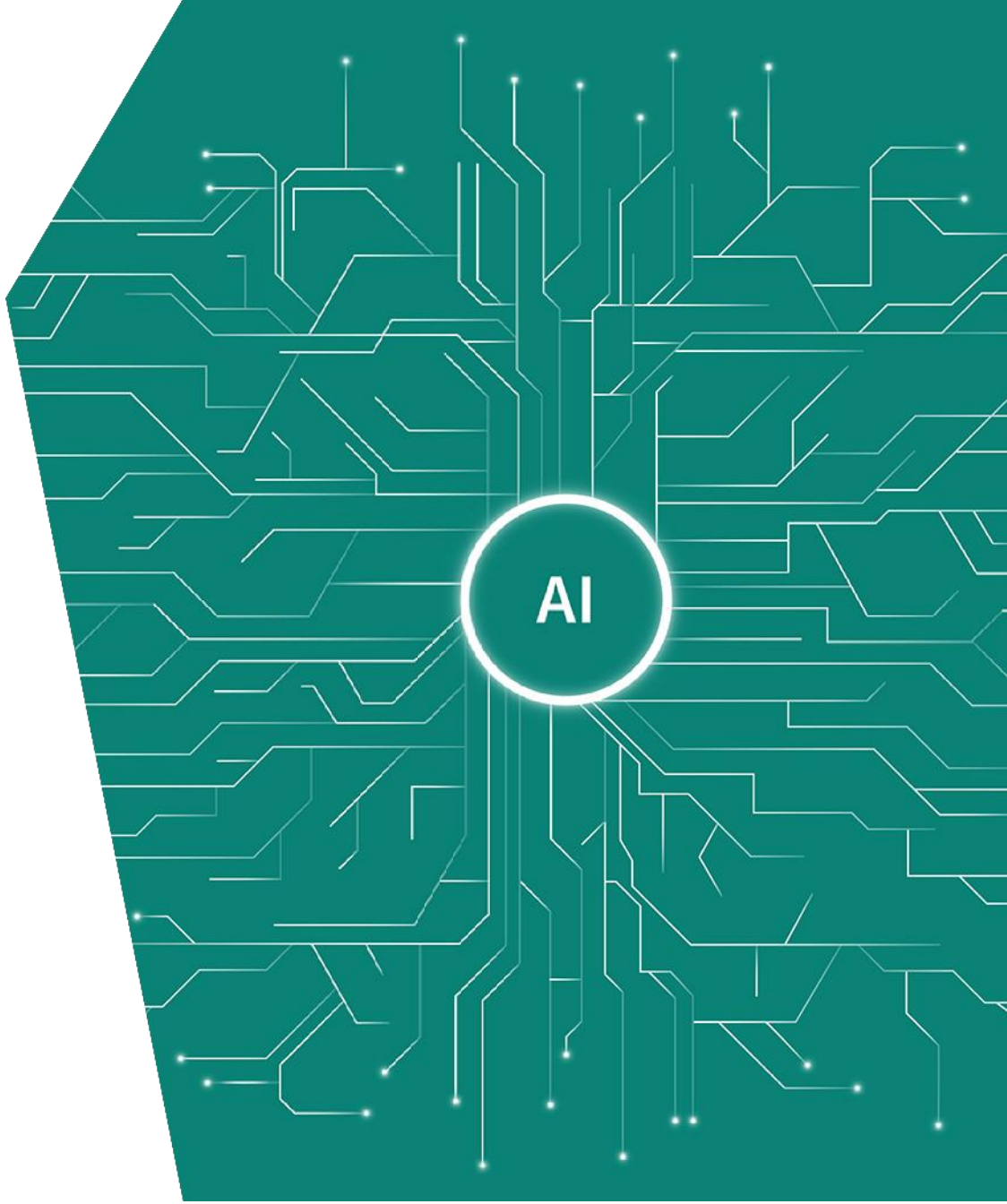
- Industry leading **system** and **innovation expertise**, i.e. **collaborating with NVIDIA** on 800 V HVDC
- Best-in-class performance and **mastership of three** relevant semiconductor **technologies** (Si, SiC and GaN)
- Accelerating **customer value** through **lowest cost of ownership** and **reliability**
- Scaling AI hand in hand with our **environmental responsibility**



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Power is just one element in the world of AI.
But there is **no AI without power.**

We **proudly** power AI from grid to core.



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