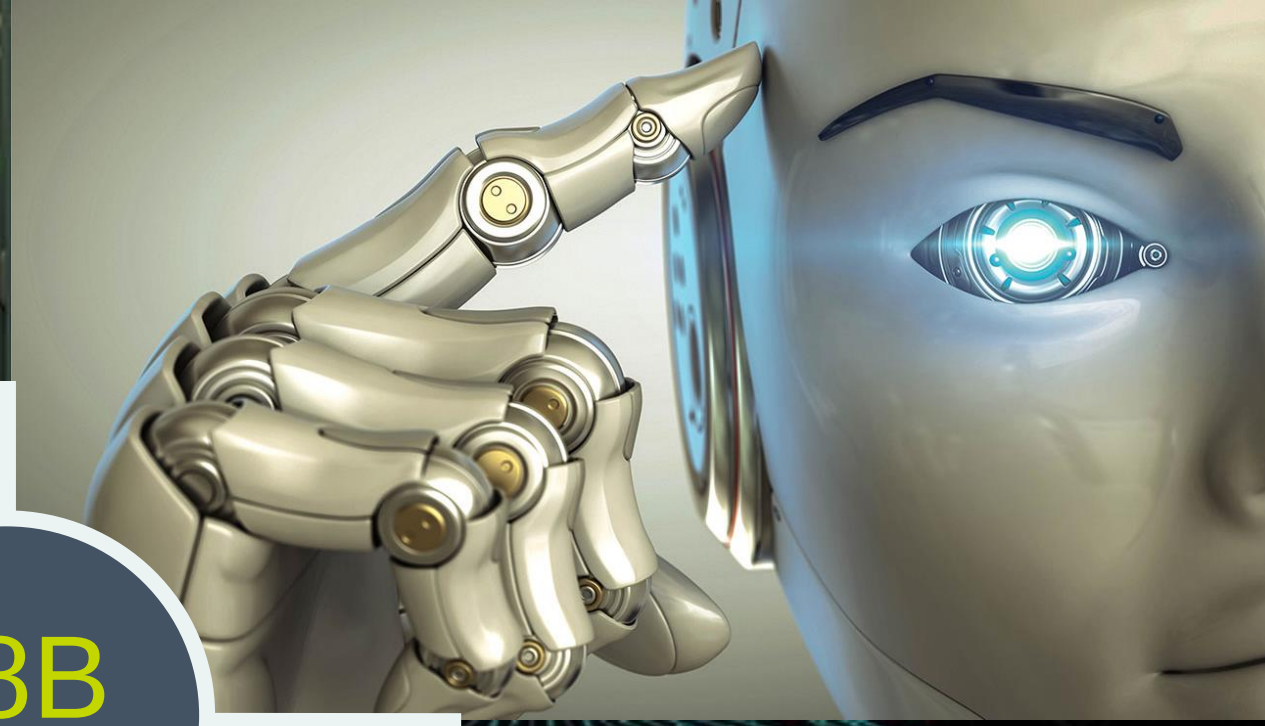
VICOR

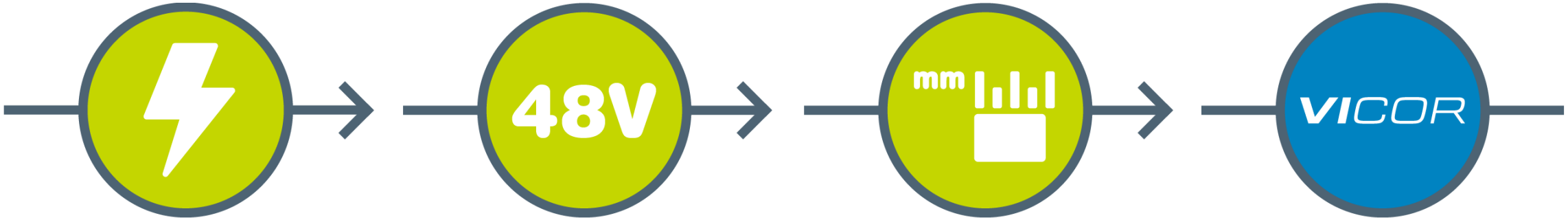
Strategy update

Innovation drives sustainable growth
with world class customers



$8B
Vicor SAM

Power Distribution Networks (PDN)



System performance demands drive rapidly increasing load power

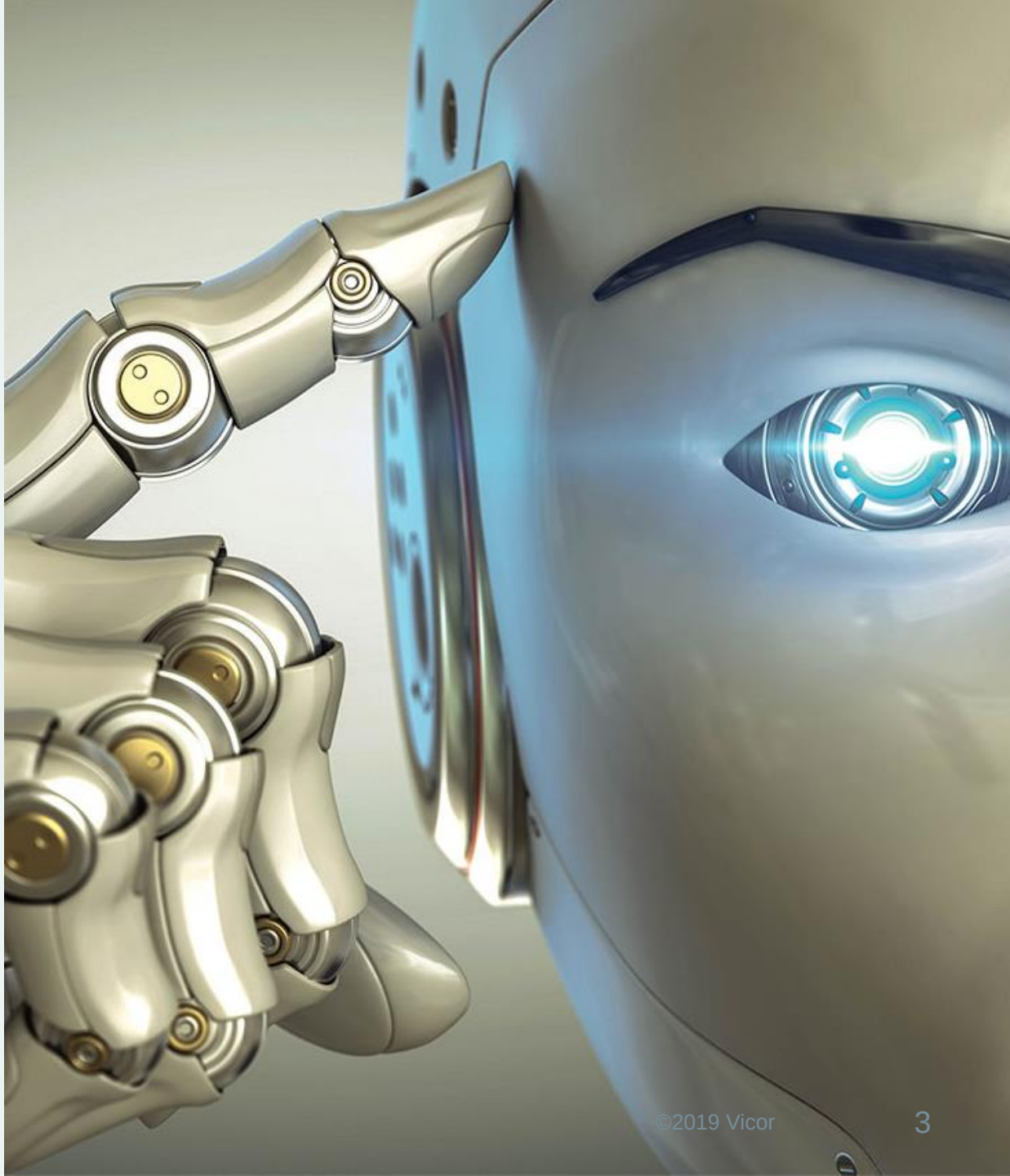
Moving PDN to higher voltages eases the delivery and distribution of higher power

Power = Voltage x Current

High-density needed at the point of load to increase performance and efficiency

The power module company with, ***by far***, the highest performance and density

Data Center Cloud, AI and HPC solutions



Data Center: HPC/AI driving the move to 48V

3-phase 480V AC

$2B
SAM
2023

380 V HVDC

48V

20KW to 80kW rack power

Heavy workload:
HPC/AI. CPU,
GPU, ASIC,
GA

@ 350A to

$2B
SAM
2023

m workloads:
ud

12V @ 150A to
300A

12KW to 20kW rack power

Data Center: HPC/AI driving the move to 48V

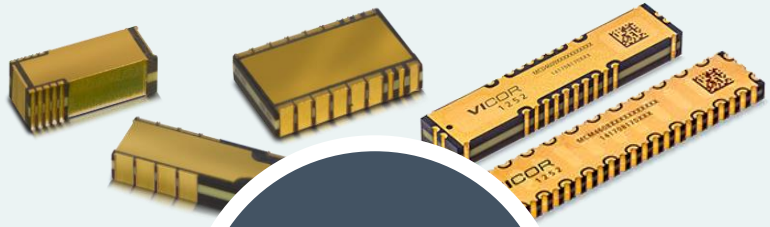
3-phase 480V AC

$2B
SAM
2023

380 V HVDC

48V

40KW to 80kW rack power



$2B
SAM
2023

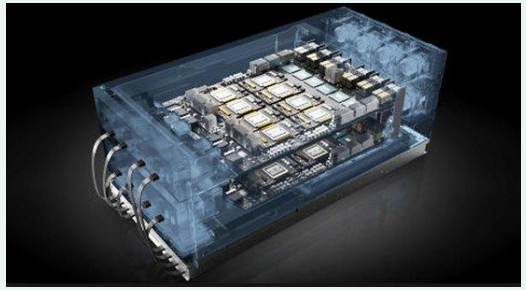
12KW to 20kW rack power

Data center: adding 48V AI on refresh or new builds with 12V legacy PDN racks

12 Volts

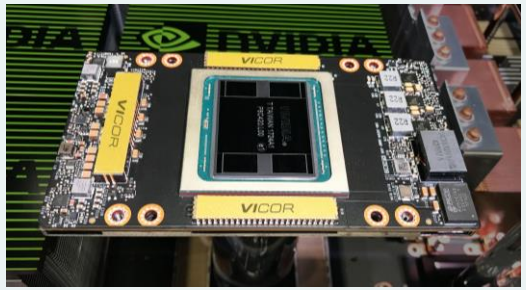
48V

HGX2



OAM

SXM



OCP AI card – winning at the hyperscalers

- Support 12V (NBM 12V to 48V) and 48V input lateral PoP)
- Up to 350W (12V) and up to 700w (48V) TDP
- 102mm x 165mm dimensions present density challenge
- Single or multiple ASICs per module – higher density

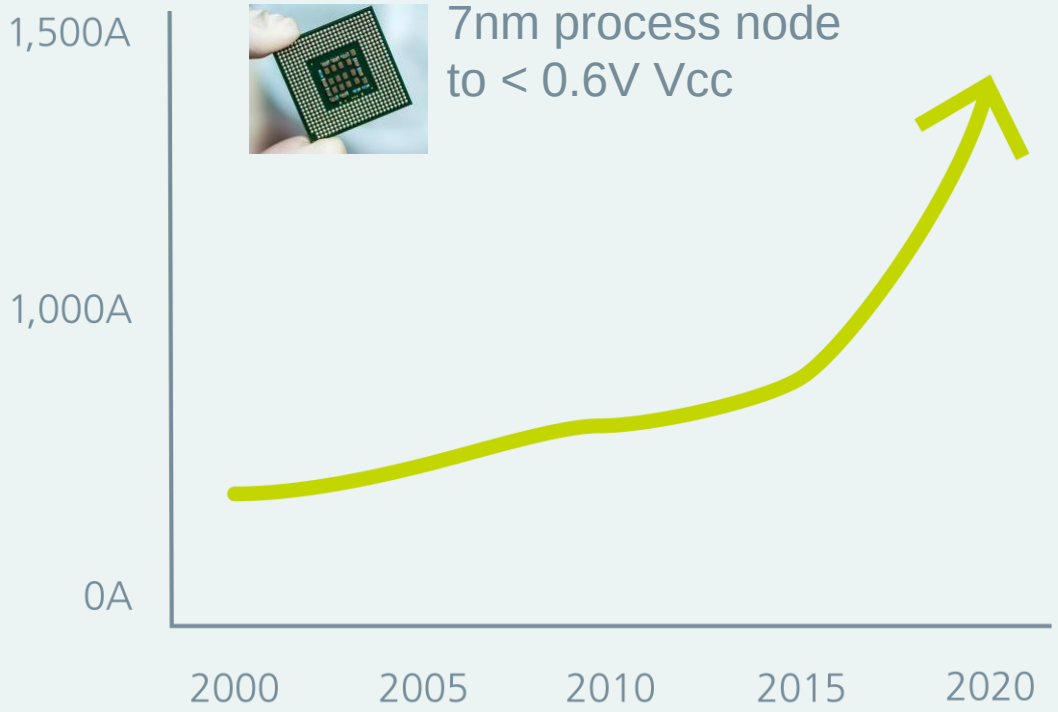
Made by: GPU, ASIC suppliers

Used by: Hyperscalers

Challenge in powering AI processors

- AI chips need higher current…
- High current causes Power Distribution Network (“PDN”) losses
- Performance of AI chips limited by current delivery

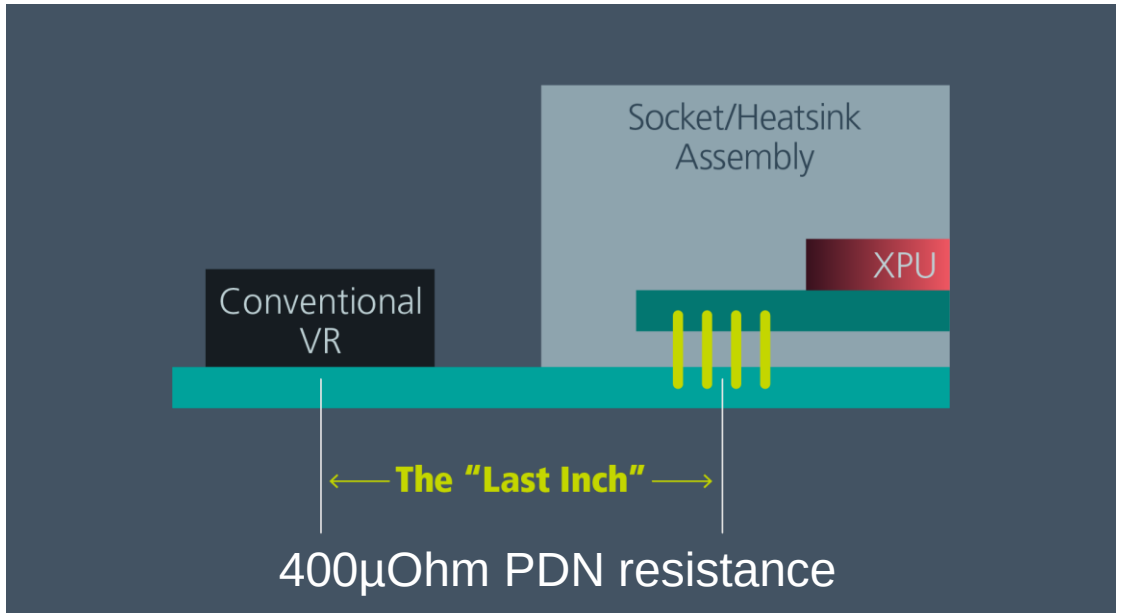
Progression of CPU/GPU/ASIC/FPGA peak current requirements



Vicor lateral power delivery reduces PDN loss

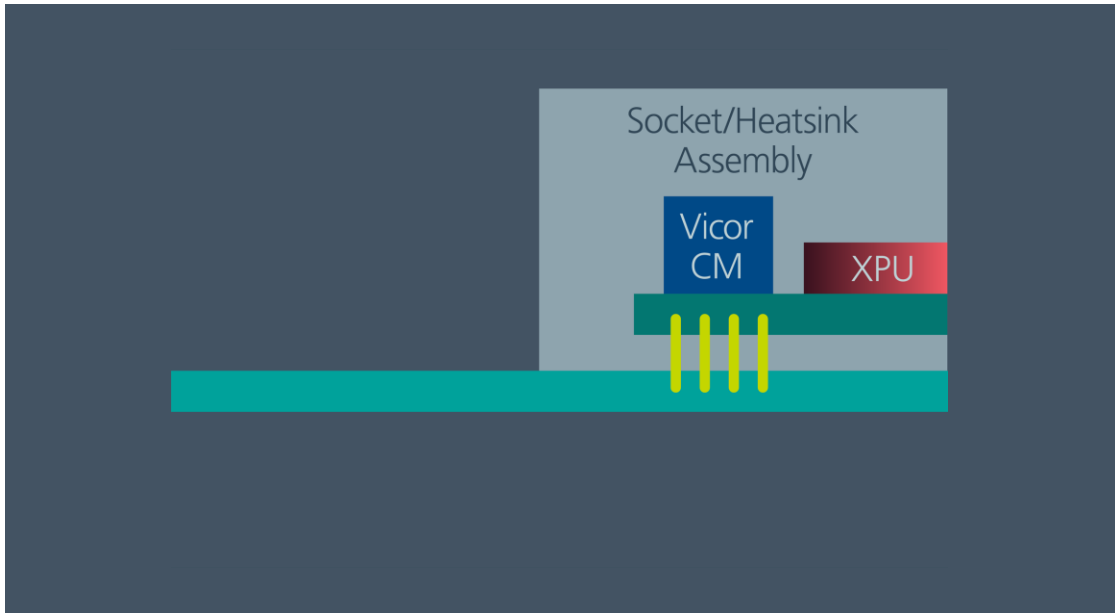
Conventional

Voltage Regulators (VRs) placement and current capability handicap XPU's performance

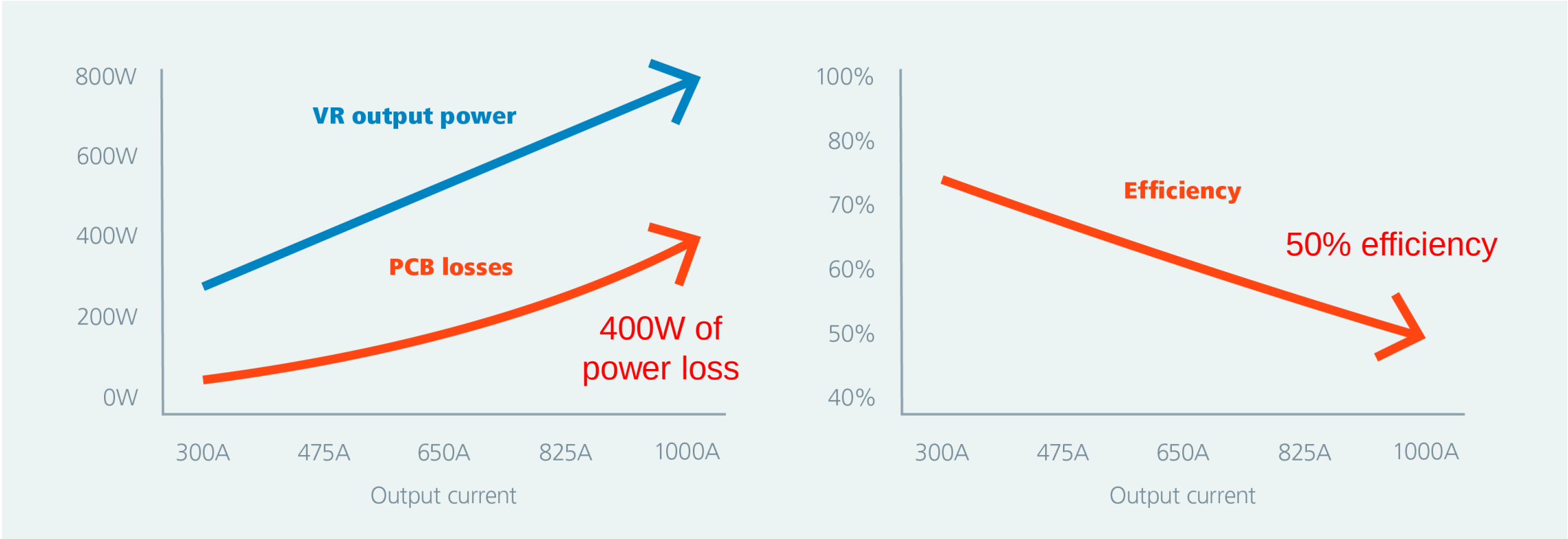


Vicor lateral power delivery

Current multiplication enables PoP with high density, high efficiency, and low noise



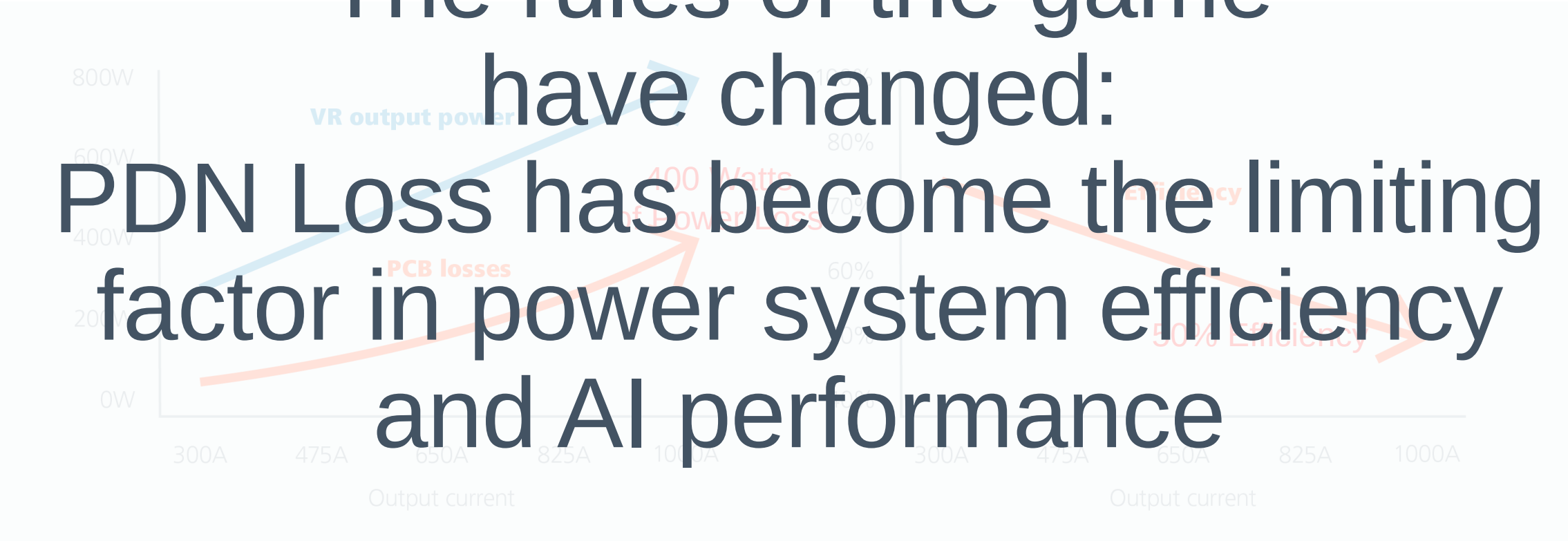
PDN Loss from the VR to the XPU



Example with PCB resistance of 400uOhm (VR at 0.8Vout)

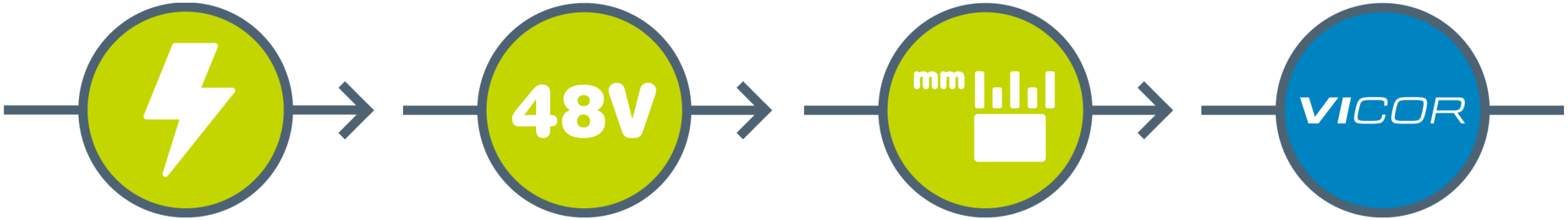
Power distribution Loss from the VR to the XPU, the “last inch”

The rules of the game have changed:
PDN Loss has become the limiting factor in power system efficiency and AI performance



Example with PCB resistance of 400uOhm (VR at 0.8Vout)

Power Distribution Networks (PDN)



System performance demands drive rapidly increasing load power

Moving PDN to higher voltages eases the delivery and distribution of higher power

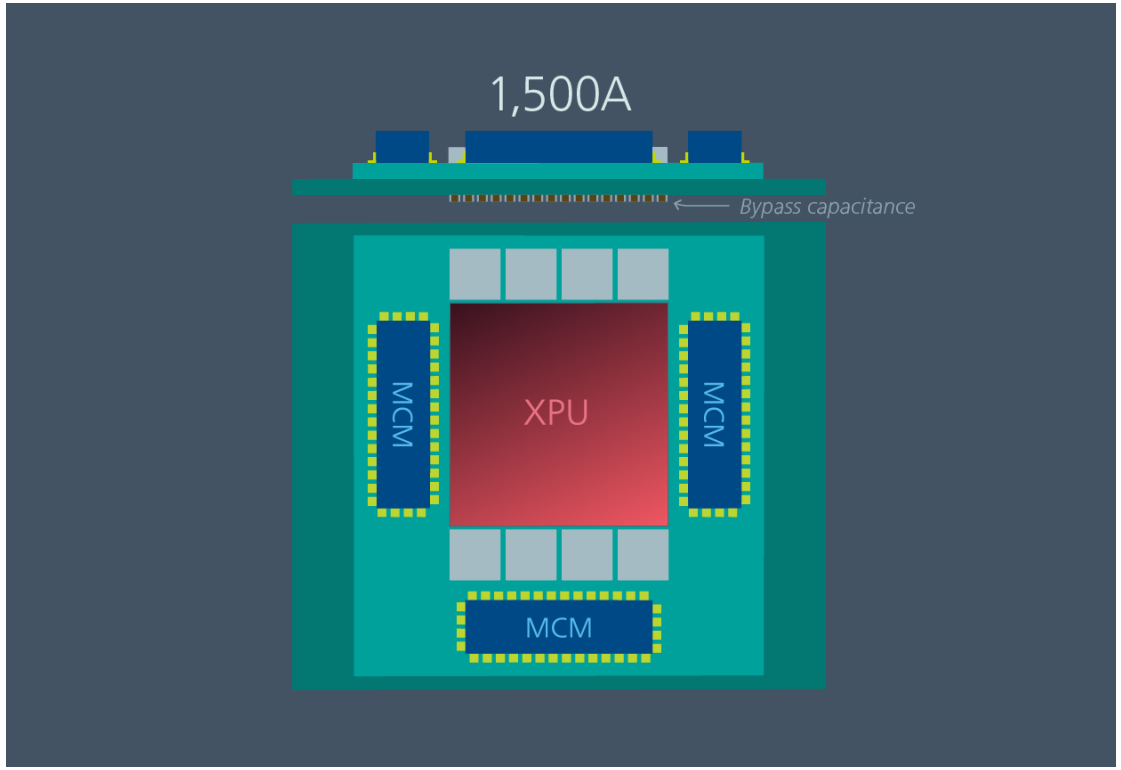
Power = Voltage x Current

High-density and high-current delivery needed at the point of load to achieve performance

The power module company with, ***by far***, the highest performance and density

Disruptive technology accelerates design wins at AI GPU and ASIC customers

Vicor lateral power delivery



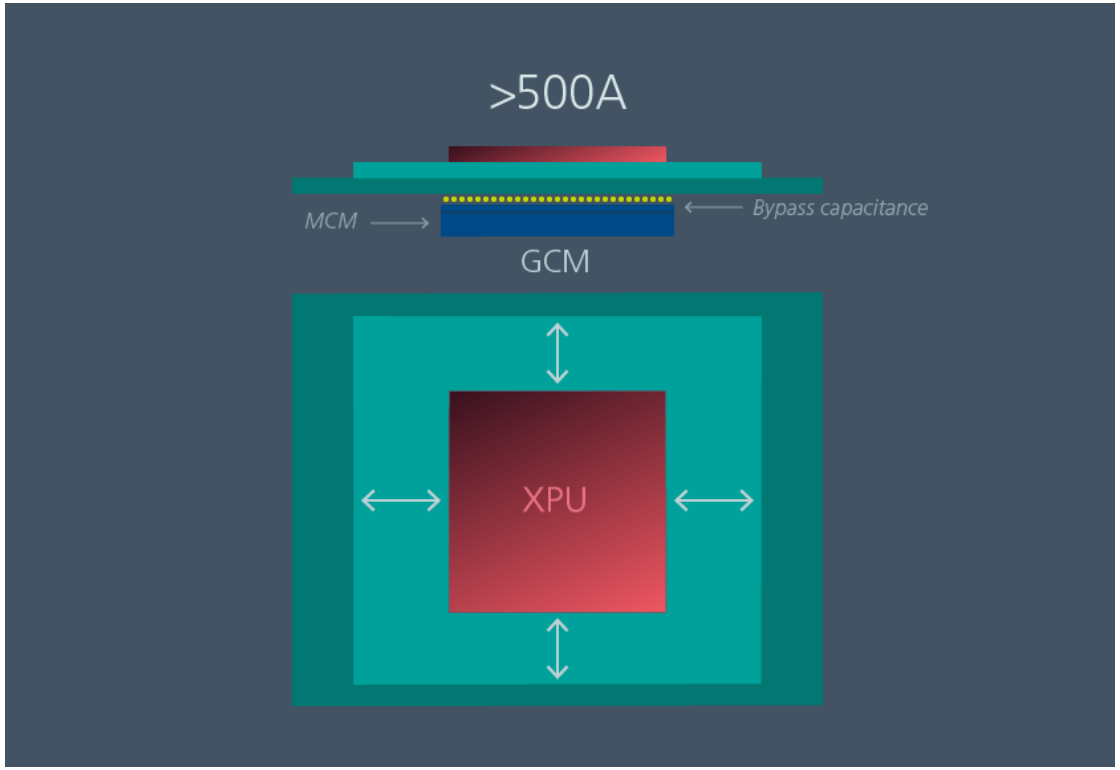
Performance comparison

	Vicor Lateral	Conventional VRs
PDN resistance	50μΩ	400μΩ
PDN loss @ 500 Amps	12.5W loss 97% efficiency	100W, 75% efficiency
PDN loss @ 1000 Amps	50W loss 97% efficiency	400W, 50% efficiency
	Enabled	***Not*** viable

PDN Power Loss, due to circuit board copper resistance = I^2R

Disruptive technology accelerates design wins at AI GPU and ASIC customers

Vicor vertical power delivery



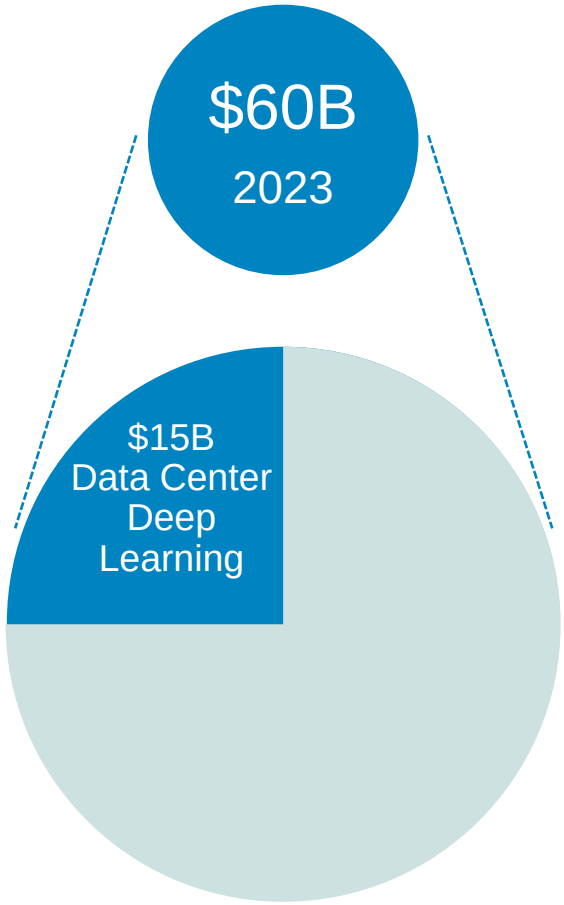
Performance comparison

	Vicor Vertical	Vicor Lateral	Conventional VRs
PDN resistance	5μΩ	50μΩ	400μΩ
PDN loss @ 500 Amps	1.25W loss 99.7% efficiency	12.5W loss 97% efficiency	100W 75% efficiency
PDN loss @ 1000 Amps	5W loss 99.4% efficiency	50W loss 94% efficiency	400W 50% efficiency
	Enabled	Enabled	***Not*** viable

PDN Power Loss, due to circuit board copper resistance = I^2R

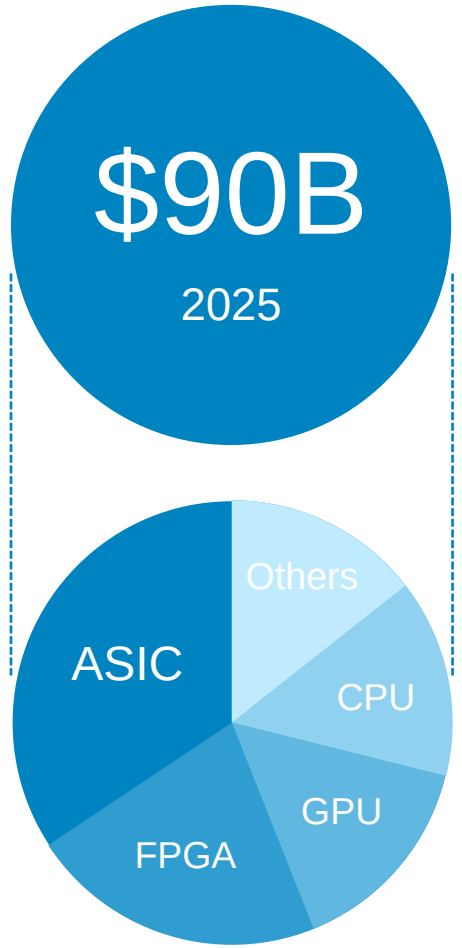
The opportunity: AI processor forecast

A $1.5B opportunity for Vicor in 2023



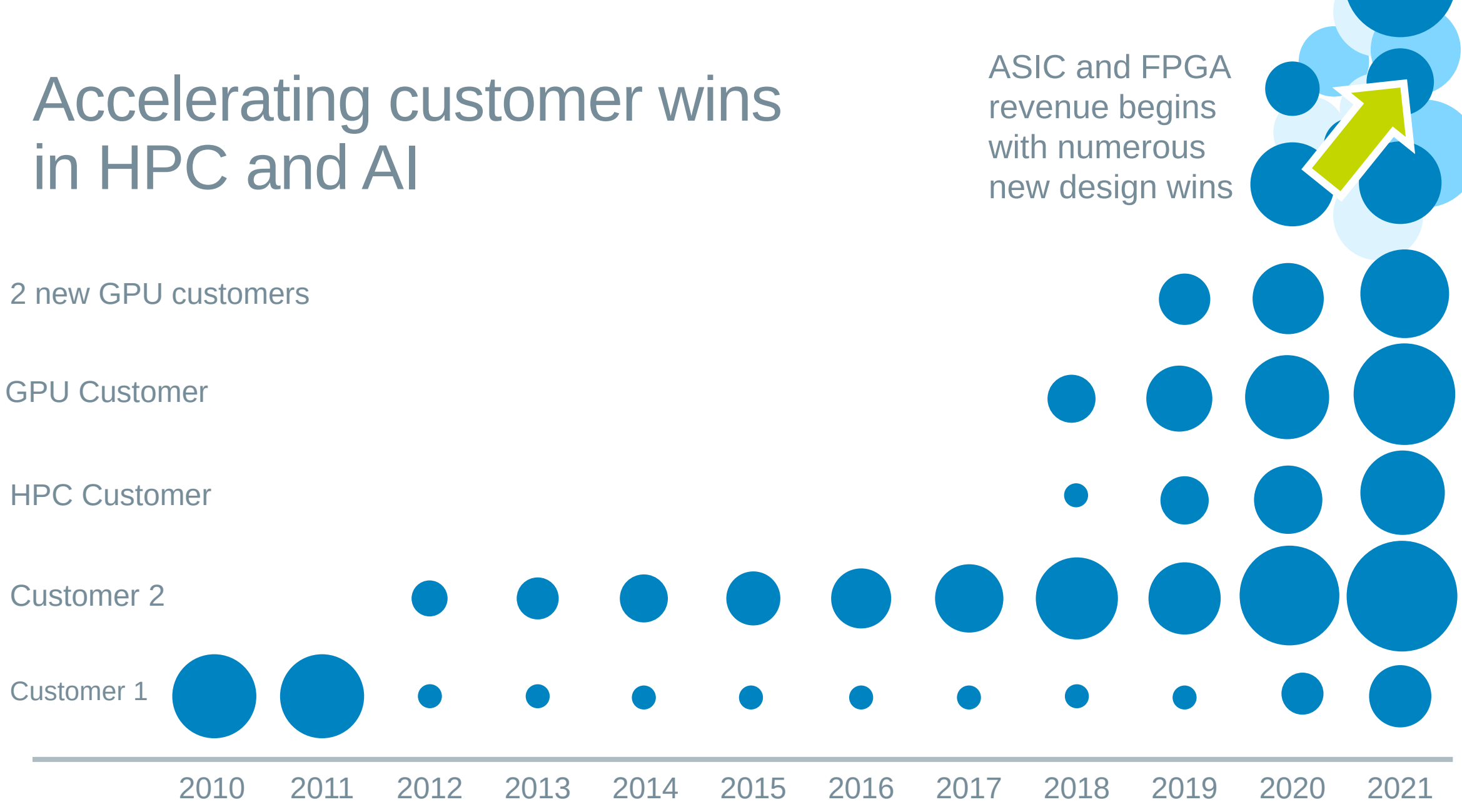
ASICs projected as the largest segment:

- Google
- Amazon
- Facebook
- Tesla
- Alibaba etc..



Accelerating customer wins in HPC and AI

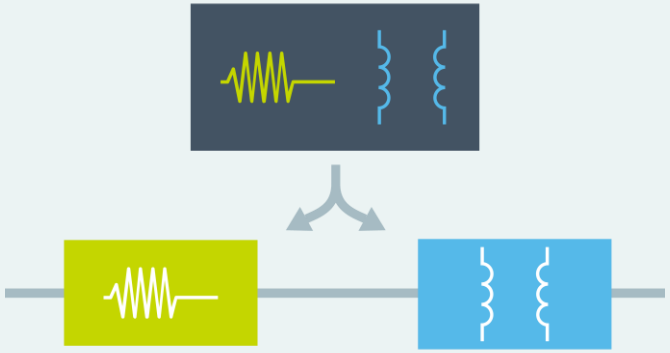
ASIC and FPGA revenue begins with numerous new design wins



Vicor's performance lead is expanding – Generation 4

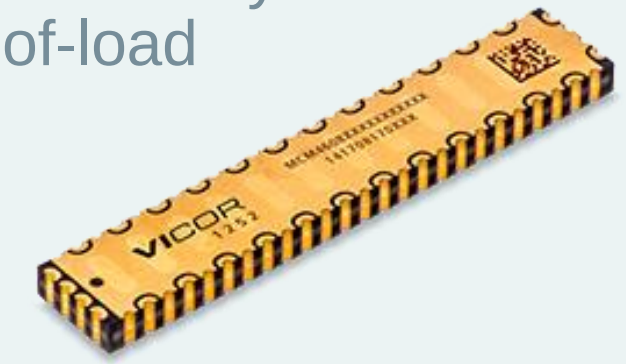
Advanced architectures

Factorized Power enables the highest density at the point-of-load

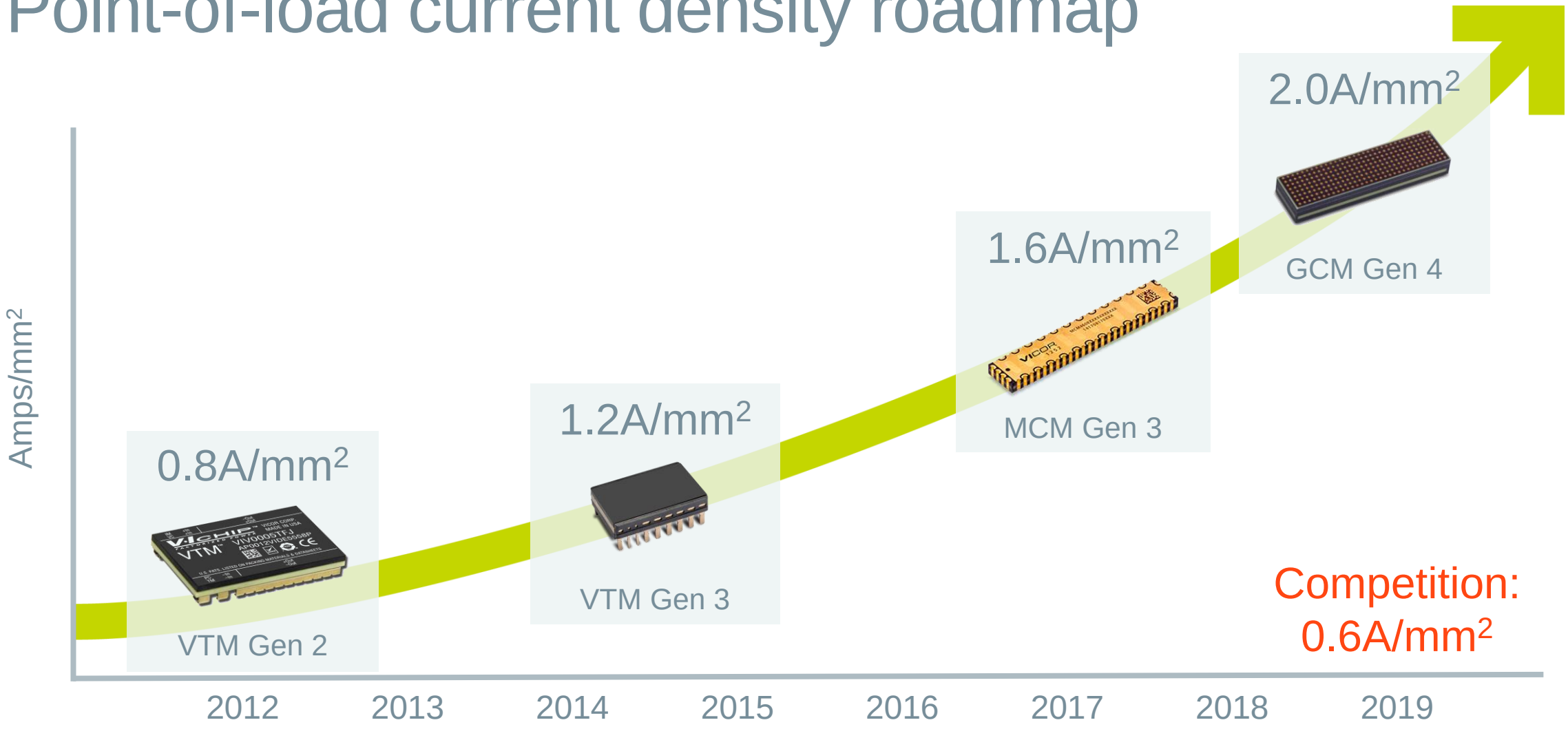


Advanced topologies

Current Multiplier enables the highest density and highest current delivery at the point-of-load



Point-of-load current density roadmap



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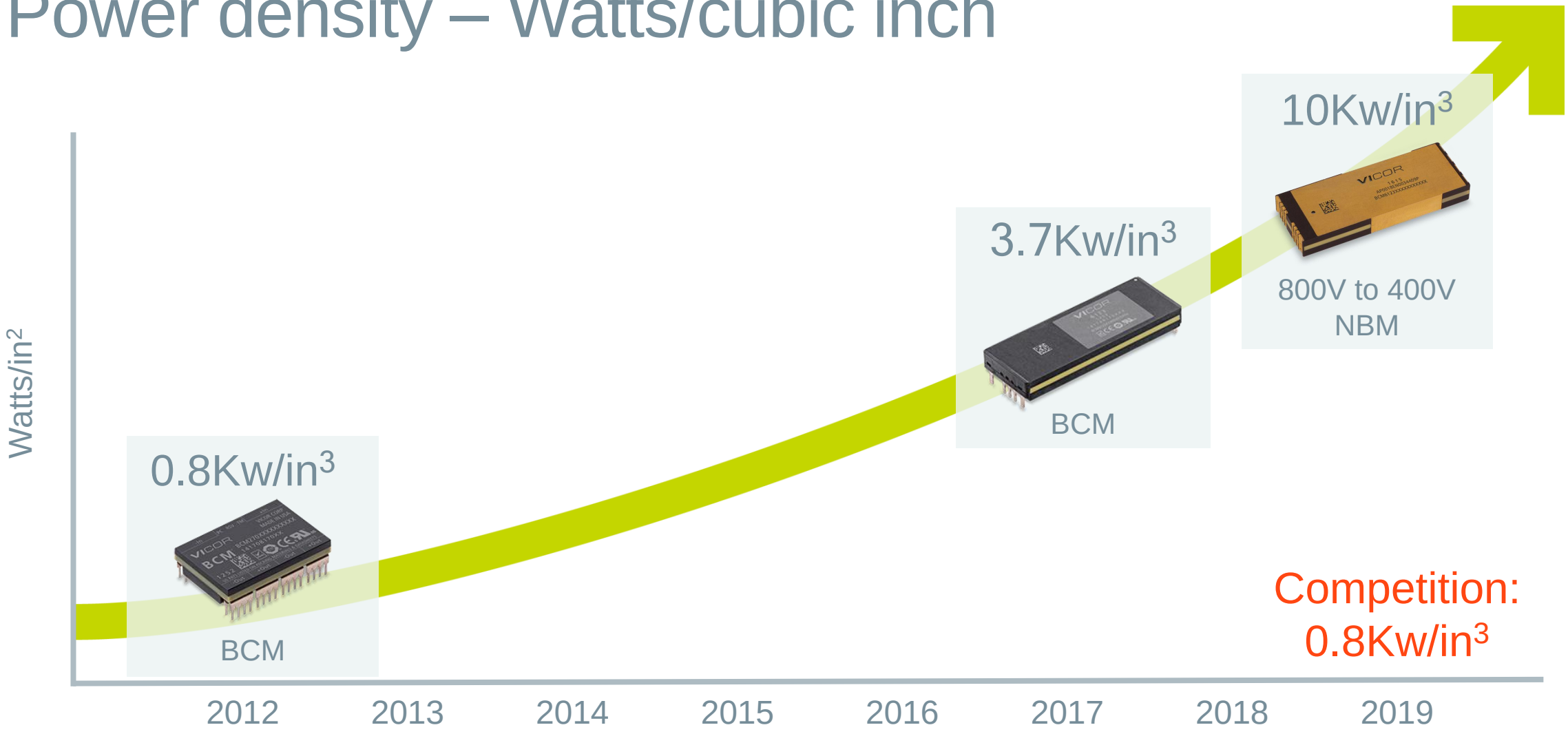
Power density – Watts/cubic inch



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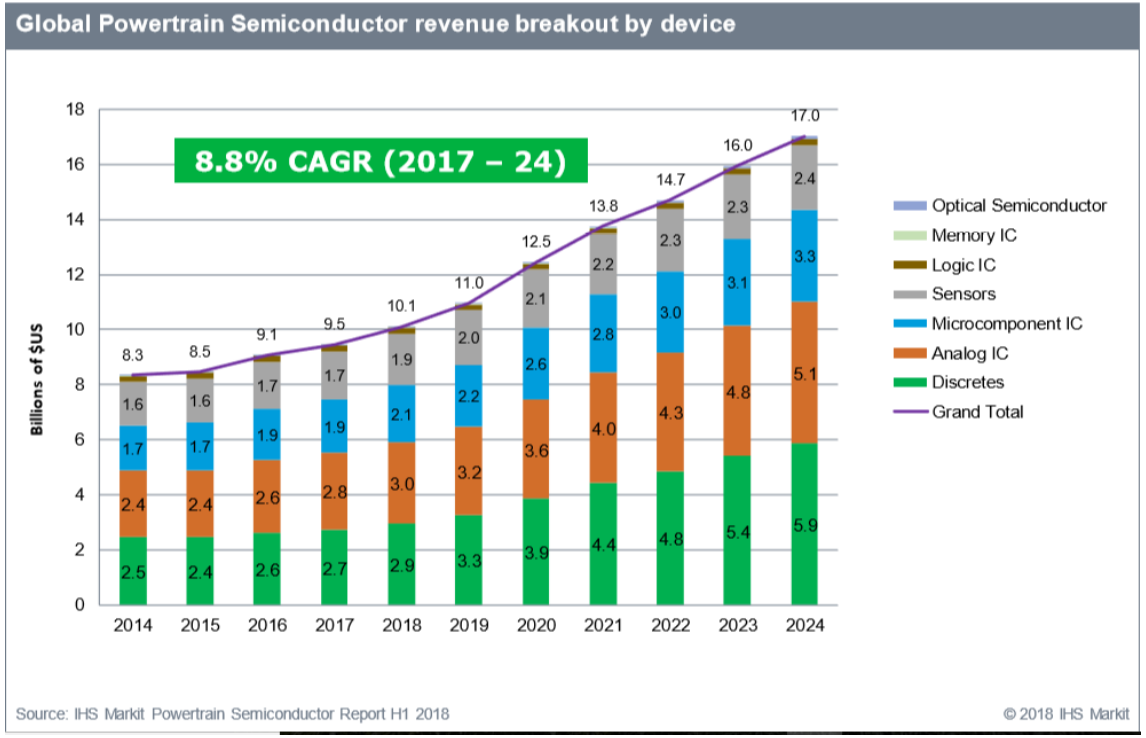
Automotive solutions

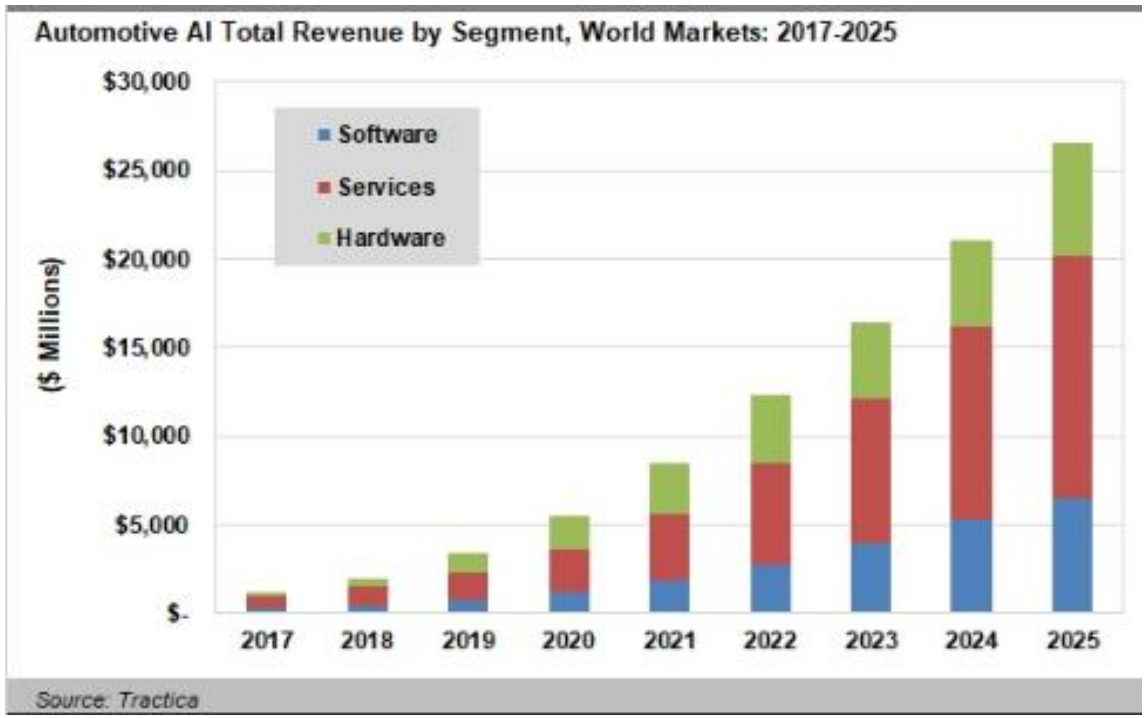
Vicor opportunity in Powertrain

- Vicor's addressable market (SAM) is approximately $2B in 5 years

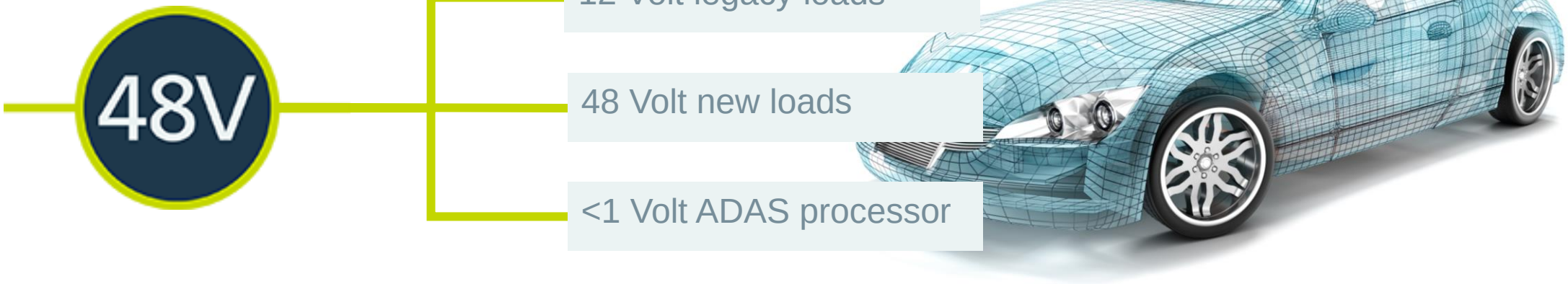


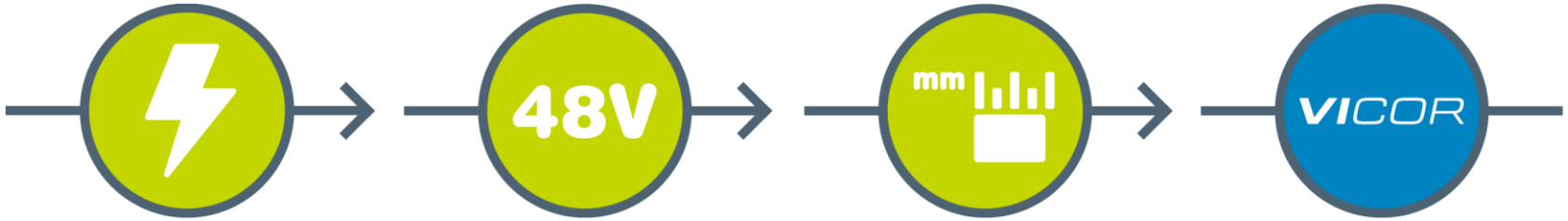
Vicor opportunity in autonomous vehicle / AI

- $500M SAM in 4-5 years for power



Mild hybrid: new features and meeting emissions





New features: 12V PDN and battery cannot meet needs

Density and lower weight to meet CO2 standards

EV: extending battery life

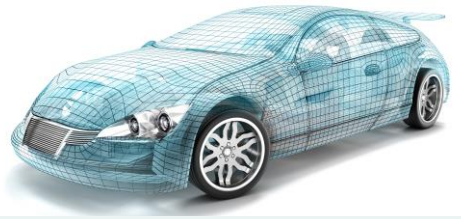
HVDC

800V

400V

48V

<1V for ADAS processors



12V for legacy electromechanical systems

48V

VICOR

800V and 400V battery systems need to efficiently convert to 48V

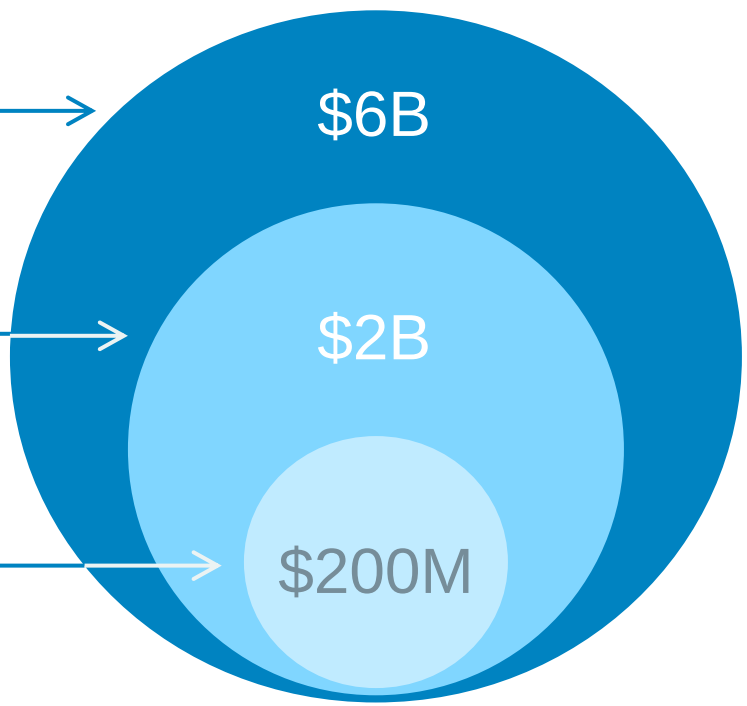
Density, higher efficiency and lower weight extend battery life and driving distance

Automotive revenue target in 2025: $250M

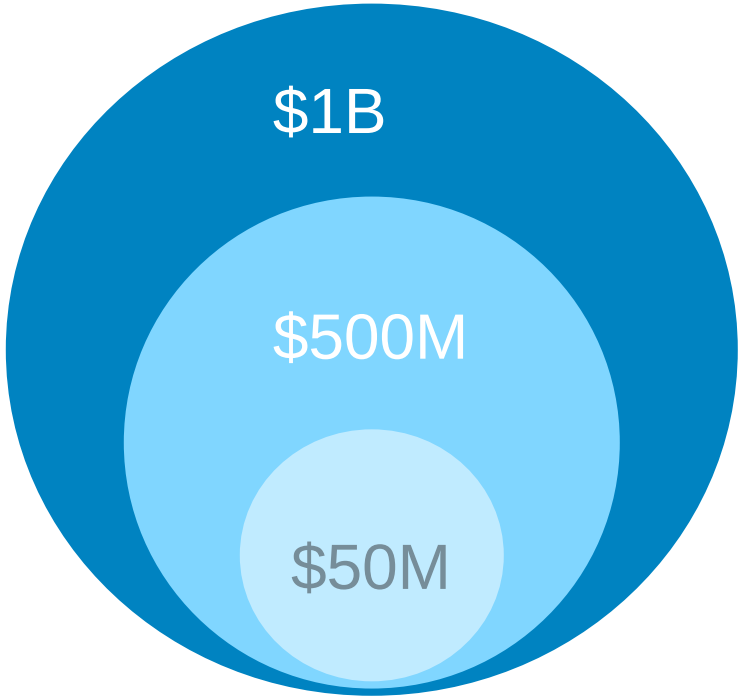
TAM
Entire automotive market opportunity

SAM
OEMs and tier-ones we can reach with Vicor solutions

SOM
Vicor target share to be captured

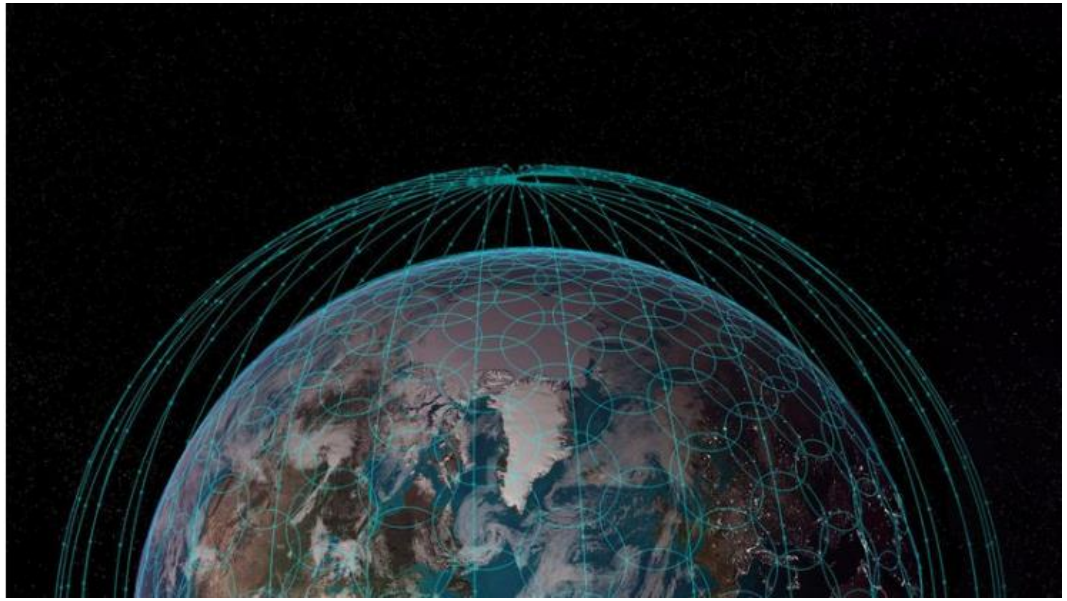


Powertrain



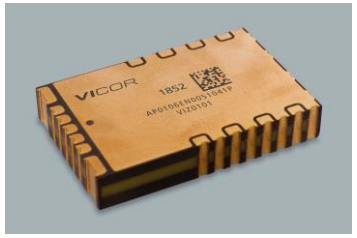
Autonomous / AI

50 Krad high density, low noise modules enable constellation of satellites



BCM3423

PRM2919



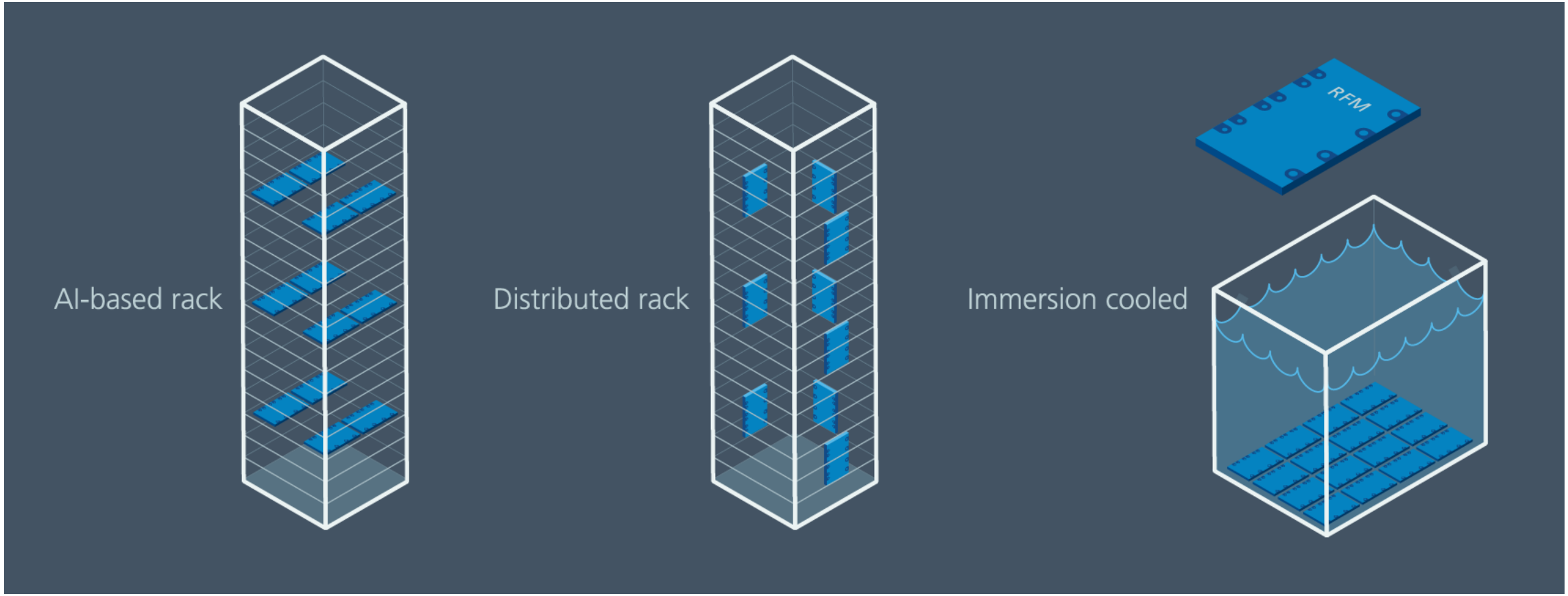
VTM2919

- $200M available market

Front end and central power solutions

A $3B market opportunity

PowerTablet enables high density conventional rack and more advanced AC power deployments



3 Phase AC to 48V

- Gen 2: 10kW RFM Power Tablet
  - iPad footprint

- Gen 4: 6KW RFM ChiP
  - iPhone footprint

From high mix/low volume to low mix/high volume

- Advanced product revenue expected to exceed that of legacy modules/systems in 2020
- Highly-leveraged go-to-market infrastructure
  - Scalable, cash-generative manufacturing model

Expanding production capacity		
	Estimated timing	Expected annualized revenue capacity
Capacity expansion	Online Q2 2019	~$500M
Facility addition	Online 2H 2020	~$750M
New facility	TBD 2022	~$1B+

Long term financial model

	2018	Long Term
Total Revenue	$291 M	DD CAGR
Advanced Products	36%	80%
Brick Products	64%	20%
Gross Margin	46%	>65%
R&D	15%	15%
SG&A	21%	15%
Operating Income	11%	>35%

Summary

- Superior, patented architectures, topologies and packaging
- Gen 4 ChiPs increase Vicor's density and performance lead
- Growing share of business with existing Data Center, HPC, and GPU customers on next generation platforms
- Dominant market share within AI GPU and advanced ASICs
- $400M Automotive opportunity pipeline developed in 9 months
- Significant operating leverage resting on a fundamental innovation