



High density power conversion
accelerating the migration to
48V power delivery networks

Our high performance power modules enable...

Breakthrough AI
processing
performance

Range-extending
48V architectures in
electric vehicles

Advanced mission-
critical functionality
and data transmission

Automation, autonomy
and electrification for
Industry 4.0



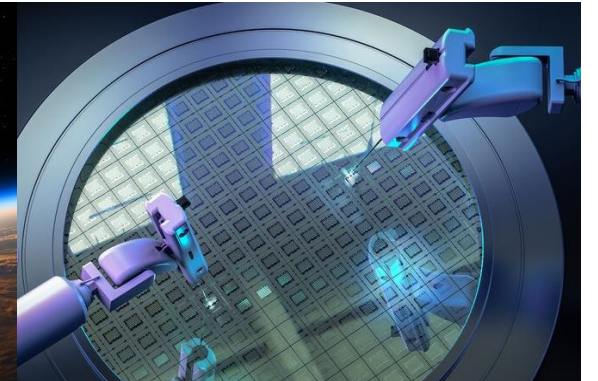
High performance
computing



Automotive



Aerospace and
defense



Industrial

The journey of 48V power delivery networks

Communications: The first to use 48V to decrease power losses over long distances



High performance computing: Adopted 48V to meet the power needs of multi-kilowatt racks

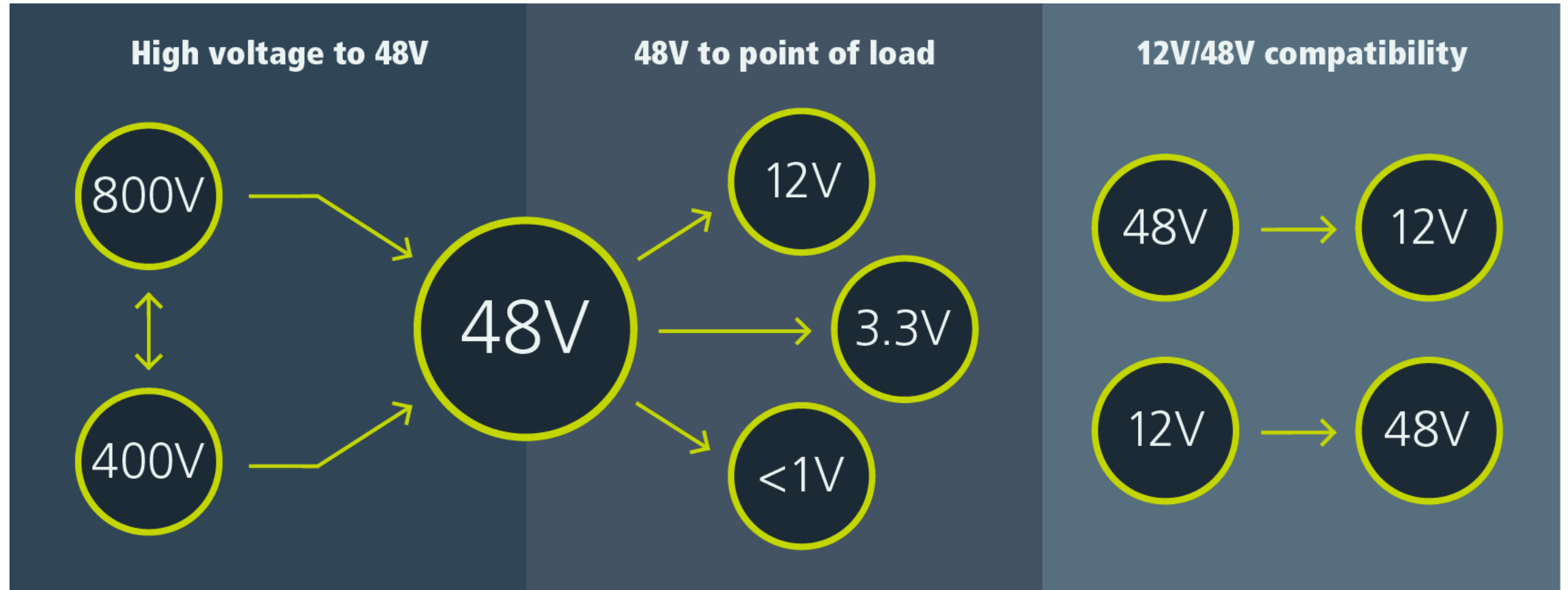


Automotive: Migrated to 48V to significantly reduce the weight of power cabling in EVs

Industrial applications are now transitioning to reap the benefits of 48V PDNs

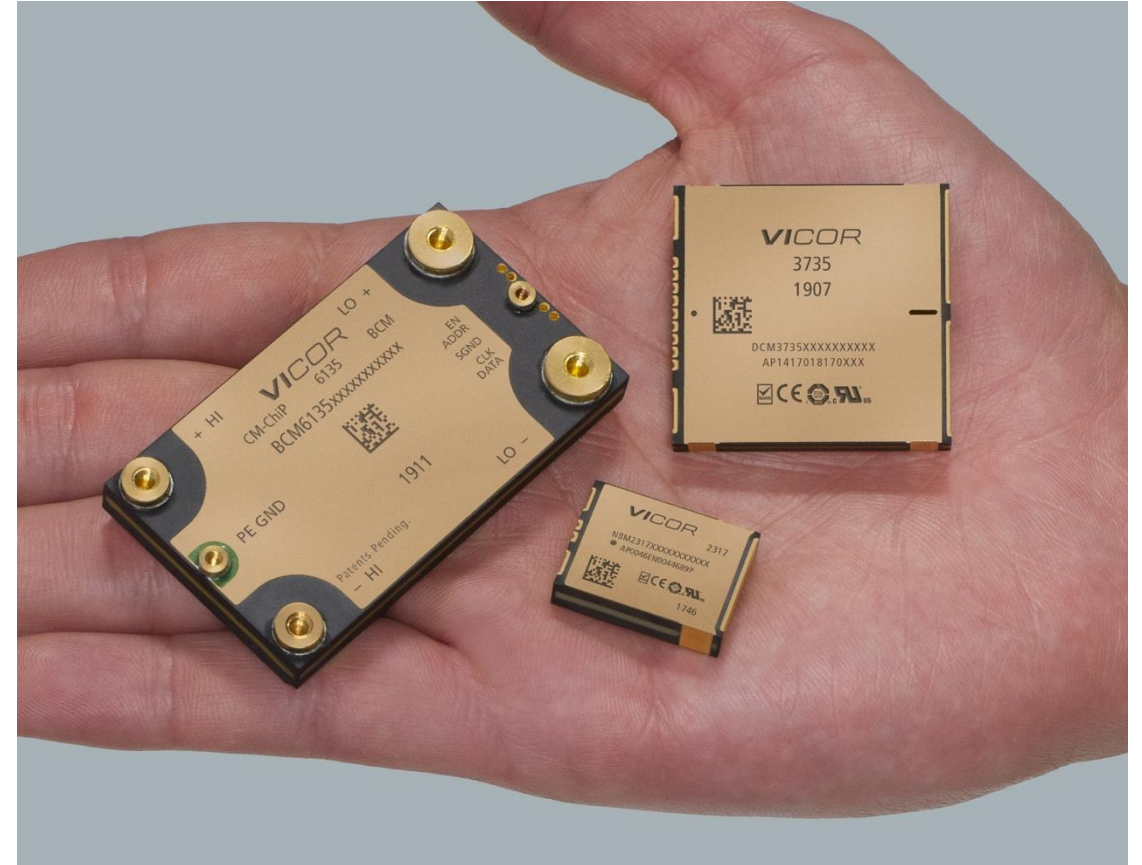


A complete portfolio of 48V products

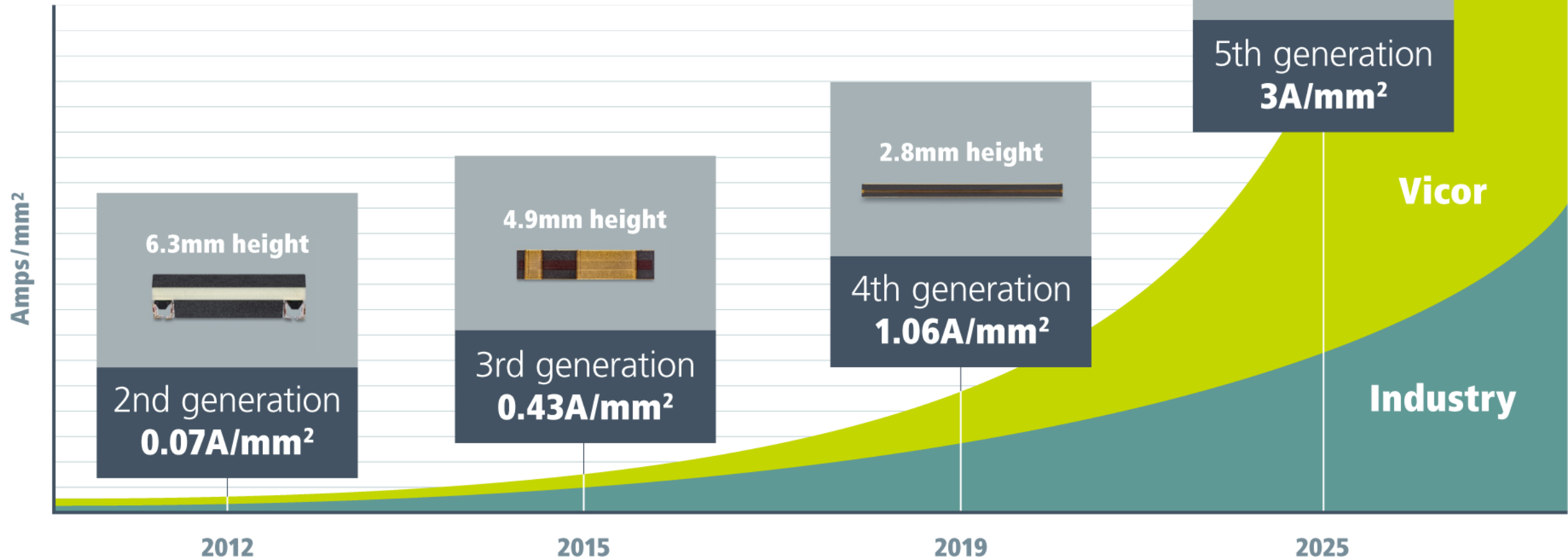


48V high performance power modules

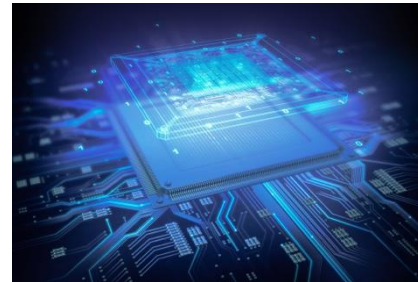
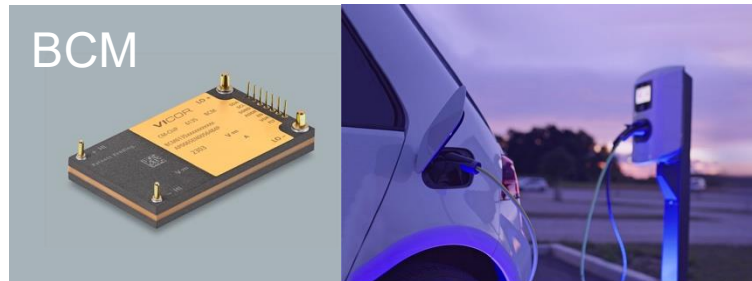
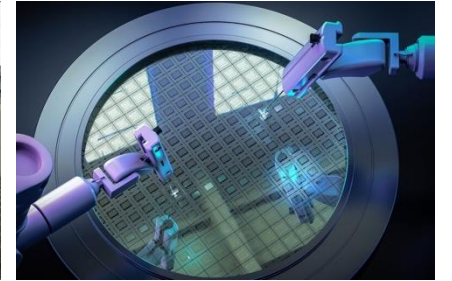
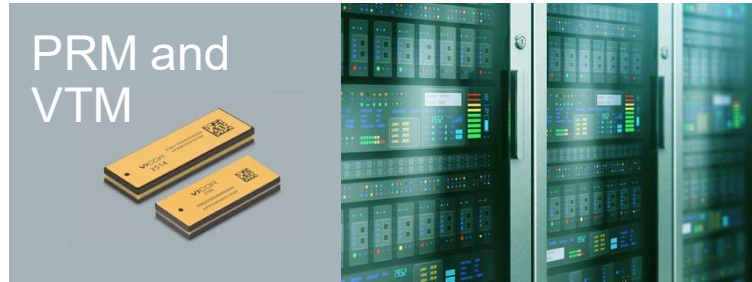
- Supporting the entire 48V power delivery network:
 - High voltage to 48V
 - 48V to point of load
 - 48V/12V compatibility
- Up to 30kW/in³ power density
- Solving the toughest problems
- Enabling quick design and prototyping of 48V PDNs



Continuous innovation provides the highest power and current density



48V innovation from computing and automotive now benefit other industries



High performance power modules

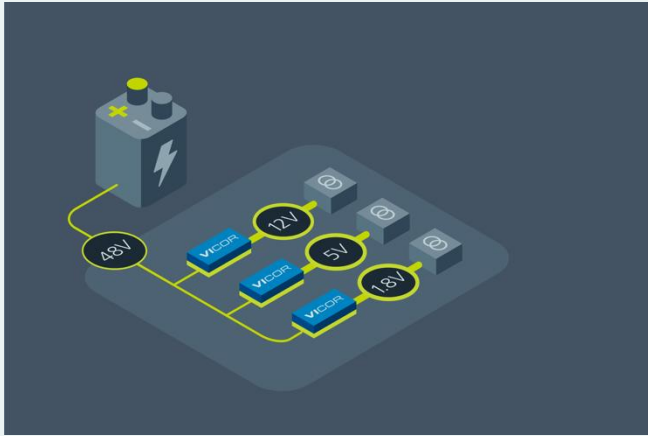
Vicor Power Module

- Compact, lightweight and up to 10x the power density of other solutions
- Simple, uniform and predictable thermal management
- Fully tested and ready to implement

Anatomy of a power module

- Extended variety of input and output voltages available
- Isolation, regulation, conversion and voltage transformation integrated in different combinations
- Hundreds of components are tightly arranged within a miniature footprint

Simpler strategy and implementation



Simple, modular approach

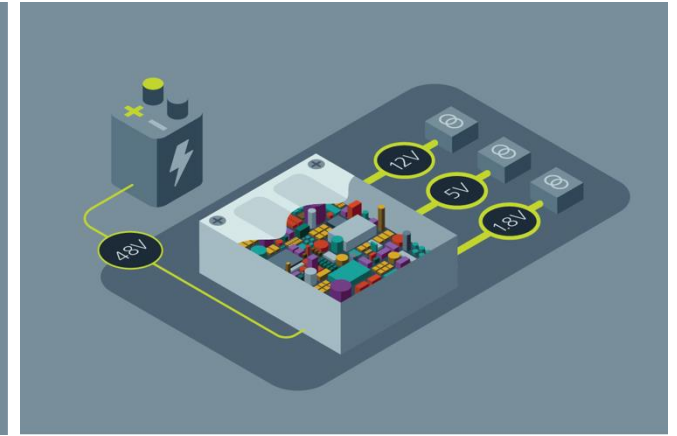
- Up to 10x power density
- Uses less board space
- Simplifies thermal management
- Flexible and scalable
- Simplifies system design

VS



Complex discrete solution

- Requires considerable expertise
- Needs hundreds of components
- Change is difficult and risky



Inflexible silver box

- Adding loads, changing power or voltage levels is not practical
- Susceptible to noise and external interference

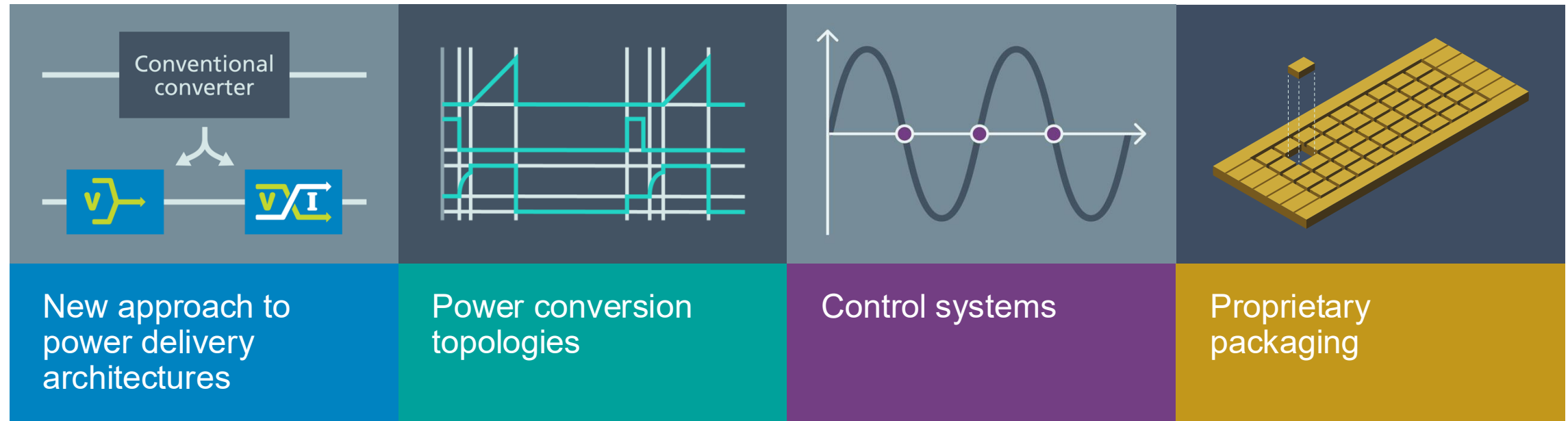
Innovation on many fronts

Factorized power reduces power loss on the intermediate bus

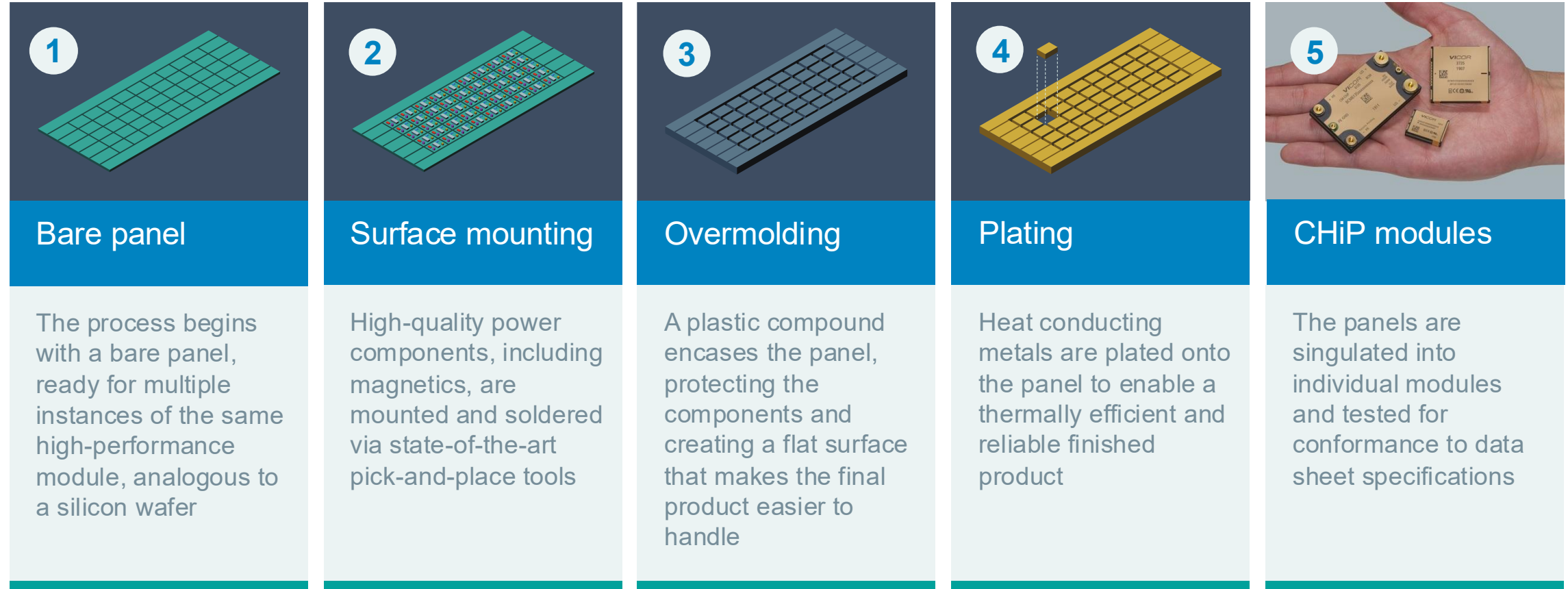
Sine amplitude conversion eliminates wasteful energy storage

Low-noise zero voltage switching performs at high frequency without sacrificing efficiency

Patented fabrication processes enable the highest density and continued innovation



Proprietary packaging process



Vertically integrated manufacturing in Andover, MA

- The higher performance of our power modules comes from a combination of design engineering and patented fabrication processes
- Manufacturing and engineering co-located to foster collaboration and continued innovation
- Increased control and oversight on product quality and cycle times
- Capacity to produce more than \$1B of power modules per year

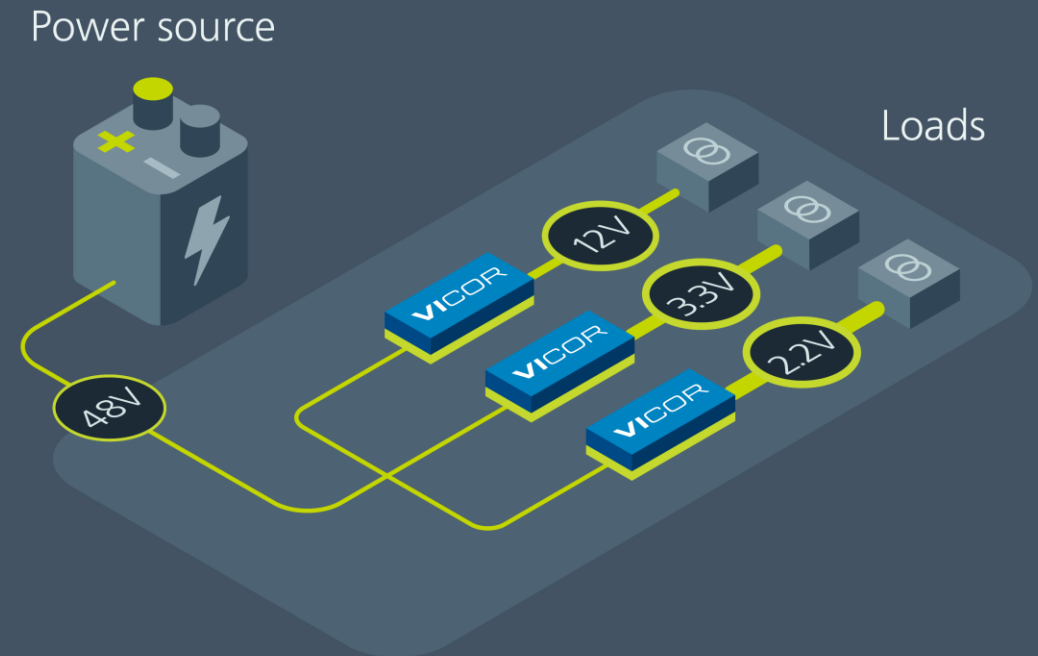


Solving the toughest power challenges

Modular power delivery networks

- Easier and simpler to design and implement
- Easily adaptable to changing power requirements
- Reduced time to design completion vs. designing and testing a discrete solution
- Reduced space and weight

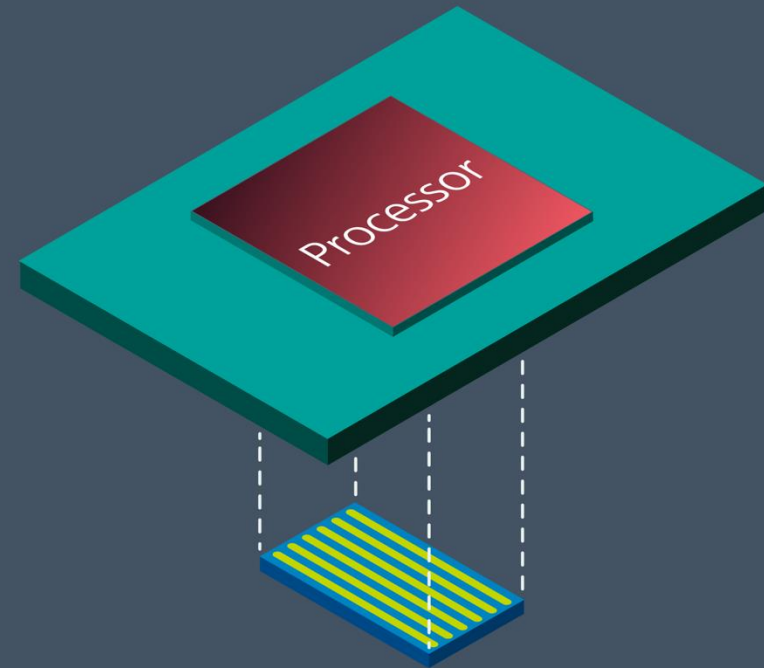
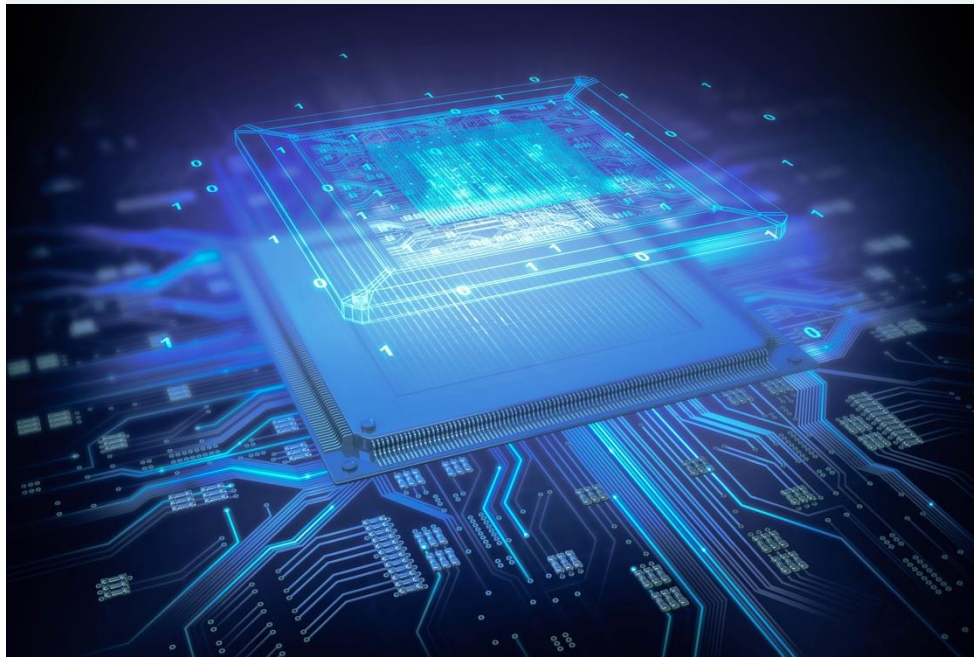
Anatomy of a power delivery network



How Vicor power modules are arranged to deliver power

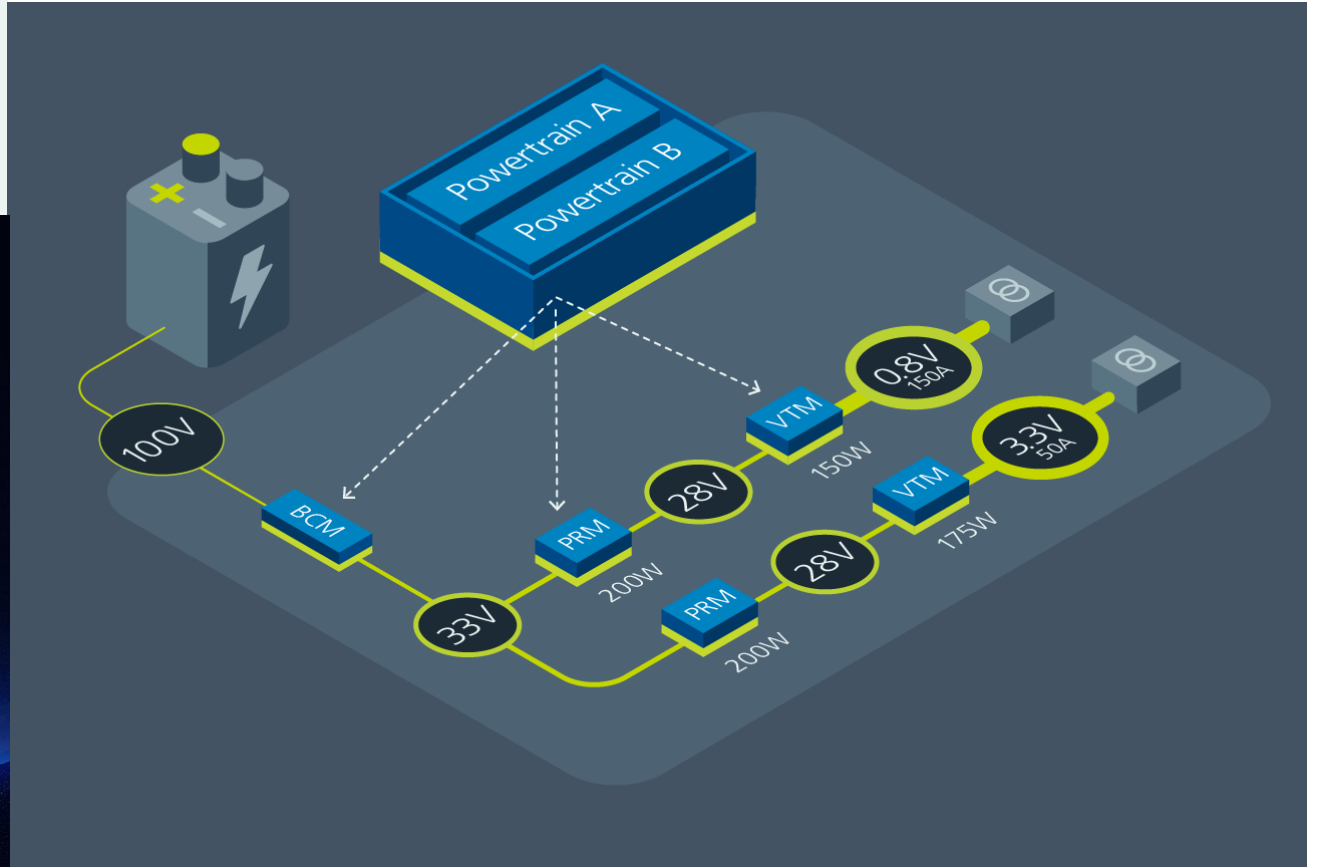
Computing case study – Vertical power delivery

High current delivery placed right below the processor helps data centers reach their optimal AI potential



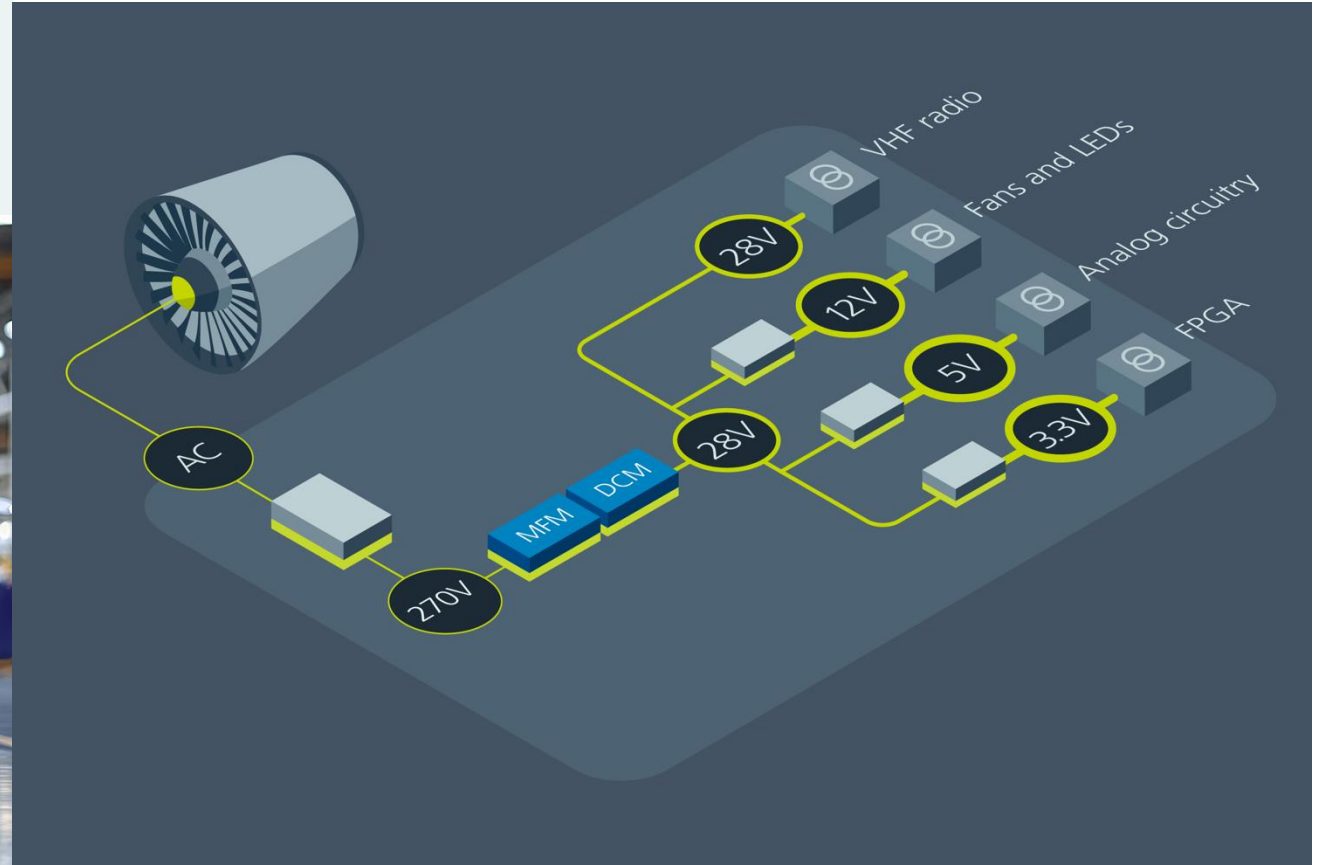
Satellite case study – AI processing on orbit

Compact, redundant power enables advanced processors to provide real time, on orbit decision-making



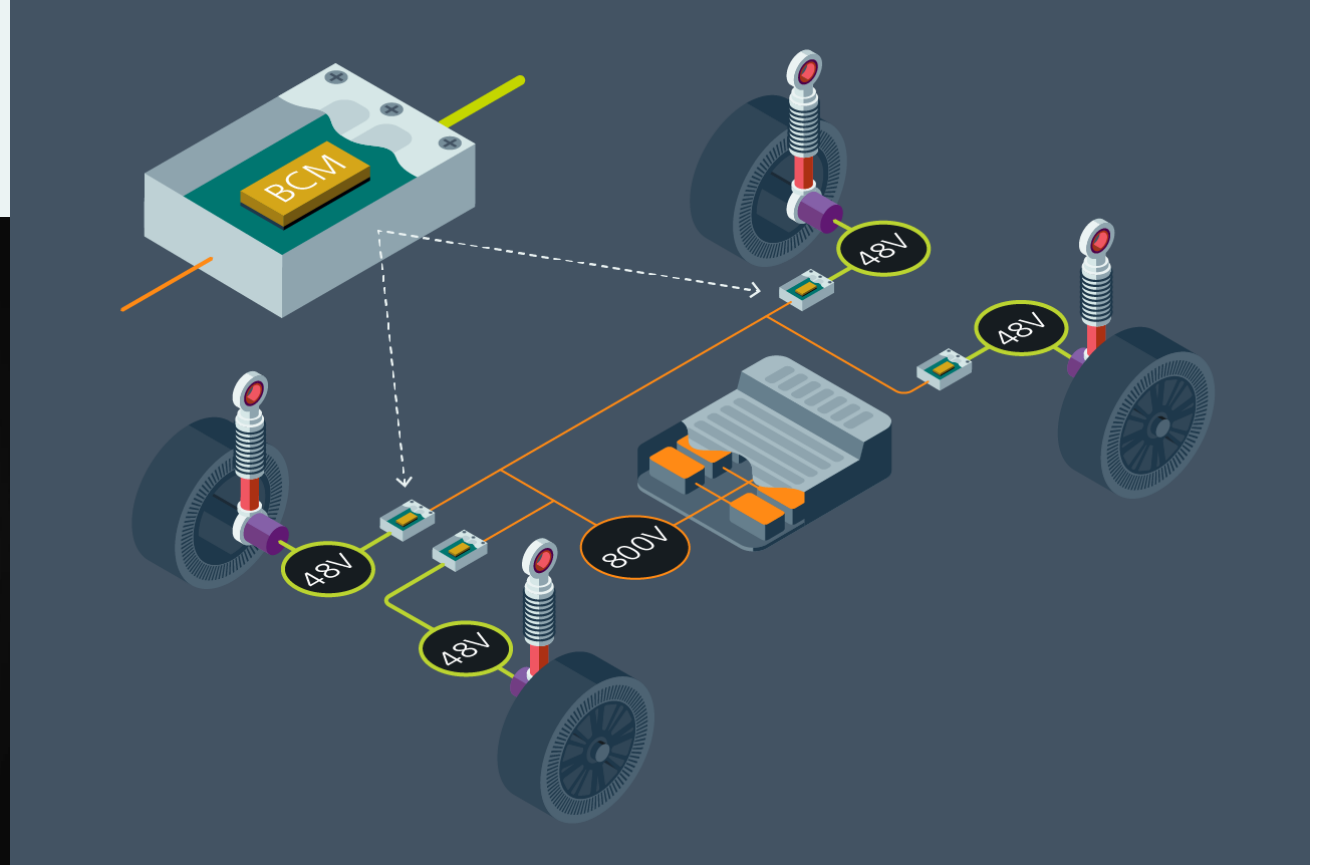
Defense case study – Airborne 28V bus

Unrivalled power density provides a groundbreaking, lightweight solution for powering airborne systems



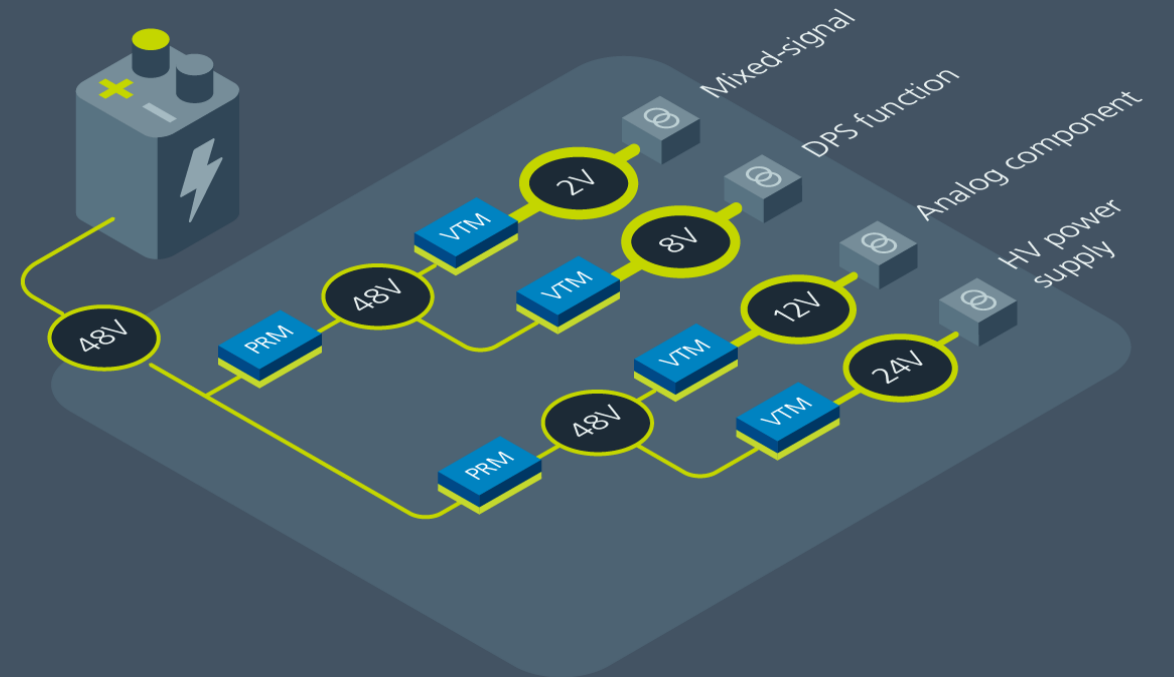
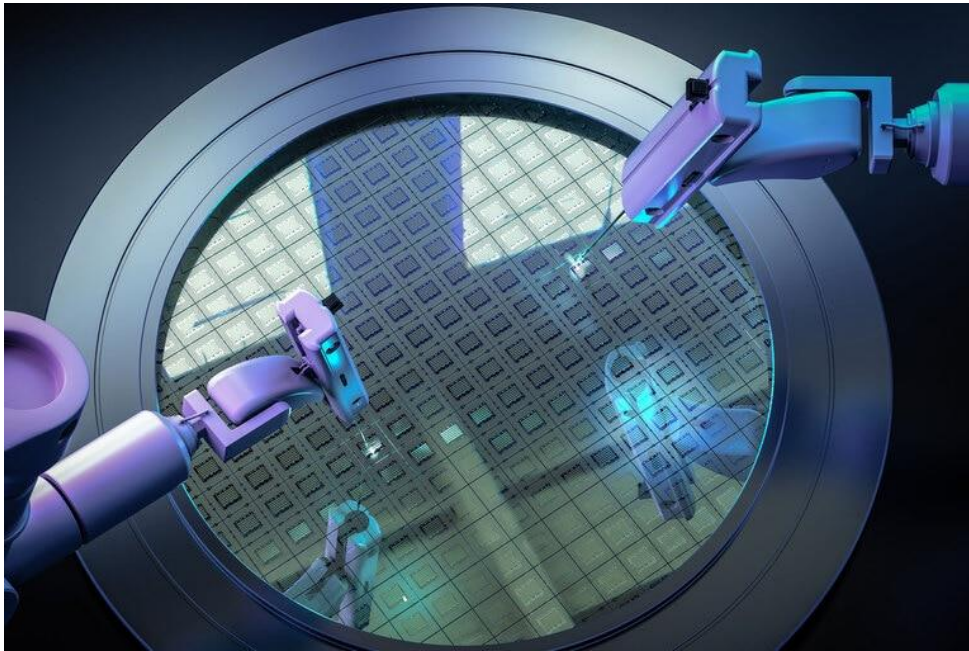
Automotive case study – EV active suspension

Transient response and density of the Vicor bidirectional modules make active suspension viable for broader use



Industrial case study – Test equipment

Low EMI noise and scalable power enables increased testing throughput and accuracy



High performance power modules optimized for 48V power delivery networks

High performance power modules



BCM[®] bus converter

Isolated fixed-ratio

Input: 800 – 48V

Output: 2.4 – 55.0V

Current: Up to 150A

Peak efficiency: 98%

As small as 22.0 x 16.5 x 6.7mm



NBM[™] bus converter

Non-isolated fixed-ratio

Input: 36 – 60V

Output: 7.2 – 15.3V

Current: Up to 170A

Peak efficiency: 98.2%

As small as 22.8 x 17.3 x 5.2mm



DCM[™] DC-DC converter

Isolated regulated

Input: 9 – 420V

Output: 3.3, 5, 12, 13.8, 15, 24, 28, 36, 48V

Power: Up to 2500W

Peak efficiency: 96%

As small as 24.8 x 22.8 x 7.21mm



DCM[™] DC-DC converter

Non-isolated regulated

Input: 40 – 60V

Output: 10 – 12.5V

Power: Up to 2kW

Peak efficiency: 96.5%

As small as 36.7 x 17.3 x 5.2mm

High performance power modules



PRM™ regulator

Non-isolated regulated

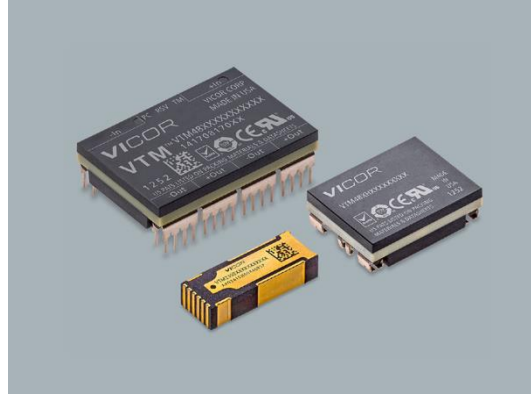
Input: 36 – 75V

Output: 5 – 55V

Power: Up to 800W

Peak efficiency: 97%

As small as 22.8 x 13.8 x 7.41mm



VTM™ current multiplier

Isolated fixed ratio

Input: 0 – 60V

Output: 0 – 55V

Current: Up to 130A

Peak efficiency: 96%

As small as 22.8 x 8.5 x 4.9mm



ZVS buck converter

Non-isolated regulated

Input: 12, 24 or 48V

Output: 2.2 – 16V

Current: Up to 22A

Peak efficiency: 98%

As small as 10 x 10 x 2.56mm



ZVS buck-boost converter

Non-isolated regulated

Input: 8 – 60V

Output: 10 – 54V

Power: Up to 150W continuously

Peak efficiency: 97%

As small as 10 x 14 x 2.56mm



Thank you