Future-proofing the HV-SELV system with integration to save weight and cost

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The type of power source is not converging, but it is electrifying

ICE base becoming > 50% hybridized

EREV grows to heavy power users

BEV remains a growing market segment

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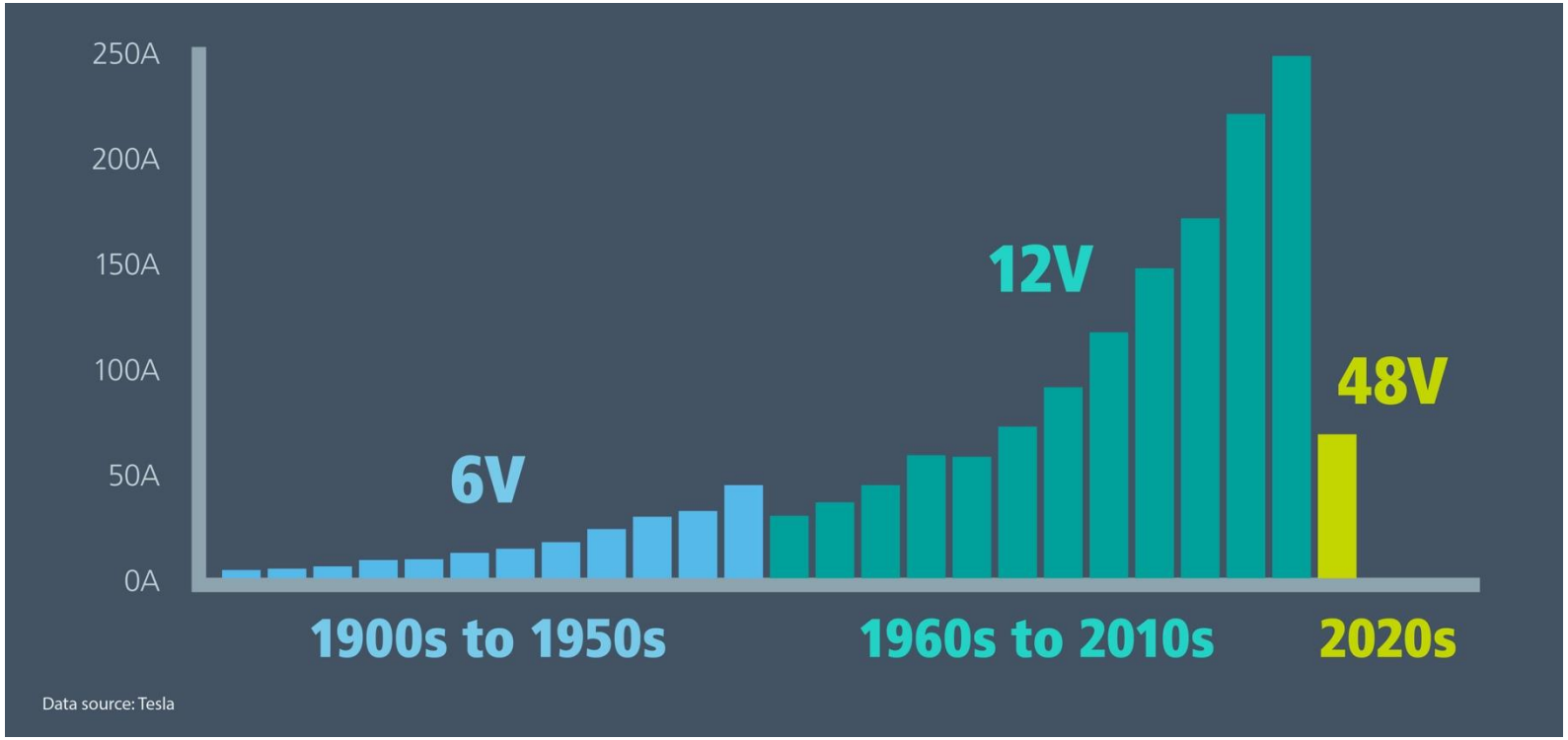
Low Voltage Current draw is achieving all time highs



ADAS

EPAS

Active Suspension

IR Heating

Infotainment

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Low weight and efficient use of vehicle space continue to be major challenges

- Vehicle content increases due to regulation and market drivers
- Space remains at a premium in all vehicle segments
  - Continual efforts to combine features
  - Downsizing power electronics key path in electrified vehicles
- Reducing weight to improve performance is a key team goal
  - Combine features to save housing weight
  - Leverage 48V power networks for savings in cost and weight of the power network

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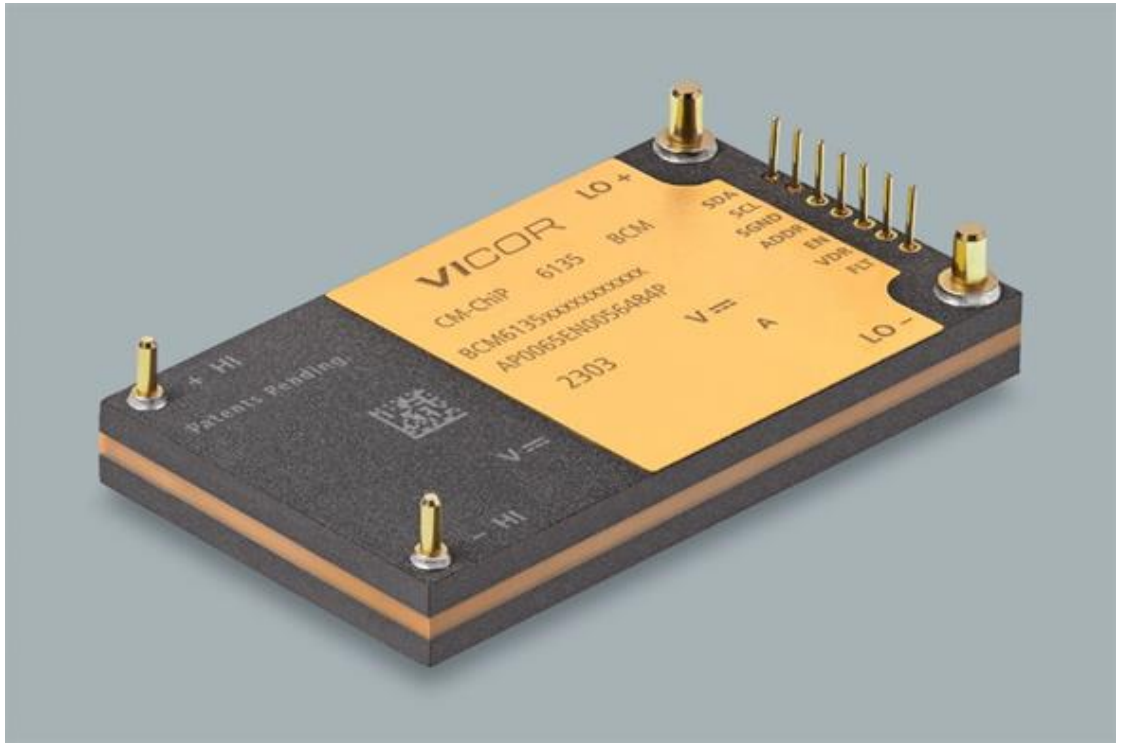
Example of ChiP™ power module – BCM

- Up to 3.1 kW peak power, or 80A peak current
- Losses and package performance
  - Peak efficiency 98.3%
  - Full power 97.8%
- Thermal resistance 0.7K/W
- Symmetrical power flow capability
- How is it possible?
  - In house development for controller, transformer, switches and packaging
  - All parameters optimized under the same function



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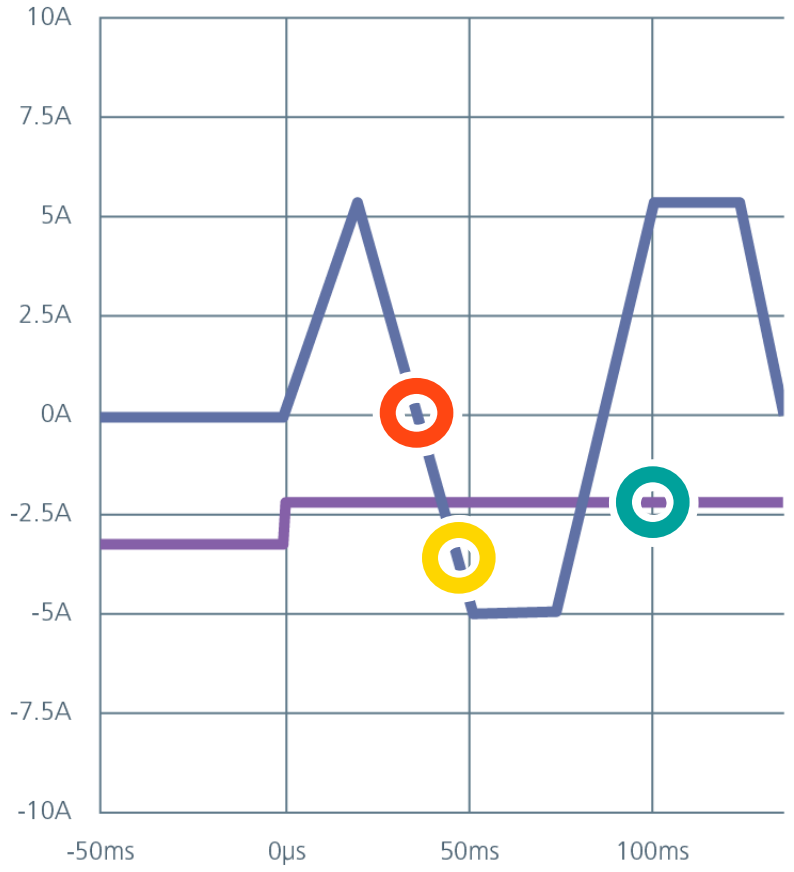
BCM® ChiP™ bidirectional current flow and bandwidth exceed all other technologies

- No dead zone in transition
- VDR is constant over change in current direction
- Linear transition between forward and reverse



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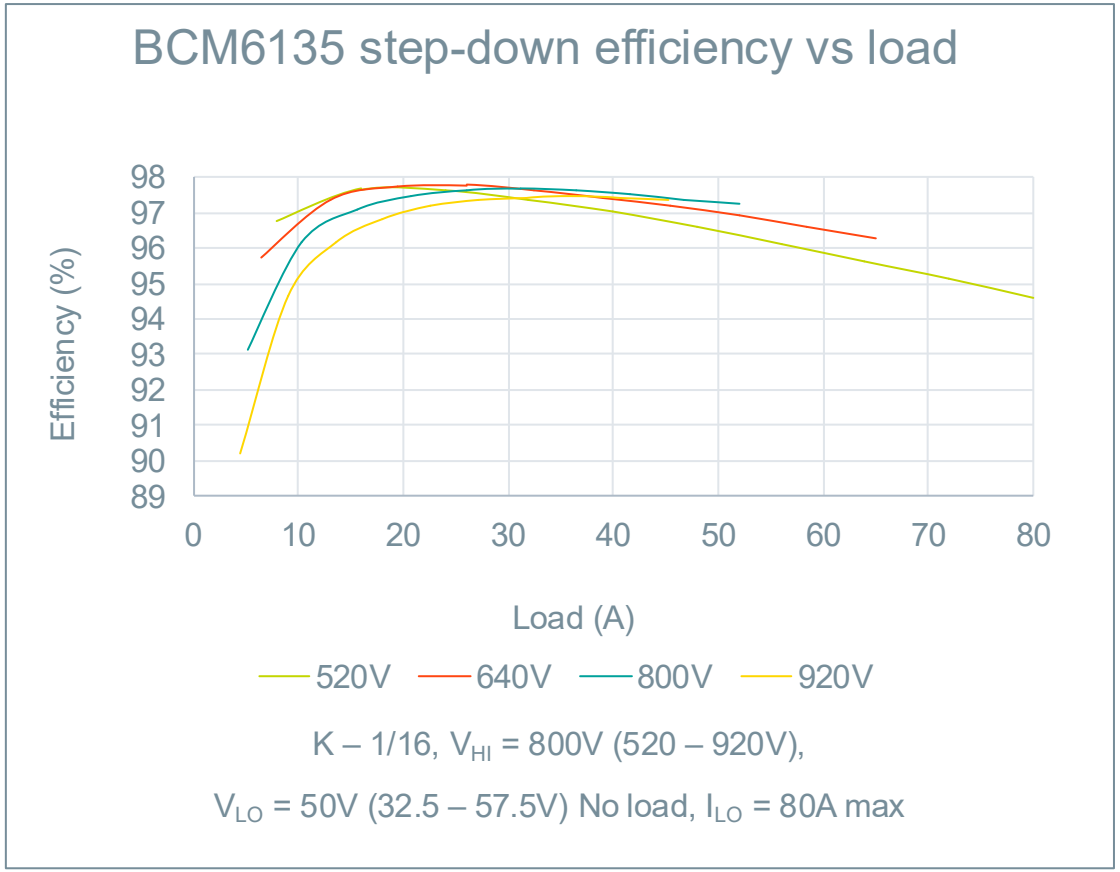
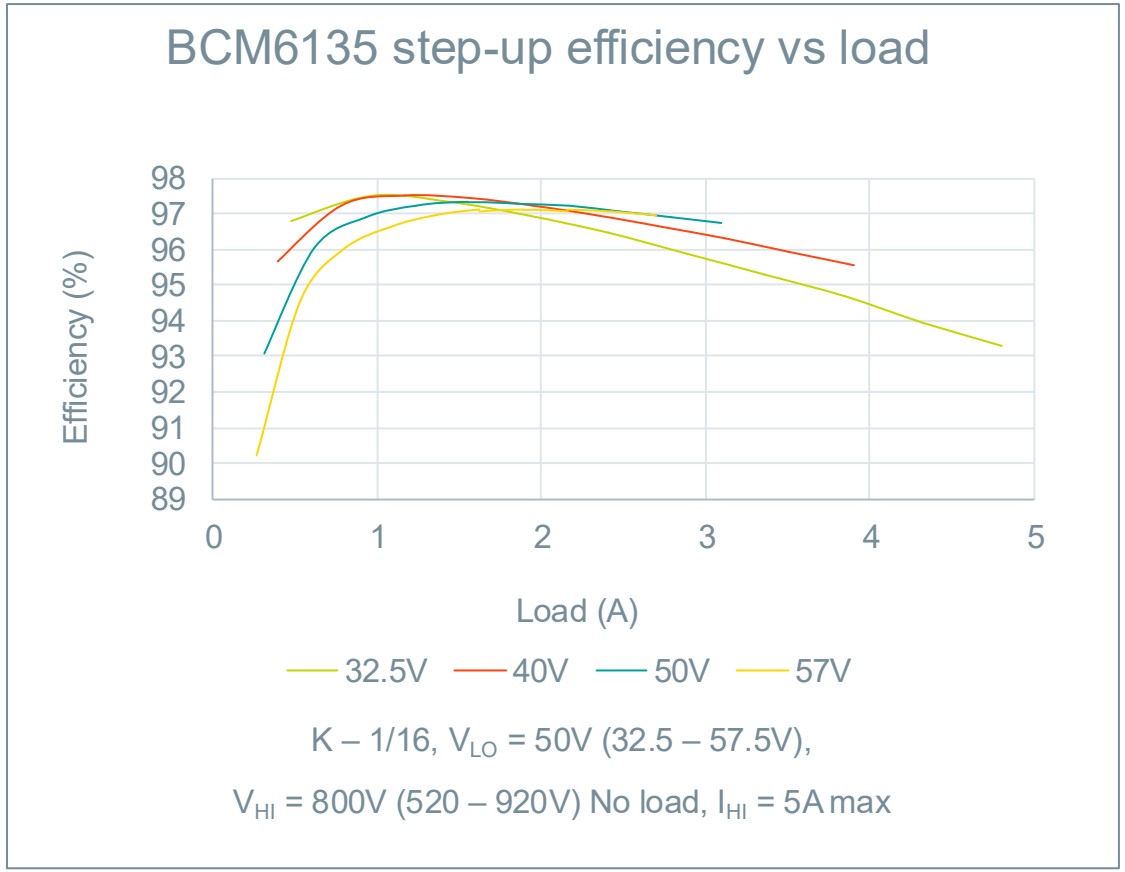
Symmetrical power processing





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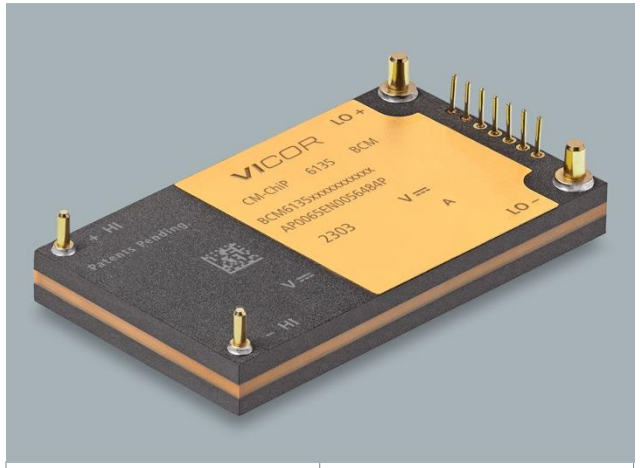
BCM6135 for 800V to 48V with isolation



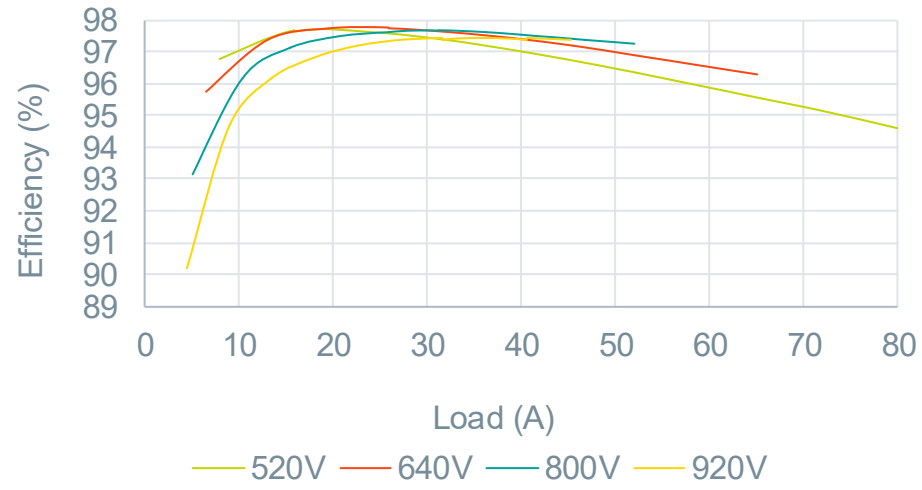
Peak Power	2.5 kW
V_{IN} Range	520 – 920V
V_{OUT} Range	32.5 – 57.5V
Peak Current	80 A
Bidirectional	Yes
Start-Up Bias	Internal

Creates 4242V input to output isolation internally

Provides 20kW of power when built in an array of 10 modules

Symmetrical performance in buck or boost

Highest current change (slew) rate of 8 M A/s



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48V to 12V SAC modules

Regulated DCM3735	
Peak Power	2.0 kW
V_{IN} Range	35 – 58V 17 – 58V
V_{OUT} Range	8 – 16V
Peak Current	160 A
Bi-Directional	No
Start-Up Bias	Internal

Ratiometric NBM2317	
Peak Power	1kW
V_{IN} Range	40 – 60V
V_{OUT} Range	10 – 15V
Peak Current	80 A
Bi-Directional	Yes
Start-Up Bias	Internal

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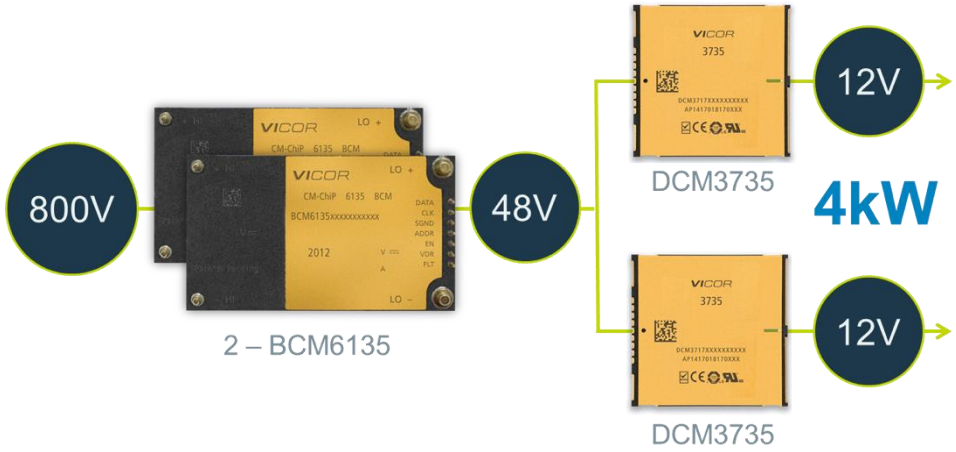
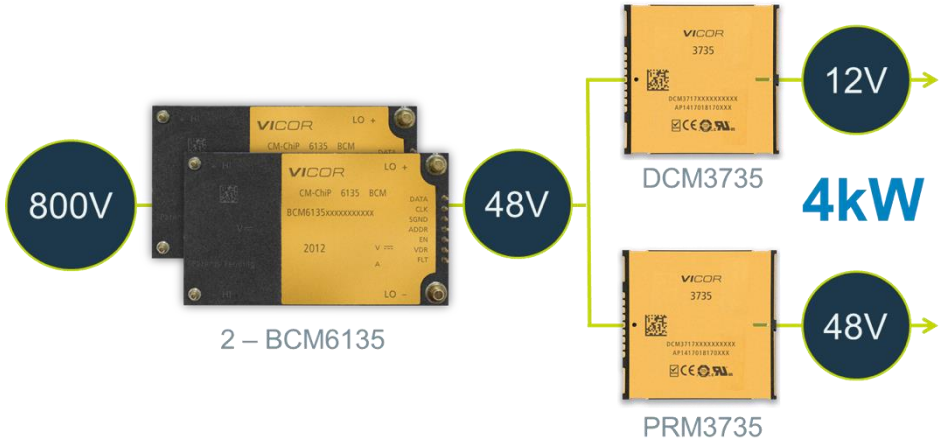
Power system designers need powerful, scalable flexible options





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3 modules support many applications

- Power delivery system
- Central DC-DC
- Zonal architecture
- Glass de-ice and de-fog
- Active suspension
- IR passenger heating

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Powering Innovation: Battery-Integrated DC-DC Conversion

INFAC enables 48V zonal architectures with innovative 800V battery power systems with Vicor

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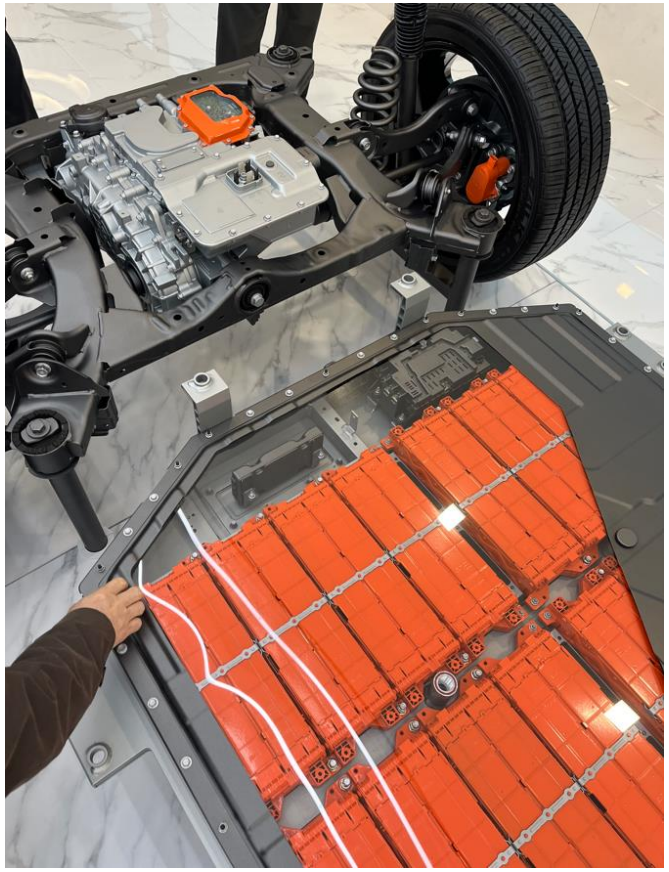
Challenges of traditional architectures

- Standalone DC-DC Limitations: High-voltage converters are typically mounted outside the battery assembly system (BAS)
- Inefficiencies:
  - Requires additional safety and thermal management systems
  - Creates unnecessary duplicative power distribution systems
  - Consumes valuable space and increases vehicle weight
  - High-voltage wiring is inefficient for 3.5kW or higher electronic systems.



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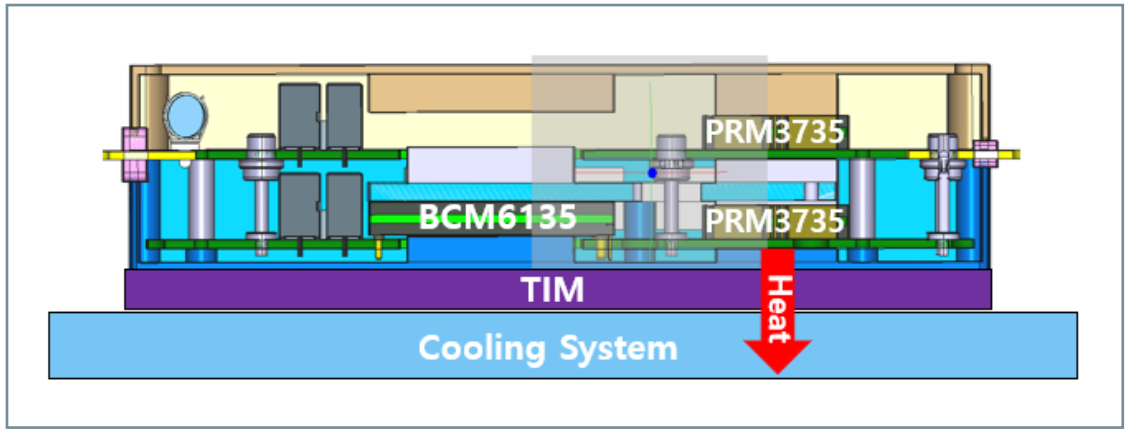
INFAC strategic insight

- The Concept: Moving DC-DC conversion inside the battery pack to allow power to be stepped down at the source
- Thermal Synergy: The battery pack already incorporates a robust liquid cooling system



- Design Innovation: Leveraging existing infrastructure eliminates the need for separate cooling paths with only minor frame changes
- Strategic Shift: Positioned as a central, intelligent power hub rather than a passive energy source

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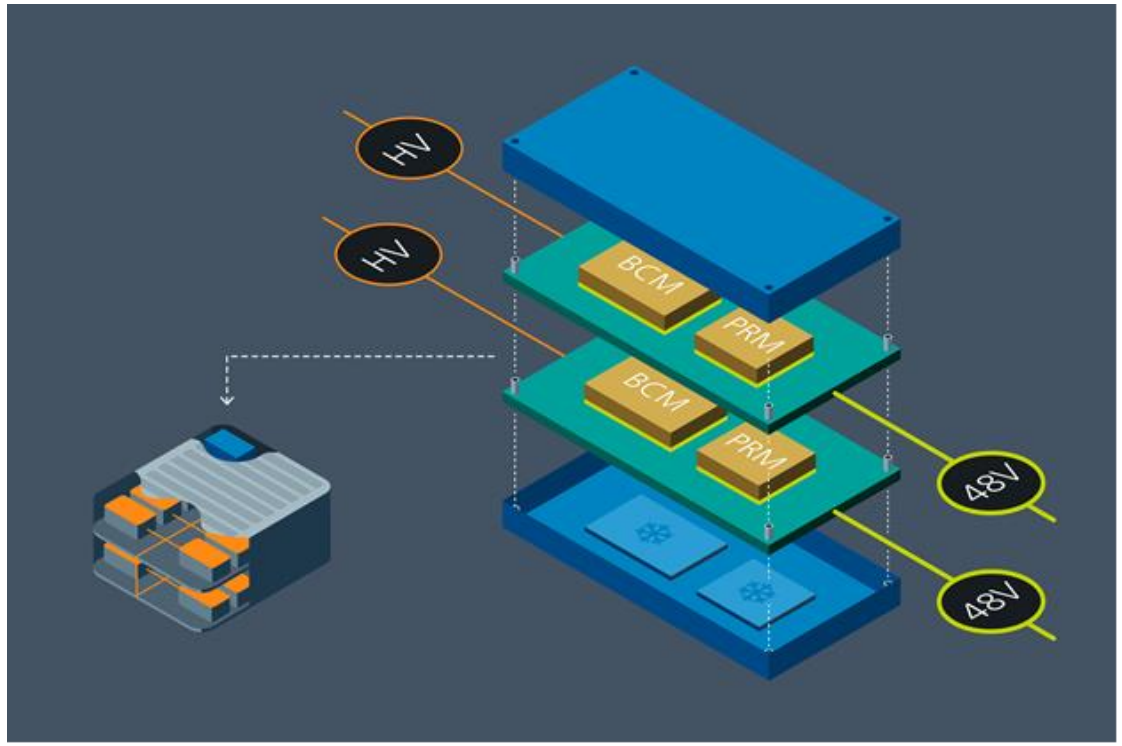
Technical implementation – Powered by Vicor

- Strategic partnership:
  Utilizing Vicor high-density modular power architecture for efficiency and scalability
- Integrated components:
  - BCM6135 and PRM3735: Enables HV-to-48V conversion and regulation directly within the zonal architecture
  - 48V Regulated Bus: Provides a high-power, fully isolated bus for the vehicle
  - Downstream Delivery: High-efficiency K 1:4 bus converter modules power 12V loads throughout the vehicle



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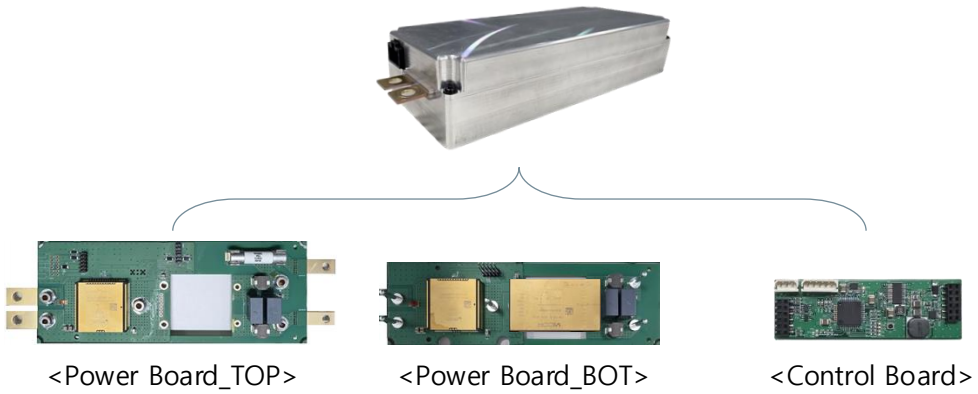
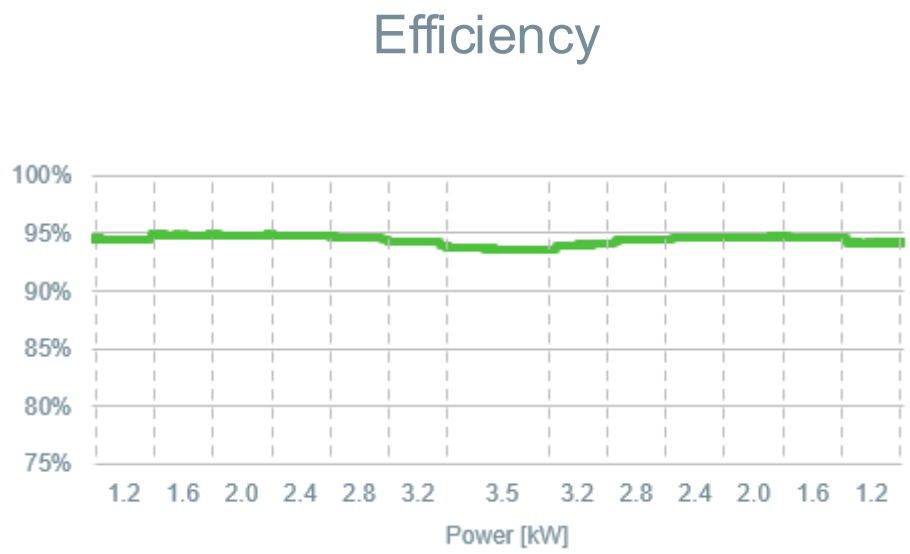
INFAC System configuration and performance



Input	570Vdc ~ 920Vdc
Output	48Vdc / 73A (max), 3.5kW
Peak efficiency	94.8% @ Vin = 697V, 3.5kW
Protection	OVP, OCP, OTP
Size / Weight	0.76L / 1.1kg
Dimensions	20.6 x 8.2 x 4.5cm



Peak efficiency is 94.8% @ Vin=697V, 3.5kW

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System-level benefits

Thermal management

Planar packaging leverages the battery's liquid cooling, reducing thermal interfaces

Reduced Complexity

Significantly reduces then length of HV cable and simplifies harness routing

Cost and weight efficiency

Fewer brackets, enclosures, and components for cooling reduce BOM cost

Reliability

Minimizing connections reduces leak points and electrical failure risks

Optimized assembly

Fewer external interfaces lead to faster, more consistent manufacturing processes

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