高功率氮化镓芯片
为AI数据中心HVDC砖块电源
提供领先的效率和功率密度

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2026年5月22号

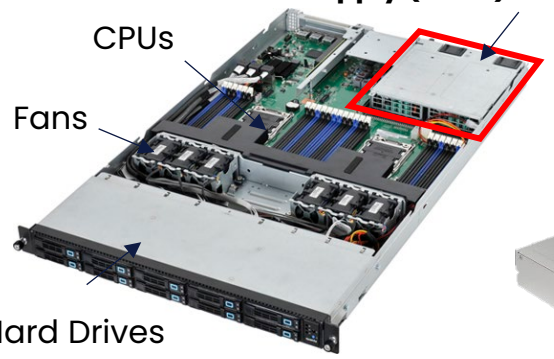
Navitas

May 2026

3 Power Architectures in Data Centers

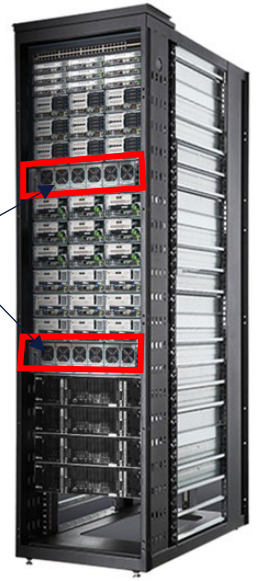
Modular Power (M-CRPS)

2 x Common Redundant Power Supply (CRPS) AC-DC

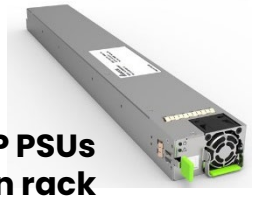


Source: Navitas

Centralized Power (OCP)

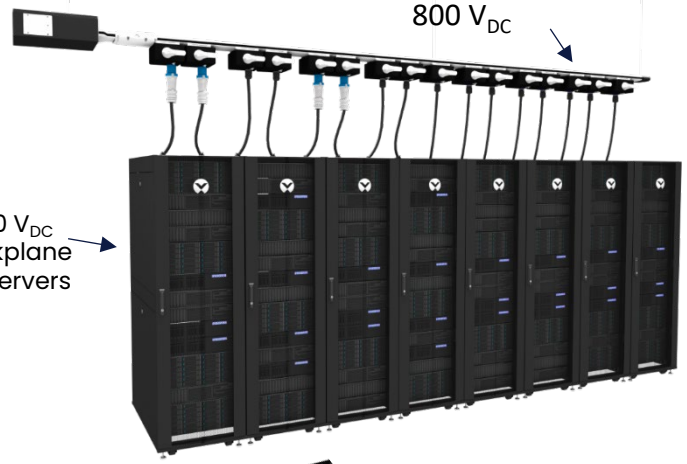


OCP Power Shelf

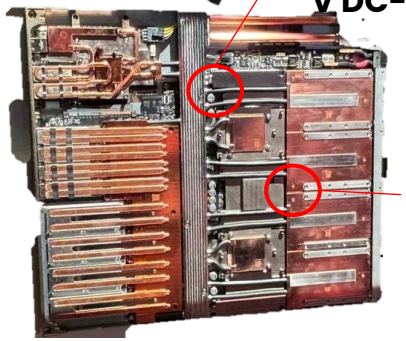


12 x OCP PSUs in rack

+/- 400 V_{DC} | 800 V_{DC}



800V – 48/12 V DC-DC



48V – 12/1V DC-DC

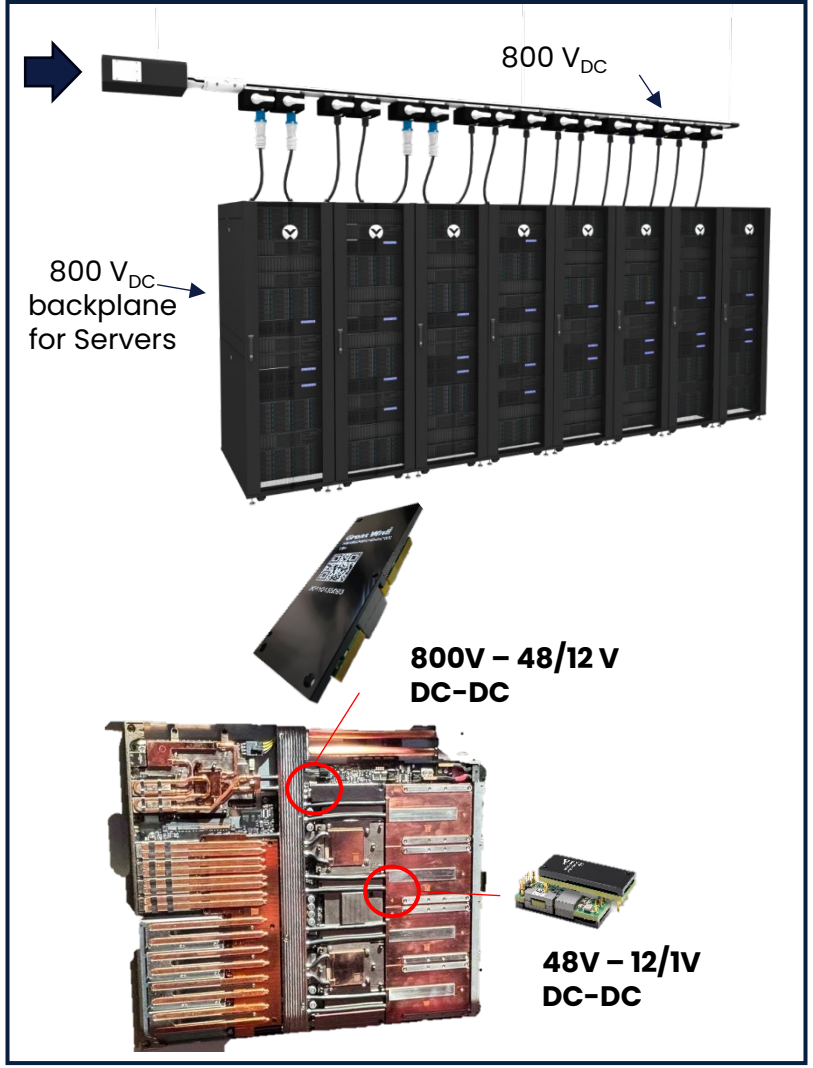
3 Power Architectures in Data Centers

Modular Power (M-CRPS)

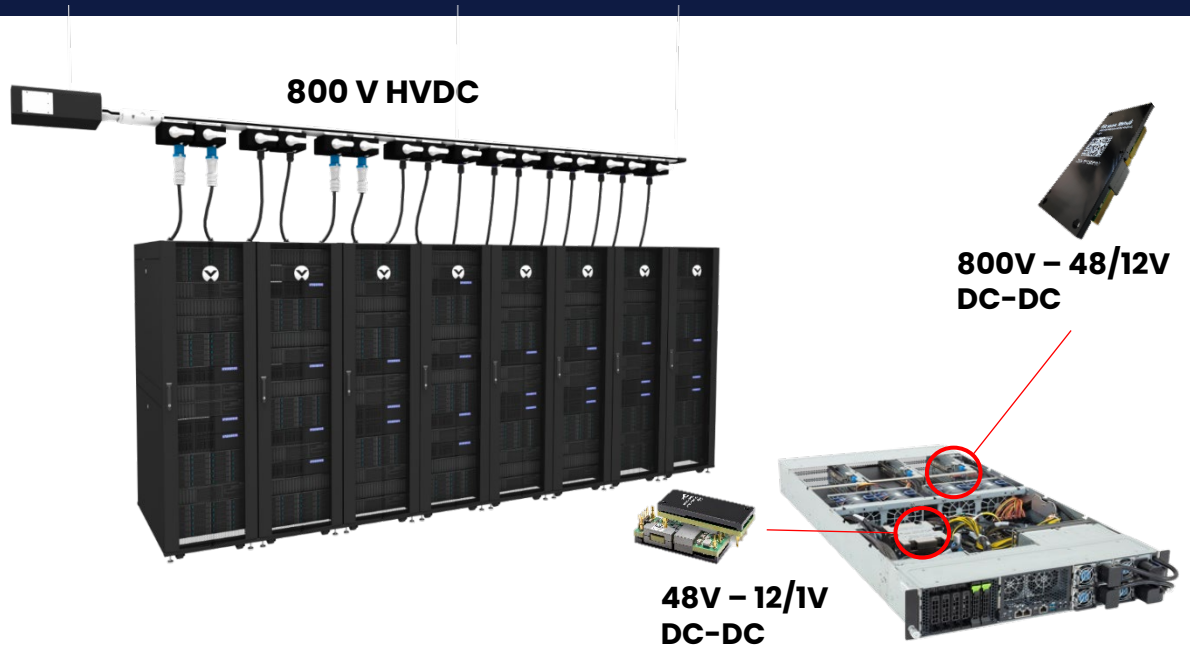
Source: Navitas

Centralized Power (OCP)

+/- 400 V_{DC} | 800 V_{DC}

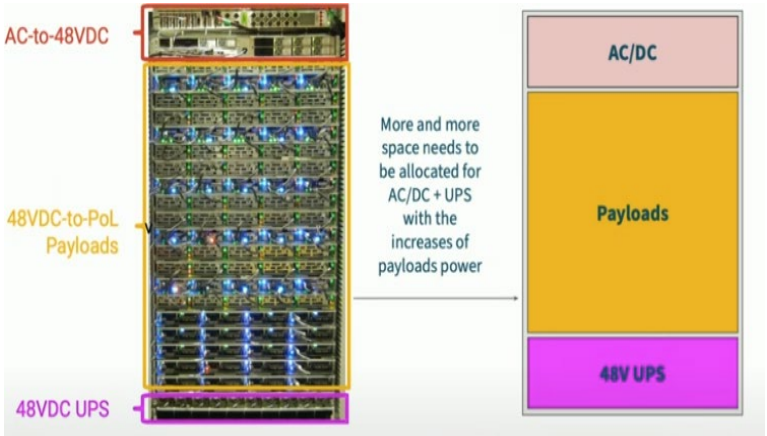


+/- 400V & 800 V DC Architecture



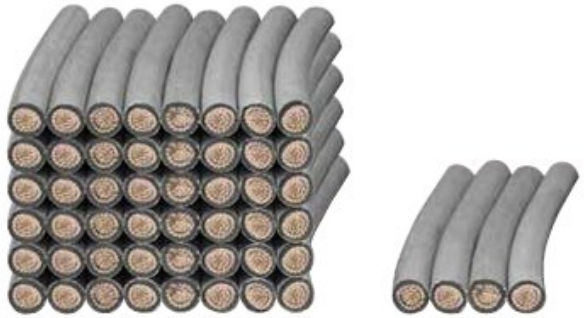
- ✓ 800 V HVDC removes power conversion from the rack
  - Separate 'Sidecar' power rack or upstream
- ✓ Improve efficiency & simplicity
- ✓ Higher computing density
- × Changing existing power distribution is challenging
- × New equipment & racks
- × Safety concerns – DC grounding, arcing/flashing

Higher Computing Density



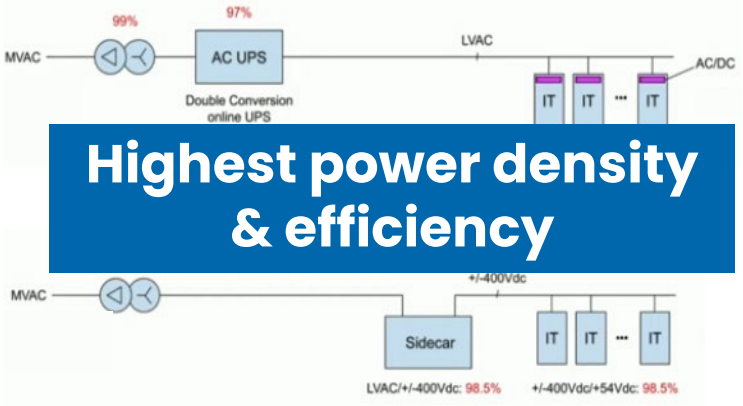
Lower Cable Costs & I2R Losses

Cable to transport 200 kW of current 245 feet



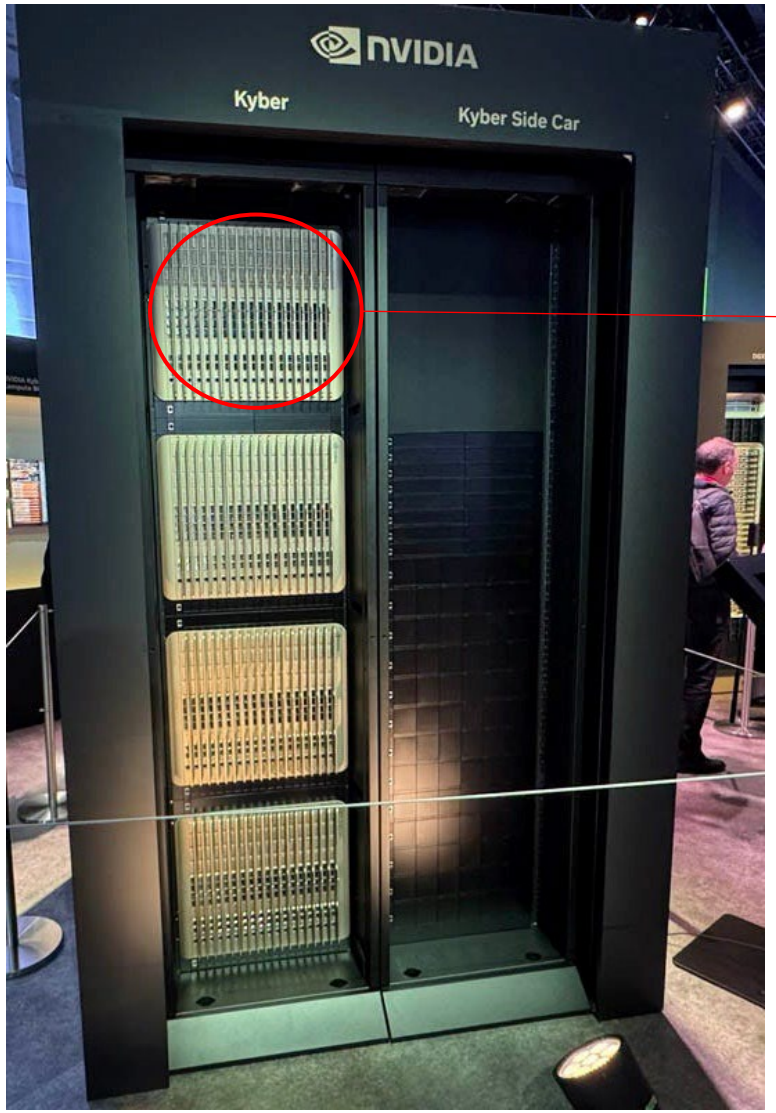
$48V_{DC}$ $400V_{DC}$

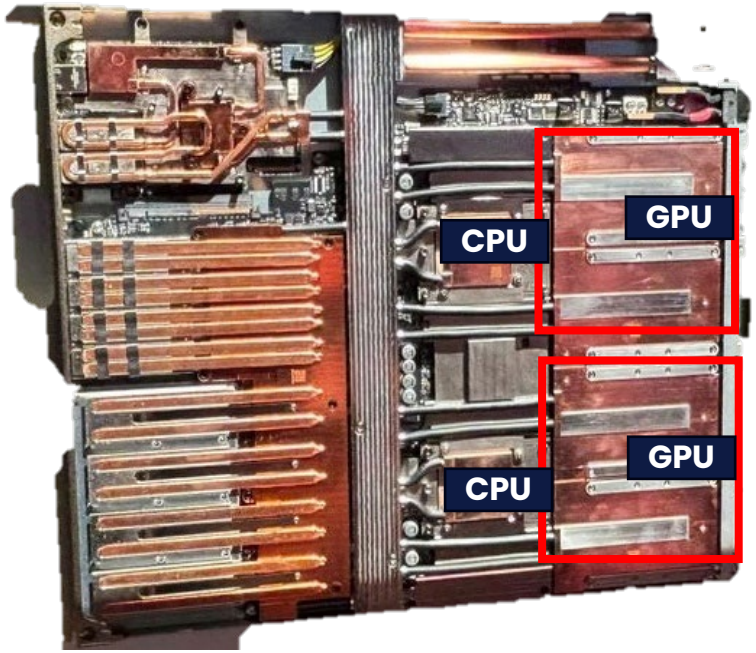
Increase System Efficiency & Simplicity



800V HVDC Solution Efficiency = 96%

>600kW 'Kyber' Rack Powering Rubinn Ultra GPUs





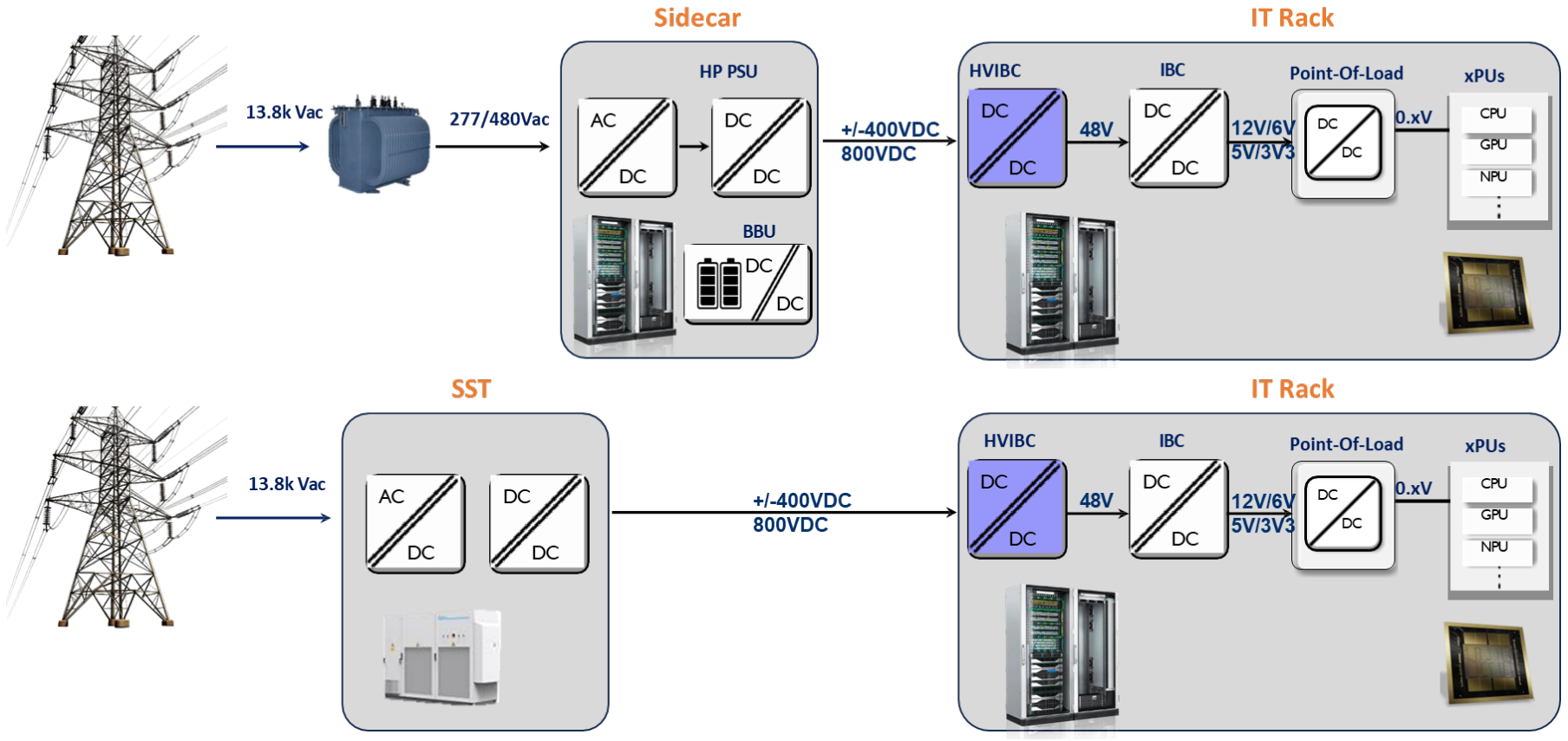
Kyber Rubin NVL576

- 27 trays/can
  - 18 trays with 2 x GPU & 2 CPU
  - 9 networking trays on the back
  - 144 GPUs / rack

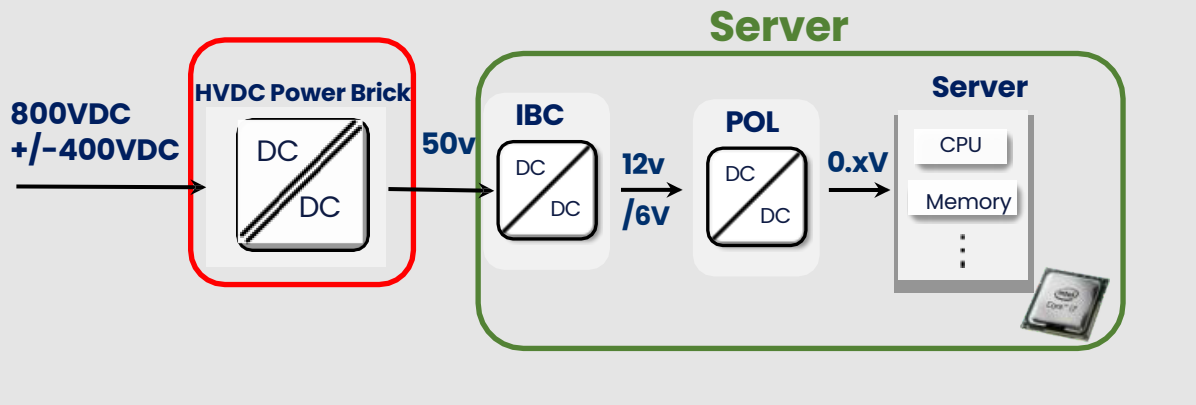
- **>600 kW…1MW 'Kyber Side Car' for power & cooling**

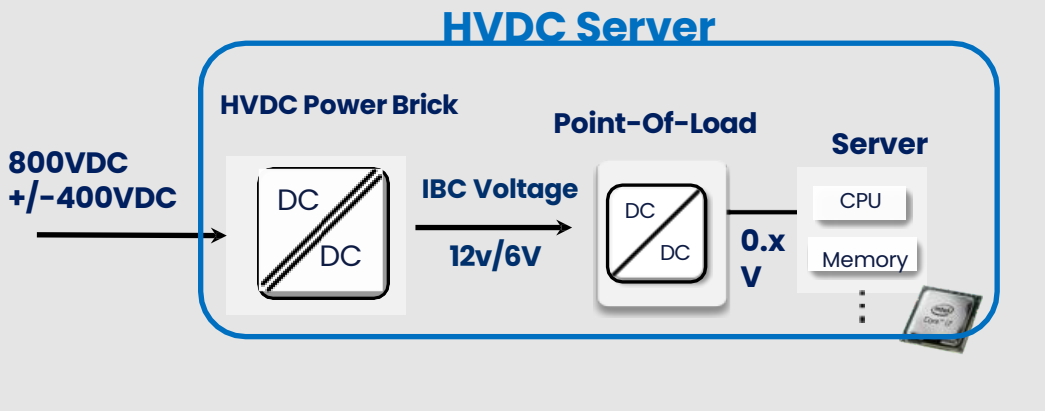
Datacenter Power Structure – HVDC Distribution

- +-400VDC for Google, 800VDC for Nvidia;
- SST-Solid state transformer to improve eff. and reduce the size and weight for future.

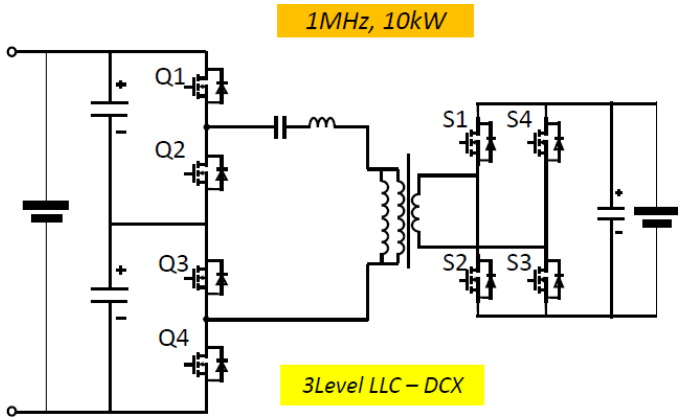


800V DC Application

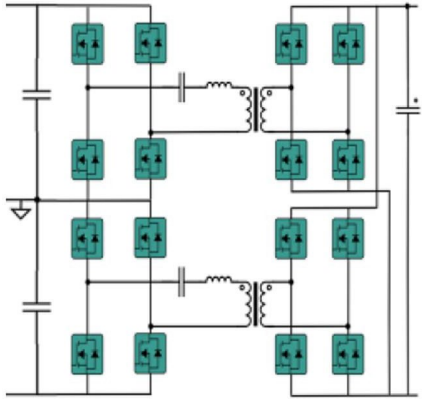




- **HVDC 800v 50v/12v/6v**
  - 1MHz Switching frequency
    - Full brick: 10kw
    - Half brick: 6kw
  - Direct liquid cooling



✓ Small footprint area
× Large output current ripple



✓ Interleaved for low output current ripple
× More devices on primary side ➔ large footprint area
× Current sharing

GaNSafe ICs (High-Power)

Family	Part #	$V_{DS(CONT)}$ (V)	$V_{DS(TRANS)}$ (V)	$R_{DS(ON)typ.}$ (mΩ)	$R_{DS(ON)max.}$ (mΩ)	Current (A)	Package	Samples	MP Date
GaNSafe™ Int. Drive + Protection	NV6511	650	800	70	98	23	 TOLL	Released	Released
	NV6512C			40	55	41			
	NV6513			32	45	53			
	NV6515			25	35	65			
	NV6514C			18	25	80			
	NV6522			40	55	41	 TOLT		
	NV6523			32	45	53			
	NV6525			25	35	65			
	NV6524			18	25	80			
	NV6578			11	15	tbd	QDPAK	2H'26	2H'26

GaNFast FETs (High Power)

Family	Part #	$V_{DS(CONT)}$ (V)	$R_{DS(ON)typ.}$ (mΩ)	$R_{DS(ON)max.}$ (mΩ)	Current (A) 25C	Package	Samples
GaNFast™ FETs Discrete GaN	NVG011C10LC	100	0.8	1.1	120	PQFN 5x6 Dual Cooled 	Now
	NVG015C10LC		1.1	1.5	100		
	NVG030C10LC		2.2	3.0	100		
	NV6036	650	11	15	120	DFN 8x8 Dual Cooled 	
	NV6034		18	25	80		
	NV6066		11	15	120	TOLT 	
	NV6064		18	25	80		
	NV6065		25	35	65		Q2'26
	NV6063		32	45	53		
	NV6062		40	55	41		
	NV6061		70	98	23		

Reliable High-Power GaN in 4 Pins

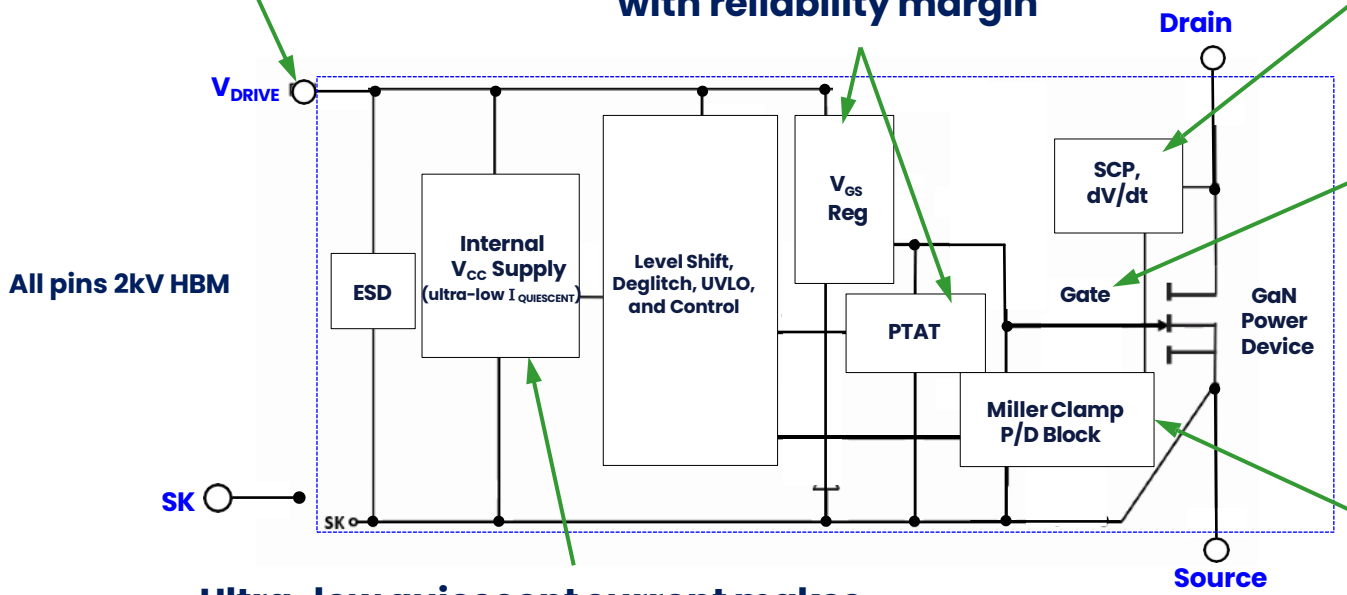
100 V/ns Immunity with wide-range input (12~20V)

Integrated V_{GS} regulation maintains optimized V_{GS} with reliability margin

Ultra-fast Short-Circuit Desat detection

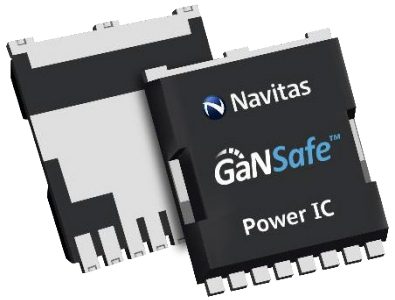
No gate-loop inductance or ringing

All pins 2kV HBM



Integrated Miller Clamp: negative gate bias not required, highest Reliability against Shoot-Thru

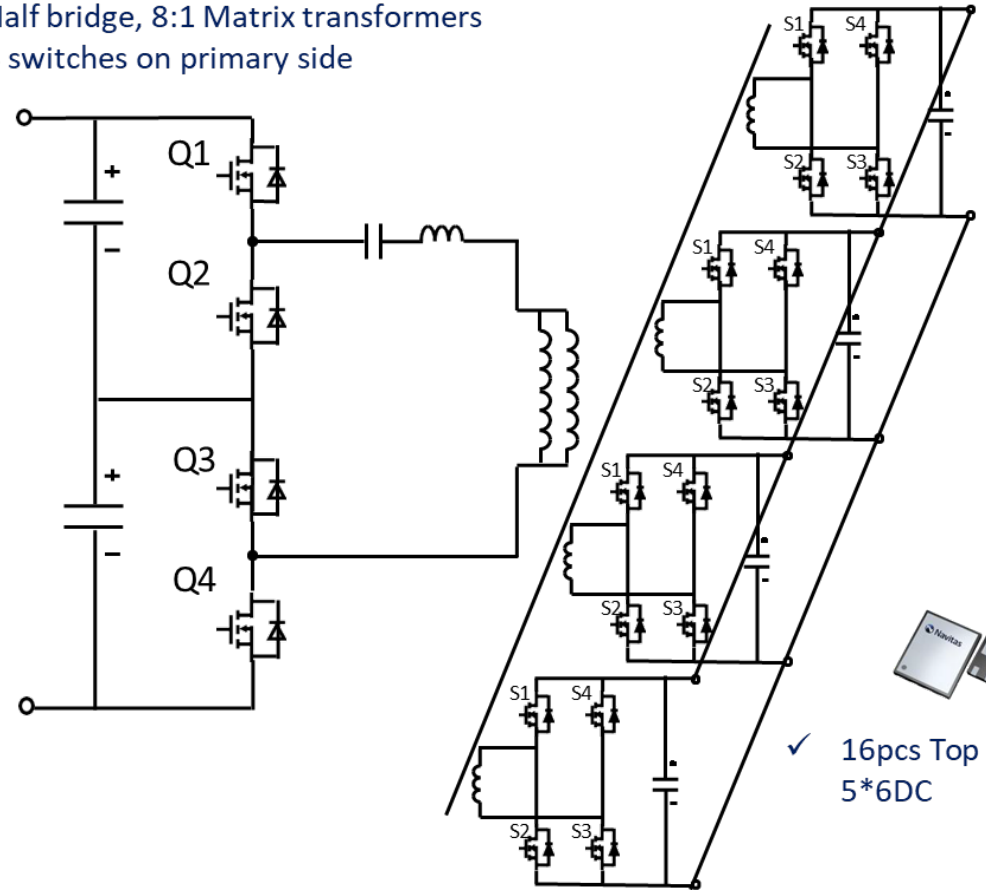
Ultra-low quiescent current makes high-power GaN feasible in 4-pin package



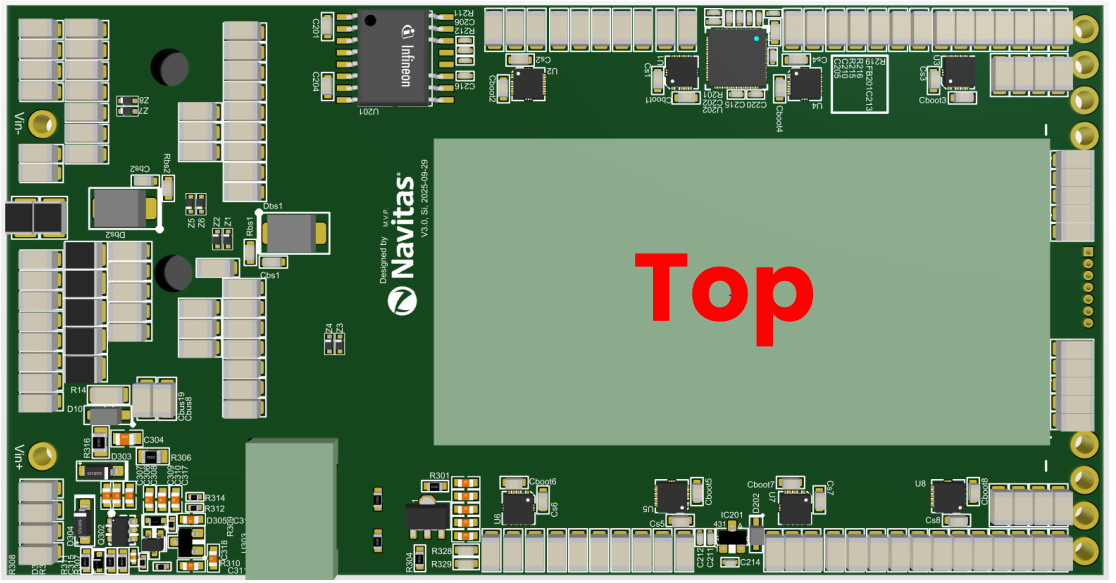
800V DC 10kW Full Brick Demo

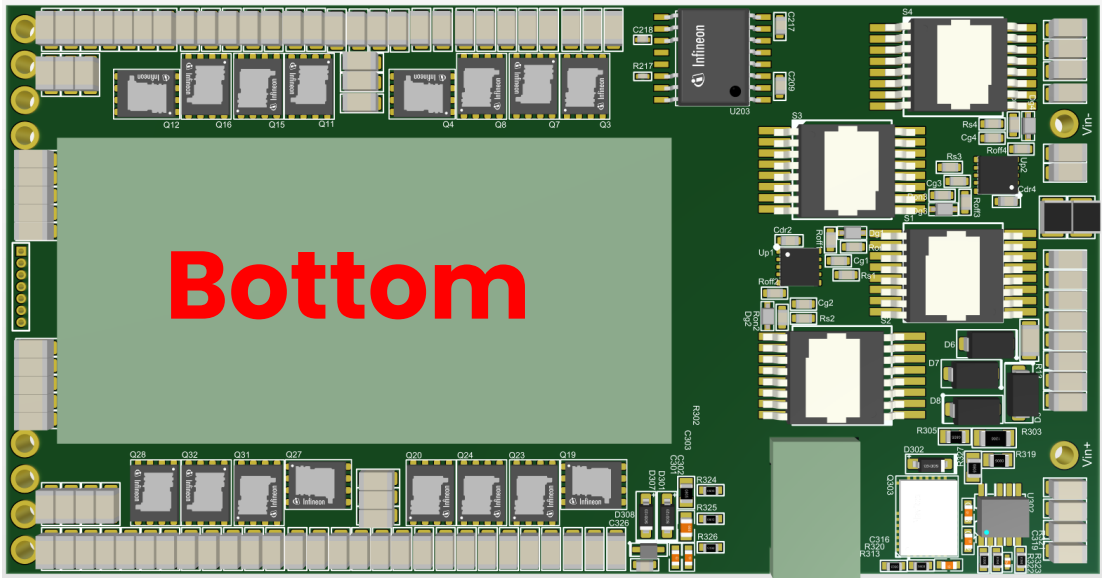
TOLT
15x10x2.3mm
650V

- ✓ Half bridge, 8:1 Matrix transformers
- ✓ 4 switches on primary side



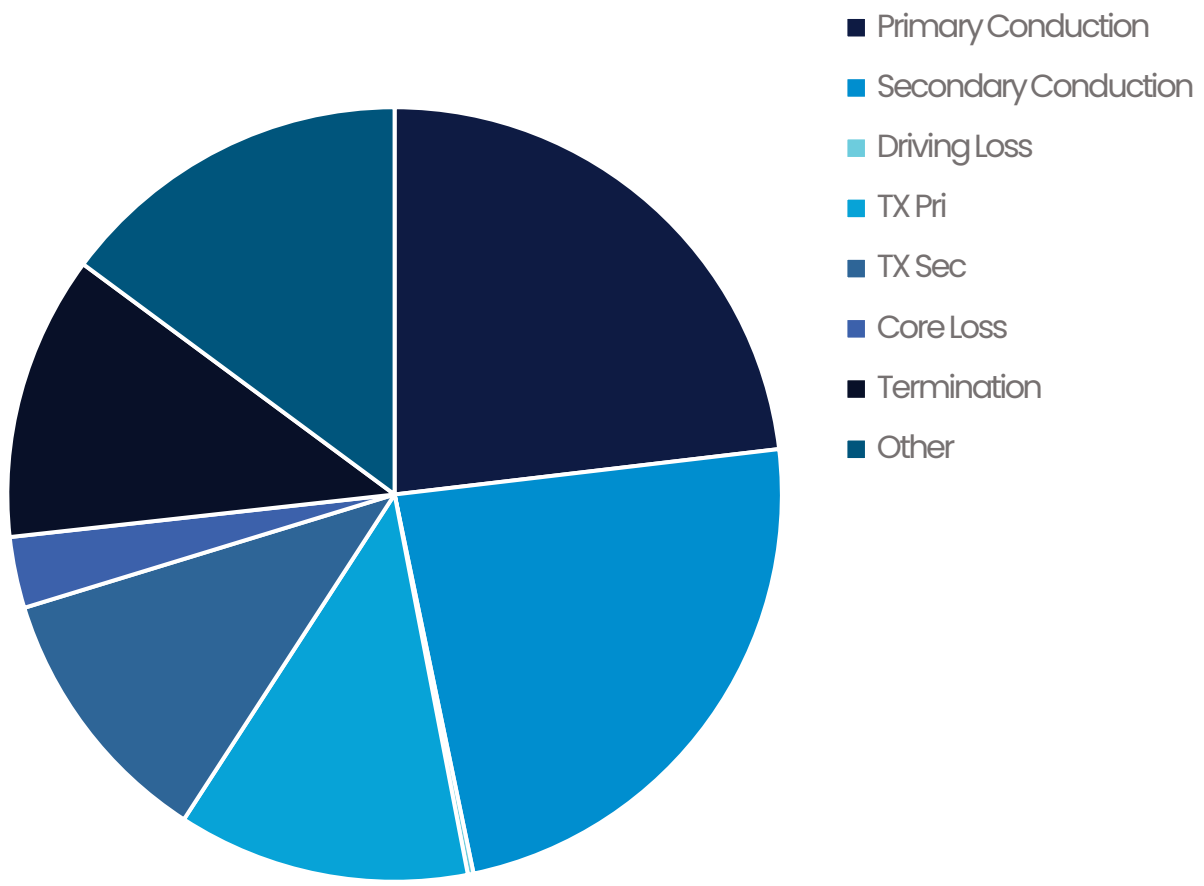
- ✓ 16pcs Top Cooled 5*6DC





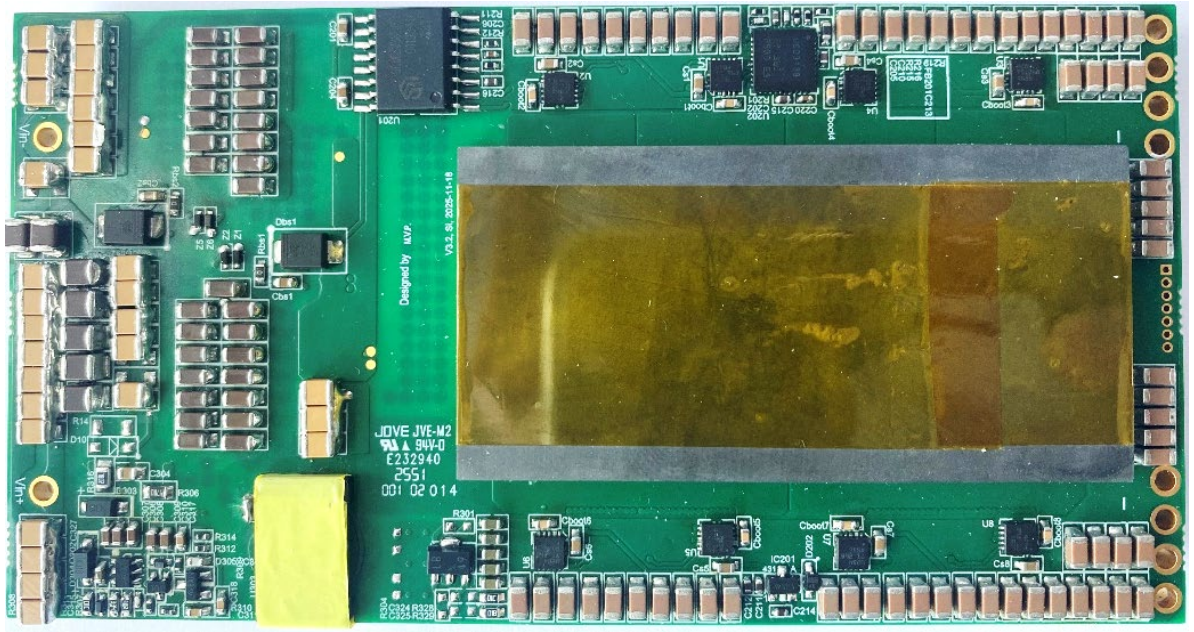
800V DC Loss Breakdown (Calculation)

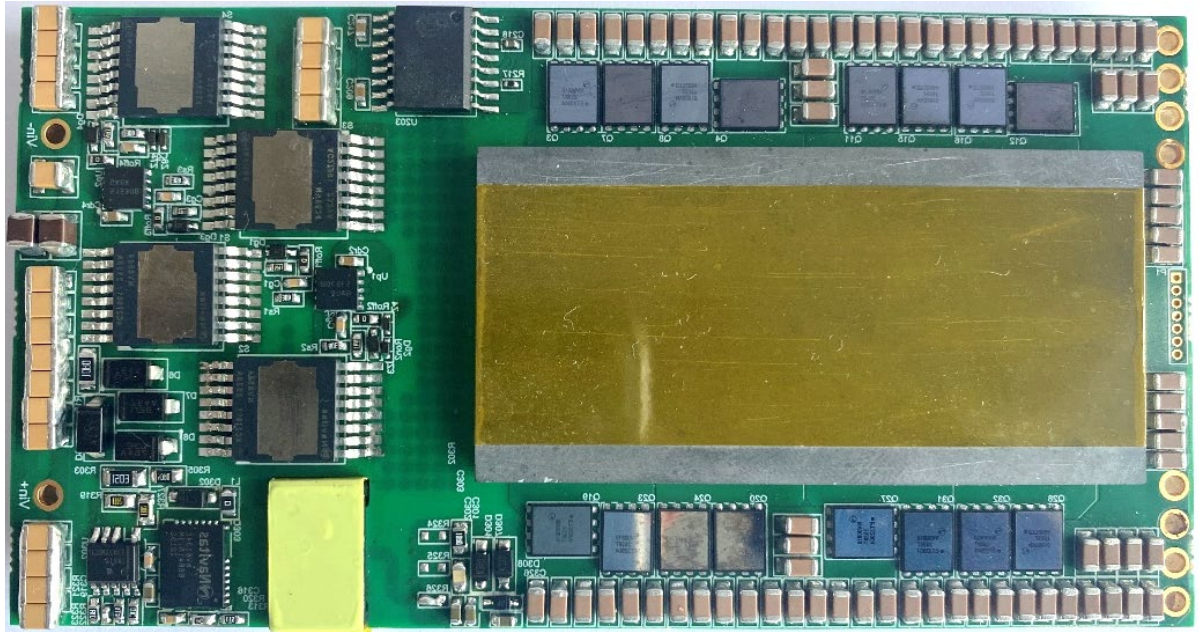
	Loss Calculation	Remark
Pri. Conduction	38.9	NV6066 (typ. 11mOhm)
Sec. Conduction	39.7	NVG011C10LC (typ. 0.8mOhm)
Driving Loss	5.5	GaN with ultra low Qg
TX Pri	20.5	@100C
TX Sec	18.7	@100C
Core Loss	5	Estimation
Termination	20	Estimation
Other Losses	25	Estimation
Total	173.3	98.3% effi.@full load



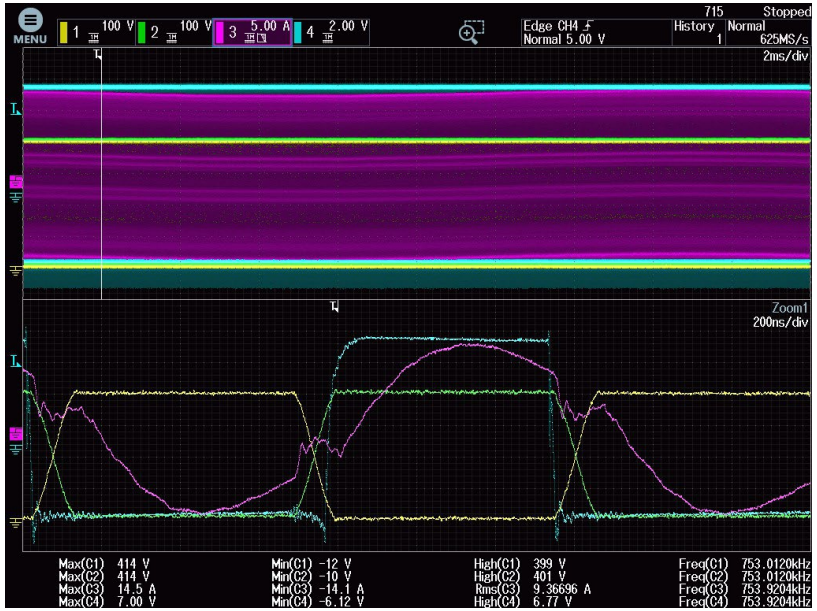
- Calculation is based on NV6066 on the primary side and GaN on the secondary side.
- Transformer loss based on 3D FEA simulation

Hardware Prototype





Gen 2 Test Waveforms (Si Version)



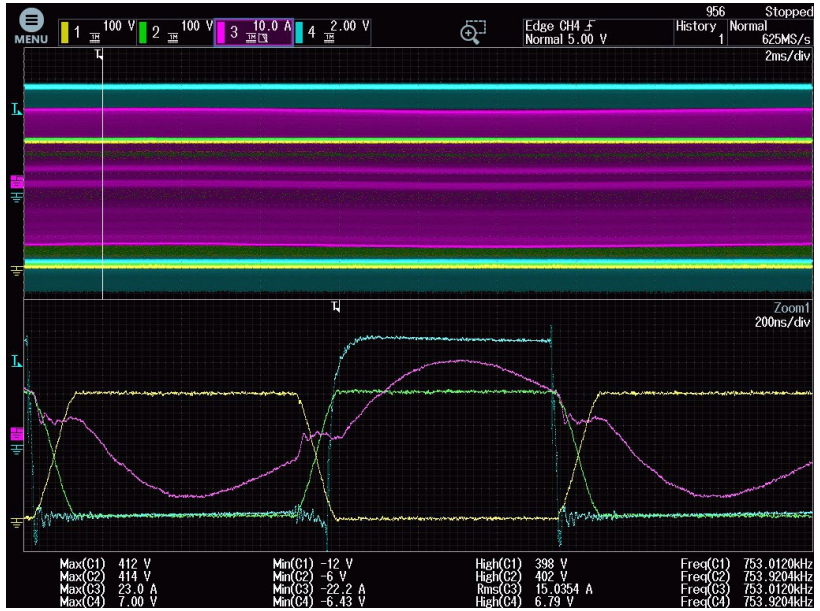
3kW

CH1:V_{ds_Q4}

CH2:V_{ds_Q2}

CH3:I_L

CH4:V_{gs_Q4}



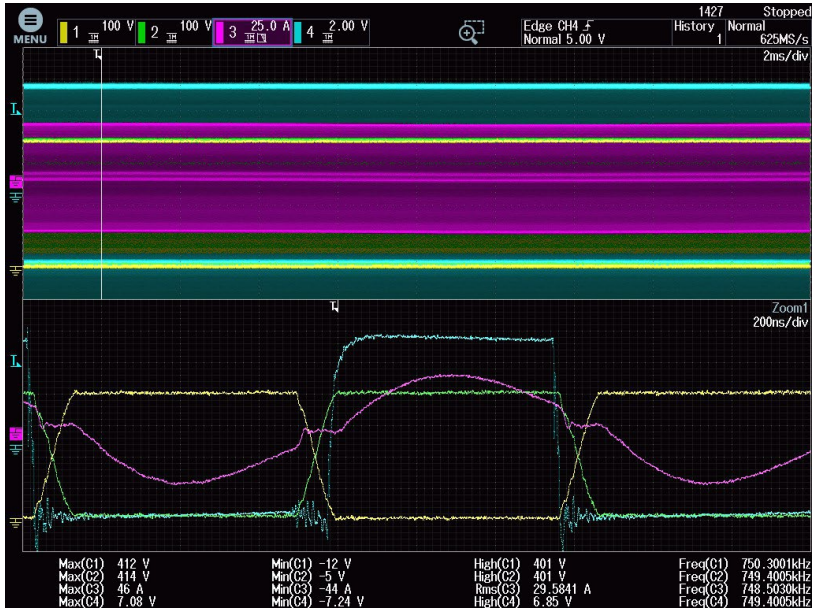
5kW

CH1:V_{ds_Q4}

CH2:V_{ds_Q2}

CH3:I_L

CH4:V_{gs_Q4}



10kW

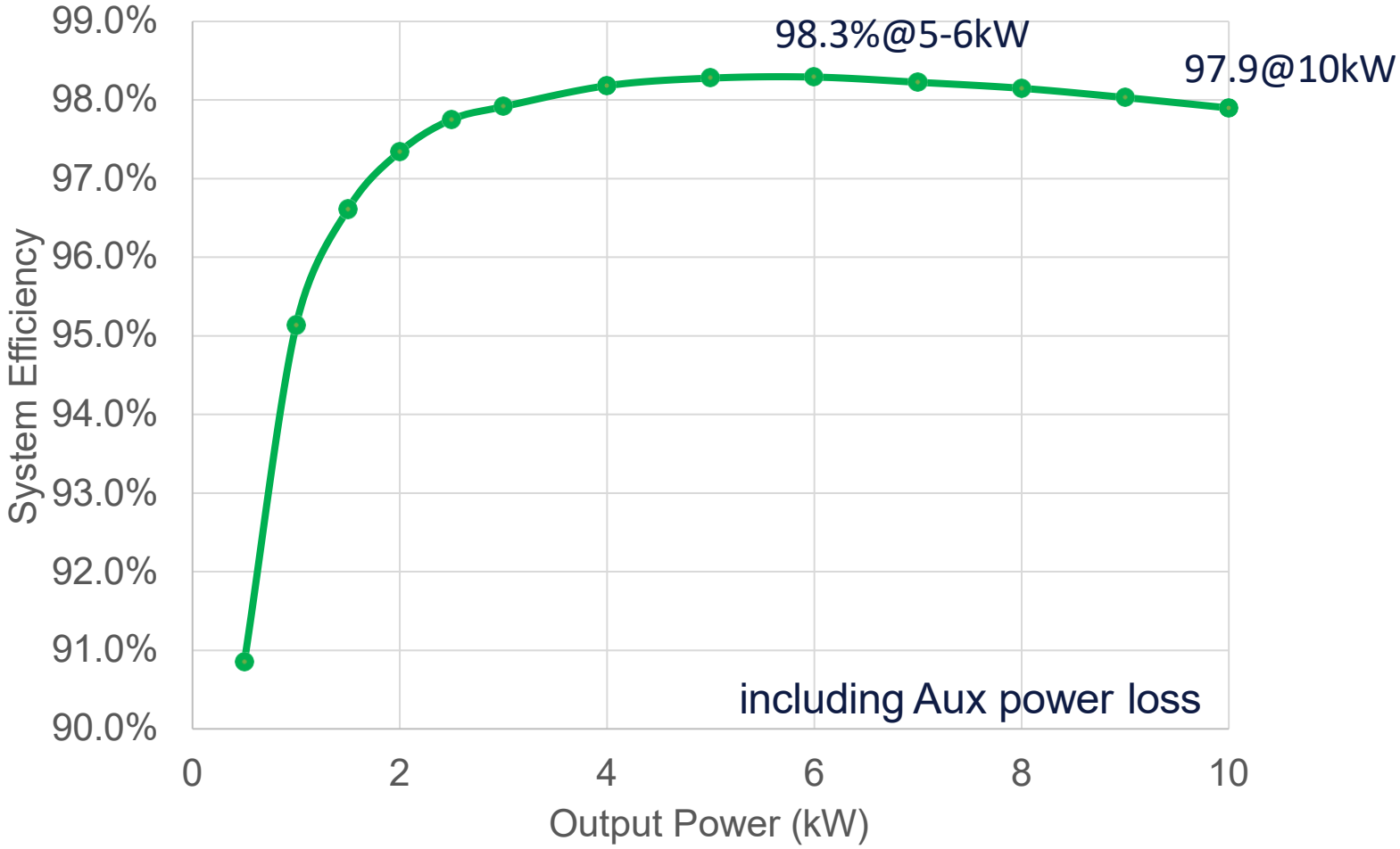
CH1:V_{ds_Q4}

CH2:V_{ds_Q2}

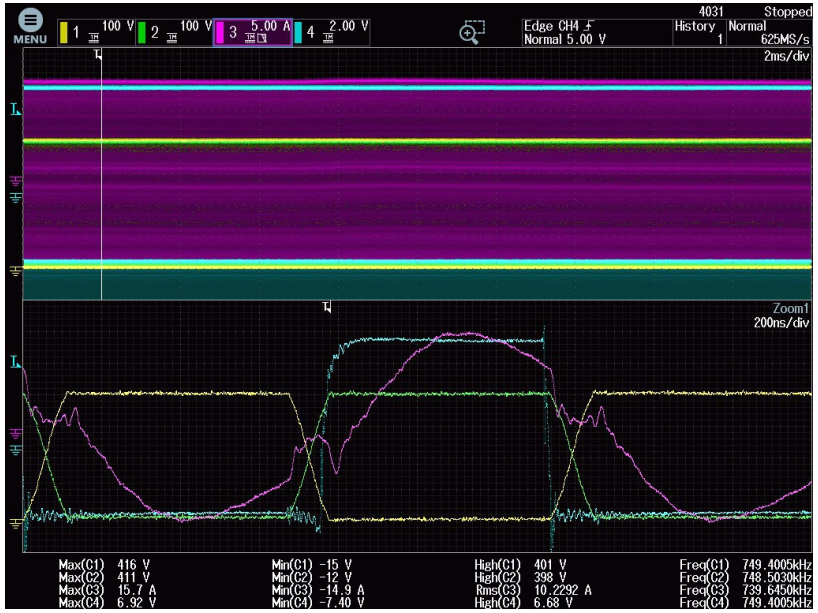
CH3:I_L

CH4:V_{gs_Q4}

Gen 2 Efficiency – Si Version



Gen 2 Test Waveforms (GaN Version)



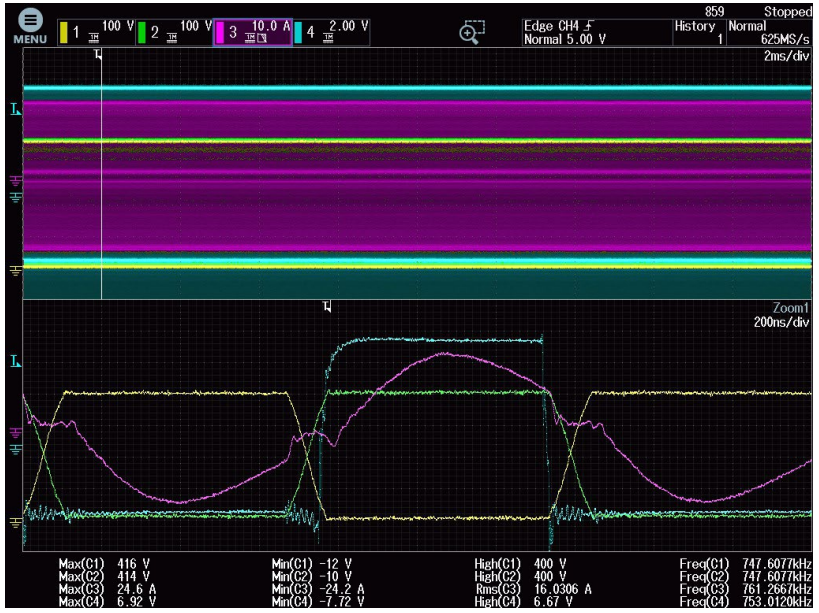
3kW

CH1:V_{ds_Q4}

CH2:V_{ds_Q2}

CH3:I_L

CH4:V_{gs_Q4}



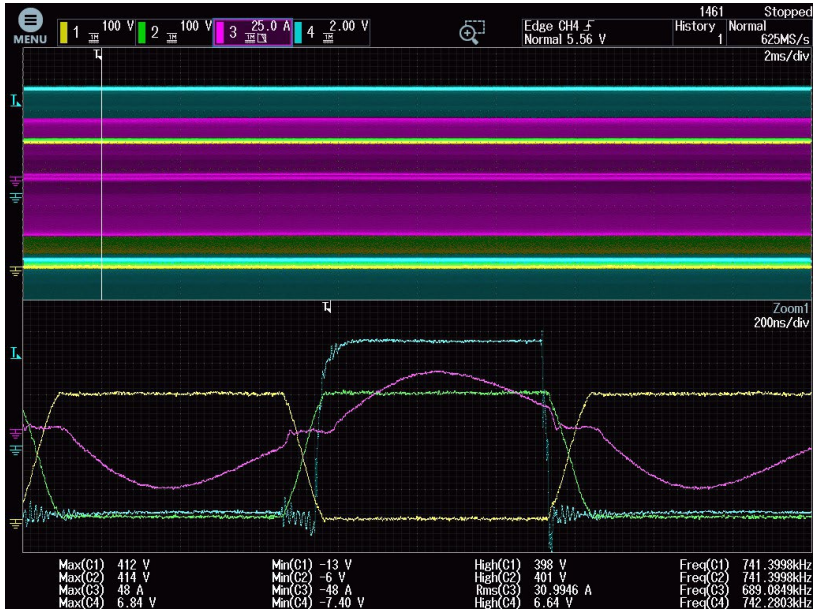
5kW

CH1:V_{ds_Q4}

CH2:V_{ds_Q2}

CH3:I_L

CH4:V_{gs_Q4}



10kW

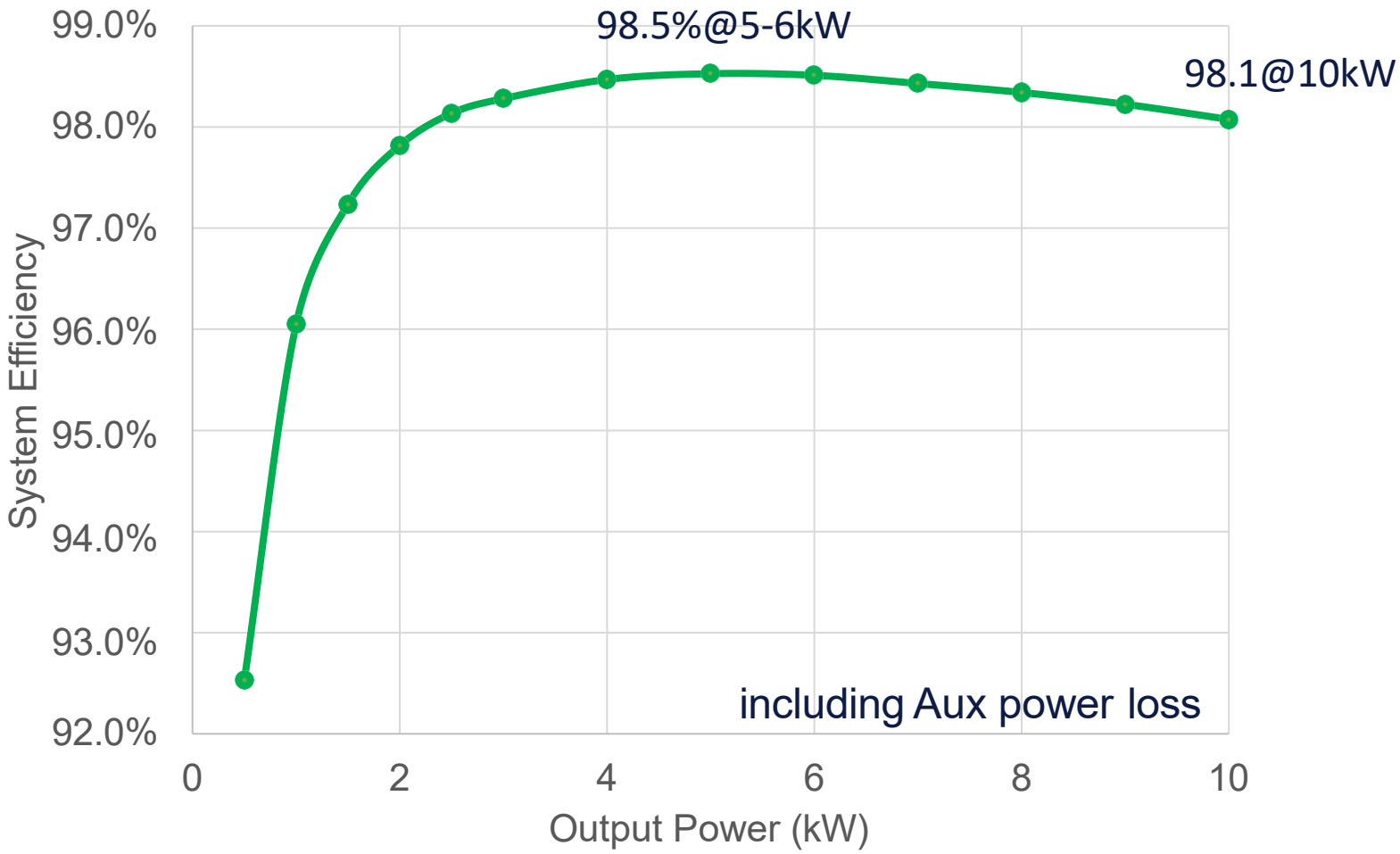
CH1:V_{ds_Q4}

CH2:V_{ds_Q2}

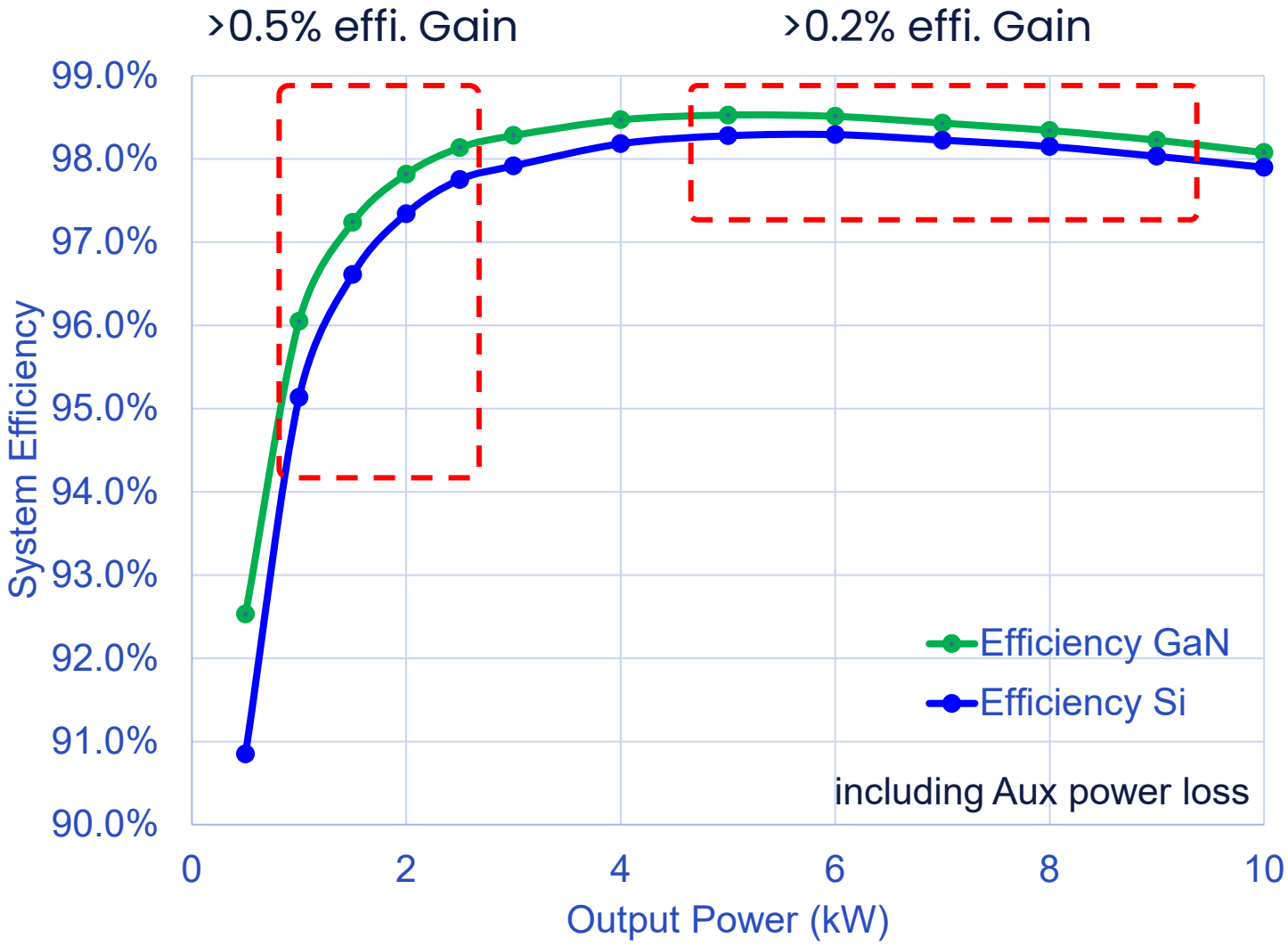
CH3:I_L

CH4:V_{gs_Q4}

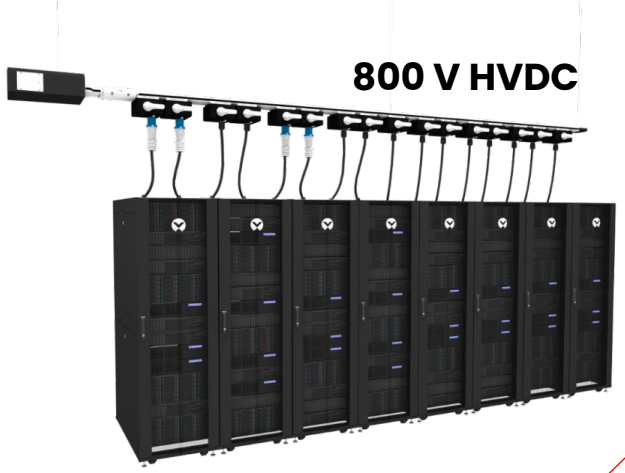
Gen 2 Efficiency – GaN Version



Gen 2 Efficiency – GaN vs. Si



650V, 100V, 80V GaN Opportunities (Today)



10kW for Full Brick

…or 2 x 6kW for Half Brick

650V GaN/SiC
100V GaN
GaNSync IC

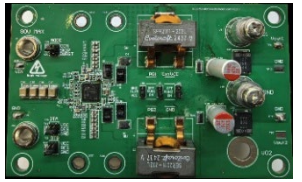
800V – 48/12V DC-DC

80-100V GaN

***300W – 3kW* 48v Power Module**

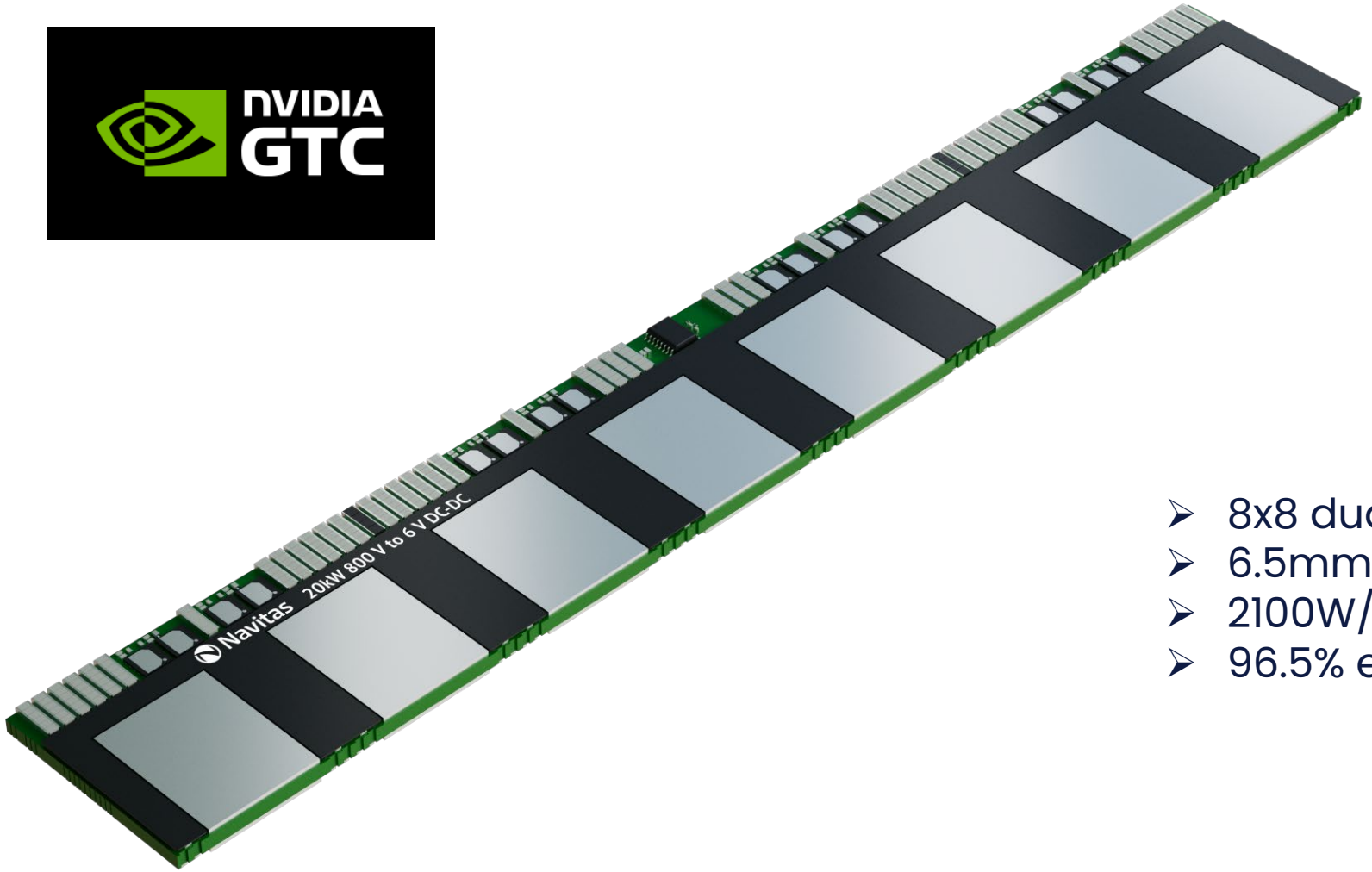
48V – 12/1V DC-DC

…or embedded 2-3kW discrete DC-DC



100V GaN

800V- 6V PDB Design for Nvidia MGX Ecosystem



- 8x8 dual cooled 650V GaN
- 6.5mm in total thickness.
- 2100W/in3 power density
- 96.5% efficiency (Target)

Summary

- AI data centers are transitioning to ±400V and 800V DC architectures to enable multi-hundred kW to MW rack densities
- 800V DC distribution eliminates rack-level AC/DC conversion, improving efficiency and compute density
- 10 kW 800V–50V full-brick DC-DC demonstrated in compact 116 × 61 × 11 mm form factor
- Gen 2 design achieves over 98.5% system efficiency (including auxiliary power) using high-power GaN
- Navitas GaN ICs enable higher switching frequency (1 MHz), improved power density, and scalable AI rack solutions

Thank You!

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Navitas

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