POWERUP
VIRTUAL EXPO

GaN & SiC: Accelerating Revolutions

Next-gen, high-frequency materials drive fast innovation, quick results and accelerated transitions to 'Electrify Our World™'

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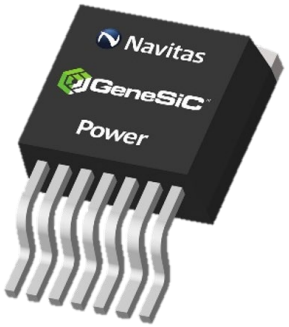
Note disclaimers. Information is as of the date specified only. Financial reporting and guidance as of Q1 2022 report (May 2023), update not provided

Acceleration, Revolution

Navitas

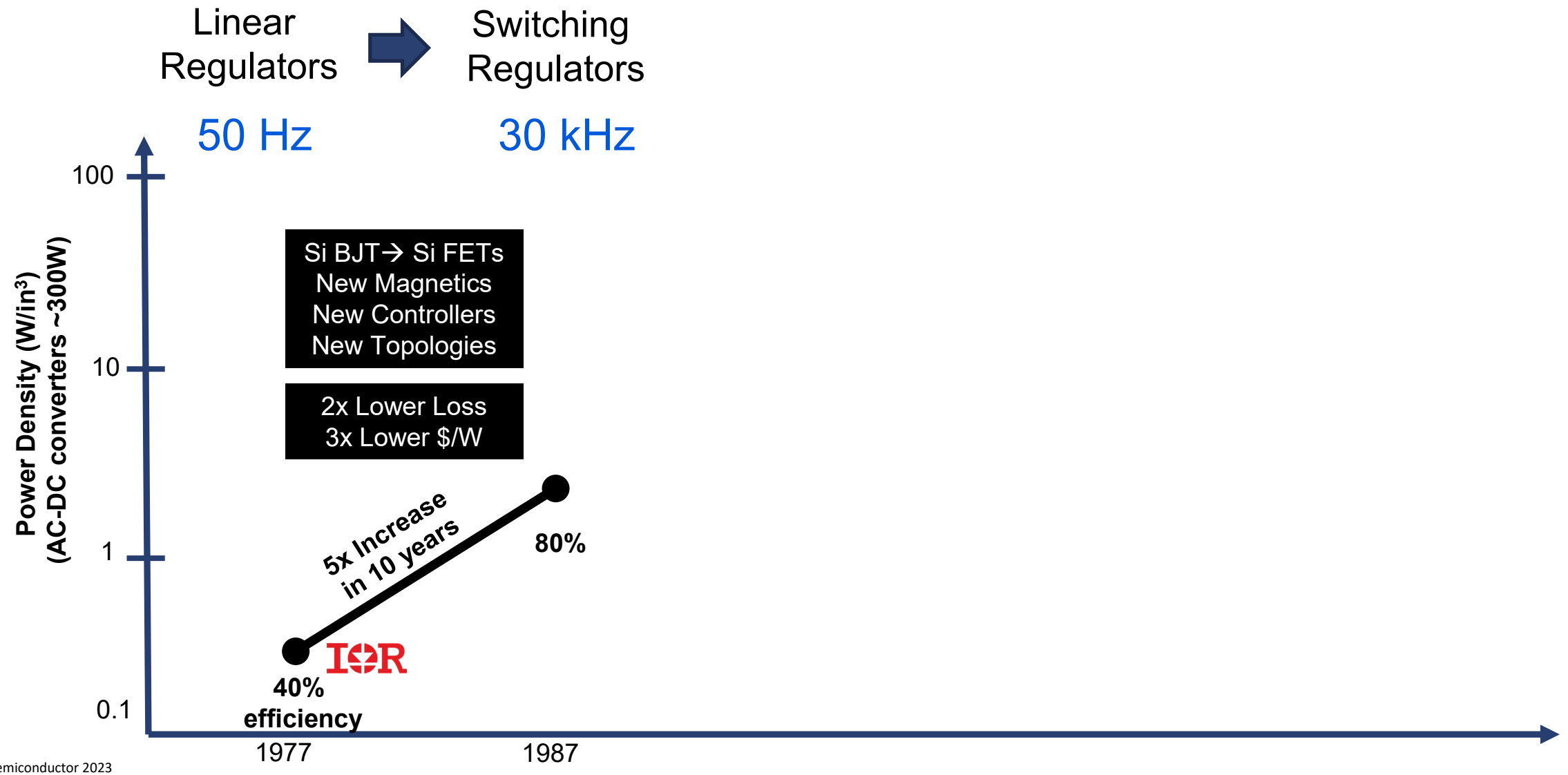
Technologies

Products



Applications

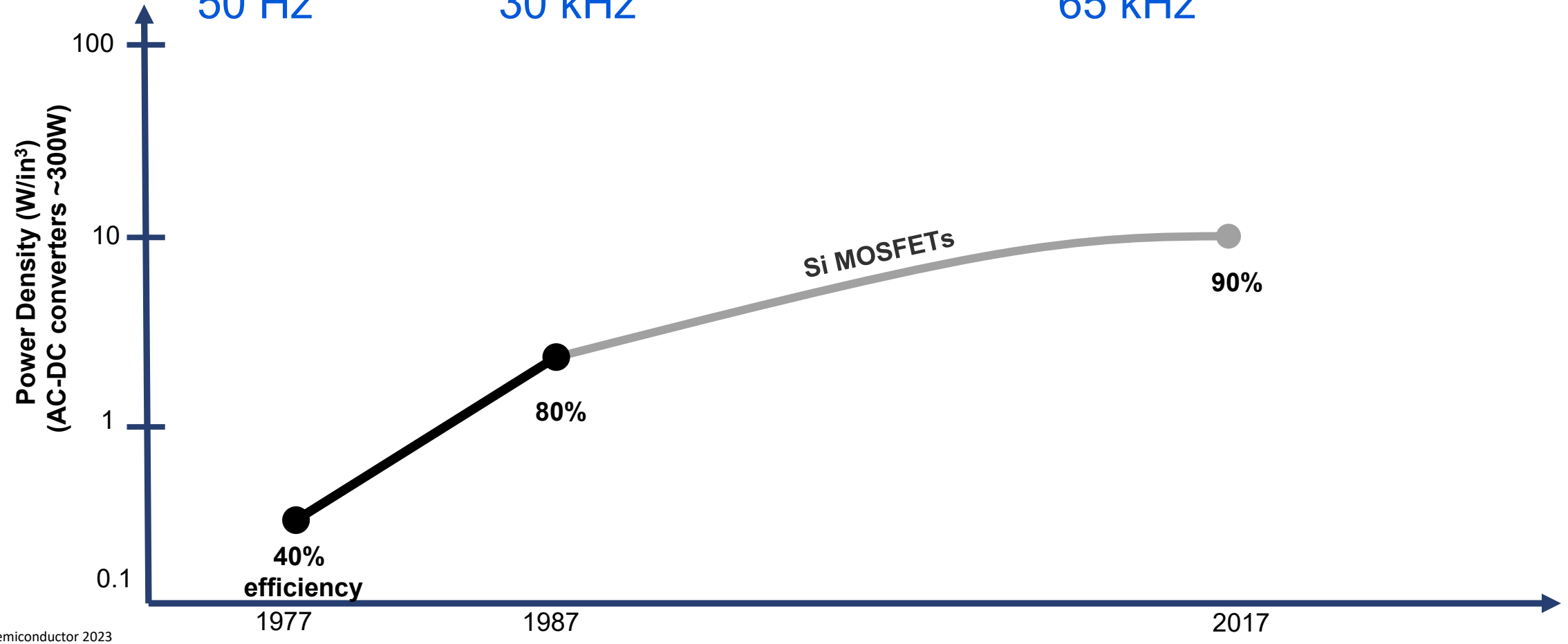
The First Power Revolution



The Years of Consolidation

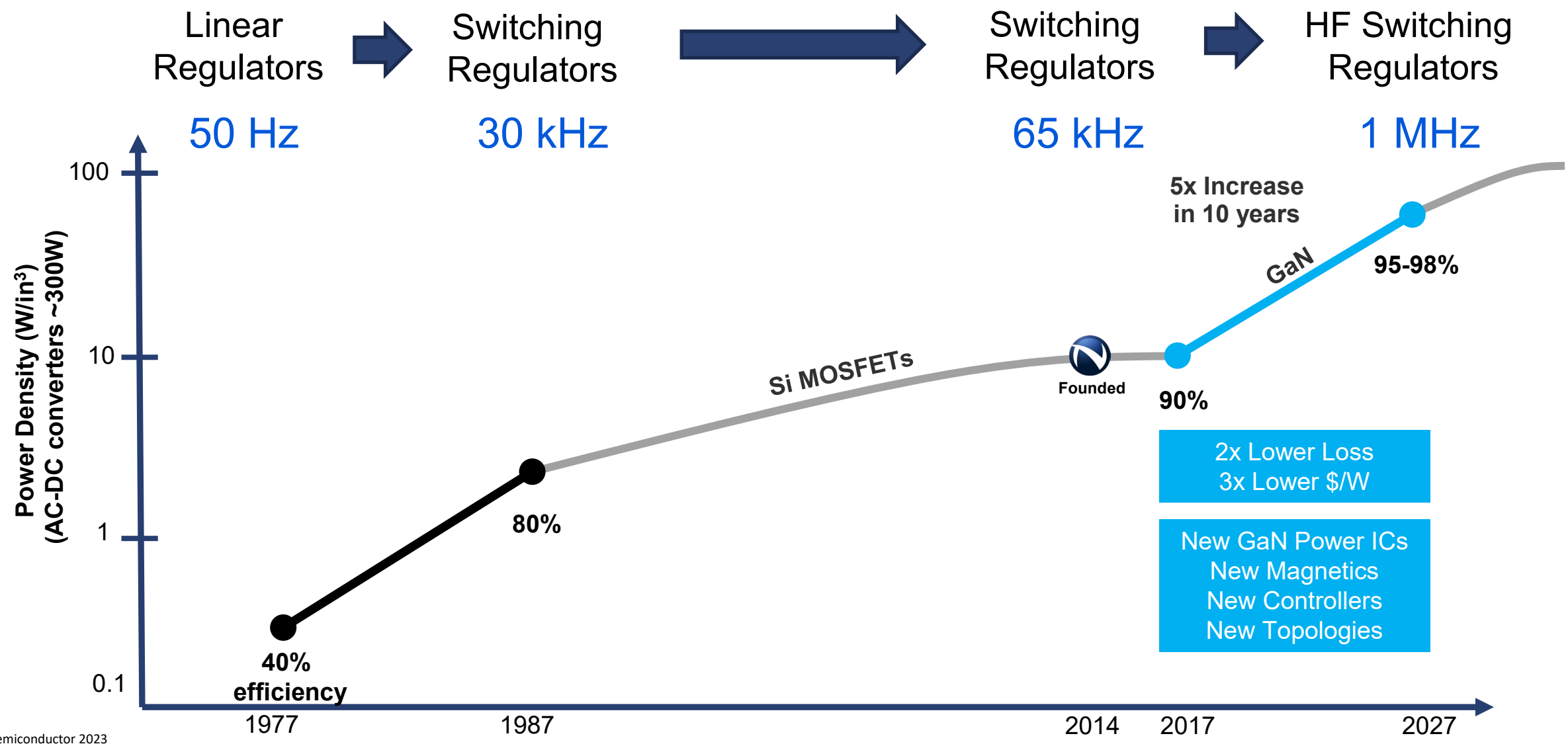
Linear Regulators → Switching Regulators → Switching Regulators

50 Hz → 30 kHz → 65 kHz



The Second Power Revolution (Si FETs → GaN)

Navitas



The Second Power Revolution (Si IGBTs → SiC)

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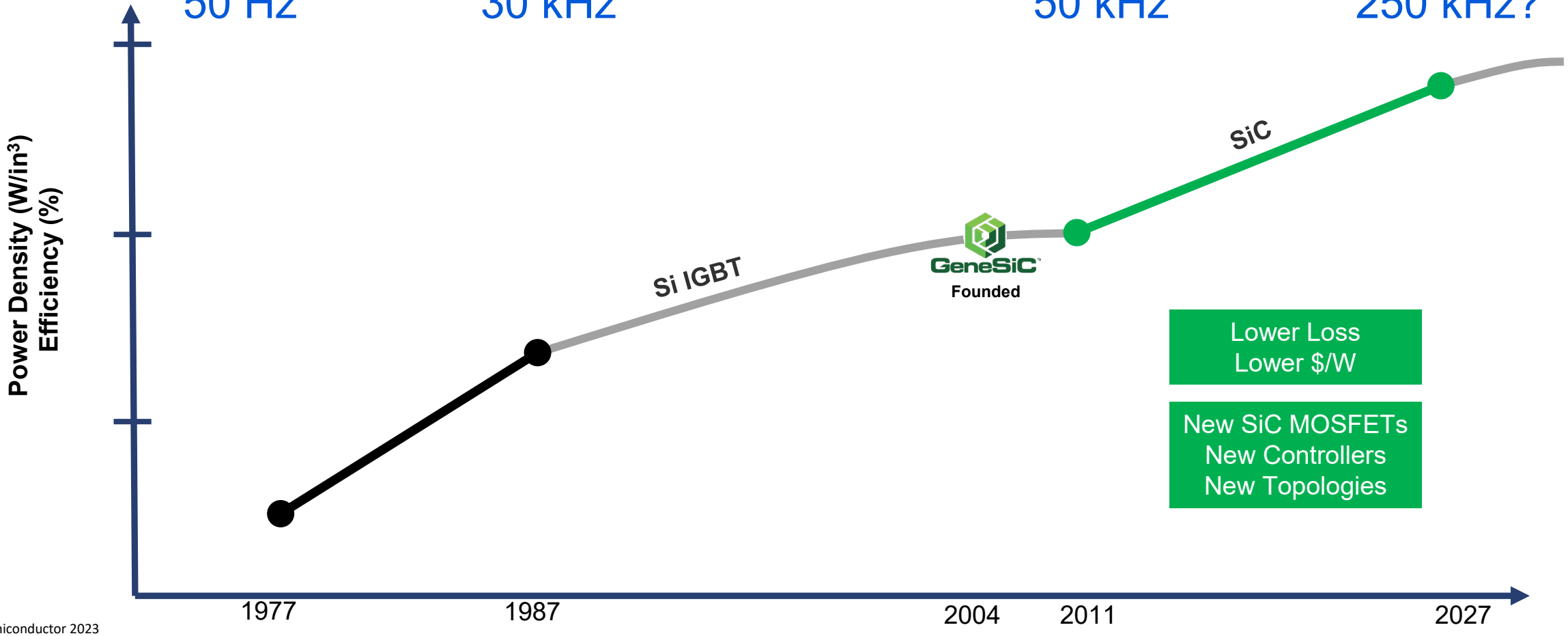
Linear Regulators → Switching Regulators → Switching Regulators → HF Switching Regulators

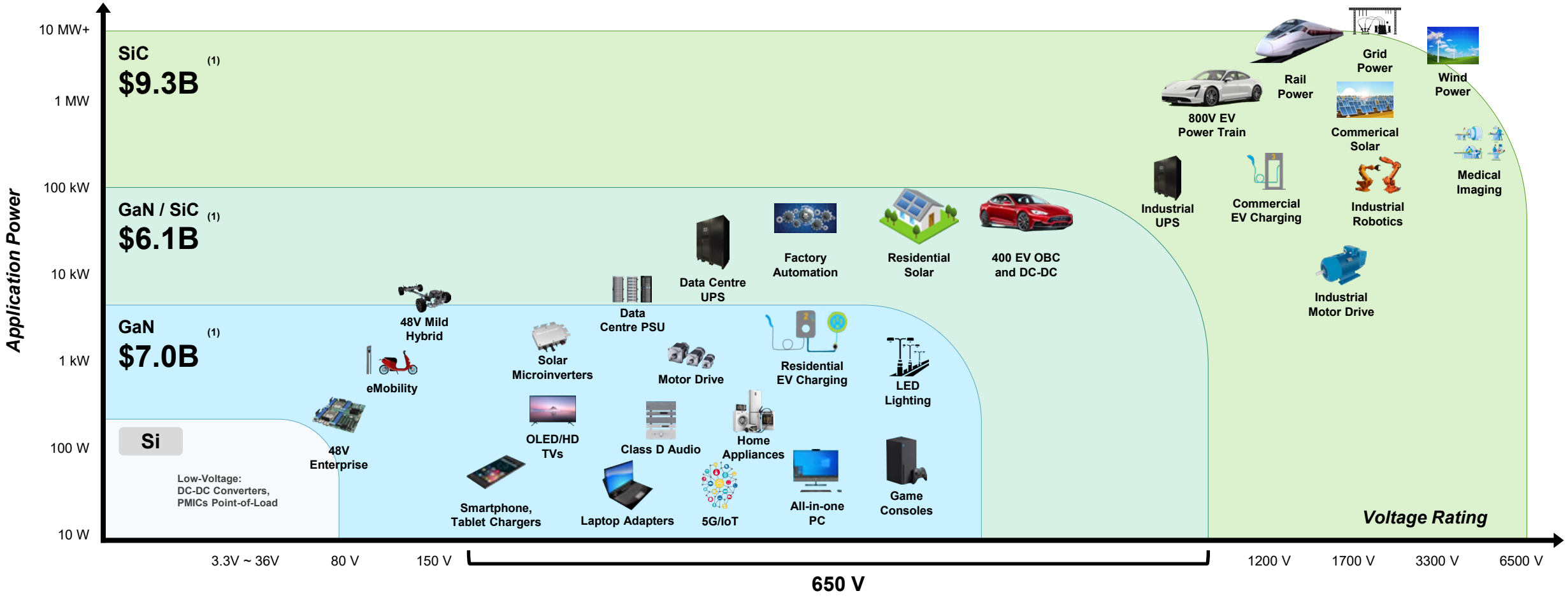
50 Hz → 30 kHz → 50 kHz → 250 kHz?



Lower Loss
Lower $/W

New SiC MOSFETs
New Controllers
New Topologies

$22B+ 'Pure-Play' Potential Opportunity (1)



(1) Axes not to scale. Based on internal company estimates, Navitas believes that the potential market opportunity in 2026 is $22B+ for GaN and SiC, replacing certain of the silicon market share

The Revolution… in GaN

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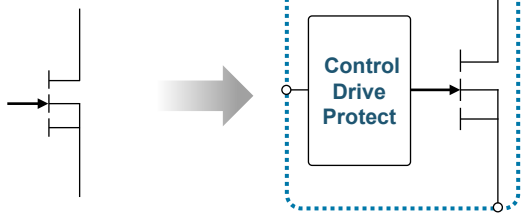
Discrete GaN

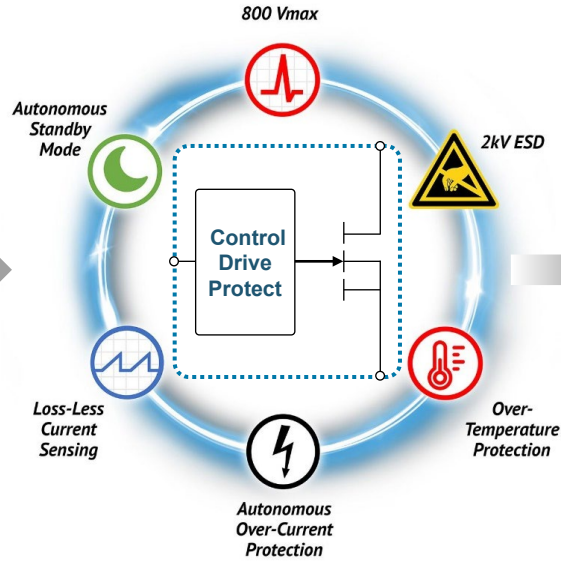


- Vulnerable
- Difficult to use
- Unknown reliability

GaNFast™

- ✓ Robust
- ✓ Easy to use
- ✓ Proven reliability

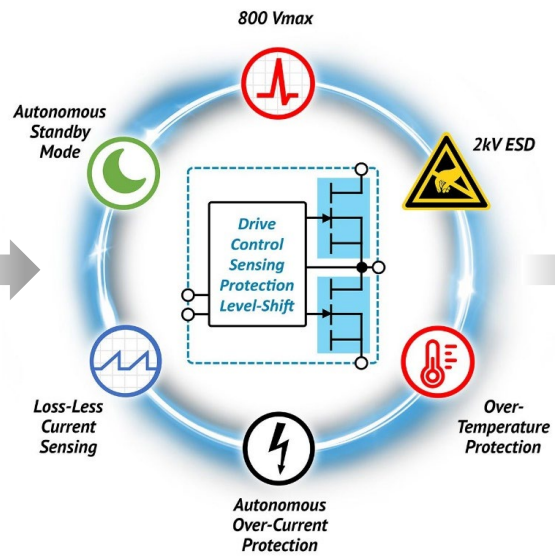
GaNSense™



GaNFast plus:

- ✓ Autonomous protection
- ✓ Loss-less current sensing

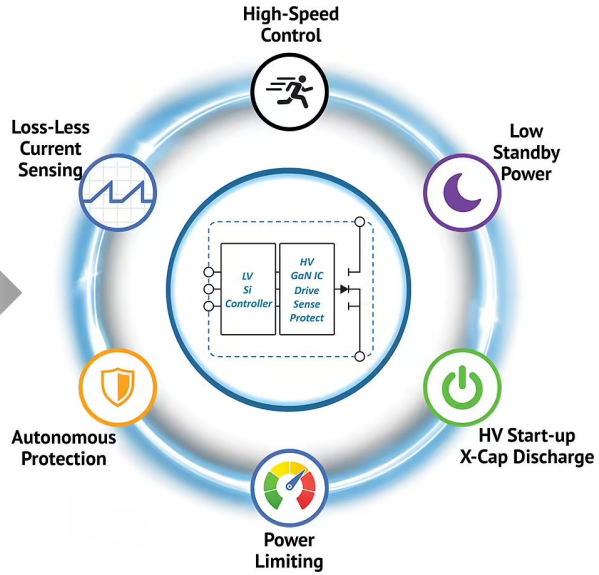
GaNSense Half-Bridge



GaNSense plus:

- ✓ Integrated HS, LS, level-shift isolation
- ✓ Complete protection

GaNSense Control



GaNSense plus:

- ✓ LV silicon system controller
- ✓ Fewest components

Efficiency

Reliability

Speed

Integration

Accelerating Integration

Navitas

Discrete GaN Half-Bridge

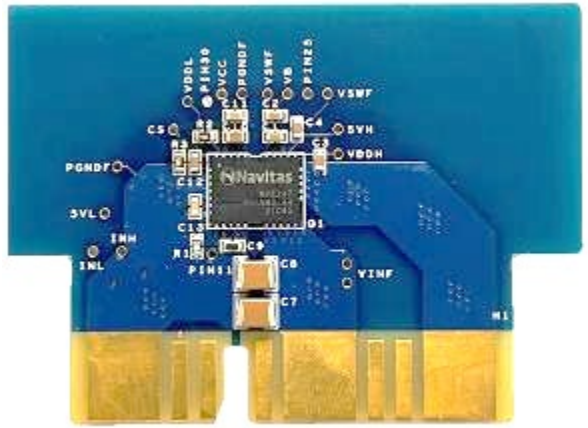
- *33 components*
- *250 mm² footprint*
- *External HB driver HVIC*
- *External HV bootstrap*
- *2x HV bypass diodes*
- *2x external gate drives*
- *Exposed gates*

61% fewer components

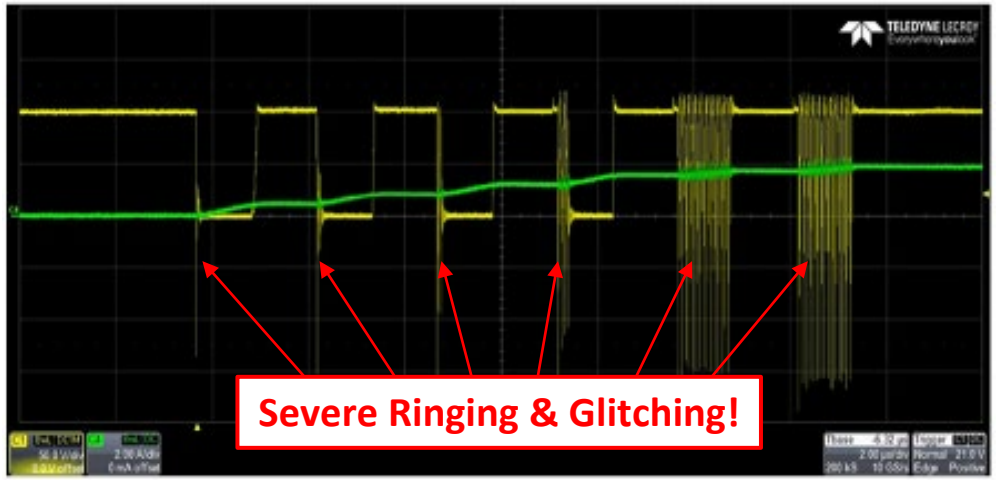
64% smaller footprint

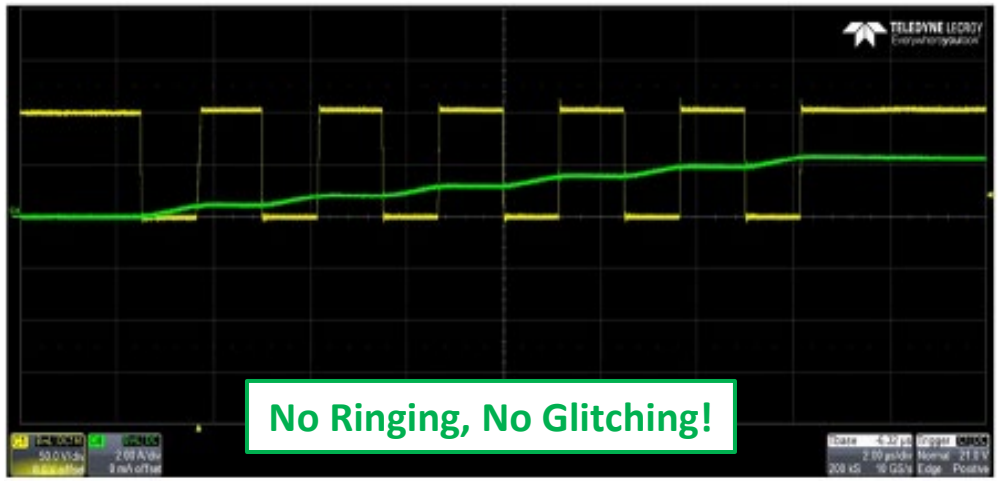
Complete integration

GaNSense Half-Bridge IC



- ✓ *13 components*
- ✓ *90 mm² footprint*
- ✓ *Level shifters*
- ✓ *Bootstrap*
- ✓ *Gate drivers*
- ✓ *No exposed gates*





Accelerating Frequency

Navitas

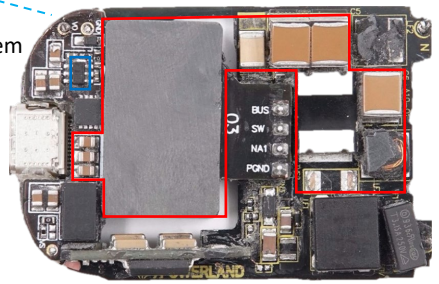
GaN MCM 45W

Passive Components

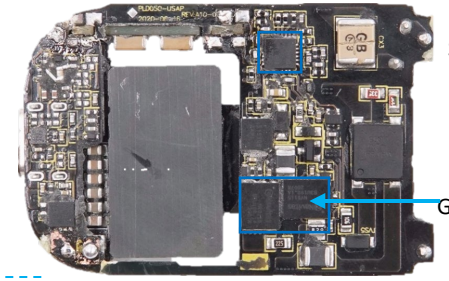
GaN Discrete in Multi-Chip-Module (MCM)

Speed Shrinks Passives

System IC



Passive Components



System IC

GaN ICs

GaN ICs 50W

65 kHz **Bobbin Transformer (*23 mm thick*)** **Electrolytic Capacitors** **52 x 53.1 x 30.1 mm = 83 cc Case + pins** **0.5 W/cc**	6x Faster 3x Smaller	**400 kHz** **Planar Transformer (*8 mm thin*)** **No Electrolytic Caps** **82.2 x 39.0 x 10.5 mm = 34 cc Case** **1.5 W/cc**

(1) Samsung 45W charger (GaN MCM) vs. OPPO 50W SuperVOOC Cookie (Navitas GaN IC)

Accelerating Adoption: Mobile

Navitas

Aftermarket Examples

Tier 1 OEMs

260
GaN Chargers
Mass Production(1)

150
GaN Chargers
In Development(1)

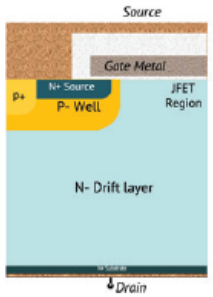
100%
Top 5/5 Smartphone OEMs and
Top 5/5 Notebook OEMs
In Production / Designing w/ Navitas(2)

75M+
GaN ICs Shipped(1)

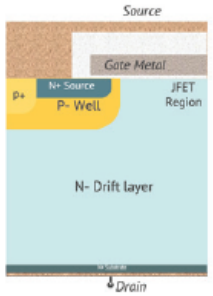
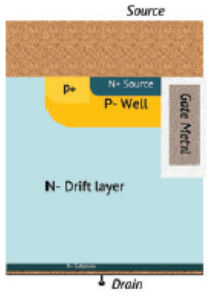
Notes:
1. As of 5/15/2023
2. Based on internal Navitas estimates of top mobile OEMs and their existing customer engagements

Accelerating SiC?

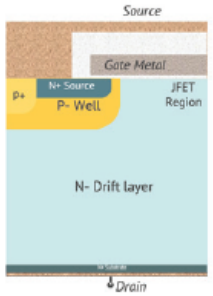
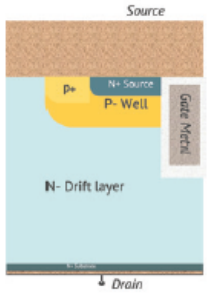
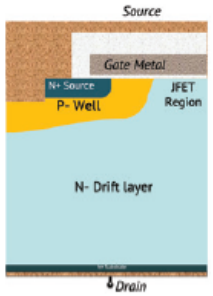
The Planar Problem

	Planar
	
Manufacturability	» Repeatable » High yield » Low cost
Performance	» High $R_{DS(ON)}$ / area » Slow switching » High $R_{DS(ON)}$ / Δ temp
Reliability	» Rugged gate oxide (stable V_{TH})

Accelerating SiC: The Trouble with Trench

	Planar	Trench
		
Manufacturability	» Repeatable » High yield » Low cost	» Inconsistent trench etch » Lower yields » High cost
Performance	» High $R_{DS(ON)}$ / area » Slow switching » High $R_{DS(ON)}$ / Δ temp	» Lower $R_{DS(ON)}$ / area » Faster switching » High $R_{DS(ON)}$ / Δ temp
Reliability	» Rugged gate oxide (stable V_{TH})	» Failures due to non-uniform gate oxide » Lower short-circuit capability

Best of Both: Trench-Assisted Planar Gate

	Planar	Trench	GeneSiC
			
Manufacturability	» Repeatable » High yield » Low cost	» Inconsistent trench etch » Lower yields » High cost	» Repeatable » High yield » Low cost
Performance	» High $R_{DS(ON)}$ / area » Slow switching » High $R_{DS(ON)}$ / Δ temp	» Lower $R_{DS(ON)}$ / area » Faster switching » High $R_{DS(ON)}$ / Δ temp	» Lower $R_{DS(ON)}$ / area » Fastest switching » Lowest $R_{DS(ON)}$ / Δ temp
Reliability	» Rugged gate oxide (stable V_{TH})	» Failures due to non-uniform gate oxide » Lower short-circuit capability	» Highest 100% tested avalanche » Long short-circuit withstand time » Rugged gate oxide (stable V_{TH})

GeneSiC: Cooler, Faster, Rugged

Up to 6.5 kV

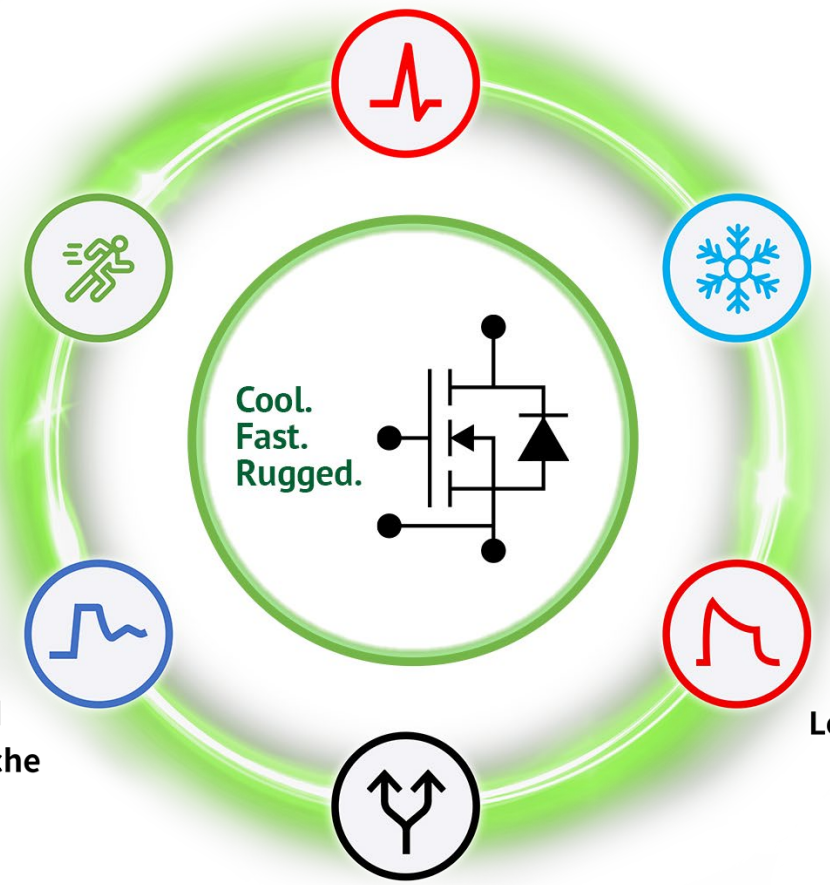
Largest range of SiC FETs (& diodes)
(650 V to 6.5 kV)

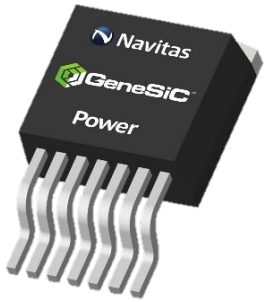
Fast Switching

Highest efficiency hard-switch, soft-switch
(Lowest E_{ON}, E_{OFF}, E_{ZVS} losses)

Cool Operation

Lowest $R_{DS(ON)}$ at high temperature
(25% lower than industry typical)





100%-Tested Robust Avalanche

Highest published capability to handle excess energy in fault condition

Long Short-Circuit Withstand Time

World-class survival duration in fault condition

High-Power Paralleling

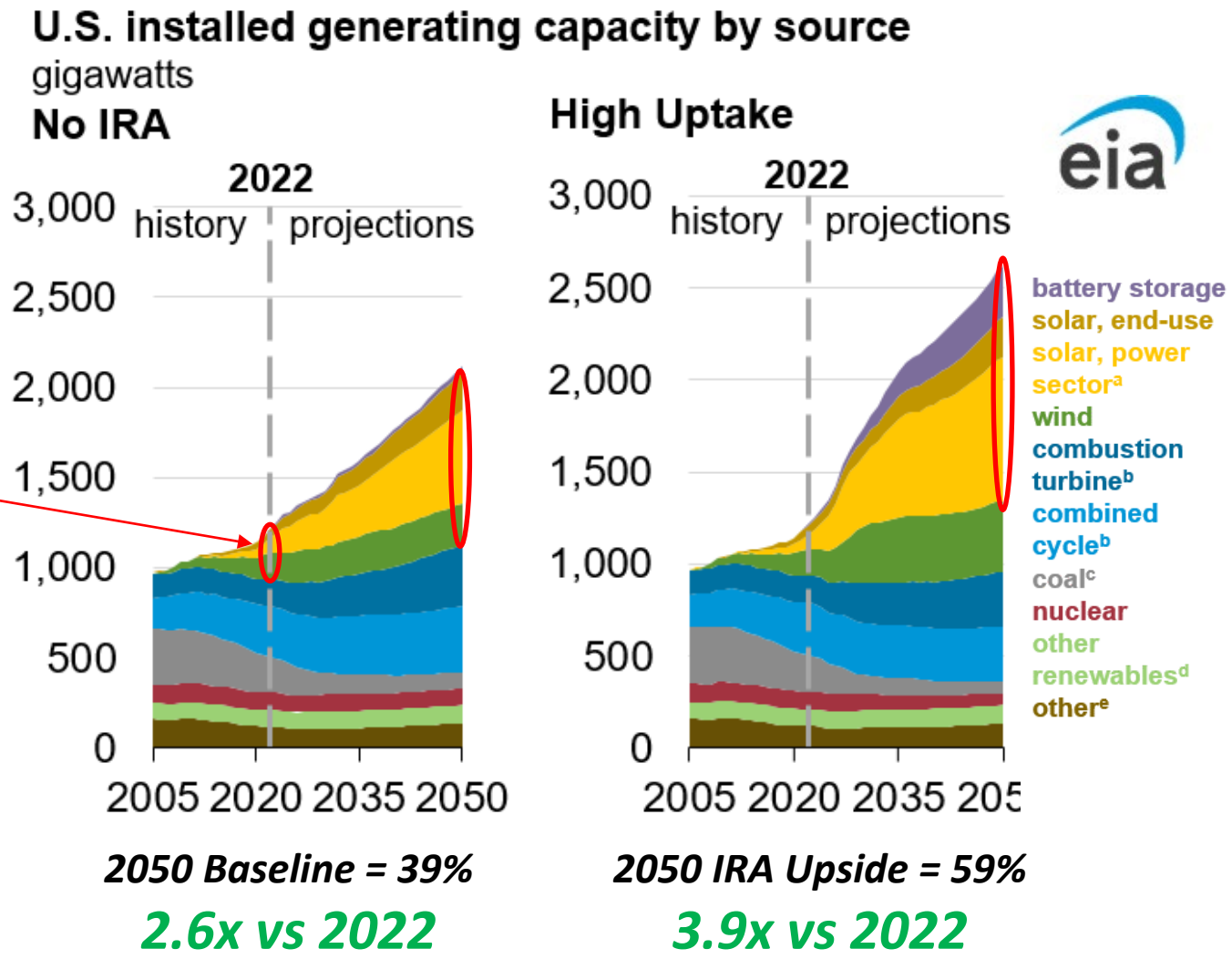
Matching currents
(Stable V_{TH})

Based on Navitas testing of 1200V SiC MOSFETs vs. competitor products

Accelerating Renewables: US Inflation Reduction Act(1)

Navitas

Solar + Wind 2022 = 15% of total generating capacity



2050 Baseline = 39%

2.6x vs 2022

2050 IRA Upside = 59%

3.9x vs 2022

1) US EIA https://www.eia.gov/outlooks/aeo/IIF_IRA/

GaN + SiC for Solar & Energy Storage

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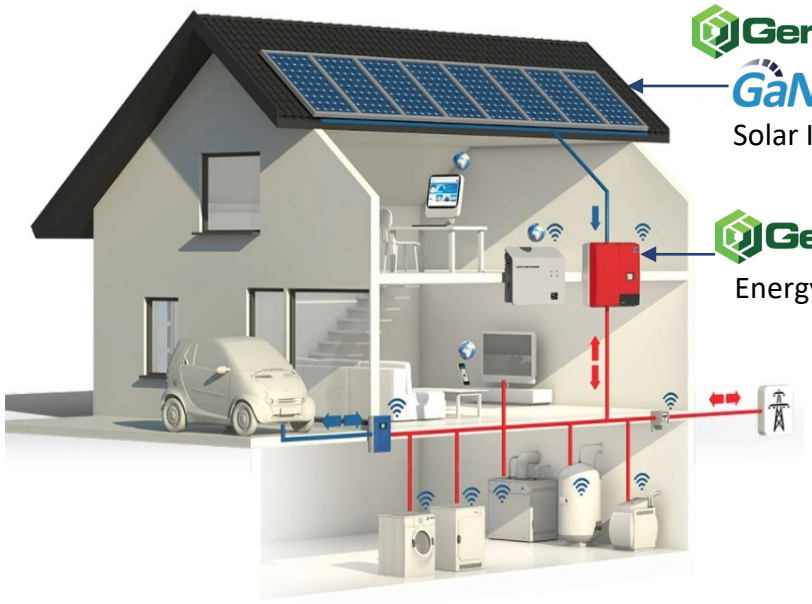


GeneSiC GaNFast™ Solar Inverters

GeneSiC Energy Storage

25°C cooler with GeneSiC

Market Potential (2)

- Residential Micro >$1.4B (GaN)
- Residential String >$1.0B (SiC)
- Commercial String >$1.0B (SiC)
- Energy Storage >$1.25B (SiC) *(50% attach rate)*

Total = >$4.65B

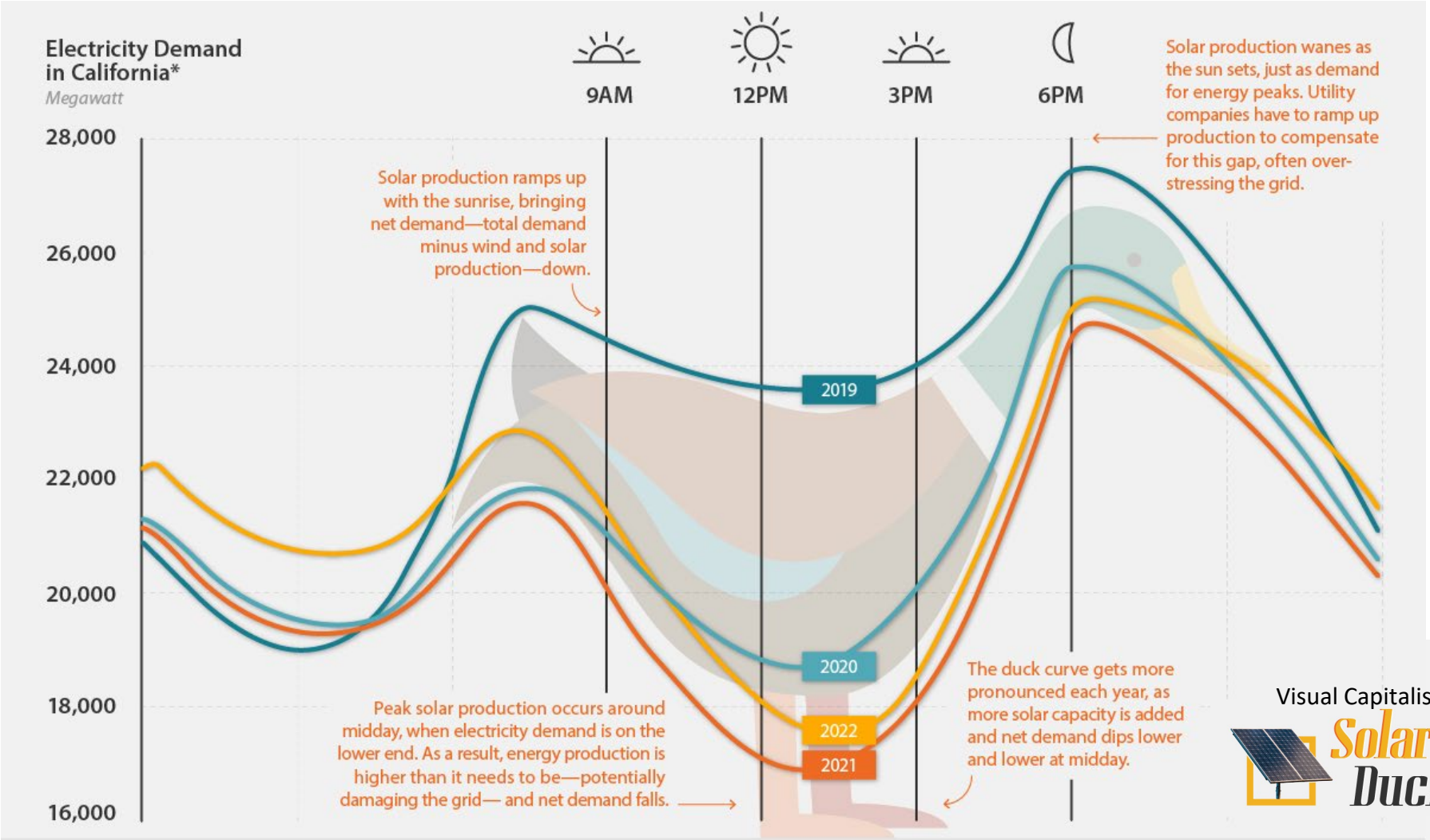
Customers in Development, Production

Advanced Energy, Alpha power solutions, ENPHASE, solaredge, GROWATT, CHINT, GOODWE, steca A KATEK Brand, SUNGROW Clean power for all, EXIDE TECHNOLOGIES, KACO new energy.

$150M+ Customer Pipeline (3)

(1) Navitas est. 6.2 kW residential installation with silicon inverter at 97.5%, GaN at 98.5% efficiency. (2) Market estimates for 2030, based on DNV and Navitas analysis. (3) Per Q1'23 earnings report

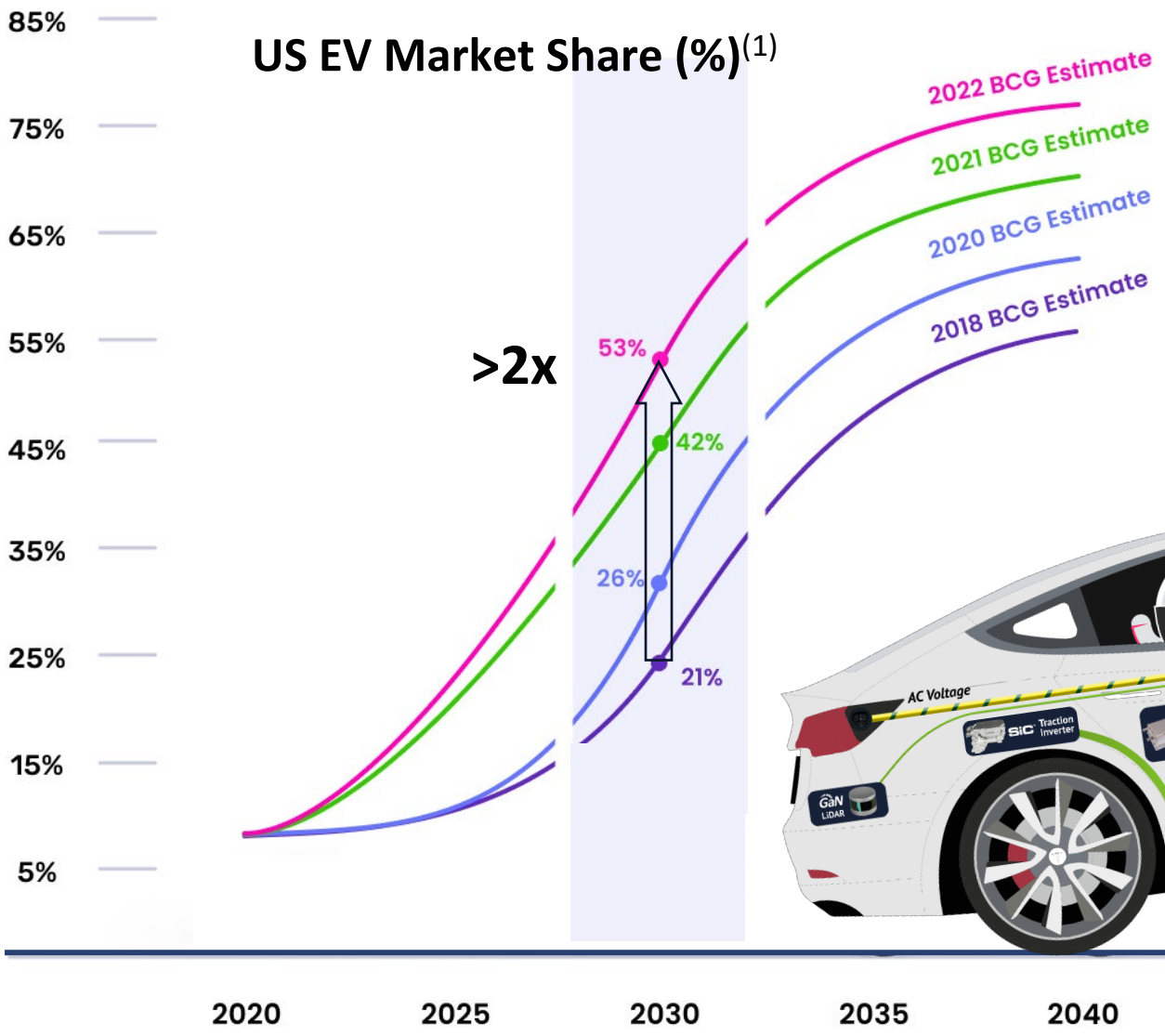
…But Supply & Demand Don't Match



Visual Capitalist Elements

Solar Power Duck Curve

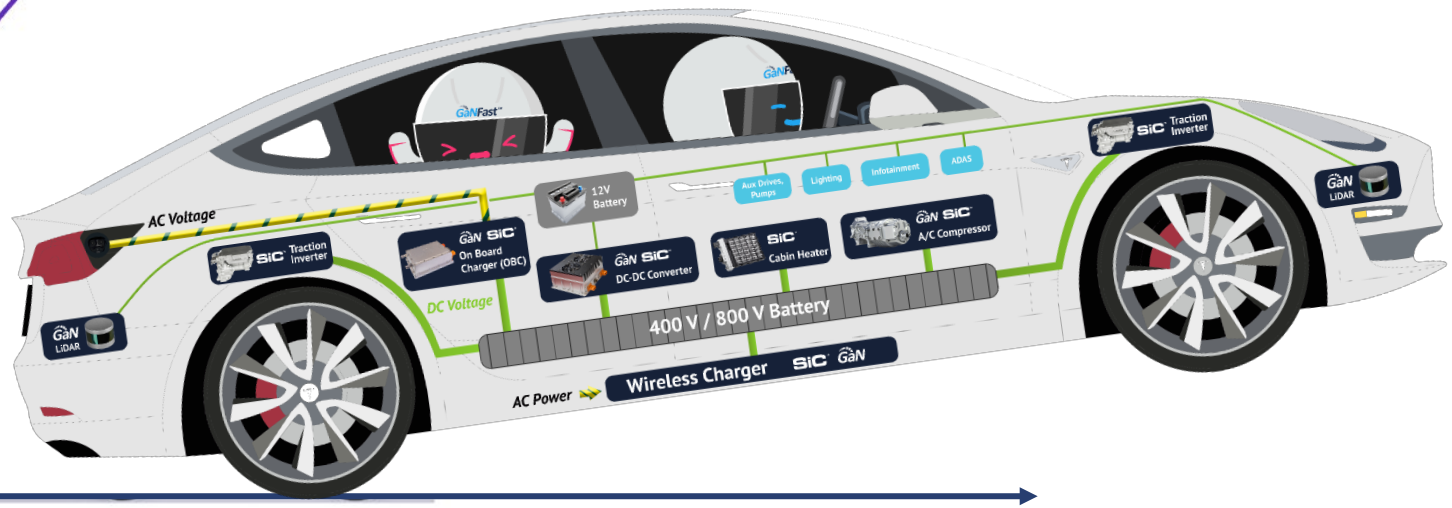
Accelerating Adoption: EV



>$11B/yr market opportunity(2)
>$300M Navitas customer pipeline(2)

Customers in Production, Engagement(3)

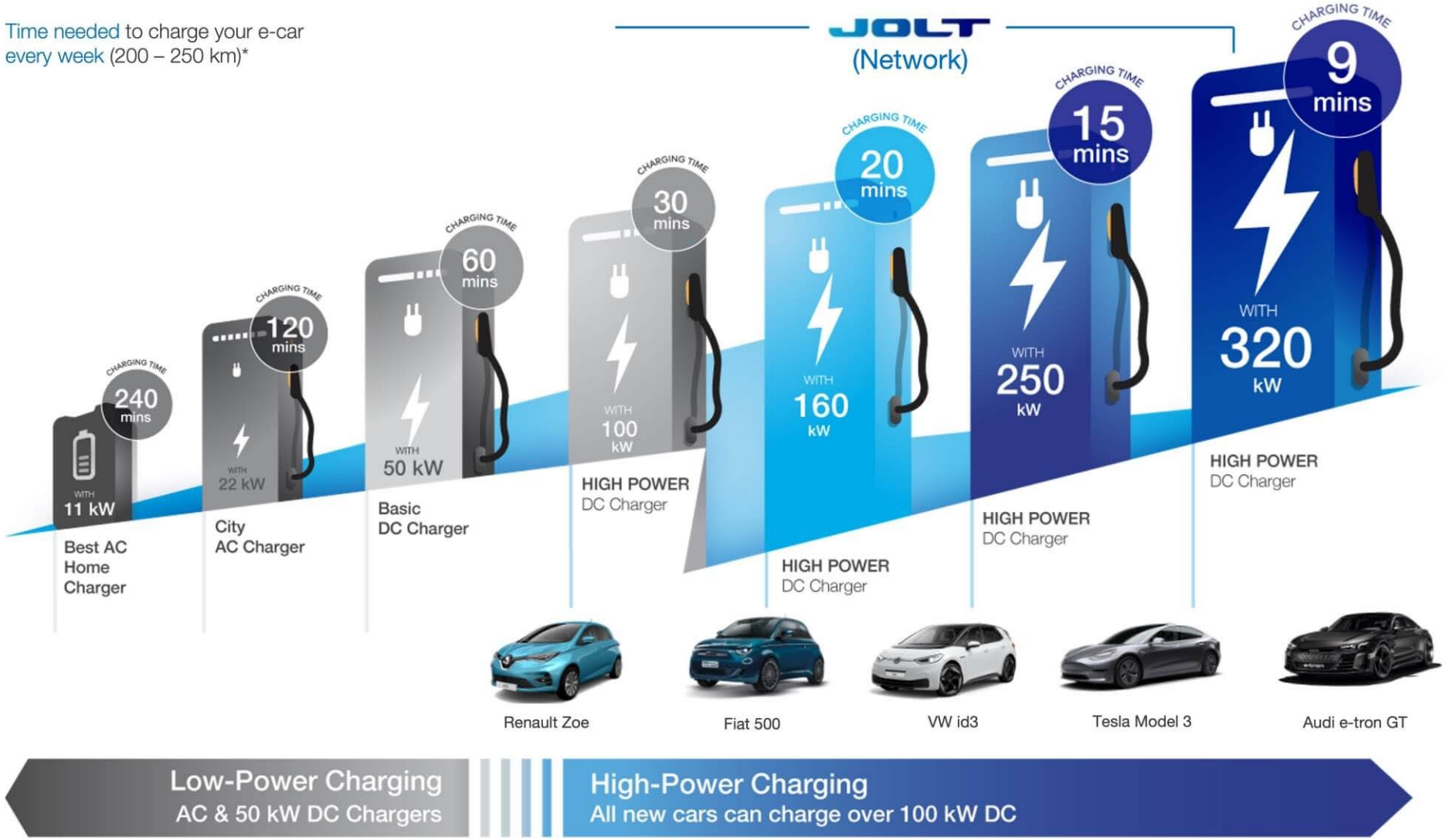
DYNEX Power through Innovation · BYD · BRUSA · INOVANCE Automotive · Rhombus Energy Solutions · ZEEKR · vitesco TECHNOLOGIES · SHINRY 欣锐科技 · ABB · AccoPower · GEELY · DELTA · VINFAST · HYUNDAI MOBIS · TRITIUM · SK signet · alpitronic · LG-MAGNA · chargepoint · AMG · BorgWarner · solaredge



(1) BCG, via https://www.recurrentauto.com/research/ev-adoption-us (2) Company internal estimate 2030, 30M EV/yr, based on DNV and Navitas analysis. Note: Assumes 150 kW traction inverter, 100 kWh battery, $100/kWh battery cost and typical 230 mile range. (3) Represent select potential, engaged customers. Logos do not indicate binding long-term agreements.

Accelerating Charging

Navitas

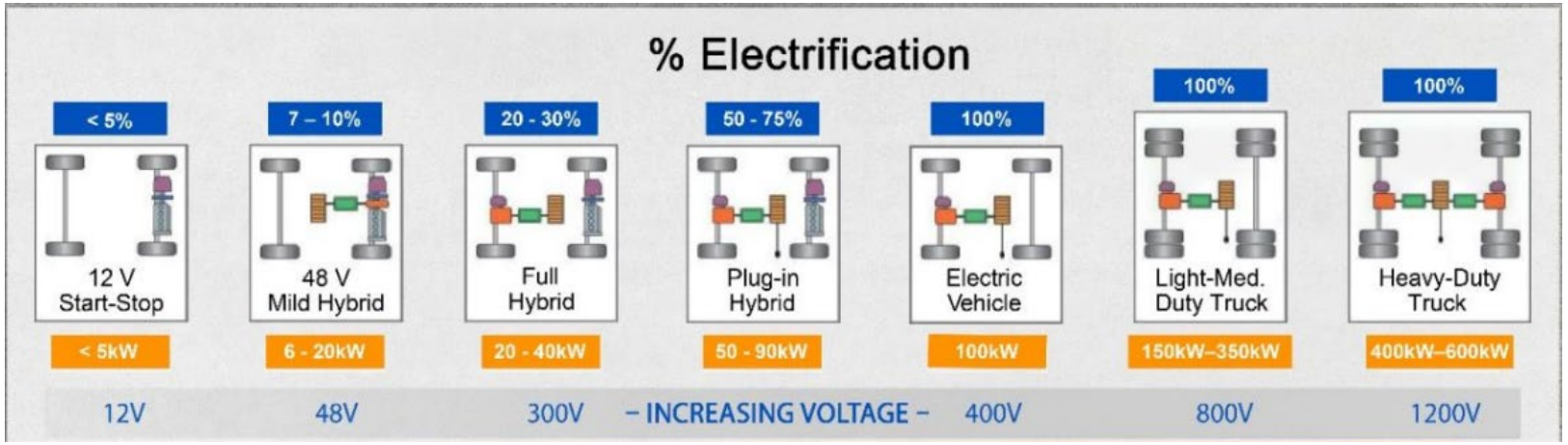


"10-80% charge in only 18 minutes!"(2)

(1) https://jolt.energy/whats-the-difference-between-ac-dc-and-ultra-fast-charging/

(2) Level 3 800V 350 kW DC charger 10-80% in 18 minutes for Genesis GV70 SUV

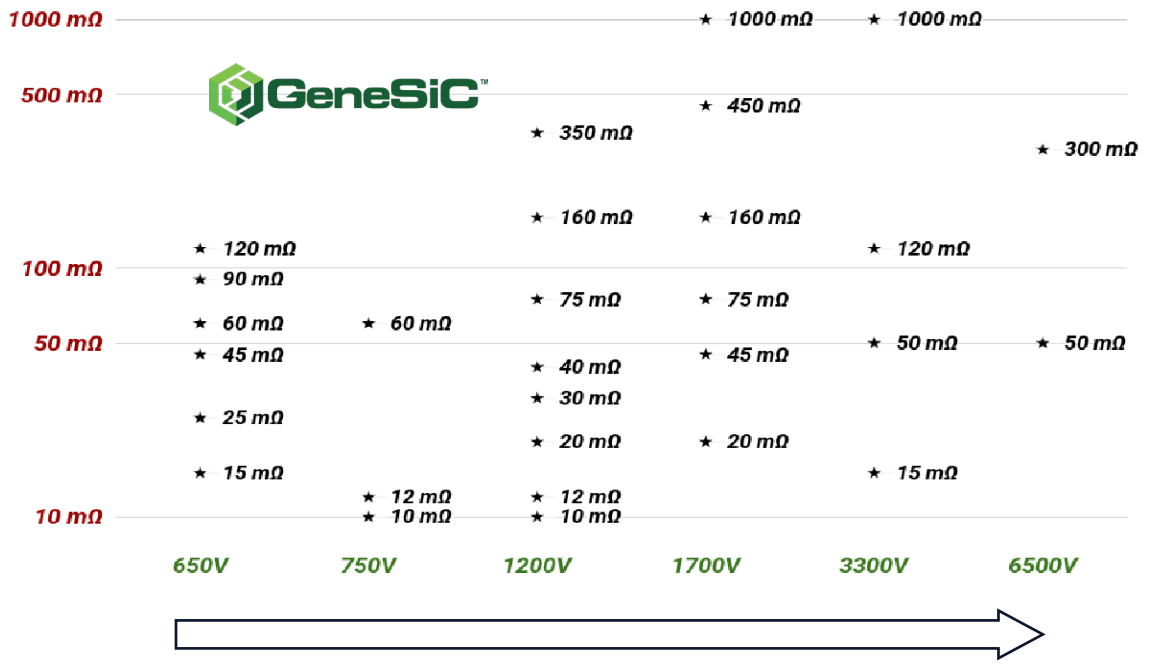
More Power, Higher Voltage Bus & SiC



Bus voltage increase to: [1]

- *Reduce I^2R conduction losses*
- *Improve the combined motor-inverter efficiency*
- *Reduced size of electric drive for the same power levels*
- *Avoid AC-DC conversion losses*

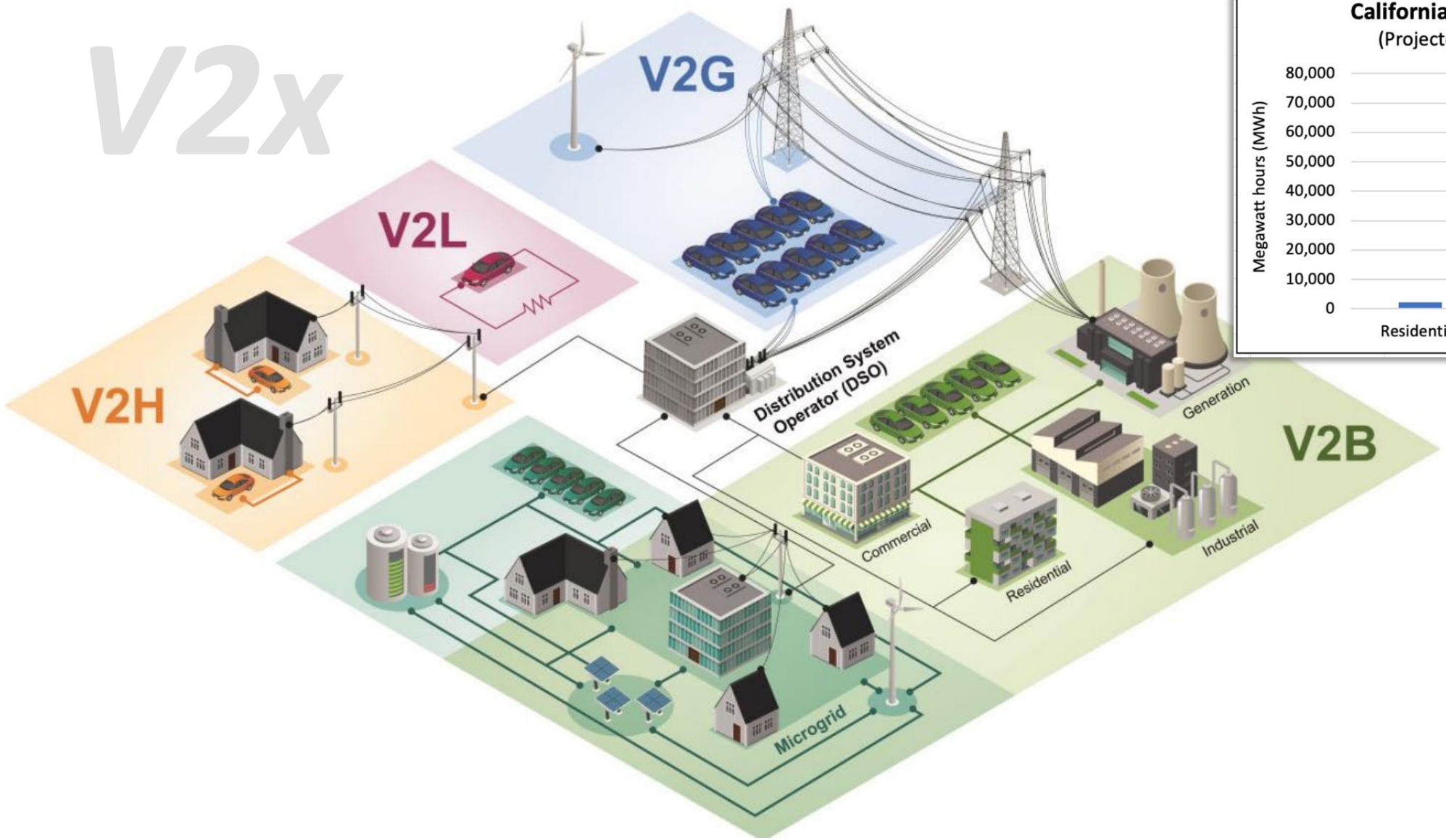
Higher bus voltages need higher-rated SiC powertrains



(1) Oak Ridge Nat. Lab. & National Renewable Energy Lab. Medium- and Heavy-Duty Vehicle Electrification: An Assessment of Technology and Knowledge Gaps (December 2019) ORNL/SPR-2020/7

“Vehicle-to-Everything” Flattens the Duck

Navitas



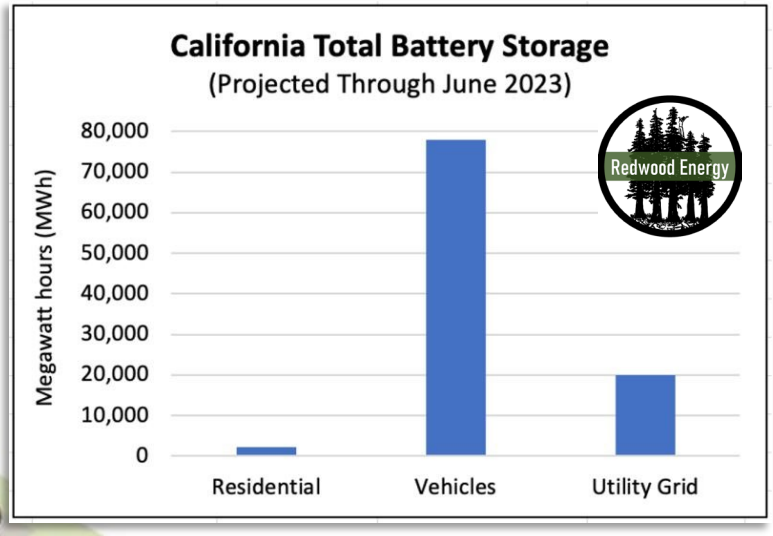


Image: Andrew W Thompson, Yannick Perez. Vehicle-to-Anything (V2X) Energy Services, Value Streams, and Regulatory Policy Implications. 2019. ffhal-02265826f
Chart: Sean Armstrong, Redwood Energy

V2x with GaNFast 3-in-1

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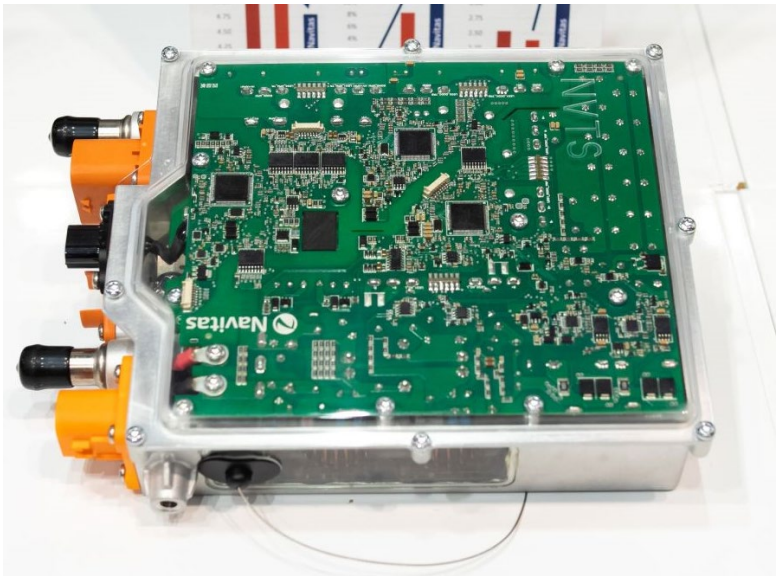
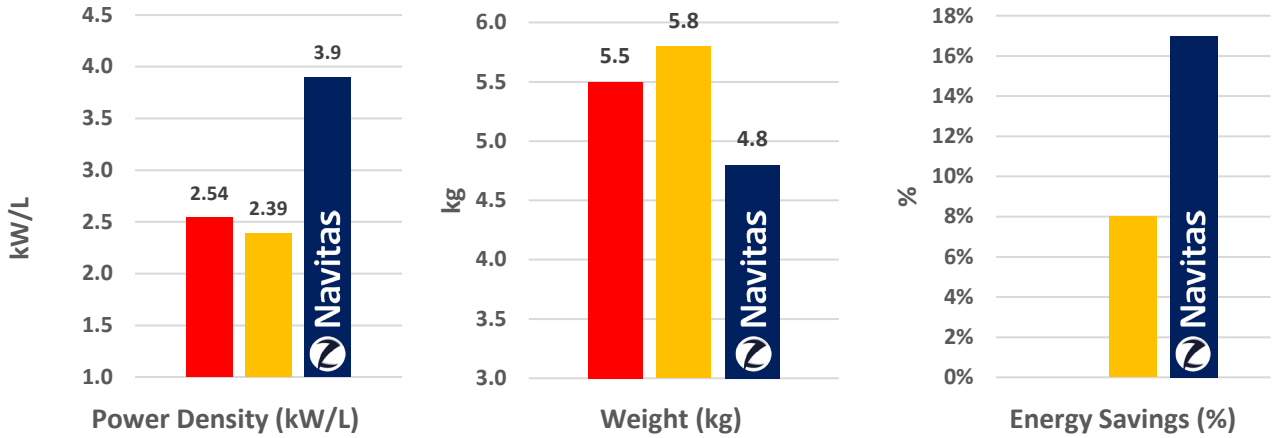
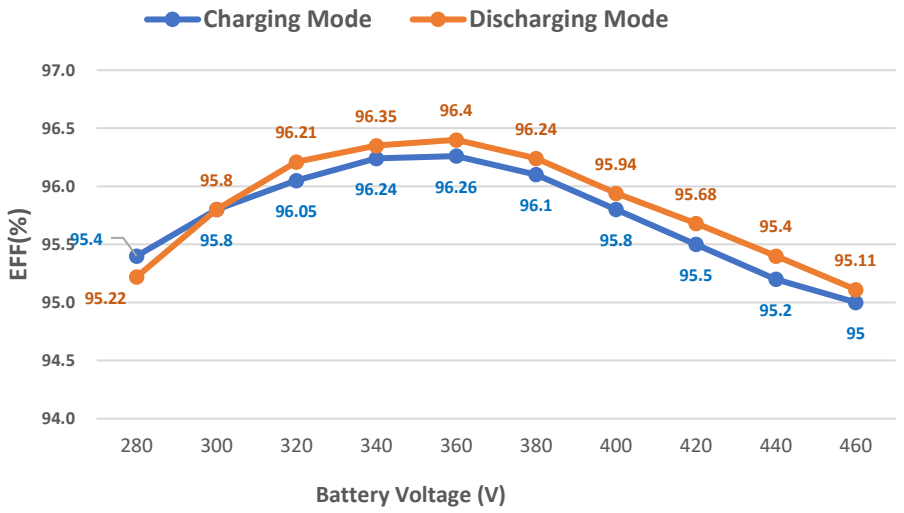
6.6 kW 3-in-1

Bi-di Interleaved CCM Totem-Pole AC/DC (*100 kHz*)
+
Bi-di CLLC Converter (*450~900 kHz*)
+
Hard Switching HV-LV DC/DC (*65 kHz*)



- 6.6kW Bi-di OBC
- AC Voltage: 90 ~ 265 V_{AC} / up to 32 A
  - DC Voltage: 250~500 V, 280~460 V full load
  - Power: 6.6 kW charging / 6.0 kVA discharging
  - Efficiency : > 95.0% @ full load
- 3.0 KW DC/DC
  - LV DC Voltage: 9~16 V
- Dimension: 210 mm x192 mm x 61 mm(<2.5L)
- Cooling: -40˚C~65˚C @ liquid cooling
- Others: IP 67, CAN interface



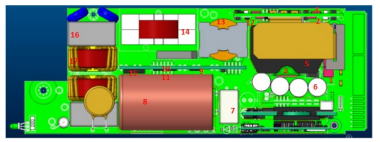


Navitas EV Design Center has 5 platform designs including 400V, 800V and 6.6–22 kW, bi-di charger (2-in-1), bi-di + DC-DC (3-in-1)

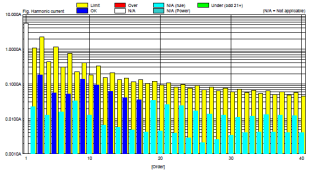
Accelerating Time-To-Market

Unique System Design Centers

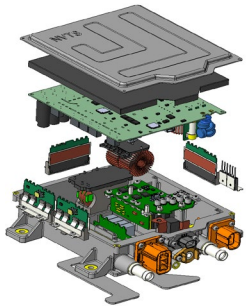
System Design
High Frequency, High Efficiency, High Density, High Integration



Electrical, thermal, mechanical, EMI, BOM cost, manufacturing and yields

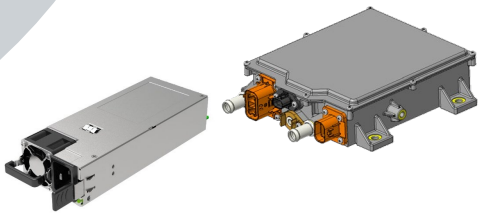


Customer Co-Development
Joint Labs / Joint Development



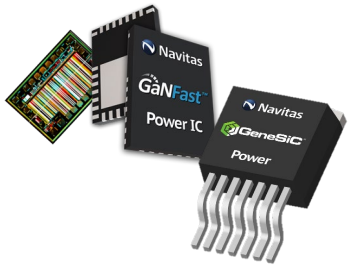
Close customer co-op for qualification, certifications, production readiness

Mass Production
Fast time to market

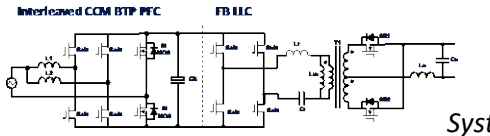


System know-how drives innovation

Semi Design
Application-specific GaN / SiC



System design evaluation & feedback



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