



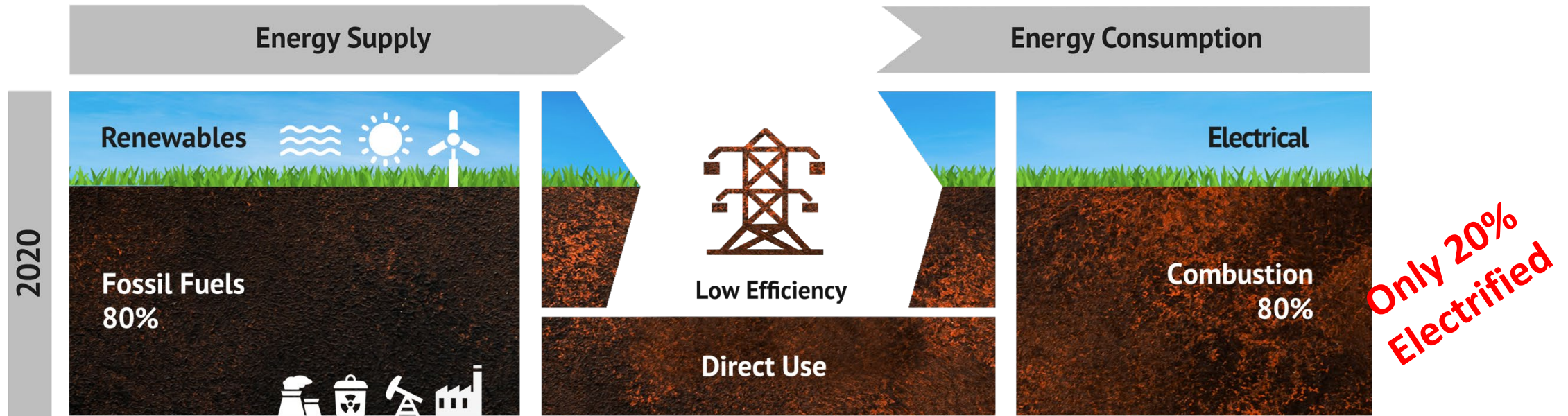
“Electrify Our World™” with next-gen GaNFast and GeneSiC power

Dan Kinzer
CTO/COO, Co-founder

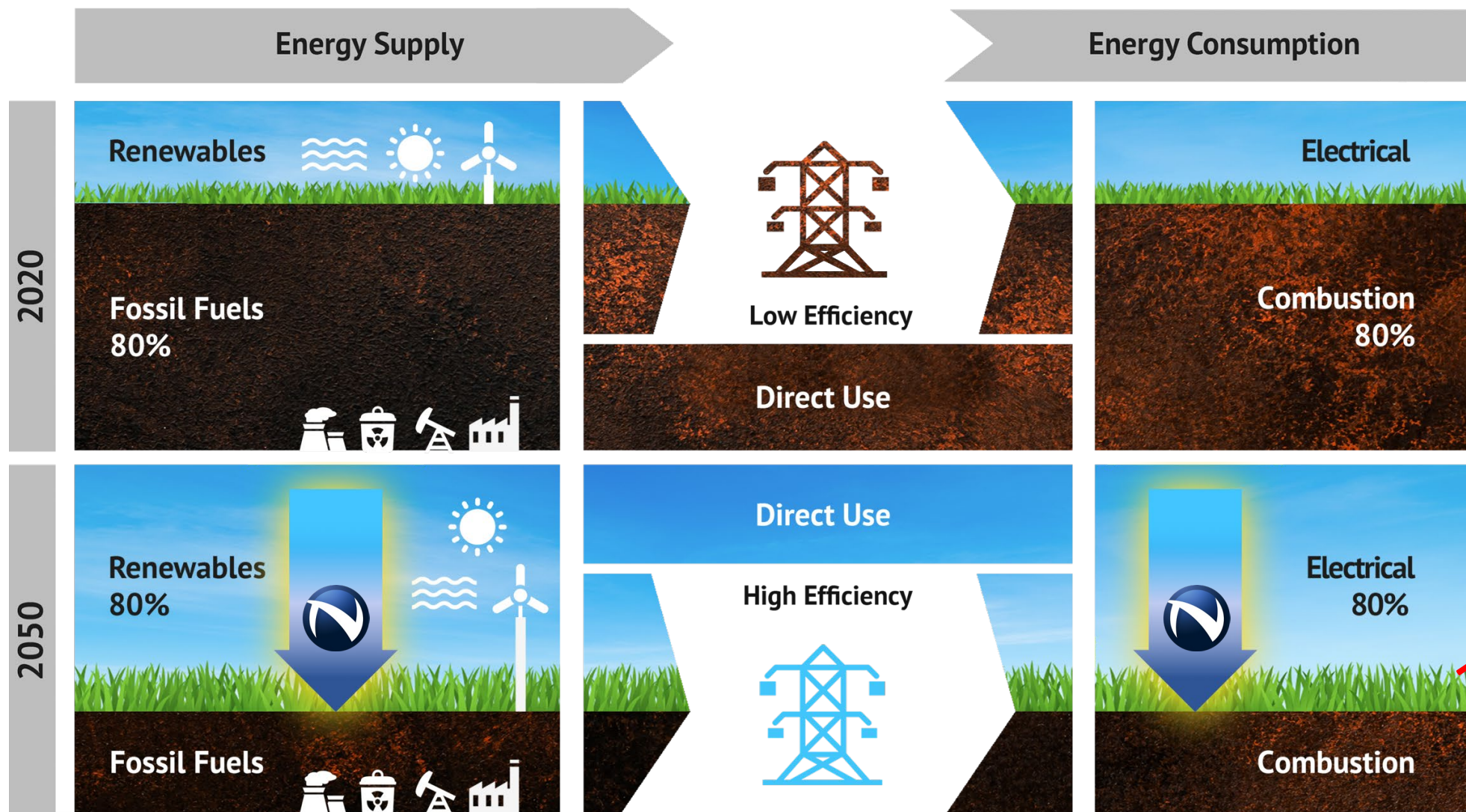
February 2024



The Fossil Fuel Challenge



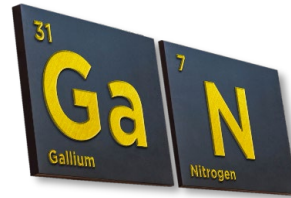
Only 20% Electrified





The Pure-Play,
Next-Gen Power
Semiconductor
Company

GaNFast™



GeneSiC™



Up to
20x

Faster
Switching⁽¹⁾

Up to
3x

Smaller &
Lighter⁽¹⁾

Up to
40%

Energy
Savings⁽¹⁾

Up to
3x

Higher
Power Density⁽¹⁾

Up to
3x

Faster
Charging⁽¹⁾

Up to
25%

Lower
System Cost⁽²⁾

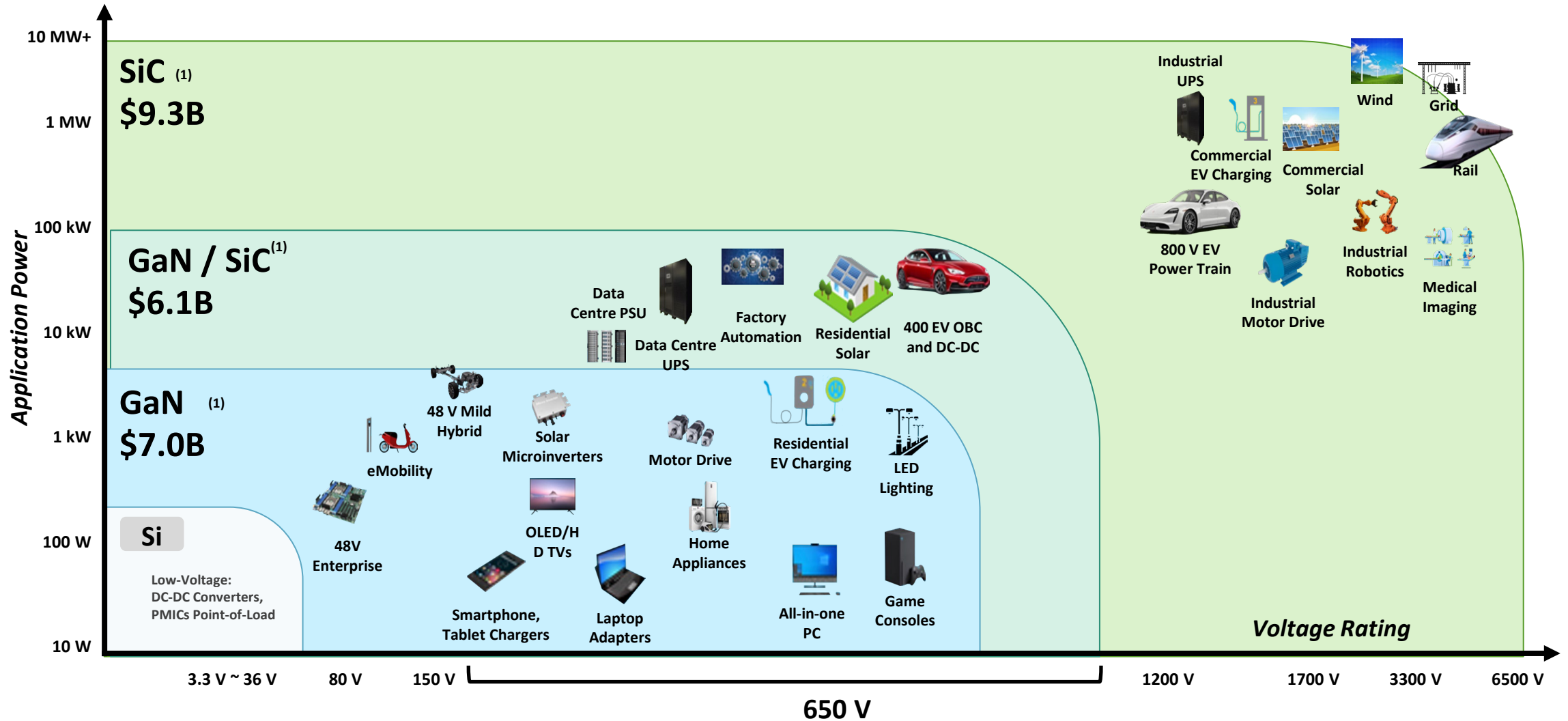


**GaN and SiC Replacing Si in Next-Gen
Power Applications**

Notes:

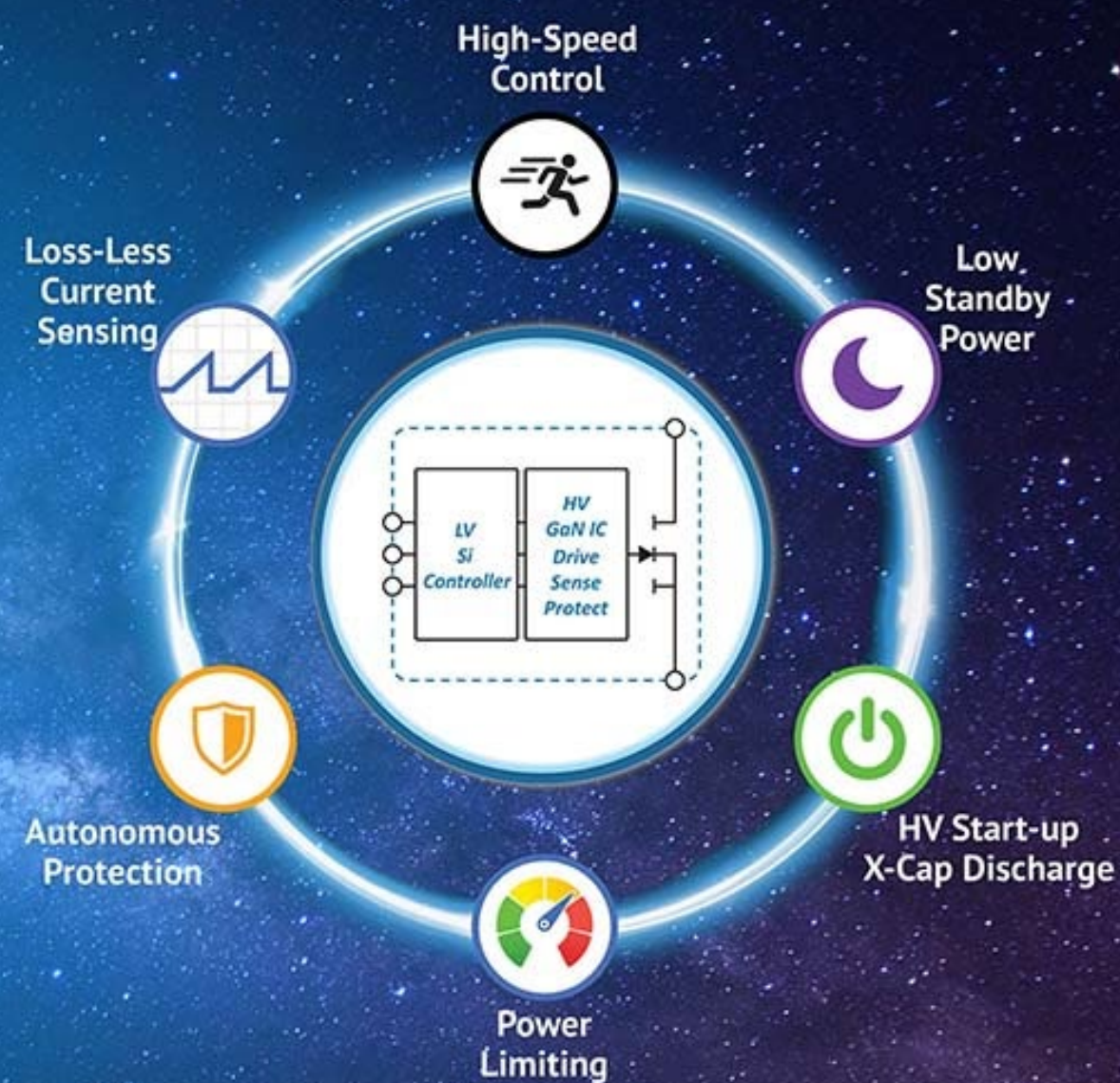
1. Statistical data is based on Navitas estimates of GaN-based systems compared to Si-based estimates in the 2024-2025 timeframe. Based on Navitas measurements of select GaN-based mobile wall chargers compared to Si-based chargers with similar output power, incl. 2019 study of 65W fast chargers, 2022 customer statement re 2.7 kW data center AC-DC
2. Navitas estimates based on customer feedback as the expected system cost saving overtime as of April 2024

\$22B+ GaN & SiC 'Pure-Play' Opportunity ⁽¹⁾



Notes: 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
- Per Yole Development, 2024-2024 estimated market revenue

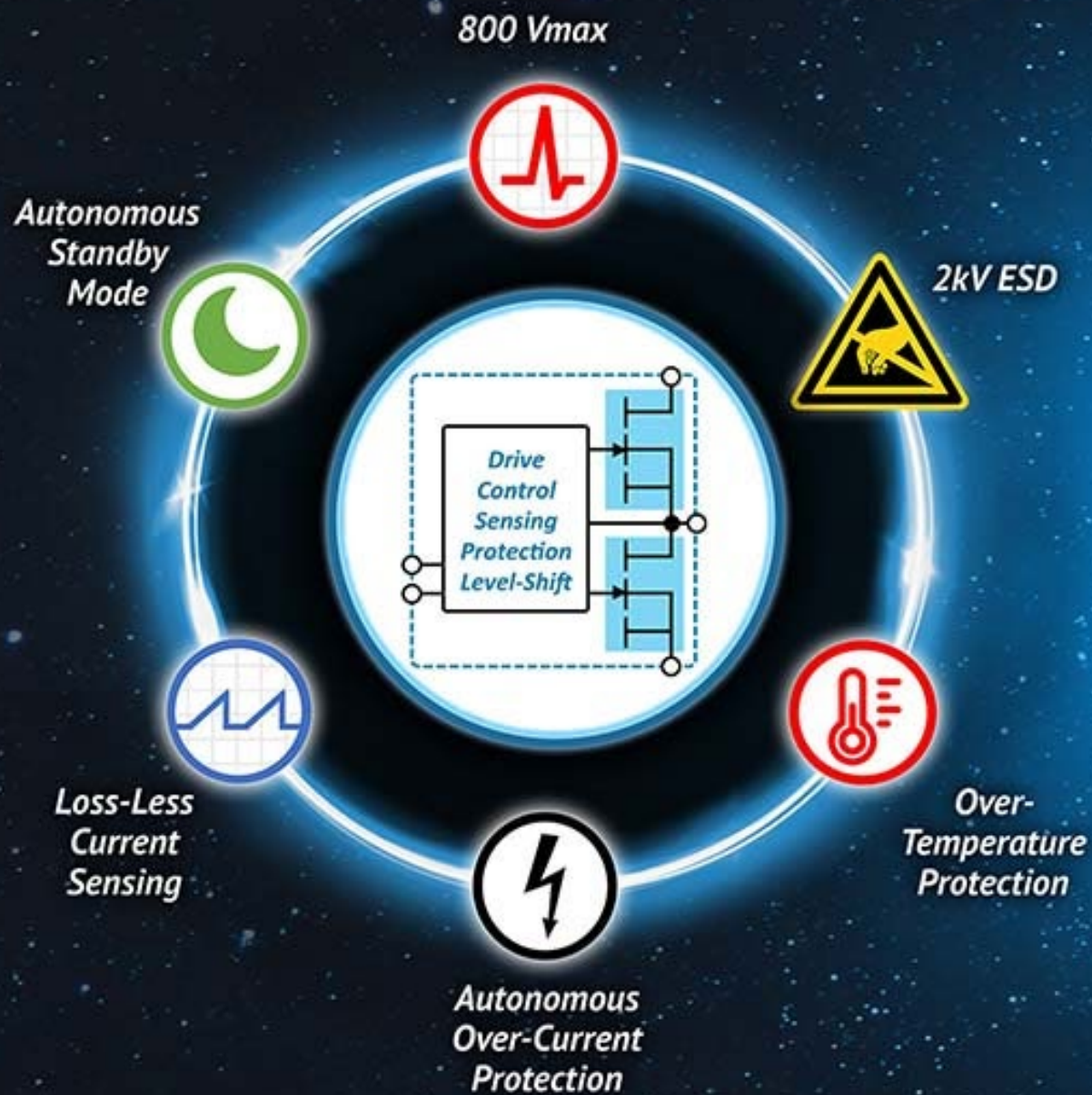


 **Navitas**

GaN Sense Control 65W = Faster, Smaller, Slimmer

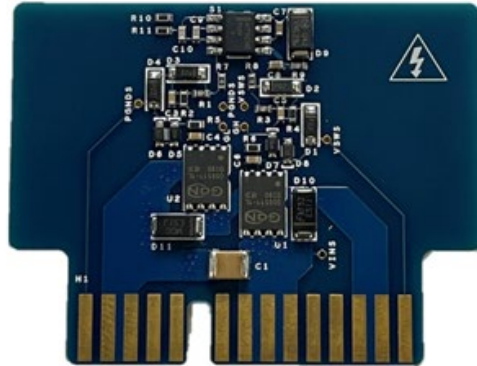


	Company P 45W	Navitas Planar 65W	Navitas Benefit
PCBA			
Size PCBA Size Cased	83 cc 116 cc	28 cc 49 cc	58% Smaller
Power	45 W	65 W	44% Higher
Efficiency	92 %	93 %	15% Energy Savings
Power Density	0.41 W/cc	1.75 W/cc	4x Higher
Frequency	65 kHz	225 kHz	3.5x Faster
Standby Power	< 30mW	< 20mW	33% Lower



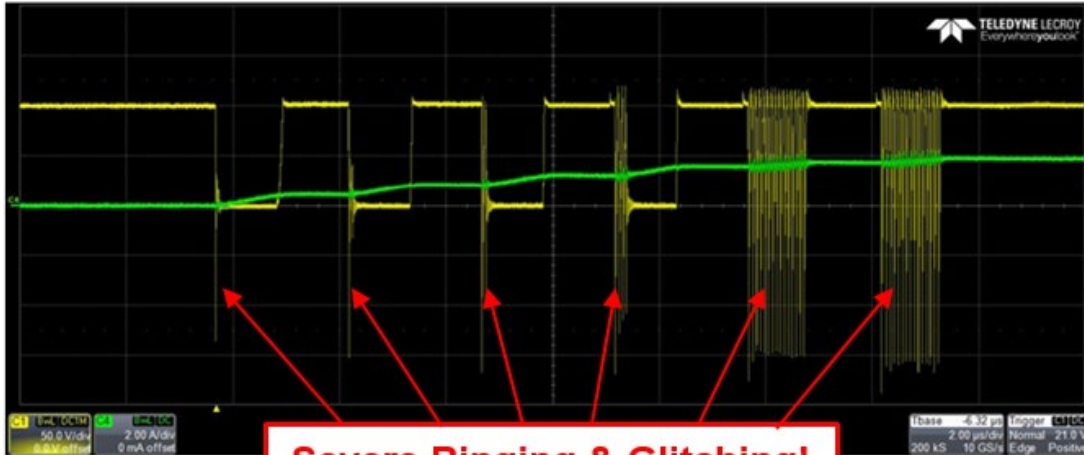
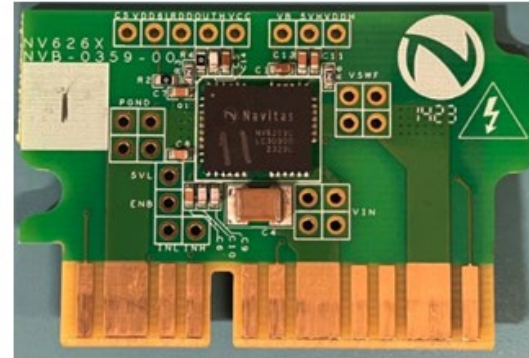
Discrete GaN Half-Bridge

- × 33 components
- × 250mm² footprint
- × 1x ext. HB driver HVIC
- × 1x ext. HV bootstrap
- × 2x HV bypass diodes
- × 2x gate drive circuits
- × Exposed gates

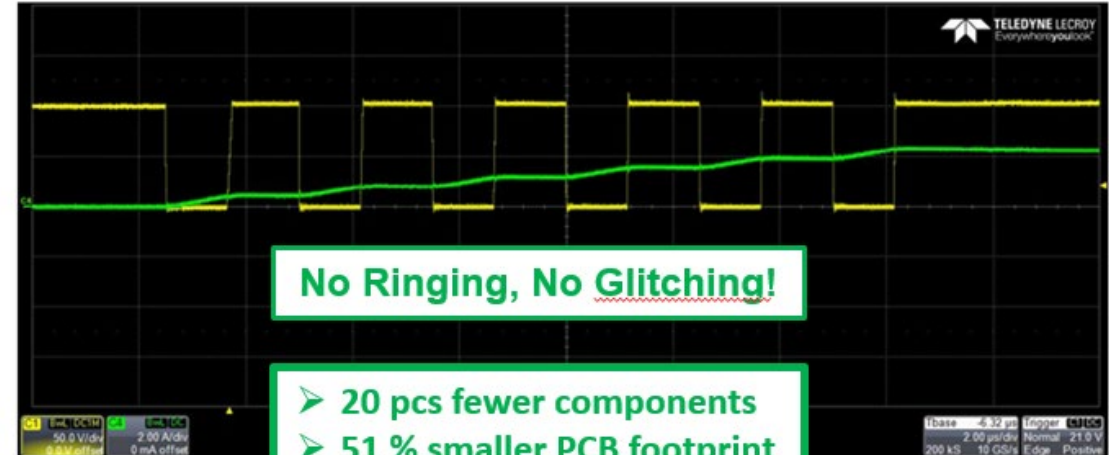


NV6269C GaNSense Half-Bridge IC

- ✓ 13 components
- ✓ 122mm² footprint
- ✓ Int. level shifters
- ✓ Int. bootstrap
- ✓ Int. gate drivers
- ✓ No exposed gates



Severe Ringing & Glitching!



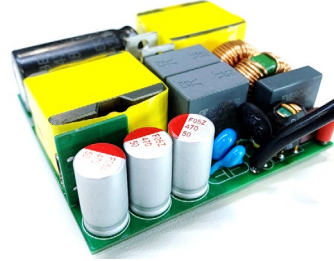


No Ringing, No Glitching!

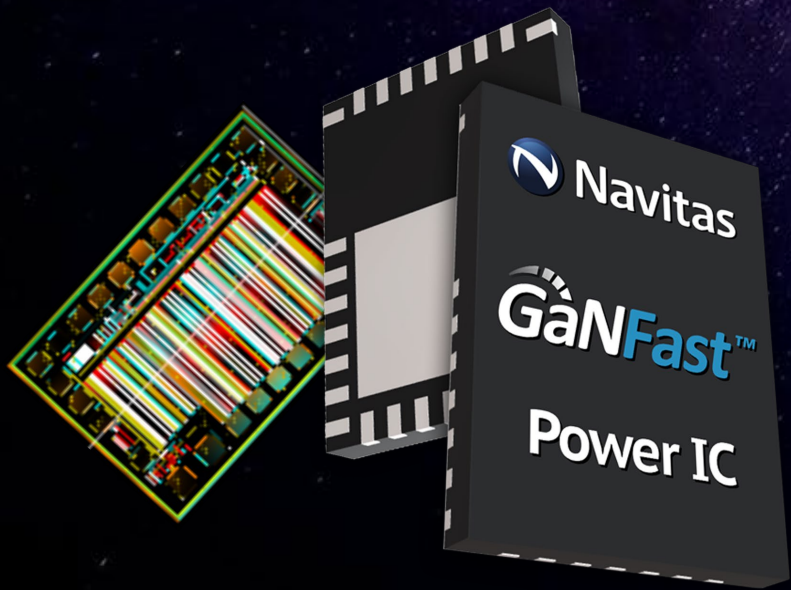
- 20 pcs fewer components
- 51 % smaller PCB footprint
- No exposed gates
- Clean, reliable switching!

All-GaN Sense 240 W = Up to 5.5% Higher Efficiency, 50% Smaller!



	Company X 240W	Company Y 240 W	All-GaN Sense 240 W	Navitas Benefit
PCBA				
Size PCNA Size Cased	186 cc 277 cc	156 cc 211 cc	100 cc 150 cc	Up to 50% smaller
Efficiency	92.0 %	90.5 %	96 %	Up to 60% Energy Savings
Power Density	0.87 W/cc	1.1 W/cc	1.6 W/cc	Up to 1.8x Higher
Frequency	100 kHz	100 kHz	200 kHz	2x Faster
Complexity	PFC (GaNFast) + AHB (Si) PCB = 240 mm ² 16 pcs shrunberry	PFC (GaNFast) + AHB (Si) PCB = 240 mm ² 16 pcs	T-P PFC (GaN Sense H-B) + AHB (GaN Sense H-B) PCB = 87 mm ² 11 pcs	Highest Integration 64% Smaller PCB Area 5 pcs fewer

10 / Top 10 Mobile OEMs Mass Production



ONEPLUS Navitas

OnePlus 10T 5G
Evolve Beyond Speed
Let's go GaNFast™

Navitas
Let's go GaNFast™

Redmi Book Pro 14 (2022)

Lenovo LEGION

135W

Navitas
Let's go GaNFast™

Moto X30 Pro

125W

Navitas
Let's go GaNFast™

Let's go GaNFast™

DELL Navitas

mi Navitas
xiaomi Let's go GaNFast™

VIVO

80W
Dual C Port

Navitas
Let's go GaNFast™

Redmi Note 12

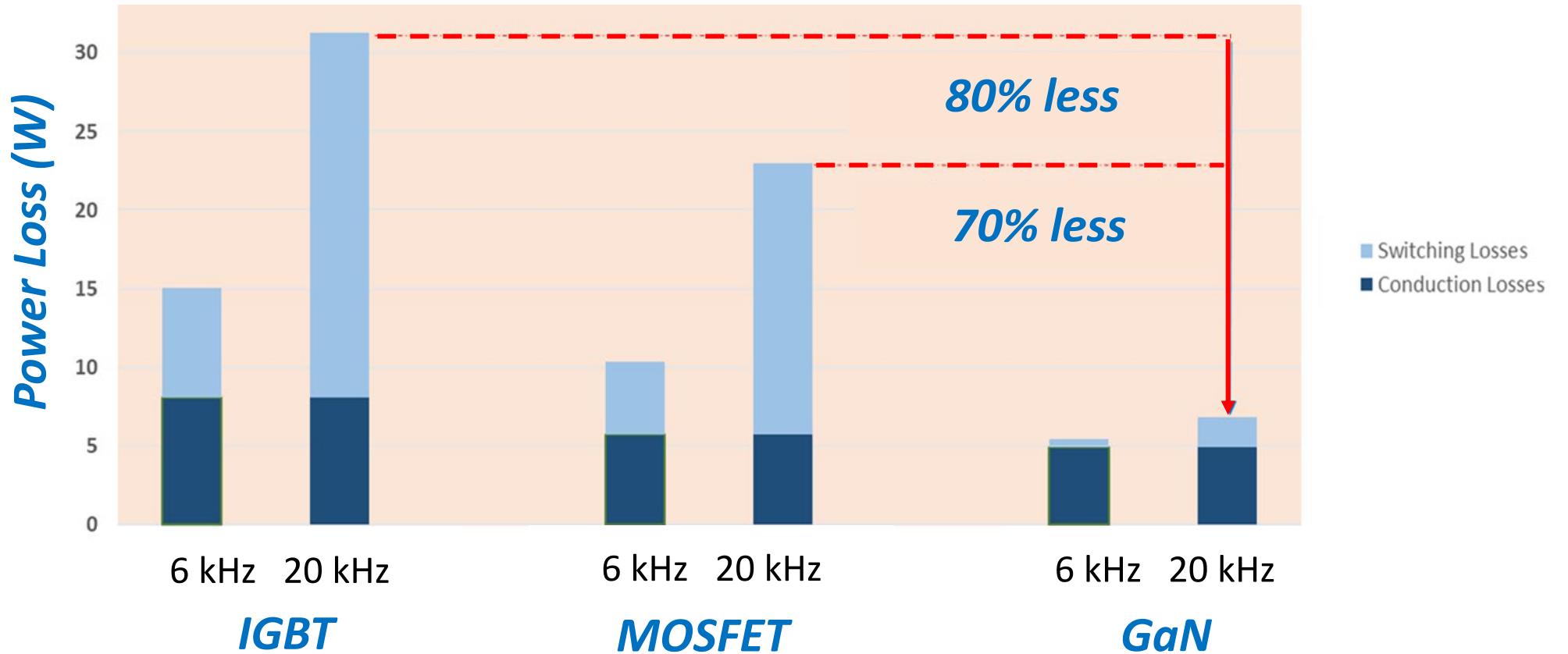
210W

100% in 9 minutes

Navitas
Let's go GaNFast™

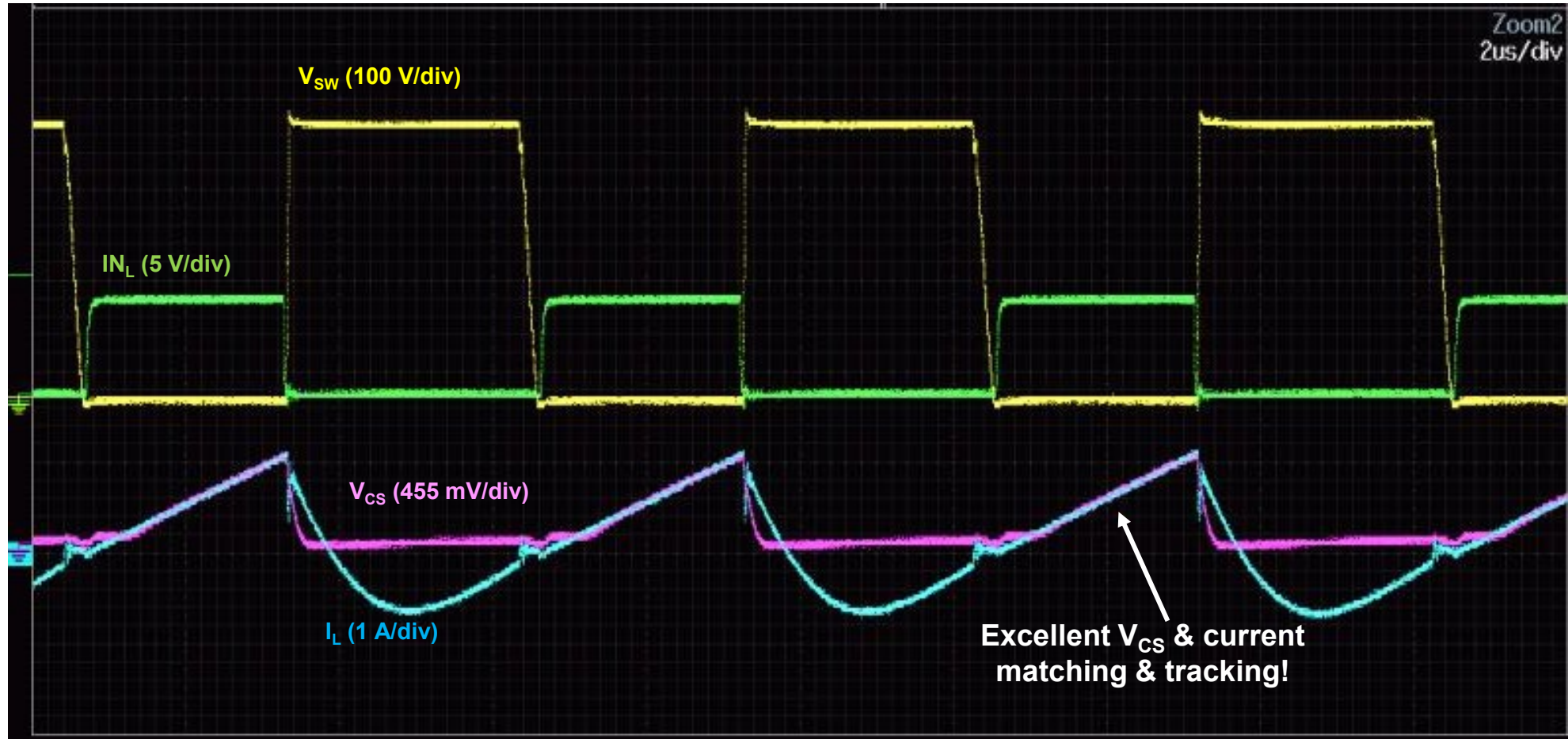
SAMSUNG
Galaxy S24

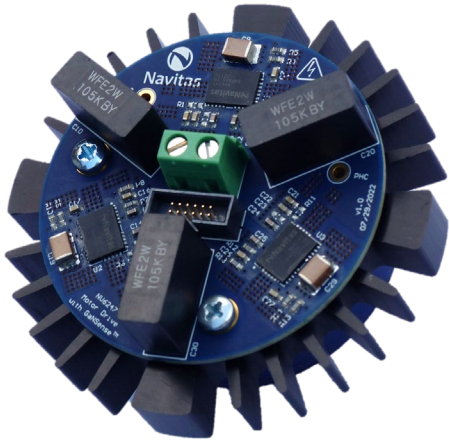
Navitas
Let's go GaNFast™



- 80% less power loss
- No heatsink
- 2% higher motor efficiency

Loss-less R_{SENSE} : 140 W, 3-phase Motor



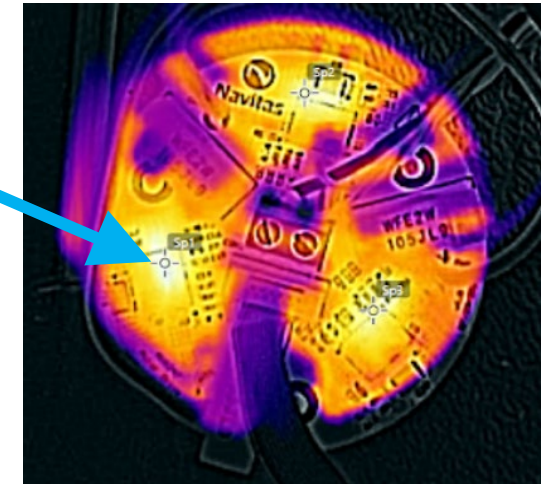


- 100 kHz capability
- 3x NV6247 GaNSense Half-bridges
- High density
- Strong protection

GaNSense™

300 W, 20 kHz peak temp only **52°C**

No Heatsink



GaNSafe™

The World's Safest GaN

 Navitas



2 kV ESD



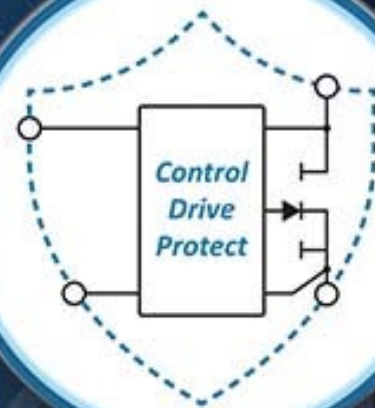
Easy EMI



High-Speed Short-Circuit Protection



800 V max



Robust Operation

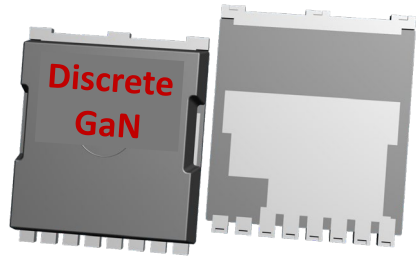


Easy Cooling



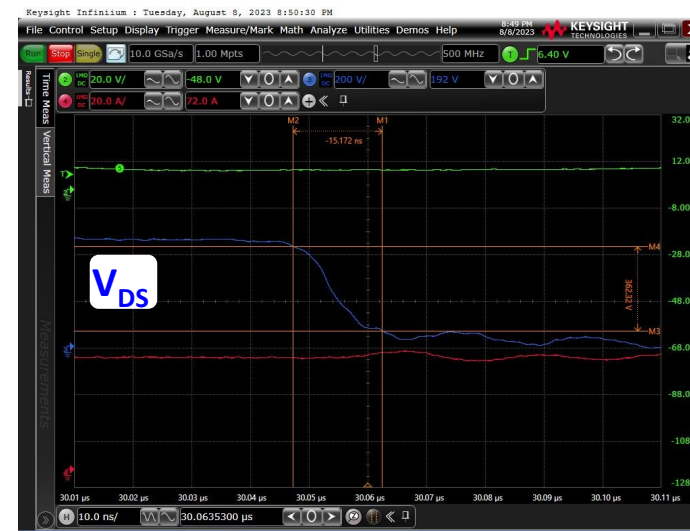
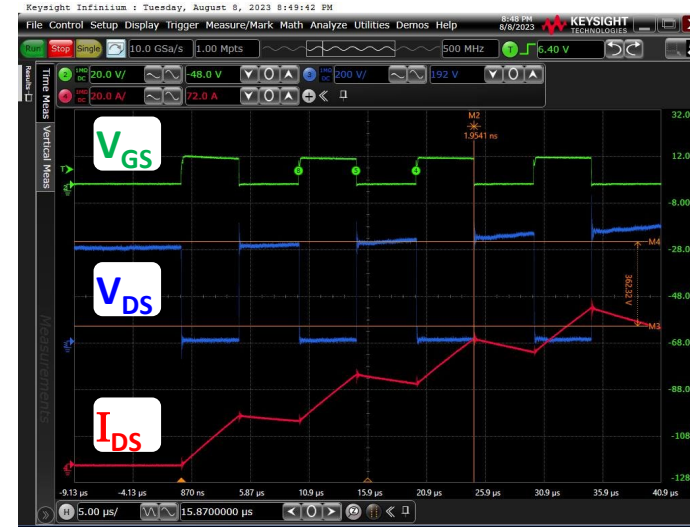
GaNSafe Reliability: Double-Pulse Test

- Double-pulse test:
400 V, 30 A, $R_{SERIES} = 11\text{ m}\Omega$



Discrete GaN
42 m Ω max

Significant spikes
Excessive turn-ON ringing
250 V undershoot



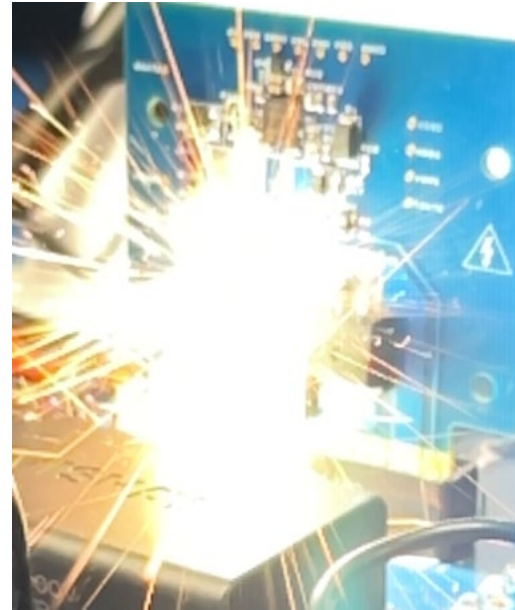
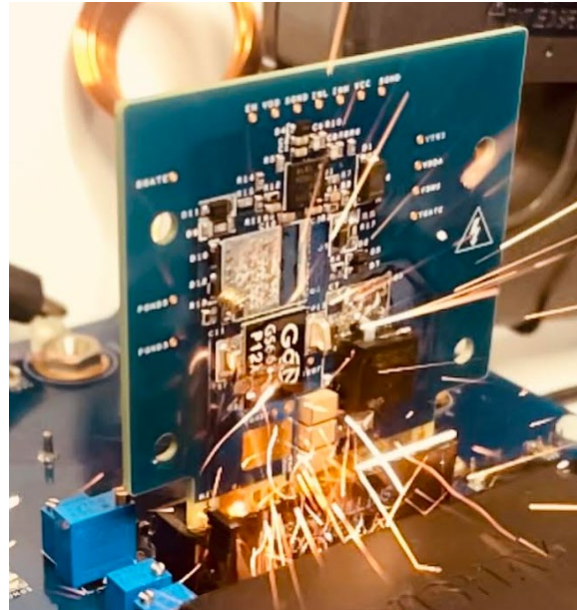
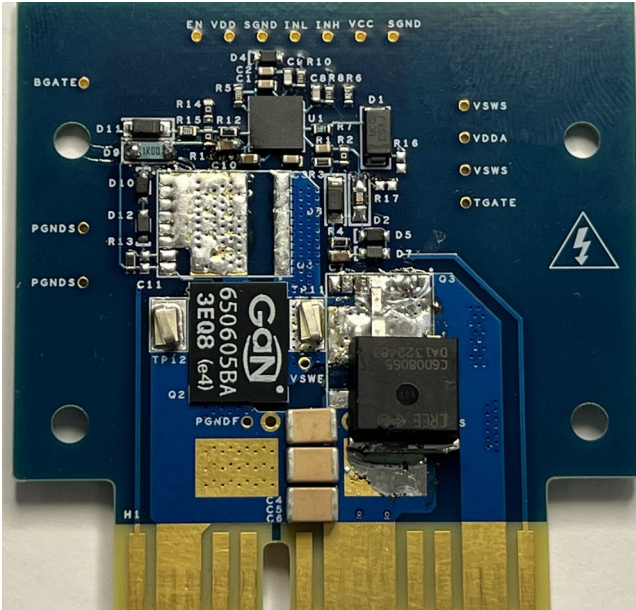
GaNSafe™

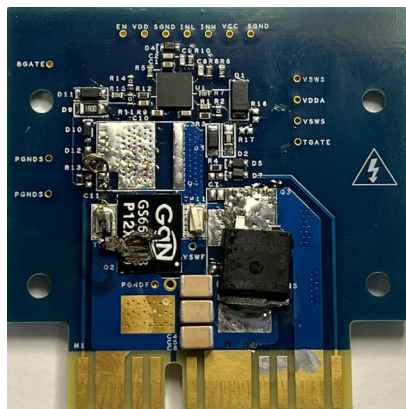
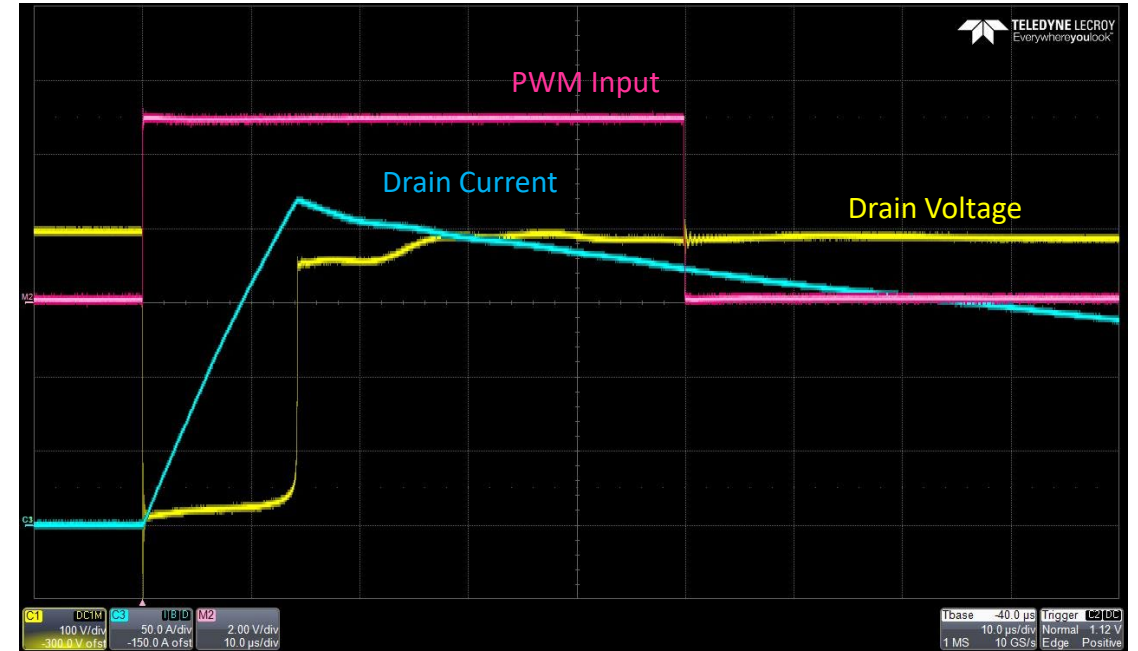
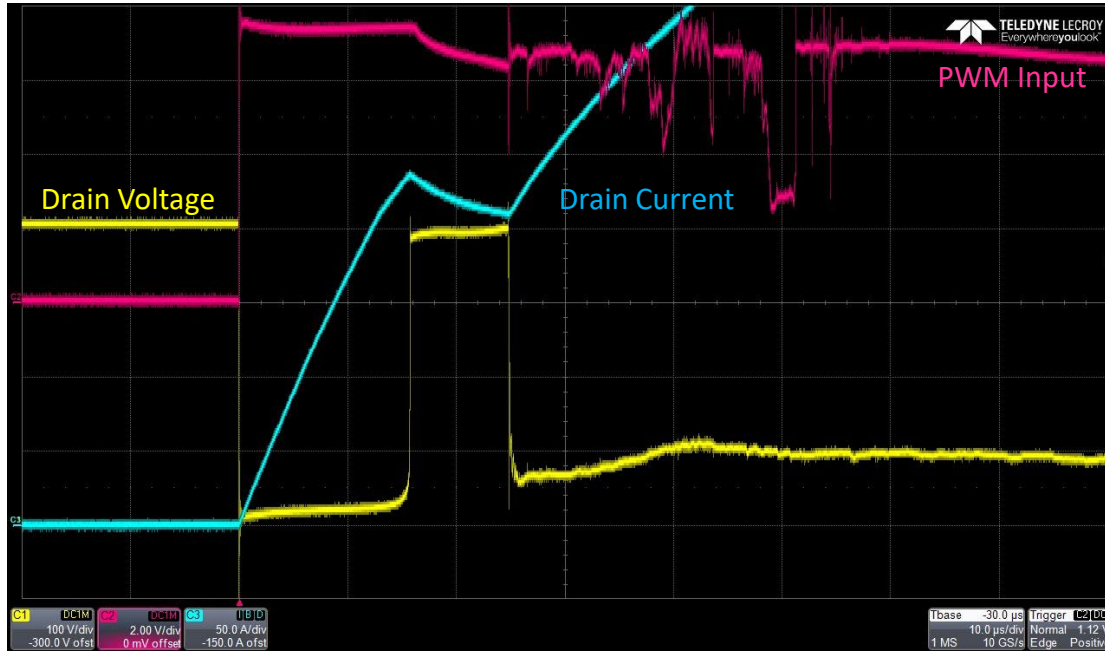
45 m Ω max (NV6513)

No voltage spikes
No ringing
No undershoot

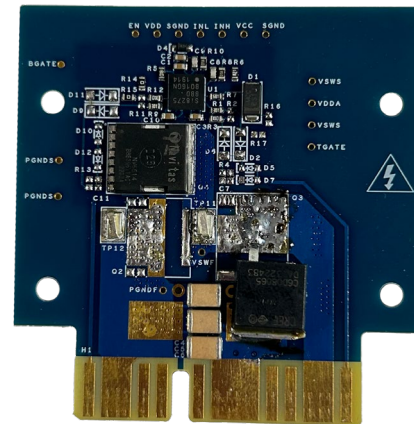


Discrete GaN: Short-Circuit Failure





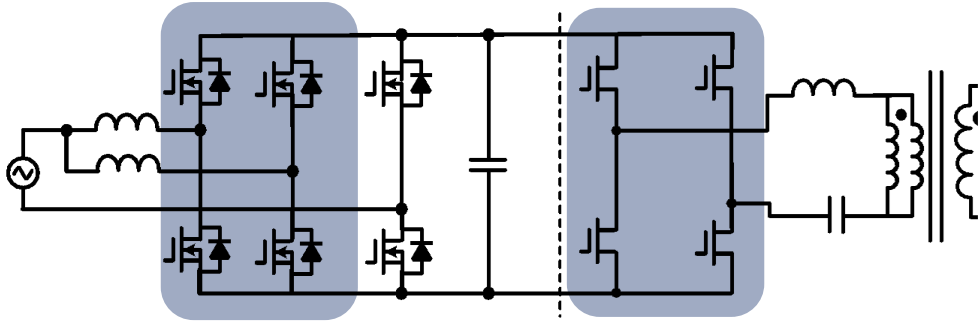
- Company X GaN discrete
- 650 V, 25 m Ω typ
- **Fails short**



- Navitas GaNSafe
- 650 V, 25 m Ω max (NV6514)
- **Survives short-circuit**

NVTS 4.5 kW AI Server Pushes Even Higher

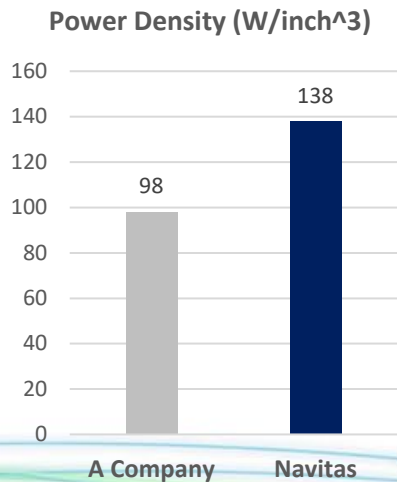
- Data center AC-DC 54 V AI/GPU Server PSU
- CRPS185 form factor



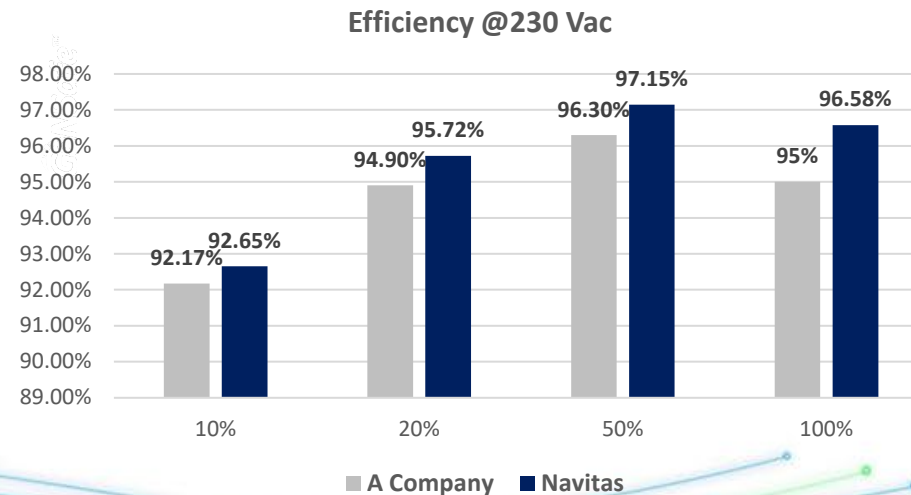
Company	A Company	Navitas
Power	3,200 W	4,500 W
DC-DC	<150 kHz Si/SiC	300 kHz GaN
PD	98 W/inch ³	138 W/inch ³
Eff	~96.3%	>97%

Navitas
40% Higher Power Density

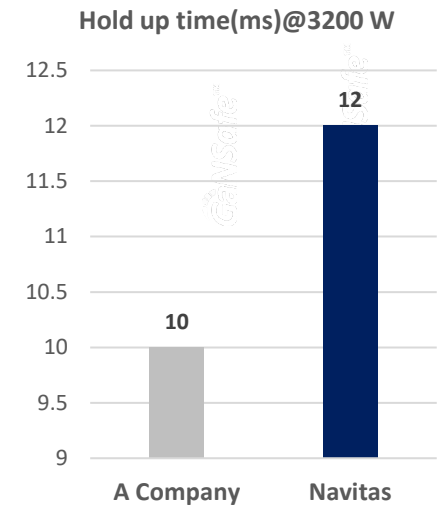
Navitas ~138 W/in³



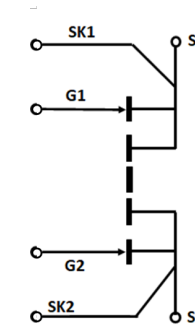
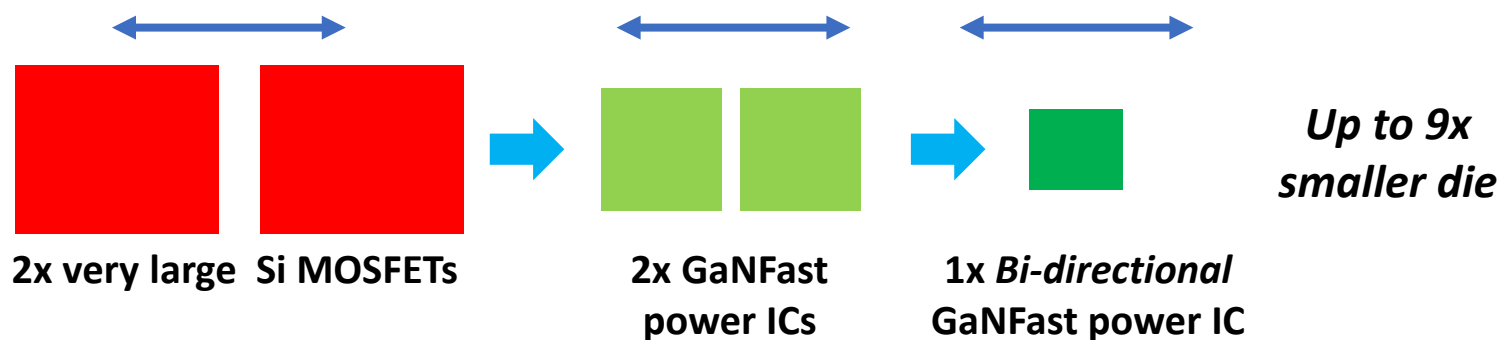
Navitas >97% Efficiency



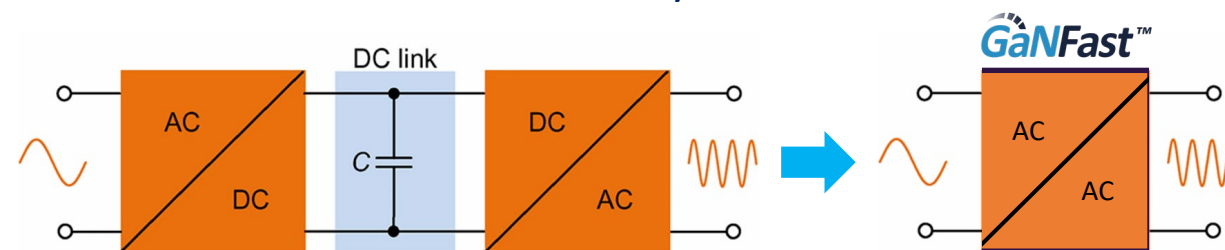
Navitas +40% Hold-up



World's First Bi-Directional GaN Power IC



- Using traditional power semis, two-way (bi-directional, or positive/negative) operation needs multiple, large-chip parts
- Proprietary, 'bi-directional' GaNFast power ICs are the smallest, most efficient, lowest system cost solution
 - Optimized for fast switching, AC voltage applications
 - Enable 'previously-impractical' topologies
 - Integrated circuitry ensures reliability
- Applications: High-power industrial, solar, energy storage, motor drives
- Topologies: Heric Inverter, Vienna Converter, T-type NPC Inverter, Matrix AC/AC Converter
- Mass production target 2024



Direct power conversion with bi-directional GaNFast means simple, small, efficient, low system-cost AC-AC conversion



Up to 6.5 kV

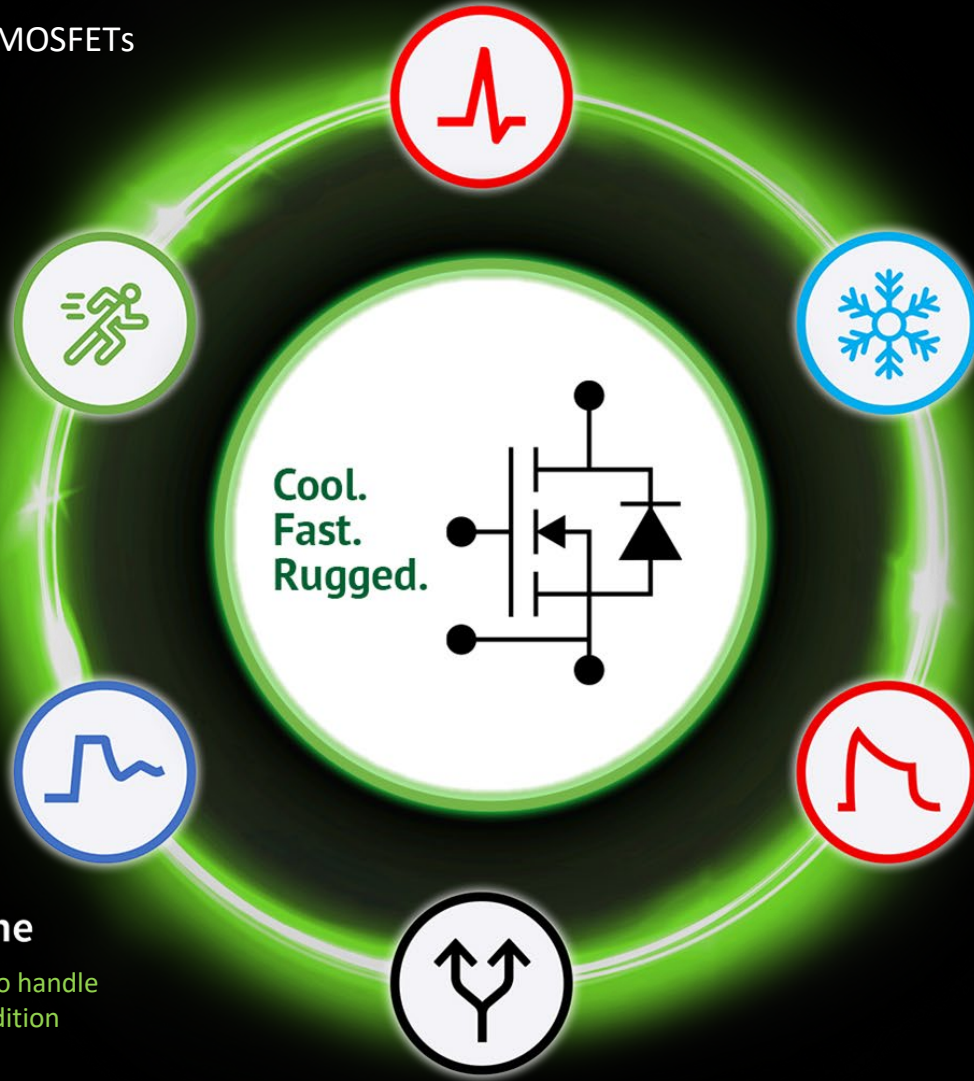
Largest range of SiC FETs & diodes
(650 V to 6.5 kV)

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)



Cool.
Fast.
Rugged.

High-Power Paralleling

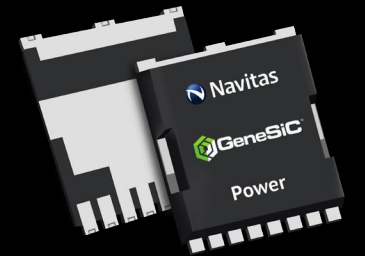
Matching currents
(Stable V_{TH})

100%-Tested Robust Avalanche

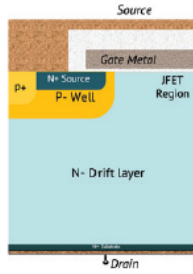
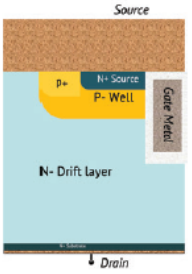
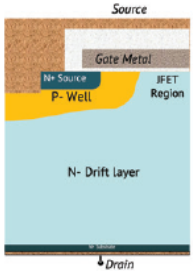
Highest published capability to handle excess energy in fault condition

Long Short-Circuit Withstand Time

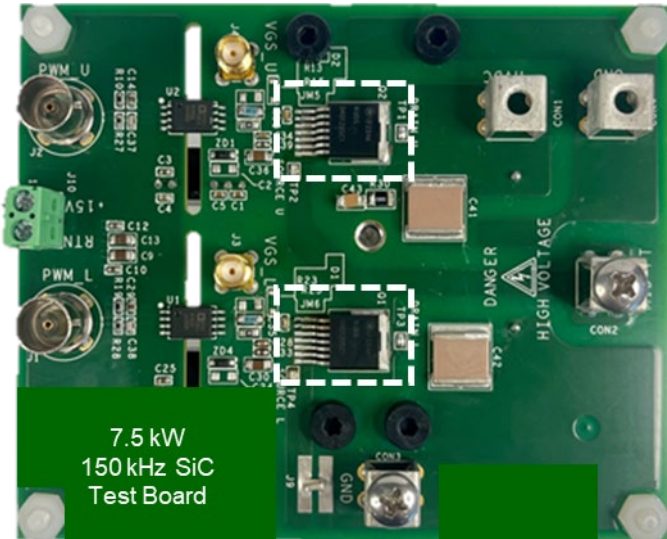
World-class survival duration in fault condition



Trench-Assisted Planar Gate – No Compromise

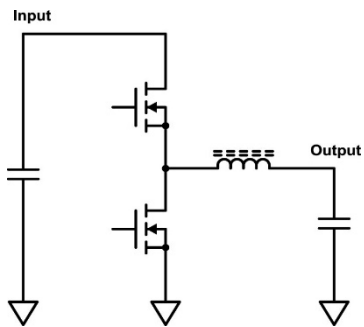
	 <p>Planar</p>	 <p>Trench</p>	 <p>GeneSiC</p>
Manufacturability	<ul style="list-style-type: none"> » Repeatable » High yield » Low cost 	<ul style="list-style-type: none"> » Inconsistent trench etch » Lower yields » High cost 	<ul style="list-style-type: none"> » Repeatable » High yield » Low cost
Performance	<ul style="list-style-type: none"> » High $R_{DS(ON)}$ / area » Slow switching » High $R_{DS(ON)}$ / Δ temp 	<ul style="list-style-type: none"> » Lower $R_{DS(ON)}$ / area » Faster switching » High $R_{DS(ON)}$ / Δ temp 	<ul style="list-style-type: none"> » Lower $R_{DS(ON)}$ / area » Fastest switching » Lowest $R_{DS(ON)}$ / Δ temp
Reliability	<ul style="list-style-type: none"> » Rugged gate oxide (stable V_{TH}) 	<ul style="list-style-type: none"> » Failures due to non-uniform gate oxide » Lower short-circuit capability 	<ul style="list-style-type: none"> » Highest 100% tested avalanche » Long short-circuit withstand time » Rugged gate oxide (stable V_{TH})

Faster, Cooler, Longer Lifetime

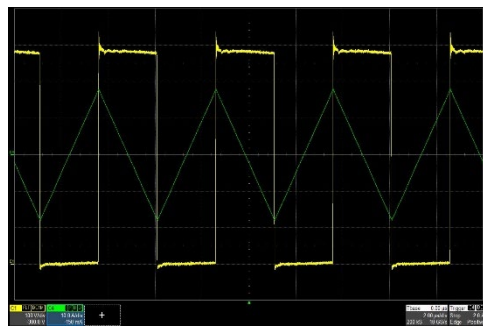


Test Board

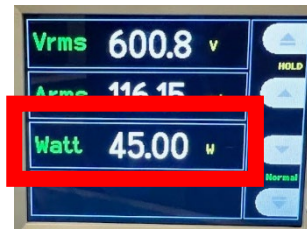
- GeneSiC trench-assisted planar FET vs. Competitor SiC FET
 - 1,200 V, 40 mΩ, D2pak in half-bridge
 - Represents 7.5 kW DC-DC converter (e.g. data center, EV)
 - 150 kHz switching = ~10x faster than Si IGBT example
- **>80% energy savings (>3,000 kWh/yr) vs Si IGBTs**
-25°C cooler = 3x longer life vs other SiC
(reduced maintenance / repair costs)



Test Circuit
(1-phase of 3-phase motor drive)



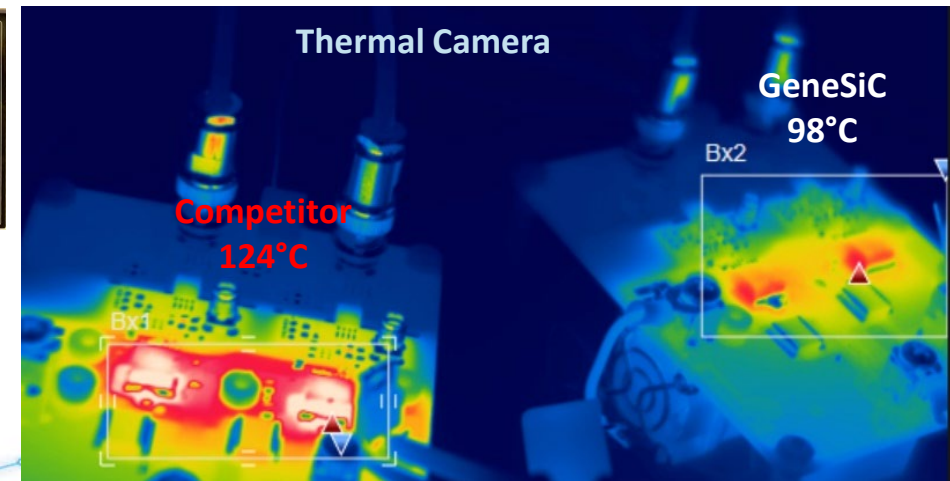
Switching Waveforms
(40 A pk-pk, 20 A turn-off)



Competitor SiC
45 W system loss



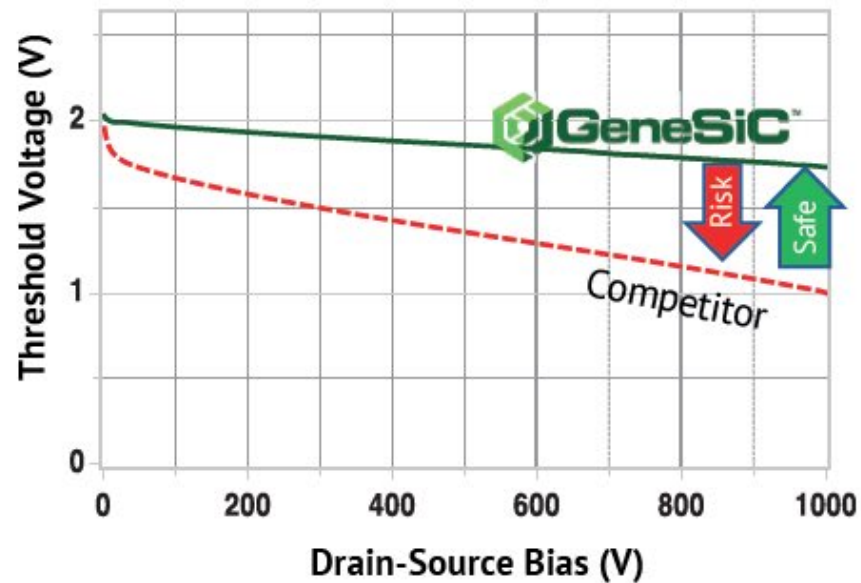
GeneSiC
40 W system loss
-30% SiC loss



Matching currents (Stable V_{TH})

Competitor products allow threshold voltage to drop under high voltage, creating risk of turn-on error

GeneSiC packaged and bare-die FETs can be paralleled reliably for high-power applications

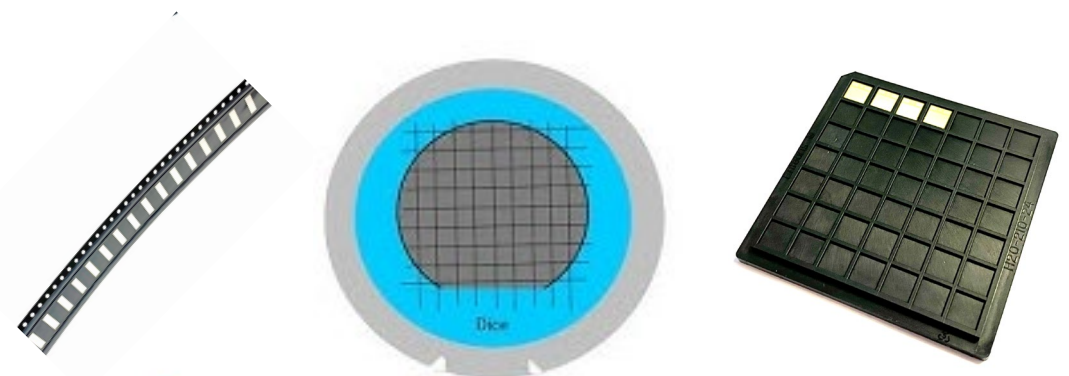


Part Number Suffix	Metallization
-CAL	Top-Side : Aluminum (Al) with 0.5% Copper (Cu) Back-Side : Nickel (Ni) + Silver (Ag)
-CAU	Top-Side : Nickel (Ni) + Palladium (Pd) + Gold (Au) Back-Side : Nickel (Ni) + Silver (Ag)



- Established, reliable partners - highest quality, fastest delivery
- Automated 'pick & place', automated visual Inspection

- Sawn wafer on Film
- Tape & Reel
- Waffle-pack





GeneSiC™

40 KW



EXIDE® / **ENERGIZING**
TECHNOLOGIES / **A NEW WORLD**

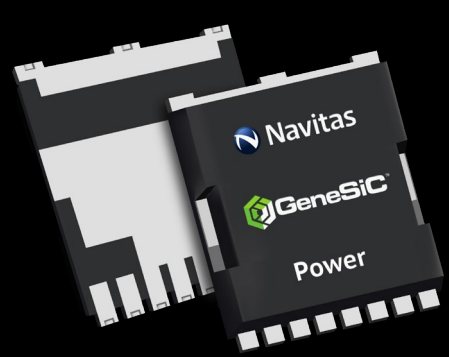


Navitas

4.6 kW



Navitas EV



SHINRY | Navitas

0 emissions bus, GaNFast Power IC, GeneSiC Power IC, EV charging station.

EV

Navitas
Let's go GaNFast™

BRUSA

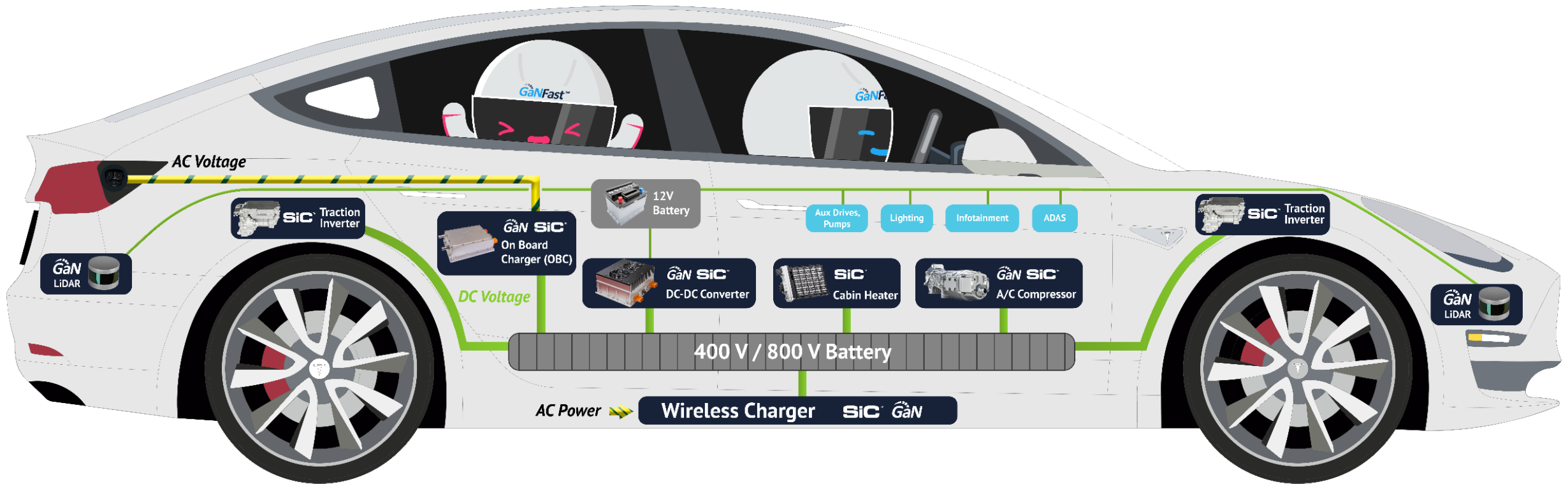
ZEEKR | VREMT

ZEEKR VREMT - Navitas Semiconductor
Next-Generation Power Semiconductor Joint Lab

Navitas

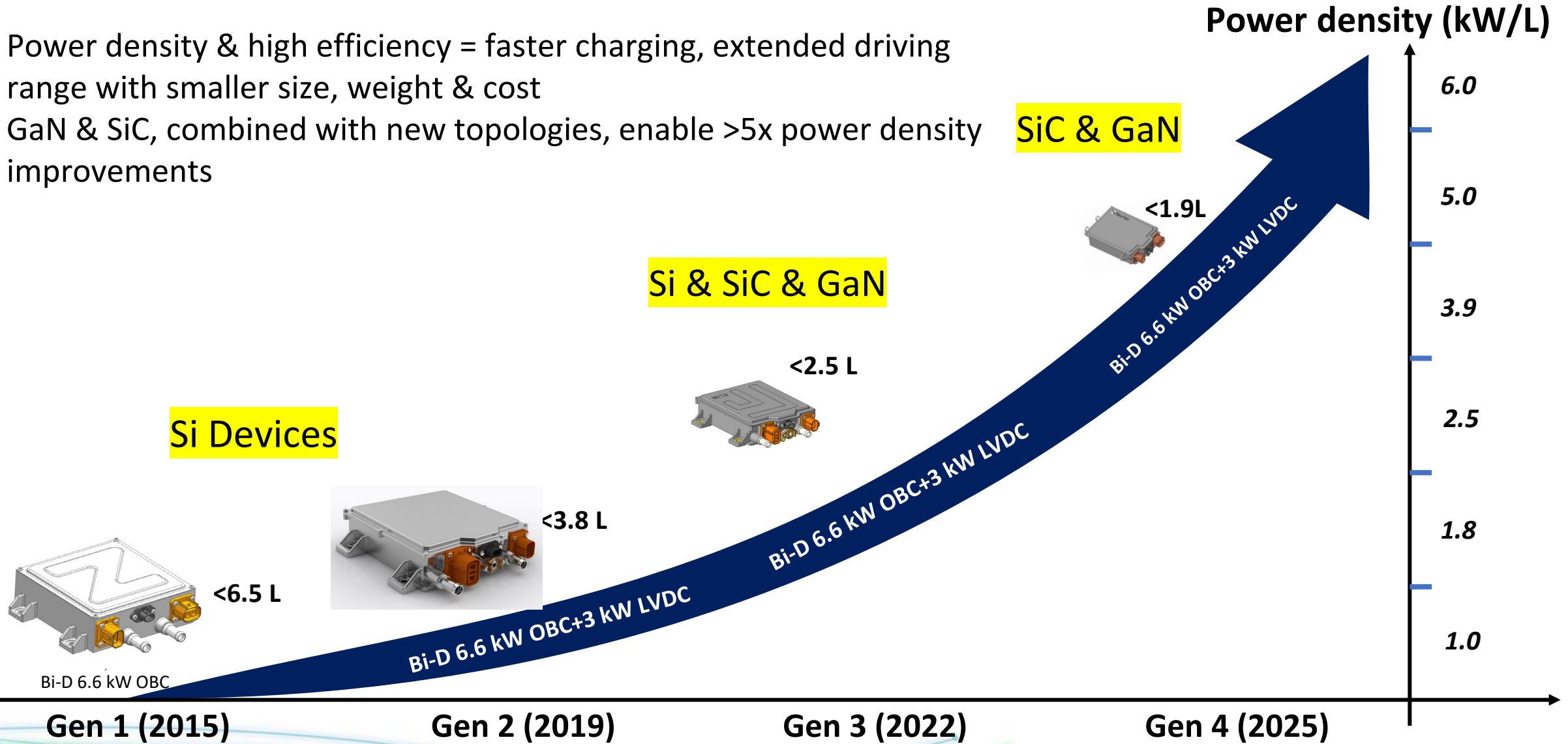
GaNFast Power IC, GeneSiC Power IC

GaN & SiC in Passenger EV

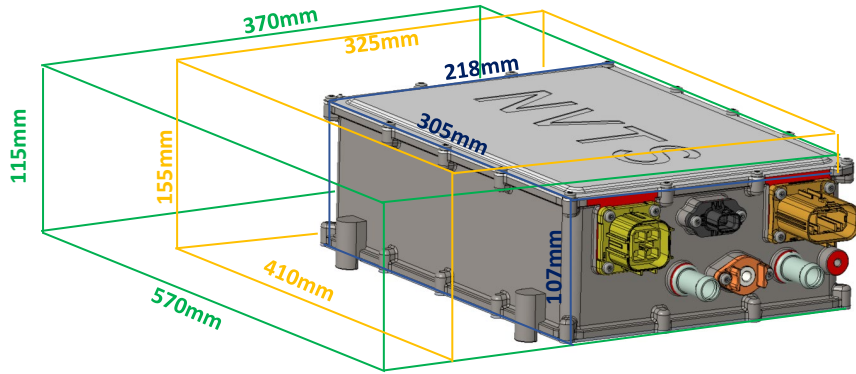


GaN & SiC Drive Power Density

- Power density & high efficiency = faster charging, extended driving range with smaller size, weight & cost
- GaN & SiC, combined with new topologies, enable >5x power density improvements

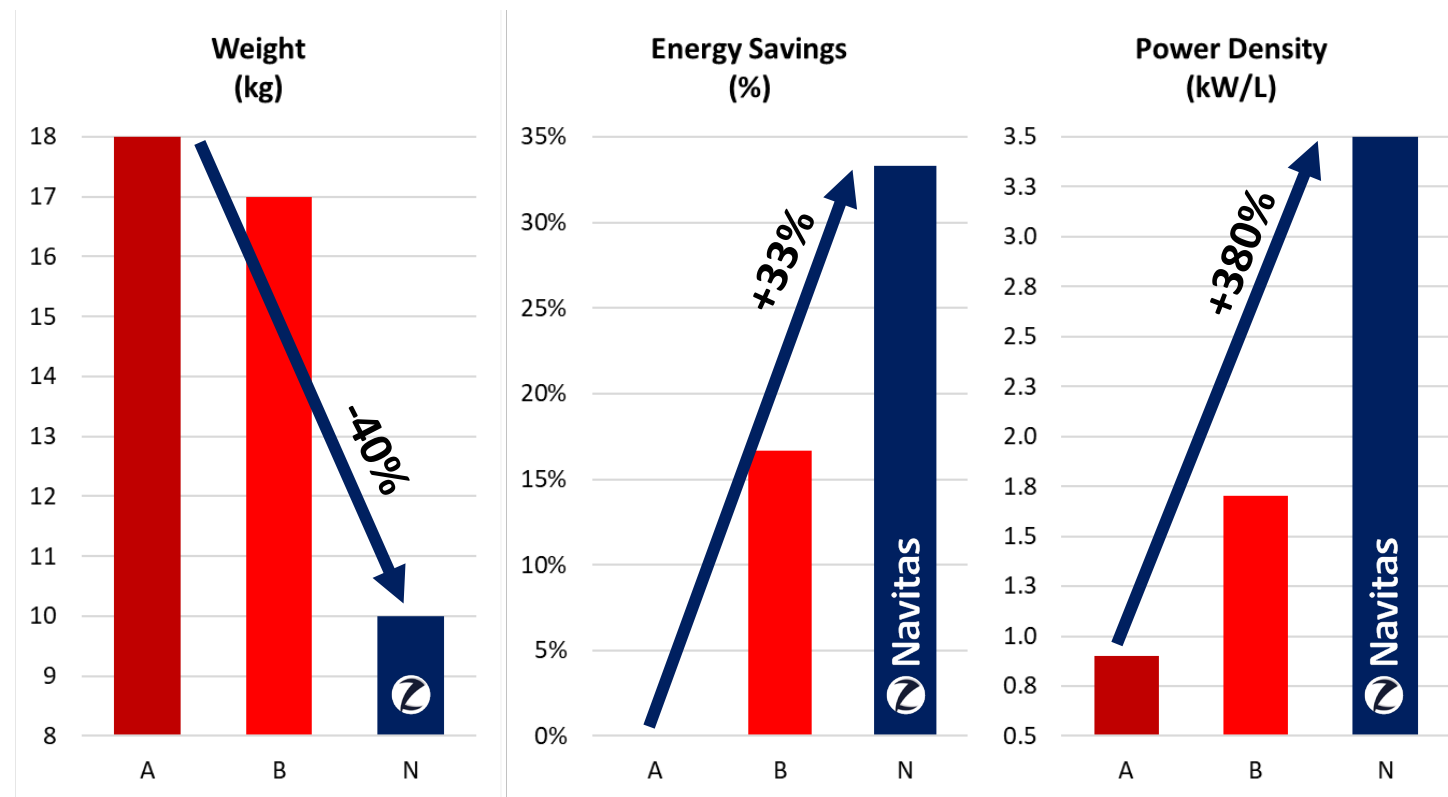


22 kW OBC 2-in-1: 40% Lighter, 380% Smaller



Peak Efficiency > 95.5%

3-Phase 6-Switches CCM AC/DC (60 kHz)
+ Bi-directional CLLC (120~250 kHz)
+ + HV-LV DC/DC (65 kHz)
All-SiC Design



“MW” EV Long-Haul Truck Charging

- “Megawatt Charging System”: SAE J3271^(1,2), up to 3.75 MW via 1,250 V cable

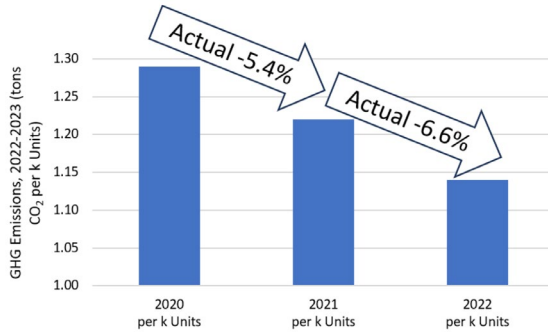
DC Fast-Charger Specifications	Passenger / LDV	HDV J3721 (non-cooled)	HDV J3721 (actively-cooled)
Power (max, kW)	350	440	3,750
Voltage (max, V)	920	1,250	1,250
Current (max, A)	500	350	3,000
Vehicle Battery (nom, V)	400 / 800	800, 1200	800, 1200
SiC Device Voltage (nom, V)	750 / 1,200	1,200 / 1,700	1,700



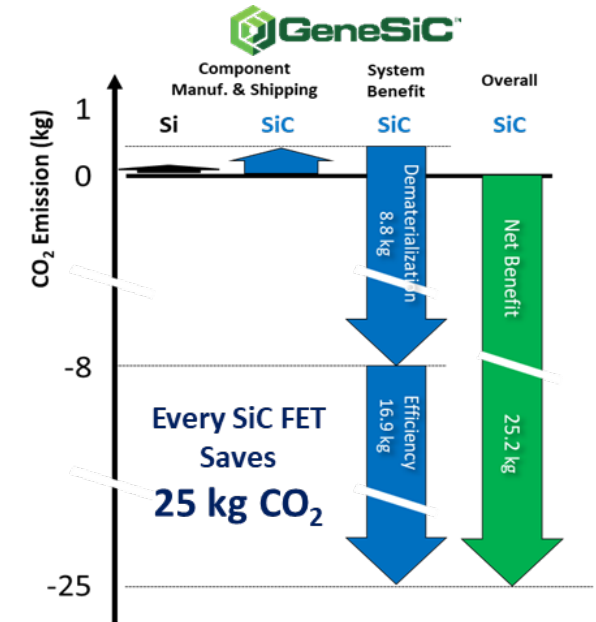
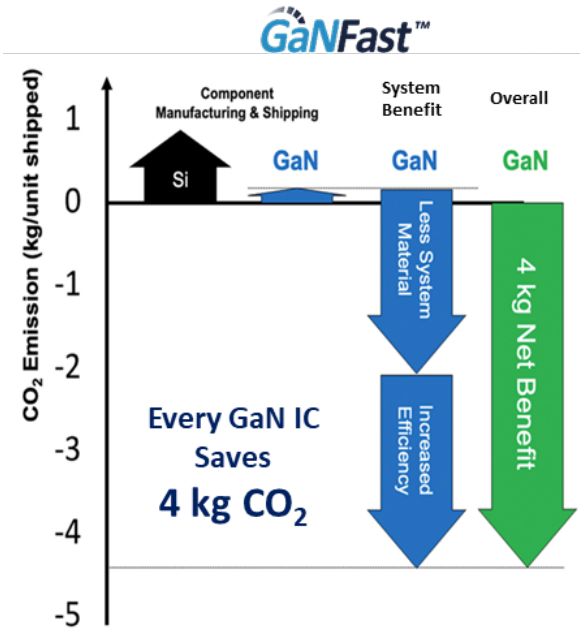
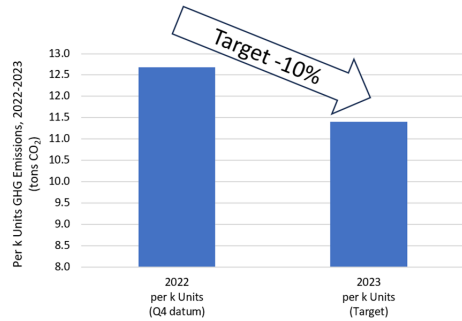
1) SAE J3271 specification, <https://standardsworks.sae.org/standards-committees/j3271-megawatt-charging-system-electric-vehicles-tf>
 2) <https://www.anl.gov/reference/faq-charging-for-heavyduty-electric-trucks>

Accelerating Sustainability

Navitas Corporate GHG Scope 2, 3 (GaN only)



Navitas Corporate GHG Scope 2, 3 (GaN + SiC)



Feb '22 World's first GaN Sustainability Report



May '22 World's first semiconductor Company certified CarbonNeutral®



Aug '22 First 100,000 tons CO₂ saved [Nov'23 over 200,000 tons]



Oct '22 Recognized as Industry-Leading Sustainability Company



Nov '23 Consolidated GaN + SiC Sustainability Report

“Electrify Our World™” with next-gen GaNFast and GeneSiC power

Dan Kinzer
CTO/COO, co-founder

February 2024

