



*GaNFast Power ICs:  
Electrify Our World™*



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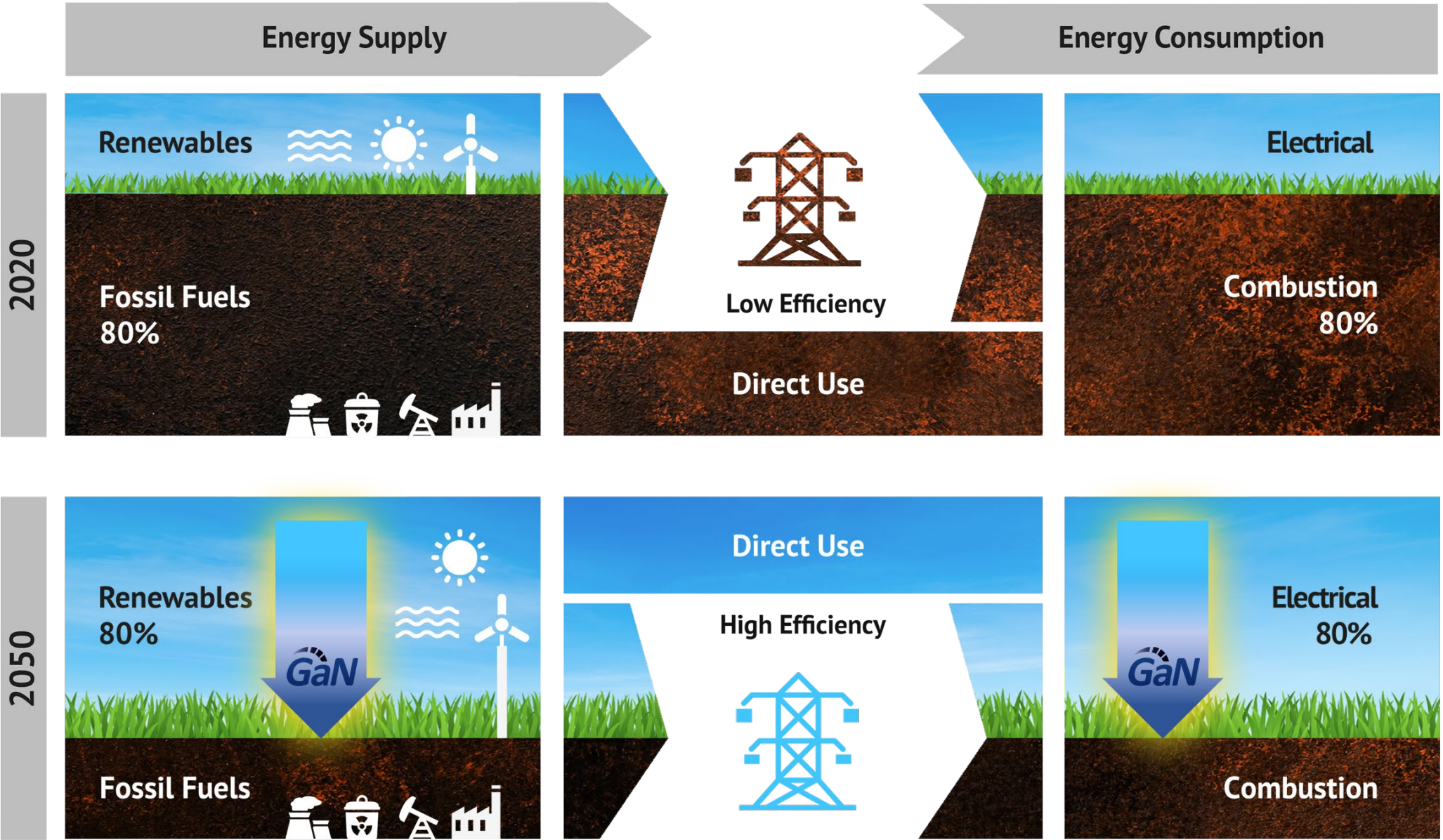


**Navitas**

*Energy • Efficiency • Sustainability*

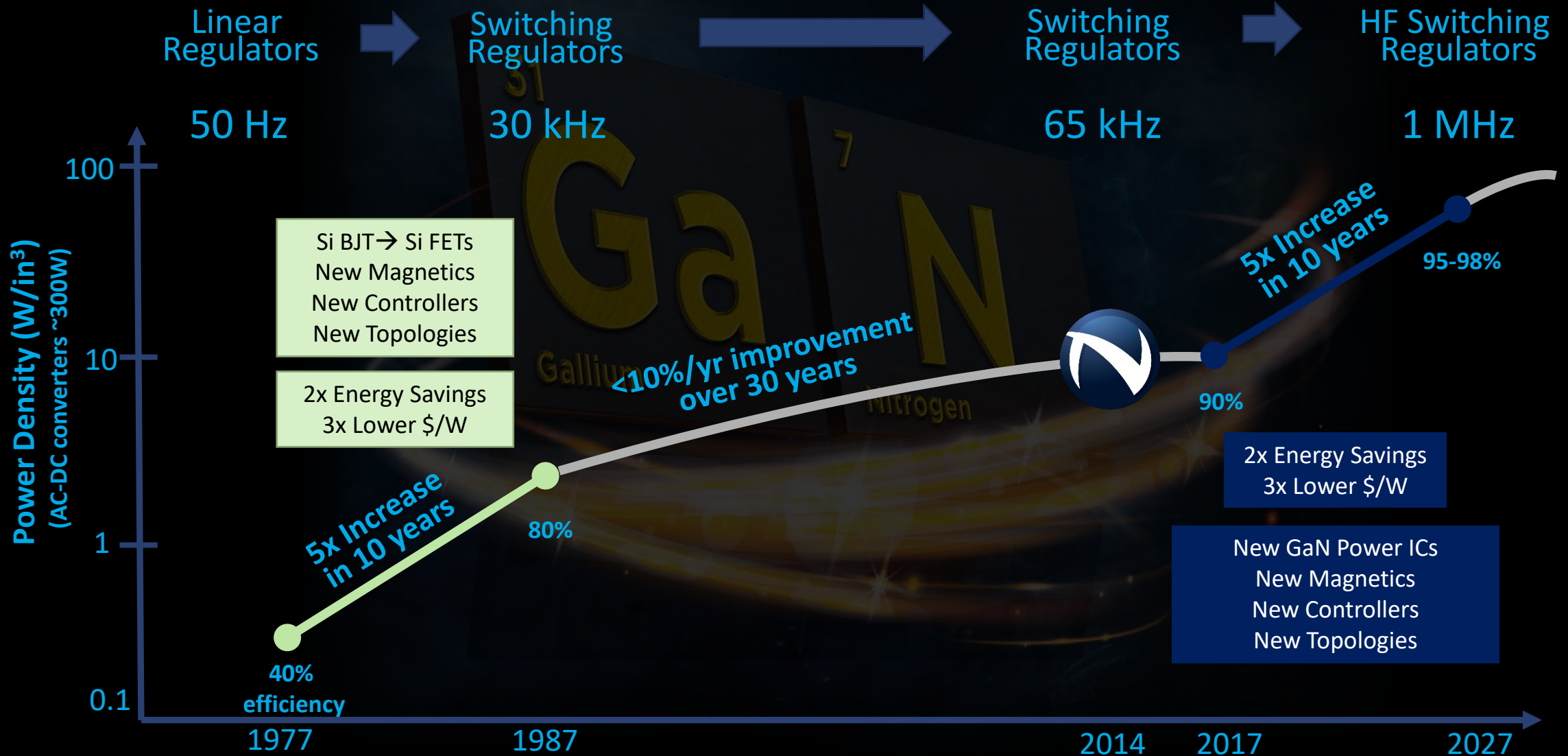


# Electrify Our World™



Once every 40 years...

# Second Revolution in Power



# The Enabling Force



**20x**

Faster  
Switching

**3x**

Smaller &  
Lighter

Up To  
**40%**

Energy  
Savings

Up To  
**3x**

Higher  
Power Density

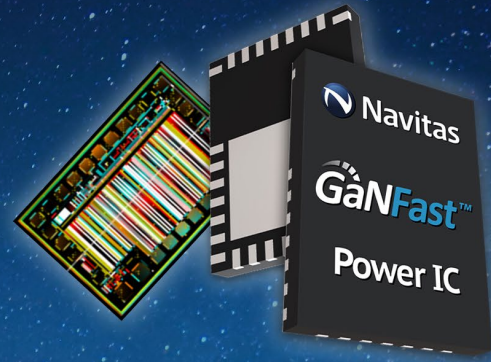
**3x**

Faster  
Charging

**20%**

Lower  
System Cost

Note: Statistical data is based on Navitas estimate of GaN-based power systems compared to Si-based systems 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. Relative to silicon, GaN has 10x stronger electrical fields and 2x greater electron mobility, enabling high voltages in fast chips and fast switching with high energy savings.



**40,000,000  
Shipped**

*Electrify Our World™*



*Let's go GaNFast™*

# High-Volume, Low-Cost, High-Reliability Manufacturing

## Navitas' 20+ years of GaN experience

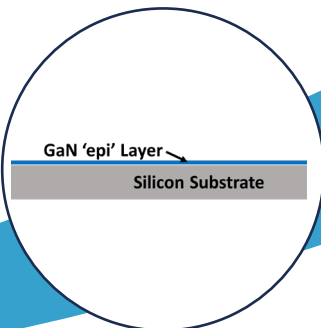
### Solved complex issues with:

- Manufacturing
- Reliability
- Materials
- Capacity
- Cost

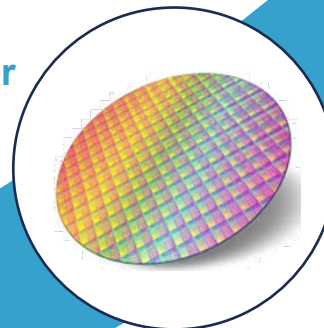
Low-cost, Si wafer  
"GaN-on-Si" technology



GaN Epi Layer  
Multi-sourced reactors,  
scalable, low CapEx



Finished Wafer



**tsmc**

Tier-1, Low-Cost Foundry  
TSMC Fab 2 (6", 0.35μm CMOS)  
Old, available, under-utilized,  
low-cost fabs available



GaNFast Power ICs

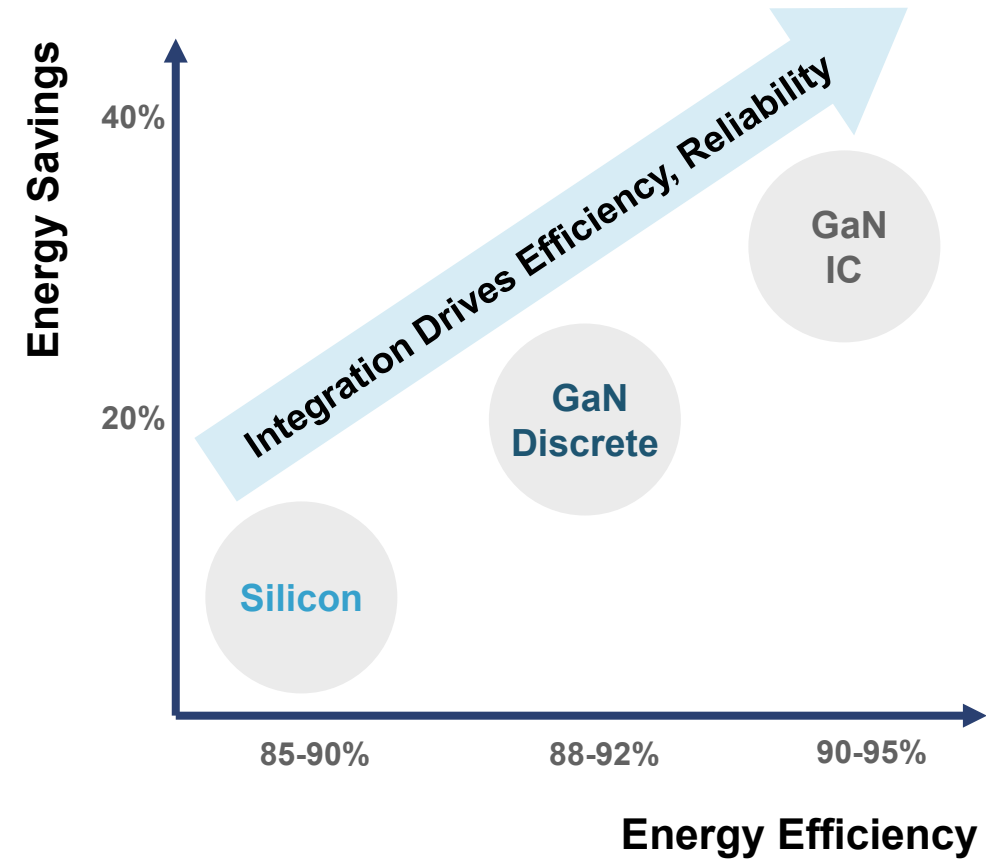
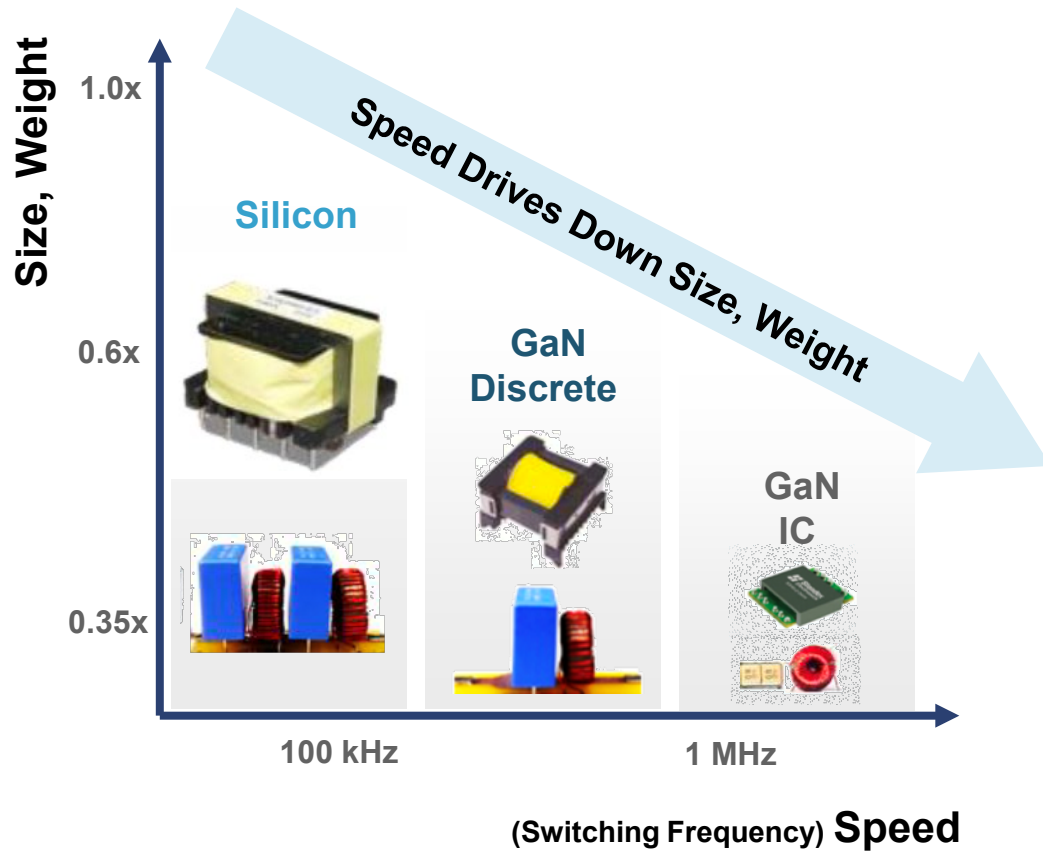
Tier-1, Low-Cost Packaging  
Multiple, major suppliers qualified

- ✓ 90%+ yields
- ✓ 40M+ shipped<sup>(1)</sup>
- ✓ 0 GaN-related field-failures<sup>(2)</sup>
- ✓ Committed capacity, with significant upside
- ✓ 6- to 12-week lead-times for select / forecasted customers

(1) Based on Navitas cumulative production shipments through Feb'22

(2) Based on no customer-reported consumer failures for production shipments through Feb'22

# Speed and Efficiency Drive Value



**GaN power ICs enable up to 3x smaller, lighter <sup>(1)</sup>**

**GaN ICs save 40% energy <sup>(2)</sup>, 100x more reliable <sup>(3)</sup>**

(1) Based on Navitas measurements of GaN-based chargers compared to Si-based chargers with the same output power.

(2) Navitas estimate of GaN-based power systems compared to Si-based systems in the 2024-2025 timeframe, Navitas measurements of select GaN-based chargers vs. Si-based chargers with similar power.

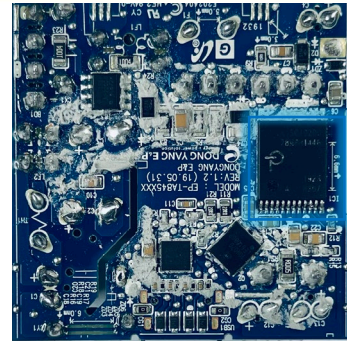
(3)  $V_{GS}$  failure distribution based on Navitas internal characterization of Discrete GaN Transistors compared to GaN power ICs.

# Critical Integration: GaN Discrete → GaN Power IC

**GaN Discrete (MCM) 45W**

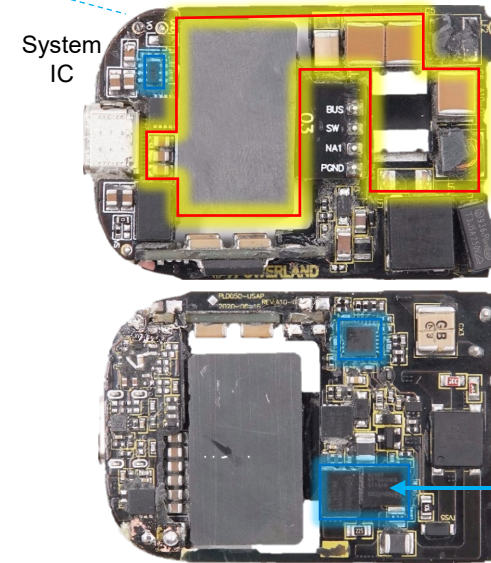


Passive Components



GaN Discrete in Multi-Chip-Module (MCM)

*Speed Shrinks Passives*



System IC

Passive Components

System IC

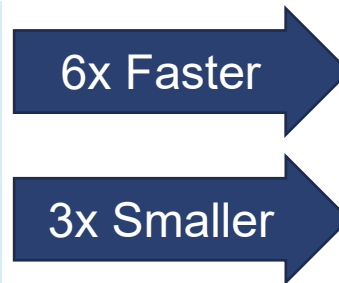
GaN ICs

**GaN IC 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**



**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)

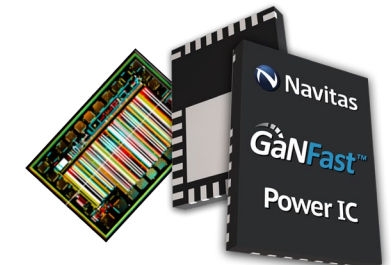
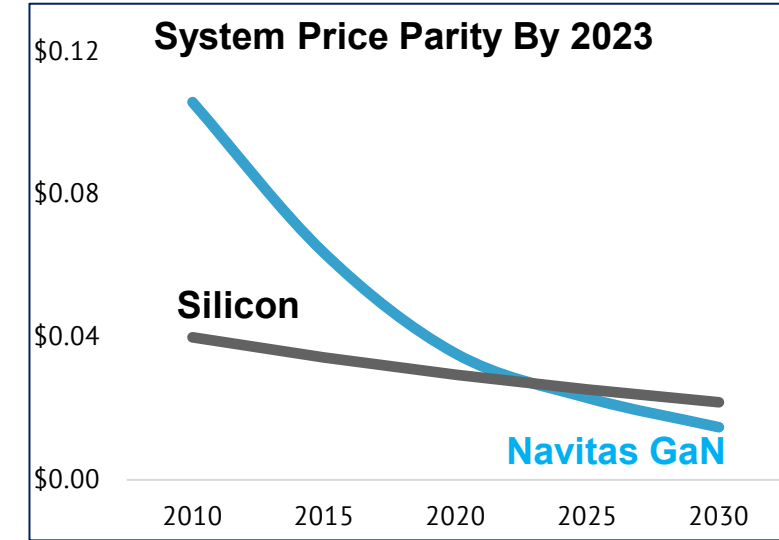
# Innovation Drives System Value & Cost



- Industry pioneer in GaN ICs
- Proprietary AllGaN™ Process Design Kit (PDK)
- 145+ patents awarded or pending

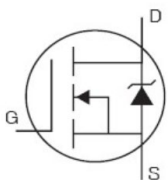


- New generation every year
  - Gen 3 GaNSense™ in production
    - $V_{DS}$  upgraded to 700V (800V transient)
  - Gen 3 high power sampled Q4'21
    - Application-specific Data Center, Solar, EV
  - Gen 4 sampling Q2'22

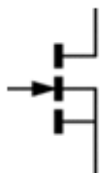


# GaNFast Evolution

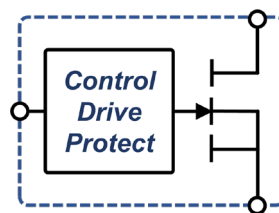
Silicon FET



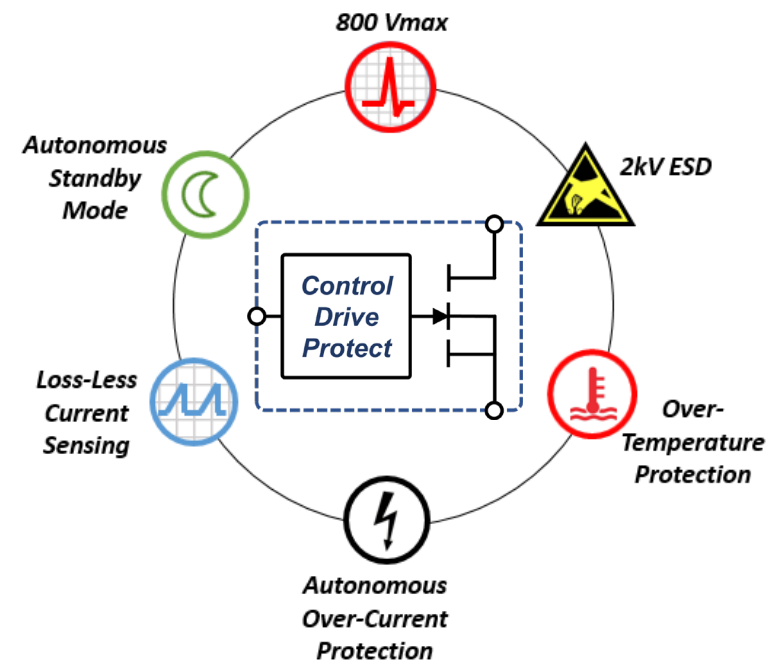
Unprotected GaN



GaNFast™



GaNFast™ with GaNSense™



- Old, slow technology
- High  $Q_g$
- High  $C_{OSS}$
- $F_{SW} < 100$  kHz

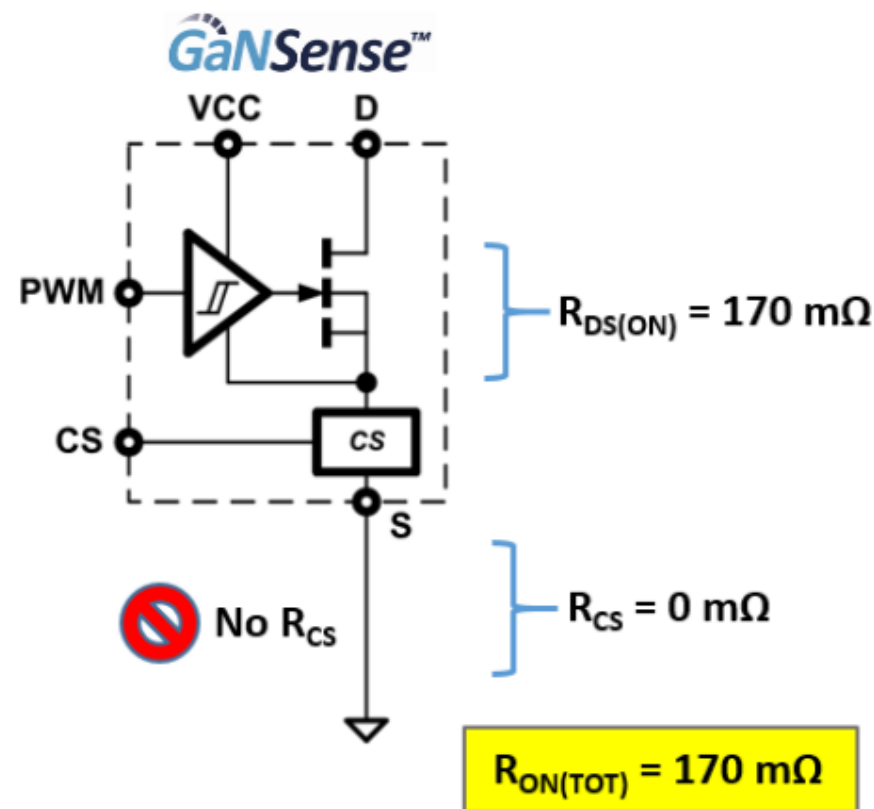
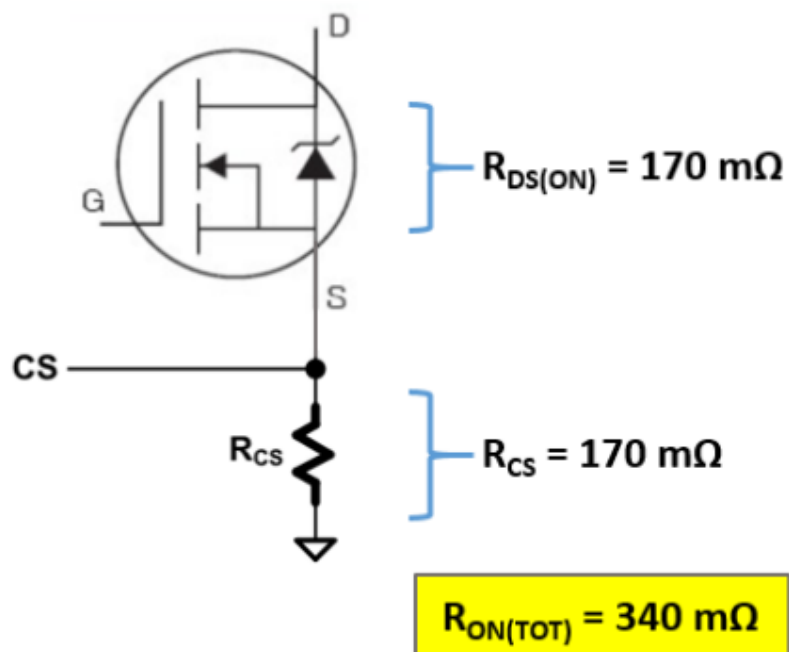
- Exposed gate
- External gate drive
- $dV/dt$  sensitivity
- Layout sensitivity
- ESD sensitivity
- Unknown reliability
- Unknown robustness

- Internal gate
- Integrated gate drive
- $dV/dt$  immunity
- Layout insensitive
- 2KV ESD rating
- Proven reliability
- Proven robustness

- Autonomous standby
- Autonomous protection
- Loss-less current sensing
- High precision
- High efficiency

# Loss-Less Current Sensing: Why?

## External Resistor Sensing Method



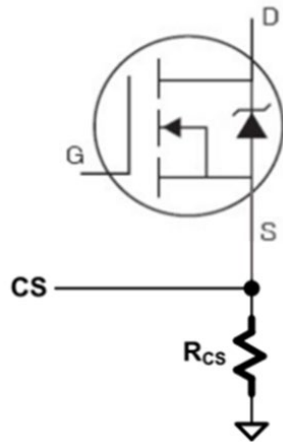
- Reduce  $R_{(ON)TOT}$  by 50%
- Efficiency increased +0.5%
- No  $R_{CS}$  PCB hotspot (-85°C)
- No  $R_{CS}$  PCB footprint (-30 mm<sup>2</sup>)

# Autonomous, 6x Faster OCP

## Discrete

Uses QR controller OCP function

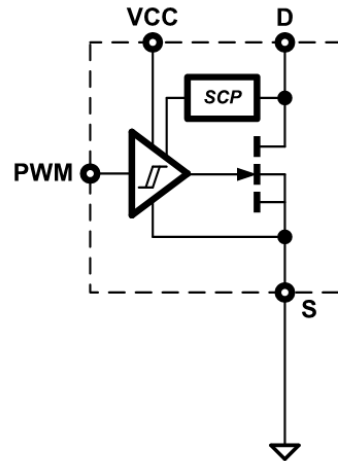
$T_{OCP} = 180 \text{ ns}$



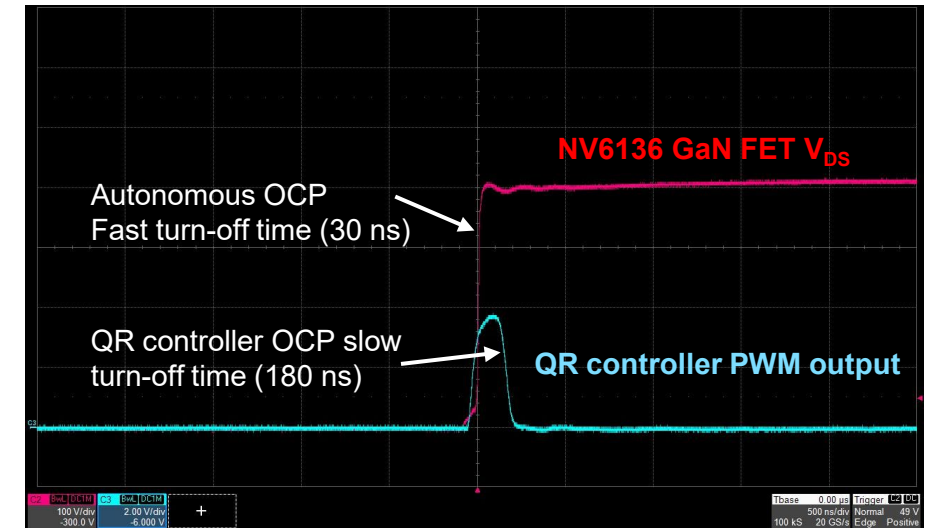
## GaNFast™ with GaNSense™

Integrated SCP function

$T_{OCP} = 30 \text{ ns}$



## 6x faster protection



- Existing solutions use ext.  $R_{CS}$
- Filter + controller mean long delay

- Autonomous over-current protection (OCP)
- Fast-acting self-protection
- Cycle-by-cycle protection
- Excellent robustness

- QR controller OCP = slow turn-off (180 ns)
- NV6136 OCP = fast turn-off (30 ns)

# Fast Chargers: 2-3% of \$2B Potential

## OEMs



## Aftermarket



**170+**  
GaN Chargers In Mass Production

**240+**  
GaN Chargers In Development

**100%**  
Top Mobile OEMs Designing With Navitas<sup>(2)</sup>

**40M+**  
Shipped<sup>(1)</sup>

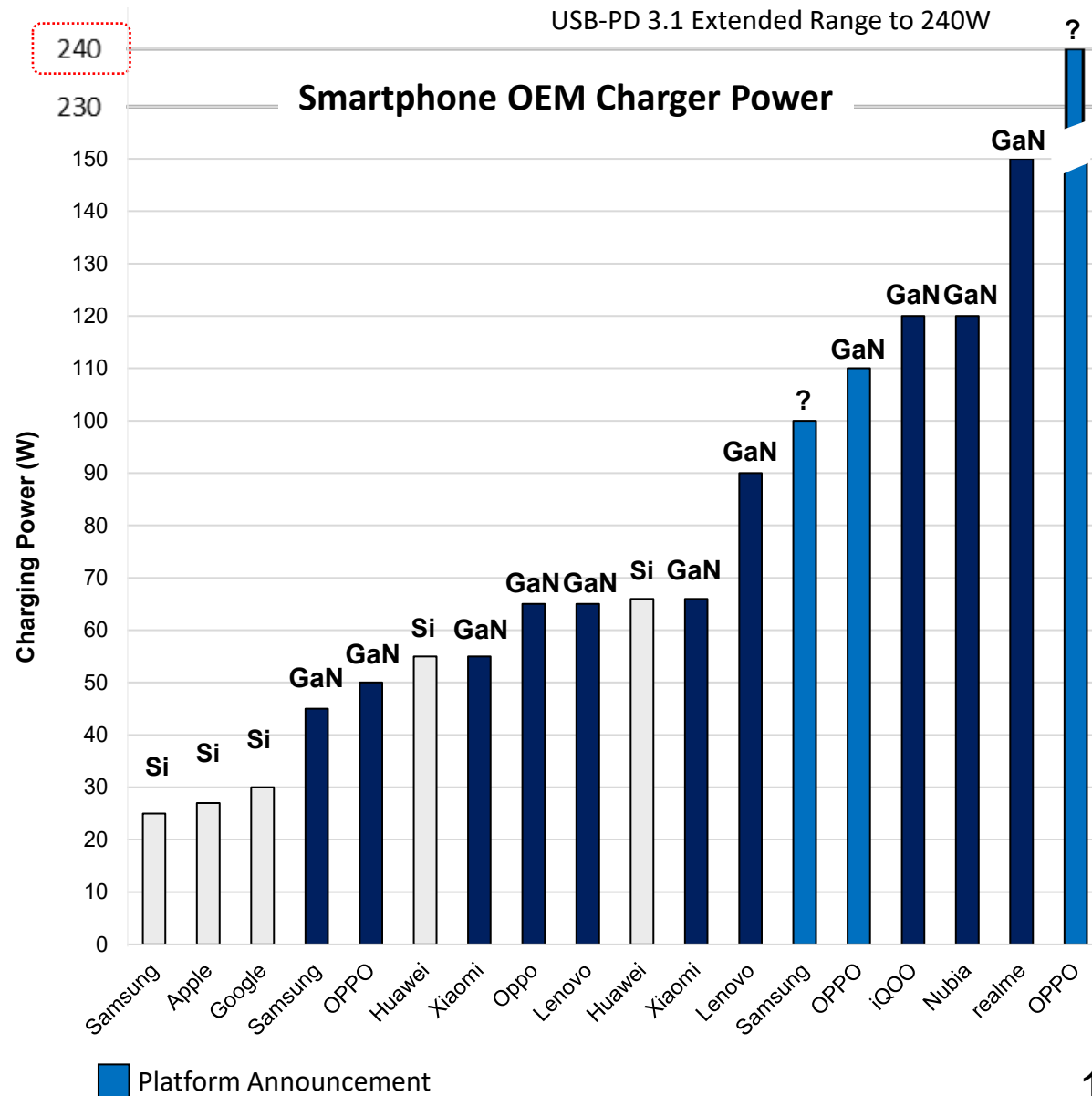
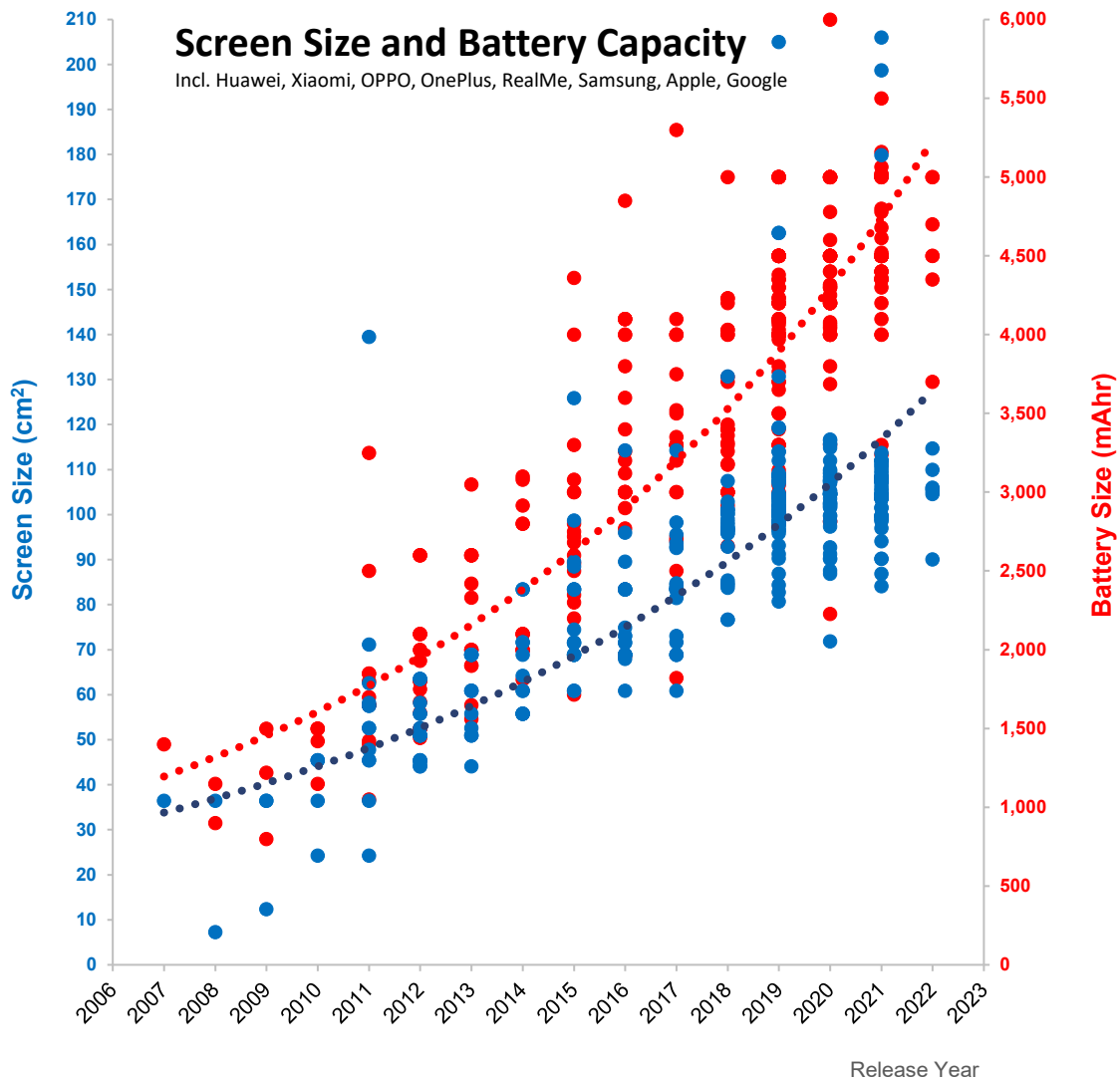
**Zero**  
GaN Field-Failures<sup>(1)</sup>

Note: #Charger metrics as of December 2021. Shipments as of Feb'22

(1) Based on no GaN-related, reported failures in consumers' end use through Feb'22.

(2) Based on 5/5 top smartphone and 5/5 top laptop suppliers

# Batteries, Fast Charging Demand More Power



Source: Navitas, GSMArena to February 2022

# Now Ultra-Fast Chargers

- New, fast-growth market: \$1B opportunity by 2025<sup>(1)</sup>
- Full charge in <10 mins (150W), <20 mins (120W)
- Increased GaN potential per charger
- World's highest power density 120W, 150W



Realme GT Neo 3, 150W



Xiaomi Note 11 Pro+, 120W

(1) Navitas estimate



vivo iQOO 9, 120W



Redmi F1 Mercedes AMG, 120W

# Beyond Chargers: \$1B+ Potential Markets

\$2B EV\*



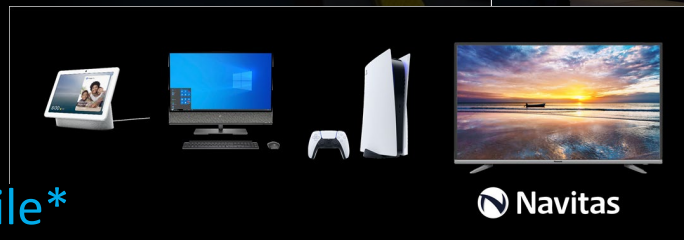
\$1B Data Center\*



\$1B Solar



\$2B Consumer



\$2B Mobile\*

Fast Chargers

Ultra-Fast



*"It's the end of the road for silicon."*  
*"GaN offers >10x frequency, significant cost advantages"* Enphase  
*"Navitas advantages: simplicity of driving, high-speed, reliability & compact form factor."* Brusa  
*"GaN is a breakthrough new technology"*  
*"Navitas: excellent partner, industry-leading GaN ICs"* Compuware

20W      100W      240W      500W      1,200W      3,200W      22,000W

\*Dedicated System Design Center

Potential GaN market opportunity estimated in 2026 (2030 for EV). Figures refer to whole market, not any named customers. Navitas estimates





# Foundational Reliability



## • Design for Reliability

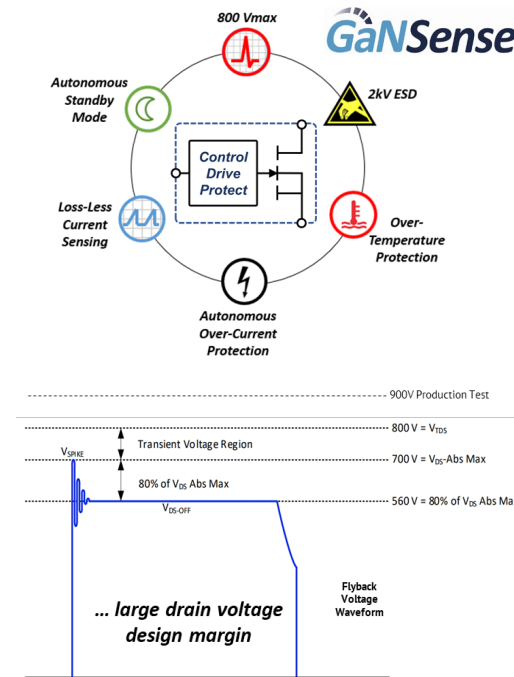
- Integrated drive, sensing and protection
- Component reliability, and **system** reliability

## • Testing for Reliability:

- Proprietary production test methods
- GaN ICs tested 400% (multi-temp, high-freq)

## • Characterization for Reliability

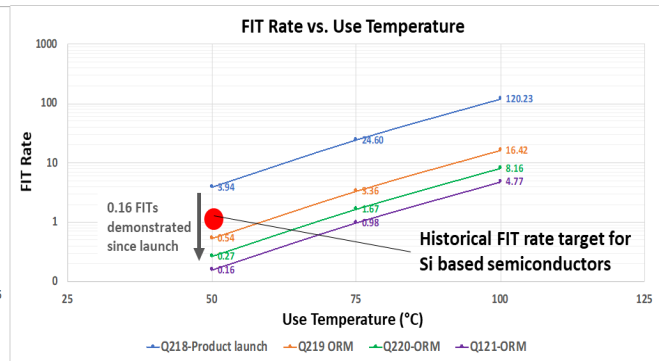
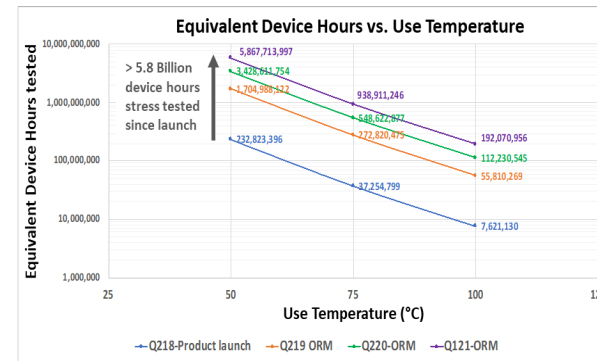
- Exhaustive, proactive, and unique Navitas reliability program
- Proprietary, highly-accelerated Op-Life, plus JEDEC, plus ELFR monitoring
- Founder member of JEDEC JC70.1



**Reliability By The Numbers: <sup>(1)</sup>**

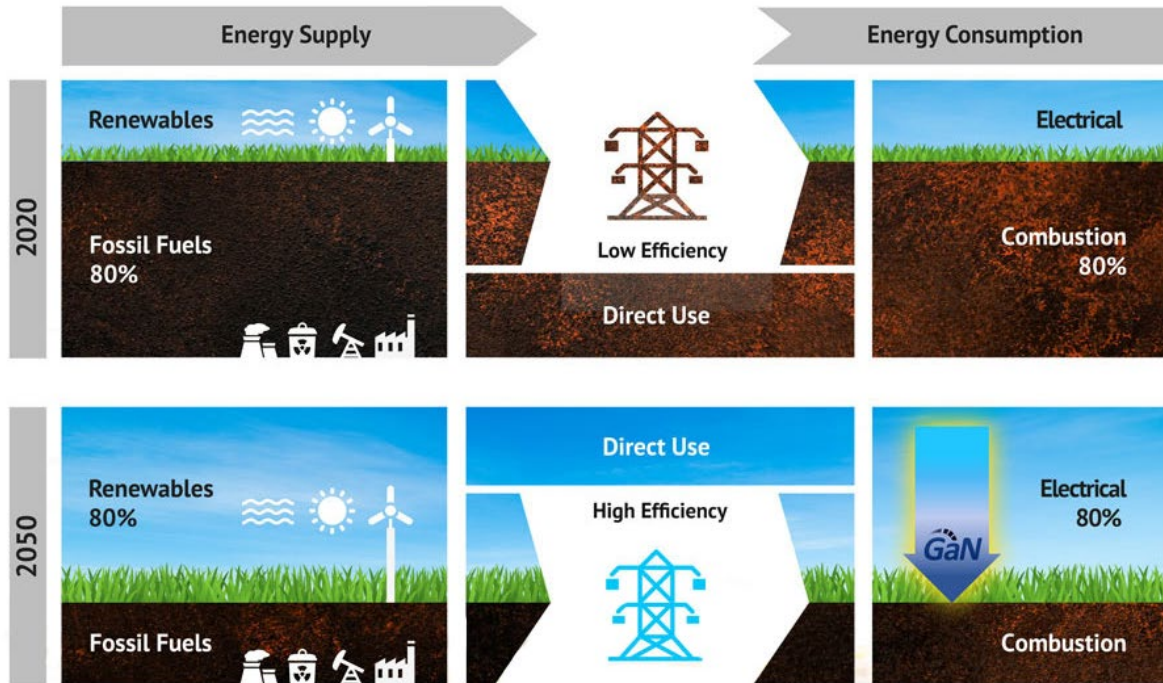
- 40+ million Shipped
- 0 (zero) Failures
- 174 billion Field hours
- 0.16 FIT rate
- 5.8 billion Eq. hrs tested

Reliability Statistics  
Calculated for High Line condition using HTOL (ZVS) results



(1) Data as of end Feb'22: Number of units shipped, reported GaN-related field failures, device hours in the field, equivalent device hours tested

# Electrify Our World™



**4x-10x** lower component CO<sub>2</sub> footprint than silicon<sup>(1)</sup>

**28% lower** lifetime CO<sub>2</sub> footprint for chargers / adapters<sup>(2)</sup>

**Accelerate** transition from ICE to EV by **3 years**, saving **20%/yr** of road sector emissions by 2050 <sup>(4)</sup>

GaN saves up to **2.6 Gton / year** by 2050<sup>(5)</sup>

Every **GaNFast™** IC saves<sup>(3)</sup>  
**4 kg CO<sub>2</sub>**



Industry's first Sustainability Report to quantify the positive impact of GaN on climate change based on global standards

(1) Navitas and Earth-Shift Global analysis. 4x Lower for 2021, 10x lower by 2022 per life-cycle analysis

(2) Navitas and Earth-Shift Global estimated based on 65W charger per life-cycle analysis

(3) Navitas estimate based on GaN vs Si total life-cycle analysis.

(4) DNV estimate for 75%-adoption milestone pull-in, total road sector benefit

(5) Company information, DNV GL, EPA, IEA, International Renewable Energy Agency (IRENA). See 5-7-21 Investor presentation for details (filed with SEC). Derived from demand & energy efficiency CO<sub>2</sub> reduction of 1.4 Gt; assumes a \$0.12 / kWh cost of electricity and a carbon to energy ratio of 0.00071 tons / kWh, aligned with the EPA's marginal emission rate.

*Thank You*

*Let's go GaNFast™*

*info@navitassemi.com*



**Navitas**

*Energy • Efficiency • Sustainability*



# Disclaimer

2-22-22

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