Next-Generation Gallium Nitride Semiconductor Accelerates Carbon Neutrality

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Electrify Our World™

**Energy Supply**

- **2020**
  - Fossil Fuels 80%

- **2050**
  - Renewables 80%
  - Fossil Fuels

**Energy Consumption**

- **2020**
  - Combustion 80% (Low Efficiency, Direct Use)

- **2050**
  - Electrical 80% (High Efficiency, Direct Use)

Navitas

GaN
The Enabling Force

- Faster Switching
- 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.
Once every 40 years...

**Second Revolution in Power**

- Linear Regulators
- Switching Regulators
- Switching Regulators
- HF Switching Regulators

- **Power Density (W/in³)** (AC-DC converters ~300W)
  - 0.1
  - 1
  - 10
  - 100

- **50 Hz**
- **30 kHz**
- **65 kHz**
- **1 MHz**

- **Si BJT → Si FETs**
- **New Magnetics**
- **New Controllers**
- **New Topologies**

- **2x Energy Savings**
- **3x Lower $/W**

- **40% efficiency**

- **5x Increase in 10 years**
  - 1977
  - 1987

- **<10%/yr improvement over 30 years**

- **90%**

- **95-98%**

- **New GaN Power ICs**
- **New Magnetics**
- **New Controllers**
- **New Topologies**

- **2x Energy Savings**
- **3x Lower $/W**

- **2014 2017 2027**

- **5x Increase in 10 years**
GaN power ICs enable up to 3x smaller, lighter (1)

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

GaN ICs save 40% energy (2), 100x more reliable (3)

(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.
## GaN-Driver Integration is Critical

<table>
<thead>
<tr>
<th></th>
<th>Driver</th>
<th>Parasitics</th>
<th>Power Device</th>
<th>Speed</th>
<th>Power Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silicon Discrete</td>
<td>Drive, control &amp; protection</td>
<td>Limit speed &amp; efficiency</td>
<td>Si or GaN</td>
<td>&lt; 100 kHz</td>
<td>&lt;0.5 W/cc</td>
</tr>
<tr>
<td>(in system controller)</td>
<td>$L_G R_G$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GaN Discrete, MCM</td>
<td></td>
<td></td>
<td></td>
<td>&lt; 200 kHz</td>
<td>&lt;1 W/cc</td>
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<tr>
<td>(complex circuit)</td>
<td>$L_G R_G$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navitas GaN IC</td>
<td></td>
<td></td>
<td></td>
<td>Up to 2 MHz (3-10x faster)</td>
<td>&gt;&gt;1 W/cc</td>
</tr>
</tbody>
</table>

- Fast Charging, Smaller Size
- Note: Based on Navitas lab evaluations of 65W chargers
Multi-Year Lead in IP, Innovation: Driving Down System Cost

- Industry inventor and pioneer for GaN power ICs
- Proprietary AllGaN™ Process Design Kit (PDK)
- 130+ patents awarded or pending

- New generation every 10-12 months
- Gen 3 GaNSense™ in production
- Gen 4 sampling Q4’21

- System cost parity in 2023(1)
- 65W example

1) Navitas research
Adapter Life Cycle Analysis, Si vs GaN

- Worst case power dissipation is at full load (65W) condition
  - Defines adapter size → Key factor in manufacturing impacts and dematerialization opportunities
- The Use-cases for this study show tradeoffs for Use-Phase Impacts
  - Total energy use across various use-cases: 70% heavy load / 30% light load
  - Full load efficiency is more important for use cases that include more charging and less plugged-in non-use
  - Light load efficiency becomes a larger factor for applications normally plugged in with light/moderate use → needs optimization across the power range
- Geography impacts Use-Phase impacts
  - Most adapters are targeted for global use so must be optimized for 115V and 240V conditions

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ISO14040/14044 Life Cycle Assessment Pre-Review
4x Lower CO₂ today

Relative Climate impacts, per wafer

- Smaller GaN Die, More die per wafer
- 4x comparing Si on 8” vs GaN on 6” wafer
- Up to 10x when GaN moves to 8” wafer, including integrated components

Relative Climate Impacts, per die

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ISO14040/14044 Life Cycle Assessment Pre-Review
Expected Dematerialization & Supply Chain Impacts

Using the GaN chip decreased charger components and weights

ISO14040/14044 Life Cycle Assessment Pre-Review
Potential Use-Phase Impacts in different regions

Work Travel Scenario (work untethered, plugged in only to charge)

Climate Impacts with Waste Energy - US (120V)

Climate Impacts with Waste Energy - China (230V)

kg CO2eq/charger lifetime

- Power semiconductors
- Controllers & MPUs
- Charger body & components
- Cables
- In-box Packaging
- EoL
- Distribution - CHN
- Lost Energy

ISO14040/14044 Life Cycle Assessment Pre-Review
**Sustainability Benefits of GaNFast ICs**

- Over 8.5 GWhr energy saved and over 6,000 metric tons CO2e saved in application use
- Estimate over 44,000 metric tons CO2e saved from Navitas products used in the field to date

Navitas Energy Savings Benefits

<table>
<thead>
<tr>
<th>Energy and CO2e Saved</th>
<th>Cumulative Units in Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>9000</td>
<td>20</td>
</tr>
<tr>
<td>8000</td>
<td>18</td>
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</tr>
<tr>
<td>100</td>
<td>2</td>
</tr>
</tbody>
</table>

**Navitas Dematerialization Benefits**

- Over 38,000 metric tons CO2e saved from size and weight reductions in the application

Estimate over 44,000 metric tons CO2e saved from Navitas products used in the field to date

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1) Navitas & 3rd-party research, estimates
Potential Benefit from Adoption in Mobile Electronics

Based on forecast units by year for Phone/Tablet/Laptop/PC from industry research

ISO14040/14044 Life Cycle Assessment Pre-Review
# Fast Chargers: 2-3% of $2B - Growth Ahead!

<table>
<thead>
<tr>
<th>Tier 1 OEMs</th>
<th>Aftermarket Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Tile 1" /></td>
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<td><img src="image3.png" alt="Tile 3" /></td>
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<tr>
<td><img src="image9.png" alt="Tile 9" /></td>
<td><img src="image10.png" alt="Tile 10" /></td>
</tr>
</tbody>
</table>

| 160+ GaN Chargers In Mass Production | 150+ GaN Chargers In Development (MP 2021-2022) | 90%+ Mobile OEMs Designing With Navitas GaN ICs | 30M+ GaN ICs Shipped<sup>(1)</sup> | Zero GaN Field-Failures<sup>(1)</sup> |

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**Note:** #Charger metrics as of October 2021. Shipments as of October 31st 2021.

- **(1)** Based on no customer-reported consumer failures for production shipments through October 10th, 2021.
- **(2)** Navitas estimated based on total GaN sales worldwide, estimated charger / adapter sales from Yole data.
Beyond Chargers: Dynamic Expansion Markets

Efficiency, Size, Weight Drive Adoption

• **Consumer**
  - Up to 3x smaller, lighter, low-profile
  - TV: UHD to 8K needs 4x power
  - >$2B/yr potential\(^{(1)}\)
    - Lead opportunities in late-stage development\(^{(2)}\)
    - Awarded Tier-1 All-in-one PC

• **Solar**
  - 25% cost reduction of micro-inverters\(^{(3)}\)
  - Up to 40% energy savings
  - Improve payback by 10%\(^{+} \(4\))
  - Residential potential >$1B/yr\(^{(5)}\)

  “It’s the end of the road for silicon.”
  “GaN offers >10x frequency, significant cost advantages”

• **Data Center: Save $1.9B/yr** \(^{(11)}\)
  - 44% of cost is electricity\(^{(11)}\), GaN could reduce by up to 10%\(^{(12)}\)
  - Save >15 TWh or $1.9B/yr, 2-month ROI\(^{(13)}\)
  - $1B+ /yr potential\(^{(14)}\)

  “GaN is a breakthrough new technology”
  “Navitas: excellent partner, industry-leading GaN ICs”

• **EV: Accelerate Adoption by 3 years** \(^{(6)}\)
  - 3x faster charging\(^{(7)}\)
  - 70% energy savings enables
    - 5% longer range, or 5% lower battery cost\(^{(8)}\)
  - >$2.5B/yr potential in 2030\(^{(9)}\)

  “Navitas advantages: simplicity of driving, high-speed, reliability & compact form factor.”

  - OBC
    - −$ 50
  - DC-DC
    - −$ 15
  - Traction
    - −$200
  - GaN potential/EV = −$250 \(^{(10)}\)

See end slide for references
Navitas is Green:  
Accelerating Major Customers’ Net Zero and Carbon Neutral Goals

GaN Power ICs Reduce CO₂ Emissions

**4x-10x** lower component CO₂ footprint than silicon\(^1\)

**28% lower** lifetime CO₂ footprint for chargers / adapters\(^2\)

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

GaN addresses **2.6 Gton / year** by 2050 \(^5\)

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\(^{1}\) 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 and energy efficiency CO₂ 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.
By the 2050 timeline of the Paris Accord, Navitas targets that GaN would address a 2.6 Gton/year reduction in CO₂ emissions

= Over 6 billion barrels of oil, or over 600 coal power plants
Join the GaN Generation!

Team Navitas
Power Electronics Partners
Design Houses
Customers
Manufacturing Partners
Consumers
Investors
Environmental Groups
Universities

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www.ganfast.com

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References to Slide 16 (Expansion Markets)

1. Based on Navitas measurements comparing typical 150W 65 kHz Si-based AC/DC power adapter to 150W 1MHz GaN-based power adapter prototype.
2. Based on information provided to management by potential customers.
4. Based on estimates from Gartner, Pulsednews, WitsView, Statista and Navitas estimates.
5. Navitas est. vs. Si-based 500W residential micro-inverters assuming GaN-based inverter enables 40% reduced power loss and 25% lower inverter costs.
7. Navitas engineering estimate 6.6 kW Si OBC vs. 21 kW GaN OBC assuming a 90 kWh battery and 80A wall charge limit.
8. Assumes 150 kW traction inverter, 100 kWh battery, $100/kWh battery cost and typical 230 mile range. Based on DNV and Navitas analysis.
9. Based on BCG Research, Yole Research and Navitas analysis.
10. Navitas estimate based on discussions with major suppliers of power electronics to the electric vehicle industry.
11. Navitas estimate based on a) Navitas server/datacom forecast & AAAS data, b) $0.12/kWhr, c) Si vs. GaN $/W and d) data center loading profile.
12. Navitas estimated based on known existing Si-based solutions to deliver >500A next-generation data processors to Navitas targets for new GaN-based AC/DC and DC/DC for these same next-generation data processors.
14. Navitas measurements based on existing Si-based 3.2kW AC/DC server power supply to a 1 MHz GaN-based 3.2kW AC/DC prototype.