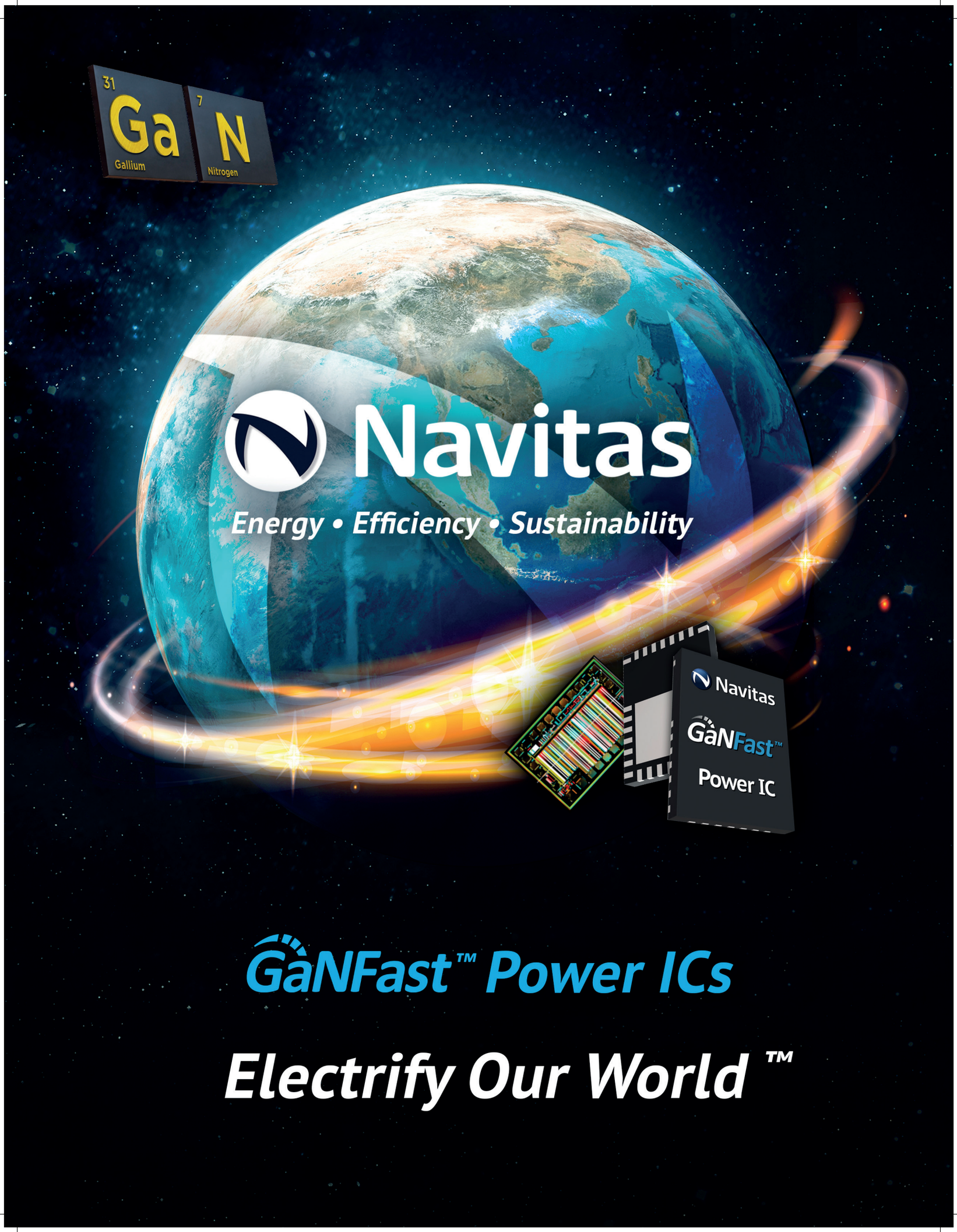
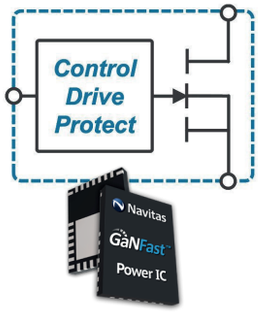


Navitas The Future is GaNFast™



GaNFast power ICs enable up to 3x more power or 3x faster charging, with up to 40% energy savings and up to 20% lower system costs in half the size and weight of legacy silicon.

Gallium nitride (GaN) is a next-generation semiconductor technology that runs up to 20x faster than legacy silicon (Si) chips. GaNFast™ power ICs integrate power, drive, and control, with additional autonomous-protection and loss-less current-sensing to deliver the smallest, fastest, most reliable power-conversion performance for mobile fast chargers, consumer electronics, solar power and storage, enterprise and EVs.

Navitas is the only pure-play next-gen power semiconductor company, with over 185 patents issued or pending.

Fast Chargers

- 3x faster charging
- 50% smaller
- 50% lighter

20-300 W

Consumer

- 3x smaller and lighter
- Low-profile

<1 kW

Enterprise

- <10% reduction in datacenter electrical consumption
- Saving >15 TWh / $1.9B/yr

<10 kW

Solar

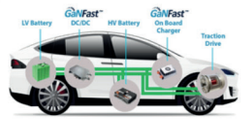
GaNFast™ Micro-inverters

GaNFast™ Energy Storage

- 25% cost reduction of micro-inverters
- 40% energy savings
- Improve payback by 10%+

<50 kW

EV



- 3x faster charging
- 70% energy savings
- 5% longer range / lower battery cost

<100 kW

60,000,000 Shipped Zero Failures

Proprietary, 400% production testing includes multi-temperature, extensive high-frequency hard- and soft-switching to ensure consistent, robust and high-quality performance for every device delivered. GaNFast ICs have a 6x-lower FIT (failures-in-time) rate than legacy silicon.

As of October 2022: total units shipped, zero reported GaN-related field failures

20-Year Limited Warranty

Unprecedented, industry-first 20-year limited warranty: 10x longer than typical silicon, SiC or discrete GaN power semiconductors, and a critical accelerator for GaN's adoption in data center, solar and EV markets. Founded on Navitas' holistic approach to product reliability through design, testing, characterization & certification.

See Navitas terms and conditions for details

Electrify Our World™

Every GaN IC Saves 4 kg CO_2. GaN supports global carbon 'net-zero' ambitions by reducing Navitas' customers' CO_2 footprints and accelerating the evolution from fossil fuels to renewable energy sources and electricity-based applications. GaN will save up to 2.6 Gton/yr CO_2 by 2050

See Sustainability Report 2021 for details

GaNFast™ Power ICs

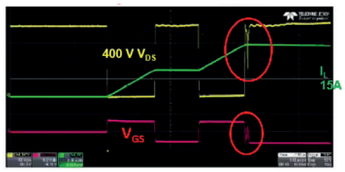
Integration of Power and Drive

Easy to drive with low component count

Discrete GaN FETs have weak, exposed gates and no electro-static discharge (ESD) capability, causing erratic system behavior and device failures. GaNFast power ICs eliminate gate overshoot and undershoot, while zero inductance on-chip ensures no turn-off loss. No ringing or overshoot makes tight control of deadtime easy in high-frequency switching circuits.

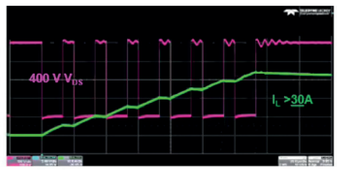
Monolithic Drive and Power Stage

Unprotected GaN



- Exposed gate
- Faulty switching
- Dangerous ringing & glitching
- Significant reliability risks

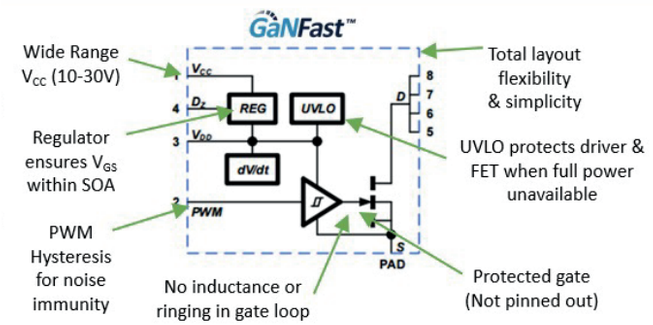
Navitas GaN Power IC



- Integrated gate drive
- Clean switching
- Safe, robust and reliable performance

Reliability by Design

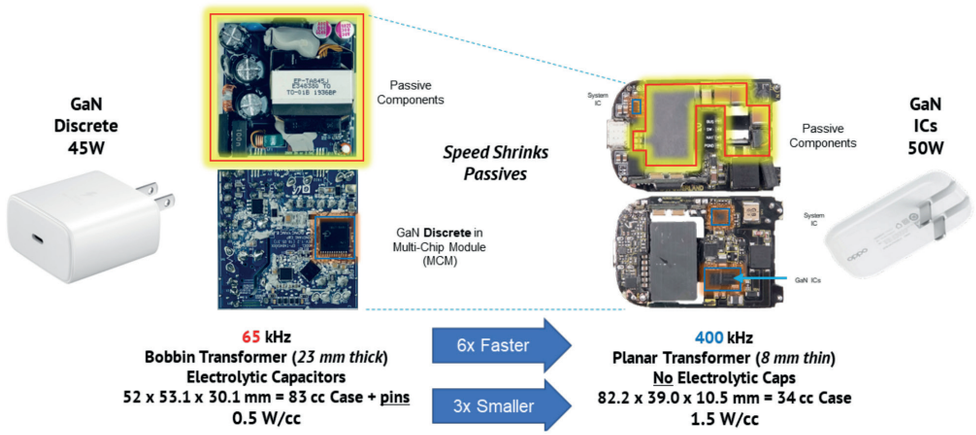
GaNFast power ICs have been designed to maximize performance whilst maintaining the highest level of reliability. A key feature is the 800 V peak capability for robust operation during transient events. The GaN gate is fully protected and the whole device is rated at an industry-leading electrostatic discharge (ESD) specification of 2 kV. Combining a wide input voltage range with programmable turn-on dV/dt and under-voltage lockout (UVLO), GaNFast power ICs are packaged in industry-standard, low-inductance, low-cost QFN packages measuring 5x6, 6x8 and 8x8 mm.



Integration of power and drive - higher efficiencies and miniaturization

Implementing a GaNFast power IC solution enables 6x-higher switching frequency, reduction of external components and 3x-smaller passives compared to a discrete GaN solution.

GaN Discrete > GaN Power IC = 6x Faster, 3x Smaller



GaNFast™ with GaNSense™

GaNFast power ICs with GaNSense technology integrate critical, real-time, autonomous sensing and protection circuits which further improve Navitas' industry-leading reliability and robustness.
This technology also enables a patent-pending, loss-less current-sensing capability, which improves energy savings by up to an additional 10% compared to prior generations, as well as further reducing external component count and shrinking system footprints.

Silicon FET

- Old, slow
- High Q_g
- High C_{oss}
- F_{sw} < 100 kHz

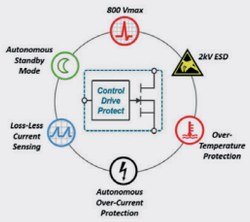
Discrete GaN

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

GaNFast™ 200-300 kHz

- ✓ Internal Gate
- ✓ Integrated Gate Drive
- ✓ dV/dt Immunity
- ✓ Layout Insensitive
- ✓ 2 kV ESD rating
- ✓ Proven Reliability
- ✓ Proven Robustness

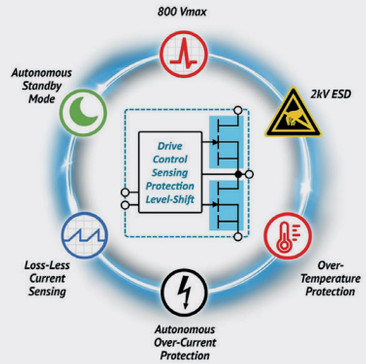
GaNSense™ 500 kHz



GaNFast plus:

- ✓ Autonomous Standby
- ✓ Autonomous Protection
- ✓ Loss-less Current Sensing
- ✓ High Precision
- ✓ High Efficiency

GaNSense™ Half-Bridge 1 MHz

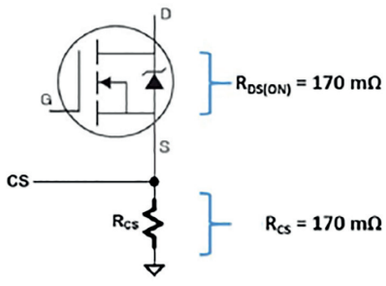


GaNSense plus:

- ✓ Highest integration
  - ✓ integrated HS and LS FETs
  - ✓ Integrated level-shift isolation
  - ✓ integrated boot-strap
  - ✓ Shoot-through protection
  - ✓ Enlarged cooling pads
- ✓ Fastest switching
- ✓ Highest efficiency

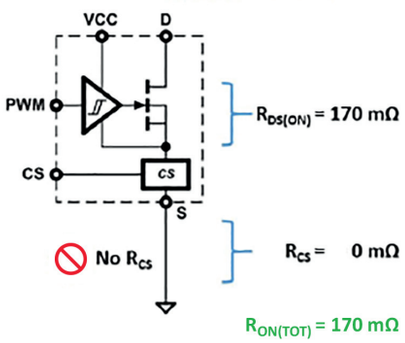
Loss-Less Current Sensing

External Resistor Sensing



$R_{ON(TOT)}$ = 340 mΩ

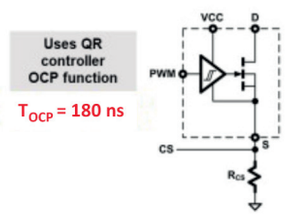
GaNSense™



$R_{ON(TOT)}$ = 170 mΩ

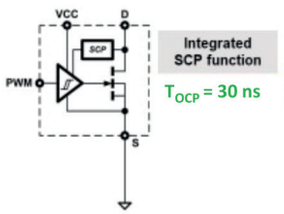
Autonomous Over-Current Protection

GaNFast™



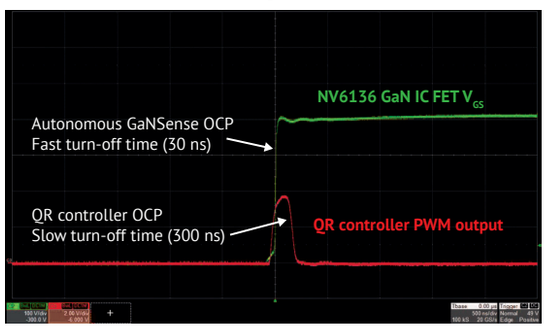
- *Discreet solutions use external R_{CS}*
- *Filter and controller delay slow*

GaNSense™

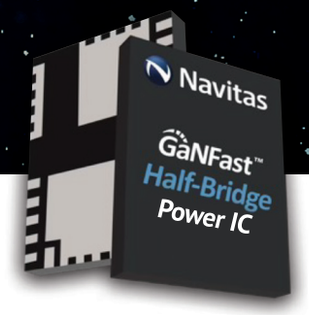


- *Autonomous OCP*
- *Fast-acting self-protection*
- *Cycle-by-cycle protection*
- *Excellent robustness*

6x faster protection



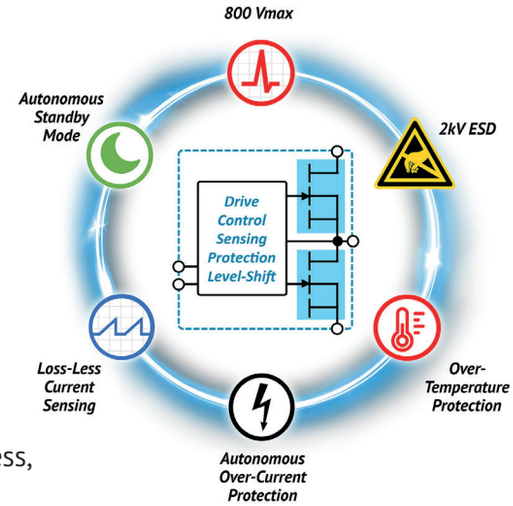
GaNSense™ Half-Bridge ICs



The next stage of the high-frequency revolution in power electronics

New GaNFast half-bridge ICs with GaNSense technology integrate two GaN FETs with drive, control, sensing, autonomous protection, and level-shift isolation, to create a fundamental power-stage building block for power electronics. This revolutionary single-package solution reduces component count and footprint by over 60% compared to existing discretes, which cuts system cost, size, weight, and complexity.

- The most integrated solution in the power semiconductor industry
- Feature-rich, in low-profile, low-inductance, industry standard 6 x 8 mm PQFN
- Enables simpler, more flexible system designs
- Autonomous protection and loss-less sensing for increased reliability, robustness, and efficiency

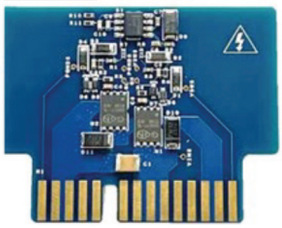


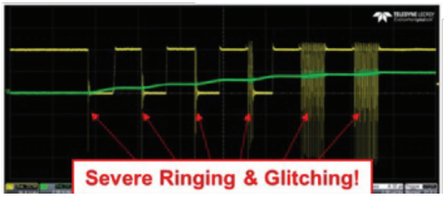
- Fast time-to-prototype and fast time-to-revenue
- Designed to enable the next generation of soft-switching topologies and exploit GaN's high-speed, fast-switching capability
- Next generation power systems can now operate in the MHz, not kHz switching range!

Highest integration, fewest components, smallest footprint, and most robust

Discrete GaN Half-Bridge

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



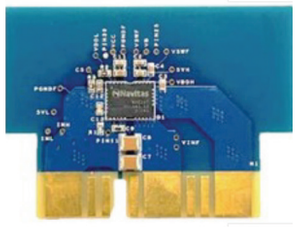


61% fewer components

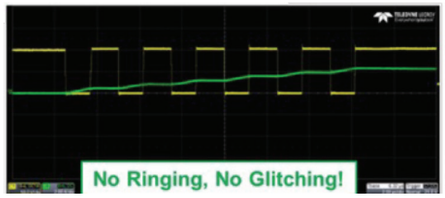
64% smaller footprint

Complete integration

GaNSense Half-Bridge IC



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

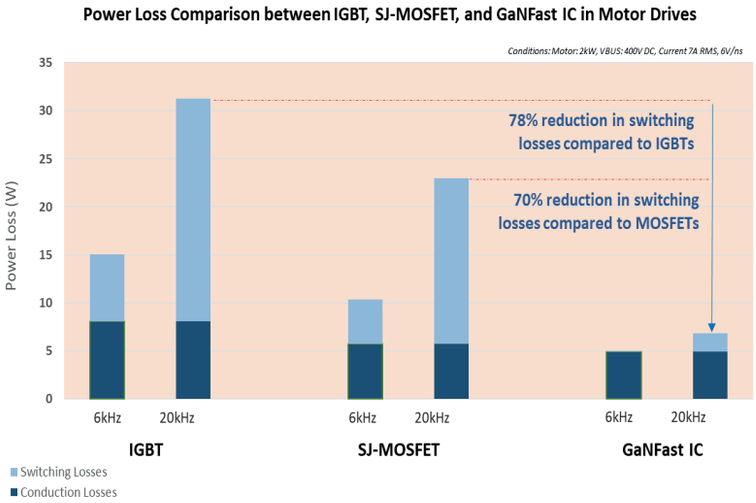


Fastest switching, highest efficiency & power density with soft-switching

Ultra-fast mobile chargers continue to transition to higher power in order to support faster charging times for increasingly power-hungry smartphones. New charging protocols such as USB PD 3.1 now support up to 240 W. For these higher power levels, soft-switching half-bridge topologies provide the fastest switching frequency, highest power density and maximum efficiency.

Soft-Switching Topology	QR Flyback (Silicon)	QR Flyback (GaNFast)	Active-Clamp Flyback (ACF) (GaNSense)	Asynchronous Half-Bridge + Totem Pole (GaNSense HB)
System Power (W)	≤65	≤65	≤65	200 - 300
F_{SW} (kHz)	100	200	500	500 - 1 MHz
Eficiency (%)	90	92	93	94.5
Power Density (W/cc)	0.5	0.8	1.2	1.6

Enabling compact size and integration in motor drives



GaNSense half-bridge ICs provide up to 78% reduction in total power losses compared to legacy silicon IGBTs or MOSFETs. This translates to a significant reduction in cost, weight and size of thermal management.

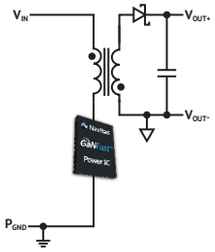
This enables next generation motors to incorporate the inverter stage into the motor chassis itself. More details can be found in our dedicated whitepapers and Application Note AN018.

Fewest components, highest integration, highest efficiency, and smallest footprint

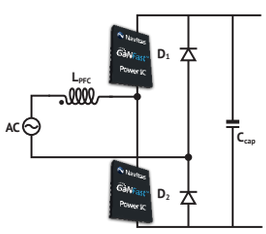
	Comp.1	Comp.2	Comp.3	Navitas	
Monolithic GaN logic, Drive, Power	No	No	Yes	Yes	Complete integration
Internal Bootstrap	Yes	No	No	Yes	
Loss-less Current Sensing	No	No	No	Yes	
Propagation Delay (ns)	47	46	Not stated	35	24% faster
δV/δt (V/ns)	100	300	Not stated	200	
Short-circuit response time (ns)	300	300	Not stated	50	6x faster
Package (PQFN)	9x9	8x8	6x8	6x8	
External components required	16	22	18	10	60% fewer
R_{thJC} (°C/W)	2.9	2.8	1.9	1.8	
PCB Footprint (incl. Controller) mm²	104	148	135	84	24% smaller

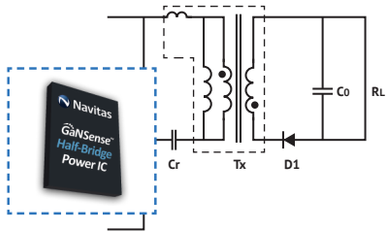
Typical Applications

Fast Charger (QR Flyback) using GaNFast IC

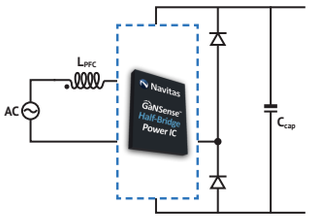


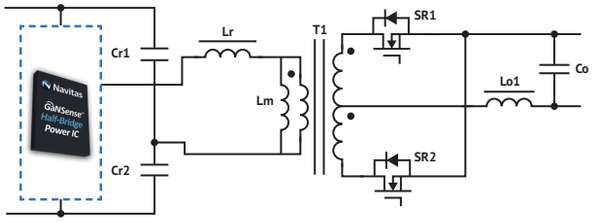
Fast Charger (Totem Pole + Asymmetric Half-Bridge) using GaNFast ICs and GaNSense Half-Bridge IC



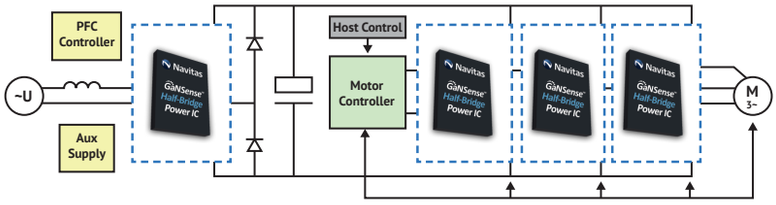


AC-DC Converter (Totem Pole + LLC + SR) using GaNSense Half-Bridge ICs





Motor Drive (3-Phase) Schematic using GaNSense Half-Bridge ICs



Product Portfolio

Family	Part#	Type	VDS(CONT) (V)	VDS(TRAN) (V)	RDS(ON) (mΩ,typ)	Package (PQFN)
GaNFast™	NV6113	Single	650	800	300	5 x 6
	NV6115	Single			170	
	NV6117	Single			120	
	NV6123	Single		800	300	6 x 8
	NV6125	Single			175	
	NV6127	Single			125	
	NV6128	Single			70	
GaNFast™ with GaNSense™	NV6152	Single	700	800	450	5 x 6
	NV6153	Single			330	
	NV6154	Single			260	
	NV6156	Single			170	
	NV6158	Single			120	
	NV6132x	Single		800	450	6 x 8
	NV6133x	Single			330	
	NV6134x	Single			260	
	NV6136x	Single			170	
	NV6138x	Single			120	
	NV6169	Single	650	800	45	8 x 8
GaNSense™ Half-Bridge	NV6247	Half-Bridge	650	800	160 / 160	6 x 8
	NV6245C	Half-Bridge			275 / 275	

Join the GaN Revolution

Samples available immediately, with short production lead-times.

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