2020（冬季）
USB PD & Type-C
亚洲展
参展邀请
12/18【周五】09:00-17:00 主办：[illegible] 中国·深圳

纳微 Navitas

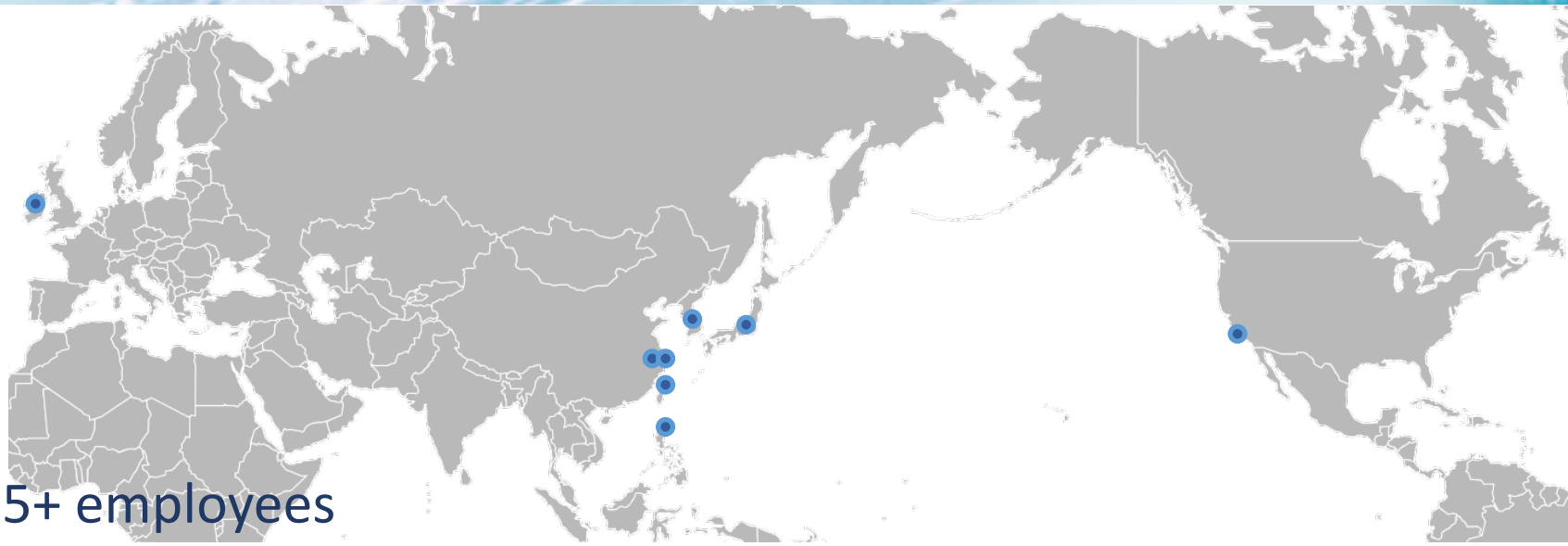
The Future of Charging is GaNFast!

December 18th, 2020

Edwin (李文辉) LEE, Director of Sales, Navitas Semiconductor
edwin.lee@navitassemi.com



Navitas Semiconductor Ltd.

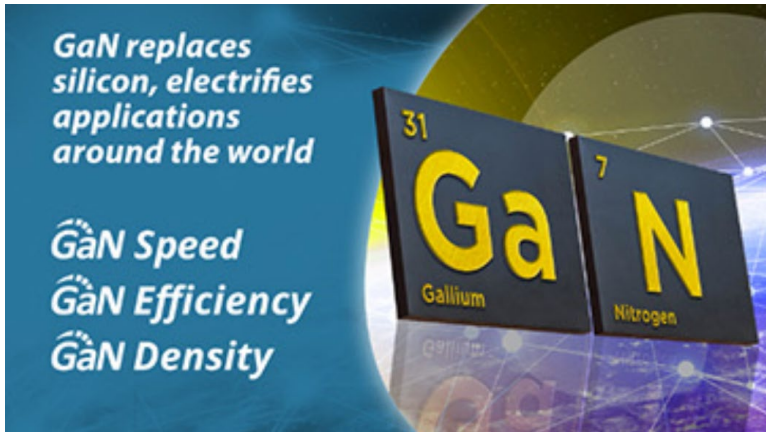


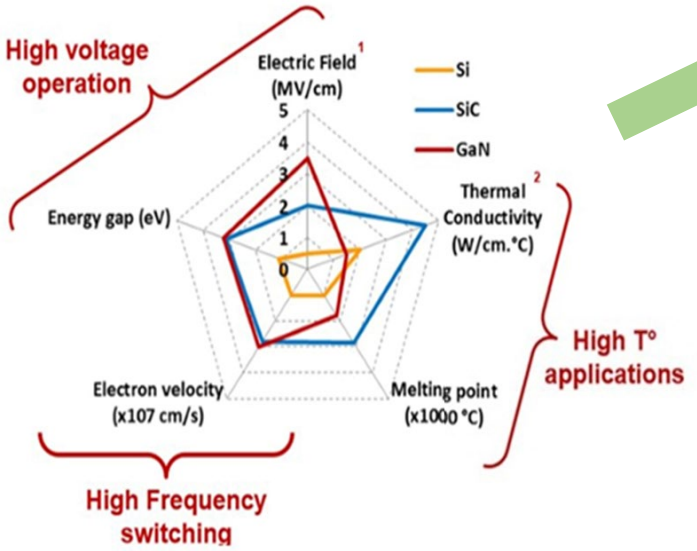
- Navitas:
  - Latin for “Energy”
  - Founded January 2014
  - Proven management, 75+ employees
  - Strong financial investors ($1B+ managed capital)
- Global Expansion
  - HQ: Dublin, Ireland
  - Locations: Hangzhou, Hsinchu Los Angeles, Manila, Shanghai, Shenzhen, Suwon, Taipei & Tokyo
- World’s first & only GaN power IC company



Power GaN Technologies

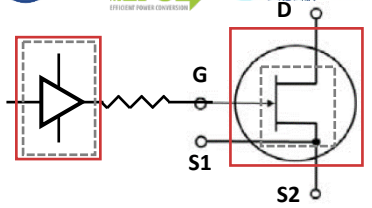
GaNFast™





eMode FET
(normally off)

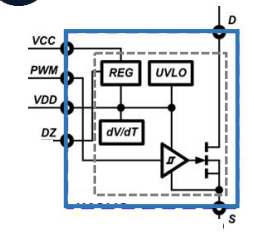
Panasonic Infineon GaN Systems EPC Innoscience



GaN Discrete
Need special gate driver to drive sensitive GaN input

Integration

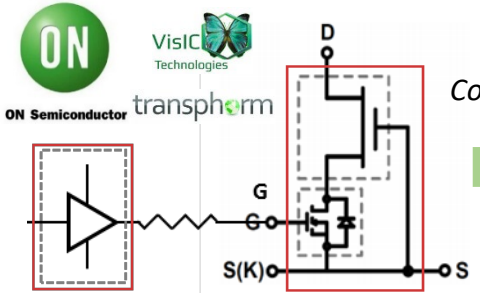
Navitas



GaN Power IC
GaN Power (FET), Drive, Control, Protection

dMode FET
(normally on)

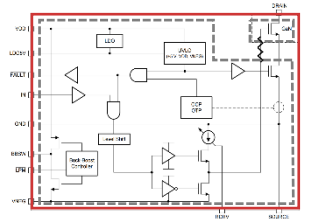
ON Semiconductor VisIC Technologies transphorm



Need extra Si FET in 'cascode' configuration

Co-pack

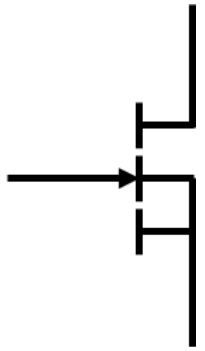
Texas Instruments power integrations



Si controller/driver + Si FET cascode + GaN dMode FET

World's First GaNFast™ Power ICs

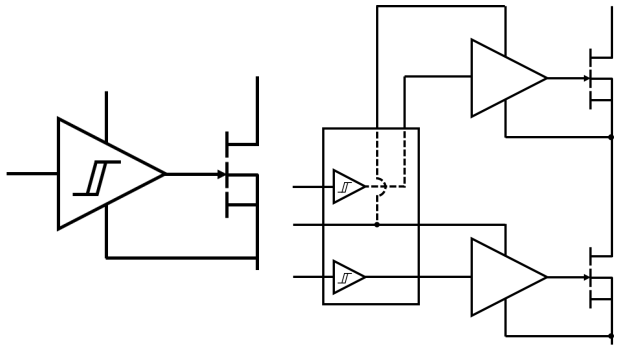
Fastest, most efficient GaN Power FETs



>20x faster than silicon
>5x faster than cascoded GaN
Proprietary design

+

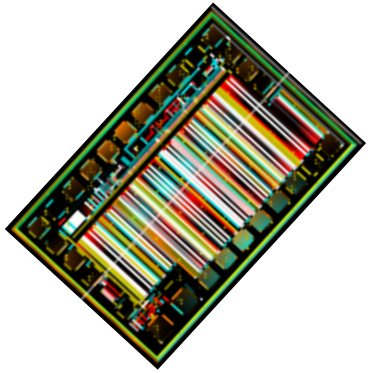
First & Fastest Integrated GaN Gate Driver with Control & Protection



>3x faster than any other gate driver
Proprietary design
120+ patents granted/applied

=

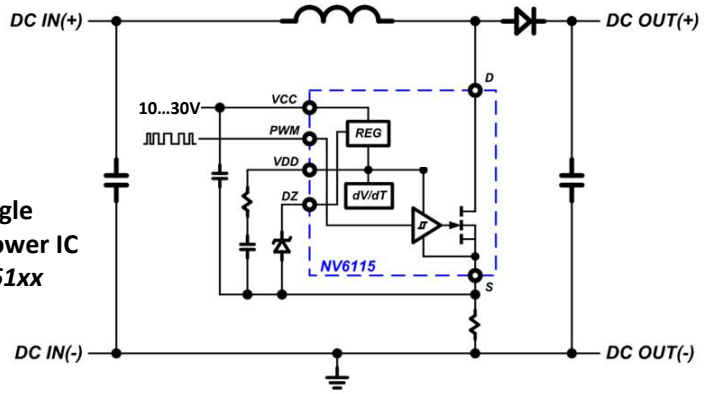
World's First GaNFast™ Power ICs



Up to 40 MHz switching, 5x higher density & 20% lower system cost

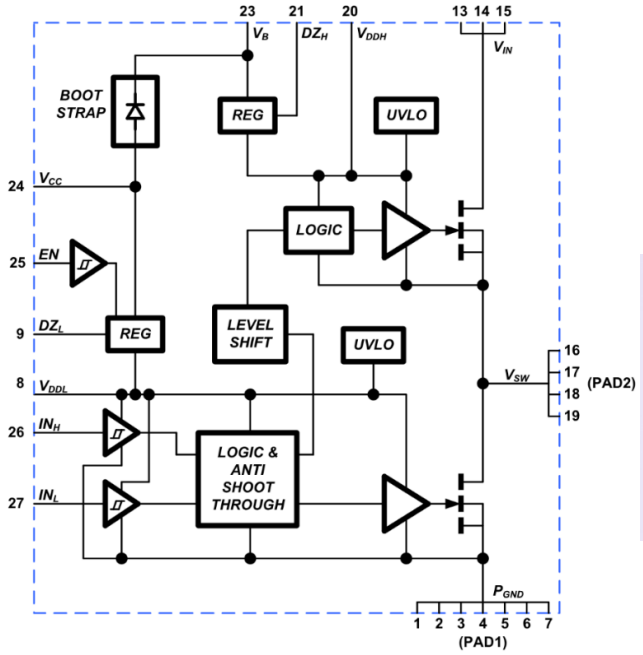
GaNFast Power ICs: Single, Half-Bridge

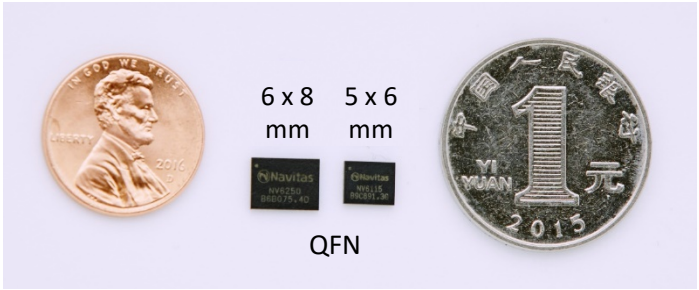
Single
GaN Power IC
NV61xx

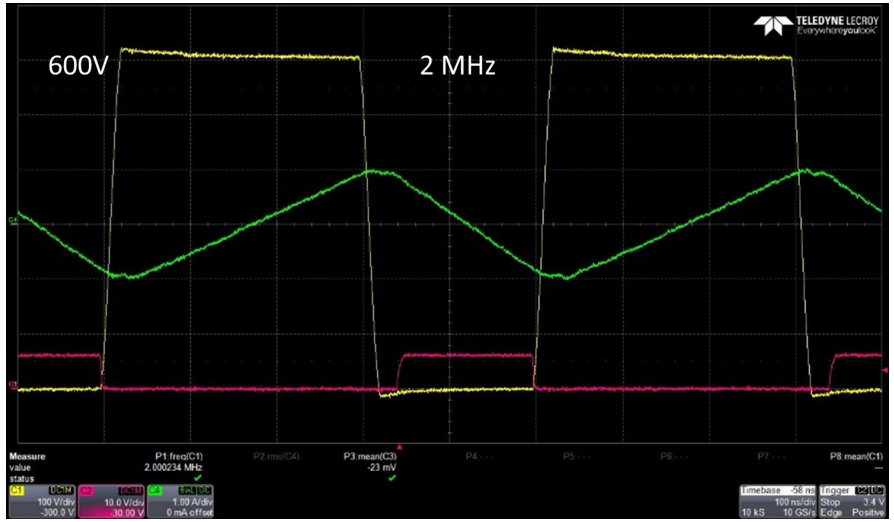


- Monolithic integration, 650V/800V, 2MHz
  - GaN Power FET(s) + Driver + Control + Protection
  - Features: on-board regulators, hysteretic input, level-shift, bootstrap, dV/dt control, UVLO, shoot-through & ESD protection
- "Digital In, Power Out"

Half-Bridge
GaN Power IC
NV62xx





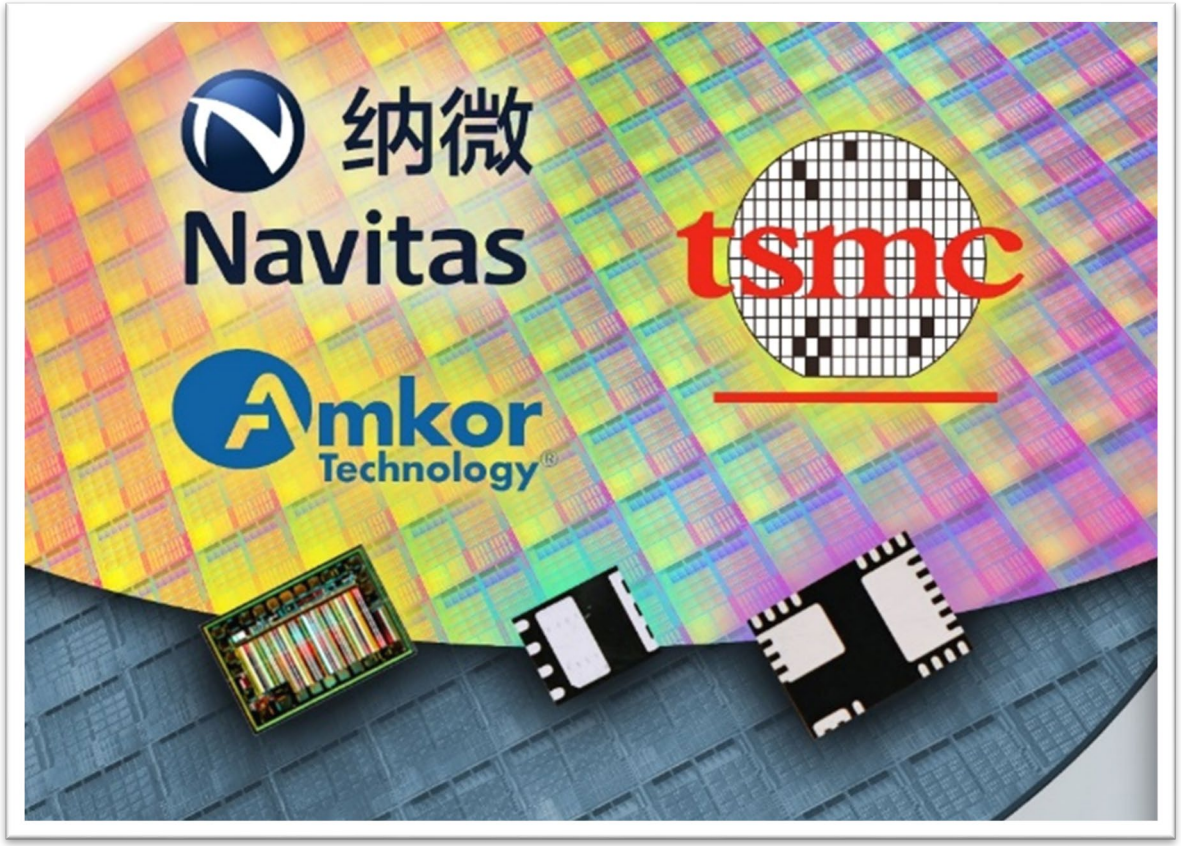


2MHz, 0-600V Half-Bridge

- 120+ patents
  - AllGaN™ PDK
    - Integrated gate drive
    - Half-bridge
    - Level-shifting
    - Autonomous protection
    - …and more
  - Low-inductance packaging
  - High-frequency systems
  - Application use cases



High Volume, High Quality





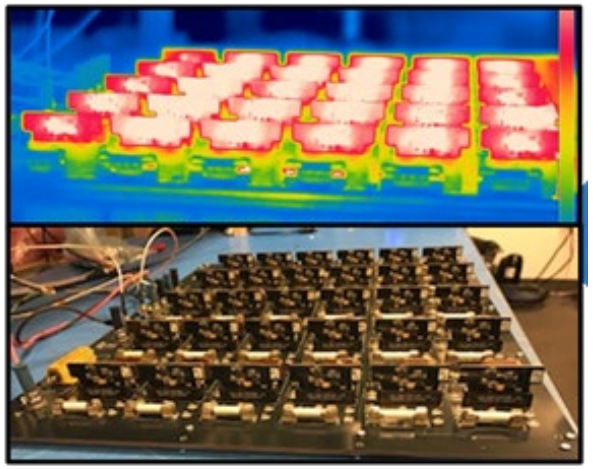
Proprietary Reliability Methods

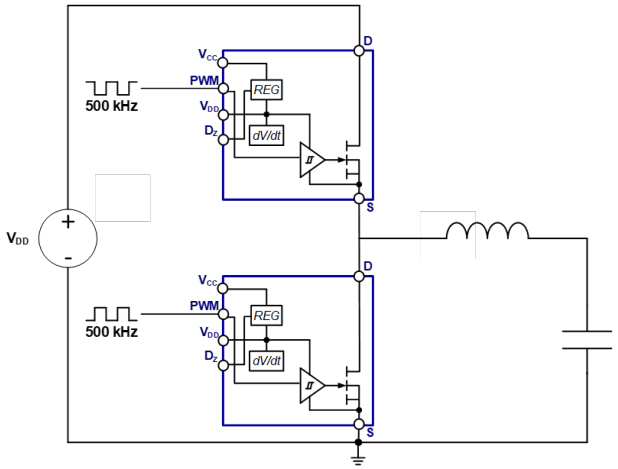
GaNFast™

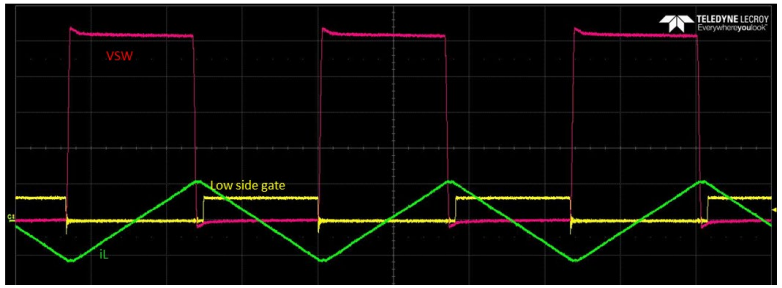
Application Specific Testing

- ✓ Matches all elements of application profile
  - ✓ FET & IC
- ✓ Many cells in parallel
  - ✓ Statistical sample sizes
- ✓ Low total power consumption
- ✓ Conditions changeable to develop lifetime and acceleration models

HTOL Mother Board

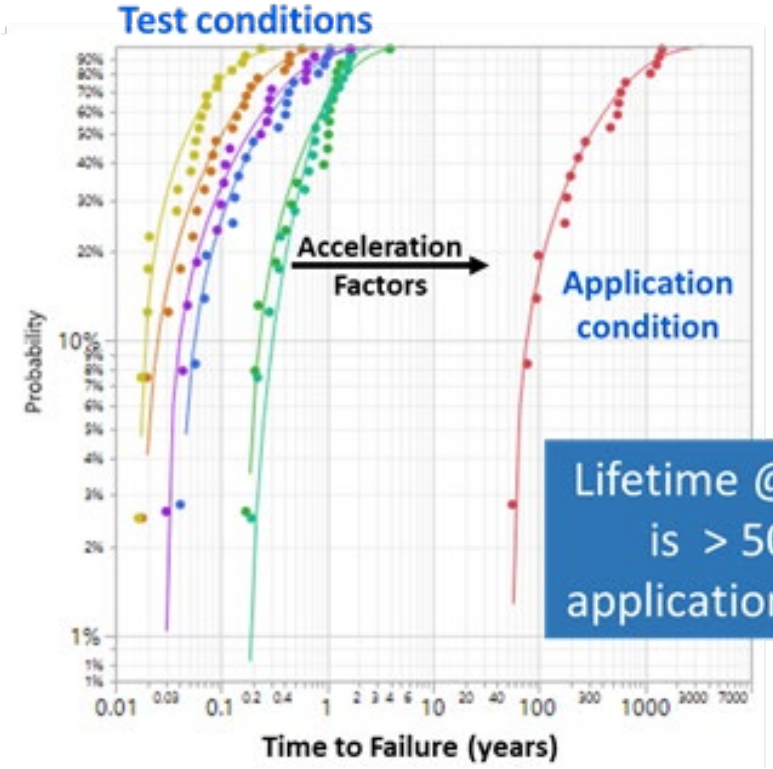






500kHz, 0-500V

Test to Failure & Lifetime Prediction



Lifetime @ 100 ppm is > 50 yrs at application condition

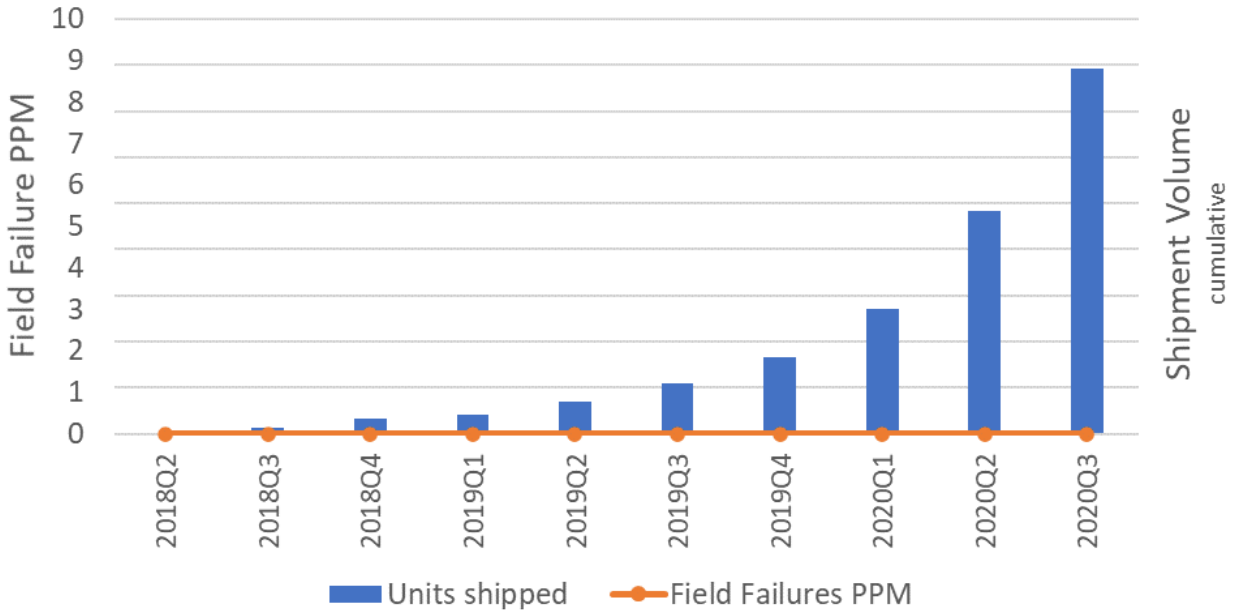
Proven Quality and Reliability

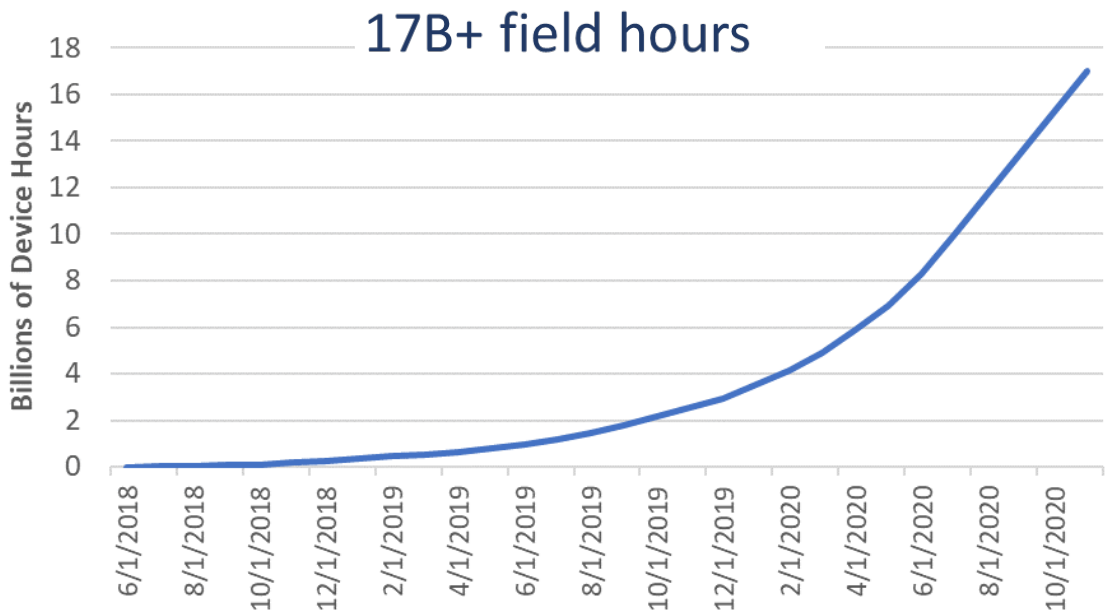
GaNFast™

Ongoing Reliability Monitoring	Results
Equivalent device hours tested	**3.4 billion hours**
FIT (Failures in Time) **Failures in 1 billion device hours in the field**	**0.27**

>9M Shipped

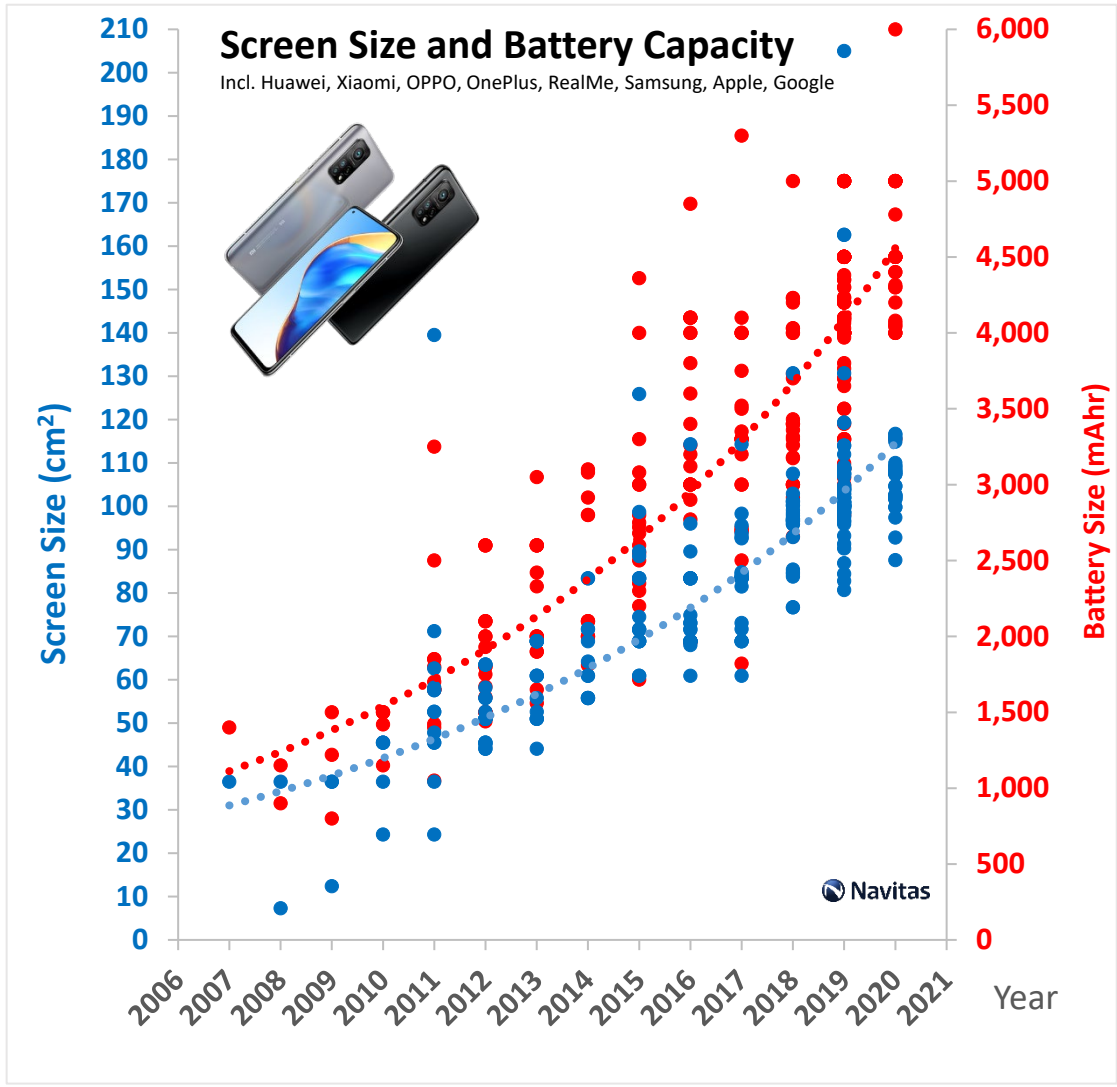
0 (zero) Field Failures

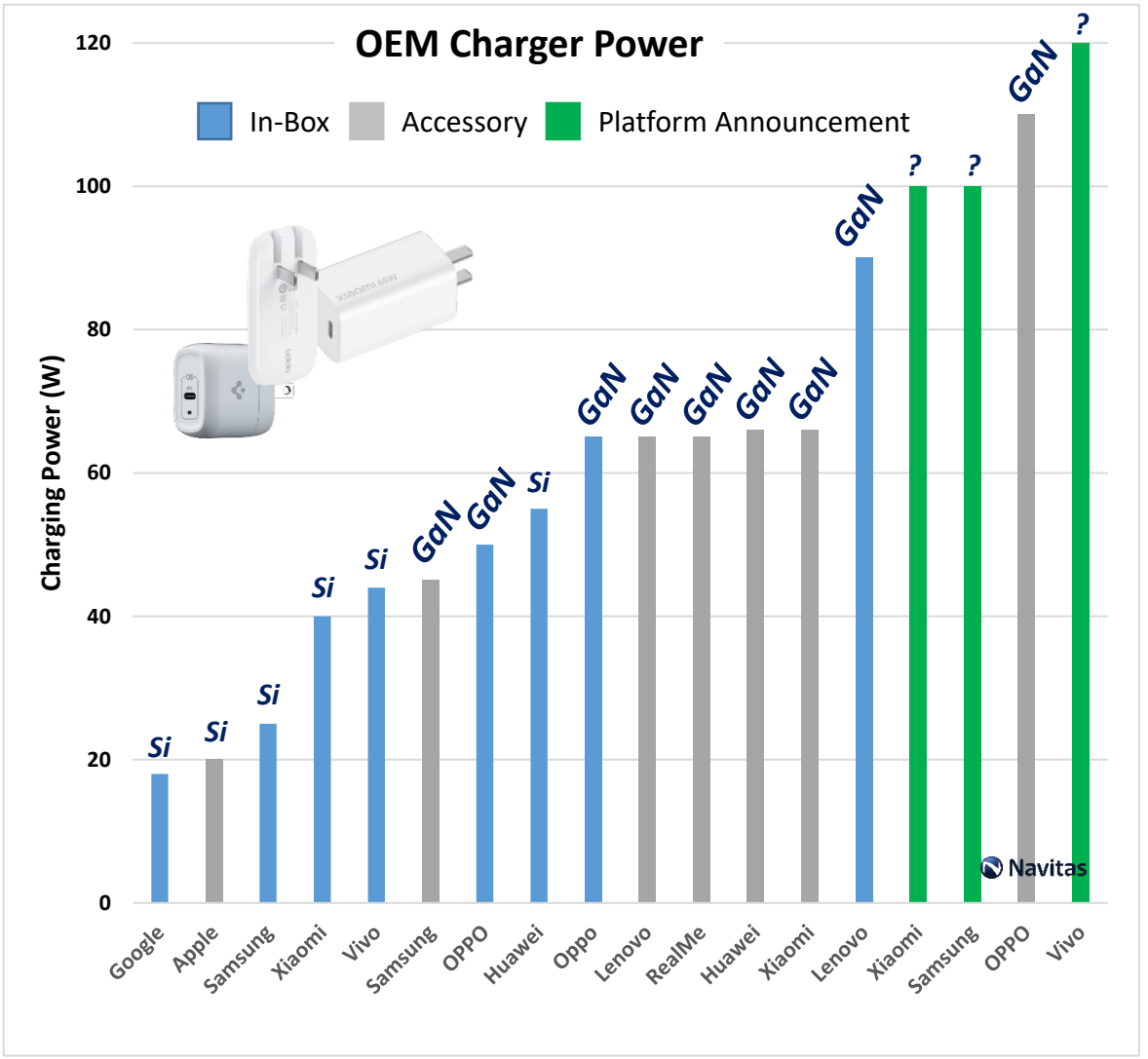




Smartphones Win With GaN

GaNFast™





Source: Navitas, to November 2020

Notebook Fast Charging

GaNFast™

Lenovo 联想

thinkplus

Lipstick 65W C
63 cc, 93 g, 1 W/cc



thinkplus

Lipstick Pro 65W C+A
76 cc, 106 g, 0.85 W/cc





Notebook Fast Charging



Power Adapter Plus (PA901)
90W captive USB-C + 10W A
188 cc, 375 g, 0.53 W/cc



ProArt StudioBook One
300W 48V
237 cc, 600 g, 1.27 W/cc

Mobile Fast Charging

"Using gallium nitride devices to drive transformers to very high frequencies has been the dream of all technical workers for many years"

50W Mini SuperVOOC "Cookie" Charger

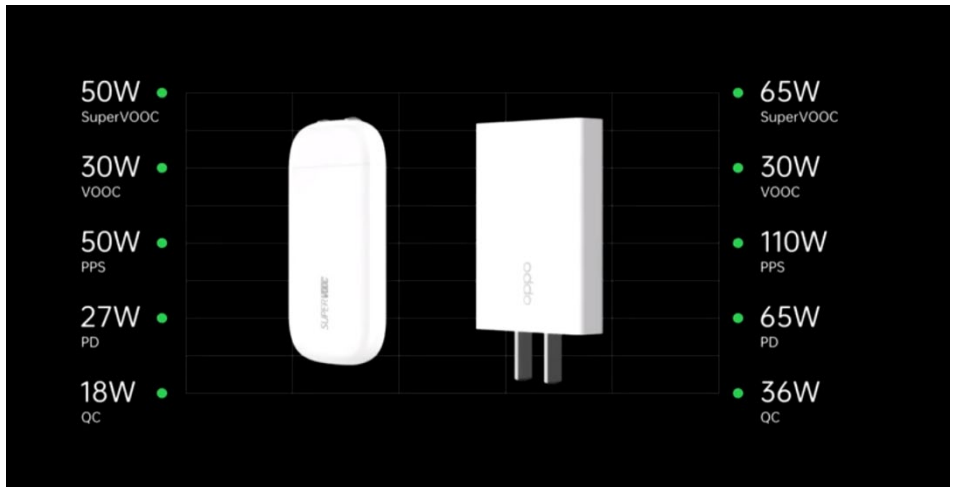


110W Platform



65W SuperDart







Mobile Fast Charging

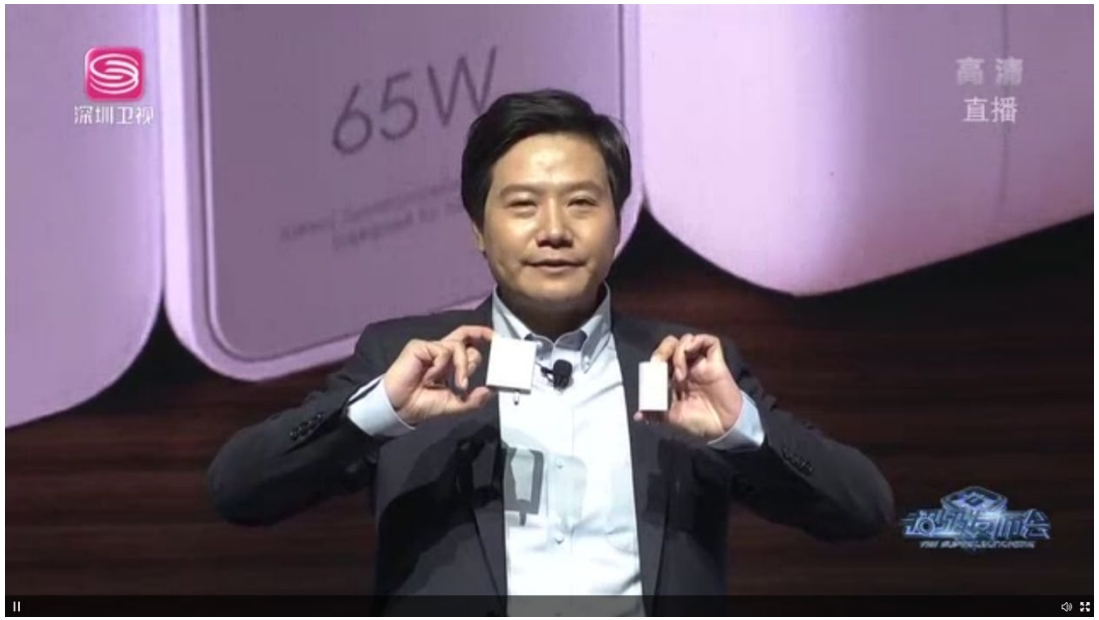
小米 xiaomi.com



65W C
53 cc



Mi 10, 10 Pro



Xiaomi CEO: "How tiny is this GaN charger?"

Lenovo 联想

Legion Gaming Phone
90W 2C









Aftermarket GaNFast

- 8 chargers from 27W to 100W 2C+2A
- Proprietary Omnia GaNFast power IC



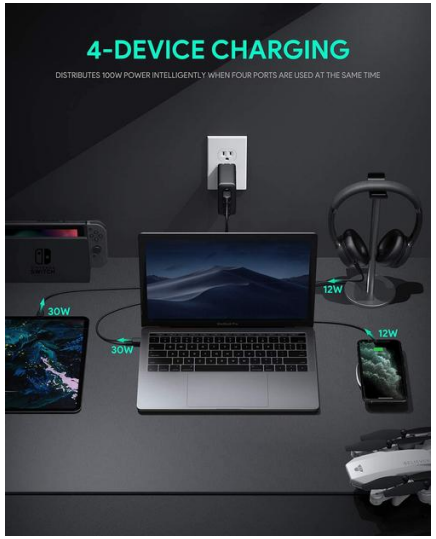


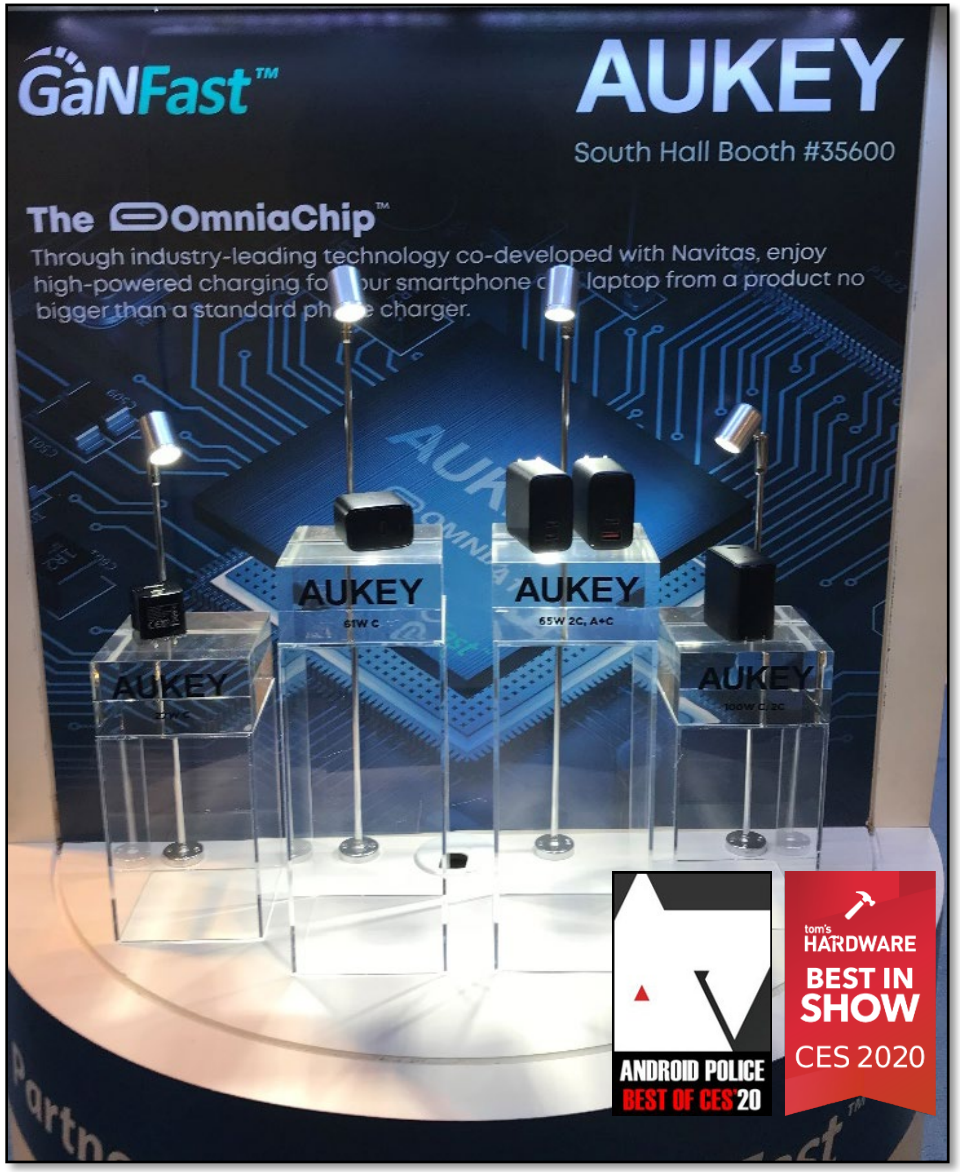
Omnia 61W C
61 cc, 92 g, 1 W/cc



Omnia 100W 2C+2A
160 cc, 223 g, 0.62 W/cc







Aftermarket GaNFast

spigen



20W C

RAVPOWER



65W C+A

belkin



61W C







World's Smallest Multi-Port 30W-200W

GaNFast™

3x smaller, lighter and lower cost than individual chargers

High-frequency ACF / QR
Toroidal or planar transformers

UIBI 柚比



30W C+A
67 cc, 82 g

Lenovo 联想
thinkplus



Pro 65W C+A
76 cc, 106 g

AUKEY



Omnia 90W 2C+A
131 cc. 190 g

SHARGE



100W 3C+A
149 cc, 220 g

Baseus



120W 2C+A
154 cc, 216 g

chargeasap



200W 2C+2A
203 cc, 220 g

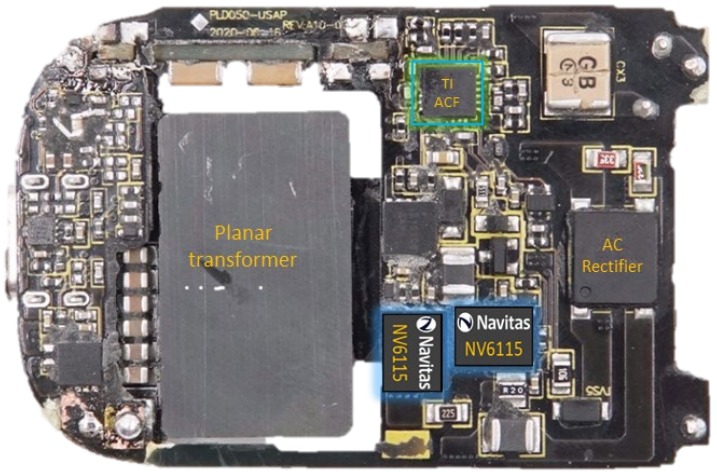
High-frequency CrCM boost PFC + ACF / QR
Toroidal or planar transformers

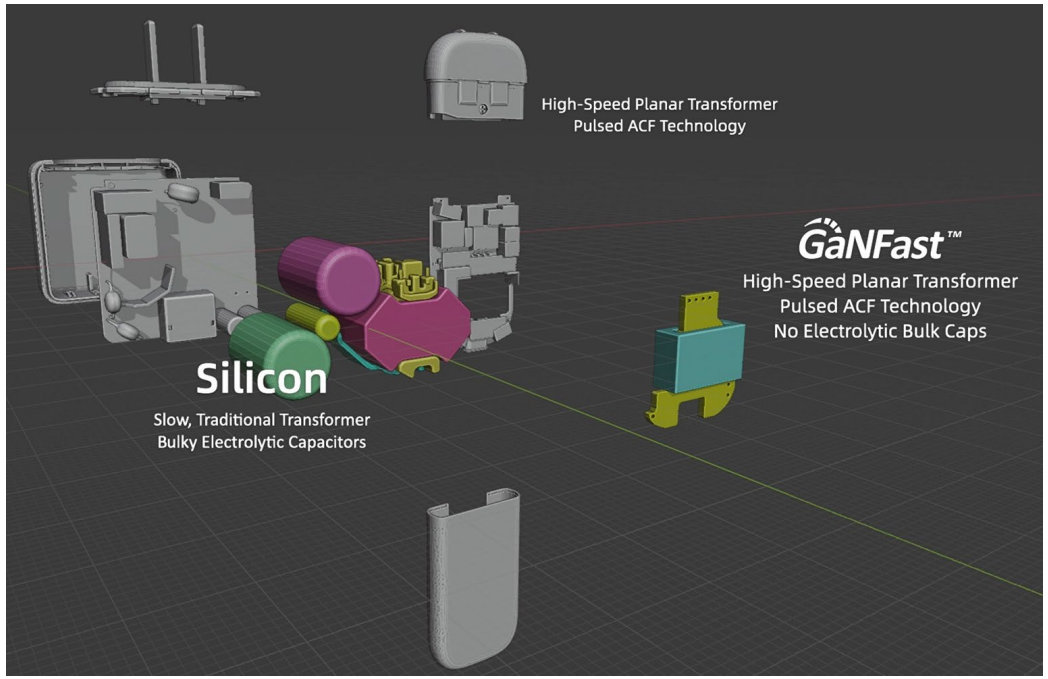
Images to scale

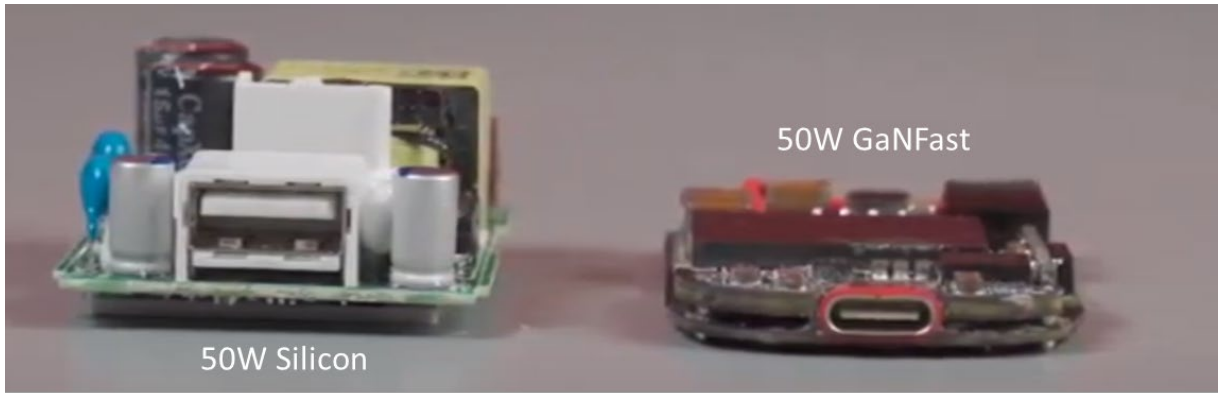
oppo 50W Mini “Cookie”

GaNFast™

- Pulsed-Active Clamp Flyback (P-ACF) soft-switching 400 kHz
  - *Very* high-frequency shrinks magnetics, etc. ***and eliminates electrolytic bulk caps***
  - 2x NV6115 GaNFast power ICs, UCC28782 controller and planar transformer
  - Planar transformer 60% thinner than traditional
  - No electrolytic caps saves 40% PCB area
- Size: 82 x 39 x 10.5 mm = 34 cc (cased), ~62 x 35 x 8 mm = ~17 cc (PCBA)
- Efficiency DoE VI: 92% @ full load, 230 V_{AC}



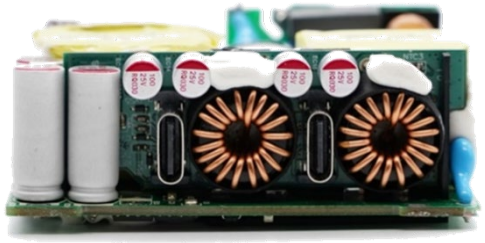




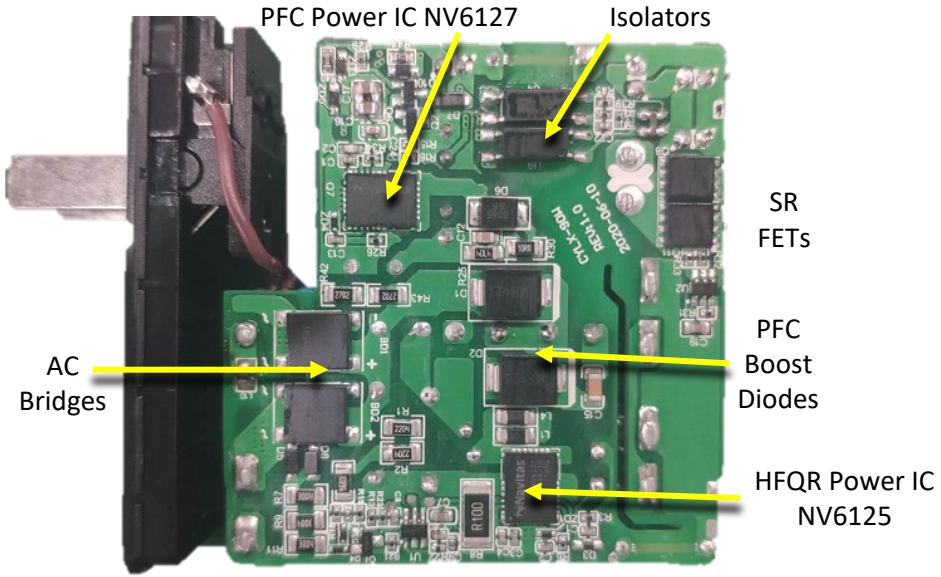
Lenovo 联想 Legion 90W 2C

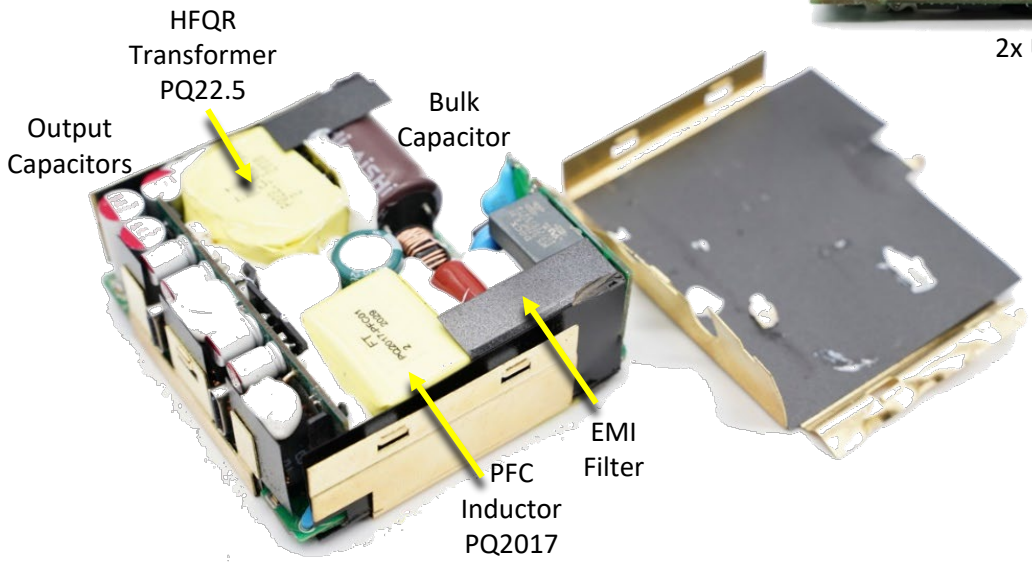


- High-frequency topology shrinks magnetics, EMI filter and output caps
  - CrCM Boost PFC (150k-200 kHz) with NV6127 GaNFast power IC and NCP1622 controller
  - HFQR DC-DC (130-160 kHz) with NV6125 and NCP1342
- Size: 66 x 63 x 28 mm = 116 cc (cased) = 0.8 W/cc
  - 58 x 59.6 x 22 mm = 76 cc (PCBA) = 1.2 W/cc
- Efficiency DoE VI (90W, Dual Output):
  - 91.8% @ full load, 230 V_{AC}, 91.6% @ 130 V_{AC}



2x USB-C





Control ICs NCP1622, NCP1342 on daughtercard


GaNFast™
氮
镓
Let's go GaNFast™
超级芯片，超速充电