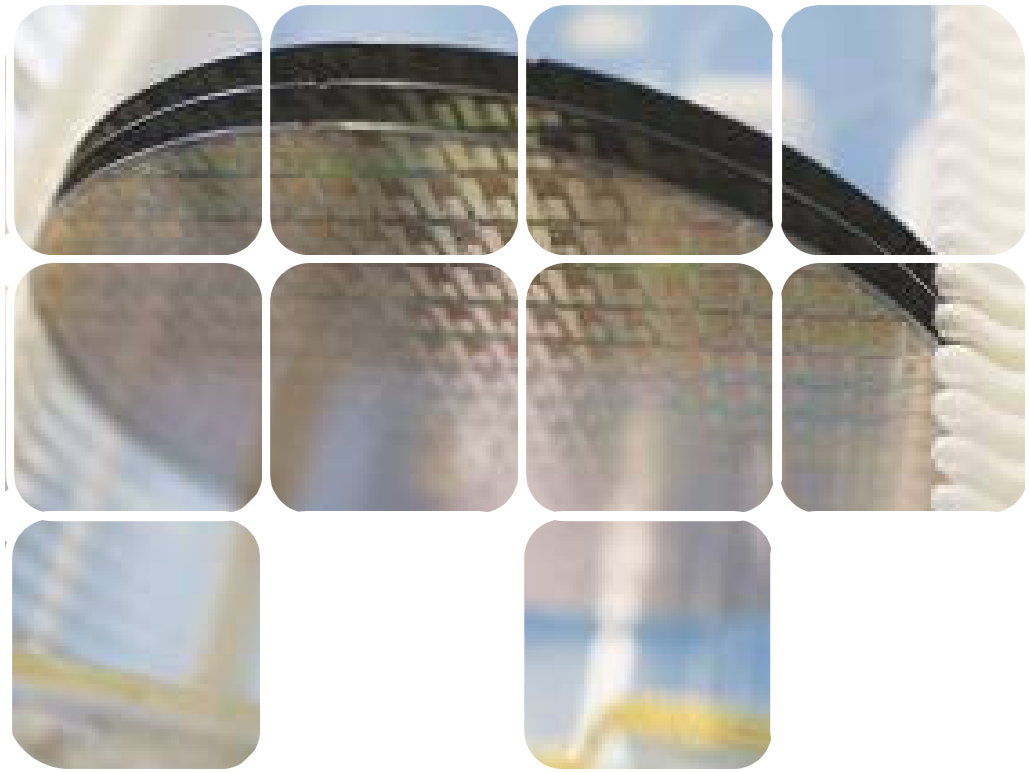


Market Opportunities for Mainstream GaN

Mark Murphy
Director of Marketing, NXP RF Power

Mainstream GaN Supporting New GaN Opps

- NXP believes GaN will create major opportunities in the RF Power world
- NXP has taken GaN Mainstream to support these opportunities
- NXP is “technology neutral” and provides both LDMOS and GaN to support optimal system solutions
- NXP, as a global leader in High Performance RF and RF Transistors is committed to developing and providing the best solution choice to its customers
- NXP is developing GaN processes for different applications including base stations. Base station applications include traditional Doherty amplifiers in the near term (GH50 process) as well as Digital Transmitters in the longer term (GHSM process). This will drive volume and cost structure.
- NXP works in collaboration with the Fraunhofer Institute and UMS

Fraunhofer IAF

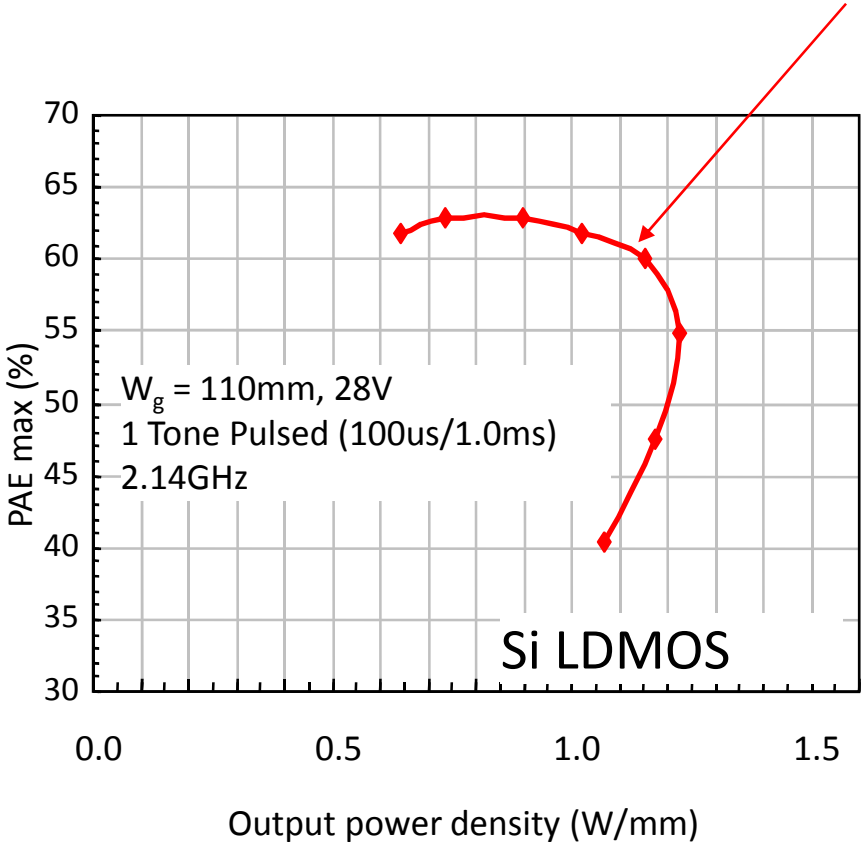
NXP founded by Philips

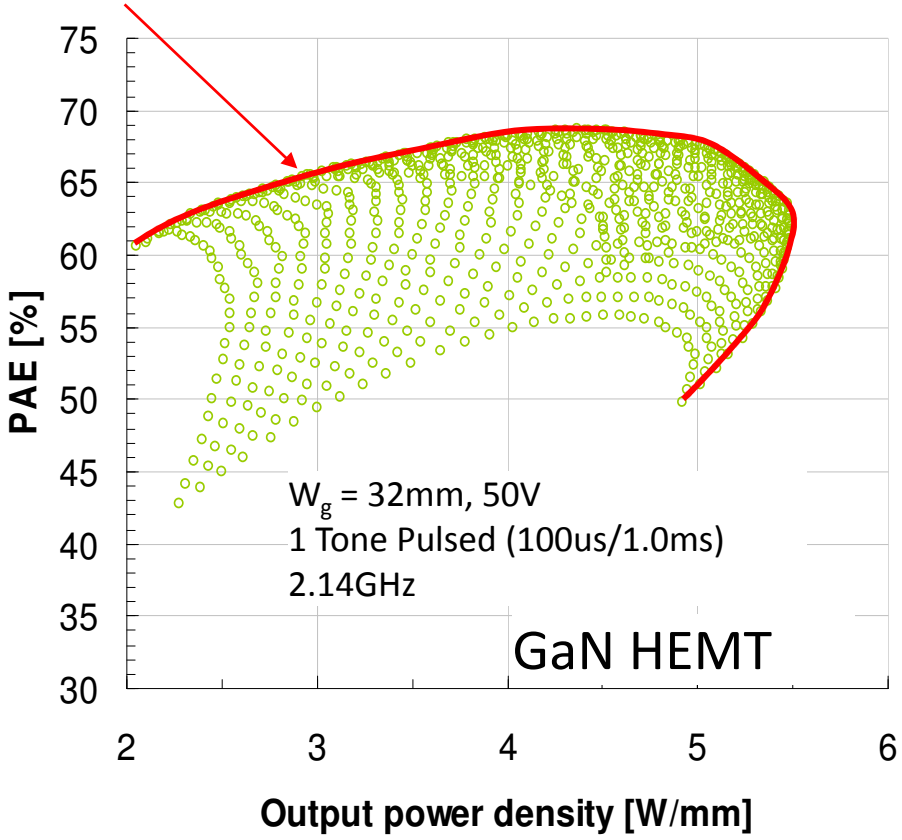
united monolithic semiconductors

ums

Why is GaN so Interesting ?

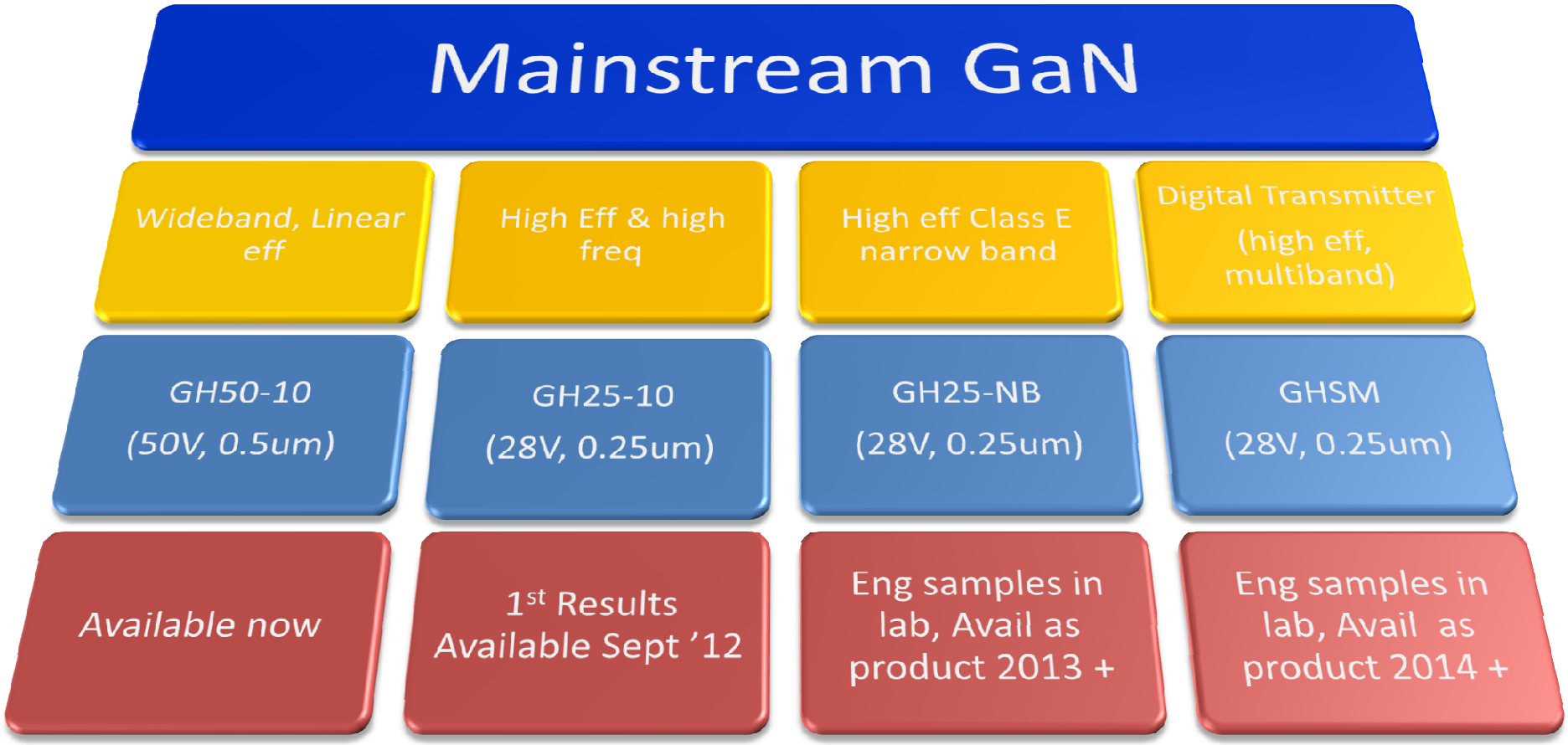
Trade-off efficiency vs. output power



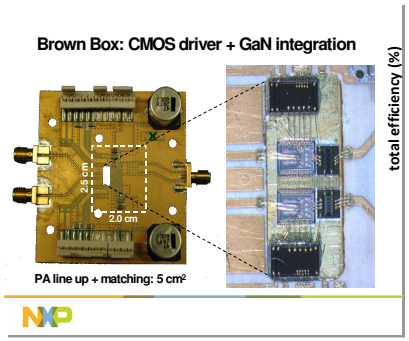


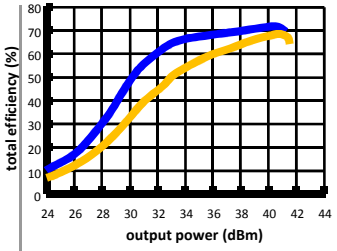
GaN has > 5% higher peak efficiency, 4-5 times more output power and works at higher frequencies

“Mainstream GaN” Technology Segmentation



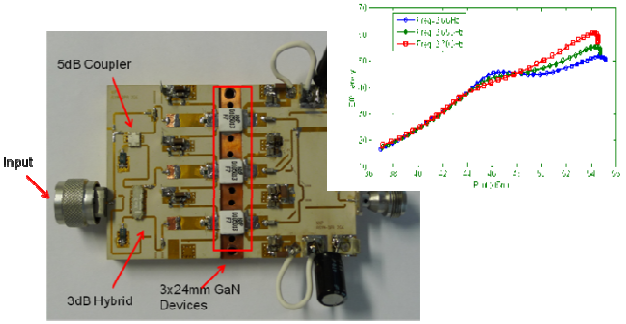
Leading GaN Markets





Digital PA

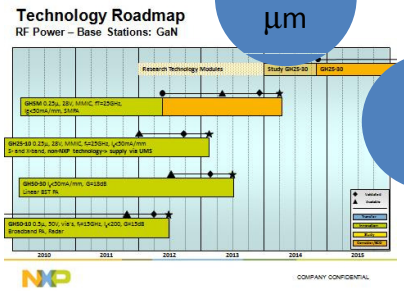
Radar

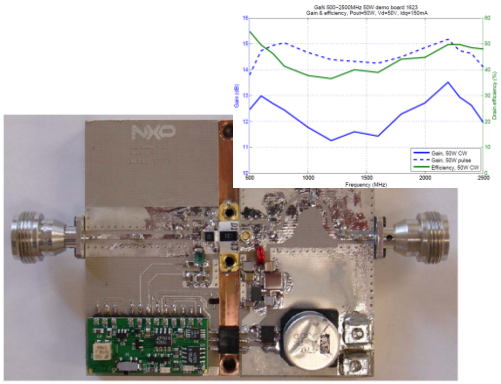


Linear PA (3-Way Doherty)

0.25 µm

0.5 µm





Broadband amplifiers

NXP

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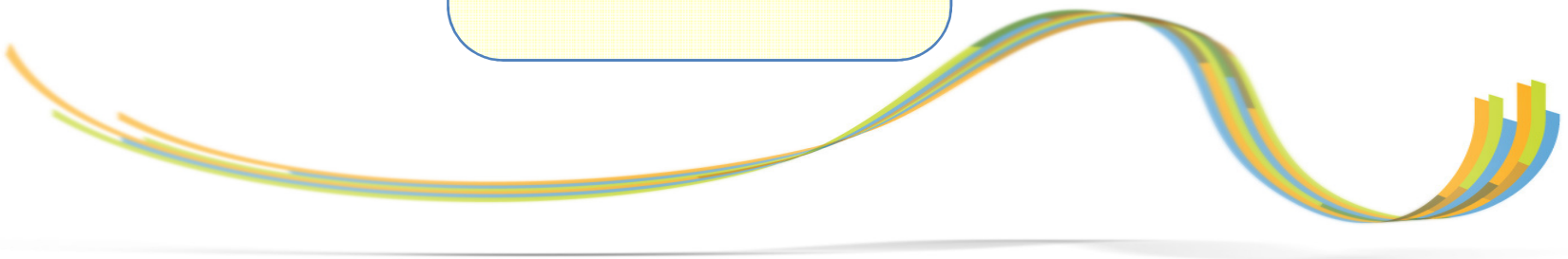
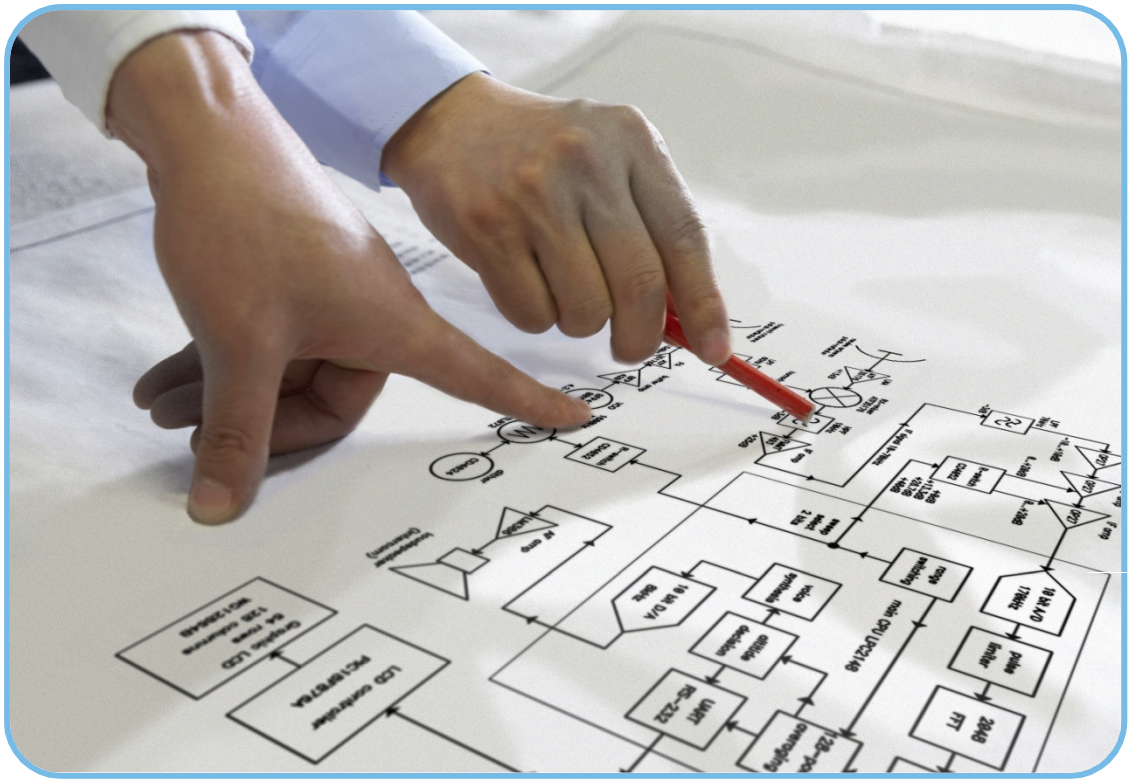
Fraunhofer IAF

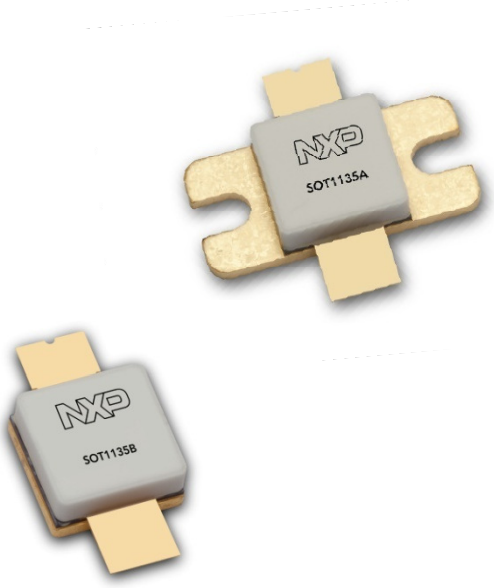
Additional GaN Opportunities

Application Landscape

Communications	Energy transfer	Sensing/Imaging
• Base stations • VSAT • P2P • Television • Radio • Radio Comms • **TWT replacement**	• Industrial Lasers • Semiconductor equip • Synchrotrons • **Surgical equipment** • **Heating & drying** • **RF Plasma Lighting** • **Solid state cooking** • **Automotive Ignition** • **Oil extraction** • **+ more**	• AESA Radar • MRI • **High end cooking** • **Ablation** • **Personal Med** • **+ many more**

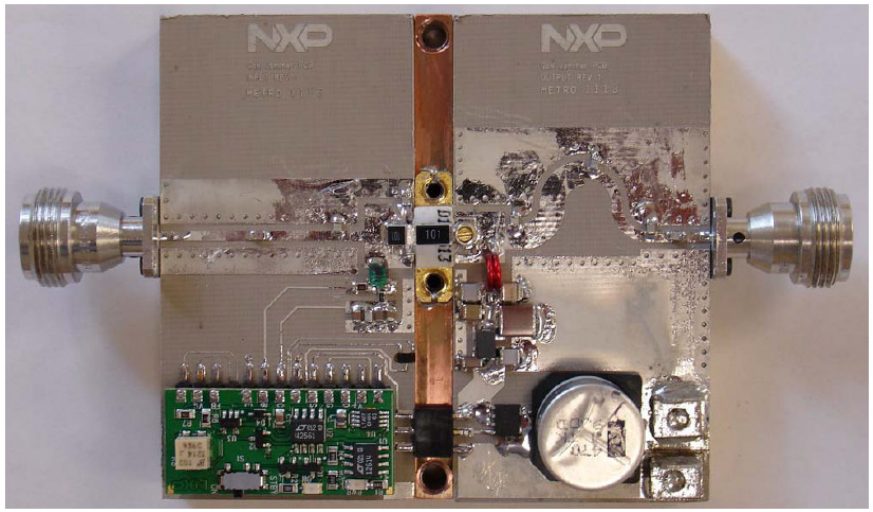


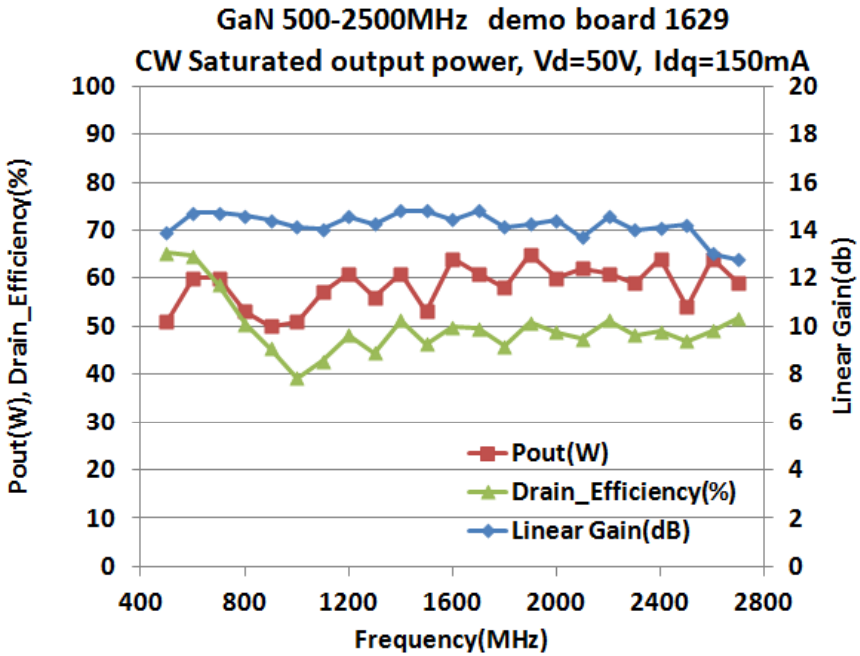




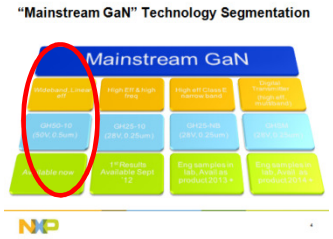
Real Application Examples

Broadband Amplifier 500-2500 MHz with CLF1G0035-50

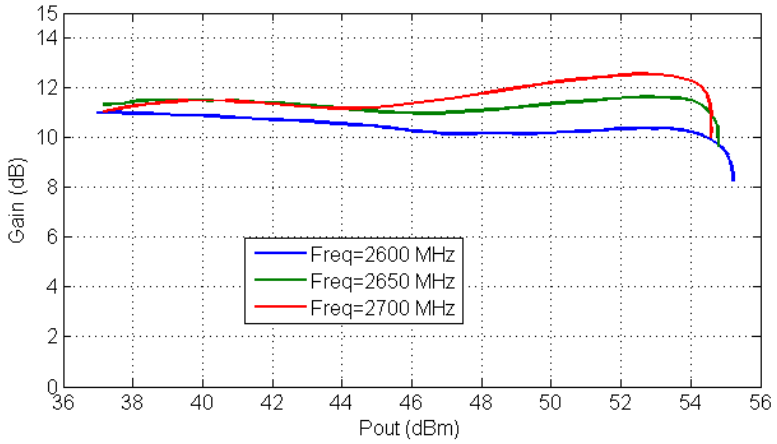


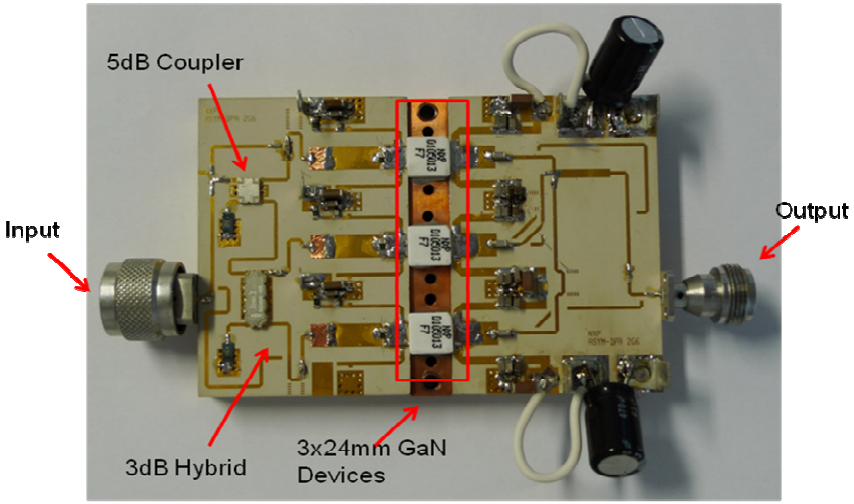


Due to the higher impedance levels of the 50 V GaN process broadband amplifiers can be designed based on one transistor.

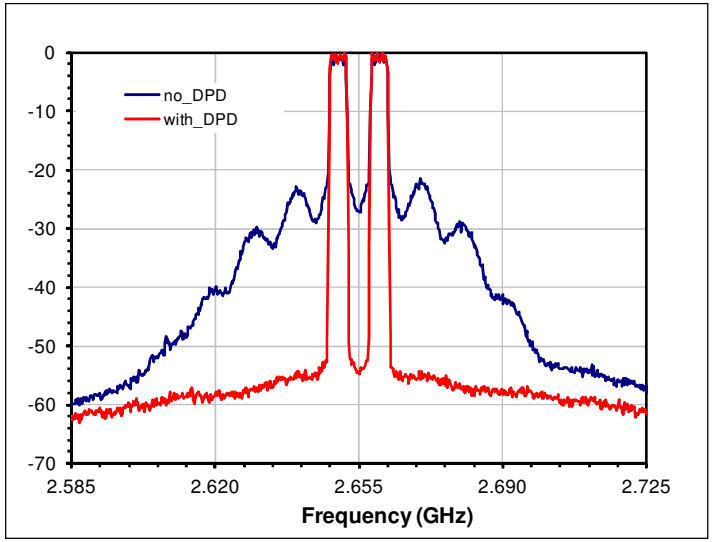


Asymmetric GaN Doherty



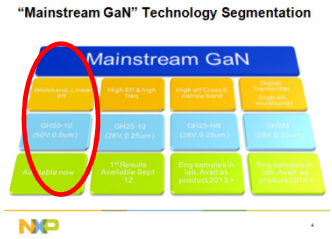


Performance (pulsed)
100 µs pulse width, 10% duty cycle @ 2.65 GHz, 50 V

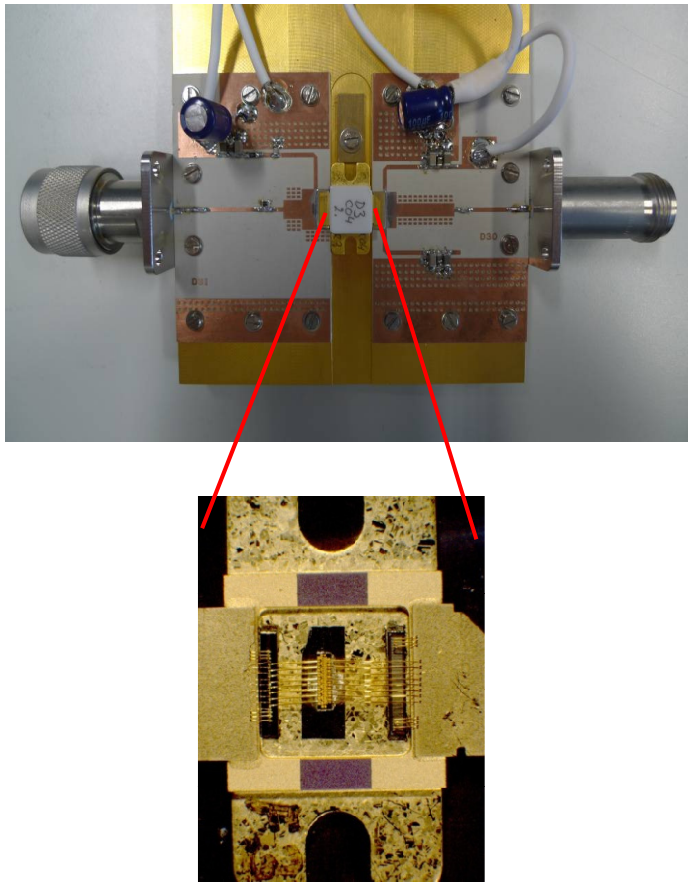


2C-WCDMA Signal, Pout=56 Watts, Efficiency = 46.5%.

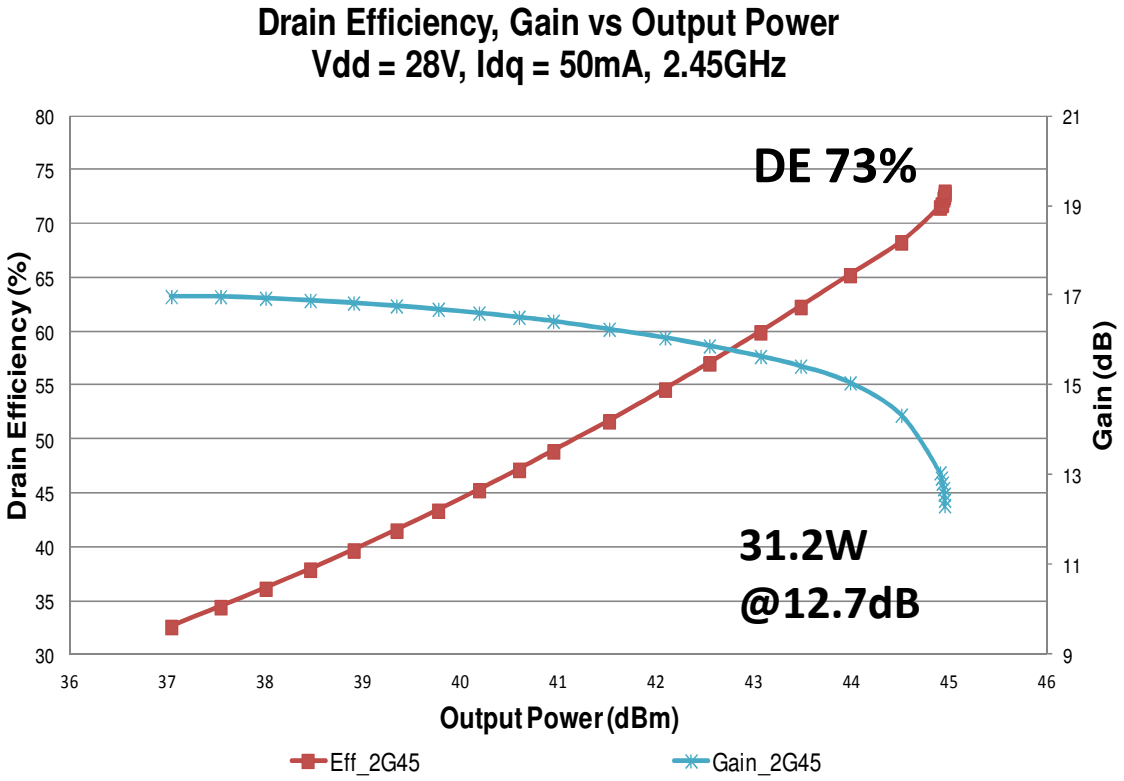
- Efficiency higher than LDMOS
- Efficiency can be improved with PA class (F,E)

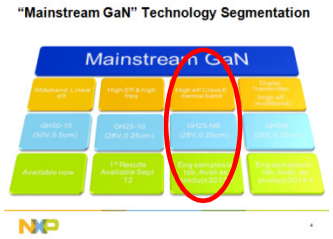


Class E Power amplifier tuned for 2.45 GHz.



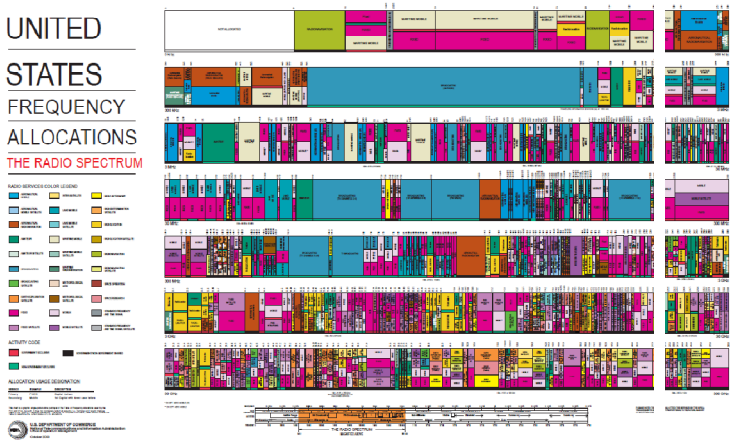
Transistor with class-E harmonic matching inside

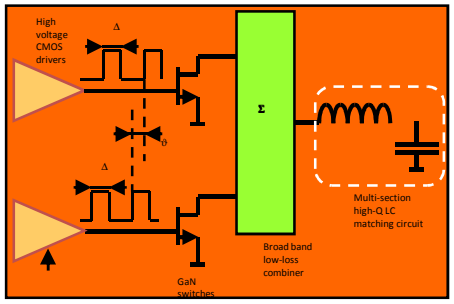


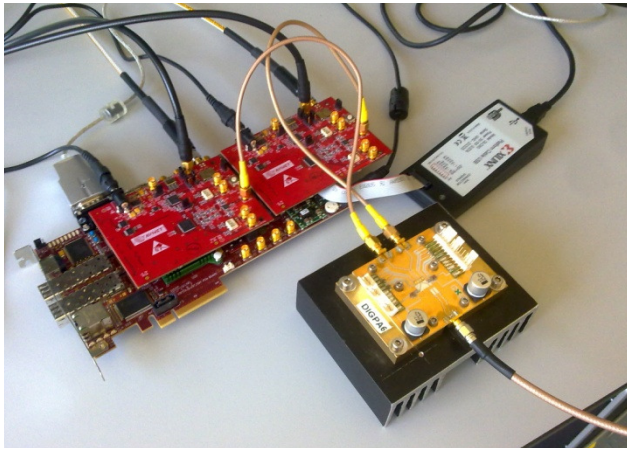


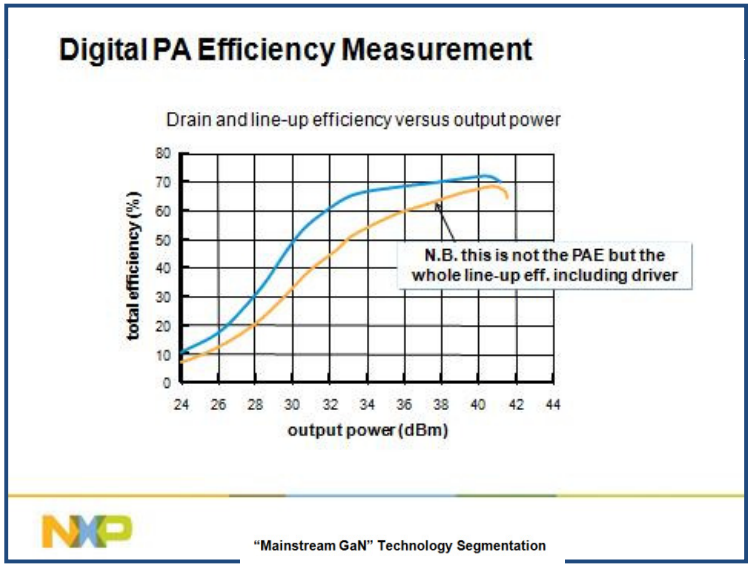
Cellular Infrastructure SMPA

- Multi-band / multi-mode, Data Rate
- Energy Efficiency
- Integration









Conclusions

- GaN has reached a maturity level where it can be used in real products
- GaN's excellent performance opens the door to better performance in traditional and emerging markets
- Products already exist today that enable designers to make breakthrough applications
- Optimized systems solutions will be a mix of silicon and GaN
- High volume applications will drive the cost of GaN down and create a broader market acceptance
- Visit NXP in Booth # 607 to see our full GaN line-up live

Thank You