

A green road sign with white text is mounted on a wooden post. The sign reads "The eGaN® FET Journey Continues". The background is a desert landscape with a road leading towards a building at sunset. The sky is blue with white clouds, and the sun is low on the horizon, creating a golden glow. The building in the distance has a grid-like facade.

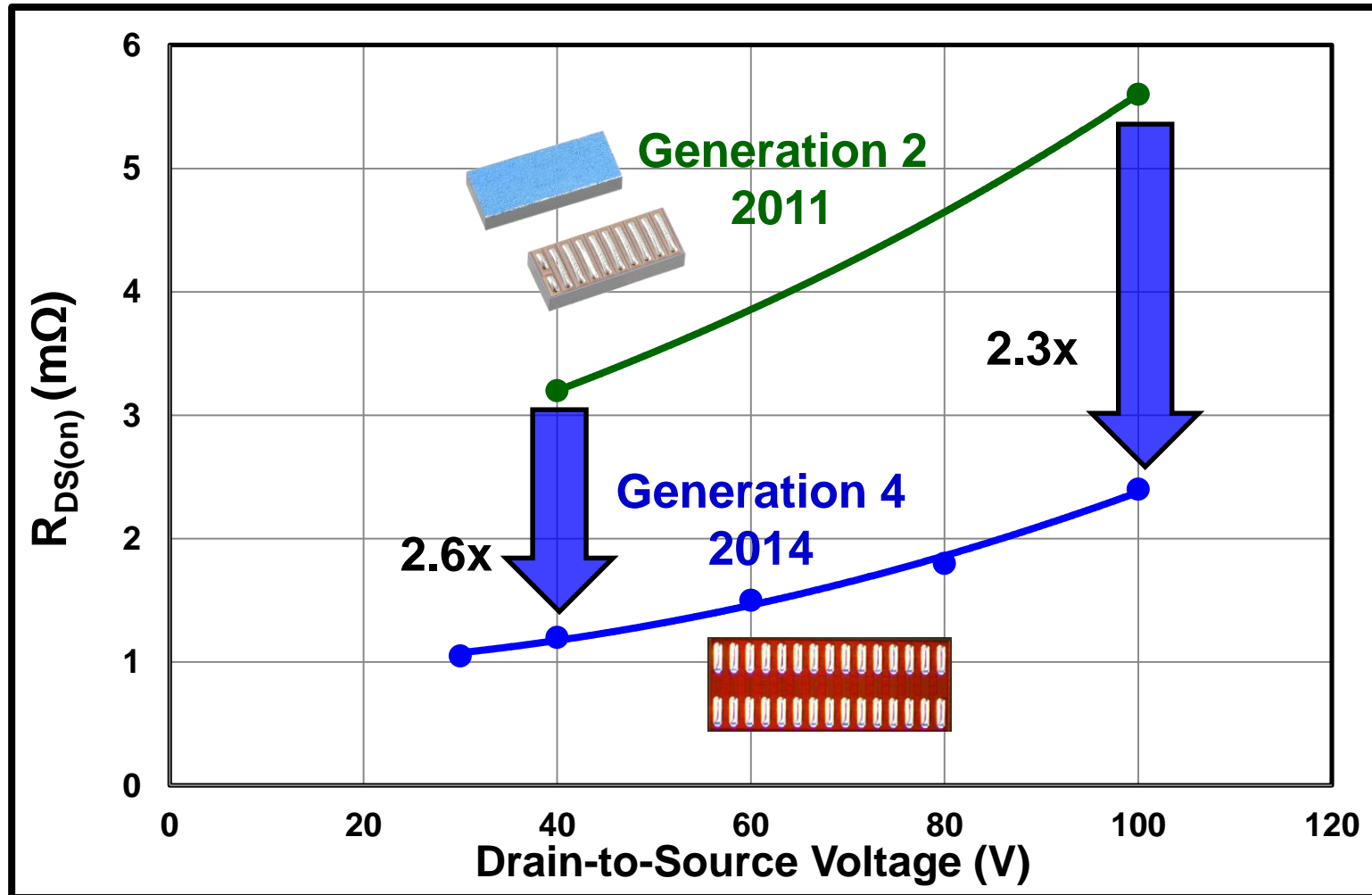
The eGaN[®] FET
Journey Continues

Giving New Life to Moore's Law

Efficient Power Conversion Corporation

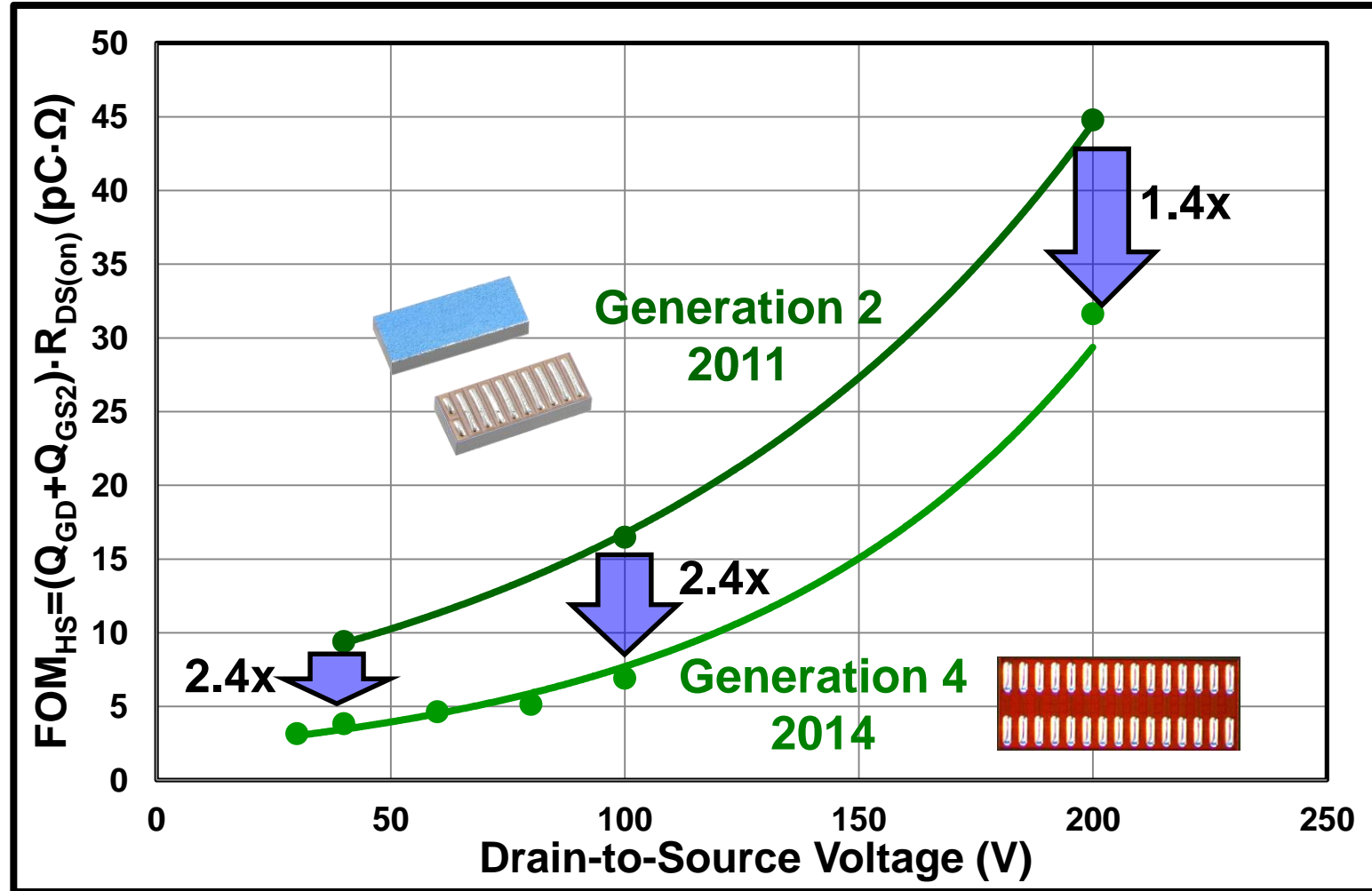
- Moore's Law is Alive and Well for GaN FETs
 - $R_{DS(on)}$ Improvements
 - Figure of Merit Improvements
- Where is GaN Going?
 - DC-DC Converters
 - Wireless Power
 - Envelope Tracking
- A Look Into the Future
- Summary

On-Resistance Comparison



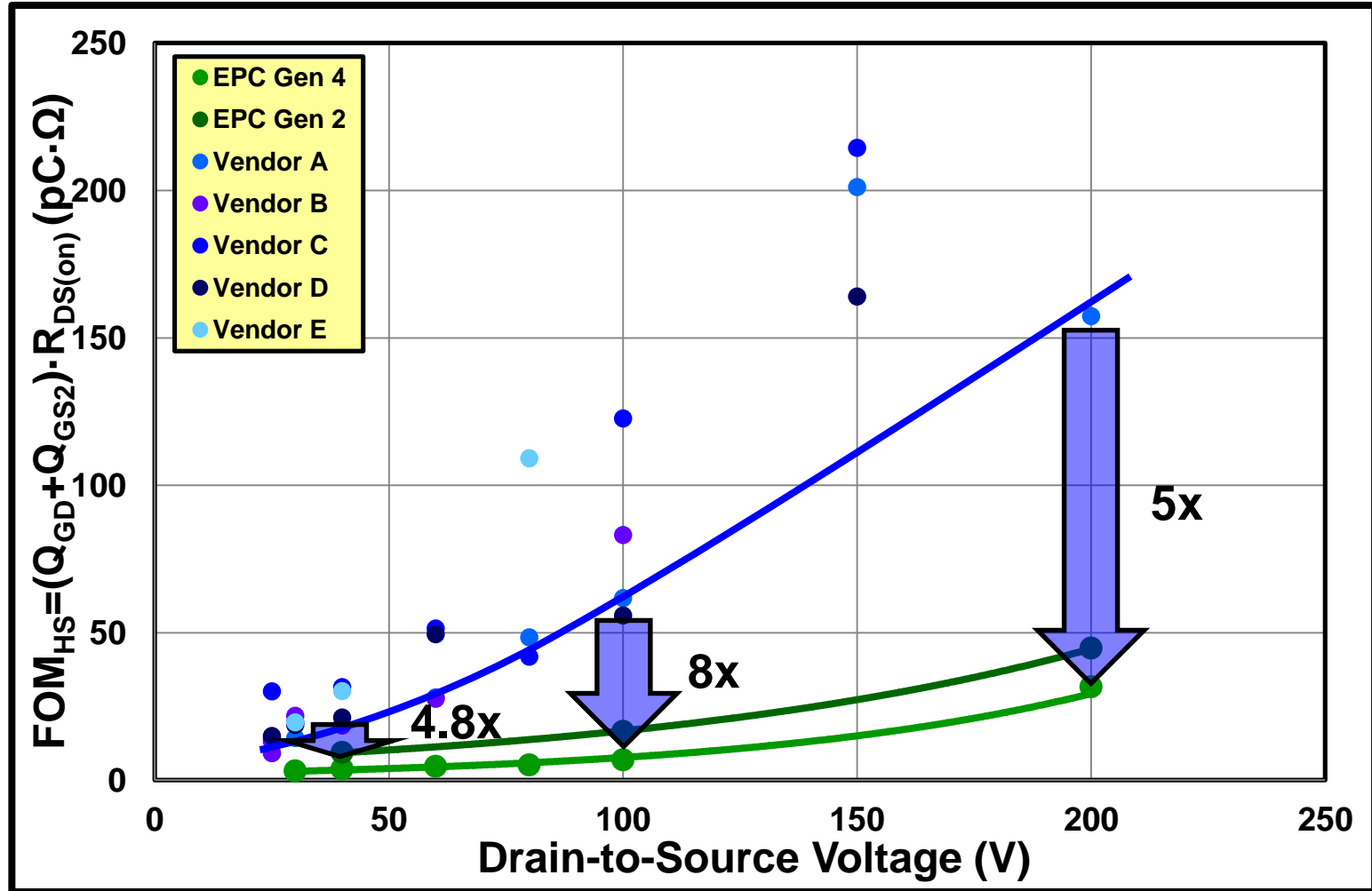
$V_{GS}=5\text{ V}$

Hard Switching FOM



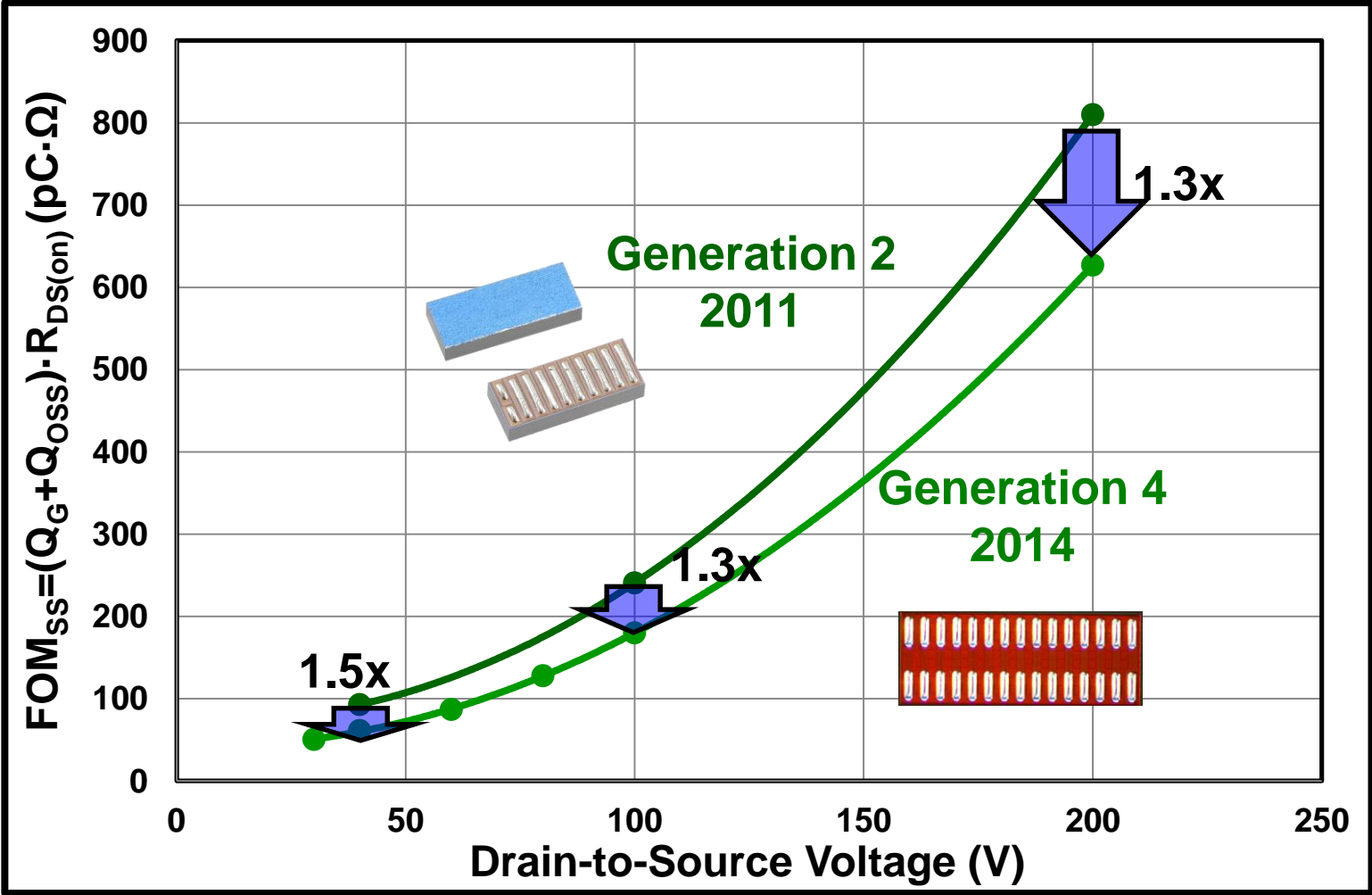
$$V_{DS} = 0.5 \cdot V_{DSS}, I_{DS} = 20 \text{ A}$$

Hard Switching FOM



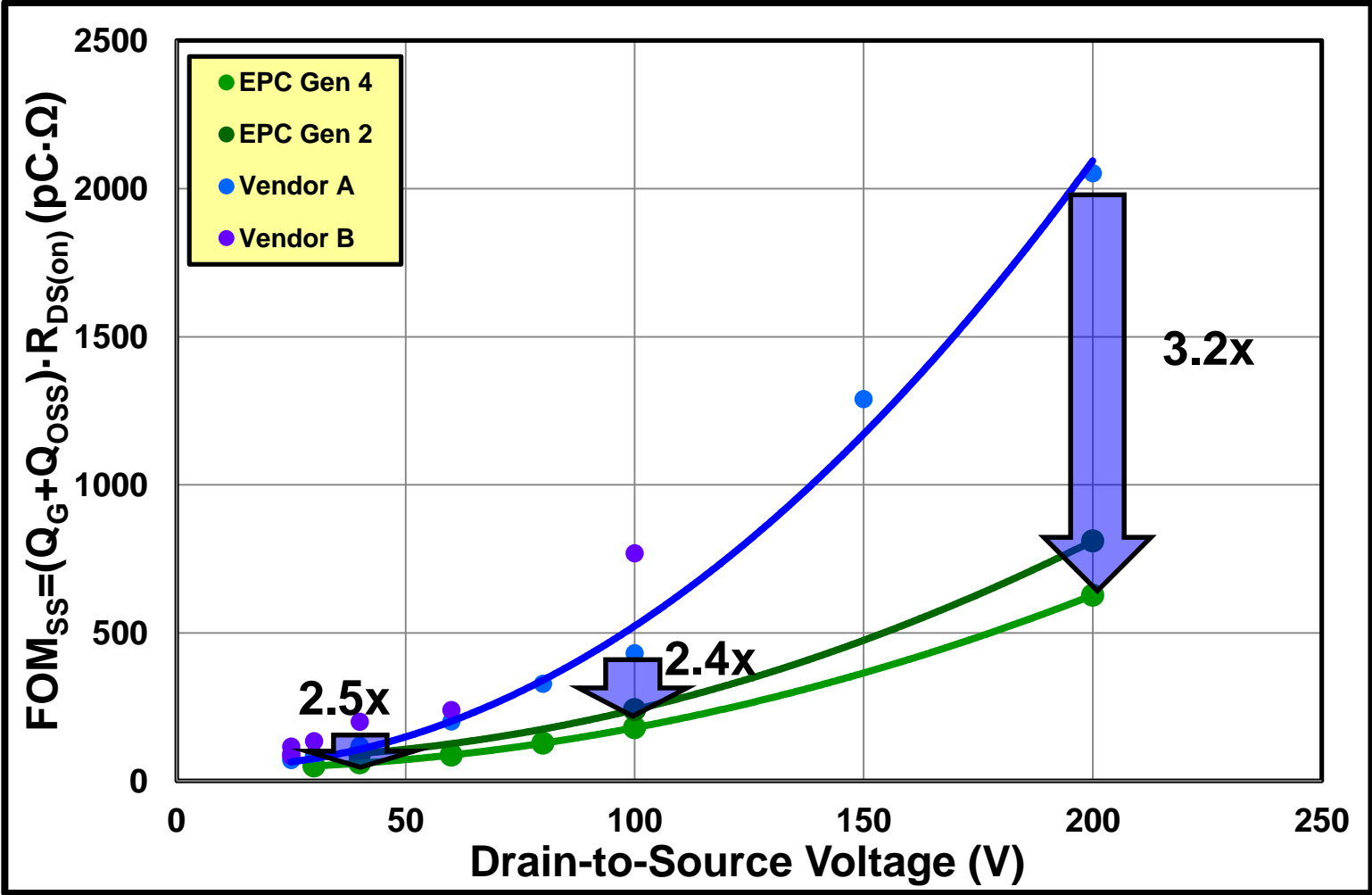
$$V_{DS} = 0.5 \cdot V_{DSS}, I_{DS} = 20 \text{ A}$$

Soft Switching FOM



$$V_{DS} = 0.5 \cdot V_{DSS}$$

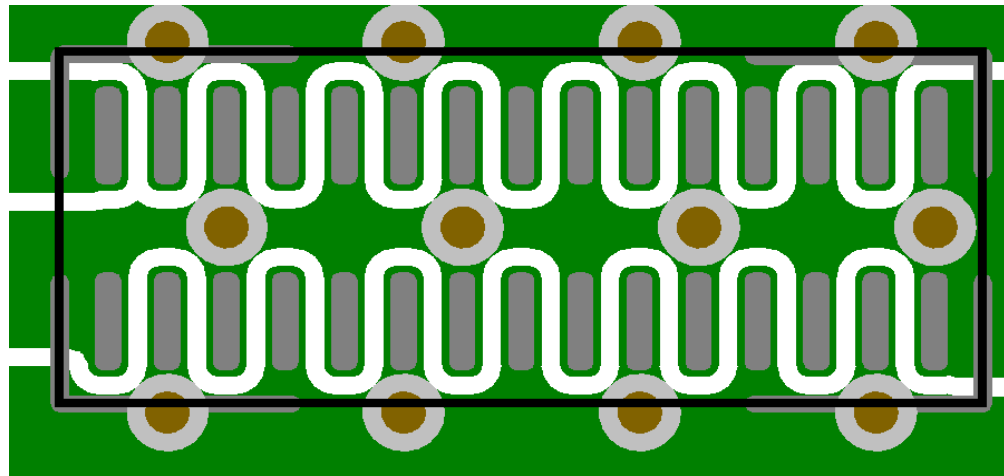
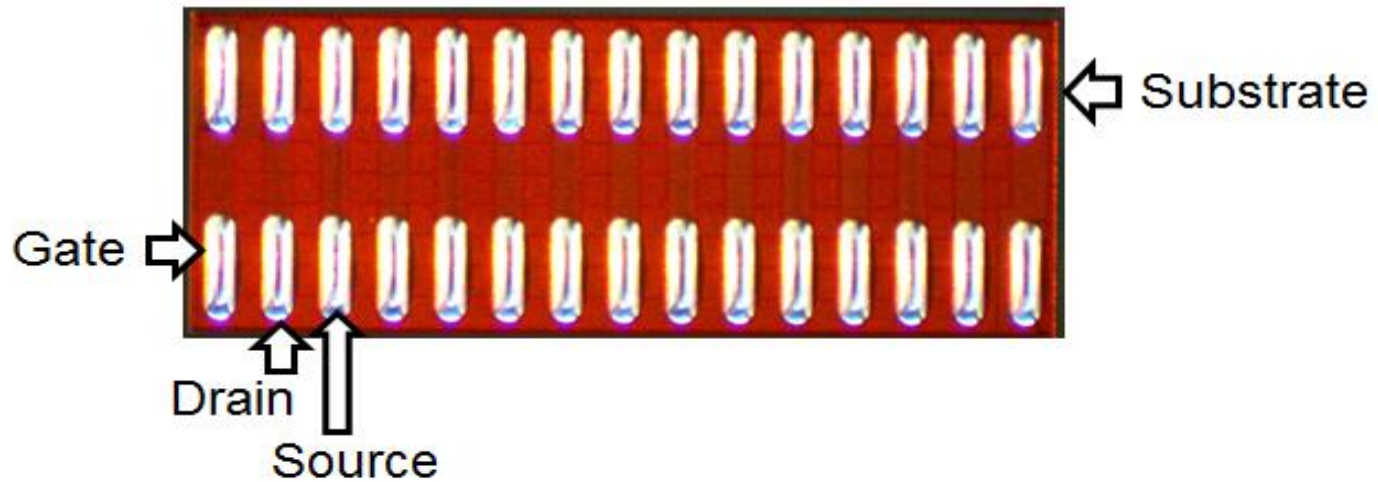
Soft Switching FOM



$$V_{DS} = 0.5 \cdot V_{DSS}$$

Die Layout

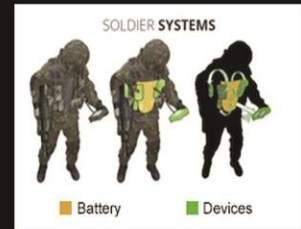
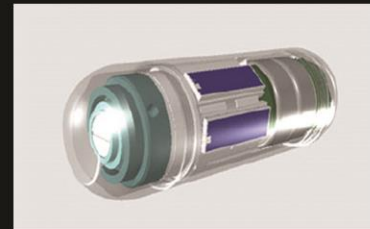
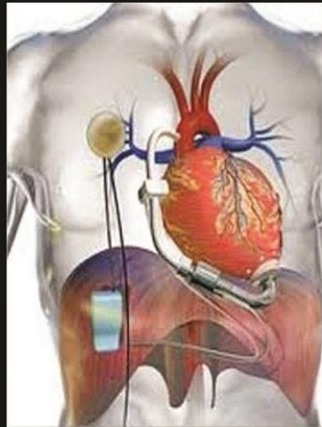
Alternating Source and Drain Bars



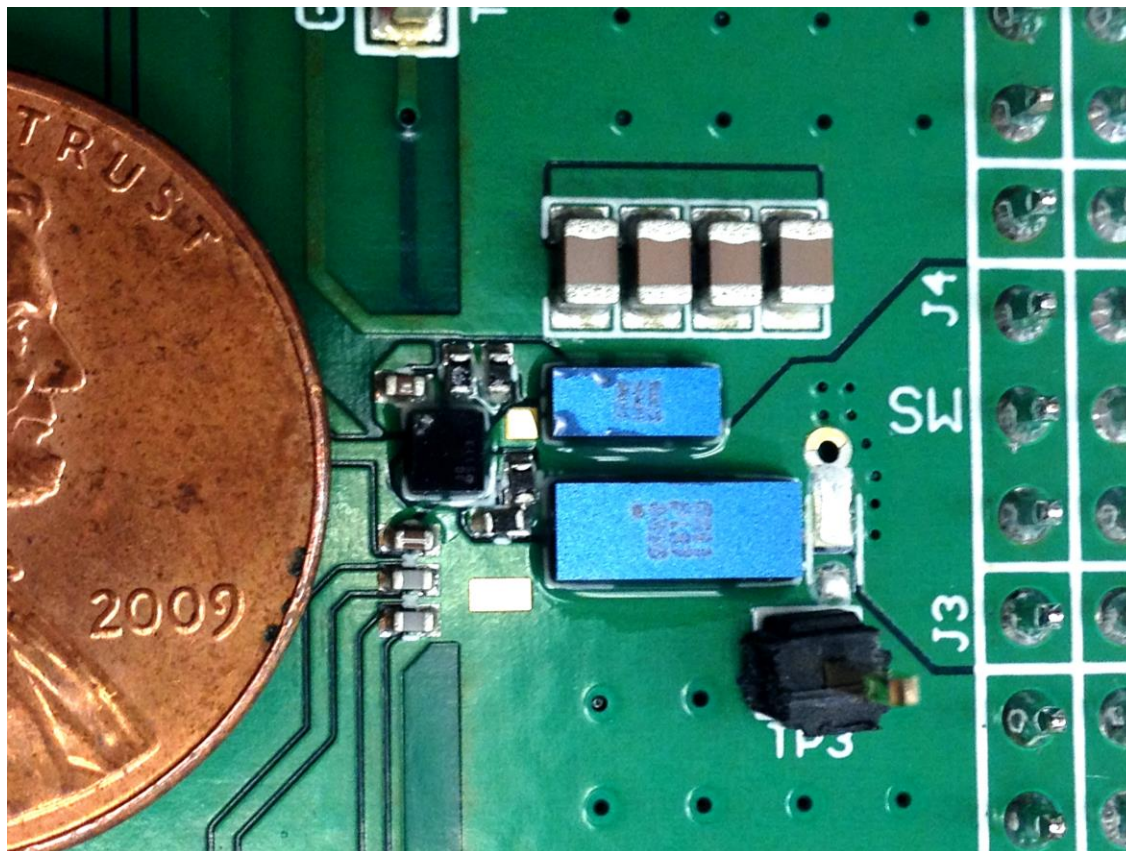
EPC

EFFICIENT POWER CONVERSION

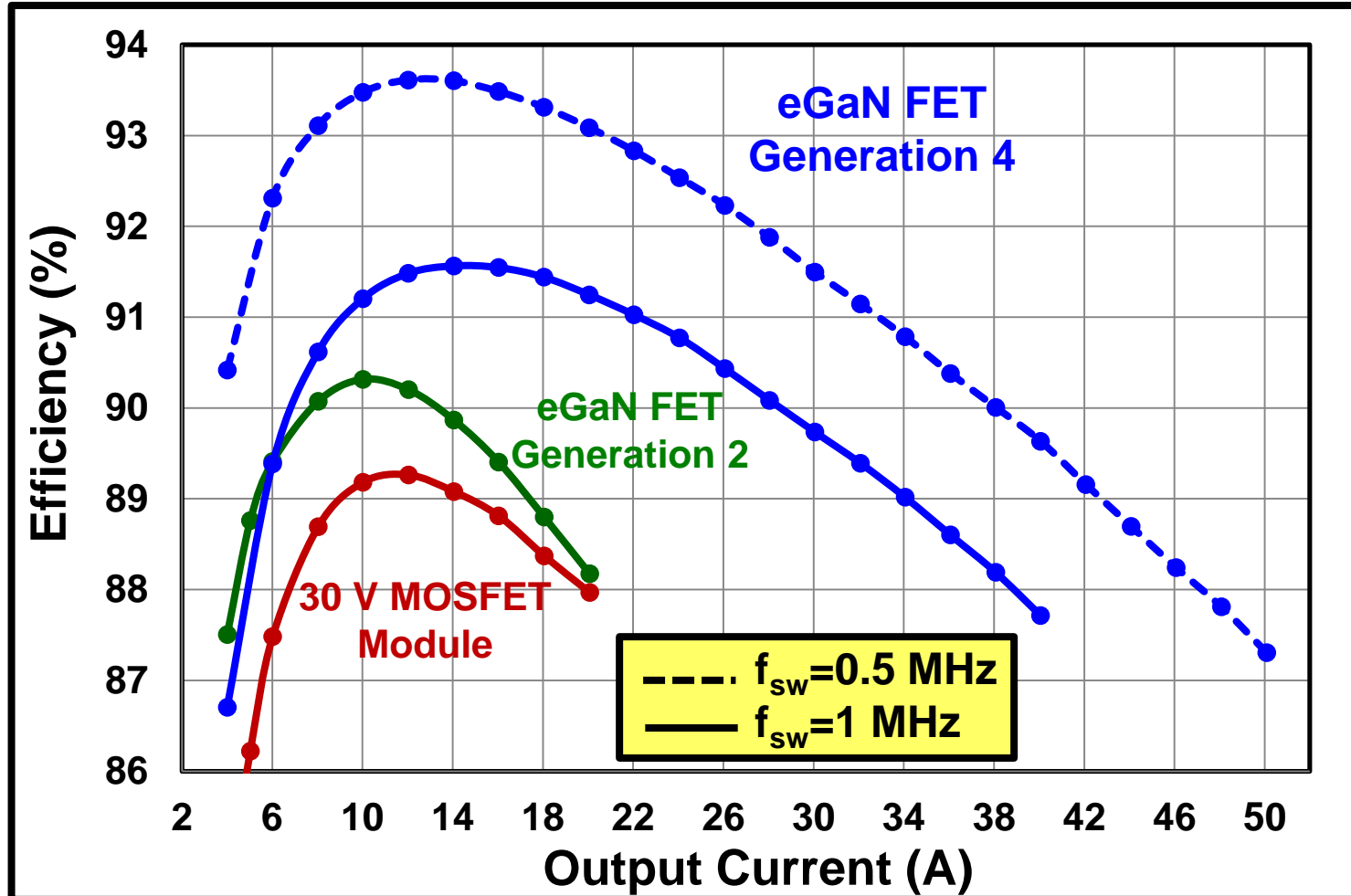
Where is GaN going...



Hard Switching Buck Converter

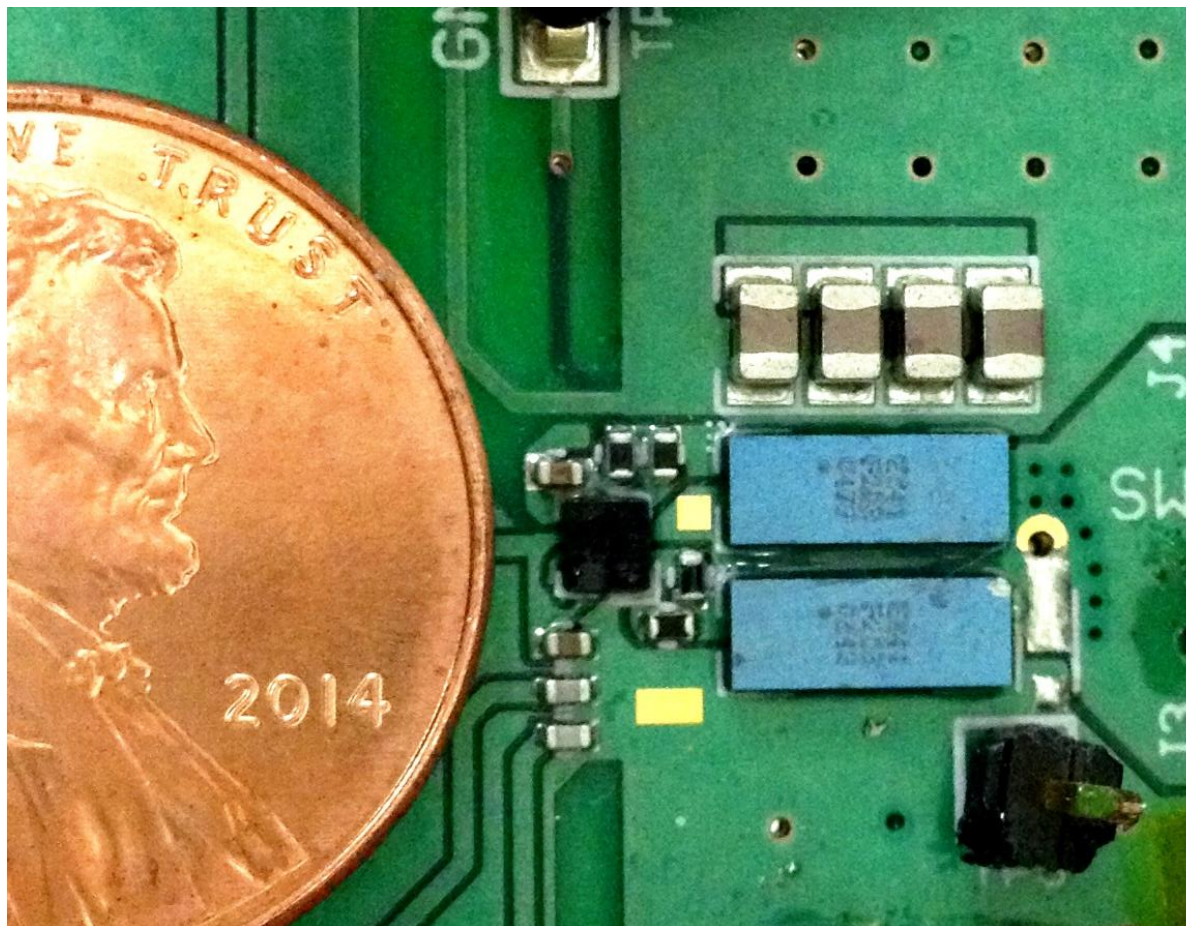


Low Voltage Buck Converter

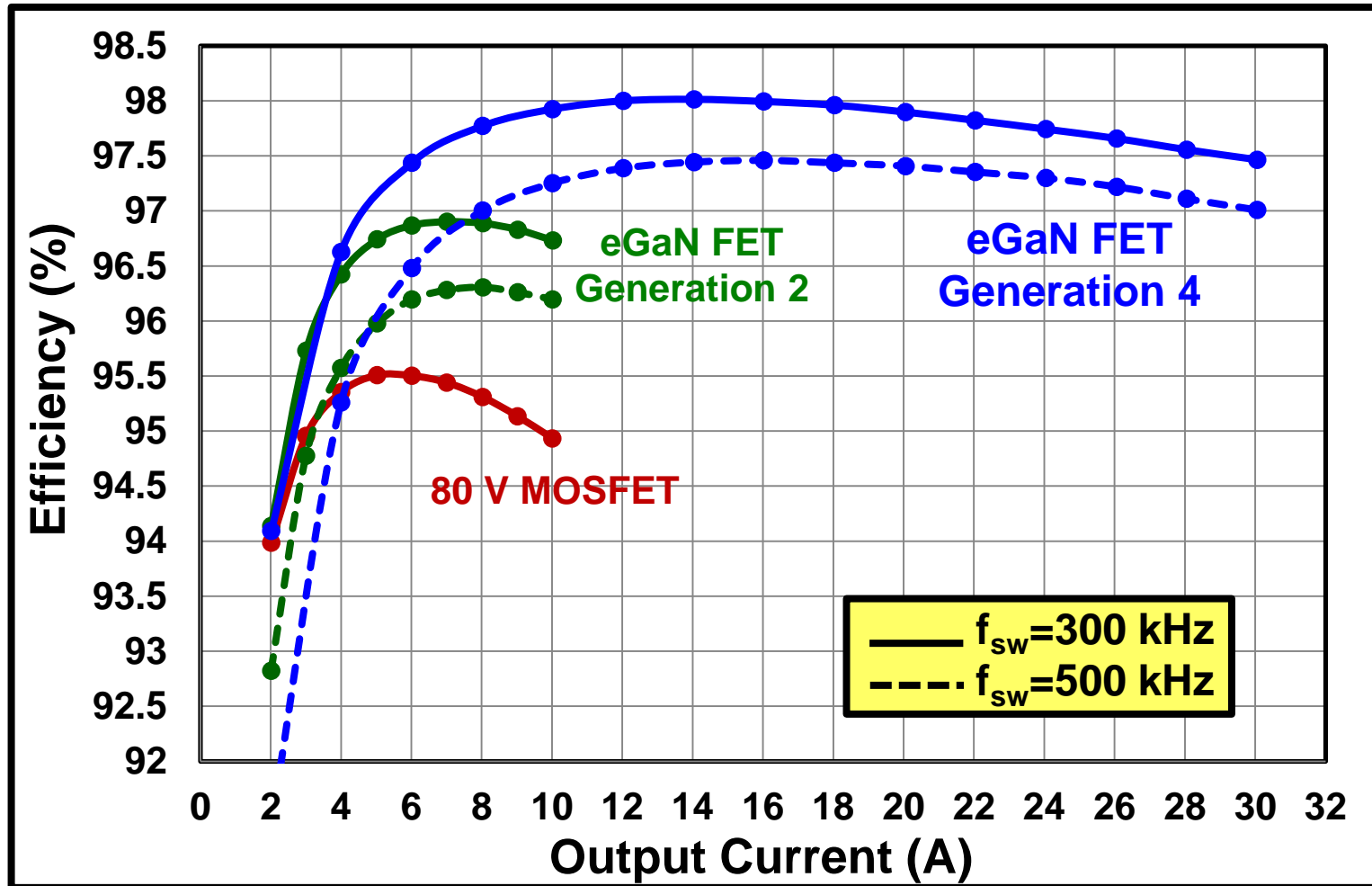


$V_{IN}=12$ V $V_{OUT}=1.2$ V

Hard Switching Buck Converter

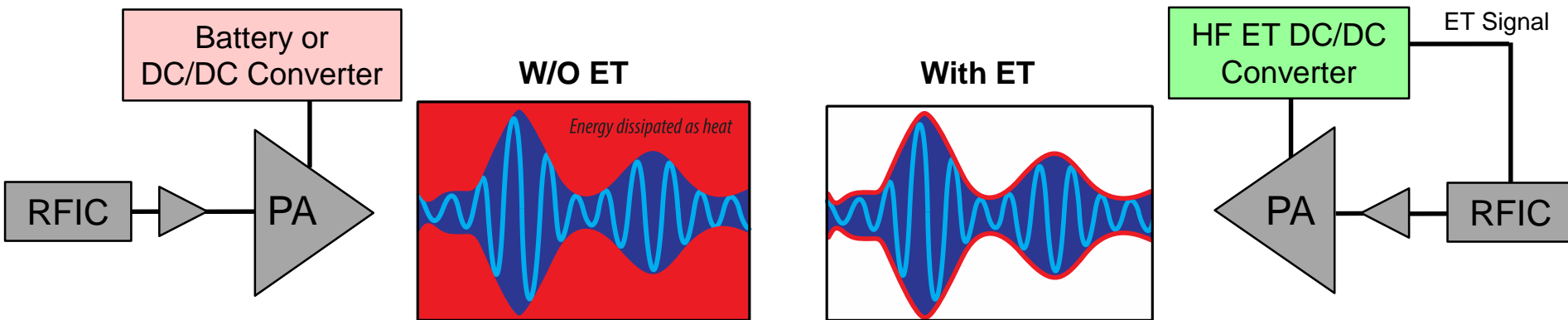
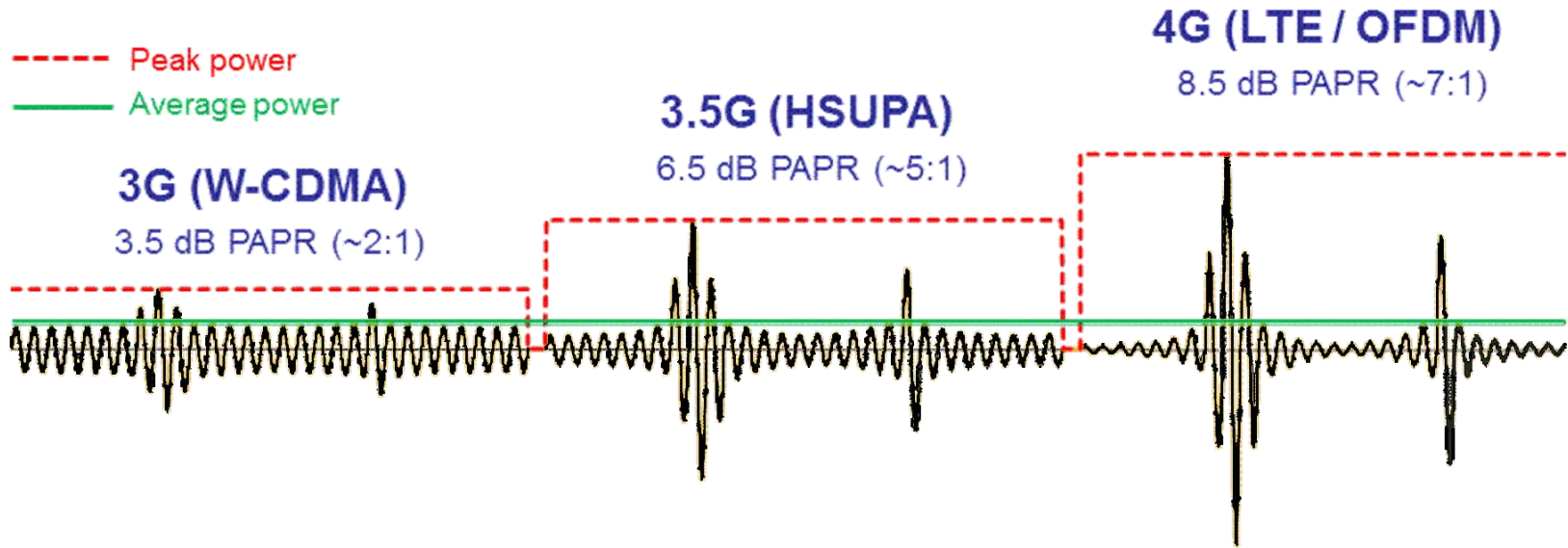


Higher Voltage Performance



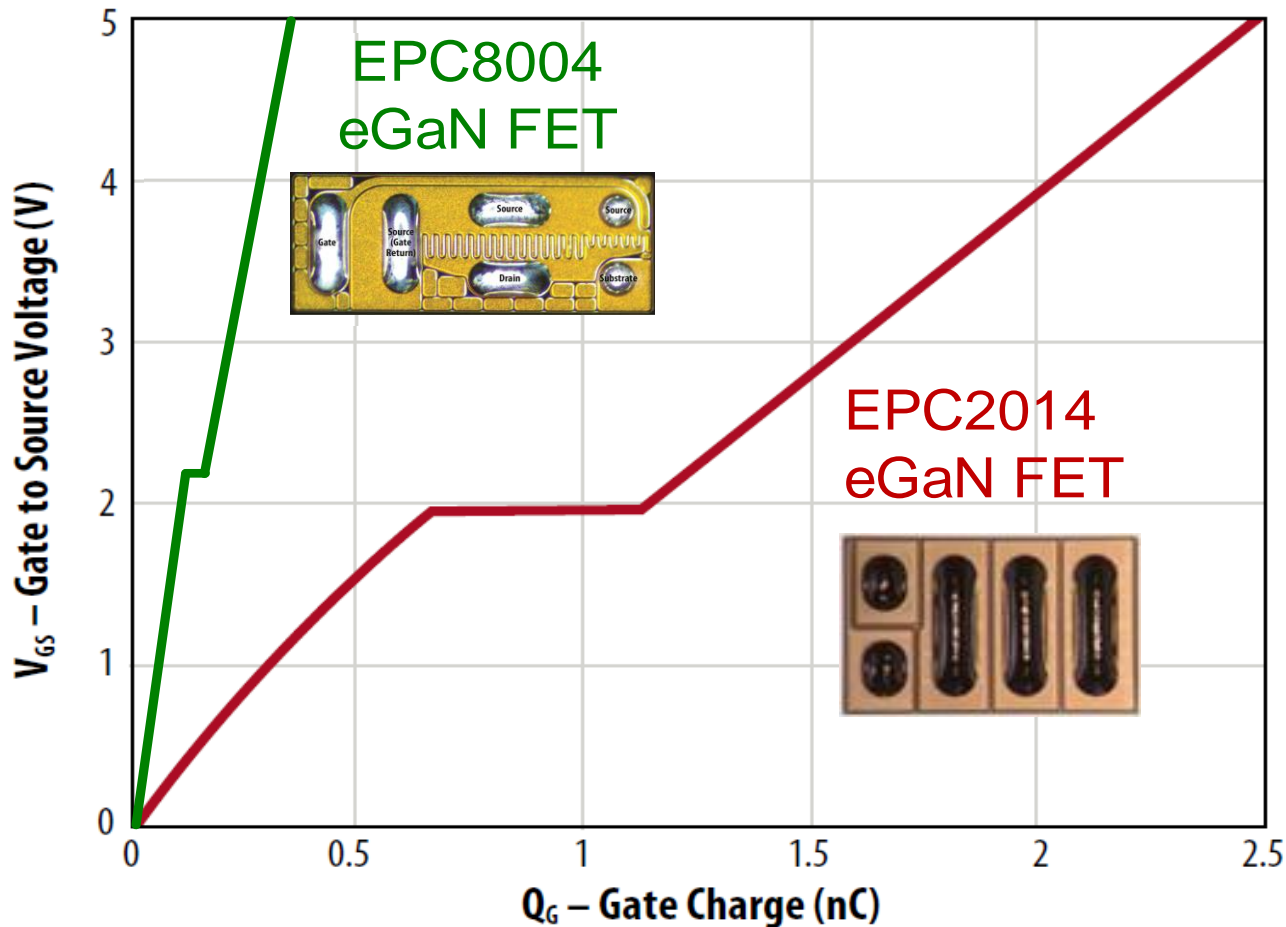
$V_{IN}=48\text{ V}$ $V_{OUT}=12\text{ V}$

Envelope Tracking

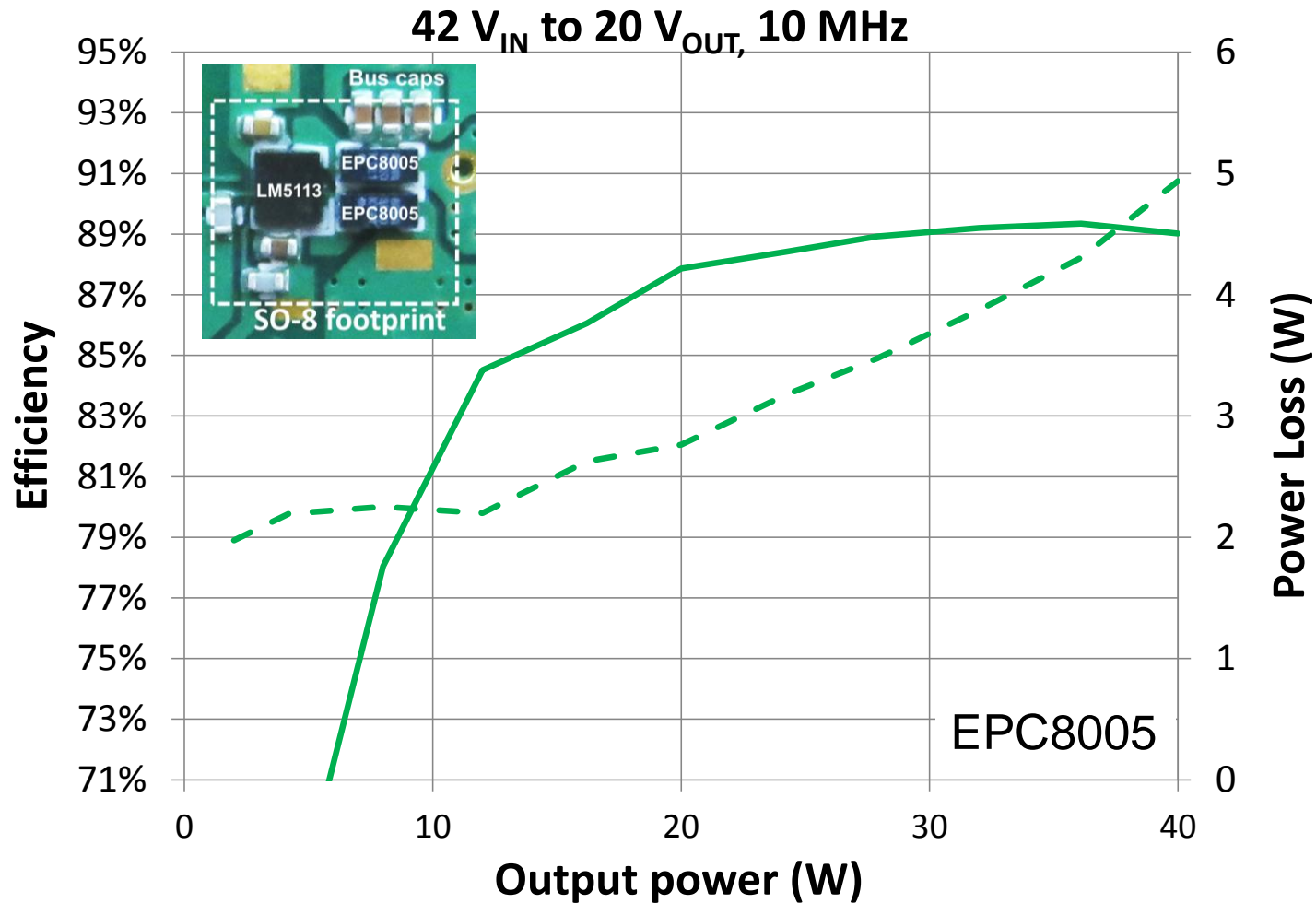


Reference: Nujira.com website

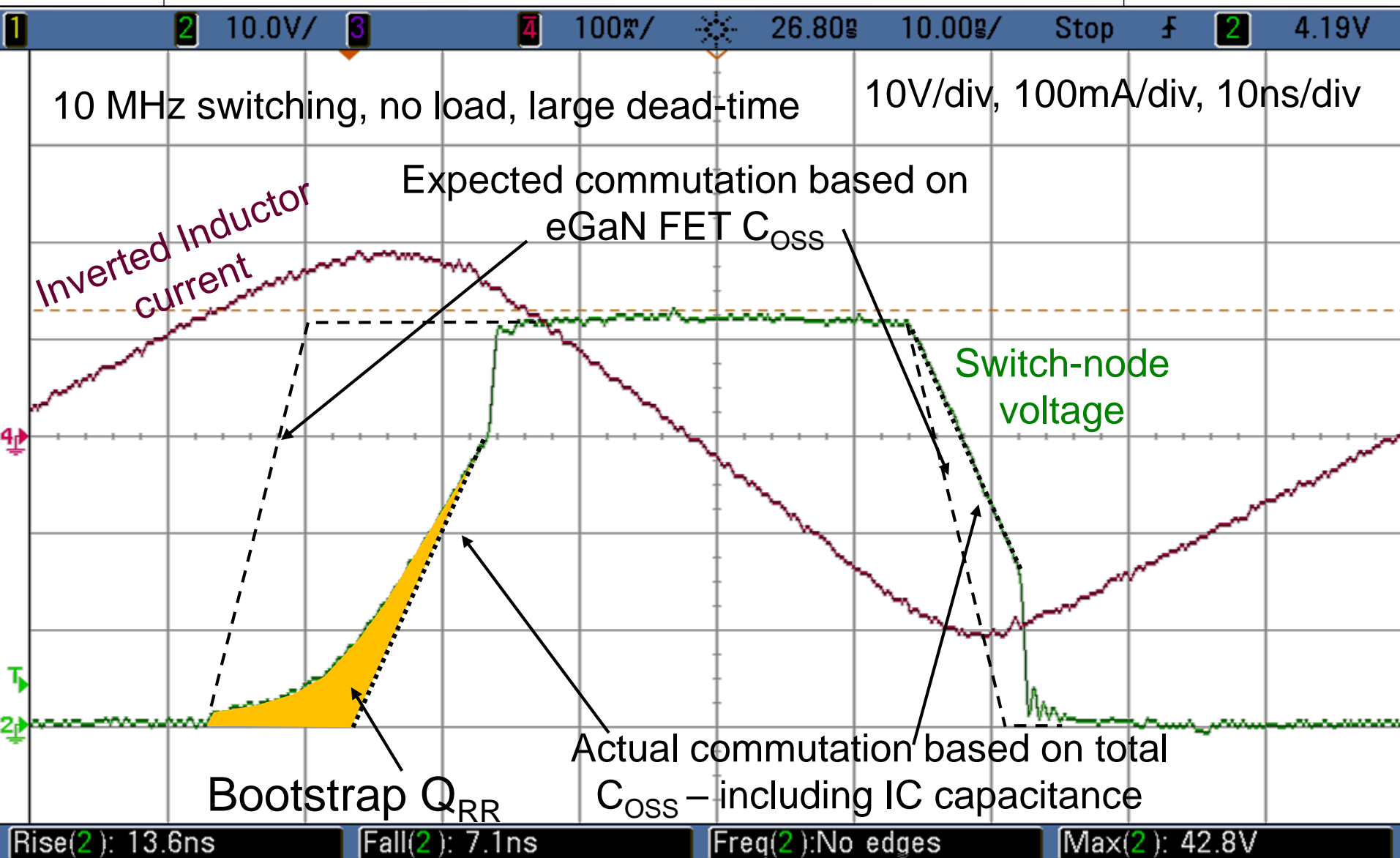
Very High Frequency eGaN FETs



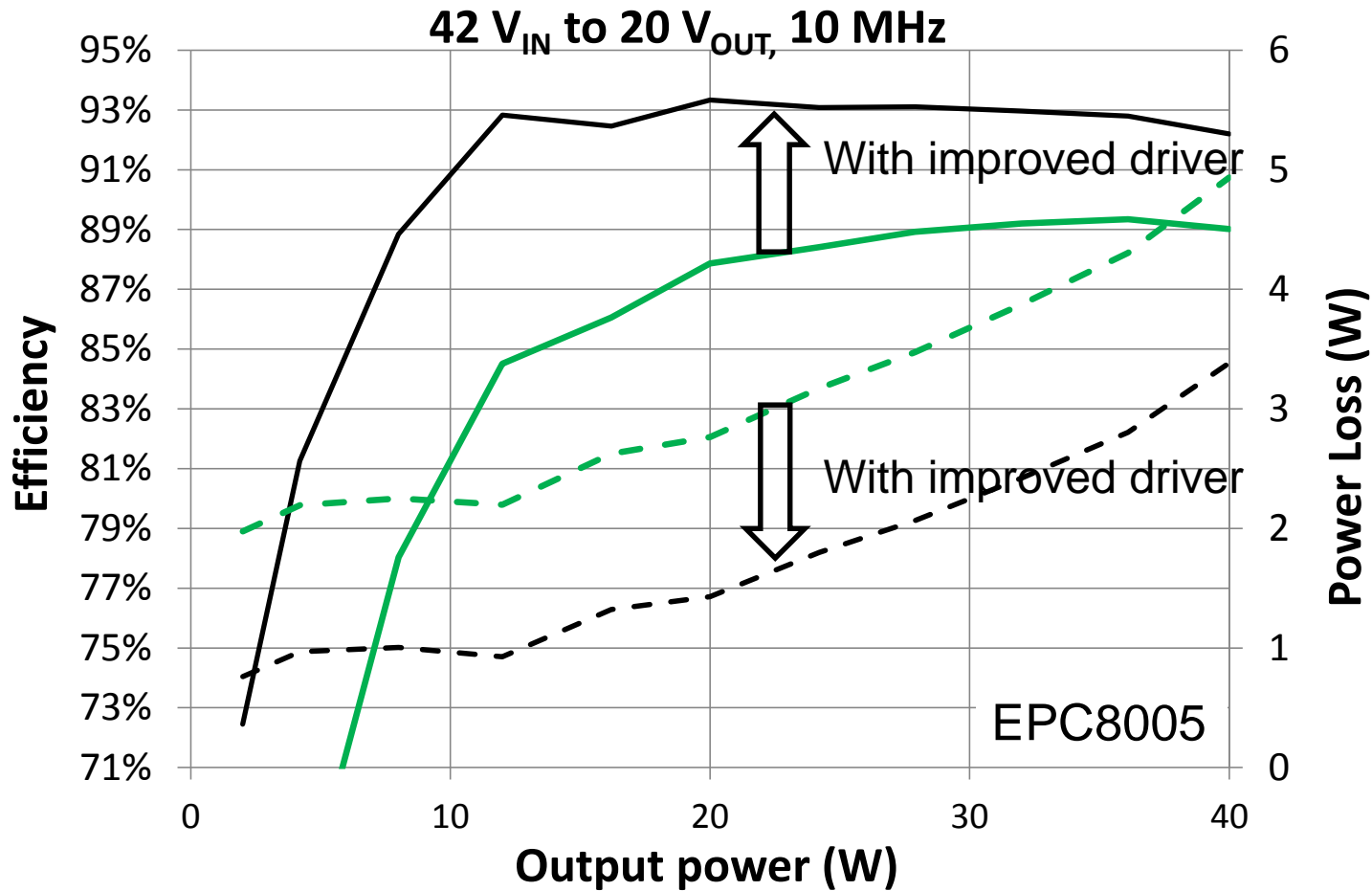
Efficiency Results



Switching Waveforms



Improving HF Performance

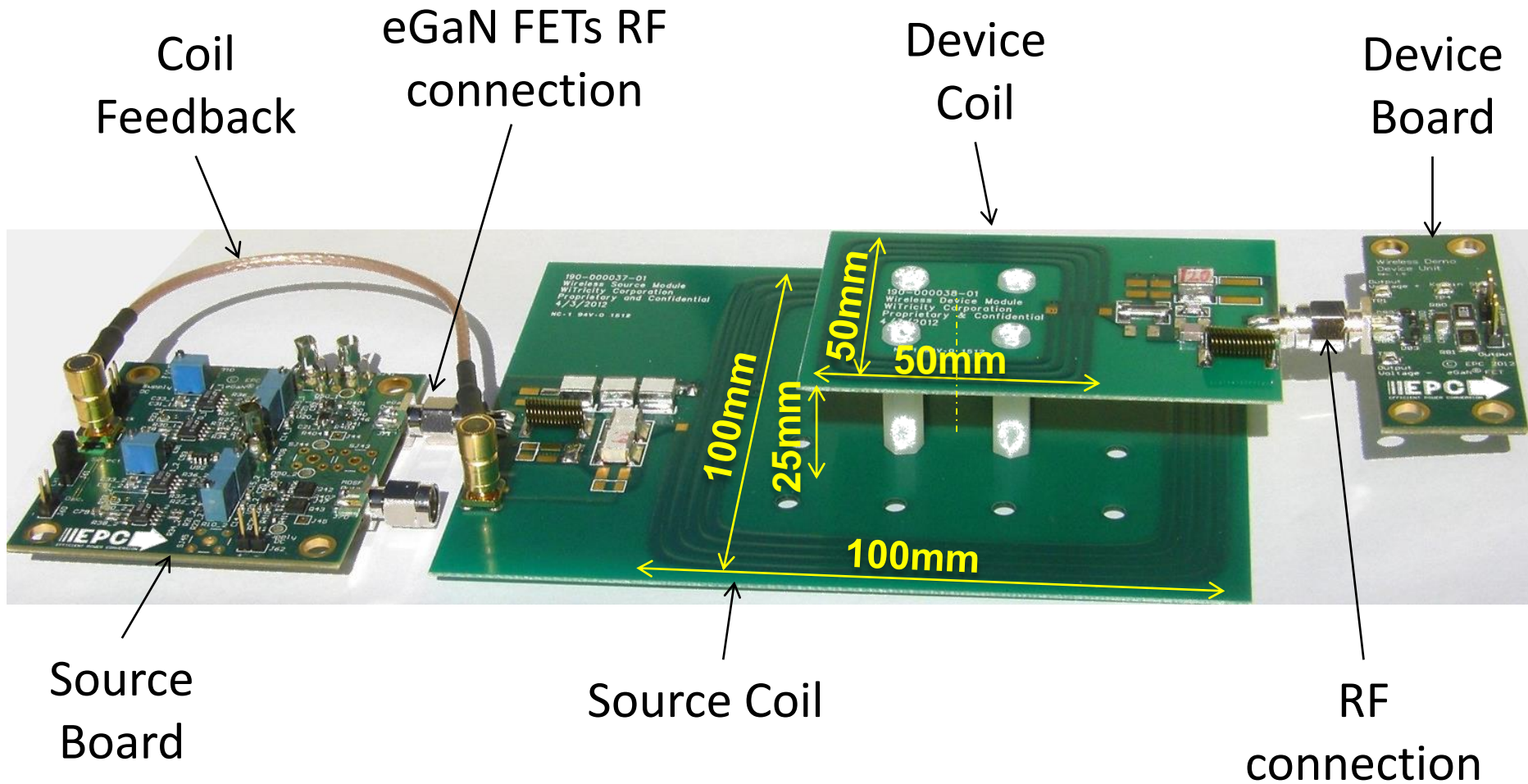


Wireless Power

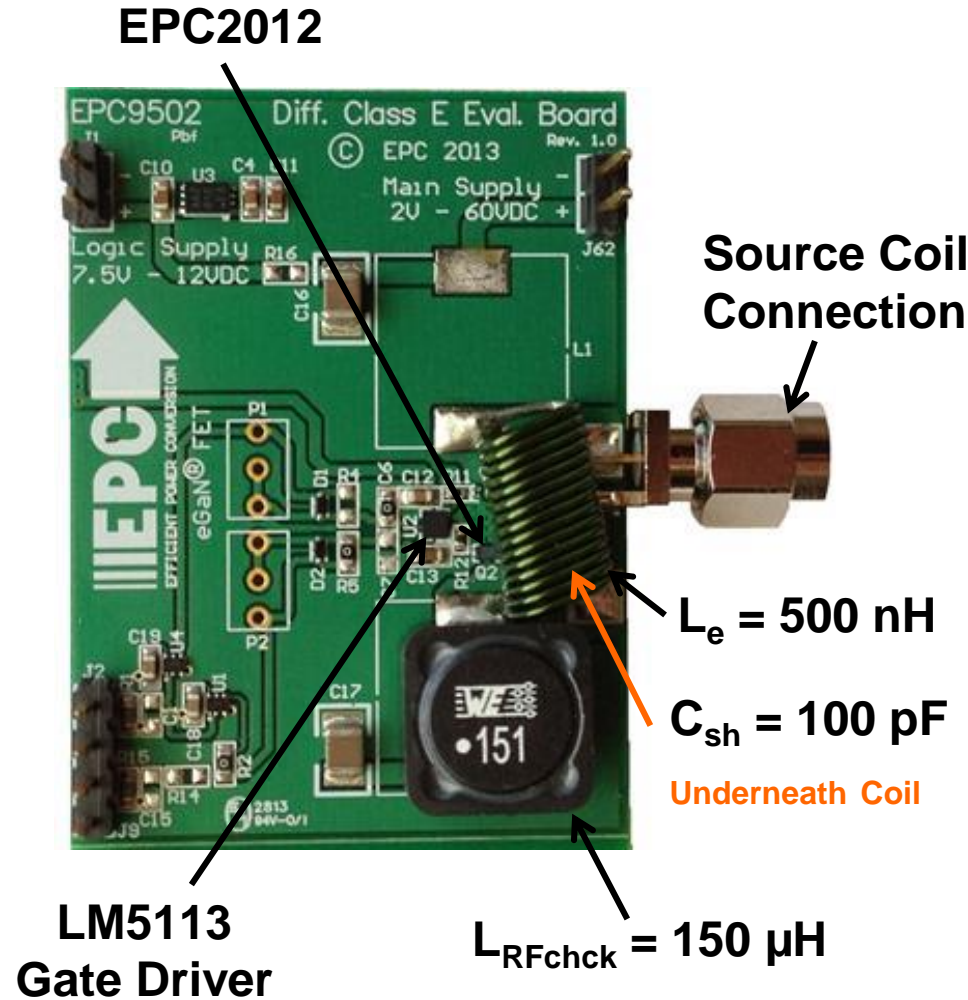
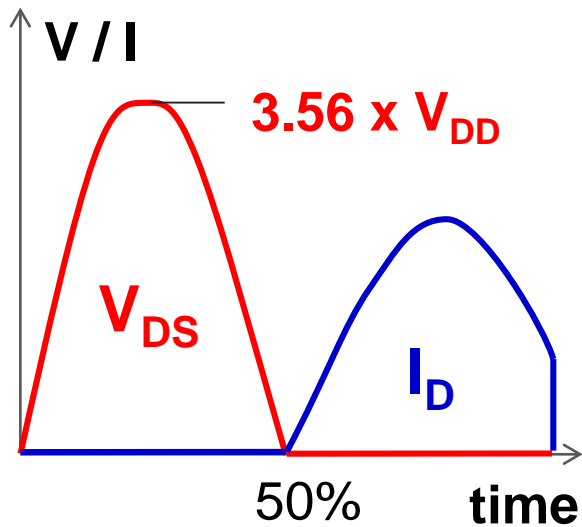
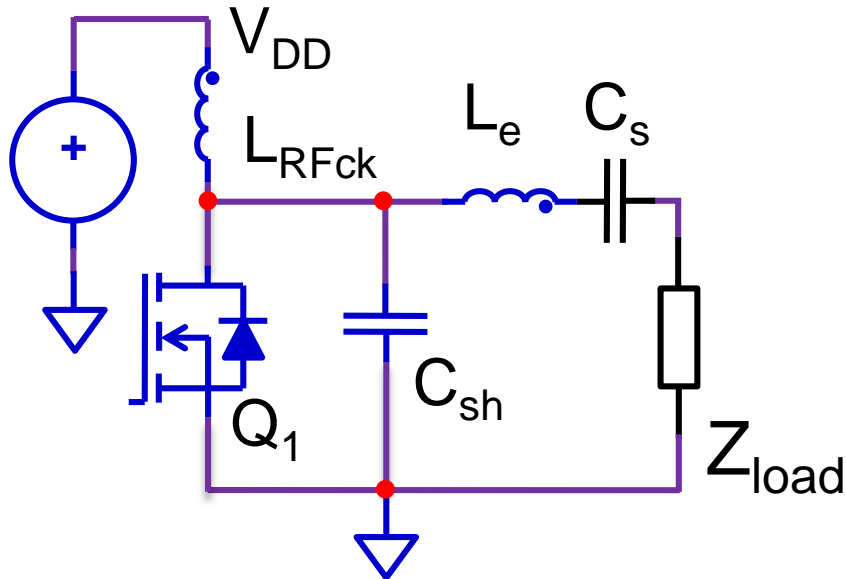


The global wireless charging market is estimated to grow to \$10B by 2018, a CAGR of 42.6%.

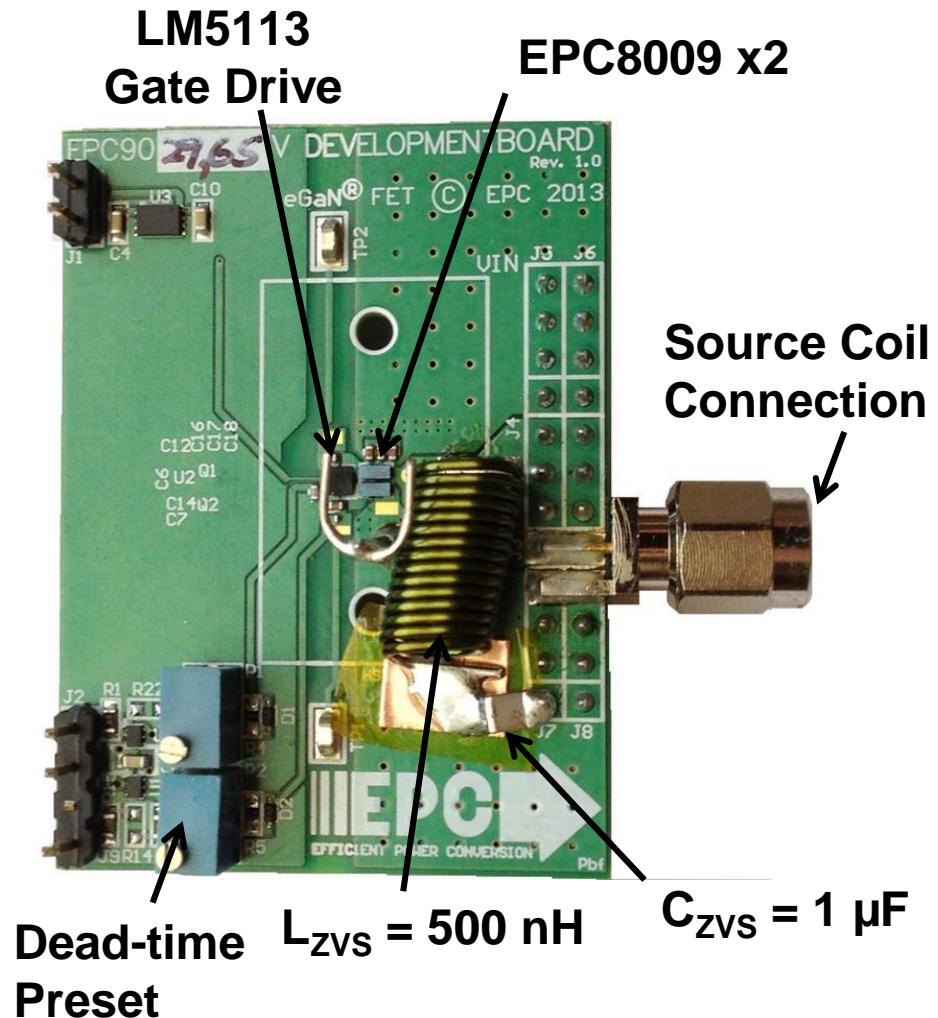
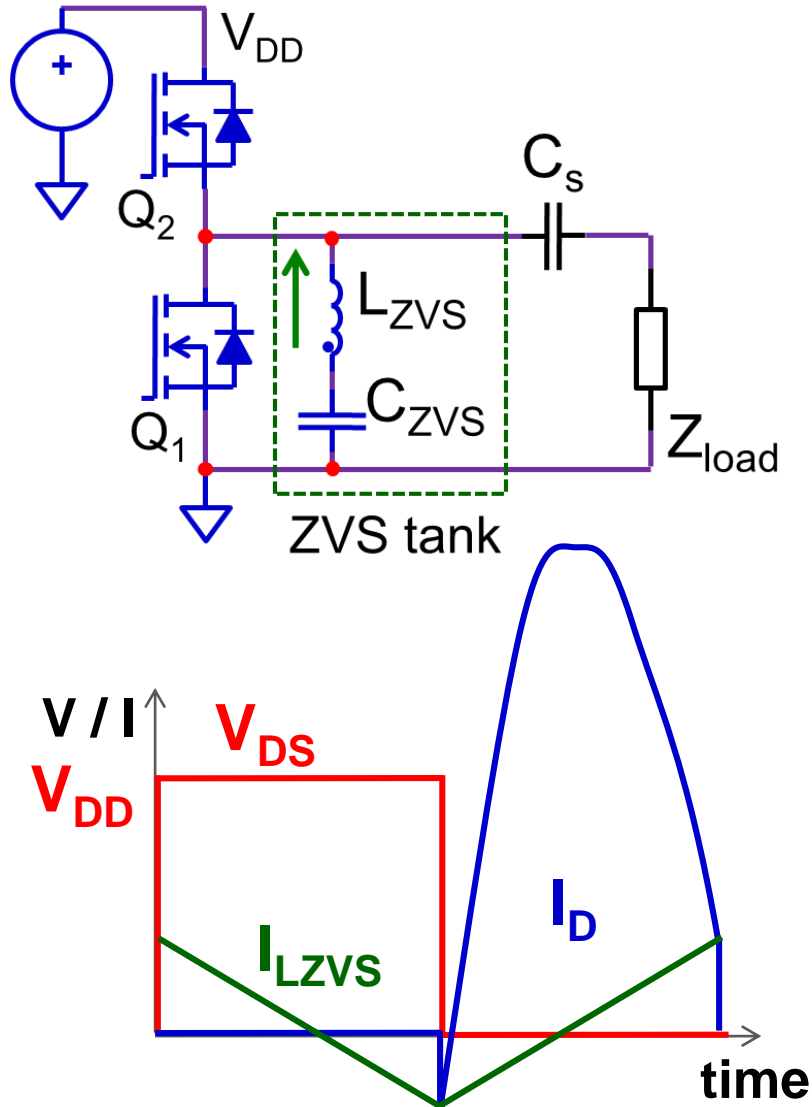
Wireless Power Setup



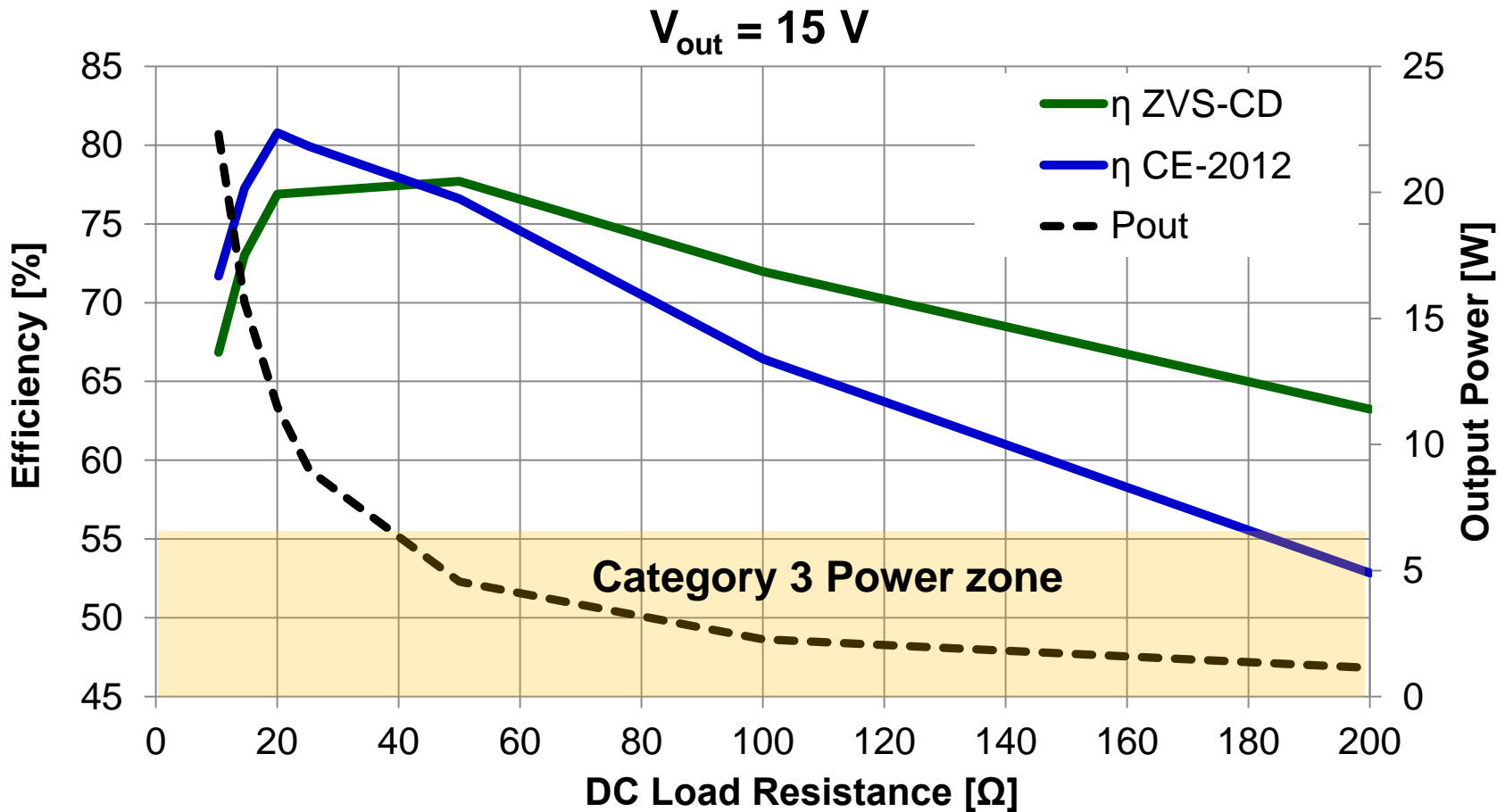
Class-E Power Amplifier



ZVS Class-D Power Amplifier

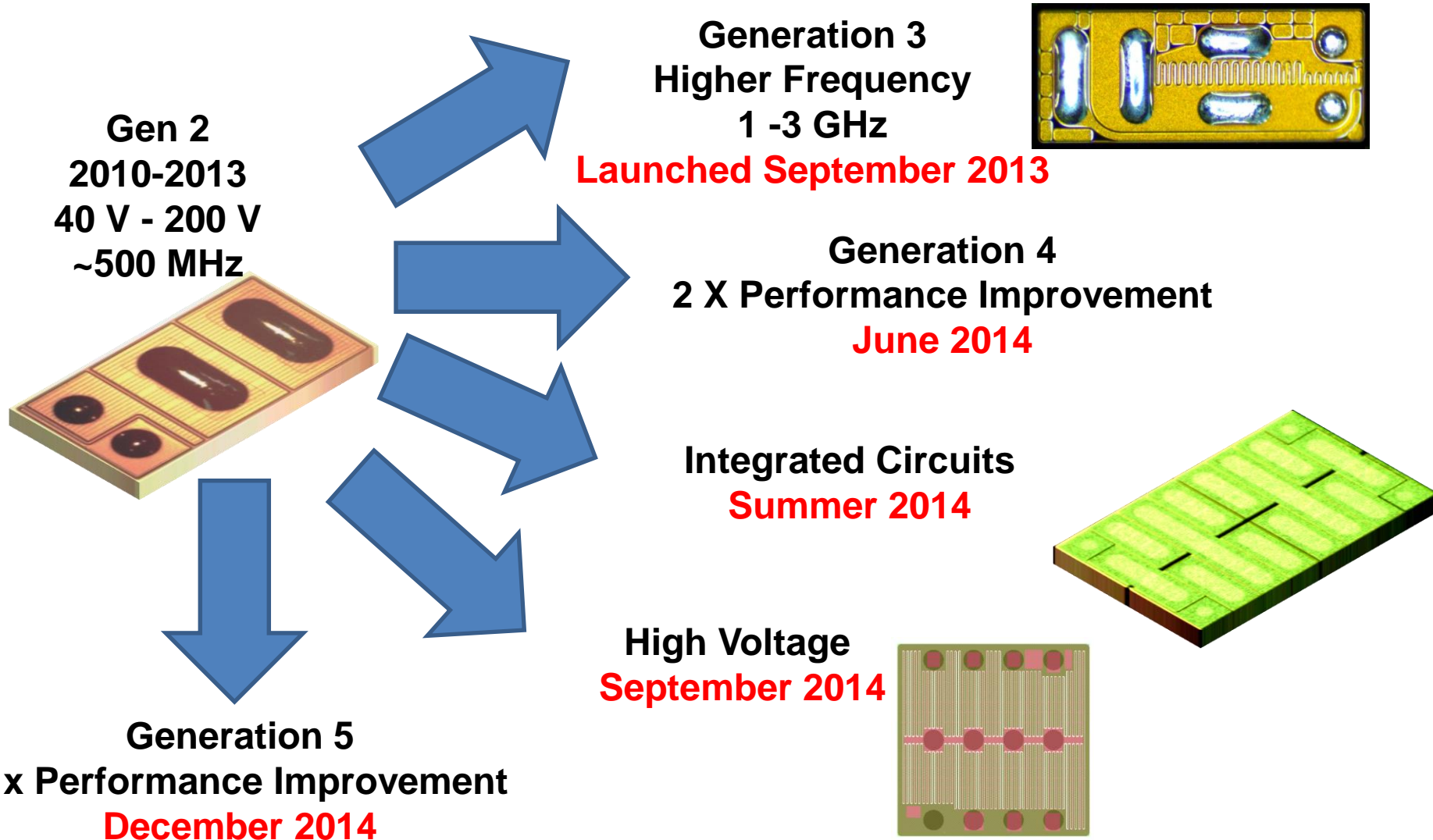


Performance Comparison



- LiDAR
- High Resolution MRI Imaging
- Network and Server Power Supplies
- AC Adapters
- Class-D Audio
- Energy Efficient Lighting
- Robotics

Moore's Law Revival



Summary



- eGaN FETs continue to improve rapidly – even faster than Moore’s Law!
- Hard-switched POLs using forth-generation eGaN FETs realize double the benefit in efficiency when compared with second-generation eGaN FETs.
- eGaN FETs are enabling efficient RF envelope tracking for 4G-LTE base stations.
- New topologies that apply eGaN FETs in loosely coupled wireless power are the most efficient and stable.
- GaN is *always* better than silicon!