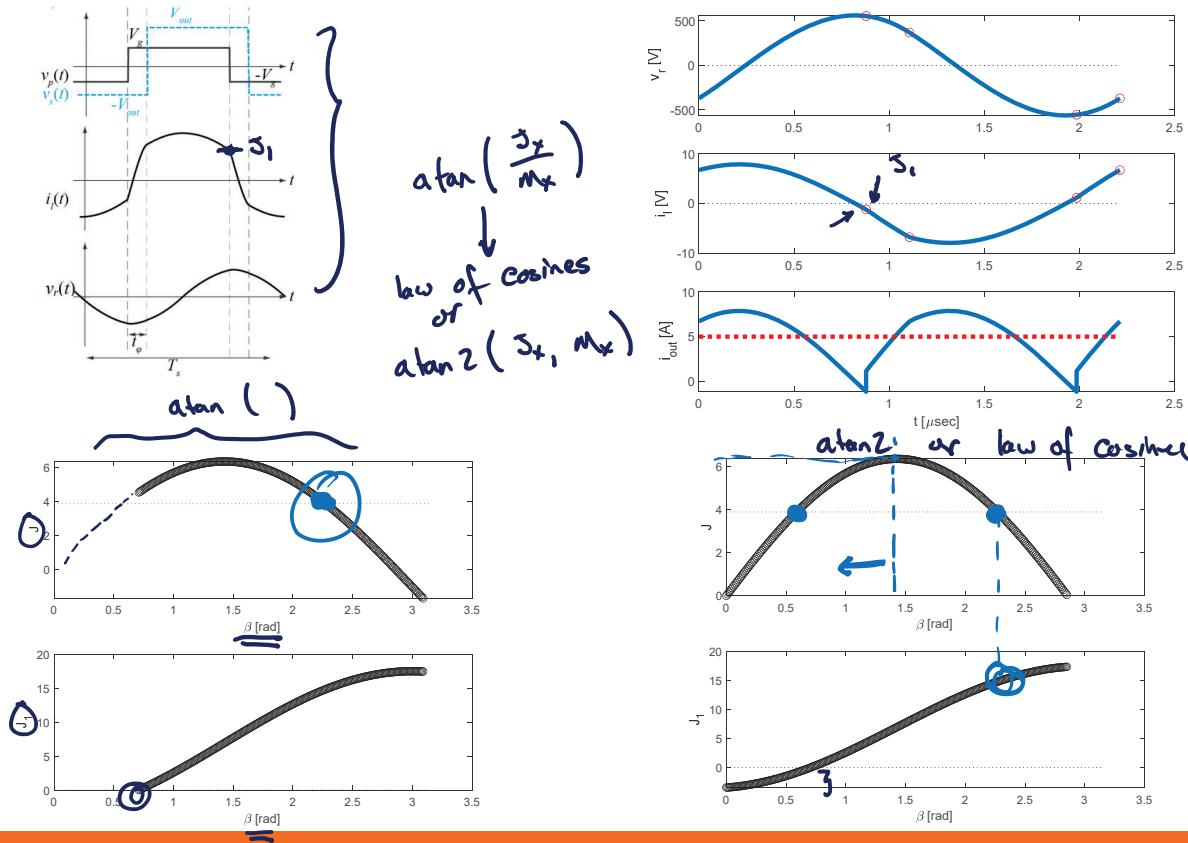


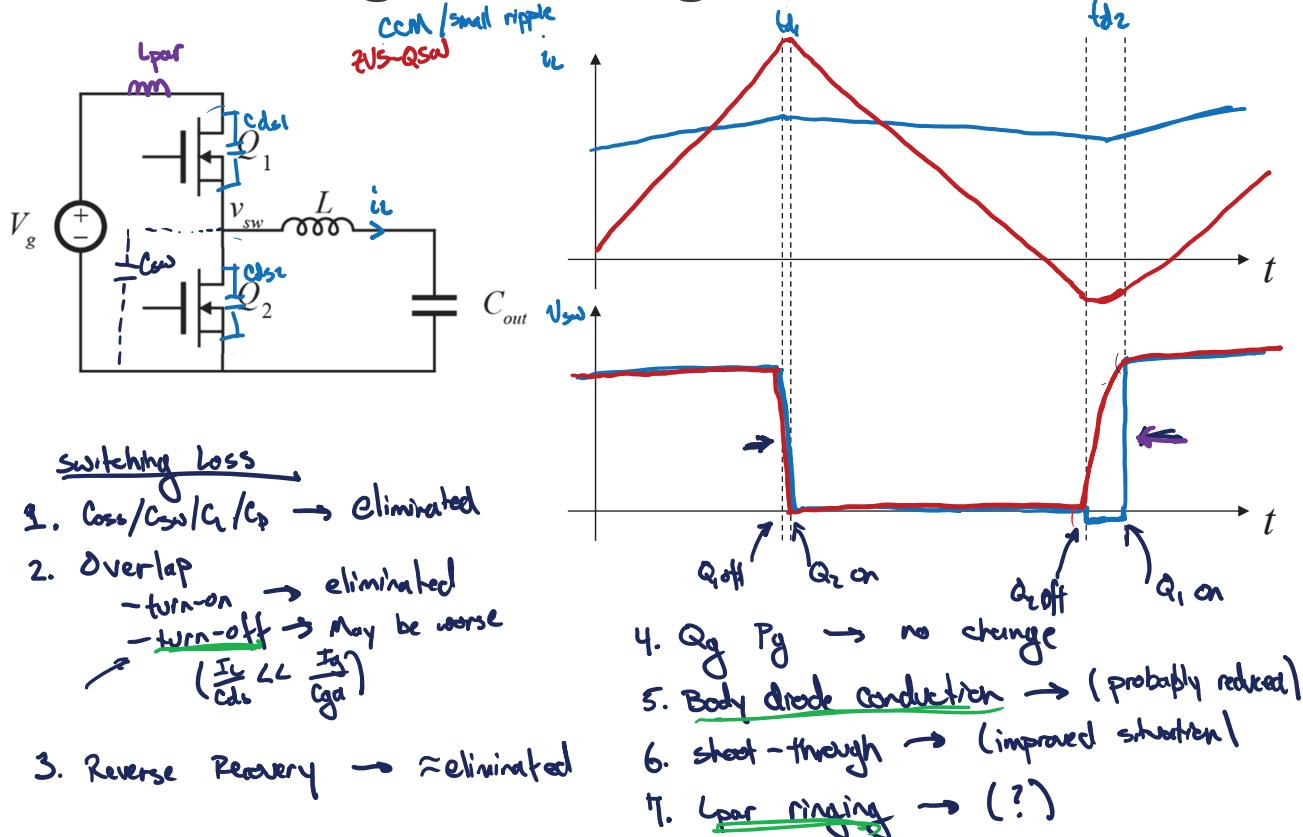
Announcements

- Midterm Exam begins after class
 - Due Friday 10/23 by 5:00pm
 - No collaboration allowed
 - No web resources other than course webpage
 - Can ask questions to instructor
- Friday Lecture → Office Hours

Homework 7 Solution

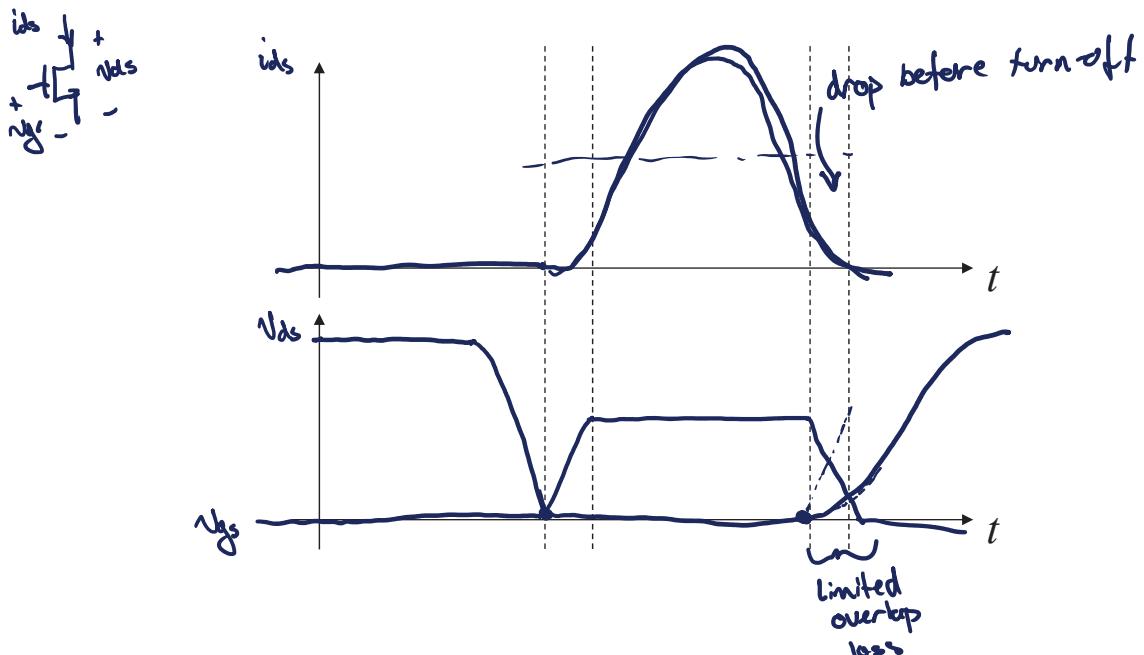


Remaining Switching Losses



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Idealized Switching Waveforms



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Class-E Amplifier

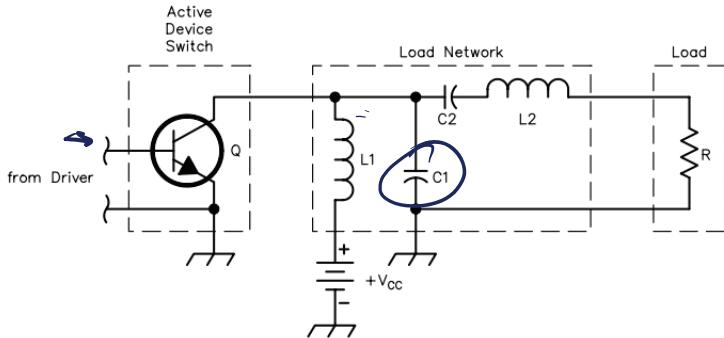


Fig 2—Schematic of a low-order Class-E amplifier.

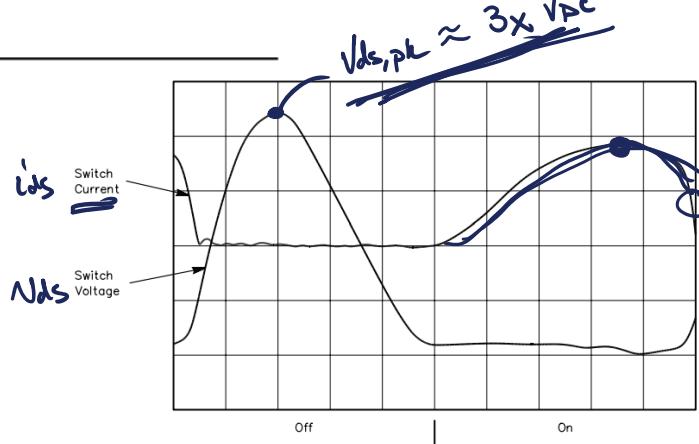
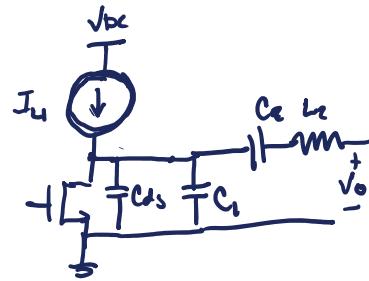
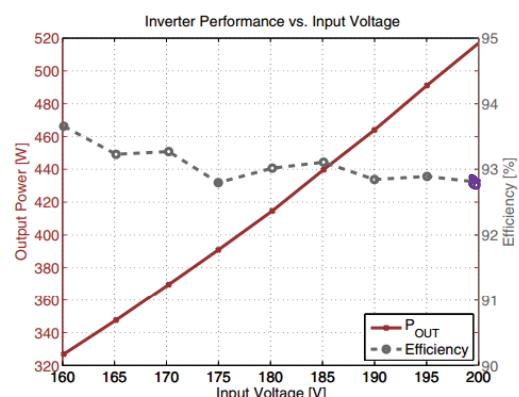
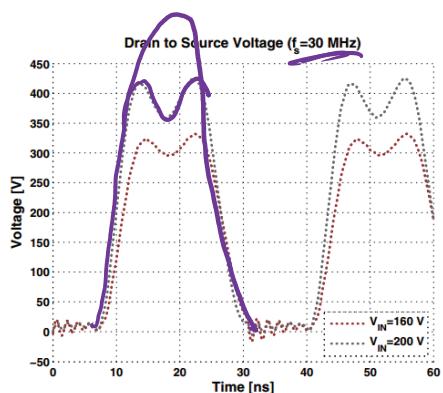
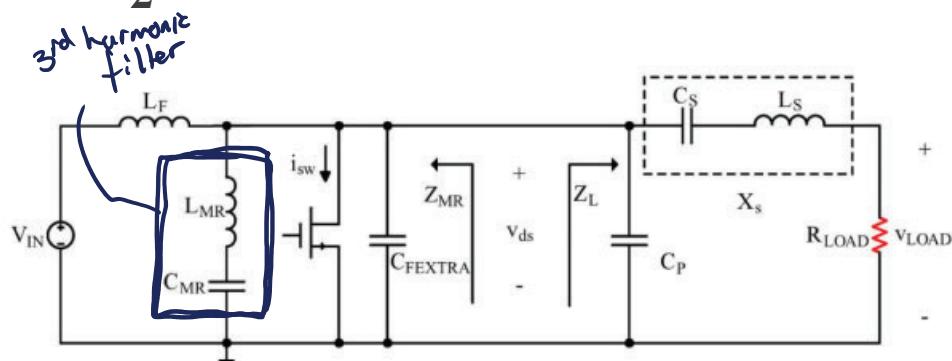


Fig 3—Actual transistor voltage and current waveforms in a low-order Class-E amplifier.

N. O. Sokal, "Class-E RF Power Amplifiers," 2001



Class Φ_2 Inverter



J. M. Rivas, O. Leitermann, Y. Han , A. D. Sagneri, and D. J. Perreault, " A High-Frequency Resonant Inverter Topology With Low-Voltage Stress", 2008



VHF DC-DC Converter

Φ_2 Boost Converter

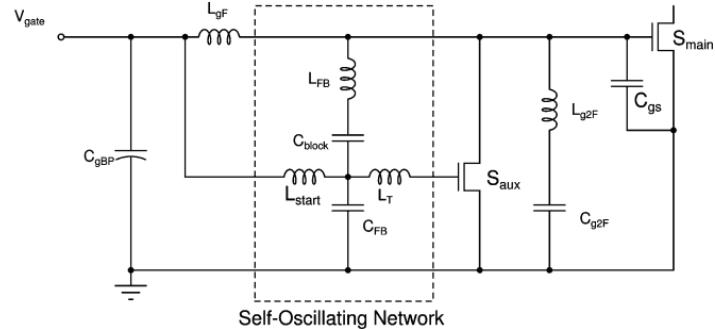
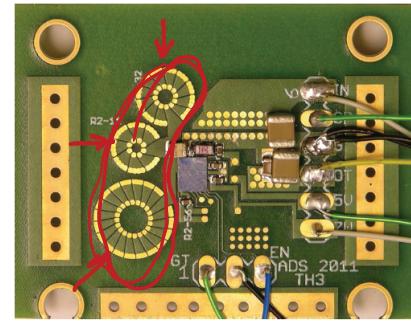
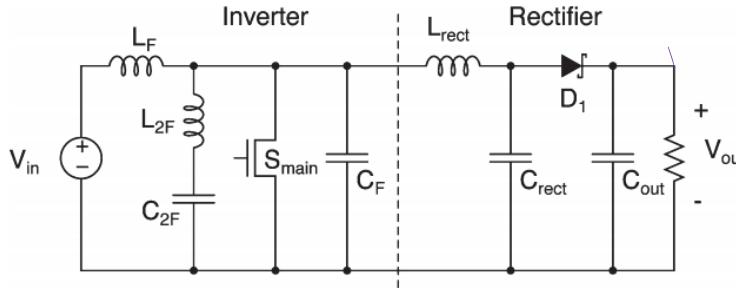


Fig. 5. Trapezoidal resonant gate drive circuit with self-oscillating network. The converter is enabled by applying the voltage V_{gate} , and disabled by setting V_{gate} to zero. This gate driver is employed in the 110-MHz converter (Fig. 9).

R. C. N. Pilawa-Podgurski, A. D. Sagneri, J. M. Rivas, D. I. Anderson and D. J. Perreault, "Very-High-Frequency Resonant Boost Converters," 2009



Chapter 20: Resonant Switch Topologies

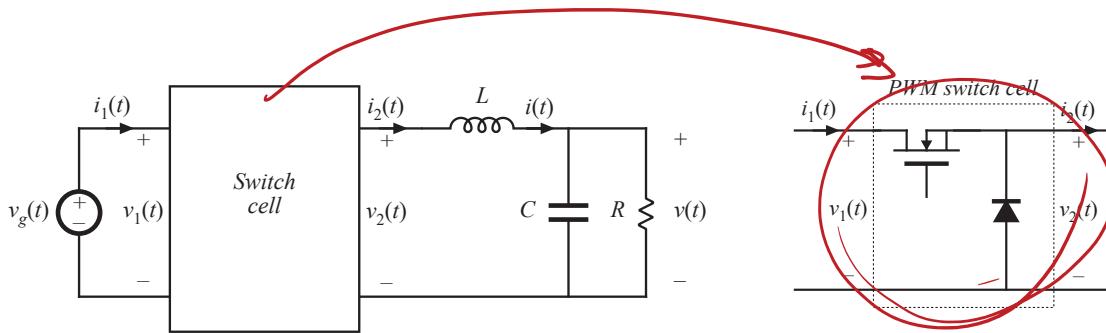
2nd edition of Fundamentals of Power Electronics

- Introduction
- 20.1 The zero-current-switching quasi-resonant switch cell
 - 20.1.1 Waveforms of the half-wave ZCS quasi-resonant switch cell
 - 20.1.2 The average terminal waveforms
 - 20.1.3 The full-wave ZCS quasi-resonant switch cell
- 20.2 Resonant switch topologies
 - 20.2.1 The zero-voltage-switching quasi-resonant switch
 - 20.2.2 The zero-voltage-switching multiresonant switch
 - 20.2.3 Quasi-square-wave resonant switches
- 20.3 Ac modeling of quasi-resonant converters
- 20.4 Summary of key points

The resonant switch concept

General idea:

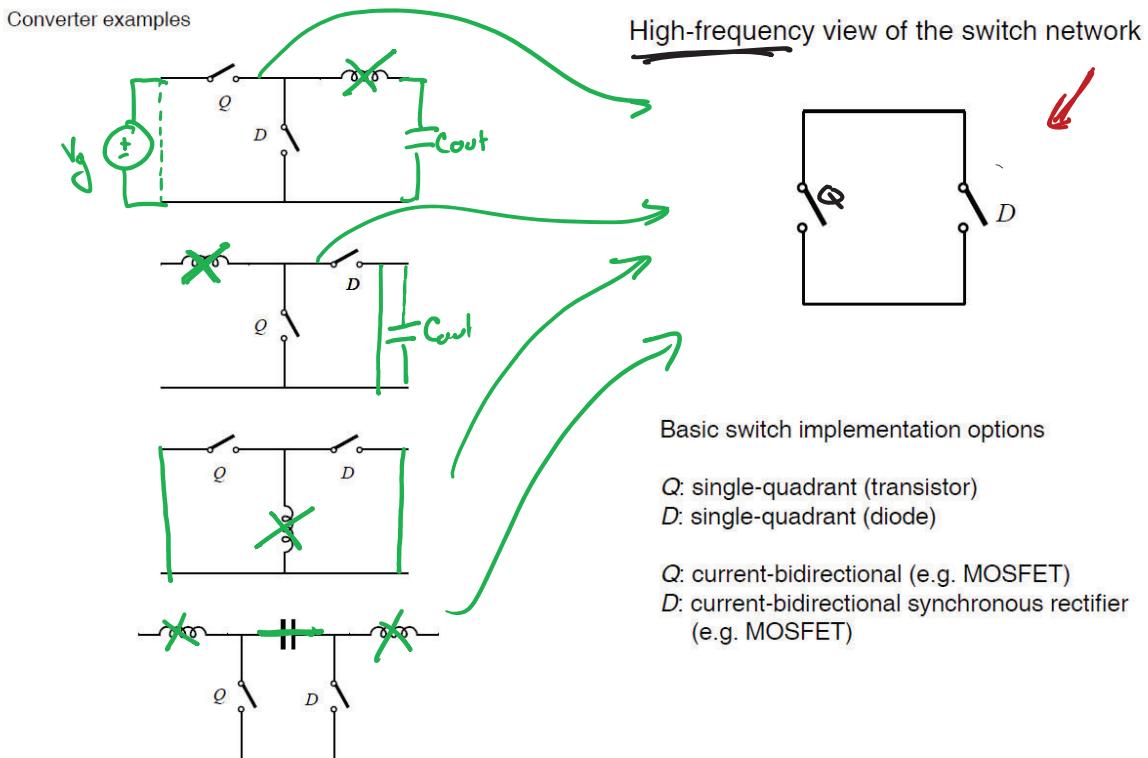
- PWM switch network is replaced by a resonant switch network
- This leads to a quasi-resonant or quasi-squarewave version of the original PWM converter



Example: realization of the switch cell in the buck converter

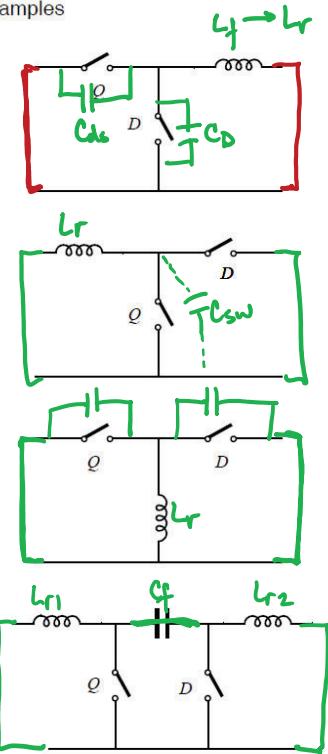


High Frequency Switch Network

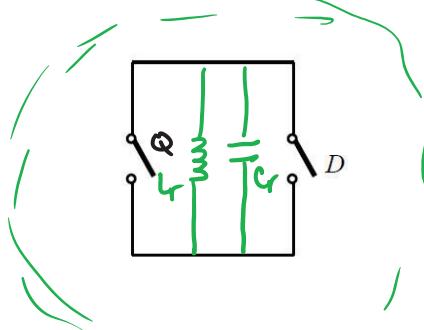


ZVS-QSW: Review

Converter examples



High-frequency view of the switch network



Basic switch implementation options

Q: single-quadrant (transistor)
D: single-quadrant (diode)

Q: current-bidirectional (e.g. MOSFET)
D: current-bidirectional synchronous rectifier
(e.g. MOSFET)