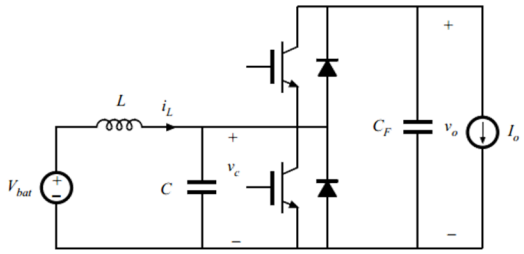
Example 3: ZVS-QSW Boost Converter



Bidirectional drivetrain boost converter in electric vehicles

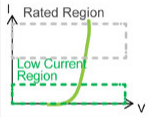
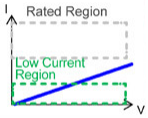
- P_o = 12.5 kW
- f_s = 100 kHz
- V_{bat} = 250 V
- V_o = 500 V
- F = 0.5

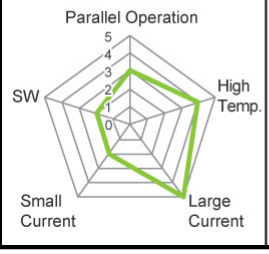
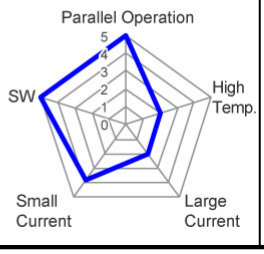
Goals:

- Find L_r, C_r to achieve ZVS for all operating points
- Sketch small-signal model for control design
- Solve $G_{vd}(s)$

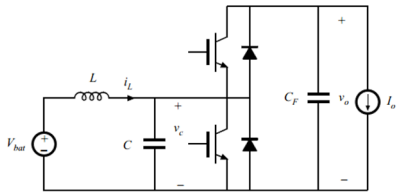
IGBT vs. MOSFET

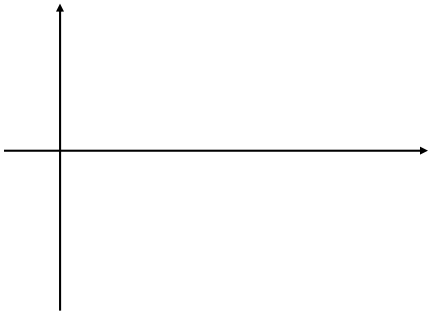
Rohm, "New Hybrid MOS Combines the Best Characteristics of MOSFETs and IGBTs Improved energy savings"

	IGBT	Superjunction MOSFET
V-I Characteristics		
Low Current	×	○
High Current	○	×
High-Speed Switching	△	○

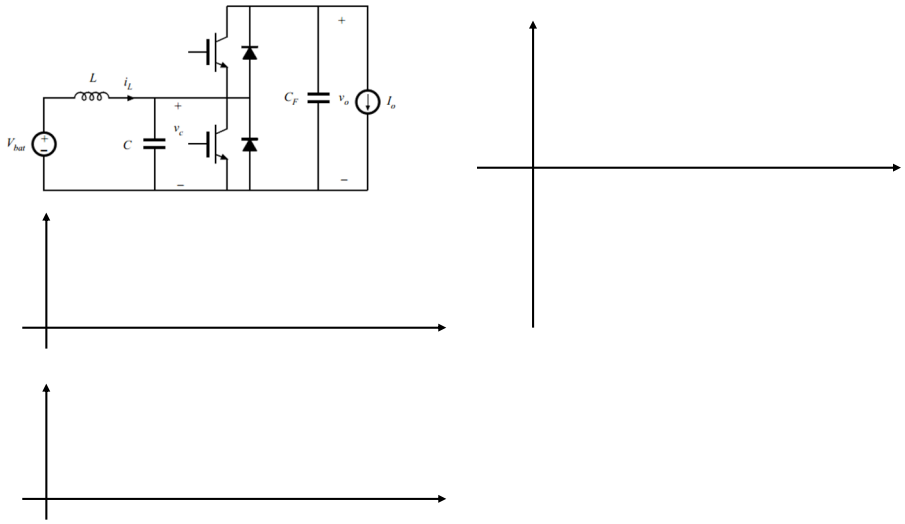
IGBT	Superjunction MOSFET
	

ZVS-QSW Boost

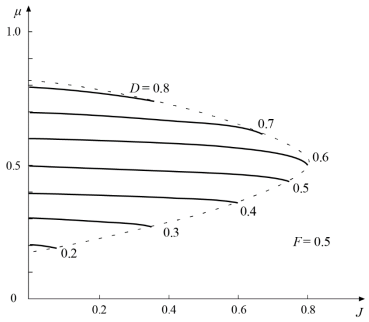




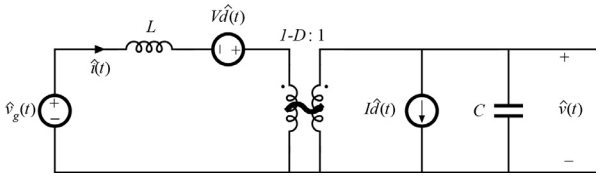
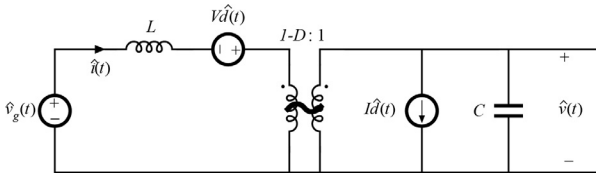
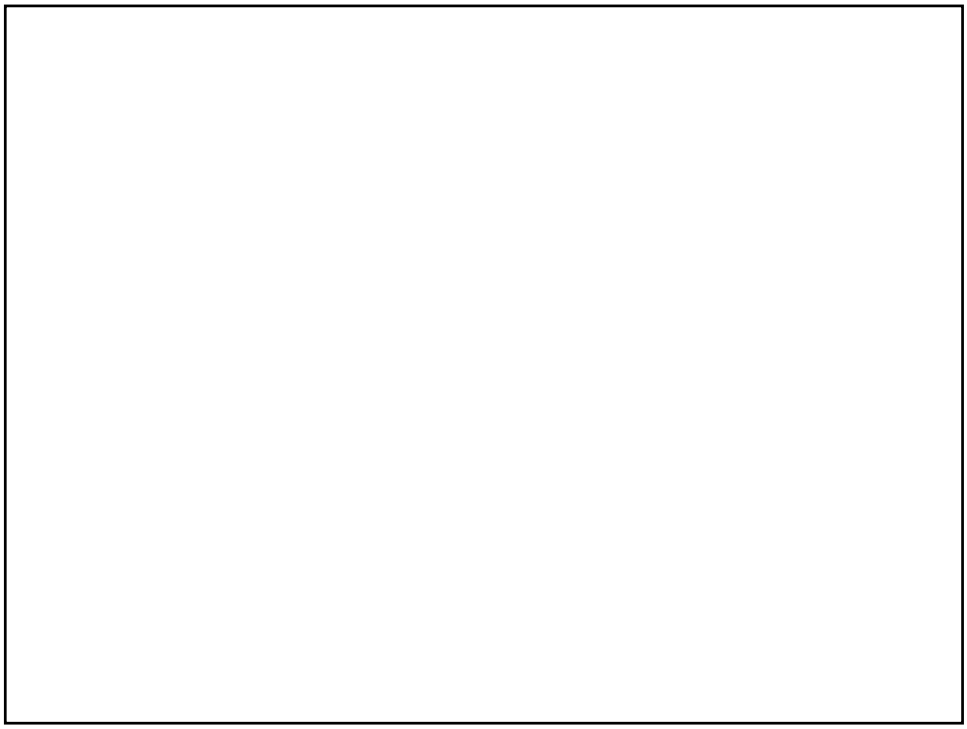
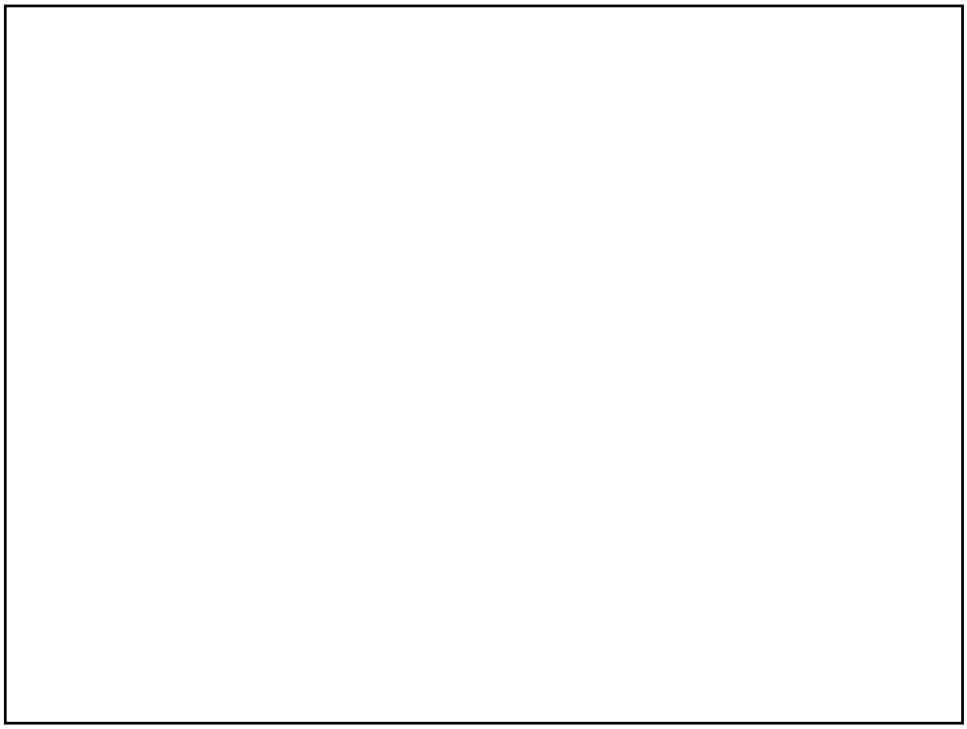
ZVS-QSW Boost



Switch Conversion Ratio



Boost SSM



PWM Converter Transfer Functions