

ECE321 ELECTRONICS I

FALL 2006

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Lecture 6
12th October, 2006



CHAPTER 3

Diodes

3.4 Zener Diodes (Rev breakdown, regulation)

3.5 Rectification (Re-visit & develop)

3.6 Clipping (Non-linear composites)

& Clamping (Capacitor effects)

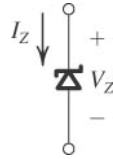


Figure 3.20 Circuit symbol for a zener diode.

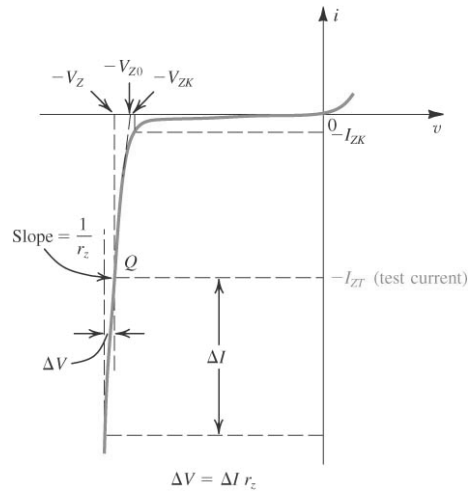


Figure 3.21 The diode i - v characteristic with the breakdown region shown in some detail.

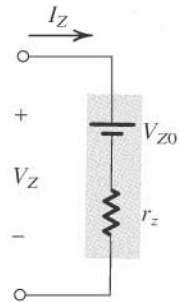


Figure 3.22 Model for the zener diode.

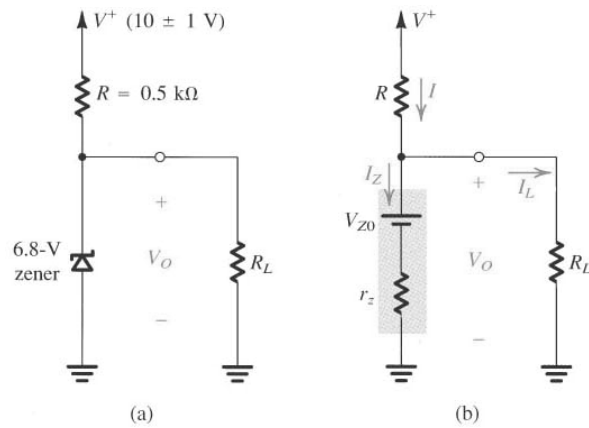


Figure 3.23 (a) Circuit for Example 3.8. (b) The circuit with the zener diode replaced with its equivalent circuit model.

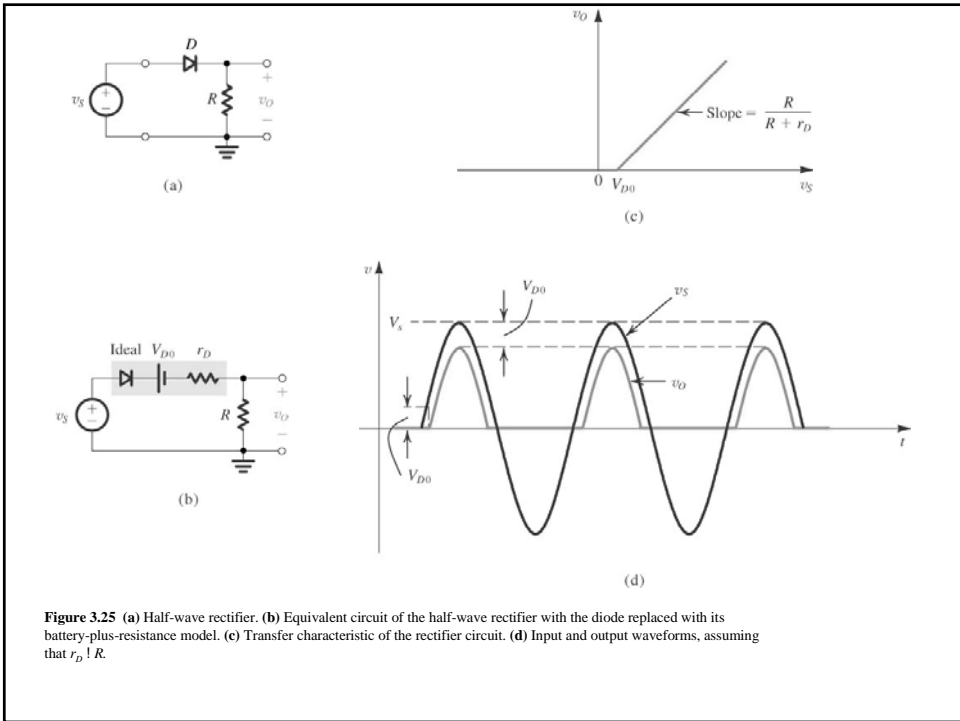
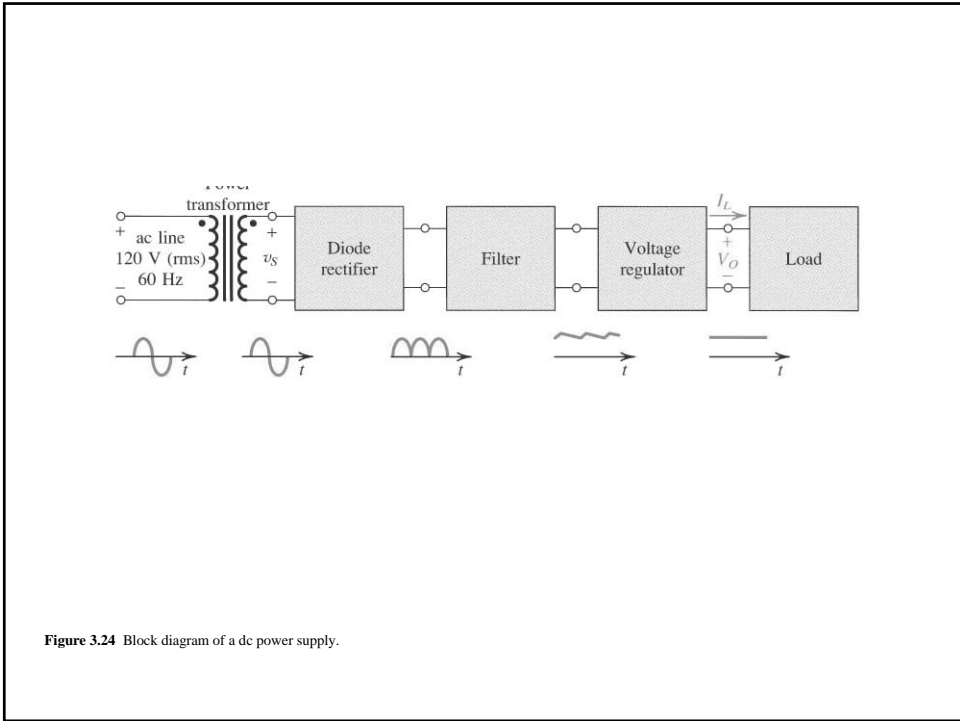
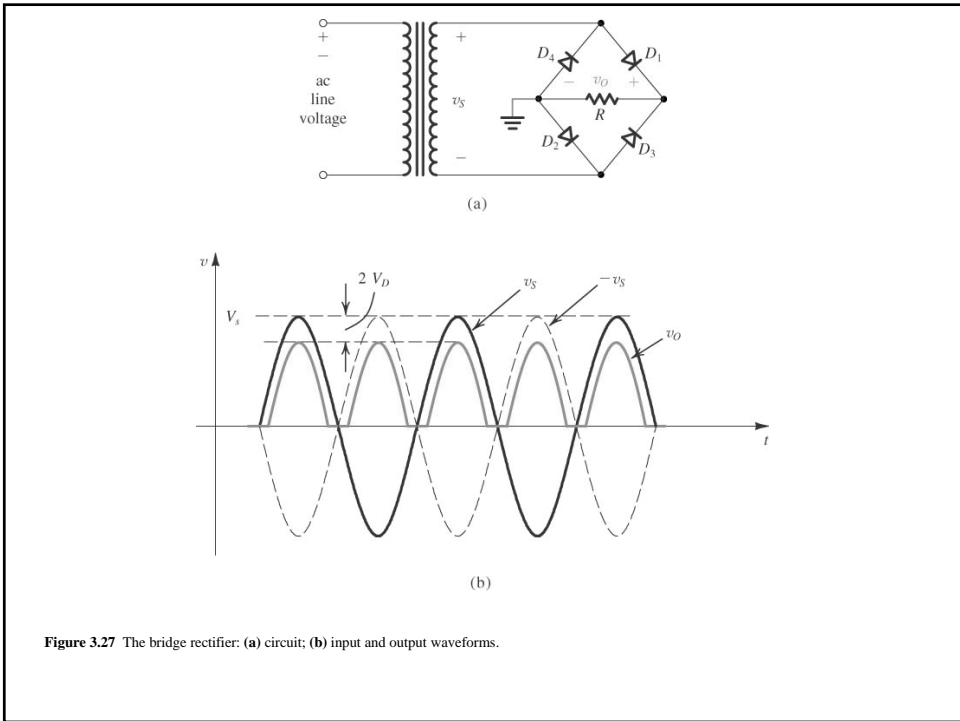
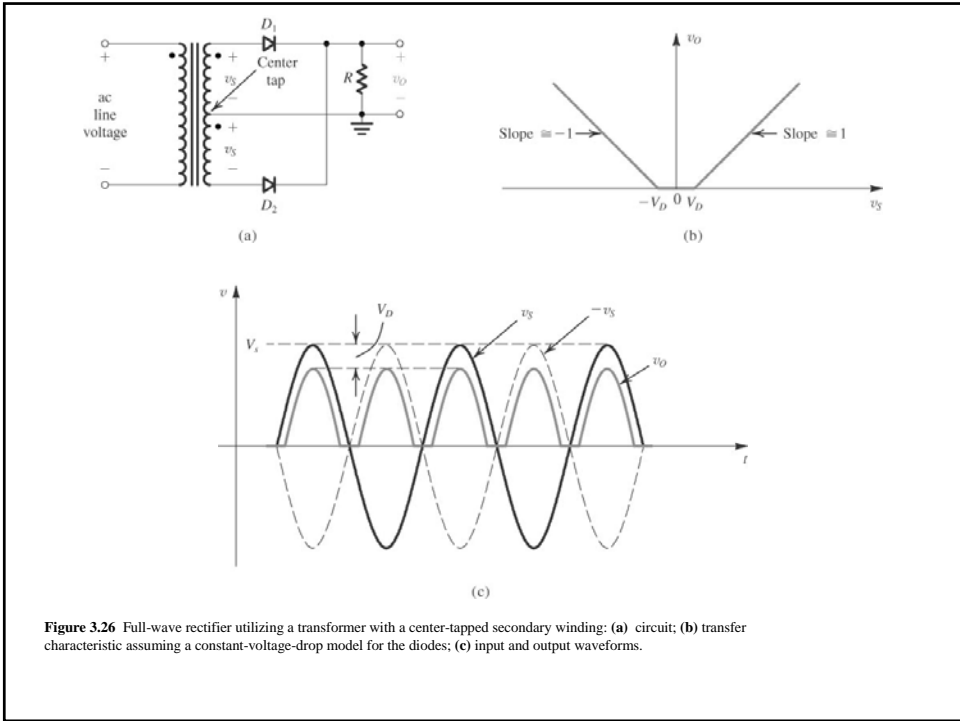
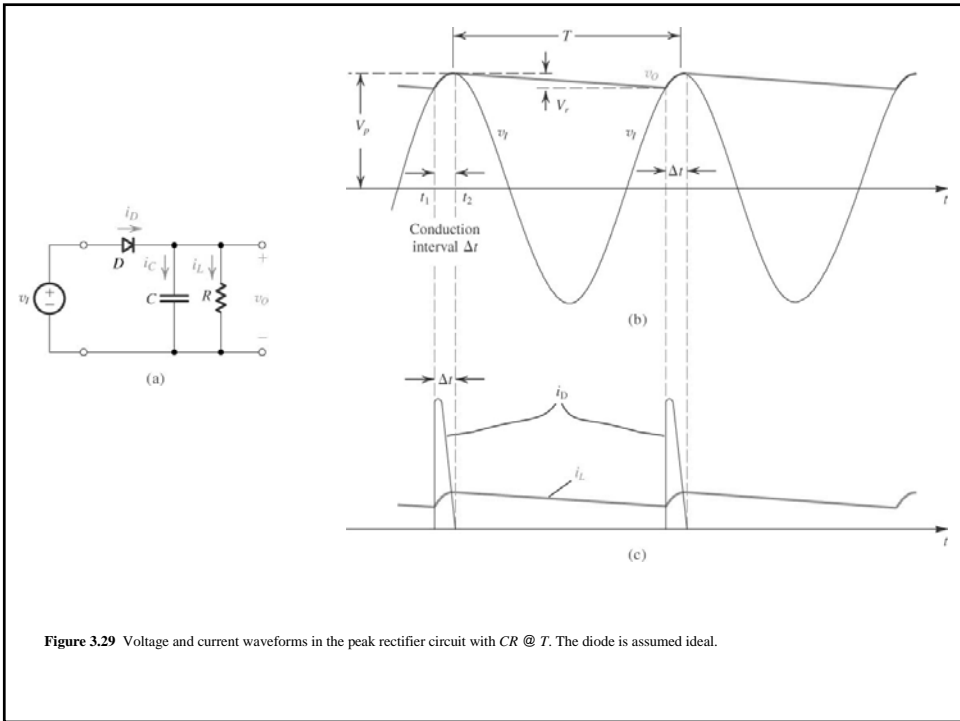
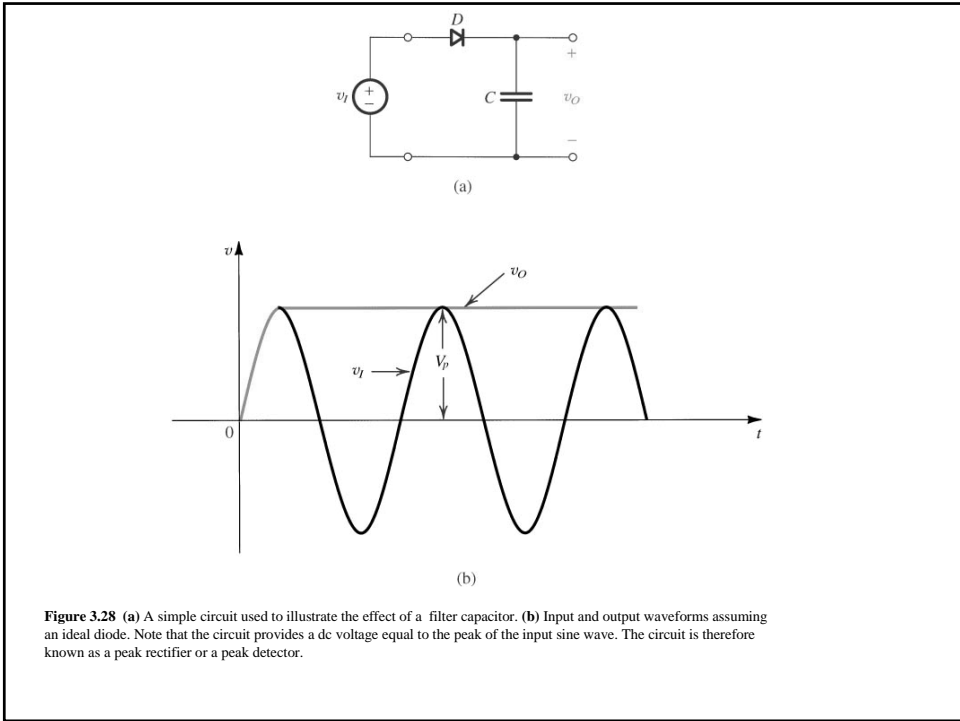


Figure 3.25 (a) Half-wave rectifier. (b) Equivalent circuit of the half-wave rectifier with the diode replaced with its battery-plus-resistance model. (c) Transfer characteristic of the rectifier circuit. (d) Input and output waveforms, assuming that $r_D \ll R$.





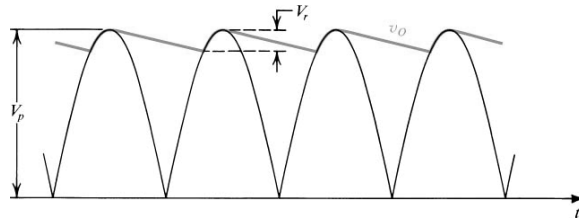


Figure 3.30 Waveforms in the full-wave peak rectifier.

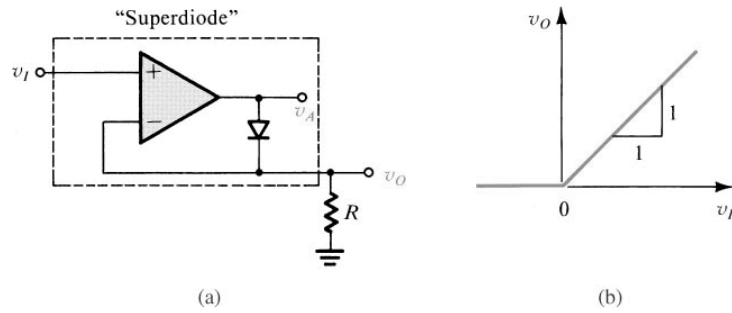


Figure 3.31 The "superdiode" precision half-wave rectifier and its almost-ideal transfer characteristic. Note that when $v_I > 0$ and the diode conducts, the op amp supplies the load current, and the source is conveniently buffered, an added advantage. Not shown are the op-amp power supplies.

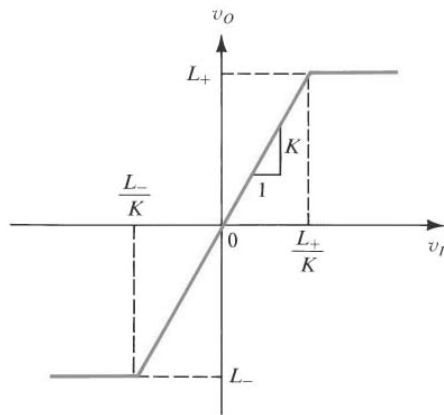


Figure 3.32 General transfer characteristic for a limiter circuit.

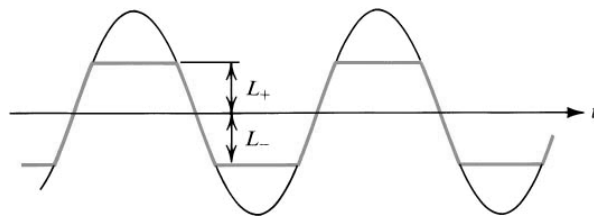
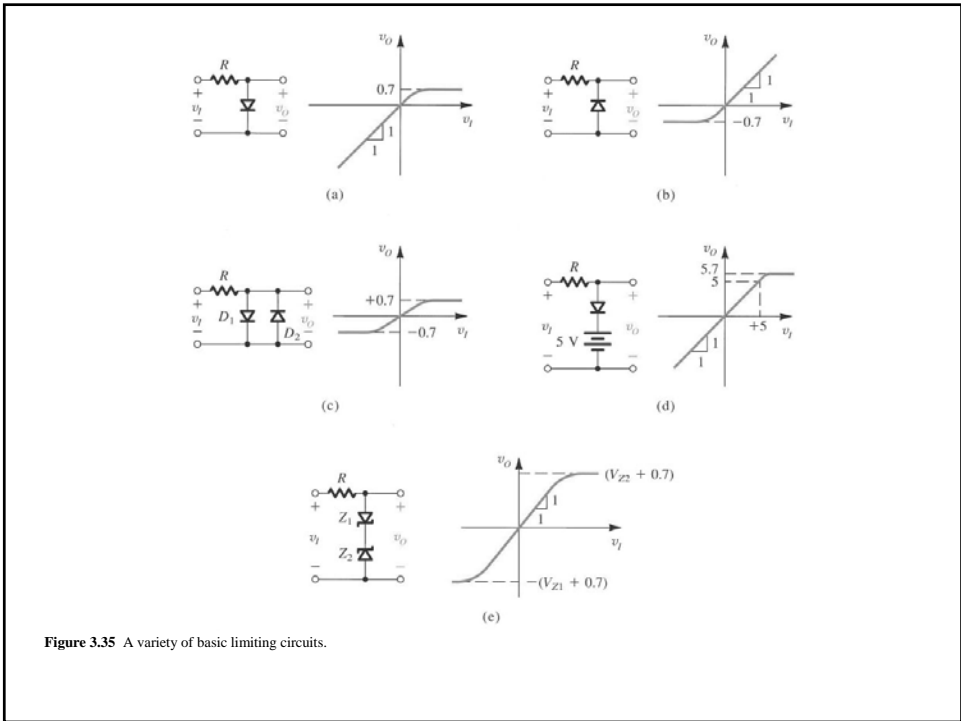
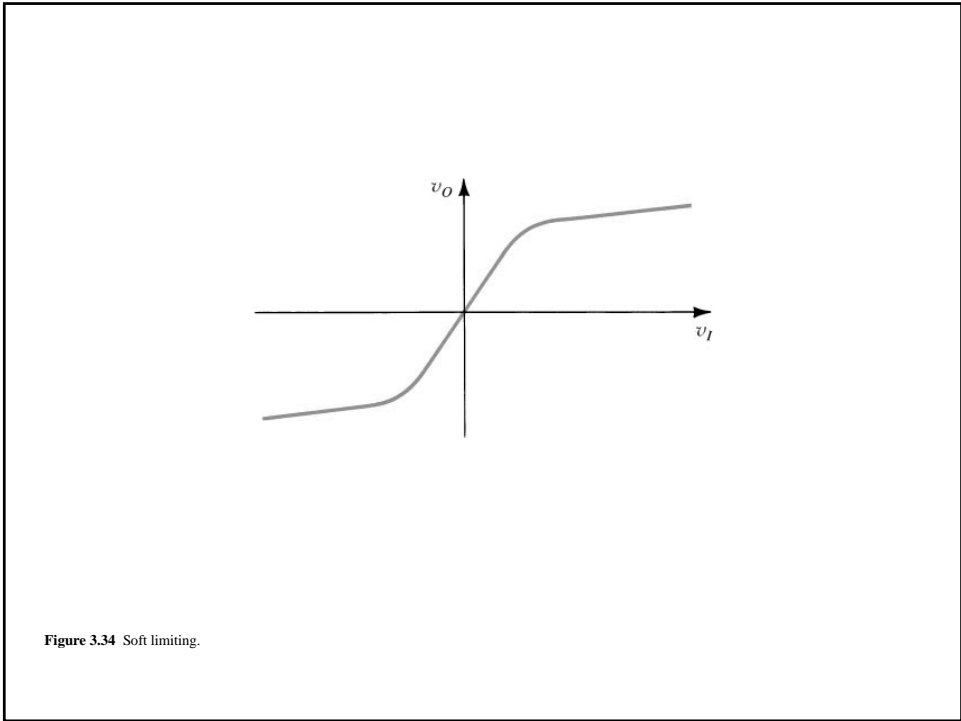


Figure 3.33 Applying a sine wave to a limiter can result in clipping off its two peaks.



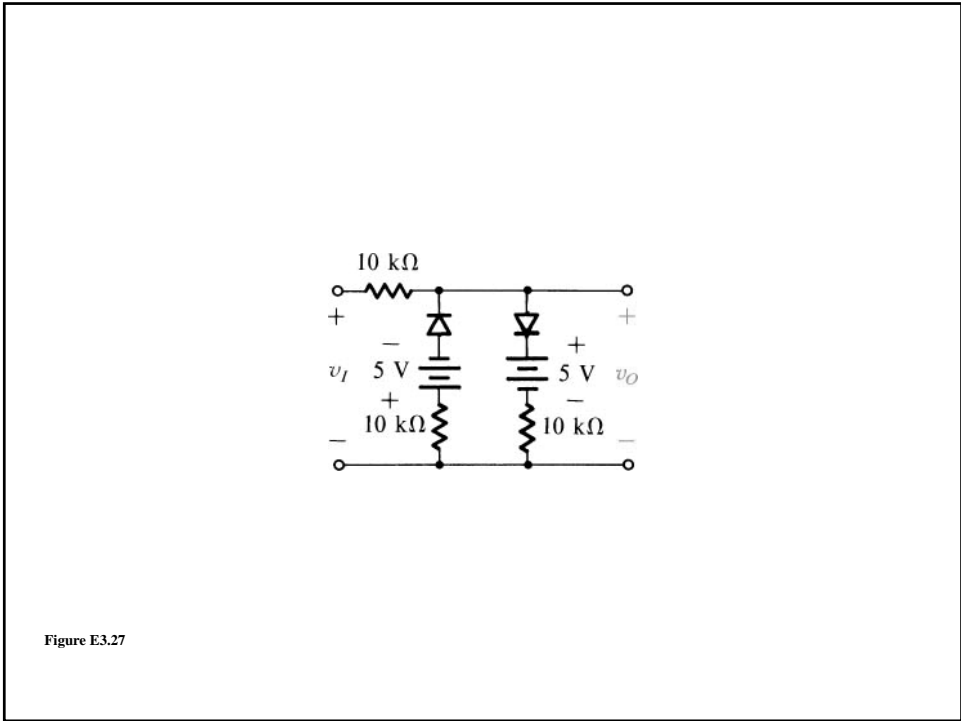


Figure E3.27

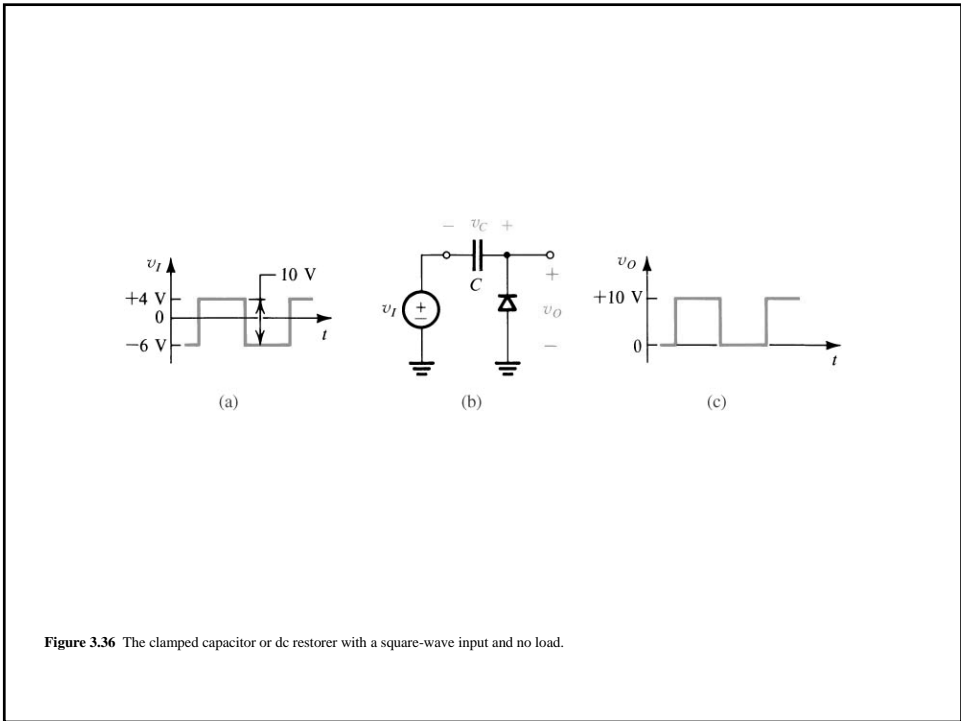


Figure 3.36 The clamped capacitor or DC restorer with a square-wave input and no load.

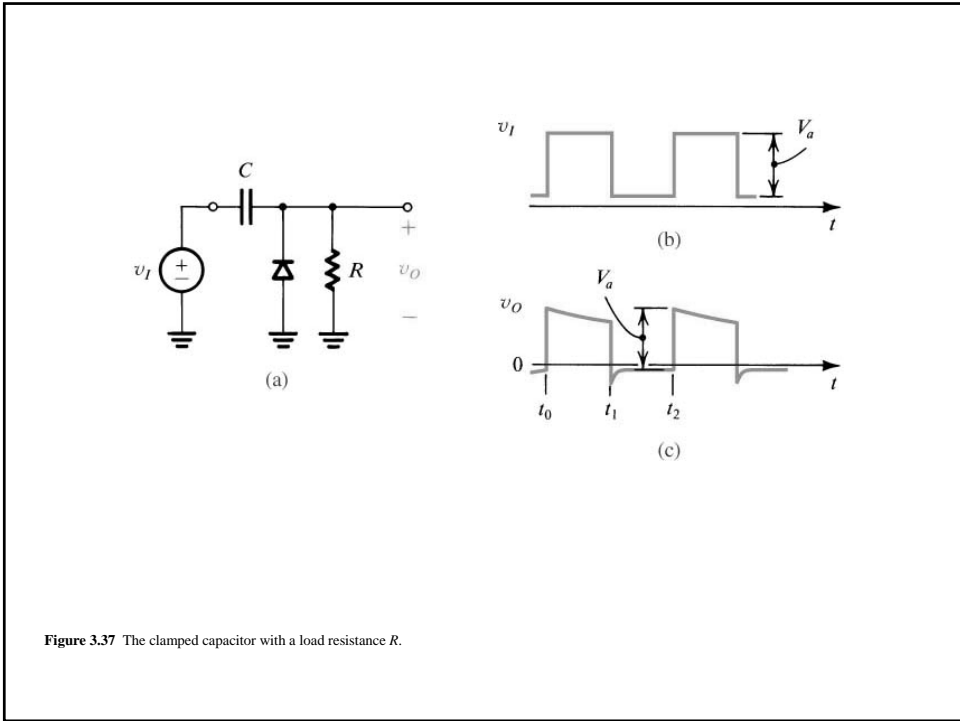


Figure 3.37 The clamped capacitor with a load resistance R .

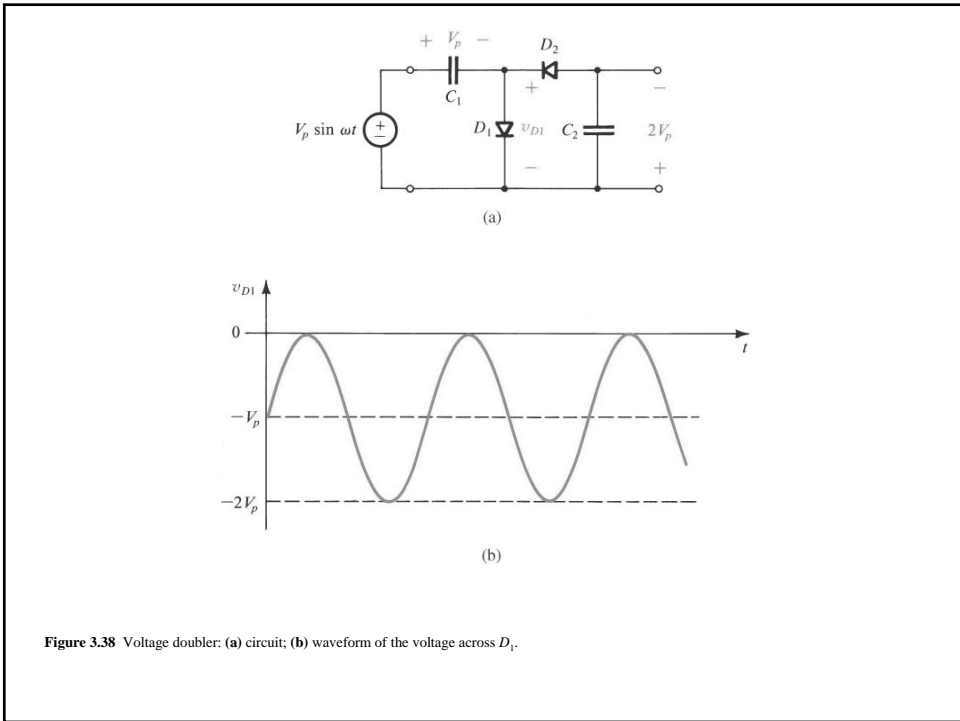


Figure 3.38 Voltage doubler: (a) circuit; (b) waveform of the voltage across D_1 .