

Problems

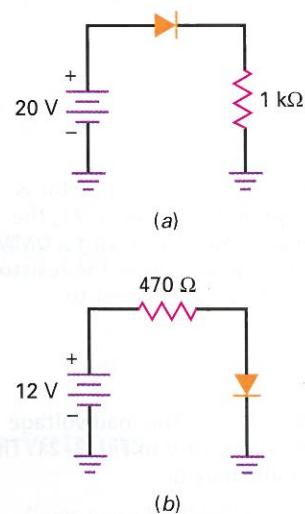
SEC. 3-1 BASIC IDEAS

- 3-1 A diode is in series with $220\ \Omega$. If the voltage across the resistor is 6 V, what is the current through the diode?
- 3-2 A diode has a voltage of 0.7 V and a current of 100 mA. What is the diode power?
- 3-3 Two diodes are in series. The first diode has a voltage of 0.75 V and the second has a voltage of 0.8 V. If the current through the first diode is 400 mA, what is the current through the second diode?

SEC. 3-2 THE IDEAL DIODE

- 3-4 In Fig. 3-22a, calculate the load current, load voltage, load power, diode power, and total power.
- 3-5 If the resistor is doubled in Fig. 3-22a, what is the load current?
- 3-6 In Fig. 3-22b, calculate the load current, load voltage, load power, diode power, and total power.
- 3-7 If the resistor is doubled in Fig. 3-22b, what is the load current?
- 3-8 If the diode polarity is reversed in Fig. 3-22b, what is the diode current? The diode voltage?

Figure 3-22



SEC. 3-3 THE SECOND APPROXIMATION

- 3-9 In Fig. 3-22a, calculate the load current, load voltage, load power, diode power, and total power.
- 3-10 If the resistor is doubled in Fig. 3-22a, what is the load current?
- 3-11 In Fig. 3-22b, calculate the load current, load voltage, load power, diode power, and total power.

- 3-12 If the resistor is doubled in Fig. 3-22a, what is the load current?
- 3-13 If the diode polarity is reversed in Fig. 3-22b, what is the diode current? The diode voltage?

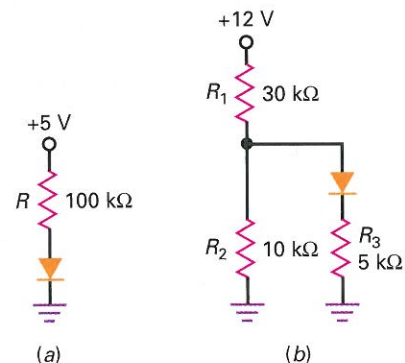
SEC. 3-4 THE THIRD APPROXIMATION

- 3-14 In Fig. 3-22a, calculate the load current, load voltage, load power, diode power, and total power. ($R_B = 0.23\ \Omega$)
- 3-15 If the resistor is doubled in Fig. 3-22a, what is the load current? ($R_B = 0.23\ \Omega$)
- 3-16 In Fig. 3-22b, calculate the load current, load voltage, load power, diode power, and total power. ($R_B = 0.23\ \Omega$)
- 3-17 If the resistor is doubled in Fig. 3-22b, what is the load current? ($R_B = 0.23\ \Omega$)
- 3-18 If the diode polarity is reversed in Fig. 3-22b, what is the diode current? The diode voltage?

SEC. 3-5 TROUBLESHOOTING

- 3-19 Suppose the voltage across the diode of Fig. 3-23a is 5 V. Is the diode open or shorted?

Figure 3-23



- 3-20 Something causes R to short in Fig. 3-23a. What will the diode voltage be? What will happen to the diode?
- 3-21 You measure 0 V across the diode of Fig. 3-23a. Next you check the source voltage and it reads +5 V with respect to ground. What is wrong with the circuit?
- 3-22 In Fig. 3-23b, you measure a potential of +3 V at the junction of R_1 and R_2 . (Remember, potentials are always with respect to ground.) Next you measure 0 V at the junction of the diode and the 5-k Ω resistor. Name some possible troubles.
- 3-23 The forward and reverse DMM diode test reading is 0.7 V and 1.8 V. Is this diode good?

SEC. 3-7 READING A DATA SHEET

- 3-24 Which diode would you select in the 1N4000 series if it has to withstand a peak repetitive reverse voltage of 300 V?
- 3-25 The data sheet shows a band on one end of the diode. What is the name of this band? Does the diode arrow

of the schematic symbol point toward or away from this band?

- 3-26 Boiling water has a temperature of 100°C. If you drop a 1N4001 into a pot of boiling water, will it be destroyed or not? Explain your answer.

Critical Thinking

- 3-27 Here are some diodes and their worst-case specifications:

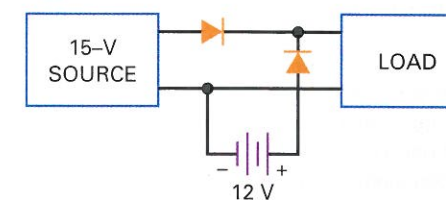
Diode	I_F	I_R
1N914	10 mA at 1 V	25 nA at 20 V
1N4001	1 A at 1.1 V	10 μ A at 50 V
1N1185	10 A at 0.95 V	4.6 mA at 100 V

Calculate the forward and the reverse resistance for each of these diodes.

- 3-28 In Fig. 3-23a, what value should R be to get a diode current of approximately 20 mA?
- 3-29 What value should R_2 be in Fig. 3-23b to set up a diode current of 0.25 mA?
- 3-30 A silicon diode has a forward current of 500 mA at 1 V. Use the third approximation to calculate its bulk resistance.

- 3-31 Given a silicon diode with a reverse current of 5 μ A at 25°C and 100 μ A at 100°C, calculate the surface leakage current.
- 3-32 The power is turned off and the upper end of R_1 is grounded in Fig. 3-23b. Now you use an ohmmeter to read the forward and reverse resistance of the diode. Both readings are identical. What does the ohmmeter read?
- 3-33 Some systems, like burglar alarms and computers, use battery backup just in case the main source of power should fail. Describe how the circuit of Fig. 3-24 works.

Figure 3-24



Up-Down Circuit Analysis

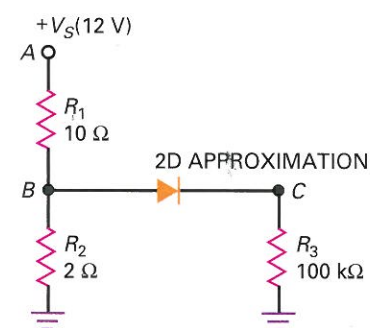
Use Fig. 3-25 for the remaining problems. Assume increases of approximately 10 percent in the independent variable and use the second approximation of a diode.

For each independent variable increase, determine what the respective dependent variable will do. Will it go up (U),

down (D), or show no change (N)? Refer to Sec. 3-6, Up-Down Circuit Analysis, to review this procedure.

- 3-34 Predict the response of each dependent variable in the row labeled V_S . Check your answers. Then, answer the

Figure 3-25 Up-down circuit analysis.



Independent Variables

	DEPENDENT VARIABLES								
	V_A	V_B	V_C	I_1	I_2	I_3	P_1	P_2	P_3
V_S									
R_1									
R_2									
R_3									
V_K									