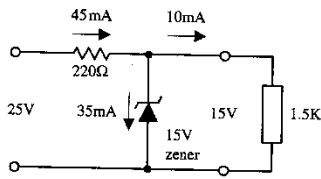


Zener Diode Regulator Examples and Problems

Scherz, Practical Electronics for Inventors, 2nd Edition

Example 1

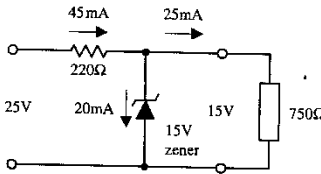


$$I_{\text{load}} = \frac{15\text{V}}{15\text{K}} = 10\text{mA}$$

$$I_R = \frac{25\text{V} - 15\text{V}}{220\Omega} = 45\text{mA}$$

$$I_{\text{zener}} = 45\text{mA} - 10\text{mA} = 35\text{mA}$$

Example 2



$$I_{\text{load}} = \frac{15\text{V}}{750\Omega} = 20\text{mA}$$

$$I_R = \frac{25\text{V} - 15\text{V}}{220\Omega} = 45\text{mA}$$

$$I_{\text{zener}} = 45\text{mA} - 20\text{mA} = 25\text{mA}$$

Example 3

Change $V_{\text{in}} = 36\text{V}$

$$I_{\text{Load}} = \frac{15\text{V}}{750\Omega} = 20\text{mA}$$

$$I_S = \frac{36\text{V} - 15\text{V}}{220\Omega} = 95\text{mA}$$

$$I_{\text{Zener}} = 95\text{mA} - 20\text{mA} = 75\text{mA}$$

$$R_S = \frac{V_{\text{in,Min}} - V_Z}{I_{Z,\text{Min}} + I_{L,\text{Max}}}$$

$$P_R = \frac{(V_{\text{in,Max}} - V_Z)^2}{R_S}$$

Change R_S to Reduce Current

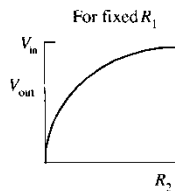
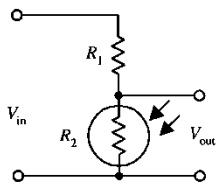
$$I_{\text{Load}} = \frac{15\text{V}}{750\Omega} = 20\text{mA}$$

$$I_S = \frac{36\text{V} - 15\text{V}}{470\Omega} = 45\text{mA}$$

$$I_{\text{Zener}} = 45\text{mA} - 20\text{mA} = 25\text{mA}$$

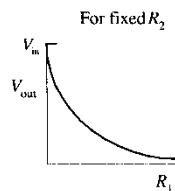
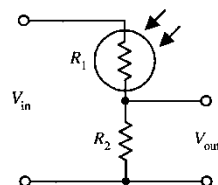
$$P_{Z,\text{Max}} = \frac{V_Z(V_{\text{in,Min}} - V_Z)}{R_S}$$

Light-Sensitive Voltage Divider



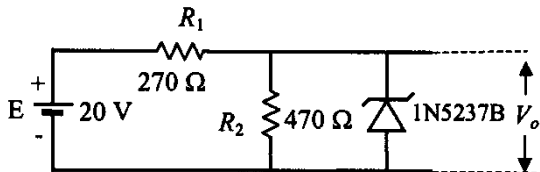
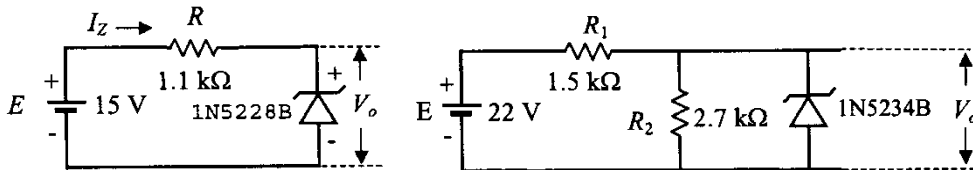
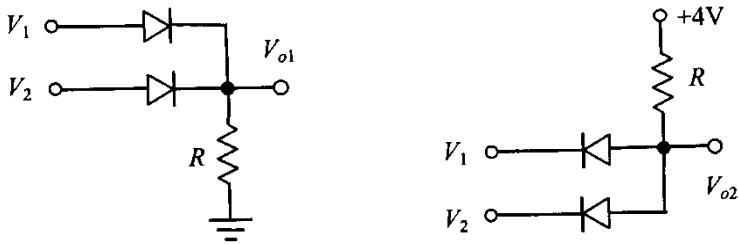
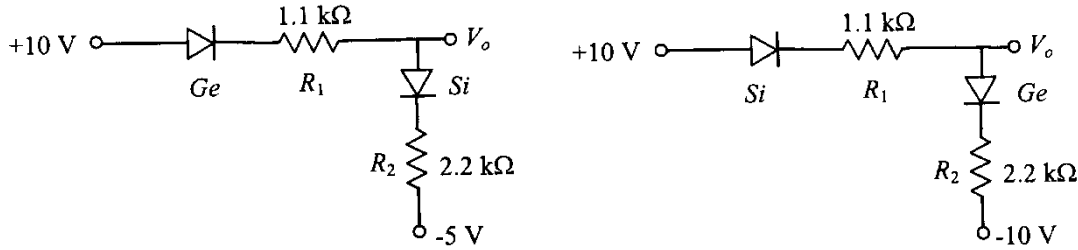
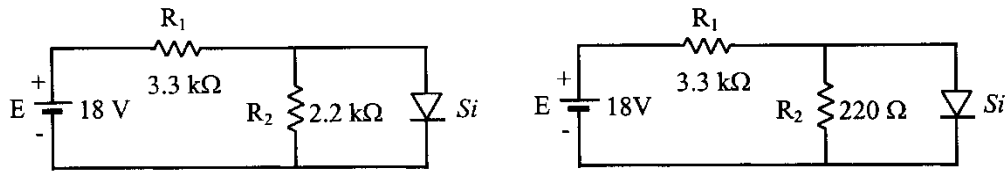
$$V_{\text{out}} = \frac{R_2}{R_1 + R_2} V_{\text{in}}$$

As the intensity of light increases, the resistance of the photoresistor decreases, so V_{out} in the top circuit gets smaller as more light hits it, whereas V_{out} in the lower circuit gets larger.



Diode Biasing Examples and Problems

Source: Aminian and Kazimierzczuk, Electronic Devices: A Design Approach



- V_B for Si = 0.7 V
- V_B for Ge = 0.3 V
- 1N5228B $V_Z = 3.9$ V
- 1N5234B $V_Z = 6.2$ V
- 1N5237B $V_Z = 8.2$ V