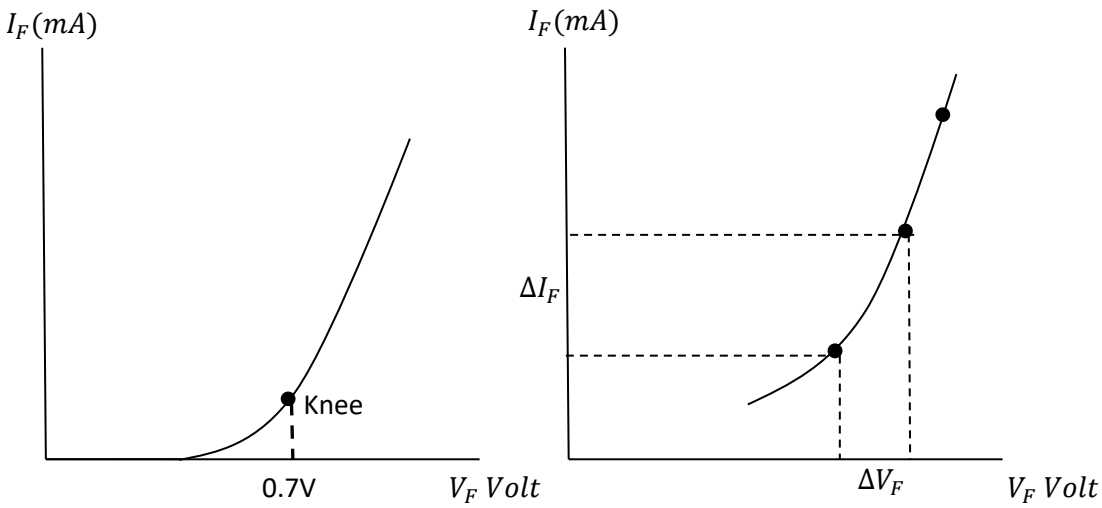
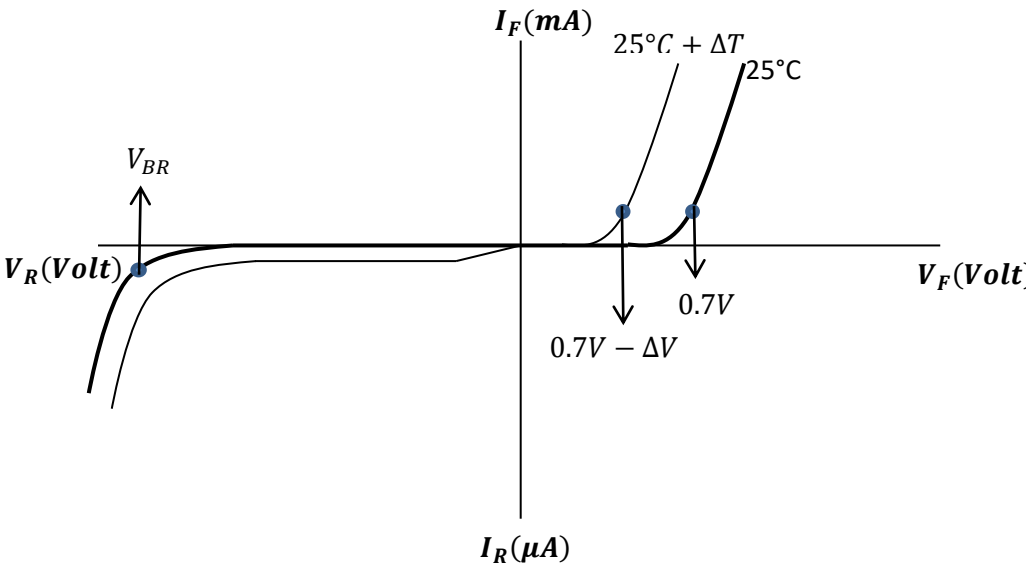


Dynamic resistance r_d' decreases as you move up the curve:

$$r_d' = \frac{\Delta V_f}{\Delta I_f}$$

Temperature effect on the Diode V-I Characteristics

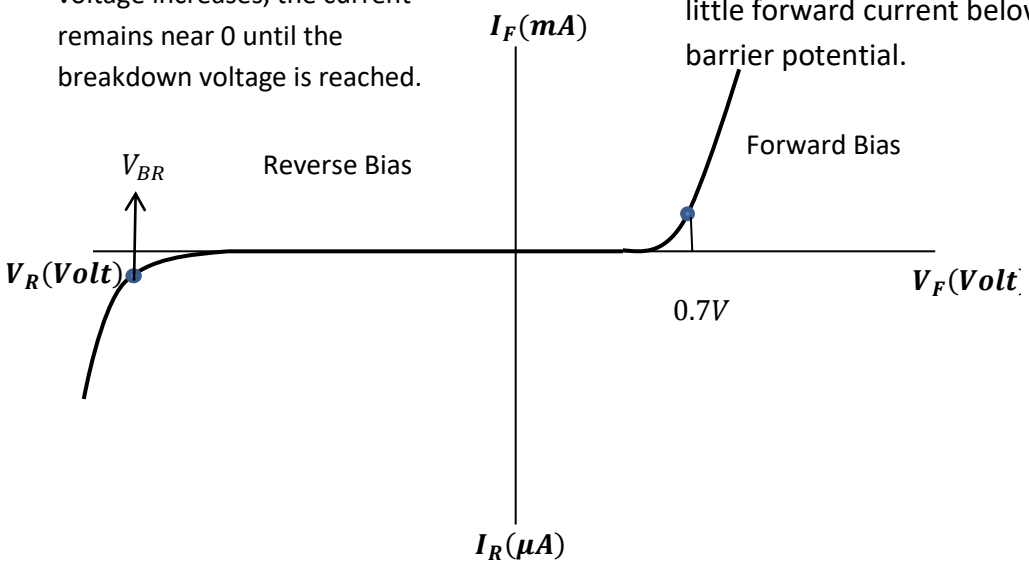


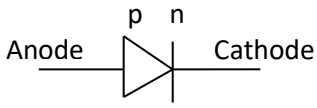
Chapter TWO: Diodes and Applications

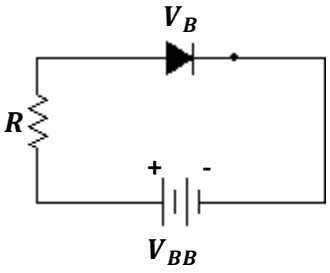
2-1 The Diode Characteristic Curve

In Reverse Bias, as the reverse voltage increases, the current remains near 0 until the breakdown voltage is reached.

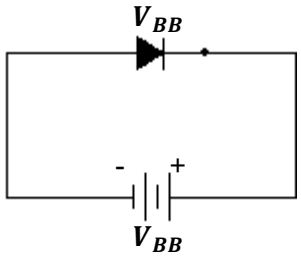
In Forward Bias, there is very little forward current below barrier potential.





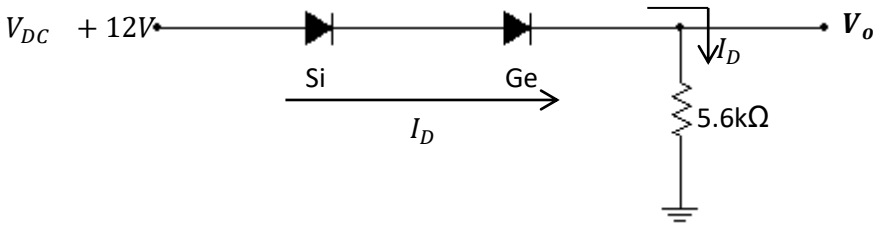


Forward Bias

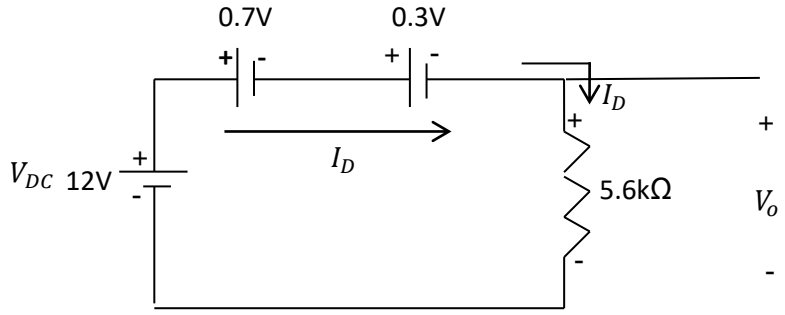


Reverse Bias

Example: Determine V_o and I_D for the series circuit:



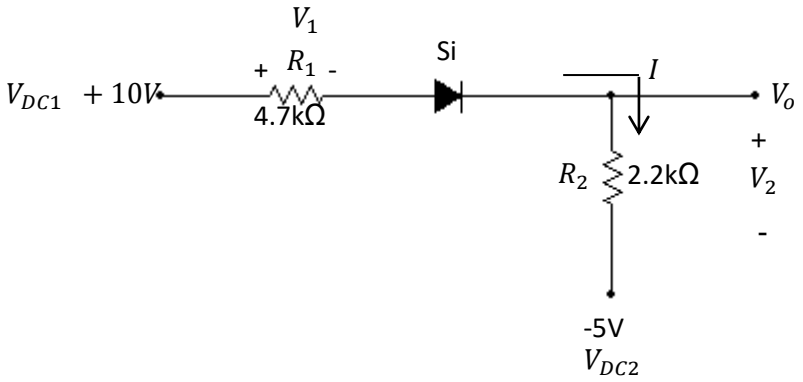
- Direction of resulting current as indicated above:
- Equivalent Circuit Model is:



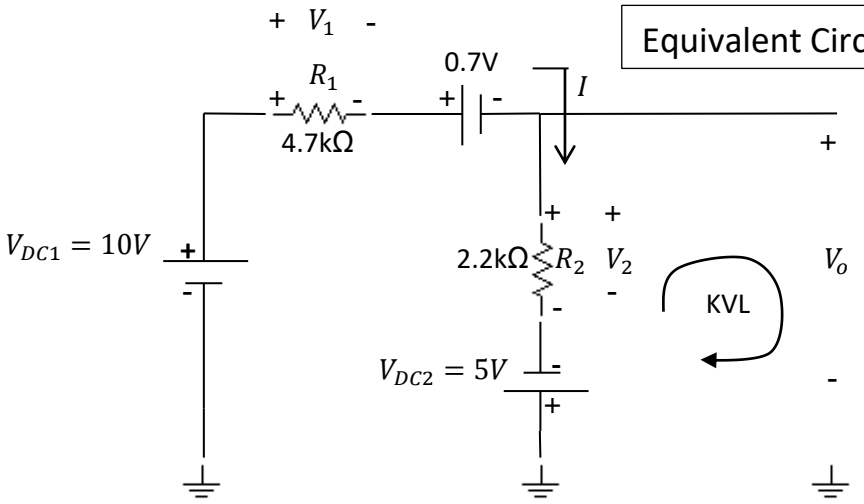
$$V_o = V_{dc} - 0.7V - 0.3V = 12V - 0.7V - 0.3V$$

$$I_D = I_R = \frac{V_R}{R} = \frac{V_o}{R} = \frac{11V}{5.6k\Omega} = 1.96\,mA$$

Example: Determine I , V_1 , V_2 and V_{out} for the series circuit:



Equivalent Circuit Model



- The resulting current through the circuit is:

$$I = \frac{V_{DC1} + V_{DC2} - V_D}{R_1 + R_2} = \frac{10V + 5V - 0.7V}{4.7k\Omega + 2.2k\Omega} = \frac{14.3V}{6.9k\Omega} = 2.07\ mA$$

$$V_1 = IR_1 = (2.07\ mA)(4.7k\Omega) = 9.73V$$

$$V_2 = IR_2 = (2.07\ mA)(2.2k\Omega) = 4.55V$$

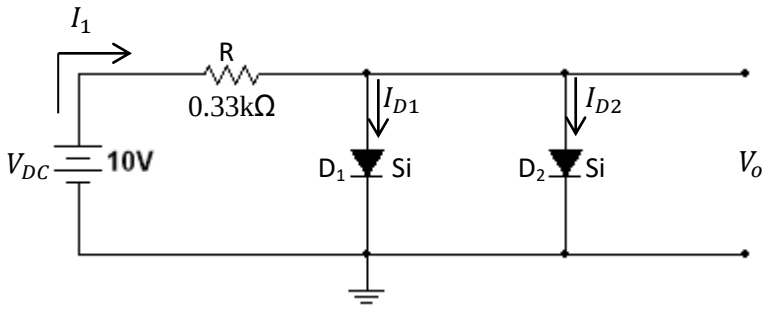
- Applying KVL to the output section in the clockwise direction will result in:

$$-V_{DC2} + V_2 - V_o = 0$$

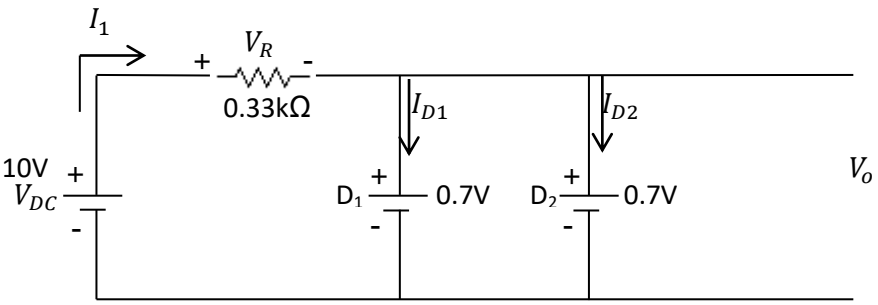
$$V_o = V_2 - V_{DC2} = 4.55V - 5V = -0.45V$$

The minus sign indicated that V_o has a polarity opposite to V_o in circuit above.

Example: Determine V_o , I_1 , I_{D1} and I_{D2} for the parallel diode configuration:



- Equivalent Circuit Model is:



$$V_o = 0.7V$$

$$I_1 = \frac{V_R}{R} = \frac{V_{DC} - 0.7V}{R} = \frac{10V - 0.7V}{0.33k\Omega} = 28.18\,mA$$

$$I_{D1} = I_{D2} = \frac{I_1}{2} = \frac{28.18\,mA}{2} = 14.09\,mA$$