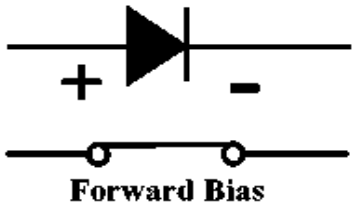
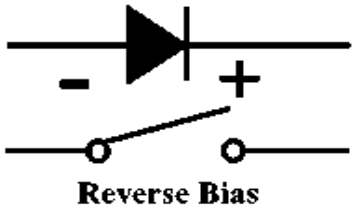
The Ideal Diode



When Forward Biased

- The diode will have no resistance
- The diode will have no control over the current through it.
- The diode will have no voltage drop across its terminals.



When Reverse Biased

- The diode will have infinite resistance
- The diode will not pass current.
- The diode will drop the entire voltage across its terminals.

The Ideal Diode acts like a Switch

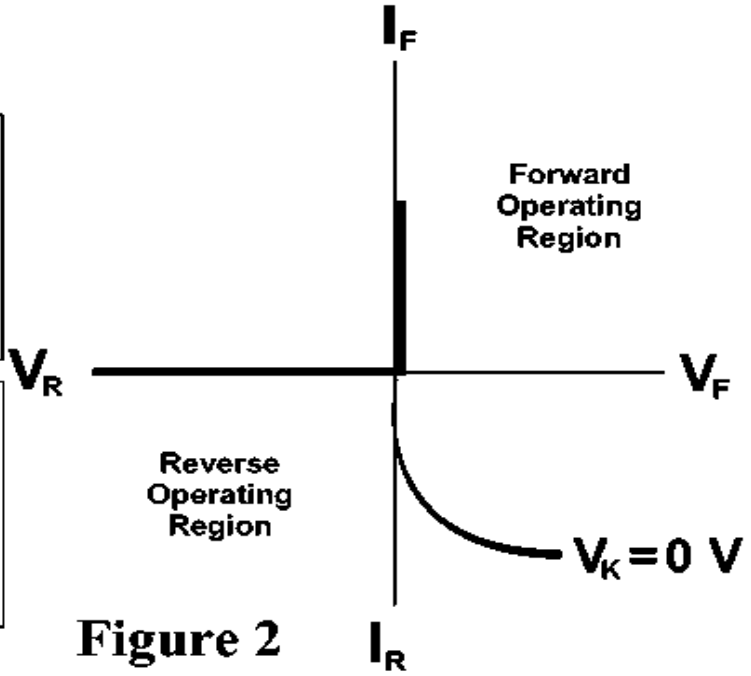
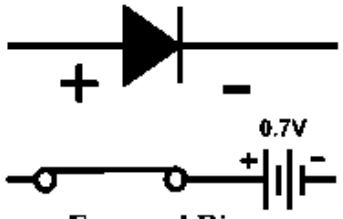


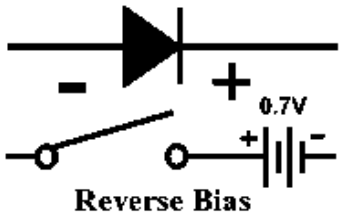
Figure 2

The Practical Diode



Forward Biased Characteristics

- The diode current remains at zero until the knee voltage is reached.
- Once the applied voltage reaches the value of V_K, the diode turns on and forward conduction occurs
- As long as the diode is conducting, the value of V_F is approximately equal to V_K



Reverse Biased Characteristics

- The diode will have infinite resistance
- The diode will not pass current.
- The diode will drop the entire voltage across its terminals.

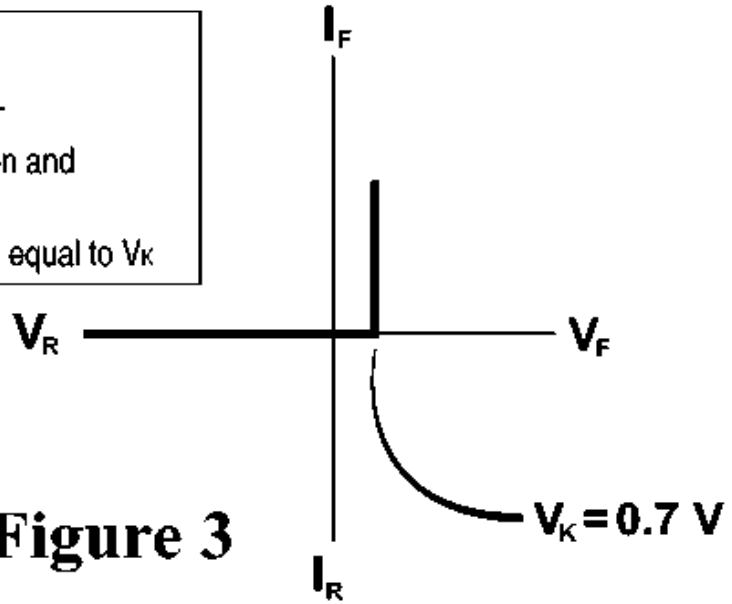
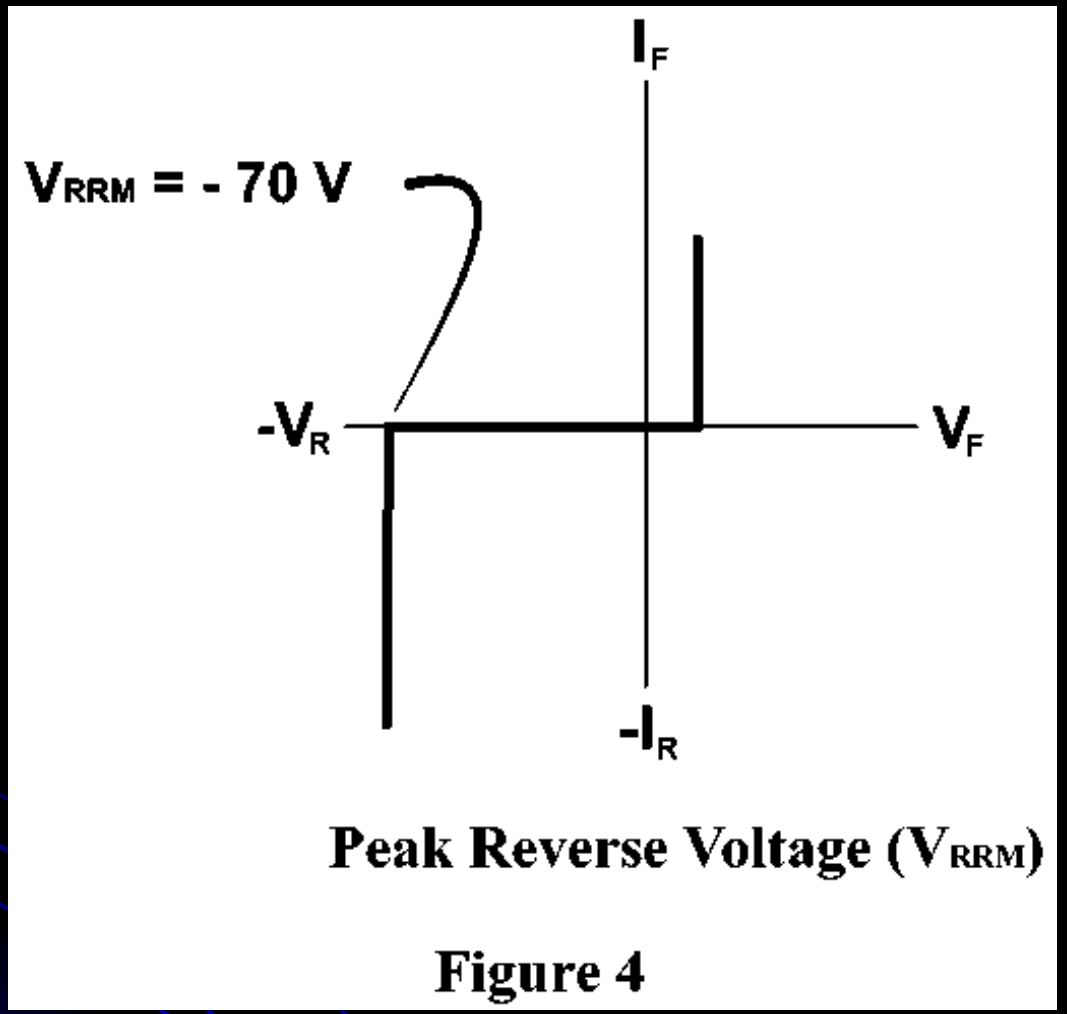


Figure 3

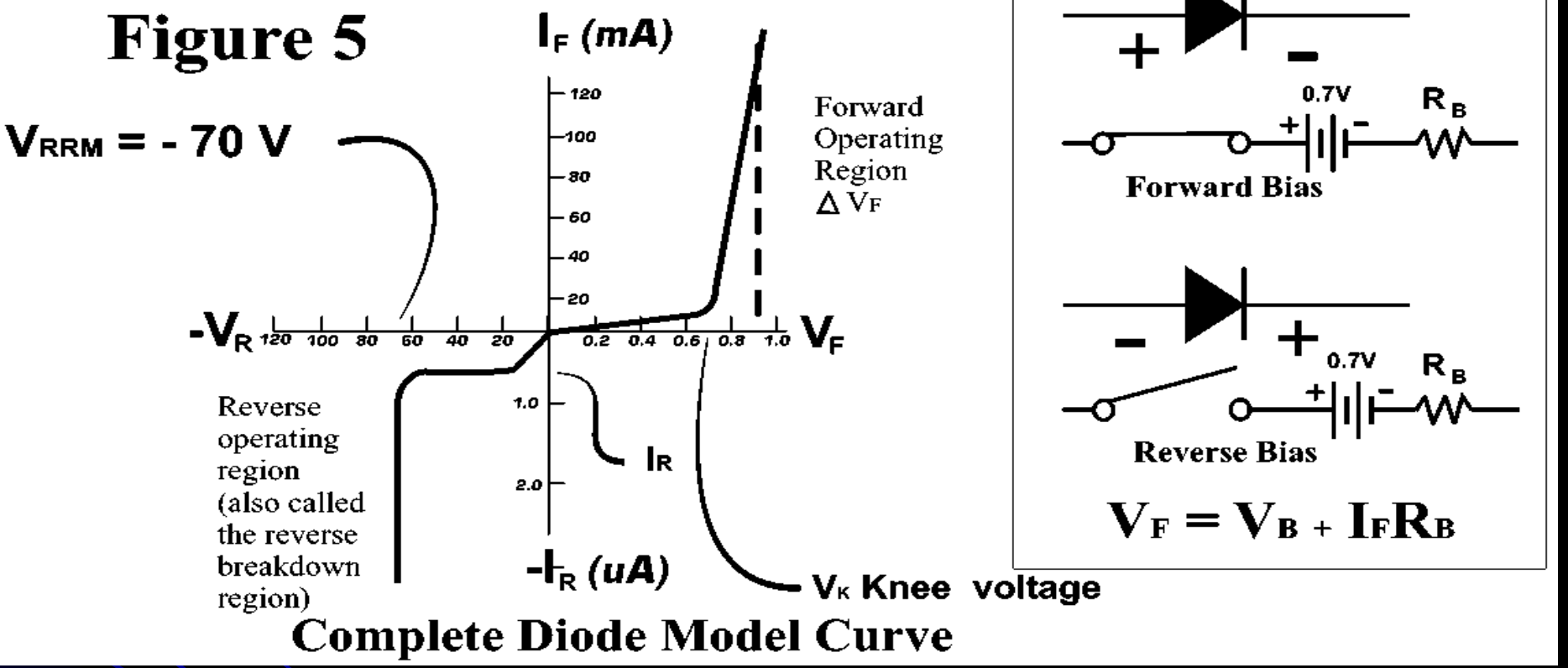


Peak Reverse Voltage (V_{RRM})

Figure 4

$$I_O = \frac{P_{D(max)}}{V_F}$$

Figure 5



Complete Diode Model Curve

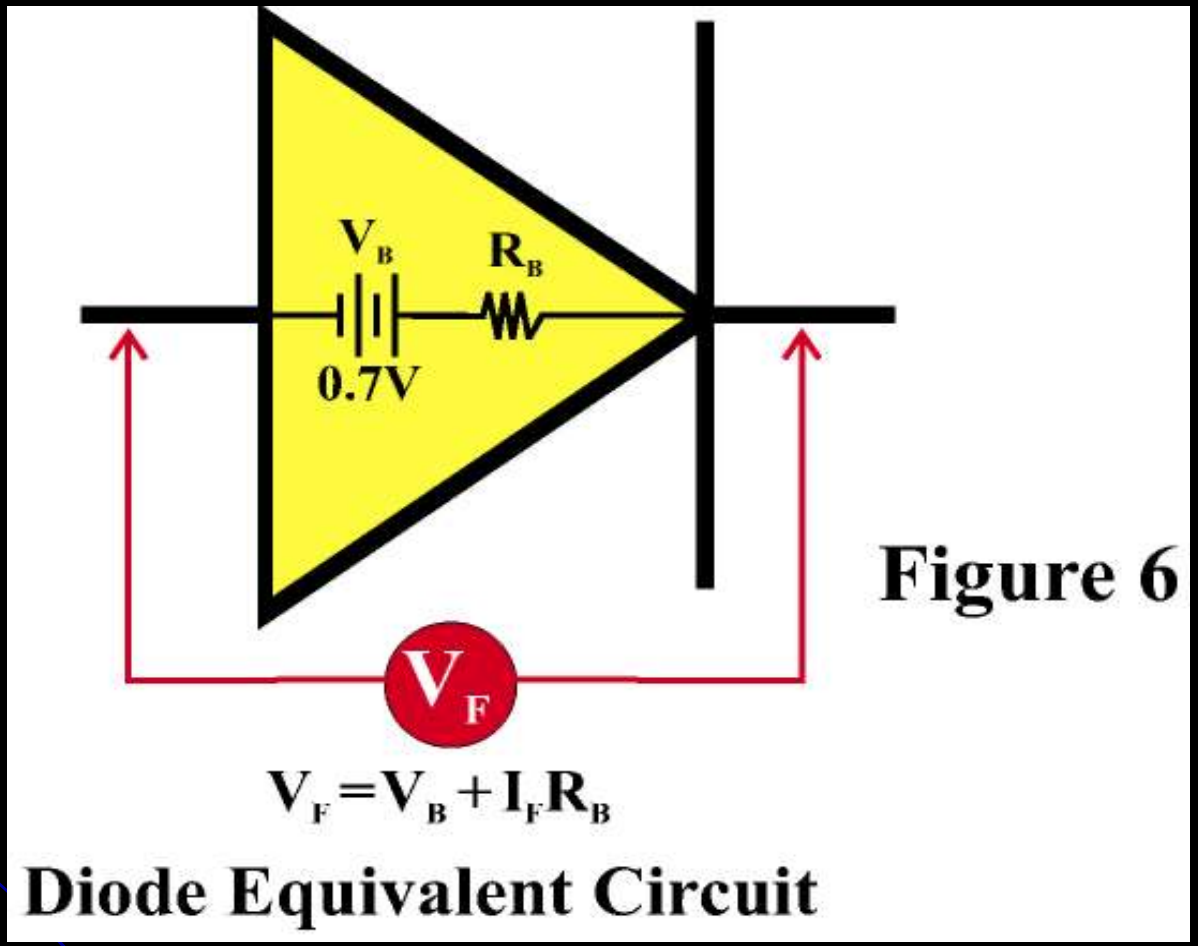


Figure 6

Diode Equivalent Circuit

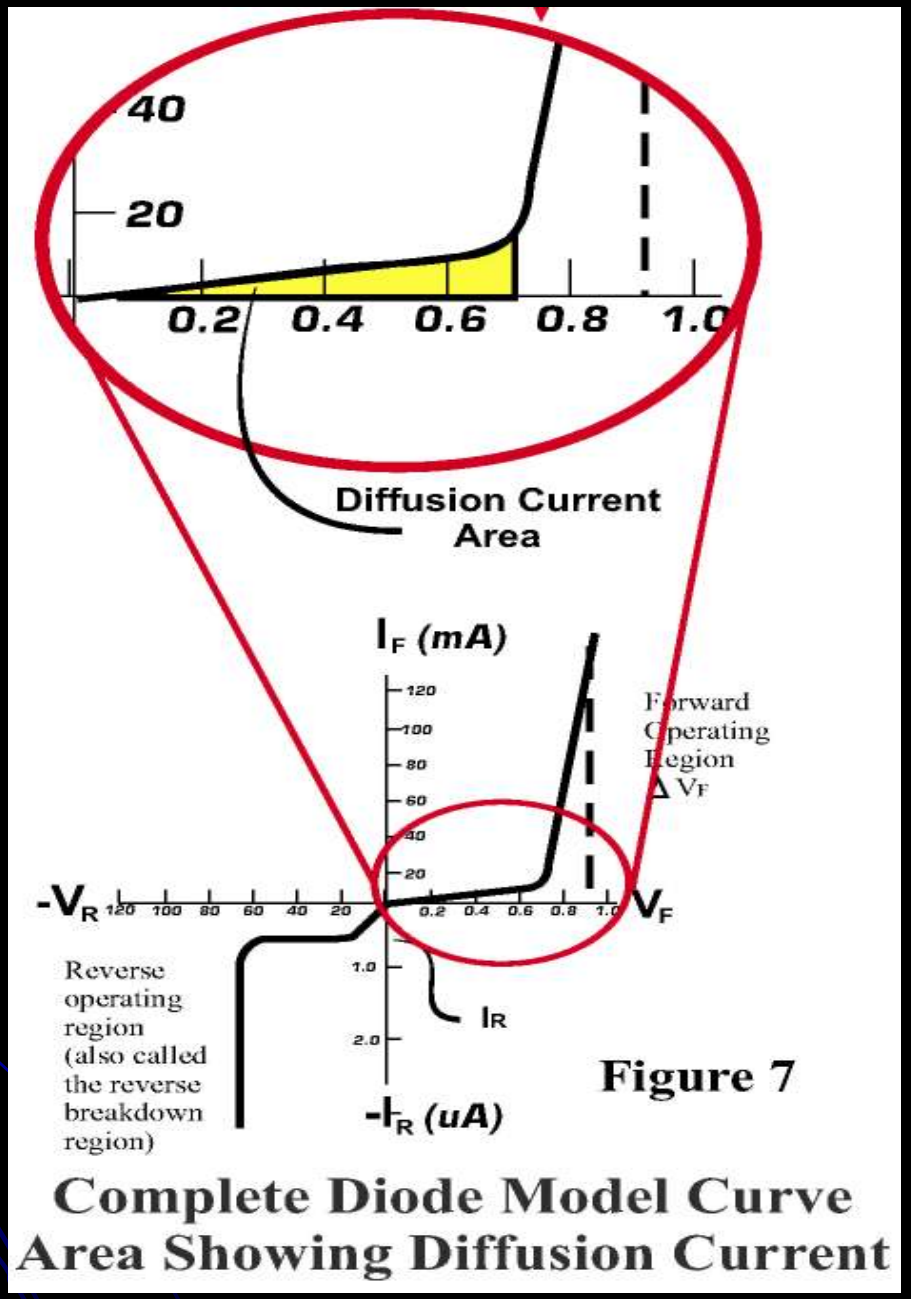
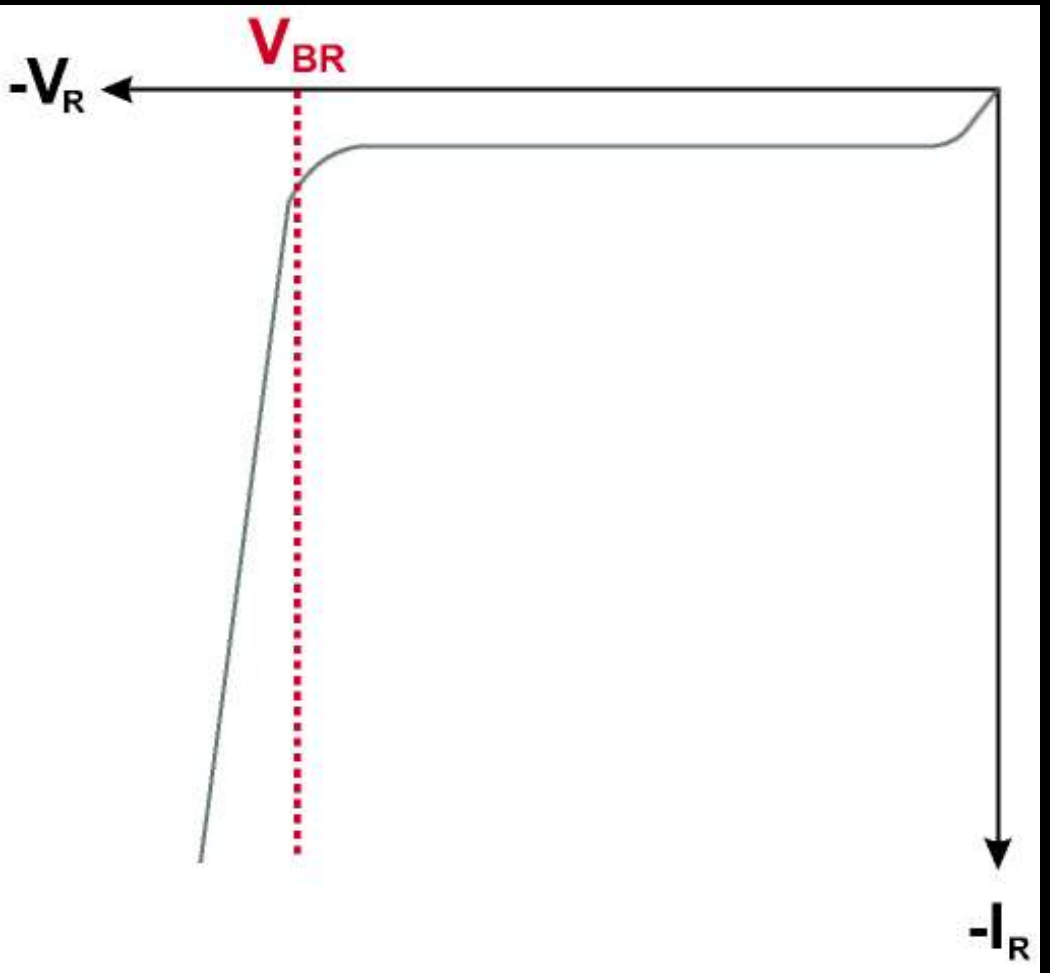


Figure 7

Complete Diode Model Curve Area Showing Diffusion Current



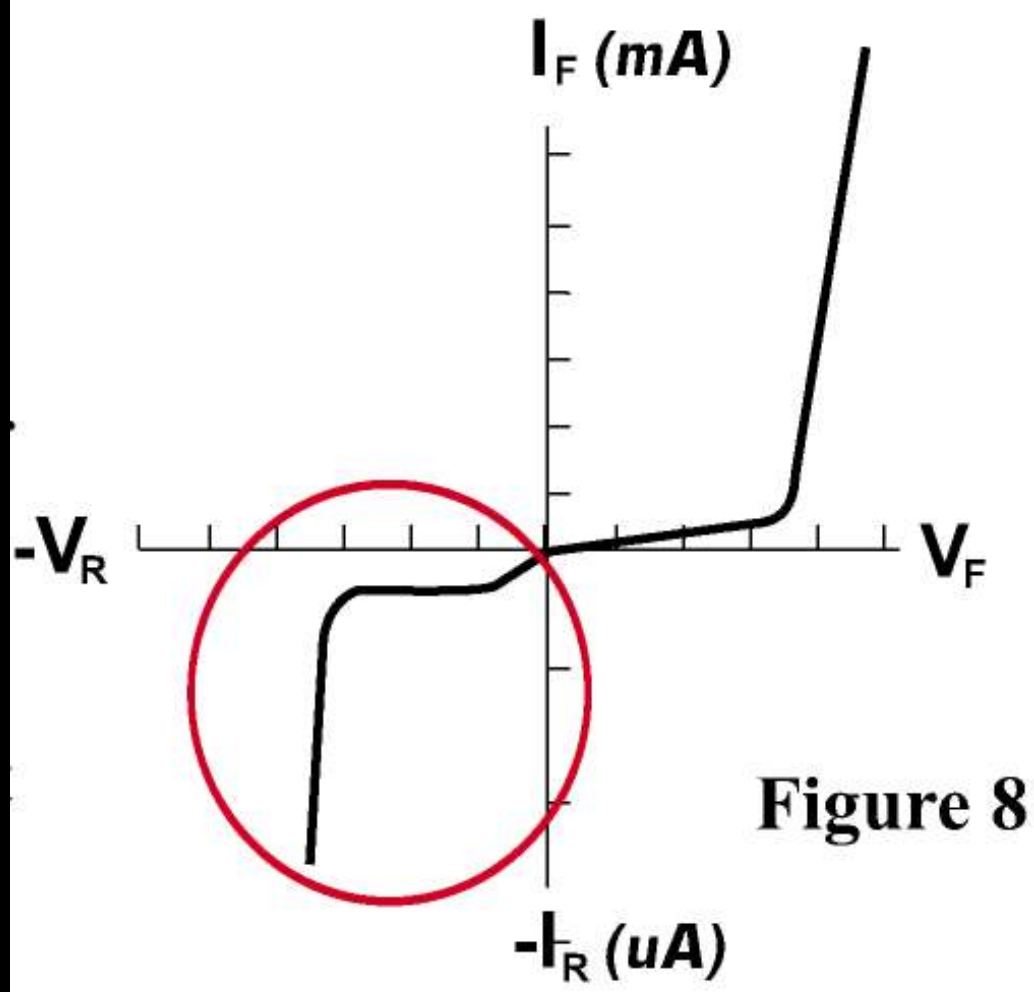
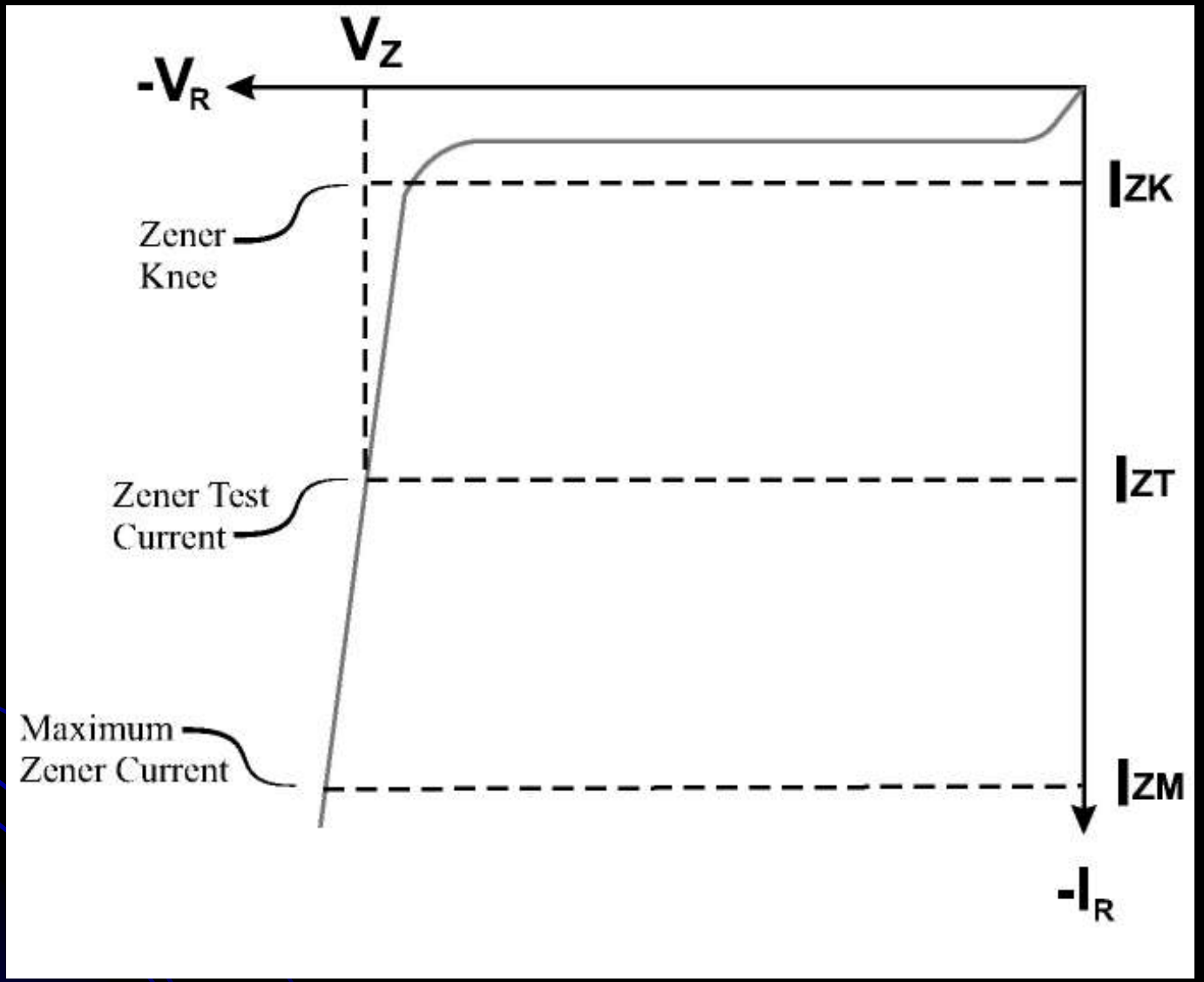


Figure 8

Typical Diode Curve
Area of Operation for the Zener Diode


V_Z
$-V_R$
I_{ZK}
Zener
Knee
Zener Test
Current
I_{ZT}
Maximum
Zener Current
I_{ZM}
$-I_R$

Determining Zener Impedance

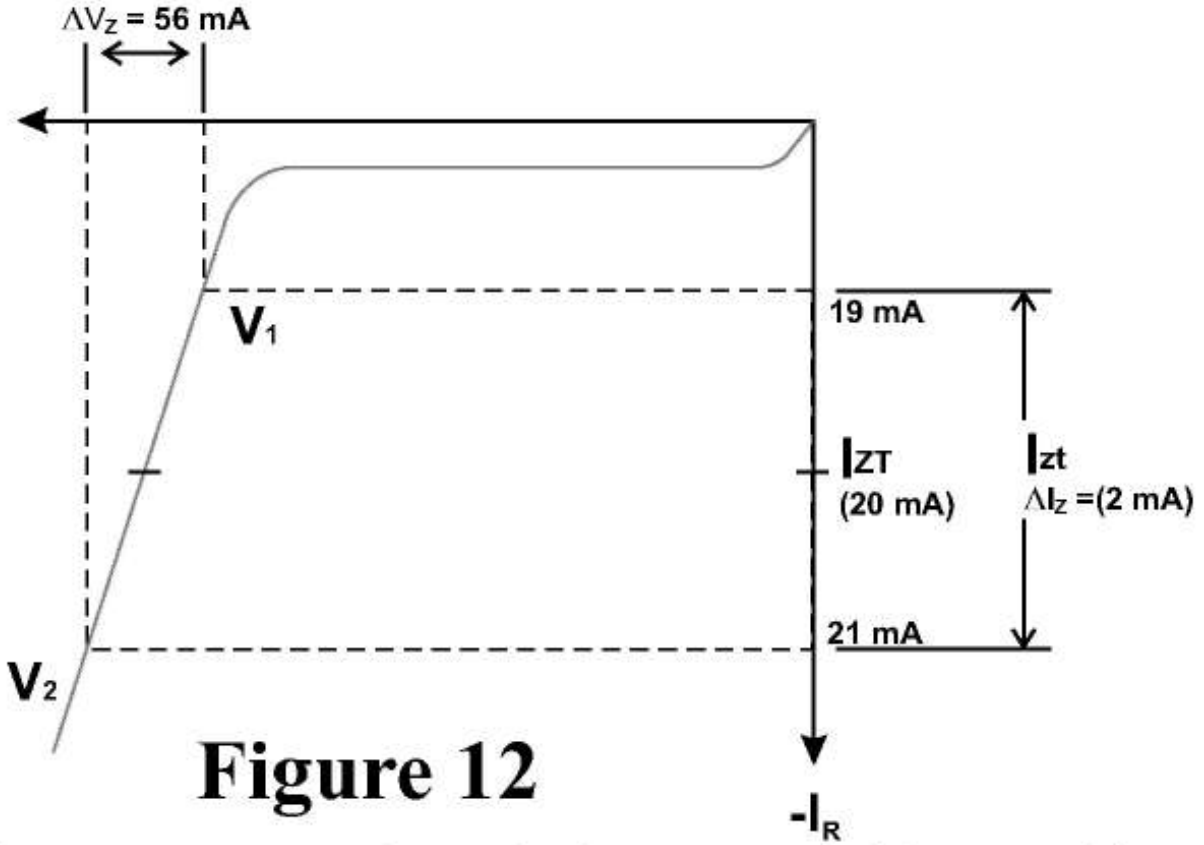


Figure 12

Z_Z ***Zener Impedance*** is the Zener Diode's opposition to a change in current.

$$Z_z = \frac{\Delta V_z}{\Delta I_z} \quad \Big| \; \Delta V_z = \text{the change in } V_z$$

$$Z_z = \frac{56\ \text{mV}}{2\ \text{mA}} = 28\ \Omega$$

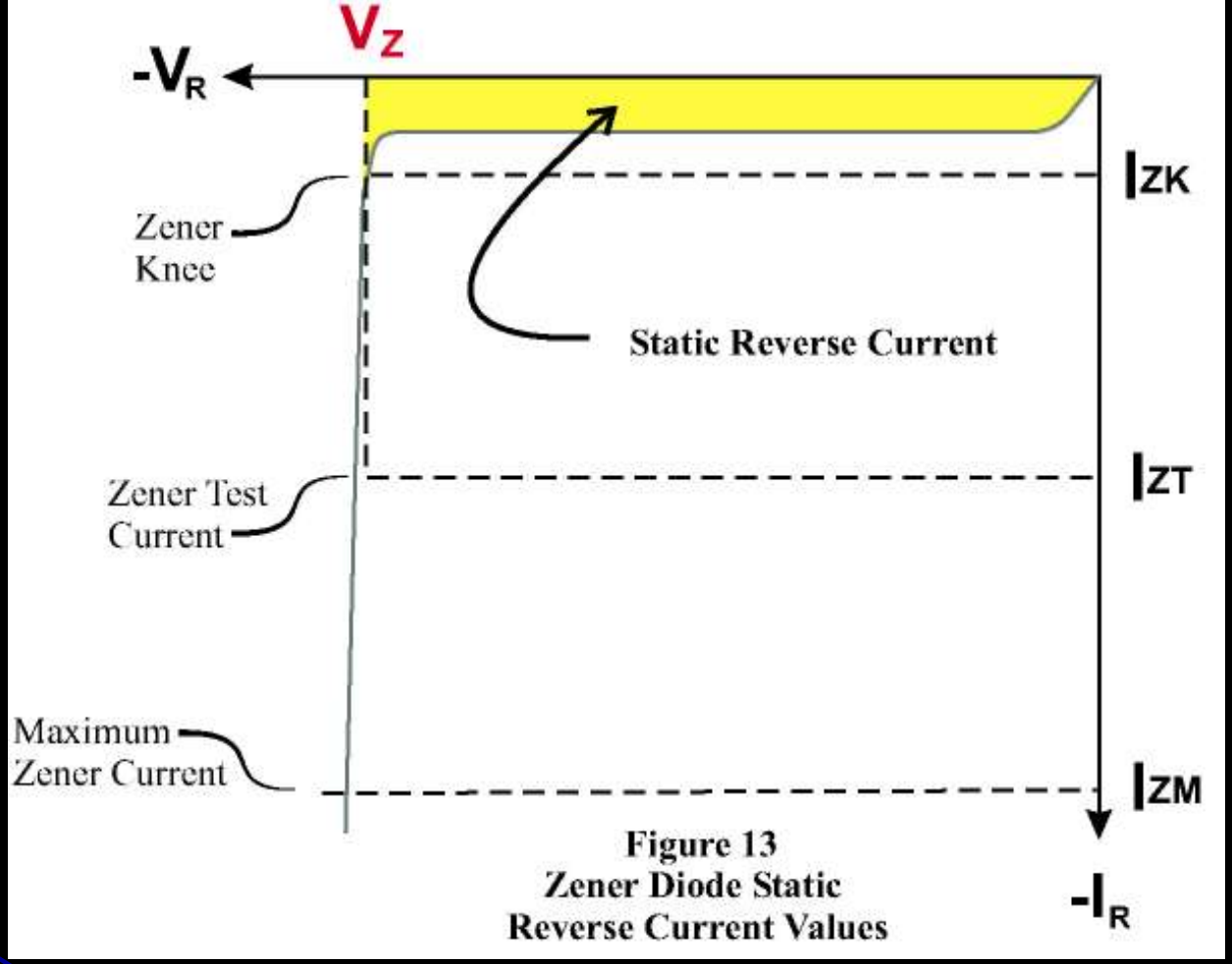


Figure 13
Zener Diode Static
Reverse Current Values

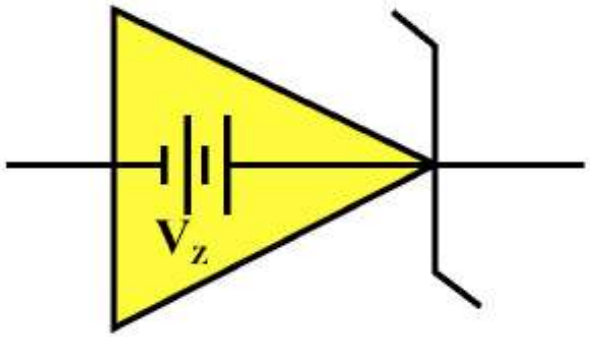


Fig. 14 (a) Ideal Zener Model

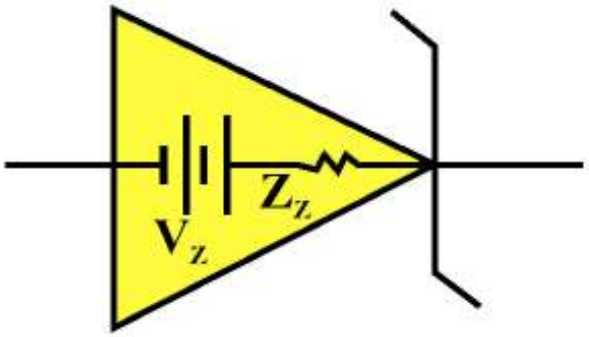


Fig. 14 (b) Practical Zener Model