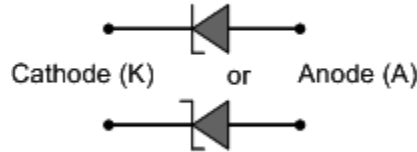
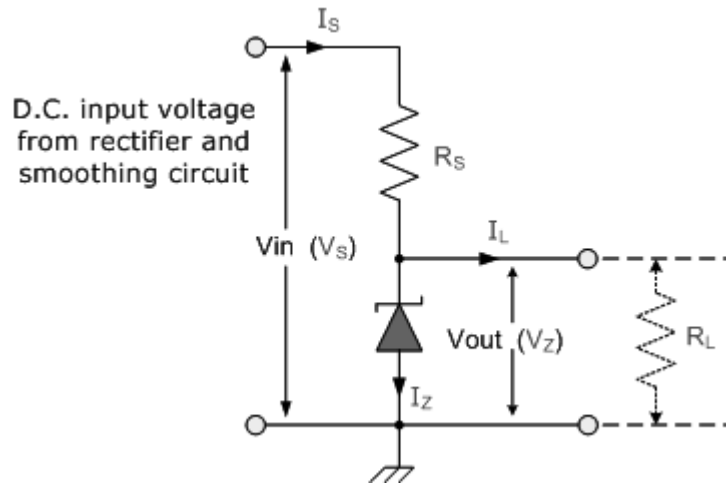


The following is for information purposes only and comes with no warranty.
See <http://www.bristolwatch.com/>



Zener Diodes or "Breakdown Diodes" as they are sometimes called, are basically the same as the standard junction diode but are specially made to have a low predetermined Reverse Breakdown Voltage, called the "Zener Voltage" (V_Z).

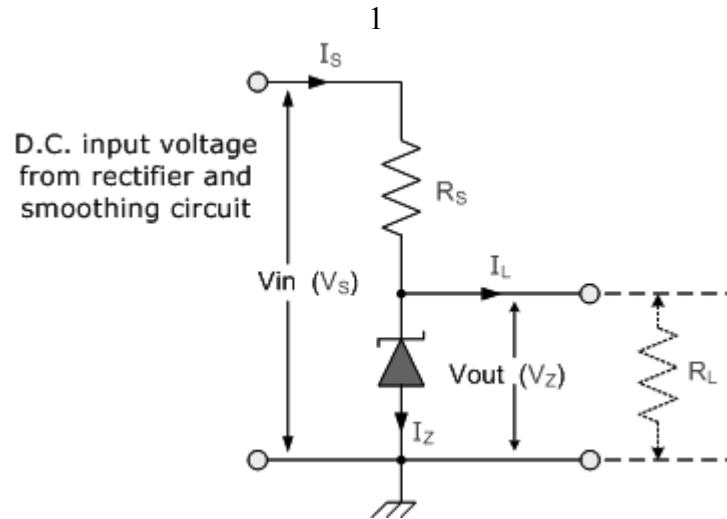
In the forward direction it behaves just like a normal signal diode passing current, but when the reverse voltage applied to it exceeds the selected reverse breakdown voltage a process called Avalanche Breakdown. This occurs in the depletion layer and the current through the diode increases to the maximum circuit value, which is usually limited by a series resistor.



The Zener Regulator

Zener Diodes can be used to produce a stabilized voltage output by passing a small current through it from a voltage source via a suitable current limiting resistor, (R_S). We remember from the previous tutorials that the DC output voltage from the half or full-wave rectifiers contains ripple superimposed onto the DC voltage and that as the load value changes so to does the average output voltage.

There is a minimum Zener current for which the stabilization of the voltage is effective and the Zener current must stay above this value operating within its breakdown region at all times. The upper limit of current is of course dependent upon the power rating of the device.



Example

A 10.0v stabilized power supply is required from a 18v D.C. input. The maximum power rating of the Zener diode is 2W.

Using the circuit above calculate:

- a) The maximum current flowing in the Zener Diode.

Maximum current in a Zener = 2 watts / 10 volts = 200 mA.

- b) The value of the series resistor, Rs

$R_s = (V_s - V_z) / I_z = (18 - 10) / .2 \text{ amps} = 8 / .2 = 40 \text{ ohms.}$

- c) The load current IL if a load resistor of 200 Ω is connected across the Zener diode.

$I_L = V_z / 200 = 50 \text{ mA.}$

- d) The total supply current Is:

$I_s = I_z + I_L = 200 \text{ mA} + 50 \text{ mA} = 250 \text{ mA.}$