

Electronics Diodes

Terry Sturtevant

Wilfrid Laurier University

September 9, 2015

Diode

- an electronic device which passes current in one direction only

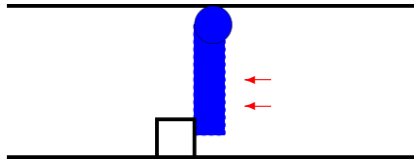
Diode

- an electronic device which passes current in one direction only
- diode starts to allow current in the forward direction when the voltage reaches around 0.6V

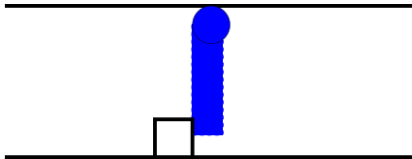
Diode

- an electronic device which passes current in one direction only
- diode starts to allow current in the forward direction when the voltage reaches around 0.6V
- If the voltage gets high enough in the reverse direction, the diode will conduct; *“reverse breakdown voltage”*

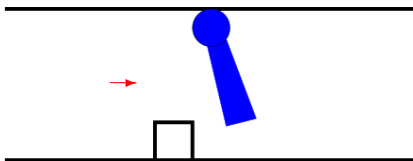
Negative pressure; no flow possible



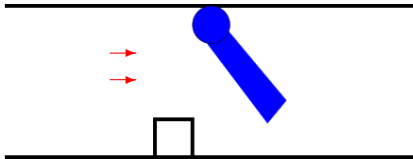
No pressure; resistance to flow is large



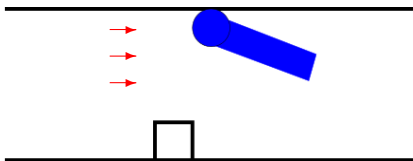
Small pressure; resistance to flow decreases



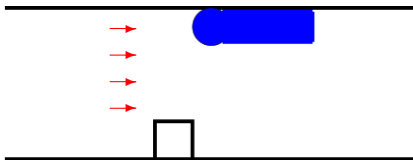
Medium pressure; resistance to flow still decreasing

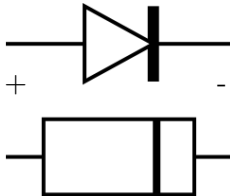


High pressure; resistance to flow small

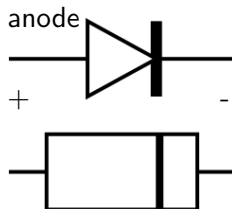


Very high pressure; resistance almost zero

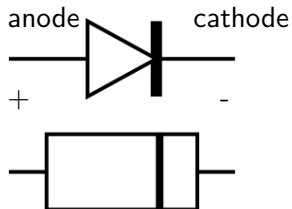




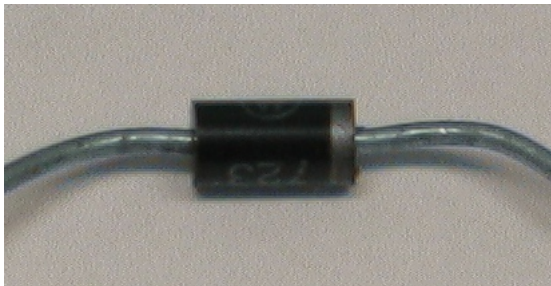
Diode symbol and physical appearance



Diode symbol and physical appearance



Diode symbol and physical appearance



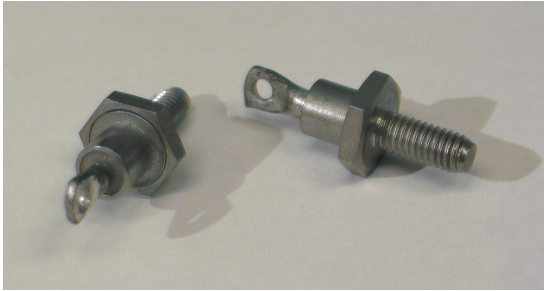
- Signal diodes (one type)



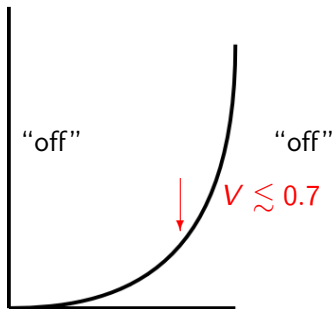
- Signal diodes (another type)



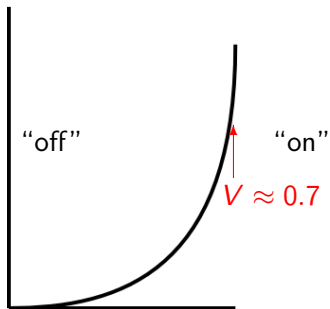
- Power diodes (one type)



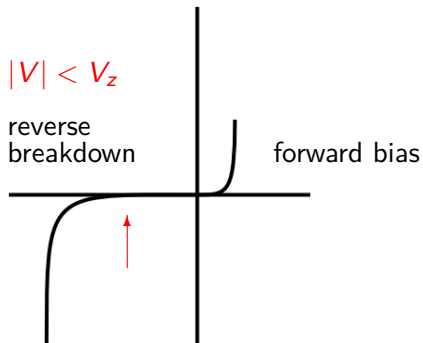
- Power diodes (another type)



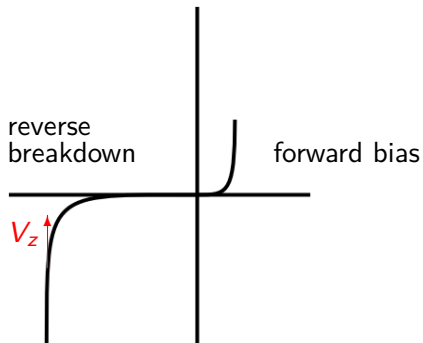
I small; changes slowly



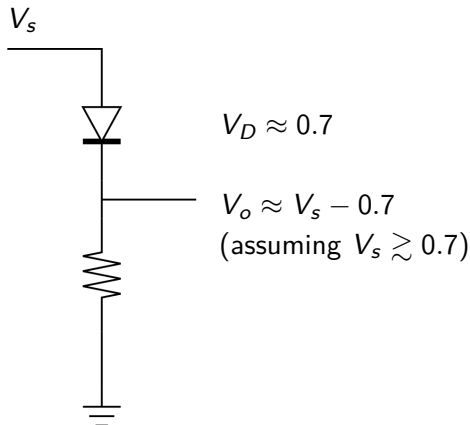
I large; almost independent of V



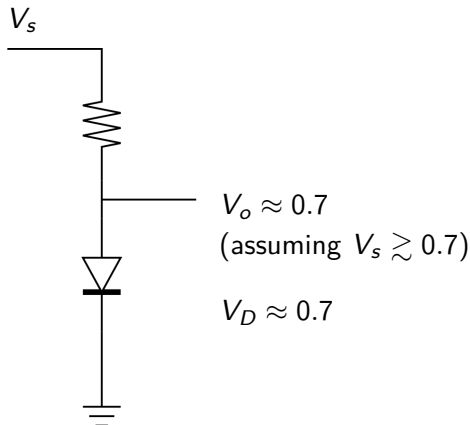
I small; changes slowly



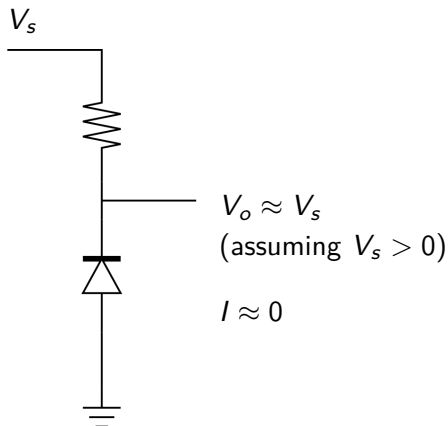
I large; almost independent of V



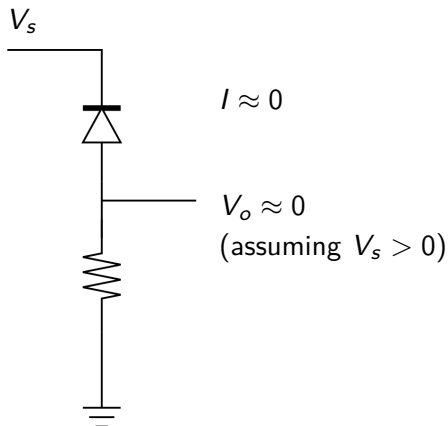
Forward biased diode in a voltage divider



Forward biased diode in a voltage divider

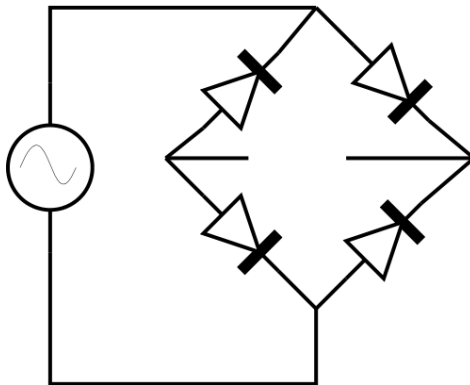


Reverse biased diode in a voltage divider

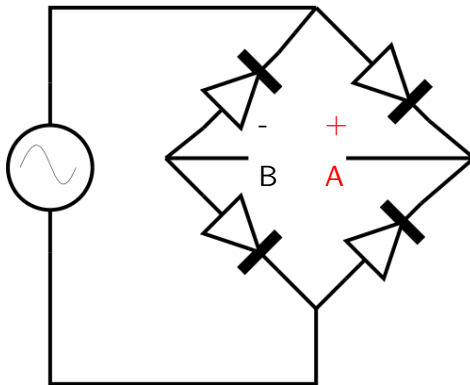


Reverse biased diode in a voltage divider

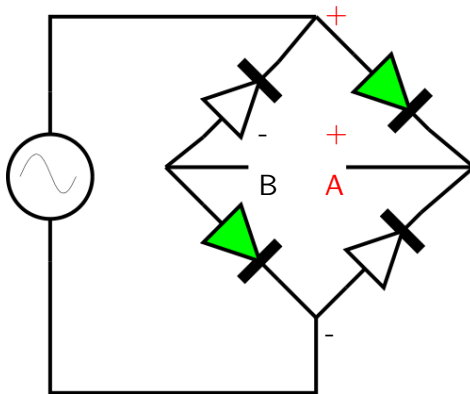
One common use of diodes is for **rectification**, by putting diodes in a bridge circuit.



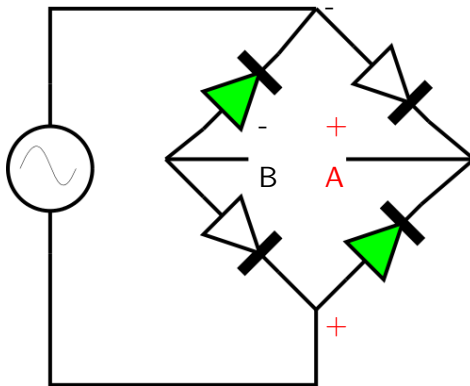
Here's the basic bridge.



The output is taken between **A** and B.



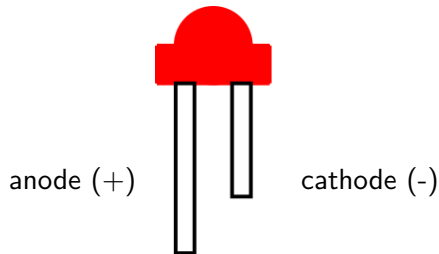
For one half of the cycle, these two diodes shown in green are forward biased, so they're on. (The others are off.)



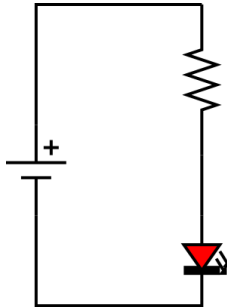
For the other half of the cycle, the other two diodes shown in green are forward biased, so they're on. (The others are off.)

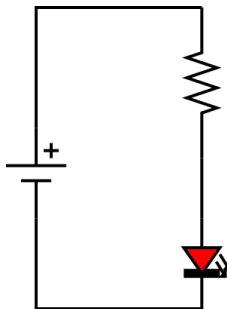
For both parts of the cycle, **A** is positive relative to B.

LEDs are a special case; they light up above a certain voltage. The voltage depends on the colour.

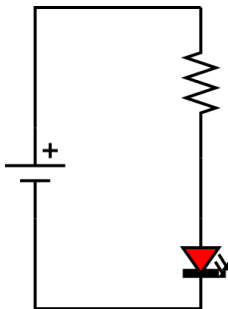


- The LED lights up when current flows from the anode to the cathode..

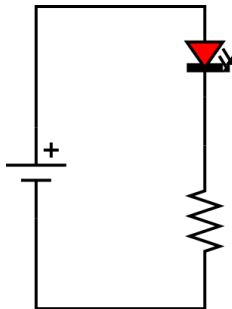




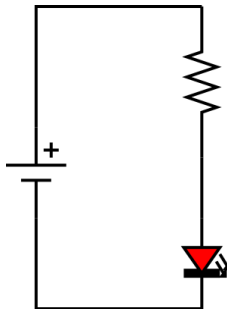
- You must use a resistor to limit the current.



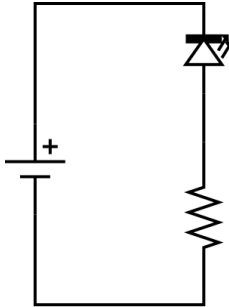
- You must use a resistor to limit the current.
- *Without a resistor, the LED will probably be destroyed.*



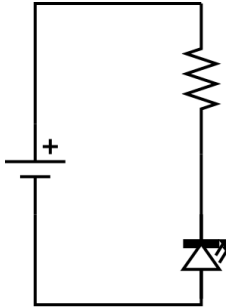
- The resistor can go before or after the LED.



- The resistor can go before or after the LED.



- Reverse-biased, the LED won't light up.



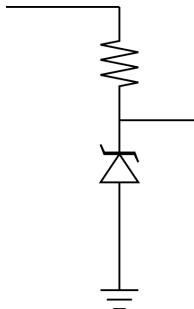
- Reverse-biased, the LED won't light up.

Zener diodes

One of the ways to produce a stable reference voltage, such as for an ADC or a DAC, is to use a Zener diode.

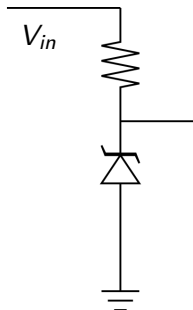
Zener diodes

One of the ways to produce a stable reference voltage, such as for an ADC or a DAC, is to use a Zener diode.



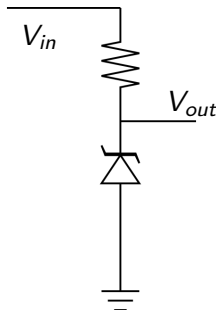
Zener diodes

One of the ways to produce a stable reference voltage, such as for an ADC or a DAC, is to use a Zener diode.



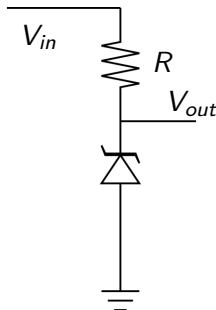
Zener diodes

One of the ways to produce a stable reference voltage, such as for an ADC or a DAC, is to use a Zener diode.



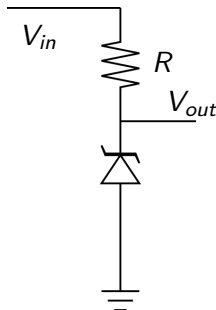
Zener diodes

One of the ways to produce a stable reference voltage, such as for an ADC or a DAC, is to use a Zener diode.



Zener diodes

One of the ways to produce a stable reference voltage, such as for an ADC or a DAC, is to use a Zener diode.



Parameters

Parameters

- Zener voltage

Parameters

- Zener voltage
- required current

Parameters

- Zener voltage
- required current
- temperature sensitivity

Parameters

- Zener voltage
- required current
- temperature sensitivity
- variation with current (ac resistance)