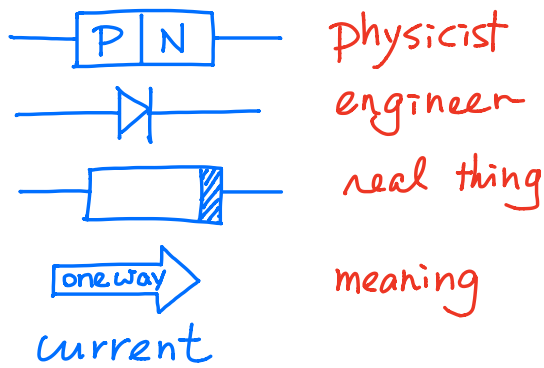
4/9/2019 P226 Lecture 3: Diodes

What is a diode?



physicist

engineer

real thing

meaning

Types of diodes:

generic diode limit voltage range

Zener diode: voltage reference (reverse biase mode)

Light emitting diode: emit light when forward biased

Shottkey diode: high speed generic diode

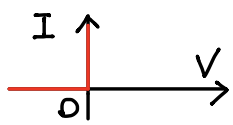
photodiode: convert photons into electrons.

laser diode: convert electric current into coherent light.

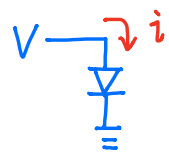
varistor: voltage limiter for power applications.

Electrical characteristic:

Ideal diode



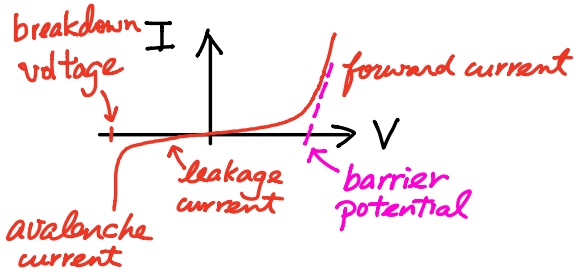
Measurement scheme.



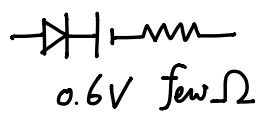
$V>0$: short circuit ≈ —

$V<0$: open circuit ≈ —/—

Real diode



Effective circuit in the forward direction:



☆ Other than Zener diodes designed to operate in the reverse-biased regime for regulation, other types of diodes can break down with strong reverse bias.

Working model:

$V>0.6V$: short circuit with a diode drop.

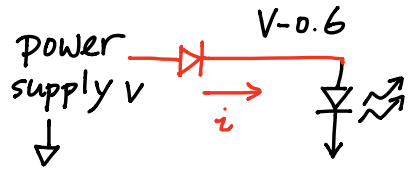
$V<0V$: open circuit

$V \ll -1V$: no-good. Can lead to damage.

Applications:

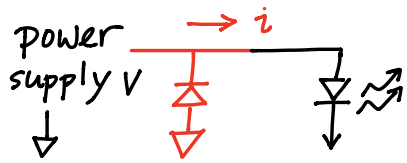
1. Protection: diode prevents reverse current

Example A:



sensitive device, say, laser diode, which cannot be reverse-biased.

Example B:



What's the difference? ExA: limits reverse current $I > -I_{reverse}$

ExB: limits reverse voltage $V > -0.6V$

2. Rectifier: Convert AC signal into DC signal