Homework 2

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Semiconductor Development Fundamentals

January 21, 2020

# Name one acceptor dopant element for silicon.

boron (B)

# Name two donor dopant elements for silicon.

phosphorus (P)

arsenic (As)

# A piece of Silicon is doped with donor atoms at a concentration of 𝑁𝐷=10^18cm-3. The piece is 1 mm long, 10 micro-m wide, and 10 micro-m thick.

## What is the electron concentration?

no = ND

no = 10^18 cm^-3

## What is the hole concentration?

po = 10^20 / 10^18 = 10^2 cm^-3

## What is the electron mobility?

## What is the hole mobility?

## What is the resistivity?

## Where is the Fermi level located relative to the middle of the bandgap?

## What is the resistance of the piece of silicon?

## 1V is applied across the length. How much current flows?

## 1000V is applied across the length. How much current flows?

# A piece of silicon is doped with acceptor atoms at a concentration of 𝑁𝐴=1017cm-3. The piece is 10 micro-m long, 2 micro-m wide, and 2 micro-m thick.

## What is the electron concentration?

## What is the hole concentration?

## What is the electron mobility?

## What is the hole mobility?

## What is the resistivity?

## Where is the Fermi level located relative to the middle of the bandgap?

## What is the resistance of the piece of silicon?

## 1V is applied across the length. How much current flows?

## 1000V is applied across the length. How much current flows?