

ECSE-2210 Microelectronic Technology
Class Activity 14

1. Two silicon p^+ -n step junction diodes are physically identical except for the n-side doping and the lifetimes. Compare the operation of the two diodes by answering the questions below. Try to explain by using physical reasoning, rather than using formula (One or two sentences are enough).

Diode #1

p^+	N $N_D = 10^{14} \text{ cm}^{-3}$ $\tau_p = 2\mu\text{s}$
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Diode #2

p^+	N $N_D = 10^{16} \text{ cm}^{-3}$ $\tau_p = 1\mu\text{s}$
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- (a) Which diode will exhibit the larger built-in voltage, V_{bi} (also called the contact potential)?
- (b) Which diode will have a larger depletion layer width, W , for a given reverse bias?
- (c) Which diode will have a larger reverse saturation current, I_0 ? (Assume D is the same for both diodes)
- (d) If the diodes are forward biased, qualitatively plot the minority carrier profiles in the n-region of each diode (Your plot should show the differences between these two diodes).

