

LINEARLY GRADED JUNCTION: DEPLETION APPROX.

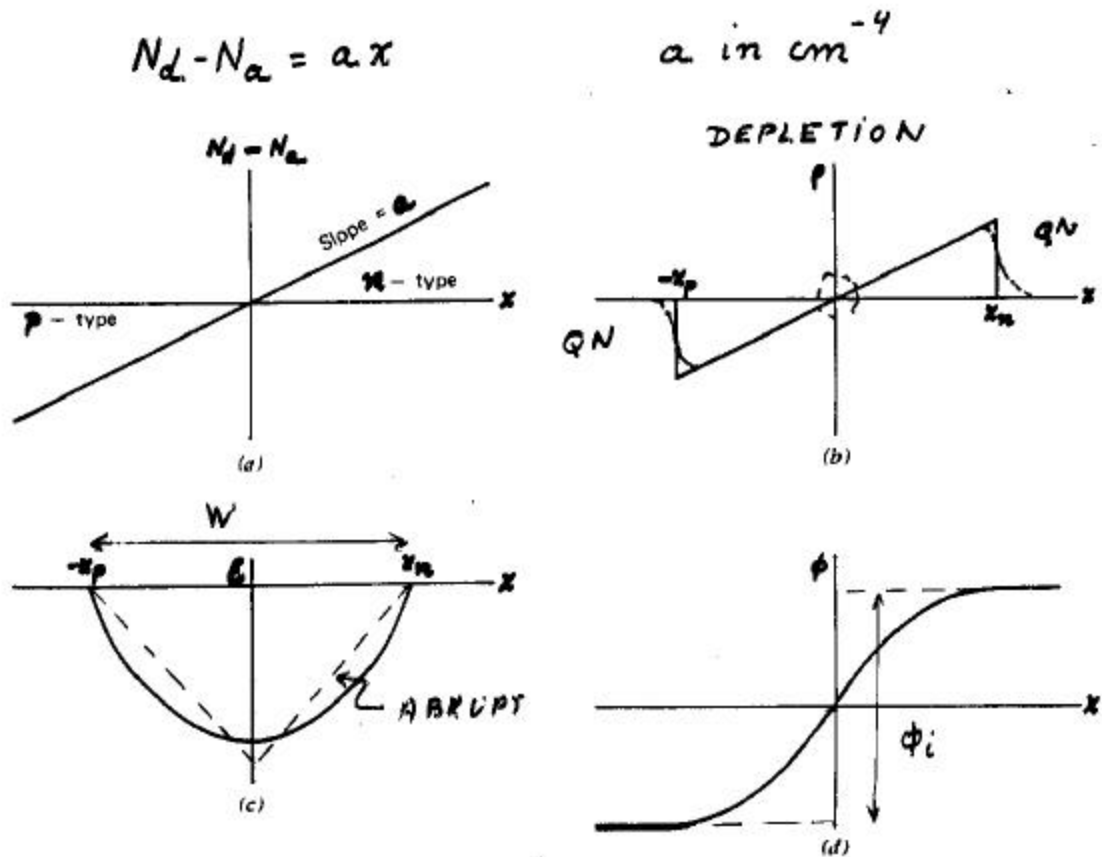


Figure 4.6 Properties of a linearly graded junction using the depletion approximation: (a) net dopant concentration: $N_d - N_a = ax$, (b) space charge, (c) electric field, (d) potential.

$$\text{SOLVE } \frac{d^2\phi}{dx^2} = - \frac{qax}{\epsilon_0\epsilon_s}$$

$$\phi_i = \frac{qa}{12\epsilon_0\epsilon_s} W^3$$

$$W = \left[\frac{12\epsilon_0\epsilon_s\phi_i}{qa} \right]^{1/3}$$

$$\phi_i = \frac{kT}{q} \ln \frac{N_a N_d(x_n)}{n_i^2}$$

$$E_{\max} = \frac{3}{2} \frac{\phi_i}{W}$$

EXPONENTIAL DOPING

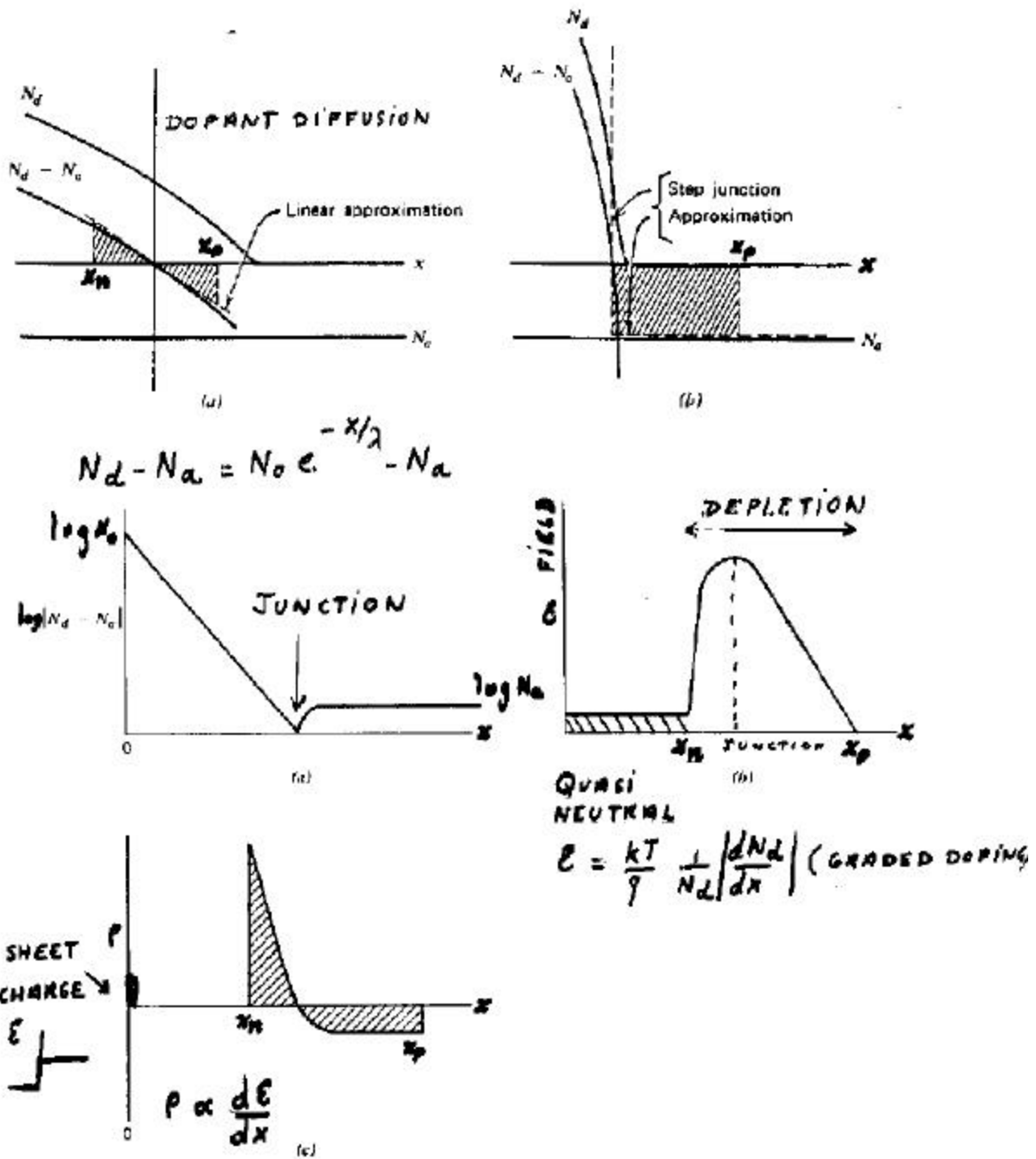


Figure 4.8 Properties of an exponential junction as functions of position: (a) net dopant concentration (semilogarithmic scale), (b) electric field, (c) space charge.