DEVELOP MINORITY CARRIER DIFF EQ: FOR e^-

START: 3-D CONTINUITY EQ FOR e^- (ALWAYS)

$$\frac{\partial n}{\partial t} = \frac{1}{q}\nabla \cdot J_N + \left.\frac{\partial n}{\partial t}\right|_{\substack{\text{THERMAL}\\ \text{R-G}}} + \left.\frac{\partial n}{\partial t}\right|_{\text{other}} \qquad [1]$$

1	1-D

$$\frac{1}{q}\frac{\partial J_N}{\partial x} \qquad [2]$$

USE TOTAL CURRENT EXPRESSION

$$J_N = q\mu_n n \mathcal{E} + qD_N\frac{\partial n}{\partial x} \quad \} \text{ ALWAYS} \qquad [3]$$

small (n) small ($\mathcal{E}$)

2	MINORITY CARR

3	$\mathcal{E}$ SMALL; DIFFUSION DOMINATES

$$\Rightarrow J_N \approx qD_N\frac{\partial n}{\partial x} \qquad [4]$$

SUB [4] INTO [2] INTO [1]

$$\frac{\partial n}{\partial t} = \frac{1}{q}\frac{\partial}{\partial x}\underbrace{qD_N\frac{\partial n}{\partial x}}_{J_N} + \cdots$$

$$\frac{\partial n}{\partial t} = D_N\frac{\partial^2 n}{\partial x^2} + \left.\frac{\partial n}{\partial t}\right|_{\substack{\text{THERMAL}\\ \text{R-G}}} + \left.\frac{\partial n}{\partial t}\right|_{\text{other}} \qquad [5]$$

$n = n_0 + \Delta n$

n_0: EQUILIBRIUM MINORITY CARR

Δn: EXCESS CONC.

$\frac{-\Delta n}{\tau_n}$

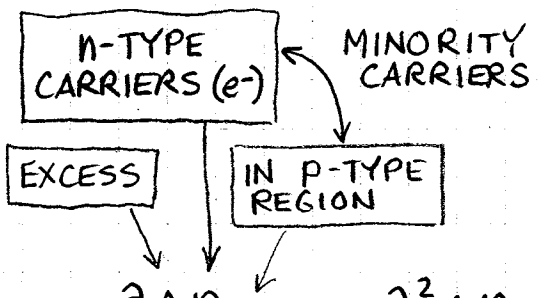
G_L

4	n_0 NOT A FUNCTION OF x; $\frac{\partial n_0}{\partial x} = 0$

5	LOW LEVEL INJECTION

6	R-G ACCORDING TO τ_n DOMINATES (MINORITY CARR LIFETIME)

7	GENERATION OF e^--HOLE PAIRS DUE TO LIGHT IS ONLY "OTHER"



$$\frac{\partial \Delta n_p}{\partial t} = D_N \frac{\partial^2 \Delta n_p}{\partial x^2} - \frac{\Delta n_p}{\tau_n} + G_L$$

TEXT (3.54a)

CHANGE IN MINORITY CARRIER CONC. VS TIME — DIFFUSION — RECOMBINATION — GENERATION

FOR HOLES

$$\frac{\partial \Delta p_n}{\partial t} = D_p \frac{\partial^2 \Delta p_n}{\partial x^2} - \frac{\Delta p_n}{\tau_p} + G_L$$

TEXT (3.54b)