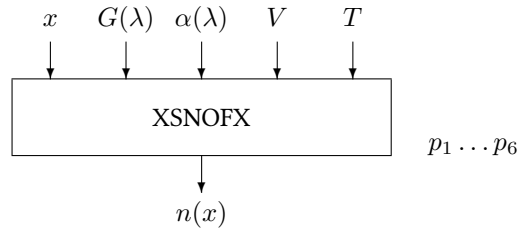


Block XSNOFX

The XSNOFX block calculates the excess electrons in p-type silicon as a function of the material depth.



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Function	se0023
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Inputs

- 1 Depth x / cm
- 2 Generation rate $G(\lambda)$ / $\text{cm}^{-3} \text{s}^{-1}$
- 3 Absorption coefficient $\alpha(\lambda)$
- 4 Voltage V / V
- 5 Temperature T / °C

Outputs

- 1 Number of excess electrons $n(x)$

Parameters

- 1 Equilibrium electron concentration in p-type Si n_{p0} / cm^{-3}
- 2 Diffusion constant of electrons D_n / $\text{cm}^2 \text{s}^{-1}$
- 3 Diffusion length of electrons L_n / μm
- 4 Thickness of basis d_{ba} / cm
- 5 Thickness of emitter d_{em} / cm
- 6 Recombination velocity at backside s_n / cm s^{-1}

Strings

None

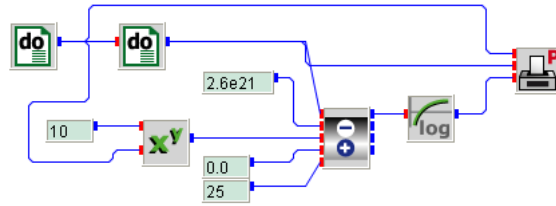
Remarks Solution from Wagemann/Eschrich Appendix A2, Eqn. A2.11)

Description According to Wagemann the number of excess electrons in the basis of a crystalline silicon semiconductor can be calculated after

$$\Delta n(x) = n_{\text{po}} \left(\exp \left(\frac{qV}{kT} \right) - 1 \right) \cdot \frac{\frac{D_n}{L_n} \cosh(x') + s_n \sinh(x')}{\frac{D_n}{L_n} \cosh(x_0) + s_n \sinh(x_0)} + \frac{G_0(\lambda) \tau_n}{1 - \alpha(\lambda)^2 L_n^2} \exp(-\alpha(\lambda) d_{\text{em}}) \cdot \left(\exp(-\alpha(\lambda) x) + \frac{(D_n \alpha(\lambda) - s_n) \exp(-\alpha(\lambda) d_{\text{ba}} \sinh(\frac{x}{L_n}) - \frac{D_n}{L_n} \cosh(x') - s_n \sinh(x'))}{\frac{D_n}{L_n} \cosh(x_0) + s_n \sinh(x_0)} \right)$$

with the shortcuts $x' = \frac{d_{\text{ba}} - x}{L_n}$ and $x_0 = \frac{d_{\text{ba}}}{L_n}$.

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For typical values of a doped silicon crystal the **PLOT** block shows the logarithmic number of excess electrons as a function of the depth in the basis.

