## Analytical verification of Drift-Diffusion Tool

(www.nanohub.org/tools/semi)

## by Saumitra Raj Mehrotra

1. Generation & Recombination verification steps.

🕕 Input 🔸 🙆 Simulate		P Abott flui tool Questions 1
Drift-Diffusion Parameters		
Structure Experim	ient Chaterials Environment	Surface Recombination
Semiconductor slab length(um): 10un	1	
Type of doping: N-type		
Options		
System to be solved: Ambipolar		
		Select a 10 µm longs silicor
.ight shine(Top):		her dened N ture 1e17/ere
	SEMICONDUCTOR SLAB	bar doped N-type 1e1//cm
		Simulate >
🕽 Input 🔸 🙆 Simulate		About this tool Questions?
Drift-Diffusion Parameters		
Structure Experin	ient Materials Environment	Surface Recombination
Type of experiment: 2. Shine light at top of	ly	
1. Apply bias only 2. Shine light at top or	niy.	
3. Shine light at left eo 4. Apply bias and shi	ige only he light at the top	
5. Apply bias and shi	ne light at left edge	
		Select experiment #2 – Lig
.ight shine(Top):		
	SEMICONDUCTOR SLAB	excitation from the top.
		Simulate >

Drift-Diffusion Parameters           Structure         Experiment           Materials         Environment	
Structure Experiment Materials Environment Surface Recombination	
Ambient temperature: 💼 300K	
Applied Voltage	
Number of points 21	
Generation Rate(/cm3*s),G =: 2e+20	
Shine linht from flum	
Shine light till.: 10um	
Shine light all along the ba	ar
Light shine(Top):	
SEMICONDUCTOR SLAB	
Simulate	
<ul> <li>Statione</li> </ul>	
Input + ② Simulate     One fine this tool     Compared and this tool     Compared and this tool     Compared and this tool     Compared and this tool	
Drift, Diffusion Parameters	
Structure ) Eventiment ) Materiale ) Environment Surface Resemblication	
Surface Recombination on left contact	
Left Contact Hole surface recobination velocity 1e+07cm/s	
Surface Recombination on right contact: no	
Right Contact Electron surface recobination velocity 1e+07cm/s	
Right Contact Hole surface recobination velocity 1e+07cm/s	on
for no loss of excess carriers.	
Light shine(Top):	
Light shine(Top):	
Light shine(Top): SEMICONDUCTOR SLAB	
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Light shine(Top): SEMICONDUCTOR SLAB Input  Simulate > Input  Simulate > Simulate > Simulate > Simulate >	
Light shine(Top): SEMICONDUCTOR SLAB Simulate > Simulate > Sim	10 <sup>20</sup> /cm <sup>3</sup> .s
Light shine(Top): SEMICONDUCTOR SLAB Input  Simulate - Simulate - Simulate - Let 2 Let 2 Let 2 Control density, hole density (under non-equilibrium) Let 2 Control density, hole density (under non-equilibrium) Control density (under non-	10 <sup>20</sup> /cm <sup>3</sup> .s
Light shine(Top): SIMULATE > Simulate >	10 <sup>20</sup> /cm <sup>3</sup> .s
Light shine(Top): SINULATE - Simulate - Simulate - Simulate - Simulate - Verification Generation Rate, G = 2x1 Carrier lifetime. τ = 10 <sup>-6</sup> s	10 <sup>20</sup> /cm <sup>3</sup> .s
Light shine(Top): EENICONDUCTOR SLAB Simulate > Neut © Simulate Simulate > Neut © Corrification Let7 Iet7 Iet7 Iet7 Carrier lifetime, τ = 10 <sup>-6</sup> s	10 <sup>20</sup> /cm <sup>3</sup> .s
Light shine(Top): Simulate - http://  Simulate - Simulate - Simulat	10 <sup>20</sup> /cm <sup>3</sup> .s
Light shine(Top): smutate > hyput • ③ Simulate suff Cooping, electron density, hole density (under non-equilibrium) Let 7 set 8 Set 8	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess
Light shine(Top): Simulate > Simulate > Simulate > Simulate >	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration
Light shine("top): Situate - biget Coping, electron density, hole density (under non-equilibrium) set 5 Coping, electron density, hole density (under non-equilibrium) set 6 Coping, electron density, coping and a coping an	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration,
Light shire("(p): Since Since Sinc	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration,
Light shine("top): Example to the state of	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration,
Light shire(Top): SINICAND CTOR SLAD SINICAND CTOR SLAD SINICAN	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration,
Light shire(Top): Similar • Similar • Si	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration,
Light thire(Top): Similar Sector density, hole density (under non-equilibrum) Sector density, hole density (under non-equilibrum) Tert7	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration, ninority
Light third(Top): INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATE INTERNATIONAL INTERNATIONAL INTERNATION	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration, ninority
Light Med(Top): Type: Control CTOR SLAS Simular >	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration, ninority I=
Light thine(Top): The structure of the	10 <sup>20</sup> /cm <sup>3</sup> .s s xcess ration, ninority I=

2. Drift current verification steps.





