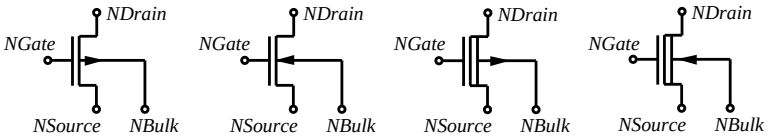
N Channel MOSFET BSIM3SOI model mosnbsim3soi

Figure 1: N Channel MOSFET BSIM3SOI model

Form: `mosnbsim3soi5T1:`⟨`instance name`⟩ n_1 n_2 n_3 n_4 n_5 ⟨`parameter list`⟩

n_1 is the drain node,
n_2 is the gate node,
n_3 is the source node,
n_4 is the substrate node,
n_5 is the bulk node.



Model Parameters:

Parameter	Description	Default	Units
l	Length	5.0e-06	m
w	Width	5e-06	m
tsi	Silicon film thickness	1e-07	m
tbox	Buried oxide thickness	3.0e-07	m
tox	Gate oxide thickness	1e-08	m
toxqm	Effective oxide thickness considering quantum effect	tox	m
xj	S/D junction depth	tsi	m
nch	Channel doping concentration	1.7e17	$1/cm^{-3}$
nsub	Substrate doping concenration	6e16	$1/cm^{-3}$
ngate	Poly-gate doping concenration	0.0	$1/cm^{-3}$
vth0	Threshold voltage @Vbs=0 for long and wide device	0.7	V
k1	First order body effect coefficient	0.6	$V^0.5$
k1w1	First body effect width dependent parameter	0.0	m
k2	Second order body effect coefficient	0.0	-
k3	Narrow width effect coefficient	0.0	-
k3b	Body effect coefficient of k3	0.0	$1/V$
kb1	Backgate body charge coefficient	1.0	-
w0	Narrow width effect parameter	0.0	m
nlx	Lateral non-uniform doping parameter	1.74e-07	m
dvt0	First coefficient of short-channel effect on Vth	2.2	-
dvt1	Second coefficient of short-channel effect on Vth	0.53	-
dvt2	Body-bias coefficient of short-channel effect on Vth	-0.032	$1/V$
dvt0w	First coefficient of narrow width effect on Vth for small channel length	0.0	-
dvt1w	Second coefficient of narrow width effect on Vth for small channel length	5.3e6	-
dvt2w	Body-bias coefficient of narrow width effect on Vth for small channel length	-0.032	$1/V$
u0	Mobility at Temp=Tnom	0.067	$cm^2/V - sec$
ua	First-order mobility degradation coefficient	2.25e-09	m/V

Table 1: MOS Model Parameter table 1

Parameter	Description	Default	Units
ub	Second-order mobility degradation coefficient	5.9e-19	m/V^2
uc	Body-effect of mobility degradation coefficient	-0.0465	$1/V$
vsat	Saturation velocity at Temp=Tnom	8e4	m/sec
a0	Bulk charge effect coefficient for channel length	1.0	-
ags	Gate bias coefficient of Abulk	0.0	$1/V$
b0	Bulk charge effect coefficient for channel width	0.0	m
b1	Bulk charge effect width offset	0.0	m
keta	Body-bias coefficient of bulk charge effect	0.0	$1/V$
ketas	Surface potential adjustment for bulk charge effect	0.0	V
a1	First non-saturation effect parameter	0.0	$1/V$
a2	Second non-saturation effect parameter	1.0	-
rdsw	Parasitic resistance per unit width	100	$ohm - um$
prwb	Body effect coefficient of rdsw	0.0	$1/V$
prwg	Gate-bias effect coefficient of rdsw	0.0	-
wr	Width offset from Weff for Rds calculation	1.0	-
nfactor	Subthreshold swing factor	1.0	-
wint	Width offset fitting parameter from I-V without bias	0.0	m
lint	Length offset fitting parameter from I-V without bias	0.0	m
dwg	Coefficient of Weff's gate dependence	0.0	m/V
dwb	Coefficient of Weff's substrate body bias dependence	0.0	$(m/V)^0.5$
dwbc	Width offset for body contact isolation edge	0.0	m
voff	Offset voltage in the threshold region for large W and L	-0.08	V
eta0	DIBL coefficient subthreshold region	0.08	-
etab	Body bias coefficient for the subthreshold DIBL effect	-0.07	$1/V$
dsub	DIBL coefficient in the subthreshold region	0.56	-
cit	Interface trap capacitance	0.0	F/m^2
cdsc	Drain/Source to channel coupling capacitance	2.4e-04	F/m^2

Table 2: MOS Model Parameter table 2

Parameter	Description	Default	Units
cdscb	Body-bias sensitivity of cdsc	0.0	F/m^2
cdscd	Drain-bias sensitivity of cdsc	0.0	F/m^2
pclm	Channel length modulation parameter	1.3	-
pdibl1	First output resistance DIBL effect correction parameter	0.39	-
pdibl2	Second output resistance DIBL effect correction parameter	0.0086	-
pvag	Gate dependence of Early voltage	0.0	-
delta	Effective Vds parameter	0.01	-
alpha0	The first parameter of impact ionization current	0.0	m/V
beta0	First Vds dependent parameter of impact ionization current	0.0	$1/V$
beta1	Second Vds dependent parameter of impact ionization current	0.0	-
beta2	Third Vds dependent parameter of impact ionization current	0.1	V
vdsatii0	Nominal drain saturation voltage at threshold for impact ionization current	0.9	V
cgeo	Gate substrate overlap capacitance per unit channel length	0.0	F/m
cjswg	Source/Drain (gate side) sidewall junction capacitance per unit width (normalized to 100nm tsi)	1e-10	F/m^2
pbswg	Source/Drain (gate side) sidewall junction capacitance built in potential	0.7	V
mjswg	Source/Drain (gate side) sidewall junction capacitance grading coefficient	0.5	V
tt	Diffusion capacitance transit time coefficient	1.0e-12	sec
csdesw	S/D sidewall fringing capacitance per unit length	0.0	F/m
cgs1	Light doped source-gate region overlap capacitance	0.0	F/m
cgd1	Light doped drain-gate region overlap capacitance	0.0	F/m
ckappa	Coefficient for lightly doped region overlap capacitance fringing field capacitance	0.6	F/m
clc	Constant term for the short channel model	0.1e-07	m
cle	Exponential term for the short channel model	0.0	-
dlc	Length offset fitting parameter for gate charge	lint	m
dlcb	Length offset fitting parameter for body charge	0.0	m
dlbg	Length offset fitting parameter for backgate charge	0.0	m
dwc	Width offset fitting parameter from C-V	wint	m

Table 3: MOS Model Parameter table 3

Parameter	Description	Default	Units
delvt	Threshold voltage adjust for C-V	0.0	V
fbody	Scaling factor for body charge	1.0	-
moin	Coefficient for the gate-bias dependent surface potential	15.0	$V^{0.5}$
tnom	Parameter measurement temperature	300.15	K
ute	Temperature coefficient of mobility	-1.5	-
kt1	Temperature coefficient of Vth	-0.11	-
kt1l	Channel length dependence of the temperature coefficient of Vth	0.0	$V * m$
kt2	Body-bias coefficient of the Vth temperature effect	0.022	-
ua1	Temperature coefficient for ua	4.31e-09	m/V
ub1	Temperature coefficient for ub	-7.61e-18	$(m/V)^2$
uc1	Temperature coefficient for uc	-0.056	$1/V$
at	Temperature coefficient of vsat	3.3e4	m/sec
prt	Temperature coefficient of rdsw	0.0	$ohm - um$
vbm	Maximum body voltage	-3.0	-
xt1	Doping depth	1.55e-07	-
pdiblb	Body-effect on drain induced barrier lowering	0.0	-
ll	Length reduction parameter	0.0	m
llc	Length reduction parameter	0.0	m
lln	Length reduction parameter	1.0	m
lw	Length reduction parameter	0.0	m
lwc	Length reduction parameter	0.0	m
lwn	Length reduction parameter	0.0	m
lwl	Length reduction parameter	0.0	m
lwlc	Length reduction parameter	0.0	m
wl	Width reduction parameter	0.0	m
wlc	Width reduction parameter	0.0	m
wln	Width reduction parameter	1.0	m
ww	Width reduction parameter	0.0	m
wwc	Width reduction parameter	0.0	m
wwn	Width reduction parameter	1.0	m
wwl	Width reduction parameter	0.0	m
wwlc	Width reduction parameter	0.0	m
temp	Circuit temperature	300.15	K
acde	Exponential coefficient for charge	1.0	m/V

Table 4: MOS Model Parameter table 4

Notes:
There is no equivalent SPICE element.

Version:
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Credits:

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