Appendix B: Model Parameter List

All model parameters additional to BSIM3v3/BSIM4 will be shown with bold cases.

B.1. BSIMSOI Model Control Parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default	Notes (below the table)
None	level	Level 10 for BSIMSOI4.0	-	10	-
SoiMod	soiMod	SOI model selector (instance) SoiMod=0: BSIMPD SoiMod=1: unified model for PD&FD. SoiMod=2: ideal FD. SoiMod=3: auto selection by BSIMSOI	-	0	
Shmod	shMod	Flag for self-heating 0 - no self-heating, 1 - self-heating	-	0	
Mobmod	mobmod	Mobility model selector	-	1	-
Capmod	capmod	Flag for the short channel capacitance model	-	2	
Noimod	noimod	Flag for Noise model	-	1	-
IgcMod	IgcMod	Gate-to-channel tunneling current model selector	-	0	
IgbMod	IgbMod	Gate-to-body tunneling current model selector	-	0	
RdsMod	rdsMod	Bias-dependent source/drain resistance model selector	-	0	
RgateMod	rgateMod	Flag for gate resistance model	-	0	-
RbodyMod	rbodyMod	Flag for body resistance model	-	0	-
FnoiMod	fnoiMod	Flicker noise model selector	-	1	
TnoiMod	TnoiMod	Thermal noise model selector	-	0	

B.2. Process Parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default	Notes (below the table)
t_{si}	Tsi	Silicon film thickness	m	10^{-7}	-
t_{box}	Tbox	Buried oxide thickness	m	$3x10^{-7}$	-
t_{ox}	tox	Gate oxide thickness	m	$1x10^{-8}$	-
Toxm	toxm	Gate oxide thickness used in extraction	m	tox	
X_j	Xj	S/D junction depth	m	Tsi	-
n_{ch}	Nch	Channel doping concentration	$1/cm^3$	$1.7x10^{17}$	-
n_{sub}	Nsub	Substrate doping concentration	$1/cm^3$	$6x10^{16}$	-
Ngate	ngate	poly gate doping concentration	$1/cm^3$	0	-

B.3. DC Parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default	Notes (below the table)
V_{th0}	vth0	Threshold voltage @V_{bs}=0 for long and wide device	-	0.7	-
K_1	k1	First order body effect coefficient	$V^{1/2}$	0.6	-
K_{1w1}	k1w1	First body effect width dependent parameter	m	0	-
K_{1w2}	k1w2	Second body effect width dependent parameter	m	0	-
K_2	k2	Second order body effect coefficient	-	0	-
K_3	k3	Narrow width coefficient	-	0	-
K_{3b}	k3b	Body effect coefficient of k3	1/V	0	-

K_{b1}	Kb1	Backgate body charge coefficient	-	1	-
W_0	w0	Narrow width parameter	m	0	-
L_{pe0}	LPE0/ NLX	Lateral non-uniform doping parameter	m	1.74e-7	**If Lpe0 not given, lpe0=nlx if nlx given,; Else take the default Lpe0 was called nlx in BSIMSOI3**
L_{peb}	LPEB	Lateral non-uniform doping effect on K1	m	0.0	-
D_{vt0}	Dvt0	first coefficient of short-channel effect on Vth	-	2.2	-
D_{vt1}	dvt1	Second coefficient of short-channel effect on Vth	-	0.53	-
D_{vt2}	dvt2	Body-bias coefficient of short-channel effect on Vth	1/V	-0.032	-
D_{vt0w}	dvt0w	first coefficient of narrow width effect on Vth for small channel length	-	0	-
D_{vt1w}	dvt1w	Second coefficient of narrow width effect on Vth for small channel length	-	5.3e6	-
D_{vt2w}	dvt2w	Body-bias coefficient of narrow width effect on Vth for small channel length	1/V	-0.032	-
m_0	u0	Mobility at Temp = Tnom NMOSFET PMOSFET	$cm^2/($ V-sec)	 670 250	-
U_a	ua	First-order mobility degradation coefficient	m/V	2.25e-9	-
U_b	ub	Second-order mobility degradation coefficient	$(m/V)^2$	5.9e-19	-
U_c	uc	Body-effect of mobility degradation coefficient	1/V	-.0465	-
v_{sat}	vsat	Saturation velocity at Temp=Tnom	m/sec	8e4	-
$A0$	a0	Bulk charge effect coefficient for	-	1.0	-

		channel length			
A_{gs}	ags	Gate bias coefficient of A_{bulk}	1/V	0.0	-
B0	b0	Bulk charge effect coefficient for channel width	m	0.0	-
B1	b1	Bulk charge effect width offset	m	0.0	-
Keta	keta	Body-bias coefficient of bulk charge effect	V^{-1}	0	-
Ketas	Ketas	Surface potential adjustment for bulk charge effect	V	0	-
A_1	A1	First non-saturation effect parameter	1/V	0.0	-
A_2	A2	Second non-saturation effect parameter	0	1.0	-
R_{dsw}	rdsw	Parasitic resistance per unit width	Ω-μm^{Wr}	100	-
Prwb	prwb	Body effect coefficient of Rdsw	1/V	0	-
Prwg	prwg	Gate bias effect coefficient of Rdsw	$1/V^{1/2}$	0	-
Wr	wr	Width offset from Weff for Rds calculation	-	1	-
Nfactor	nfactor	Subthreshold swing factor	-	1	-
Wint	wint	Width offset fitting parameter from I-V without bias	m	0.0	-
Lint	lint	Length offset fitting parameter from I-V without bias	m	0.0	-
DWg	dwg	Coefficient of W_{eff}'s gate dependence	m/V	0.0	
DWb	dwb	Coefficient of W_{eff}'s substrate body bias dependence	$m/V^{1/2}$	0.0	
DWbc	Dwbc	Width offset for body contact isolation edge	m	0.0	
V_{off}	voff	Offset voltage in the subthreshold region for large W and L	V	-0.08	-

Eta0	eta0	DIBL coefficient in subthreshold region	-	0.08	-
Etab	etab	Body-bias coefficient for the subthreshold DIBL effect	1/V	-0.07	-
D_{sub}	dsub	DIBL coefficient exponent	-	0.56	-
C_{it}	cit	Interface trap capacitance	F/m^2	0.0	-
C_{dsc}	cdsc	Drain/Source to channel coupling capacitance	F/m^2	2.4e-4	-
C_{dscb}	cdscb	Body-bias sensitivty of C_{dsc}	F/m^2	0	-
C_{dscd}	cdscd	Drain-bias sensitivty of C_{dsc}	F/m^2	0	-
P_{clm}	pclm	Channel length modulation parameter	-	1.3	-
P_{dibl1}	pdibl1	First output resistance DIBL effect correction parameter	-	.39	-
P_{dibl2}	pdibl2	Second output resistance DIBL effect correction parameter	-	0.086	-
D_{rout}	drout	L dependence coefficient of the DIBL correction parameter in Rout	-	0.56	-
Pvag	pvag	Gate dependence of Early voltage	-	0.0	-
d	delta	Effective V_{ds} parameter	-	0.01	-
a_0	alpha0	The first parameter of impact ionization current	m/V	0.0	-
F_{bjtii}	fbjtii	Fraction of bipolar current affecting the impact ionization	-	0.0	-
b_0	beta0	First V_{ds} dependent parameter of impact ionization current	V^{-1}	0	-
b_1	beta1	Second V_{ds} dependent parameter of impact ionization current	-	0	-
b_2	beta2	Third V_{ds} dependent parameter of impact ionization current	V	0.1	-
$V_{dsatii0}$	vdsatii0	Nominal drain saturation voltage at	V	0.9	-

		threshold for impact ionization current			
T_{ii}	tii	Temperature dependent parameter for impact ionization current	-	0	-
L_{ii}	lii	Channel length dependent parameter at threshold for impact ionization current	-	0	-
E_{satii}	esatii	Saturation channel electric field for impact ionization current	V/m	1e7	-
S_{ii0}	sii0	First V_{gs} dependent parameter for impact ionization current	V^{-1}	0.5	-
S_{ii1}	sii1	Second V_{gs} dependent parameter for impact ionization current	V^{-1}	0.1	-
S_{ii2}	sii2	Third V_{gs} dependent parameter for impact ionization current	-	0	-
S_{iid}	siid	V_{ds} dependent parameter of drain saturation voltage for impact ionization current	V^{-1}	0	-
A_{gidl}	Agidl	Pre-exponential GIDL constant	Ω^{-1}	0.0	-
B_{gidl}	Bgidl	GIDL exponential coefficient	V/m	2.3e9	-
C_{gidl}	Cgidl	Parameter for body bias effect on GIDL	V^3	0.5	
E_{gidl}	Egidl/ Ngidl	Fitting parameter for band bending for GIDL	V	1.2	If Egidl not given, Egidl=Ngidl if Ngidl given,; Else take the default Egidl was called Ngidl in BSIMSOI3
n_{tuns}	Ntun	Reverse tunneling non-ideality factor for	-	10.0	-

		source			
n_{tund}	Ntund	Reverse tunneling non-ideality factor for drain	-	10.0	-
n_{diodes}	Ndiode	Diode non-ideality factor for source	-	1.0	-
n_{dioded}	Ndioded	Diode non-ideality factor for drain	-	Default to its source value	-
n_{recf0s}	Nrecf0	Recombination non-ideality factor at forward bias for source	-	2.0	-
n_{recf0d}	Nrecf0d	Recombination non-ideality factor at forward bias for drain	-	Default to its source value	-
n_{recr0s}	Nrecr0	Recombination non-ideality factor at reversed bias for source	-	10	-
n_{recr0d}	Nrecr0d	Recombination non-ideality factor at reversed bias for drain	-	Default to its source value	-
i_{sbjt}	Isbjt	BJT injection saturation current	A/m^2	1e-6	-
I_{dbjt}	Idbjt	BJT injection saturation current	A/m^2	1e-6	-
i_{sdif}	Isdif	Body to source/drain injection saturation current	A/m^2	1e-7	-
I_{ddif}	Iddif	Body to source/drain injection saturation current	A/m^2	1e-7	-
i_{srec}	Isrec	Recombination in depletion saturation current	A/m^2	1e-5	-
I_{drec}	Idrec	Recombination in depletion saturation current	A/m^2	1e-5	-
i_{stun}	Istun	Reverse tunneling saturation current	A/m^2	0.0	-
I_{dtun}	Idtun	Reverse tunneling saturation current	A/m^2	0.0	-
Ln	Ln	Electron/hole diffusion length	m	2e-6	-
V_{rec0s}	Vrec0	Voltage dependent parameter for	V	0	-

		recombination current for source			
V_{rec0d}	Vrec0d	Voltage dependent parameter for recombination current for drain	V	Default to its source value	-
V_{tun0s}	Vtun0	Voltage dependent parameter for tunneling current for source	V	0	-
V_{tun0d}	Vtun0d	Voltage dependent parameter for tunneling current for drain	V	Default to its source value	-
N_{bjt}	Nbjt	Power coefficient of channel length dependency for bipolar current	-	1	-
L_{bjt0}	Lbjt0	Reference channel length for bipolar current	m	0.20e-6	-
V_{abjt}	Vabjt	Early voltage for bipolar current	V	10	-
A_{ely}	Aely	Channel length dependency of early voltage for bipolar current	V/m	0	-
A_{hlis}	Ahli	High level injection parameter for bipolar current for source	-	0	-
A_{hlid}	Ahlid	High level injection parameter for bipolar current for drain	-	Default to its source value	-
Rbody	Rbody	Intrinsic body contact sheet resistance	ohm/square	0.0	-
Rbsh	Rbsh	Extrinsic body contact sheet resistance	ohm/square	0.0	-
Rsh	rsh	Source drain sheet resistance in ohm per square	ohm/square	0.0	-
Rhalo	rhalo	Body halo sheet resistance	ohm/m	1e15	-
Rsw	Rsw	Zero bias lightly-doped source resistance per unit width for RDSMOD=1	$Ohm(um)^{WR}$	50	

Rdw	Rdw	Zero bias lightly-doped drain resistance per unit width for RDSMOD=1	Ohm(um)^{WR}	50	
Rswmin	Rswmin	Lightly-doped source resistance per unit width at high Vgs and zero Vbs for RDSMOD=1	Ohm(um)^{WR}	0	
Rdwmin	Rdwmin	Lightly-doped source resistance per unit width at high Vgs and zero Vbs for RDSMOD=1	Ohm(um)^{WR}	0	
Dvtp0	Dvtp0	First parameter for Vth shift due to pocket	m	0.0	
Dvtp1	Dvtp1	Second parameter for Vth shift due to pocket	v^{-1}	0.0	
Pdits	Pdits	Coefficient for drain-induced Vth shifts	v^{-1}	1e-20	
Pditsl	Pditsl	Length dependence of drain-induced Vth shifts	m^{-1}	0	
Pditsd	Pditsd	Vds dependence of drain-induced Vth shifts	v^{-1}	0	
Fprout	Fprout	Effect of pocket implant on rout degradation	$V/m^{0.5}$	0.0	
Minv	Minv	Vgsteff fitting parameter for moderate inversion		0.0	

B.4. Gate-to-body tunneling parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default
IgMod	igMod	Gate current model selector	-	0
Toxqm	toxqm	Oxide thickness for I_{gb} calculation	m	Tox
Ntox	ntox	Power term of gate current	-	1
Toxref	toxref	Target oxide thickness	m	2.5e-9
j_g	ebg	Effective bandgap in gate current calculation	V	1.2
a_{gb1}	alphaGB1	First Vox dependent parameter for gate current in inversion	1/V	.35
b_{gb1}	betaGB1	Second Vox dependent parameter for gate current in inversion	$1/V^2$	.03
V_{gb1}	vgb1	Third Vox dependent parameter for gate current in inversion	V	300
V_{EVB}	vevb	Vaux parameter for valence band electron tunneling	-	0.075
a_{gb2}	alphaGB2	First Vox dependent parameter for gate current in accumulation	1/V	.43
b_{gb2}	betaGB2	Second Vox dependent parameter for gate current in accumulation	$1/V^2$	.05
V_{gb2}	vgb2	ThirdVox dependent parameter for gate current in accumulation	V	17
V_{ECB}	vecb	Vaux parameter for conduction band electron tunneling	-	.026

B.5. AC and Capacitance Parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default	Notes (below the table)
Xpart	xpart	Charge partitioning rate flag	-	0	
CGS0	cgso	Non LDD region source-gate overlap capacitance per channel length	F/m	calcu-lated	**nC-1**
CGD0	cgdo	Non LDD region drain-gate overlap capacitance per channel length	F/m	calcu-lated	**nC-2**
CGEO	cgeo	Gate substrate overlap capacitance per unit channel length	F/m	0.0	-
Cjswgs	cjswg	Source (gate side) sidewall junction capacitance per unit width (normalized to 100nm T_{si})	F/m^2	1e-10	-
Cjswgd	cjswgd	Drain (gate side) sidewall junction capacitance per unit width (normalized to 100nm T_{si})	F/m^2	Default to its source value	-
Pbswgs	pbswg	Source (gate side) sidewall junction capacitance buit in potential	V	.7	-
Pbswgd	pbswgd	Drain (gate side) sidewall junction capacitance buit in potential	V	Default to its source value	-
Mjswgs	mjswg	Source (gate side) sidewall junction capacitance grading coefficient	V	0.5	-
Mjswgd	mjswgd	Drain (gate side) sidewall junction capacitance grading coefficient	V	Default to its source value	-
t_t	tt	Diffusion capacitance transit time coefficient	second	1e-12	-

N_{dif}	Ndif	Power coefficient of channel length dependency for diffusion capacitance	-	-1	-
L_{dif0}	Ldif0	Channel-length dependency coefficient of diffusion cap.	-	1	-
V_{sdfb}	vsdfb	Source/drain bottom diffusion capacitance flatband voltage	V	calcu-lated	nC-3
V_{sdth}	vsdth	Source/drain bottom diffusion capacitance threshold voltage	V	calcu-lated	nC-4
C_{sdmin}	csdmin	Source/drain bottom diffusion minimum capacitance	V	calcu-lated	nC-5
A_{sd}	asd	Source/drain bottom diffusion smoothing parameter	-	0.3	-
C_{sdesw}	csdesw	Source/drain sidewall fringing capacitance per unit length	F/m	0.0	-
CGSl	cgsl	Light doped source-gate region overlap capacitance	F/m	0.0	-
CGDl	cgdl	Light doped drain-gate region overlap capacitance	F/m	0.0	-
CKAPPA	ckappa	Coefficient for lightly doped region overlap capacitance fringing field capacitance	F/m	0.6	-
Cf	cf	Gate to source/drain fringing field capacitance	F/m	calcu-lated	**nC-6**
CLC	clc	Constant term for the short channel model	m	0.1×10^{-7}	-
CLE	cle	Exponential term for the short channel model	none	0.0	-
DLC	dlc	Length offset fitting parameter for gate charge	m	lint	-
DLCB	dlcb	Length offset fitting parameter for body	m	0	-

		charge			
DLBG	dlbg	Length offset fitting parameter for backgate charge	m	0.0	-
DWC	dwc	Width offset fitting parameter from C-V	m	wint	-
DelVt	delvt	Threshold voltage adjust for C-V	V	0.0	-
F_{body}	fbody	Scaling factor for body charge	-	1.0	-
acde	acde	Exponential coefficient for charge thickness in capMod=3 for accumulation and depletion regions.	m/V	1.0	-
moin	moin	Coefficient for the gate-bias dependent surface potential.	$V^{1/2}$	15.0	-

B.6. Temperature Parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default	Note
Tnom	tnom	Temperature at which parameters are expected	°C	27	-
mte	ute	Mobility temperature exponent	none	-1.5	-
Kt1	kt1	Temperature coefficient for threshold voltage	V	-0.11	-
Kt11	kt11	Channel length dependence of the temperature coefficient for threshold voltage	V*m	0.0	
Kt2	kt2	Body-bias coefficient of the Vth temperature effect	none	0.022	-
Ua1	ua1	Temperature coefficient for U_a	m/V	4.31e-9	-
Ub2	ub1	Temperature coefficient for U_b	$(m/V)^2$	-7.61e-18	-

Uc1	uc1	Temperature coefficient for Uc	1/V	-.056	**nT-1**
At	at	Temperature coefficient for saturation velocity	m/sec	3.3e4	-
Tcijswgs	tcjswg	Temperature coefficient of C_{jswgs}	1/K	0	-
Tpbswgs	tpbswg	Temperature coefficient of P_{bswgs}	V/K	0	-
Tcijswgd	tcjswgd	Temperature coefficient of C_{jswgd}	1/K	Default to its source value	-
Tpbswgd	tpbswgd	Temperature coefficient of P_{bswgd}	V/K	Default to its source value	-
Cth0	cth0	Normalized thermal capacity	(W*sec) / m°C	1e-5	-
Prt	prt	Temperature coefficient for Rdsw	Ω-μm	0	-
Rth0	rth0	Normalized thermal resistance	m°C/W	0	-
Nt_{recf}	Ntrecf	Temperature coefficient for N_{recf}	-	0	-
Nt_{recr}	Ntrecr	Temperature coefficient for N_{recr}	-	0	-
X_{bjt}	xbjt	Power dependence of j_{bjt} on temperature	-	1	-
X_{difs}	xdifs	Power dependence of j_{difs} on temperature	-	X_{bjt}	-
X_{recs}	xrecs	Power dependence of j_{recs} on temperature	-	1	-
X_{tuns}	xtuns	Power dependence of j_{tuns} on temperature	-	0	-
X_{difd}	xdifd	Power dependence of j_{difd} on temperature	-	X_{bjt}	-
X_{recd}	xrecd	Power dependence of j_{recd} on temperature	-	1	-
X_{tund}	xtund	Power dependence of j_{tund} on temperature	-	0	-
W_{th0}	Wth0	Minimum width for thermal resistance calculation	m	0	-

B.7. BSIMSOI Built-In Potential Lowering (ΔV_{bi}) Model Parameters

Symbol used in equation	Symbol used in SPICE	Description	Unit	Default
SoiMod	soiMod	SOI model selector. SoiMod=0: BSIMPD. SoiMod=1: unified model for PD&FD. SoiMod=2: ideal FD. SoiMod=3: auto selection by BSIMSOI	-	0
$V_{nonideal}$	vbsa	Offset voltage due to non-idealities	V	0
$N_{OFF,FD}$	nofffd	Smoothing parameter in FD module	-	1
$V_{OFF,FD}$	vofffd	Smoothing parameter in FD module	V	0
K_{1b}	K1b	First backgate body effect parameter	-	1
K_{2b}	K2b	Second backgate body effect parameter for short channel effect	-	0
D_{k2b}	dk2b	Third backgate body effect parameter for short channel effect	-	0
D_{vbd0}	dvbd0	First short channel effect parameter in FD module	-	0
D_{vbd1}	dvbd1	Second short channel effect parameter in FD module	-	0
MoinFD	moinfd	Gate bias dependence coefficient of surface potential in FD module	-	1e3
V_{bs0pd}	vbs0pd	Upper bound of built-in potential lowering for BSIMPD operation	V	0.0
V_{bs0fd}	vbs0fd	Lowering bound of built-in potential lowering for ideal FD operation	V	0.5

B.8. BSIMSOI RF Model Parameters

RgateMod	rgateMod	Gate resistance model selector rgateMod = 0 No gate resistance rgateMod = 1 Constant gate resistance rgateMod = 2 Rii model with variable resistance rgateMod = 3 Rii model with two nodes	-	0
RbodyMod	RbodyMod	RbodyMod=0 No body resistance model RbodyMod=1 Two-resistor body resistance model	-	0
Rshg	Rshg	Gate electrode sheet resistance	Ohm/square	0.1
XRCRG1	xrcrg1	Parameter for distributed channel-resistance effect for intrinsic input resistance	-	12.0
XRCRG2	xrcrg2	Parameter to account for the excess channel diffusion resistance for intrinsic input resistance	-	1.0
NGCON	ngcon	Number of gate contacts	-	1
XGW	xgw	Distance from the gate contact to the channel edge	m	0.0
XGL	xgl	Offset of the gate length due to variations in patterning	m	0.0
RBSB	rbsb	Resistance between sbNode and bNode	Ohm	50.0
RBDB	rbdb	Resistance between dbNode and bNode	Ohm	50.0
GBMIN	gbmin	Conductance parallel with RBSB/RBDB	mho	1e-12

B.9. BSIMSOI Noise Model Parameters

FnoiMod	fnoiMod	Flicker noise model selector	-	1
TnoiMod	TnoiMod	Thermal noise model selector	-	0

NTNOI	ntnoi	Noise factor for short-channel devices for TNOIMOD=0 or 2	-	1.0
TNOIA	Tnoia	Coefficient of channel length dependence of total channel thermal noise	-	1.5
TNOIB	Tnoib	Channel length dependence parameter for channel thermal noise partitioning	-	3.5
RNOIA	rnoia	Thermal noise parameter	-	0.577
RNOIB	rnoib	Thermal noise parameter	-	0.37
W0FLK	W0flk	Flicker noise width dependence parameter	-	-1
BF	bf	Flicker noise length dependence exponent	-	2.0

B.10. BSIMSOI Stress Model Parameters

SA (instance parameter)	sa	Distance between OD edge to poly from one side	m	0.0
SB (instance parameter)	sb	Distance between OD edge to poly from another side	m	0.0
SD (instance parameter)	sd	Distance between neighbouring fingers	m	0.0
SAREF	saref	Reference distance between OD and edge to poly of one side	m	1e-6
SBREF	sbref	Reference distance between OD and edge to poly of another side	m	1e-6
WLOD	Wlod	Width parameter for stress effect	M	0.0
KU0	Ku0	Mobility degradation/enhancement	M	0.0
KVSAT	Kvsat	Saturation velocity degradation/enhancement parameter for stress effect	M	0.0
TKU0	TKU0	Temperature coefficient of KU0		0.0
LKU0	LKU0	Length dependence of KU0		0.0
WKU0	WKU0	width dependence of KU0		0.0
PKU0	PKU0	Cross-term dependence of KU0		0.0
LLODKU0	LLODKU0	Length parameter for u0 stress effect		0.0
WLODKU0	WLODKU0	Width parameter for u0 stress effect		0.0
KVTH0	KVTH0	Threshold shift parameter for stress effect	Vm	0.0
LKVTH0	LKVTH0	Length dependence of KVHT0		0.0
WKVTH0	WKVTH0	Width dependence of KVHT0		0.0

PKVTH0	PKVTH0	Cross term dependence of KVHT0		0.0
LLODVTH	Llodvth	Length parameter for Vth stress effect		0.0
WLODVTH	Wlodvth	Width parameter for Vth stress effect		0.0
STK2	Stk2	K2 shift factor related to Vth0 change	M	0.0
LODK2	LODk2	K2 shift modification factor for stress effect		1.0
STETA0	Steta0	Eta0 shift factor related to vth0 change	M	0.0
LODETA0	Lodeta0	Eta0 shift modification factor for stress effect		1.0

B.11. Model Parameter Notes

nI-1. BSIMPD supports *capmod*=2 and 3 only. *Capmod=0* and *1* are not supported.

nI-2. In modern SOI technology, source/drain extension or LDD are commonly used. As a result, the source/drain junction depth (X_j) can be different from the silicon film thickness (T_{si}). By default, if X_j is not given, it is set to T_{si}. X_j is not allowed to be greater than T_{si}.

nI-3. BSIMPD refers substrate to the silicon below buried oxide, not the well region in BSIM3. It is used to calculate backgate flatband voltage (V_{fbb}) and parameters related to source/drain diffusion bottom capacitance (V_{sdth}, V_{sdfb}, C_{sdmin}). Positive n_{sub} means the same type of doping as the body and negative n_{sub} means opposite type of doping.

nC-1. If *cgso* is not given then it is calculated using:

if (*dlc* is given and is greater 0) then,

cgso = *p1* = (*dlc*cox*) - *cgs1*

if (the previously calculated *cgso* <0), then

cgso = 0

else *cgso* = 0.6 * *Tsi* * *cox*

nC-2. *Cgdo* is calculated in a way similar to *Csdo*

nC-3. If (n_{sub} is positive)

$$V_{sdfb} = -\frac{kT}{q}\log\left(\frac{10^{20}\cdot n_{sub}}{n_i \cdot n_i}\right) - 0.3$$

else

$$V_{sdfb} = -\frac{kT}{q}\log\left(\frac{10^{20}}{n_{sub}}\right) + 0.3$$

nC-4. If (n_{sub} is positive)

$$f_{sd} = 2\frac{kT}{q}\log\left(\frac{n_{sub}}{n_i}\right),\ g_{sd} = \frac{5.753\times10^{-12}\sqrt{n_{sub}}}{C_{box}}$$

$$V_{sdth} = V_{sdfb} + f_{sd} + g_{sd}\sqrt{f_{sd}}$$

else

$$f_{sd} = 2\frac{kT}{q}\log\left(-\frac{n_{sub}}{n_i}\right),\ g_{sd} = \frac{5.753\times10^{-12}\sqrt{-n_{sub}}}{C_{box}}$$

$$V_{sdth} = V_{sdfb} - f_{sd} - g_{sd}\sqrt{f_{sd}}$$

nC-5. $X_{sddep} = \sqrt{\frac{2e_{si}f_{sd}}{q\left|n_{sub}\cdot10^{6}\right|}}$, $C_{sddep} = \frac{e_{si}}{X_{sddep}}$, $C_{sd\,\min} = \frac{C_{sddep}C_{box}}{C_{sddep}+C_{box}}$

nC-6. If cf is not given then it is calculated using

$$CF = \frac{2e_{ox}}{p}\ln\left(1+\frac{4\times10^{-7}}{T_{ox}}\right)$$

nT-1. For mobmod=1 and 2, the unit is m/V^2. Default is -5.6E-11. For mobmod=3, unit is 1/V and default is -0.056.