Appendix A: Complete Parameter List

A.1 BSIM4.0.0 Model Selectors/Controllers

Parameter name	**Description**	**Default value**	**Binnable?**	**Note**
LEVEL **(SPICE3 parameter)**	SPICE3 model selector	14	NA	BSIM4 also set as the default model in SPICE3
VERSION	Model version number	4.0.0	NA	Berkeley Latest official release
BINUNIT	Binning unit selector	1	NA	-
PARAMCHK	Switch for parameter value check	1	NA	Parameters checked
MOBMOD	Mobility model selector	0	NA	-
RDSMOD	Bias-dependent source/drain resistance model selector	0	NA	$R_{ds}(V)$ modeled internally through IV equation
IGCMOD	Gate-to-channel tunneling current model selector	0	NA	OFF
IGBMOD	Gate-to-substrate tunneling current model selector	0	NA	OFF
CAPMOD	Capacitance model selector	2	NA	-
RGATEMOD **(Also an instance parameter)**	Gate resistance model selector	0 (no gate resistance)		-

Parameter name	Description	Default value	Binnable?	Note
RBODYMOD **(Also an instance parameter)**	Substrate resistance network model selector	0 (network off)	NA	-
TRNQSMOD **(Also an instance parameter)**	Transient NQS model selector	0	NA	OFF
ACNQSMOD **(Also an instance parameter)**	AC small-signal NQS model selector	0	NA	OFF
FNOIMOD	Flicker noise model selector	1	NA	-
TNOIMOD	Thermal noise model selector	0	NA	-
DIOMOD	Source/drain junction diode IV model selector	1	NA	-
PERMOD	Whether PS/PD (when given) includes the gate-edge perimeter	1 (including the gate-edge perime-ter)	NA	-
GEOMOD **(Also an instance parameter)**	Geometry-dependent parasitics model selector - specifying how the end S/D diffusions are connected	0 (isolated)	NA	-
RGEOMOD **(Instance parameter only)**	Source/drain diffusion resistance and contact model selector - specifying the end S/D contact type: point, wide or merged, and how S/D parasitics resis-tance is computed	0 (no S/D diffusion resistance)	NA	-

A.2 Process Parameters

Parameter name	Description	Default value	Binnable?	Note
EPSROX	Gate dielectric constant relative to vacuum	3.9 (SiO_2)	No	Typically greater than or equal to 3.9
TOXE	Electrical gate equivalent oxide thickness	3.0e-9m	No	Fatal error if not positive
TOXP	Physical gate equivalent oxide thickness	TOXE	No	Fatal error if not positive
TOXM	Tox at which parameters are extracted	TOXE	No	Fatal error if not positive
DTOX	Defined as (TOXE-TOXP)	0.0m	No	-
XJ	S/D junction depth	1.5e-7m	Yes	-
GAMMA1 (γ1 in equation)	Body-effect coefficient near the surface	calculated	$V^{1/2}$	Note-1
GAMMA2 (γ2 in equation)	Body-effect coefficient in the bulk	calculated	$V^{1/2}$	Note-1
NDEP	Channel doping concentration at depletion edge for zero body bias	1.7e17cm^{-3}	Yes	Note-2
NSUB	Substrate doping concentration	6.0e16cm^{-3}	Yes	-
NGATE	Poly Si gate doping concentration	0.0cm^{-3}	Yes	-
NSD	Source/drain doping concentrationFatal error if not positive	1.0e20cm^{-3}	Yes	-
VBX	V_{bs} at which the depletion region width equalsXT	calculated (V)	No	Note-3
XT	Doping depth	1.55e-7m	Yes	-

Parameter name	Description	Default value	Binnable?	Note
RSH	Source/drain sheet resistance	0.0ohm/ square	No	Should not be negative
RSHG	Gate electrode sheet resistance	0.1ohm/ square	No	Shoule not be negative

A.3 Basic Model Parameters

Parameter name	Description	Default value	Binnable?	Note
VTH0 or VTHO	Long-channel threshold voltage at V_{bs}=0	0.7V (NMOS) -0.7V (PMOS)	Yes	Note-4
VFB	Flat-band voltage	-1.0V	Yes	Note-4
PHIN	Non-uniform vertical doping effect on surface potential	0.0V	Yes	-
K1	First-order body bias coefficient	$0.5V^{1/2}$	Yes	Note-5
K2	Second-order body bias coefficient	0.0	Yes	Note-5
K3	Narrow width coefficient	80.0	Yes	-
K3B	Body effect coefficient of K3	$0.0\ V^{-1}$	Yes	-
W0	Narrow width parameter	2.5e-6m	Yes	-
LPE0	Lateral non-uniform doping parameter at V_{bs}=0	1.74e-7m	Yes	-
LPEB	Lateral non-uniform doping effect on K1	0.0m	Yes	-
VBM	Maximum applied body bias in VTH0 calculation	-3.0V	Yes	-
DVT0	First coefficient of short-channel effect on V_{th}	2.2	Yes	-
DVT1	Second coefficient of short-channel effect on V_{th}	0.53	Yes	-
DVT2	Body-bias coefficient of short-channel effect on Vth	$-0.032V^{-1}$	Yes	-
DVTP0	First coefficient of drain-induced V_{th} shift due to for long-channel pocket devices	0.0m	Yes	Not modeled if binned DVTP0 <=0.0
DVTP1	First coefficient of drain-induced V_{th} shift due to for long-channel pocket devices	$0.0V^{-1}$	Yes	-

Parameter name	Description	Default value	Binnable?	Note
DVT0W	First coefficient of narrow width effect on V_{th} for small channel length	0.0	Yes	-
DVT1W	Second coefficient of narrow width effect on V_{th} for small channel length	5.3e6m^{-1}	Yes	-
DVT2W	Body-bias coefficient of narrow width effect for small channel length	-0.032V^{-1}	Yes	-
U0	Low-field mobility	0.067 $m^2/(Vs)$ (NMOS); 0.025 $m^2/(Vs)$ PMOS	Yes	-
UA	Coefficient of first-order mobility degradation due to vertical field	1.0e-9m/V for MOBMOD =0 and 1; 1.0e-15m/V for MOBMOD =2	Yes	-
UB	Coefficient of secon-order mobility degradation due to vertical field	1.0e-19m^2/V^2	Yes	-
UC	Coefficient of mobility degradation due to body-bias effect	-0.0465V^{-1} for MOB-MOD=1; -0.0465e-9 m/V^2 for MOBMOD =0 and 2	Yes	-
EU	Exponent for mobility degradation of MOBMOD=2	1.67 (NMOS); 1.0 (PMOS)		-
VSAT	Saturation velocity	8.0e4m/s	Yes	-

Parameter name	Description	Default value	Binnable?	Note
A0	Coefficient of channel-length dependence of bulk charge effect	1.0	Yes	-
AGS	Coefficient of V_{gs} dependence of bulk charge effect	$0.0V^{-1}$	Yes	-
B0	Bulk charge effect coefficient for channel width	0.0m	Yes	-
B1	Bulk charge effect width offset	0.0m	Yes	-
KETA	Body-bias coefficient of bulk charge effect	$-0.047V^{-1}$	Yes	-
A1	First non-saturation effect parameter	$0.0V^{-1}$	Yes	-
A2	Second non-saturation factor	1.0	Yes	-
WINT	Channel-width offset parameter	0.0m	No	-
LINT	Channel-length offset parameter	0.0m	No	-
DWG	Coefficient of gate bias dependence of W_{eff}	0.0m/V	Yes	-
DWB	Coefficient of body bias dependence of W_{eff} bias dependence	$0.0m/V^{1/2}$	Yes	-
VOFF	Offset voltage in subthreshold region for large W and L	-0.08V	Yes	-
VOFFL	Channel-length dependence of VOFF	0.0mV	No	-
MINV	V_{gsteff} fitting parameter for moderate inversion condition	0.0	Yes	-
NFACTOR	Subthreshold swing factor	1.0	Yes	-
ETA0	DIBL coefficient in subthreshold region	0.08	Yes	-
ETAB	Body-bias coefficient for the subthreshold DIBL effect	$-0.07V^{-1}$	Yes	-
DSUB	DIBL coefficient exponent in subthreshold region	DROUT	Yes	-
CIT	Interface trap capacitance	$0.0F/m^2$	Yes	-

Parameter name	Description	Default value	Binnable?	Note
CDSC	coupling capacitance between source/ drain and channel	2.4e-4F/m^2	Yes	-
CDSCB	Body-bias sensitivity of Cdsc	0.0F/(Vm^2)	Yes	-
CDSCD	Drain-bias sensitivity of CDSC	0.0(F/Vm^2)	Yes	-
PCLM	Channel length modulation parameter	1.3	Yes	-
PDIBLC1	Parameter for DIBL effect on Rout	0.39	Yes	-
PDIBLC2	Parameter for DIBL effect on Rout	0.0086	Yes	-
PDIBLCB	Body bias coefficient of DIBL effect on Rout	0.0V^{-1}	Yes	-
DROUT	Channel-length dependence of DIBL effect on Rout	0.56	Yes	-
PSCBE1	First substrate current induced body-effect parameter	4.24e8V/m	Yes	-
PSCBE2	Second substrate current induced body-effect parameter	1.0e-5m/V	Yes	-
PVAG	Gate-bias dependence of Early voltage	0.0	Yes	-
DELTA (δ in equation)	Parameter for DC V_{dseff}	0.01V	Yes	-
FPROUT	Effect of pocket implant on Rout degradation	0.0V/$m^{0.5}$	Yes	Not modeled if binned FPROUT not positive
PDITS	Impact of drain-induced V_{th} shift on Rout	0.0V^{-1}	Yes	Not modeled if binned PDITS=0; Fatal error if binned PDITS negative

Parameter name	Description	Default value	Binnable?	Note
PDITSL	Channel-length dependence of drain-induced V_{th} shift for Rout	$0.0m^{-1}$	No	Fatal error if PDITSL negative
PDITSD	V_{ds} dependence of drain-induced V_{th} shift for Rout	$0.0V^{-1}$	Yes	-

A.4 Parameters for Asymmetric and Bias-Dependent R_{ds} Model

Parameter name	Description	Default value	Binnable?	Note
RDSW	Zero bias LDD resistance per unit width for RDSMOD=0	200.0 ohm(μm)^{WR}	Yes	If negative, reset to 0.0
RDSWMIN	LDD resistance per unit width at high V_{gs} and zero V_{bs} for RDSMOD=0	0.0 ohm(μm)^{WR}	No	-
RDW	Zero bias lightly-doped drain resistance $R_d(V)$ per unit width for RDSMOD=1	100.0 ohm(μm)^{WR}	Yes	-
RDWMIN	Lightly-doped drain resistance per unit width at high V_{gs} and zero V_{bs} for RDSMOD=1	0.0 ohm(μm)^{WR}	No	-
RSW	Zero bias lightly-doped source resistance $R_s(V)$ per unit width for RDSMOD=1	100.0 ohm(μm)^{WR}	Yes	-
RSWMIN	Lightly-doped source resistance per unit width at high V_{gs} and zero V_{bs} for RDSMOD=1	0.0 ohm(μm)^{WR}	No	-
PRWG	Gate-bias dependence of LDD resistance	1.0V^{-1}	Yes	-
PRWB	Body-bias dependence of LDD resistance	0.0V$^{-0.5}$	Yes	-
WR	Channel-width dependence parameter of LDD resistance	1.0	Yes	-
NRS **(instance parameter only)**	Number of source diffusion squares	1.0	No	-
NRD **(instance parameter only)**	Number of drain diffusion squares	1.0	No	-

A.5 Impact Ionization Current Model Parameters

Parameter name	Description	Default value	Binnable?	Note
ALPHA0	First parameter of impact ionization current	0.0Am/V	Yes	-
ALPHA1	Isub parameter for length scaling	0.0A/V	Yes	-
BETA0	The second parameter of impact ionization current	30.0V	Yes	-

A.6 Gate-Induced Drain Leakage Model Parameters

Parameter name	Description	Default value	Binnable?	Note
AGIDL	Pre-exponential coefficient for GIDL	0.0mho	Yes	I_{gidl}=0.0 if binned AGIDL =0.0
BGIDL	Exponential coefficient for GIDL	2.3e9V/m	Yes	I_{gidl}=0.0 if binned BGIDL =0.0
CGIDL	Paramter for body-bias effect on GIDL	$0.5V^3$	Yes	-
EGIDL	Fitting parameter for band bending for GIDL	0.8V	Yes	-

A.7 Gate Dielectric Tunneling Current Model Parameters

Parameter name	Description	Default value	Binnable?	Note
AIGBACC	Parameter for I_{gb} in accumulation	0.43 $(Fs^2/g)^{0.5}m^{-1}$	Yes	-
BIGBACC	Parameter for I_{gb} in accumulation	0.054 $(Fs^2/g)^{0.5}$ $m^{-1}V^{-1}$	Yes	-
CIGBACC	Parameter for I_{gb} in accumulation	$0.075V^{-1}$	Yes	-
NIGBACC	Parameter for I_{gb} in accumulation	1.0	Yes	Fatal error if binned value not positive
AIGBINV	Parameter for I_{gb} in inversion	0.35 $(Fs^2/g)^{0.5}m^{-1}$	Yes	-
BIGBINV	Parameter for I_{gb} in inversion	0.03 $(Fs^2/g)^{0.5}$ $m^{-1}V^{-1}$	Yes	-
CIGBINV	Parameter for I_{gb} in inversion	$0.006V^{-1}$	Yes	-
EIGBINV	Parameter for I_{gb} in inversion	1.1V	Yes	-
NIGBINV	Parameter for I_{gb} in inversion	3.0	Yes	Fatal error if binned value not positive
AIGC	Parameter for I_{gcs} and I_{gcd}	0.054 (NMOS) and 0.31 (PMOS) $(Fs^2/g)^{0.5}m^{-1}$	Yes	-

Parameter name	Description	Default value	Binnable?	Note
BIGC	Parameter for I_{gcs} and I_{gcd}	0.054 (NMOS) and 0.024 (PMOS) $(Fs^2/g)^{0.5} m^{-1}V^{-1}$	Yes	-
CIGC	Parameter for I_{gcs} and I_{gcd}	0.075 (NMOS) and 0.03 (PMOS) V^{-1}	Yes	-
AIGSD	Parameter for I_{gs} and I_{gd}	0.43 (NMOS) and 0.31 (PMOS) $(Fs^2/g)^{0.5}m^{-1}$	Yes	-
BIGSD	Parameter for I_{gs} and I_{gd}	0.054 (NMOS) and 0.024 (PMOS) $(Fs^2/g)^{0.5} m^{-1}V^{-1}$	Yes	-
CIGSD	Parameter for I_{gs} and I_{gd}	0.075 (NMOS) and 0.03 (PMOS) V^{-1}	Yes	-
DLCIG	Source/drain overlap length for I_{gs} and I_{gd}	LINT	Yes	-
NIGC	Parameter for I_{gcs}, I_{gcd} ,I_{gs} and I_{gd}	1.0	Yes	Fatal error if binned value not positive
POXEDGE	Factor for the gate oxide thickness in source/drain overlap regions	1.0	Yes	Fatal error if binned value not positive

Parameter name	Description	Default value	Binnable?	Note
PIGCD	V_{ds} dependence of I_{gcs} and I_{gcd}	1.0	Yes	Fatal error if binned value not positive
NTOX	Exponent for the gate oxide ratio	1.0	Yes	-
TOXREF	Nominal gate oxide thickness for gate dielectric tunneling current model only	3.0e-9m	No	Fatal error if not positive

A.8 Charge and Capacitance Model Parameters

Parameter name	Description	Default value	Binnable?	Note
XPART	Charge partition parameter	0.0	No	-
CGSO	Non LDD region source-gate overlap capacitance per unit channel width	calculated (F/m)	No	Note-6
CGDO	Non LDD region drain-gate overlap capacitance per unit channel width	calculated (F/m)	No	Note-6
CGBO	Gate-bulk overlap capacitance per unit channel length	0.0	F/m	Note-6
CGSL	Overlap capacitance between gate and lightly-doped source region	0.0F/m	Yes	-
CGDL	Overlap capacitance between gate and lightly-doped source region	0.0F/m	Yes	-
CKAPPAS	Coefficient of bias-dependent overlap capacitance for the source side	0.6V	Yes	-
CKAPPAD	Coefficient of bias-dependent overlap capacitance for the drain side	CKAPPAS	Yes	-
CF	Fringing field capacitance	calculated (F/m)	Yes	Note-7
CLC	Constant term for the short channel model	1.0e-7m	Yes	-
CLE	Exponential term for the short channel model	0.6	Yes	-
DLC	Channel-length offset parameter for CV model	LINT (m)	No	-
DWC	Channel-width offset parameter for CV model	WINT (m)	No	-
VFBCV	Flat-band voltage parameter (for CAPMOD=0 only)	-1.0V	Yes	-
NOFF	CV parameter in $V_{gsteff,CV}$ for weak to strong inversion	1.0	Yes	-
VOFFCV	CV parameter in $V_{gsteff,CV}$ for week to strong inversion	0.0V	Yes	-

Parameter name	Description	Default value	Binnable?	Note
ACDE	Exponential coefficient for charge thickness in CAPMOD=2 for accumulation and depletion regions	1.0m/V	Yes	-
MOIN	Coefficient for the gate-bias dependent surface potential	15.0	Yes	-

A.9 High-Speed/RF Model Parameters

Parameter name	Description	Default value	Binnable?	Note
XRCRG1	Parameter for distributed channel-resistance effect for both intrinsic-input resistance and charge-deficit NQS models	12.0	Yes	Warning message issued if binned XRCRG1 <=0.0
XRCRG2	Parameter to account for the excess channel diffusion resistance for both intrinsic input resistance and charge-deficit NQS models	1.0	Yes	-
RBPB **(Also an instance parameter)**	Resistance connected between bNodePrime and bNode	50.0ohm	No	If less than 1.0e-3ohm, reset to 1.0e-3ohm
RBPD **(Also an instance parameter)**	Resistance connected between bNodePrime and dbNode	50.0ohm	No	If less than 1.0e-3ohm, reset to 1.0e-3ohm
RBPS **(Also an instance parameter)**	Resistance connected between bNodePrime and sbNode	50.0ohm	No	If less than 1.0e-3ohm, reset to 1.0e-3ohm
RBDB **(Also an instance parameter)**	Resistance connected between dbNode and bNode	50.0ohm	No	If less than 1.0e-3ohm, reset to 1.0e-3ohm
RBSB **(Also an instance parameter)**	Resistance connected between sbNode and bNode	50.0ohm	No	If less than 1.0e-3ohm, reset to 1.0e-3ohm
GBMIN	Conductance in parallel with each of the five substrate resistances to avoid potential numerical instability due to unreasonably too large a substrate resistance	1.0e-12mho	No	Warning message issued if less than 1.0e-20 mho

A.10 Flicker and Thermal Noise Model Parameters

Parameter name	Description	Default value	Binnable?	Note
NOIA	Flicker noise parameter A	6.25e41 $(eV)^{-1}s^{1-EF}m^{-3}$ for NMOS; 6.188e40 $(eV)^{-1}s^{1-EF}m^{-3}$ for PMOS	No	-
NOIB	Flicker noise parameter B	3.125e26 $(eV)^{-1}s^{1-EF}m^{-1}$ for NMOS; 1.5e25 $(eV)^{-1}s^{1-EF}m^{-1}$ for PMOS	No	-
NOIC	Flicker noise parameter C	8.75 $(eV)^{-1}s^{1-EF}m$	No	-
EM	Saturation field	4.1e7V/m	No	-
AF	Flicker noise exponent	1.0	No	-
EF	Flicker noise frequency exponent	1.0	No	-
KF	Flicker noise coefficient	0.0 $A^{2-EF}s^{1-EF}F$	No	-
NTNOI	Noise factor for short-channel devices for TNOIMOD=0 only	1.0	No	-
TNOIA	Coefficient of channel-length dependence of total channel thermal noise	1.5	No	-
TNOIB	Channel-length dependence parameter for channel thermal noise partitioning	3.5	No	-

A.11 Layout-Dependent Parasitics Model Parameters

Parameter name	Description	Default value	Binnable?	Note
DMCG	Distance from S/D contact center to the gate edge	0.0m	No	-
DMCI	Distance from S/D contact center to the isolation edge in the channel-length direction	DMCG	No	-
DMDG	Same as DMCG but for merged device only	0.0m	No	-
DMCGT	DMCG of test structures	0.0m	No	-
NF **(instance parameter only)**	Number of device fingers	1	No	Fatal error if less than one
DWJ	Offset of the S/D junction width	DWC (in CVmodel)	No	-
MIN **(instance parameter only)**	Whether to minimize the number of drain or source diffusions for even-number fingered device	0 (minimize the drain diffusion number)	No	-
XGW	Distance from the gate contact to the channel edge	0.0m	No	-
XGL	Offset of the gate length due to variations in patterning	0.0m	No	-
XL	Channel length offset due to mask/etch effect	0.0m	No	-

Parameter name	Description	Default value	Binnable?	Note
XW	Channel width offset due to mask/etch effect	0.0m	No	-
NGCON	Number of gate contacts	1	No	Fatal error if less than one; if not equal to 1 or 2, warning message issued and reset to 1

A.12 Asymmetric Source/Drain Junction Diode Model Parameters

Parameter name (separate for source and drain side as indicated in the names)	**Description**	**Default value**	**Binnable?**	**Note**
IJTHSREV IJTHDREV	Limiting current in reverse bias region	IJTHSREV =0.1A IJTHDREV =IJTHSREV	No	If not positive, reset to 0.1A
IJTHSFWD IJTHDFWD	Limiting current in forward bias region	IJTHSFWD =0.1A IJTHDFWD =IJTHS-FWD	No	If not positive, reset to 0.1A
XJBVS XJBVD	Fitting parameter for diode breakdown	XJBVS=1.0 XJBVD =XJBVS	No	Note-8
BVS BVD	Breakdown voltage	BVS=10.0V BVD=BVS	No	If not positive, reset to 10.0V
JSS JSD	Bottom junction reverse saturation current density	JSS= 1.0e-4A/m^2 JSD=JSS	No	-
JSWS JSWD	Isolation-edge sidewall reverse saturation current density	JSWS =0.0A/m JSWD =JSWS	No	-

Parameter name (separate for source and drain side as indicated in the names)	**Description**	**Default value**	**Binnable?**	**Note**
JSWGS JSWGD	Gate-edge sidewall reverse saturation current density	JSWGS =0.0A/m JSWGD =JSWGS	No	-
CJS CJD	Bottom junction capacitance per unit area at zero bias	CJS=5.0e-4 F/m^2 CJD=CJS	No	-
MJS MJD	Bottom junction capacitance grating coefficient	MJS=0.5 MJD=MJS	No	-
MJSWS MJSWD	Isolation-edge sidewall junction capacitance grading coefficient	MJSWS =0.33 MJSWD =MJSWS	No	-
CJSWS CJSWD	Isolation-edge sidewall junction capacitance per unit area	CJSWS= 5.0e-10 F/m CJSWD =CJSWS	No	-
CJSWGS CJSWGD	Gate-edge sidewall junction capacitance per unit length	CJSWGS =CJSWS CJSWGD =CJSWS	No	-
MJSWGS MJSWGD	Gate-edge sidewall junction capacitance grading coefficient	MJSWGS =MJSWS MJSWGD =MJSWS	No	-

Parameter name (separate for source and drain side as indicated in the names)	**Description**	**Default value**	**Binnable?**	**Note**
PB	Bottom junction built-in potential	PBS=1.0V PBD=PBS	No	-
PBSWS PBSWD	Isolation-edge sidewall junction built-in potential	PBSWS =1.0V PBSWD =PBSWS	No	-
PBSWGS PBSWGD	Gate-edge sidewall junction built-in potential	PBSWGS =PBSWS PBSWGD =PBSWS	No	-

A.13 Temperature Dependence Parameters

Parameter name	Description	Default value	Binnable?	Note
TNOM	Temperature at which parameters are extracted	27°C	No	-
UTE	Mobility temperature exponent	-1.5	Yes	-
KT1	Temperature coefficient for threshold voltage	-0.11V	Yes	-
KT1L	Channel length dependence of the temperature coefficient for threshold voltage	0.0Vm	Yes	-
KT2	Body-bias coefficient of Vth temperature effect	0.022	Yes	-
UA1	Temperature coefficient for UA	1.0e-9m/V	Yes	-
UB1	Temperature coefficient for UB	-1.0e-18 $(m/V)^2$	Yes	-
UC1	Temperature coefficient for UC	$0.056V^{-1}$ for MOBMOD=1; 0.056e-9m/V^2 for MOBMOD=0 and 2	Yes	-
AT	Temperature coefficient for saturation velocity	3.3e4m/s	Yes	-
PRT	Temperature coefficient for Rdsw	0.0ohm-m	Yes	-
NJS, NJD	Emission coefficients of junction for source and drain junctions, respectively	NJS=1.0; NJD=NJS	No	-
XTIS, XTID	Junction current temperature exponents for source and drain junctions, respectively	XTIS=3.0; XTID=XTIS	No	-

Parameter name	Description	Default value	Binnable?	Note
TPB	Temperature coefficient of PB	0.0V/K	No	-
TPBSW	Temperature coefficient of PBSW	0.0V/K	No	-
TPBSWG	Temperature coefficient of PBSWG	0.0V/K	No	-
TCJ	Temperature coefficient of CJ	$0.0K^{-1}$	No	-
TCJSW	Temperature coefficient of CJSW	$0.0K^{-1}$	No	-
TCJSWG	Temperature coefficient of CJSWG	$0.0K^{-1}$	No	-

A.14 *dW* and *dL* Parameters

Parameter name	Description	Default name	Binnable?	Note
WL	Coefficient of length dependence for width offset	$0.0m^{WLN}$	No	-
WLN	Power of length dependence of width offset	1.0	No	-
WW	Coefficient of width dependence for width offset	$0.0m^{WWN}$	No	-
WWN	Power of width dependence of width offset	1.0	No	-
WWL	Coefficient of length and width cross term dependence for width offset	$0.0\ m^{WWN+WLN}$	No	-
LL	Coefficient of length dependence for length offset	$0.0m^{LLN}$	No	-
LLN	Power of length dependence for length offset	1.0	No	-
LW	Coefficient of width dependence for length offset	$0.0m^{LWN}$	No	-
LWN	Power of width dependence for length offset	1.0	No	-
LWL	Coefficient of length and width cross term dependence for length offset	$0.0\ m^{LWN+LLN}$	No	-
LLC	Coefficient of length dependence for CV channel length offset	LL	No	-
LWC	Coefficient of width dependence for CV channel length offset	LW	No	-
LWLC	Coefficient of length and width cross-term dependence for CV channel length offset	LWL	No	-
WLC	Coefficient of length dependence for CV channel width offset	WL	No	-

Parameter name	Descrition	Default name	Binnable?	Note
WWC	Coefficient of width dependence for CV channel width offset	WW	No	-
WWLC	Coefficient of length and width cross-term dependence for CV channel width offset	WWL	No	-

A.15 Range Parameters for Model Application

Parameter name	Description	Default value	Binnable?	Note
LMIN	Minimum channel length	0.0m	No	-
LMAX	Maximum channel length	1.0m	No	-
WMIN	Minimum channel width	0.0m	No	-
WMAX	Maximum channel width	1.0m	No	-

A.16 Notes 1-8

Note-1: If γ_1 is not given, it is calculated by

$$g_1 = \frac{\sqrt{2qe_{si}NDEP}}{C_{oxe}}$$

If γ_2 is not given, it is calculated by

$$g_2 = \frac{\sqrt{2qe_{si}NSUB}}{C_{oxe}}$$

Note-2: If *NDEP* is not given and γ_1 is given, *NDEP* is calculated from

$$NDEP = \frac{g_1^2 C_{oxe}^2}{2qe_{si}}$$

If both γ_1 and *NDEP* are not given, *NDEP* defaults to 1.7e17cm^{-3} and γ_1 is calculated from *NDEP*.

Note-3: If *VBX* is not given, it is calculated by

$$\frac{qNDEP \cdot XT^2}{2e_{si}} = \Phi_s - VBX$$

Note-4: If *VTH*0 is not given, it is calculated by

$$VTH0 = VFB + \Phi_s + K1\sqrt{\Phi_s - V_{bs}}$$

where *VFB* = -1.0. If *VTH*0 is given, *VFB* defaults to

$$VFB = VTH0 - \Phi_s - K1\sqrt{\Phi_s - V_{bs}}$$

Note-5: If K_1 and K_2 are not given, they are calculated by

$$K1 = g_2 - 2K2\sqrt{\Phi_s - VBM}$$

$$K2 = \frac{(g_1 - g_2)\left(\sqrt{\Phi_s - VBX} - \sqrt{\Phi_s}\right)}{2\sqrt{\Phi_s}\left(\sqrt{\Phi_s - VBM} - \sqrt{\Phi_s}\right) + VBM}$$

Note-6: If *CGSO* is not given, it is calculated by

If (*DLC* is given and > 0.0)

$$CGSO = DLC \cdot C_{oxe} - CGSL$$

if (*CGSO* < 0.0), *CGSO* = 0.0

Else

$$CGSO = 0.6 \cdot XJ \cdot C_{oxe}$$

If *CGDO* is not given, it is calculated by

If (*DLC* is given and > 0.0)

$$CGDO = DLC \cdot C_{oxe} - CGDL$$

if (*CGDO* < 0.0), *CGDO* = 0.0

Else

$$CGDO = 0.6 \cdot XJ \cdot C_{oxe}$$

If *CGBO* is not given, it is calculated by

$$CGBO = 2 \cdot DWC \cdot C_{oxe}$$

Note-7: If *CF* is not given, it is calculated by

$$CF = \frac{2 \cdot EPSROX \cdot \varepsilon_0}{\pi} \cdot \log\left(1 + \frac{4.0e-7}{TOXE}\right)$$

Note-8:

For ***dioMod*** = 0, if *XJBVS* < 0.0, it is reset to 1.0.

For ***dioMod*** = 2, if *XJBVS* <=0.0, it is reset to 1.0.

For ***dioMod*** = 0, if *XJBVD* < 0.0, it is reset to 1.0.

For ***dioMod*** = 2, if *XJBVD* <=0.0, it is reset to 1.0.

